Calix

2019 Annual Meeting

Proxy Statement | 2018 Annual Report

Calix

April 2, 2019

Fellow Calix stockholders:

Our mission is to connect everyone and everything. Calix platforms empower our customers to build new business models, rapidly deploy new services and make the promise of the smart home and business a reality.

Our vision is focused on providing the platforms and services that enable innovative service providers to create services at a DevOps pace and provide their subscribers with an exceptional experience. Service providers achieve this objective by building their infrastructure and service offerings on platforms.

Our relentless focus over the past few years on the transformation of Calix into a communications cloud and software platform, systems and services business yielded further progress in 2018. Over the long term, we believe this transformation will manifest in improved financial performance across four measurable metrics:

- Gross margin expansion
- Disciplined operating expense investment
- Deliberate revenue growth
- Increased predictability

We are happy to report in 2018 we continued to deliver on these objectives and expect these metrics will continue to improve as our platforms and related services increase as a percentage of our total business. We will continue to take every opportunity to simplify our business and increase our focus on our all-platform solutions. In the first quarter of 2018, we did just that by selling our cabinet business to a long-standing partner, Clearfield, which sharpened our organizational focus on our all-platform solutions while putting these assets in the hands of a focused supply chain partner. We also relocated our global headquarters from Petaluma, CA to San Jose, CA, putting us in the heart of the innovation capital of the world. With our transformation to an all platform company, we evaluated our existing global footprint, streamlining it by more than 40% while maintaining our accelerated pace of innovation.

Additional examples of our progress made in 2018 were:

- Added 119 new customers spanning all classes of communications service providers;
- More than doubled Calix Cloud bookings and revenue;
- Established strong market traction with our EXOS-powered platform with more than 100 early adopters;
- Increased number of AXOS platform licenses more than five-fold;
- Achieved production status in Verizon's Intelligent Edge Network with our AXOS E9-2 solution for NGPON2;
- AXOS platform selected by UK-based CityFibre for its multi-gigabit network build-out in the UK to as many as five million households through 2025;
- Achieved a new benchmark for our mesh-enhanced carrier class Wi-Fi solutions with more than 600 service providers purchasing the solution in 2018;

- Entered into a strategic co-creation partnership with Infosys, a significant step in the development of our AXOS ecosystem; and
- Enhanced our value-added services offerings with the launch of Remote Monitoring Services allowing our customers to dramatically reduce operating costs.

In summary, we made significant progress towards our mission in 2018, and as we continue to execute, we expect to see our performance improve over the long-term. In 2018, we grew our customer base, expanded our gross margin and continued to demonstrate discipline in operating expense investment, all of which we believe reflect the benefits inherent in our all-platform solutions.

Our platform solutions enable us to win across all types of communications service providers, including traditional wireline, cable/MSO, hospitality, fiber overbuilders, municipalities, utilities and cooperatives. With an expanding pipeline of opportunities spanning service providers of every type, Calix … an all-platform company … is well positioned in front of the largest wave of disruption our industry has ever experienced. We remain committed to our vision.

As always, I want to thank you – my fellow Calix stockholders, customers, suppliers and employees – for your continued support. As we completed the transformation of Calix over the last several years, we made significant investments in people, systems and platforms. We remain focused on helping our existing customers transform their business models while striving to win new strategically-aligned customers. As we continue to diversify and expand our customer base across different markets and geographies, we are laying the groundwork for long-term growth and value to our stockholders.

Sincerely,

Carl Russo
President & CEO

CALIX, INC.
2777 Orchard Parkway
San Jose, California 95134

NOTICE OF ANNUAL MEETING OF STOCKHOLDERS
TO BE HELD ON MAY 22, 2019

To the Stockholders of Calix, Inc.:

The Annual Meeting of Stockholders ("Annual Meeting") of Calix, Inc. ("Calix"), will be held virtually, via live webcast at www.virtualshareholdermeeting.com/CALX19, on Wednesday, May 22, 2019 at 9:00 a.m. Pacific Daylight Time. The Annual Meeting will be held for the following purposes:

1. To elect four directors to the Calix Board of Directors ("Board");
2. To approve the 2019 Equity Incentive Award Plan;
3. To approve the Amended and Restated Employee Stock Purchase Plan ("ESPP") to increase the number of shares of common stock issuable under the ESPP by 2,500,000;
4. To approve, on a non-binding, advisory basis, the compensation of our named executive officers;
5. To ratify the selection of KPMG LLP as Calix's independent registered public accounting firm for the fiscal year ending December 31, 2019; and
6. To transact such other business as may properly come before the Annual Meeting or any adjournment or postponement thereof.

The above items of business are more fully described in the Proxy Statement. Only stockholders who owned Calix common stock at the close of business on March 25, 2019 can vote at this meeting or any adjournments that take place.

We have elected to use the Internet as our primary means of providing our proxy materials to stockholders. As a result, we are sending a Notice of Internet Availability of Proxy Materials ("Notice") rather than mailing a paper copy of this Proxy Statement and our 2018 Annual Report on or about April 2, 2019 to our stockholders of record as of the close of business on March 25, 2019. We are also providing access to our proxy materials over the Internet beginning on or about April 2, 2019. Electronic delivery of our proxy materials minimizes printing and mailing costs and reduces the environmental impact of the proxy materials.

The Notice contains instructions for accessing the proxy materials, including the Proxy Statement and our 2018 Annual Report, and provides information on how stockholders may obtain paper copies free of charge. The Notice also provides the date and time of the virtual Annual Meeting, the matters to be acted upon at the meeting and the Board's recommendation with regard to each matter and information on how to attend the virtual Annual Meeting and vote online.

You are cordially invited to attend the virtual Annual Meeting. Whether or not you expect to attend, you should vote and submit your proxy over the Internet following the voting procedures described in the Notice to ensure that your vote is recorded. If you have requested and received paper copies of proxy materials, you can also vote over the phone or by signing, dating and returning by mail the proxy card sent to you.

By Order of the Board of Directors

Suzanne Tom
Corporate Secretary

San Jose, California
April 2, 2019

The Notice of Annual Meeting, Proxy Statement and Form of Proxy are being distributed and made available on or about April 2, 2019.

PROXY STATEMENT
FOR 2019 ANNUAL MEETING OF STOCKHOLDERS

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CALIX, INC.
2777 Orchard Parkway
San Jose, California 95134

PROXY STATEMENT
FOR THE 2019 ANNUAL MEETING OF STOCKHOLDERS

IMPORTANT NOTICE REGARDING THE AVAILABILITY OF PROXY MATERIALS FOR THE STOCKHOLDER MEETING TO BE HELD ON MAY 22, 2019

The Board of Directors of Calix, Inc. is soliciting your proxy to vote at the virtual Annual Meeting of Stockholders to be held on May 22, 2019, at 9:00 a.m. Pacific Daylight Time, and any adjournment or postponement of that meeting ("Annual Meeting"). The Annual Meeting will be held via live webcast only at www.virtualshareholdermeeting.com/CALX19.

We have elected to provide access to our proxy materials on the Internet. Accordingly, we are sending a Notice of Internet Availability of Proxy Materials ("Notice") to our stockholders of record as of March 25, 2019 ("Record Date"), while brokers and other nominees who hold shares on behalf of beneficial owners will be sending their own similar notice. All stockholders will have the ability to access the proxy materials on the website referred to in the Notice or to request a printed set of the proxy materials. Instructions on how to request a printed copy by mail or email may be found in the Notice and on the website referred to in the Notice, including an option to request paper copies on an ongoing basis. On or about April 2, 2019, we are making this Proxy Statement available on the Internet and are mailing the Notice to all stockholders entitled to vote at the Annual Meeting. We intend to mail or email this Proxy Statement, together with a proxy card, to those stockholders entitled to vote at the Annual Meeting who have properly requested paper copies of such materials within three business days of request.

The only voting securities of Calix, Inc. are shares of common stock, $0.025 par value per share ("common stock"), of which there were 54,163,829 shares outstanding as of the Record Date (excluding treasury shares). We need the holders of a majority of the outstanding shares of common stock, present or represented by proxy, to hold the Annual Meeting.

In this Proxy Statement, we refer to Calix, Inc. as the "Company," "Calix," "we" or "us" and the Board of Directors as the "Board." When we refer to Calix's fiscal year, we mean the twelve-month period ending December 31 of the stated year.

Our 2018 Annual Report to Stockholders, which contains consolidated financial statements for fiscal year 2018, accompanies this Proxy Statement if you have requested and received a copy of the proxy materials in the mail. Stockholders who received the Notice can access this Proxy Statement and the 2018 Annual Report to Stockholders at the website referred to in the Notice. You also may obtain a copy of our 2018 Annual Report on Form 10-K, which was filed with the Securities and Exchange Commission ("SEC"), without charge, by writing to our Investor Relations department at the above address. Our 2018 Annual Report on Form 10-K and Proxy Statement are also available under "Financials" in the Investor Relations section of our website at investor-relations.calix.com and at the SEC's web site at www.sec.gov.

THE PROXY PROCESS AND STOCKHOLDER VOTING

QUESTIONS AND ANSWERS ABOUT THIS PROXY MATERIAL AND VOTING

Who can vote at the Annual Meeting?

Only stockholders of record at the close of business on March 25, 2019 will be entitled to vote online at the Annual Meeting. At the close of business on March 25, 2019, there were 54,163,829 shares of common stock outstanding and entitled to vote.

Stockholder of Record: Shares Registered in Your Name

If, on March 25, 2019, your shares were registered directly in your name with Calix's transfer agent, Computershare, Inc., then you are a stockholder of record. As a stockholder of record, you may vote online at the Annual Meeting or vote by proxy. Whether or not you expect to attend, you should vote and submit your proxy over the Internet following the voting procedures described in the Notice to ensure that your vote is recorded. If you have requested and received paper copies of proxy materials, you can also vote over the phone or by signing, dating and returning by mail the proxy card sent to you.

Beneficial Owner: Shares Registered in the Name of a Broker, Bank or Other Agent

If, on March 25, 2019, your shares were held in an account at a brokerage firm, bank, dealer or other similar organization, then you are the beneficial owner of shares held in a "street name" and these proxy materials are being forwarded to you by that organization. The organization holding your account is considered the stockholder of record for purposes of voting at the Annual Meeting. As a beneficial owner, you have the right to direct your broker or other agent on how to vote the shares in your account. You are also welcome to attend the Annual Meeting and to vote online.

What do I need in order to be able to attend the Annual Meeting online?

Any stockholder can attend the Annual Meeting live online at www.virtualshareholdermeeting.com/CALX19. The webcast will start at 9:00 a.m. Pacific Daylight Time. Stockholders may vote and submit questions while attending the Annual Meeting online. In order to be able to participate in the online Annual Meeting, you will need the control number included on your Notice or, if you received a printed copy of the proxy materials, your proxy card if you are a stockholder of record, or included with your voting instruction card and voting instructions you received from your broker, bank or other agent if you hold your shares in a "street name." Instructions on how to participate online are also posted online at www.virtualshareholdermeeting.com/CALX19.

Why is Calix hosting the Annual Meeting online?

Among other reasons, Calix believes hosting the Annual Meeting online enables broader stockholder attendance and participation from any location around the world, minimizing travel time and cost. In designing our online format, we have taken measures to ensure our virtual meeting provides all stockholders with equal access to ask questions of our Board and management. Our virtual meeting allows participating stockholders to vote on proposals, access our Proxy Statement and 2018 Annual Report and engage in a live Q&A with our Board, management and auditors. In addition, a recording of our Annual Meeting is publicly available for a year following each annual meeting at www.virtualshareholdermeeting.com/CALX19.

What am I being asked to vote on?

You are being asked to vote on:

- election of four Class III directors to hold office until our 2022 Annual Meeting of Stockholders (Proposal No. 1);
- approval of the 2019 Equity Incentive Award Plan (Proposal No. 2);
- approval of the Amended and Restated Employee Stock Purchase Plan ("ESPP") to increase the number of shares of common stock issuable under the ESPP by 2,500,000 (Proposal No. 3);
- approval on a non-binding, advisory basis of the compensation of our named executive officers ("NEOs") as disclosed in this Proxy Statement (Proposal No. 4); and
- ratification of the selection of KPMG LLP as our independent registered public accounting firm for the fiscal year ending December 31, 2019 (Proposal No. 5).

In addition, you are entitled to vote on any other matters that are properly brought before the Annual Meeting.

How does the Board recommend I vote on the Proposals?

The Board recommends that you vote:

- **FOR** each of the Class III director nominees;
- **FOR** approval of our 2019 Equity Incentive Award Plan;
- **FOR** approval of the increase of the number of shares of common stock issuable under the ESPP by 2,500,000;
- **FOR** approval, on a non-binding, advisory basis, of the compensation of our NEOs; and
- **FOR** ratification of KPMG LLP as our independent registered public accounting firm.

How do I vote?

For election of directors, you may either vote "For" the four nominees or you may "Withhold" your vote for all or for any nominee you specify. For any other matter to be voted on, you may vote "For" or "Against" or abstain from voting. The procedures for voting are as follows:

Stockholder of Record: Shares Registered in Your Name

If you are a stockholder of record, you may vote in any of the following manners:

- To vote during the Annual Meeting, follow the online instructions provided on the Notice of Internet Availability of Proxy Materials to login to www.virtualshareholdermeeting.com/CALX19 to cast your vote.
- To vote over the Internet prior to the Annual Meeting, follow the instructions provided on the Notice of Internet Availability of Proxy Materials.
- To vote by phone, call the toll-free number found on the proxy card, which you can request by following the instructions provided on the Notice of Internet Availability of Proxy Materials.
- To vote by mail, complete, sign and date the proxy card, which you can request by following the instructions provided on the Notice of Internet Availability of Proxy Materials, and return it promptly by mail. As long as we receive your signed proxy card, or your vote by Internet or phone, by 11:59 p.m. Eastern Daylight Time on May 21, 2019, we will vote your shares as you direct.
- Whether or not you plan to attend the Annual Meeting, we urge you to vote by proxy, phone or the Internet to ensure that your vote is counted. Even if you have submitted a proxy or voted by phone or the Internet before the Annual Meeting, you may still attend the Annual Meeting and vote online. In such case, your previously submitted proxy or vote will be disregarded.

Beneficial Owner: Shares Registered in the Name of Broker, Bank or Other Agent

If you are a beneficial owner of shares registered in the name of your broker, bank or other agent, you should have received a voting instruction card and voting instructions with these proxy materials from that organization rather than from us. You should complete and mail the voting instruction card to ensure that your vote is counted. You should follow the instructions from your broker, bank or other agent included with these proxy materials, or contact your broker, bank or other agent to request a proxy form. You may also vote online at the Annual Meeting.

Who counts the votes?

We have engaged Broadridge Financial Solutions, Inc. ("Broadridge") as our independent agent to tabulate stockholder votes. If you are a stockholder of record, and you choose to vote over the Internet (either prior to or during the Annual Meeting) or by phone, Broadridge will access and tabulate your vote electronically, and if you have requested and received proxy materials via mail or email and choose to sign and mail your proxy card, your executed proxy card is returned directly to Broadridge for tabulation. As noted above, if you hold your shares through a broker, your broker (or its agent for tabulating votes of shares held in a "street name") returns one proxy card to Broadridge on behalf of all its clients.

What is the required vote and how are votes counted?

A majority of the outstanding shares of common stock must be present or represented by proxy at the Annual Meeting in order to have a quorum. Abstentions and broker non-votes will be treated as shares present for the purpose of determining the presence of a quorum.

With respect to Proposal No. 1, the election of directors, directors will be elected by a plurality of the votes cast, which means that the four nominees receiving the highest number of “For” votes will be elected. Abstentions and broker non-votes will have no effect with regard to this proposal, because approval of a percentage of shares present or outstanding is not required for this proposal.

With respect to Proposals No. 2, 3, 4 and 5, the affirmative vote of the holders of a majority in voting power of the shares of common stock present or by proxy and entitled to vote on the proposal is required for approval. Abstentions have the same effect as a vote against these proposals.

Because your vote on Proposal No. 4 is advisory, it will not be binding on us, our Board or our Compensation Committee. However, we value our stockholders’ views on the effectiveness of our executive compensation program. Our Board and Compensation Committee consider the annual advisory vote of our stockholders when making decisions about executive compensation.

Under the New York Stock Exchange (“NYSE”) rules, brokers are permitted to vote their clients’ proxies in their own discretion as to certain “routine” proposals. However, where a proposal is considered “non-routine,” a broker who has received no instructions from its client generally does not have discretion to vote its clients’ uninstructed shares on that proposal. When a broker indicates on a proxy that it does not have discretionary authority to vote certain shares on a particular proposal, the missing votes are referred to as “broker non-votes.” Those shares would be considered present for purposes of determining whether a quorum is present but would not be counted in determining the number of votes present for the proposal. Those shares would not be taken into account in determining the outcome of the non-routine proposal.

Under NYSE rules, Proposals No. 1 through No. 4 are non-routine matters while Proposal No. 5 is a routine matter. Because brokers cannot vote uninstructed shares on behalf of their customers for non-routine matters, it is important that stockholders vote their shares.

Broadridge will separately count “For” and “Withhold” votes with respect to Proposal No. 1, “For” and “Against” votes and abstentions, with respect to Proposal Nos. 2, 3 and 4, and “For” and “Against” votes, abstentions and broker non-votes with respect to Proposal No. 5.

How many votes do I have?

On each matter to be voted upon, you have one vote for each share of common stock you own as of March 25, 2019.

What if I return a proxy card but do not make specific choices?

If you have properly requested and received a proxy card by mail or email, and we receive a signed and dated proxy card that does not specify how your shares are to be voted, your shares will be voted “For” the election of each of the four nominees for director and “For” Proposals No. 2, 3, 4 and 5. If any other matter is properly presented at the Annual Meeting, the individuals named as proxy holders on your proxy card will vote your shares in the manner recommended by the Board on all proposals presented in this Proxy Statement and as they may determine in their best judgment as to any other matters properly presented for vote at the Annual Meeting.

Who is paying for this proxy solicitation?

We will pay for the entire cost of soliciting proxies. In addition to these mailed proxy materials, our directors, officers and employees may also solicit proxies in person, by phone or by other means of communication. Directors, officers and employees will not be paid any additional compensation for soliciting proxies. We may also reimburse brokerage firms, banks and other agents for the cost of forwarding proxy materials to beneficial owners.

What does it mean if I receive more than one Notice of Internet Availability of Materials or set of materials?

If you receive more than one Notice of Internet Availability of Materials or more than one set of materials, your shares are registered in more than one name or are registered in different accounts. In order to vote all the shares you own, you must follow the instructions for voting on the Internet on all of the Notices of Internet Availability of Proxy Materials or proxy cards you receive via mail or email upon your request, which includes voting over the Internet, phone or by signing and returning all of the proxy cards you request and receive.

Can I change my vote after submitting my proxy or voting on the Internet or by phone?

Yes. You can revoke your proxy or prior vote at any time before the final vote at the Annual Meeting. If you are the record holder of your shares, you may revoke your proxy or prior vote in any one of three ways:

- You may submit another properly completed proxy with a later date or submit a new vote on the Internet or by phone using the same instructions followed when you submitted your prior vote.
- You may send a written notice that you are revoking your proxy to Calix's Corporate Secretary at Calix, Inc., 2777 Orchard Parkway, San Jose, California 95134.
- You may attend the Annual Meeting and vote online. Simply logging into the Annual Meeting will not, by itself, revoke your proxy or prior vote.

If your shares are held by your broker, bank or other agent, you should follow the instructions provided by them.

How will voting on any business not described in this Proxy Statement be conducted?

We are not aware of any business to be considered at the Annual Meeting other than the items described in this Proxy Statement. If any other matter is properly presented for vote at the Annual Meeting and you are not attending the meeting in person but have voted by proxy, the individuals named as proxy holder on your proxy card will vote your shares as they may determine in their best judgment.

When are stockholder proposals due for next year's Annual Meeting?

To be considered for inclusion in next year's proxy materials, your proposal must be submitted in writing by December 4, 2019, to Calix's Corporate Secretary at 2777 Orchard Parkway, San Jose, California 95134. If you wish to submit a proposal that is not to be included in next year's proxy materials under the SEC's shareholder proposal procedures or nominate a director, you must do so between January 23, 2020 and February 22, 2020; provided that if the date of the annual meeting is earlier than April 22, 2020 or later than July 21, 2020, you must give notice not later than the 90th day prior to the annual meeting date or, if later, the 10th day following the date on which public disclosure of the annual meeting date is first made. You are also advised to review our bylaws, which contain additional requirements about advance notice of stockholder proposals and director nominations.

What is the quorum requirement?

A quorum of stockholders is necessary to hold a valid meeting. A quorum will be present if the holders of a majority in voting power of the shares of common stock issued and outstanding and entitled to vote are present or represented by proxy at the Annual Meeting. On the Record Date, there were 54,163,829 shares outstanding and entitled to vote. Accordingly, 27,081,915 shares must be represented by stockholders present at the Annual Meeting or by proxy to have a quorum.

Your shares will be counted towards the quorum if you submit a valid proxy vote or vote online at the Annual Meeting. Abstentions and broker non-votes also will be counted towards the quorum requirement. If there is no quorum, either the chairperson of the Annual Meeting or a majority in voting power of the stockholders entitled to vote at the Annual Meeting, present or represented by proxy, may adjourn the Annual Meeting to another time or place.

How can I find out the results of the voting at the Annual Meeting?

Voting results will be announced by the filing of a Current Report on Form 8-K within four business days after the Annual Meeting. If final voting results are unavailable at that time, we will file an amended Current Report on Form 8-K within four business days of the day the final results are available.

CORPORATE GOVERNANCE

Overview

Our Board is responsible for providing oversight over the Company's business and affairs, including the Company's strategic direction, as well as the management and financial and operational execution that can best perpetuate the success of the business and support the long-term interest of our stockholders. To effectively support its responsibilities, the Board has three principal board committees: an Audit Committee, a Compensation Committee and a Nominating and Corporate Governance Committee that each carry out responsibilities set out in specific committee charters approved by the Board and consistent with applicable requirements of the NYSE and the SEC. The Board has also established a Cybersecurity Committee and a Strategic Committee, each with specific committee charters approved by the Board. The Board and each Board committee may at their discretion retain outside advisors at the Company's expense in carrying out their responsibilities.

Our Board is committed to good corporate governance practices and seeks to represent stockholder interests through the exercise of sound judgment. To this end, the Board has adopted Corporate Governance Guidelines ("Guidelines") that provide specific provisions for the governance of the Board and Company. We have a Code of Business Conduct and Ethics ("Code of Conduct") applicable to all directors, officers and employees that is approved and adopted by our Board representing our commitment to the highest standards of ethics and integrity in the conduct of our business. Our bylaws, together with the Guidelines, the Board committee charters and our Code of Conduct serve as the governance and compliance framework of the Company.

On an annual basis, the Board and its committees review the Guidelines, Board committee charters and our Code of Conduct. The Guidelines, the written charter for each of the Audit Committee, Compensation Committee, Nominating and Corporate Governance Committee, Cybersecurity Committee, Strategic Committee and the Code of Conduct, as well as any amendments from time to time, may be found under "Governance" in the Investor Relations section of our website at investor-relations.calix.com. The referenced information on the Investor Relations section of our website is not a part of this Proxy Statement.

Leadership Structure of the Board

Under our bylaws, our Board appoints our corporate officers, including the chief executive officer. We separate the roles of chief executive officer and chairman of the Board in recognition of the differences between the two roles. Mr. Russo serves as president and chief executive officer and is responsible for setting the strategic direction for and the day-to-day leadership and performance of Calix, while Mr. Listwin serves as chairman and provides guidance to the chief executive officer and management, sets the agenda for Board meetings and presides over meetings of the full Board. The Board does not have a policy on whether the role of the chairman and chief executive officer should be separate and, if it is to be separate, whether the chairman should be selected from the non-employee directors or be an employee and if it is to be combined, whether a lead independent director should be selected. As president and chief executive officer, Mr. Russo is not "independent" under the rules of the NYSE. Mr. Listwin, Calix's chairman, is an independent director as defined under the rules of the NYSE and has significant executive leadership and strategic experience, including multiple executive leadership roles at large publicly-traded technology companies. The Board believes that the current board leadership structure is best for Calix and its stockholders at this time. Our Nominating and Corporate Governance Committee periodically reviews and recommends to the Board the leadership structure of the Board.

Board Independence

Among other considerations, the Board strongly values independent board oversight as an essential component of strong corporate performance. On at least an annual basis, the Board undertakes a review of the independence of each director and considers whether any director has a material relationship with Calix. The Board evaluates each director under the independence rules of the NYSE and the non-employee director and audit committee independence requirements of the SEC.

The NYSE rules require listed company boards have at least a majority of independent directors. Based on its evaluation, our Board determined that each of Messrs. Bowick, DeNuccio, Everett, Listwin, Matthews, Peters and Plants, and each of Mses. Crusco and Makagon, representing nine of Calix's ten current directors, are independent directors as defined under the NYSE rules. Mr. Russo, who has served as our president and chief executive office since 2002, is the only member of the Board who is not independent.

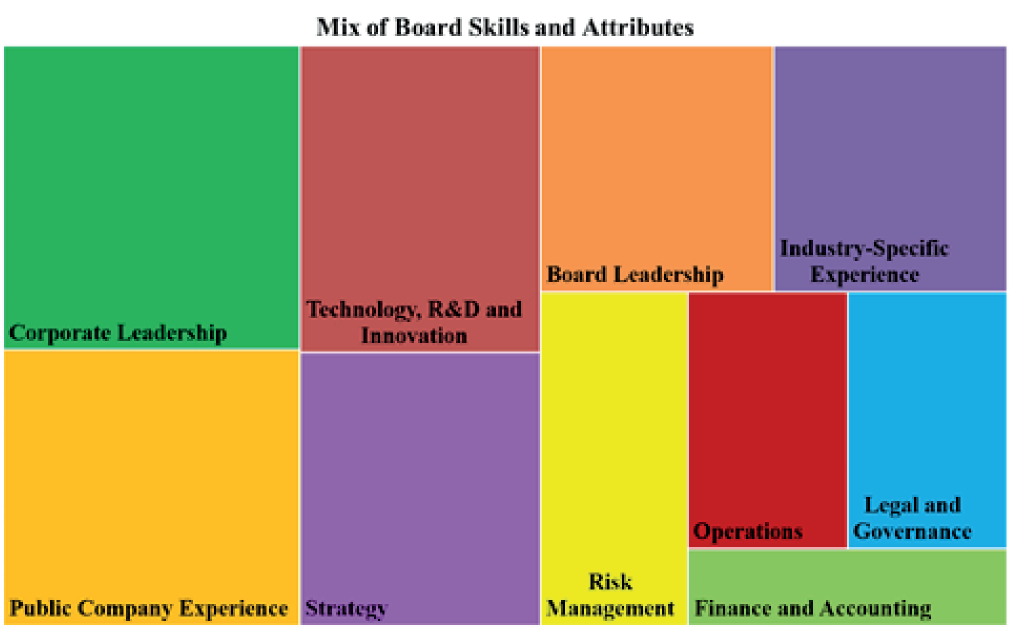
Nine of the total ten current directors of our Board are independent under NYSE rules:

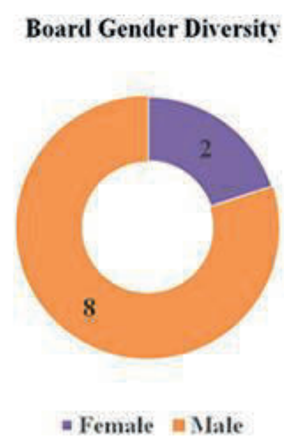
Director	Independent	Director Since
Christopher Bowick	Independent	2014
Kathy Crusco	Independent	2017
Kevin DeNuccio	Independent	2012
Mike Everett	Independent	2007
Don Listwin	Independent	2007
Kira Makagon	Independent	2017
Michael Matthews	Independent	2010
Kevin Peters	Independent	2014
J. Daniel Plants	Independent	2018
Carl Russo	Not Independent	1999

Board Composition and Qualifications

The Board assesses Board composition and qualifications at least annually. In assessing Board composition and qualifications, as well as in evaluating candidates for nomination or to fill vacancies on the Board, the Board seeks to maximize effectiveness of the Board and its committees to perpetuate the success of the Company, to best represent stockholder interests through the exercise of sound judgment and to assure continuity in the Board's oversight over the Company and management. The Board places significant emphasis on ensuring an appropriate mix of characteristics, skills and experience for the Board as a whole and as to each individual director. The Board, through its Nominating and Corporate Governance Committee, evaluates the skills and attributes of the Board as a whole and each individual director against the Company's needs and strategic direction. Among other considerations, the Board seeks to ensure an appropriate mix of expertise in executive and corporate leadership, diversity of background, perspective and experience (including diversity of gender, age and ethnicity), personal and professional integrity, ethics and values, financial and operational experience, as well as expertise and insights in technologies, industries and markets relevant to the Company's strategic plans.

Our Board believes the current mix of skills, backgrounds and attributes of our Board maximizes the effectiveness of our Board in its oversight responsibilities. In 2017, we added two new directors to our Board, with Ms. Makagon bringing substantial expertise in global platform strategy, technology, cybersecurity, operations and high-technology executive leadership to our Board and Ms. Crusco adding deep financial, accounting and operational expertise, public company leadership and governance experience to our Board. In 2018, we added Mr. Plants as a new director, bringing his expertise in corporate governance and leadership, as well as adding stockholder insight, to our Board. The Board values the board gender diversity, experience and perspective from the additions of Mses. Crusco and Makagon and Mr. Plants to the Board. A summary of the mix of key skills and attributes representative of our current Board is as follows:





Our Board also considers board tenure in its review of Board composition. Our Board consists of a mix of board tenure. The average tenure of our independent directors is approximately six years, with three directors at tenures of less than three years, two directors at tenures of three to five years, two directors at five to ten years and two directors at ten or more years.

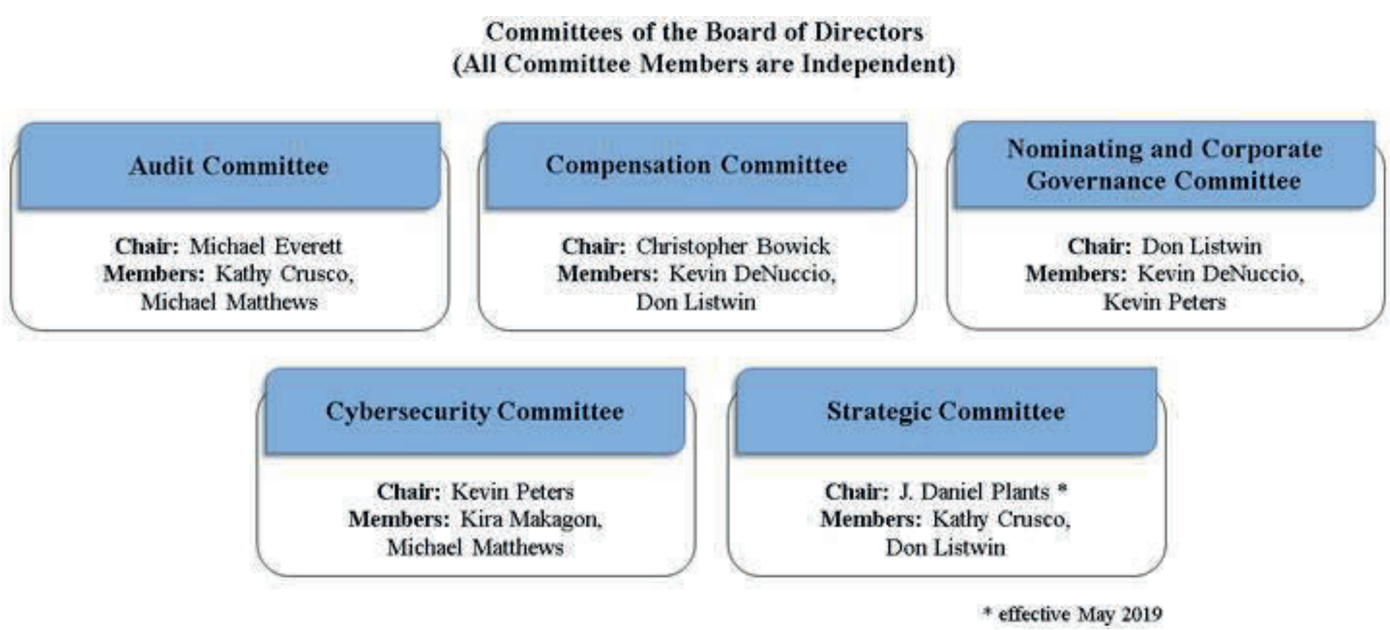
Director	Date Joined
Christopher Bowick	July 2014
Kathy Crusco	September 2017
Kevin DeNuccio	September 2012
Mike Everett	August 2007
Don Listwin	January 2007
Kira Makagon	July 2017
Michael Matthews	December 2010
Kevin Peters	October 2014
J. Daniel Plants	March 2018
Carl Russo	December 1999

Board Meetings and Committees

Our Board met seven times during fiscal year 2018. During 2018, each Board member attended 75% or more of the aggregate of the meetings of the Board and of the committees on which he or she served. In addition, our Board met in executive session without management present during its four regularly scheduled in-person meetings in 2018. Our chairman of the Board presides over the executive sessions of the Board.

We encourage our directors to attend our annual meetings of stockholders. Messrs. Bowick, DeNuccio, Everett, Listwin, Matthews, Peters, Plants and Russo and Ms. Crusco each attended our 2018 annual meeting of stockholders.

The Board has established three principal Board committees: the Audit Committee, the Compensation Committee and the Nominating and Corporate Governance Committee. In June 2017, the Board established a fourth Board committee, the Cybersecurity Committee, and in June 2018, the Board established a fifth Board committee, the Strategic Committee. The membership of all five Board committees are composed entirely of independent directors.



Audit Committee

Our Audit Committee is established in accordance with Section 3(a)(58)(A) of the Exchange Act and is responsible for overseeing management of Calix's risks relating to accounting matters, financial reporting and legal and regulatory compliance. Each director serving on our Audit Committee is independent within the meaning of the NYSE listing standards and applicable rules and regulations of the SEC.

The current members of our Audit Committee are Mr. Everett, Ms. Crusco and Mr. Matthews, with Mr. Everett serving as the Audit Committee chair. Our Board has determined that Mr. Everett and Ms. Crusco are each an "audit committee financial expert" as defined under the SEC rules. During 2018, the Audit Committee met eleven times, and conducted private sessions with our independent registered public accounting firm, with individual members of management and with the committee members at each of its four regularly scheduled in-person meetings.

Our Audit Committee oversees our corporate accounting and financial reporting process. Among other matters, the Audit Committee evaluates the independent registered public accounting firm's qualifications, independence and performance; determines the engagement of the independent registered public accounting firm; reviews and approves the scope of the annual audit and the audit fees; discusses with management and the independent registered public accounting firm the results of the annual audit and the review of Calix's quarterly consolidated financial statements; approves the retention of the independent registered public accounting firm to perform any proposed permissible non-audit services; monitors the rotation of partners of the independent registered public accounting firm on Calix's engagement team as required by law; reviews Calix's critical accounting policies and estimates; oversees the internal audit function and annually reviews the Audit Committee charter and the committee's performance. The Audit Committee operates under a written charter pursuant to applicable standards and rules of the SEC and the NYSE. The Audit Committee's written charter is available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

In carrying out its responsibilities, the Audit Committee may at its discretion retain outside advisors at the Company's expense.

Compensation Committee

Our Compensation Committee is responsible for overseeing the management of risks relating to Calix's executive compensation plans and arrangements. Each director serving on our Compensation Committee is independent within the meaning of the NYSE listing standards and applicable rules and regulations of the SEC. Mr. Listwin joined the Compensation Committee on May 16, 2018 upon the retirement of Michael Flynn from our Board on May 16, 2018. Mr. Flynn was independent within the meaning of the applicable rules and regulations of the NYSE and SEC during his service on the Compensation Committee.

The current members of our Compensation Committee are Messrs. Bowick, DeNuccio and Listwin, with Mr. Bowick serving as the Compensation Committee chair. During 2018, the Compensation Committee met eight times.

Our Compensation Committee reviews and oversees policies relating to compensation and benefits of Calix executive officers and employees. The Compensation Committee reviews and approves corporate goals and objectives relevant to compensation of the chief executive officer and other executive officers, certifies performance against such corporate goals and objectives and sets the compensation of our executive officers. The Compensation Committee also administers Calix's stock-based compensation plans, including the issuance of stock options and other awards under Calix's equity incentive award plan. The Compensation Committee reviews and evaluates, at least annually, the performance of the Compensation Committee and its members, including compliance of the Compensation Committee with its charter. In fulfilling its responsibilities, the Compensation Committee may delegate any or all of its responsibilities to a subcommittee of the Compensation Committee, but only to the extent consistent with Calix's certificate of incorporation and bylaws, NYSE rules and other applicable law. The Compensation Committee operates under a written charter pursuant to applicable standards and rules of the SEC and the NYSE. The Compensation Committee's written charter is available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

In carrying out its responsibilities, the Compensation Committee may at its discretion retain outside advisors at the Company's expense.

Compensation Committee Interlocks and Insider Participation

Messrs. Bowick and DeNuccio served on Calix's Compensation Committee for the entirety of 2018. Mr. Flynn served on the Compensation Committee until May 16, 2018. Mr. Listwin has served on the Compensation Committee since May 16, 2018. None of the members of Calix's Compensation Committee is or was at any time during 2018 an officer or employee of Calix, was formerly an officer of Calix or has engaged in certain related transactions with Calix, as required to be disclosed by SEC regulations. None of Calix's executive officers currently serves or in the past year has served as a member of the board of directors or compensation committee of any other entity that has one or more executive officers serving on Calix's Board or Compensation Committee.

Nominating and Corporate Governance Committee

The Nominating and Corporate Governance Committee is responsible for overseeing management of Calix's risks associated with the independence of the Board and potential conflicts of interest. Each director serving on our Nominating and Corporate Governance Committee is independent within the meaning of the NYSE listing standards. Mr. DeNuccio joined the Nominating and Corporate Governance Committee on May 16, 2018 upon Mr. Flynn's retirement from our Board on May 16, 2018. Mr. Flynn was independent within the meaning of the applicable rules and regulations of the NYSE and SEC during his service on the Nominating and Corporate Governance Committee.

Our Nominating and Corporate Governance Committee currently consists of Messrs. DeNuccio, Listwin and Peters, with Mr. Listwin serving as the Nominating and Corporate Governance Committee chair. During 2018, the Nominating and Corporate Governance Committee met five times.

The Nominating and Corporate Governance Committee is responsible for making recommendations regarding candidates for directorships and the size and composition of the Board. In addition, the Nominating and Corporate Governance Committee is responsible for overseeing Calix's Corporate Governance Guidelines and reporting and making recommendations concerning governance matters. The Nominating and Corporate Governance Committee operates under a written charter that satisfies the applicable standards of the SEC and the NYSE. The Nominating and Corporate Governance Committee's written charter is available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

In carrying out its responsibilities, the Nominating and Corporate Governance Committee may at its discretion retain outside advisors at the Company's expense.

Director Nominations

The Nominating and Corporate Governance Committee considers director candidate recommendations from a variety of sources, including nominees recommended by stockholders. The Nominating and Corporate Governance Committee may also retain an executive search firm to assist in identifying, screening and facilitating the interview process of director candidates. The Nominating and Corporate Governance Committee may take into account minimum qualifications including, among other factors the Committee may deem appropriate: diversity of personal and professional background, perspective and experience, including diversity of gender, age and ethnicity; personal and professional integrity, ethics and values; experience in corporate management, operations or finance; experience relevant to the Company's industry and with relevant social policy concerns; experience as a board member or executive officer of another publicly held company; relevant academic expertise; practical and mature business judgment; promotion of a diversity of business or career experience relevant to the success of the Company; and any other relevant qualifications, attributes or skills, which will be evaluated in the context of the Board as a whole, with the objective of assembling a board that can best perpetuate the success of the business and represent stockholder interests through the exercise of sound judgment using its diversity of experience in these various areas. In addition, the Nominating and Corporate Governance Committee expects any candidate for the Board to be able to represent the interests of the Company's stockholders as a whole rather than any special interest or constituency.

Each of our nominees standing for election at this 2019 Annual Meeting was recommended to the Board by the Nominating and Corporate Governance Committee based on the Committee's evaluation as set forth above.

The policy of the Nominating and Corporate Governance Committee is to consider properly submitted director candidates recommended by stockholders. For a stockholder to make any nomination for election to the Board at an annual meeting, the stockholder must provide notice to Calix, which must be received at Calix's principal executive office not less than 90 days and not more than 120 days prior to the one-year anniversary of the preceding year's annual meeting; provided, that if the date of the annual meeting is more than 30 days before or more than 60 days after such anniversary date, the stockholder's notice must be delivered not later than 90 days prior to the date of the annual meeting or, if later, the 10th day following the date on which public disclosure of the annual meeting date is first made. Further updates and supplements to such notice may be required at the times and in the forms required under our bylaws. As set forth in our bylaws, submissions must include the name and address of the proposed nominee, information regarding the proposed nominee that is required to be disclosed in a proxy statement or other filings in a contested election under Section 14(a) of the Exchange Act, information regarding the proposed nominee's indirect and direct interests in shares of Calix's common stock, and a completed and signed questionnaire, representation and agreement of the proposed nominee. Our bylaws also specify further requirements as to the form and content of a stockholder's notice. We recommend that any stockholder wishing to make a nomination for director review a copy of our bylaws, as amended and restated to date, which is available, without charge, from our Corporate Secretary at 2777 Orchard Parkway, San Jose, California 95134. The presiding officer at the applicable annual meeting may, if the facts warrant, determine that a nomination was not properly made in accordance with the foregoing, in which case the defective nomination may be disregarded.

Cybersecurity Committee

The Cybersecurity Committee was constituted by the Board in June 2017 as a Board committee of independent directors responsible for overseeing the management of enterprise security over cyber risks, overall data and security breach programs and readiness and our program for data and security breach response and management. Each director serving on our Cybersecurity Committee is independent within the meaning of the NYSE listing standards.

Calix's Cybersecurity Committee currently consists of Mr. Peters, Ms. Makagon and Mr. Matthews, with Mr. Peters serving as the Cybersecurity Committee chair. During 2018, the Cybersecurity Committee met four times.

Our Cybersecurity Committee oversees Calix's management of risks associated with cybersecurity threats and reviews with management at each meeting the Company's assessment of cybersecurity threats and risks, data security programs, and management and mitigation of potential and any actual cybersecurity and information technology risks and breaches. Among other responsibilities, the Cybersecurity Committee also reviews and provides oversight of: the effectiveness of Calix's data breach incident response plan; Calix's cybersecurity risk systems against industry benchmarks and best practices; and Calix's information security planning and resources to manage changes in Calix's cybersecurity threat landscape, including assessments of the potential impact of cybersecurity risk on Calix's business, operations and reputation. The Cybersecurity Committee's written charter is available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

In carrying out its responsibilities, the Cybersecurity Committee may at its discretion retain outside advisors at the Company's expense.

Strategic Committee

The Board constituted a Strategic Committee in June 2018 as a committee of independent directors with responsibility to oversee our business strategy, strategic direction and objectives.

Our Strategic Committee currently consists of Ms. Crusco and Messrs. Listwin and Plants. Mr. Listwin has served as chair of the Strategic Committee from its formation until May 2019. Mr. Plants will serve as chair of the Strategic Committee commencing in May 2019.

Among other duties, the Strategic Committee provides oversight over our long-term strategic plan to support our objectives and to create long-term stockholder value and evaluates potential strategic actions and financing strategies. The Strategic Committee also works with management to monitor internal and external risks, threats and potential disruptions to our strategic plan. The Strategic Committee's written charter is available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

In carrying out its responsibilities, the Strategic Committee may at its discretion retain outside advisors at the Company's expense.

Annual Self-Assessment and Board Education

Annually, the Board and each Board committee conduct a self-assessment to assess the performance and effectiveness of the Board and Board committees, as well as to provide feedback on individual directors. The chairman of the Board leads discussions and actions related to the self-assessments. The Board is committed to the ongoing director education and advancement. To that end, the Company has a written Board education policy and provides its directors with membership in the National Association of Corporate Directors ("NACD") to assist them in remaining current with best practices and developments in board oversight and corporate governance, as well as opportunities to participate in NACD fellowship programs on leading boardroom practices and commitment to boardroom excellence.

Board Oversight Over Risks

The Board has an active role, as a whole and also at the committee level, in overseeing management of Calix's risks, including financial risks, cybersecurity risks, credit and liquidity risks, legal and regulatory risks and operational risks. The Board is responsible for general oversight of risks and regularly reviews information from management who is responsible for the day-to-day processes and operations to manage risks.

The Audit Committee has primary responsibility for oversight over management's processes over financial, credit and liquidity, legal and regulatory risks, including the Company's compliance program; the Cybersecurity Committee oversees Calix's management of risks associated with cybersecurity and data breach threats; the Compensation Committee is responsible for risk assessments over Calix's compensation practices and policies; and the Strategic Committee has oversight over internal and external risks to our strategic plan. While Board committees have responsibility for evaluating certain areas of risks and overseeing the management of such risks, the entire Board retains overall responsibility and remains regularly informed through committee reports about such risks.

Code of Conduct and Compliance

We are committed to the conduct of our business to the highest standards of ethics and integrity as reflected in our Code of Conduct. All of our directors, officers and employees are expected to comply with our Code of Conduct, including our principal executive officer, principal financial officer, principal accounting officer and persons performing similar functions. Under our Code of Conduct, we have established a compliance hotline that is operated by an independent third party to receive complaints about any accounting, internal control or auditing matters as well as compliance, ethical or other matters of concern (including on an anonymous basis where permitted under applicable law). Annually, our Audit Committee reviews our Code of Conduct and related policies and processes with management. Our Code of Conduct is available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

Risk Assessment of Compensation Practices and Policies

We have assessed, with input from outside consultants, and discussed with the Compensation Committee our compensation policies and practices for our employees as they relate to risk management. Based upon this assessment, we believe that any risks arising from such policies and practices are not reasonably likely to have a material adverse effect on the Company.

Our employees' base salaries are fixed in amount and thus we do not believe that they encourage excessive risk-taking. While performance-based cash incentives and sales-based incentives focus on achievement of short-term or annual goals, we believe that our performance-based cash incentives and sales-based incentives appropriately balance risk and the desire to focus employees on specific goals important to our long-term success. We believe these programs also do not encourage unnecessary or excessive risk taking as the potential payout is limited, with payouts on performance-based cash incentives generally limited to 100% of target and payouts of greater than target based on limited incremental achievement above 100% of target. Further, such programs represent only one portion of the total compensation opportunities available to most employees and we believe that our internal policies and controls help mitigate this risk.

A significant portion of the compensation provided to senior management is in the form of long-term equity-based incentives that are important to help further align management's interests with those of our stockholders. We do not believe that these equity-based incentives encourage unnecessary or excessive risk taking because their ultimate value is tied to our stock price.

The statements regarding the risks arising from our compensation policies and practices contain forward-looking statements that involve substantial risks and uncertainties. We have based these forward-looking statements largely on our current expectations and projections about future events and financial trends that we believe may affect our financial condition, results of operations, business strategy and financial needs.

Communications with the Board

Stockholders and other interested parties may communicate with the Board or any specified individual directors. Such correspondence should be sent to the attention of the Board or specific directors, c/o Corporate Secretary, 2777 Orchard Parkway, San Jose, California 95134.

SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT

The following table presents information as to the beneficial ownership of our common stock as of March 25, 2019 for:

- each stockholder known by us to be the beneficial owner of more than 5% of our common stock;
- each of our directors;
- each NEO as set forth in the Summary Compensation Table in this Proxy Statement; and
- all current executive officers and directors as a group.

Beneficial ownership is determined in accordance with the rules of the SEC and generally includes voting or investment power with respect to securities. Unless otherwise indicated below, to our knowledge, the persons and entities named in the table have sole voting and sole investment power with respect to all shares beneficially owned, subject to community property laws where applicable. Shares of our common stock subject to options that are currently exercisable or exercisable within 60 days of March 25, 2019 and restricted stock units ("RSUs") that vest within 60 days of March 25, 2019, are deemed to be outstanding and to be beneficially owned by the person holding the options or RSUs for the purpose of computing the percentage ownership of that person, but are not treated as outstanding for the purpose of computing the percentage ownership of any other person.

Percentage ownership of our common stock in the table is based on 54,163,829 shares of our common stock outstanding (exclusive of treasury shares) on March 25, 2019. Unless otherwise indicated, the address of each of the individuals and entities named below is c/o Calix, Inc., 2777 Orchard Parkway, San Jose, California 95134.

	Shares of Common Stock Beneficially Owned (1)				
Name of Beneficial Owner	**Common Stock**	**Options Exercisable Within 60 Days**	**RSUs Vesting Within 60 Days**	**Total Number of Shares Beneficially Owned**	**Percent**
5% Stockholder:					
BlackRock, Inc. 55 East 52nd Street New York, NY 10055	4,180,423 (2)	—	—	4,180,423	7.90%
Divisar Partners QP, L.P. 275 Sacramento Street, 8th Floor San Francisco, CA 94111	3,064,255 (3)			3,064,255	5.80%
Dimensional Fund Advisors LP Dimensional Place 6300 Bee Cave Road, Building One Austin, TX 78746	2,981,386 (4)	—	—	2,981,386	5.61%
Renaissance Technologies LLC 800 Third Avenue New York, NY 10022	2,905,918 (5)	—	—	2,905,918	5.47%
Named Executive Officers:					
Carl Russo	6,127,855 (6)	420,000	—	6,547,855	12.09%
Cory Sindelar	54,000	173,250	—	227,250	*
Michael Weening	6,374	376,000	—	382,374	*
Gregory Billings (7)	—	267,750	—	267,750	*
Non-Employee Directors:					
J. Daniel Plants	1,280,630 (8)	—	—	1,280,630	2.36%
Don Listwin	860,000 (9)	7,500	18,320	885,820	1.64%
Kevin DeNuccio	206,335	—	18,320	224,655	*
Michael Everett	125,761	10,000	18,320	154,081	*
Kevin Peters	74,083	—	18,320	92,403	*
Michael Matthews	73,940	12,500	18,320	104,760	*
Christopher Bowick	66,301	—	18,320	84,621	*
Kathy Crusco	26,936	—	18,320	45,256	*
Kira Makagon	12,330	—	18,320	30,650	*
All Current Directors and Executive Officers as a Group (12 persons)	8,914,545	999,250	146,560	10,060,355	18.57%

* Represents beneficial ownership of less than one percent of the outstanding shares of common stock.

(1) Shares shown in the table above include shares held in the beneficial owner's name or jointly with others, or in the name of a bank, nominee or trustee for the beneficial owner's account.

(2) The information was based upon a Schedule 13G/A filed with the SEC on February 4, 2019 by BlackRock, Inc. BlackRock, Inc. has sole voting with respect to 3,921,892 of these shares and sole dispositive power over 4,180,423 of these shares. The shares reported as being beneficially held by BlackRock, Inc. may be held by one or more of its subsidiaries: BlackRock Advisors, LLC; BlackRock Asset Management Canada Limited; BlackRock Fund Advisors; BlackRock Institutional Trust Company, N.A.; Blackrock International Limited; Blackrock Financial Management, Inc.; BlackRock Investment Management, LLC; Blackrock Investment Management (UK) Limited; or Blackrock Japan Co., Ltd.

(3) The information was based upon a Schedule 13G filed with the SEC on February 13, 2019 by Divisar Partners QP, L.P., Divisar Capital Management LLC and Steven Baughman as a group. Divisar Partners QP, L.P. has shared voting power with respect to 2,818,015 shares and shared dispositive power with respect to 2,818,015 shares. Divisar Partners QP, L.P. disclaims beneficial ownership of the shares. Each of Divisar Capital Management LLC and Mr. Baughman has shared voting power with respect to 3,064,255 shares and shared dispositive power with respect to 3,064,255 shares.

(4) The information was based upon a Schedule 13G filed with the SEC on February 8, 2019 by Dimensional Fund Advisors LP. Dimensional Fund Advisors LP has sole voting power with respect to 2,282,975 of these shares, sole dispositive power with respect to 2,981,386 of these shares. Dimensional Fund Advisors LP disclaims beneficial ownership of the shares.

(5) The information was based upon a Schedule 13G filed with the SEC on February 13, 2019 by Renaissance Technologies LLC and Renaissance Technologies Holdings Corporation as a group. Each of Renaissance Technologies LLC and Renaissance Technologies Holdings Corporation has sole voting with respect to 2,762,700 of these shares, sole dispositive power over 2,762,700 of these shares and shared dispositive power with respect to 143,218 of these shares.

(6) Includes 2,239,188 shares held by The Crescentico Trust, Carl Russo, Trustee; 275,633 shares held by Equanimous Investments; and 284,653 shares held by Calgrat Partners, L.P. The managing members of Equanimous Investments are Carl Russo and Tim Pasquinelli. The managing partner of Calgrat Partners, L.P. is Tim Pasquinelli. Mr. Russo and Mr. Pasquinelli may be deemed to have shared voting and investment power over the shares held by Equanimous Investments and Calgrat Partners, L.P., as applicable. Mr. Russo and Mr. Pasquinelli each disclaim beneficial ownership of such shares, except to the extent of his pecuniary interest therein. The address of each of The Crescentico Trust, Carl Russo, Trustee; Equanimous Investments; and Calgrat Partners, L.P. is 1960 The Alameda #150, San Jose, California 95126.

(7) Mr. Billings no longer served as an executive officer as defined under Section 240.3b-7 of the Exchange Act after December 31, 2018.

(8) Includes 1,253,044 shares held by Voce Capital Management LLC. Mr. Plants is a managing member of Voce Capital Management LLC and disclaims beneficial ownership of such shares, except to the extent of his pecuniary interest therein.

(9) Includes 200,000 shares held by No Mas Ninos, L.P. Mr. Listwin is a general partner of No Mas Ninos, L.P. and may be deemed to have shared voting and investment power over the shares held by the partnership.

SECTION 16(a) BENEFICIAL OWNERSHIP REPORTING COMPLIANCE

Section 16(a) of the Exchange Act requires our directors and executive officers, and persons who own more than 10% of a registered class of our equity securities, to file with the SEC initial reports of ownership and reports of changes in ownership of our common stock and other equity securities. Officers, directors and greater than 10% stockholders are required by SEC regulations to furnish us with copies of all Section 16(a) forms they file. We believe that during the fiscal year 2018, our directors and Section 16 officers complied with all Section 16(a) filing requirements, except as to one late Form 4 for Mr. Matthews to report a transaction in May 2018. In making the above statements, we have relied upon the written representations of our directors and Section 16 officers.

PROPOSAL NO. 1

ELECTION OF DIRECTORS

Our Amended and Restated Certificate of Incorporation provides that our Board shall be divided into three classes, with the directors in each class having a three-year term. Unless the Board determines that vacancies (including vacancies created by increases in the number of directors) shall be filled by the stockholders, and except as otherwise provided by law, vacancies on the Board may be filled only by the affirmative vote of a majority of the remaining directors. A director elected by the Board to fill a vacancy (including a vacancy created by an increase in the number of directors) shall serve for the remainder of the full term of the class of directors in which the vacancy occurred and until such director's successor is elected and qualified.

As of April 2, 2019, the date this Proxy Statement is made available, the Board consists of ten directors, divided into the following three classes:

- **Class I directors:** Kathy Crusco, Kevin DeNuccio and Michael Everett, whose current terms will expire at the 2020 Annual Meeting;
- **Class II directors:** Don Listwin, Kevin Peters and J. Daniel Plants, whose current terms will expire at the 2021 Annual Meeting; and
- **Class III directors:** Christopher Bowick, Kira Makagon, Michael Matthews and Carl Russo, whose current terms will expire at the 2019 Annual Meeting.

Our Nominating and Corporate Governance Committee recommended, and our Board has approved, Christopher Bowick, Kira Makagon, Michael Matthews and Carl Russo as nominees for election to the Board as Class III directors at the 2019 Annual Meeting. Messrs. Bowick, Matthews and Russo and Ms. Makagon have each agreed to stand for reelection as Class III directors. Each director to be elected will hold office from the date of such director's election by the stockholders until the third subsequent annual meeting of stockholders or until his or her successor is elected and has been qualified, or until such director's earlier death, resignation or removal. Shares of common stock represented by executed proxies will be voted, if authority to do so is not withheld, for the election of the four Class III director nominees named above.

The Board expects each of the nominees to be available for election to the Board at the 2019 Annual Meeting. In the event that any nominee should be unable to serve or for good cause will not serve, such shares will be voted for the election of such substitute nominee as the Board may propose. Each person nominated for election has agreed to serve if elected, and management has no reason to believe that any nominee will be unable to serve. Directors are elected by a plurality of the votes cast at the meeting.

Our Director Nominees and Board of Directors

At least annually our Nominating and Corporate Governance Committee reviews the skills and characteristics of directors and the mix of skills and experience and diversity of the Board in the context of our business strategy, growth initiatives and our customers and target market, our business and operating requirements and the long-term interests of our stockholders. In doing so, the Nominating and Corporate Governance Committee seeks a board composition that can best perpetuate the success of the business and represent stockholder interests. The Committee also considers the tenure of our directors and seeks to maintain a balance of longer tenured directors with deep institutional knowledge and newer directors who bring new perspectives to the Board. See further discussion under "*Board Meetings and Committees — Nominating and Corporate Governance Committee*" above regarding the Nominating and Corporate Governance Committee's evaluation and selection of director nominees.

The Board believes that all the nominees for reelection are highly qualified and have the skills and experience required for effective service on the Board. In particular, Mr. Bowick, a long-time executive in the telecommunications industry, brings significant industry-specific experience along with technical and operational knowledge and expertise with respect to large communications service providers representative of the markets we serve. Ms. Makagon, an innovator in the technology platform space, brings substantial expertise in global platform strategy, technology, cybersecurity, operations and high technology executive leadership to our Board. Mr. Matthews, a marketing and business strategy executive with global experience, contributes significant expertise in the technology industry with a strong background in telecommunications, software, technology and innovation. Mr. Russo, our president and chief executive officer, brings industry-specific expertise as well as extensive experience and background about our customers and markets, and provides substantial expertise and knowledge regarding our business strategy, markets and operations. We believe the skills and attributes of these nominees complement the expertise, background and experience of our other continuing directors.

Biographical information describing the qualifications and relevant experience, skills and attributes of our Class III nominees and our other current directors who will continue in office after the Annual Meeting as of April 2, 2019 is set forth below.

Nominees for Election to a Three-Year Term Expiring at the 2022 Annual Meeting of Stockholders

Christopher Bowick — Compensation Committee Chair

Independent director

Age: 63
Director since 2014

Calix Board committees:
Compensation (Chair)

Other current directorships:

- Minerva Networks (private)
- ComSonics, Inc. (private)

Mr. Bowick brings to our Board extensive experience in advising and managing companies in the technology and telecommunications industries. Mr. Bowick is principal of The Bowick Group, LLC, where he provides technology, product, business and executive-development advice and counsel to clients in the cable television and telecommunications industries.

From 1998 until his retirement in 2009, Mr. Bowick held various positions at Cox Communications. Mr. Bowick joined Cox in 1998 as vice president, technology development, and was named senior vice president of engineering and chief technical officer in 2000. Mr. Bowick retired as chief technology officer of Cox in June of 2009. At Cox, Mr. Bowick was responsible for strategic technology planning, day-to-day technical operations and the development and deployment of technology solutions for the company's video, voice, high speed data and wireless products, including the development and deployment of telecommunications services, such as circuit-switched telephone, voice over IP, high-speed data, digital video, HDTV, video-on-demand and interactive television. Mr. Bowick was also responsible for network engineering and network operations for Cox's nation-wide network infrastructure including its national backbone, Metropolitan Area Networks and HFC networks. Prior to joining Cox, Mr. Bowick served as group vice president of technology and chief technical officer for Jones Intercable, Inc., while simultaneously serving as president of Jones Futurex, a designer and manufacturer of triple DES, PC-based hardware encryption devices and provider of contract manufacturing services. Prior to Jones, Mr. Bowick served as vice president of engineering for Scientific Atlanta's Transmission Systems Business Division, and as a design engineer for Rockwell International, Collins Avionics Division.

Mr. Bowick holds a Master of Business Administration from the University of Colorado and a Bachelor of Science in Electrical Engineering from the Georgia Institute of Technology. Mr. Bowick is a National Association of Corporate Director ("NACD") Governance Fellow under the NACD's director credential program.

Kira Makagon

Independent director

Age: 55
Director since 2017

Calix Board committees:
Cybersecurity

Other current directorships:
None

Ms. Makagon brings to the Board extensive experience in global platform strategy, technology, cybersecurity, operations and high technology executive leadership. Since August 2012, Ms. Makagon has served as executive vice president of innovation at RingCentral, Inc., a publicly-held provider of cloud-based global collaborative communications solutions.

From January 2012 to July 2012, Ms. Makagon served as the senior vice president of products of iCrossing, a global digital marketing agency owned by Hearst Corporation. From June 2009 to December 2011, she held various executive leadership roles at Red Aril, Inc., an online media technology company, serving as founder, chief executive officer and member of the board of directors from June 2009 to April 2010, and president from April 2010 to December 2011. Prior to joining Red Aril, Ms. Makagon held various executive leadership roles at NebuAd, Inc., an online data and media company, serving as co-founder and president from September 2006 to July 2008, chief executive officer from August 2008 to December 2008, and consultant and board member from January 2009 to May 2009. Ms. Makagon has also served in various roles at Exigen Group, a provider of SaaS workflow platforms and call center solutions, including president, ventures and alliances, and executive vice president, marketing and business development, as well as serving on the board of directors. Prior to that, Ms. Makagon co-founded and held key executive positions in flagship online marketing and CRM companies, including Octane Software, which was acquired by E.piphany, and Scopus Technology, where she brought multiple generations of CRM products to market.

Ms. Makagon holds a Bachelor of Science in computer science and a Master of Business Administration from the University of California, Berkeley.

Michael Matthews

Independent director

Age: 62
Director since 2010

Calix Board committees:
- Audit
- Cybersecurity

Other current directorships:
- AwareX, Inc. (private)

Mr. Matthews is a marketing and business strategy executive with significant exposure to the telecommunications industry and to global markets. Mr. Matthews brings to our Board over 30 years of experience in the technology industry, and a strong background in telecommunications, software, technology and innovation. Mr. Matthews currently serves as an advisor to the TM Forum, a global trade association with over 850 member companies including communication service providers, digital service providers and enterprises. Since January 2016, Mr. Matthews has served as chief executive officer and chairman of AwareX, Inc., a privately-held software technology company.

From January 2012 through September 2013, Mr. Matthews served as chief corporate development officer for the information technology company AGT International GMBH, where he was responsible for AGT's research and development, new business ventures and marketing. From September 2008 to December 2011, Mr. Matthews served as head of strategy and business development at Nokia Siemens Networks, a telecommunications company, where he directed the company's strategic planning and investments, mergers and acquisitions program and strategic alliances and partnerships. From February 2003 to January 2008, Mr. Matthews served as chief marketing officer at Amdocs Inc., a publicly-held software and services provider. From September 1999 to March 2002 he served as the executive vice president, sales and marketing, at Groove Networks, a privately held software company which was acquired by Microsoft Corporation. Prior to this, he served in leadership positions across technology companies in the United States and Australia such as Platinum Technology, Inc. a database management software company which was acquired by Computer Associates, Inc., Sterling Software, a software company which was acquired by Computer Associates, Inc., and Digital Equipment Corporation, which was acquired by Compaq Computer Corporation.

Mr. Matthews has a degree in Civil Engineering from the University of Queensland, Australia.

Carl Russo — President and Chief Executive Officer

Director

Age: 62
Director since 1999

Calix Board committees:
None

Other current directorships:
None

Mr. Russo has served as Calix's president and chief executive officer since December 2002. As Calix's president and chief executive officer, Mr. Russo brings substantial expertise and knowledge regarding our business strategy, markets and operations to Calix's board of directors. He also brings to the Board an extensive background in the telecommunications and networking technology industries.

From November 1999 to May 2002, Mr. Russo served as vice president of optical strategy and group vice president of optical networking of Cisco Systems, Inc. From April 1998 to October 1999, Mr. Russo served as president and chief executive officer of Cerent Corporation, which was acquired by Cisco. From April 1995 to April 1998, Mr. Russo served in various capacities, including as chief operating officer, at Xircom, Inc., which was acquired by Intel Corporation. Previously, Mr. Russo served as senior vice president and general manager for the hyperchannel networking group of Network Systems Corporation and as vice president and general manager of the data networking products division of AT&T Paradyne Corporation. Mr. Russo served on the board of directors of Vital Network Services, Inc., a privately-held company delivering network lifecycle services, and Xirrus, Inc., a privately-held company providing products that enable high-performance wireless networks.

Mr. Russo attended Swarthmore College and previously served on its board of managers.

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" THE ELECTION OF EACH CLASS III DIRECTOR NOMINEE NAMED ABOVE.

Directors Continuing in Office Until the 2020 Annual Meeting of Stockholders

Kathy Crusco

Independent director

Age: 54
Director since 2017

Calix Board committees:
- Audit (Audit Committee financial expert)
- Strategic

Other current directorships:
Plantronics, Inc. (branded as *Poly*) (member of audit committee)

Ms. Crusco brings to our Board a wealth of experience instilling operational rigor at leading technology companies. Since December 2017, Ms. Crusco has served as executive vice president and chief financial officer at Kony, Inc., a privately-held mobile applications solutions provider.

From August 2016 until November 2017, Ms. Crusco served as executive vice president, chief operating officer and chief financial officer at Epicor Software Corporation, a privately-held software company. Ms. Crusco joined Epicor in May 2011 when the company merged with Activant Solutions Inc., a business management software company where she served as senior vice president and chief financial officer from May 2007 to November 2010, then as executive vice president and chief financial officer. Before joining Activant, she worked for Polycom from 2002 to 2007, rising to the role of vice president of worldwide finance during her tenure. Ms. Crusco has also held a variety of financial roles at Documentum, Inc., Adaptec, Inc. and Price Waterhouse LLP.

Ms. Crusco holds a Bachelor of Science in Business Administration with an emphasis in accounting from California State University, Chico.

Kevin DeNuccio

Independent director

Age: 59
Director since 2012

Calix Board committees:
- Compensation
- Nominating and Corporate Governance

Other current directorships:
- Juniper Networks, Inc. (member of compensation committee)
- SevOne, Inc. (private)
- Zededa (private)

Mr. DeNuccio brings to our Board over 25 years of leadership and governance experience at communications technology companies and service providers worldwide. Mr. DeNuccio is presently general partner of Wild West Capital LLC, a private investment firm which he co-founded in July 2012.

From February 2014 until April 2017, Mr. DeNuccio served as president, chief executive officer and a member of the board of directors of Violin Memory, Inc., a publicly-held data storage company, which filed a voluntary petition for Chapter 11 bankruptcy protection in December 2016 and was subsequently acquired by a unit of Soros Fund Management LLC. Mr. DeNuccio served as chief executive officer of Metaswitch Networks, a telecommunications hardware and software company, from February 2010 until June 2012. From January 2007 until the present, Mr. DeNuccio has also worked as a private equity investor, both individually and through Wild West Capital. Mr. DeNuccio served as chief executive officer of Redback Networks from August 2001 until its acquisition by Ericsson in January 2007. From 1995 to 2001, he held a number of executive positions at Cisco Systems, Inc., including senior vice president of worldwide service provider operations. Prior to joining Cisco, Mr. DeNuccio was founder, president, and chief executive officer of Bell Atlantic Network Integration, a wholly owned subsidiary of Bell Atlantic (now Verizon Communications). He has also held senior management positions at both Unisys Corporation’s and Wang Laboratories’ network integration and worldwide channel partner businesses. Mr. DeNuccio previously served on numerous public and private boards of directors, including Sandisk, Redback and JDS Uniphase Corporation, each a publicly-held company.

Mr. DeNuccio has a Master of Business Administration from Columbia University and a Bachelor’s degree in Finance from Northeastern University.

Michael Everett — Audit Committee Chair

Independent director

Age: 69
Director since 2007

Calix Board committees:
Audit (Chair and Audit Committee financial expert)

Other current directorships:
None

Mr. Everett brings to our Board over 30 years of experience in senior management and financial operations at communications technology companies, as well as his background as a corporate attorney. Mr. Everett was named chief financial officer of the year by San Francisco Business Times in 2007 and is admitted to the State Bar of California and the New York Bar.

From May 2007 until his retirement in December 2008, Mr. Everett served as vice president of finance at Cisco Systems, Inc. From April 2003 to May 2007, Mr. Everett was chief financial officer of WebEx Communications, Inc., a web collaboration service provider that was acquired by Cisco. From 2001 to 2003, Mr. Everett served as chief financial officer of Bivio Networks, Inc., a network appliance company. In 2001, Mr. Everett served as chief financial officer of VMware, Inc., an infrastructure software company. From February 1997 to November 2000, Mr. Everett served as executive vice president and chief financial officer of Netro Corporation, a broadband wireless technology provider. Mr. Everett served in several senior management positions at Raychem Corporation from 1987 through 1996, including senior vice president and chief financial officer from August 1988 to August 1993, and was involved in the company's early fiber to the home initiatives. Before joining Raychem Corporation, Mr. Everett served as a partner in the law firm of Heller, Ehrman, White & McAuliffe LLC. He currently serves on the advisory boards of Moxtra, Inc. and Zuora, Inc. and as chair and trustee of the Santa Fe Chamber Music Festival. Mr. Everett also formerly served on the board of directors and as chairman of the audit committee of Smart Focus, Ltd., a privately-held marketing analytics company, and on the board of directors of Broncus Technologies, Inc., a privately-held medical technology company, including as chairman of the audit committee and member of the compensation committee.

Mr. Everett holds a Juris Doctor from the University of Pennsylvania Law School and a Bachelor of Arts in History from Dartmouth College.

Directors Continuing in Office Until the 2021 Annual Meeting of Stockholders

Don Listwin — Chairman of the Board; Nominating and Corporate Governance Committee Chair

Independent director

Age: 60
Director since 2007

Calix Board committees:
- Compensation
- Nominating and Corporate Governance (Chair)
- Strategic (Chair – through May 2019)

Other current directorships:
- AwareX, Inc. (private)
- iSchemaView (private)
- D-Wave Systems, Inc. (private)
- POET Technologies Inc. (member of audit and compensation committees)
- Robin Systems, Inc. (private)
- Teradici Corporation (private)

Mr. Listwin has served as chairman of our Board since July 2007 and brings over 30 years of experience in the networking industry to our Board. Since January 2018, Mr. Listwin has served as chief executive officer of iSchemaView, a privately-held medical device company.

Mr. Listwin founded BelizeKIDS.org in 2016, a non-profit organization focused on helping children in Belize, and Canary Foundation in 2004, a non-profit organization devoted to the early detection of cancer, and has served on the board of directors of both organizations since their inception. From January 2008 to January 2009, Mr. Listwin served as chief executive officer of Sana Security, Inc., a security software company, which was acquired by AVG Technologies. From September 2000 to October 2004, Mr. Listwin served as chief executive officer of Openwave Systems Inc., a leader in mobile internet infrastructure software. From August 1990 to September 2000, he served in various capacities at Cisco Systems, Inc., most recently as executive vice president. Mr. Listwin formerly served on the board of directors of Violin Memory, Inc., Isilon Systems, Inc., Openwave Systems Inc. (now known as Unwired Planet, Inc.), TIBCO Software Inc., Redback Networks, Inc. and E-Tek Dynamics Inc., each a publicly-held company. Mr. Listwin also previously served as a member of the board of scientific advisors of the National Cancer Institute.

Mr. Listwin holds an honorary Doctorate of Law from the University of Saskatchewan and a Bachelor of Science in Electrical Engineering from the University of Saskatchewan.

Kevin Peters — Cybersecurity Committee Chair

Independent director

Age: 55
Director since 2014

Calix Board committees:
- Cybersecurity (Chair)
- Nominating and Corporate Governance

Other current directorships:
- AwareX, Inc. (private)
- NetNumber Inc. (private)
- UniTek Global Services, Inc. (private)

Mr. Peters brings to our Board a wealth of leadership experience gained over the course of a 28-year career with AT&T, one of world's largest communications companies. Since February 2018, Mr. Peters has served as president and chief executive officer of NetNumber Inc., a privately-held technology company.

Mr. Peters formerly served as executive vice president, global customer service for AT&T, Inc., from 2012 until his retirement in 2014. Mr. Peters joined AT&T in 1986, and held various functional roles, including in information technology, sales, engineering and finance until 2000. Mr. Peters then served as vice president, local network planning and project management in 2001. During his subsequent career at AT&T, Mr. Peters served in the following capacities: senior vice president, network engineering from 2003 until 2004; senior vice president, global network technology program management, AT&T Labs in 2005; senior vice president-enterprise systems and software engineering in 2006; executive vice president, global network operations from 2006 until 2009; and chief marketing officer, business from 2010 until 2011. Since retiring, Mr. Peters has provided advisory services to a number of companies, including Accenture, a global management consulting and professional services firm, and J&L Group, a privately-held telecommunications company. In addition to the other current directorships described, Mr. Peters also currently volunteers and serves on the board of directors of the Crandon Lakes Country Club and the Yogi Berra Museum and Learning Center; and serves on the advisory board of the Howe School of Business, Stevens Institute of Technology.

Mr. Peters holds a Master of Business Administration with honors (Beta Gamma Sigma) from Columbia University, a Master of Science in Telecommunications Engineering from Stevens Institute of Technology and a Bachelor of Science in Psychology from Fairfield University, and attended the Harvard University Advanced Management Program.

J. Daniel Plants — Strategic Committee Chair

Independent director

Age: 52
Director since 2018

Calix Board committees:
Strategic (Chair – effective May 2019)

Other current directorships:
Cutera, Inc. (chairman of the board and member of compensation committee)

Mr. Plants brings to our Board extensive experience as a successful investor, director and advisor to public companies. Currently, Mr. Plants serves as chief investment officer of Voce Capital Management LLC, an investment advisor that he founded in 2011.

From July 2007 until May 2009, Mr. Plants served as managing director and head of communications technology and media for Needham & Company LLC, an investment banking and asset management firm. Prior to joining Needham & Company, Mr. Plants held a number of executive leadership roles at investment banking firms Goldman Sachs and JPMorgan Chase. Mr. Plants also served on the board of directors of Destination Maternity Corporation, a maternity apparel retailer, from November 2014 until December 2016.

Mr. Plants holds a Juris Doctor from the University of Michigan Law School and a Bachelor of Arts in economics from Baylor University. Mr. Plants is also admitted to the New York Bar.

There are no family relationships among any directors, director nominees or executive officers of Calix.

Our Executive Officers

The following is biographical information for our current executive officers who were not discussed above.

Name	Age	Position(s)
Cory Sindelar	50	Chief Financial Officer
Michael Weening	50	Executive Vice President, Field Operations

Cory Sindelar has served as Calix's chief financial officer and principal financial officer since October 1, 2017, and previously served as Calix's interim chief financial officer and principal financial officer from May 31, 2017 to September 30, 2017. Prior to joining Calix, Mr. Sindelar served from December 2011 to April 2017 as the chief financial officer of Violin Memory, Inc., a publicly-held data storage company, which filed a voluntary petition for Chapter 11 bankruptcy protection in December 2016 and was subsequently acquired by a unit of Soros Fund Management LLC. He also previously served as chief financial officer of Kilopass Technology, Inc. from November 2010 to December 2011, and as chief financial officer of Ikanos Communications, Inc. from September 2006 to July 2010. From 2003 to 2006, Mr. Sindelar held various finance positions at EMC Corporation. From 2000 to 2003, Mr. Sindelar was vice president, corporate controller and principal accounting officer at Legato Systems, Inc., an enterprise software company, which was acquired by EMC. Mr. Sindelar holds a Bachelor of Science in Business Administration with an emphasis in accounting from Georgetown University.

Michael Weening has served as Calix's executive vice president of field operations since July 2018, and previously served as executive vice president of sales and marketing from November 2016 until June 2018, and as executive vice president of sales from June 2016 until November 2016. Prior to joining Calix, Mr. Weening held various executive leadership roles at Salesforce.com, a customer relationship management company. From August 2014 until June 2016, Mr. Weening served as senior vice president of global customer success and services at Salesforce.com, and from May 2012 until August 2014 as senior vice president of customer and sales growth in Japan and Asia Pacific at Salesforce.com. From May 2009 until May 2012, Mr. Weening served as vice president of business sales at Bell Mobility in Canada. Prior to joining Bell Mobility, Mr. Weening also held various sales leadership roles at Microsoft Corporation in Canada and the United Kingdom. Mr. Weening holds a Bachelor of Arts in Business Administration from Brock University.

Independence of the Board

The NYSE prescribes independence standards for listed companies. These standards require a majority of the Board to be independent. They also require each member of the Audit Committee, Compensation Committee and Nominating and Corporate Governance Committee of the Board to be independent. No director qualifies as independent unless the Board determines that the director has no direct or indirect material relationship with us. The Board also evaluates each director's independence to serve on our Board and committees under the applicable requirements of the SEC. On an annual basis, each director and executive officer is obligated to complete a director and officer questionnaire which requires disclosure of any transactions with us in which the director or executive officer, or any member of his or her immediate family, have a direct or indirect material interest. We also review our relationship with any entity employing a director or on which the director currently serves as a member of the board.

After review of all relevant transactions or relationships between each director, or any of his or her immediate family members, and Calix, its senior management and its independent registered public accounting firm, the Board has affirmatively determined that all of Calix's current directors are independent directors within the meaning of the applicable NYSE standards, except for Mr. Russo, Calix's current president and chief executive officer. All of the committees of our Board are comprised entirely of directors determined by the Board to be independent within the meaning of the NYSE standards and applicable SEC regulations.

PROPOSAL NO. 2

APPROVAL OF THE CALIX, INC. 2019 EQUITY INCENTIVE AWARD PLAN

Summary

On March 22, 2019, the Board adopted, subject to stockholder approval, the Calix, Inc. 2019 Equity Incentive Award Plan (the "2019 Plan"). The 2019 Plan is intended to replace our 2010 Equity Incentive Award Plan (the "2010 Plan"). Upon stockholder approval of the 2019 Plan, the 2019 Plan will become effective and will supersede and replace in its entirety the 2010 Plan, and no further awards will be granted under the 2010 Plan; however, the terms and conditions of the 2010 Plan will continue to govern any outstanding awards granted thereunder. If the 2019 Plan is not approved by our stockholders, it will not become effective, the 2010 Plan will continue in effect, and we may continue to grant awards under the 2010 Plan, subject to its terms, conditions and limitations, using the shares available for issuance thereunder.

Employees and consultants of the Company, its subsidiaries and affiliates, as well as members of our Board, are eligible to receive awards under the 2019 Plan. The 2019 Plan provides for the grant of stock options, including incentive stock options ("ISOs") and nonqualified stock options ("NQSOs"), stock appreciation rights ("SARs"), restricted stock, restricted stock units ("RSUs"), other stock or cash-based awards and dividend equivalents to eligible individuals.

The Board approved a 1,700,000 share reserve under the 2019 Plan, such that the number of shares available for issuance under the 2019 Plan is equal to the sum of (i) 1,700,000 shares of our common stock, (ii) any shares of our common stock that are available for issuance under the 2010 Plan as of the effective date of the 2019 Plan, and (iii) any shares of our common stock subject to issued and outstanding awards under the 2010 Plan that expire, are cancelled or otherwise terminate following the effective date of the 2019 Plan. In designing the 2019 Plan, we sought to implement a number of important compensation and governance best practices to ensure the 2019 Plan furthers our compensation plan objectives and supports long-term stockholder interests. Specifically, compared to our 2010 Plan, we (i) removed the evergreen provisions so that increases in the share pool for the 2019 Plan would require stockholder approval, (ii) eliminated any reload rights associated with awards, (iii) adopted minimum vesting requirements for awards and (iv) prohibited dividend payments on unvested awards. Furthermore, we adopted a policy that any award to our NEOs under the 2019 Plan would be subject to our Compensation Recovery Policy with clawback provisions that will apply to any awards to NEOs under the 2019 Plan. In addition, the following items will not be counted against the shares available for issuance under the 2019 Plan: (i) the payment of dividend equivalents in cash in conjunction with any outstanding awards and (ii) to the extent permitted by applicable law or any exchange rule, shares issued in assumption of, or in substitution for, any outstanding awards of any entity acquired in any form of combination by our company or any of its subsidiaries, except as may be required by reason of Section 422 of the U.S. Internal Revenue Code of 1986, as amended (the "Code").

On March 25, 2019, the record date for the 2019 Annual Meeting (the "Record Date"), the Company had an aggregate of 54,163,829 common shares outstanding. On the Record Date, the Company had a total of approximately 1,029,559 common shares reserved for issuance and available for future grants under the 2010 Plan. As of the Record Date, there were approximately 629,196 full-value awards issued and outstanding and approximately 6,390,368 options outstanding under our prior plans, including the 2010 Plan, with an approximate weighted average exercise price of the outstanding options of $7.61 and an approximate weighted average remaining contractual term for the outstanding options of eight years.

Approval of the 2019 Plan will constitute approval pursuant to the stockholder approval requirements of Section 422 of the Code, relating to ISOs.

Key Features of the 2019 Plan

- ***No repricing of awards without stockholder approval***. Under the 2019 Plan, awards may not be repriced, replaced or regranted through cancellation or modification without stockholder approval if the effect would be to reduce the exercise price for the shares underlying the award.
- ***No evergreen feature/stockholder approval required for share reserve increases***. The 2019 Plan does not provide for an annual increase in the share reserve, and the 2019 Plan may not be amended to increase the share reserve without stockholder approval.
- ***No reload features***. Awards granted under the 2019 Plan are not subject to any reload provisions.
- ***Minimum vesting requirements.*** Subject to limited exceptions, no awards granted under the 2019 Plan may vest until the first anniversary of the date of grant.
- ***No payment of dividends on unvested awards.*** Under the 2019 Plan, no dividends or dividend equivalents in respect of shares underlying an unvested award may be paid.
- ***Requirement that all awards granted to NEOs are subject to clawback***. Awards granted to our NEOs under the 2019 Plan are subject to the clawback provisions under our Compensation Recovery Policy.

Background on Share Request

In its determination to approve the 2019 Plan, our Board reviewed an analysis prepared by Radford, its compensation consultant, which included an analysis of our historical share usage, certain burn rate metrics and the costs of the 2019 Plan. Specifically, our Board considered the following:

- In determining the reasonableness of the 2019 Plan share reserve, our Board considered our historic burn rate. In 2018, 2017 and 2016, we granted equity awards representing a total of approximately 404,146 shares, 4,032,236 shares, and 2,516,681 shares, respectively, under the 2010 Plan. This level of equity awards represents a three-year average burn rate of approximately 4.66% of weighted average ordinary shares outstanding. Equity burn rate is calculated by dividing the number of shares subject to equity awards granted during the fiscal year (without adjusting for forfeitures) by the weighted average ordinary shares outstanding during the fiscal year. The following table lists all grants of performance-based stock options against actual shares earned by our NEOs in each of the last three fiscal years.

	Performance-Based Stock Options					
	2016		2017		2018	
	Granted	Earned	Granted	Earned	Granted	Earned
Carl Russo *President and Chief Executive Officer*	—	—	420,000	—	—	—
Cory Sindelar *Chief Financial Officer*	—	—	108,000	—	—	54,000 (1)
Michael Weening *Executive Vice President, Field Operations*	—	—	344,000	—	—	102,000 (1)
Gregory Billings *Senior Vice President, Services*	—	—	201,000	—	—	63,000 (1)

(1) Shares earned in 2018 represent the vested portion of the 2018 Performance-Based Equity Awards granted to Messrs. Sindelar, Weening and Billings. Vesting of the 2018 Performance-Based Equity Awards were contingent upon achievement of a 2018 financial performance metric, with 50% of the shares earned based on performance scheduled to vest on January 1, 2019 and the remaining 50% scheduled to vest in substantially equal installments over the subsequent 24 months. In February 2019, the Compensation Committee certified attainment of the 2018 performance metric. See discussion in our Compensation Discussion and Analysis under "*Performance-Based Grant – 2018 Financial Performance*."

- We expect the share authorization under the 2019 Plan to provide us with enough shares for awards for approximately one year through the 2020 annual meeting of stockholders, assuming we continue to grant awards consistent with our current practices and historical usage, as reflected in our historical burn rate. We cannot predict our future equity grant practices, the future price of our shares or future hiring activity with any degree of certainty at this time, and the share reserve under the 2019 Plan could last for a shorter or longer time.
- Radford's analysis, which is based on generally accepted evaluation methodologies, concluded that the number of shares under the 2019 Plan is well within generally accepted standards as measured by an analysis of the plan cost relative to industry standards.

In light of the factors described above, and that the ability to continue to grant equity compensation is vital to our ability to continue to attract and retain employees in the competitive labor markets in which we compete, our Board has determined that the size of the share reserve under the 2019 Plan is reasonable and appropriate at this time.

A summary of the principal provisions of the 2019 Plan is set forth below. The summary is qualified by reference to the full text of the 2019 Plan, which is attached as Appendix A to this Proxy Statement.

Administration

The Compensation Committee (or, with respect to awards to non-employee directors, our Board) (together, the "administrator") is charged with the general administration of the 2019 Plan. The 2019 Plan provides that, subject to certain limitations, our Board and the Compensation Committee may from time to time delegate its authority to grant awards to a committee consisting of one or more members of our Board or the Compensation Committee or one or more of our officers. Subject to the terms and conditions of the 2019 Plan, the administrator will have the authority to select the persons to whom awards are to be made; to determine the type of awards to be granted, the number of shares to be subject to awards and the terms and conditions of awards; to determine when awards can be settled in cash, shares, other awards or whether to cancel, forfeit or surrender awards; to prescribe the form award agreements; to accelerate vesting or lapse restrictions; and to make all other determinations and to take all other actions necessary or advisable for the administration of the 2019 Plan. The administrator will also be authorized to adopt, amend or rescind rules relating to the administration of the 2019 Plan, excluding certain matters described below that will require the approval of our stockholders.

Eligibility

Persons eligible to participate in the 2019 Plan include all members of the Board, currently comprised of nine non-employee directors and approximately 767 employees (including three NEOs) of the Company and its subsidiaries, as well as consultants of the Company and its subsidiaries, in each case, as determined by the administrator of the 2019 Plan. Only employees may be granted ISOs under the 2019 Plan.

Limitation on Awards and Shares Available

If our stockholders approve the 2019 Plan, the number of shares available for issuance under 2019 Plan will be equal to the sum of (i) 1,700,000 shares of our common stock, (ii) any shares of our common stock that are available for issuance under the 2010 Plan as of the effective date of the 2019 Plan, and (iii) any shares of our common stock subject to issued and outstanding awards under the 2010 Plan that expire, are cancelled or otherwise terminate following the effective date of the 2019 Plan. In addition, the following items will not be counted against the shares available for issuance under the 2019 Plan: (i) the payment of dividend equivalents in cash in conjunction with any outstanding awards and (ii) to the extent permitted by applicable law or any exchange rule, shares issued in assumption of, or in substitution for, any outstanding awards of any entity acquired in any form of combination by our company or any of its subsidiaries, except as may be required by reason of Section 422 of the Code.

Awards granted under the 2019 Plan must vest no earlier than one year measured from the date of grant and no award agreement may reduce or eliminate such minimum vesting requirement, provided that an award may provide that such minimum vesting restrictions may lapse or be waived upon a participant's termination of service. In addition, up to an aggregate of five percent of the number of shares available for issuance under the 2019 Plan may be granted without regard to the foregoing minimum vesting requirement. For the purposes of awards to non-employee directors, a vesting period shall be deemed to be one year if it runs from the date of one annual meeting of the Company's stockholders to the next annual meeting of the Company's stockholders, so long as the period between such meetings is not less than 50 weeks.

As of March 25, 2019, the closing price of a share of our common stock on the NYSE was $7.75.

Awards

The 2019 Plan provides for the grant of ISOs, NQSOs, SARs, restricted stock, RSUs, dividend equivalents and other share or cash-based awards. All awards under the 2019 Plan will be set forth in award agreements, which will detail all terms and conditions of the awards, including any applicable vesting and payment terms and post-termination exercise limitations. No fractional shares shall be issued or delivered pursuant to the 2019 Plan or any award thereunder.

The 2019 Plan provides that the administrator may grant or issue stock options, SARs, restricted stock, RSUs, dividend equivalents and other stock or cash awards, or any combination thereof. Each award will be set forth in an agreement with the person receiving the award and will set forth the type, terms and conditions of the award, including exercise price, vesting schedule, and treatment of awards upon termination of employment, if applicable. Vesting provisions may require that certain conditions be met, such as continued employment or specified performance goals, before an awardee may receive the shares underlying an award or before such shares become freely tradeable and nonforfeitable.

Stock Options. Stock options, including ISOs and NQSOs may be granted pursuant to the 2019 Plan. The option exercise price of all stock options granted pursuant to the 2019 Plan will not be less than 100% of the fair market value of a share of common stock on the date of grant, or in the case of ISOs granted to an individual who owns (or is deemed to own) at least 10% of the total combined voting power of all classes of our capital stock, 110% of the fair market value of a share on the date of grant. Stock options may be exercised as determined by the administrator, but in no event more than ten years after their date of grant, or in the case of ISOs granted to an individual who owns (or is deemed to own) at least 10% of the total combined voting power of all class of our capital stock, five years. The aggregate fair market value of the shares with respect to which options intended to be incentive stock options are exercisable for the first time by an employee in any calendar year may not exceed $100,000, or such other amount as the Code provides.

Restricted Stock. Restricted stock may be granted pursuant to the 2019 Plan. A restricted stock award is the grant of shares of common stock at a price determined by the administrator (which may be zero), that is nontransferable and may be subject to substantial risk of forfeiture until specific conditions are met. Conditions may be based on continuing employment or service or achieving performance goals. During the period of restriction, participants holding shares of restricted stock may have full voting and dividend rights with respect to such shares. The restrictions will lapse in accordance with a schedule or other conditions determined by the administrator. Dividends that otherwise would be paid prior to vesting are held by the Company and will be paid to the participants only to the extent that the vesting conditions are met.

Stock Appreciation Rights/SARs. Stock appreciation rights or SARs may be granted pursuant to the 2019 Plan, either alone or in tandem with other awards. A SAR is the right to receive payment of an amount equal to the excess of the fair market value of a share of common stock on the date of exercise of the SAR over the fair market value of a share of common stock on the date of grant of the SAR. SARs may be paid in cash or stock. SARs may be exercised as determined by the administrator, but in no event more than 10 years after their date of grant.

Restricted Stock Units/RSUs. Restricted stock units or RSUs represent the right to receive shares of common stock at a specified date in the future, subject to forfeiture of such right. If the RSU has not been forfeited, then on the date specified in the RSU award we shall deliver to the holder of the RSU unrestricted shares of common stock which will be freely transferable. The administrator will specify the purchase price, if any, to be paid by the grantee for the common stock.

Dividend Equivalents / Dividends. Dividend equivalents represent the value of the dividends per share of common stock paid by the Company, calculated with reference to the number of shares covered by an Award (other than a dividend equivalent award, option or SAR) held by the participant. Dividend Equivalents will not be granted on options or stock appreciation rights. In addition, no dividend or dividend equivalents will be paid in respect of shares underlying any unvested awards.

Other Stock or Cash Based Awards. Other stock or cash based awards are awards of cash, fully vested shares of common stock and other awards valued wholly or partially by referring to, or otherwise based on, our common stock. Other stock or cash based awards may be granted to participants and may also be available as a payment form in the settlement of other awards, as standalone payments and as payment in lieu of base salary, bonus, fees or other cash compensation otherwise payable to any individual who is eligible to receive awards. The administrator will determine the terms and conditions of other stock or cash based awards, which may include vesting conditions based on continued service, performance and/or other conditions.

Prohibition on Repricing Without Stockholder Approval

Except in connection with a corporate transaction involving our company, the terms of outstanding awards may not be amended without the approval of our stockholders to (a) reduce the exercise price per share of outstanding options or SARs or (b) cancel outstanding options or SARs in exchange for cash, other awards or options or SARs with an exercise price per share that is less than the exercise price per share of the original options or SARs.

Awards Subject to Clawback

The 2019 Plan allows the administrator to subject awards (including any proceeds, gains or other economic benefit actually or constructively received by a participant) granted under the 2019 Plan to the clawback provisions of our Compensation Recovery Policy and any clawback policy we adopt to comply with applicable law, including, without limitation, the Dodd-Frank Wall Street Reform and Consumer Protection Act and any rules or regulations promulgated thereunder, whether or not such clawback policy was in place at the time of grant of an award, to the extent set forth in such clawback policy and/or in the applicable award agreement.

MISCELLANEOUS PROVISIONS

Adjustment Upon Certain Events

In the event of a stock dividend, stock split, combination or exchange of shares, merger, consolidation, spin-off, recapitalization, distribution of assets or any other corporate event affecting the common stock or the share price of the common stock in a manner that causes dilution or enlargement of benefits or potential benefits under the 2019 Plan, the administrator will make proportionate and equitable adjustments, in its discretion, to: (i) the aggregate number and types of shares of stock that may be issued under the 2019 Plan; (ii) the number and kind of shares subject to outstanding awards; (iii) the terms and conditions of any outstanding awards (including any applicable performance targets); and/or (iv) the grant or exercise price for any outstanding awards.

In addition, in such a case as noted above or in the event of any unusual or nonrecurring transactions or events affecting the Company or the financial statements of the Company, or of changes in applicable laws, the administrator, may, in its discretion, subject to the terms of the 2019 Plan, take any of the following actions if it determines that such action is appropriate in order to prevent the dilution or enlargement of benefits or potential benefits intended to be made available under the 2019 Plan or with respect to any award: (i) provide for either the payment and termination of the award or the replacement of the award; (ii) provide that the awards shall be assumed by the successor or survivor corporation, or a parent or subsidiary thereof, or shall be substituted for by similar awards covering the stock of the successor or survivor corporation, or a parent or subsidiary thereof, with appropriate adjustments as to the number and kind of shares and prices; (iii) make adjustments in the number and type of shares of stock (or other securities or property) subject to outstanding awards and/or in the terms and conditions of (including the grant or exercise price), and the criteria included in, outstanding awards which may be granted in the future; (iv) provide for the acceleration of vesting or exercisability of the awards; (v) replace such Awards with other rights or property selected by the Administrator; and/or (vi) provide that the awards cannot vest or be exercised after the event that triggers the action.

If a Change in Control of the Company occurs (as defined in the 2019 Plan), all outstanding options and SARs that are not exercised shall be assumed or substituted by the surviving corporation and other outstanding awards shall be converted into similar awards of the surviving corporation. If the surviving corporation refuses to assume or substitute for an award, the award shall accelerate and become fully vested and exercisable upon the Change in Control and all restrictions on the award shall lapse.

Transferability of Awards

Except by will or the laws of descent and distribution or pursuant to beneficiary designation procedures approved from time to time by the administrator or as otherwise provided by the administrator, no award granted under the 2019 Plan may be assigned, transferred or otherwise disposed of by the awardee, unless and until the award has been exercised or the shares underlying the award have been issued, and all restrictions applicable to the shares have lapsed.

Rights as a Stockholder

An awardee will not have any rights as a stockholder with respect to the shares covered by an award until the awardee becomes the owner of the shares.

No Rights as Employee

Nothing in the 2019 Plan or in any award agreement will give any awardee under the 2019 Plan any right to continue as an employee, consultant or non-employee director for our Company or any of our Subsidiaries or will interfere with or restrict in any way the rights of any such entity to discharge any awardee at any time.

Data Privacy

The 2019 Plan provides that, as a condition of receipt of any award, each awardee explicitly consents to the collection, use and transfer, in electronic or other form, of personal data by and among, as applicable, our Company and subsidiaries, including any transfer of this data required to a broker or other third party with whom our Company or any of our Subsidiaries or the awardee may elect to deposit any shares, to implement, administer and manage the awardee's participation in the 2019 Plan.

Tax Withholding

We may deduct or withhold, or require an awardee to remit to our Company, an amount sufficient to satisfy applicable withholding tax obligations with respect to any taxable event concerning the awardee arising as a result of the 2019 Plan or any award. The administrator may in its discretion and in satisfaction of the foregoing requirement, or in satisfaction of such additional withholding obligations as an awardee may have elected, allow the awardee to satisfy these obligations by means of cash or check, wire transfer of immediately available funds, shares, broker-assisted cashless exercise or any other form of legal consideration acceptable to the administrator. The Administrator may allow the awardee to elect to have us withhold shares otherwise issuable under any award (or allow the surrender of shares). The number of shares which may be withheld (or surrendered) will be no greater than the number of shares having a fair market value on the date of withholding or repurchase equal to the aggregate amount of such liabilities based on the maximum statutory withholding rates in the awardee's applicable jurisdictions for federal, state, local and foreign income and payroll taxes.

Amendment and Termination

The 2019 Plan may be amended, modified or terminated at any time and from time to time; provided that, no amendment, suspension or termination of the 2019 Plan shall, without the consent of the awardee, materially and adversely affect any rights or obligations under any award theretofore granted or awarded, unless the award itself otherwise expressly so provides or such action is to comply with the requirements of any applicable clawback policy or Section 409A of the Code.

Notwithstanding the foregoing, the 2019 Plan requires us to obtain stockholder approval within twelve (12) months before or after doing any of the following (other than in connection with certain corporate events, as described above):

- Increasing the maximum number of shares available under the 2019 Plan;
- Reducing the price per share of any outstanding option or SAR granted under the 2019 Plan; and
- Cancelling any option or SAR in exchange for cash or another option or SAR having a lower per share exercise price.

In addition, subject to applicable law and the limitations above, the administrator may amend, modify or terminate any outstanding award, including substituting another award of the same or a different type, changing the date of exercise or settlement, and converting an ISO to an NQSO. The awardee's consent to such action will be required unless (a) the administrator determines that the action, taking into account any related action, would not materially and adversely affect the awardee, or (b) the change is otherwise permitted under the 2019 Plan.

Expiration Date

The 2019 Plan will expire on, and no award will be granted pursuant to the 2019 Plan after March 22, 2029, the tenth anniversary of the date the 2019 Plan was approved by the Board of Directors. Any award outstanding on the expiration date of the 2019 Plan will remain in force according to the terms of the 2019 Plan and the applicable award agreement.

FEDERAL INCOME TAX CONSEQUENCES

This discussion regarding federal tax consequences is intended for the general information of our share owners, not 2019 Plan awardees. Alternative minimum tax and state and local income taxes are not discussed and may vary depending on individual circumstances and from locality to locality.

Code Section 162(m)

Under Code Section 162(m), income tax deductions of publicly-traded companies may be limited to the extent total compensation (including, without limitation, base salary, annual bonus, RSU settlement and nonqualified benefits) for certain executive officers exceeds $1 million (less the amount of any “excess parachute payments” as defined in Code Section 280G) in any one year. Under the tax rules in effect before 2018, the Code Section 162(m) deduction limit did not apply to qualified “performance-based” compensation that was established by an independent compensation committee and conformed to certain restrictive conditions stated under the Code and related regulations. However, the U.S. Tax Cuts and Jobs Act of 2017 eliminated this performance-based compensation exception effective January 1, 2018, subject to a special rule that “grandfathers” certain awards and arrangements that were in effect on or before November 2, 2017. As a result, compensation awarded in excess of $1 million to our current and former NEOs generally is not deductible.

Code Section 409A

Certain awards under the 2019 Plan may be considered “nonqualified deferred compensation” subject to Code Section 409A, which imposes additional requirements on the payment of deferred compensation. These requirements generally provide that, if at any time during a taxable year a nonqualified deferred compensation plan fails to meet the requirements of Code Section 409A or is not operated in accordance with those requirements, all amounts deferred under the nonqualified deferred compensation plan for the then-current taxable year and all preceding taxable years, by or for any awardee with respect to whom the failure relates, are includible in the gross income of the awardee for the taxable year to the extent not subject to a substantial risk of forfeiture and not previously included in gross income. If a deferred amount is required to be included in income under Code Section 409A, the amount will be subject to income tax at regular income tax rates plus a 20 percent penalty, as well as potential premium interest tax.

Federal Tax Treatment of Award Types

With respect to NQSOs, the Company is generally entitled to deduct and the optionee recognizes taxable income in an amount equal to the difference between the option exercise price and the fair market value of the shares at the time of exercise. A participant receiving ISOs will not recognize taxable income upon grant. Additionally, if applicable holding period requirements are met, the participant will not recognize taxable income at the time of exercise. However, the excess of the fair market value of the Common Stock received over the option price is an item of tax preference income potentially subject to the alternative minimum tax. If stock acquired upon exercise of an ISO is held for a minimum of two years from the date of grant and one year from the date of exercise, the gain or loss (in an amount equal to the difference between the fair market value on the date of sale and the exercise price) upon disposition of the stock will be treated as a long-term capital gain or loss, and the Company will not be entitled to any deduction. If the holding period requirements are not met, the ISO will be treated as one which does not meet the requirements of the Code for ISOs and the tax consequences described for NQSOs will apply.

The current federal income tax consequences of other awards authorized under the 2019 Plan generally follow certain basic patterns: SARs are taxed and deductible in substantially the same manner as NQSOs; nontransferable restricted stock subject to a substantial risk of forfeiture results in income recognition equal to the excess of the fair market value over the price paid, if any, only at the time the restrictions lapse (unless the recipient elects to accelerate recognition as of the date of grant); stock-based performance awards, dividend equivalents and other types of awards are generally subject to tax at the time of payment. Compensation otherwise effectively deferred is taxed when paid. In each of the foregoing cases, the Company will generally have a corresponding deduction at the time the participant recognizes income, subject to Section 162(m) with respect to covered employees. An award of a retainer, committee fee or meeting-based fee generally realizes ordinary income and we are entitled to a deduction in an amount equal to the amount of such retainer or fees upon payment thereof.

New Plan Benefits

Other than with respect to annual grants of stock options to our non-employee directors that will be made immediately following the date of the Annual Meeting, all future awards under the 2019 Plan (assuming it is approved by stockholders) are subject to the discretion of the plan administrator, and therefore it is not possible to determine the benefits that will be received in the future by other participants in the 2019 Plan (although the *Grants of Plan-Based Awards in 2018* table in this Proxy Statement describes all equity awards granted to our named executive officers during our fiscal year ended December 31, 2018 under the 2010 Plan).

Name and Position	Dollar Value ($)	Number of Shares Underlying Award Grants (#)
Carl Russo, *President and Chief Executive Officer*	—	—
Cory Sindelar, *Chief Financial Officer*	—	—
Michael Weening, *Executive Vice President, Field Operations*	—	—
All current executive officers as a group	—	—
All current directors who are not executive officers as a group (1)	1,080,000	—
All employees who are not executive officers as a group	—	—

(1) Our Non-Employee Director Equity Compensation Policy provides that each director who is a non-employee director (provided that such director has served as a director for at least six months prior to such date) will automatically be granted RSUs valued at $120,000 (based on the per share closing price of our common stock on the date of such annual meeting of stockholders), which will be granted on the first business day after the Annual Meeting and vest on the earlier of the first anniversary of the grant date or the day prior to the next annual general meeting of our stockholders, subject to continuous service as a director until such vesting date, except in the event of certain terminations of service.

To be approved, this proposal must receive a "For" vote from the holders of a majority in voting power of the shares of common stock which are present or represented by proxy and entitled to vote on the proposal. Abstentions will have the same effect as an "Against" vote for purposes of determining whether this matter has been approved. Broker non-votes will not be counted for any purpose in determining whether this matter has been approved.

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" APPROVAL OF THE CALIX, INC. 2019 EQUITY INCENTIVE AWARD PLAN AS DISCUSSED ABOVE.

PROPOSAL NO. 3

APPROVAL OF THE CALIX, INC. AMENDED AND RESTATED EMPLOYEE STOCK PURCHASE PLAN

We are asking our stockholders to approve the Calix, Inc. Amended and Restated Employee Stock Purchase Plan ("ESPP") to increase the number of shares authorized for issuance under the ESPP by 2,500,000 shares. This would increase the total shares authorized for issuance under the ESPP from 7,300,000 shares to 9,800,000 shares. Our Board, upon recommendation of the Compensation Committee, approved the increase by 2,500,000 shares of the shares authorized for issuance effective as of March 22, 2019, subject to stockholder approval.

The purpose of the ESPP is to provide our employees with an opportunity to purchase the Company's common stock so that they may increase their proprietary interest in our success and to align employee interests to those of our stockholders. We believe that the ESPP is an important component of the benefits package that we offer to our employees, is a key factor in recruiting and retaining talented and high caliber employees in a competitive market and serves to incentivize employee performance aligned with our business strategy and growth initiatives. In the past two years, we averaged approximately 400 employees participating in the ESPP in each purchase period.

Under the ESPP, eligible employees purchase our common stock through accumulated payroll deductions. All eligible employees of the Company (or of any subsidiary) shall have equal rights and privileges under the ESPP. The ESPP qualifies as an employee stock purchase plan under Section 423 of the Internal Revenue Code of 1986, as amended (the "Code").

Our stockholders last approved an increase in the shares authorized for issuance under the ESPP in May 2017 which increased the shares available for issuance under the ESPP to 7,300,000. As of March 25, 2019, a total of 5,750,431 shares have been purchased under the ESPP since its inception in July 2010. Given the current rate of participation by our employees in the ESPP and the expansion of ESPP eligibility to our employees in China, we expect that the additional 2,500,000 share increase to the ESPP will cover two to three years of purchases.

The current purchase periods under the ESPP, as set by the Compensation Committee of our Board, provide for six-month purchase periods commencing May 15 and November 15 of each year. If approved by our stockholders, the increase in shares for the ESPP will go into effect for the six-month purchase period commencing November 15, 2019 with an exercise date of May 14, 2020.

A copy of the proposed ESPP is included as Appendix B to this Proxy Statement.

Summary of the ESPP

The principal features of the ESPP are summarized below. The following summary of the ESPP is not a complete description of all the provisions of the ESPP and is qualified in its entirety by reference to the complete text of the ESPP, which is filed with the SEC as Appendix B to this Proxy Statement. Any stockholder who wishes to obtain a copy of the ESPP may do so by written request to the Calix's Corporate Secretary at 2777 Orchard Parkway, San Jose, California 95134.

Administration. Our Board has appointed our Compensation Committee to serve as the administrator of the ESPP. The ESPP administrator has final authority for interpretation of any provisions of the ESPP or of any right to purchase stock granted under the ESPP. The Plan administrator may request advice or assistance or employ such other persons as are necessary for proper administration of the Plan. Interpretations and constructions of the administrator of any provision of the ESPP or of any rights under it is conclusive and binding on all persons. We bear all expenses and liabilities incurred by the ESPP administrator.

Offerings. The ESPP provides for the grant to employees of rights to purchase shares of the Company's common stock at reduced prices through payroll deductions. "Purchase Periods" are six-month periods that are set as November 15 through May 14 and May 15 through November 14 of each year, unless otherwise determined by our Compensation Committee as administrator of the ESPP. However, in no event may a Purchase Period be longer than 27 months in length.

Shares Available Under ESPP. Under the proposed ESPP, the maximum number of our shares of common stock which will be authorized for sale under the ESPP is 9,800,000, an increase of 2,500,000 shares from the share reserve last approved by our stockholders in May 2017. The shares made available for sale under the ESPP may be authorized but unissued shares or reacquired shares reserved for issuance under the ESPP.

Eligibility and Enrollment. Any employee of the Company (and such present or future subsidiaries of the Company as our Board may designate) who (i) is customarily employed more than twenty hours a week; (ii) is customarily employed more than five months per calendar year and (iii) who is an employee at the commencement of a Purchase Period is eligible to participate in the ESPP. However, no employee is eligible to participate in the ESPP if, immediately after the election to participate, such employee would own stock of the Company (including stock such employee may purchase under outstanding options) representing 5% or more of the total combined voting power or value of all classes of stock of the Company or any parent or subsidiary of the Company. In addition, no employee is permitted to participate if the rights of the employee to purchase common stock of the Company under the ESPP and any other qualified employee stock purchase plans would accrue at a rate which exceeds $25,000 of the fair market value of such stock (determined at the time the right is granted) for each calendar year. Eligible employees become participants in the ESPP by executing a participation agreement and filing it with the Company's stock administrator. By enrolling in the ESPP, a participant is deemed to have elected to purchase the maximum number of whole shares of common stock that can be purchased with the compensation withheld during each Purchase Period for which the participant is enrolled. No participant will be eligible to purchase more than 2,000 shares of stock within any Purchase Period. Termination of a participant's status as an eligible employee for any reason, including death, is treated as an automatic withdrawal from the ESPP.

As of March 25, 2019, two of our current executive officers and approximately 737 current non-executive officer employees in the U.S., Canada and China are eligible to participate in the ESPP. Mr. Russo is not eligible to participate in the ESPP based on his total share holdings of Calix common stock. In addition, consultants and non-employee directors are not eligible to participate in the ESPP.

Payroll Deductions. The payroll deductions made for each participant may be not less than 1% nor more than 15% of a participant's base salary compensation. Compensation is defined in the ESPP, and generally includes cash renumeration that would be reported as income for federal income tax purposes. Payroll deductions commence with the first paycheck issued during the Purchase Period for which the participant is enrolled and are deducted from subsequent paychecks throughout the Purchase Period unless changed or terminated as provided in the ESPP. A participant may decrease (but not increase) his or her payroll deduction authorization once during any Purchase Period. If a participant wishes to increase or decrease the rate of payroll withholding, he or she may do so effective for the next Purchase Period by submitting a new election.

Exercise Date; Purchase of Stock. The "Exercise Date" of each Purchase Period occurs on the last trading day of each Purchase Period. On the Exercise Date, each participant's accumulated payroll deductions are applied to the purchase of whole shares of common stock at a purchase price which is the lower of 85% of the fair market value per share of the common stock on the first trading day or on the last trading day of the applicable Purchase Period. The fair market value of the common stock on a given date is defined as the closing price on that day as reported by the NYSE. As of March 25, 2019, the closing price of our common stock on the NYSE was $7.75 per share.

A participant may cancel his or her payroll deduction authorization at any time at least seven days before the last day of the Purchase Period. Upon cancellation, the participant's account balance will be refunded in cash without interest. A participant who ceases contributions to the ESPP during any Purchase Period shall not be permitted to resume contributions to the ESPP during the same Purchase Period.

Unless a participant has previously canceled his or her participation in the ESPP in accordance with the terms of the ESPP, the participant will be deemed to have exercised his or her purchase right in full as of each Exercise Date. Upon exercise, the participant will purchase the number of whole shares that his or her accumulated payroll deductions will buy at the purchase price, subject to the participation limitations listed above.

A participant may not assign, transfer, pledge or otherwise dispose of (other than by will or the laws of descent and distribution) payroll deductions credited to a participant's account or any rights or interest, including purchase rights, under the ESPP, and during a participant's lifetime, purchase rights under the ESPP shall be exercisable only by such participant. Any such attempt at assignment, transfer, pledge or other disposition will not be given effect.

Adjustments upon Changes in Recapitalization, Dissolution, Liquidation, Merger or Asset Sale. In the event of any increase or decrease in the number of issued shares of our common stock resulting from a subdivision or consolidation of shares or any other capital adjustment, the payment of a stock dividend, or other increase or decrease in such shares affected without receipt of consideration, we will proportionately adjust the aggregate number of shares of our common stock offered under the ESPP, the number and price of shares which any participant has elected to purchase pursuant under the ESPP and the maximum number of shares which a participant may elect to purchase in any single Purchase Period.

If there is a proposal to dissolve or liquidate the Company, then the ESPP will terminate, and any amounts that a participant has paid towards the purchase of common stock under the ESPP will be refunded without interest. If the Company undergoes a merger with or into another corporation or sale of all or substantially all of our assets, each outstanding Purchase Period will be assumed or an equivalent Purchase Period substituted by the successor corporation or the parent or subsidiary of the successor corporation. If the successor corporation refuses to assume or substitute for the outstanding Purchase Period, then the outstanding Purchase Period will be shortened by setting a new Exercise Date to take place before the date of the proposed sale or merger. We will notify each participant in writing at least five days prior to any such new Exercise Date.

Amendment and Termination. Our Board may amend, suspend or terminate the ESPP at any time. The ESPP shall terminate upon the earlier of (i) such date as is determined by the Company in its sole discretion or (ii) the date on which all shares available for issuance under the ESPP shall have been sold pursuant to purchase rights exercised under the ESPP. However, the Board may not amend the ESPP without obtaining stockholder approval within 12 months before or after such amendment to the extent required by applicable laws.

Federal Income Tax Consequences

Generally, no federal income tax consequences will arise at the time an employee purchases shares of common stock under the ESPP. If an employee disposes of shares purchased under the ESPP less than one year after the shares are purchased or within two years of the enrollment date, the employee will be deemed to have received compensation taxable as ordinary income for the taxable year in which the disposition occurs in the amount of the difference between the fair market value of the shares of common stock at the time of purchase and the amount paid by the employee for the shares. The amount of such ordinary income recognized by the employee will be added to the employee's basis in the shares for purposes of determining capital gain or loss upon the disposition of the shares by the employee.

If an employee does not dispose of the shares of common stock purchased under the ESPP until at least one year after the shares are purchased and at least two years after the enrollment date, the employee will be deemed to have received compensation taxable as ordinary income for the taxable year in which the disposition occurs in an amount equal to the lesser of (a) the excess of the fair market value of the shares of common stock on the date of disposition over the purchase price paid by the employee, or (b) the excess of the fair market value of the shares of common stock on the enrollment date over the purchase price paid by the employee. The amount of such ordinary income recognized by the employee will be added to the employee's basis in the shares for purposes of determining capital gain or loss upon the disposition of the shares by the employee.

We generally will not be entitled to a tax deduction with respect to the shares of common stock purchased by an employee under the ESPP, unless the employee disposes of the shares less than one year after the shares are transferred to the employee or less than two years after the enrollment date, in which case we will generally be entitled to a tax deduction corresponding to the amount of ordinary income recognized by the employee.

New Plan Benefits

The increase in shares authorized for issuance under the proposed ESPP applies to future Purchase Periods under the ESPP, starting with the Purchase Period commencing November 15, 2019 and closing with an Exercise Date of May 14, 2020. The number of shares of common stock that may be purchased under the ESPP is dependent upon the stock's market value on the first and last day of each future Purchase Period, the voluntary election by each eligible employee to participate and the amount each participant has elected to apply to a Purchase Period, and is not currently determinable. The following table states the amounts which were received by each of the named individuals and groups under our ESPP for our last completed fiscal year, and the number of shares of common stock purchased under the ESPP from its inception through March 25, 2019.

Name and Position	Dollar Value of Shares Purchased in 2018 ($)(1)	Number of Shares Purchased in 2018	Number of Shares Purchased from Inception through March 25, 2019
Carl Russo (2) *President and Chief Executive Officer*	—	—	—
Cory Sindelar *Chief Financial Officer*	33,500	4,000	4,000
Michael Weening *Executive Vice President, Field Operations*	33,080	3,960	6,374
Gregory Billings *Senior Vice President, Services*	—	—	—
Executive Group	66,580	7,960	10,374
Non-Executive Director Group (3)	—	—	—
Non-Executive Officer Employee Group	7,384,228	898,162	5,740,057

(1) Represents fair market value at date of purchase. The average purchase price of the shares was $5.25.

(2) Mr. Russo is not eligible to participate in the ESPP based on his total share holdings of Calix common stock.

(3) Non-executive directors are not eligible to participate in the ESPP.

To be approved, this proposal must receive a "For" vote from the holders of a majority in voting power of the shares of common stock which are present or represented by proxy and entitled to vote on the proposal. Abstentions will have the same effect as an "Against" vote for purposes of determining whether this matter has been approved. Broker non-votes will not be counted for any purpose in determining whether this matter has been approved.

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" APPROVAL OF THE CALIX, INC. AMENDED AND RESTATED EMPLOYEE STOCK PURCHASE PLAN AS DISCUSSED ABOVE.

PROPOSAL NO. 4

APPROVAL ON A NON-BINDING, ADVISORY BASIS OF THE COMPENSATION OF OUR NAMED EXECUTIVE OFFICERS ("SAY-ON-PAY")

We are seeking an advisory vote from our stockholders to approve the compensation paid to our NEOs, as disclosed in this Proxy Statement under the "Compensation Discussion and Analysis" section ("CD&A") below.

Our Compensation Committee, with advice and information from its external compensation consultant, has structured our executive compensation program to stress a pay-for-performance philosophy. The compensation opportunities provided to our NEOs are significantly dependent on Calix's financial performance, the performance of Calix's stock and the NEO's individual performance, which are intended to drive creation of sustainable stockholder value. The Compensation Committee intends to continue to emphasize what it believes to be responsible compensation arrangements that attract, retain and motivate high-caliber executive officers to achieve Calix's short- and long-term business strategies and objectives.

Our Board previously determined to hold an advisory "say-on-pay" vote every year. In accordance with this determination and Section 14A of the Exchange Act, you have the opportunity to vote "For" or "Against" or to "Abstain" from voting on the following non-binding resolution relating to executive compensation:

"RESOLVED, that the stockholders approve, on an advisory basis, the compensation paid to Calix's NEOs as disclosed in Calix's proxy statement for the 2019 Annual Meeting of Stockholders under the compensation disclosure rules of the SEC, including the compensation discussion and analysis, compensation tables and narrative discussion of the proxy statement."

In deciding how to vote on this proposal, we encourage you to consider Calix's executive compensation philosophy and objectives, the design principles and the elements of Calix's executive compensation program described in our CD&A below. As described in the CD&A, a guiding principle of our compensation philosophy is that pay should be linked to performance and that the interests of our executives and stockholders should be aligned. Our compensation program is a mix of short- and long-term components, cash and equity elements and fixed and contingent payments in proportions we believe will provide the proper incentives, reward our NEOs, help us achieve our goals and increase stockholder value. For example:

- *Chief Executive Officer Compensation Aligned with Stockholder Interests.* A significant portion of our chief executive officer's compensation is performance-based and reflects a market-based cash compensation package. As a holder of more than 10% of our common stock consistently since Calix's initial public offering, our chief executive officer is a significant stockholder and his personal wealth has consistently been, and continues to be, tied directly to sustained stock price appreciation and performance, which provides direct alignment with stockholder interests.
- *Other NEOs Compensation Substantially Tied to Performance.* Our other NEOs earn a significant portion of their total compensation based upon increases in Calix's stock price and a significant portion of their variable cash and long-term equity compensation is contingent upon Calix's financial performance along with our Compensation Committee's assessment of executive performance.
- *Change in Control and Severance Benefits Not Grossed Up.* Calix provides limited change in control and severance benefits to provide NEOs security and to remain competitive in attracting and retaining executive talent. Calix does not provide for any tax gross up to any NEO in connection with any change in control or severance benefits.

To be approved, on a non-binding and advisory basis, the compensation paid to our NEOs must receive a "For" vote from the holders of a majority in voting power of the shares of common stock which are present or represented by proxy and entitled to vote on the proposal. Abstentions will have the same effect as "Against" votes for purposes of determining whether this matter has been approved. Broker non-votes will not be counted for any purpose in determining whether this matter has been approved.

While your vote on this proposal is advisory and will not be binding, we value the opinions of Calix's stockholders on executive compensation matters and will take the results of this advisory vote into consideration when making future decisions regarding Calix's executive compensation program. Unless the Board modifies its determination of the frequency of future "say on pay" advisory votes, the next "say-on-pay" advisory vote will be held at our 2020 Annual Meeting of stockholders.

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" THE APPROVAL OF THE COMPENSATION PAID TO THE NAMED EXECUTIVE OFFICERS, AS DISCLOSED IN THIS PROXY STATEMENT UNDER THE COMPENSATION DISCLOSURE RULES OF THE SEC.

PROPOSAL NO. 5

RATIFICATION OF SELECTION OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

Our Audit Committee has engaged KPMG LLP ("KPMG") as our independent registered public accounting firm for the fiscal year ending December 31, 2019 and is seeking ratification of such selection by our stockholders at the Annual Meeting. KPMG has audited our financial statements since February 29, 2016. Representatives of KPMG are expected to be present at the Annual Meeting. They will have an opportunity to make a statement if they so desire and will be available to respond to appropriate questions.

Neither our bylaws nor other governing documents or law require stockholder ratification of the selection of KPMG as our independent registered public accounting firm. However, our Audit Committee is submitting the selection of KPMG to our stockholders for ratification as a matter of good corporate practice. If our stockholders fail to ratify the selection, the Audit Committee will reconsider whether or not to retain KPMG. Even if the selection is ratified, the Audit Committee in its discretion may direct the appointment of a different independent registered public accounting firm at any time during the year if they determine that such a change would be in the best interests of Calix and its stockholders.

To be approved, the ratification of the selection of KPMG as our independent registered public accounting firm must receive a "For" vote from the holders of a majority in voting power of the shares of common stock which are present or represented by proxy and entitled to vote on the proposal. Abstentions will have the same effect as an "Against" vote for purposes of determining whether this matter has been approved. Broker non-votes will not be counted for any purpose in determining whether this matter has been approved.

Principal Accountant Fees and Services

The following table provides information regarding the fees for the audit and other services provided by KPMG for the fiscal years ended December 31, 2018 and 2017 (in thousands).

	Fiscal Years Ended December 31, 2018	Fiscal Years Ended December 31, 2017
Audit Fees	$ 1,480	$ 1,497
Audit-Related Fees	—	200
Tax Fees	—	—
All Other Fees	—	—
Total Fees	$ 1,480	$ 1,697

Audit Fees

Audit fees of KPMG consist of fees billed or expected to be billed for professional services rendered for the audit of our annual consolidated financial statements for the fiscal years ended 2018 and 2017, the audit of the effectiveness of our internal control over financial reporting and the review of our consolidated financial statements included in our Form 10-Q quarterly reports for the fiscal years ended 2018 and 2017. Audit fees also include services that are typically provided by the independent registered public accounting firm in connection with statutory and regulatory filings for our international subsidiaries for those fiscal years.

Audit-Related Fees

Audit-related fees of KPMG consist of assurance and related services that are reasonably related to the performance of the audit or review of our financial statements and are not reported above under "Audit Fees." The services for the fees under this category include approximately $200,300 for the fiscal year ended 2017 for consultation and review of ASC Topic 606 adoption.

Pre-Approval Policy and Procedures

Our Audit Committee pre-approves all audit and non-audit services provided by our independent registered public accounting firm. Our Audit Committee may delegate authority to one or more members of the Audit Committee to provide such pre-approvals, provided that such approvals are presented to the Audit Committee at a subsequent meeting. This policy is set forth in the charter of the Audit Committee and available under "Governance" in the Investor Relations section of our website at investor-relations.calix.com.

THE BOARD OF DIRECTORS RECOMMENDS A VOTE "FOR" THE RATIFICATION OF THE SELECTION OF KPMG LLP AS OUR INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM FOR THE FISCAL YEAR ENDING DECEMBER 31, 2019.

EXECUTIVE COMPENSATION

Compensation Discussion and Analysis

Executive Summary

Our compensation and benefits programs reflect our philosophy of compensation and incentivizing all of our employees, including our named executive officers ("NEOs"), in ways that support two primary objectives:

- attract, reward and retain exceptional talent in the markets in which we operate
- identify and reward outstanding performance that reflects Calix principles and values and aligns with long-term stockholder value creation

To help us achieve these objectives, a significant portion of our NEOs' compensation is at risk with significant upside potential for strong performance as well as downside exposure for underperformance. NEOs with greater responsibilities and the ability to directly impact our Company's goals and long-term results bear a greater proportion of the risk if these goals and results are not achieved.

The following discussion describes and analyzes our compensation objectives and policies as well as the material components of our compensation program for our NEOs during 2018. Our NEOs for 2018 were:

- Carl Russo, President and Chief Executive Officer
- Cory Sindelar, Chief Financial Officer
- Michael Weening, Executive Vice President, Field Operations
- Gregory Billings, Senior Vice President, Services

Compensation Philosophy and Process

We strive to find the best talent, resources and infrastructure to serve our customers and strategically expand our systems and services portfolio. Our goal is to attract and retain highly qualified executives to manage and oversee each of our business functions. We seek out individuals who we believe will be able to contribute to our business and our vision of future success, culture, principles and values and who will promote the long-term interests and growth of our Company. Our compensation philosophy is intended to promote a team-oriented approach to performance as a portion of each NEO's incentive compensation is based on achievement against the same performance objectives as our broad-based incentive plan.

Our executive compensation program aims to achieve the following:

- enable us to attract, retain and drive a high caliber, talented leadership team to execute on our business strategy
- foster a goal-oriented leadership team with a clear understanding of long-term business objectives and shared corporate principles and values
- ensure that the elements of compensation provided to our employees and executives are balanced, individually and in combination, and do not encourage excessive risk-taking
- reflect the competitive environment of our industry and our changing business needs
- allocate our resources effectively and efficiently in the development and selling of market-leading technology, systems and services
- maintain pay parity and fair compensation practices across our organization

In furtherance of these goals, our executive compensation program is designed to:

- be market competitive, including targeting benchmarking and evaluating compensation levels and compensation practices to our peer group
- emphasize pay for performance

- share risks and rewards with our stockholders
- align the interests of our executives with those of our stockholders
- reflect our principles and values

Our executive compensation program in 2018 consisted of the following components:

- base salary
- incentive-based cash compensation
- grants of equity awards that vest contingent on corporate performance and that include a component that vest on continued service if performance thresholds are met
- health, welfare and retirement benefits

In November 2018, our Compensation Committee conducted its annual review of our executive compensation program with its independent compensation consultant, Radford, including a review of our pay philosophy, compensation mix, short and long-term incentive plan structures, equity plan risk assessment and severance plan, and concluded that overall our executive compensation program was consistent with market practice. In reaching these conclusions, our Compensation Committee, in consultation with Radford, also reviewed governance and pay-for-performance guidelines issued by proxy advisory firms.

Stockholder Advisory Vote on Executive Compensation

We hold an advisory, non-binding stockholder vote on executive compensation every year. At our 2018 Annual Meeting of Stockholders, our stockholders voted to approve the compensation of our NEOs, with approval of over 95% of the votes cast. Our Compensation Committee reviewed these voting results along with the results from our 2017 Annual Meeting of Stockholders, noting the strong level of our stockholders' support for our NEOs' compensation. The Compensation Committee also reviewed our compensation programs with Radford and management, including consideration of governance and pay-for-performance guidelines issued by proxy advisory firms. The Compensation Committee regularly reviews executive compensation programs, in conjunction with Radford, and makes changes it determines are appropriate. The Compensation Committee intends to continue to take into consideration the outcome of our stockholders' future advisory "say-on-pay" votes when making future compensation decisions for the NEOs.

Role of Our Compensation Committee

Our Compensation Committee approves and interprets our executive compensation and benefit plans and policies. The Compensation Committee is appointed by the Board and consists entirely of directors who are non-employee directors for purposes of Rule 16b-3 of the Exchange Act. In 2018, our Compensation Committee determined the compensation for all of our NEOs. Except for our chief executive officer's compensation and performance, each NEO's individual performance and contributions to our Company for each fiscal year is assessed by our chief executive officer who reports his recommendations regarding each element of the NEOs' compensation to the Compensation Committee. Our chief executive officer does not participate in any formal discussion with the Compensation Committee regarding decisions on his own compensation and he recuses himself from meetings in which his compensation is assessed or discussed.

Competitive Market Review

The market for experienced executive leaders is highly competitive in our industry. We strive to attract and retain highly qualified executives to effectively lead each of our business functions. In doing so, we draw upon a pool of talent that is highly sought after by both large and established technology and telecommunications companies in our geographic area and by other competitive companies in development or growth phases. Established organizations in our industry seek to recruit top talent from emerging companies in the sector just as smaller organizations look to attract and retain the best talent from the industry as a whole. We also compete for key talent on the basis of: our vision of future success; our culture and values; the cohesiveness and productivity of our teams; and the excellence of our technical and leadership teams. The competition for technical and non-technical skills is aggressive across the sector, and we expect it to remain high for the foreseeable future.

Our Compensation Committee determines compensation for our NEOs, in large part based upon our financial resources as well as competitive market data. In setting executive compensation for 2018, our Compensation Committee conducted a review of our NEOs' compensation, as well as a mix of elements used to compensate our NEOs, and compared that information with data provided by Radford, as discussed below.

Our 2018 peer group criteria consisted of companies within the technology industry with revenues between $200 million and $1.2 billion and market capitalizations between $150 million and $1.5 billion that we believe compete with us for executive talent. Our 2018 peer group was set by our Compensation Committee based on recommendations from Radford, consideration of ISS and Glass Lewis peer group criteria, and discussion with management. Although Aerohive Networks and Digi International are both below $200 million in revenue, our Compensation Committee determined to retain these companies in our 2018 peer group because both companies are within range based on our market capitalization. Although Infinera and Oclaro were both above $1.5 billion in market capitalization at the time of our 2018 peer group evaluation and selection, our Compensation Committee determined to retain Infinera in our 2018 peer group because Infinera is a local talent competitor and has been included in our peer group in prior years, and to retain Oclaro because Oclaro's revenue is within range for our peer group and is on ISS and Glass Lewis' peer group list for Calix. Our 2018 peer group consisted of the following companies:

• 8x8, Inc.	• Extreme Networks, Inc.
• A10 Networks, Inc.	• Five9 Inc.
• ADTRAN, Inc.	• Gigamon Inc. (1)
• Aerohive Networks, Inc.	• Harmonic Inc.
• Barracuda Networks, Inc. (1)	• Infinera Corporation
• Broadsoft, Inc. (1)	• Oclaro, Inc. (1)
• CalAmp Corp.	• ShoreTel, Inc. (1)
• Comtech Telecommunications Corp.	• Silver Spring Networks, Inc. (1)
• Digi International Inc.	• Sonus Networks, Inc. (1)

(1) Represents companies that were acquired after our 2018 peer group evaluation and selection.

Our revenue was at the 65th percentile and our market cap was positioned at the 10th percentile of our 2018 peer group. We determine our approximate position relative to the appropriate market benchmark by comparing our practices and levels: by target annual cash compensation, which includes base salary, target annual incentive opportunity; and by total direct compensation, which includes target cash compensation and equity compensation. Our Compensation Committee seeks to set the total target cash compensation for our NEOs at approximately the 50th percentile of our peer group, when looking at the group in the aggregate.

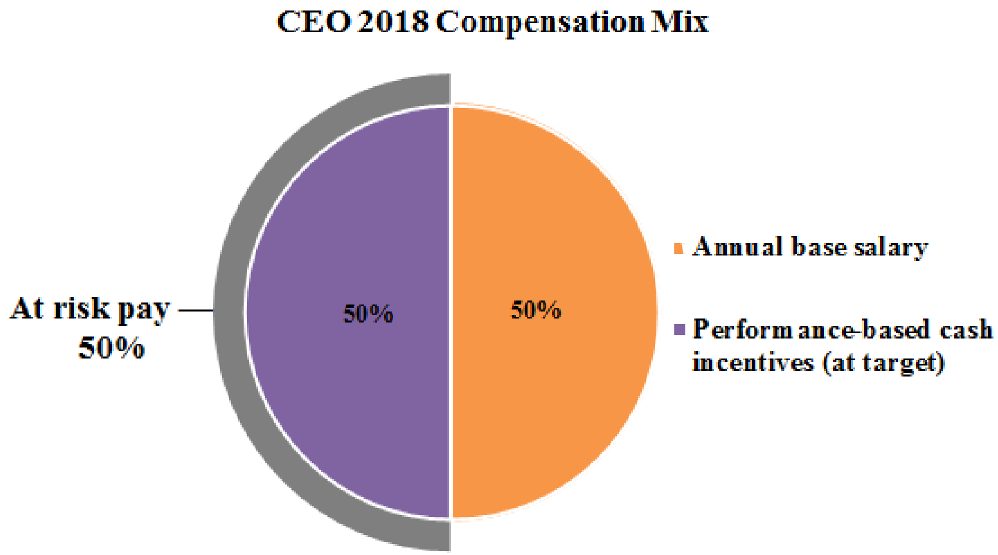
During 2018, our Compensation Committee continued to engage Radford as its independent executive compensation consultant. Radford was hired directly by our Compensation Committee and works with management only at our Compensation Committee's direction to interpret results, make recommendations and assist in setting compensation levels for our executive officers. After review and consultation with Radford, our Compensation Committee determined that Radford is independent and that there is no conflict of interest in retaining Radford currently or during 2018.

Weighting of Elements in our Compensation Program

The use and weight of each compensation element is based on a determination by our Compensation Committee of the importance of each element in meeting our overall corporate objectives for each year as well as our long-term business strategy. We also take into consideration assessments of our compensation program, including an assessment of compensation program risk, conducted by Radford for the Compensation Committee.

Chief Executive Officer Compensation

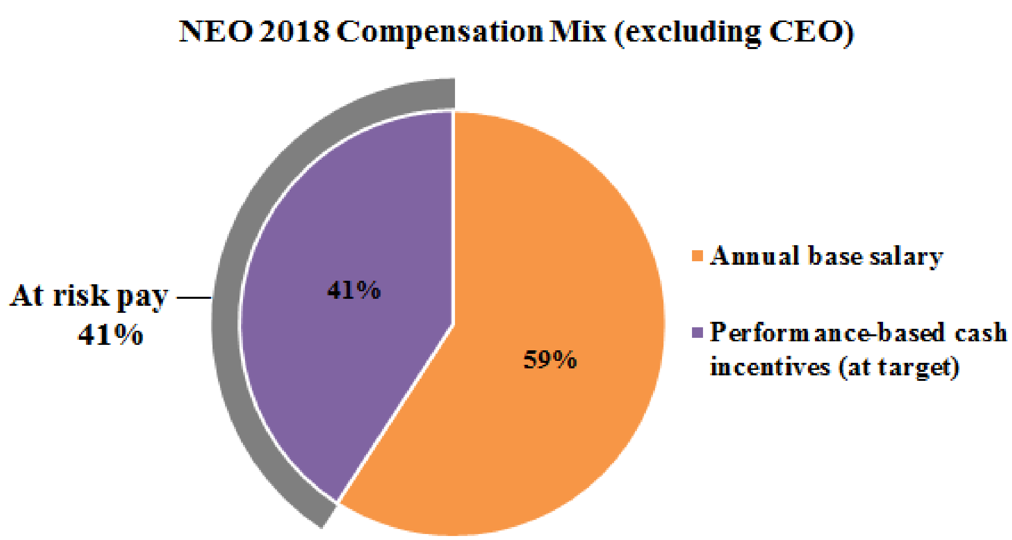
In 2012, Mr. Russo's base salary was set at $500,000 per year and his performance target under our cash incentive plan was set to be equal to 100% of his annual base salary. For 2018, Mr. Russo's base salary and performance target remained as set in 2012. Mr. Russo was not granted any equity awards during 2018, but continues to be a significant stockholder (with stock ownership of approximately 12.09% of common stock outstanding) with his personal wealth tied directly to sustained stock price appreciation and performance, which provides direct alignment with stockholder interests. Mr. Russo's 2018 total target cash compensation is between the 25th and 50th percentile of our peer group of companies.



Other NEO Compensation

As with our chief executive officer compensation, we put a significant amount of the total potential compensation of our other NEOs in 2018 "at risk" based on our achievements of corporate financial targets aligned with our business strategy.

The 2018 weighting of compensation elements for our other NEOs in 2018 as a group is as follows:



Base salary reflects the experience, skills, knowledge and responsibilities of each NEO as well as competitive market conditions. Base salary is one component of total cash compensation. During 2018, our Compensation Committee adjusted the base salaries of Messrs. Sindelar and Weening from $320,000 to $352,000 based on the recommendations of our chief executive officer and Radford and our Compensation Committee's assessment of the executive's base salary relative to the base salaries paid to similarly situated executives at our peer group of companies.

The table below sets forth the annual base salary for each NEO as set by our Compensation Committee as of December 31, 2018.

Name of Executive Officer	Annual Base Salary
Carl Russo	$ 500,000
Cory Sindelar (1)	352,000
Michael Weening (1)	352,000
Gregory Billings	300,000

(1) Each of Messrs. Sindelar's and Weening's base salaries increased from $320,000 to $352,000 effective July 1, 2018.

The annual base salaries of our NEOs are reviewed at least once a year, and our Compensation Committee intends to make adjustments to reflect performance considerations as well as competitive conditions.

Cash Incentive Compensation

Our NEOs participate in our executive cash incentive plan. To be consistent with market practice, our Compensation Committee, in consultation with Radford, determined that as of 2017 Mr. Weening would no longer participate in cash incentive awards under the sales-based incentive compensation plan for our sales organization, although he would continue to receive payments under the 2016 sales-based incentive compensation plan for shipments against bookings attained in 2016, which amounted to less than $5,000 for 2018 and is not expected to be material to Mr. Weening's compensation in future years. Mr. Weening continues to participate in our executive cash incentive plan.

The executive cash incentive plan provides for funding based on quarterly corporate financial targets and an annual payout based on assessment of the NEO's performance for the year. The cash incentive plan does not provide for any guaranteed payments. Our chief executive officer recommends, and our Compensation Committee determines, the achievement as to individual performance of each NEO. Our chief executive officer's performance is evaluated and determined solely by our Compensation Committee.

Our Compensation Committee sets target incentive opportunities for each NEO under the plan in an amount equal to a percentage of the NEO's annual base salary. We seek to align the performance targets of our cash incentive plan to our business strategy and long-term stockholder interests. Our Compensation Committee establishes targets for our quarterly corporate financial targets based on the annual operating plan approved by our Board at the beginning of the year and based on quarterly financial information prepared by management. In general, in order for the cash incentive compensation pool to be funded, the financial targets need to be achieved for that particular quarter, which for 2018 consisted of both revenue and non-GAAP operating income (loss) targets, although our Compensation Committee retains discretion over whether or not the plan is funded quarter over quarter. Non-GAAP operating income (loss), for the purposes of the cash incentive plan, is calculated as operating income (loss) on a GAAP basis less certain items that are not considered indicative of our normal operating performance, consisting of: non-cash stock-based compensation, gain on sale of product line, restructuring charges (benefit) and U.S. tariff and tariff-related costs.

These performance metrics were selected by our Compensation Committee in order to incentivize revenue growth and operational efficiencies as key measures of our operational performance at this stage of our development. The non-GAAP operating income (loss) component is a measure that is required in addition to the revenue target to mitigate risks of revenue generation activities at the expense of achieving profitability goals. The Compensation Committee believes that the use of these targets incentivizes long-term stockholder value.

Even though our Compensation Committee has established target cash incentive opportunities for each NEO, once our corporate performance goals are achieved and the cash incentive compensation pool is funded, our Compensation Committee retains discretion to adjust cash incentive compensation paid to each individual up or down, ranging from 0% to 125% of the individual's target cash incentive opportunity in 2018, based upon assessment of individual performance by our Compensation Committee, including upon consultation with Mr. Russo (except as to Mr. Russo's compensation).

A summary of the total cash incentive compensation targets set by our Compensation Committee for our NEOs for 2018 is as follows:

Total Target Cash Incentive Opportunity

Named Executive Officer	Target Cash Incentive Plan Opportunity	Target Cash Incentive Plan Opportunity as a Percentage of Base Salary
Carl Russo	$ 500,000	100%
Cory Sindelar (1)	201,600	60%
Michael Weening (2)	302,400	90%
Gregory Billings	165,000	55%

(1) Mr. Sindelar's base salary increased from $320,000 to $352,000 effective July 1, 2018. Accordingly, his target cash incentive plan opportunity for 2018 is pro-rated at 60% of his base salary from January 1 through June 30, 2018 and July 1 through December 31, 2018.

(2) Mr. Weening's base salary increased from $320,000 to $352,000 effective July 1, 2018. Accordingly, his target cash incentive plan opportunity for 2018 is pro-rated at 90% of his base salary from January 1 through June 30, 2018 and July 1 through December 31, 2018.

Achievement Against Quarterly Financial Targets

The table below sets forth the quarterly financial targets under our cash incentive plan and the Compensation Committee's determination of our achievement for each fiscal quarter of 2018 for purposes of funding the cash incentive plan (in thousands, except for percentages).

	Target		Achievement		
Fiscal Quarter	Revenue	Non-GAAP Operating Income (Loss)	Revenue	Non-GAAP Operating Income (Loss) (1)	Compensation Committee Determination of Funding (2)
First quarter	$108,000	$ (5,000)	$ 99,403	$ (9,716)	0%
Second quarter	111,000	400	111,702	411	100%
Third quarter	115,000	2,400	114,699	3,018	100% (3)
Fourth quarter	122,000	8,800	115,500	7,443	0%

(1) Reconciliation of these non-GAAP amounts to GAAP is provided in Appendix C.

(2) Our executive cash incentive plan requires achievement of both quarterly revenue and non-GAAP operating income (loss) targets in each quarter.

(3) In making its determination of corporate achievement against the third quarter financial targets, the Compensation Committee exercised its discretion under the executive cash incentive plan to fund the bonus at 100% after considering the significant accomplishments of the executive team, the Company's significant achievement above target for non-GAAP operating income and the closeness of the reported revenue to the set target.

Summary of Payouts of Cash Incentive Compensation

The table below summarizes the annual payout awarded to each NEO under the cash incentive plan on amounts funded for 2018. The payout awards are determined by our Compensation Committee following assessment of corporate performance and in consultation with Mr. Russo as to each NEO other than Mr. Russo. In addition, after the assessment of the funding for awards under our 2018 cash incentive plans on a company-wide basis, including consideration of recommendations by Mr. Russo, the Compensation Committee exercised its discretion to downward adjust the award payout under the 2018 cash incentive plan for the NEOs by $278,000 in favor of increasing funding for non-executive awards. The amounts awarded to each of Messrs. Russo, Sindelar and Weening, reflecting an allocation of this downward adjustment, is as set forth below.

Named Executive Officer		Target Cash Incentive Plan Opportunity		Amount Funded		Actual Award Payout
Carl Russo	$	500,000	$	250,000	$	—
Cory Sindelar (1)		201,600		100,800		86,800
Michael Weening (2)		302,400		151,200		142,145 (3)
Gregory Billings		165,000		82,500		82,500

(1) Mr. Sindelar's base salary increased from $320,000 to $352,000 effective July 1, 2018. Accordingly, his target cash incentive plan opportunity for 2018 is pro-rated at 60% of his base salary from January 1 through June 30, 2018 and July 1 through December 31, 2018.
(2) Mr. Weening's base salary increased from $320,000 to $352,000 effective July 1, 2018. Accordingly, his target cash incentive plan opportunity for 2018 is pro-rated at 90% of his base salary from January 1 through June 30, 2018 and July 1 through December 31, 2018.
(3) Amount for Mr. Weening represents an award payout of $137,200 under the cash incentive plan plus a payment of $4,945 in 2018 under the 2016 sales-based incentive compensation plan for shipments against bookings Mr. Weening attained in 2016. Mr. Weening no longer participated in the sales-based incentive compensation plan as of January 1, 2017.

Compensation Committee Discretion

Our Compensation Committee may, from time to time, exercise discretion to award discretionary cash bonuses to its NEOs, which awards are made on an infrequent basis and intended to recognize exemplary performance. No discretionary bonuses were awarded to any NEO in 2018. Similarly, our Compensation Committee may, from time to time, exercise discretion to downward adjust incentive awards to our NEOs.

Equity-Based Incentives

Our 2010 Equity Incentive Award Plan provides our key employees, including our NEOs, with stock-based incentives to align their interests with the interests of our stockholders.

We believe that award of stock-based compensation to our key employees and executives encourages strong long-term financial and operational performance and provides them the opportunity to participate in the long-term appreciation of our stock value. Our Compensation Committee also reviews the equity "burn" rate annually to ensure it is aligned with peer/industry practices.

We generally provide grants of stock-based awards to our NEOs under our 2010 Equity Incentive Award Plan on an annual basis as determined by our Compensation Committee. Stock-based awards are generally in the form of stock option grants or restricted stock units ("RSUs") with either time-based vesting or performance-based vesting. Awards with time-based vesting typically vest as to 25% of the shares subject to the award after the first twelve months of service and in equal quarterly installments thereafter with full vest in four years, subject to continued service through each vesting date. Awards with performance-based vesting typically vest contingent on achievement of corporate goals or other financial targets.

Initial awards at the time of hire generally vest solely based on the continued service of the NEO. The size and terms of the initial option or RSU grant made to each new NEO upon joining the Company is primarily based on competitive conditions applicable to the NEO's specific position and the value of unvested equity the executive is leaving at his or her prior company. In addition, we consider the number of shares of our common stock underlying options and RSUs granted to other executives in comparable positions within the Company.

Subsequent RSU awards and stock options are granted at the discretion of the Compensation Committee, generally in recognition of a promotion or extraordinary performance, or as an annual refresh grants to continue to incentivize future performance. Annual refresh equity awards in recent years have generally included threshold performance criteria which are intended to reduce or eliminate the economic benefit of such awards in the event we do not achieve specified performance objectives. Because the performance-based awards are contingent upon the Company achieving financial targets as established by the Compensation Committee based on our business strategy and long-term growth initiatives, we believe the award to each NEO is aligned to the interests of our stockholders. If achieved, a portion of the shares underlying the performance-based awards vest immediately and a portion vests over time based on continuous service. We believe these awards provide an appropriate blend of performance-based incentive and executive-retention impact with a service-based vesting component. We believe that award size, performance target and vest terms are such that a significant portion of each NEO's total compensation would be attained only if we achieved performance aligned with our growth initiatives and long-term stockholder value. We believe that our equity awards also provide an important retention tool for our NEOs, as they are typically subject to vesting over a longer period of time, generally four years, based on the Compensation Committee's assessment of the circumstances, such as timing of award, retention or other considerations.

Our Compensation Committee generally evaluates annual refresh grants of stock-based awards for our NEOs with any such equity awards expected to be tied to the following year's financial performance and with vesting over a future service period, generally four years from the date of grant. In particular, the Company believes that the financial performance targets chosen for its equity awards to executives align with its objective of creating long-term stockholder value.

Performance-Based Grant – 2018 Financial Performance

In December 2017, the Compensation Committee evaluated an annual refresh grant of performance-based stock options for our executives tied to a specific financial target for 2018 (the "2018 Performance-Based Equity Award"). After consideration, the Compensation Committee approved the grant of a 2018 Performance-Based Equity Award on December 29, 2017 to each NEO that would be earned and vest, contingent upon achievement of the Company's 2018 non-GAAP operating income goal, as to 50% of the shares of common stock underlying the stock option grant on January 1, 2019, subject to the Compensation Committee's certification of the achievement of the financial target, and as to 50% of the shares of common stock underlying the stock option grant, in substantially equal quarterly installments over the subsequent 24 months. The 2018 Performance-Based Equity Award included an option to purchase 108,000 shares of common stock for Mr. Sindelar, an option to purchase 204,000 shares of common stock for Mr. Weening and an option to purchase 126,000 shares of common stock for Mr. Billings. At his request, Mr. Russo did not receive a stock option grant in connection with the 2018 Performance-Based Equity Award. The Compensation Committee determined to select a financial target of 2018 non-GAAP operating income for the 2018 Performance-Based Equity Award to align the equity awards to what it considered to be a key financial metric for the Company for 2018. The Compensation Committee elected to provide for 50% vesting, subject to achievement of the target 2018 non-GAAP operating income, in recognition that our NEOs did not vest into any stock option grants under the performance-based equity awards granted in 2017 as the 2017 financial targets were not achieved, and in consideration of the importance of the non-GAAP operating income target as part of the Company's execution on its strategic objectives and focus on long-term stockholder value.

In November 2018, the Compensation Committee exercised its discretion to modify the performance target for the 2018 Performance-Based Equity Award such that the stock option would be earned if the Company was profitable for the year ended December 31, 2018 as measured by non-GAAP net income, which represented a significant year-over-year improvement of approximately $1.24 per share compared to a non-GAAP net loss in the prior year. Previously, the Compensation Committee had set the target at a specified non-GAAP operating income target of $12.5 million. The Compensation Committee made this modification after consideration of several factors, including the importance to long-term stockholder value of the Company's achievement of profitability on a non-GAAP net income basis, the opportunity the Company had of achieving profitability for 2018 in light of the second and third quarter performance improvements and work underway on the Company's ramp of its new platforms, while recognizing the challenges related to the continued transformation of the Company's business model and certain external factors impacting operating performance. The Compensation Committee also considered the importance of incentivizing and retaining executive talent and noted that no equity awards had been granted to the NEOs in 2017. The Compensation Committee determined that the modified target represented a performance target that was challenging but attainable with concerted effort and execution, and therefore would incentivize strong executive performance toward the desired financial objective. No other modifications were made to the terms of the 2018 Performance-Based Equity Award. In February 2019, following review of the Company's financial performance for 2018, the Compensation Committee certified that, based on the Company's reported non-GAAP net income of $0.4 million for the fiscal year ended December 31, 2018, the performance target for the 2018 Performance-Based Equity Award was met and each stock option immediately vested in respect of 50% of the shares subject thereto with the remaining shares underlying the options to vest in eight substantially equal quarterly installments.

Performance-Based Grant – 2019 Financial Performance

In February 2019, the Compensation Committee evaluated an annual refresh grant of performance-based stock options for our executives tied to specific financial targets for 2019 (the "2019 Performance-Based Equity Award"). After consideration, the Compensation Committee approved the grant of a 2019 Performance-Based Equity Award on February 14, 2019 to each NEO, with the actual number of shares earned contingent upon achievement of both annual and quarterly corporate financial targets for revenue, non-GAAP gross margin and non-GAAP earnings per share for fiscal year 2019 (collectively, the "2019 Performance Targets"). The 2019 Performance-Based Equity Award would vest, subject to the Compensation Committee's certification of the achievement of the 2019 Performance Targets, as to 25% of the shares of common stock earned on the date of such certification, and as to the remaining 75% of the shares of common stock earned, in substantially equal quarterly installments over the subsequent 36 months. No shares are awarded unless all of the 2019 Performance Targets are met. If all of the 2019 Performance targets are met, each NEO receives 100% of their target shares. Furthermore, each NEO may receive a number of shares above their target shares for achievement of at least 125% above the non-GAAP earnings per share target, up to a maximum of 200% of the target shares for achievement above 125% of the earnings per share target. The 2019 Performance-Based Equity Award includes an option to purchase up to 240,000 shares of common stock for Mr. Sindelar, an option to purchase up to 300,000 shares of common stock for Mr. Weening and an option to purchase up to 150,000 shares of common stock for Mr. Billings, in each case with the number of shares representing the target share opportunity at 200% of the target shares. At his request, Mr. Russo did not receive a stock option grant in connection with the 2019 Performance-Based Equity Award. In determining the 2019 Performance Targets, the Compensation Committee set the 2019 Performance Targets to align each NEO's opportunity to earn the equity awards to the Company's 2019 focus on gross margin expansion, disciplined operating expense investment, deliberate revenue growth and increased predictability, such that the NEO's equity awards are "at risk" based on the Company's performance in these areas. The Compensation Committee determined to provide for 25% vesting upon achievement of the 2019 Performance Targets and time-based vesting for the remaining award shares over the subsequent 36 months such that the 2019 Performance-Based Equity Awards both incentivizes corporate financial performance and provides retention value for each NEO.

Change in Control and Severance Benefits

We provide our NEOs with certain change in control and severance benefits under our Amended and Restated Executive Change in Control and Severance Plan ("CICSP"), which our Compensation Committee adopted in July 2010. In September 2017, our Compensation Committee amended the CICSP to expand eligibility to include additional members of senior management and to amend certain benefits in the event of a termination in connection with a change in control. Our Compensation Committee provides change in control and severance benefits to our senior management to, among other things, provide security to our NEOs including in the event of a change in control of the Company.

Under the CICSP, in the event an eligible NEO's employment with us is terminated by us other than for Cause (as defined in the CICSP), death or disability and such termination is outside of the Change in Control Period (as defined below), he or she is eligible to receive (i) a cash severance payment in an amount equal to 12 months of base salary and a pro-rata portion of the eligible NEO's annual bonus opportunity at target, (ii) 12 months accelerated vesting of equity awards and (iii) 12 months of health insurance benefit continuation, subject to certain exceptions.

In the event an eligible NEO's employment with us is terminated by us other than for Cause, or the eligible NEO terminates his or her employment for Good Reason (as defined in the CICSP) during a period of time commencing 60 days prior to a change in control and ending 12 months following the change in control (the "Change in Control Period"), he or she is eligible to receive (i) a cash severance payment in an amount equal to: 24 months of base salary (in the case of Mr. Russo) or 12 months of base salary (in the case of Messrs. Sindelar, Weening and Billings); 200% of the annual bonus opportunity at target (in the case of Mr. Russo) or 100% of the annual bonus opportunity at target (in the case of Messrs. Sindelar, Weening and Billings); and a pro-rata portion the eligible NEO's annual bonus opportunity at target, subject to attainment of the performance criteria with respect to the eligible NEO's bonus opportunity, (ii) 100% acceleration of all equity awards and (iii) 24 months of health insurance benefit continuation (in the case of Mr. Russo) or 12 months of health insurance benefit continuation (in the case of Messrs. Sindelar, Weening and Billings), in each case subject to certain exceptions.

Our NEOs must execute, and not revoke during any applicable revocation period, a general release of claims against us in order to be eligible for any severance benefits. We do not provide for any tax gross-up payments under our CICSP or otherwise in connection with executive severance benefits.

Benefits

We provide the following benefits, as applicable to all employees, including our NEOs:

- medical, dental and vision insurance
- life insurance, accidental death and dismemberment and business travel and accident insurance
- employee assistance program
- health and dependent care flexible spending accounts
- transportation flexible spending accounts
- employee stock purchase plans
- short- and long-term disability
- 401(k) plan for U.S. employees
- Registered Retirement Savings Plan for Canadian employees, including for Mr. Weening, and a pension plan for employees in certain other countries outside of the U.S. and Canada
- health club membership reimbursement

Perquisites

Our NEOs participate in the same benefit programs as other employees and do not receive any other perquisites.

Clawback Policy

In early 2019, we adopted a clawback policy that applies to all executive officers and covers all compensation under the cash incentive programs and all equity awards granted or awarded after the date the policy was adopted. The policy applies in the event our financial statements are restated as a result of material non-compliance with financial reporting rules and provides our Board of Directors with broad discretion as to what actions may be taken based on circumstances leading to the restatement, including recovery of incentive-based compensation received by an executive officer in excess of what the executive officer would have been paid under the restatement. Our Compensation Committee monitors regulatory developments with respect to compensation policies and will recommend to our Board of Directors any changes to the current policy that are necessary or appropriate in light of guidance issued by the SEC.

Policy Prohibiting Speculative Transactions and Hedging or Pledging

In accordance with our insider trading policy, we do not permit any officer, director or employee, and their respective family members, to directly or indirectly participate in certain trading activities related to our common stock that are considered aggressive or speculative in nature, including short sales, publicly traded options, hedging transactions, margin purchases and pledging our common stock.

Tax and Accounting Considerations

Section 280G of the Internal Revenue Code

Section 280G of the Internal Revenue Code disallows a tax deduction for "excess parachute payments" and Section 4999 of the Code imposes a 20% excise tax on any person who receives excess parachute payments. Our NEOs are not eligible to receive any tax gross-up payments in the event any payments made or that may be made to them become subject to this excise tax. The Compensation Committee will take into account the implications of Section 280G in determining potential payments to be made to our executives in connection with a change in control. Nevertheless, to the extent that certain payments upon a change in control are classified as excess parachute payments, such payments may not be deductible under Section 280G.

Section 409A of the Internal Revenue Code

Section 409A of the Internal Revenue Code, which governs the form and timing of payment of deferred compensation, imposes a 20% tax and an interest penalty on the recipient of deferred compensation that is subject to but does not comply with Section 409A. As a general matter, it is our intention to design and administer our compensation and benefits plans and arrangements for all of our employees and other service providers, including our NEOs, so that they are either exempt from, or satisfy the requirements of, Section 409A of the Code. The Compensation Committee will take into account the implications of Section 409A in determining the form and timing of compensation awarded to our executives and will strive to structure any nonqualified deferred compensation plans or arrangements to be exempt from or to comply with the requirements of Section 409A.

Section 162(m) of the Internal Revenue Code

Section 162(m) disallows a tax deduction for any publicly held corporation for individual compensation exceeding $1 million in any taxable year for our CEO, our CFO, any employee who is one of the top three highest compensated executive officers for the tax year; or for any employee who was a covered employee for any preceding taxable year beginning after December 31, 2016 referred to as "covered employees." Further, since the enactment of tax reform legislation on December 22, 2017 (the "2017 Tax Reform Act"), "qualified performance-based compensation" is exempt from this $1 million limitation only if payable pursuant to a written binding contract in effect on November 2, 2017 (and that has not subsequently been materially modified). The Compensation Committee has not previously taken the deductibility limit imposed by Section 162(m) into consideration in setting compensation and as a result of the 2017 Tax Reform Act, a deduction for any compensation paid to our NEOs in excess of $1 million is disallowed.

Accounting for Stock-Based Compensation

We follow Financial Accounting Standards Board Accounting Standards Codification Topic 718 ("ASC Topic 718") for our stock-based compensation awards. ASC Topic 718 requires companies to calculate the grant date "fair value" of their stock-based awards using a variety of assumptions. ASC Topic 718 also requires companies to recognize the compensation cost of their stock-based awards in their income statements over the period that an employee is required to render service in exchange for the award. Grants of stock options, restricted stock, RSUs and other stock-based awards under our equity incentive award plans will be accounted for under ASC Topic 718. Our Compensation Committee will regularly consider the accounting implications of significant compensation decisions, especially in connection with decisions that relate to our equity incentive award plans and programs. As accounting standards change, we may revise certain programs to appropriately align accounting expenses of our equity awards with our overall executive compensation philosophy and objectives.

Summary Compensation Table

The following table sets forth all of the compensation awarded to, earned by or paid to our NEOs during 2018, 2017 and 2016.

Name and Principal Position	Year	Salary ($)	Bonus ($)	Option Awards ($) (1)	Non-Equity Incentive Plan Compensation ($) (2)	All Other Compensation ($) (3)	Total ($)
Carl Russo	2018	500,000	—	—	—	—	500,000
President and Chief Executive Officer	2017	500,000	—	1,440,222	—	—	1,940,222
	2016	500,000	—	—	225,000	—	725,000
Cory Sindelar (4)	2018	336,000	—	383,670	86,800	6,979	813,449
Chief Financial Officer	2017	73,846	—	1,026,959	—	102,215	1,203,020
Michael Weening (5)	2018	336,000	—	724,710	142,145	7,703	1,210,558
Executive Vice President, Field Operations	2017	320,000	140,000	1,012,738	59,293	5,813	1,537,844
	2016	166,154	50,000	1,249,098	144,450	2,066	1,611,768
Gregory Billings (6)	2018	300,000	—	447,615	82,500	8,250	838,365
Senior Vice President, Services	2017	300,000	85,000	721,066	—	7,691	1,113,757

(1) Amounts reported in 2018 represent the incremental value to the 2018 Performance-Based Equity Awards granted to Messrs. Sindelar, Weening and Billings as a result of the November 2018 modification to the 2018 Performance-Based Equity Awards, which were originally granted in 2017. This incremental value as reported for 2018 was calculated in accordance with ASC Topic 718, excludes the impact of estimated forfeitures related to service-based vesting conditions, assumes 100% performance and are not adjusted for subsequent changes in our stock performance or the level of ultimate vesting. For a further discussion on these performance-based stock option awards, see above under "*Performance-Based Grant – 2018 Financial Performance*." For a discussion of the assumptions used in the valuations of the stock options, see Note 7 of the Notes to Consolidated Financial Statements included in our Annual Report on Form 10-K for the year ended December 31, 2018.

(2) Amounts reported for Mr. Weening in 2018 include $4,945 in payment in 2018 under the 2016 sales-based incentive compensation plan for shipments against bookings Mr. Weening attained in 2016. Mr. Weening no longer participated in the sales-based incentive compensation plan as of January 1, 2017.

(3) Amounts reported for 2018 represent (i) employer matching contributions of $6,979 we made for Mr. Sindelar pursuant to our U.S. 401(k) Plan, (ii) employer matching contributions of $7,703 we made for Mr. Weening to the Canadian Registered Retirement Savings Plan ("RRSP"), a tax-deferred capital accumulation plan in which our Canadian employees can participate and (iii) employer matching contributions of $8,250 we made for Mr. Billings pursuant to our U.S. 401(k) Plan, Payments under the RRSP are set in Canadian dollars and were converted to U.S. dollars using an average exchange rate of CAD1.00 to US$0.7697. Amount reported for Mr. Sindelar in 2017 represent (i) compensation in the amount of $100,000 we made to Mr. Sindelar under a consulting arrangement pursuant to which Mr. Sindelar served as our interim chief financial officer and principal financial officer and (ii) employer matching contributions of $2,215 we made for Mr. Sindelar pursuant to our U.S. 401(k) Plan.

(4) Mr. Sindelar's base salary increased from $320,000 to $352,000 effective July 1, 2018.

(5) Mr. Weening's base salary increased from $320,000 to $352,000 effective July 1, 2018.

(6) Mr. Billings' employment with Calix commenced on December 19, 2016. He was designated a named executive officer for 2017 and 2018.

Grants of Plan-Based Awards in 2018

The following table lists grants of plan-based awards to our NEOs in 2018 and their related fair value as of the respective grant date.

Name	Grant Date	Estimated Possible Payouts Under Non-Equity Incentive Plan Awards Target ($) (1)	Estimated Possible Payouts Under Equity Incentive Plan Awards Target (#)	Exercise or Base Price of Option Awards ($/Sh)	Grant Date Fair Value of Option and Stock Awards ($) (3)
Carl Russo	—	500,000	—	—	—
Cory Sindelar	—	201,600	—	—	—
	12/29/2017 (2)	—	108,000 (2)	5.95	383,670
Michael Weening	—	302,400	—	—	—
	12/29/2017 (2)	—	204,000 (2)	5.95	724,710
Gregory Billings	—	165,000	—	—	—
	12/29/2017 (2)	—	126,000 (2)	5.95	447,615

(1) These amounts represent possible payouts if the incentive plan performance goals are achieved at target level under our cash incentive plan for 2018, which do not provide for threshold or maximum levels. See discussion above under "*Summary of Payouts of Cash Incentive Compensation.*"

(2) Amounts reported represent shares underlying options that comprised the 2018 Performance-Based Equity Awards granted to Messrs. Sindelar, Weening and Billings that were modified in November 2018 after originally being granted in 2017. The number of shares subject to such stock option grants eligible to vest are contingent upon achievement of a 2018 financial performance metric, with 50% of the shares earned based on performance scheduled to vest on January 1, 2019 and the remaining 50% scheduled to vest in substantially equal installments over the subsequent 24 months. In February 2019, the Compensation Committee certified attainment of the 2018 performance metric. See discussion above under "*Performance Based Grant – 2018 Financial Performance*."

(3) Amounts reported represent the incremental value to the 2018 Performance-Based Equity Awards granted to Messrs. Sindelar, Weening and Billings that were modified in November 2018 after originally being granted in 2017. This incremental value was calculated in accordance with ASC Topic 718, excludes the impact of estimated forfeitures related to service-based vesting conditions, assumes 100% performance and are not adjusted for subsequent changes in our stock performance or the level of ultimate vesting. See discussion above under "*Performance-Based Grant – 2018 Financial Performance*." For a discussion of the assumptions used in the valuations of the stock options, see Note 7 of the Notes to Consolidated Financial Statements included in our Annual Report on Form 10-K for the year ended December 31, 2018.

Outstanding Equity Awards at December 31, 2018

The following table lists all outstanding equity awards held by our NEOs as of December 31, 2018.

	Option Awards					
Name	Grant Date	Number of Securities Underlying Unexercised Options Exercisable (#)	Number of Securities Underlying Unexercised Options Unexercisable (#)	Equity Incentive Plan Awards: Number of Securities Underlying Unexercised Unearned Options (#)	Option Exercise Price ($)	Option Expiration Date
Carl Russo	1/28/2014	120,000	—	—	8.18	1/28/2024
	2/21/2013	200,000	—	—	8.41	2/21/2023
	2/24/2011	100,000	—	—	19.75	2/24/2021
Cory Sindelar	12/29/2017	—	—	108,000 (1)	5.95	12/29/2027
	10/1/2017	75,000	225,000 (2)	—	5.05	10/1/2027
Michael Weening	12/29/2017	—	—	204,000 (1)	5.95	12/29/2027
	6/27/2016	237,500	142,500 (2)	—	6.38	6/27/2026
Gregory Billings	12/29/2017	—	—	126,000 (1)	5.95	12/29/2027
	11/1/2017	25,000	25,000 (3)	—	5.45	11/1/2027
	12/21/2016	150,000	150,000 (2)	—	7.70	12/21/2026

(1) Represents the 2018 Performance-Based Equity Awards that vest based on attainment of 2018 financial performance metrics, with 50% of the shares earned based on performance vesting on January 1, 2019 and the remaining 50% scheduled to vest in substantially equal installments over the subsequent 24 months. In February 2019, the Compensation Committee certified attainment of the 2018 performance metric. At his election, Mr. Russo did not receive a 2018 Performance-Based Equity Award. See discussion above under "*Performance-Based Grant – 2018 Financial Performance*."

(2) The stock option grant vests over four years, with 25% of the common stock subject to the grant vesting on the one-year anniversary of the grant date, and the remainder vesting quarterly thereafter in substantially equal installments over the next 36 months, subject to the NEO's continued employment with Calix through the applicable vesting dates.

(3) Represents Mr. Billings' performance-based stock option grant pursuant to his amended offer letter. The stock option grant vests over four years, with 25% of the common stock subject to the grant vesting and becoming exercisable on December 19, 2017 and the remainder vesting and becoming exercisable quarterly thereafter in substantially equal installments over the next 36 months, subject to Mr. Billings' continued employment with Calix through the applicable vesting dates.

Option Exercises and Stock Vested in 2018

None of our NEOs exercised stock options or held stock awards that vested during 2018.

Potential Payments Upon Termination or Change of Control

Each of our NEOs is entitled to severance upon a termination without cause or, only during a change in control, a resignation for good reason under our CICSP. See the section above entitled "*Change in Control and Severance Benefits*" for more information regarding the benefits provided under our CICSP.

The table below sets forth the estimated payments and benefits that would be provided to each of our NEOs upon a termination of employment without cause or, following a change in control, resignation for good reason if our NEO's employment had terminated on December 31, 2018 or a change in control was consummated on December 31, 2018, as applicable, taking into account the NEO's compensation as of that date.

Executive Benefits and Payments upon Termination	Involuntary Termination for Reasons Other Than Cause, Death or Disability, or Voluntary Termination for Good Reason Only During a Change in Control: Not in Connection with a Change in Control ($)	60 Days Prior to or 12 Months Following a Change in Control ($)
Carl Russo		
Cash severance (1)	$ 1,000,000	$ 2,500,000
Value of accelerated vesting of equity awards (2)	—	—
Health insurance benefit continuation (3)	18,967	37,913
Total	$ 1,018,967	$ 2,537,913
Cory Sindelar		
Cash severance (1)	$ 563,200	$ 774,400
Value of accelerated vesting of equity awards (2)	634,650	1,467,900
Health insurance benefit continuation (3)	18,614	18,614
Total	$ 1,216,464	$ 2,260,914
Michael Weening		
Cash severance (1)	$ 668,800	$ 985,600
Value of accelerated vesting of equity awards (2)	853,100	1,255,425
Health insurance benefit continuation (3)	4,927	4,927
Total	$ 1,526,827	$ 2,245,952
Gregory Billings		
Cash severance (1)	$ 465,000	$ 630,000
Value of accelerated vesting of equity awards (2)	536,675	893,800
Health insurance benefit continuation (3)	34,539	34,539
Total	$ 1,036,214	$ 1,558,339

(1) In the event of termination not in connection with a Change in Control, an eligible NEO is eligible to receive a cash severance payment in an amount equal to 12 months base salary and a pro-rata portion of the eligible NEO's annual bonus opportunity at target. In the event of termination in connection with a Change in Control, an eligible NEO is eligible to receive a cash severance payment in an amount equal to: 24 months of base salary (in the case of Mr. Russo) or 12 months of base salary (in the case of Messrs. Sindelar, Weening and Billings); 200% of the annual bonus opportunity at target (in the case of Mr. Russo) or 100% of the annual bonus opportunity at target (in the case of Messrs. Sindelar, Weening and Billings); and a pro-rata portion the eligible NEO's annual bonus opportunity at target, subject to attainment of the performance criteria with respect to the eligible NEO's bonus opportunity.

(2) In the event of termination not in connection with a Change in Control, an eligible NEO is eligible to receive 12 months accelerated vesting of equity awards. In the event of termination in connection with a Change in Control, an eligible NEO is eligible to receive 100% acceleration of all equity awards. The value of accelerated vesting of equity awards amounts was calculated based on a closing trading price of $9.75 per share at December 31, 2018. The value associated with stock option grants for which the per share exercise price is higher than the closing trading price of $9.75 per share is reflected as zero.

(3) In the event of termination not in connection with a Change in Control, an eligible NEO is eligible to receive 12 months of health insurance benefit continuation. In the event of termination in connection with a Change in Control, an eligible NEO is eligible to receive) 24 months of health insurance benefit continuation (in the case of Mr. Russo) or 12 months of health insurance benefit continuation (in the case of Messrs. Sindelar, Weening and Billings).

Limitation of Liability and Indemnification

Calix's amended and restated certificate of incorporation contains provisions that limit the liability of Calix's directors for monetary damages to the fullest extent permitted by Delaware law. Consequently, Calix's directors will not be personally liable to Calix or Calix's stockholders for monetary damages for any breach of fiduciary duties as directors, except liability for:

- any breach of the director's duty of loyalty to Calix or Calix's stockholders;
- any act or omission not in good faith or that involves intentional misconduct or a knowing violation of law;
- unlawful payments of dividends or unlawful stock repurchases or redemptions as provided in Section 174 of the Delaware General Corporation Law; or
- any transaction from which the director derived an improper personal benefit.

Calix's amended and restated certificate of incorporation and amended and restated bylaws provide that Calix is required to indemnify Calix's directors and officers, in each case to the fullest extent permitted by Delaware law. Calix's amended and restated bylaws also provide that Calix is obligated to advance expenses incurred by a director or officer in advance of the final disposition of any action or proceeding, and permit Calix to secure insurance on behalf of any officer, director, employee or other agent for any liability arising out of his or her actions in that capacity regardless of whether Calix would otherwise be permitted to indemnify him or her under the provisions of Delaware law. Calix has entered into and expects to continue to enter into agreements to indemnify Calix's directors, executive officers and other employees as determined by the Board. With specified exceptions, these agreements provide for indemnification for related expenses including, among other things, attorneys' fees, judgments, fines and settlement amounts incurred by any of these individuals in any action or proceeding. Calix believes that these provisions and indemnification agreements are necessary to attract and retain qualified persons as directors and officers. Calix also maintains directors' and officers' liability insurance.

The limitation of liability and indemnification provisions in Calix's amended and restated certificate of incorporation and amended and restated bylaws may discourage stockholders from bringing a lawsuit against Calix's directors and officers for breach of their fiduciary duty. They may also reduce the likelihood of derivative litigation against Calix's directors and officers, even though an action, if successful, might benefit Calix and other stockholders. Further, a stockholder's investment may be adversely affected to the extent that Calix pays the costs of settlement and damage awards against directors and officers as required by these indemnification provisions. Insofar as indemnification for liabilities arising under the Securities Act may be permitted to Calix's directors, officers and controlling persons under the above provisions, or otherwise, Calix has been advised that, in the opinion of the SEC, such indemnification is against public policy as expressed in the Securities Act, and is, therefore, unenforceable. At present, there is no pending litigation or proceeding involving any of Calix's directors, officers or employees for which indemnification is sought, and Calix is not aware of any threatened litigation that may result in claims for indemnification.

CEO PAY RATIO

As required by Section 953(b) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 402(u) of Regulation S-K, we are required to disclose the ratio of our principal executive officer's annual total compensation to the annual total compensation of our median employee.

During fiscal 2018, Mr. Russo was the principal executive officer of Calix. For 2018, the annual total compensation for Mr. Russo was $500,000, as disclosed under the Summary Compensation Table above, and the annual total compensation for our median employee was $133,788, calculated using the same methodology as applied for Mr. Russo in the Summary Compensation Table above, resulting in a pay ratio of approximately 4:1.

Due to restructuring activities in the first half of 2018 that resulted in a shift in our employee population, we determined to reidentify the median employee for 2018. In accordance with Item 402(u) of Regulation S-K, and consistent with the process developed to identify the median employee for 2017, we identified the median employee for 2018 by (i) aggregating for each applicable employee, as of October 1, 2018 (the median employee determination date): (A) annual base salary for permanent salaried employees, or hourly rate multiplied by expected work schedule, for hourly employees and (B) the target incentive compensation for 2018, and (ii) ranking this compensation measure for our employees from lowest to highest. This calculation was performed for all employees, excluding Mr. Russo, whether employed on a full-time, part-time or seasonal basis.

We believe the pay ratio reported above is a reasonable estimate calculated in a manner consistent with SEC rules. Because the SEC rules allow companies to utilize different methodologies and companies have different employee populations and compensation practices, the pay ratio reported by other companies may not be comparable to the pay ratio reported above.

DIRECTOR COMPENSATION

Our Compensation Committee reviews compensation for our non-employee directors on an annual basis, taking into consideration market data for our peer group, recommendations from Radford based on market data analysis and governance considerations issued by proxy advisory firms. Compensation for our non-employee directors consists of cash retainers for service on the Board and Board committees, with an initial equity award granted upon joining the Board and an annual equity award granted on the date of each annual meeting of stockholders. We do not provide for any per meeting fees for attendance at meetings. Members of the Board who are employees of Calix do not receive any additional compensation for their service as directors.

Cash Compensation

Under Calix's Non-Employee Director Cash Compensation Policy, directors who were not employed by Calix or one of our affiliates received the following cash retainers for their service on the Board (including service on committees of the Board) during 2018:

	Amount
Base Retainer	$ 40,000
Board and Committee Chair Service Premiums (in addition to Base Retainer)	
Board Chair	40,000
Audit Committee Chair	35,000
Compensation Committee Chair	20,000
Nominating and Corporate Governance Committee Chair	10,000
Cybersecurity Committee Chair	10,000
Strategic Committee Chair	10,000
Non-Chair Committee Service Premiums (in addition to Base Retainer)	
Audit Committee	10,000
Compensation Committee	7,500
Nominating and Corporate Governance Committee	5,000
Cybersecurity Committee	5,000
Strategic Committee	5,000

Except for the addition of retainers for the Cybersecurity Committee upon the formation of that Committee in 2017 and for the Strategic Committee upon the formation of that Committee in 2018, the cash retainers for the Board have remained the same since 2014.

Equity Compensation

Under our Non-Employee Director Equity Compensation Policy, non-employee directors will automatically be granted RSUs valued at $200,000 (based on the per share closing price of our common stock on the date such director commences service) upon their election or appointment to the Board. The initial grant is prorated based on the non-employee director's start date through the applicable vesting date and will vest with respect to 100% of the RSUs on the earlier of the one-year anniversary of the date of grant or the day immediately preceding the date of the next annual meeting of stockholders following the year of grant.

Each director who is a non-employee director immediately following each annual meeting of stockholders (provided that such director has served as a director for at least six months prior to such date) will also automatically be granted RSUs valued at $120,000 (based on the per share closing price of our common stock on the date of such annual meeting of stockholders). The annual grants vest as to 100% of the RSUs on the day immediately prior to the date of the next annual meeting of stockholders following the date of grant, subject to continued service to Calix through the applicable vesting date.

Members of the Board who are Calix employees and who subsequently terminate employment with Calix and remain on the Board are not eligible for initial grants of RSUs but are eligible, after termination of employment with Calix, for annual grants of RSUs.

All options, RSUs and other equity awards held by a non-employee director, regardless of when granted, automatically accelerate in the event of a change in control of Calix.

Director Stock Ownership

Under our director stock ownership guidelines, each director is expected to acquire and maintain ownership of Calix common stock having a value of no less than four (4) times the annual Board cash retainer, which achievement of the requisite stock ownership expected on or before the date five years after the initial appointment date of such director. If a director fails to meet these guidelines, shares from such director's annual equity grants will be held until the guidelines are met. Each of our directors is currently in compliance with our director stock ownership guidelines.

Other Arrangements

We reimburse non-employee directors for travel, lodging and other expenses incurred in connection with their attendance at Board and committee meetings.

Director Compensation Table

The following table sets forth information regarding compensation earned by our non-employee directors during the year ended December 31, 2018.

Name	Fees Earned or Paid in Cash	Stock Awards (1)	Total
Don Listwin	$ 100,996	$ 120,000	$ 220,996
Christopher Bowick	55,295	120,000	175,295
Kathy Crusco	53,159	120,000	173,159
Kevin DeNuccio	50,618	120,000	170,618
Michael Everett	75,000	120,000	195,000
Michael Flynn (2)	24,464	—	24,464
Kira Makagon	45,000	120,000	165,000
Michael Matthews	55,000	120,000	175,000
Kevin Peters	55,000	120,000	175,000
J. Daniel Plants	35,259	199,999	235,258

(1) Amounts reflect the grant date fair value of RSUs granted in 2018 calculated in accordance with ASC Topic 718 for share-based payment transactions and exclude the impact of estimated forfeitures related to service-based vesting conditions. We value RSUs based on the closing trading price of our common stock on the date of grant. Mr. Plants' initial RSU grant upon his appointment to the Board was calculated based on a value of $200,000 divided by the per share closing price of our common stock on March 14, 2018, the date Mr. Plants commenced service as a director, and rounded down to the nearest whole share.

(2) Mr. Flynn retired from the Board effective as of the Annual Meeting on May 16, 2018.

As of December 31, 2018, outstanding options and RSUs held by our current non-employee directors were as follows:

Name	Stock Options (#)	Restricted Stock Units (#)
Don Listwin	7,500	18,320
Christopher Bowick	—	18,320
Kathy Crusco	—	18,320
Kevin DeNuccio	—	18,320
Michael Everett	10,000	18,320
Kira Makagon	—	18,320
Michael Matthews	12,500	18,320
Kevin Peters	—	18,320
J. Daniel Plants	—	27,586

EQUITY COMPENSATION PLAN INFORMATION

The following table provides certain information as of December 31, 2018, with respect to all of our equity compensation plans in effect on that date.

Plan Category	Number of Securities to be Issued Upon Exercise of Outstanding Options and Restricted Stock Units (a)	Weighted-Average Exercise Price of Outstanding Options (b)	Number of Securities Remaining Available for Future Issuance Under Equity Compensation Plans (Excluding Securities Reflected in Column(a))
Equity Compensation Plans Approved by Stockholders (1)	4,992,157 (3)	$ 7.58 (4)	6,619,186 (6)
Equity Compensation Plans Not Approved by Stockholders (2)	300,000	$ 5.05	—
Total	5,292,157	$ 7.40 (4)(5)	6,619,186

(1) Includes our Amended and Restated 2002 Stock Plan, 2010 Equity Incentive Award Plan, Amended and Restated Employee Stock Purchase Plan and Amended and Restated 2017 Nonqualified Employee Stock Purchase Plan. Also includes 17,101 stock options assumed through our acquisition of Occam Networks in 2011.

(2) Consists of a Nonstatutory Inducement Stock Option Grant, which constitutes an employment inducement award for Mr. Sindelar under NYSE Listed Company Manual Rule 303A.08 that was approved by the Compensation Committee on September 28, 2017. The NYSE approved the Supplemental Listing Application for the Inducement Award on October 30, 2017. The Nonstatutory Inducement Stock Option Grant was awarded on October 1, 2017 and provides Mr. Sindelar the right to purchase up to 300,000 shares of our common stock for an exercise price of $5.05 per share. The Nonstatutory Inducement Stock Option Grant has a term of 10 years and vests and becomes exercisable over four years from the date of grant. In the event of a termination of Mr. Sindelar's employment, the unvested portion of the Nonstatutory Inducement Stock Option Grant would be immediately forfeited and Mr. Sindelar would have three months, or 12 months in the case of death or disability, to exercise the vested portion of the option.

(3) Includes 850,068 shares of common stock subject to RSUs, including performance-based RSUs, that will entitle each holder the issuance of one share of common stock for each unit and 4,142,089 shares of common stock subject to stock options.

(4) The weighted-average exercise price of outstanding options excludes RSUs, which do not have an exercise price.

(5) The weighted-average remaining term for outstanding options is 7.3 years.

(6) Includes 1,549,569 shares available for future issuance under the Amended and Restated Employee Stock Purchase Plan, 2,763,889 shares available for future issuance under the Amended and Restated 2017 Nonqualified Employee Stock Purchase Plan and 2,305,728 shares available for future issuance under the 2010 Equity Incentive Award Plan. The 2010 Equity Incentive Award Plan contains an "evergreen" provision under which the number of shares of common stock reserved for issuance under the plan will be increased on the first day of each fiscal year through 2020, equal to the lesser of (A) 666,666 shares, (B) 2% of the shares of stock outstanding (on an as converted basis) on the last day of the immediately preceding fiscal year and (C) such smaller number of shares of stock as determined by our Board.

COMPENSATION COMMITTEE REPORT

The information contained in this report shall not be deemed to be "soliciting material," to be "filed" with the SEC or be subject to Regulation 14A or Regulation 14C (other than as provided in Item 407 of Regulation S-K) or to the liabilities of Section 18 of the Securities Exchange Act of 1934, and shall not be deemed to be incorporated by reference in future filings with the SEC except to the extent that Calix specifically incorporates it by reference into a document filed under the Securities Act of 1933 or the Securities Exchange Act of 1934.

The Compensation Committee of the Board has reviewed and discussed the Compensation Discussion and Analysis required by Item 402(b) of Regulation S-K with management and, based on such review and discussions, the Compensation Committee of the Board recommended to the Board that the Compensation Discussion and Analysis be included in this Proxy Statement.

Compensation Committee

Christopher Bowick, Chair
Kevin DeNuccio
Don Listwin

AUDIT COMMITTEE REPORT

The information contained in this report shall not be deemed to be "soliciting material," to be "filed" with the SEC or be subject to Regulation 14A or Regulation 14C (other than as provided in Item 407 of Regulation S-K) or to the liabilities of Section 18 of the Securities Exchange Act of 1934, and shall not be deemed to be incorporated by reference in future filings with the SEC except to the extent that Calix specifically incorporates it by reference into a document filed under the Securities Act of 1933 or the Securities Exchange Act of 1934.

The Audit Committee has reviewed and discussed with Calix management and KPMG LLP the audited consolidated financial statements of Calix contained in the Calix Annual Report on Form 10-K for the year ended December 31, 2018. The Audit Committee has also discussed with KPMG LLP the matters required to be discussed by AS No. 1301, as amended, as adopted by the Public Company Accounting Oversight Board in Rule 3200T.

The Audit Committee has received the written disclosures and the letter from KPMG LLP required by the Public Company Accounting Oversight Board regarding the independent accountant's communications with the Audit Committee concerning independence and has discussed with KPMG LLP its independence.

Based on the review and discussions referred to above, the Audit Committee recommended to the Board of Directors that the audited consolidated financial statements be included in Calix's Annual Report on Form 10-K for its year ended December 31, 2018 for filing with the Securities and Exchange Commission.

Audit Committee

Michael Everett, Chair
Kathy Crusco
Michael Matthews

CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS

Calix's Board and Audit Committee have adopted a written related person transaction policy that sets forth the policies and procedures for the review and approval or ratification of related person transactions that may be deemed "related person transactions" under the rules of the SEC. This policy covers any transaction, arrangement or relationship, or any series of similar transactions, arrangements or relationships, in which Calix was or is to be a participant, the amount involved exceeds $120,000 and a related person had or will have a direct or indirect material interest, including, without limitation, purchases of goods or services by or from the related person or entities in which the related person has a material interest, indebtedness, guarantees of indebtedness or employment by Calix of a related person. For purposes of the policy, a "related person" is a director, officer or greater than 5% beneficial owner of Calix's stock and their immediate family members.

Calix recognizes that related person transactions can present potential or actual conflicts of interest or create the appearance of a conflict of interest. Management presents to the Audit Committee each proposed related person transaction, including all relevant facts and circumstances, and the Audit Committee reviews the relevant facts and circumstances of each related person transaction, including if the transaction is on terms comparable to those that could be obtained in arm's length dealings with an unrelated third party and the extent of the related person's interest in the transaction, takes into account the conflicts of interest and corporate opportunity provisions of Calix's Code of Business Conduct and Ethics, and either approves or disapproves the related person transaction. Any related person transaction may be consummated and shall continue only if the Audit Committee has approved or ratified such transaction in accordance with the guidelines set forth in the policy. No director may participate in approval of a related person transaction for which he or she is a related person. As required under rules issued by the SEC, transactions that are determined to be directly or indirectly material to a related person are or will be disclosed in Calix's proxy statements.

During fiscal year 2018, Calix has not participated in any transactions, nor are there any currently proposed transactions in which Calix will participate, where the amount involved exceeds, or would exceed, $120,000, and in which any related person had or will have a direct or indirect material interest.

HOUSEHOLDING OF PROXY MATERIALS

The SEC has adopted rules that permit companies and intermediaries (*e.g.*, brokers) to satisfy the delivery requirements for Notices of Internet Availability of Proxy Materials, proxy statements and annual reports with respect to two or more stockholders sharing the same address by delivering a single Notice of Internet Availability of Proxy Materials, or proxy statement and annual report, as applicable, addressed to those stockholders. This process, which is commonly referred to as "householding," potentially means extra convenience for stockholders and cost savings for companies.

This year, a number of brokers with account holders who are Calix stockholders will be "householding" our proxy materials. A single Notice of Internet Availability of Proxy Materials may be delivered to multiple stockholders sharing an address unless contrary instructions have been received from the affected stockholders. Once you have received notice from your broker that it will be "householding" communications to your address, "householding" will continue until you are notified otherwise or until you notify your broker or Calix that you no longer wish to participate in "householding."

If, at any time, you no longer wish to participate in "householding" and would prefer to receive a separate Notice of Internet Availability of Proxy Materials, you may (1) notify your broker, (2) direct your written request to: Investor Relations, Calix, Inc., 2777 Orchard Parkway, San Jose, California 95134 or (3) contact our Investor Relations department by telephone at (408) 474-0080. Stockholders who currently receive multiple copies of the Notice of Internet Availability of Proxy Materials at their address and would like to request "householding" of their communications should contact their broker. In addition, Calix will promptly deliver, upon written or oral request to the address or telephone number above, a separate copy of the Notice of Internet Availability of Proxy Materials to a stockholder at a shared address to which a single copy of the documents was delivered.

OTHER MATTERS

The Board knows of no other matters that will be presented for consideration at the Annual Meeting. If any other matters are properly brought before the Annual Meeting, it is the intention of the persons named in the proxy card to vote on such matters in accordance with their best judgment.

ANNUAL REPORTS

The 2018 Annual Report to Stockholders, including our 2018 Annual Report on Form 10-K (which is not a part of our proxy soliciting materials), will be mailed with this Proxy Statement to those stockholders that request and receive a copy of the proxy materials in the mail. Stockholders that received the Notice of Internet Availability of Proxy Materials can access this Proxy Statement and our 2018 Annual Report at www.proxyvote.com.

We have filed our Annual Report on Form 10-K for the year ended December 31, 2018 with the SEC. It is available free of charge in the "SEC Filings" section of our website at investor-relations.calix.com or at the SEC's website at www.sec.gov. Upon written request by a Calix stockholder, we will mail without charge a copy of our Annual Report on Form 10-K, including the financial statements and financial statement schedules, but excluding exhibits to the Annual Report on Form 10-K. Exhibits to the Annual Report on Form 10-K are available upon payment of a reasonable fee, which is limited to our expenses in furnishing the requested exhibit. All requests should be directed to Investor Relations, Calix, Inc., 2777 Orchard Parkway, San Jose, California 95134.

By Order of the Board of Directors

Suzanne Tom
Corporate Secretary

April 2, 2019

Appendix A

CALIX, INC.
2019 EQUITY INCENTIVE AWARD PLAN

ARTICLE 1.

PURPOSE

The purpose of the Calix, Inc. 2019 Equity Incentive Award Plan (as it may be amended or restated from time to time, the "Plan") is to promote the success and enhance the value of Calix, Inc. (the "Company") by linking the individual interests of the members of the Board, Employees and Consultants to those of Company stockholders and by providing such individuals with an incentive for outstanding performance to generate superior returns to Company stockholders. The Plan is further intended to provide flexibility to the Company in its ability to attract, incentivize and retain the services of members of the Board, Employees and Consultants upon whose judgment, interest and special effort the successful conduct of the Company's operation is largely dependent.

ARTICLE 2.

DEFINITIONS AND CONSTRUCTION

Wherever the following terms are used in the Plan they shall have the meanings specified below, unless the context clearly indicates otherwise. The singular pronoun shall include the plural where the context so indicates.

2.1 "Administrator" shall mean the entity that conducts the general administration of the Plan as provided in Article 11. With reference to the duties of the Committee under the Plan which have been delegated to one or more persons pursuant to Section 11.6, or as to which the Board has assumed, the term "Administrator" shall refer to such person(s) unless the Committee or the Board has revoked such delegation or the Board has terminated the assumption of such duties.

2.2 "Applicable Accounting Standards" shall mean Generally Accepted Accounting Principles in the United States, International Financial Reporting Standards or such other accounting principles or standards as may apply to the Company's financial statements under United States federal securities laws from time to time.

2.3 "Applicable Law" shall mean any applicable law, including without limitation: (a) provisions of the Code, the Securities Act, the Exchange Act and any rules or regulations thereunder; (b) corporate, securities, tax or other laws, statutes, rules, requirements or regulations, whether federal, state, local or foreign; and (c) rules of any securities exchange or automated quotation system on which the Shares are listed, quoted or traded.

2.4 Reserved.

2.5 "Award" shall mean an Option, a Stock Appreciation Right, a Restricted Stock award, a Restricted Stock Unit award, an Other Stock or Cash Based Award or a Dividend Equivalent award, which may be awarded or granted under the Plan.

2.6 "Award Agreement" shall mean any written notice, agreement, terms and conditions, contract or other instrument or document evidencing an Award, including through electronic medium, which shall contain such terms and conditions with respect to an Award as the Administrator shall determine consistent with the Plan.

2.7 "Board" shall mean the Board of Directors of the Company.

2.8 "Cause" shall mean (a) a Holder (i) has committed willful fraud, willful misconduct or gross negligence, (ii) has repeatedly failed to execute the duties and responsibilities of Holder's service to the Company as reasonably requested by Company's management, or (iii) has committed an incurable material breach of the Company's Confidential Information and Invention Assignment Agreement, or (b) Holder has been convicted of, or has admitted culpability with respect to, a felony or a crime involving moral turpitude causing material harm to the standing or reputation of Company, in each case as determined in good faith by the Administrator.

2.9 "Change in Control" shall mean and includes each of the following:

(a) A transaction or series of transactions (other than an offering of Common Stock to the general public through a registration statement filed with the Securities and Exchange Commission) whereby any "person" or related "group" of "persons" (as such terms are used in Sections 13(d) and 14(d)(2) of the Exchange Act) (other than the Company, any of its parents or subsidiaries, an employee benefit plan maintained by the Company or any of its subsidiaries or a "person" that, prior to such transaction, directly or indirectly controls, is controlled by, or is under common control with, the Company) directly or indirectly acquires beneficial ownership (within the meaning of Rule 13d-3 under the Exchange Act) of securities of the Company possessing more than 50% of the total combined voting power of the Company's securities outstanding immediately after such acquisition; or

(b) During any period of two consecutive years, individuals who, at the beginning of such period, constitute the Board together with any new director(s) (other than a director designated by a person who shall have entered into an agreement with the Company to effect a transaction described in Section 2.9(a) or Section 2.9(c)) whose election by the Board or nomination for election by the Company's stockholders was approved by a vote of at least two-thirds of the directors then still in office who either were directors at the beginning of the two-year period or whose election or nomination for election was previously so approved, cease for any reason to constitute a majority thereof; or

(c) The consummation by the Company (whether directly involving the Company or indirectly involving the Company through one or more intermediaries) of (x) a merger, consolidation, reorganization, or business combination or (y) a sale or other disposition of all or substantially all of the Company's assets in any single transaction or series of related transactions or (z) the acquisition of assets or stock of another entity, in each case other than a transaction:

(i) Which results in the Company's voting securities outstanding immediately before the transaction continuing to represent (either by remaining outstanding or by being converted into voting securities of the Company or the person that, as a result of the transaction, controls, directly or indirectly, the Company or owns, directly or indirectly, all or substantially all of the Company's assets or otherwise succeeds to the business of the Company (the Company or such person, the "Successor Entity")) directly or indirectly, at least a majority of the combined voting power of the Successor Entity's outstanding voting securities immediately after the transaction, and

(ii) After which no person or group beneficially owns voting securities representing 50% or more of the combined voting power of the Successor Entity; provided, however, that no person or group shall be treated for purposes of this Section 2.9(c)(ii) as beneficially owning 50% or more of combined voting power of the Successor Entity solely as a result of the voting power held in the Company prior to the consummation of the transaction; or

(d) The Company's stockholders approve a liquidation or dissolution of the Company.

In addition, if a Change in Control constitutes a payment event with respect to any Award which provides for the deferral of compensation and is subject to Section 409A of the Code, the transaction or event described in subsection (a), (b), (c) or (d) with respect to such Award must also constitute a "change in control event," as defined in Treasury Regulation §1.409A-3(i)(5) to the extent required by Section 409A.

The Committee shall have full and final authority, which shall be exercised in its discretion, to determine conclusively whether a Change in Control of the Company has occurred pursuant to the above definition, and the date of the occurrence of such Change in Control and any incidental matters relating thereto.

2.10 "Code" shall mean the Internal Revenue Code of 1986, as amended from time to time, together with the regulations and official guidance promulgated thereunder, whether issued prior or subsequent to the grant of any Award.

2.11 "Committee" shall mean the Compensation Committee of the Board, or another committee or subcommittee of the Board or the Compensation Committee of the Board described in Article 11 hereof.

2.12 "Common Stock" shall mean the common stock of the Company.

2.13 "Company" shall have the meaning set forth in Article 1.

2.14 “Constructive Termination” shall mean Holder’s resignation that constitutes a Termination of Service following (a) a material reduction (without Holder’s written consent) in Holder’s title, job duties, responsibilities and job requirements inconsistent with Holder’s position with Company and Holder’s prior duties, responsibilities and requirements taking into account the differences in job title and duties that are normally occasioned by reason of an acquisition of one company by another and that do not actually result in a material change in duties, responsibilities and requirements; (b) a material reduction of a Holder’s base compensation without the Holder’s written consent (except an equal, across-the-board reduction in the compensation of all similarly-situated employees of Company or the surviving entity that is approved by the Board); or (c) the relocation of Holder’s principal office that increases Holder’s one way commute more than thirty-five (35) miles. Notwithstanding the foregoing, a resignation shall not constitute a “Constructive Termination” unless the event or condition giving rise to such resignation continues more than thirty (30) days following the Holder’s written notice of such condition provided to the Company within ninety (90) days of the first occurrence of such event or condition and such resignation is effective within thirty (30) days following the end of such notice period.

2.15 “Consultant” shall mean any consultant or adviser engaged to provide services to the Company or any Subsidiary who qualifies as a consultant or advisor under the applicable rules of the Securities and Exchange Commission for registration of shares on a Form S-8 Registration Statement.

2.16 “Director” shall mean a member of the Board, as constituted from time to time.

2.17 “Director Limit” shall have the meaning set forth in Section 4.6.

2.18 “Dividend Equivalent” shall mean a right to receive the equivalent value (in cash or Shares) of dividends paid on Shares, awarded under Section 9.2.

2.19 “DRO” shall mean a “domestic relations order” as defined by the Code or Title I of the Employee Retirement Income Security Act of 1974, as amended from time to time, or the rules thereunder.

2.20 “Effective Date” shall mean the date the Plan is adopted by the Board, subject to approval of the Plan by the Company’s stockholders.

2.21 “Eligible Individual” shall mean any person who is an Employee, a Consultant or a Non-Employee Director, as determined by the Administrator.

2.22 “Employee” shall mean any officer or other employee (as determined in accordance with Section 3401(c) of the Code and the Treasury Regulations thereunder) of the Company or of any Subsidiary.

2.23 “Equity Restructuring” shall mean a nonreciprocal transaction between the Company and its stockholders, such as a stock dividend, stock split, spin-off, rights offering or recapitalization through a large, nonrecurring cash dividend, that affects the number or kind of Shares (or other securities of the Company) or the share price of Common Stock (or other securities) and causes a change in the per-share value of the Common Stock underlying outstanding Awards.

2.24 “Exchange Act” shall mean the Securities Exchange Act of 1934, as amended from time to time.

2.25 “Expiration Date” shall have the meaning given to such term in Section 12.1(c).

2.26 “Fair Market Value” shall mean, as of any given date, the value of a Share determined as follows:

(a) If the Common Stock is (i) listed on any established securities exchange (such as the New York Stock Exchange, the NASDAQ Capital Market, the NASDAQ Global Market and the NASDAQ Global Select Market), (ii) listed on any national market system or (iii) quoted or traded on any automated quotation system, its Fair Market Value shall be the closing sales price for a Share as quoted on such exchange or system for such date or, if there is no closing sales price for a Share on the date in question, the closing sales price for a Share on the last preceding date for which such quotation exists, as reported in *The Wall Street Journal* or such other source as the Administrator deems reliable;

(b) If the Common Stock is not listed on an established securities exchange, national market system or automated quotation system, but the Common Stock is regularly quoted by a recognized securities dealer, its Fair Market Value shall be the mean of the high bid and low asked prices for such date or, if there are no high bid and low asked prices for a Share on such date, the high bid and low asked prices for a Share on the last preceding date for which such information exists, as reported in *The Wall Street Journal* or such other source as the Administrator deems reliable; or

(c) If the Common Stock is neither listed on an established securities exchange, national market system or automated quotation system nor regularly quoted by a recognized securities dealer, its Fair Market Value shall be established by the Administrator in good faith.

2.27 "Greater Than 10% Stockholder" shall mean an individual then owning (within the meaning of Section 424(d) of the Code) more than 10% of the total combined voting power of all classes of stock of the Company or any subsidiary corporation (as defined in Section 424(f) of the Code) or parent corporation thereof (as defined in Section 424(e) of the Code).

2.28 "Holder" shall mean a person who has been granted an Award.

2.29 "Incentive Stock Option" shall mean an Option that is intended to qualify as an incentive stock option and conforms to the applicable provisions of Section 422 of the Code.

2.30 "Non-Employee Director" shall mean a Director of the Company who is not an Employee.

2.31 "Non-Employee Director Equity Compensation Policy" shall have the meaning set forth in Section 4.6.

2.32 "Non-Qualified Stock Option" shall mean an Option that is not an Incentive Stock Option or which is designated as an Incentive Stock Option but does not meet the applicable requirements of Section 422 of the Code.

2.33 "Option" shall mean a right to purchase Shares at a specified exercise price, granted under Article 5. An Option shall be either a Non-Qualified Stock Option or an Incentive Stock Option; provided, however, that Options granted to Non-Employee Directors and Consultants shall only be Non-Qualified Stock Options.

2.34 "Option Term" shall have the meaning set forth in Section 5.4.

2.35 "Organizational Documents" shall mean, collectively, (a) the Company's articles of incorporation, certificate of incorporation, bylaws or other similar organizational documents relating to the creation and governance of the Company, and (b) the Committee's charter or other similar organizational documentation relating to the creation and governance of the Committee.

2.36 "Other Stock or Cash Based Award" shall mean a cash payment, cash bonus award, stock payment, stock bonus award, performance award or incentive award that is paid in cash, Shares or a combination of both, awarded under Section 9.1, which may include, without limitation, deferred stock, deferred stock units, performance awards, retainers, committee fees and meeting-based fees.

2.37 "Permitted Transferee" shall mean, with respect to a Holder, any "family member" of the Holder, as defined in the General Instructions to Form S-8 Registration Statement under the Securities Act (or any successor form thereto), or any other transferee specifically approved by the Administrator after taking into account Applicable Law.

2.38 "Plan" shall have the meaning set forth in Article 1.

2.39 "Prior Plans" shall mean, collectively, the following plans of the Company: the Calix Networks, Inc. 2010 Equity Incentive Award Plan, the Calix Networks, Inc. 2000 Stock Plan and the Calix Networks, Inc. Amended and Restated 2002 Stock Plan, as each such plan may be amended from time to time.

2.40 "Program" shall mean any program adopted by the Administrator pursuant to the Plan containing the terms and conditions intended to govern a specified type of Award granted under the Plan and pursuant to which such type of Award may be granted under the Plan.

2.41 "Restricted Stock" shall mean Common Stock awarded under Article 7 that is subject to certain restrictions and may be subject to risk of forfeiture or repurchase.

2.42 "Restricted Stock Units" shall mean the right to receive Shares awarded under Article 8.

2.43 "Section 409A" shall mean Section 409A of the Code and the Department of Treasury regulations and other interpretive guidance issued thereunder, including, without limitation, any such regulations or other guidance that may be issued after the Effective Date.

2.44 "Securities Act" shall mean the Securities Act of 1933, as amended.

2.45 “Shares” shall mean shares of Common Stock.

2.46 “Stock Appreciation Right” shall mean an Award entitling the Holder (or other person entitled to exercise pursuant to the Plan) to exercise all or a specified portion thereof (to the extent then exercisable pursuant to its terms) and to receive from the Company an amount determined by multiplying the difference obtained by subtracting the exercise price per share of such Award from the Fair Market Value on the date of exercise of such Award by the number of Shares with respect to which such Award shall have been exercised, subject to any limitations the Administrator may impose.

2.47 “SAR Term” shall have the meaning set forth in Section 5.4.

2.48 “Subsidiary” shall mean any entity (other than the Company), whether domestic or foreign, in an unbroken chain of entities beginning with the Company if each of the entities other than the last entity in the unbroken chain beneficially owns, at the time of the determination, securities or interests representing at least fifty percent (50%) of the total combined voting power of all classes of securities or interests in one of the other entities in such chain.

2.49 “Substitute Award” shall mean an Award granted under the Plan in connection with a corporate transaction, such as a merger, combination, consolidation or acquisition of property or stock, in any case, upon the assumption of, or in substitution for, outstanding equity awards previously granted by a company or other entity; provided, however, that in no event shall the term “Substitute Award” be construed to refer to an award made in connection with the cancellation and repricing of an Option or Stock Appreciation Right.

2.50 “Termination of Service” shall mean:

(a) As to a Consultant, the time when the engagement of a Holder as a Consultant to the Company or a Subsidiary is terminated for any reason, with or without cause, including, without limitation, by resignation, discharge, death or retirement, but excluding terminations where the Consultant simultaneously commences or remains in employment or service with the Company or any Subsidiary.

(b) As to a Non-Employee Director, the time when a Holder who is a Non-Employee Director ceases to be a Director for any reason, including, without limitation, a termination by resignation, failure to be elected, death or retirement, but excluding terminations where the Holder simultaneously commences or remains in employment or service with the Company or any Subsidiary.

(c) As to an Employee, the time when the employee-employer relationship between a Holder and the Company or any Subsidiary is terminated for any reason, including, without limitation, a termination by resignation, discharge, death, disability or retirement; but excluding terminations where the Holder simultaneously commences or remains in employment or service with the Company or any Subsidiary.

The Administrator, in its sole discretion, shall determine the effect of all matters and questions relating to any Termination of Service, including, without limitation, whether a Termination of Service has occurred, whether a Termination of Service resulted from a discharge for cause and all questions of whether particular leaves of absence constitute a Termination of Service; provided, however, that, with respect to Incentive Stock Options, unless the Administrator otherwise provides in the terms of any Program, Award Agreement or otherwise, or as otherwise required by Applicable Law, a leave of absence, change in status from an employee to an independent contractor or other change in the employee-employer relationship shall constitute a Termination of Service only if, and to the extent that, such leave of absence, change in status or other change interrupts employment for the purposes of Section 422(a)(2) of the Code and the then-applicable regulations and revenue rulings under said Section. For purposes of the Plan, a Holder’s employee-employer relationship or consultancy relations shall be deemed to be terminated in the event that the Subsidiary employing or contracting with such Holder ceases to remain a Subsidiary following any merger, sale of stock or other corporate transaction or event (including, without limitation, a spin-off).

ARTICLE 3.

SHARES SUBJECT TO THE PLAN

3.1 Number of Shares.

(a) Subject to Sections 3.1(b) and 12.2, the aggregate number of Shares which may be issued or transferred pursuant to Awards under the Plan is (i) 1,700,000 plus (ii) that number of Shares that are available for issuance under the Calix Networks, Inc. 2010 Equity Incentive Award Plan as of the Effective Date plus (iii) that number of Shares that are subject to equity awards granted under the Prior Plans which are outstanding as of the Effective Date and thereafter terminate, expire, lapse or are forfeited for any reason and which following the termination, expiration, lapse or forfeiture of such awards do not again become available for issuance under the Prior Plans; provided that no more than 1,700,000 Shares may be issued upon the exercise of Incentive Stock Options. Any Shares distributed pursuant to an Award may consist, in whole or in part, of authorized and unissued Common Stock, treasury Common Stock or Common Stock purchased on the open market.

(b) To the extent all or a portion of an Award or Prior Plan award is forfeited, expires or such Award, Prior Plan award or portion thereof is settled for cash (in whole or in part), the Shares subject to such Award, Prior Plan award or portion thereof, shall, to the extent of such forfeiture, expiration or cash settlement, again be available for future grants of Awards under the Plan. Any Shares tendered or withheld to satisfy the grant or exercise price or tax withholding obligation pursuant to any Award shall again be available for the grant of an Award pursuant to the Plan. Any shares of Common Stock repurchased by the Company prior to vesting so that such shares are returned to the Company will again be available for Awards.

(c) Substitute Awards shall not reduce the Shares authorized for grant under the Plan, except as may be required by reason of Section 422 of the Code. Additionally, in the event that a company acquired by the Company or any Subsidiary or with which the Company or any Subsidiary combines has shares available under a pre-existing plan approved by its stockholders and not adopted in contemplation of such acquisition or combination, the shares available for grant pursuant to the terms of such pre-existing plan (as adjusted, to the extent appropriate, using the exchange ratio or other adjustment or valuation ratio or formula used in such acquisition or combination to determine the consideration payable to the holders of common stock of the entities party to such acquisition or combination) may be used for Awards under the Plan and shall not reduce the Shares authorized for grant under the Plan; provided that Awards using such available Shares shall not be made after the date awards or grants could have been made under the terms of the pre-existing plan, absent the acquisition or combination, and shall only be made to individuals who were not employed by or providing services to the Company or its Subsidiaries immediately prior to such acquisition or combination.

3.2 Award Vesting Limitations. Notwithstanding any other provision of the Plan to the contrary, but subject to Section 12.2 of the Plan, Awards granted under the Plan shall vest no earlier than the first anniversary of the date the Award is granted and no Award Agreement shall reduce or eliminate such minimum vesting requirement; provided, however, that, notwithstanding the foregoing, (i) an Award may provide that such minimum vesting restrictions may lapse or be waived upon the Holder's Termination of Service, (ii) Awards that result in the issuance of an aggregate of up to 5% of the shares of Common Stock available pursuant to Section 3.1(a) may be granted to any one or more Eligible Individuals without respect to such minimum vesting provisions, and (iii) for purposes of Awards granted to Non-Employee Directors, a vesting period shall be deemed to be one year if it runs from the date of one annual meeting of the Company's stockholders to the next annual meeting of the Company's stockholders, so long as the period between such meetings is not less than 50 weeks.

ARTICLE 4.

GRANTING OF AWARDS

4.1 Participation. The Administrator may, from time to time, select from among all Eligible Individuals, those to whom an Award shall be granted and shall determine the nature and amount of each Award, which shall not be inconsistent with the requirements of the Plan. Except for any Non-Employee Director's right to Awards that may be required pursuant to the Non-Employee Director Equity Compensation Policy as described in Section 4.6, no Eligible Individual or other Person shall have any right to be granted an Award pursuant to the Plan and neither the Company nor the Administrator is obligated to treat Eligible Individuals, Holders or any other persons uniformly. Participation by each Holder in the Plan shall be voluntary and nothing in the Plan or any Program shall be construed as mandating that any Eligible Individual or other Person shall participate in the Plan.

4.2 Award Agreement. Each Award shall be evidenced by an Award Agreement that sets forth the terms, conditions and limitations for such Award as determined by the Administrator in its sole discretion (consistent with the requirements of the Plan and any applicable Program). Award Agreements evidencing Incentive Stock Options shall contain such terms and conditions as may be necessary to meet the applicable provisions of Section 422 of the Code.

4.3 Limitations Applicable to Section 16 Persons. Notwithstanding any other provision of the Plan, the Plan, and any Award granted or awarded to any individual who is then subject to Section 16 of the Exchange Act, shall be subject to any additional limitations set forth in any applicable exemptive rule under Section 16 of the Exchange Act (including Rule 16b-3 of the Exchange Act and any amendments thereto) that are requirements for the application of such exemptive rule. To the extent permitted by Applicable Law, the Plan and Awards granted or awarded hereunder shall be deemed amended to the extent necessary to conform to such applicable exemptive rule.

4.4 At-Will Service. Nothing in the Plan or in any Program or Award Agreement hereunder shall confer upon any Holder any right to continue in the employ of, or as a Director or Consultant for, the Company or any Subsidiary, or shall interfere with or restrict in any way the rights of the Company and any Subsidiary, which rights are hereby expressly reserved, to discharge any Holder at any time for any reason whatsoever, with or without cause, and with or without notice, or to terminate or change all other terms and conditions of employment or engagement, except to the extent expressly provided otherwise in a written agreement between the Holder and the Company or any Subsidiary.

4.5 Foreign Holders. Notwithstanding any provision of the Plan or applicable Program to the contrary, in order to comply with the laws in countries other than the United States in which the Company and its Subsidiaries operate or have Employees, Non-Employee Directors or Consultants, or in order to comply with the requirements of any foreign securities exchange or other Applicable Law, the Administrator, in its sole discretion, shall have the power and authority to: (a) determine which Subsidiaries shall be covered by the Plan; (b) determine which Eligible Individuals outside the United States are eligible to participate in the Plan; (c) modify the terms and conditions of any Award granted to Eligible Individuals outside the United States to comply with Applicable Law (including, without limitation, applicable foreign laws or listing requirements of any foreign securities exchange); (d) establish subplans and modify exercise procedures and other terms and procedures, to the extent such actions may be necessary or advisable; provided, however, that no such subplans and/or modifications shall increase the share limitation contained in Section 3.1 or the Director Limit; and (e) take any action, before or after an Award is made, that it deems advisable to obtain approval or comply with any necessary local governmental regulatory exemptions or approvals or listing requirements of any foreign securities exchange.

4.6 Non-Employee Director Awards.

(a) Non-Employee Director Equity Compensation Policy. The Administrator, in its sole discretion, may provide that Awards granted to Non-Employee Directors shall be granted pursuant to a written nondiscretionary formula established by the Administrator (the "Non-Employee Director Equity Compensation Policy"), subject to the limitations of the Plan. The Non-Employee Director Equity Compensation Policy shall set forth the type of Award(s) to be granted to Non-Employee Directors, the number of Shares to be subject to Non-Employee Director Awards, the conditions on which such Awards shall be granted, become exercisable and/or payable and expire, and such other terms and conditions as the Administrator shall determine in its sole discretion. The Non-Employee Director Equity Compensation Policy may be modified by the Administrator from time to time in its sole discretion, and pursuant to the exercise of its business judgment, taking into account such factors, circumstances and considerations as it shall deem relevant from time to time.

(b) Director Limit. Notwithstanding any provision to the contrary in the Plan or in the Non-Employee Director Equity Compensation Policy, the grant date fair value of equity-based Awards granted to a Non-Employee Director during any calendar year shall not exceed $750,000 (the "Director Limit").

ARTICLE 5.

GRANTING OF OPTIONS AND STOCK APPRECIATION RIGHTS

5.1 Granting of Options and Stock Appreciation Rights to Eligible Individuals. The Administrator is authorized to grant Options and Stock Appreciation Rights to Eligible Individuals from time to time, in its sole discretion, on such terms and conditions as it may determine, which shall not be inconsistent with the Plan.

5.2 Qualification of Incentive Stock Options. The Administrator may grant Options intended to qualify as Incentive Stock Options only to employees of the Company, any of the Company's present or future "parent corporations" or "subsidiary corporations" as defined in Sections 424(e) or (f) of the Code, respectively, and any other entities the employees of which are eligible to receive Incentive Stock Options under the Code. No person who qualifies as a Greater Than 10% Stockholder may be granted an Incentive Stock Option unless such Incentive Stock Option conforms to the applicable provisions of Section 422 of the Code. To the extent that the aggregate fair market value of stock with respect to which "incentive stock options" (within the meaning of Section 422 of the Code, but without regard to Section 422(d) of the Code) are exercisable for the first time by a Holder during any calendar year under the Plan, and all other plans of the Company and any parent corporation or subsidiary corporation thereof (as defined in Section 424(e) and 424(f) of the Code, respectively), exceeds $100,000, the Options shall be treated as Non-Qualified Stock Options to the extent required by Section 422 of the Code. The rule set forth in the immediately preceding sentence shall be applied by taking Options and other "incentive stock options" into account in the order in which they were granted and the fair market value of stock shall be determined as of the time the respective options were granted. Any interpretations and rules under the Plan with respect to Incentive Stock Options shall be consistent with the provisions of Section 422 of the Code. Neither the Company nor the Administrator shall have any liability to a Holder, or any other Person, (a) if an Option (or any part thereof) which is intended to qualify as an Incentive Stock Option fails to qualify as an Incentive Stock Option or (b) for any action or omission by the Company or the Administrator that causes an Option not to qualify as an Incentive Stock Option, including without limitation, the conversion of an Incentive Stock Option to a Non-Qualified Stock Option or the grant of an Option intended as an Incentive Stock Option that fails to satisfy the requirements under the Code applicable to an Incentive Stock Option.

5.3 Option and Stock Appreciation Right Exercise Price. The exercise price per Share subject to each Option and Stock Appreciation Right shall be set by the Administrator, but shall not be less than 100% of the Fair Market Value of a Share on the date the Option or Stock Appreciation Right, as applicable, is granted (or, as to Incentive Stock Options, on the date the Option is modified, extended or renewed for purposes of Section 424(h) of the Code). In addition, in the case of Incentive Stock Options granted to a Greater Than 10% Stockholder, such price shall not be less than 110% of the Fair Market Value of a Share on the date the Option is granted (or the date the Option is modified, extended or renewed for purposes of Section 424(h) of the Code). Notwithstanding the foregoing, in the case of an Option or Stock Appreciation Right that is a Substitute Award, the exercise price per share of the Shares subject to such Option or Stock Appreciation Right, as applicable, may be less than the Fair Market Value per share on the date of grant; provided that the exercise price of any Substitute Award shall be determined in accordance with the applicable requirements of Section 424 and 409A of the Code.

5.4 Option and SAR Term. The term of each Option (the "Option Term") and the term of each Stock Appreciation Right (the "SAR Term") shall be set by the Administrator in its sole discretion; provided, however, that the Option Term or SAR Term, as applicable, shall not be more than (a) ten (10) years from the date the Option or Stock Appreciation Right, as applicable, is granted to an Eligible Individual (other than a Greater Than 10% Stockholder), or (b) five (5) years from the date an Incentive Stock Option is granted to a Greater Than 10% Stockholder. Except as limited by the requirements of Section 409A or Section 422 of the Code and regulations and rulings thereunder or the first sentence of this Section 5.4 and without limiting the Company's rights under Section 10.7, the Administrator may extend the Option Term of any outstanding Option or the SAR Term of any outstanding Stock Appreciation Right, and may extend the time period during which vested Options or Stock Appreciation Rights may be exercised, in connection with any Termination of Service of the Holder or otherwise, and may amend, subject to Section 10.7 and 12.1, any other term or condition of such Option or Stock Appreciation Right relating to such Termination of Service of the Holder or otherwise.

5.5 Option and SAR Vesting. The period during which the right to exercise, in whole or in part, an Option or Stock Appreciation Right vests in the Holder shall be set by the Administrator and set forth in the applicable Award Agreement, subject to Section 3.2. Unless otherwise determined by the Administrator in the Award Agreement, the applicable Program or by action of the Administrator following the grant of the Option or Stock Appreciation Right, (a) no portion of an Option or Stock Appreciation Right which is unexercisable at a Holder's Termination of Service shall thereafter become exercisable and (b) the portion of an Option or Stock Appreciation Right that is unexercisable at a Holder's Termination of Service shall automatically expire on the date of such Termination of Service.

ARTICLE 6.

EXERCISE OF OPTIONS AND STOCK APPRECIATION RIGHTS

6.1 Exercise and Payment. An exercisable Option or Stock Appreciation Right may be exercised in whole or in part. However, an Option or Stock Appreciation Right shall not be exercisable with respect to fractional Shares and the Administrator may require that, by the terms of the Option or Stock Appreciation Right, a partial exercise must be with respect to a minimum number of Shares. Payment of the amounts payable with respect to Stock Appreciation Rights pursuant to this Article 6 shall be in cash, Shares (based on its Fair Market Value as of the date the Stock Appreciation Right is exercised), or a combination of both, as determined by the Administrator.

6.2 Manner of Exercise. All or a portion of an exercisable Option or Stock Appreciation Right shall be deemed exercised upon delivery of all of the following to the Secretary of the Company, the stock plan administrator of the Company or such other person or entity designated by the Administrator, or his, her or its office, as applicable:

(a) A written or electronic notice complying with the applicable rules established by the Administrator stating that the Option or Stock Appreciation Right, or a portion thereof, is exercised. The notice shall be signed or otherwise acknowledge electronically by the Holder or other person then entitled to exercise the Option or Stock Appreciation Right or such portion thereof;

(b) Such representations and documents as the Administrator, in its sole discretion, deems necessary or advisable to effect compliance with Applicable Law.

(c) In the event that the Option shall be exercised pursuant to Section 10.3 by any person or persons other than the Holder, appropriate proof of the right of such person or persons to exercise the Option or Stock Appreciation Right, as determined in the sole discretion of the Administrator; and

(d) Full payment of the exercise price and applicable withholding taxes for the Shares with respect to which the Option or Stock Appreciation Right, or portion thereof, is exercised, in a manner permitted by the Administrator in accordance with Sections 10.1 and 10.2.

6.3 Notification Regarding Disposition. The Holder shall give the Company prompt written or electronic notice of any disposition of Shares acquired by exercise of an Incentive Stock Option which occurs within (a) two years from the date of granting (including the date the Option is modified, extended or renewed for purposes of Section 424(h) of the Code) such Option to such Holder, or (b) one year after the date of transfer of such Shares to such Holder. Such notice shall specify the date of such disposition or other transfer and the amount realized, in cash, other property, assumption of indebtedness or other consideration, by the Holder in such disposition or other transfer.

ARTICLE 7.

AWARD OF RESTRICTED STOCK

7.1 Award of Restricted Stock. The Administrator is authorized to grant Restricted Stock to Eligible Individuals, and shall determine the terms and conditions, including the restrictions applicable to each award of Restricted Stock, which terms and conditions shall not be inconsistent with the Plan or any applicable Program, and may impose such conditions on the issuance of such Restricted Stock as it deems appropriate. The Administrator shall establish the purchase price, if any, and form of payment for Restricted Stock; provided, however, that if a purchase price is charged, such purchase price shall be no less than the par value, if any, of the Shares to be purchased, unless otherwise permitted by Applicable Law. In all cases, legal consideration shall be required for each issuance of Restricted Stock to the extent required by Applicable Law.

7.2 Rights as Stockholders. Subject to Section 7.4, upon issuance of Restricted Stock, the Holder shall have, unless otherwise provided by the Administrator, all the rights of a stockholder with respect to said Shares, subject to the restrictions in the Plan, any applicable Program and/or the applicable Award Agreement, including the right to receive all dividends and other distributions paid or made with respect to the Shares to the extent such dividends and other distributions have a record date that is on or after the date on which the Holder to whom such Restricted Stock are granted becomes the record holder of such Restricted Stock; provided, however, that, in the sole discretion of the Administrator, any extraordinary distributions with respect to the Shares may be subject to the restrictions set forth in Section 7.3. In addition, dividends payable in respect to Restricted Stock prior to vesting shall only be paid out to the Holder to the extent that the vesting conditions are subsequently satisfied and the share of Restricted Stock vests.

7.3 Restrictions. All shares of Restricted Stock (including any shares received by Holders thereof with respect to shares of Restricted Stock as a result of stock dividends, stock splits or any other form of recapitalization) shall be subject to such restrictions and vesting requirements as the Administrator shall provide in the applicable Program or Award Agreement, subject to Section 3.2. By action taken after the Restricted Stock is issued, the Administrator may, on such terms and conditions as it may determine to be appropriate, accelerate the vesting of such Restricted Stock by removing any or all of the restrictions imposed by the terms of the applicable Program or Award Agreement.

7.4 Repurchase or Forfeiture of Restricted Stock. Except as otherwise determined by the Administrator, if no price was paid by the Holder for the Restricted Stock, upon a Termination of Service during the applicable restriction period, the Holder's rights in unvested Restricted Stock then subject to restrictions shall lapse, and such Restricted Stock shall be surrendered to the Company and cancelled without consideration on the date of such Termination of Service. If a price was paid by the Holder for the Restricted Stock, upon a Termination of Service during the applicable restriction period, the Company shall have the right to repurchase from the Holder the unvested Restricted Stock then subject to restrictions at a cash price per share equal to the price paid by the Holder for such Restricted Stock or such other amount as may be specified in the applicable Program or Award Agreement. Notwithstanding the foregoing, except as otherwise provided by Section 3.2, the Administrator, in its sole discretion, may provide that upon certain events, including, without limitation, a Change in Control, the Holder's death, retirement or disability or any other specified Termination of Service or any other event, the Holder's rights in unvested Restricted Stock then subject to restrictions shall not lapse, such Restricted Stock shall vest and cease to be forfeitable and, if applicable, the Company shall cease to have a right of repurchase.

7.5 Section 83(b) Election. If a Holder makes an election under Section 83(b) of the Code to be taxed with respect to the Restricted Stock as of the date of transfer of the Restricted Stock rather than as of the date or dates upon which the Holder would otherwise be taxable under Section 83(a) of the Code, the Holder shall be required to deliver a copy of such election to the Company promptly after filing such election with the Internal Revenue Service along with proof of the timely filing thereof with the Internal Revenue Service.

ARTICLE 8.
AWARD OF RESTRICTED STOCK UNITS

8.1 Grant of Restricted Stock Units. The Administrator is authorized to grant Awards of Restricted Stock Units to any Eligible Individual selected by the Administrator in such amounts and subject to such terms and conditions as determined by the Administrator.

8.2 Term. Except as otherwise provided herein, the term of a Restricted Stock Unit award shall be set by the Administrator in its sole discretion.

8.3 Purchase Price. The Administrator shall specify the purchase price, if any, to be paid by the Holder to the Company with respect to any Restricted Stock Unit award; provided, however, that value of the consideration shall not be less than the par value of a Share, unless otherwise permitted by Applicable Law.

8.4 Vesting of Restricted Stock Units. At the time of grant, the Administrator shall specify the date or dates on which the Restricted Stock Units shall become fully vested and nonforfeitable, and may specify such conditions to vesting as it deems appropriate, including, without limitation, vesting based upon the Holder's duration of service to the Company or any Subsidiary, one or more performance criteria, Company performance, individual performance or other specific criteria, in each case on a specified date or dates or over any period or periods, as determined by the Administrator, subject to Section 3.2.

8.5 Maturity and Payment. At the time of grant, the Administrator shall specify the maturity date applicable to each grant of Restricted Stock Units, which shall be no earlier than the vesting date or dates of the Award and may be determined at the election of the Holder (if permitted by the applicable Award Agreement); provided that, except as otherwise determined by the Administrator, and subject to compliance with Section 409A, in no event shall the maturity date relating to each Restricted Stock Unit occur following the later of (a) the 15th day of the third month following the end of the calendar year in which the applicable portion of the Restricted Stock Unit vests; or (b) the 15th day of the third month following the end of the Company's fiscal year in which the applicable portion of the Restricted Stock Unit vests. On the maturity date, the Company shall, in accordance with the applicable Award Agreement and subject to Section 10.4(f), transfer to the Holder one unrestricted, fully transferable Share for each Restricted Stock Unit scheduled to be paid out on such date and not previously forfeited, or in the sole discretion of the Administrator, an amount in cash equal to the Fair Market Value of such Shares on the maturity date or a combination of cash and Common Stock as determined by the Administrator.

8.6 Payment upon Termination of Service. An Award of Restricted Stock Units shall only be payable while the Holder is an Employee, a Consultant or a member of the Board, as applicable; provided, however, that the Administrator, in its sole discretion, may provide (in an Award Agreement or otherwise) that a Restricted Stock Unit award may be paid subsequent to a Termination of Service in certain events, including a Change in Control, the Holder's death, retirement or disability or any other specified Termination of Service.

ARTICLE 9.

AWARD OF OTHER STOCK OR CASH BASED AWARDS AND DIVIDEND EQUIVALENTS

9.1 Other Stock or Cash Based Awards. The Administrator is authorized to grant Other Stock or Cash Based Awards, including awards entitling a Holder to receive Shares or cash to be delivered immediately or in the future, to any Eligible Individual. Subject to the provisions of the Plan and any applicable Program, the Administrator shall determine the terms and conditions of each Other Stock or Cash Based Award, including the term of the Award, any exercise or purchase price, performance goals, transfer restrictions, vesting conditions and other terms and conditions applicable thereto, which shall be set forth in the applicable Award Agreement, subject to Section 3.2. Other Stock or Cash Based Awards may be paid in cash, Shares, or a combination of cash and Shares, as determined by the Administrator, and may be available as a form of payment in the settlement of other Awards granted under the Plan, as stand-alone payments, as a part of a bonus, deferred bonus, deferred compensation or other arrangement, and/or as payment in lieu of compensation to which an Eligible Individual is otherwise entitled.

9.2 Dividend Equivalents. Dividend Equivalents may be granted by the Administrator, either alone or in tandem with another Award, based on dividends declared on the Common Stock, to be credited as of dividend payment dates during the period between the date the Dividend Equivalents are granted to a Holder and the date such Dividend Equivalents terminate or expire, as determined by the Administrator. Such Dividend Equivalents shall be converted to cash or additional Shares by such formula and at such time and subject to such restrictions and limitations as may be determined by the Administrator. In addition, Dividend Equivalents with respect to an Award that are based on dividends paid prior to the vesting of such Award shall only be paid out to the Holder to the extent that the vesting conditions are subsequently satisfied and the Award vests. Notwithstanding the foregoing, no Dividend Equivalents shall be payable with respect to Options or Stock Appreciation Rights.

ARTICLE 10.

ADDITIONAL TERMS OF AWARDS

10.1 Payment. The Administrator shall determine the method or methods by which payments by any Holder with respect to any Awards granted under the Plan shall be made, including, without limitation: (a) cash or check, (b) Shares (including, in the case of payment of the exercise price of an Award, Shares issuable pursuant to the exercise of the Award) or Shares held for such minimum period of time as may be established by the Administrator, in each case, having a Fair Market Value on the date of delivery equal to the aggregate payments required, (c) delivery of a written or electronic notice that the Holder has placed a market sell order with a broker acceptable to the Company with respect to Shares then issuable upon exercise or vesting of an Award, and that the broker has been directed to pay a sufficient portion of the net proceeds of the sale to the Company in satisfaction of the aggregate payments required; provided that payment of such proceeds is then made to the Company upon settlement of such sale, (d) other form of legal consideration acceptable to the Administrator in its sole discretion, or (e) any combination of the above permitted forms of payment. Notwithstanding any other provision of the Plan to the contrary, no Holder who is a Director or an “executive officer” of the Company within the meaning of Section 13(k) of the Exchange Act shall be permitted to make payment with respect to any Awards granted under the Plan, or continue any extension of credit with respect to such payment, with a loan from the Company or a loan arranged by the Company in violation of Section 13(k) of the Exchange Act.

10.2 Tax Withholding. The Company or any Subsidiary shall have the authority and the right to deduct or withhold, or require a Holder to remit to the Company, an amount sufficient to satisfy federal, state, local and foreign taxes (including the Holder’s FICA, employment tax or other social security contribution obligation) required by law to be withheld with respect to any taxable event concerning a Holder arising as a result of the Plan or any Award. The Administrator may, in its sole discretion and in satisfaction of the foregoing requirement, allow a Holder to satisfy such obligations by any payment means described in Section 10.1 hereof, including without limitation, by allowing such Holder to have the Company or any Subsidiary withhold Shares otherwise issuable under an Award (or allow the surrender of Shares). The number of Shares which may be so withheld or surrendered shall be limited to the number of Shares which have a fair market value on the date of withholding or repurchase no greater than the aggregate amount of such liabilities based on the maximum statutory withholding rates for federal, state, local and foreign income tax and payroll tax purposes that are applicable to such supplemental taxable income (or such other number as would not result in adverse financial accounting consequences for the Company or any of its Subsidiaries). The Administrator shall determine the fair market value of the Shares, consistent with applicable provisions of the Code, for tax withholding obligations due in connection with a broker-assisted cashless Option or Stock Appreciation Right exercise involving the sale of Shares to pay the Option or Stock Appreciation Right exercise price or any tax withholding obligation.

10.3 Transferability of Awards.

(a) Except as otherwise provided in Sections 10.3(b) and 10.3(c):

(i) No Award under the Plan may be sold, pledged, assigned or transferred in any manner other than (A) by will or the laws of descent and distribution or (B) subject to the consent of the Administrator, pursuant to a DRO, unless and until such Award has been exercised or the Shares underlying such Award have been issued, and all restrictions applicable to such Shares have lapsed;

(ii) No Award or interest or right therein shall be liable for or otherwise subject to the debts, contracts or engagements of the Holder or the Holder's successors in interest or shall be subject to disposition by transfer, alienation, anticipation, pledge, hypothecation, encumbrance, assignment or any other means whether such disposition be voluntary or involuntary or by operation of law by judgment, levy, attachment, garnishment or any other legal or equitable proceedings (including bankruptcy) unless and until such Award has been exercised, or the Shares underlying such Award have been issued, and all restrictions applicable to such Shares have lapsed, and any attempted disposition of an Award prior to satisfaction of these conditions shall be null and void and of no effect, except to the extent that such disposition is permitted by Section 10.3(a)(i); and

(iii) During the lifetime of the Holder, only the Holder may exercise any exercisable portion of an Award granted to such Holder under the Plan, unless it has been disposed of pursuant to a DRO. After the death of the Holder, any exercisable portion of an Award may, prior to the time when such portion becomes unexercisable under the Plan or the applicable Program or Award Agreement, be exercised by the Holder's personal representative or by any person empowered to do so under the deceased Holder's will or under the then-applicable laws of descent and distribution.

(b) Notwithstanding Section 10.3(a), the Administrator, in its sole discretion, may determine to permit a Holder or a Permitted Transferee of such Holder to transfer an Award other than an Incentive Stock Option (unless such Incentive Stock Option is intended to become a Nonqualified Stock Option) to any one or more Permitted Transferees of such Holder, subject to the following terms and conditions: (i) an Award transferred to a Permitted Transferee shall not be assignable or transferable by the Permitted Transferee other than (A) to another Permitted Transferee of the applicable Holder or (B) by will or the laws of descent and distribution or, subject to the consent of the Administrator, pursuant to a DRO; (ii) an Award transferred to a Permitted Transferee shall continue to be subject to all the terms and conditions of the Award as applicable to the original Holder (other than the ability to further transfer the Award to any Person other than another Permitted Transferee of the applicable Holder); and (iii) the Holder (or transferring Permitted Transferee) and the receiving Permitted Transferee shall execute any and all documents requested by the Administrator, including, without limitation documents to (A) confirm the status of the transferee as a Permitted Transferee, (B) satisfy any requirements for an exemption for the transfer under Applicable Law and (C) evidence the transfer. In addition, and further notwithstanding Section 10.3(a), hereof, the Administrator, in its sole discretion, may determine to permit a Holder to transfer Incentive Stock Options to a trust that constitutes a Permitted Transferee if, under Section 671 of the Code and other Applicable Law, the Holder is considered the sole beneficial owner of the Incentive Stock Option while it is held in the trust.

(c) Notwithstanding Section 10.3(a), a Holder may, in the manner determined by the Administrator, designate a beneficiary to exercise the rights of the Holder and to receive any distribution with respect to any Award upon the Holder's death. A beneficiary, legal guardian, legal representative, or other person claiming any rights pursuant to the Plan is subject to all terms and conditions of the Plan and any Program or Award Agreement applicable to the Holder and any additional restrictions deemed necessary or appropriate by the Administrator. If the Holder is married or a domestic partner in a domestic partnership qualified under Applicable Law and resides in a community property state, a designation of a person other than the Holder's spouse or domestic partner, as applicable, as the Holder's beneficiary with respect to more than 50% of the Holder's interest in the Award shall not be effective without the prior written or electronic consent of the Holder's spouse or domestic partner. If no beneficiary has been designated or survives the Holder, payment shall be made to the person entitled thereto pursuant to the Holder's will or the laws of descent and distribution. Subject to the foregoing, a beneficiary designation may be changed or revoked by a Holder at any time; provided that the change or revocation is delivered in writing to the Administrator prior to the Holder's death.

10.4 Conditions to Issuance of Shares.

(a) The Administrator shall determine the methods by which Shares shall be delivered or deemed to be delivered to Holders. Notwithstanding anything herein to the contrary, the Company shall not be required to issue or deliver any certificates or make any book entries evidencing Shares pursuant to the exercise of any Award, unless and until the Administrator has determined, with advice of counsel, that the issuance of such Shares is in compliance with Applicable Law and the Shares are covered by an effective registration statement or applicable exemption from registration. In addition to the terms and conditions provided herein, the Administrator may require that a Holder make such reasonable covenants, agreements and representations as the Administrator, in its sole discretion, deems advisable in order to comply with Applicable Law.

(b) All share certificates delivered pursuant to the Plan and all Shares issued pursuant to book entry procedures are subject to any stop-transfer orders and other restrictions as the Administrator deems necessary or advisable to comply with Applicable Law. The Administrator may place legends on any share certificate or book entry to reference restrictions applicable to the Shares (including, without limitation, restrictions applicable to Restricted Stock).

(c) The Administrator shall have the right to require any Holder to comply with any timing or other restrictions with respect to the settlement, distribution or exercise of any Award, including a window-period limitation, as may be imposed in the sole discretion of the Administrator.

(d) No fractional Shares shall be issued and the Administrator, in its sole discretion, shall determine whether cash shall be given in lieu of fractional Shares or whether such fractional Shares shall be eliminated by rounding down.

(e) The Company, in its sole discretion, may (i) retain physical possession of any stock certificate evidencing Shares until any restrictions thereon shall have lapsed and/or (ii) require that the stock certificates evidencing such Shares be held in custody by a designated escrow agent (which may but need not be the Company) until the restrictions thereon shall have lapsed, and that the Holder deliver a stock power, endorsed in blank, relating to such Shares.

(f) Notwithstanding any other provision of the Plan, unless otherwise determined by the Administrator or required by Applicable Law, the Company shall not deliver to any Holder certificates evidencing Shares issued in connection with any Award and instead such Shares shall be recorded in the books of the Company (or, as applicable, its transfer agent or stock plan administrator).

10.5 Forfeiture and ClawBack Provisions. All Awards (including any proceeds, gains or other economic benefit actually or constructively received by a Holder upon any receipt or exercise of any Award or upon the receipt or resale of any Shares underlying the Award and any payments of a portion of an incentive-based bonus pool allocated to a Holder) shall be subject to the provisions of any clawback policy implemented by the Company, including, without limitation, any clawback policy adopted to comply with the requirements of Applicable Law, including, without limitation, the Dodd-Frank Wall Street Reform and Consumer Protection Act and any rules or regulations promulgated thereunder, whether or not such clawback policy was in place at the time of grant of an Award, to the extent set forth in such clawback policy and/or in the applicable Award Agreement.

10.6 Prohibition on Repricing. Subject to Section 12.2, the Administrator shall not, without the approval of the stockholders of the Company, (a) authorize the amendment of any outstanding Option or Stock Appreciation Right to reduce its price per Share, or (b) cancel any Option or Stock Appreciation Right in exchange for cash or another Award when the Option or Stock Appreciation Right price per Share exceeds the Fair Market Value of the underlying Shares. Furthermore, for purposes of this Section 10.6, except in connection with a corporate transaction involving the Company (including, without limitation, any stock dividend, stock split, extraordinary cash dividend, recapitalization, reorganization, merger, consolidation, split-up, spin-off, combination or exchange of shares), the terms of outstanding Awards may not be amended to reduce the exercise price per Share of outstanding Options or Stock Appreciation Rights or cancel outstanding Options or Stock Appreciation Rights in exchange for cash, other Awards or Options or Stock Appreciation Rights with an exercise price per Share that is less than the exercise price per Share of the original Options or Stock Appreciation Rights without the approval of the stockholders of the Company.

10.7 Amendment of Awards. Subject to Applicable Law, the Administrator may amend, modify or terminate any outstanding Award, including but not limited to, substituting therefor another Award of the same or a different type, changing the date of exercise or settlement, and converting an Incentive Stock Option to a Non-Qualified Stock Option. The Holder’s consent to such action shall be required unless (a) the Administrator determines that the action, taking into account any related action, would not materially and adversely affect the Holder, or (b) the change is otherwise permitted under the Plan (including, without limitation, under Section 12.2 or 12.10).

10.8 Data Privacy. As a condition of receipt of any Award, each Holder explicitly and unambiguously consents to the collection, use and transfer, in electronic or other form, of personal data as described in this Section 10.8 by and among, as applicable, the Company and its Subsidiaries for the exclusive purpose of implementing, administering and managing the Holder's participation in the Plan. The Company and its Subsidiaries may hold certain personal information about a Holder, including but not limited to, the Holder's name, home address and telephone number, date of birth, social security or insurance number or other identification number, salary, nationality, job title(s), any shares of stock held in the Company or any of its Subsidiaries, details of all Awards, in each case, for the purpose of implementing, managing and administering the Plan and Awards (the "Data"). The Company and its Subsidiaries may transfer the Data amongst themselves as necessary for the purpose of implementation, administration and management of a Holder's participation in the Plan, and the Company and its Subsidiaries may each further transfer the Data to any third parties assisting the Company and its Subsidiaries in the implementation, administration and management of the Plan. These recipients may be located in the Holder's country, or elsewhere, and the Holder's country may have different data privacy laws and protections than the recipients' country. Through acceptance of an Award, each Holder authorizes such recipients to receive, possess, use, retain and transfer the Data, in electronic or other form, for the purposes of implementing, administering and managing the Holder's participation in the Plan, including any requisite transfer of such Data as may be required to a broker or other third party with whom the Company or any of its Subsidiaries or the Holder may elect to deposit any Shares. The Data related to a Holder will be held only as long as is necessary to implement, administer, and manage the Holder's participation in the Plan. A Holder may, at any time, view the Data held by the Company with respect to such Holder, request additional information about the storage and processing of the Data with respect to such Holder, recommend any necessary corrections to the Data with respect to the Holder or refuse or withdraw the consents herein in writing, in any case without cost, by contacting his or her local human resources representative. The Company may cancel Holder's ability to participate in the Plan and, in the Administrator's discretion, the Holder may forfeit any outstanding Awards if the Holder refuses or withdraws his or her consents as described herein. For more information on the consequences of refusal to consent or withdrawal of consent, Holders may contact their local human resources representative.

ARTICLE 11.

ADMINISTRATION

11.1 Administrator. The Committee shall administer the Plan (except as otherwise permitted herein). To the extent necessary to comply with Rule 16b-3 of the Exchange Act, the Committee shall take all action with respect to such Awards, and the individuals taking such action shall consist solely of two or more Non-Employee Directors, each of whom is intended to qualify as a "non-employee director" as defined by Rule 16b-3 of the Exchange Act or any successor rule. Additionally, to the extent required by Applicable Law, each of the individuals constituting the Committee shall be an "independent director" under the rules of any securities exchange or automated quotation system on which the Shares are listed, quoted or traded. Notwithstanding the foregoing, any action taken by the Committee shall be valid and effective, whether or not members of the Committee at the time of such action are later determined not to have satisfied the requirements for membership set forth in this Section 11.1 or the Organizational Documents. Except as may otherwise be provided in the Organizational Documents or as otherwise required by Applicable Law, (a) appointment of Committee members shall be effective upon acceptance of appointment, (b) Committee members may resign at any time by delivering written or electronic notice to the Board and (c) vacancies in the Committee may only be filled by the Board. Notwithstanding the foregoing, (i) the full Board, acting by a majority of its members in office, shall conduct the general administration of the Plan with respect to Awards granted to Non-Employee Directors and, with respect to such Awards, the terms "Administrator" as used in the Plan shall be deemed to refer to the Board and (ii) the Board or Committee may delegate its authority hereunder to the extent permitted by Section 11.6.

11.2 Duties and Powers of Administrator. It shall be the duty of the Administrator to conduct the general administration of the Plan in accordance with its provisions. The Administrator shall have the power to interpret the Plan, all Programs and Award Agreements, and to adopt such rules for the administration, interpretation and application of the Plan and any Program as are not inconsistent with the Plan, to interpret, amend or revoke any such rules and to amend the Plan or any Program or Award Agreement; provided that the rights or obligations of the Holder of the Award that is the subject of any such Program or Award Agreement are not materially and adversely affected by such amendment, unless the consent of the Holder is obtained or such amendment is otherwise permitted under Section 10.7 or Section 12.10. In its sole discretion, the Board may at any time and from time to time exercise any and all rights and duties of the Committee in its capacity as the Administrator under the Plan except with respect to matters which under Rule 16b-3 under the Exchange Act or any successor rule, or the rules of any securities exchange or automated quotation system on which the Shares are listed, quoted or traded are required to be determined in the sole discretion of the Committee.

11.3 Action by the Administrator. Unless otherwise established by the Board, set forth in any Organizational Documents or as required by Applicable Law, a majority of the Administrator shall constitute a quorum and the acts of a majority of the members present at any meeting at which a quorum is present, and acts approved in writing by all members of the Administrator in lieu of a meeting, shall be deemed the acts of the Administrator. Each member of the Administrator is entitled to, in good faith, rely or act upon any report or other information furnished to that member by any officer or other employee of the Company or any Subsidiary, the Company's independent certified public accountants, or any executive compensation consultant or other professional retained by the Company to assist in the administration of the Plan.

11.4 Authority of Administrator. Subject to the Organizational Documents, any specific designation in the Plan and Applicable Law, the Administrator has the exclusive power, authority and sole discretion to:

(a) Designate Eligible Individuals to receive Awards;

(b) Determine the type or types of Awards to be granted to each Eligible Individual (including, without limitation, any Awards granted in tandem with another Award granted pursuant to the Plan);

(c) Determine the number of Awards to be granted and the number of Shares to which an Award will relate;

(d) Determine the terms and conditions of any Award granted pursuant to the Plan, including, but not limited to, the exercise price, grant price, purchase price, any performance criteria, any restrictions or limitations on the Award, any schedule for vesting, lapse of forfeiture restrictions or restrictions on the exercisability of an Award, and accelerations or waivers thereof, and any provisions related to non-competition and clawback and recapture of gain on an Award, based in each case on such considerations as the Administrator in its sole discretion determines;

(e) Determine whether, to what extent, and under what circumstances an Award may be settled in, or the exercise price of an Award may be paid in cash, Shares, other Awards, or other property, or an Award may be canceled, forfeited, or surrendered;

(f) Prescribe the form of each Award Agreement, which need not be identical for each Holder;

(g) Decide all other matters that must be determined in connection with an Award;

(h) Establish, adopt, or revise any Programs, rules and regulations as it may deem necessary or advisable to administer the Plan;

(i) Interpret the terms of, and any matter arising pursuant to, the Plan, any Program or any Award Agreement;

(j) Make all other decisions and determinations that may be required pursuant to the Plan or as the Administrator deems necessary or advisable to administer the Plan; and

(k) Accelerate wholly or partially the vesting or lapse of restrictions of any Award or portion thereof at any time after the grant of an Award, subject to whatever terms and conditions it selects Section 3.2 and Section 12.2.

11.5 Decisions Binding. The Administrator's interpretation of the Plan, any Awards granted pursuant to the Plan, any Program or any Award Agreement and all decisions and determinations by the Administrator with respect to the Plan are final, binding and conclusive on all Persons.

11.6 Delegation of Authority. The Board or Committee may from time to time delegate to a committee of one or more members of the Board or one or more officers of the Company the authority to grant or amend Awards or to take other administrative actions pursuant to this Article 11; provided, however, that in no event shall an officer of the Company be delegated the authority to grant Awards to, or amend Awards held by, the following individuals: (a) individuals who are subject to Section 16 of the Exchange Act or (b) officers of the Company (or Directors) to whom authority to grant or amend Awards has been delegated hereunder; provided, further, that any delegation of administrative authority shall only be permitted to the extent it is permissible under any Organizational Documents and Applicable Law. Any delegation hereunder shall be subject to the restrictions and limits that the Board or Committee specifies at the time of such delegation or that are otherwise included in the applicable Organizational Documents, and the Board or Committee, as applicable, may at any time rescind the authority so delegated or appoint a new delegatee. At all times, the delegatee appointed under this Section 11.6 shall serve in such capacity at the pleasure of the Board or the Committee, as applicable, and the Board or the Committee may abolish any committee at any time and re-vest in itself any previously delegated authority.

ARTICLE 12.

MISCELLANEOUS PROVISIONS

12.1 Amendment, Suspension or Termination of the Plan.

(a) Except as otherwise provided in Section 12.1(b), the Plan may be wholly or partially amended or otherwise modified, suspended or terminated at any time or from time to time by the Board; provided that, except as provided in Section 10.7 and Section 12.10, no amendment, suspension or termination of the Plan shall, without the consent of the Holder, materially and adversely affect any rights or obligations under any Award theretofore granted or awarded, unless the Award itself otherwise expressly so provides.

(b) Notwithstanding Section 12.1(a), the Board may not, except as provided in Section 12.2, take any of the following actions without approval of the Company's stockholders given within twelve (12) months before or after such action: (i) increase the limit imposed in Section 3.1 on the maximum number of Shares which may be issued under the Plan or the Director Limit, (ii) reduce the price per share of any outstanding Option or Stock Appreciation Right granted under the Plan or take any action prohibited under Section 10.6, or (iii) cancel any Option or Stock Appreciation Right in exchange for cash or another Award in violation of Section 10.6.

(c) No Awards may be granted or awarded during any period of suspension or after termination of the Plan, and notwithstanding anything herein to the contrary, in no event may any Award be granted under the Plan after the tenth (10^{th}) anniversary of the earlier of (i) the date on which the Plan was adopted by the Board or (ii) the date the Plan was approved by the Company's stockholders (such anniversary, the "Expiration Date"). Any Awards that are outstanding on the Expiration Date shall remain in force according to the terms of the Plan, the applicable Program and the applicable Award Agreement.

12.2 Changes in Common Stock or Assets of the Company, Acquisition or Liquidation of the Company and Other Corporate Events.

(a) In the event of any stock dividend, stock split, combination or exchange of shares, merger, consolidation or other distribution (other than normal cash dividends) of Company assets to stockholders, or any other change affecting the shares of the Company's stock or the share price of the Company's stock other than an Equity Restructuring, the Administrator may make equitable adjustments, if any, to reflect such change with respect to: (i) the aggregate number and kind of Shares that may be issued under the Plan (including, but not limited to, adjustments of the limitations in Section 3.1 on the maximum number and kind of Shares which may be issued under the Plan); (ii) the number and kind of Shares (or other securities or property) subject to outstanding Awards; (iii) the terms and conditions of any outstanding Awards (including, without limitation, any applicable performance targets or criteria with respect thereto); (iv) the grant or exercise price per share for any outstanding Awards under the Plan; and (v) the number and kind of Shares (or other securities or property) for which automatic grants are subsequently to be made to new and continuing Non-Employee Directors pursuant to Section 4.6.

(b) In the event of any transaction or event described in Section 12.2(a) or any unusual or nonrecurring transactions or events affecting the Company, any Subsidiary of the Company, or the financial statements of the Company or any Subsidiary, or of changes in Applicable Law or Applicable Accounting Standards, the Administrator, in its sole discretion, and on such terms and conditions as it deems appropriate, either by the terms of the Award or by action taken prior to the occurrence of such transaction or event, is hereby authorized to take any one or more of the following actions whenever the Administrator determines that such action is appropriate in order to prevent dilution or enlargement of the benefits or potential benefits intended to be made available under the Plan or with respect to any Award under the Plan, to facilitate such transactions or events or to give effect to such changes in Applicable Law or Applicable Accounting Standards:

(i) To provide for the termination of any such Award in exchange for an amount of cash and/or other property with a value equal to the amount that would have been attained upon the exercise of such Award or realization of the Holder's rights (and, for the avoidance of doubt, if as of the date of the occurrence of the transaction or event described in this Section 12.2 the Administrator determines in good faith that no amount would have been attained upon the exercise of such Award or realization of the Holder's rights, then such Award may be terminated by the Company without payment);

(ii) To provide that such Award be assumed by the successor or survivor corporation, or a parent or subsidiary thereof, or shall be substituted for by similar options, rights or awards covering the stock of the successor or survivor corporation, or a parent or subsidiary thereof, with appropriate adjustments as to the number and kind of shares and applicable exercise or purchase price, in all cases, as determined by the Administrator;

(iii) To make adjustments in the number and type of Shares of the Company's stock (or other securities or property) subject to outstanding Awards, and/or in the terms and conditions of (including the grant or exercise price), and the criteria included in, outstanding Awards and Awards which may be granted in the future;

(iv) To provide that such Award shall be exercisable or payable or fully vested with respect to all Shares covered thereby, notwithstanding anything to the contrary in the Plan or the applicable Program or Award Agreement;

(v) To replace such Award with other rights or property selected by the Administrator; and/or

(vi) To provide that the Award cannot vest, be exercised or become payable after such event.

(c) In connection with the occurrence of any Equity Restructuring, and notwithstanding anything to the contrary in Sections 12.2(a) and 12.2(b):

(i) The number and type of securities subject to each outstanding Award and the exercise price or grant price thereof, if applicable, shall be equitably adjusted (and the adjustments provided under this Section 12.2(c)(i) shall be nondiscretionary and shall be final and binding on the affected Holder and the Company); and/or

(ii) The Administrator shall make such equitable adjustments, if any, as the Administrator, in its sole discretion, may deem appropriate to reflect such Equity Restructuring with respect to the aggregate number and kind of Shares that may be issued under the Plan (including, but not limited to, adjustments of the limitation in Section 3.1 on the maximum number and kind of Shares which may be issued under the Plan).

(d) Notwithstanding any other provision of the Plan but subject to Section 12.2(e), in the event of a Change in Control, each outstanding Award shall be assumed or an equivalent Award substituted by the successor corporation or a parent or subsidiary of the successor corporation. In the event a Holder experiences a Termination of Service by the Company without Cause or Constructive Termination within the twelve (12) month period commencing upon a Change in Control, each Award held by such Holder shall become fully vested and, if applicable, exercisable and all forfeiture restrictions on such Award shall lapse, in each case, as of immediately prior to such Termination of Service or Constructive Termination.

(e) In the event that the successor corporation in a Change in Control refuses to assume or substitute for an Award upon a Change in Control, such Award shall become fully vested and, if applicable, exercisable and all forfeiture restrictions on such Award shall lapse, in each case, as of immediately prior to the consummation of such Change in Control. If an Award is exercisable in lieu of assumption or substitution in the event of a Change in Control, the Administrator shall notify the Holder that the Award shall be fully exercisable for a period of fifteen (15) days from the date of such notice, contingent upon the occurrence of the Change in Control, and the Award shall terminate upon the expiration of such period.

(f) For the purposes of this Section 12.2, an Award shall be considered assumed if, following the Change in Control, the Award confers the right to purchase or receive, for each Share subject to the Award immediately prior to the Change in Control, the consideration (whether stock, cash, or other securities or property) received in the Change in Control by holders of Common Stock for each Share held on the effective date of the transaction (and if holders were offered a choice of consideration, the type of consideration chosen by the holders of a majority of the outstanding Shares); provided, however, that if such consideration received in the Change in Control was not solely common stock of the successor corporation or its parent, the Administrator may, with the consent of the successor corporation, provide for the consideration to be received upon the exercise of the Award, for each Share subject to an Award, to be solely common stock of the successor corporation or its parent equal in fair market value to the per-share consideration received by holders of Common Stock in the Change in Control

(g) The Administrator, in its sole discretion, may include such further provisions and limitations in any Award, agreement or certificate, as it may deem equitable and in the best interests of the Company that are not inconsistent with the provisions of the Plan.

(h) Unless otherwise determined by the Administrator, no adjustment or action described in this Section 12.2 or in any other provision of the Plan shall be authorized to the extent it would (i) cause the Plan to violate Section 422(b)(1) of the Code, (ii) result in short-swing profits liability under Section 16 of the Exchange Act or violate the exemptive conditions of Rule 16b-3 of the Exchange Act, or (iii) cause an Award to fail to be exempt from or comply with Section 409A.

(i) The existence of the Plan, any Program, any Award Agreement and/or the Awards granted hereunder shall not affect or restrict in any way the right or power of the Company or the stockholders of the Company to make or authorize any adjustment, recapitalization, reorganization or other change in the Company's capital structure or its business, any merger or consolidation of the Company, any issue of stock or of options, warrants or rights to purchase stock or of bonds, debentures, preferred or prior preference stocks whose rights are superior to or affect the Common Stock or the rights thereof or which are convertible into or exchangeable for Common Stock, or the dissolution or liquidation of the Company, or any sale or transfer of all or any part of its assets or business, or any other corporate act or proceeding, whether of a similar character or otherwise.

(j) In the event of any pending stock dividend, stock split, combination or exchange of shares, merger, consolidation or other distribution (other than normal cash dividends) of Company assets to stockholders, or any other change affecting the Shares or the share price of the Common Stock including any Equity Restructuring, for reasons of administrative convenience, the Administrator, in its sole discretion, may refuse to permit the exercise of any Award during a period of up to thirty (30) days prior to the consummation of any such transaction.

12.3 Approval of Plan by Stockholders. The Plan shall be submitted for the approval of the Company's stockholders within twelve (12) months after the date of the Board's initial adoption of the Plan.

12.4 No Stockholders Rights. Except as otherwise provided herein or in an applicable Program or Award Agreement, a Holder shall have none of the rights of a stockholder with respect to Shares covered by any Award until the Holder becomes the record owner of such Shares.

12.5 Paperless Administration. In the event that the Company establishes, for itself or using the services of a third party, an automated system for the documentation, granting or exercise of Awards, such as a system using an internet website or interactive voice response, then the paperless documentation, granting or exercise of Awards by a Holder may be permitted through the use of such an automated system.

12.6 Effect of Plan upon Other Compensation Plans. The adoption of the Plan shall not affect any other compensation or incentive plans in effect for the Company or any Subsidiary. Nothing in the Plan shall be construed to limit the right of the Company or any Subsidiary: (a) to establish any other forms of incentives or compensation for Employees, Directors or Consultants of the Company or any Subsidiary, or (b) to grant or assume options or other rights or awards otherwise than under the Plan in connection with any proper corporate purpose including without limitation, the grant or assumption of options in connection with the acquisition by purchase, lease, merger, consolidation or otherwise, of the business, stock or assets of any corporation, partnership, limited liability company, firm or association.

12.7 Compliance with Laws. The Plan, the granting and vesting of Awards under the Plan and the issuance and delivery of Shares and the payment of money under the Plan or under Awards granted or awarded hereunder are subject to compliance with all Applicable Law (including but not limited to state, federal and foreign securities law and margin requirements), and to such approvals by any listing, regulatory or governmental authority as may, in the opinion of counsel for the Company, be necessary or advisable in connection therewith. Any securities delivered under the Plan shall be subject to such restrictions, and the person acquiring such securities shall, if requested by the Company, provide such assurances and representations to the Company as the Company may deem necessary or desirable to assure compliance with all Applicable Law. The Administrator, in its sole discretion, may take whatever actions it deems necessary or appropriate to effect compliance with Applicable Law, including, without limitation, placing legends on share certificates and issuing stop-transfer notices to agents and registrars. Notwithstanding anything to the contrary herein, the Administrator may not take any actions hereunder, and no Awards shall be granted, that would violate Applicable Law. To the extent permitted by Applicable Law, the Plan and Awards granted or awarded hereunder shall be deemed amended to the extent necessary to conform to Applicable Law.

12.8 Titles and Headings, References to Sections of the Code or Exchange Act. The titles and headings of the Sections in the Plan are for convenience of reference only and, in the event of any conflict, the text of the Plan, rather than such titles or headings, shall control. References to sections of the Code or the Exchange Act shall include any amendment or successor thereto.

12.9 Governing Law. The Plan and any Programs and Award Agreements hereunder shall be administered, interpreted and enforced under the internal laws of the State of Delaware without regard to conflicts of laws thereof or of any other jurisdiction.

12.10 Section 409A. To the extent that the Administrator determines that any Award granted under the Plan is subject to Section 409A, the Plan, the Program pursuant to which such Award is granted and the Award Agreement evidencing such Award shall incorporate the terms and conditions required by Section 409A. In that regard, to the extent any Award under the Plan or any other compensatory plan or arrangement of the Company or any of its Subsidiaries is subject to Section 409A, and such Award or other amount is payable on account of a Holder's Termination of Service (or any similarly defined term), then (a) such Award or amount shall only be paid to the extent such Termination of Service qualifies as a "separation from service" as defined in Section 409A, and (b) if such Award or amount is payable to a "specified employee" as defined in Section 409A then to the extent required in order to avoid a prohibited distribution under Section 409A, such Award or other compensatory payment shall not be payable prior to the earlier of (i) the expiration of the six-month period measured from the date of the Holder's Termination of Service, or (ii) the date of the Holder's death. To the extent applicable, the Plan, the Program and any Award Agreements shall be interpreted in accordance with Section 409A. Notwithstanding any provision of the Plan to the contrary, in the event that following the Effective Date the Administrator determines that any Award may be subject to Section 409A, the Administrator may (but is not obligated to), without a Holder's consent, adopt such amendments to the Plan and the applicable Program and Award Agreement or adopt other policies and procedures (including amendments, policies and procedures with retroactive effect), or take any other actions, that the Administrator determines are necessary or appropriate to (A) exempt the Award from Section 409A and/or preserve the intended tax treatment of the benefits provided with respect to the Award, or (B) comply with the requirements of Section 409A and thereby avoid the application of any penalty taxes under Section 409A. The Company makes no representations or warranties as to the tax treatment of any Award under Section 409A or otherwise. The Company shall have no obligation under this Section 12.10 or otherwise to take any action (whether or not described herein) to avoid the imposition of taxes, penalties or interest under Section 409A with respect to any Award and shall have no liability to any Holder or any other person if any Award, compensation or other benefits under the Plan are determined to constitute non-compliant, "nonqualified deferred compensation" subject to the imposition of taxes, penalties and/or interest under Section 409A.

12.11 Unfunded Status of Awards. The Plan is intended to be an "unfunded" plan for incentive compensation. With respect to any payments not yet made to a Holder pursuant to an Award, nothing contained in the Plan or any Program or Award Agreement shall give the Holder any rights that are greater than those of a general creditor of the Company or any Subsidiary.

12.12 Indemnification. To the extent permitted under Applicable Law and the Organizational Documents, each member of the Administrator shall be indemnified and held harmless by the Company from any loss, cost, liability, or expense that may be imposed upon or reasonably incurred by such member in connection with or resulting from any claim, action, suit, or proceeding to which he or she may be a party or in which he or she may be involved by reason of any action or failure to act pursuant to the Plan and against and from any and all amounts paid by him or her in satisfaction of judgment in such action, suit, or proceeding against him or her; provided he or she gives the Company an opportunity, at its own expense, to handle and defend the same before he or she undertakes to handle and defend it on his or her own behalf. The foregoing right of indemnification shall not be exclusive of any other rights of indemnification to which such persons may be entitled pursuant to the Organizational Documents, as a matter of law, or otherwise, or any power that the Company may have to indemnify them or hold them harmless.

12.13 Relationship to other Benefits. No payment pursuant to the Plan shall be taken into account in determining any benefits under any pension, retirement, savings, profit sharing, group insurance, welfare or other benefit plan of the Company or any Subsidiary except to the extent otherwise expressly provided in writing in such other plan or an agreement thereunder.

12.14 Expenses. The expenses of administering the Plan shall be borne by the Company and its Subsidiaries.

* * * * *

I hereby certify that the foregoing Plan was duly adopted by the Board of Directors of Calix, Inc. on __________ __, 2019.

I hereby certify that the foregoing Plan was approved by the stockholders of Calix, Inc. on __________ __, 2019.

Executed on this __day of __________, 2019.

____

Corporate Secretary

Appendix B

CALIX, INC.
AMENDED AND RESTATED EMPLOYEE STOCK PURCHASE PLAN

Section 1. Establishment of the Plan.

The Calix, Inc. Amended and Restated Employee Stock Purchase Plan (as may be amended from time to time, the "Plan") provides Eligible Employees with an opportunity to purchase the Company's common stock so that they may increase their proprietary interest in the success of the Company. The Plan, which provides for the purchase of stock through payroll withholding, is intended to qualify under Section 423 of the Code. The Plan amends and restates the Amended and Restated Employee Stock Purchase Plan effective as of May 17, 2017 (the "Prior Plan") in its entirety, subject to stockholder approval of this Plan at the annual meeting of the Company's stockholders in 2019. In the event the Company's stockholders fail to approve the Plan as set forth herein at the annual meeting of the Company's stockholders in 2019, then this Plan shall be deemed *void ab initio* and the Prior Plan shall continue in effect in accordance with its terms.

Section 2. Definitions.

(a) "Board of Directors" or "Board" means the Board of Directors of the Company.

(b) "Code" means the Internal Revenue Code of 1986, as amended.

(c) "Company" means Calix, Inc., a Delaware corporation.

(d) "Company Affiliate" means any company which is either the parent corporation of the Company (as determined in accordance with Section 424 of the Code) or a Subsidiary.

(e) "Compensation" means the cash remuneration paid to a Participant during a Purchase Period that is reported on Form W-2 for federal income tax purposes (including salary deferrals to the Company's 401(k) retirement savings plan and contributions to any Code Section 125 plan adopted by the Company). Compensation shall include incentive compensation, commissions, profit sharing payments and bonuses. Notwithstanding the foregoing, Compensation shall exclude overtime and shift differential payments and any special payments (e.g., moving or auto allowances, educational reimbursements, welfare benefits, amounts realized from the exercise, sale exchange or other disposition of any stock option and premiums for life and disability insurance).

(f) "Date of Exercise" means the last trading day of each Purchase Period.

(g) "Eligible Employee" means any Employee of a Participating Company (i) who is customarily employed for at least twenty (20) hours per week, (ii) who is customarily employed for more than five (5) months per calendar year, and (iii) who is an Employee at the commencement of a Purchase Period.

In the event an Eligible Employee fails to remain in the continuous employ of a Participating Company customarily for at least twenty (20) hours per week during a Purchase Period, he or she will be deemed to have elected to withdraw from the Plan and the payroll deductions credited to his or her account will be returned to him or her; provided that a Participant who goes on an unpaid leave of absence shall be permitted to remain in the Plan during such leave of absence. Notwithstanding the preceding sentence, if such Participant is not guaranteed reemployment by contract or statute and the leave of absence extends beyond ninety (90) days, such Participant shall be deemed to have terminated employment for purposes of the Plan on the ninety-first (91st) day of such leave of absence. Payroll deductions for a Participant who has been on an unpaid leave of absence will resume at the same rate as in effect prior to such leave upon return to work unless changed by such Participant.

(h) "Employee" means any person who renders services to a Participating Company in the status of an employee within the meaning of Code Section 3401(c). "Employee" shall not include any Board member of a Participating Company who does not render services to the Participating Company in the status of an employee within the meaning of Code Section 3401(c).

(i) "Fair Market Value" shall mean, as of any given date, the value of a share of Stock determined as follows:

(A) If the Stock is listed on any established stock exchange (such as the New York Stock Exchange, the NASDAQ Global Market and the NASDAQ Global Select Market) or national market system, its Fair Market Value shall be the closing sales price for a share of Stock as quoted on such exchange or system for such date or, if there is no closing sales price for a share of Stock on the date in question, the closing sales price for a share of Stock on the last preceding date for which such quotation exists, as reported in *The Wall Street Journal* or such other source as the Plan Administrator deems reliable;

(B) If the Stock is not listed on an established stock exchange or national market system, but the Stock is regularly quoted by recognized securities dealer, its Fair Market Value shall be the mean of the high bid and low asked prices for such date or, if there are no high bid and low asked prices for a share of Stock on such date, the high bid and low asked prices for a share of Stock on the last preceding date for which such information exists, as reported in *The Wall Street Journal* or such other source as the Plan Administrator deems reliable; or

(C) If the Stock is neither listed on an established stock exchange or a national market system nor regularly quoted by a recognized securities dealer, its Fair Market Value shall be established by the Plan Administrator in good faith.

(j) "Participant" means an Eligible Employee who elects to participate in the Plan, as provided in Section 5 hereof.

(k) "Participating Company" means the Company and such present or future Subsidiaries of the Company as the Board of Directors shall from time to time designate.

(l) "Plan Account" means the account established for each Participant pursuant to Section 8(a).

(m) "Plan Administrator" means the committee appointed by the Board to administer the Plan pursuant to Section 4.

(n) "Purchase Period" shall mean the period commencing on November 15, 2019 and ending on May 14, 2020 and the six (6) month periods commencing on each November 15 and May 15 thereafter. The duration and timing of Purchase Periods may be changed by the Plan Administrator, in its sole discretion. In no event may a Purchase Period exceed twenty-seven (27) months in length.

(o) "Purchase Price" means the price at which Participants may purchase Stock under Section 8 of the Plan, as determined pursuant to Section 6.

(p) "Stock" means the common stock, par value $0.025, of the Company.

(q) "Stock Administrator" means the Company's Stock Administration Department or such other person(s) as may be retained by the Company to perform or otherwise be delegated some or all of the duties of the Stock Administrator under this Plan.

(r) "Subsidiary" means a subsidiary corporation as defined in Section 424(f) of the Code.

Section 3. Shares Authorized.

The maximum aggregate number of shares which may be issued under the Plan shall be 9,800,000 shares of Stock (subject to adjustment as provided in Section 12 hereof), which may be either authorized but unissued Stock or reacquired Stock, including shares of Stock purchased on the open market.

Section 4. Administration.

(a) Except as otherwise provided herein, the Plan shall be administered by the Board or by a committee (the "Plan Administrator") appointed by the Board of Directors which shall consist of not less than two members of the Board. References in this Plan to the "Plan Administrator" shall mean the Board if no Plan Administrator has been appointed. The interpretation and construction by the Plan Administrator of any provision of the Plan or of any right to purchase stock qualified hereunder shall be conclusive and binding on all persons.

(b) No member of the Board or the Plan Administrator shall be liable for any action or determination made in good faith with respect to the Plan or the right to purchase Stock hereunder. The Plan Administrator shall be indemnified by the Company against the reasonable expenses, including attorney's fees actually and necessarily incurred in connection with the defense of any action, suit or proceeding, or in connection with any appeal therein, to which it may be a party by reason of any action taken or failure to act under or in connection with the Plan or any stock purchased thereunder, and against all amounts paid by it in settlement thereof (provided such settlement is approved by independent legal counsel selected by the Company) or paid by it in satisfaction of a judgment in any such action, suit or proceeding, except in relation to matters as to which it shall be adjudged in such action, suit or proceeding that the Plan Administrator is liable for negligence or misconduct in the performance of its duties; provided that within sixty (60) days after institution of any such action, suit or proceeding, the Plan Administrator shall in writing offer the Company the opportunity, at its own expense, to handle and defend the same.

(c) All costs and expenses incurred in administering the Plan shall be paid by the Company. The Board or the Plan Administrator may request advice for assistance or employ such other persons as are necessary for proper administration of the Plan.

(d) At the discretion of the Plan Administrator, the Stock Administrator or such persons providing advice or assistance pursuant to Section 4(c), any elections, submission or filings made under the Plan by Eligible Employees and/or any statements or notices provided under the Plan to Eligible Employees in each case may be made electronically or through such "paperless" means as the Plan Administrator, the Stock Administrator or such persons may determine appropriate.

Section 5. Eligibility and Participation.

(a) Any person who qualifies or will qualify as an Eligible Employee on the first day of a Purchase Period may elect to participate in the Plan for such Purchase Period. An Eligible Employee may elect to participate by submitting the prescribed enrollment form. The enrollment form shall be filed with the Stock Administrator no later than the filing deadline imposed and communicated to Eligible Employees with respect to the Purchase Period for which such enrollment form is intended to be effective by the Stock Administrator, and if none is so imposed and/or communicated, then no later than five (5) days before the Purchase Period for which such enrollment form is intended to be effective. The Eligible Employee shall designate on the enrollment form the percentage of his or her Compensation which he or she elects to have withheld for the purchase of Stock, which may be any whole percentage from 1 to 15% of the Participant's compensation.

(b) By enrolling in the Plan, a Participant shall be deemed to have been granted an option on the first day of each Purchase Period for which he or she is enrolled to purchase the maximum number of whole shares of Stock which can be purchased with the amount of the Participant's Compensation which is withheld during the Purchase Period for which the Participation is enrolled. However, with respect to any Purchase Period, no Participant shall be eligible to purchase more than two thousand (2,000) shares of Stock provided that such amount shall not result in the limitations set forth in Section 13 being exceeded. Notwithstanding the foregoing, the Plan Administrator, or a committee appointed by the Plan Administrator, which committee may be comprised solely of employees of the Company, shall have the right to amend the limit set forth in this Section 5(b); provided, however, that in no event shall the limit exceed two thousand (2,000) shares of Stock per Purchase Period or the limitations set forth in Section 13.

(c) Once enrolled, a Participant will continue to participate in the Plan for each succeeding Purchase Period until he or she terminates participation or ceases to qualify as an Eligible Employee. A Participant who withdraws from the Plan in accordance with Section 9 may again become a Participant in a subsequent Purchase Period, if he or she then is an Eligible Employee, by following the procedure described in Section 5(a).

Section 6. Purchase Price.

The Purchase Price for each share of Stock shall be the lesser of (a) eighty-five percent (85%) of the Fair Market Value of such share on the first trading day of an applicable Purchase Period or (b) eighty-five percent (85%) of the Fair Market Value of such share on the Date of Exercise for an applicable Purchase Period.

Section 7. Employee Contributions.

A Participant may purchase shares of Stock solely by means of payroll deductions. Payroll deductions, as designated by the Participant pursuant to Section 5(a), shall commence with the first paycheck issued during the Purchase Period and shall be deducted from each subsequent paycheck throughout the Purchase Period; provided, however, that, with respect to a Participant, the Company shall be entitled to discontinue payroll deductions for such Participant during a Purchase Period to the extent that the Company determines that the payroll deductions for such Participant during such Purchase Period will cause the Participant to exceed the limitations set forth in Sections 5 or 13; provided, further, that the Company will recommence payroll deductions for such Participant on the first day of the next Purchase Period to the extent the limitation set forth in Section 13 has not been exceeded. If a Participant desires to decrease the rate of payroll withholding during a Purchase Period, he or she may do so one time during a Purchase Period by submitting the prescribed percentage change form with the Stock Administrator. Such decrease will be effective no later than the first day of the second payroll period which begins following the receipt of the new percentage change form. If a Participant desires to increase or decrease the rate of payroll withholding, he or she may do so effective for the next Purchase Period by submitting a new percentage change form with the Stock Administrator on or before the date imposed and communicated to Eligible Employees by the Stock Administrator, and if none is so imposed and/or communicated, then no later than five (5) days before the Purchase Period for which such change is to be effective.

Section 8. Plan Accounts; Purchase of Shares.

(a) The Company will maintain a Plan Account on its books in the name of each Participant. At the close of each pay period, the amount deducted from the Participant's Compensation will be credited to the Participant's Plan Account.

(b) As of each Date of Exercise, the amount then in the Participant's Plan Account will be divided by the Purchase Price, and the number of whole shares which results (subject to the limitations described in Sections 5(b), 8(c) and 13) shall be purchased from the Company with the funds in the Participant's Plan Account. The number of shares of Stock so purchased shall be delivered to a brokerage account designated by the Plan Administrator and kept in such account pursuant to the enrollment form (which shall be uniform) between each Participant and the Company and subject to the conditions described therein (which may include, without limitation, restrictions on transferability of the shares of Stock so purchased).

(c) In the event that the aggregate number of shares which all Participants elect to purchase during a Purchase Period shall exceed the number of shares remaining available for issuance under the Plan, then the number of shares to which each Participant shall become entitled shall be determined by multiplying the number of shares available for issuance by a fraction the numerator of which is the sum of the number of shares the Participant has elected to purchase pursuant to Section 5, and the denominator of which is the sum of the number of shares which all employees have elected to purchase pursuant to Section 5. Any cash amount remaining in the Participant's Plan Account under these circumstances shall be refunded to the Participant.

(d) Any amount remaining in the Participant's Plan Account caused by a surplus due to fractional shares after deducting the amount of the Purchase Price for the number of whole shares issued to the Participant shall be carried over in the Participant's Plan Account for the succeeding Purchase Period, without interest. Any amount remaining in the Participant's Plan Account caused by anything other than a surplus due to fractional shares shall be refunded to the Participant in cash, without interest.

(e) Unless otherwise determined by the Plan Administrator, as soon as practicable following the end of each Purchase Period, the Company shall deliver to each Participant a Plan Account statement setting forth the amount of payroll deductions, the Purchase Price, the number of shares purchased and the remaining cash balance, if any.

Section 9. Withdrawal from the Plan.

A Participant may elect to withdraw from participation under the Plan at any time up to seven (7) days prior to the last day of a Purchase Period by submitting the prescribed withdrawal form with the Stock Administrator. As soon as practicable after a withdrawal, payroll deductions shall cease and all amounts credited to the Participant's Plan Account will be refunded in cash, without interest. A Participant who has withdrawn from the Plan shall not be a Participant in future Purchase Periods, unless he or she again enrolls in accordance with the provisions of Section 5.

Section 10. Effect of Termination of Employment or Death.

(a) Termination of employment as an Eligible Employee for any reason, including death, shall be treated as an automatic withdrawal from the Plan under Section 9. A transfer from one Participating Company to another shall not be treated as a termination of employment.

(b) A Participant may file a written designation of a beneficiary who is to receive any shares and cash, if any, from the Participant's Account under the Plan in the event of such Participant's death subsequent to the purchase of shares but prior to delivery to him or her of such shares and cash. In addition, a Participant may file a written designation of a beneficiary who is to receive any cash from the Participant's Account under the Plan in the event of such Participant's death prior to the last day of a Purchase Period.

(c) Such designation of beneficiary may be changed by the Participant at any time by submitting the prescribed designation of beneficiary change form with the Stock Administrator. In the event of the death of a Participant in the absence of a valid designation of a beneficiary who is living at the time of such Participant's death, the Company shall deliver such shares and/or cash to the executor or administrator of the estate of the Participant; or if no such executor or administrator has been appointed (to the knowledge of the Company), the Company, in its discretion, may deliver such shares and/or cash to the spouse or to any one or more dependents or relatives of the Participant; or if no spouse, dependent or relative is known to the Company, then to such other person as the Company may designate.

Section 11. Rights Not Transferable.

The rights or interests of any Participant in the Plan, or in any Stock or moneys to which he or she may be entitled under the Plan, shall not be transferable by voluntary or involuntary assignment or by operation of law, or by any other manner other than as permitted by will or the laws of descent and distribution, and during the Participant's lifetime, purchase rights in the Plan shall be exercisable only by the Participant. If a Participant in any manner attempts to transfer, assign or otherwise encumber his or her rights or interest under the Plan, other than as permitted by will or the laws of descent and distribution, such act shall be treated as an automatic withdrawal under Section 9.

Section 12. Recapitalization, Etc.

(a) The aggregate number of shares of Stock offered under the Plan, the number and price of shares which any Participant has elected to purchase pursuant to Section 5 and the maximum number of shares which a Participant may elect to purchase under the Plan in any Purchase Period shall be proportionately adjusted for any increase or decrease in the number of issued shares of Stock resulting from a subdivision or consolidation of shares or any other capital adjustment, the payment of a stock dividend, or other increase or decrease in such shares affected without receipt of consideration by the Company.

(b) In the event of a dissolution or liquidation of the Company, this Plan shall terminate, and all amounts which each Participant has paid towards the Purchase Price of Stock hereunder shall be refunded, without interest.

(c) In the event of a sale of all or substantially all of the assets of the Company, an acquisition of the Company or the merger of the Company with or into another corporation, each outstanding Purchase Period shall be assumed or an equivalent Purchase Period substituted by the successor corporation or acquiror or a Parent or Subsidiary of the successor corporation or acquiror. In the event that the successor corporation or acquirer refuses to assume or substitute for the Purchase Period, the Purchase Period shall be shortened by setting a new Date of Exercise (the "New Exercise Date"). The New Exercise Date shall be before the date of the applicable transaction. The Company shall notify each Participant in writing at least five (5) days prior to the New Exercise Date, that the Date of Exercise for the Purchase Period has been changed to the New Exercise Date and that the purchase shall automatically occur on the New Exercise Date, unless prior to such date the Participant has withdrawn from the Purchase Period pursuant to Section 9.

(d) The Plan shall in no event be construed to restrict in any way the Company's right to undertake a dissolution, liquidation, merger, consolidation, reorganization or other corporate transaction.

Section 13. Limitation on Stock Ownership.

Notwithstanding any provision herein to the contrary, no Participant shall be permitted to elect to participate in the Plan (i) if such Participant, immediately after his or her election to participate, would own stock possessing five percent (5%) or more of the total combined voting power or value of all classes of stock of the Company or any Company Affiliate, or (ii) if under the terms of the Plan the rights of the Employee to purchase Stock under this Plan and all other qualified employee stock purchase plans of the Company or its Company Affiliates would accrue at a rate which exceeds twenty-five thousand dollars ($25,000) of Fair Market Value of such Stock (determined at the time such right is granted) for each calendar year for which such right is outstanding at any time. For purposes of this Section, ownership of stock shall be determined by the attribution rules of Section 424(d) of the Code, and Participants shall be considered to own any stock which they have a right to purchase under this or any other stock plan.

Section 14. No Rights as an Employee.

Nothing in the Plan shall be construed to give any person the right to remain in the employ of a Participating Company. Each Participating Company reserves the right to terminate the employment of any person at any time and for any reason.

Section 15. Rights as a Stockholder.

A Participant shall have no rights as a stockholder with respect to any shares he or she may have a right to purchase under the Plan until the date of issuance to the brokerage account designated by the Plan Administrator the shares of Stock issued pursuant to the Plan.

Section 16. Use of Funds.

All payroll deductions received or held by the Company under the Plan may be used by the Company for any corporate purpose, and the Company shall not be obligated to segregate such payroll deductions in separate accounts.

Section 17. Amendment or Termination of the Plan.

Except as otherwise provided herein, the Board of Directors shall have the right to amend, modify or terminate the Plan at any time without notice. An amendment of the Plan shall be subject to stockholder approval only to the extent required by applicable laws, regulations or rules. The Plan shall terminate upon the earlier of (i) such date as is determined by the Company in its sole discretion or (ii) the date on which all shares available for issuance under the Plan shall have been sold pursuant to purchase rights exercised under the Plan.

Section 18. Governing Law.

The Plan shall be governed by, and construed and interpreted in accordance with, the laws of the State of Delaware.

Section 19. Stockholder Approval.

No purchase rights granted under the Plan shall be exercised, and no shares of Stock shall be issued hereunder, until such time as (i) the Plan shall have been approved by the stockholders of the Company; and (ii) the Company shall have complied with all applicable requirements of the Securities Act of 1933, as amended (including the registration of the shares of Stock issuable under the Plan on a Form S-8 registration statement filed with the Securities and Exchange Commission), all applicable listing requirements of any securities exchange on which the Stock is listed for trading and all other applicable requirements established by law or regulation. Such stockholder approval shall be prior to the earlier to occur of: (a) the first Date of Exercise of the Plan and (b) the twelve (12) month anniversary of the adoption of the Plan, provided, however, that such approval may not occur prior to twelve (12) months before the adoption of the Plan. In the event the Plan shall not have been approved by the stockholders of the Company prior to the first Date of Exercise of the Plan, the Plan shall terminate and all purchase rights granted under the Plan shall be canceled and become null and void.

Section 20. Equal Rights and Privileges.

All Eligible Employees of the Company (or of any Subsidiary) will have equal rights and privileges under this Plan so that this Plan qualifies as an "employee stock purchase plan" within the meaning of Section 423 of the Code or applicable Treasury regulations thereunder. Any provision of this Plan that is inconsistent with Section 423 and the Treasury regulations and other guidance promulgated thereunder will, without further act or amendment by the Company, the Board or the Plan Administrator, be reformed to comply with the equal rights and privileges requirement of Section 423 or such Treasury regulations or guidance.

******

I hereby certify that the foregoing Plan was duly adopted by the Board of Directors of Calix, Inc. on __________ __, 2019.

I hereby certify that the foregoing Plan was approved by the stockholders of Calix, Inc. on __________ __, 2019.

Executed on this __ day of __________, 2019.

Corporate Secretary

Appendix C

Calix, Inc.

Reconciliation of GAAP to non-GAAP Measures

(In thousands)

(Unaudited)

	Three Months Ended				Year Ended
	March 31, 2018	June 30, 2018	September 29, 2018	December 31, 2018	December 31, 2018
GAAP operating income (loss)	$ (11,109)	$ (2,926)	$ 676	$ (5,155)	$ (18,514)
Adjustments to reconcile GAAP operating income (loss) to non-GAAP operating income (loss):					
Stock-based compensation	2,757	2,544	2,499	9,674	17,474
Restructuring charges (benefit)	5,340	793	(157)	(271)	5,705
U.S. tariff and tariff-related costs	—	—	—	3,195	3,195
Gain on sale of product line	(6,704)	—	—	—	(6,704)
Non-GAAP operating income (loss)	$ (9,716)	$ 411	$ 3,018	$ 7,443	$ 1,156

Use of Non-GAAP Financial Information

Calix uses certain non-GAAP financial measures to supplement its consolidated financial statements, which are presented in accordance with GAAP. In this proxy statement, Calix has presented non-GAAP operating income (loss). This non-GAPP measure is provided as a performance target in our executive cash incentive plan as the measure primarily excludes certain non-cash charges for stock-based compensation, restructuring charges (benefit), U.S. tariff and tariff-related costs and gain on sale of product line, which Calix believes are not indicative of its core operating results. The presentation of this non-GAAP measure is not meant to be a substitute for results presented in accordance with GAAP, but rather should be evaluated in conjunction with the comparable GAAP measure. A reconciliation of the non-GAAP measure to the most directly comparable GAAP measure is provided above. The non-GAAP financial measures used by Calix may be calculated differently from, and therefore may not be comparable to, similarly titled measures used by other companies.

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, DC 20549

FORM 10-K

(Mark One)

☒ **ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the fiscal year ended December 31, 2018

OR

☐ **TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934**

For the transition period from to

Commission File Number: 001-34674

Calix, Inc.
(Exact Name of Registrant as Specified in Its Charter)

Delaware	**68-0438710**
(State or Other Jurisdiction of Incorporation or Organization)	**(I.R.S. Employer Identification No.)**
2777 Orchard Parkway **San Jose, California** **(Address of Principal Executive Offices)**	**95134** **(Zip Code)**

Registrant's telephone number, including area code (408) 514-3000

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
Common Stock, $0.025 par value	The New York Stock Exchange

Securities registered pursuant to section 12(g) of the Act:

None

(Title of class)

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes: ☐ No: ☒

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes: ☐ No: ☒

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes: ☒ No: ☐

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes: ☒ No: ☐

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☐

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large Accelerated Filer	☐	Accelerated Filer	☒
Non-accelerated filer	☐	Smaller Reporting Company	☐
Emerging Growth Company	☐		

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act). ☐

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes: ☐ No: ☒

The aggregate market value of the Common Stock held by non-affiliates of the registrant based upon the closing sale price on the New York Stock Exchange on June 29, 2018, the last business day of the Registrant's most recently completed second fiscal quarter, was approximately $346 million. Shares held by each executive officer, director and by each other person (if any) who owns more than 10% of the outstanding common stock have been excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

As of February 25, 2019, the number of shares of the registrant's common stock outstanding was 54,040,657.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive proxy statement for its 2019 annual meeting of stockholders are incorporated by reference in Items 10, 11, 12, 13 and 14 of Part III.

Calix, Inc.

Form 10-K

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SPECIAL NOTE REGARDING FORWARD-LOOKING STATEMENTS

This report includes forward-looking statements that involve substantial risks and uncertainties. All statements other than statements of historical facts contained in this report, including statements regarding Calix's future financial position, business strategy and plans and objectives of management for future operations, are forward-looking statements. In some cases, you can identify forward-looking statements by terminology such as "believe," "could," "expect," "may," "estimate," "continue," "anticipate," "intend," "should," "plan," "predict," "will," "would," "project," "potential" or the negative of these terms or other similar expressions. Forward-looking statements include Calix's expectations concerning the outlook for its business, productivity, plans and goals for future operational improvements and capital investments, operational performance, future market conditions or economic performance and developments in the capital and credit markets and expected future financial performance.

Forward-looking statements involve a number of risks, uncertainties and assumptions, and actual results or events may differ materially from those projected or implied in those statements. Important factors that could cause such differences include:

- our ability to predict our revenue and reduce and control costs related to our products or service offerings, including larger scale turnkey network improvement projects that may span several quarters;
- our ability to increase our sales to larger communications service providers, or CSPs, globally;
- the capital spending patterns of CSPs, and any decrease or delay in capital spending by CSPs due to macro-economic conditions, regulatory uncertainties, or other reasons;
- the impact of government-sponsored programs on our customers and the impact to our customers of the recent U.S. government shutdown;
- intense competition;
- our ability to develop new products or enhancements that support technological advances and meet changing CSP requirements;
- our ability to ramp sales and achieve market acceptance of new our products and CSPs' willingness to deploy our new products;
- the concentration of our customer base as well as our dependence on a limited number of key customers;
- the length and unpredictability of our sales cycles and timing of orders;
- our lack of long-term, committed-volume purchase contracts with our customers;
- our exposure to the credit risks of our customers;
- fluctuations in our gross margin;
- the interoperability of our products with CSP networks;
- our dependence on sole-, single- and limited-source suppliers;
- our ability to manage our relationships with our third-party, including contract manufacturers, or CMs, original design manufacturers, or ODMs, logistics providers, component suppliers and development partners;
- our ability to forecast our manufacturing requirements and manage our inventory;
- our products' compliance with industry standards;
- our ability to expand our international operations;
- our ability to protect our intellectual property and the cost of doing so;
- the quality of our products, including any undetected hardware defects or bugs in our software;
- our ability to estimate future warranty obligations due to product failure rates;
- our ability to obtain necessary third-party technology licenses at reasonable costs;
- the regulatory and physical impacts of climate change and other natural events;
- the attraction and retention of qualified employees and key management personnel;
- our ability to build and sustain an adequate and secure information technology infrastructure; and
- our ability to maintain proper and effective internal controls.

Calix cautions you against placing undue reliance on forward-looking statements, which reflect our current beliefs and are based on information currently available to us as of the date a forward-looking statement is made. Forward-looking statements set forth in this Annual Report on Form 10-K speak only as of the date of its filing. We undertake no obligation to revise forward-looking statements to reflect future events, changes in circumstances or changes in beliefs. In the event that we do update any forward-looking statements, no inference should be made that we will make additional updates with respect to that statement, related matters or any other forward-looking statements.

PART I

ITEM 1. Business

Company Overview

Calix, Inc. (together with its subsidiaries, "Calix," "we," "our" or "us") was incorporated in August 1999 and is a Delaware corporation. Calix is a leading global provider of cloud and software platforms, systems and services required to deliver the unified access network and smart premises of tomorrow. Our mission is to connect everyone and everything. Calix platforms empower our customers to build new business models, rapidly deploy new services and make the promise of the smart home and business a reality. Innovative communications service providers, or CSPs, rely on Calix platforms to help them master and monetize the complex infrastructure between their subscribers and the cloud. Our platforms and services help our customers build next generation networks by embracing a DevOps operating model, optimizing the subscriber experience by leveraging big data analytics and turning the complexity of the smart home and business into new revenue streams.

We are the pioneer in software defined access, or SDA, and our portfolio of solutions is designed to help CSPs meet emerging threats from web-scale players and reinvent how they serve their device-enabled subscribers. Our platforms enable our customers to capitalize on the opportunity that is being generated by the Internet of Things, or IoT, augmented and virtual reality applications and autonomous technologies. Our customers, who are embracing our strategic platforms, recognize that providing a sensational subscriber experience, via an infrastructure that is Always On, can be enhanced at a DevOps pace and is intelligent enough to run itself, enables them to compete in the future. We also provide cloud analytics designed to help service providers create and market new offerings that monetize their investments in the network. Finally, we strive to put our customers and their brands first to ensure that they will always have a central place in their subscribers' lives. Our solution strategy is intended to help our customers build and reinforce their brand presence within their subscribers' premises. We believe this must be an element of their strategy for sustaining and growing their businesses.

Our current customers include CSPs of almost every size and type. Our solutions may be used by any entity providing communications services to a subscriber. This universe includes local and competitive exchange carriers, cable multiple system operators, or cable MSOs, wireless internet service providers, or wireless ISPs, overbuilders such as municipalities and electric cooperatives, hospitality providers and others globally. We market and sell our portfolio to CSPs globally through our direct sales force as well as in partnership with a number of resellers. We have enabled over 1,500 customers to deploy passive optical, Active Ethernet and point-to-point Ethernet fiber access networks.

Industry Background and Trends

CSPs compete in a rapidly changing market to deliver a range of services to their residential and business subscribers. Subscribers purchase an array of services from providers, starting with basic voice and data through advanced broadband services such as high-speed Internet, Internet protocol television, or IPTV, mobile broadband, high-definition, ultra-high-definition and over-the-top video and online gaming from a variety of CSPs. Consumers are also rapidly adding devices that require high bandwidth, low latency services such as virtual and augmented reality as well as IoT devices that bring significant complexity to the premises network. It is likely that adoption of autonomous technologies such as self-driving cars will dramatically increase demand and complexity.

The rapid growth in new technologies is generating increased network traffic and putting pressure on CSPs to cost effectively upgrade and enhance their networks to meet demand. For example, Cisco Systems, Inc. estimates that global Internet Protocol, or IP, traffic on a monthly basis will increase from 122 exabytes in 2017 to 396 exabytes in 2022, representing a compound annual growth rate of 26%. By 2022, 81% of IP traffic will originate from non-personal computer devices. The impact of video service on network traffic will become even more pronounced with the introduction of ultra-high-definition video streaming. For example, an Internet-enabled high-definition television that draws 2 hours of content per day generates as much traffic as an entire typical household today. Combined with the growth of video viewing on smartphones and tablets, demands on the network will continue to accelerate. The proliferation of new devices (and usage patterns) creates a tremendous opportunity and increases the pressure on CSPs to offer new services and create revenue streams by mastering the complexity of the smart home and business for their subscribers.

The Emergence of Web-Scale Players as a Competitive Force

The level of competition among CSPs - wireline and wireless service providers, cable MSOs and other CSPs - has increased over the last decade as traditional service boundaries have fallen. All providers are now competing for the same residential and business subscribers using similar types of IP-based services. The explosion of new technologies in the subscriber premises creates significant new opportunities for all CSPs. Technology innovators of all types and sizes are moving aggressively to seize that opportunity. Perhaps the most significant recent change in the competitive dynamic across the communications industry is the aggressive entrance of web-scale players into subscribers' homes and businesses via interactive smart home hubs and devices. These entrants, such as Amazon, Google and Microsoft, are extending their current platforms (e.g., data driven search, e-commerce) into subscriber premises with new devices and services that are helping to reshape the home environment. The simplicity of operating these devices, as well as their use of data, enables these web-scale players to rapidly deploy new services and command a central place in the subscriber's daily life. The level of insight that they generate by mining user data, coupled with their DevOps business model, positions them to offer and deploy services to subscribers at pace that traditional CSP operating and business models cannot match.

To address this challenge and establish control of the device-enabled subscriber, we believe CSPs must respond by leveraging analytical tools that utilize network data and subscriber behavioral data to tailor services that meet the individual subscribers' needs. These services include high-bandwidth packages, managed Wi-Fi, whole home Wi-Fi and smart home and business services. We believe these new services represent the CSP's greatest opportunity to create new revenue streams and higher average revenue per user, or ARPU, while reducing subscriber churn. CSPs must also mine network and subscriber data to streamline and automate subscriber facing functions such as customer service. These data-driven approaches can significantly reduce service costs, improve profitability and support investment in new services and technologies. Increasingly, companies in the communications space will embrace strategies that apply machine learning and artificial intelligence technologies that promise to dramatically improve the subscriber experience, build subscriber intimacy and loyalty, while increasing ARPU. By leveraging data to build a tighter bond with their subscribers and deliver high-value services, CSPs can more effectively meet the challenge presented by web-scale players.

The Rise of Smart Premises

We believe 2018 was the tipping point for the smart home market. IoT, virtual reality and other connected devices have become mainstream for many consumers and they are increasingly prevalent in subscriber premises. Worldwide, the smart speaker installed base is expected to reach more than 225 million units by 2020 according to Canalys. IDC anticipates a compound annual growth rate of 18.5% as the smart home market balloons to 939.7 million devices shipped in 2022. Finally, according to Statista, the average annual revenue per installed smart home amounts to $186. Leading technology players such as Amazon and Apple recognize this new business opportunity, and they have created significant new smart premises offerings. This trend exacerbates the significant disruption to CSP business models already created by "over-the-top" services like Netflix, Facebook and YouTube.

To improve performance and coverage throughout their homes, many subscribers are purchasing Wi-Fi routers and gateways via consumer channels and introducing them into the home network. Since these consumer products do not provide carrier class management capabilities that enable remote diagnostics, management and troubleshooting, performance issues can create satisfaction issues for the subscriber and a cost burden for the service provider. The introduction of smart devices into the home is accelerating the scale and complexity of these management challenges for CSPs. According to Parks Associates, nearly 50% of smart home device owners reported issues setting up their devices. Increasingly, subscribers view any device that is connected to the home network as the purview and responsibility of their CSP regardless of what the device is or where they may have purchased it. When these issues arise, subscribers typically contact their CSPs for help.

Recognizing that many subscribers see the CSP as the logical source of insights and services that enable the smart home and business, innovative CSPs are developing strategies and business models that embrace these new technologies via carrier class premises systems. Over the last year, several of the largest and most innovative CSPs have announced strategies that incorporate the latest technologies such as voice interaction and IoT connectivity into their service offerings for subscribers. By leveraging cloud management technologies and developing a proactive strategy for smart device connectivity, voice interaction, security and premises system instrumentation, CSPs can position themselves as the critical enabler of the smart home and business. Winners will embrace software platforms that enable all of these capabilities and premises systems that provide a foundation for turning the current burden of the smart home into new services and revenue streams.

The Shift to a DevOps Business Model

Access networks directly and physically connect the residential or business subscriber to the CSP's data center, central office or similar facilities and create the on-ramp to the Internet. The access network is critical for service delivery as it governs the bandwidth capacity, service quality available to subscribers and ultimately the services and experience CSPs can provide to subscribers. Providing differentiated, high-quality, high-speed connectivity has become increasingly critical for CSPs to retain and expand their subscriber base and launch new revenue-generating services. To meet the demands of device-enabled subscribers, CSPs are starting to deploy access technologies that are software defined and leverage next generation Passive Optical Network, or PON, architectures such as NG-PON2, XGS-PON and 10G EPON. In doing so, they will address many of limitations of legacy access systems:

- Limited capacity of outdated access architectures - Network architectures have physical limitations in their ability to scale bandwidth, avoid latency issues and deliver the advanced broadband services subscribers demand today and are expected to increasingly demand in the future.
- Inflexible networks that constrain subscriber offerings – Networks were designed to support a narrow range of services, and as a result, they limit the ability of CSPs to deploy the advanced broadband services increasingly demanded by their subscribers.
- Expensive to deploy and operate – With a wide variety of equipment installed, networks require significant downtime and labor for maintenance and upgrades, thereby placing a significant and recurring capital and operating expense burden on CSPs.
- Back-office systems that inhibit deployment of new services - Traditional methods for operationalizing new products and services often require significant testing and lengthy back-office integration activities. This often places CSPs at a competitive disadvantage relative to emerging service providers that are leveraging agile management practices.

By replacing traditional hardware functions with SDA, as well as software defined networking, or SDN, CSPs can overcome these operational challenges and bring new products and services to market faster. Many CSPs are embracing SDA and SDN to help accelerate innovation, deploy automation, bring agility to their network and significantly reduce service disruptions. By embracing standards-based, modular software platforms that abstract software functions from hardware, CSPs can free themselves from a dependence on specific hardware technologies and upgrade their access network to enable a DevOps business model. The winning service providers of the future will embrace SDA platforms and transform their access networks into a competitive weapon. Ultimately, this new model will enable CSPs to manage a complete range of access systems across every deployment scenario (e.g., central office, head-end, cabinet, mounted on a pole) in a consistent manner. With this shift they will introduce services at a pace that can then match the speed of the web-scale players.

The Imperative to Develop Lean Operating Models

CSPs face a dual challenge in the coming years - mounting competitive pressure and the requirement to increase their investments in technologies that can deliver the new services that their subscribers demand. Most will need to make shifts in their operating models to thrive in the coming decade. They must implement a lean operating model that reduces the overall operating cost to run the network and deliver services to subscribers at an accelerated pace as well as at a significantly lowered cost. The adoption of new technologies that provide automation and intelligence, such as SDA, will help service providers adopt agile operating models and reduce the burden of network and back-office operations.

The Deployment of 5th Generation, or 5G, Networks

As subscribers adopt next generation mobile applications and technologies, the demand for higher bandwidth, lower latency and dramatically higher device densities is accelerating. Because existing LTE mobile networks are increasingly challenged to meet these demands, many CSPs are announcing and moving to deploy 5G mobile networks that promise dramatically greater performance and capabilities for mobile and fixed broadband services. 5G is significantly different from previous generations in the mobile evolution because it delivers higher bandwidth (10 Gbps per radio), lower latency (less than 1 msec) and supports a dramatically greater number of connections (1 million devices per km2). By leveraging higher frequency spectrum and more efficient data encoding, 5G offers CSPs a path to differentiate their services and shift the competitive landscape. CSPs are pursuing two major strategies to deploy 5G capabilities across their networks:

- **Upgrading existing LTE infrastructure -** By upgrading their existing LTE wireless networks with 5G radios, CSPs will realize 10 to 20 percent higher bandwidth for 5G mobile devices. This approach will offer a quick path to 5G services for some CSPs and may differentiate their mobile broadband services. However, this incremental strategy offers relatively limited improvements in wireless capacity.

- **Leveraging millimeter wavelength technology -** Leading CSPs will deploy thousands of millimeter wave 5G small cells to realize a 5- to 10-fold increase in capacity across their mobile and fixed broadband networks. This approach will enable CSPs to support virtually any next generation mobile, augmented or virtual reality, IoT or autonomous vehicle or device application. This will open up tremendous new business opportunities for early adopters. Due to the inherent range limitations of millimeter wave technology, 5G small cells must be deployed in very close proximity to subscriber devices. This will require the deployment of thousands of 5G small cells throughout a CSPs network to deliver services to subscribers.

With the adoption of 5G millimeter wavelength technology, CSPs will require transport that is both very capable and economically efficient. CSP cell networks will ultimately come to resemble high-density broadband access networks that leverage high-bandwidth, reliable fiber transport. To make the economics work, CSPs will ultimately need to embrace fiber efficient point-to-multi-point capabilities offered by NG-PON2 that include:

- Aggregated 10 gigabit services delivered over a single wave length;
- Channel bonding to increase capacity delivered for a single service; and
- Multiple wave lengths over a single PON to provide unmatched resiliency and low latency operations.

While 5G networks will be significantly more capable, the deployment of thousands of radio stations will introduce significant operational complexity for CSPs. As a result, 5G will accelerate the imperative for CSPs to adopt SDA technologies that simplify network operations and architectures. CSPs will also need to embrace advanced premises systems that exploit the capabilities delivered by 5G fixed wireless access networks to deliver an exceptional subscriber experience.

The Role of Governments in Supporting Technology Investment

As CSPs face increasing competitive pressure, they must accelerate their investments to upgrade their access networks and deploy new subscriber facing technologies. Governments around the world recognize the importance of expanding broadband networks and delivering advanced broadband services to more people and businesses. As a result, many governments have established stimulus programs or other incentives for broadband investment.

In the United States, programs like the Connect America Fund, or CAF, and E-Rate provide billions of dollars each year to CSPs in the form of capital investment incentives, grants and loans to encourage broadband network investment in unserved or underserved communities and schools. For example, in 2015, the CAF program was authorized to distribute $1.5 billion per year through 2020 to offset the costs of installing and operating CSP operated broadband and voice networks for large service providers in the United States. In 2016, this program was extended to smaller service providers to distribute $2.0 billion annually over the next 10 years to offset the costs of installing and operating CSP operated broadband and voice networks. In order to promote greater accountability, in 2019 the Federal Communications Commission established a uniform framework for measuring the speed and latency performance for recipients of CAF. CSPs who wish to continue leveraging this program must seek new solutions that enable them to report and demonstrate their ability to meet the requirements established by this new framework. In addition, the E-Rate program was authorized to offer $1.5 billion in grants to build gigabit capable network connections to schools. The E-Rate program targeted at networks is funded at its current level indefinitely.

The Canadian Radio-television and Telecommunications Commission in 2016 created a fund targeted at increasing broadband coverage and speeds that made available up to $750 million over the next five years, and the European Commission is pursuing similar goals via its Connecting Europe Facility and other programs.

There are also increasing investments being made by governments at the state level. Programs such as Minnesota's Border-to-Border Grant Program ($20 million in 2017), Tennessee's Broadband Accessibility Act ($45 million over three years) and New York's Broadband for All Program ($500 million over three years) have created grant programs that encourage investments in broadband to unserved areas. These state level programs will complement national programs and increase investment in unserved and underserved areas.

With the increasing importance of broadband connectivity and the evolution of the smart home and business market, we expect this investment focus to continue and potentially increase to accommodate higher service tiers. World-class connectivity and services are becoming essential capabilities for individuals, as well as businesses and nations, who strive to remain economically competitive in an increasingly global and connected marketplace.

Strategy Overview

We believe that many CSPs can and will evolve to providing the most relevant services and experience to their subscribers. Today, many CSPs command a privileged and strategic position in their subscribers' premises. They provide a service that is becoming a necessity for most subscribers. With significant new technologies coming into the marketplace, the opportunities to generate new revenue streams are manifold. However, the journey from connectivity provider to essential provider of high bandwidth Wi-Fi and services for the smart home and business will require significant transformation for most CSPs. Our strategy is to position Calix as the essential provider of platforms and services that enable this transformation. The principal elements of our strategy are:

Increase Focus on Our Strategic Platforms - Our strategy centers on increasing the market adoption of our three strategic platforms - Calix Cloud, EXOS (Experience eXtensible Operating System) and AXOS (Access eXtensible Operating System).

- Calix Cloud is a role-based analytics platform that leverages network data and subscriber behavioral data to deliver analytics and intelligence to communications professionals via role-specific dashboards. Calix Cloud provides the subscriber analytics that enable a CSP to deliver targeted marketing, services and experiences to build customer intimacy and loyalty. Calix Cloud currently includes Calix Marketing Cloud for CSP marketing teams and Calix Support Cloud for CSP customer support teams.
- EXOS is a carrier class smart home and business operating system that supports residential, business and mobile subscribers. EXOS, coupled with our market leading GigaSpire premises systems, provides a unique "service enablement platform" that is designed for mastering and monetizing the complexity of the subscriber edge. EXOS enables CSPs to elevate every aspect of their business by deploying smart home and business services and generate new revenue streams.
- AXOS is an operating system for access networks that allows a service provider to deliver all services on a single, elastic, converged access network that is always on, simple to operate and quick to deploy. AXOS, coupled with our E-Series systems, provides a unique platform for the software defined access network that enables CSPs to transform their business processes and deliver new services at DevOps speed. Armed with AXOS, CSPs can radically simplify their network operations, their network architectures and their business models.

Extend Portfolio of Calix Services – Our services team helps CSPs define their transformation strategy, build new skills, implement new technologies and deploy new subscriber services. Calix Services address a CSP's entire network and service delivery lifecycle. We have recently extended the scope of our service offerings with new managed services for Remote Network Monitoring. These services allow CSPs to benefit directly from our experience working with thousands of service providers to optimize their operations and leverage our advanced analytics to radically improve the operational efficiency of their teams.

Engage Directly with Customers – Calix continues to invest in our direct sales capabilities to ensure that we engage deeply with our customers to help them understand the differentiable value that our platforms provide. As an innovator and a market leader, it is important that our sales and solution engineering resources continually drive the adoption of our strategic platforms. As we deploy new solutions, we are building the expertise of our team by adding specialized resources with deep expertise in areas such as marketing, smart home services and network operations. Our direct model is complemented with selective programs for Calix Channel Partners who have established local market expertise, demonstrated the ability to generate new market opportunities and supported sales of cutting-edge technologies.

Expand Customer Footprint Across Our Expanded Total Addressable Market – Our diverse and growing customer footprint is a critical source of our growth as we expand our portfolio and sell additional platforms to both new and existing customers. Our platforms are dramatically expanding our total addressable market, and as such we intend to build on our recent momentum in penetrating service provider segments where our current share is relatively low (e.g., cable MSOs, large CSPs and international markets) and continue to engage emerging providers who are creating entirely new customer segments (e.g., fiber overbuilders, utilities, municipalities and hospitality).

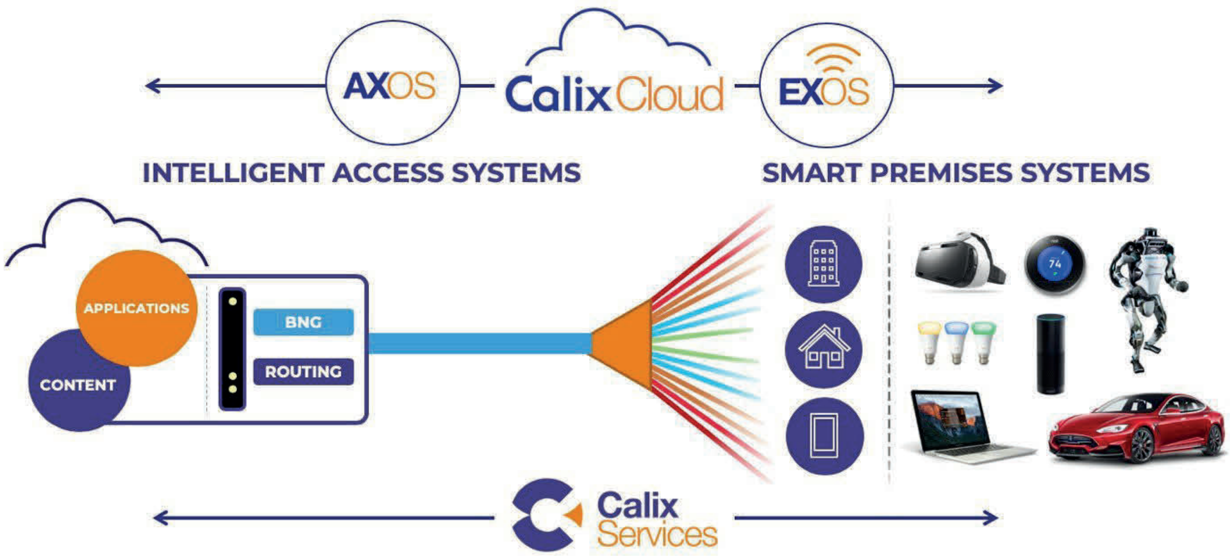
Pursue Strategic Relationships – We expect to continue to pursue strategic technology and distribution relationships, alliances and acquisitions that help us align with CSPs' strategic priorities. We continue to invest to ensure interoperability across the ecosystems that support our customers' most critical business processes through our Calix Compatible Program. This program has dozens of technology members and it is designed to enable our customers to rapidly deploy qualified solutions globally. We are also adding new ecosystem partners such as Infosys and Amazon Alexa Voice Services. By adding their solutions to our platform ecosystem, Calix is significantly enhancing the value that our platforms deliver to CSPs and their subscribers.

Portfolio Overview

By embracing open, modular, standards-based strategies, we provide intelligence and flexibility across a CSP's entire network – from their data centers to their subscribers' connected devices. Calix platforms are designed to provide our customers the agility that they need to offer the managed services that their subscribers demand. While we continue to support our non-AXOS and non-EXOS systems and our traditional cloud and software products, we are focused on driving the evolution and market penetration of our strategic platforms and services.

The Calix portfolio allows for a broad range of subscriber services to be provisioned and delivered over a single unified network. These systems can deliver voice and data services, advanced broadband services, mobile broadband, as well as high-definition video and online gaming. Our ultimate goal is to help CSPs radically simplify their network operations, network architectures and business operations as they offer new services. Our premises systems allow CSPs to master the complexity of the smart home and business and offer new services to their device-enabled subscribers. Furthermore, our goal is to help CSPs elevate every aspect of their business - their brand, their service quality, their subscriber experience and their revenue streams. All of these platforms and systems can be monitored, analyzed, managed and supported by Calix Cloud.

Representation of how Calix platforms and services support a CSP's entire network:



Calix Cloud Platform

Calix Cloud is an analytics platform that leverages network data and subscriber behavioral data to deliver intelligence to communications professionals via role specific dashboards. Calix Cloud provides customer support personnel with troubleshooting dashboards and tailored analytics that reduce call volumes, reduce call times and lower "truck rolls". Calix Cloud provides marketing personnel with segmentation dashboards and tailored analytics that reduce churn, increase ARPU and improve marketing return on investment. Calix Cloud transforms insights into action for CSPs, enabling them to:

- **Analyze:** Calix Cloud allows CSPs a deeper understanding of their subscribers and their satisfaction. As a result, CSPs can directly address churn risk and improve marketing campaigns.
- **Engage:** Calix Cloud provides CSPs real-time insights into network issues, allowing CSPs to be responsive in resolving issues and offering solutions.
- **Grow:** Calix Cloud analytics combine multiple information sources to build a full picture of subscribers, which can enable higher marketing success rates.

Calix Cloud is currently composed of two subscription-based offerings that complement each other to provide a powerful platform that CSP employees utilize within their daily work flows to increase the effectiveness of their marketing campaigns, address support issues and improve the subscriber experience.

Representation that summarizes the primary benefits delivered by Calix Cloud:

Calix Marketing Cloud (CMC) – CMC enables marketers to move away from a one-size-fits-all approach to marketing and deliver personalized campaigns. CMC provides insights regarding subscriber behavior including website visits, social channel engagement, device usage and bandwidth consumption. CMC also helps CSPs identify subscribers who are experiencing service issues and exhibiting behaviors that correlate with higher churn rates (e.g., running speed tests). By delivering these insights through intuitive segmentation dashboards and tailored analytics, CMC helps CSPs deliver the right message, at the optimal time, via the optimal channel. CMC enables CSPs to adopt data-driven strategies to effectively compete with web-scale players.

Calix Support Cloud (CSC) – Recent Calix studies demonstrate that a large portion of support calls result from Wi-Fi performance issues. Since Wi-Fi related support calls take approximately three times as long to complete as the average support call, reducing these calls can significantly improve operational efficiency. CSC enables more informed and efficient conversations between CSP customer service representatives and their subscribers. Support personnel utilize troubleshooting dashboards and tailored analytics that are built directly into their work flows to quickly identify issues with network, devices and Wi-Fi performance. Once the issues are identified, many can be resolved via CSC with a simple click of a button. Recent enhancements to CSC include automation capabilities that can fix many common issues without any manual intervention. We intend to incorporate more advanced machine learning and artificial intelligence capabilities into CSC to help CSPs optimize their support processes and improve subscriber experiences.

We have recently augmented the capabilities of Calix Cloud to help CSPs analyze smart home device and service adoption and performance across their subscriber base. These capabilities provide the intelligence that is required to craft targeted campaigns for marketing smart home offerings and managing smart device performance in the subscriber premises. Complexity is an inherent characteristic of the smart home and business. We believe that the intelligence provide by the Calix Cloud is rapidly becoming a necessity for any CSP entering the smart home and business market.

Calix Cloud software is hosted in a cloud data center, and Calix offers an array of support, customer success and service offerings that are designed to ensure rapid deployment and easy adoption of Calix Cloud.

EXOS Platform

EXOS is a carrier class premises operating system and software platform that supports residential, business and mobile subscribers. EXOS is the first premises operating system that is designed to help CSPs elevate every aspect of their business by rapidly deploying new services for the smart home and business. EXOS incorporates a software model that is standards-based, fully abstracted from the hardware and always-on. Thanks to the unique architecture of EXOS, CSPs can offer new subscriber services and master the complexity of the subscriber edge. Armed with EXOS, CSPs can select and rapidly deploy smart home services such as cloud-enabled voice services, IoT services and parental controls. EXOS is the foundation of our Calix Smart Home and Business Solution that includes our recently launched GigaSpire premises gateway family, Calix Cloud and the Calix Solutions Exchange. When combined with these capabilities, EXOS offers a unique and powerful services enablement platform.

Representation that summarizes the primary benefits delivered by EXOS and the Calix Smart Home and Business Solution:

EXOS is architected to abstract software functionality from the underlying system-on-chip in premises gateways. The EXOS abstraction layer isolates applications and management software from the Linux kernel and low-level chipset functions, regardless of the hardware deployed for specific residential and business use cases. This architecture simplifies software updates and streamlines operational processes. The EXOS abstraction layer also ensures the delivery of a consistent subscriber experience regardless of the specific hardware deployed to subscribers. EXOS leverages Linux containers that provide complete flexibility to CSPs when they deploy application packages to create new revenue streams. The Linux containers also offer an ideal environment for third-party software vendors to add their applications to the EXOS ecosystem via the Calix Solutions Exchange. This “containerized” architecture also ensures that new applications may be deployed without the requirement to regression test the entire applications portfolio running on the system. This approach accelerates time to market for new services.

The EXOS management plane is decoupled and centralized, enabling CSPs to manage all applications simultaneously, even if applications are installed independently. The EXOS architecture ensures that subscribers receive an “always on” service and benefit from application updates without the need to “re-boot” their premises systems or schedule service visits. The Microservices Aggregation Platform, or MAP, that supports EXOS captures data from every system or activity across a subscriber base. As CSPs deploy EXOS they can leverage this data for performance analytics, subscriber experience insights, marketing, maintenance and the application of artificial intelligence for predictive modeling.

Because EXOS is fully abstracted from the underlying hardware, it provides CSPs with the flexibility to offer services on the hardware of their choice. Many of the largest CSPs develop their own, bespoke premises hardware for their subscribers. For CSPs who elect to develop their own hardware, EXOS is an ideal software platform for delivering smart home services faster than their competition. To meet the needs of service providers who desire a fully integrated solution, EXOS is available on the GigaSpire family of hardware. The GigaSpire is currently available in two models - the GigaSpire BLAST and the GigaSpire MAX.

As the first carrier-class Wi-Fi 6 (802.11ax) systems, both GigaSpire models provide unsurpassed bandwidth throughput and wireless coverage across the subscriber premises. By integrating the latest Multi-User, Multiple-input and Multiple-output (MU-MIMO) technology, the GigaSpire is capable of supporting up to eight simultaneous, symmetrical data streams to dramatically expand network capacity and improve efficiency. The latest security capabilities are integrated into the GigaSpire at both the hardware and software levels. With Physical Unclonable Functions (PUF) integrated into the chipset, the GigaSpire can create a digital “fingerprint” for each system that can't be replicated or “spoofed”. These capabilities ensure network authentication at the gateway. The advanced instrumentation built into the GigaSpire also provides telemetry, performance and behavioral analytics that CSPs can leverage through the Calix Cloud to ensure that performance is optimized across the network and at the device level.

The GigaSpire MAX is a smart home service enablement platform designed to master the complexity of the subscriber edge and provide universal IoT support. The GigaSpire MAX integrates the latest IoT protocols - Zigbee, Z-Wave, combo Bluetooth Low-Energy and Bluetooth Classic. This integration enables a CSP to offer the IoT services of their choice from the major IoT brands or through their own branded IoT bundles and packages. The GigaSpire MAX offers fully integrated Alexa Voice Services, or AVS. With AVS, CSPs can offer the world's leading cloud-enabled voice service and deliver an experience that meets growing subscriber expectations for voice interaction. As their subscribers interact directly with the EXOS powered GigaSpire Smart Home system, the CSP's brand is brought into a central place in the subscriber's experience - reinforcing the CSP's brand as the provider of advanced smart home services.

Representation of the EXOS-powered GigaSpire family:

AXOS Platform

AXOS is a software platform built for the specific needs of the access network. The AXOS platform is an architecture built to leverage the best of data center software design and network virtualization across the challenging and variable environment of the access network. With an always-on architecture and consistent provisioning services, a CSP can leverage AXOS to deliver all services on a single, elastic, converged access network that is always on. By supporting all existing and next generation PON architectures (anyPON), any silicon chipset (anyPHY) and any CSP operating model (anySDN), AXOS provides unmatched flexibility to our customers. Over 200 Calix customers are already deploying AXOS to simplify their operations, network and business models.

Representation that summarizes the primary benefits delivered by AXOS:

We believe AXOS offers a revolutionary way for CSPs to operate their access networks and accelerate their business transformation. AXOS achieves this because it is architected with discrete software modules that operate on top of a unique hardware abstraction layer that preserves software independence from the underlying hardware. This architecture simplifies upgrades to non-events, supports stateful, self-healing operation and facilitates virtualization of processes and services. All components within AXOS utilize standards based YANG data models to represent the operational functions and the NETCONF protocol that enable AXOS-powered systems to fit into any open SDN orchestration and control framework. Open, published APIs also allow customers to directly program unique network applications and services.

With AXOS, CSPs can collapse and automate networks functions such as subscriber management and routing to streamline deployment of services and simplify operations. This functionality is supported via software modules including AXOS RPm (Routing Protocol module), AXOS SMm (Subscriber Management module) and connectors such as SMx (Service Management Connector), AXOS DPx (virtualized DOCSIS connector), AXOS OFx (OpenFlow connector) and AXOS Sandbox - an SDA virtual environment for system design and testing. The recently announced AXOS Intelligent Access Edge solution includes the AXOS RPm and SMm as well as the new Advanced Routing Protocol Module (ARm) that provides CSPs with the flexibility to bring Layer 3 functionality-including multiprotocol label switching, or MPLS, routed networking-to their new or existing Layer 2 access network. This revolutionary new solution will simplify network architectures and reduce total cost of ownership. This solution will include a new line card for the E9-2 Intelligent Edge System that will aggregate Layer 2 OLTs and deliver the functionality and benefits of the Layer 3 Access network to the access edge.

The AXOS platform removes the complexity of network deployments by reducing the need to utilize middleware to integrate costly hardware and software. AXOS offers CSPs a path to the simplified, intelligent, unified access network that can accelerate time-to-revenue, increase service velocity, eliminate service disruptions and reduce total cost of ownership. As a result, CSPs can simplify their business models and focus investment and resources on revenue generating services and functions.

AXOS is currently implemented in our E-Series family of modular, non-blocking systems including the E9-2, E7-2, E3-2, E3-16F, E5-16F and E5 business systems. By offering AXOS on the entire E-Series family of systems, Calix enables our customers to meet a wide variety of deployment scenarios. The Calix Access system portfolio is designed for high availability and purpose-built for the demands of access network deployments. Our access systems are built and tested to meet or exceed network equipment-building system standards, which are a set of safety, spatial and environmental design guidelines for communications equipment. Our products are highly compatible and designed to be easily integrated into the existing operational and management infrastructure of CSP access networks.

Representation of the AXOS E-Series systems portfolio and where they are typically placed in the CSP network:

Traditional Products

Calix continues to support and sell our portfolio of non-AXOS and non-EXOS systems as well as traditional software and Compass Cloud products that are widely deployed in customer networks. For many CSPs, the process of operationalizing new systems and transitioning to new products can be lengthy. We expect that these products will continue to be utilized in our customers' networks for many years to come. These products include:

- **Calix GigaFamily** – The Calix GigaFamily includes our first generation of carrier-class Wi-Fi gateways. It includes the Calix GigaCenter and 804 mesh systems. These systems provide 802.11ac Wi-Fi and whole home Wi-Fi services. When deployed in conjunction with the Calix Cloud, the GigaFamily systems provide the complete set of capabilities required for a fully managed Wi-Fi offering that delivers optimized Wi-Fi services to subscribers.

- **Compass Cloud** – Consists of Flow Analyze Plus (a tool that provides an in-depth view of the traffic in CSP networks on a real-time basis), Consumer Connect Plus (a tool that enables service providers to remotely activate new broadband devices and manage home networks, creating new revenue sources, improved customer satisfaction and reduced service delivery costs) and Service Verify (a tool that gives service providers the tools to comprehensively validate quality of service commitments for their business subscribers).
- **Non-AXOS E-Series Access Systems and Nodes:** – A small subset of our E-Series access systems and access nodes that are designed to support an array of advanced IP-based service and run our EXA operating system. These systems are not supported by AXOS.
- **Calix C-Series Multiservice Access Systems** – Designed to support a wide array of basic voice and data services offered by CSPs while also supporting advanced, high-speed, packet-based services such as Gigabit Ethernet, GPON, digital subscriber line, or DSL (including very high-speed DSL 2, or VDSL2) and advanced applications.
- **Calix B-Series Access Nodes –** Consist of chassis-based nodes that are designed to support an array of advanced IP-based services offered by CSPs, including Ethernet transport and aggregation, as well as voice, data and video services over both fiber- and copper-based network architectures.
- **P-Series Optical Network Terminals and Residential Gateways** – A broad range of non-EXOS customer premises solutions, including optical network terminals, or ONTs, and residential gateways for residential and business use in conjunction with our E-Series, C-Series and B-Series systems.

Calix Services

The Calix Services team helps CSPs define their strategy, implement new solutions and manage their networks. CSPs choose Calix platforms because of their ability to simplify network management and support an agile service delivery model. Calix Services spans the entirety of the network and service delivery lifecycle. Our expertise, developed over many years of building cutting-edge software platforms and providing critical services to our customers, positions us to be the vendor of choice. Today, the Calix Services team delivers services to CSPs of every size and every type. We are continually expanding our portfolio of service offerings to ensure that our customers realize the full potential of our platforms.

- **Calix Professional Services** – Calix offers defined service packages to accelerate network design and deployment, optimize performance and scalability and apply field-proven best practices, processes and tools. Use Cases for Calix Professional Services include the collapse of multiple network silos into a single software defined access architecture, the seamless migration to next-generation PON architectures, the deployment of managed whole home Wi-Fi services and smart home services and facilitated OSS/BSS integration services. These offerings optimize CSP end-to-end processes from operations to technology deployment to service lifecycle management.
- **Calix Managed Services** – Our managed services feature a cloud-based remote monitoring service that monitors a CSP's end-to-end access network (24 hours a day, 7 days a week) to ensure issues are automatically identified and assessed. This service leverages machine learning technology developed through thousands of Calix Support Services engagements with CSPs to correlate alarms, filter extraneous events and identify critical issues. The service provides incident notifications to CSP team members that include the nature, location and severity of events to help reduce mean time-to-repair.
- **Calix Support Services** – Calix offers three tiers of support services - Standard, Essential, and Vantage - that ensure software updates, the agility of operational workflows, service uptime and customer experience. Calix support tiers are designed to provide optimal support to our customers who are adopting our strategic platforms - Calix Cloud, EXOS, and AXOS. Our highest support tier, Vantage, includes our Remote Monitoring service and support from a Calix service director who partners with customers to implement strategies that ensure delivery of an exceptional subscriber experience.
- **Calix Education Services** – Calix offers an array of self-service and instructor-led, remote and onsite learning and certifications solutions to help CSPs build the skills required to successfully execute deployments and effectively run next generation networks. Calix offers specific learning paths that are designed to help CSPs enhance the skills of their teams and maximize the value that they derive when they deploy our strategic platforms.
- **Calix Success Services** – To ensure that our customers maximize the return on their investments in our software solutions, we offer Calix Success Services. The primary focus of the Success Services engagements is the use of the data and analytics delivered through our Calix Cloud Platform to transform our customers' business processes. Our Success Services team members leverage their domain expertise in marketing, customer support and operations to help our customers achieve their business objectives. These engagements are typically multi-year (aligned to our cloud subscription terms).

Representation of the Calix Services portfolio:

Customers

We operate a differentiated customer engagement model that focuses on direct alignment with our customers through sales, service and support. In order to allocate our product development and sales efforts efficiently, we believe that it is critical to target markets, customers and applications deliberately. We have traditionally targeted CSPs, which own, build and upgrade their own access networks and value strong relationships with their systems and software suppliers.

The United States Incumbent Local Exchange Carrier, or ILEC, market is composed of three distinct “tiers” of carriers, which we categorize based on their subscriber line counts and geographic coverage. Tier 1 CSPs are very large with wide geographic footprints. They have greater than seven million subscriber lines, and they generally correspond with the former Regional Bell Operating Companies. Tier 2 CSPs also operate typically within a wide geographic footprint but are smaller in scale with subscriber line counts that range from approximately half a million to approximately seven million subscriber lines. Their service coverage areas are predominantly regional in scope, and therefore they are often known as Regional Local Exchange Carriers. Tier 3 CSPs consist primarily of over 1,000 predominantly local operators (often called IOCs) typically focused on a single community or a cluster of communities, although they also include a growing number of municipalities, electric cooperatives, fiber overbuilders and wireless ISPs. These entities range in size from a few hundred to approximately half a million subscriber lines.

To date, we have focused primarily on CSPs in the North American market. Our existing customers’ networks serve over 100 million subscriber lines. Our customers span Tiers 1, 2 and 3, including Allo Communications; CenturyLink, Inc., or CenturyLink; CityFibre Holdings Limited; City of Beverly Hills; Emirates Integrated Telecommunications Company, or du; Cox Communications; Frontier Communications Corporation; Windstream Holdings, Inc., or Windstream; and Verizon Communications, Inc.

We have a few large customers who have represented a significant portion of our sales in any given period. CenturyLink accounted for 18% of total revenue in 2018, 31% in 2017 and 21% in 2016. Windstream accounted for less than 10% of our revenue in 2018 and 2017 and 15% of our revenue in 2016.

Sales to customers outside the United States represented approximately 12% of our total revenue in 2018, 11% in 2017 and 9% in 2016. Historically, our sales outside the United States were predominantly to customers in the Middle East, Canada, Europe and Caribbean.

Customer Engagement Model

We design, market and sell our Calix Cloud and software platforms, systems and Calix Services predominantly through our direct sales force, supported by marketing and product management personnel. We have expanded this model to include a small number of select channel partners in North America and dozens of international channel partners, who are part of our Fiber Forward Partner Program. Our sales effort is organized either by named accounts or regional responsibilities. Account teams comprise sales managers, supported by solution engineers and account managers, who work to target and sell to existing and prospective CSPs. The sales process includes analyzing CSPs’ existing networks and identifying how they can utilize our products and services within their networks. Even in circumstances where a channel partner is involved, our sales and marketing personnel are often selling side-by-side with the channel partner. We believe that our direct customer engagement approach provides us with significant differentiation in the customer sales process by aligning us more closely with our customers' changing needs.

Research and Development

Continued investment in research and development is critical to our business. Our research and development team is composed of engineers with expertise in software, optics, wireless and hardware. Our teams of engineers are located in our San Jose and Petaluma facilities located in California; our Minneapolis, Minnesota facility and our Nanjing, China facility. We also outsource a portion of our software development to domestic and international third parties. Our research and development efforts are also extended by our co-development partnerships with third-party developers such as Infosys whereby we are able to utilize their substantially larger product development teams to bring cutting edge, software-based products to market while creating new revenue opportunities for both parties. Our research and development team is responsible for designing, developing and enhancing our Cloud and software platforms and systems, performing product and quality assurance testing and ensuring the compatibility of our products with third-party hardware and software products. We have made significant investments in the Calix portfolio. We intend to continue to dedicate significant resources to research and development to develop, enhance and deliver new platform features and capabilities, including investment in innovative technologies that support our business strategy.

Manufacturing

We rely substantially on CMs, ODMs and other third-party partners for the supply and distribution of our products. We work closely with these third parties to provide system design, source and procure materials, manufacture and deliver our products. Our manufacturing organization consists primarily of supply chain managers, new product introduction personnel and test engineers. We tightly integrate our supply chain management and new product introduction activities with the activities outsourced to these third parties. We have made changes to our supply chain management to align to our platform strategy and, more recently, in response to the imposition by the U.S. government of tariffs on goods imported from China. Such changes include increased leveraging of CM and ODM partners for systems design and management of raw materials used for manufacture and transition of global supply chain operations and activities to new geographies to mitigate the impact of the U.S. tariffs. Our relationships with our CMs and ODMs allow us to decrease new product introduction time, conserve working capital, reduce product costs and minimize delivery lead times while maintaining high product quality. Order fulfillment is performed by Pegasus Logistics Group, Inc. located in Texas. We also qualify and utilize other vendors for various portions of our supply chain from time to time, including order fulfillment of our circuit boards, optics and cabinets. This model allows us to operate with lower inventory levels while maintaining the ability to scale quickly to handle increased order volume.

Product reliability is essential for our customers, who place a premium on continuity of service for their subscribers. We perform rigorous in-house quality control testing to help ensure the reliability of our systems. Our internal manufacturing organization designs, develops and implements complex test processes to help ensure the quality and reliability of our products.

Our activities with our CM and ODM partners involve complexity and certain risks, including the potential absence of adequate capacity, the unavailability of or interruptions in access to certain process technologies and the reduced control over delivery schedules, manufacturing yields, quality and costs. As such, we may experience production problems or manufacturing delays. Additionally, shortages in components that we use in our systems are possible and our ability to predict the availability of such components may be limited. Our systems include components that are proprietary in nature and only available from a single source, as well as some components that are generally available from only a limited number of suppliers. Furthermore, lead times associated with certain components are lengthy and preclude rapid changes in product specifications or delivery schedules. In some cases, significant time would be required to establish relationships with alternate suppliers or providers of proprietary components. We generally do not have long-term contracts that guarantee the supply of components or manufacturing services. Our ability to deliver products in a timely manner to our customers would be adversely impacted materially if we needed to qualify replacements for any of the components used in our systems. If we experience any difficulties in managing our relationships with our CMs, ODMs or other third party partners, or any interruption in either our own operations or those of our partners, or if a supplier is unable to meet our needs, we may encounter supply delays that could impede our ability to meet our customers' requirements and harm our business, operating results and financial condition.

Seasonality

Fluctuations in our revenue occur due to many factors, including the varying budget cycles and seasonal buying patterns of our customers. More specifically, our customers tend to spend less in the first fiscal quarter as they are finalizing their annual capital spending budgets, and in certain regions, customers are also challenged by winter weather conditions that inhibit outside fiber deployment.

Intellectual Property

Our success depends upon our ability to protect our core technology and intellectual property. To accomplish this, we rely on a combination of intellectual property rights, including patents, trade secrets, copyrights and trademarks as well as customary contractual protections. In addition, we generally control access to and the use of our proprietary technology and other confidential information. This protection is accomplished through a combination of internal and external controls, including contractual protections with employees, contractors, customers and partners, and through a combination of U.S. and international intellectual property laws.

As of December 31, 2018, we held 124 U.S. patents and had 7 pending U.S. patent applications. One of the U.S. patents is also covered by granted international patents in three countries. As of December 31, 2018, we had no pending international patent applications. U.S. patents generally have a term of twenty years from filing. We have added to our patent portfolio since our inception. The remaining terms on the individual patents vary from one to 19 years.

We rely on intellectual property laws as well as nondisclosure agreements, licensing arrangements and confidentiality provisions to establish and protect our proprietary rights. U.S. patent, copyright and trade secret laws afford us only limited protection, and the laws of some foreign countries do not protect proprietary rights to the same extent. Our pending patent applications may not result in issued patents, and the issued patents may not be enforceable. Any infringement of proprietary rights could result in significant litigation costs. Further, any failure by us to adequately protect our proprietary rights could result in competitors offering similar products, resulting in the loss of our competitive advantage and decreased sales.

We believe that the frequency of assertions of patent infringement continues to increase in our industry. In particular, patent holders, including entities and organizations that purchase or hold patents to monetize such rights, assert patent infringement claims as a competitive tactic as well as a source of revenue. Any claim of infringement from a third party, even claims without merit, could cause us to incur substantial costs defending against such claims and could distract our management from operating our business. Furthermore, a party making such a claim, if successful, could secure a judgment that requires us to pay substantial damages. A judgment could also include an injunction or other court order that could prevent us from selling our products. In addition, we might be required to seek a license for the use of such intellectual property, which may not be available on commercially reasonable terms or at all. Alternatively, we may be required to develop non-infringing technology, which would require significant effort and expense and may ultimately not be successful.

Competition

The communications equipment market is highly competitive. Competition in this market is based on any one or a combination of the following factors:

- functionality;
- price;
- existing business and customer relationships;
- the ability of products and services, including turnkey professional services capabilities, to meet customers' immediate and future network requirements;
- product quality;
- installation capability;
- service and support;
- scalability; and
- manufacturing capability.

We compete with a number of companies within markets that we serve, and we anticipate that competition will intensify. Suppliers with which we compete include ADTRAN, Inc., or ADTRAN; Arris Group, Inc. (being acquired by CommScope Inc.); Casa Systems; Ciena Corporation; Cisco Systems Inc.; DASAN Zhone Solutions, Inc.; Huawei Technologies Co. Ltd.; Juniper Networks Inc.; Nokia Corporation and ZTE Corporation. There are also a number of smaller companies with which we compete in various geographic or vertical markets. While most of these smaller competitors lack broad national scale and product portfolios, they can offer strong competition on a deal-by-deal basis. As we expand into adjacent markets, we expect to encounter new competitors. Many of our competitors have substantially greater name recognition, manufacturing capacity and technical, financial and marketing resources as well as better established relationships with CSPs than we do. Many of our competitors have greater resources to develop products or pursue acquisitions and more experience in developing or acquiring new products and technologies and in creating market awareness for their products and technologies. In addition, a number of our competitors have the financial resources to offer competitive products at below market pricing levels that could prevent us from competing effectively.

Employees

As of December 31, 2018, we employed a total of 802 employees, of which 623 employees were located in the United States. Our United States employees are not represented by a labor union with respect to their employment with us. Our French employee is subject to a collective bargaining arrangement. We have not experienced any work stoppages, and we consider our relations with our employees to be good.

Corporate Information

Calix, Inc., a Delaware corporation, was founded in August 1999. Our principal executive offices are located at 2777 Orchard Parkway, San Jose, California 95134, and our telephone number is (408) 514-3000. Our website address is www.calix.com. We do not incorporate the information on or accessible through our website into this Annual Report on Form 10-K, and you should not consider any information on, or that can be accessed through, our website as part of this Annual Report on Form 10-K. Calix®, the Calix logo design, E3®, E5®, E7®, E9 TM, Calix Cloud SM, Compass®, Consumer Connect SM, Fiber Forward TM and other trademarks or service marks of Calix appearing in this Annual Report on Form 10-K are the property of Calix. Trade names, trademarks and service marks of other companies appearing in this Annual Report on Form 10-K are the property of the respective holders. The SEC maintains a website at www.sec.gov that contains reports, proxy statements and other information regarding issuers that file electronically with the SEC. We post on the Investor Relations page of our website, www.calix.com, a link to our filings with the SEC free of charge, as soon as reasonably practical after they are filed electronically with the SEC.

ITEM 1A. Risk Factors

We have identified the following additional risks and uncertainties that may affect our business, financial condition and/or results of operations. Investors should carefully consider the risks described below, together with the other information set forth in this Annual Report on Form 10-K, before making any investment decision. The risks described below are not the only ones we face. Additional risks not currently known to us or that we currently believe are immaterial may also significantly impair our business operations. Our business could be harmed by any of these risks. The trading price of our common stock could decline due to any of these risks, and investors may lose all or part of their investment.

Risks Related to Our Business and Industry

Our markets are rapidly changing, which makes it difficult to predict our future revenue and plan our expenses appropriately.

We compete in markets characterized by rapid technological change, changing needs of CSPs, evolving industry standards and frequent introductions of new products and services. We invest significant amounts to pursue innovative technologies that we believe would be adopted by CSPs. In addition, on an ongoing basis we expect to reposition our product and service offerings and introduce new products and services as we encounter rapidly changing CSP requirements and increasing competitive pressures. If we cannot increase sales of our new products and services, keep pace with rapid technological developments to meet our customers' needs and compete with evolving industry standards or if the technologies we choose to invest in fail to meet customer needs or are not adopted by customers, the use of our products and our revenue could decline, making it difficult to forecast our future revenue and plan our operating expenses appropriately.

Adverse global economic conditions and geopolitical issues, including the U.S. tariffs imposed on imports from China, could have a negative effect on our business, results of operations and financial condition and liquidity.

As a global company, our performance is affected by global economic conditions as well as geopolitical issues. In recent years concerns about the global economic outlook have adversely affected market and business conditions in general. Macroeconomic weakness and uncertainty also make it more difficult for us to accurately forecast revenue, gross margin and expenses. Geopolitical issues, such as the ones resulting in the recent tariffs imposed by both the U.S. and China and the increasing tensions among China, the U.S., Canada and other countries, create uncertainly for global commerce. Sustained uncertainty about, or worsening of, global economic conditions and geopolitical issues may cause our customers to reduce or delay spending and could intensify pricing pressures. Any or all of these factors could negatively affect demand for our products and our business, financial condition and result of operations. Additional risks associated with the impact of the U.S. tariffs on our business and result of operations are described in the below risk factor captioned, "*Substantially all of the products we currently sell in the United States are manufactured in China. The imposition by the federal government of tariffs on goods imported from China has significantly increased the cost of our products manufactured in China and imported into the United States which may have a material adverse effect on our business, gross margins and results of operations.*"

We have a history of losses, and we may not be able to generate positive operating income and positive cash flows in the future.

We have experienced net losses in each year of our existence. We incurred net losses of $19.3 million in 2018, $83.0 million in 2017 and $27.4 million in 2016. As of December 31, 2018, we had an accumulated deficit of $684.9 million.

We expect to continue to incur significant expenses and cash outlays for research and development associated with our platforms and systems, including our cloud and services operations, investments in innovative technologies, expansion of our product portfolio, sales and marketing, customer support and general and administrative functions as we expand our business and operations and target new customer segments, primarily larger CSPs including cable MSOs. Given our anticipated growth and the intense competitive pressures we face, we may be unable to control our operating costs.

We cannot guarantee that we will achieve profitability in the future. We will have to generate and sustain significant and consistent increased revenue, while continuing to control our expenses, in order to achieve and then maintain profitability. We may also incur significant losses in the future for a number of reasons, including the risks discussed in this "Risk Factors" section and other factors that we cannot anticipate. If we are unable to generate positive operating income and positive cash flows from operations, our liquidity, results of operations and financial condition will be adversely affected. If we are unable to generate cash flows to support our operational needs, we may need to seek other sources of liquidity, including additional borrowings, to support our working capital needs. In addition, we may choose to seek other sources of liquidity even if we believe we have generated sufficient cash flows to support our operational needs. There is no assurance that any other sources of liquidity may be available to us on acceptable terms or at all. If we are unable to generate sufficient cash flows or obtain other sources of liquidity, we will be forced to limit our development activities, reduce our investment in growth initiatives and institute cost-cutting measures, all of which would adversely impact our business and growth.

Our quarterly and annual operating results may fluctuate significantly, which may make it difficult to predict our future performance and could cause the market price of our stock to decline.

A number of factors, many of which are outside of our control, may cause or contribute to significant fluctuations in our quarterly and annual operating results. These fluctuations may make financial planning and forecasting difficult. Comparing our operating results on a period-to-period basis may not be meaningful, and you should not rely on our past results as an indication of our future performance. If our revenue or operating results fall below the expectations of investors or securities analysts, or below any guidance we may provide to the market, the market price of our stock would likely decline. Moreover, we may experience delays in recognizing revenue under applicable revenue recognition rules. For example, revenue associated with large turnkey network improvement projects, which include projects that are funded by the CAF program, is generally deferred until customer acceptance is received and may be subject to delays, rework requirements and unexpected costs, among other uncertainties. Certain government-funded contracts, such as those funded by U.S. Department of Agriculture's Rural Utility Service, or RUS, also include acceptance and administrative requirements that delay revenue recognition. The extent of these delays and their impact on our revenue can fluctuate considerably depending on the number and size of purchase orders under these contracts for a given time period. Furthermore, our customers who rely on government-funded programs may delay or reduce purchase activities due to the recent prolonged U.S. government shutdown, which could have a negative impact on our result of operations. In addition, unanticipated decreases in our available liquidity due to fluctuating operating results could limit our growth and delay implementation of our expansion plans.

In addition to the other risk factors listed in this "Risk Factors" section, factors that have in the past and may continue to contribute to the variability of our operating results include:

- our ability to predict our revenue and reduce and control product costs, including larger scale turnkey network improvement projects that may span several quarters;
- the impact of global economic conditions;
- the impact of current and future tariffs that may impact our products, including the U.S. tariffs on goods imported from China;
- our ability to increase our sales to larger CSPs globally;
- the capital spending patterns of CSPs and any decrease or delay in capital spending by CSPs due to macro-economic conditions, regulatory uncertainties or other reasons;
- the impact of government-sponsored programs on our customers and the impact to our customers of the recent U.S. government shutdown on such programs;
- intense competition;
- our ability to develop new products or enhancements that support technological advances and meet changing CSP requirements;

- our ability to ramp sales and achieve market acceptance of our new products and CSPs' willingness to deploy our new products;
- the concentration of our customer base as well as our dependence on a limited number of key customers;
- the length and unpredictability of our sales cycles and timing of orders;
- our lack of long-term, committed-volume purchase contracts with our customers;
- our exposure to the credit risks of our customers;
- fluctuations in our gross margin;
- the interoperability of our products with CSP networks;
- our dependence on sole-, single- and limited-source suppliers;
- our ability to manage our relationships with our third-party vendors, including CMs, ODMs, logistics providers, component suppliers and development partners;
- our ability to forecast our manufacturing requirements and manage our inventory;
- our products' compliance with industry standards;
- our ability to expand our international operations;
- our ability to protect our intellectual property and the cost of doing so;
- the quality of our products, including any undetected hardware defects or bugs in our software;
- our ability to estimate future warranty obligations due to product failure rates;
- our ability to obtain necessary third-party technology licenses at reasonable costs;
- the regulatory and physical impacts of climate change and other natural events;
- the attraction and retention of qualified employees and key management personnel;
- our ability to build and sustain an adequate and secure information technology infrastructure; and
- our ability to maintain proper and effective internal controls.

Our gross margin may fluctuate over time, and our current level of gross margin may not be sustainable.

Our current level of gross margin may not be sustainable and may be adversely affected by numerous factors, including:

- changes in customer, geographic or product mix, including the mix of configurations within each product group;
- the pursuit or addition of new large customers;
- increased price competition, including the impact of customer discounts and rebates;
- the impact of current and future tariffs that may impact our products, including the U.S. tariffs on goods imported from China;
- our ability to reduce and control product costs;
- an increase in revenue mix toward services, which typically have lower margins;
- changes in component pricing;
- changes in pricing with our third-party manufacturing partners;
- charges incurred due to inventory holding periods if parts ordering does not correctly anticipate product demand;
- introduction of new products and new technologies, which may involve higher component costs;
- our ability to scale our services business in order to gain desired efficiencies;
- changes in shipment volume;
- changes in or increased reliance on distribution channels;
- potential liabilities associated with increased reliance on third-party vendors;
- increased expansion efforts into new or emerging markets;

- increased warranty costs;
- excess and obsolete inventory and inventory holding charges;
- expediting costs incurred to meet customer delivery requirements; and
- potential costs associated with contractual obligations.

Substantially all of the products we currently sell in the United States are manufactured in China. The imposition by the federal government of tariffs on goods imported from China has significantly increased the cost of our products manufactured in China and imported into the United States which may have a material adverse effect on our business, gross margins and results of operations.

Recently, the federal government imposed significant tariffs on goods imported from China in connection with China's intellectual property practices with proposed additional tariffs of $200 billion or more covering a broader list of goods imported from China. Substantially all of the products that we sell in the United States are currently manufactured in China. Accordingly, we expect that these U.S. tariffs as currently implemented would have significant cost impact to us to the extent we are not able to mitigate the impact of the tariffs. Although we are actively working to modify our supply chain operations to avoid the impact of these tariffs, if we are not able to successfully modify our supply chain operations as planned, the tariffs could have a material adverse impact on our product margins, result of operations and cash flows. Furthermore, transition of global supply chain operations is complex, require significant resources and carry numerous risks of disruptions to the manufacture and supply of our products, delays in implementation of our transition plans and significant unanticipated costs, including exacerbation of the risks associated with our reliance upon third-party manufacturing and supply partners. Furthermore, there is no assurance that we can secure our desired rates for the manufacture and supply of our products with new supply chain partners and may face higher costs as a result. Disruptions, delays or unanticipated costs associated with the supply of our products due to our transition efforts could impair our ability to meet customer requirements, result in cancellation of orders and harm our relationships with our customers, all of which could materially impact our revenues, gross margin and result of operations. Additional risks associated with our reliance upon third-party manufacturing and supply partners are described in the below risk factors captioned *"We utilize domestic and international third-party vendors to assist in the design, development and manufacture of certain of our products, and to provide logistics services in the distribution of our products. If these vendors fail to provide these services, we could incur additional costs and delays or lose revenue"* and *"If we fail to forecast our manufacturing requirements accurately or fail to properly manage our inventory with our contract manufacturers, we could incur additional costs, experience manufacturing delays and lose revenue."*

The imposition of any additional tariffs or trade restrictions that may be implemented by the United States or other countries in connection with a global trade war, could increase the cost of our products manufactured in China or other countries, which in turn could adversely affect the demand for these products and have a material adverse effect on our business, gross margins and results of operations.

Our business is dependent on the capital spending patterns of CSPs, and any decrease or delay in capital spending by CSPs in response to economic conditions, seasonality, uncertainties associated with the implementation of regulatory reform or otherwise would reduce our revenue and harm our business.

Demand for our products depends on the magnitude and timing of capital spending by CSPs as they construct, expand, upgrade and maintain their access networks. Any future economic downturn may cause a slowdown in telecommunications industry spending, including in the specific geographies and markets in which we operate. In response to reduced consumer spending, challenging capital markets or declining liquidity trends, capital spending for network infrastructure projects of CSPs could be delayed or canceled. In addition, capital spending is cyclical in our industry, sporadic among individual CSPs and can change on short notice. As a result, we may not have visibility into changes in spending behavior until nearly the end of a given quarter.

CSP spending on network construction, maintenance, expansion and upgrades is also affected by reductions in their budgets, delays in their purchasing cycles, access to external capital (such as government grants and loan programs or the capital markets) and seasonality and delays in capital allocation decisions. For example, our CSP customers tend to spend less in the first quarter as they are still finalizing their annual budgets and in certain regions customers are also challenged by winter weather conditions that inhibit outside fiber deployment, resulting in weaker demand for our products in the first quarter of our fiscal year. Also, softness in demand across any of our customer markets, including due to macro-economic conditions beyond our control or uncertainties associated with the implementation of regulatory reform, has in the past and could in the future lead to unexpected slowdown in capital expenditures by service providers.

Many factors affecting our results of operations are beyond our control, particularly in the case of large CSP orders and network infrastructure deployments involving multiple vendors and technologies where the achievement of certain thresholds for acceptance is subject to the readiness and performance of the CSP or other providers and changes in CSP requirements or installation plans. Further, CSPs may not pursue investment for our new platforms or infrastructure upgrades that require our access systems and software. Infrastructure improvements may be delayed or prevented by a variety of factors including cost, regulatory obstacles (including uncertainties associated with the implementation of regulatory reforms), mergers, lack of consumer demand for advanced communications services and alternative approaches to service delivery. Reductions in capital expenditures by CSPs, particularly CSPs that are significant customers, may have a material negative impact on our revenue and results of operations and slow our rate of revenue growth. As a consequence, our results for a particular period may be difficult to predict, and our prior results are not necessarily indicative of results in future periods.

Government-sponsored programs and the recent U.S. federal government shutdown could impact the timing and buying patterns of CSPs, which may cause fluctuations in our operating results.

We sell to CSPs, which include U.S.-based IOCs, which have revenue that is particularly dependent upon interstate and intrastate access charges and federal and state subsidies. The FCC and some states may consider changes to such payments and subsidies, and these changes could reduce IOC revenue. Furthermore, many IOCs use or expect to use government-supported loan programs or grants, such as RUS loans and grants, to finance capital spending. These government-supported loan programs and grants generally include conditions such as deployment criteria, domestic preference provisions and other requirements that apply to the project and selected equipment as conditions for funding. Changes to the terms or administration of these programs, including uncertainty from government and administrative change, potential funding limitations that impact our ability to meet program requirements or funding delays due to the recent U.S. federal government shutdown could reduce the ability of IOCs to access capital or secure funding under government-funded programs to purchase our products and services and thus reduce our revenue opportunities.

Many of our customers were awarded grants or loans under government stimulus programs such as the Broadband Stimulus programs under the American Recovery and Reinvestment Act of 2009 and the funds distributed under the FCC's CAF program, and have purchased and will continue to purchase products from us or other suppliers while such programs and funding are available. However, customers may substantially curtail purchases as funding winds down or as planned purchases are completed.

In addition to the impact of the recent U.S. federal government shutdown, any further government shutdowns or any changes in government regulations and subsidies could cause our customers to change their purchasing decisions, which could have an adverse effect on our operating results and financial condition.

We face intense competition that could reduce our revenue and adversely affect our financial results.

The market for our products is highly competitive, and we expect competition from both established and new companies to increase. Our competitors include companies such as ADTRAN, Inc., or ADTRAN; Arris Group, Inc. (being acquired by CommScope Inc.); Casa Systems; Ciena Corporation; Cisco Systems Inc.; DASAN Zhone Solutions, Inc.; Huawei Technologies Co. Ltd.; Juniper Networks Inc.; Nokia Corporation and ZTE Corporation, among others.

Our ability to compete successfully depends on a number of factors, including:

- the successful development of new products;
- our ability to anticipate CSP and market requirements and changes in technology and industry standards;
- our ability to differentiate our products from our competitors' offerings based on performance, cost-effectiveness or other factors;
- our ongoing ability to successfully integrate acquired product lines and customer bases into our business;
- our ability to meet increased customer demand for professional services associated with network improvement projects;
- our ability to gain customer acceptance of our products; and
- our ability to market and sell our products.

The broadband access equipment market has undergone and continues to undergo consolidation, as participants have merged, made acquisitions or entered into partnerships or other strategic relationships with one another to offer more comprehensive solutions than they individually had offered. Examples include Arris' acquisition of Pace plc in January 2016; Nokia's acquisition of Alcatel-Lucent in January 2016; the merger of DASAN Zhone Solutions with DASAN Network Solutions in September 2016; and CommScope's acquisition of Arris that is expected to close in the first half of 2019. We expect this trend to continue as companies attempt to strengthen or maintain their market positions in an evolving industry.

Many of our current or potential competitors have longer operating histories, greater name recognition, larger customer bases and significantly greater financial, technical, sales, marketing and other resources than we do and are better positioned to acquire and offer complementary products and services. Many of our competitors have broader product lines and can offer bundled solutions, which may appeal to certain customers. Our competitors may also invest additional resources in developing more compelling product offerings. Potential customers may also prefer to purchase from their existing suppliers rather than a new supplier, regardless of product performance or features, because the products that we and our competitors offer require a substantial investment of time and funds to qualify and install.

Some of our competitors may offer substantial discounts or rebates to win new customers or to retain existing customers. If we are forced to reduce prices in order to secure customers, we may be unable to sustain gross margin at desired levels or achieve profitability. Competitive pressures could result in increased pricing pressure, reduced profit margin, increased sales and marketing expenses and failure to increase, or the loss of, market share, any of which could reduce our revenue and adversely affect our financial results.

An increase in revenue mix towards services will adversely affect our gross margin.

In response to greater customer demand for certain professional and support services for our products, we continue to invest and grow our services business. Our services include professional services associated with turnkey network improvement projects, product support services, managed services to help our customers manage and optimize their networks and education and certification services, all of which typically have a lower gross margin than product purchases. For example, revenue recognized from turnkey network improvement projects whereby we supply products and related professional services such as network planning, product installation, testing and network turn up may be delayed because of the timing of completion and acceptance of a project or milestone, including third-party delays that may be outside our control. We also rely upon third-party subcontractors to assist with some of our professional and support services projects, which generally result in higher costs and increased risk of cost overruns, which can negatively impact our gross margin. Moreover, if we are unable to achieve desired efficiencies and scale as we ramp and develop our services business, we may incur higher than expected costs, which can further adversely impact our gross margin.

Product development is costly, and if we fail to develop new products or enhancements that meet changing CSP requirements, we could experience lower sales.

Our industry is characterized by rapid technological advances, frequent new product introductions, evolving industry standards and unanticipated changes in subscriber requirements. Our future success will depend significantly on our ability to anticipate and adapt to such changes, and to offer, on a timely and cost-effective basis, products and features that meet changing CSP demands and industry standards. We intend to continue to invest in developing new products and enhancing the functionality of our platforms, including to reach a broader set of customers. Developing our products is expensive and complex and involves uncertainties, including pricing risks from sourcing sufficient quantities of custom components from limited suppliers on terms which may not be commercially acceptable for us. We may not have sufficient resources to successfully manage lengthy product development cycles. Our research and development expenses were $90.0 million, or 20% of our revenue, in 2018, $127.5 million, or 25% of our revenue, in 2017 and $106.9 million, or 23% of our revenue, in 2016. We believe that we must continue to dedicate a significant amount of resources to our research and development efforts, including increased reliance on third-party development partners, to maintain our competitive position. These investments may take several years to generate positive returns, if ever. In addition, we may experience design, manufacturing, marketing and other difficulties that could delay or prevent the development, introduction or marketing of new products and enhancements. If we fail to meet our development targets, demand for our products will decline.

In addition, the introduction of new or enhanced products also requires that we manage the transition from older products to these new or enhanced products in order to minimize disruption in customer ordering patterns, fulfill ongoing customer commitments and ensure that adequate supplies of new products are available for delivery to meet anticipated customer demand. If we fail to maintain compatibility with other software or equipment found in our customers' existing and planned networks, we may face substantially reduced demand for our products, which would reduce our revenue opportunities and market share. Moreover, as customers complete infrastructure deployments, they may require greater levels of service and support than we have provided in the past. We may not be able to provide products, services and support to compete effectively for these market opportunities. If we are unable to anticipate and develop new products or enhancements to our existing products on a timely and cost-effective basis, we could experience lower sales, which would harm our business.

Our new products are early in their life cycles and subject to uncertain market demand. If our customers are unwilling to install our new products or deploy our new services, or we are unable to achieve market acceptance of our new products, our business and financial results will be harmed.

Our new products are early in their life cycles and subject to uncertain market demand. They also may face obstacles in manufacturing, deployment and competitive response. Potential customers may choose not to invest the additional capital required for initial system deployment of new products. In addition, demand for new products is dependent on the success of our customers in deploying and selling advanced services to their subscribers. Our products support a variety of advanced broadband services, such as high-speed Internet, Internet protocol television, mobile broadband, high-definition video and online gaming. If we are unable to ramp sales of our new products, or if subscriber demand for our services does not grow as expected or declines, or our customers are unable or unwilling to deploy and market these services, demand for our products may decrease or fail to grow at rates we anticipate.

Our customer base is concentrated, and there are a limited number of potential customers for our products. The loss of any of our key customers, a decrease in purchases by our key customers, pricing pressures or our inability to grow our customer base would adversely impact our revenue and results of operations and any delays in payment by a key customer could negatively impact our cash flows and working capital.

Historically, a large portion of our sales has been to a limited number of customers. For example, one customer accounted for 18% of our revenue in 2018, 31% of our revenue in 2017 and 21% of our revenue in 2016, and another customer accounted for 15% of our revenue in 2016. However, we cannot anticipate the level of purchases in the future by these customers. Customer purchases may be delayed or impacted due to financial difficulties, spending cuts or corporate consolidations. For example, one of our large customers completed a large acquisition at the end of 2017, which continues to disrupt its normal expenditure plans, including prolonged delays and reduction in purchases of our products and services as it continues to finalize its transition activities and corporate strategies. We have experienced and expect to continue to experience delays or declines in purchases by certain CSPs due to deterioration and weakness in their financial condition. For example, Windstream, another one of our larger customers, recently filed a voluntary petition for relief under Chapter 11 of the U.S. Bankruptcy Code after it was found in default of certain debt instruments. Any decrease or delay in purchases and/or capital expenditure plans of any of our key customers, or our inability to grow our sales with existing customers, may have a material negative impact on our revenue and results of operations.

We anticipate that a large portion of our revenue will continue to depend on sales to a limited number of customers. In addition, some larger customers may demand discounts and rebates or desire to purchase their access systems and software from multiple providers. As a result of these factors, our future revenue opportunities may be limited, and we may face pricing pressures, which in turn could adversely impact our margins and our profitability. The loss of, reduction in or pricing discounts associated with, orders from any key customer would significantly reduce our revenue and harm our business. Furthermore, delays in payment and/or extended payment terms from any of our key or larger customers could have a material negative impact on our cash flows and working capital to support our business operations.

Furthermore, in recent years, the CSP market has undergone substantial consolidation. Industry consolidation generally has negative implications for equipment suppliers, including a reduction in the number of potential customers, a decrease in aggregate capital spending and greater pricing leverage on the part of CSPs over equipment suppliers. Continued consolidation of the CSP industry and among ILEC and IOC customers, who represent a large part of our business, could make it more difficult for us to grow our customer base, increase sales of our products and maintain adequate gross margin.

Our sales cycles can be long and unpredictable, and our sales efforts require considerable time and expense. As a result, our sales are difficult to predict and may vary substantially from quarter to quarter, which may cause our operating results to fluctuate significantly.

The timing of our revenue is difficult to predict. Our sales efforts often involve educating CSPs about the use and benefits of our products. CSPs typically undertake a significant evaluation process, which frequently involves not only our products but also those of our competitors and results in a lengthy sales cycle. Sales cycles for larger customers are relatively longer and require considerably more time and expense. We spend substantial time, effort and money in our sales efforts without any assurance that our efforts will produce sales. In addition, product purchases are frequently subject to budget constraints, multiple approvals and unplanned administrative, processing and other delays. The timing of revenue related to sales of products and services that have installation requirements may be difficult to predict due to interdependencies that may be beyond our control, such as CSP testing and turn-up protocols or other vendors' products, services or installations of equipment upon which our products and services rely. Such delays may result in fluctuations in our quarterly revenue. If sales expected from a specific customer for a particular quarter are not realized in that quarter or at all, we may not achieve our revenue forecasts and our financial results would be adversely affected.

Our focus on CSPs with relatively small networks limits our revenue from sales to any one customer and makes our future operating results difficult to predict.

A large portion of our sales efforts continue to be focused on CSPs with relatively small networks, cable MSOs and selected international CSPs. Our current and potential customers generally operate small networks with limited capital expenditure budgets. Accordingly, we believe the potential revenue from the sale of our products to any one of these customers is limited. As a result, we must identify and sell products to new customers each quarter to continue to increase our sales. In addition, the spending patterns of many of our customers are characterized by small and sporadic purchases. As a consequence, we have limited backlog and will likely continue to have limited visibility into future operating results.

We do not have long-term, committed-volume purchase contracts with our customers, and therefore have no guarantee of future revenue from any customer.

We typically have not entered into long-term, committed-volume purchase contracts with our customers, including our key customers which account for a material portion of our revenue. As a result, any of our customers may cease to purchase our products at any time. In addition, our customers may attempt to renegotiate terms of sale, including price and quantity. If any of our key customers stop purchasing our access platforms, systems and software for any reason, our business and results of operations would be harmed.

Our efforts to increase our sales to CSPs globally, including cable MSOs, may be unsuccessful.

Our sales and marketing efforts have been focused on CSPs in North America. Part of our long-term strategy is to increase sales to CSPs globally, including cable MSOs. We have devoted and continue to devote substantial technical, marketing and sales resources to these larger CSPs, who have lengthy equipment qualification and sales cycles, without any assurance of generating sales. In particular, sales to these larger CSPs may require us to upgrade our products to meet more stringent performance criteria and interoperability requirements, develop new customer-specific features or adapt our products to meet international standards. Implementing these requirements and features is costly and could negatively impact our operating results, financial condition and cash flows. Moreover, if we are unable to obtain materials at favorable costs, our margins and profitability could be adversely impacted. For example, we work with large CSPs in testing and laboratory trials for our NG-PON2 technology and MSO applications. We have invested and expect to continue to invest considerable time, effort and expenditures, including investment in product research and development, related to these opportunities without any assurance that our efforts will produce orders or revenue. If we are unable to successfully increase our sales to larger CSPs, our operating results, financial condition, cash flows and long-term growth may be negatively impacted.

We are exposed to the credit risks of our customers; if we have inadequately assessed their creditworthiness, we may have more exposure to accounts receivable risk than we anticipate. Failure to collect our accounts receivable in amounts that we anticipate could adversely affect our operating results and financial condition.

In the course of our sales to customers, we may encounter difficulty collecting accounts receivable and could be exposed to risks associated with uncollectible accounts receivable. We maintain an allowance for doubtful accounts for estimated losses resulting from the inability or unwillingness of our customers to make required payments. However, these allowances are based on our judgment and a variety of factors and assumptions.

We perform credit evaluations of our customers' financial condition. However, our evaluation of the creditworthiness of customers may not be accurate if they do not provide us with timely and accurate financial information, or if their situations change after we evaluate their credit. While we attempt to monitor these situations carefully, adjust our allowances for doubtful accounts as appropriate and take measures to collect accounts receivable balances, we have written down accounts receivable and written off doubtful accounts in prior periods and may be unable to avoid additional write-downs or write-offs of doubtful accounts in the future. Such write-downs or write-offs could negatively affect our operating results for the period in which they occur and could harm our financial condition.

Our products must interoperate with many software applications and hardware products found in our customers' networks. If we are unable to ensure that our products interoperate properly, our business will be harmed.

Our products must interoperate with our customers' existing and planned networks, which often have varied and complex specifications, utilize multiple protocol standards, include software applications and products from multiple vendors and contain multiple generations of products that have been added over time. As a result, we must continually ensure that our products interoperate properly with these existing and planned networks. To meet these requirements, we must undertake development efforts that require substantial capital investment and employee resources. We may not accomplish these development goals quickly or cost-effectively, if at all. If we fail to maintain compatibility with other software or equipment found in our customers' existing and planned networks, we may face substantially reduced demand for our products, which would reduce our revenue opportunities and market share.

We have entered into interoperability arrangements with a number of equipment and software vendors for the use or integration of their technology with our products. These arrangements give us access to and enable interoperability with various products that we do not otherwise offer. If these relationships fail, we may have to devote substantially more resources to the development of alternative products and processes and our efforts may not be as effective as the combined solutions under our current arrangements. In some cases, these other vendors are either companies that we compete with directly or companies that have extensive relationships with our existing and potential customers and may have influence over the purchasing decisions of those customers. Some of our competitors have stronger relationships with some of our existing and other potential interoperability partners, and as a result, our ability to have successful interoperability arrangements with these companies may be harmed. Our failure to establish or maintain key relationships with third-party equipment and software vendors may harm our ability to successfully sell and market our products.

The quality of our support and services offerings is important to our customers, and if we fail to continue to offer high quality support and services, we could lose customers, which would harm our business.

Once our products are deployed within our customers' networks, they depend on our support organization to resolve any issues relating to those products. A high level of support is critical for the successful marketing and sale of our products. Furthermore, our services to customers have increasingly broadened to include network design and services to deploy our products within our customers' networks, such as our professional services associated with turnkey network improvement projects for our customers. If we do not effectively assist our customers in deploying our products, succeed in helping them quickly resolve post-deployment issues or provide effective ongoing support, it could adversely affect our ability to sell our products to existing customers and harm our reputation with potential new customers. As a result, our failure to maintain high quality support and services could result in the loss of customers, which would harm our business.

Our products are highly technical and may contain undetected hardware defects or software bugs, which could harm our reputation and adversely affect our business.

Our products, including our cloud and software platforms and systems, are highly technical and, when deployed, are critical to the operation of many networks. Our products have contained and may contain undetected defects, bugs or security vulnerabilities, which risks may be exacerbated as we continue to expand our cloud and software portfolio. Some defects in our products may only be discovered after a product has been installed and used by customers and may in some cases only be detected under certain circumstances or after extended use. Any errors, bugs, defects or security vulnerabilities discovered in our products after commercial release could result in loss of revenue or delay in revenue recognition, loss of customers and increased service and warranty and retrofit costs, any of which could adversely affect our business, operating results and financial condition. In addition, we could face claims for product liability, tort or breach of warranty. Our contracts with customers contain provisions relating to warranty disclaimers and liability limitations, which may not be upheld. Defending a lawsuit, regardless of its merit, is costly and may divert management's attention and adversely affect the market's perception of us and our products. In addition, if our business liability insurance coverage proves inadequate or future coverage is unavailable on acceptable terms or at all, our business, operating results and financial condition could be adversely impacted.

Privacy concerns relating to our products and services could affect our business practices, damage our reputation and deter customers from purchasing our products and services.

Government and regulatory authorities in the United States and around the world have implemented and are continuing to implement broader and more stringent laws and regulations concerning data protection. For example, in July 2016, the European Commission adopted the EU-U.S. Privacy Shield to replace Safe Harbor as a compliance mechanism for the transfer of personal data from the European Union to the United States. In addition, the General Data Protection Regulation adopted by the EU Parliament became effective in May 2018 to harmonize data privacy laws across Europe. Among other requirements, the GDPR imposes specific duties and requirements upon companies that collect, process or control personal data of EU residents. Although we currently do not have material operations or business in the EU, the GDPR regulations could cause us to incur substantial costs in order to expand our business or deliver certain services in the EU. Furthermore, the GDPR imposes penalties for noncompliance of up to the greater of €20 million or 4% of a company's worldwide revenue; accordingly, any non-compliance with the GDPR could result in a material adverse effect on our business, financial condition and results of operations. Similarly, in June 2018, California passed the California Consumer Privacy Act which provides new data privacy rights for consumers and new operational requirements for companies effective in 2020. The interpretation and application of these data protection laws and regulations are often uncertain and in flux, and it is possible that they may be interpreted and applied in a manner that is inconsistent with our data practices. Complying with emerging and changing laws could cause us to incur substantial costs or require us to change our business practices in a manner adverse to our business.

Concerns about or regulatory actions involving our practices with regard to the collection, use, disclosure, or security of customer information or other privacy related matters, even if unfounded, could damage our reputation and adversely affect operating results. While we strive to provide transparency about our collection, use, disclosure and security over any personal data and to comply with all applicable data protection laws and regulations, the failure or perceived failure to comply may result in inquiries and other proceedings or actions against us by government entities or others, or could cause us to lose customers, which could potentially have an adverse effect on our business.

We are subject to cybersecurity and privacy risks.

Our information systems and data centers (including third-party data centers) contain sensitive information that help us operate our business efficiently, interface with and provide software solutions to customers, maintain financial accuracy and accurately produce our financial statements. In addition, we host sensitive data in data centers, including subscriber data, in the course of providing services and solutions to customers. Malicious hackers may attempt to gain access to our network or data centers; steal proprietary information related to our business, products, employees, and customers; or interrupt our systems and services or those of our customers or others. The theft, loss, or misuse of personal data collected, used, stored or transferred by us to run our business could result in significantly increased security and remediation costs or costs related to defending legal claims. If we do not allocate and effectively manage the resources necessary to build and sustain the proper technology infrastructure, we could be subject to cyberattacks, transaction errors, processing inefficiencies, the loss of customers, business disruptions or the loss of or damage to intellectual property through security breaches. If our data management systems, including those of our third-party data centers, do not effectively and securely collect, store, process and report relevant data for the operation of our business, whether due to cyberattacks, equipment malfunction or constraints, software deficiencies or human error, our ability to effectively plan, forecast and execute our business plan and comply with laws and regulations will be impaired, perhaps materially. Any such impairment could materially and adversely affect our financial condition, results of operations, cash flows, the timeliness with which we internally and externally report our operating results and our business and reputation.

While we have applied multiple layers of security to control access to our information technology systems and use encryption and authentication technologies to secure the transmission and storage of data, these security measures may be compromised as a result of third-party security breaches, employee error, malfeasance, faulty password management or other irregularity, and result in persons obtaining unauthorized access to our data or accounts. Third parties may attempt to fraudulently induce employees into disclosing user names, passwords or other sensitive information, which may in turn be used to access our information technology systems.

While we seek to apply best practice policies and devote significant resources to network security, data encryption and other security measures to protect our information technology and communications systems and data, these security measures cannot provide absolute security. We or our third-party hosting providers may experience a system breach and be unable to protect sensitive data. The costs to us to eliminate or alleviate network security problems, bugs, viruses, worms, malicious software programs and security vulnerabilities could be significant, and our efforts to address these problems may not be successful and could result in unexpected interruptions, delays and cessation of service which may harm our business operations.

Although our systems have been designed around industry-standard architectures to reduce downtime in the event of outages or catastrophic occurrences, they remain vulnerable to damage or interruption from earthquakes, floods, fires, power loss, telecommunication failures, terrorist attacks, cyberattacks, viruses, denial-of-service attacks, human error, hardware or software defects or malfunctions, and similar events or disruptions. Some of our systems are not fully redundant, and our disaster recovery planning is not sufficient for all eventualities. Our systems are also subject to break-ins, sabotage and intentional acts of vandalism. Despite any precautions we may take, the occurrence of a natural disaster, a decision by any of our third-party hosting providers to close a facility we use without adequate notice for financial or other reasons, a data breach or other unanticipated problems at our hosting facilities could cause system interruptions and delays which may result in loss of critical data and lengthy interruptions in our services.

Our estimates regarding future warranty or product obligations may change due to product failure rates, shipment volumes, field service obligations and rework costs incurred in correcting product failures. If our estimates change, the liability for warranty or product obligations may be increased, impacting future cost of revenue.

Our products are highly complex, and our product development, manufacturing and integration testing may not be adequate to detect all defects, errors, failures and quality issues. Quality or performance problems for products covered under warranty could adversely impact our reputation and negatively affect our operating results and financial position. The development and production of new products with high complexity often involves problems with software, components and manufacturing methods. If significant warranty or other product obligations arise due to reliability or quality issues arising from defects in software, faulty components or improper manufacturing methods, our operating results and financial position could be negatively impacted by:

- cost associated with fixing software or hardware defects;
- high service and warranty expenses;
- high inventory obsolescence expense;
- delays in collecting accounts receivable;
- payment of liquidated damages for performance failures; and
- declining sales to existing customers.

We do not have manufacturing capabilities, and therefore we depend upon a small number of CMs and ODMs. We do not have supply contracts with all of these CMs and ODMs. Consequently, our operations could be disrupted if we encounter problems with any of these CMs or ODMs.

We do not have internal manufacturing capabilities and rely upon a small number of CMs and ODMs to build our products. Our reliance on a small number of CMs and ODMs makes us vulnerable to possible capacity constraints and reduced control over component availability, delivery schedules, manufacturing yields and costs.

We do not have supply contracts with some of our CMs and ODMs. Consequently, these CMs are not obligated to supply products to us for any specific period, in any specific quantity or at any certain price. In addition, we are dependent upon our CMs' and ODMs' quality systems and controls and the adherence of such systems and controls to applicable standards. If our CMs and ODMs fail to maintain levels of quality manufacture suitable for us or our customers, we may incur higher costs and our relationships with our customers may be harmed.

The revenue that our CMs generate from our orders represent a relatively small percentage of their overall revenue. As a result, fulfilling our orders may not be considered a priority if such manufacturers are constrained in their ability to fulfill all of their customer obligations in a timely manner. In addition, a substantial part of our manufacturing is done in our CM's and ODM's facilities that are located outside of the United States. We believe that the location of these facilities outside of the United States increases supply risk, including the risk of supply interruptions or reductions in manufacturing quality or controls. Moreover, regulatory changes or government actions relating to export or import regulations, economic sanctions or related legislation, or the possibility of such changes or actions, may create uncertainty or result in changes to or disruption in our operations with our CMs. Additional risks associated with the transition of our supply chain operations to mitigate the impact of substantial tariffs are described in the below risk factor captioned *"Substantially all of the products we currently sell in the United States are manufactured in China. The imposition by the federal government of tariffs on goods imported from China has significantly increased the cost of our products manufactured in China and imported into the United States which may have a material adverse effect on our business, gross margins and results of operations."*

If any of our CMs or ODMs were unable or unwilling to continue manufacturing our products in required volumes and at high quality levels, we would have to identify, qualify and select acceptable alternative contract manufacturers. An alternative CM may not be available to us when needed or may not be in a position to satisfy our production requirements at commercially reasonable prices and quality. Any significant interruption in manufacturing would require us to reduce our supply of products to our customers, which in turn would reduce our revenue and harm our relationships with our customers.

We and our business partners, including our CMs and suppliers, depend on sole-source, single-source and limited-source suppliers for some key components. If we and our business partners are unable to source these components on a timely or cost-effective basis, we will not be able to deliver our products to our customers.

We and our business partners, including our CMs and suppliers, depend on sole-source, single-source and limited-source suppliers for some key components of our products. For example, certain of our application-specific integrated circuit processors and resistor networks are purchased from sole-source suppliers.

Any of the sole-source, single-source and limited-source suppliers upon whom we or our business partners rely could stop producing our components, cease operations, or enter into exclusive arrangements with our competitors. We may also experience shortages or delay of critical components as a result of growing demand in the industry or other sectors. For example, growth in electronic and IoT devices, wireless products, automotive electronics and artificial intelligence all drive increased demand for certain components, such as chipsets and memory products, which may result in lower availability and increased prices for such components. The cost of components may also be impacted by regulatory requirements.

In addition, purchase volumes of such components may be too low for Calix to be considered a priority customer by these suppliers, and we may not be able to negotiate commercially reasonable terms for our business needs. As a result, these suppliers could stop selling to us and our business partners at commercially reasonable prices, or at all. Any such interruption or delay may force us and our business partners to seek similar components from alternative sources, which may not be available, or result in higher than anticipated prices for such components. Switching suppliers could also require that we redesign our products to accommodate new components and could require us to re-qualify our products with our customers, which would be costly and time consuming. Any interruption in the supply of sole-source, single-source or limited-source components for our products would adversely affect our ability to meet scheduled product deliveries to our customers, could result in lost revenue or higher expenses and would harm our business.

We utilize domestic and international third-party vendors to assist in the design, development and manufacture of certain of our products, and to provide logistics services in the distribution of our products. If these vendors fail to provide these services, we could incur additional costs and delays or lose revenue.

From time to time we enter into ODM and development agreements for the design, development and/or manufacture of certain of our products in order to enable us to offer products on an accelerated basis. For example, a third party assisted in the design and currently manufactures portions of our E-Series systems and nodes family. We also rely upon limited third party vendors for logistics services to distribute our products. If any of these third-party vendors stop providing their services, for any reason, we would have to obtain similar services from alternative sources, which may not be available on commercially reasonable terms, if at all. We also have limited control over disruptions that may occur at the facilities of these third-party partners, such as supply interruptions or manufacturing quality that may occur at ODM facilities and strikes or systems failures that may interrupt transportation and logistics services. In addition, switching development firms or manufacturers could require us to extend our development timeline and/or re-qualify our products with our customers, which would also be costly and time-consuming. Any interruption in the development, supply or distribution of our products would adversely affect our ability to meet scheduled product deliveries to our customers and could result in lost revenue or higher costs, which would negatively impact our margins and operating results and harm our business.

If we fail to forecast our manufacturing requirements accurately or fail to properly manage our inventory with our contract manufacturers, we could incur additional costs, experience manufacturing delays and lose revenue.

We bear inventory risk under our CM arrangements and our ODM agreements. Lead times for the materials and components that we order through our manufacturers vary significantly and depend on numerous factors, including the specific supplier, contract terms and market demand for a component at a given time. Lead times for certain key materials and components incorporated into our products are currently lengthy, requiring our manufacturers to order materials and components several months in advance of manufacture.

If we overestimate our production requirements, our manufacturers may purchase excess components and build excess inventory. If our manufacturers, at our request, purchase excess components that are unique to our products or build excess products, we could be required to pay for these excess parts or products and their storage costs. Historically, we have reimbursed our primary contract manufacturers for a portion of inventory purchases when our inventory has been rendered excess or obsolete. Examples of when inventory may be rendered excess or obsolete include manufacturing and engineering change orders resulting from design changes or in cases where inventory levels greatly exceed projected demand. If we incur payments to our manufacturers associated with excess or obsolete inventory, this may have an adverse effect on our gross margins, financial condition and results of operations.

We have experienced unanticipated increases in demand from customers, which resulted in delayed shipments and variable shipping patterns. If we underestimate our product requirements, our manufacturers may have inadequate component inventory, which could interrupt manufacturing of our products, increase our cost of product revenue associated with expedite fees and air freight and/or result in delays or cancellation of sales.

As the market for our products evolves, changing customer requirements may adversely affect the valuation of our inventory.

Customer demand for our products can change rapidly in response to market and technology developments. Demand can be affected not only by customer- or market-specific issues, but also by broader economic and/or geopolitical factors. We may, from time to time, adjust inventory valuations downward in response to our assessment of demand from our customers for specific products or product lines. The related excess inventory charges may have an adverse effect on our gross margin, financial condition and results of operations.

If we fail to comply with evolving industry standards, sales of our existing and future products would be adversely affected.

The markets for our products are characterized by a significant number of standards, both domestic and international, which are evolving as new technologies are developed and deployed. As we expand into adjacent markets and increase our international footprint, we are likely to encounter additional standards. Our products must comply with these standards in order to be widely marketable. In some cases, we are compelled to obtain certifications or authorizations before our products can be introduced, marketed or sold in new markets or to customers that we have not historically served. For example, our ability to maintain Operations System Modification for Intelligent Network Elements certification for our products will affect our ongoing ability to continue to sell our products to Tier 1 CSPs.

In addition, our ability to expand our international operations and create international market demand for our products may be limited by regulations or standards adopted by other countries that may require us to redesign our existing products or develop new products suitable for sale in those countries. Although we believe our products are currently in compliance with domestic and international standards and regulations in countries in which we currently sell, we may not be able to design our products to comply with evolving standards and regulations in the future. This ongoing evolution of standards may directly affect our ability to market or sell our products. Further, the cost of complying with the evolving standards and regulations or the failure to obtain timely domestic or foreign regulatory approvals or certification could prevent us from selling our products where these standards or regulations apply, which would result in lower revenue and lost market share.

We may be unable to successfully expand our international operations. In addition, we may be subject to a variety of international risks that could harm our business.

We currently generate most of our sales from customers in North America and have more limited experience marketing, selling and supporting our products and services outside North America or managing the administrative aspects of a worldwide operation. Our ability to expand our international operations is dependent on our ability to create or maintain international market demand for our products. In addition, as we expand our operations internationally, our support organization will face additional challenges including those associated with delivering support, training and documentation in languages other than English. If we invest substantial time and resources to expand our international operations and are unable to do so successfully and in a timely manner, our business, financial condition and results of operations may suffer.

In the course of expanding our international operations and operating overseas, we will be subject to a variety of risks, including:

- differing regulatory requirements, including tax laws, trade laws, data privacy laws, labor regulations, tariffs, export quotas, custom duties or other trade restrictions;
- liability or damage to our reputation resulting from corruption or unethical business practices in some countries;
- exposure to effects of fluctuations in currency exchange rates if, over time, international customer contracts are increasingly denominated in local currencies;
- longer collection periods and difficulties in collecting accounts receivable;
- greater difficulty supporting and localizing our products;
- different or unique competitive pressures as a result of, among other things, the presence of local equipment suppliers;
- challenges inherent in efficiently managing an increased number of employees over large geographic distances, including the need to implement appropriate systems, policies and compensation, benefits and compliance programs;
- limited or unfavorable intellectual property protection;
- risk of change in international political or economic conditions, terrorist attacks or acts of war; and
- restrictions on the repatriation of earnings.

We engage resellers to promote, sell, install and support our products to some customers in North America and internationally. Their failure to do so or our inability to recruit or retain appropriate resellers may reduce our sales and thus harm our business.

We engage some value-added resellers, or VARs, who provide sales and support services for our products. We compete with other telecommunications systems providers for our VARs' business and many of our VARs are free to market competing products. Our use of VARs and other third-party support partners and the associated risks of doing so are likely to increase as we expand sales outside of North America. If a VAR promotes a competitor's products to the detriment of our products or otherwise fails to market our products and services effectively, we could lose market share. In addition, the loss of a key VAR or the failure of VARs to provide adequate customer service could have a negative effect on customer satisfaction and could cause harm to our business. If we do not properly recruit and train VARs to sell, install and service our products, our business, financial condition and results of operations may suffer.

The results of the United Kingdom's referendum on withdrawal from the European Union may have a negative effect on global economic conditions, financial markets and our business.

In June 2016, a majority of voters in the United Kingdom elected to withdraw from the European Union in a national referendum, commonly referred to as Brexit. In March 2017, the United Kingdom began the process to exit the European Union, with the terms of the withdrawal subject to a negotiation period anticipated to last at least two years. In January 2019, the EU Parliament rejected a bill proposed by the United Kingdom's prime minister outlining the terms of the United Kingdom's withdrawal, resulting in further uncertainty associated with Brexit. The referendum has created significant uncertainty about the future relationship between the United Kingdom and the European Union, including with respect to the laws and regulations that will apply as the United Kingdom determines which European Union laws to replace or replicate in the event of a withdrawal. The referendum has also given rise to calls for the governments of other European Union member states to consider withdrawal. These developments, or the perception that any of them could occur, have had and may continue to have a material adverse effect on global economic conditions and the stability of global financial markets, and may significantly reduce global market liquidity and restrict the ability of key market participants to operate in certain financial markets. Any of these factors could depress economic activity and restrict our access to capital, or the access to capital of our customers or partners, which could have a material adverse effect on our operations in the United Kingdom, and generally on our business, financial condition and results of operations and reduce the price of our securities.

We may have difficulty evolving and scaling our business and operations to meet customer and market demand, which could result in lower profitability or cause us to fail to execute on our business strategies.

In order to grow our business, we will need to continually evolve and scale our business and operations to meet customer and market demand. Evolving and scaling our business and operations places increased demands on our management as well as our financial and operational resources to effectively:

- manage organizational change;
- manage a larger organization;
- accelerate and/or refocus research and development activities;
- expand our manufacturing, supply chain and distribution capacity;
- increase our sales and marketing efforts;
- broaden our customer-support and services capabilities;
- maintain or increase operational efficiencies;
- scale support operations in a cost-effective manner;
- implement appropriate operational and financial systems; and
- maintain effective financial disclosure controls and procedures.

If we cannot evolve and scale our business and operations effectively, we may not be able to execute our business strategies in a cost-effective manner and our business, financial condition, profitability and results of operations could be adversely affected.

We may not be able to protect our intellectual property, which could impair our ability to compete effectively.

We depend on certain proprietary technology for our success and ability to compete. We rely on intellectual property laws as well as nondisclosure agreements, licensing arrangements and confidentiality provisions to establish and protect our proprietary rights. U.S. patent, copyright and trade secret laws afford us only limited protection, and the laws of some foreign countries do not protect proprietary rights to the same extent. Our pending patent applications may not result in issued patents, and our issued patents may not be enforceable. Any infringement of our proprietary rights could result in significant litigation costs. Further, any failure by us to adequately protect our proprietary rights could result in our competitors offering similar products, resulting in the loss of our competitive advantage and decreased sales.

It may become more difficult to adequately protect our intellectual property as we expand our reliance on third parties for the design, development and/or manufacture of our products. While our contracts with such third parties contain provisions relating to intellectual property rights, indemnification and liability, they may not be adequately enforced. Our third-party providers may also be subject to unauthorized third-party copying or use of our proprietary rights.

Despite our efforts to protect our proprietary rights, attempts may be made to copy or reverse engineer aspects of our products or to obtain and use information that we regard as proprietary. Accordingly, we may be unable to protect our proprietary rights against unauthorized third-party copying or use. Furthermore, policing the unauthorized use of our intellectual property is difficult and costly. Litigation may be necessary in the future to enforce our intellectual property rights, to protect our trade secrets or to determine the validity and scope of the proprietary rights of others. Litigation could result in substantial costs, diversion of resources and harm to our business.

We could become subject to litigation regarding intellectual property rights that could harm our business.

We may be subject to intellectual property infringement claims that are costly to defend and could limit our ability to use some technologies in the future. The risk of such claims could increase as we expand our product portfolio and increasingly rely on more technologies. Third parties may assert patent, copyright, trademark or other intellectual property rights to technologies or rights that are important to our business. Such claims may originate from non-practicing entities, patent holding companies or other adverse patent owners who have no relevant product revenue, and therefore, our own issued and pending patents may provide little or no deterrence to suit from these entities.

We have received in the past and expect that in the future we may receive communications from competitors and other companies alleging that we may be infringing their patents, trade secrets or other intellectual property rights; offering licenses to such intellectual property; threatening litigation or requiring us to act as a third-party witness in litigation. In addition, we have agreed, and may in the future agree, to indemnify our customers for expenses or liabilities resulting from certain claimed infringements of patents, trademarks or copyrights of third parties. Such indemnification may require us to be financially responsible for claims made against our customers, including costs of litigation and damages awarded, which could negatively impact our results of operations. Any claims asserting that our products infringe the proprietary rights of third parties, with or without merit, could be time-consuming, result in costly litigation and divert the efforts of our engineering teams and management. These claims could also result in product shipment delays or require us to modify our products or enter into royalty or licensing agreements. Such royalty or licensing agreements, if required, may not be available to us on acceptable terms, if at all.

Our use of open source software could impose limitations on our ability to commercialize our products.

We incorporate open source software into our products. Although we closely monitor our use of open source software, the terms of many open source software licenses have not been interpreted by the courts, and there is a risk that such licenses could be construed in a manner that could impose unanticipated conditions or restrictions on our ability to sell our products. In such event, we could be required to make our proprietary software generally available to third parties, including competitors, at no cost, to seek licenses from third parties in order to continue offering our products, to re-engineer our products or to discontinue the sale of our products in the event re-engineering cannot be accomplished on a timely basis or at all, any of which could adversely affect our revenue and operating expenses.

If we or our ODMs are unable to obtain necessary third-party technology licenses, our ability to develop new products or product enhancements may be impaired.

While our current licenses of third-party technology generally relate to commercially available off-the-shelf technology, we or our ODMs may from time to time be required to license additional technology from third parties to develop new products or product enhancements. These third-party licenses may be unavailable to us or our ODMs on commercially reasonable terms, if at all. The inability to obtain necessary third-party licenses may force us to or our ODMs to obtain substitute technology of lower quality or performance standards or at greater cost or may increase the time-to-market of our products or product enhancements, any of which could harm the competitiveness of our products and result in lost revenue.

Our ability to incur debt and the use of our funds could be limited by borrowing base restrictions and restrictive covenants in our loan and security agreement for our revolving credit facility.

The Loan Agreement we entered into in August 2017 with Silicon Valley Bank, or SVB, provides for a revolving credit facility based on a customary accounts receivable borrowing base, subject to certain exceptions and exclusions, such that borrowings available to us are limited by eligible accounts receivable (as defined in the Loan Agreement). We are dependent on our existing cash, cash equivalents and borrowings available under our Loan Agreement to provide adequate funds for ongoing operations, planned capital expenditures and working capital requirements for at least the next twelve months. If our financial position deteriorates, our borrowing capacity under the credit facility may be reduced, which would adversely impact our business and growth. In addition, the Loan Agreement includes affirmative and negative covenants and requires that we maintain a specified minimum liquidity ratio and maintenance of Adjusted EBITDA (as defined in the Loan Agreement, as amended). The negative covenants also include, among others, restrictions on our and our subsidiaries' transferring collateral, making changes to the nature of our business or the business of the applicable subsidiary, incurring additional indebtedness, engaging in mergers or acquisitions, paying dividends or making other distributions, making investments, engaging in transactions with affiliates, making payments in respect of subordinated debt, creating liens and selling assets, in each case subject to certain exceptions. Failure to maintain these restrictive covenants and requirements can limit the amount of borrowings that are available to us, increase the cost of borrowings under the facility, and/or require us to make immediate payments to reduce borrowings. Since entering into the Loan Agreement, we have had to request waiver or amendment of certain financial covenants in order to avoid a default under the terms of the Loan Agreement and to maintain our ability to borrow under the Loan Agreement. For the month ended November 30, 2017, we were not able to maintain the minimum Adjusted Quick Ratio (as defined in the Loan Agreement, as amended), or AQR, at the level required in the Loan Agreement, which constituted an event of default. Although SVB waived this event of default effective as of November 30, 2017 and, therefore, this default did not terminate our ability to borrow under the Loan Agreement, we were required to pay an amendment fee and amend certain covenants under the Loan Agreement and, in February 2018, we entered into an amendment to the Loan Agreement that, among other things, amended certain affirmative financial covenants, including reductions to the required minimum level of the AQR and the inclusion of an additional financial covenant related to the maintenance of Adjusted EBITDA. In August 2018, we entered into a Second Amendment to the Loan Agreement to, among other things, provide for the extension of the maturity date of the senior secured revolving credit facility to August 7, 2020 and further amend certain financial covenants, including covenants with respect to the AQR and the Adjusted EBITDA. In February 2019, we entered into a Third Amendment to the Loan Agreement to reduce the required minimum level of the AQR for the first half of 2019 and the required minimum Adjusted EBITDA for the first fiscal quarter of 2019. Although we were compliant with the financial covenants under the Loan Agreement at December 31, 2018, we have in the past been unable to meet the financial covenants required in the Loan Agreement. Given our current financial position and history of operating losses, it is possible that we may fail to meet the minimum levels required by the financial covenants in a future period, which would constitute an event of default under the Loan Agreement. In particular, if we are unable to generate positive cash flows on a continued basis, we could fall below the minimum AQR requirement, which would constitute an event of default under the Loan Agreement. Under such circumstances we may be forced to immediately repay amounts outstanding under the Loan Agreement. Events beyond our control could have a material adverse impact on our results of operations, financial condition or liquidity, in which case we may not be able to meet our financial covenants. The Loan Agreement covenants may also affect our ability to obtain future financing and to pursue attractive business opportunities and our flexibility in planning for, and reacting to, changes in business conditions. These covenants could place us at a disadvantage compared to some of our competitors, who may have fewer restrictive covenants and may not be required to operate under these restrictions.

Our failure or the failure of our manufacturers to comply with environmental and other legal regulations could adversely impact our results of operations.

The manufacture, assembly and testing of our products may require the use of hazardous materials that are subject to environmental, health and safety regulations, or materials subject to laws restricting the use of conflict minerals. Our failure or the failure of our contract manufacturers, ODMs and OEMs to comply with any of these requirements could result in regulatory penalties, legal claims or disruption of production. In addition, our failure or the failure of our manufacturers to properly manage the use, transportation, emission, discharge, storage, recycling or disposal of hazardous materials could subject us to increased costs or liabilities. Existing and future environmental regulations and other legal requirements may restrict our use of certain materials to manufacture, assemble and test products. Any of these consequences could adversely impact our results of operations by increasing our expenses and/or requiring us to alter our manufacturing processes.

Regulatory and physical impacts of climate change and other natural events may affect our customers and our contract manufacturers, resulting in adverse effects on our operating results.

As emissions of greenhouse gases continue to alter the composition of the atmosphere, affecting large-scale weather patterns and the global climate, any new regulation of greenhouse gas emissions may result in additional costs to our customers and our contract manufacturers. In addition, the physical impacts of climate change and other natural events, including changes in weather patterns, drought, rising ocean and temperature levels, earthquakes and tsunamis may impact our customers, suppliers and contract manufacturers, and our operations. These potential physical effects may adversely affect our revenue, costs, production and delivery schedules, and cause harm to our results of operations and financial condition.

We have in the past pursued, and may in the future continue to pursue, acquisitions which involve a number of risks and uncertainties. If we are unable to address and resolve these risks and uncertainties successfully, such acquisitions could disrupt our business and result in higher costs than we anticipate.

We acquired Occam in 2011 and Ericsson's fiber access assets in 2012. We may in the future acquire other businesses, products or technologies to expand our product offerings and capabilities, customer base and business. We have evaluated and expect to continue to evaluate a wide array of potential strategic transactions. We have limited experience making such acquisitions or integrating these businesses after such acquisitions. Unanticipated costs to us from these historical transactions as well as both anticipated and unanticipated costs to us related to any future transactions could exceed amounts that are covered by insurance and could have a material adverse impact on our financial condition and results of operations. For example, the Occam acquisition resulted in litigation with defense costs that were in excess of available directors and officers liability insurance coverage, including costs for which coverage was denied by our insurance carriers. In addition, the anticipated benefit of any acquisitions may never materialize or the process of integrating acquired businesses, products or technologies may create unforeseen operating difficulties and expenditures.

Some of the areas where we have experienced and may in the future experience acquisition-related risks include:

- expenses and distractions, including diversion of management time related to litigation;
- expenses and distractions related to potential claims resulting from any possible future acquisitions, whether or not they are completed;
- retaining and integrating employees from acquired businesses;
- issuance of dilutive equity securities or incurrence of debt;
- integrating various accounting, management, information, human resource and other systems to permit effective management;
- incurring possible write-offs, impairment charges, contingent liabilities, amortization expense of intangible assets or impairment of goodwill and intangible assets with finite useful lives;
- difficulties integrating and supporting acquired products or technologies;
- unexpected capital expenditure requirements;
- insufficient revenue to offset increased expenses associated with acquisitions; and

- opportunity costs associated with committing capital to such acquisitions.

If our goodwill becomes impaired, we may be required to record a significant charge to our results of operations. We review our goodwill for impairment annually or when events or changes in circumstances indicate the carrying value may not be recoverable, such as a sustained or significant decline in stock price and market capitalization. If the carrying value of goodwill was deemed to be impaired, an impairment loss equal to the amount by which the carrying amount exceeds the estimated fair value would be recognized. Any such impairment could materially and adversely affect our financial condition and results of operations.

Foreign acquisitions would involve risks in addition to those mentioned above, including those related to integration of operations across different cultures and languages, currency risks and the particular economic, political and regulatory risks associated with specific countries. We may not be able to address these risks and uncertainties successfully, or at all, without incurring significant costs, delays or other operating problems.

Our inability to address or anticipate any of these risks and uncertainties could disrupt our business and could have a material impact on our financial condition and results of operations.

Our use of and reliance upon development resources in China may expose us to unanticipated costs or liabilities.

We operate a wholly foreign owned enterprise in Nanjing, China, where a dedicated team of engineers performs product development, quality assurance, cost reduction and other engineering work. Our reliance upon development resources in China may not enable us to achieve meaningful product cost reductions or greater resource efficiency. Further, our development efforts and other operations in China involve significant risks, including:

- difficulty hiring and retaining appropriate engineering resources due to intense competition for such resources and resulting wage inflation;
- the knowledge transfer related to our technology and exposure to misappropriation of intellectual property or confidential information, including information that is proprietary to us, our customers and third parties;
- heightened exposure to changes in the economic, security and political conditions of China;
- fluctuation in currency exchange rates and tax risks associated with international operations;
- development efforts that do not meet our requirements because of language, cultural or other differences associated with international operations, resulting in errors or delays; and
- uncertainty with regards to tariffs imposed by the federal government on products imported from China and future actions the federal government may take with respect to international trade agreements and U.S. tax provisions related to international commerce that could adversely affect our international operations.

Difficulties resulting from the factors above and other risks related to our operations in China could expose us to increased expense, impair our development efforts, harm our competitive position and damage our reputation.

Our customers are subject to government regulation, and changes in current or future laws or regulations that negatively impact our customers could harm our business.

The FCC has jurisdiction over all of our U.S. customers. FCC regulatory policies that create disincentives for investment in access network infrastructure or impact the competitive environment in which our customers operate may harm our business. For example, future FCC regulation affecting providers of broadband Internet access services could impede the penetration of our customers into certain markets or affect the prices they may charge in such markets. Similarly, changes to regulatory tariff requirements or other regulations relating to pricing or terms of carriage on communication networks could slow the development or expansion of network infrastructures. Consequently, such changes could adversely affect the sale of our products and services. Furthermore, many of our customers are subject to FCC rate regulation of interstate telecommunications services and are recipients of CAF capital incentive payments, which are intended to subsidize broadband and telecommunications services in areas that are expensive to serve. Changes to these programs, rules and regulations that could affect the ability of IOCs to access capital, and which could in turn reduce our revenue opportunities, remain possible.

In addition, many of our customers are subject to state regulation of intrastate telecommunications services, including rates for such services, and may also receive funding from state universal service funds. Changes in rate regulations or universal service funding rules, either at the U.S. federal or state level, could adversely affect our customers' revenue and capital spending plans. Moreover, various international regulatory bodies have jurisdiction over certain of our non-U.S. customers. Changes in these domestic and international standards, laws and regulations, or judgments in favor of plaintiffs in lawsuits against CSPs based on changed standards, laws and regulations could adversely affect the development of broadband networks and services. This, in turn, could directly or indirectly adversely impact the communications industry in which our customers operate.

Many jurisdictions, including international governments and regulators, are also evaluating, implementing and enforcing regulations relating to cyber security, privacy and data protection, which can affect the market and requirements for networking and communications equipment. To the extent our customers are adversely affected by laws or regulations regarding their business, products or service offerings, our business, financial condition and results of operations would suffer.

We are subject to governmental export and import controls that could subject us to liability or impair our ability to compete in additional international markets.

Our products are subject to U.S. export and trade controls and restrictions. International shipments of certain of our products may require export licenses or are subject to additional requirements for export. In addition, the import laws of other countries may limit our ability to distribute our products, or our customers' ability to buy and use our products, in those countries. Changes in our products or changes in export and import regulations or duties may create delays in the introduction of our products in international markets, prevent our customers with international operations from deploying our products or, in some cases, prevent the export or import of our products to certain countries altogether. Any change in export or import regulations, duties or related legislation, shift in approach to the enforcement or scope of existing regulations, or change in the countries, persons or technologies targeted by such regulations, could negatively impact our ability to sell, profitably or at all, our products to existing or potential international customers.

If we lose any of our key personnel, or are unable to attract, train and retain qualified personnel, our ability to manage our business and continue our growth would be negatively impacted.

Our success depends, in large part, on the continued contributions of our key management, engineering, sales and marketing personnel, many of whom are highly skilled and would be difficult to replace. None of our senior management or key technical or sales personnel are bound by a written employment contract to remain with us for a specified period. In addition, we do not currently maintain key person life insurance covering our key personnel. If we lose the services of any key personnel, our business, financial condition and results of operations may suffer.

Competition for skilled personnel, particularly those specializing in engineering and sales, is intense. We cannot be certain that we will be successful in attracting and retaining qualified personnel, or that newly hired personnel will function effectively, both individually and as a group. If we are unable to effectively recruit, hire and utilize new employees to align with our company objectives, execution of our business strategy and our ability to react to changing market conditions may be impeded, and our business, financial condition and results of operations may suffer.

Volatility or lack of performance in our stock price may also affect our ability to attract and retain our key personnel. Our executive officers and employees hold a substantial number of shares of our common stock and vested stock options. Employees may be more likely to leave us if the shares they own or the shares underlying their equity awards decline in value, or if the exercise prices of stock options that they hold are significantly above the market price of our common stock. If we are unable to retain our employees, our business, operating results and financial condition will be harmed.

If we fail to maintain proper and effective internal controls, our ability to produce accurate financial statements on a timely basis could be impaired, which would adversely affect our operating results, our ability to operate our business and our stock price.

Ensuring that we have adequate internal financial and accounting controls and procedures in place to produce accurate financial statements on a timely basis is a costly and time-consuming effort that needs to be re-evaluated frequently. We have in the past discovered, and may in the future discover, areas of our internal financial and accounting controls and procedures that need improvement.

Our management is responsible for establishing and maintaining adequate internal control over financial reporting to provide reasonable assurance regarding the reliability of our financial reporting and the preparation of financial statements for external purposes in accordance with U.S. generally accepted accounting principles. Our management does not expect that our internal control over financial reporting will prevent or detect all error and all fraud. A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud, if any, within our company will have been detected.

We are required to comply with Section 404 of the Sarbanes-Oxley Act, or SOX, which requires us to expend significant resources in developing the required documentation and testing procedures. We cannot be certain that the actions we have taken and are taking to improve our internal controls over financial reporting will be sufficient to maintain effective internal controls over financial reporting in subsequent reporting periods or that we will be able to implement our planned processes and procedures in a timely manner. In addition, new and revised accounting standards and financial reporting requirements may occur in the future and implementing changes required by new standards, requirements or laws may require a significant expenditure of our management's time, attention and resources which may adversely affect our reported financial results. If we are unable to produce accurate financial statements on a timely basis, investors could lose confidence in the reliability of our financial statements, which could cause the market price of our common stock to decline and make it more difficult for us to finance our operations and growth.

We incur significant costs as a result of operating as a public company, which may adversely affect our operating results and financial condition.

As a public company, we incur significant accounting, legal and other expenses, including costs associated with our public company reporting requirements. We also anticipate that we will continue to incur costs associated with corporate governance requirements, including requirements and rules under SOX and the Dodd-Frank Wall Street Reform and Consumer Protection Act, or Dodd-Frank, among other rules and regulations implemented by the SEC, as well as listing requirements of the New York Stock Exchange, or NYSE. Furthermore, these laws and regulations could make it difficult or costly for us to obtain certain types of insurance, including director and officer liability insurance, and we may be forced to accept reduced policy limits and coverage or incur substantially higher costs to obtain the same or similar coverage. The impact of these requirements could also make it difficult for us to attract and retain qualified persons to serve on our Board of Directors, our board committees or as executive officers.

New laws and regulations as well as changes to existing laws and regulations affecting public companies, including the provisions of SOX and the Dodd-Frank Act and rules adopted by the SEC and the NYSE, would likely result in increased costs to us as we respond to their requirements. We continue to invest resources to comply with evolving laws and regulations, and this investment may result in increased general and administrative expense.

Risks Related to Ownership of Our Common Stock

Our stock price may continue to be volatile, and the value of an investment in our common stock may decline.

The trading price of our common stock has been, and is likely to continue to be, volatile, which means that it could decline substantially within a short period of time and could fluctuate widely in response to various factors, some of which are beyond our control. These factors include those discussed in the "Risk Factors" section of this Annual Report on Form 10-K and others such as:

- quarterly variations in our results of operations or those of our competitors;
- failure to meet any guidance that we have previously provided regarding our anticipated results;
- changes in earnings estimates or recommendations by securities analysts;
- failure to meet securities analysts' estimates;
- announcements by us or our competitors of new products, significant contracts, commercial relationships, acquisitions or capital commitments;
- developments with respect to intellectual property rights;
- our ability to develop and market new and enhanced products on a timely basis;
- our commencement of, or involvement in, litigation and developments relating to such litigation;
- changes in governmental regulations; and
- a slowdown in the communications industry or the general economy.

In recent years, the stock market in general, and the market for technology companies in particular, has experienced extreme price and volume fluctuations that have often been unrelated or disproportionate to the operating performance of those companies. Broad market and industry factors may seriously affect the market price of our common stock, regardless of our actual operating performance. In addition, in the past, following periods of volatility in the overall market and the market price of a particular company's securities, securities class action litigation has often been instituted against these companies. This litigation, if instituted against us, could result in substantial costs and a diversion of our management's attention and resources.

If securities or industry analysts do not publish research or reports about our business or if they issue an adverse or misleading opinion regarding our stock, our stock price and trading volume could decline.

The trading market for our common stock will be influenced by the research and reports that industry or securities analysts publish about us or our business. If any of the analysts who cover us issue an adverse or misleading opinion regarding our stock, our stock price would likely decline. If several of these analysts cease coverage of our company or fail to publish reports on us regularly, we could lose visibility in the financial markets, which in turn could cause our stock price or trading volume to decline.

Provisions in our charter documents and under Delaware law could discourage a takeover that stockholders may consider favorable and may lead to entrenchment of our management and Board of Directors.

Our amended and restated certificate of incorporation and amended and restated bylaws contain provisions that could have the effect of delaying or preventing changes in control or changes in our management or our Board of Directors. These provisions include:

- a classified Board of Directors with three-year staggered terms, which may delay the ability of stockholders to change the membership of a majority of our Board of Directors;
- no cumulative voting in the election of directors, which limits the ability of minority stockholders to elect director candidates;
- the exclusive right of our Board of Directors to elect a director to fill a vacancy created by the expansion of the Board of Directors or the resignation, death or removal of a director, which prevents stockholders from being able to fill vacancies on our Board of Directors;
- the ability of our Board of Directors to issue shares of preferred stock and to determine the price and other terms of those shares, including preferences and voting rights, without stockholder approval, which could be used to significantly dilute the ownership of a hostile acquirer;
- a prohibition on stockholder action by written consent, which forces stockholder action to be taken at an annual or special meeting of our stockholders;
- the requirement that a special meeting of stockholders may be called only by the chairman of the Board of Directors, the chief executive officer or the Board of Directors, which may delay the ability of our stockholders to force consideration of a proposal or to take action, including the removal of directors; and
- advance notice procedures that stockholders must comply with in order to nominate candidates to our Board of Directors or to propose matters to be acted upon at a stockholders' meeting, which may discourage or deter a potential acquirer from conducting a solicitation of proxies to elect the acquirer's own slate of directors or otherwise attempting to obtain control of us.

We are also subject to certain anti-takeover provisions under Delaware law. Under Delaware law, a corporation may not, in general, engage in a business combination with any holder of 15% or more of its capital stock unless the holder has held the stock for three years or, among other things, the Board of Directors has approved the transaction.

We may need additional capital in the future to finance our business.

We may need to raise additional capital to fund operations in the future. Our working capital needs and cash use have continued to increase to support our growth initiatives, and we may need additional capital if our current plans and assumptions change. In addition, the recently implemented U.S. tariffs are expected to have significant negative impact on our cash flows until we are able to mitigate the impact of the tariffs whether through re-engineering of our supply chain or otherwise. Delays in our mitigation plans or unanticipated expenditures associated with these mitigation efforts would further negatively impact our cash flows and result of operations. Failure to maintain certain restrictive covenants and requirements under the Loan Agreement could result in limiting the amount of borrowings that are available to us, increase the cost of borrowings under the credit facility, and/or cause us to make immediate payments to reduce borrowings or result in an event of default. If future financings involve the issuance of equity securities, our then-existing stockholders would suffer dilution. If we raise additional debt financing, we may be subject to restrictive covenants that limit our ability to conduct our business. If we are unable to generate positive operating income and positive cash flows from operations, our liquidity, results of operations and financial condition will be adversely affected. Furthermore, if we are unable to generate sufficient cash flows to support our operational needs, we may need to seek additional sources of liquidity, including borrowings, to support our working capital needs. In addition, we may choose to seek other sources of liquidity even if we believe we have generated sufficient cash flows to support our operational needs. There is no assurance that any other sources of liquidity may be available to us on acceptable terms or at all. If we are unable to generate sufficient cash flows or obtain other sources of liquidity, we will be forced to limit our development activities, reduce our investment in growth initiatives and institute cost-cutting measures, all of which would adversely impact our business and growth.

We do not currently intend to pay dividends on our common stock and, consequently, our stockholders' ability to achieve a return on their investment will depend on appreciation in the price of our common stock.

We do not currently intend to pay any cash dividends on our common stock for the foreseeable future. We currently intend to invest our future earnings, if any, to fund our growth. Additionally, the terms of our credit facility restrict our ability to pay dividends under certain circumstances. Therefore, our stockholders are not likely to receive any dividends on our common stock for the foreseeable future.

ITEM 1B. Unresolved Staff Comments

None.

ITEM 2. Properties

We currently lease approximately 205,900 square feet of office space worldwide. Information concerning our principal leased properties as of December 31, 2018 is set forth below:

Location	Principal Use	Square Footage	Lease Expiration Date
San Jose, California	Corporate headquarters, product design, research and development, administration	65,000	December 2025
Petaluma, California	Sales, marketing, product design, service and repair engineering, distribution, research and development	58,000	March 2019
Nanjing, China	Research and development	40,000	February 2021
Minneapolis, Minnesota	Product design, research and development, service and repair engineering	28,500	March 2019
Richardson, Texas	Service and test engineering	14,400	January 2022

We believe that our facilities are in good condition and are generally suitable to meet our needs for the foreseeable future. We believe that prior to expiration of our current office space leases that we can renew or obtain suitable lease space on commercially reasonable terms for our business needs. In addition, we may continue to seek additional space as needed, and we believe this space will be available on commercially reasonable terms.

In August 2018, we entered a new office space lease in Petaluma, California for 22,000 square feet, which is expected to commence in March 2019 for a term of 64 months.

ITEM 3. Legal Proceedings

From time to time, we are involved in various legal proceedings arising from the normal course of business. We are not currently a party to any legal proceedings that, if determined adversely to us, in our opinion, are currently expected to individually or in the aggregate have a material adverse effect on our business, operating results or financial condition taken as a whole.

ITEM 4. Mine Safety Disclosures

Not applicable.

PART II

ITEM 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Comparative Stock Prices

Our common stock has been trading on the New York Stock Exchange, under the trading symbol "CALX" since our initial public offering on March 24, 2010. Prior to this time, there was no public market for our common stock.

Number of Common Stock Holders

As of February 25, 2019, the approximate number of holders of our common stock was 363 (not including beneficial owners of stock held in street name).

Dividends

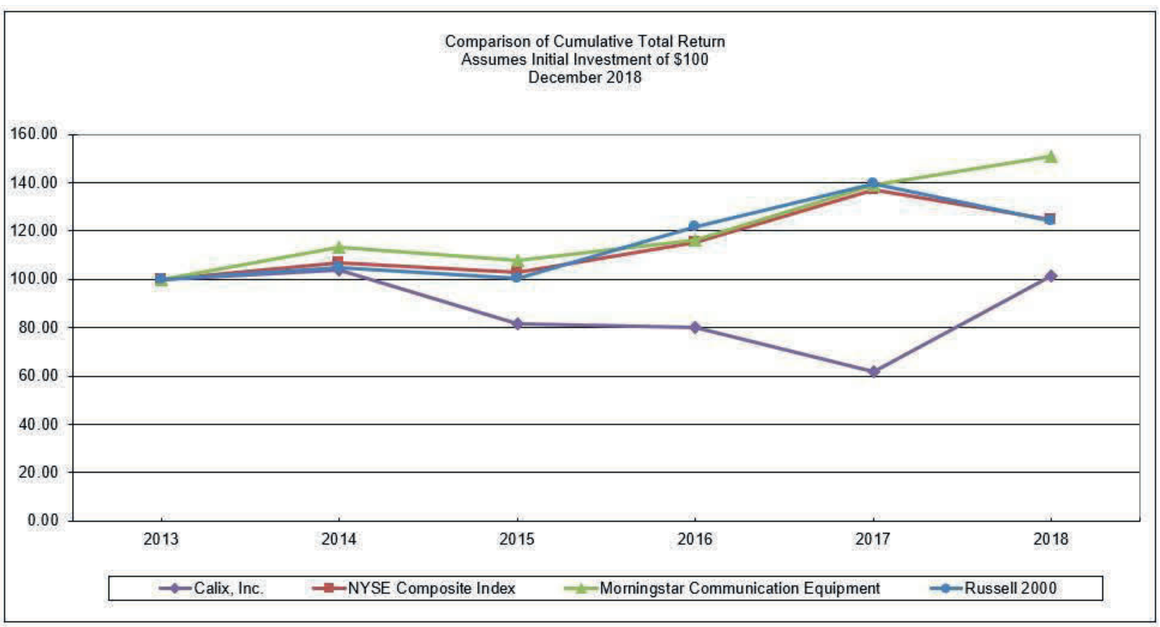
We have never declared or paid any cash dividends on our common stock, and we do not currently intend to pay any cash dividends on our common stock in the foreseeable future. In addition, our credit facility requires SVB's consent before dividends can be declared. See Note 5, *"Credit Agreements"* of Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K.

Recent Sales of Unregistered Securities

None.

Performance Graph

The following graph shows a comparison of the cumulative total stockholder return on our common stock with the cumulative total returns of the Russell 2000 Index and the Morningstar Communication Equipment Index. The graph tracks the performance of a $100 investment in our common stock and in each of the indexes during the last five fiscal years ended December 31, 2018. Data for the Russell 2000 Index and the Morningstar Communication Equipment Index assume reinvestment of dividends. Stockholder returns over the indicated period are based on historical data and should not be considered indicative of future stockholder returns.



This performance graph shall not be deemed "soliciting material" or to be "filed" with the SEC for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or otherwise subject to the liabilities under that Section, and shall not be deemed to be incorporated by reference into any filing of Calix, Inc. under the Securities Act of 1933, as amended.

ITEM 6. Selected Financial Data

The following selected consolidated financial data should be read in conjunction with our consolidated financial statements and the related notes thereto, of this Annual Report on Form 10-K, the section titled "Management's Discussion and Analysis of Financial Condition and Results of Operations" and the other financial information and data appearing elsewhere in this Annual Report on Form 10-K. The selected financial data included in this section is not intended to replace and is not a substitute for, the consolidated financial statements and related notes in this Annual Report on Form 10-K.

We derived the statements of operations data for the years ended December 31, 2018, 2017 and 2016 and the balance sheet data as of December 31, 2018 and 2017 from our audited consolidated financial statements and related notes thereto of this Annual Report on Form 10-K. We derived the statements of operations data for the years ended December 31, 2015 and 2014 and the balance sheet data as of December 31, 2016, 2015 and 2014 from our audited consolidated financial statements and related notes which are not included in this Annual Report on Form 10-K. Historical results for any prior period are not necessarily indicative of future results for any period.

	Years Ended December 31,				
	2018	2017	2016	2015	2014
	(In thousands, except per share data)				
Statement of Operations Data:					
Revenue	$ 441,320	$ 510,367	$ 458,787	$ 407,163	$ 401,227
Cost of revenue [(1)]	243,938	337,477	257,569	217,034	223,438
Gross profit	197,382	172,890	201,218	190,129	177,789
Operating expenses:					
Research and development [(1)]	89,963	127,541	106,869	89,714	80,311
Sales and marketing [(1)]	86,432	82,781	83,675	78,563	76,283
General and administrative [(1)]	40,500	39,875	41,592	38,454	31,371
Restructuring charges	5,705	4,249	—	—	—
Amortization of intangible assets	—	—	1,701	10,208	10,208
Gain on sale of product line	(6,704)	—	—	—	—
Litigation settlement gain	—	—	(4,500)	—	—
Total operating expenses	215,896	254,446	229,337	216,939	198,173
Loss from operations	(18,514)	(81,556)	(28,119)	(26,810)	(20,384)
Interest and other income (expense), net	(254)	(233)	1,064	712	151
Loss before provision for income taxes	(18,768)	(81,789)	(27,055)	(26,098)	(20,233)
Provision for income taxes	530	1,243	347	535	581
Net loss	$ (19,298)	$ (83,032)	$ (27,402)	$ (26,633)	$ (20,814)
Net loss per common share:					
Basic and diluted	$ (0.37)	$ (1.66)	$ (0.56)	$ (0.52)	$ (0.41)
Weighted-average number of shares used to compute net loss per common share:					
Basic and diluted	52,609	50,155	48,730	51,489	50,808
[(1)] Includes stock-based compensation as follows:					
Cost of revenue	$ 1,248	$ 749	$ 672	$ 709	$ 1,120
Research and development	5,969	4,869	5,125	4,797	5,056
Sales and marketing	5,787	3,433	4,586	4,712	5,601
General and administrative	4,469	3,317	3,902	3,587	4,240
	$ 17,473	$ 12,368	$ 14,285	$ 13,805	$ 16,017

	December 31,				
	2018	2017	2016	2015	2014
			(In thousands)		
Balance Sheet Data:					
Cash, cash equivalents, restricted cash and marketable securities	$ 50,274	$ 39,775	$ 78,107	$ 73,590	$ 111,679
Working capital	31,079	34,123	97,926	115,561	131,693
Total assets	317,080	295,070	355,475	323,886	370,221
Common stock and additional paid-in capital	877,555	852,475	837,931	820,080	803,101
Total stockholders' equity	151,934	144,963	212,964	235,785	272,591

ITEM 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

The Management's Discussion and Analysis of Financial Condition and Results of Operations contains forward-looking statements regarding future events and our future results that are subject to the safe harbors created under the Securities Act of 1933 (the "Securities Act") and the Securities Exchange Act of 1934 (the "Exchange Act"). All statements other than statements of historical facts are statements that could be deemed forward-looking statements. These statements are based on current expectations, estimates, forecasts and projections about the industry in which we operate and the beliefs and assumptions of our management. In some cases, forward-looking statements can be identified by the use of words such as "believe," "expect," "may," "estimate," "continue," "anticipate," "intend," "should," "plan," "predict," "will," "project," "potential," or the negative thereof or other comparable terminology. In addition, any statements that refer to projections of our future financial performance, our anticipated growth and trends in our business and industry and other characterizations of future events or circumstances are forward-looking statements. Readers are cautioned that these forward-looking statements are only predictions and are subject to risks, uncertainties and assumptions that are difficult to predict, including those identified in the Risk Factors discussed in Item 1A, in the discussion below, as well as in other sections of this Annual Report on Form 10-K. Therefore, actual results may differ materially and adversely from those expressed in any forward-looking statements. All forward-looking statements and reasons why results may differ included in this report are made as of the date hereof, and we assume no obligation to update these forward-looking statements or reasons why actual results might differ.

Overview

We are a leading global provider of cloud and software platforms, systems and software for fiber- and copper-based network architectures and a pioneer in software defined access and cloud products focused on access networks and the subscriber. Our portfolio allows for a broad range of subscriber services to be provisioned and delivered over a single unified network. Our access systems can deliver voice and data services, advanced broadband services, mobile broadband, as well as high-definition video and online gaming. Our most recent generation of premises systems enable CSPs to address the complexity of the smart home and business and offer new services to their device enabled subscribers. We have designed all of these platforms and related systems so that they can be monitored, analyzed, managed and supported by Calix Cloud.

We market our cloud and software platforms, systems and services to CSPs globally through our direct sales force as well as select resellers. Our customers range from smaller, regional CSPs to some of the world's largest CSPs. We have enabled over 1,500 customers to deploy passive optical, Active Ethernet and point-to-point Ethernet fiber access networks.

Our revenue decreased to $441.3 million for 2018 from $510.4 million for 2017 and $458.8 million for 2016. Our revenue and revenue growth will depend on our ability to sell and license our cloud and software platforms, systems and services to existing customers as well as our ability to attract new customers, particularly larger CSPs, in the U.S. and internationally.

During 2018, we recognized revenue based on Accounting Standard Update No., or ASU, 2014-09, *"Revenue from Contracts with Customers (Topic 606)"*, but revenue for the year ended December 31, 2017 was recognized based on Topic 605. Revenue in 2018 was $1.7 million higher than it would have been under the previous accounting standard. For additional information on the impact of the new accounting standard on our revenue, see Note 1 of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K.

Revenue fluctuations result from many factors, including, but not limited to: increases or decreases in customer orders for our products and services, market, financial or other factors that may delay or materially impact customer purchasing decisions, contractual terms with customers that result in delayed revenue recognition and varying budget cycles and seasonal buying patterns of our customers. More specifically, our customers tend to spend less in the first quarter as they are finalizing their annual budgets, and in certain regions, customers are challenged by winter weather conditions that inhibit fiber deployment in outside infrastructure. Our revenue is also dependent upon our customers' timing of purchases, capital expenditure plans and decisions to upgrade their network or adopt new technologies, including expenditure plans for turnkey solutions projects, which are generally non-recurring in nature. In particular, since the end of 2017, we experienced significantly lower order volumes by our largest customer due to the timing of their recent acquisition and lower amounts of CAF deployment services in 2018. Specifically, this customer represented 18% of total revenue in 2018 compared with 31% in the prior year. We expect that this acquisition may continue to disrupt the customer's expenditure plans and result in continued delays and lower levels of purchases of our products and services.

Cost of revenue is strongly correlated to revenue and tends to fluctuate due to all of the above factors that could impact revenue. Factors that impacted our cost of revenue for the year ended December 31, 2018, and that we expect would impact cost of revenue in future periods, also include: changes in the mix of products delivered, customer location and regional mix, changes in product warranty and incurrence of retrofit costs, changes in the cost of our inventory, including higher costs due to materials shortages, supply constraints or unfavorable changes in trade policies, tariffs and inventory write-downs. Cost of revenue also includes fixed expenses related to our internal operations, which could impact our cost of revenue as a percentage of revenue if there are large fluctuations in revenue.

During the year ended December 31, 2018, our gross profit and gross margin were positively impacted by the customer mix shift, the sale of our new platform offerings and a decrease in our services revenue, which carries a lower than corporate average gross margin, as a mix of total revenue. Overall, our gross profit and gross margin fluctuate based on timing of factors such as new product introductions or upgrades to existing products, changes in customer mix, changes in the mix of products demanded and sold (and any related write-downs of existing inventory) and may be negatively impacted by increases in mix of revenue towards professional services, increases in mix of revenue from channel sales rather than direct sales or other unfavorable customer or product mix, shipment volumes and any related volume discounts, changes in our product and services costs, pricing decreases or discounts, customer rebates and incentive programs due to competitive pressure or materials shortages, supply constraints, tariffs or unfavorable changes in trade policies.

Our operating expenses have fluctuated based on the following factors: changes in headcount and personnel costs, which comprise a significant portion of our operating expenses; timing of variable compensation expenses due to fluctuations in shipment volumes; timing of research and development expenses, including investments in innovative solutions and new customer segments, prototype builds and outsourced development projects; investments in our business and information technology infrastructure; and fluctuations in stock-based compensation expenses due to timing of equity grants or other factors affecting vesting. During the year ended December 31, 2018 as compared to 2017, our total operating expenses decreased largely due to the restructuring actions we took in 2017 and early 2018. In March 2017, we adopted a restructuring plan to realign our business to increase focus towards investments in software platforms and to reduce the expense structure in our traditional systems business. We incurred restructuring charges of $4.2 million in 2017 under this plan. In the first quarter of 2018, we established a new restructuring plan to further align our business resources based on the production releases of our platform offerings and incurred restructuring charges of $5.7 million during 2018. Our restructuring activities were completed in the second quarter of 2018.

Our net loss was $19.3 million in 2018, $83.0 million in 2017 and $27.4 million in 2016. Since our inception, we have incurred significant losses, and as of December 31, 2018, we had an accumulated deficit of $684.9 million. Further, as a result of the fluctuations described above and a number of other factors, many of which are outside our control, our annual operating results fluctuate from period to period. Comparing our operating results on a period-to-period basis may not be meaningful, and you should not rely on our past results as an indication of our future performance.

Product Line Divestiture

In February 2018, we sold our outdoor cabinet product line to Clearfield, Inc. for $10.4 million in cash as well as the assumption by Clearfield of related product warranty liabilities and open purchase order commitments with our contract manufacturer. The divestiture of this non-strategic product line reflects our continued focus on execution on our platforms and business strategy.

Critical Accounting Policies and Estimates

Our financial statements are prepared in accordance with U.S. GAAP. These accounting principles require us to make certain estimates and judgments that can affect the reported amounts of assets and liabilities as of the date of the financial statements, as well as the reported amounts of revenue and expenses during the periods presented. We base our estimates, assumptions and judgments on historical experience and on various other factors that are believed to be reasonable under the circumstances. To the extent there are material differences between these estimates and actual results, our financial statements may be affected. We evaluate our estimates, assumptions and judgments on an ongoing basis.

We believe the following critical accounting policies affect our significant judgments and estimates used in the preparation of our financial statements.

Revenue Recognition

Revenue is recognized when a performance obligation is satisfied, which occurs when control of the promised goods or services is transferred to the customer, in an amount that reflects the consideration the we expect to be entitled to in exchange for those goods or services.

A performance obligation is a promise in a contract to transfer a distinct good or service to the customer and is the unit of account. A contract's transaction price is allocated to each distinct performance obligation and recognized as revenue when, or as, the performance obligation is satisfied. Our hardware products contain both software and non-software components that function together to deliver the products' essential functionality and therefore constitutes a single performance obligation as the promise to transfer the individual software and non-software components is not separately identifiable and, therefore, not distinct. Our contracts may include multiple performance obligations. For such arrangements, we allocate the contract's transaction price to each performance obligation using the relative stand-alone selling price of each distinct good or service in the contract. We generally determine stand-alone selling prices based on the prices charged to customers or our best estimate of stand-alone selling price. Our estimate of stand-alone selling price is established considering multiple factors including, but not limited to, geographies, market conditions, competitive landscape, internal costs, gross margin objectives, characteristics of targeted customers and pricing practices. The determination of estimated stand-alone selling price is made through consultation with and formal approval by management, taking into consideration the go-to-market strategy.

For certain revenue arrangements involving delivery of both systems and professional services, each is considered a distinct performance obligation. Systems revenue is recognized at a point in time when management has determined that control over systems has transferred to the customer, which is generally when legal title has transferred to the customer. For the same revenue arrangements, we believe that control of the associated professional services is transferred to the customer over time. As such, professional services revenue is recognized over the period in which the services are provided using a cost input measure. We recognize revenue when control of the systems and services has been transferred to the customer, which may be earlier than system installation or customer acceptance, in accordance with the agreed-upon specifications in the contract.

Inventory Valuation

Inventory, which primarily consists of finished goods purchased from CMs or ODMs, is stated at the lower of cost (determined by the first-in, first-out method) and net realizable value. Inbound shipping costs and tariffs are included in the cost of inventory. In addition, we, from time to time, procure component inventory primarily as a result of manufacturing discontinuation of critical components by suppliers. We regularly monitor inventory quantities on-hand and record write-downs for excess and obsolete inventory based on our estimate of demand for our products, potential obsolescence of technology, product life cycle and whether pricing trends or forecasts indicate that the carrying value of inventory exceeds our estimated selling price. These factors are impacted by market and economic conditions, technology changes and new product introductions and require estimates that may include elements that are uncertain. Actual demand may differ from forecasted demand and may have a material effect on gross profit. If inventory is written down, a new cost basis is established that cannot be increased in future periods. The sale of previously reserved inventory has not had a material impact on our gross margin.

Recent Accounting Pronouncements Not Yet Adopted

Leases

In February 2016, the FASB issued ASU 2016-02, *"Leases (Topic 842)"*, which requires recognition of an asset and liability for lease arrangements longer than twelve months. ASU 2016-02 became effective for us beginning in the first quarter of 2019. The standard can be adopted using either a modified retrospective approach, whereby we would recognize and measure leases at the beginning of the earliest period presented, or the effective date approach, whereby we would initially account for the impact of the adoption with a cumulative-effect adjustment to the January 1, 2019 financial statements. The effective date approach eliminates the need to restate amounts presented prior to January 1, 2019. We adopted the new standard effective January 1, 2019 using the effective date approach. Upon adoption of the standard, our assets and liabilities increased by approximately $16 million as the new standard requires recognition of right-of-use assets and lease liabilities for operating leases, but the new standard does not impact our Statements of Comprehensive Loss or Cash Flows.

Results of Operations for Years Ended December 31, 2018, 2017 and 2016

Revenue

Our revenue is comprised of the following:

- Systems – includes revenue from the sale of access and premises systems, software platform licenses and cloud-based software subscriptions.
- Services – includes revenue from professional services, customer support, software- and cloud-based maintenance, extended warranty subscriptions, training and managed services.

The following table sets forth our revenue (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Revenue:							
Systems	$ 405,923	$ 421,890	$ 428,584	$ (15,967)	(4)%	$ (6,694)	(2)%
Services	35,397	88,477	30,203	(53,080)	(60)%	58,274	193 %
	$ 441,320	$ 510,367	$ 458,787	$ (69,047)	(14)%	$ 51,580	11 %
Percent of total revenue:							
Systems	92%	83%	93%				
Services	8%	17%	7%				
	100%	100%	100%				

Our revenue is principally derived in the United States. Revenue generated in the United States represented approximately 88% of our total revenue in 2018, 89% in 2017 and 91% in 2016.

2018 compared to 2017: The decrease in revenue during 2018 compared with 2017 was due to lower services revenue of $53.1 million primarily driven by a lower level of CAF-related professional services and the substantial completion of services associated with a significant turnkey network improvement project during the first quarter of 2017 and to lower systems revenue of $16.0 million, also impacted by a lower level of CAF projects and a decline in sales of our traditional systems. This was partially offset by greater traction with our AXOS and Calix Cloud platforms.

We had one customer that accounted for more than 10% of our total revenue in 2018 and 2017 and two customers that each accounted for more than 10% of our total revenue in 2016. See Note 1 to the Consolidated Financial Statements set forth in this report for more details on concentration of revenue for the periods presented.

2017 compared to 2016: The increase in revenue during 2017 compared with 2016 resulted from an increase in services revenue by $58.3 million, or 193%, primarily driven by the substantial completion of services associated with a significant turnkey network improvement project during the first quarter of 2017 and the completion of the vast majority of sites from previously-awarded CAF projects by the fourth quarter of 2017. Our product revenue decreased by $6.7 million mainly due to lower shipments to one of our large Tier 2 customers relative to the prior year period related to a significant turnkey network improvement project in 2016, which was completed in the first half of 2017.

Cost of Revenue, Gross Profit and Gross Margin

The following table sets forth our cost of revenue (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Cost of revenue:							
Systems	$ 216,529	$ 236,137	$ 228,976	$ (19,608)	(8)%	$ 7,161	3%
Services	27,409	101,340	28,593	(73,931)	(73)%	72,747	254%
	$ 243,938	$ 337,477	$ 257,569	$ (93,539)	(28)%	$ 79,908	31%

2018 compared to 2017: The decrease in cost of revenue of $93.5 million during 2018 as compared to 2017 was primarily attributable to a decrease in cost of service revenue by $73.9 million, as we experienced higher levels of service activities in 2017 as well as higher costs attributed to rework, delays, unanticipated costs and overruns (including third party costs) for our turnkey network improvement projects in 2017. Our cost of systems revenue also decreased by $19.6 million as compared with 2017 mainly due to lower systems revenue partially offset by improved regional and new product mix, which have higher gross margins.

2017 compared to 2016: The increase in cost of revenue of $79.9 million during 2017 as compared to 2016 was primarily attributable to an increase in cost of services revenue by $72.7 million, as we experienced higher levels of service activities as well as higher costs attributed to rework, delays, unanticipated costs and overruns (including third party costs) for our turnkey network improvement projects. Our cost of product revenue increased by $7.2 million during 2017 compared with 2016 primarily due to a product mix shift to lower margin products, partially offset by the lower volume of revenue. Cost of product revenue also included an increase in inventory write-downs of $2.9 million attributed to slow moving inventories, partially offset by a decrease in warranty and retrofit costs of $1.2 million primarily related to certain retrofit charges for two specific product families.

The following table sets forth our gross profit and gross margin (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Gross profit:							
Systems	$ 189,394	$ 185,753	$ 199,608	$ 3,641	2 %	$ (13,855)	(7)%
Services	7,988	(12,863)	1,610	20,851	(162)%	(14,473)	(899)%
	$ 197,382	$ 172,890	$ 201,218	$ 24,492	14 %	$ (28,328)	(14)%
Gross margin:							
Systems	47 %	44 %	47 %				
Services	23 %	(15) %	5 %				
	45 %	34 %	44 %				

2018 compared to 2017: Gross profit increased by $24.5 million to $197.4 million during 2018 from $172.9 million during 2017. Gross margin increased to 45% during 2018 from 34% during 2017. The increase in gross profit and gross margin during 2018 was primarily due to the completion of a turnkey network improvement project and CAF-related projects in 2017, where project rework and cost overruns resulted in negative gross margin, and a decrease in our services revenue, which carries a lower than average gross margin, as a mix of total revenue. Services gross margin improved in 2018 primarily due to process improvements and efficiencies implemented in 2017. Systems gross margin increased due to strength in sales to our smaller regional customers and to an increasing mix of new products that have higher margins than some of our older traditional products. The improvement in system gross margin was partially offset by U.S. tariff and tariff-related costs of $3.2 million in the fourth quarter of 2018.

Given the recently enacted U.S. tariffs, we are working aggressively with partners and suppliers to re-engineer our supply chain and move production outside of China in addition to other supply chain improvements. We anticipate the cost impact of the current U.S. tariffs to be significant going forward, including in the next several quarters, but expect that we would be able to mitigate the impact of these tariffs through our supply chain re-engineering efforts with the cost impact diminishing beginning after the first half of 2019. We further anticipate that if we are successful in mitigating the impact of these tariffs within our planned timing, we would be able to avoid raising prices to our customers to cover tariff increases. Regardless of our mitigation plans, we expect these U.S. tariffs as well as the costs to realign our global supply chain will negatively impact overall gross margin.

2017 compared to 2016: Gross profit decreased by $28.3 million to $172.9 million during 2017 from $201.2 million during 2016. Gross margin decreased to 34 % during 2017 from 44 % during 2016. The decrease in gross profit and gross margin during 2017 was primarily due to an increase in revenue mix toward service revenue as we grew our professional services business, an increased level of activities in our turnkey network improvement projects and higher costs attributed to services rework and overruns. The rework costs and overruns generally relate to projects that were started in 2016 that incurred higher than anticipated costs from third party contractors, project delays, third party dependencies, quality issues associated with subcontracted work, rework to meet customer requirements and longer than anticipated time to complete. The vast majority of these 2016 projects were completed by the end of 2017.

Operating Expenses

Research and Development Expenses

Research and development expenses represent the largest component of our operating expenses and include personnel costs, outside contractor and consulting services, depreciation on lab equipment, costs of prototypes and overhead allocations. The following table sets forth our research and development expenses (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Research and development	$ 89,963	$ 127,541	$ 106,869	$ (37,578)	(29)%	$ 20,672	19%
Percent of total revenue	20%	25%	23%				

2018 compared to 2017: The decrease in research and development expenses during 2018 compared with 2017 was primarily due to the leverage of our software platforms enabling us to lower our level of investment and introduce new products faster. In addition, during 2017 and the first quarter of 2018, we restructured our business to increase our focus towards investments in software platforms and to reduce the expense structure of our traditional systems business. As a result, our personnel for research and development decreased during 2018 as compared 2017, which lowered compensation and employee benefits by $21.9 million. The decrease was also due to lower expenses for outside services of $8.2 million and lower expenditures relating to prototype and expendable equipment of $5.4 million. We expect our investments in research and development will be relatively consistent in absolute dollars from our current post-restructuring levels over the near term.

2017 compared to 2016: The increase in research and development expenses during 2017 compared with 2016 was primarily due to an increase in expenses for outside contractors by $15.0 million and expenditures relating to prototype and expendable equipment used for research and development activities by $0.8 million, primarily for development services including investments in our cloud and software platforms and next generation systems to pursue broader growth opportunities. Our personnel for research and development also increased in 2017 as compared to 2016, which resulted in higher compensation and employee benefits (other than bonuses) of $4.8 million. This increase was partially offset by lower employee bonuses of $0.6 million in 2017 as compared to 2016.

Sales and Marketing Expenses

Sales and marketing expenses consist of personnel costs, employee sales commissions, marketing programs, software tools and travel-related expenses. The following table sets forth our sales and marketing expenses (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Sales and marketing	$ 86,432	$ 82,781	$ 83,675	$ 3,651	4%	$ (894)	(1)%
Percent of total revenue	20%	16%	18%				

2018 compared to 2017: Sales and marketing expenses increased by $3.7 million during 2018 compared with 2017 primarily due to an increase in stock-based compensation of $2.4 million and an increase in marketing programs of $1.4 million to promote our software and cloud platforms.

We expect to continue our investments in sales and marketing in order to extend our market reach and grow our business in support of our key strategic initiatives.

2017 compared to 2016: Sales and marketing expenses decreased by $0.9 million during 2017 compared with 2016 primarily due to decreases in personnel costs of $1.7 million as headcount decreased and a decrease in stock-based compensation of $1.2 million. These decreases were partially offset by an increase in marketing expenses of $1.4 million as we invested more in ConneXions, our annual user conference, and other industry and marketing events and an increase in software tools of $0.9 million.

General and Administrative Expenses

General and administrative expenses consist primarily of personnel costs related to our executive, finance, human resources, information technology and legal organization, outside consulting services, insurance, allocated facilities and fees for professional services. Professional services consist of outside audit, legal, accounting and tax services. The following table sets forth our general and administrative expenses (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
General and administrative	$ 40,500	$ 39,875	$ 41,592	$ 625	2%	$ (1,717)	(4)%
Percent of total revenue	9%	8%	9%				

2018 compared to 2017: The increase in general and administrative expenses of $0.6 million during 2018 compared with 2017 was primarily due to an increase in stock-based compensation of $1.2 million partially offset by an overall decrease in professional service fees of $0.6 million. We incurred professional services fees for ongoing activities to migrate our on-premise enterprise resource planning system to a cloud model at the same levels as the prior year.

Our general and administrative expenses as a percentage of total revenue remained relatively flat from year to year. We expect our general and administrative expenses to decrease as a percentage of revenue over time.

2017 compared to 2016: The decrease in general and administrative expenses during 2017 compared with 2016 included legal fees and expenses related to the Occam litigation of $6.4 million that did not recur in 2017 as the litigation was settled in 2016. The decrease was partially offset by increases in professional services of $2.5 million primarily related to outside consulting services for migrating of our on-premise enterprise resource planning infrastructure to a cloud model, compensation and employee benefits of $1.0 million, primarily due to increase in headcount and severance benefits of $0.5 million related to our separation agreement with our former Chief Financial Officer and an increase in legal expenses of $0.5 million. The increase in compensation and employee benefits includes reductions in employee bonuses of $0.7 million and stock-based compensation of $0.6 million during 2017 as compared to 2016.

Restructuring Charges

We adopted a restructuring plan in March 2017. This restructuring plan realigned our business, increasing our focus towards investments in software platforms and cloud products, while reducing our expense structure in the traditional systems business. We began to take actions under this plan beginning in March 2017 and recognized $4.2 million of restructuring charges during 2017, consisting of severance and other one-time termination benefits. Actions pursuant to this restructuring plan were complete as of December 31, 2017.

In the first quarter of 2018, we established a new restructuring plan to further realign our business resources based on the production releases of our platform offerings. We incurred restructuring charges of $5.7 million during 2018, consisting primarily of severance and other termination related benefits. Actions pursuant to this restructuring plan were complete as of June 30, 2018. Please refer to Note 4, *"Balance Sheet Details – Accrued Restructuring Charges"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K.

Gain on Sale of Product Line

During 2018, we recognized a gain of $6.7 million relating to the sale of our outdoor cabinet product line to Clearfield, Inc. for $10.4 million. Please refer to Note 13, *"Product Line Divestiture"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K.

Interest and Other Income (Expense), Net

The following table sets forth our interest and other income (expense), net (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Interest and other income (expense), net	$ (254)	$ (233)	$ 1,064	$ (21)	9 %	$ (1,297)	(122)%

2018 compared to 2017: Interest and other income (expense) was relatively flat in 2018 compared with 2017.

2017 compared to 2016: The decrease in interest and other income (expense), net during 2017 compared with 2016 is primarily due to a reduction in interest income resulting from lower levels of marketable securities investments in 2017, an increase in interest expense resulting from initiating line of credit borrowings in 2017 and a decrease in foreign currency gain (loss).

Provision for Income Taxes

The provision for income taxes primarily consist of state and foreign income taxes. The following table sets forth our provision for income taxes (dollars in thousands):

	Years Ended December 31,			2018 vs 2017 Change		2017 vs 2016 Change	
	2018	2017	2016	$	%	$	%
Provision for income taxes	$ 530	$ 1,243	$ 347	$ (713)	(57)%	$ 896	258%
Effective tax rate	(2.8)%	(1.5)%	(1.3)%				

2018 compared to 2017: The provision for income taxes decreased by $0.7 million from $1.2 million in 2017 to $0.5 million in 2018. The decrease was primarily due to a write-off of a foreign entity's deferred tax assets in 2017.

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the *"Tax Cuts and Jobs Act"*, or the Tax Act. The significant impacts from the Tax Act include a net, one-time transition tax of $1.1 million on unrepatriated earnings of foreign subsidiaries, which was offset by our current net operating loss, and a tax expense of $84.4 million related to the revaluation of our deferred tax assets and liabilities due to the reduction of the U.S. corporate tax rate from 34% to 21%, which was offset by a reduction in our valuation allowance.

As of December 31, 2018, we had unrecognized tax benefits of $22.0 million, none of which would affect our effective tax rate if recognized.

2017 compared to 2016: Income tax expense increased by $0.9 million from $0.3 million in 2016 to $1.2 million in 2017. The increase was primarily due to the write-off of a foreign entity's deferred tax assets in 2017.

Liquidity and Capital Resources

We have funded our operations and investing activities primarily through cash generated from operations, borrowing on our line of credit and sales of our common stock. As of December 31, 2018, we had cash and cash equivalents of $49.6 million, which consisted of deposits held at banks and money market mutual funds held at major financial institutions. This includes $3.7 million of cash held by our foreign subsidiaries primarily in China. As of December 31, 2018, our liability for taxes that would be payable as a result of repatriation of undistributed earnings of our foreign subsidiaries to the United States was not significant and limited to withholding taxes considering our existing net operating loss carryovers.

The following table presents the cash inflows and outflows by activity during 2018, 2017 and 2016 (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Net cash provided by (used in) operating activities	$ 3,560	$ (62,772)	$ 24,419
Net cash provided by (used in) investing activities	(76)	19,734	12,083
Net cash provided by (used in) financing activities	7,492	31,990	(9,243)

Operating Activities

Our operating activities provided cash of $3.6 million in 2018, used cash of $62.8 million in 2017 and provided cash of $24.4 million in 2016. The increase in net cash provided by operating activities during 2018 as compared to 2017 was due primarily to a favorable change of $60.4 million in our net operating results after adjustment of non-cash charges and a $5.9 million increase in net cash inflow resulting from changes in operating assets and liabilities. In 2018, cash provided by operating activities increased as we reduced our operating expenses while investing in inventory to support our supply chain realignment efforts.

In 2018, cash inflows from changes in operating assets and liabilities primarily consisted of an decrease in accounts receivable of $13.9 million, mainly due to the collection of payments from a large customer in early January 2018, an increase in accounts payable of $4.6 million primarily due to increased inventory purchases related to our supply chain realignment efforts, a decrease in prepaid expenses and other assets of $3.6 million due to the return of an advance previously made to a CM and an increase in accrued liabilities of $2.8 million due primarily to accrued incentive compensation. Cash outflows from changes in operating assets and liabilities primarily consisted of an increase in inventory of $20.6 million associated with our supply chain realignment efforts and a decrease in deferred revenue of $1.4 million. Non-cash charges were $20.3 million, the majority of which consist of stock-based compensation expense and depreciation, partially offset by a $6.7 million gain on sale of our outdoor cabinet product line.

The increase in net cash used in operating activities during 2017 as compared to 2016 was due primarily to an unfavorable change of $60.8 million in our operating results after adjustment of non-cash charges and a $26.4 million decrease in net cash inflow resulting from changes in operating assets and liabilities. In 2017, cash used in operating activities increased as we continued to invest in research and development to pursue broader market and customer opportunities. Furthermore, during this period we continued to experience losses due to higher costs, delays, overruns and other inefficiencies associated with our professional services business for turnkey network improvement projects (including CAF projects). These turnkey network improvement projects generally involve greater working capital needs at the outset as services and products are supplied, while revenue and cash collections occur after projects are accepted or agreed-upon milestones are reached. In 2017, cash outflows from changes in operating assets and liabilities primarily consisted of an increase in net accounts receivable of $29.1 million, mainly due to the delayed payments by a large customer until early January 2018, and a decrease in accrued liabilities of $20.2 million primarily due to a decrease in customer advance payments for turnkey services projects for one of our customers and partly due to the timing of our payments of payroll, sales commissions and other expenses. Cash outflows from changes in operating assets and liabilities primarily consisted of a decrease in deferred cost of revenue of $32.4 million, partly offset by a decrease in deferred revenue of $14.4 million mainly due to recognition of associated costs related to turnkey network improvement projects that are either accepted or for which agreed-upon milestones are reached, a decrease in inventory of $13.0 million due to higher inventory turnover, an increase in accounts payable of $11.8 million primarily due to the timing of inventory receipts and payments to our contract manufacturers and a decrease in prepaid expenses and other assets of $2.8 million. Non-cash charges were $23.6 million, the majority of which consist of stock-based compensation expense, amortization expenses and depreciation.

Investing Activities

In 2018, net cash used in investing activities of $0.1 million consisted of capital expenditures of $10.4 million for purchases of test equipment, computer equipment and software, partially offset by the receipt of $10.4 million related to proceeds from the sales of our outdoor cabinet product line.

In 2017, our net cash provided by investing activities of $19.7 million consisted of net sales and maturities of marketable securities of $27.8 million partially offset by capital expenditures of $8.0 million for purchases of test equipment, computer equipment and software.

In 2016, our net cash provided by investing activities of $12.1 million consisted of net maturities of marketable securities of $21.9 million, partially offset by capital expenditures of $9.8 million for purchases of test equipment, computer equipment and software.

Financing Activities

In 2018, net cash provided by financing activities of $7.5 million primarily consisted of proceeds from the issuance of common stock under our employee stock purchase plans of $7.3 million.

In 2017, net cash provided by financing activities of $32.0 million primarily consisted of net proceeds from our line of credit of $30.0 million and the proceeds from the issuance of common stock under our employee stock purchase plans of $4.9 million , partially offset by the payment of payroll taxes for the vesting of awards under our 2010 Equity Incentive Award Plan of $2.8 million and payments to originate our line of credit with SVB of $0.2 million.

In 2016, net cash used in financing activities of $9.2 million consisted of the repurchases of common stock of $12.8 million and the payment of payroll taxes for the vesting of awards under our 2010 Equity Incentive Award Plan of $2.1 million, partially offset by the proceeds from the issuance of common stock under our ESPP of $5.7 million.

Stock Repurchase Program

On April 26, 2015, our Board of Directors approved a program to repurchase up to $40 million of our common stock from time to time. This stock repurchase program commenced in May 2015 and concluded in March 2016. During the year ended December 31, 2016, we repurchased a total of 1,789,287 shares of common stock for $12.8 million at an average price of $7.16 per share.

Working Capital and Capital Expenditure Needs

Our material cash commitments include contractual obligations under our Loan Agreement, normal recurring trade payables, compensation-related and expense accruals, operating leases and non-cancelable firm purchase commitments. We believe that our outsourced approach to manufacturing provides us significant flexibility in both managing inventory levels and financing our inventory. In the event that our revenue plan does not meet our expectations, we may be required to eliminate or curtail expenditures to mitigate the impact on our working capital.

In August 2017, we entered into the Loan Agreement for a senior secured revolving credit facility with SVB, which provides for a revolving credit facility of up to $30.0 million based on a customary accounts receivable borrowing base, subject to certain exceptions for accounts originating outside the United States and certain specific accounts, which could reduce the amount available to us under the credit facility. The Loan Agreement includes affirmative and negative covenants and requires us to maintain a liquidity ratio at minimum levels specified in the Loan Agreement. For the month ended November 30, 2017, we were not able to maintain the minimum AQR (as defined in the Loan Agreement, as amended) at the level required in the Loan Agreement, which constituted an event of default. Although SVB waived this event of default effective as of November 30, 2017 and, therefore, this default did not change our ability to borrow under the Loan Agreement, we were required to amend certain covenants under the Loan Agreement and, in February 2018, we entered into an amendment to the Loan Agreement that, among other things, amended certain affirmative financial covenants, including reductions to the required minimum level of the AQR and the inclusion of an additional financial covenant related to the maintenance of Adjusted EBITDA (as defined in the Loan Agreement, as amended). In August 2018, we entered into a second amendment to the Loan Agreement that, among other things, extended the maturity date from August 7, 2019 to August 7, 2020, amended certain financial covenants, including covenants with respect to the AQR and the Adjusted EBITDA, and changed the compliance requirements for the AQR covenant from a monthly basis to a quarterly basis. In February 2019, we entered into a third amendment to the Loan Agreement to reduce the required minimum level of the AQR for the first half of 2019 and the required minimum Adjusted EBITDA for the first fiscal quarter of 2019 to accommodate the increased costs and use of cash that we anticipate for the first half of 2019 related to activities to mitigate the impact of the U.S. tariffs. As of December 31, 2018, we were in compliance with these covenants. Although we were compliant with the financial covenants under the Loan Agreement at December 31, 2018, given our current financial position and history of operating losses, it is possible that we may fail to meet the minimum levels required by the financial covenants in a future period. In particular, if we are unable to generate positive cash flows on a continued basis, we could fall below the minimum AQR requirement, which would constitute an event of default under the Loan Agreement.

As of December 31, 2018, we borrowed the full principal amount under this line of credit of $30 million. Please refer to Note 5, "*Credit Agreements*" of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K for more details on this credit facility.

We established a new restructuring plan in early 2018 to further realign our business resources based on the production releases of our platform offerings. These actions were completed as of June 30, 2018 and resulted in annualized savings of over $20 million.

In February 2018, we sold our outdoor cabinet product line to Clearfield, Inc. for $10.4 million in cash as well as the assumption by Clearfield of the related product warranty liabilities and open purchase order commitments with our contract manufacturer. See Note 13, *"Product Line Divestiture"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K.

During 2018 we entered into financing arrangements to purchase research and development equipment for approximately $5.1 million. Each agreement is to be paid over 36 months with a weighted average interest rate of 6.2%.

We believe, based on our current operating plan and expected operating cash flows, that our existing cash and cash equivalents, along with available borrowings under our SVB line of credit, will be sufficient to meet our anticipated cash needs for at least the next twelve months. We expect to continue to draw on the SVB line of credit from time to time to support our working capital needs. Our future capital requirements will depend on many factors including our rate of revenue growth; timing of customer payments and payment terms, particularly of larger customers; the timing and extent of spending to support development efforts, particularly research and development related to growth initiatives such as our software defined access portfolio, our ability to partner with third parties to outsource our research and development projects; our ability to manage product cost, including the cost impact of the current U.S. tariffs as well as our ability to mitigate the cost impact through supply chain re-engineering as currently planned, the possibility of additional tariffs that may impact our product costs and higher component costs associated with new technologies; our ability to implement efficiencies and maintain product margin levels; the expansion of sales and marketing activities; the timing of introductions and customer adoption of new products and enhancements to existing products; the slowdowns or declines in customer purchases of traditional systems; acquisition of new capabilities or technologies; and the continued market acceptance of our products. If we are unable to execute to our current operating plan or generate positive operating income and positive cash flows, our liquidity, results of operations and financial condition will be adversely affected and we may fail to comply with the covenants in the Loan Agreement, in which case we may not be able to borrow under the SVB line of credit. In particular, until we are able to mitigate the cost impact of the U.S. tariffs, these tariffs will have a material adverse impact on our cash flows. Re-engineering of our supply chain to mitigate the impact of the tariffs requires significant effort, may take longer to complete than anticipated and may require higher expenditures than planned. Moreover, there remains uncertainty as to the scope of the tariffs and whether additional tariffs or other measures may be imposed that could have further cost impact to us. We may need to seek other sources of liquidity, including the sale of equity or incremental borrowings, to support our working capital needs. In addition, we may choose to seek other sources of liquidity even if we believe we have generated sufficient cash flows to support our operational needs. There is no assurance that any other sources of liquidity may be available to us on acceptable terms or at all. If we are unable to generate sufficient cash flows or obtain other sources of liquidity, we will be forced to limit our development activities, reduce our investment in growth initiatives and institute cost-cutting measures, all of which may adversely impact our business and growth.

Contractual Obligations and Commitments

Our principal commitments as of December 31, 2018 consisted of our contractual obligations under the Loan Agreement, operating leases for office space and non-cancelable outstanding purchase obligations. The following table summarizes our contractual obligations at December 31, 2018 (in thousands):

	Payments Due by Period				
	Total	**Less Than 1 Year**	**1-3 Years**	**3-5 Years**	**More Than 5 Years**
Line of credit, including interest [(1)]	$ 33,366	$ 2,100	$ 31,266	$ —	$ —
Equipment financing arrangements [(2)]	4,987	1,863	3,124	—	—
Operating lease obligations [(3)]	23,799	3,750	7,286	6,712	6,051
Non-cancelable purchase commitments [(4)]	57,770	41,955	8,390	7,425	—
Total	$ 119,922	$ 49,668	$ 50,066	$ 14,137	$ 6,051

(1) Line of credit contractual obligations include projected interest payments over the term of the Loan Agreement, assuming interest rate in effect for the outstanding borrowings as of December 31, 2018 of 7% and payment of the borrowings on August 7, 2020, the

contractual maturity date of the credit facility. See Note 5, *"Credit Agreements"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K for further discussion regarding our contractual obligations relating to our line of credit.

(2) Represents loan payments, including interest, for equipment financing arrangements. See Note 5, *"Credit Agreements"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K for further discussion regarding our equipment financing arrangements.

(3) Future minimum operating lease obligations in the table above include primarily payments for our office space in San Jose and Petaluma, California; Minneapolis, Minnesota; Nanjing, China; and Richardson, Texas, which expire at various dates through 2025. See Note 6, *"Commitments and Contingencies"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K for further discussion regarding our operating leases.

(4) Represents outstanding purchase commitments for inventory and services to be delivered by our suppliers, including CMs, ODMs and engineering service providers. See Note 6, *"Commitments and Contingencies"* of the Notes to Consolidated Financial Statements included in this Annual Report on Form 10-K for further discussion regarding our outstanding purchase commitments.

Off-Balance Sheet Arrangements

As of December 31, 2018 and 2017, we did not have any off-balance sheet arrangements.

ITEM 7A. Quantitative and Qualitative Disclosures About Market Risk

Interest Rate Risk

The primary objectives of our investment activity are to preserve principal, provide liquidity and maximize income without significantly increasing risk. By policy, we do not enter into investments for trading or speculative purposes. As of December 31, 2018, we had cash and cash equivalents of $49.6 million, which were held primarily in cash and money market funds. Due to the nature of these money market funds, we believe that we do not have any material exposure to changes in the fair value of our cash equivalents as a result of changes in interest rates.

Our exposure to interest rate risk also relates to the amount of interest we must pay on our borrowings under our revolving credit facility pursuant to our Loan Agreement with SVB. Borrowings under the Loan Agreement will bear interest through maturity at a variable annual rate based upon an annual rate of either a prime rate or a LIBOR rate, plus an applicable margin between 0.5% to 1.5% for prime rate advances and between 2.0% and 3.0% for LIBOR advances based on our maintenance of an applicable liquidity ratio. As of December 31, 2018, we had $30.0 million outstanding under the Loan Agreement.

Foreign Currency Exchange Risk

Our primary foreign currency exposures are described below.

Economic Exposure

The direct effect of foreign currency fluctuations on our sales and expenses has not been material because our sales and expenses are primarily denominated in U.S. dollars, or USD. However, we are indirectly exposed to changes in foreign currency exchange rates to the extent of our use of foreign contract manufacturers whom we pay in USD. Increases in the local currency rates of these vendors in relation to USD could cause an increase in the price of products that we purchase. Additionally, if the USD strengthens relative to other currencies, such strengthening could have an indirect effect on our sales to the extent it raises the cost of our products to non-U.S. customers and thereby reduces demand. A weaker USD could have the opposite effect. The precise indirect effect of currency fluctuations is difficult to measure or predict because our sales are influenced by many factors in addition to the impact of such currency fluctuations.

Translation Exposure

Our sales contracts are primarily denominated in USD and, therefore, the majority of our revenue is not subject to foreign currency risk. We are directly exposed to changes in foreign exchange rates to the extent such changes affect our expenses related to our foreign assets and liabilities with our subsidiaries in Brazil, China and the United Kingdom, whose functional currencies are the Brazilian Real, or BRL, Chinese Renminbi, or RMB, and British Pounds Sterling, or GBP, respectively.

Our operating expenses are incurred primarily in the United States, with a small portion of expenses incurred in Brazil associated with the administration of the entity, in China associated with our research and development operations that are maintained there and in the United Kingdom for our international sales and marketing activities. Our operating expenses are generally denominated in the functional currencies of our subsidiaries in which the operations are located.

The percentages of our operating expenses denominated in the following currencies for the indicated fiscal years were as follows:

	Years Ended December 31,		
	2018	2017	2016
USD	89%	89%	88%
RMB	7	7	7
GBP	4	3	4
BRL	—	1	1
	100%	100%	100%

If the currency exchange rates in 2018 had been the same as in 2017, our 2018 operating expenses would have decreased by approximately $0.8 million. If the U.S. dollar had appreciated or depreciated by 10% relative to RMB, GBP and BRL, our operating expenses for 2018 would have decreased or increased by $2.4 million, or approximately 1%. We do not currently enter into forward exchange contracts to hedge exposure denominated in foreign currencies or any derivative financial instruments. In the future, we may consider entering into hedging transactions to help mitigate our foreign currency exchange risk.

Foreign exchange rate fluctuations may also adversely impact our financial position as the assets and liabilities of our foreign operations are translated into USD in preparing our Consolidated Balance Sheets. The effect of foreign exchange rate fluctuations on our consolidated financial position for the year ended December 31, 2018 was a net translation loss of approximately $0.6 million. This loss is recognized as an adjustment to stockholders' equity through accumulated other comprehensive loss.

Transaction Exposure

We have certain assets and liabilities, primarily receivables and accounts payable (including inter-company transactions) that are denominated in currencies other than the relevant entity's functional currency. In certain circumstances, changes in the functional currency value of these assets and liabilities create fluctuations in our reported consolidated financial position, cash flows and results of operations. Transaction gains and losses on these foreign currency denominated assets and liabilities are recognized each period within other income (expense), net in our Consolidated Statements of Comprehensive Loss. During the year ended December 31, 2018, we recognized a net gain related to these foreign exchange assets and liabilities of approximately $0.4 million.

ITEM 8. Financial Statements and Supplementary Data

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
Calix, Inc.:

Opinions on the Consolidated Financial Statements and Internal Control Over Financial Reporting

We have audited the accompanying consolidated balance sheets of Calix, Inc. and subsidiaries (the Company) as of December 31, 2018 and 2017, the related consolidated statements of comprehensive loss, stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes (collectively, the consolidated financial statements). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018 based on criteria established in I*nternal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying *Item 9A, Controls and Procedures*. Our responsibility is to express an opinion on the Company's consolidated financial statements and an opinion on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG LLP

We have served as the Company's auditor since 2016.

San Francisco, California
March 1, 2019

CALIX, INC.

CONSOLIDATED BALANCE SHEETS
(In thousands, except par value)

	December 31, 2018	December 31, 2017
ASSETS		
Current assets:		
Cash and cash equivalents	$ 49,646	$ 39,775
Restricted cash	628	—
Accounts receivable, net	67,026	80,392
Inventory	50,151	31,529
Prepaid expenses and other current assets	7,306	10,759
Total current assets	174,757	162,455
Property and equipment, net	24,945	15,681
Goodwill	116,175	116,175
Other assets	1,203	759
	$ 317,080	$ 295,070
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 40,209	$ 35,977
Accrued liabilities	57,869	49,279
Deferred revenue	15,600	13,076
Line of credit	30,000	30,000
Total current liabilities	143,678	128,332
Long-term portion of deferred revenue	17,496	20,645
Other long-term liabilities	3,972	1,130
Total liabilities	165,146	150,107
Commitments and contingencies (See Note 6)		
Stockholders' equity:		
Preferred stock, $0.025 par value; 5,000 shares authorized; no shares issued and outstanding as of December 31, 2018 and 2017	—	—
Common stock, $0.025 par value; 100,000 shares authorized; 59,285 shares issued and 53,955 shares outstanding as of December 31, 2018, and 56,839 shares issued and 51,509 shares outstanding as of December 31, 2017	1,482	1,421
Additional paid-in capital	876,073	851,054
Accumulated other comprehensive loss	(753)	(169)
Accumulated deficit	(684,882)	(667,357)
Treasury stock, 5,330 shares as of December 31, 2018 and 2017	(39,986)	(39,986)
Total stockholders' equity	151,934	144,963
	$ 317,080	$ 295,070

See accompanying notes to consolidated financial statements.

CALIX, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS
(In thousands, except per share data)

	Years Ended December 31, 2018	2017	2016
Revenue:			
Systems	$ 405,923	$ 421,890	$ 428,584
Services	35,397	88,477	30,203
Total revenue	441,320	510,367	458,787
Cost of revenue:			
Systems (1)	216,529	236,137	228,976
Services (1)	27,409	101,340	28,593
Total cost of revenue	243,938	337,477	257,569
Gross profit	197,382	172,890	201,218
Operating expenses:			
Research and development (1)	89,963	127,541	106,869
Sales and marketing (1)	86,432	82,781	83,675
General and administrative (1)	40,500	39,875	41,592
Restructuring charges	5,705	4,249	—
Amortization of intangible assets	—	—	1,701
Gain on sale of product line	(6,704)	—	—
Litigation settlement gain	—	—	(4,500)
Total operating expenses	215,896	254,446	229,337
Loss from operations	(18,514)	(81,556)	(28,119)
Interest and other income (expense), net:			
Interest income (expense), net	(632)	(160)	152
Other income (expense), net	378	(73)	912
Total interest and other income (expense), net	(254)	(233)	1,064
Loss before provision for income taxes	(18,768)	(81,789)	(27,055)
Provision for income taxes	530	1,243	347
Net loss	$ (19,298)	$ (83,032)	$ (27,402)
Net loss per common share:			
Basic and diluted	$ (0.37)	$ (1.66)	$ (0.56)
Weighted-average number of shares used to compute net loss per common share:			
Basic and diluted	52,609	50,155	48,730
Net loss	$ (19,298)	$ (83,032)	$ (27,402)
Other comprehensive income (loss), net of tax:			
Unrealized gain on available-for-sale marketable securities, net	—	6	88
Foreign currency translation adjustments, net	(584)	481	(549)
Total other comprehensive income (loss), net of tax	(584)	487	(461)
Comprehensive loss	$ (19,882)	$ (82,545)	$ (27,863)

(1) Includes stock-based compensation as follows:			
Cost of revenue:			
Systems	$ 885	$ 473	$ 465
Services	363	276	207
Research and development	5,969	4,869	5,125
Sales and marketing	5,787	3,433	4,586
General and administrative	4,469	3,317	3,902

See accompanying notes to consolidated financial statements.

CALIX, INC.

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands)

	Common Stock		Additional Paid-in	Accumulated Other Comprehensive	Accumulated	Treasury	Total Stockholders'
	Shares	Amount	Capital	Loss	Deficit	Stock	Equity
Balance at December 31, 2015	49,509	$ 1,326	$ 818,754	$ (195)	$ (556,923)	$ (27,177)	$ 235,785
Stock-based compensation	—	—	14,285	—	—	—	14,285
Exercise of stock options	3	—	17	—	—	—	17
Issuance of vested performance restricted stock units and restricted stock units, net of taxes withheld	659	17	(2,118)	—	—	—	(2,101)
Stock issued under employee stock purchase plan	1,010	25	5,625	—	—	—	5,650
Net loss	—	—	—	—	(27,402)	—	(27,402)
Other comprehensive loss	—	—	—	(461)	—	—	(461)
Repurchases of common stock	(1,789)	—	—	—	—	(12,809)	(12,809)
Balance at December 31, 2016	49,392	1,368	836,563	(656)	(584,325)	(39,986)	212,964
Stock-based compensation	—	—	12,368	—	—	—	12,368
Exercise of stock options	11	—	62	—	—	—	62
Issuance of vested performance restricted stock units and restricted stock units, net of taxes withheld	994	24	(2,788)	—	—	—	(2,764)
Stock issued under employee stock purchase plans	1,112	29	4,849	—	—	—	4,878
Net loss	—	—	—	—	(83,032)	—	(83,032)
Other comprehensive income	—	—	—	487	—	—	487
Balance at December 31, 2017	51,509	1,421	851,054	(169)	(667,357)	(39,986)	144,963
Stock-based compensation	—	—	17,473	—	—	—	17,473
Exercise of stock options	57	1	383	—	—	—	384
Issuance of vested performance restricted stock units and restricted stock units, net of taxes withheld	913	22	(96)	—	—	—	(74)
Stock issued under employee stock purchase plans	1,476	38	7,259	—	—	—	7,297
Cumulative effect of accounting change	—	—	—	—	1,773	—	1,773
Net loss	—	—	—	—	(19,298)	—	(19,298)
Other comprehensive loss	—	—	—	(584)	—	—	(584)
Balance at December 31, 2018	53,955	$ 1,482	$ 876,073	$ (753)	$ (684,882)	$ (39,986)	$ 151,934

See accompanying notes to consolidated financial statements.

CALIX, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Years Ended December 31,		
	2018	2017	2016
Operating activities:			
Net loss	$ (19,298)	$ (83,032)	$ (27,402)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:			
Stock-based compensation	17,473	12,368	14,285
Depreciation and amortization	9,187	10,178	8,319
Loss on retirement of property and equipment	326	280	—
Amortization of intangible assets	—	813	5,805
Amortization of premium (discount) relating to available-for-sale securities	—	(6)	382
Gain on sale of product line	(6,704)	—	—
Changes in operating assets and liabilities:			
Accounts receivable, net	13,858	(29,056)	(4,185)
Inventory	(20,639)	13,016	3,122
Prepaid expenses and other assets	3,579	35,210	(31,042)
Accounts payable	4,596	11,759	4,236
Accrued liabilities	2,791	(20,184)	34,913
Deferred revenue	(1,426)	(14,370)	16,398
Other long-term liabilities	(183)	252	(412)
Net cash provided by (used in) operating activities	3,560	(62,772)	24,419
Investing activities:			
Purchases of property and equipment	(10,426)	(8,026)	(9,839)
Purchases of marketable securities	—	(8,732)	(16,478)
Sales of marketable securities	—	5,051	—
Maturities of marketable securities	—	31,441	38,400
Proceeds from sale of product line	10,350	—	—
Net cash provided by (used in) investing activities	(76)	19,734	12,083
Financing activities:			
Proceeds from exercise of stock options	384	62	17
Proceeds from employee stock purchase plans	7,297	4,878	5,650
Payments for repurchases of common stock	—	—	(12,809)
Taxes paid for awards vested under equity incentive plan	(74)	(2,764)	(2,101)
Proceeds from line of credit	557,915	171,268	—
Repayments of line of credit	(557,915)	(141,268)	—
Payments to originate the line of credit	(115)	(186)	—
Net cash provided by (used in) financing activities	7,492	31,990	(9,243)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	(477)	464	(526)
Net increase (decrease) in cash, cash equivalents and restricted cash	10,499	(10,584)	26,733
Cash, cash equivalents and restricted cash at beginning of period	39,775	50,359	23,626
Cash, cash equivalents and restricted cash at end of period	$ 50,274	$ 39,775	$ 50,359
Supplemental disclosures of cash flow information:			
Interest paid	$ 649	$ 313	$ 127
Income taxes paid	$ 561	915	965
Non-cash investing activities:			
Changes in accounts payable and accrued liabilities related to purchases of property and equipment	$ 8,459	$ (55)	$ (478)

See accompanying notes to consolidated financial statements.

CALIX, INC.

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

1. Description of Business and Significant Accounting Policies

Company

Calix, Inc. (together with its subsidiaries, “Calix” or the “Company”) was incorporated in August 1999 and is a Delaware corporation. The Company is a leading global provider of the cloud and software platforms, systems and services required to deliver the unified access network and smart premises of tomorrow. The Company’s platforms and services help its customers build next generation networks by embracing a DevOps operating model, optimize the subscriber experience by leveraging big data analytics and turn the complexity of the smart home and business into new revenue streams. The Company's cloud and software platforms, systems and services enable communication service providers (“CSPs”) to provide a wide range of revenue-generating services, from basic voice and data to advanced broadband services, over legacy and next-generation access networks. The Company focuses on CSP access networks, the portion of the network that governs available bandwidth and determines the range and quality of services that can be offered to subscribers.

Basis of Presentation

The accompanying consolidated financial statements have been prepared in accordance with the requirements of the U.S. Securities and Exchange Commission (“SEC”). In the opinion of management, the consolidated financial statements include all normal and recurring adjustments that are considered necessary for the fair presentation of the Company’s financial position and operating results. All significant intercompany balances and transactions have been eliminated in consolidation.

Applicable Accounting Guidance

Any reference in these notes to applicable accounting guidance (“guidance”) is meant to refer to the authoritative U.S. generally accepted accounting principles (“GAAP”) as found in the Financial Accounting Standards Board (“FASB”) Accounting Standards Codification (“ASC”).

Use of Estimates

The preparation of financial statements is in conformity with U.S. GAAP, which requires management to make estimates and assumptions that affect the amounts reported in the consolidated financial statements and accompanying notes. For the Company, these estimates include, but are not limited to: allowances for doubtful accounts and sales returns, excess and obsolete inventory, allowances for obligations to its contract manufacturers, valuation of stock-based compensation, useful lives assigned to long-lived assets, standard and extended warranty costs and contingencies. Actual results could differ from those estimates, and such differences could be material to the Company’s financial position and results of operations.

Revenue Recognition

Revenue is recognized when a performance obligation is satisfied, which occurs when control of the promised goods or services is transferred to the customer, in an amount that reflects the consideration the Company expects to be entitled to in exchange for those goods or services.

A performance obligation is a promise in a contract to transfer a distinct good or service to the customer and is the unit of account. A contract’s transaction price is allocated to each distinct performance obligation and recognized as revenue when, or as, the performance obligation is satisfied. The Company’s hardware products contain both software and non-software components that function together to deliver the products’ essential functionality and therefore constitutes a single performance obligation as the promise to transfer the individual software and non-software components is not separately identifiable and, therefore, not distinct. The Company’s contracts may include multiple performance obligations. For such arrangements, the Company allocates the contract’s transaction price to each performance obligation using the relative stand-alone selling price of each distinct good or service in the contract. The Company generally determines stand-alone selling prices based on the prices charged to customers or its best estimate of stand-alone selling price. The Company’s estimate of stand-alone selling price is established considering multiple factors including, but not limited to, geographies, market conditions, competitive landscape, internal costs, gross margin objectives, characteristics of targeted customers and pricing practices. The determination of estimated stand-alone selling price is made through consultation with and formal approval by management, taking into consideration the go-to-market strategy.

For certain revenue arrangements involving delivery of both systems and professional services, each is considered a distinct performance obligation. Systems revenue is recognized at a point in time when management has determined that control over systems has transferred to the customer, which is generally when legal title has transferred to the customer. For the same revenue arrangements, management believes that the output of the associated professional services is transferred to the customer over time. As such, professional services revenue is recognized over the period in which the services are provided using a cost input measure. The Company recognizes revenue when control of the systems and services has been transferred to the customer, which may be earlier than system installation or customer acceptance, in accordance with the agreed-upon specifications in the contract.

The Company derives revenue from contracts with customers primarily from the following and categorizes its revenue as follows:

- Systems include revenue from the sale of access and premises systems, software platform licenses and cloud-based software subscriptions.
- Services include revenue from professional services, customer support, software- and cloud-based maintenance, extended warranty subscriptions, training and managed services.

Cost of Revenue

Cost of revenue consists primarily of finished goods inventory purchased from the Company’s contract manufacturers, payroll and related expenses associated with managing the relationships with contract manufacturers, depreciation of manufacturing test equipment, warranty and retrofit costs, excess and obsolete inventory costs, shipping charges and amortization of certain intangible assets. It also includes contractor and other costs of services incurred directly related to the delivery of services to customers.

Warranty and Retrofit

The Company offers limited warranties for its hardware products for a period of one, three or five years, depending on the product type. The Company recognizes estimated costs related to warranty activities as a component of cost of revenue upon product shipment or upon identification of a specific product failure. Under certain circumstances, the Company also provides fixes on specifically identified performance failures for products that are outside of the standard warranty period and recognizes estimated costs related to retrofit activities as a component of cost of revenue upon identification of such product failures. The Company recognizes estimated warranty and retrofit costs when it is probable that a liability has been incurred and the amount of loss is reasonably estimable. The estimates are based upon historical and projected product failure and claim rates, historical costs incurred in correcting product failures and information available related to any specifically identified product failures. Judgment is required in estimating costs associated with warranty and retrofit activities, and the Company's estimates are limited to information available to the Company at the time of such estimates. In some cases, such as when a specific product failure is first identified or a new product is introduced, the Company may initially have limited information and limited historical failure and claim rates upon which to base its estimates, and such estimates may require revision in future periods. The recorded amount is adjusted from time to time for specifically identified warranty and retrofit exposure. Actual warranty and retrofit expenses are charged against the Company’s estimated warranty and retrofit liability when incurred. Factors that affect the Company’s warranty and retrofit liability include the number of active installed units and historical and anticipated rates of warranty and retrofit claims and cost per claim.

Stock-Based Compensation

Stock-based compensation expense associated with stock options, restricted stock units (“RSUs”), performance restricted stock units (“PRSUs”) and purchase rights under the Amended and Restated Employee Stock Purchase Plan (the“ESPP”) and the Amended and Restated 2017 Nonqualified Employee Stock Purchase Plan (the “Nonqualified ESPP”) is measured at the grant date based on the fair value of the award, and is recognized, net of forfeitures, as expense over the remaining requisite service period (generally the vesting period) on a straight-line basis.

The fair value of stock option and employee stock purchase right under the ESPP is estimated at the grant date using the Black-Scholes option valuation model. The fair value of RSUs and employee stock purchase right under the Nonqualified ESPP is based on closing market price of the Company’s common stock on the date of grant.

Stock-based compensation expense associated with PRSUs with graded vesting features and which contain both a performance and a service condition is measured based on the closing market price of the Company’s common stock on the date of grant, and is recognized, net of forfeitures, as expense over the requisite service period using the graded vesting attribution method.

Stock-based compensation expense associated with performance-based stock options with graded vesting features and which contain both a performance and a service condition is measured based on fair value of stock options estimated at the grant date using the Black-Scholes option valuation model, and is recognized, net of forfeitures, as expense over the requisite service period using the graded vesting attribution method.

Compensation expense associated with PRSUs and performance-based stock option awards with graded vesting features and which contain both a performance and a service condition is only recognized if the Company has determined that it is probable that the performance condition will be met. The Company reassesses the probability of vesting at each reporting period and adjusts compensation expense based on its probability assessment.

Loss Contingencies

From time to time, the Company is involved in legal proceedings arising from the normal course of business activities. The Company evaluates the likelihood of an unfavorable outcome of legal proceedings to which it is a party and accrues a loss contingency when the loss is probable and reasonably estimable. Assessing legal contingencies involves significant judgment and estimates, and the outcome of litigation is inherently uncertain and subject to numerous factors outside the Company's control. Significant judgment is required when the Company assesses the likelihood of any adverse judgments or outcomes, including the potential range of possible losses, and whether losses are probable and reasonably estimable.

Because of uncertainties related to these matters, the Company bases its estimates of whether a loss contingency is probable or reasonably possible, as well as the reasonable range of possible losses associated with each loss contingency, only on the information available at the time. As additional information becomes available, and at least quarterly, the Company reassesses the potential liability on each significant matter and may revise its estimates. These revisions could have a material impact on the Company's business, operating results or financial condition. The actual outcome of these legal proceedings may materially differ from the Company's estimates of potential liability, which could have a material adverse effect on the Company's business, operating results or financial condition.

Credit Risk and Inventory Supplier Concentrations

Financial instruments that potentially subject the Company to significant concentrations of credit risk consist primarily of cash and cash equivalents and accounts receivable. Cash equivalents consist of money market funds, which are invested through financial institutions in the United States. Deposits in these financial institutions may, at times, exceed federally insured limits. The Company has not experienced any losses in such accounts. The Company also has approximately $3.7 million of cash held by its foreign subsidiaries in Brazil, China and the United Kingdom. Management believes that the financial institutions that hold the Company's cash and cash equivalents are financially sound and, accordingly, minimal credit risk exists with respect to these cash and cash equivalents.

Concentrations of credit risk in relation to customers with an accounts receivable balance of 10% or greater of total accounts receivable and customers with net revenue of 10% or greater of total revenue are presented below for the periods indicated.

	Percentage of Accounts Receivable		Percentage of Revenue		
	December 31,		Years Ended December 31,		
	2018	2017	2018	2017	2016
CenturyLink	16%	42%	18%	31%	21%
Windstream	*	*	*	*	15%

* Less than 10% of total accounts receivable or revenue.

The Company depends primarily on a small number of outside contract manufacturers ("CMs") and original design manufacturers ("ODMs") for the bulk of its finished goods inventory. In particular, the Company relied on Flex Ltd for the manufacture of a large percentage of its products through 2018. The Company generally purchases its products through purchase orders with its suppliers. While the Company seeks to maintain a sufficient supply of its products, the Company's business and results of operations could be adversely affected by a stoppage or delay in receiving such products, the receipt of defective parts, an increase in price of such products or the Company's inability to obtain lower prices from its CMs and other suppliers in response to competitive pressures.

Fair Value of Financial Instruments

The carrying amounts of cash and cash equivalents, marketable securities, trade receivables, accounts payable, line of credit and other accrued liabilities approximate their fair value due to their relatively short-term nature.

Cash, Cash Equivalents, Restricted Cash and Marketable Securities

Cash equivalents and marketable securities are stated at amounts that approximate fair value based on quoted market prices.

Restricted cash is cash that is legally restricted as to withdrawal or usage. As of December 31, 2018, the Company had $0.6 million in restricted cash related to a letter of credit for our San Jose lease.

The Company has invested its excess cash primarily in money market funds and highly liquid marketable securities such as corporate debt instruments, commercial paper and U.S. government agency securities. The Company considers all investments with maturities of three months or less when purchased to be cash equivalents. Marketable securities represent highly liquid corporate debt instruments, commercial paper and U.S. government agency securities with maturities greater than 90 days at date of purchase. Marketable securities with maturities greater than one year are classified as current because management considers all marketable securities to be available for current operations.

The Company's investments have been classified and accounted for as available-for-sale. Such investments are recorded at fair value and unrealized holding gains and losses are reported as a separate component of comprehensive loss in the stockholders' equity until realized. Realized gains and losses on sales of marketable securities, if any, are determined on the specific identification method and are reclassified from accumulated other comprehensive loss to results of operations as "Other income (expense), net". The Company had no investments as of December 31, 2018 and 2017.

Allowance for Doubtful Accounts

The Company maintains an allowance for doubtful accounts for estimated losses resulting from the inability of its customers to make required payments. The Company records a specific allowance based on an analysis of individual past-due balances. Additionally, based on historical write-offs and the Company's collection experience, the Company records an additional allowance based on a percentage of outstanding receivables. The Company performs credit evaluations of its customers' financial condition. These evaluations require judgment and are based on a variety of factors including, but not limited to, current economic trends, payment history and a financial review of the customer. Actual collection losses may differ from management's estimates, and such differences could be material to our financial position and results of operations.

Inventory Valuation

Inventory, which primarily consists of finished goods purchased from CMs or ODMs, is stated at the lower of cost (determined by the first-in, first-out method) or market value. Inbound shipping costs and U.S. tariffs are included in cost of inventory. In addition, the Company, from time to time, procures component inventory primarily as a result of manufacturing discontinuation of critical components by suppliers. The Company regularly monitors inventory quantities on hand and records write-downs for excess and obsolete inventories based on the Company's estimate of demand for its products, potential obsolescence of technology, product life cycles and whether pricing trends or forecasts indicate that the carrying value of inventory exceeds its estimated selling price. These factors are impacted by market and economic conditions, technology changes and new product introductions and require significant estimates that may include elements that are uncertain. Actual demand may differ from forecasted demand and may have a material effect on gross profit. If inventory is written down, a new cost basis is established that cannot be increased in future periods. Shipments from suppliers or CMs before the Company receives them are recorded as in-transit inventory when title and the significant risks and rewards of ownership have passed to the Company.

Contract Costs

The Company capitalizes all incremental costs incurred to obtain a contract with a customer that it would not have incurred if the contract had not been obtained, provided it expects to recover the costs. The Company capitalizes certain sales commissions related primarily to extended warranty and Calix Cloud products for which the expected amortization period is greater than one year.

The Company expects that sales commissions as a result of obtaining customer contracts are recoverable, and therefore the Company defers and capitalizes them as contract costs. Capitalized commissions are amortized as sales and marketing expenses over the period that the related revenue is recognized, which typically range from three to ten years for extended warranty and cloud offerings. The Company classifies the unamortized portion of deferred commissions as current or noncurrent based on the timing of when the Company expects to recognize the expense. The current and noncurrent portions of deferred commissions are included in prepaid expenses and other current assets and other assets, respectively, in the Company's Consolidated Balance Sheets.

As of December 31, 2018, the unamortized balance of deferred commissions was $0.8 million. For the year ended December 31, 2018, the amount of amortization was $0.1 million, and there was no impairment loss in relation to the costs capitalized.

Property and Equipment

Property and equipment are stated at cost, less accumulated depreciation, and are depreciated using the straight-line method over the estimated useful life of each asset. Generally, computer equipment is depreciated over two years; purchased software is depreciated over three years; test equipment is depreciated over three years; furniture and fixtures are depreciated over seven years; and leasehold improvements are depreciated over the shorter of the respective lease term or the estimated useful life of the asset. Maintenance and repairs are charged to expense as incurred.

Goodwill

Goodwill was recorded as a result of the Company's acquisitions of Occam Networks, Inc. ("Occam") in February 2011 and Optical Solutions, Inc. in February 2006. The Company records goodwill when consideration paid in a business acquisition exceeds the fair value of the net tangible assets and the identified intangible assets acquired. Goodwill is not amortized but instead is subject to an annual impairment test or more frequently if events or changes in circumstances indicate that it may be impaired. The Company evaluates goodwill on an annual basis as of the end of the second quarter of each fiscal year. Management has determined that it operates as a single reporting unit and, therefore, evaluates goodwill impairment at the enterprise level.

In an annual impairment test, the Company first assesses qualitative factors to determine whether it is necessary to perform the two-step quantitative goodwill impairment test. In assessing the qualitative factors, management considers the impact of these key factors: macro-economic conditions, industry and market environment, overall financial performance of the Company, cash flow from operating activities, market capitalization and stock price. If the Company determines as a result of the qualitative assessment that it is more likely than not (that is, a likelihood of more than 50 percent) that the fair value of a reporting unit is less than its carrying amount, then the quantitative test is required. Otherwise, no further testing is required.

In a quantitative test, the Company compares its fair value to its carrying value including goodwill. The Company determines its fair value using both an income approach and a market approach. Under the income approach, the Company determines fair value based on estimated future cash flows, discounted by an estimated weighted-average cost of capital, which reflects the overall level of inherent risk of the Company and the rate of return an outside investor would expect to earn. Under the market-based approach, the Company utilizes information regarding the Company as well as publicly available industry information to determine earnings multiples that are used to value the Company. If the carrying value of the Company exceeds its fair value, the Company will determine the amount of impairment loss by comparing the implied fair value of goodwill with the carrying value of goodwill. An impairment charge is recognized for the excess of the carrying value of goodwill over its implied fair value.

At the end of the second quarter of 2018, the Company completed its annual goodwill impairment test. Based on its assessment of the above qualitative factors, management concluded that the fair value of the Company was more likely than not greater than its carrying amount as of June 30, 2018. As such, it was not necessary to perform the two-step quantitative goodwill impairment test at the time.

There have been no significant events or changes in circumstances subsequent to the 2018 annual impairment test that would more likely than not indicate that the carrying value of goodwill may have been impaired as of December 31, 2018. Therefore, there was no impairment to the carrying value of the Company's goodwill as of December 31, 2018. There were no impairment losses for goodwill in the years ended December 31, 2017 or 2016.

Deferred Revenue

Deferred revenue results from transactions where the Company billed the customer for products or services and when cash payments are received or due prior to transferring control of the promised goods or services to the customer.

Revenue allocated to remaining performance obligations represent contract revenue that has not yet been recognized, which includes deferred revenue and amounts that will be invoiced and recognized as revenue in future periods. This amount was $33.1 million as December 31, 2018, and the Company expects to recognize 47% of such revenue over the next year and the remainder thereafter.

Payment terms to customers typically range from net 30 to net 90 days and vary by the size and location of customer and the products or services offered. The period between the transfer of control of the promised good or service to a customer and when payment is due is not significant.

Income Taxes

The Company evaluates its tax positions and estimates its current tax exposure along with assessing temporary differences that result from different book to tax treatment of items not currently deductible for tax purposes. These differences result in deferred tax assets and liabilities on the Company's Consolidated Balance Sheets, which are estimated based upon the difference between the financial statement and tax bases of assets and liabilities using the enacted tax rates that will be in effect when these differences reverse. In general, deferred tax assets represent future tax benefits to be received when certain expenses previously recognized in the Company's Consolidated Statements of Comprehensive Loss become deductible expenses under applicable income tax laws or loss or credit carryforwards are utilized. Accordingly, realization of the Company's deferred tax assets is dependent on future taxable income against which these deductions, losses and credits can be utilized.

The Company must assess the likelihood that the Company's deferred tax assets will be recovered from future taxable income, and to the extent the Company believes that recovery is not more likely than not, the Company must establish a valuation allowance. Management judgment is required in determining the Company's provision for income taxes, the Company's deferred tax assets and liabilities and any valuation allowance recorded against the Company's net deferred tax assets. Excluding foreign operations, the Company recorded a full valuation allowance at each balance sheet date presented because, based on the available evidence, the Company believes it is more likely than not that it will not be able to utilize all of its deferred tax assets in the future. The Company intends to maintain the full valuation allowance until sufficient evidence exists to support the reversal of the valuation allowance.

Newly Adopted Accounting Standards

Revenue from Contracts with Customers

In May 2014, the FASB issued Accounting Standards Update No. ("ASU") 2014-09, "*Revenue from Contracts with Customers (Topic 606)"*, which provides guidance for revenue recognition. ASU 2014-09 supersedes the revenue recognition requirements in Topic 605, "*Revenue Recognition"*, and most industry-specific guidance. Additionally, it supersedes some cost guidance included in Subtopic 605-35, "*Revenue Recognition-Construction-Type and Production-Type Contracts"*, and creates new Subtopic 340-40, "*Other Assets and Deferred Costs-Contracts with Customers*." The Company determines revenue recognition through the following steps: identification of the contract, or contracts, with a customer; identification of the performance obligations in the contract; determination of the transaction price; allocation of the transaction price to the performance obligations in the contract; and recognition of revenue when, or as, the Company satisfies a performance obligation. The standard's core principle is that a company will recognize revenue when it transfers promised goods or services to customers in an amount that reflects the consideration to which the company expects to be entitled in exchange for those goods or services. In doing so, companies will need to use more judgment and make more estimates than under the previous guidance. These may include identifying performance obligations in the contract, estimating the amount of variable consideration to include in the transaction price and allocating the transaction price to each separate performance obligation. The new standard permits adoption by using either (i) a full retrospective approach for all periods presented in the period of adoption or (ii) a modified retrospective approach with the cumulative effect of initially applying the new standard recognized at the date of initial application and providing certain additional disclosures.

On January 1, 2018, the Company adopted Topic 606 and Subtopic 340-40 using the modified retrospective transition method applied to those contracts which were not completed as of January 1, 2018. Accordingly, results for reporting periods beginning after January 1, 2018 are presented under Topic 606, while results for prior periods have not been restated and continues to be reported under the accounting standards in effect for those periods. The Company recognized the cumulative effect of initially applying the standards as an adjustment to the opening balance of accumulated deficit of $1.8 million as of January 1, 2018, with the impact primarily relating to deferring the costs of obtaining contracts (sales commissions) and the upfront recognition of software license revenue. The impact to revenue of applying Topic 606 for the year ended December 31, 2018 was an increase of $1.7 million.

Practical Expedients

The Company expenses sales commissions as sales and marketing expenses when incurred if the expected amortization period is one year or less. This applies generally to all transactions other than extended warranty contracts and Calix Cloud products.

The Company does not disclose the value of unsatisfied performance obligations for (i) contracts with an original expected length of one year or less and (ii) contracts for which the Company recognizes revenue at the amount to which it has the right to invoice for services performed.

The Company does not adjust the promised amount of consideration for the effects of a significant financing component if the Company expects, at contract inception, that the period between when the Company transfers a promised good or service to a customer and when the customer pays for that good or service will be one year or less.

Cumulative Effect of Adoption

The cumulative effect of changes made to the Consolidated January 1, 2018 Balance Sheet was as follows (in thousands):

	Balance at December 31, 2017	Adjustments	Balance at January 1, 2018
Accounts receivable, net	$ 80,392	$ 491	$ 80,883
Prepaid expenses and other current assets	10,759	(245)	10,514
Other assets	759	698	1,457
Total assets	295,070	944	296,014
Deferred revenue	13,076	(829)	12,247
Total liabilities	150,107	(829)	149,278
Accumulated deficit	(667,357)	1,773	(665,584)
Total liabilities and stockholders' equity	295,070	944	296,014

The impact of adopting the new revenue standard on the Company's consolidated financial statements as of and for the year ended December 31, 2018 were as follows (in thousands):

Consolidated Balance Sheet

As of December 31, 2018	As Reported	Adjustments	Balances Without Adoption of Topic 606
Accounts receivable, net	$ 67,026	$ (1,095)	$ 65,931
Prepaid expenses and other current assets	7,306	953	8,259
Other assets	1,203	(567)	636
Total assets	317,080	(709)	316,371
Accrued liabilities	57,869	(880)	56,989
Deferred revenue	33,096	2,801	35,897
Total liabilities	165,146	1,921	167,067
Accumulated deficit	(684,882)	(2,630)	(687,512)
Total liabilities and stockholders' equity	317,080	(709)	316,371

Consolidated Statement of Comprehensive Loss

Year Ended December 31, 2018	As Reported	Adjustments	Balances Without Adoption of Topic 606
Revenue:			
Systems	$ 405,923	$ (3,253)	$ 402,670
Services	35,397	1,559	36,956
Total revenue	441,320	(1,694)	439,626
Cost of revenue:			
Systems	216,529	(1,052)	215,477
Services	27,409	274	27,683
Total cost of revenue	243,938	(778)	243,160
Gross profit	197,382	(916)	196,466
Sales and marketing	86,432	(59)	86,373
Net loss	(19,298)	(857)	(20,155)

Cloud Computing Costs

In August 2018, the FASB issued ASU 2018-15, *"Intangibles (Topic 350): Customer's Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract"*, which aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. This new standard also requires customers to expense the capitalized implementation costs of a hosting arrangement that is a service contract over the term of the hosting arrangement. This new standard becomes effective for the Company in the first quarter of 2020, with early adoption permitted.

This new standard can be applied either retrospectively or prospectively to all implementation costs incurred after the date of adoption. The Company adopted the standard prospectively in the fourth quarter of 2018, resulting in the capitalization of $1.2 million in implementation costs related to the Company's SaaS-based enterprise resource planning infrastructure project.

Statement of Cash Flows

In November 2016, the FASB issued ASU 2016-18, an update to *"Statement of Cash Flows (Topic 230)"*, to provide guidance on classification and presentation of changes in restricted cash on the statement of cash flows. ASU 2016-18 requires that an entity's reconciliation of the beginning-of-period and end-of-period total amounts shown on the statement of cash flows to include restricted cash within cash and cash equivalents. The Company adopted ASU 2016-18 in 2018. Prior to 2018, the Company did not have restricted cash. As of December 31, 2018, the Company classified $0.6 million as restricted cash in our Consolidated Balance Sheets. The adoption of ASU 2016-18 did not have a material impact on our Consolidated Statements of Cash Flows.

Recent Accounting Pronouncements Not Yet Adopted

Leases

In February 2016, the FASB issued ASU 2016-02, *"Leases (Topic 842)"*, which requires recognition of an asset and liability for lease arrangements longer than twelve months. ASU 2016-02 will be effective for the Company beginning in the first quarter of 2019. The standard can be adopted using either a modified retrospective approach, whereby the Company would recognize and measure leases at the beginning of the earliest period presented, or the effective date approach, whereby the Company would initially account for the impact of the adoption with a cumulative-effect adjustment to the January 1, 2019 financial statements. The effective date approach will eliminate the need to restate amounts presented prior to January 1, 2019. The Company adopted the new standard effective January 1, 2019 using the effective date approach. Upon adoption of the standard, the Company's assets and liabilities will increase by approximately $16 million as the new standard requires recognition of right-of-use assets and lease liabilities for operating leases, but the new standard does not impact its Statements of Comprehensive Loss or Cash Flows.

2. Cash and Cash Equivalents

Cash and cash equivalents consisted of the following (in thousands):

	December 31,	
	2018	2017
Cash and cash equivalents:		
Cash	$ 45,806	$ 35,999
Money market funds	3,840	3,776
	$ 49,646	$ 39,775

The carrying amounts of the Company's money market funds approximate their fair values due to their nature, duration and short maturities.

3. Fair Value Measurements

The Company measures its cash equivalents and marketable securities at fair value on a recurring basis. Fair value is an exit price, representing the amount that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. The Company utilizes the following three-tier value hierarchy which prioritizes the inputs used in measuring fair value:

Level 1 – Observable inputs that reflect quoted prices (unadjusted) for identical assets or liabilities in active markets.

Level 2 – Observable inputs other than quoted prices included in Level 1 for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active, and model-driven valuations in which all significant inputs and significant value drivers are observable in active markets.

Level 3 – Unobservable inputs to the valuation derived from fair valuation techniques in which one or more significant inputs or significant value drivers are unobservable. The fair value hierarchy also requires the Company to maximize the use of observable inputs, when available, and to minimize the use of unobservable inputs when determining inputs and determining fair value.

As of December 31, 2018 and 2017, the Company had money market funds of $3.8 million for each period, and each was classified as a Level 1 financial asset. The fair values of money market funds classified as Level 1 were derived from quoted market prices as active markets for these instruments exist. The Company had no Level 2 or Level 3 financial assets.

4. Balance Sheet Details

Accounts receivable, net consisted of the following (in thousands):

	December 31, 2018	December 31, 2017
Accounts receivable	$ 67,396	$ 81,793
Allowance for doubtful accounts	(370)	(579)
Product return reserve [1]	—	(822)
	$ 67,026	$ 80,392

(1) With adoption of Topic 606 on January 1, 2018, the product return reserve is considered a contract liability and has been reclassified to accrued liabilities.

The table below summarizes the changes in allowance for doubtful accounts and product return reserve for the periods indicated (in thousands):

	Balance at Beginning of Year	Additions Charged to Costs or Expenses or Revenue	Deductions and Write Offs	Balance at End of Year
Year Ended December 31, 2018				
Allowance for doubtful accounts	$ 579	$ (5)	$ (204)	$ 370
Product return reserve	822	771	(713)	880
Year Ended December 31, 2017				
Allowance for doubtful accounts	$ 518	$ 103	$ (42)	$ 579
Product return reserve	938	3,682	(3,798)	822
Year Ended December 31, 2016				
Allowance for doubtful accounts	$ 501	$ 232	$ (215)	$ 518
Product return reserve	663	3,679	(3,404)	938

Inventory consisted of the following (in thousands):

	December 31, 2018	December 31, 2017
Raw materials	$ 10,815	$ 1,211
Finished goods	39,336	30,318
	$ 50,151	$ 31,529

Property and equipment, net consisted of the following (in thousands):

	December 31, 2018	December 31, 2017
Test equipment	$ 39,148	$ 39,952
Computer equipment and purchased software	34,697	32,175
Furniture and fixtures	1,976	2,714
Leasehold improvements	3,559	6,029
	79,380	80,870
Accumulated depreciation and amortization	(54,435)	(65,189)
	$ 24,945	$ 15,681

Depreciation and amortization expenses were $9.2 million, $10.2 million and $8.3 million for the years ended December 31, 2018, 2017 and 2016, respectively.

Accrued liabilities consisted of the following (in thousands):

	December 31, 2018	December 31, 2017
Accrued compensation and related benefits	$ 19,811	$ 15,563
Accrued warranty and retrofit	8,547	8,708
Accrued customer rebates/prepayments	6,103	1,432
Accrued professional and consulting fees	6,060	9,604
Accrued excess and obsolete inventory at CMs or ODMs	2,667	2,430
Current portion of equipment financing arrangements	1,778	—
Accrued business events	1,696	1,272
Accrued non-income related taxes	1,288	1,778
Accrued freight	1,187	593
Accrued insurance	917	827
Product return reserve (1)	880	—
Accrued restructuring charges	28	1,417
Accrued other	6,907	5,655
	$ 57,869	$ 49,279

(1) With adoption of Topic 606 on January 1, 2018, the product return reserve is considered a contract liability and has been reclassified from accounts receivable.

Changes in the Company's accrued warranty and retrofit liability were as follows (in thousands):

	Years Ended December 31, 2018	2017	2016
Balance at beginning of period	$ 8,708	$ 12,214	$ 9,564
Provision for warranty and retrofit charged to cost of revenue	5,215	8,720	9,898
Utilization of reserve	(5,376)	(12,226)	(6,816)
Adjustments to pre-existing reserve	—	—	(432)
Balance at end of period	$ 8,547	$ 8,708	$ 12,214

Accrued Restructuring Charges

The Company adopted a restructuring plan in March 2017. This restructuring plan realigned the Company's business, increasing its focus towards its investments in software defined access and cloud products, while reducing its expense structure in its traditional systems business. The Company began to take actions under this plan beginning in March 2017 and recognized $4.2 million of restructuring charges for the year ended December 31, 2017, consisting primarily of severance and other one-time termination benefits. Actions pursuant to this restructuring plan were complete as of December 31, 2017.

The Company established a new restructuring plan in February 2018 to further align its business resources based on the production releases of its platform offerings. The Company incurred restructuring charges of approximately $5.7 million for the year ended December 31, 2018, consisting primarily of severance and other termination related benefits.

The following table summarizes the activities pursuant to the above restructuring plans (in thousands):

	Severance and Related Benefits	Facilities	Total
Balance at December 31, 2016	$ —	$ —	$ —
Restructuring charges for the year	3,807	442	4,249
Cash payments	(2,832)	—	(2,832)
Balance at December 31, 2017	$ 975	$ 442	$ 1,417
Restructuring charges for the year	5,203	502	5,705
Cash payments	(6,178)	(916)	(7,094)
Balance at December 31, 2018	$ —	$ 28	$ 28

Contract Asset

The primary contract asset is revenue recognized on professional services contracts where the services are transferred to the customer over time, less any progress billings and advanced payments, and is classified within accounts receivable. Amounts are billed in accordance with the agreed-upon contractual terms. The opening balance at January 1, 2018 was $1.5 million of which $0.2 million remained in our Consolidated Balance Sheet at December 31, 2018. The closing balance at December 31, 2018 was $5.9 million of which we expect to bill substantially all of the balance during 2019. The increase in the contract asset was driven by the timing of professional services contracts with a major customer at the end of fiscal 2018.

Contract Liability

Deferred revenue consisted of the following (in thousands):

	December 31,	
	2018	**2017**
Current:		
Product and services	$ 11,600	$ 9,125
Extended warranty	4,000	3,951
	15,600	13,076
Non-current:		
Product and services	440	18
Extended warranty	17,056	20,627
	17,496	20,645
	$ 33,096	$ 33,721

The decrease in the deferred revenue balance for the year ended December 31, 2018 is primarily driven by $11.9 million of revenue recognized that was included in the deferred revenue balance at the beginning of the year offset by cash payments received or due in advance of satisfying our performance obligations.

5. Credit Agreements

Line of Credit

On August 7, 2017, the Company entered into a loan and security agreement (the "Loan Agreement") with Silicon Valley Bank ("SVB"). The Loan Agreement provides for a senior secured revolving credit facility with SVB, pursuant to which SVB agreed to make revolving advances available to the Company in a principal amount of up to $30.0 million based on a customary accounts receivable borrowing base, subject to certain exceptions for accounts originating outside the United States and certain specific accounts, which could reduce the amount available to the Company under the credit facility.

The credit facility includes affirmative and negative covenants applicable to the Company and its subsidiaries. Furthermore, the Loan Agreement requires the Company to maintain a liquidity ratio at minimum levels set forth in more detail in the Loan Agreement. The credit facility also includes events of default, the occurrence and continuation of which would provide SVB with the right to demand immediate repayment of any principal and unpaid interest under the credit facility, and to exercise remedies against the Company and the collateral securing the loans under the credit facility. For the month ended November 30, 2017, the Company was not able to maintain the minimum Adjusted Quick Ratio ("AQR"), (as defined in the Loan Agreement) at the level required in the Loan Agreement, which constituted an event of default. Although SVB waived this event of default effective as of November 30, 2017 and, therefore, this default did not change the Company's ability to borrow under the Loan Agreement, the Company was required to amend certain covenants under the Loan Agreement. In February 2018, the Company entered into an amendment to the Loan Agreement that, among other things, amended certain affirmative financial covenants, including reductions to the required minimum level of the AQR and the inclusion of an additional financial covenant related to the maintenance of Adjusted EBITDA (as defined in the Loan Agreement, as amended). In August 2018, the Company entered into a second amendment to the Loan Agreement that, among other things, extended the maturity date from August 7, 2019 to August 7, 2020, amended certain financial covenants, including covenants with respect to the AQR and the Adjusted EBITDA, and changed the compliance requirements for the AQR covenant from a monthly basis to a quarterly basis. As of December 31, 2018, the Company was in compliance with these requirements.

As of December 31, 2018 and December 31, 2017, the Company had borrowings outstanding of $30.0 million, representing the full amount available under the line of credit. Our interest rate on the line of credit was 7.0% as of December 31, 2018 and 5.8% as of December 31, 2017.

Equipment Financing Arrangements

During 2018, the Company entered into financing arrangements to purchase lab and test equipment for approximately $5.1 million. Each agreement is to be paid over 36 months with a weighted average interest rate of 6.2%.

6. Commitments and Contingencies

Lease Commitments

The Company leases office space under non-cancelable operating leases. Certain of the Company's operating leases contain renewal options and rent acceleration clauses. Future minimum payments under the non-cancelable operating leases consisted of the following as of December 31, 2018 (in thousands):

Year Ending December 31,	Minimum Future Lease Payments
2019	$ 3,750
2020	3,817
2021	3,468
2022	3,300
2023	3,411
Thereafter	6,053
Total	$ 23,799

The Company leases its headquarters office space in San Jose, California under a lease agreement that expires in December 2025. In March 2018, the Company entered into this lease agreement for approximately 65,000 square feet, which commenced in September 2018. The future minimum lease payments under the lease are $16.1 million and are included in the table above.

In June 2018, the Company entered into a co-location license agreement to lease data center space in West Jordan, Utah for a term of 84 months. The future minimum lease payments under the lease are $2.9 million and are included in the table above.

In August 2018, the Company entered into a new office lease agreement for 22,000 square feet in Petaluma, California as its current office lease in Petaluma, California expires in February 2019. The lease is expected to commence in March 2019 for a term of 64 months. The future minimum lease payments of $2.8 million are included in the table above.

The above table also includes future minimum lease payments for the Company's office facilities in Minneapolis, Minnesota; Nanjing, China; Richardson, Texas; and the current office in Petaluma, California, which expire at various dates through 2022.

For the years ended December 31, 2018, 2017 and 2016, total rent expense of the Company was $3.4 million, $3.7 million and $3.5 million, respectively.

Purchase Commitments

The Company's CMs place orders for component inventory in advance based upon the Company's build forecasts in order to reduce manufacturing lead times and ensure adequate component supply. The components are used by the CM to build the products included in the build forecasts. The Company generally does not take ownership of the components held by CMs. The Company places purchase orders with its CMs in order to fulfill its monthly finished product inventory requirements. The Company incurs a liability when the CMs convert the component inventory to a finished product and takes ownership of the inventory when transferred to the designated shipping warehouse. In the event of termination of services with a CM, the Company has purchased, and may be required to purchase in the future, the remaining components inventory held by the CM as well as any outstanding orders pursuant to the contractual provisions with such CM. As of December 31, 2018, the Company had approximately $42.0 million of outstanding purchase commitments for inventories to be delivered by its suppliers, including CMs and ODMs, within one year.

The Company has from time to time, and subject to certain conditions, reimbursed its CMs for component inventory purchases when this inventory has been rendered excess or obsolete, for example due to manufacturing and engineering change orders resulting from design changes, manufacturing discontinuation of parts by its suppliers, or in cases where inventory levels greatly exceed projected demand. The estimated excess and obsolete inventory liabilities related to such manufacturing and engineering change orders and other factors, which are included in accrued liabilities in the accompanying balance sheets, were $2.7 million and $2.4 million as of December 31, 2018 and 2017, respectively. The Company records the related charges in cost of systems revenue in its Consolidated Statements of Comprehensive Loss.

In March 2018, the Company entered into an agreement with a vendor for engineering services pursuant to which the Company will be obligated to make future minimum payments of $15.8 million through 2022.

Contingencies

The Company evaluates the circumstances regarding outstanding and potential litigation and other contingencies on a quarterly basis to determine whether there is at least a reasonable possibility that a loss exists requiring accrual or disclosure, and if so, whether an estimate of the possible loss or range of loss can be made. When a loss is probable and reasonably estimable, the Company accrues for such amount based on its estimate of the probable loss considering information available at that time. When a loss is reasonably possible, the Company discloses the estimated possible loss or range of loss in excess of amounts accrued if material. Except as otherwise disclosed below, the Company does not believe that there was a reasonable possibility that a material loss may have been incurred during the period presented with respect to the matters disclosed.

Litigation

From time to time, the Company is involved in various legal proceedings arising from the normal course of business activities. The Company is not currently a party to any legal proceedings that, if determined adversely to the Company, in management's opinion, are currently expected to individually or in the aggregate have a material adverse effect on the Company's business, operating results or financial condition taken as a whole.

Indemnifications

The Company from time to time enters into contracts that require it to indemnify various parties against claims from third parties. These contracts primarily relate to (i) certain real estate leases, under which the Company may be required to indemnify property owners for environmental and other liabilities, and other claims arising from the Company's use of the applicable premises, (ii) agreements with the Company's officers, directors and certain employees, under which the Company may be required to indemnify such persons for liabilities arising out of their relationship with the Company, (iii) contracts under which the Company may be required to indemnify customers against third-party claims that a Company product infringes a patent, copyright or other intellectual property right and (iv) agreements under which the Company may be required to indemnify the counterparty for certain claims that may be brought against them arising from the Company's acts or omissions with respect to the transactions contemplated by such agreements.

Because any potential obligation associated with these types of contractual provisions are not quantified or stated, the overall maximum amount of the obligation cannot be reasonably estimated. Historically, the Company has not been required to make payments under these obligations, and no liabilities have been recorded for these obligations in the accompanying Consolidated Balance Sheets.

7. Stockholders' Equity

Preferred Stock

The Board of Directors has the authority, without action by stockholders with the exception of stockholders who hold board positions, to designate and issue up to 5.0 million shares of preferred stock in one or more series and to fix the rights, preferences, privileges and restrictions thereof. These rights, preferences and privileges could include dividend rights, conversion rights, voting rights, terms of redemption, liquidation preferences, sinking fund terms and the number of shares constituting any series or the designation of such series, any or all of which may be greater than the rights of common stock. The issuance of the Company's preferred stock could adversely affect the voting power of holders of common stock and the likelihood that such holders will receive dividend payments and payments upon liquidation. In addition, the issuance of preferred stock could have the effect of delaying, deferring or preventing a change in control of the Company or other corporate action. Since the Company's initial public offering, the Board of Directors has not designated any rights, preference or powers of any preferred stock and no shares of preferred stock have been issued.

Common Stock

Holders of the Company's common stock are entitled to receive dividends, if any, as may be declared from time to time by the Board of Directors out of legally available funds. No dividends have been declared or paid as of December 31, 2018. In the event of the Company's liquidation, dissolution or winding up, holders of the Company's common stock will be entitled to share ratably in the net assets legally available for distribution to stockholders after the payment of all of the Company's debts and other liabilities and the satisfaction of any liquidation preference granted to the holders of any then outstanding shares of preferred stock.

Equity Incentive Plans

As of December 31, 2018, the Company maintained two equity incentive plans, the 2002 Stock Plan (“2002 Plan”) and the 2010 Equity Incentive Award Plan (“2010 Plan”). These plans were approved by the Company's stockholders at the time of adoption. Under the 2002 Plan, the Company granted stock options at a price not less than 100% of the fair market value of the common stock on the date of grant. The majority of the stock options granted under the 2002 Plan vested over 4 years and expire in 10 years.

The 2010 Plan allows the Company to grant stock options, restricted stock awards (“RSAs”), RSUs, PRSUs, stock appreciation rights, dividend equivalents, deferred stock and stock payments to employees, directors and consultants of the Company. A total of 4.7 million shares of common stock were initially reserved for future issuance under the 2010 Plan, which became effective upon the completion of the Company’s initial public offering of common stock. In addition, on the first day of each year beginning in 2011 and ending in 2020, the 2010 Plan provides for an annual automatic increase to the shares reserved for issuance equal to the lesser of: i) 2% of the outstanding shares at the end of the previous year or ii) 666,666 shares. No more than 17.2 million shares of Common Stock may be issued upon the exercise of Incentive Stock Options. Pursuant to the automatic annual increase, a total of 5.3 million additional shares had been reserved as of December 31, 2018 under the 2010 Plan since 2011.

Upon the effectiveness of the 2010 Plan, equity awards were granted only under the 2010 Plan and shares of common stock previously reserved for issuance under the prior plan became available for issuance under the 2010 Plan. To date, awards granted under the 2010 Plan consist of stock options, RSAs, RSUs and PRSUs.

Stock options granted under the 2010 Plan are granted in general at a price not less than 100% of the fair market value of the common stock on the date of grant. Stock options issued under the 2010 Plan through 2016 generally vest 25% on the first anniversary of the vesting commencement date and on a monthly basis thereafter for a period of an additional three years. Stock options granted during 2017 vest 25% on the first anniversary of the vesting commencement date and on a quarterly basis thereafter for a period of an additional three years. The options have a maximum term of ten years.

Each RSU granted under the 2010 Plan represents a right to receive one share of the Company’s common stock (subject to adjustment for certain specified changes in the capital structure of the Company) upon the completion of a specific period of continued service. The majority of RSUs granted vest over four years.

In February 2016, the Company granted 0.6 million shares of PRSUs to its executives. These particular performance-based awards contained a one-year performance period and a subsequent two-year service period. The performance target was based on the Company’s revenue during the performance period and accounted for as a performance condition. In February 2017, the Compensation Committee of the Company’s Board of Directors determined that the performance condition related to PRSUs granted to executives in 2016 was met based on the Company’s actual revenue recognized during 2016. As such, each PRSU award vested in respect to 50% of the PRSUs subject to the award in February 2017; 25% in February 2018 and 25% in February 2019, subject to the executive’s continuous service with the Company from the grant date through the remaining vesting date.

In August 2017, the Company granted 1.2 million shares of performance-based stock option awards to its executives. These performance-based stock option awards contained a one-year performance period and a subsequent three-year service period. The performance target was based on a combination of the Company’s fiscal year 2017 revenue and non-GAAP operating income and was accounted for as a performance condition. In February 2018, the Compensation Committee of the Company’s Board of Directors concluded that the performance target was not met and all such performance-based stock options were forfeited and canceled.

In October 2017, in connection with the hiring of its Chief Financial Offer, the Company made an “inducement” award of non-qualified stock options to purchase 0.3 million shares of the Company's common stock with an exercise price of $5.05 per share, equal to the grant date fair value based upon the closing price of the Company's common stock. The stock option was granted outside the terms of the Company's 2010 Equity Incentive Award Plan (under the employee inducement award exemption under the New York Stock Exchange Listed Company Manual Rule 303A.08). The stock option will vest and become exercisable over four years from the date of grant, with 25% of the shares vesting on the one-year anniversary of the grant date and the remaining shares vesting quarterly thereafter over the next three years, subject to continued employment with the Company.

In December 2017, the Company granted 1.6 million shares of performance-based stock option awards to its executives. These performance-based stock option awards contain a one-year performance period and a subsequent two-year service period. The performance target is based on the Company’s non-GAAP operating income during the performance period and accounted for as a performance condition. After the one-year performance period, if the performance target is met and subject to certification by the Compensation Committee of the Company’s Board of Directors, each performance-based stock option award shall vest with respect to 50% of the earned shares on January 1, 2019 and 6.25% of the earned shares quarterly thereafter, subject to the executive’s continuous service with the Company from the grant date through the respective vesting dates. If the performance target is not met, all such performance-based stock options shall be immediately forfeited and canceled. In November 2018, the Compensation Committee of the Company's Board of Directors modified the performance target. Subsequently, in February 2019, the Compensation Committee of the Company's Board of Directors concluded that the revised performance target was met based on the actual non-GAAP net income achieved for 2018. As such, each stock option was earned subject to the executive's continuous service with the Company from the grant date through the remaining vesting dates.

Stock Options

The following table summarizes the activity of stock options under the Company's equity incentive plans (in thousands, except per share data):

Stock Options	Number of Shares	Weighted-Average Exercise Price Per Share	Weighted-Average Remaining Contractual Life (in years)	Aggregate Intrinsic Value (1)
Outstanding as of December 31, 2017	5,756	$ 7.38		
Granted	230	6.77		
Exercised	(57)	6.70		
Canceled	(1,487)	7.22		
Outstanding as of December 31, 2018	4,442	$ 7.40	7.3	$ 12,377
Vested and expected to vest as of December 31, 2018	4,333	$ 7.43	7.3	$ 12,006
Options exercisable as of December 31, 2018	1,903	$ 9.04	5.4	$ 3,300

(1) Amounts represent the difference between the exercise price and the fair market value of common stock at December 31, 2018 of $9.75 per share for all in the money options outstanding.

During the years ended December 31, 2018, 2017 and 2016, total intrinsic value of stock options exercised was $148 thousand, $10 thousand and $5 thousand, respectively. Total cash received from employees as a result of stock option exercises in 2018, 2017 and 2016 was $0.4 million, $62 thousand and $17 thousand, respectively. Total fair values of stock options vested during 2018, 2017 and 2016 were $2.7 million, $2.1 million and $1.9 million, respectively.

Restricted Stock Units and Performance Restricted Stock Units

The following table summarizes the activities of the Company's RSUs and PRSUs under the Company's equity incentive plans (in thousands, except per share data):

	RSUs		PRSUs	
	Number of Shares	Weighted-Average Grant Date Fair Value Per Share	Number of Shares	Weighted-Average Grant Date Fair Value Per Share
Outstanding at December 31, 2017	1,726	$ 7.53	150	$ 7.42
Granted	174	6.66	—	—
Vested	(835)	7.57	(87)	7.42
Canceled	(277)	7.65	—	—
Outstanding at December 31, 2018	788	$ 7.26	63	$ 7.42

Upon vesting of certain RSUs and PRSUs, the Company withheld shares with value equivalent to the employees' minimum statutory obligation for the applicable income and other employment taxes and remitted the cash to the appropriate taxing authorities. The number of shares withheld was based on the value of the RSUs or PRSUs on their vesting date as determined by the Company's closing stock price. The withheld shares are reserved for future grant and issuance under the 2010 Plan.

Employee Stock Purchase Plans

The Company maintains two employee stock purchase plans - the Amended and Restated Employee Stock Purchase Plan (the "ESPP") and the Amended and Restated 2017 Nonqualified Employee Stock Purchase Plan (the "Nonqualified ESPP").

The ESPP allows eligible employees to purchase shares of the Company’s common stock through payroll deductions of up to 15% of their annual compensation subject to certain Internal Revenue Code limitations. In addition, no participant may purchase more than 2,000 shares of common stock in each offering period.

The offering periods under the ESPP are six-month periods commencing on May 15th and November 15th of each year. The price of common stock purchased under the ESPP is 85% of the lower of the fair market value of the common stock on the commencement date and end date of each six-month offering period.

The ESPP provides for the issuance of a maximum of 7.3 million shares of common stock. For the year ended December 31, 2018, shares totaling 0.9 million were purchased and issued. As of December 31, 2018, there were 1.5 million shares available for issuance.

On March 30, 2017, the Company’s Board of Directors, upon recommendation of the Compensation Committee, approved the adoption of the Nonqualified ESPP. The Nonqualified ESPP was approved by the Company's stockholders on May 17, 2017, with the initial offering period commencing July 1, 2017. Under the Nonqualified ESPP, eligible employees can purchase shares of the Company’s common stock through payroll deductions of up to 25% of their annual compensation. Eligible employees have the right to (a) purchase the maximum number of whole shares of common stock that can be purchased with the elected payroll deductions during each offering period for which the employee is enrolled at a purchase price equal to the closing price of the Company’s common stock on the last day of such offering period and (b) receive an equal number of shares of the Company’s common stock that are subject to a risk of forfeiture in the event the employee terminates employment within the one year period immediately following the purchase date. The Nonqualified ESPP provides two six-month offering periods, from June 21 through December 20 and December 21 through June 20 of each year. At the annual meeting of the Company's stockholders on May 16, 2018, the stockholders approved to amend certain terms and increase the number of shares of common stock issuable under the Nonqualified ESPP by 2.5 million shares. The maximum number of shares of common stock authorized for issuance under the Nonqualified ESPP as of December 31, 2018 is 3.5 million shares, with a maximum of 0.5 million shares allocated per purchase period. For the year ended December 31, 2018, shares totaling 0.3 million were purchased and issued, with an additional equal number of shares issued subject to a risk of forfeiture. As of December 31, 2018, there were 2.8 million shares available for future issuance.

Stock-Based Compensation

Stock-based compensation expense associated with stock options, RSUs, PRSUs and purchase rights under the Company’s ESPP and Nonqualified ESPP is measured at the grant date based on the fair value of the award, and is recognized, net of forfeitures, as expense over the remaining requisite service period on a straight-line basis. During the years ended December 31, 2018, 2017 and 2016, the Company recorded stock-based compensation expense of $17.5 million, $12.4 million and $14.3 million, respectively.

The following table summarizes the weighted-average grant date fair values of the Company’s stock-based awards granted in the periods indicated:

	Years Ended December 31,		
	2018	2017	2016
Stock options	$ 3.41	$ 3.19	$ 3.58
RSUs	N/A	$ 6.75	$ 6.91
PRSUs	N/A	N/A	$ 7.42
ESPP	$ 2.21	$ 1.76	$ 1.92
Nonqualified ESPP	$ 7.34	$ 6.90	N/A

The Company values the RSUs and employee stock purchase rights under the Nonqualified ESPP at the closing market price of the Company’s common stock on the date of grant.

Stock-based compensation expense associated with PRSUs and performance-based stock option awards with graded vesting features and which contain both a performance and a service condition is only recognized if the Company has determined that it is probable that the performance condition will be met. The Company reassesses the probability of vesting at each reporting period and adjusts compensation expense based on its probability assessment. The probability of meeting the performance condition related to the performance-based stock option awards granted in December 2017 was assessed as probable as of December 31, 2018. As a result, the Company recognized a cumulative stock-based compensation expense of $6.9 million in the fourth quarter of 2018, based on a fair value assessment as of the date of modification.

The Company estimates the fair value of stock options and employee stock purchase right under the ESPP at the grant date using the Black-Scholes option-pricing model. This model requires the use of the following assumptions:

(i) Expected volatility of the Company's common stock – The Company computes its expected volatility assumption based on a blended volatility (50% historical volatility and 50% implied volatility from traded options on the Company's common stock). The selection of a blended volatility assumption was based upon the Company's assessment that a blended volatility is more representative of the Company's future stock price trend as it weighs the historical volatility with the future implied volatility.

(ii) Expected life of the option award – Represents the weighted-average period that the stock options are expected to remain outstanding. The Company's computation of expected life utilizes the simplified method in accordance with Staff Accounting Bulletin No. 110 ("SAB 110") due to the lack of sufficient historical exercise data to provide a reasonable basis upon which to estimate expected term. The mid-point between the vesting date and the expiration date is used as the expected term under this method.

(iii) Expected dividend yield – Assumption is based on the Company's history of not paying dividends and no future expectations of dividend payouts.

(iv) Risk-free interest rate – Based on the U.S. Treasury yield curve in effect at the time of grant with maturities approximating the grant's expected life.

The following table summarizes the weighted-average assumptions used in estimating the grant-date fair value of stock options and of each employee's purchase right under the ESPP in the periods indicated:

	Years Ended December 31,		
Stock Options	**2018**	**2017**	**2016**
Expected volatility	50%	52%	53%
Expected life (years)	6.11	5.88	6.25
Expected dividend yield	—	—	—
Risk-free interest rate	2.83%	2.10%	1.60%

	Years Ended December 31,		
ESPP	**2018**	**2017**	**2016**
Expected volatility	42%	45%	46%
Expected life (years)	0.50	0.49	0.52
Expected dividend yield	—	—	—
Risk-free interest rate	2.21%	1.24%	0.47%

In addition, the Company applies an estimated forfeiture rate to awards granted and records stock-based compensation expense only for those awards that are expected to vest. Forfeiture rates are estimated at the time of grant based on the Company's historical experience. Further, to the extent the Company's actual forfeiture rate is different from management's estimate, stock-based compensation is adjusted accordingly.

As of December 31, 2018, unrecognized stock-based compensation expenses by award type, net of estimated forfeitures, and their expected weighted-average recognition periods are summarized in the following table (in thousands).

	December 31, 2018		
	Stock Option	**RSU**	**ESPPs**
Unrecognized stock-based compensation expense	$ 5,088	$ 3,337	$ 3,879
Weighted-average amortization period (in years)	1.9	1.0	1.1

The Company expects to recognized stock-based compensation expense of $8.6 million in 2019, $3.0 million in 2020, $0.6 million in 2021 and $0.1 million in 2022.

Shares Reserved for Future Issuance

The Company had common shares reserved for future issuance as follows (in thousands):

	December 31,	
	2018	2017
Stock options outstanding	4,442	5,756
Restricted stock units outstanding	788	1,726
Performance restricted stock units outstanding	63	150
Shares available for future grant under 2010 Plan	2,306	281
Shares available for future issuance under ESPP	1,550	2,456
Shares available for future issuance under Nonqualified ESPP	2,764	551
	11,913	10,920

8. Employee Benefit Plan

The Company sponsors a 401(k) tax-deferred savings plan for all employees who meet certain eligibility requirements. Participants may contribute, on a pre-tax basis, a percentage of their annual compensation, but not to exceed a maximum contribution amount pursuant to Section 401(k) of the Internal Revenue Code. The Company, at the discretion of the Board of Directors, may make additional matching contributions on behalf of the participants. The Company made matching contributions totaling $2.5 million, $3.0 million and $2.1 million in 2018, 2017 and 2016, respectively.

9. Accumulated Other Comprehensive Loss

The table below summarizes the changes in accumulated other comprehensive loss by component:

	Unrealized Gains and Losses on Available-for-Sale Marketable Securities	Foreign Currency Translation Adjustments	Total
Balance at December 31, 2016	$ (6)	$ (650)	$ (656)
Other comprehensive income	6	481	487
Balance at December 31, 2017	—	(169)	(169)
Other comprehensive loss	—	(584)	(584)
Balance at December 31, 2018	$ —	$ (753)	$ (753)

Assets and liabilities of the Company's wholly owned foreign subsidiaries are translated from their respective functional currencies at exchange rates in effect at the balance sheet date, and revenue and expenses are translated at the monthly average exchanges rates. These translations result in differences called foreign currency translation adjustments. Realized foreign currency transaction gains or losses were not significant during the years ended December 31, 2018, 2017 and 2016 and are recorded in "Other income (expense), net" in our Consolidated Statements of Comprehensive Loss.

10. Income Taxes

The domestic and foreign components of loss before provision for incomes taxes were as follows (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Domestic	$ (20,463)	$ (84,387)	$ (28,931)
Foreign	1,695	2,598	1,876
	$ (18,768)	$ (81,789)	$ (27,055)

Provision for income taxes consisted of the following (in thousands):

	Years Ended December 31,		
	2018	2017	2016
Current:			
State	$ 105	$ 115	$ 102
Foreign	360	577	673
Current income tax	465	692	775
Deferred foreign income tax (benefit)	65	551	(428)
	$ 530	$ 1,243	$ 347

The differences between the statutory tax rate and the effective tax rate, expressed as a percentage of loss before income taxes, were as follows:

	Years Ended December 31,		
	2018	2017	2016
Federal statutory rate	21.0 %	34.0 %	34.0 %
State statutory rate	5.7	4.5	6.1
Foreign operations	0.3	0.5	0.6
R&D tax credits	7.2	2.7	6.4
Foreign income inclusion	(1.2)	(0.1)	(0.7)
Non-deductible stock compensation	(4.3)	(3.7)	(5.1)
Other permanent items	(1.6)	(0.4)	(1.4)
Tax true-up	(2.3)	(1.7)	21.0
Valuation allowance	(25.6)	67.3	(62.2)
Tax reform	—	(104.6)	—
Topic 606 adjustment	(2.0)	—	—
Effective tax rate	(2.8)%	(1.5)%	(1.3)%

The significant components of the Company's deferred tax assets were as follows (in thousands):

	December 31,	
	2018	2017
Deferred tax assets:		
Net operating loss carryforwards	$ 132,420	$ 134,731
Tax credit carryforwards	46,884	43,095
Depreciation and amortization	1,924	1,892
Accruals and reserves	10,021	7,933
Deferred revenue	7,815	7,928
Stock-based compensation	4,447	3,100
Intangible assets	37	64
Other	5	23
Gross deferred tax assets	203,553	198,766
Valuation allowance	(203,550)	(198,746)
	$ 3	$ 20

All deferred tax assets, along with any related valuation allowance, are classified in the Consolidated Balance Sheet as long-term.

Management reviews the recognition of deferred tax assets to determine if realization of such assets is more likely than not. The realization of the Company's deferred tax assets is dependent upon future earnings. The Company has been in a cumulative loss position since inception, which represents a significant piece of negative evidence. Using the more likely than not criteria specified in the applicable accounting guidance, this negative evidence cannot be overcome by positive evidence currently available to the Company. As a result, the Company has established a full valuation allowance against its deferred tax assets with the exception of certain foreign deferred tax assets. The Company's valuation allowance increased by $4.8 million in 2018 and decreased by $40.5 million in 2017.

As of December 31, 2018, the Company had U.S. federal and state net operating losses of approximately $597.0 million and $189.5 million, respectively. The U.S. federal net operating loss carryforwards have begun to expire and will continue to expire at various dates through 2037 if not utilized. The state net operating loss carryforwards have begun to expire and will continue to expire at various dates through 2037, if not utilized. Additionally, the Company has U.S. federal, California and other U.S. states research and development credits of approximately $35.4 million, $35.0 million and $3.0 million, respectively, as of December 31, 2018. The U.S. federal research and development credits will begin to expire in 2020 and the California research and development credits have no expiration date. The credits related to other various U.S. states began to expire in 2018.

Uncertain Tax Positions

ASC Topic 740, *"Income Taxes,"* prescribes a recognition threshold and measurement attribute to the financial statement recognition and measurement of a tax position taken or expected to be taken in a tax return. The guidance also provides guidance on derecognition, classification, accounting in interim periods and disclosure requirements for uncertain tax positions. The standard requires the Company to recognize the financial statement effects of an uncertain tax position when it is more likely than not that such position will be sustained upon audit. The Company recognizes accrued interest and penalties related to unrecognized tax benefits as interest expense and income tax expense, respectively, in statements of comprehensive loss.

The following table reconciles the Company's unrecognized tax benefits (in thousands):

	Years Ended December 31,	
	2018	2017
Balance at beginning of year	$ 20,289	$ 18,349
Additions for tax positions related to prior year	516	—
Additions for tax positions related to current year	1,193	1,940
Balance at end of year	$ 21,998	$ 20,289

As of December 31, 2018 and 2017, the Company had unrecognized tax benefits of $22.0 million and $20.3 million, respectively, none of which would affect the Company's effective tax rate if recognized. There were no accrued interest or penalties for uncertain income tax as of December 31, 2018.

The Company files tax returns in the United State and various state jurisdictions, the United Kingdom, China and Brazil. The tax years 1999 through 2017 remain open and subject to examination by the appropriate governmental agencies in the U.S. due to tax attribute carryforwards.

U.S. Tax Reform

On December 22, 2017, the U.S. government enacted comprehensive tax legislation commonly referred to as the Tax Cuts and Jobs Act (the "Tax Act"). The Tax Act includes, among other items, a reduction in the federal corporate income tax rate from 34% to 21%, certain interest expense deduction limitations and changes in the timing of certain taxable income. The Company was required to recognize the effect of the tax law changes in 2017, such as remeasuring its U.S. deferred tax assets and liabilities and reassessing the net realizability of our deferred tax assets and liabilities.

On December 22, 2017, the SEC staff issued Staff Accounting Bulletin No. 118 ("SAB 118") which provided guidance on accounting for the tax effects of the Tax Act. The Company completed its analysis and accounting with respect the Tax Act and identified no additional changes from amounts previously recorded. However, future changes in law, interpretations and facts may result in adjustments to these amounts. Based on the Company's net operating loss carryovers and valuation allowance, there was no impact to its consolidated financial statements as a result of the accounting for the tax effects of the Tax Act.

The Tax Act created a new requirement that global intangible low-taxed income ("GILTI") earned by our foreign subsidiaries must be included in gross U.S. taxable income. While the Tax Act provides for a modified territorial tax system, beginning in 2018, GILTI provisions will be applied providing an incremental tax on low taxed foreign income. The GILTI provisions require us to include in our U.S. income tax return foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. During 2018, we made an accounting policy election to treat taxes related to GILTI as a current period expense when incurred.

11. Net Loss Per Common Share

The following table sets forth the computation of basic and diluted net loss per common share for the periods indicated (in thousands, except per share data):

	Years Ended December 31,		
	2018	2017	2016
Numerator:			
Net loss	$ (19,298)	$ (83,032)	$ (27,402)
Denominator:			
Weighted-average common shares outstanding	52,609	50,155	48,730
Basic and diluted net loss per common share	$ (0.37)	$ (1.66)	$ (0.56)
Potentially dilutive shares, weighted-average	5,833	3,446	5,890

For the year ended December 31, 2018 and 2017, unvested restricted stock awards are included in the calculation of basic weighted-average shares because such shares are participating securities; however, the impact was immaterial. There were no unvested restricted stock awards for the year ended December 31, 2016.

Potentially dilutive shares have been excluded from the computation of diluted net loss per common share when their effect is antidilutive. These antidilutive shares were primarily from stock options, restricted stock units and performance restricted stock units. For each of the periods presented where the Company reported a net loss, the effect of all potentially dilutive securities would be antidilutive, and as a result diluted net loss per common share is the same as basic net loss per common share.

12. Segment Information

The Company develops, markets and sells communications access systems and software, and there are no segment managers who are held accountable for operations, operating results and plans for levels or components below the Company unit level. Accordingly, the Company is considered to be in a single reporting segment and operating unit structure. The Company's chief operating decision maker is the Company's Chief Executive Officer, who reviews financial information presented on a Company-wide basis, for purposes of allocating resources and evaluating financial performance.

Geographic Information:

The following is a summary of revenue by geographic region based upon the location of the customers (in thousands):

	Years Ended December 31,		
	2018	2017 (1)	2016 (1)
United States	$ 386,341	$ 452,956	$ 415,629
Middle East	18,814	18,267	8,098
Canada	10,542	13,105	9,064
Europe	8,858	6,575	6,334
Caribbean	7,075	9,853	12,934
Other	9,690	9,611	6,728
	$ 441,320	$ 510,367	$ 458,787

(1) Revenue amounts are accounted for under Topic 605 for 2017 and 2016.

The Company's property and equipment, net of accumulated depreciation, are located in the following geographical areas (in thousands):

	December 31,	
	2018	2017
United States	$ 23,249	$ 13,109
China	1,696	2,572
	$ 24,945	$ 15,681

13. Product Line Divestiture

In February 2018, the Company sold its outdoor cabinet product line to Clearfield, Inc. ("Clearfield") for $10.4 million in cash as well as the assumption by Clearfield of the related product warranty liabilities and open purchase order commitments with a CM. The Company transferred $2.1 million in net inventory and agreed to solicit orders on Clearfield's behalf on the newly transferred outdoor cabinets product lines free of charge for 15 months. The Company established a liability of $1.6 million in deferred revenue for providing this service and is amortizing this amount to service revenue over the corresponding 15-month period. The Company also recognized a $6.7 million gain for the year ended December 31, 2018 within operating expenses in the accompanying Consolidated Statements of Comprehensive Loss.

14. Quarterly Financial Data—Unaudited

The Company's fiscal year begins on January 1st and ends on December 31st. Quarterly periods are based on a 4-4-5 fiscal calendar with the first, second and third fiscal quarters ending on the 13th Saturday of each fiscal period. As a result, the Company had one fewer day in the first quarter of 2018 and one more day in the fourth quarter of 2018 than in the respective 2017 periods.

The following table presents selected unaudited quarterly financial data of the Company (in thousands, except per share data). The Company's quarterly results of operations for these periods are not necessarily indicative of future results of operations.

	Fiscal Year 2018 Quarter Ended			
	March 31	June 30	September 29	December 31
Revenue	$ 99,403	$ 111,702	$ 114,699	$ 115,516
Gross profit	42,059	50,866	52,833	51,624
Operating income (loss)	(11,109)	(2,926)	676	(5,155)
Net income (loss)	(11,736)	(2,793)	809	(5,578)
Net income (loss) per common share, basic and diluted	$ (0.23)	$ (0.05)	$ 0.02	$ (0.10)

	Fiscal Year 2017 Quarter Ended			
	April 1	July 1	September 30	December 31
Revenue	$ 117,518	$ 126,123	$ 128,827	$ 137,899
Gross profit	34,377	43,323	44,633	50,557
Operating loss	(32,816)	(18,714)	(17,263)	(12,763)
Net loss	(33,325)	(18,988)	(17,853)	(12,866)
Net loss per common share, basic and diluted	$ (0.67)	$ (0.38)	$ (0.35)	$ (0.25)

15. Subsequent Event

In February 2019, the Company entered into an amendment to the Loan Agreement with SVB that amended the affirmative financial covenants to reduce the required minimum level of the AQR for the first half of 2019 and the required minimum Adjusted EBITDA for the first fiscal quarter of 2019. AQR and Adjusted EBITDA are defined in the Loan Agreement, as previously amended. These covenant modifications were provided to accommodate the increased costs and use of cash anticipated for the first half of 2019 related to activities to mitigate the impact of the U.S. tariffs imposed on goods imported from China, including advance purchases of inventory, as part of the Company's realignment of its supply chain.

ITEM 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

There were no changes in nor any disagreements with accountants on accounting principles or practices, financial statement disclosure, auditing scope or procedures, or other reportable events requiring disclosure pursuant to Item 304(b) of Regulation S-K.

ITEM 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

As of the end of the period covered by this report, which we refer to as the evaluation date, we carried out an evaluation under the supervision and with the participation of management, including our principle executive officer and principle financial officer, of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act).

The purpose of this evaluation was to determine whether as of the evaluation date our disclosure controls and procedures were effective to provide reasonable assurance that the information we are required to disclose in our filings with the SEC, (i) is recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms and (ii) accumulated and communicated to our management, including our principal executive officer and our principal financial officer, as appropriate to allow timely decisions regarding required disclosure. Based upon this evaluation, our principal executive officer and our principal financial officer concluded that our disclosure controls and procedures were effective as of the end of the period covered by this report.

Management's Report on Internal Control Over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting. Our internal control over financial reporting is designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate. Management has evaluated the effectiveness of our internal control over financial reporting as of December 31, 2018 using the criteria set forth in the Internal Control—Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission, or COSO, (2013 framework). Based on our evaluation, management has concluded that we maintained effective control over financial reporting as of December 31, 2018 based on the COSO criteria. The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by KPMG LLP, an independent registered public accounting firm, as stated in their report included in this Annual Report on Form 10-K.

Limitations on the Effectiveness of Controls

Our disclosure controls and procedures provide our principal executive officer and our principal financial officer reasonable assurances that our disclosure controls and procedures will achieve their objectives. However, our management, including our principal executive officer and our principal financial officer, does not expect that our disclosure controls and procedures or our internal control over financial reporting can or will prevent all human error. A control system, no matter how well designed and implemented, can provide only reasonable, not absolute, assurance that the objectives of the control system are met. Furthermore, the design of a control system must reflect the fact that there are internal resource constraints, and the benefit of controls must be weighed relative to their corresponding costs. Because of the limitations in all control systems, no evaluation of controls can provide complete assurance that all control issues and instances of error, if any, within our company are detected. These inherent limitations include the realities that judgments in decision-making can be faulty, and that breakdowns can occur due to human error or mistake. Additionally, controls, no matter how well designed, could be circumvented by the individual acts of specific persons within the organization. The design of any system of controls is also based in part upon certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated objectives under all potential future conditions.

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting identified in connection with the evaluation required by Rule 13a-15(d) and 15d-15(d) of the Exchange Act that occurred during the period covered by this report that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. Other Information

None.

PART III

ITEM 10. Directors, Executive Officers and Corporate Governance

Information required by this Item 10 relating to our directors is incorporated by reference to the information set forth under the captions “Proposal No. 1—Election of Directors” and “Director Compensation” and in other applicable sections of the Proxy Statement for the 2019 Annual Meeting of Stockholders to be filed with the Securities and Exchange Commission pursuant to Regulation 14A of the Exchange Act, or the Proxy Statement, to be filed within 120 days of the end of the fiscal year covered by this Report. Information required by this Item 10 relating to our officers is incorporated by reference to the information set forth under the captions “Executive Officers” and “Executive Compensation” and in other applicable sections of the Proxy Statement. Information regarding our Section 16 reporting compliance is incorporated by reference to the information set forth under the captions “Security Ownership of Certain Beneficial Owners and Management” and “Section 16(a) Beneficial Ownership Reporting Compliance” of the Proxy Statement.

We have adopted a code of ethics, which applies to all employees, officers and directors of Calix. The Code of Business Conduct and Ethics meets the requirements of a “code of ethics” as defined by Item 406 of Regulation S-K, and applies to our Chief Executive Officer, Chief Financial Officer and all other employees, as indicated above. The Code of Business Conduct and Ethics also meets the requirements of a code of conduct under NYSE listing standards. The Code of Business Conduct and Ethics is posted on our website at www.calix.com under the links “About - Investor Relations - Governance - Code of Conduct.” We intend to disclose any amendments to the Code of Business Conduct and Ethics, as well as any waivers for executive officers or directors, on our website at www.calix.com.

ITEM 11. Executive Compensation

Information required by this Item 11 relating to executive compensation and other matters is incorporated by reference to the information set forth under the caption “Compensation Discussion and Analysis” and in other applicable sections of the Proxy Statement.

ITEM 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

Information required by this Item 12 relating to security ownership of certain beneficial owners and management and related stockholder matters is incorporated by reference to the information set forth under the caption “Security Ownership of Certain Beneficial Owners and Management” and in other applicable sections of the Proxy Statement. Information regarding securities authorized for issuance under our equity compensation plans is incorporated by reference to the information set forth under the caption “Equity Compensation Plan Information” of the Proxy Statement.

ITEM 13. Certain Relationships and Related Transactions, and Director Independence

Information required by this Item 13 relating to certain relationships and related transactions and director independence is incorporated by reference to the information set forth under the caption “Certain Relationships and Related Transactions” and in other applicable sections of the Proxy Statement.

ITEM 14. Principal Accountant Fees and Services

Information required by this Item 14 relating to principal account fees and services is incorporated by reference to the information set forth under the caption “Principal Accountant Fees and Services” of the Proxy Statement.

PART IV

ITEM 15. Exhibits, Financial Statement Schedules

(a) The following documents are filed as part of this Report:

1. Consolidated Financial Statements

The consolidated financial statements of Calix and the report of independent registered public accounting firm thereon are set forth under Part II, Item 8 of this report.

2. Consolidated Financial Statement Schedules

All schedules have been omitted because they are not applicable, not required, not presently in amounts sufficient to require submission of the schedule, or the information required to be set forth therein is included in the consolidated financial statements or notes thereto.

3. Exhibits

The following exhibits are filed with or incorporated by reference in this report. Where such filing is made by incorporation by reference to a previously filed registration statement or report, such registration statement or report is identified in parentheses. We will furnish any exhibit upon request to: Calix Investor Relations, Thomas J. Dinges at Tom.Dinges@calix.com.

Exhibit Number	Description
2.1	Agreement and Plan of Merger and Reorganization, dated as of September 16, 2010, by and among Calix, Inc., Ocean Sub I, Inc., Ocean Sub II, LLC, Occam Networks, Inc. (filed as Exhibit 2.1 to Calix's Registration Statement on Form S-4 originally filed with the Securities and Exchange Commission on November 2, 2010 (File No. 333-170282), as amended by Amendment No. 1 filed December 14, 2010, as amended by Post-Effective Amendment No. 1, filed December 14, 2010 and as amended by Post-Effective Amendment No. 2, filed February 7, 2011 and incorporated by reference).
3.1	Amended and Restated Certificate of Incorporation of Calix, Inc. (filed as Exhibit 3.3 to Amendment No. 7 to Calix's Registration Statement on Form S-1 filed with the Securities and Exchange Commission on March 23, 2010 (File No. 333-163252) and incorporated by reference).
3.2	Amended and Restated Bylaws of Calix, Inc. (filed as Exhibit 3.5 to Amendment No. 7 to Calix's Registration Statement on Form S-1 filed with the Securities and Exchange Commission on March 23, 2010 (File No. 333-163252) and incorporated by reference).
4.1	Form of Calix, Inc.'s Common Stock Certificate (filed as Exhibit 4.1 to Amendment No. 7 to Calix's Registration Statement on Form S-1 filed with the Securities and Exchange Commission on March 23, 2010 (File No. 333-163252) and incorporated by reference).
10.1*	Calix Networks, Inc. Amended and Restated 2002 Stock Plan and related documents (filed as Exhibit 10.2 to Amendment No. 6 to Calix's Registration Statement on Form S-1 filed with the SEC on March 8, 2010 (File No. 333-163252) and incorporated by reference).
10.2*	Calix, Inc. 2010 Equity Incentive Award Plan and related documents (filed as Exhibit 10.4 to Amendment No. 6 to Calix's Registration Statement on Form S-1 filed with the SEC on March 8, 2010 (File No. 333-163252) and incorporated by reference).
10.3	Form of Indemnification Agreement made by and between Calix, Inc. and each of its directors, executive officers and some employees (filed as Exhibit 10.5 to Amendment No. 6 to Calix's Registration Statement on Form S-1 filed with the SEC on March 8, 2010 (File No. 333-163252) and incorporated by reference).
10.4	Lease between RNM Lakeville, LLC and Calix, Inc. dated February 13, 2009 (filed as Exhibit 10.6 to Calix's Registration Statement on Form S-1 filed with the SEC on November 20, 2009 (File No. 333-163252) and incorporated by reference).

Exhibit Number	Description
10.5	First Amendment to Lease by and between 1031, 1035, 1039 North McDowell, LLC and Calix, Inc. effective January 28, 2013 (filed as Exhibit 10.25 to Calix's Form 10-K filed with the SEC on February 22, 2013 (File No. 001-34674) and incorporated by reference).
10.6	Lease Termination Agreement between SSCOP DE LLC and Calix, Inc. dated November 21, 2018.
10.7*	Offer Letter between Calix, Inc. and Carl Russo dated November 1, 2006 (filed as Exhibit 10.8 to Amendment No. 1 to Calix's Registration Statement on Form S-1 filed with the SEC on December 31, 2009 (File No. 333-163252) and incorporated by reference).
10.8†	Asset Purchase Agreement between Ericsson Inc. and Calix, Inc. dated August 20, 2012 (filed as Exhibit 10.1 to Calix's Form 10-Q/A filed with the SEC on December 18, 2012 (File No. 001-34674) and incorporated by reference).
10.9*	Calix, Inc. Non-Employee Director Restricted Stock Unit Deferred Compensation Plan, effective January 1, 2013 (filed as Exhibit 10.22 to Calix's Form 10-K filed with the SEC on February 22, 2013 (File No. 001-34674) and incorporated by reference).
10.10*	Calix, Inc. Management Bonus Program Under the 2010 Equity Incentive Award Plan (filed as Exhibit 10.1 to Calix's Form 8-K filed with the SEC on February 28, 2012 (File No. 001-34674) and incorporated by reference).
10.11*	Calix, Inc. Long Term Incentive Program Under the 2010 Equity Incentive Award Plan (filed as Exhibit 10.2 to Calix's Form 8-K filed with the SEC on February 28, 2012 (File No. 001-34674) and incorporated by reference).
10.12*	Calix, Inc. Non-Employee Director Equity Compensation Policy, as amended October 18, 2011, July 25, 2012, April 22, 2014 and April 26, 2016 (filed as Exhibit 10.18 to Calix's Form 10-K filed with the SEC on February 28, 2017 (File No. 001-34674) and incorporated by reference).
10.13*	Offer Letter by and between Calix, Inc. and Michael Weening dated May 20, 2016 (filed as Exhibit 10.1 to Calix's Form 10-Q filed with the SEC on August 3, 2016 (File No. 001-34674) and incorporated by reference).
10.14*	Offer Letter by and between Calix, Inc. and Greg Billings dated December 8, 2016 (filed as Exhibit 10.24 to Calix's Form 10-K filed with the SEC on February 28, 2016 (File No. 001-34674) and incorporated by reference).
10.15*	Amendment to Offer Letter by and between Calix, Inc. and Greg Billings dated August 1, 2017 (filed as Exhibit 10.17 to Calix's Form 10-K filed with the SEC on March 14, 2018 (File No. 001-34674) and incorporated by reference).
10.16*	Consulting Agreement by and between Calix, Inc. and Cory Sindelar dated May 31, 2017 (filed as Exhibit 10.1 to Calix's Form 10-Q filed with the SEC on August 10, 2017 (File No. 001-34674) and incorporated by reference).
10.17*	Calix, Inc. Non-Employee Director Cash Compensation Policy, as amended June 7, 2018.
10.18*	Calix, Inc. Amended and Restated Employee Stock Purchase Plan (incorporated by reference to Appendix A to the Registrant's definitive proxy statement on Schedule 14A, filed with the SEC on April 4, 2017 (File No. 001-34674)).
10.19*	Calix, Inc. Amended and Restated 2017 Nonqualified Employee Stock Purchase Plan (incorporated by reference to Appendix A to the Registrant's definitive proxy statement on Schedule 14A, filed with the SEC on April 3, 2018 (File No. 001-34674)).
10.20*	Amendment to Calix, Inc. Amended and Restated 2017 Nonqualified Employee Stock Purchase Plan dated June 24, 2018 (filed as Exhibit 10.1 to Calix's Form 10-Q filed with the SEC on August 8, 2018 (File No. 001-34674) and incorporated by reference).
10.21†	Loan and Security Agreement dated August 7, 2017 between Silicon Valley Bank and Calix, Inc. (filed as Exhibit 10.1 to Calix's Form 10-Q filed with the SEC on August 11, 2017 (File No. 001-34674) and incorporated by reference).
10.22	First Amendment to Loan and Security Agreement dated February 13, 2018 between Silicon Valley Bank and Calix, Inc. (filed as Exhibit 10.24 to Calix's Annual Report on Form 10-K/A filed with the SEC on May 10, 2018 (File No. 001-34674) and incorporated by reference).
10.23†	Second Amendment to Loan and Security Agreement dated August 24, 2018 by and between Silicon Valley Bank and Calix, Inc. (filed as Exhibit 10.1 to Calix's Form 10-Q filed with the SEC on November 5, 2018 (File No. 001-34674) and incorporated by reference).
10.24*	Offer Letter between Calix, Inc. and Cory Sindelar dated September 28, 2017 (filed as Exhibit 10.2 to Calix's Form 10-Q filed with the SEC on August 11, 2017 (File No. 001-34674) and incorporated by reference).
10.25*	Nonstatutory Inducement Stock Option Grant Notice between Calix, Inc. and Cory Sindelar dated October 1, 2017 (filed as Exhibit 10.3 to Calix's Form 10-Q filed with the SEC on August 11, 2017 (File No. 001-34674) and incorporated by reference).
10.26*	Amended and Restated Executive Change in Control and Severance Plan effective September 6, 2017 (filed as Exhibit 10.1 to Calix's Form 8-K filed with the SEC on September 11, 2017 (File No. 001-34674) and incorporated by reference).
10.27*	Amendment to Amended and Restated Executive Change in Control and Severance Plan effective October 1, 2017 (filed as Exhibit 10.5 to Calix's Form 10-Q filed with the SEC on November 8, 2017 (File No. 001-34674) and incorporated by reference).
10.28*	Second Amendment to Amended and Restated Executive Change in Control and Severance Plan effective August 1, 2018 (filed as Exhibit 10.2 to Calix's Form 10-Q filed with the SEC on August 8, 2018 (File No. 001-34674) and incorporated by reference).

Exhibit Number	Description
10.29	Net Lease Agreement by and between Calix, Inc. and Orchard Parkway San Jose, LLC dated March 9, 2018 (filed as Exhibit 10.1 to Calix's Form 10-Q filed with the SEC on May 5, 2018 (File No. 001-34674) and incorporated by reference).
10.30	First Amendment to Net Lease Agreement by and between Calix, Inc. and Orchard Parkway San Jose, LLC dated November 14, 2018.
21.1	Subsidiaries of the Registrant.
23.1	Consent of KPMG LLP, independent registered public accounting firm.
24.1	Power of Attorney (included on signature page to this Annual Report on Form 10-K).
31.1	Certification of Principal Executive Officer of Calix, Inc. Pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934.
31.2	Certification of Principal Financial Officer of Calix, Inc. Pursuant to Rule 13a-14(a) of the Securities Exchange Act of 1934.
32.1	Certification of Principal Executive Officer and Principle Financial Officer of Calix, Inc. Pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	XBRL Instance Document.
101.SCH	XBRL Taxonomy Extension Schema Document.
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.

* Indicates management contract or compensatory plan or arrangement.

† Confidential treatment has been granted as to certain portions of this agreement.

†† Confidential treatment has been requested as to certain portions of this agreement.

ITEM 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned thereunto duly authorized.

CALIX, INC.
(Registrant)

Dated: March 1, 2019	By: /s/ Carl Russo
	Carl Russo
	Chief Executive Officer (Principal Executive Officer)
Dated: March 1, 2019	By: /s/ Cory Sindelar
	Cory Sindelar
	Chief Financial Officer (Principal Financial Officer)

POWER OF ATTORNEY

Each person whose individual signature appears below hereby authorizes and appoints Carl Russo and Cory Sindelar, and each of them, with full power of substitution and re-substitution and full power to act without the other, as his true and lawful attorney-in-fact and agent to act in his name, place and stead and to execute in the name and on behalf of each person, individually and in each capacity stated below, and to file any and all amendments to this Annual Report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing, ratifying and confirming all that said attorneys-in-fact and agents or any of them or their or his substitute or substitutes may lawfully do or cause to be done by virtue thereof.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities indicated on March 1, 2019.

Signature	Title	Date
/s/ Carl Russo Carl Russo	Chief Executive Officer and Director (Principal Executive Officer)	March 1, 2019
/s/ Cory Sindelar Cory Sindelar	Chief Financial Officer (Principal Financial Officer)	March 1, 2019
/s/ Don Listwin Don Listwin	Chairman of the Board of Directors	March 1, 2019
/s/ Christopher Bowick Christopher Bowick	Director	March 1, 2019
/s/ Kathy Crusco Kathy Crusco	Director	March 1, 2019
/s/ Kevin DeNuccio Kevin DeNuccio	Director	March 1, 2019
/s/ Michael Everett Michael Everett	Director	March 1, 2019
/s/ Kira Makagon Kira Makagon	Director	March 1, 2019
/s/ Michael Matthews Michael Matthews	Director	March 1, 2019
/s/ Kevin Peters Kevin Peters	Director	March 1, 2019
/s/ J. Daniel Plants J. Daniel Plants	Director	March 1, 2019

Exhibit 21.1

SUBSIDIARIES OF THE REGISTRANT

Entity Name	Jurisdiction
Calix Networks Canada, Inc.	Canada
Calix Network Technology Development (Nanjing) Co. Ltd.	China
Calix Networks UK, Ltd	England, UK
Calix Brasil Servicos Ltda	Brazil

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders
Calix, Inc.:

We consent to the incorporation by reference in the registration statements (No. 333-223637, 333-218066, 333-216323, 333-209732, 333-202496, 333-194054, 333-185025, 333-172379, 333-166245) on Form S-8 of Calix, Inc. of our report dated March 1, 2019, with respect to the consolidated balance sheets of Calix, Inc. and subsidiaries as of December 31, 2018 and 2017, and the related consolidated statements of comprehensive loss, stockholders' equity, and cash flows for each of the years in three-year period ended December 31, 2018, and the related notes, and the effectiveness of internal control over financial reporting as of December 31, 2018, which report appears in the December 31, 2018 annual report on Form 10-K of Calix, Inc.

/s/ KPMG LLP

San Francisco, California
March 1, 2019

Exhibit 31.1

**CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER
PURSUANT TO SECTION 302 OF
THE SARBANES-OXLEY ACT OF 2002**

I, Carl Russo, certify that:

1. I have reviewed this annual report on Form 10-K of Calix, Inc. for the year ended December 31, 2018;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

    (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

    (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

    (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

    (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting;

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

    (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

    (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 1, 2019

/s/ Carl Russo

Carl Russo

Chief Executive Officer
(Principal Executive Officer)

Exhibit 31.2

**CERTIFICATION OF PRINCIPLE FINANCIAL OFFICER
PURSUANT TO SECTION 302 OF
THE SARBANES-OXLEY ACT OF 2002**

I, Cory Sindelar, certify that:

1. I have reviewed this annual report on Form 10-K of Calix, Inc. for the year ended December 31, 2018;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting;

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 1, 2019

/s/ Cory Sindelar

Cory Sindelar

Chief Financial Officer
(Principal Financial Officer)

Exhibit 32.1

**CERTIFICATION OF PRINCIPAL EXECUTIVE OFFICER AND PRINCIPAL FINANCIAL OFFICER
PURSUANT TO 18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

I, Carl Russo, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that the Annual Report of Calix, Inc. (the “Company”) on Form 10-K for the fiscal year ended December 31, 2018 fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and that information contained in such Annual Report on Form 10-K fairly presents in all material respects the financial condition and results of operations of the Company.

Date: March 1, 2019

/s/ Carl Russo

Carl Russo

Chief Executive Officer
(Principal Executive Officer)

I, Cory Sindelar, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that the Annual Report of Calix, Inc. (the “Company”) on Form 10-K for the fiscal year ended December 31, 2018 fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934 and that information contained in such Annual Report on Form 10-K fairly presents in all material respects the financial condition and results of operations of the Company.

Date: March 1, 2019

/s/ Cory Sindelar

Cory Sindelar

Chief Financial Officer
(Principal Financial Officer)

This certification accompanies the Form 10-K to which it relates, is not deemed filed with the Securities and Exchange Commission and is not to be incorporated by reference into any filing of Calix, Inc. under the Securities Act of 1933, as amended, or the Securities Exchange Act of 1934, as amended (whether made before or after the date of the Form 10-K), irrespective of any general incorporation language contained in such filing.