UNITED STATES
SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 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 001-38324

Casa Systems, Inc.

(Exact name of Registrant as specified in its Charter)

Delaware **(State or other jurisdiction of incorporation or organization)**	**75-3108867** **(I.R.S. Employer Identification No.)**
100 Old River Road **Andover, Massachusetts** **(Address of principal executive offices)**	**01810** **(Zip Code)**

Registrant's telephone number, including area code: (978) 688-6706

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

Common stock, $0.001 par value per share **(Title of each class)**	**Nasdaq Global Select Market** **(Name of each exchange on which registered)**

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 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) 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, 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	☐	Small 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 voting and non-voting common equity held by non-affiliates of the Registrant, based on the closing price of the shares of Common Stock on The Nasdaq Global Select Market on June 29, 2018 was approximately $552.2 million.

The number of shares of Registrant's Common Stock outstanding as of January 31, 2019 was 83,128,218.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive proxy statement relating to its 2019 Annual Stockholders' Meeting expected to be filed pursuant to Regulation 14A within 120 days after the registrant's fiscal year end of December 31, 2018 are incorporated by reference into Part III of this Annual Report on Form 10-K.

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Cautionary Note Regarding Forward-Looking Statements

This Annual Report on Form 10-K contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933, as amended, and Section 21E of the Securities Exchange Act of 1934, as amended. All statements other than statements of historical fact contained in this Annual Report on Form 10-K, including statements regarding our future results of operations and financial position, business strategy and plans and objectives of management for future operations, are forward-looking statements. These statements involve known and unknown risks, uncertainties and other important factors that may cause our actual results, performance or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements.

In some cases, you can identify forward-looking statements by terms such as “may,” “might,” “should,” “expects,” “plans,” “anticipates,” “would,” “could,” “intends,” “target,” “projects,” “contemplates,” “believes,” “estimates,” “predicts,” “potential” or “continue” or the negative of these terms or other similar expressions. The forward-looking statements in this Annual Report on Form 10-K are only predictions. 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 business, financial condition and results of operations. These forward-looking statements speak only as of the date of this Annual Report on Form 10-K and are subject to a number of risks, uncertainties and assumptions described in the “Risk Factors” section and elsewhere in this Annual Report on Form 10-K. Because forward-looking statements are inherently subject to risks and uncertainties, some of which cannot be predicted or quantified, you should not rely on these forward-looking statements as predictions of future events. The events and circumstances reflected in our forward-looking statements may not be achieved or occur and actual results could differ materially from those projected in the forward-looking statements. Some of the key factors that could cause actual results to differ from our expectations include:

- our ability to anticipate technological shifts;
- our ability to generate positive returns on our research and development;
- changes in the rate of broadband service providers’ deployment of, and investment in, ultra-broadband network capabilities;
- the lack of predictability of revenue due to lengthy sales cycles and the volatility in capital expenditure budgets of broadband service providers;
- our ability to maintain and expand gross profit and net income;
- the sufficiency of our cash resources and needs for additional financing;
- our ability to further penetrate our existing customer base and obtain new customers;
- changes in our pricing policies, whether initiated by us or as a result of competition;
- the amount and timing of operating costs and capital expenditures related to the operation and expansion of our business;
- the actual or rumored timing and success of new product and service introductions by us or our competitors or any other change in the competitive landscape of our industry, including consolidation among our competitors or customers;
- our ability to successfully expand our business domestically and internationally;
- insolvency or credit difficulties confronting our customers, which could adversely affect their ability to purchase or pay for our products and services, or confronting our key suppliers, which could disrupt our supply chain;
- our inability to fulfill our customers’ orders due to supply chain delays, access to key commodities or technologies or events that impact our manufacturers or their suppliers;
- future accounting pronouncements or changes in our accounting policies;
- stock-based compensation expense;
- the cost and possible outcomes of any potential litigation matters;
- our overall effective tax rate, including impacts caused by the relative proportion of foreign to U.S. income, the amount and timing of certain employee stock-based compensation transactions, changes in the valuation of our deferred tax assets and any new legislation or regulatory developments;
- increases or decreases in our expenses caused by fluctuations in foreign currency exchange rates;

- general economic conditions, both domestically and in foreign markets;
- our ability to obtain and maintain intellectual property protection for our products; and
- our use of proceeds from our initial public offering.

Except as required by applicable law, we do not plan to publicly update or revise any forward-looking statements contained herein, whether as a result of any new information, future events or otherwise.

PART I

Item 1. Business.

Overview

We offer converged solutions for next-generation centralized, distributed and virtualized architectures for cable broadband, fixed-line broadband and wireless networks. Our innovative products enable customers to cost-effectively and dynamically increase network speed, add bandwidth capacity and new services for consumers and enterprises, reduce network complexity and reduce operating and capital expenditures.

We focus our development efforts on innovation and being the first to market with new products at each generational shift in network technology. For example, we pioneered the use of a software-centric approach to leverage the programmability of field programmable gate arrays, or FPGAs, and general-purpose processors for use in the cable industry. In addition, we believe we were the first to provide each of the following to our customers: a solution enabling cable service providers to deliver Internet Protocol, or IP, voice, digital video and data over a single port; a solution enabling cable service providers to deliver multi-gigabit speeds to their subscribers; and a remote node solution to enable distributed broadband cable access at gigabit speeds. With our recently launched wireless products, including our Apex™ Strand and Small Cell Management System, our mobile edge computing (MEC) solution, and our Axyom™ Small Cell Core, we believe that we are ahead of the market in enabling mobile network service providers to deliver increased bandwidth and new services to their subscribers.

We have created a software-centric, multi-service portfolio based on our Axyom software which enables a broad range of core and access network functions for fixed and wireless networks. These networks share a common set of core and access network functions that enable network services such as subscriber management, session management, transport security and radio frequency, or RF, management. Our Axyom software architecture allows each of these network functions to be provided and controlled, integrated or combined together, in a building block-style fashion with the segments of software responsible for each other network function. This allows us to offer network architectures that can be efficiently and rapidly tailored to meet each customer's specific requirements, both as they exist at the time of initial implementation and as they evolve over time. While we initially focused on providing solutions for cable service providers due to our founders' experience in the cable industry, the commonalities between new fixed and wireless network architectures have allowed us to leverage our existing Axyom software and to expand our solutions into the wireless and fixed communications markets.

We offer a scalable solution that can meet the evolving bandwidth needs of our customers and their subscribers. Our first installation in a service provider's network frequently involves deploying our broadband products in only a portion of the provider's network and with only a fraction of the capacity of our products enabled at the time of initial installation. Over time, our customers have generally expanded the use of our solutions to other areas of their networks to increase network capacity. Capacity expansions are accomplished either by deploying additional systems, line cards, or the sale of additional channels through the use of software. Sales of software-based capacity expansions generate higher gross margins than hardware-based deployments.

Our solutions are commercially deployed in over 70 countries by more than 475 customers, including regional service providers as well as some of the world's largest Tier 1 broadband service providers, serving millions of subscribers. Our principal customers include Charter/Time Warner Cable, Rogers, Sprint and Mediacom in North America; Televisa/IZZI Mexico, Megacable Mexico and Claro Colombia in Latin America; Liberty Global, Vodafone and DNA Oyj in Europe; and Jupiter Communications, Beijing Gehua CATV Networks and China Mobile in Asia-Pacific.

Our revenue for the years ended December 31, 2018, 2017 and 2016 was $297.1 million, $351.6 million and $316.1 million, respectively. Our net income for the years ended December 31, 2018, 2017 and 2016 was $73.0 million, $88.5 million and $88.7 million, respectively. As of December 31, 2018, 2017 and 2016, our total assets were $474.6 million, $469.7 million and $583.0 million, respectively.

Industry Background and Broadband Service Provider Challenges

As broadband service providers look to address the rapidly evolving demands of consumers and enterprises, we believe they must address several key challenges.

Rapidly Increasing Bandwidth Demand

Bandwidth demand has grown substantially and is expected to continue to increase. Key drivers of this increased demand include:

- more users with more connected devices and applications;
- more time spent online by users;
- the increased use of bandwidth-intensive streaming media services, such as Amazon Prime Video, Netflix and YouTube; cloud applications, such as iCloud and Dropbox; and augmented and virtual reality applications;
- Internet of Things, or IoT, solutions, as already seen in connected homes, business and industries; connected devices such as Amazon Alexa or Google Assistant; machine-to-machine connectivity; car connectivity and smart cities;
- backhaul requirements of wireless service providers; and
- the rise of data consumption by enterprises with strict latency requirements on mission-critical and public safety-related applications.

According to the 2018 Cisco Systems Visual Networking Index report, global IP traffic per month is forecasted to grow from 122 exabytes in 2017 (1 exabyte = 1,000,000,000 GB) to 396 exabytes in 2022, representing a 26% compound annual growth rate in global IP traffic; global IP traffic per capita is expected to increase from 16GB in 2017 to 50GB in 2023; and the number of connected devices is forecast to be 3.6 times the global population by 2022.

Competition Fueled by Increasing Convergence of Service Offerings

Convergence is allowing consumers and enterprises to enjoy increased choice among broadband service providers. So-called “triple-play” and “quadruple-play” service offerings are being provided by cable service providers such as Charter and Comcast and diversified telecommunications companies such as AT&T and Verizon. Mobile-only network operators such as Sprint and T-Mobile are offering higher bandwidth wireless connectivity and, as a result, cable and fixed communications service providers are experiencing increased “cord cutting” as subscribers opt for mobile only voice and broadband services. To respond to increased competition, broadband service providers across all access technologies are facing increasing pressure to maintain high bandwidth availability, while developing differentiated service offerings with higher levels of performance at lower cost to consumers and enterprises.

Increasing Network Complexity

Historically, broadband service providers have deployed separate systems within their fixed broadband networks for video and data services and have operated separate networks for fixed, Wi-Fi and mobile services. This traditional model requires service providers to maintain separate network infrastructure and personnel for each service. As network capacity and coverage have increased, and the diversity of service offerings has grown, the need for network infrastructure convergence with reduced operating and capital expenses is increasing.

Need to Control Operating and Capital Expenditures

Operating hardware-centric network infrastructure is costly, with material space, power and personnel requirements. Moreover, hardware-centric networks can be expensive to update or replace. Frequent technology shifts and network upgrade requirements are increasing demand for more cost-efficient and agile network architectures.

Opportunity to Transform Broadband Networks

Given the challenges they face, broadband service providers are undertaking three key technology initiatives to help build next-generation networks.

Densification

Increasing demand for bandwidth and user expectations for ubiquitous and seamless connectivity require, among other things, the addition of more access points for users to connect to broadband networks, also known as network densification. Consequently, broadband service providers are shifting from centralized to more distributed architectures. Densification requires extending network connectivity and distributing access aggregation solutions closer to end users. For cable operators this entails deploying more access aggregation nodes and reducing the size of service groups per node. For wireless operators, this will lead to an emphasis on small, versus traditional macro, cells in new network deployments.

Network Convergence

Today service providers use separate networks to deliver both fixed (cable, fiber or copper) and mobile broadband to their subscribers. To meet the demands of next generation networks, service providers are focused on converging siloed fixed and mobile core networks into a single converged 5G Core. Our Axyom Software Platform is a single software framework that supports network convergence by implementing common micro-services across different virtual network functions, or VNFs.

Virtualization

Service providers are rethinking traditional network architectures and moving toward virtualized, disaggregated and automated network architectures. The introduction of network virtualization is a fundamental change in the way broadband service providers deliver critical network functions. Software-enabled architectures are decoupled from underlying server hardware for increased efficiency, upgradability, configuration flexibility, service agility and scalability not feasible with proprietary hardware-based solutions. Once the networks have been virtualized, a service-based architecture that supports scalable network slicing will be launched.

Our Solutions

We offer solutions for fixed and wireless networks. Our software-centric, multi-service broadband platform, Axyom, enables ultra-broadband delivery and convergence.

We engineered our platform from the ground-up to be high performance, flexible and adaptable, and to allow our customers to seamlessly address the growing demand for bandwidth and connectivity and competitive need for service agility. Axyom also enables our customers to efficiently manage their networks and provide their subscribers with additional services.

Our software-centric broadband platform provides the following key benefits to broadband service providers:

Addition of Critical Bandwidth Capacity

Our solutions enable broadband service providers to offer multi-gigabit speeds to meet the growing demand for bandwidth. Our platform permits software-centric expansion of network capacity to enable rapid bandwidth and service provisioning, helping broadband service providers to respond flexibly to increased customer demands.

Flexibility to Add New and Expand Existing Services

Our platform provides us with the flexibility to adapt to changing industry standards and customer needs. We designed our Axyom software platform using what we refer to as Network Function Virtualization 2.0, or NFV 2.0, principles, which allow us to provide and control each needed network function through a distinct segment of software, which can be integrated or combined in a building block-style fashion with the segments of software responsible for each other network function. This allows us to offer network architectures that can be efficiently tailored to meet each customer’s specific requirements, both as they exist at the time of initial implementation and as they evolve over time. When possible, we also seek to implement new features and enhanced customization through the use of FPGAs, which can be reprogrammed in the field as service needs evolve. This software-centric approach enables our customers, in turn, to commercialize new features faster than they could with hardware-centric solutions. For example, our solutions enable broadband service providers to efficiently add new services and features, such as wholesale connectivity services for wireless service providers, enterprise-class connectivity services and interactive communication services, such as voice over Wi-Fi and video calling.

Ability to Upgrade Networks Remotely

Our programmable architecture allows us to deploy technology updates to our customers remotely without the expense, disruption or network downtime caused by hardware replacements or field visits by personnel, while minimizing network downtime. We can remotely turn on additional features or capacity in order to scale our solutions to meet the needs of our customers as they look to broaden the use and capabilities of our products. Similarly, we are often able to troubleshoot and assist our customers with technical issues through seamless software updates.

Reduced Network Complexity, Operating Costs and Capital Expenditures

Our converged software platform allows broadband service providers to significantly reduce the complexity and costs of their networks by reducing parallel and otherwise redundant network architecture. The large capacity increases that our solutions enable, and the ability of our solutions to deliver voice, video and data over a single platform, mean fewer pieces of equipment in the network, and lower energy usage, operating costs and capital expenditures.

Ability to Densify Networks

Our products help broadband service providers deploy more capacity at the network edge, closer to where end users and devices are accessing the network, thereby increasing available bandwidth and reducing latency to improve quality of service. For example, our solutions allow cable service providers to take advantage of new technologies and standards such as distributed access architectures, including passive optical networking, or PON, architectures, allowing cable service providers to move fiber closer to the network edge. Additionally, our portfolio of indoor and outdoor small cells, Apex Strand solutions, and outdoor 5G metro-cells enables wireless operators to improve coverage and enhance throughput, while meeting the standards' requirements for new 5G network architectures.

Common Platform Capabilities to Address the Needs of Both Fixed and Wireless Networks

Our software-centric, multi-service platform enables a broad range of network services for fixed and wireless networks, allowing for the delivery of diverse consumer and enterprise applications. Both fixed and wireless networks share a common set of core and access network functions that enable network services, such as subscriber management, session management, transport security, access aggregation and RF management. Our Axyom software architecture allows each of these network functions to be provided and controlled by a distinct segment of software, which can be integrated or combined together in a building block-style fashion with the segments of software responsible for each other network function. This allows us to offer network architectures that can be efficiently tailored to meet each customer's specific requirements, both as they exist at the time of initial implementation and as they evolve over time.

Our Competitive Strengths

The following competitive strengths have helped us become a market leader:

Highly Flexible, Software-Centric Architecture

We have designed our product portfolio from the ground-up to be software-centric and modular in nature. Our proprietary software is at the heart of our products. Our software-centric architecture allows us to virtualize core network and access functions allowing these functions to be decoupled from underlying hardware, which is not feasible with hardware-centric approaches. As a result, our software-centric architecture allows for increased efficiencies, upgradability, configuration flexibility, service agility and scalability while increasing the potential service life of the underlying hardware. Our software allows us to leverage the programmability of FPGAs and general-purpose processors in our solutions.

Proven Engineering and Product Development Track Record

We have a proven history of anticipating network evolutions and developing solutions that enable next-generation networks. Our forward-looking design and investment approach, coupled with our proven product development track record, has enabled us to deliver fully featured next-generation solutions in advance of competitors. For example, we believe we:

- were first to market (2005) with a software-centric cable solution leveraging the programmability of FPGAs and general-purpose processors;

- were first to market (2008) with a commercially deployed, fully qualified DOCSIS 3.0 cable modem termination system, or CMTS;
- were first to market (2012) with a commercially deployed converged cable access platform, or CCAP, delivering IP voice, digital video and data over a single port;
- were first to market (2015) with commercially deployed DOCSIS 3.1-compliant solutions supporting speeds of up to 10 gigabits per second;
- were first to market (2016) with a commercially deployable remote-PHY solution;
- accelerated innovation (2017) with cloud-native design;
- transformed fixed networks (2018) with a commercially deployable vBNG and Multiservice Router; and
- unlocked small cell potential (2018) with Strand-mounted Pico cell to support MNO and MSO unique densification requirements.

Strong Management and Engineering Team with a Culture of Innovation

We pride ourselves on our culture of innovation, which is driven by our management team of experienced executives and engineers with deep industry expertise. As of December 31, 2018, approximately 86% of our employees were engineers or had other technical backgrounds. With our talented and passionate engineering-led organization, we aim to be an industry visionary and are committed to delivering products based on next-generation technology before our competitors do. By providing customers with direct access to our engineers for product feedback and assistance, we believe our engineering expertise contributes to an enhanced customer experience.

Customer Focus

We have a passion to serve our customers and the agility and flexibility to offer solutions to meet their evolving requirements. Our sales, sales engineering, development and support teams work directly with customers to design, develop and implement new solutions and to resolve customer problems, even if another provider is the root cause of the problem. Our product development roadmap is based on our vision for the future but heavily influenced by near-term and mid-term customer requirements. This market insight helps us meet customer demands and achieve faster time to market with new features.

Diversified and Established Customer Base

Our solutions are commercially deployed in more than 70 countries by more than 475 customers, including regional service providers as well as some of the largest Tier 1 broadband service providers, serving millions of subscribers. According to S&P Global Intelligence, our market share by channels shipped in the CCAP and CMTS market has been: 27% in 2016; 22% in 2017; and 27% in the nine months ended September 30, 2018. Our wireless solutions have been purchased by several customers, including Tier 1 mobile operators such as Telefonica, Sprint and China Mobile. In addition, our wireless solutions are currently in over 27 trials with 24 prospective customers.

Market Opportunity

We believe that the shift to software-centric ultra-broadband networks and fixed and wireless convergence presents us with a compelling market opportunity. Because fixed and wireless networks share a common set of core and access network functions, our platform is capable of addressing the needs of both fixed and wireless networks.

Our current CCAP solution addresses the service delivery needs of cable service providers. We believe there is an opportunity for us to take new market share as fixed and wireless networks continue to converge. Although we currently generate the majority of our revenue from the fixed broadband CCAP market, we expect to generate increased revenue in the future from sales of both wireless and PON solutions to new and existing customers. Our current wireless products consist of small cells, Wi-Fi and related gateways as well as evolved packet core products. Our small cells and related products enable wireless access, routing and traffic management functions to support the delivery of a number of services to end users. Our evolved packet core products enable subscriber and session management, security and data exchange between the core wireless network and wireless subscribers. Our PON solutions enable cable service providers to push fiber closer to the network edge while leveraging their existing network assets and existing industry-standard protocols.

According to S&P Global Market Intelligence, the CCAP market (including both centralized and distributed solutions) is projected to grow from $1.5 billion in 2017 to $1.8 billion in 2021 representing a 5% compound annual growth rate. This market currently accounts for the majority of our revenue.

In addition, we believe the global market for our small cell, evolved packet core, 5G Core and PON solutions will grow from $7.7 billion in 2017 to $19.4 billion 2021, including the following:

- According to ABI Research, the evolved packet mobile core market is expected to grow from $2.4 billion in 2017 to $8.7 billion in 2021, representing a 38% compound annual growth rate.
- According to S&P Global Market Intelligence, the high-growth segments of the broadband service provider PON market that we address are projected to grow from $0.9 billion in 2017 to $3.9 billion in 2021, representing a 44% compound annual growth rate.

Our small cell-related solutions have already been purchased by several customers, including Tier 1 mobile operators. Our small cell-related solutions, components of our evolved packet mobile core application, our vBNG solution and our PON solutions are currently in trials with numerous prospective customers.

Our Growth Strategy

The key elements of our growth strategy are:

Continue to Innovate and Extend Technology Leadership Through R&D Investment

We believe that we offer market-leading broadband infrastructure products today. We intend to continue to enhance our existing products and develop new products in both our current and adjacent markets. For example, we have invested in and launched distributed access architecture solutions to allow our cable customers to densify their networks, providing higher bandwidth, which enhances user experience.

Further Penetrate Existing Customers

Our customers often deploy our products in a specific region or for a specific application, which may only account for a portion of their overall network infrastructure needs. We plan to expand our footprint within the networks of existing customers as they realize the technological and financial benefits of our solutions. Our software-centric approach, which is embedded in our products already deployed in our customers' networks, allows those customers to expand network capacity to address increasing bandwidth demand and serve additional users through software.

Expand Our Customer Base

We intend to continue to invest in our sales and marketing organization to increase awareness of our products and services and expand our customer base. We believe our focus on hiring, training and retaining a knowledgeable and technical sales team helps us build better relationships with customers. We added approximately 20 customers in 2018.

Expand the Breadth of Solutions Sold to Customers

We intend to sell additional products and solutions to our growing installed base of broadband service providers, particularly as they increasingly offer converged services to their subscribers. We have invested in developing a virtualized platform that allows us to rapidly provide new applications and services to our customers.

Continue to Leverage Our Core Technology for the Cable Industry into Adjacent Wireless and Fixed Telco Markets

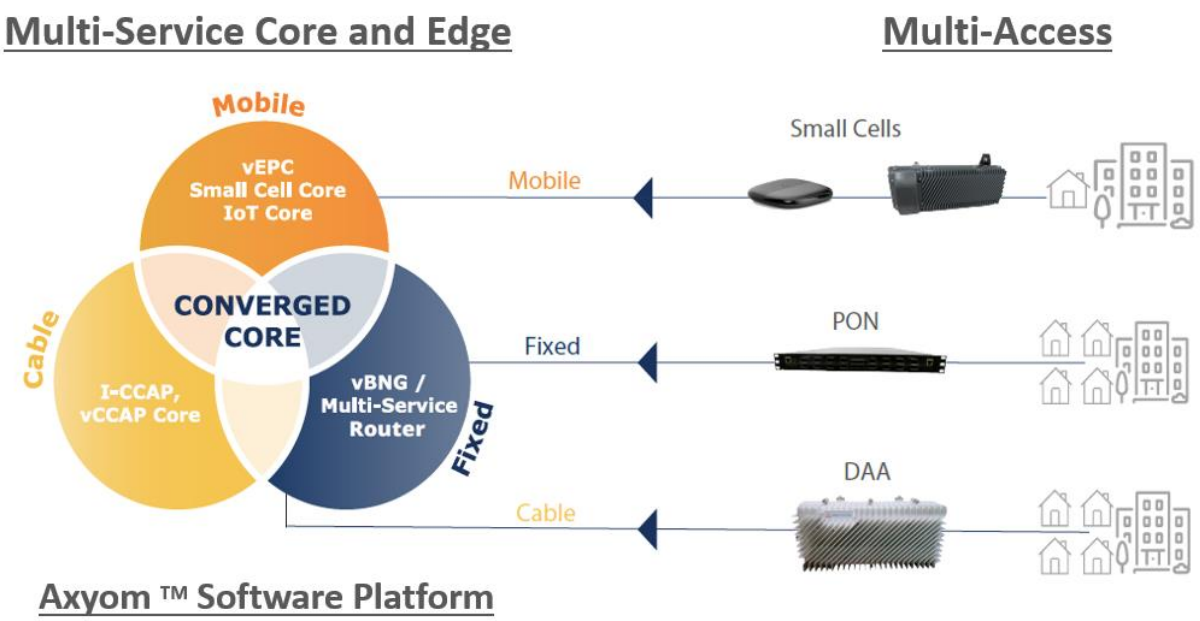
While we initially focused on providing solutions for cable service providers due to our founders' experience in the cable industry, the commonalities between fixed and wireless network architectures have allowed us to expand our solutions into the wireless market as cable service providers have increasingly sought to add wireless capabilities to their service offerings. Our wireless solutions have been purchased by several customers, including Tier 1 mobile operators such as Sprint and China Mobile, and we are in negotiations with several broadband service providers for the purchase of our wireless solutions. In addition, our wireless solutions are currently in over 27 trials with 24 prospective customers.

Invest in Our Platform through Selective Acquisitions

We may selectively pursue acquisitions that enhance our existing platform capabilities and are consistent with our overall growth strategy. For example, on February 21, 2019, we announced that we had agreed to acquire NetComm Wireless Limited for cash consideration of approximately 161.0 million Australian dollars, or AUD ($115.3 million United States dollars, or USD, based on an exchange rate of USD $0.716 per AUD $1.00 on February 21, 2019) to diversify our revenues both geographically and by product channel.

Products and Technology

We offer physical and virtual network solutions that enable our customers to provide fixed and wireless broadband services to consumers and enterprises.



Axyom Software Platform

Our Axyom software platform is central to our multi-service, ultra-broadband delivery architecture, integrating multiple core and access network functions. Axyom is 5G-ready and is designed to provide high performance, programmability, scalability and flexibility. We designed Axyom using NFV 2.0 principles, which allow us to provide and control each needed network function through a distinct segment of software, which can be integrated or combined together in a building block-style fashion with the segments of software responsible for each other network function. This allows us to offer network architectures that can be efficiently tailored to meet each customer's specific requirements, both as they exist at the time of initial implementation and as they evolve over time. Axyom has predominantly been integrated into our physical products to date and is increasingly being deployed in virtual environments.

Our Axyom software platform performs several critical network services:

- *Subscriber Management*. Enables dynamic management of subscriber authentication, provisioning, policy enforcement and allocation of network resources based on specific end-user service requirements to enhance quality of service.
- *Session Management.* Intelligently manages application layer data streams to enable service creation and delivery and enhance quality of service.
- *RF Management.* Efficiently manages RF signal generation (modulation/demodulation) while reducing noise to increase available RF spectrum and maximize data throughput over the network link in both fixed and wireless applications.

- *Access Aggregation.* Manages and combines high volume data streams, regardless of connection type, including fixed broadband, Wi-Fi, LTE and 5G.
- *Security.* Enables end-to-end secure connectivity between users, devices and networks without sacrificing performance.

Axyom can be deployed on a centralized basis on one of our hardware chassis, over distributed network hardware or as a virtualized solution, allowing operators to place network functions where they choose, whether close to the network edge or at a centralized location or data center.

Delivery Platforms

Depending on customer preference, network requirements and current network configuration, our solutions can be deployed in a centralized, distributed or virtual environment. While centralized deployments allow our customers to deploy all critical CCAP functions in a single location, distributed and virtual deployments enable our customers to densify the access network by distributing access deeper into the network, away from existing data centers.

Centralized Deployment. Our C100G CCAP combines CMTS functionality that enables IP data transport from data centers to end-users over cable networks, including voice over IP and edge-quadrature amplitude modulation, or Edge-QAM, functionality to enable video delivery over cable networks in one integrated chassis. We believe our C100G CCAP solution was the industry's first fully integrated CCAP and DOCSIS 3.1 solution. Our C100G CCAP is capable of supporting downstream speeds of 10 gigabits per second. Our C100G CCAP also features high downstream and upstream channel capacity, and low space and energy consumption requirements. Using our C100G CCAP, our customers whose networks are configured for DOCSIS 3.0 can adopt DOCSIS 3.1 through either a software upgrade or a simple line card addition, while continuing to service their end customers who use DOCSIS 3.0 modems. We are also able to increase capacity for our C100G CCAP through channel expansions, which are delivered via software-enabled increases in the bandwidth capacity, regardless of whether it is configured for DOCSIS 3.0 or 3.1. We believe that our software-centric approach will enable us to seamlessly provide our customers with future upgrades as standards evolve. In addition to our C100G CCAP, we also offer our C40G CCAP, that provides per rack unit performance comparable to that of our C100G CCAP, but in a smaller form factor.

Distributed Deployment. We offer three solutions for distributed deployment:

- *Remote-PHY Solution.* Our R-PHY solution for cable networks consists of remotely deployable hardware that primarily performs RF modulation and connects to a CCAP at the network core to provide subscriber management, session management, access aggregation and security functions. The remotely deployed R-PHY nodes aggregate end-user traffic for delivery back to the central data center. The software at the central data center can run on our C100G CCAP chassis or in a virtual environment. Our R-PHY solution allows broadband service providers that have implemented fiber-deep architectures to deploy ultra-fast fiber connections closer to the end user. By retaining software-driven network control and intelligence functions at the network core and placing physical layer functions remotely in a fiber node, broadband services providers can densify their networks to increase operational efficiencies and network capacity.
- *Remote-MAC/PHY Solution (R-MAC/PHY)*. Our R-MAC/PHY solution for cable networks offers the capabilities of our R-PHY solution while also moving media access control functions from the network core to remotely deployed R-MAC/PHY nodes, allowing cable service providers to increase network throughput to serve more customers at higher speed.
- *Apex Small Cell Solution.* Our portfolio of indoor and outdoor Apex small cell solutions consists of remotely deployable access points that provide cellular connectivity services at the network edge in conjunction with transport security functions to address coverage and capacity challenges. Additionally, our small cell portfolio includes our Apex Strand solution and our outdoor 5G metro-cell. These solutions allow broadband service providers to more cost-effectively densify their networks while simultaneously improving coverage and enhancing throughput.

In connection with all of our centralized and distributed deployment solutions, we offer a portfolio of PON solutions, enabling service providers to move fiber closer to the network edge and deliver a broader range of ultra-broadband services more efficiently and at higher speed. In particular, our portfolio of PON solutions includes end-to-end network elements, including optical line terminals and optical network units, and a DOCSIS Provisioning over Ethernet system for seamless integration of our PON solutions with existing DOCSIS network protocols. In conjunction with our PON portfolio, we have commercially deployed its vBNG and Multiservice Router (MSR) to support functional disaggregation and edge deployments which help to transform fixed networks.

Virtual Deployment. Using our NFV 2.0 software architecture, all of the multi-service applications supported across fixed and wireless by our Axyom software platform can be delivered on a virtualized basis utilizing commodity servers. We are in trials with numerous prospective customers to deliver multi-service applications virtually.

Multi-Service Applications

Our Axyom software platform initially focused on supporting applications enabling fixed broadband delivery. We have focused our recent development efforts on expanding Axyom's capabilities to support wireless applications. We refer to multi-service to describe a set of applications that are able to support requirements for both fixed and wireless networks.

Cable Network Applications

We believe our C100G CCAP was the first solution offering full CCAP functionality, allowing the delivery of voice, video and data on a single platform. Our CCAP enables three key applications over a single cable network:

- *DOCSIS Core.* Provides high-speed delivery of IP data for broadband connectivity services, including voice over IP.
- *Video Core.* Delivers high speed video processing, including for HD and 4K.
- *Intelligent Routing.* Intelligently manages network traffic to optimize service quality.

Wireless Network Applications

Our Axyom software platform also enables a number of applications addressing the evolving needs of fixed-mobile convergence as well as mobile network operators:

- *Security Gateway.* Enables secure encrypted access for subscribers roaming between trusted and untrusted networks, while providing high levels of density and performance.
- *Small Cells, Wi-Fi and Related Wireless Gateways.* Enables routing and security functions as well as traffic management to provide secure connectivity for wireless endpoints and enable broadband services such as LTE over Wi-Fi, including Wi-Fi calling.
- *Evolved Packet Mobile Core.* Enables subscriber management, session management and authentication, security and data exchange between the core network and subscribers. Moreover, we have designed and built a commercially deployable 5G converged core supporting fixed and mobile access.

Capacity Expansion Products

Our CCAP's flexible design allows our customers to rapidly increase service capabilities and tailor our solution to meet their evolving service needs.

Our software platform permits additional capacity and features to be provisioned remotely, as compared to hardware-centric solutions, which require wholesale hardware replacements. As new standards and services evolve, and broadband networks become increasingly virtualized, we expect we will be able to deliver additional capabilities as software-only updates.

Our line card expansion options allow our customers to rapidly add new service interfaces and physical connection capacity without the need for chassis replacements. In addition, our expansion cards can cost-effectively enable support for our distributed access solutions utilizing the same C100G CCAP chassis.

Our Customers

Our solutions are commercially deployed by more than 475 customers, including some of the world's largest Tier 1 broadband service providers:

- in North America: Charter/Time Warner Cable, Rogers, Sprint and Mediacom;
- in Latin America: Televisa/IZZI Mexico, Megacable Mexico and Claro Colombia;

- in Europe: Liberty Global, Vodafone and DNA Oyj; and
- in Asia-Pacific: Jupiter Communications, Beijing Gehua CATV Networks and China Mobile.

Sales and Marketing

We sell our products and services through our direct sales force and in partnership with our resellers and sales agents. Our sales force is supported by our sales engineering team, which has deep technical expertise and the capability for product presentations, product evaluations, trials and customer care. Each sales team is responsible for specific direct end-customer accounts and/or a geographic territory across the following regions: North America, Latin America, Asia-Pacific and Europe, Middle East and Africa. We intend to expand our sales force and our reseller and sales agent network.

Our products typically have a long sales cycle, requiring detailed discussions with prospective customers about their network requirements and technology roadmaps. To help us succeed in a market characterized by long sales cycles, we have developed strong customer relationships, which in turn provide us with insight into how our products will be deployed in our customers' networks. We involve product engineers in the sales process, enabling them to build relationships with customers that are valuable both during implementation and in post-sales customer support. These relationships also provide us with opportunities to leverage our familiarity with our customers' needs to make additional sales following the initial sale.

We also use resellers to market, sell and support our products and services, and we use sales agents to assist our direct global sales force with certain customers primarily located in the Latin America and Asia-Pacific regions.

Our marketing activities consist primarily of technology conferences, web marketing, trade shows, seminars and events, public relations, analyst relations, demand generation and direct marketing to build our brand, increase customer awareness, communicate our product advantages and generate qualified leads for our field sales force and resellers and sales agents.

Competition

The broadband service provider market is highly competitive and subject to rapidly changing technology trends and shifting customer needs.

We primarily compete with larger and more established companies in the broadband service provider market, such as Arris, Cisco, Ericsson and Nokia.

The principal factors upon which we compete are:

- product capabilities;
- performance;
- scalability, flexibility and adaptability to new standards;
- ability to innovate;
- time to market;
- customer support; and
- total cost of ownership relative to performance and features.

We believe that we compete favorably with respect to these factors. Nevertheless, many of our competitors have substantial competitive advantages, including greater name recognition, longer operating histories, and substantially greater financial, technical, research and development or other resources than we do.

Research and Development

Our research and development efforts are focused on developing new broadband products for the cable and wireless markets and enhancing our current products to meet the current and future needs of our customers. We aim to be first to market with deployable products and are willing to invest early in research and development and take technological risks to meet this goal. We also seek to enhance our technological innovation through our partnerships with industry standard-setting organizations and groups, such as CableLabs, 3GPP and Wi-Fi Alliance. These efforts position us to be able to advance industry standards while evolving our solutions to meet such new standards.

As of December 31, 2018, our research and development organization consisted of 430 employees worldwide, including both software and hardware engineers. Our research and development expense totaled $71.0 million, $60.7 million and $49.2 million for the years ended December 31, 2018, 2017 and 2016, respectively. We plan to continue to devote substantial resources to our research and development activities.

Manufacturing

We contract with multiple U.S.-based manufacturing firms, including Benchmark and Sanmina, to manufacture the hardware for our products using the designs, components and standards that we specify. After taking delivery from our contract manufacturers, we conduct final assembly and quality assurance testing at our facilities in Lawrence, Massachusetts and Limerick, Ireland. We believe our combination of local manufacturing and in-house assembly and quality assurance allows us to maintain consistency and quality in the products we ship to customers. We also believe that this manufacturing model enables us to respond quickly to technological changes and supports our engineering goal of being first to market with deployable products. We believe our inventory management enables us to offer shorter times between order and delivery to our customers as compared to our competitors.

We enter into purchase agreements with our contract manufacturers, generally with terms of one year or more. There are no minimum purchase requirements under these agreements and we purchase manufactured goods on a purchase order basis. As a result of our use of multiple contract manufacturers, we believe that we are not substantially dependent on the availability of any single contract manufacturer. Our contract manufacturers purchase the materials and components for our products through a variety of major electronics distributors. The materials and components of our solutions are generally available in adequate quantities from multiple potential suppliers.

Backlog

We do not have any long-term purchase commitments from customers. Customers generally order products on an as-needed basis with short lead and delivery times on a per-purchase-order basis. We maintain substantial finished goods inventory to ensure that products can generally be shipped shortly after receipt of an order.

A portion of our customer shipments in any fiscal period relate to orders received in prior fiscal periods. As of December 31, 2018 and 2017, we had backlog of $28.6 million and $40.0 million, respectively. The decrease in backlog over that period was due principally to the timing of shipments of our wireless and software-centric broadband products, delivery of software-based capacity expansions and the timing of maintenance and support contract renewals. Of the amount of backlog as of December 31, 2018, we expect that approximately $28.6 million will be shipped within the following twelve months. However, because our customers utilize purchase orders containing non-binding purchase commitments and customers may cancel, change or reschedule orders without penalty at any time prior to shipment, we have no assurance that we will be able to convert our backlog into shipped orders.

Intellectual Property

Our success depends to a significant degree upon our ability to protect our core technology and intellectual property. To accomplish this, we rely on a combination of trade secrets, patents, copyrights and trademarks, as well as contractual protections. To date, we have focused our efforts to protect our intellectual property primarily on trade secrets because the cable industry generally relies on non-patentable CableLabs standards and specifications that are jointly developed by market participants.

We limit access to and use of our proprietary software, technology and other confidential information through the use of internal and external controls, including nondisclosure agreements with employees, consultants, customers and vendors and other measures for maintaining trade secret protection. We generally license our software to customers pursuant to agreements that impose restrictions on the customers' ability to use the software, including prohibitions on reverse engineering and limitations on the use of copies. We also seek to avoid disclosure of our intellectual property by requiring employees and consultants with access to our proprietary information to execute nondisclosure and assignment of intellectual property agreements and by restricting access to our source code.

We also incorporate a number of third-party software programs into our solutions pursuant to license agreements. Our software is not substantially dependent on any third-party software, although in some cases it utilizes open source code.

Employees

As of December 31, 2018, we employed 743 full-time employees, of which 394 were located in the United States and 349 were located outside the United States. Our workforce as of December 31, 2018, consisted of 430 employees in engineering and research and development, 142 employees in sales and marketing, 70 employees in general and administrative, 68 employees in manufacturing and 33 employees in services and support. None of our employees are represented by unions. We consider our relationship with our employees to be good and have not experienced significant interruptions of operations due to labor disagreements.

Our Corporate Information

We were incorporated in the State of Delaware on February 28, 2003. Our principal executive offices are located at 100 Old River Road, Andover, Massachusetts 01810, and our telephone number at that address is (978) 688-6706.

Available Information

We maintain an internet website at www.casa-systems.com and make available free of charge through our website our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and amendments to those reports filed or furnished pursuant to Sections 13(a) and 15(d) of the Exchange Act of 1934, or the Exchange Act. We make these reports available through our website as soon as reasonably practicable after we electronically file such reports with, or furnish such reports to, the Securities and Exchange Commission, or the SEC. You can review our electronically filed reports and other information that we file with the SEC on the SEC's web site at http://www.sec.gov. We also make available, free of charge on our website, the reports filed with the SEC by our executive officers, directors and 10% stockholders pursuant to Section 16 under the Exchange Act as soon as reasonably practicable after copies of those filings are provided to us by those persons. In addition, we regularly use our website to post information regarding our business, product development programs and governance, and we encourage investors to use our website, particularly the information in the section entitled "Investor Relations," as a source of information about us.

The information on our website is not incorporated by reference into this Annual Report on Form 10-K and should not be considered to be a part of this Annual Report on Form 10-K. Our website address is included in this Annual Report on Form 10-K as an inactive technical reference only.

Item 1A. Risk Factors.

Our business is subject to numerous risks. The following important factors, among others, could cause our actual results to differ materially from those expressed in forward-looking statements made by us or on our behalf in this Annual Report on Form 10-K and other filings with the Securities and Exchange Commission, or the SEC, press releases, communications with investors, and oral statements. Actual future results may differ materially from those anticipated in our forward-looking statements. We undertake no obligation to update any forward-looking statements, whether as a result of new information, future events, or otherwise.

Risks Related to Our Business and Our Industry

If we do not successfully anticipate technological shifts, market needs and opportunities, and develop new products and product enhancements that meet those technological shifts, needs and opportunities, we may not be able to compete effectively.

The broadband service provider market, including fixed and wireless, is characterized by rapid technological shifts and increasingly complex customer requirements to achieve scalable networks that accommodate rapidly increasing consumer demand for bandwidth. To compete effectively, we must continue to develop new technologies and products that address emerging technological trends and changing customer needs. The process of developing new technology is complex and uncertain, and the development of new offerings requires significant upfront investment that may not result in material improvements to existing products or result in marketable new products or costs savings or revenue for an extended period of time, if at all.

We believe that our culture of innovation is a significant factor in our ability to develop new products. If we are not able to attract and retain employees that are able to contribute to our culture of innovation, our ability to identify emerging technological trends and changing customer needs and successfully develop new products to address them could be adversely impacted.

The success of new products and enhancements also depends on many other factors, including timely completion and introduction, differentiation from products offered by competitors and previous versions of our own products and, ultimately, market acceptance of these new products and enhancements. In addition, new technologies or standards could render our existing products obsolete or less attractive to customers. If we are unable to successfully introduce new products and enhancements, we would not be able to compete effectively and our business, financial condition, results of operations and prospects could be materially adversely affected.

Our success depends in large part on broadband service providers' continued deployment of, and investment in, ultra-broadband network capabilities that make use of our solutions.

A significant portion of our product and solution suite is dedicated to enabling cable service providers to deliver voice, video and data services over newer and faster ultra-broadband networks. As a result, our success depends significantly on these cable service providers' continued deployment of, and investment in, their networks, which depends on a number of factors outside of our control. These factors include capital constraints, the presence of available capacity on legacy networks, perceived subscriber demand for ultra-broadband networks, competitive conditions within the broadband service provider industry and regulatory issues. If broadband service providers do not continue deploying and investing in their ultra-broadband networks in ways that involve our solutions, for these or other reasons, our business, financial condition, results of operations and prospects could be materially adversely affected.

We expect certain of our customers will continue to represent a substantial portion of our revenue.

Historically, certain of our customers have accounted for a significant portion of our revenue. For example, sales to Charter Communications, which purchased Time Warner Cable in 2016, accounted for 27%, 37%, and 23% of our revenue for the years ended December 31, 2018, 2017 and 2016, respectively; sales to Liberty Global Affiliates accounted for 11%, 11%, and 10% of our revenue for the years ended December 31, 2018, 2017 and 2016, respectively; sales to Vodafone Kabel Deutschland GmbH accounted for 14% of our revenue for the year ended December 31, 2018; and sales to Rogers accounted for 12% and 19% of our revenue for the years ended December 31, 2018 and 2016. Based on their historical purchasing patterns, we expect that our large customers will continue to account for a substantial portion of our revenue in future periods. However, our customers generally make purchases from us on a purchase-order basis rather than pursuant to long-term contracts, and those that do enter long-term contracts typically have the right to terminate their contracts for convenience. As a result, we generally have no assurances that these large customers will continue to purchase our solutions.

We may also see consolidation of our customer base, which could result in loss of customers. In addition, some of our large customers have used, and may in the future use, the sizes and relative importance of their orders to our business to require that we enter into agreements with more favorable terms than we would otherwise agree to and obtain price concessions. The loss of a significant customer, a significant delay or reduction in purchases by large customers or significant price concessions to one or more large customers, could have a material adverse effect on our business, financial condition, results of operations and prospects.

Timing of large orders and seasonality in our revenue may cause our quarterly revenue and results of operations to fluctuate and possibly decline materially from quarter to quarter.

Our customers tend to make large purchases from us when initiating or upgrading services based on our solutions, followed by smaller purchases for maintenance and ongoing support. In addition, purchases by existing customers of capacity expansions can also involve large individual orders that may represent a significant portion of our revenue for a fiscal quarter, which may also have a significant impact on our quarterly gross margin due to these capacity expansions generating higher gross margins than our initial hardware-based deployments. As a result of all of these factors, our quarterly revenue and results of operations, including our gross margin, may be significantly impacted by one or a small number of large individual orders. For example, any cancellation of orders or any acceleration or delay in anticipated product purchases or the acceptance of shipped products by a large customer could materially affect our revenue and results of operations in any quarterly period. We may be unable to sustain or increase our revenue from other new or existing customers to offset the discontinuation of purchases by one of our larger customers. As a result, our quarterly revenue and results of operations are difficult to estimate and may fluctuate or decline materially from quarter to quarter.

In addition, we believe that there are significant seasonal factors which may cause revenue to be greater for the first and fourth quarters of our fiscal year as compared to the second and third quarters. We believe that this seasonality results from a number of factors, including the procurement, budgeting and deployment cycles of many of our customers. These seasonal variations may cause our quarterly revenue and results of operations to fluctuate or decline materially from quarter to quarter.

Our sales to the broadband service provider market are volatile and our sales cycles can be long and unpredictable. As a result, our sales and revenue are difficult to predict and may vary substantially from period to period, which may cause our revenue and results of operations to fluctuate and possibly decline significantly.

Our sales to the broadband service provider market have been characterized by large and sporadic purchases and long sales cycles. Sales activity often depends upon the stage of completion of expanding network infrastructures, the availability of funding and the extent to which broadband service providers are affected by regulatory, economic and business conditions in the countries in which they operate.

In addition, the timing of our sales and revenue recognition is difficult to forecast because of the unpredictability of our products' sales cycles. A sales cycle is the period between initial contact with a prospective customer and the sale of our products to that customer. Customer orders often involve the purchase of multiple products. These orders are complex and difficult to obtain because prospective customers generally consider a number of factors over an extended period of time before committing to purchase the products and solutions we sell. Customers, especially in the case of our large customers, often view the purchase of our products as a significant and strategic decision and require considerable time to evaluate, test and qualify our products prior to making a purchase decision and placing an order. The length of time that customers devote to their evaluation, contract negotiation and budgeting processes varies significantly, but can often exceed 24 months. During the sales cycle, we expend significant time and money on sales and marketing activities and make investments in evaluation equipment, all of which are included in our sales and marketing expenses and lower our operating margins, particularly if no sale occurs.

Even if a customer decides to purchase our products, there are many factors affecting the timing of our recognition of revenue, which makes our revenue difficult to forecast. For example, the sale of our products may be subject to acceptance testing or there may be unexpected delays in a customer's internal procurement processes, particularly for some of our larger customers, for whom our products represent a very small percentage of their total procurement activity. These factors may result in our inability to recognize revenue for months or years following a sale. In addition, other factors that are specific to particular customers can affect the timing of their purchases and the variability of our revenue recognition, including the strategic importance of a particular project to a customer, budgetary constraints and changes in their personnel. For all of these reasons, it is difficult to predict whether a sale will be completed, the particular period in which a sale will be completed and the period in which revenue from a sale will be recognized. If our sales cycles lengthen, our revenue could be lower than expected, which could have a material adverse effect on our business, financial condition, results of operations and prospects.

We may not generate positive returns on our research and development investments.

Developing our products is expensive, and the investment in product development may involve a long payback cycle or may result in investments in technologies or standards that do not get adopted in the timeframe we anticipate, or at all. For the years ended December 31, 2018, 2017 and 2016, our research and development expenses were $71.0 million, or approximately 23.9% of our revenue, $60.7 million, or approximately 17.3% of our revenue, and $49.2 million, or approximately 15.6% of our revenue, respectively. We expect to continue to invest heavily in software development in order to expand the capabilities of our broadband and wireless infrastructure solutions, introduce new products and features and build upon our technology leadership, and we expect that our research and development expenses will continue to increase in absolute dollars and as a percentage of revenue from 2018 to 2019. Our investments in research and development may not generate positive returns in a timely fashion or at all.

Our converged cable access platform, or CCAP, solutions currently represent a significant majority of our product sales; this concentration may limit our ability to increase our revenue, and our business would be adversely affected in the event we are unable to sell one or more of our products.

We are heavily dependent upon the sales of our CCAP solutions. In the event we are unable to market and sell these products or any future product that represents a substantial amount of our revenue, our business, financial condition, results of operations and prospects could be materially adversely affected.

We have invested heavily in developing wireless solutions, and we face risks in seeking to expand our platform into the wireless market.

We have invested heavily in developing wireless solutions that have yet to generate any significant revenue. We cannot guarantee that these investments, or any of our other investments in research and development, will ever generate material revenue or become profitable for us, and the failure of these investments to generate positive returns may adversely impact our business, financial condition, results of operations and prospects. The wireless market makes up a substantial portion of our total potential addressable market. In addition, expanding our offerings into the wireless market presents other significant risks and uncertainties, including potential distraction of management from other business operations that generate more substantial revenue, the dedication of significant research and development, sales and marketing, and other resources to this new business line at the expense of our other business operations and other risks that we may not have adequately anticipated.

We believe the broadband service provider industry is in the early stages of a major architectural shift toward the virtualization of networks and the use of networks with distributed architectures. If the architectural shift does not occur, if it does not occur at the pace we predict, or if the products and services we have developed are not attractive to our customers after such shift takes place, our revenues could decline.

We believe the broadband service provider industry is in the early stages of transitioning to the virtualization of networks and the use of networks with distributed architectures. We are developing products and services that we believe will be attractive to our customers and potential customers who make that shift. Our strategy depends in part on our belief that the industry shift to a software-centric cloud-based architecture and increasing densification will continue. In our experience, fundamental changes like this often take time to accelerate and the adoption rates of our customers may vary. As our customers determine their future network architectures and how to implement them, we may encounter delayed timing of orders, deferred purchasing decisions and reduced expenditures. These longer decision cycles and reduced expenditures may negatively impact our revenues, or make it difficult for us to accurately predict our revenues, either of which could materially adversely affect our business, financial condition, results of operations and prospects. Moreover, it is possible that our customers may reverse or fail to expand upon current trends toward virtualization and distributed architectures, which could result in significantly reduced demand for the products that we have developed and currently plan to develop.

We face intense competition, including from larger, well-established companies, and we may lack sufficient financial or other resources to maintain or improve our competitive position.

The market for broadband infrastructure solutions is intensely competitive, and we expect competition to increase in the future from established competitors and new market entrants. This competition could result in increased pricing pressure, reduced profit margins, increased sales and marketing expenses and our failure to increase, or the loss of, market share, any of which could materially adversely affect our business, financial condition, results of operations and prospects.

In the broadband service provider market, we primarily compete with larger and more established companies, such as Arris, Cisco, Ericsson and Nokia.

Many of our existing and potential competitors enjoy substantial competitive advantages, such as:

- greater name recognition and longer operating histories;
- larger sales and marketing budgets and resources;
- broader distribution and established relationships with customers;
- greater access to larger customer bases;
- greater customer support resources;
- greater manufacturing resources;
- the ability to leverage their sales efforts across a broader portfolio of products;
- the ability to leverage purchasing power with vendor subcomponents;
- the ability to incorporate additional functionality into their existing products;
- the ability to bundle offerings with other products and services;
- the ability to set more aggressive pricing policies;
- the ability to offer greater amounts of equity and more valuable equity as incentives for purchases of their products and services;
- lower labor and development costs;
- greater resources to fund research and development or otherwise acquire new product offerings;
- larger intellectual property portfolios; and
- substantially greater financial, technical, research and development or other resources.

Our ability to compete will depend upon our ability to provide a better solution than our competitors at a price that offers superior value. We may be required to make substantial additional investments in research, development, sales and marketing in order to respond to competition.

We also expect increased competition if our market continues to expand. Conditions in our market could change rapidly and significantly as a result of technological advancements or other factors. Current or potential competitors may be acquired by third parties that have greater resources available than we do. Our current or potential competitors might take advantage of the greater resources of the larger organizations resulting from these acquisitions to compete more vigorously or broadly with us. In addition, continued industry consolidation might adversely affect customers’ perceptions of the viability of smaller and even medium-sized companies, such as us, and, consequently, customers’ willingness to purchase from us. Further, certain large customers may develop broadband infrastructure solutions for internal use and/or to broaden their portfolios of internally developed resources, which could allow these customers to become new competitors in our market.

If we are unable to sell additional products to our existing customers, our revenue growth will be adversely affected and our revenue could decline.

To increase our revenue, we must sell additional products to our existing customers and add new customers. We expect that a substantial portion of our future sales will be follow-on sales to existing customers. For example, one of our sales strategies is to target sales of capacity expansions and implementation of wireless solutions at our current cable customers because they are familiar with the operational and economic benefits of our solutions. However, our existing customers may choose to use other providers for their infrastructure needs. If we fail to sell additional products to our existing customers, our business, financial condition, results of operations and prospects could be materially adversely affected.

We may have difficulty attracting new large customers or acquiring new customers due to the high costs of switching broadband equipment.

Broadband service providers typically need to make substantial investments when deploying network infrastructure, which can delay a purchasing decision. Once a broadband service provider has deployed infrastructure for a particular portion of its network, it is often difficult and costly to switch to another vendor's infrastructure. Unless we are able to demonstrate that our products offer significant performance, functionality or cost advantages that outweigh a customer's expense of switching from a competitor's product, it will be difficult for us to generate sales once that competitor's equipment has been deployed. Accordingly, if a customer has already deployed a competitor's product for its broadband infrastructure, it may be difficult for us to sell our products to that customer. If we fail to attract new large customers or acquire new customers, our business, financial condition, results of operations and prospects could be materially adversely affected.

We are exposed to the credit risk of some of our customers and to credit exposures in the event of turmoil in the credit markets, which could result in material losses.

Due to our reliance on significant customers, we are dependent on the continued financial strength of these customers. If one or more of our significant customers experience financial difficulties, it could result in uncollectible accounts receivable and our loss of such customers and anticipated revenue.

The majority of our sales are on an open credit basis, with typical payment terms of one year or less. We monitor individual customer payment capability in granting such open credit arrangements, seeking to limit such open credit to amounts we believe our customers can pay and maintain reserves we believe are adequate to cover exposure for doubtful accounts. However, there can be no assurance that our open credit customers will pay the amounts they owe to us or that the reserves we maintain will be adequate to cover such credit exposure. Our customers' failure to pay and/or our failure to maintain sufficient reserves could have a material adverse effect on our consolidated financial statements. In addition, in the event that turmoil in the credit markets makes it more difficult for some customers to obtain financing, those customers' ability to pay could be adversely impacted, which in turn could have a material adverse impact on our business and operations.

A portion of our sales is also derived through our resellers, which tend to have more limited financial resources than other customers and to present increased credit risk. Our resellers also typically have the ability to terminate their agreements with us for any reason upon advance written notice.

We are exposed to fluctuations in currency exchange rates, which could adversely affect our business, financial condition, results of operations and prospects.

Our sales agreements are primarily denominated in U.S. dollars. Therefore, a strengthening U.S. dollar could increase the real cost of our products to our customers outside of the U.S., and alternatively a decrease in the value of the U.S. dollar relative to foreign currencies could increase our product and operating costs in foreign locations. If we are not able to successfully hedge against the risks associated with the currency fluctuations, our business, financial condition, results of operations and prospects could be materially adversely affected.

We generate a significant amount of revenue from sales to customers outside of the United States, and we are therefore subject to a number of risks associated with international sales and operations.

We have extensive international operations and generate a significant amount of revenue from sales to customers in Asia-Pacific, Europe and Latin America. Our ability to grow our business and our future success will depend to a significant extent on our ability to continue to expand our operations and customer base worldwide.

As a result of our international reach, we must hire and train experienced personnel to staff and manage our foreign operations. To the extent that we experience difficulties in recruiting, training, managing and retaining an international staff, and specifically staff related to sales management and sales personnel, we may experience difficulties in sales productivity in foreign markets. We also enter into strategic relationships with resellers and sales agents in certain international markets where we do not have a local presence. If we are not able to maintain these relationships or to recruit additional companies to enter into reseller and sales agent relationships, our future success in these international markets could be limited. Business practices in the international markets that we serve may differ from those in the U.S. and may require us in the future to include terms other than our standard terms in customer contracts. To the extent that we may enter into customer contracts in the future that include non-standard terms related to payment, warranties or performance obligations, our business, financial condition, results of operations and prospects could be materially adversely affected.

Our international sales and operations are subject to a number of risks, including the following:

- greater risk of unexpected changes in regulatory practices, tariffs and tax laws and treaties;
- greater difficulty in enforcing contracts and accounts receivable collection and longer collection periods;
- increased expenses incurred in establishing and maintaining our international operations;
- fluctuations in exchange rates between the U.S. dollar and foreign currencies where we do business;
- greater difficulty and costs in recruiting local experienced personnel;
- wage inflation in certain growing economies;
- general economic and political conditions in these foreign markets;
- economic uncertainty around the world as a result of sovereign debt issues;
- communication and integration problems resulting from cultural and geographic dispersion;
- limitations on our ability to access cash resources in our international operations;
- ability to establish necessary business relationships and to comply with local business requirements;
- risks associated with trade restrictions and foreign legal requirements, including the importation, certification and localization of our products required in foreign countries;
- the uncertainty of protection for intellectual property rights in some countries;
- delays resulting from our need to comply with foreign cybersecurity laws;
- greater risk of a failure of our operations and employees to comply with both U.S. and foreign laws and regulations, including antitrust regulations; the U.S. Foreign Corrupt Practices Act of 1977, as amended, or the FCPA; privacy and data protection laws and regulations and any trade regulations ensuring fair trade practices; and
- heightened risk of unfair or corrupt business practices in certain geographies and of improper or fraudulent sales arrangements that may impact financial results and result in restatements of, or irregularities in, financial statements.

These and other factors could harm our ability to gain future international revenue and, consequently, materially adversely affect our business, financial condition, results of operations and prospects. Expanding our existing international operations and entering into additional international markets will require significant management attention and financial commitments. Our failure to successfully manage our international operations and the associated risks effectively could limit our future growth or materially adversely affect our business, financial condition, results of operations and prospects.

We are subject to anti-corruption laws such as the FCPA.

We are subject to anti-corruption laws such as the FCPA, which generally prohibits U.S. companies and their employees and intermediaries from making corrupt payments to foreign officials for the purpose of obtaining or keeping business, securing an advantage or directing business to another individual or entity, and requires companies to maintain accurate books and records. Under the FCPA, U.S. companies may be held liable for the corrupt actions taken by directors, officers, employees, agents, or other strategic or local partners or representatives. We rely on non-employee third-party representatives and other intermediaries to develop international sales opportunities, and generally have less direct control over such third parties' actions taken on our behalf. If we or our intermediaries fail to comply with the requirements of the FCPA or similar legislation, governmental authorities in the United States and elsewhere could seek to impose civil and/or criminal fines and penalties, which could have a material adverse effect on our business, reputation, results of operations and financial condition. We intend to increase our international sales and business and, as such, the cost of complying with such laws, and the potential harm from our noncompliance, are likely to increase.

Failure to comply with anti-corruption laws, such as the FCPA and the United Kingdom Bribery Act 2010, or the Bribery Act, and similar laws associated with our activities outside the U.S., could subject us to penalties and other adverse consequences. Any violation of the FCPA, Bribery Act or similar laws could result in whistleblower complaints, adverse media coverage, investigations, loss of export privileges, severe criminal or civil sanctions suspension or debarment from U.S. government contracts, all of which could have a material adverse effect on our reputation, business, results of operations and prospects. In addition, responding to any enforcement action or related investigation may result in a materially significant diversion of management's attention and resources and significant defense costs and other professional fees.

We are subject to governmental export and import controls and similar restrictions that could impair our ability to compete in international markets or subject us to liability if we violate them.

Our products may be subject to various export controls and because we incorporate encryption technology into certain of our products, certain of our products may be exported from various countries only with the required export license or through an export license exception. Furthermore, certain export control and economic sanctions laws prohibit the shipment of certain products, technology, software and services to embargoed countries and sanctioned governments, entities, and persons. If we fail to comply with the applicable export control laws, customs regulations, economic sanctions or other applicable laws, we could be subject to monetary damages or the imposition of restrictions which could materially adversely affect our business, financial condition, results of operations and prospects and could also harm our reputation. Further, there could be criminal penalties for knowing or willful violations, including incarceration for culpable employees and managers. Obtaining the necessary export license or other authorization for a particular sale may be time-consuming and may result in the delay or loss of sales opportunities. We previously disclosed that we may have inadvertently violated certain technical provisions of the U.S. export control laws and regulations by failing to inform customers of their export control obligations and failing to make certain submissions to the Commerce Department’s Bureau of Industry and Security, or BIS, in a timely and complete manner. However, we believe that the exports of our products were all to destinations and end users that would not have required licensing under the U.S. export control and sanctions laws. We voluntarily disclosed the potential technical violations to BIS, and, on March 27, 2018, we were notified by BIS that it would not be imposing a penalty regarding this matter.

In addition, various countries regulate the import of certain encryption technology and products, including through import permit and license requirements, and have enacted laws that could limit our ability to distribute our products or could limit our customers’ ability to implement our products in those countries. Any change in export or import regulations, economic sanctions or related legislation, shift in the enforcement or scope of existing regulations or change in the countries, governments, persons or technologies targeted by such regulations could result in decreased use of our products by, or in our decreased ability to export or sell our products to, existing or potential customers with international operations or create delays in the introduction of our products into international markets. Any decreased use of our products or limitation on our ability to export or sell our products could materially adversely affect our business, financial condition, results of operations and prospects.

Our revenue growth rate in recent periods may not be indicative of our future performance.

Our revenue growth rate has varied over time, and our revenue performance in recent periods may not be indicative of our future performance. Our revenue grew 16.0% from the year ended December 31, 2015 to the year ended December 31, 2016 and grew 11.2% from the year ended December 31, 2016 to the year ended December 31, 2017. Our revenue then decreased 15.5% from the year ended December 31, 2017 to the year ended December 31, 2018 and we may not achieve revenue growth in future periods. You should not rely on our revenue for any prior quarterly or annual period as any indication of our future revenue or revenue growth. If we are unable to maintain consistent revenue or revenue growth, our business, financial condition, results of operations and prospects could be materially adversely affected.

As the majority of the growth in our revenue and income from operations has occurred since 2013, it is difficult to evaluate our future prospects.

We were founded in 2003 and booked our first revenue in 2006. The majority of the growth in our revenue and income from operations has occurred since 2013, and it is difficult to evaluate our future prospects, including our ability to plan for and manage future growth. We have encountered and will continue to encounter risks and difficulties frequently experienced by rapidly growing companies in constantly evolving industries, including the risks described in this Annual Report on Form 10-K. If we do not address these risks successfully, our business, financial condition, results of operations and prospects could be materially adversely affected, and the market price of our common stock could decline.

Our products are necessary for the operation of our customers’ broadband service operations. Product quality problems, warranty claims, services disruptions, or other defects, errors or vulnerabilities in our products or services could harm our reputation and materially adversely affect our business, financial condition, results of operations and prospects.

We assist our customers in the operation of their broadband service operations. Failures of our products could result in significant interruptions in our customers’ capabilities to maintain their networks and operations. Further, unsatisfactory performance could cause us to lose revenue or market share, increase our service costs, cause us to incur substantial costs in analyzing, correcting or redesigning our products, cause us to lose significant customers, subject us to liability for damages and divert our resources from other tasks, any one of which could materially adversely affect our business, financial condition, results of operations and prospects.

In addition, sophisticated hardware and operating system software and applications that we produce or procure from third parties may contain defects in design or manufacture, including “bugs” and other problems that could unexpectedly interfere with the operation of our networks, system, or products. Such defects could result in warranty claims or claims by customers for losses that they sustain or, in some cases, could allow customers to claim damages. In the past, we have had to replace certain components of products that we had shipped or provide remediation in response to the discovery of defects or bugs from failures in software protocols.

Limitation of liability provisions in our standard terms and conditions of sale, and those of our resellers and sales agents, may not be enforceable under some circumstances or may not fully or effectively protect us from end-customer claims and related liabilities and costs. In some cases, including with respect to indemnification obligations under many of our agreements with customers and resellers, our contractual liability may be uncapped. The sale and support of our products also entail the risk of product liability claims. We maintain insurance to protect against certain types of claims associated with the use of our products, but our insurance coverage may not adequately cover any such claims. In addition, even claims that ultimately are unsuccessful could result in expenditures of funds in connection with litigation and divert management’s time and other resources.

Our products must interoperate with operating systems, software applications and hardware, and comply with industry standards, that are developed by others, and if we are unable to devote the necessary resources for our products to interoperate with such software and hardware and comply with such standards, we may lose or fail to increase market share and experience a weakening demand for our products.

Generally, our products comprise only a part of and must interoperate with our customers’ existing infrastructure, specifically their networks, servers, software and operating systems, which may be manufactured by a wide variety of vendors and original equipment manufacturers. Our products must also comply with industry standards, such as Data Over Cable Service Interface Specification, or DOCSIS, 3.0 and 3.1, which are established by third parties, in order to interoperate with such servers, storage, software and other networking equipment such that all systems function efficiently together. We may depend on other vendors to support prevailing industry standards. Also, some industry standards may not be widely adopted or implemented uniformly, and competing standards and other approaches may emerge that may be preferred by our customers.

In addition, when new or updated versions of these industry standards, software systems or applications are introduced, we must sometimes develop updated versions of our software so that our products will interoperate properly. We may not accomplish these development efforts quickly, cost-effectively or at all. These development efforts require capital investment and the devotion of engineering resources. If we fail to maintain compatibility with these systems and applications, our customers may not be able to adequately utilize our products, and we may lose or fail to increase market share and experience a weakening in demand for our products, among other consequences, which could materially adversely affect our business, financial condition, results of operations and prospects.

Our ability to sell our products is highly dependent on the quality of our support and services offerings, and our failure to offer high-quality support and services could have a material adverse effect on our business, financial condition, results of operations and prospects.

Once our products are deployed within our customers’ networks, our customers depend on our support organization to resolve any issues relating to our products. Our provision of high-quality support is critical for the successful marketing and sale of our products. If we do not assist our customers in deploying our products effectively, do not succeed in helping our customers resolve post-deployment issues quickly or do not provide adequate ongoing support, it could adversely affect our ability to sell our products to existing customers and could harm our reputation with potential customers. In addition, our standard sales contracts require us to provide minimum service requirements to our customers on an ongoing basis and our failure to satisfy these requirements could expose us to claims under these contracts. Our failure to maintain high-quality support and services, including compliance with our contractual minimum service obligations, could have a material adverse effect on our business, financial condition, results of operations and prospects.

We base our inventory requirements on our forecasts of future sales. If these forecasts are materially inaccurate, we may procure inventory that we may be unable to use in a timely manner or at all.

We and our contract manufacturers procure components and build our products based on our forecasts. These forecasts are based on estimates of future demand for our products, which are in turn based on historical trends and analyses from our sales and marketing organizations, adjusted for overall market conditions. To the extent our forecasts are materially inaccurate or if we otherwise do not need such inventory, we may under- or over-procure inventory, and such inaccuracies in our forecasts could subject us to contractual damages and otherwise materially adversely affect our business, financial condition, results of operations and prospects.

Because we depend on third-party manufacturers to build our hardware, we are susceptible to manufacturing delays and pricing fluctuations that could prevent us from delivering customer orders on time, if at all, or on a cost-effective basis, which may result in the loss of sales and customers.

We depend on third-party contract manufacturers to manufacture our product hardware. A significant portion of our cost of revenue consists of payments to these third-party contract manufacturers. Our reliance on these third-party contract manufacturers reduces our control over the manufacturing process, quality assurance, product costs and product supply and timing, which exposes us to risk. To the extent that our products are manufactured at facilities in foreign countries, we may be subject to additional risks associated with complying with local rules and regulations in those jurisdictions. If we are unable to manage our relationships with our third-party contract manufacturers effectively, or if these third-party manufacturers suffer delays or disruptions for any reason, experience increased manufacturing lead times, capacity constraints or quality control problems in their manufacturing operations or fail to meet our future requirements for timely delivery, our ability to ship products to our customers would be severely impaired, and our business, financial condition, results of operations and prospects could be materially adversely affected.

Our contract manufacturers typically fulfill our supply requirements on the basis of individual orders. We do not have long-term contracts with our third-party manufacturers that guarantee capacity, the continuation of particular pricing terms or the extension of credit limits. Accordingly, they are not obligated to continue to fulfill our supply requirements, which could result in supply shortages, and increases in the prices for manufacturing services on short notice. We may not be able to develop alternate contract manufacturers in a timely manner, or at all. If we add or change contract manufacturers, or change any manufacturing plant locations within a contract manufacturer network, we would add additional complexity and risk to our supply chain management.

In addition, we may be subject to significant challenges in ensuring that quality, processes and costs, among other issues, are consistent with our expectations and those of our customers. A new contract manufacturer or manufacturing location may not be able to scale its production of our products at the volumes or quality we require. This could also adversely affect our ability to meet our scheduled product deliveries to our customers, which could damage our customer relationships and cause the loss of sales to existing or potential customers, late delivery penalties, delayed revenue or an increase in our costs which could adversely affect our gross margins. This could also result in increased levels of inventory subjecting us to increased excess and obsolete charges that could have a negative impact on our results of operations.

Because some of the key components in our products come from limited sources of supply, we are susceptible to supply shortages or supply changes, which could disrupt or delay our scheduled product deliveries to our customers and may result in the loss of sales and customers.

Our products rely on key components that our contract manufacturers purchase on our behalf from a limited number of suppliers, including Altera, Analog Devices, Bell Power, Broadcom, Maxim, Mini-Circuits, Qorvo, TTM Technologies and Xilinx. We do not have guaranteed supply contracts with any of our component suppliers, and our suppliers could delay shipments or cease manufacturing such products or selling them to us at any time. The development of alternate sources for those components is time-consuming, difficult and costly. If we are unable to obtain a sufficient quantity of these components on commercially reasonable terms or in a timely manner, sales of our products could be delayed or halted entirely or we may be required to redesign our products. Any of these events could result in lost sales and damage to our customer relationships, which would adversely impact our business, financial condition, results of operations and prospects. In the event of a shortage or supply interruption from our component suppliers, we may not be able to develop alternate or second sources in a timely manner, on commercially reasonable terms or at all. In addition, certain of our customer contracts require us to notify our customers of any discontinuation of the products that we supply to them and to provide support for discontinued products, and lack of supply from our suppliers could leave us unable to fulfill our customer support obligations. Adverse changes to our relationships with our sole suppliers could result in lost sales and damage to our customer relationships, which would adversely impact our business, financial condition, results of operations and prospects.

We rely on resellers and sales agents to sell our products into certain international markets, and the loss of such resellers and sales agents could delay or harm our ability to deliver our products to our customers.

We rely upon resellers and sales agents to coordinate sales and distribution of our products in certain international markets. We provide our resellers and sales agents with specific training and programs to assist them in selling our products, but these steps may not be effective. In addition, our resellers and sales agents may be unsuccessful in marketing, selling and supporting our products and services. If we are unable to develop and maintain effective sales incentive programs for our resellers and sales agents, we may not be able to incentivize these resellers and sales agents to sell our products to customers. Any of our resellers and sales agents could elect to consolidate or enter into a strategic partnership with one of our competitors, which could reduce or eliminate our future opportunities with that reseller or sales agent. Our agreements with our resellers and sales agents may generally be terminated for any reason by either party with advance notice. We may be unable to retain these resellers and sales agents or secure additional or replacement resellers and sales agents. The replacement of one or more of our significant resellers or sales agents requires extensive training, and any new or expanded relationship with a reseller or sales agent may take several months or more to achieve productivity. Any of these events could materially adversely affect our business, financial condition, results of operations and prospects.

Our business and operations have experienced rapid growth in recent years, and if we do not appropriately manage any future growth or are unable to improve our systems and processes, our business, financial condition, results of operations and prospects will be adversely affected.

We have experienced rapid growth and increased demand for our products in recent years, which have placed a strain on our management, administrative, operational and financial infrastructure. To handle this growth and increase in demand, we have significantly expanded our headcount, from 604 as of December 31, 2016 to 680 as of December 31, 2017 and to 743 as of December 31, 2018, and we expect to continue to increase our headcount. As we have grown, we have had to manage an increasingly larger and more complex array of internal systems and processes to scale with all aspects of our business, including our software development, contract manufacturing and purchasing, logistics and fulfillment and sales, maintenance and support. Our success will depend in part upon our ability to manage our growth effectively. To do so, we must continue to increase the productivity of our existing employees and continue to hire, train and manage new employees as needed. To manage domestic and international growth of our operations and personnel, we will need to continue to improve our operational, financial and management controls and our reporting processes and procedures and implement more extensive and integrated financial and business information systems. We may not be able to successfully implement these or other improvements to our systems and processes in an efficient or timely manner, and we may discover deficiencies in their capabilities or effectiveness. Our failure to improve our systems and processes, or their failure to operate effectively and in the intended manner, may result in disruption of our current operations and customer relationships, our inability to manage the growth of our business and our inability to accurately forecast our revenue, expenses and earnings.

If we are unable to hire, retain, train and motivate qualified personnel and senior management, including in particular our founders, our business, financial condition, results of operations and prospects could be adversely affected.

Our future success depends, in part, on our ability to continue to attract and retain highly skilled personnel, particularly software engineering and sales personnel. Competition for highly skilled personnel is often intense, particularly in the greater Boston region where we are headquartered, and we may not be able to attract and retain the highly skilled employees that we need to support our business. Many of the companies with which we compete for experienced personnel have greater resources than we have to provide more attractive compensation packages and other amenities. Research and development personnel are aggressively recruited by startup and growth companies, which are especially active in many of the technical areas and geographic regions in which we conduct product development. In addition, in making employment decisions, particularly in the high-technology industry, job candidates often consider the value of the stock-based compensation they are to receive in connection with their employment. Declines in the market price of our stock could adversely affect our ability to attract, motivate or retain key employees. If we are unable to attract or retain qualified personnel, or if there are delays in hiring required personnel, our business, financial condition, results of operations and prospects could be materially adversely affected.

Also, to the extent we hire personnel from competitors, or from certain customers or other third parties whose employees we have agreed not to solicit, we may be subject to allegations that such personnel have been improperly solicited, that such personnel have divulged proprietary or other confidential information or that former employers own certain inventions or other work product. Such claims could result in litigation.

Our future performance also depends on the continued services and continuing contributions of our founders and senior management to execute our business plan and to identify and pursue new opportunities and product innovations. Our employment arrangements with our employees do not require that they continue to work for us for any specified period, and therefore, they could terminate their employment with us at any time. In particular, the loss of Jerry Guo, our President and Chief Executive Officer, and Weidong Chen, our Chief Technology Officer, could have a material adverse impact on our business. Further, the loss of other members of our senior management team, sales and marketing team or engineering team, or any difficulty attracting or retaining other highly qualified personnel in the future, could significantly delay or prevent the achievement of our development and strategic objectives, which could materially adversely affect our business, financial condition, results of operations and prospects. Except with respect to Mr. Guo, we do not maintain "key person" life insurance on our officers, directors or key employees.

If we do not effectively expand and train our direct sales force, we may be unable to increase sales to our existing customers or add new customers, and our business will be adversely affected.

We depend on our direct sales force to increase sales with existing customers and to obtain new customers. As such, we have invested and will continue to invest substantially in our sales organization. In recent periods, we have been adding personnel to our sales function as we focus on growing our business, entering new markets and increasing our market share, and we expect to incur significant additional expenses in expanding our sales personnel in order to achieve revenue growth. There is significant competition for sales personnel with the skills and technical knowledge that we require. Our ability to achieve significant revenue growth will depend, in large part, on our success in recruiting, training, retaining and integrating sufficient numbers of sales personnel to support our growth, particularly in international markets. In addition, we have significantly increased the number of personnel in our sales and marketing departments in recent periods, with headcount growing from 114 as of December 31, 2016, to 122 as of December 31, 2017 and to 142 as of December 31, 2018. New hires require significant training and may take significant time before they achieve full productivity. Our recent hires and planned hires may not become productive as quickly as we expect, and we may be unable to hire, retain or integrate into our corporate culture sufficient numbers of qualified individuals in the markets where we do business or plan to do business. If we are unable to hire, integrate and train a sufficient number of effective sales personnel, or the sales personnel we hire are not successful in obtaining new customers or increasing sales to our existing customer base, our business, financial condition, results of operations and prospects could be materially adversely affected.

Adverse economic conditions or reduced broadband infrastructure spending may adversely affect our business, financial condition, results of operations and prospects.

Our business depends on the overall demand for broadband connectivity. Weak domestic or global economic conditions, fear or anticipation of such conditions or a reduction in broadband infrastructure spending even if economic conditions improve, could materially adversely affect our business, financial condition, results of operations and prospects in a number of ways, including longer sales cycles, lower prices for our products and services, reduced sales and lower or no growth. Continued turmoil in the geopolitical environment in many parts of the world may also affect the overall demand for our products and services. Deterioration in global economic or political conditions could materially adversely affect our business, financial condition, results of operations and prospects in the future. A prolonged period of economic uncertainty or a downturn may also significantly affect the availability of capital and the terms and conditions of financing arrangements, including the overall cost of financing as well as the financial health or creditworthiness of our customers. Circumstances may arise in which we need, or desire, to raise additional capital, and such capital may not be available on commercially reasonable terms, or at all.

Breaches of our cybersecurity systems and measures could degrade our ability to conduct our business operations and deliver products and services to our customers, delay our ability to recognize revenue, compromise the integrity of our products, result in significant data losses and the theft of our intellectual property, damage our reputation, expose us to liability to third parties and require us to incur significant additional costs to maintain the security of our networks and data.

We increasingly depend upon our IT systems to conduct virtually all of our business operations, ranging from our internal operations and product development activities to our marketing and sales efforts and communications with our customers and business partners. Certain persons and entities may attempt to penetrate our network and systems, or of the systems hosting our website, and may otherwise seek to misappropriate our proprietary or confidential information or cause interruptions of our service. Because the techniques used by such persons and entities to access or sabotage networks and systems change frequently and may not be recognized until launched against a target, we may be unable to anticipate these techniques. We have also outsourced a number of our business functions to third parties, including our manufacturers and logistics providers, and our business operations also depend, in part, on the success of these third parties' own cybersecurity measures. Additionally, we depend upon our employees and independent contractors to appropriately handle confidential data and deploy our IT resources in a safe and secure fashion that does not expose our network systems to security breaches and the loss of data. Accordingly, if any of our cybersecurity systems, processes or policies, or those of any of our manufacturers, logistics providers, customers or independent contractors, fail to protect against unauthorized access, sophisticated hacking or terrorism and the mishandling, misuse, or misappropriation of data by employees, contractors or other persons or entities, our ability to conduct our business effectively could be damaged in a number of ways, including:

- sensitive data regarding our business, including intellectual property, personal information and other confidential and proprietary data, could be stolen;
- our electronic communications systems, including email and other methods, could be disrupted, and our ability to conduct our business operations could be seriously damaged until such systems can be restored;
- our ability to process customer orders and electronically deliver products and services could be degraded, and our distribution channels could be disrupted, resulting in delays in revenue recognition, damage to our relationships with customers and prospective customers and damage to our reputation;
- defects and security vulnerabilities could be introduced into our software, products, network and systems, thereby damaging our reputation and perceived reliability and security of our products and potentially making the systems of our customers vulnerable to data loss and cyber incidents; and
- personally identifiable data relating to various parties, including end users, employees and business partners could be compromised.

Should any of the above events occur, we could be subject to significant claims for liability from our customers, employees or others and regulatory investigations or actions from governmental agencies. In addition, our ability to protect our intellectual property rights could be compromised and our reputation and competitive position could be significantly harmed. Any regulatory, contractual or other actions, litigations, investigations, fines, penalties and liabilities relating to any actual or alleged misuse or misappropriation of personal data or other confidential or proprietary information could be significant in terms of monetary exposure and reputational impact and necessitate changes to our business operations that may be disruptive to us. Additionally, we could incur significant costs in order to upgrade our cybersecurity systems, processes, policies and procedures and remediate damages. Consequently, our financial performance and results of operations could be materially adversely affected.

If we are unable to obtain, maintain or protect our intellectual property rights, our competitive position could be harmed or we could be required to incur significant expenses to enforce our rights.

Our success depends, in part, on our ability to protect our proprietary technology. We rely on trade secret, patent, copyright and trademark laws and confidentiality agreements with employees and third parties to protect and enforce our rights to our proprietary technology, all of which offer only limited protection.

In order to protect our proprietary information, we rely in significant part on confidentiality arrangements with our employees, licensees, independent contractors, advisers and customers. These arrangements may not be effective to prevent disclosure of confidential information, including trade secrets, and may not provide an adequate remedy in the event of unauthorized disclosure of confidential information. In addition, if others independently discover our trade secrets, we would not be able to assert trade secret rights against such parties. Effective trade secret protection may not be available in every country in which our services are available or where we have employees or independent contractors. The loss or unavailability of trade secret protection could make it easier for third parties to compete with our products by copying functionality. In addition, any changes in, or unexpected interpretations of, the trade secret and employment laws in any jurisdiction in which we operate may compromise our ability to enforce our intellectual property rights. Costly and time-consuming litigation could be necessary to enforce and determine the scope of our proprietary rights, and failure to obtain or maintain trade secret protection could adversely affect our competitive business position.

We also rely on patents to protect certain aspects of our proprietary technology in the United States. The process of obtaining patent protection is expensive and time-consuming, and we may not be able to prosecute all necessary or desirable patent applications at a reasonable cost or in a timely manner. We may choose not to seek patent protection for certain innovations and may choose not to pursue patent protection in certain jurisdictions. Further, we cannot guarantee that any of our pending patent applications will result in the issuance of patents or that any patents that do issue from such applications will have adequate scope to provide us with a competitive advantage. There is no assurance that all potentially relevant prior art relating to our patents and patent applications has been found. To the extent that additional patents are issued from our patent applications, which is not certain, third parties may challenge their validity, enforceability or scope, which may result in such patents being narrowed or invalidated. If third parties have prepared and filed patent applications in the United States that also claim technology to which we have rights, we may have to participate in interference proceedings in the United States Patent and Trademark Office to determine priority of invention for patent applications filed before March 16, 2013, or in derivation proceedings to determine inventorship for patent applications filed after such date. In addition, patents have a limited lifespan. In the United States, the natural expiration of a patent is generally 20 years after its effective filing date. Even if patents covering our products are obtained by us or by our licensors, once such patents expire, we may be vulnerable to competition from similar products. Moreover, the rights granted under any issued patents may not provide us with adequate protection or competitive advantages, and, as with any technology, competitors may be able to develop similar or superior technologies to our own now or in the future.

Despite our efforts, the steps we have taken to protect our proprietary rights may not be adequate to preclude misappropriation of our proprietary information or infringement of our intellectual property rights, and our ability to police such misappropriation or infringement is uncertain, particularly in countries outside of the United States. Competitors may use our technologies in jurisdictions where we have not obtained or are unable to adequately enforce intellectual property protection to develop their own products. We are also restricted from asserting our intellectual property rights against certain customers under our contracts with them.

Detecting and protecting against the unauthorized use of our products, technology and proprietary rights is expensive, difficult and, in some cases, impossible. Litigation may be necessary in the future to enforce or defend our intellectual property rights, to protect our trade secrets or to determine the validity and scope of the proprietary rights of others. Such litigation could result in substantial costs and diversion of management resources, either of which could materially adversely affect our business, financial condition, results of operations and prospects, and there is no guarantee that we would be successful. Furthermore, many of our current and potential competitors have the ability to dedicate substantially greater resources to protecting their technology or intellectual property rights than we do. Accordingly, despite our efforts, we may not be able to prevent third parties from infringing upon or misappropriating our intellectual property, which could result in a substantial loss of our market share. Even if we did succeed in enforcing our intellectual property through litigation, this may be costly and divert management resources.

Finally, certain of our license agreements with our third-party licensors provide for joint ownership of developments or inventions that we create that are related to the subject matter of the license. Other agreements to which we are subject, including member agreements with standards bodies and research and development consortia, may require us to disclose and/or grant licenses to technology that is related to the subject matter of the standards body or the consortium and included in our contributions to specifications established by these bodies. These agreements could result in third parties having ownership or license rights to important intellectual property that we otherwise may have elected to maintain exclusive ownership of.

If our trademarks and trade names are not adequately protected, then we may not be able to build name recognition in our markets of interest and our business may be adversely affected.

We have not applied for trademark registration for our name and logo in all geographic markets. In those markets where we have applied for trademark registration, failure to secure those registrations could adversely affect our ability to enforce and defend our trademark rights and result in indemnification claims. Our registered or unregistered trademarks or trade names, as well as the registered or unregistered trademarks or trade names used by our resellers or distributors associated with our products, may be challenged, infringed, circumvented or declared generic or determined to be infringing on other marks. Any claim of infringement by a third party, even those claims without merit, could cause us to incur substantial costs defending against such claim, could divert management attention from our business and could require us to cease use of such intellectual property in certain geographic markets. Over the long term, if we, or our resellers or distributors, are unable to establish name recognition based on our trademarks and trade names, then our business may be adversely affected.

Assertions by third parties of infringement or other violations by us of their intellectual property rights, or other lawsuits asserted against us, could result in significant costs and materially adversely affect our business, financial condition, results of operations and prospects.

Patent and other intellectual property disputes are common in the broadband infrastructure industry and have resulted in protracted and expensive litigation for many companies. Many companies in the broadband infrastructure industry, including our competitors and other third parties, as well as non-practicing entities, own large numbers of patents, copyrights, trademarks and trade secrets, which they may use to assert claims of patent infringement, misappropriation or other violations of intellectual property rights against us. From time to time, they have or may in the future also assert such claims against our customers whom we typically indemnify against claims that our products infringe, misappropriate or otherwise violate the intellectual property rights of third parties.

As the number of products and competitors in our market increases and overlaps occur, claims of infringement, misappropriation and other violations of intellectual property rights may increase. Any claim of infringement, misappropriation or other violations of intellectual property rights by a third party, even those without merit, could cause us to incur substantial costs defending against the claim, distract our management from our business and require us to cease use of such intellectual property, which may impact important elements of our business. In addition, some claims for patent infringement may relate to subcomponents that we purchase from third parties. If these third parties are unable or unwilling to indemnify us for these claims, we could be substantially harmed.

The patent portfolios of most of our competitors are larger than ours. This disparity may increase the risk that our competitors may sue us for patent infringement and may limit our ability to counterclaim for patent infringement or settle through patent cross-licenses. In addition, future assertions of patent rights by third parties, and any resulting litigation, may involve patent holding companies or other adverse patent owners who have no relevant product revenue and against whom our own patents may therefore provide little or no deterrence or protection. We cannot guarantee that we are not infringing or otherwise violating any third-party intellectual property rights.

The third-party asserters of intellectual property claims may be unreasonable in their demands, or may simply refuse to settle, which could lead to expensive settlement payments, prolonged periods of litigation and related expenses, additional burdens on employees or other resources, distraction from our business, supply stoppages and lost sales. Moreover, in recent years, individuals and groups that are non-practicing entities, commonly referred to as “patent trolls,” have purchased patents and other intellectual property assets for the purpose of making claims of infringement in order to extract settlements. In the past, we have received threatening letters or notices and have been the subject of claims that our solutions and underlying technology infringe or violate the intellectual property rights of others. Responding to such claims, regardless of their merit, can be time-consuming, costly to defend in litigation, divert management’s attention and resources, damage our reputation and brand, and cause us to incur significant expenses.

An adverse outcome of a dispute may require us to pay substantial damages including treble damages if we are found to have willfully infringed a third party’s patents; cease making, licensing or using solutions that are alleged to infringe or misappropriate the intellectual property of others; expend additional development resources to attempt to redesign our products or services or otherwise to develop non-infringing technology, which may not be successful; enter into potentially unfavorable royalty or license agreements in order to obtain the right to use necessary technologies or intellectual property rights; and indemnify our partners and other third parties. Any damages or royalty obligations we may become subject to as a result of an adverse outcome, and any third-party indemnity we may need to provide, could materially adversely affect our business, financial condition, results of operations and prospects. Royalty or licensing agreements, if required or desirable, may be unavailable on terms acceptable to us, or at all, and may require significant royalty payments and other expenditures. Further, there is little or no information publicly available concerning market or fair values for license fees, which can lead to overpayment of license or settlement fees. In addition, some licenses may be non-exclusive, and therefore our competitors may have access to the same technology licensed to us. Suppliers subject to third-party intellectual property claims also may choose or be forced to discontinue or alter their arrangements with us, with little or no advance notice to us. Any of these events could materially adversely affect our business, financial condition, results of operations and prospects.

Unavailability, termination or breach of licenses to third-party software and other intellectual property could materially harm our business.

Many of our products and services include software or other intellectual property licensed from third parties, and we otherwise use software and other intellectual property licensed from third parties in our business. We exercise no control over our third-party licensors, and the failure or unsuitability of their software or other intellectual property exposes us to risks that we will have little ability to control. For example, a licensor may have difficulties keeping up with technological changes or may stop supporting the software or other intellectual property that it licenses to us; our licensors may also have the ability to terminate our licenses if the licensed technology becomes the subject of a claim of intellectual property infringement. Also, it will be necessary in the future to renew licenses, expand the scope of existing licenses or seek new licenses, relating to various aspects of these products and services or otherwise relating to our business, which may result in increased license fees. Any new licenses may not be available on acceptable terms, if at all. In addition, a third party may assert that we or our customers are in breach of the terms of a license, which could, among other things, give such third party the right to terminate a license or seek damages from us, or both. The inability to obtain or maintain certain licenses or other rights or to obtain or maintain such licenses or rights on favorable terms, or the need to engage in litigation regarding these matters, could result in delays in releases of products and services and could otherwise disrupt our business, until equivalent technology can be identified, licensed or developed, if at all, and integrated into our products and services or otherwise in the conduct of our business. Moreover, the inclusion in our products and services of software or other intellectual property licensed from third parties on a nonexclusive basis may limit our ability to differentiate our products from those of our competitors. Any of these events could have a material adverse effect on our business, financial condition, results of operations and prospects.

Our products contain third-party open source software components, and failure to comply with the terms of the underlying open source software licenses could restrict our ability to sell our products.

Our products contain software modules licensed to us by third-party authors under "open source" licenses. Use and distribution of open source software may entail greater risks than use of third-party commercial software, as open source licensors generally do not provide warranties or other contractual protections regarding infringement claims or the quality of the code. Some open source licenses contain requirements that we make available source code for modifications or derivative works we create based upon the type of open source software that we use. If we combine our software with open source software in a certain manner, we could, under certain open source licenses, be required to release portions of the source code of our software to the public. This would allow our competitors to create similar products with lower development effort and time and ultimately could result in a loss of product sales for us.

Although we monitor our use of open source software to avoid subjecting our products to undesirable conditions, we do not have a formal open source policy in place that gives our developers written guidance on what open source licenses we deem "safe." Further, even where we believe an open source license may have acceptable conditions, the terms of many open source licenses have not been interpreted by U.S. courts, and these licenses could be construed in a way that could impose unanticipated conditions or restrictions on our ability to commercialize our products. Moreover, we cannot assure you that our informal processes for controlling our use of open source software in our products will be effective or that our compliance with open source licenses, including notice and attribution requirements, are adequate. If we are held to have breached the terms of an open source software license, we could be required to seek licenses from third parties to continue offering our products on terms that are not economically feasible, to re-engineer our products, to discontinue the sale of our products if re-engineering could not be accomplished on a timely or commercially reasonable basis or to make generally available, in source code form, our proprietary code. We also could face infringement claims. Any of the foregoing could materially adversely affect our business, financial condition, results of operations and prospects.

Our failure to adequately protect personal data and to comply with related laws and regulations could result in material liability.

A wide variety of provincial, state, national, foreign, and international laws and regulations apply to the collection, use, retention, protection, disclosure, transfer (including across national boundaries), and other processing of personal data. These data protection and privacy-related laws and regulations are evolving and being tested in courts and may result in ever-increasing regulatory and public scrutiny and escalating levels of enforcement and sanctions.

Any failure by us to comply with applicable laws and regulations, or to protect such data, could result in enforcement action against us, including fines, imprisonment of company officials, public censure, claims for damages by end customers and other affected persons and entities, damage to our reputation and loss of goodwill, and other forms of injunctive or operations-limiting relief, any of which could have a material adverse effect on our operations, financial performance, and business.

Definitions of personal data and personal information, and requirements relating to the same under applicable laws and regulations within the European Union, the United States, and elsewhere, change frequently and are subject to new and different interpretations by courts and regulators. Because the interpretation and application of laws and other obligations relating to privacy and data protection are uncertain, it is possible that existing or future laws, regulations, and other obligations may be interpreted and applied in a manner that is inconsistent with our data management practices. We may be required to expend significant resources to modify our products and otherwise adapt to these changes, which we may be unable to do on commercially reasonable terms or at all, and our ability to develop new products and features could be limited. These developments could harm our business, financial condition and results of operations. Even if not subject to legal challenge, the perception of privacy concerns, whether or not valid, may harm our reputation and inhibit adoption of our products by current and prospective customers.

Failure to comply with governmental laws and regulations could materially adversely affect our business, financial condition, results of operations and prospects.

Our business is subject to regulation by various federal, state, local and foreign governmental agencies, including agencies responsible for monitoring and enforcing employment and labor laws, workplace safety, product safety, environmental laws, consumer protection laws, anti-bribery laws, import/export controls, foreign investment, federal securities laws and tax laws and regulations. In certain jurisdictions, these regulatory requirements may be more stringent than those in the United States. From time to time, we may receive inquiries from such governmental agencies or we may make voluntary disclosures regarding our compliance with applicable governmental regulations or requirements. Noncompliance with applicable government regulations or requirements could subject us to sanctions, mandatory product recalls, enforcement actions, disgorgement of profits, fines, damages, civil and criminal penalties or injunctions. If any governmental sanctions are imposed, or if we do not prevail in any possible civil or criminal litigation, our business, financial condition, results of operations and prospects could be materially adversely affected. In addition, responding to any action will likely result in a significant diversion of management’s attention and resources and an increase in professional fees. Enforcement actions and sanctions could materially adversely affect our business, financial condition, results of operations and prospects.

We may invest in or acquire other businesses, which could require significant management attention, disrupt our business, dilute stockholder value and adversely affect our business, financial condition, results of operations and prospects.

As part of our growth strategy, we may make investments in or acquire complementary companies, products or technologies. For example, on February 21, 2019, we announced that we had agreed to acquire NetComm Wireless Limited for cash consideration of approximately AUD $161.0 million (USD $115.3 million, based on an exchange rate of USD $0.716 per AUD $1.00 on February 21, 2019) to diversify our revenues both geographically and by product channel. We do not have significant experience in making investments in other companies nor have we made a significant number of acquisitions to date, and as a result, our ability as an organization to evaluate and/or complete investments or acquire and integrate other companies, products or technologies in a successful manner is unproven. We may not be able to find suitable future investment or acquisition candidates, and we may not be able to complete such investments or acquisitions on favorable terms, if at all. Our pending acquisition of NetComm Wireless Limited, once completed, may not achieve its objectives or strengthen our competitive position. If we complete additional investments or acquisitions, we may not ultimately strengthen our competitive position or achieve our goals, and any investments or acquisitions we complete could be viewed negatively by our customers, investors and securities analysts.

In addition, current and future investments and acquisitions may result in unforeseen operating difficulties and expenditures. For example, if we are unsuccessful at integrating any acquisitions or retaining key talent from those acquisitions, or the technologies associated with such acquisitions, into our company, the business, financial condition, results of operations and prospects of the combined company could be materially adversely affected. Any integration process may require significant time and resources, and we may not be able to manage the process successfully. We may not successfully evaluate or utilize the acquired technology or personnel or accurately forecast the financial effects of an acquisition transaction, including accounting charges. We may have to pay cash, incur debt or issue equity securities to pay for any such investment or acquisition, each of which could adversely affect our financial condition or the market price of our common stock. The sale of equity or issuance of debt to finance any such acquisitions could result in dilution to our stockholders. The incurrence of indebtedness would result in increased fixed obligations and could also include covenants or other restrictions that would impede our ability to manage our operations. Moreover, if the investment or acquisition becomes impaired, we may be required to take an impairment charge, which could adversely affect our financial condition or the market price of our common stock.

Our international operations may give rise to potentially adverse tax consequences.

We are expanding our international operations and staff to better support our growth into the international markets. We generally conduct our international operations through wholly owned subsidiaries and report our taxable income in various jurisdictions worldwide based upon our business operations in those jurisdictions. Our corporate structure and associated transfer pricing policies contemplate the business flows and future growth into the international markets, and consider the functions, risks and assets of the various entities involved in the intercompany transactions. The amount of taxes we pay in different jurisdictions may depend on the application of the tax laws of the various jurisdictions, including the United States, to our international business activities, changes in tax rates, new or revised tax laws or interpretations of existing tax laws and policies and our ability to operate our business in a manner consistent with our corporate structure and intercompany arrangements. The taxing authorities of the jurisdictions in which we operate may challenge our methodologies for pricing intercompany transactions, which are required to be computed on an arm’s-length basis pursuant to the intercompany arrangements or disagree with our determinations as to the income and expenses attributable to specific jurisdictions. If such a challenge or disagreement were to occur, and our position was not sustained, we could be required to pay additional taxes, interest and penalties, which could result in one-time tax charges, higher effective tax rates, reduced cash flows and lower overall profitability of our operations. Our financial statements could fail to reflect adequate reserves to cover such a contingency.

On December 22, 2017, the President signed into law new U.S. federal income tax legislation that contains significant changes to corporate taxation, including the transition of U.S. international taxation to a modified territorial system and the imposition of a one-time transition tax on a deemed repatriation of certain foreign earnings and profits. While we have recorded the impacts of U.S. tax reform based on our interpretation of the provisions as enacted, it is expected the U.S. Department of Treasury, the IRS and state tax authorities will issue additional interpretative guidance in the future that could result in changes to previously finalized provisions. The overall impact of this new legislation is uncertain, and our business and financial condition could be adversely affected. In addition, further changes in the tax laws of foreign jurisdictions could arise, including as a result of the base erosion and profit shifting project undertaken by the Organisation for Economic Co-operation and Development, or the OECD. The OECD, which represents a coalition of member countries, has issued recommendations that, in some cases, make substantial changes to numerous long-standing tax positions and principles; many of these changes have been adopted or are under active consideration by OECD members and/or other countries.

Recent changes to the U.S. tax laws impact the tax treatment of foreign earnings by, among other things, creating limits on the ability of taxpayers to claim and utilize foreign tax credits, imposing minimum effective rates of current tax on certain classes of foreign income, and imposing additional taxes in connection with specified payments to related foreign recipients. While some of the changes made in the 2017 U.S. tax reform may be adverse on a going forward basis, the Company intends to work with its tax advisors to determine the full impact of tax reform and to utilize the potential benefits that may be applicable to the Company. Due to our existing, and anticipated expansion of, our international business activities, any additional guidance such as U.S Treasury regulations and administrative interpretations may increase our worldwide effective tax rate and adversely affect our financial condition and operating results.

Taxing authorities may successfully assert that we should have collected or in the future should collect sales and use, value added or similar taxes, and we could be subject to liability with respect to past or future sales, which could adversely affect our operating results.

We do not collect sales and use, value added or similar taxes in all jurisdictions in which we have sales, and we have been advised that such taxes are not applicable to our products and services in certain jurisdictions. Sales and use, value added and similar tax laws and rates vary greatly by jurisdiction. Certain jurisdictions in which we do not collect such taxes may assert that such taxes are applicable, which could result in tax assessments, penalties and interest, to us or our end-customers for the past amounts, and we may be required to collect such taxes in the future. If we are unsuccessful in collecting such taxes from our end-customers, we could be held liable for such costs. Such tax assessments, penalties and interest, or future requirements may adversely affect our operating results.

If we needed to raise additional capital to expand our operations and invest in new products, our failure to do so on favorable terms could reduce our ability to compete and could materially adversely affect our business, financial condition, results of operations and prospects.

We expect that our existing cash and cash equivalents will be sufficient to meet our anticipated cash needs for at least the next 12 months. However, if we need to raise additional funds to expand our operations and invest in new products, we may not be able to obtain additional debt or equity financing on favorable terms, if at all. If we raise additional equity financing, our stockholders may experience significant dilution of their ownership interests, and the market price of our common stock could decline.

Our business is subject to the risks of fire, power outages, floods and other catastrophic events and to interruption by manmade problems such as terrorism.

Our corporate headquarters and the operations of our key manufacturing vendors, as well as many of our customers, are located in areas exposed to risks of natural disasters such as fires and floods. A significant natural disaster, such as a fire, flood or other catastrophic events such as a disease outbreak, could have a material adverse effect on our or their business, which could in turn materially adversely affect our business, financial condition, results of operations and prospects. For example, in the event our manufacturing or logistics abilities are hindered by any of the events discussed above, shipments could be delayed, which could result in missed financial targets, such as revenue and shipment targets, for a particular quarter. Further, if a natural disaster occurs in a region from which we derive a significant portion of our revenue, customers in that region may delay or forego purchases of our products, which could materially adversely affect our business, financial condition, results of operations and prospects. In addition, acts of terrorism could cause disruptions in our business or the business of our manufacturers, logistics providers, partners or customers or the economy as a whole. All of the aforementioned risks may be compounded if our disaster recovery plans and those of our manufacturers, logistics providers or partners prove to be inadequate. To the extent that any of the above results in delays or cancellations of customer orders, or delays in the manufacture, deployment or shipment of our products, our business, financial condition, results of operations and prospects would be adversely affected.

Regulations affecting broadband infrastructure could reduce demand for our products.

Laws and regulations governing the Internet and electronic commerce are emerging but remain largely unsettled, even in the areas where there has been some legislative action. Regulations may focus on, among other things, assessing access or settlement charges, or imposing tariffs or regulations based on the characteristics and quality of products, either of which could restrict our business or increase our cost of doing business. Government regulatory policies are likely to continue to have a major impact on the pricing of existing and new network services and, therefore, are expected to affect demand for those services and the communications products, including our products, supporting those services.

Any changes to existing laws or the adoption of new regulations by federal or state regulatory authorities or any legal challenges to existing laws or regulations affecting IP networks could materially adversely affect the market for our products. Moreover, customers may require us, or we may otherwise deem it necessary or advisable, to alter our products to address actual or anticipated changes in the regulatory environment. Our inability to alter our products or address any regulatory changes could have a material adverse effect on our consolidated financial position, results of operations or cash flows.

We have outstanding debt that could limit our ability to make expenditures and investments in the conduct of our business and adversely impact our ability to obtain future financing.

We have outstanding debt. We may be unable to generate cash sufficient to pay when due the principal of, interest on or other amounts due in respect of our indebtedness. We may be required to dedicate significant cash flows from operations to make such payments, which could limit our ability to make other expenditures and investments in the conduct of our business. Our indebtedness may also reduce our flexibility in planning for or reacting to changes in our business and market conditions. Our indebtedness also exposes us to interest rate risk, since our debt obligations generally bear interest at variable rates. In addition, we may incur additional indebtedness in the future to meet future financing needs. If we add new debt, the risks described above could increase.

The elimination of LIBOR could adversely affect our business, results of operations or financial condition.

In July 2017, the head of the United Kingdom Financial Conduct Authority announced plans to phase out the use of LIBOR by the end of 2021. Although the impact is uncertain at this time, the elimination of LIBOR could have an adverse impact on our business, results of operations, or financial condition. We may incur significant expenses to amend our LIBOR-indexed loans, derivatives, and other applicable financial or contractual obligations, including our credit facilities, to a new reference rate, which may differ significantly from LIBOR. Accordingly, the use of an alternative rate could result in increased costs, including increased interest expense on our credit facilities, and increased borrowing and hedging costs in the future. Additionally, the elimination of LIBOR may adversely impact the value of and the expected return on our existing derivatives. At this time, no consensus exists as to what rate or rates may become acceptable alternatives to LIBOR and we are unable to predict the effect of any such alternatives on our business, results of operations or financial condition.

Our credit facility contains restrictive and financial covenants that may limit our operating flexibility.

Our credit facility contains certain restrictive covenants that either limit our ability to, or require a mandatory prepayment in the event we, incur additional indebtedness and liens, merge with other companies or consummate certain changes of control, acquire other companies, engage in new lines of business, change business locations, make certain investments, make any payments on any subordinated debt, transfer or dispose of assets, amend certain material agreements, and enter into various specified transactions. We, therefore, may not be able to engage in any of the foregoing transactions unless we obtain the consent of our lender or prepay the outstanding amount under the credit facility. The credit facility also contains certain financial covenants and financial reporting requirements. Our obligations under the credit facility are secured by substantially all of our assets, excluding intellectual property and investments in foreign subsidiaries. We may not be able to generate or sustain sufficient cash flow or sales to meet the financial covenants or pay the principal and interest under the credit facility. Furthermore, our future working capital, borrowings or equity financing could be unavailable to repay or refinance the amounts outstanding under the credit facility. In the event of a liquidation, our lender would be repaid all outstanding principal and interest prior to distribution of assets to unsecured creditors, and the holders of our common stock would receive a portion of any liquidation proceeds only if all of our creditors, including our lender, were first repaid in full.

Risks Related to Our Common Stock

Our results of operations are likely to vary significantly from period to period and be unpredictable. If we fail to meet the expectations of analysts or investors, the market price of our common stock could decline substantially.

Our results of operations have historically varied from period to period, and we expect that this trend will continue. As a result, you should not rely upon our past financial results for any period as indicators of future performance. Our results of operations in any given period can be influenced by a number of factors, many of which are outside of our control and may be difficult to predict, including the factors described above as well as:

- changes in our pricing policies, whether initiated by us or as a result of competition;
- the amount and timing of operating costs and capital expenditures related to the operation and expansion of our business;
- changes in the growth rate of the broadband services market;
- the actual or rumored timing and success of new product and service introductions by us or our competitors or any other change in the competitive landscape of our industry, including consolidation among our competitors or customers;
- our ability to successfully expand our business geographically;
- insolvency or credit difficulties confronting our customers, which could adversely affect their ability to purchase or pay for our products and services, or confronting our key suppliers, including our sole source suppliers, which could disrupt our supply chain;
- our inability to fulfill our customers’ orders due to supply chain delays, access to key commodities or technologies or events that impact our manufacturers or their suppliers;
- the cost and possible outcomes of any potential litigation matters;
- our overall effective tax rate, including impacts caused by any changes in the valuation of our deferred tax assets and any new legislation or regulatory developments;

- increases or decreases in our expenses caused by fluctuations in foreign currency exchange rates; and
- general economic conditions, both domestically and in foreign markets.

Any one of the factors above or the cumulative effect of several of the factors described above may result in significant fluctuations in our financial and other results of operations. This variability and unpredictability could result in our failure to meet expectations of securities analysts or investors for a particular period. If we fail to meet or exceed such expectations for these or any other reasons, the market price of our common stock could decline substantially, and we could face costly lawsuits, including securities class action suits.

An active trading market for our common stock may not be sustained.

Our common stock began trading on the Nasdaq Global Select Market on December 15, 2017. Given the limited trading history of our common stock, there is a risk that an active trading market for our shares may not be sustained, which could put downward pressure on the market price of our common stock and thereby affect the ability of our stockholders to sell their shares at attractive prices, at the times that they would like to sell them, or at all.

The market price of our common stock may be volatile, which could result in substantial losses for investors.

The market price of our common stock could be subject to significant fluctuations. Some of the factors that may cause the market price of our common stock to fluctuate include:

- actual or anticipated changes in our earnings or fluctuations in our results of operations or in the expectations of securities analysts;
- price and volume fluctuations in the overall stock market from time to time;
- volatility in the market price and trading volume of comparable companies;
- announcements of technological innovations, new products, strategic alliances, or significant agreements by us or by competitive vendors;
- announcements by our customers regarding significant increases or decreases in capital expenditures;
- departure of key personnel;
- litigation involving us or that may be perceived as having an impact on our business;
- changes in general economic, industry and market conditions and trends;
- investors’ general perception of us;
- sales of large blocks of our stock; and
- announcements regarding further industry consolidation.

In the past, following periods of volatility in the market price of a company’s securities, securities class action litigation has often been brought against that company. Because of the potential volatility of our stock price, we may become the target of securities litigation in the future. Securities litigation could result in substantial costs and divert management’s attention and resources from our business.

We have broad discretion in the use of our cash reserves and may not use them effectively.

Subject to restrictions in the agreements governing our indebtedness, our management has broad discretion to use our cash reserves and could use our cash reserves in ways that do not improve our results of operations or enhance the value of our common stock. The failure by our management to apply these funds effectively could adversely affect our ability to operate and grow our business. Pending their use, we may invest our cash reserves in a manner that does not produce income or that loses value.

If securities or industry analysts cease publishing research or reports about us, our business or our market, or if they publish negative evaluations of our stock or the stock of other companies in our industry, the price of our stock 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 may publish about us, our business, our market or our competitors. If one or more of the industry analysts covering our business downgrade their evaluations of our stock or the stock of other companies in our industry, the price of our stock could decline. If one or more of these analysts cease to cover our stock, we could lose visibility in the market for our stock, which in turn could cause our stock price to decline.

Because we do not expect to declare any dividends on our common stock for the foreseeable future, investors in our common stock may never receive a return on their investment.

Although we declared special dividends on five occasions prior to our initial public offering, we do not anticipate that we will declare any cash dividends to holders of our common stock in the foreseeable future, and investors should not rely on an investment in our common stock to provide dividend income. Instead, we plan to retain any earnings to maintain and expand our existing operations. Accordingly, investors must rely on sales of their common stock after price appreciation, which may never occur, as the only way to realize any return on their investment. As a result, investors seeking cash dividends should not purchase our common stock.

Any future determination to declare dividends will be made at the discretion of our board of directors and will depend on a number of factors, including future earnings, capital requirements, financial conditions, future prospects, contractual restrictions and covenants and other factors that our board of directors may deem relevant. Our credit facility contains covenants that limit our ability to pay dividends on our capital stock.

Insiders have substantial control over us, which could limit your ability to influence the outcome of key transactions, including a change of control.

As of January 31, 2019, our directors, executive officers and 10% stockholders beneficially owned, in the aggregate, approximately 64.5% of our outstanding common stock. As a result, these stockholders could have significant influence over the outcome of matters submitted to our stockholders for approval, including the election of directors and any merger, consolidation or sale of all or substantially all of our assets, and over the management and affairs of our company. This concentration of ownership may have the effect of delaying or preventing a change in control of our company and might affect the market price of our common stock.

A significant portion of our total outstanding shares may be sold into the public market in the near future, which could cause the market price of our common stock to drop significantly, even if our business is doing well.

Sales of a significant number of shares of our common stock in the public market could occur at any time. These sales, or the market perception that the holders of a large number of shares intend to sell shares, could reduce the market price of our common stock.

In addition to our outstanding common stock, as of January 31, 2019, there were 9,545,780 shares subject to outstanding options, 525,511 shares subject to outstanding restricted stock unit awards, or RSUs, and an additional 11,765,262 shares reserved for future issuance under our equity incentive plans. Because we have registered most shares of common stock that may be issued under our equity incentive plans pursuant to a Registration Statement on Form S-8, any such registered shares that we issue can be freely sold in the public market upon issuance, subject to the restrictions imposed on our affiliates under Rule 144.

Moreover, holders of an aggregate of approximately 37,129,787 shares of our common stock as of January 31, 2019, have rights, subject to certain conditions, to require us to file registration statements covering their shares or to include their shares in registration statements that we may file for ourselves or other stockholders. Upon registration, such shares would be able to be freely sold in the public market.

Anti-takeover provisions in our restated certificate of incorporation and our amended and restated bylaws, as well as provisions of Delaware law, might discourage, delay or prevent a change in control of our company or changes in our management and, therefore, depress the trading price of our common stock.

Our restated certificate of incorporation and amended and restated bylaws and Delaware law contain provisions that may discourage, delay or prevent a merger, acquisition or other change in control that stockholders may consider favorable, including transactions in which you might otherwise receive a premium for your shares of our common stock. These provisions may also prevent or delay attempts by our stockholders to replace or remove our management. Our corporate governance documents include provisions:

- establishing a classified board of directors with staggered three-year terms so that not all members of our board are elected at one time;
- providing that directors may be removed by stockholders only for cause and only with a vote of the holders of at least 75% of the issued and outstanding shares of common stock;
- limiting the ability of our stockholders to call and bring business before special meetings and to take action by written consent in lieu of a meeting;
- requiring advance notice of stockholder proposals for business to be conducted at meetings of our stockholders and for nominations of candidates for election to our board of directors;
- authorizing blank check preferred stock, which could be issued with voting, liquidation, dividend and other rights superior to our common stock; and
- limiting the liability of, and providing indemnification to, our directors and officers.

As a Delaware corporation, we are also subject to provisions of Delaware law, including Section 203 of the Delaware General Corporation Law, which limits the ability of stockholders holding more than 15% of our outstanding common stock from engaging in certain business combinations with us. Any provision of our restated certificate of incorporation or amended and restated bylaws or Delaware law that has the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock, and could also affect the price that some investors are willing to pay for our common stock.

The existence of the foregoing provisions and anti-takeover measures could limit the price that investors might be willing to pay in the future for shares of our common stock. They could also deter potential acquirers of our company, thereby reducing the likelihood that you could receive a premium for your common stock in an acquisition.

Our restated certificate of incorporation provides that the Court of Chancery of the State of Delaware will be the exclusive forum for substantially all disputes between us and our stockholders. Our restated certificate of incorporation further provides that the federal district courts of the United States are the sole and exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act. These choice of forum provisions could limit our stockholders' ability to obtain a more favorable judicial forum for disputes with us or our directors, officers or employees.

Our restated certificate of incorporation provides that the Court of Chancery of the State of Delaware is the exclusive forum for any derivative action or proceeding brought on our behalf; any action asserting a breach of fiduciary duty; any action asserting a claim against us arising pursuant to the Delaware General Corporation Law, our certificate of incorporation or our bylaws; or any action asserting a claim against us that is governed by the internal affairs doctrine. Our restated certificate of incorporation further provides that, unless we consent in writing to the selection of an alternative forum, the federal district courts of the United States shall, to the fullest extent permitted by law, be the sole and exclusive forum for the resolution of any complaint asserting a cause of action arising under the Securities Act of 1933, as amended, or the Securities Act. On December 19, 2018, the Delaware Court of Chancery, in *Sciabacucchi v. Salzberg, et al.*, C.A. No. 2017-0931-JTL (Del. Ch. Dec. 19, 2018), held that such federal forum selection provisions are invalid under Delaware law. These choice of forum provisions may limit a stockholder's ability to bring a claim in a judicial forum that it finds favorable for disputes with us or our directors, officers or other employees, which may discourage such lawsuits against us and our directors, officers and other employees. Alternatively, if a court were to find the choice of forum provisions contained in our certificate of incorporation to be inapplicable or unenforceable in an action, we may incur additional costs associated with resolving such action in other jurisdictions, which could materially adversely affect our business, financial condition, results of operations and prospects.

We are an "emerging growth company," and the reduced disclosure requirements applicable to emerging growth companies may make our common stock less attractive to investors.

We are an "emerging growth company," as defined in the Jumpstart Our Business Startups Act of 2012, or the JOBS Act, and may remain an emerging growth company until the last day of our fiscal year following the fifth anniversary of our initial public offering, subject to specified conditions. For so long as we remain an emerging growth company, we are permitted, and intend, to rely on exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include being permitted to provide reduced disclosure regarding executive compensation and exemptions from the requirements to hold non-binding advisory votes on executive compensation and golden parachute payments, not being required to comply with the auditor attestation requirements of Section 404 of the Sarbanes-Oxley Act of 2002 related to our internal control over financial reporting, and not being required to comply with any requirement that may be adopted by the Public Company Accounting Oversight Board regarding a supplement to the auditor's report providing additional information about the audit and the financial statements. We cannot predict whether investors will find our common stock less attractive if we rely on these exemptions. If some investors find our common stock less attractive as a result, there may be a less active trading market for our common stock and our stock price may be more volatile.

Further, Section 102(b)(1) of the JOBS Act exempts emerging growth companies from being required to comply with new or revised financial accounting standards until private companies (that is, companies that have not filed a pending registration statement under the Securities Act, had a Securities Act registration statement declared effective or do not have a class of securities registered under the Securities Exchange Act of 1934, as amended, or the Exchange Act) are required to comply with the new or revised financial accounting standards. The JOBS Act provides that a company can elect to opt out of the extended transition period and comply with the requirements that apply to non-emerging growth companies, but any such an election to opt out is irrevocable. We have elected not to opt out of such extended transition period, which means that when a standard is issued or revised, and it has different application dates for public or private companies, we will adopt the new or revised standard at the time private companies adopt the new or revised standard, provided that we continue to be an emerging growth company. This may make comparison of our financial statements with the financial statements of another public company that is not an emerging growth company, or an emerging growth company that has opted out of using the extended transition period, difficult or impossible because of the potential differences in accounting standards used.

We will remain an emerging growth company until the last day of the fiscal year following the fifth anniversary of our initial public offering or such earlier time that we are no longer an emerging growth company. We would cease to be an emerging growth company if we have more than $1.07 billion in annual revenue, we have more than $700 million in market value of our stock held by non-affiliates (and we have been a public company for at least 12 months and have filed one Annual Report on Form 10-K) or we issue more than $1 billion of non-convertible debt securities over a three-year period.

We are subject to new U.S. foreign investment regulations which may impose additional burdens on or may limit certain investors' ability to purchase our common stock, potentially making our common stock less attractive to investors.

In October 2018, the U.S. Department of Treasury announced a pilot program to implement part of the Foreign Investment Risk Review Modernization Act, or FIRRMA, effective November 10, 2018. The pilot program expands the jurisdiction of the Committee on Foreign Investment in the United States, or CFIUS, to include certain direct or indirect foreign investments in a defined category of U.S. companies, including companies involved in manufacturing communications equipment. Among other things, FIRRMA empowers CFIUS to require certain foreign investors to make mandatory filings and permits CFIUS to charge filing fees related to such filings. Such filings are subject to review by CFIUS. Any such restrictions on the ability to purchase shares of our common stock that have the effect of delaying or deterring a change in control could limit the opportunity for our stockholders to receive a premium for their shares of our common stock and could also affect the price that some investors are willing to pay for our common stock.

Our management team has limited experience managing a public company.

Most members of our management team have limited experience managing a publicly traded company, interacting with public company investors and complying with the increasingly complex laws pertaining to public companies. Our management team may not successfully or efficiently manage our transition to being a public company subject to significant regulatory oversight and reporting obligations under the federal securities laws and the scrutiny of securities analysts and investors. These new obligations and constituents will require significant attention from our management team and could divert their attention away from the day-to-day management of our business, which could materially adversely affect our business, financial condition, results of operations and prospects.

The requirements of being a public company may strain our resources, divert management's attention and affect our ability to attract and retain qualified board members.

As a public company, we are subject to the reporting requirements of the Exchange Act, the listing requirements of the Nasdaq Stock Market and other applicable securities rules and regulations. Compliance with these rules and regulations will increase our legal and financial compliance costs, make some activities more difficult, time-consuming or costly, and increase demand on our systems and resources, particularly after we are no longer an emerging growth company. Among other things, the Exchange Act requires that we file annual, quarterly and current reports with respect to our business and results of operations and maintain effective disclosure controls and procedures and internal control over financial reporting. In order to maintain and, if required, improve our disclosure controls and procedures and internal control over financial reporting to meet this standard, significant resources and management oversight may be required. As a result, management's attention may be diverted from other business concerns, which could harm our business and results of operations. Although we have already hired additional employees to comply with these requirements, we may need to hire even more employees in the future, which will increase our costs and expenses.

We are currently evaluating our internal controls, including to identify and remediate any deficiencies in those internal controls. We may not be able to complete our evaluation, testing and any required remediation in a timely fashion. During the evaluation and testing process, if we identify one or more material weaknesses in our internal control over financial reporting that we are unable to remediate before the end of the same fiscal year in which the material weakness is identified, we will be unable to assert that our internal controls are effective. If we are unable to assert that our internal control over financial reporting is effective, or if our auditors are unable to attest to management's report on the effectiveness of our internal controls, which will be required after we are no longer an emerging growth company, we could lose investor confidence in the accuracy and completeness of our financial reports, which would cause the price of our common stock to decline.

In addition, changing laws, regulations and standards relating to corporate governance and public disclosure are increasing legal and financial compliance costs and making some activities more time-consuming. We intend to invest resources to comply with evolving laws, regulations and standards, and this investment may result in increased general and administrative expense and a diversion of management's time and attention from revenue-generating activities to compliance activities. If our efforts to comply with new laws, regulations and standards differ from the activities intended by regulatory or governing bodies, regulatory authorities may initiate legal proceedings against us and our business may be harmed.

We also expect that being a public company will make it more expensive for us to obtain director and officer liability insurance, and we may be required to accept reduced coverage or incur substantially higher costs to obtain coverage. These factors could also make it more difficult for us to attract and retain qualified members of our board of directors and qualified executive officers.

We estimate that we will incur approximately $2.0 to $3.0 million of annual costs associated with being a publicly traded company, which we expect will be included in general and administrative expenses. However, it is possible that our actual costs of being a publicly traded company will be higher than we currently estimate. In estimating these costs, we took into account expenses related to insurance, legal, accounting and compliance activities.

Item 1B. Unresolved Staff Comments.

None.

Item 2. Properties.

Facilities

Our corporate headquarters is located in Andover, Massachusetts and consists of approximately 122,000 square feet of space. We own the property constituting our corporate headquarters, subject to an $8.0 million mortgage loan. The annual interest rate on the loan is 3.5%, and the loan is repayable in 60 monthly installments of principal and interest based on a 20-year amortization schedule. The remaining amount of unpaid principal under the loan is due on the maturity date of July 1, 2020. The loan terms include annual affirmative, negative and financial covenants, including a requirement that we maintain a minimum debt service ratio. We were in compliance with all annual covenants of the mortgage loan as of December 31, 2018. As of December 31, 2018, outstanding borrowings under the mortgage loan were $7.0 million.

We lease additional facilities in Lawrence and Methuen, Massachusetts and Limerick, Ireland that we use for manufacturing, testing, logistics, and customer support. We also lease a facility in Guangzhou, China that we use for manufacturing, testing, logistics, research and development and technical support and a facility in Valencia, Spain that we use primarily for research and development.

We believe that our current facilities are adequate to meet our current needs. We anticipate expanding our facilities as we add employees and enter new geographic markets. We believe that suitable additional or alternative space will be available on acceptable terms as needed to accommodate future growth.

Item 3. Legal Proceedings.

From time to time, we are a party to various litigation matters and subject to claims that arise in the ordinary course of business including, for example, patent infringement lawsuits by non-practicing entities. In addition, third parties may from time to time assert claims against us in the form of letters and other communications. There is no pending or threatened legal proceeding to which we are a party that, in our opinion, is likely to have a material adverse effect on our financial condition or results of operations. However, litigation is inherently unpredictable. Regardless of the outcome, litigation can adversely affect us because of defense and settlement costs, diversion of management resources and other factors.

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.

Market Information

Our common stock trades on the Nasdaq Global Select Market under the symbol "CASA". Trading of our common stock on the Nasdaq Global Select Market commenced on December 15, 2017 in connection with our initial public offering, or IPO. Prior to that time, there was no established public trading market for our common stock.

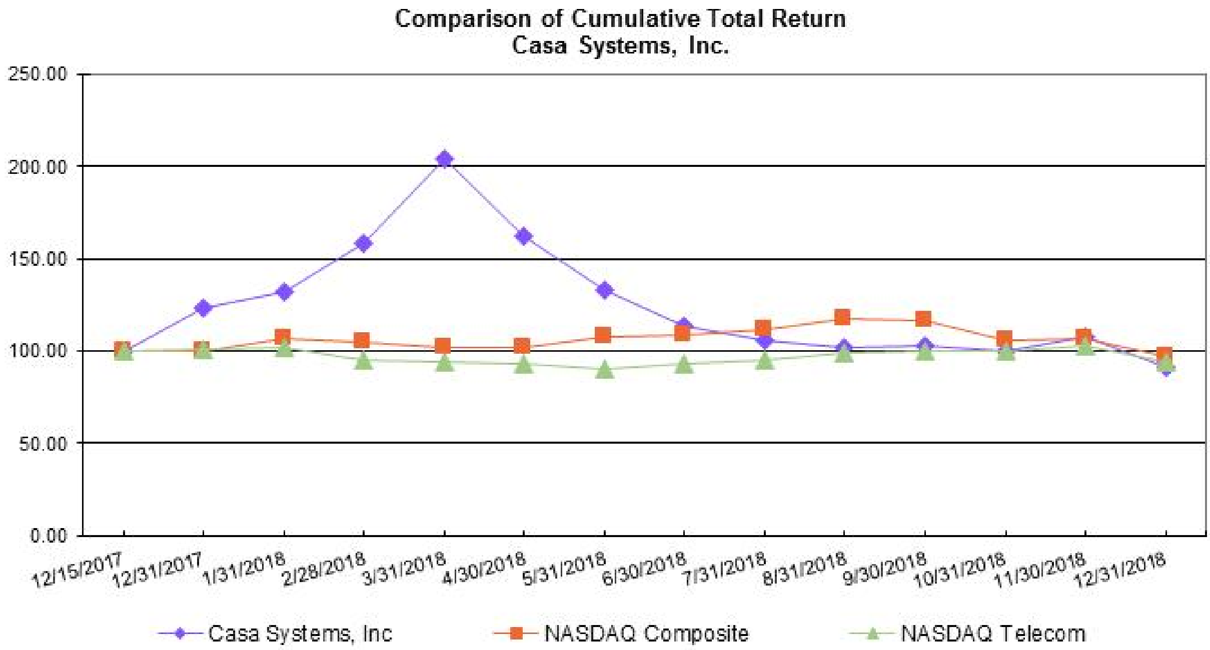
Holders of Record

As of January 31, 2019, there were 21 holders of record of our common stock. Because many of our shares are held by brokers and other institutions on behalf of stockholders, we are not able to estimate the number of stockholders represented by these record holders.

Performance Graph

This performance graph shall not be deemed to be "soliciting material" or to be "filed" with the U.S. Securities and Exchange Commission, or the SEC, for purposes of Section 18 of the Securities Exchange Act of 1934, as amended, or the Exchange Act, or otherwise subject to liabilities under that section, and shall not be deemed to be incorporated by reference into any of our filings under the Securities Act of 1933, as amended, or the Exchange Act, except to the extent that we specifically incorporate it by reference into such filing.

The following graph compares the cumulative total return to stockholders for our common shares for the period from December 15, 2017 (the date our common stock began trading on the Nasdaq Global Select Market) through December 31, 2018 with the Nasdaq Composite Index. The comparison assumes an investment of $100 is made on December 15, 2017 in our common shares and in each of the indices and in the case of the indices it also assumes reinvestment of all dividends. The performance shown is not necessarily indicative of future performance.



Recent Sales of Unregistered Equity Securities

None.

Issuer Repurchases of Equity Securities

The following table sets forth information with respect to repurchases of shares of our common stock during the three-month period ended December 31, 2018.

Period	Total Number of Shares Purchased		Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs		Approximate Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs (1)
	(In thousands)			(In thousands)		(In thousands)
October 1 - October 31, 2018	2,082	$	14.11	2,082	$	—
November 1 - November 30, 2018	—		—	—		—
December 1 - December 31, 2018	—		—	—		—

(1) On August 14, 2018, we announced that our board of directors authorized the repurchase of up to $75.0 million of our common stock under a stock repurchase program. We repurchased and retired the remaining $29.4 million of shares authorized under the stock repurchase program during the three-month period ended December 31, 2018. The stock repurchase program had no expiration date, did not require us to purchase a minimum number of shares, and was able to be suspended, modified or discontinued at any time without prior notice.

Securities Authorized for Issuance Under Equity Compensation Plans

The information required by this item with respect to our equity compensation plans is expected to be incorporated by reference to our proxy statement for the 2019 Annual Meeting of Stockholders to be filed with the SEC within 120 days of the fiscal year ended December 31, 2018.

Use of Proceeds

On December 19, 2017, we closed our initial public offering of common stock under a registration statement on Form S-1 (File No. 333-221658) that was declared effective by the SEC on December 14, 2017. The net offering proceeds to us from the offering, after deducting underwriting discounts of $6.3 million and offering expenses payable by us totaling $4.1 million, were approximately $79.3 million. No offering discounts, commissions or expenses were paid directly or indirectly to any of our directors or officers (or their associates) or persons owning 10.0% or more of any class of our equity securities or to any other affiliates. There has been no material change in the planned use of proceeds from our initial public offering as described in our final prospectus filed with the SEC on December 15, 2017 pursuant to Rule 424(b)(4) promulgated under the Securities Act. As of December 31, 2018, we had not used any of the net offering proceeds and we have invested the proceeds into an investment portfolio with the primary objective of preserving principal and providing liquidity without significantly increasing risk.

Item 6. Selected Financial Data.

The selected consolidated statements of operations data for the years ended December 31, 2018, 2017 and 2016 and the consolidated balance sheet data as of December 31, 2018 and 2017 are derived from our audited financial statements appearing in Item 8, “Financial Statements and Supplementary Data,” of this Annual Report on Form 10-K. The selected consolidated statements of operations data for the year ended December 31, 2015 and 2014, and the consolidated balance sheet data as of December 31, 2016, 2015 and 2014 are derived from audited financial statements not included in this Annual Report on Form 10-K. Our historical results are not necessarily indicative of the results to be expected in the future.

The following selected consolidated financial data below should be read in conjunction with Item 7, “Management's Discussion and Analysis of Financial Condition and Results of Operations,” our Consolidated financial statements, and the accompanying notes appearing in Item 8, “Financial Statements and Supplementary Data,” of this Annual Report on Form 10-K to fully understand factors that may affect the comparability of the information presented below.

	Year Ended December 31,				
	2018	2017	2016	2015	2014
	(in thousands, except per share amounts)				
Consolidated Statement of Operations Data:					
Revenue:					
Product	$ 256,989	$ 311,896	$ 279,223	$ 247,588	$ 194,358
Service	40,138	39,679	36,905	24,862	16,920
Total revenue	297,127	351,575	316,128	272,450	211,278
Cost of revenue(1):					
Product	74,350	88,538	89,340	74,349	59,088
Service	4,811	4,973	8,477	5,265	5,917
Total cost of revenue	79,161	93,511	97,817	79,614	65,005
Gross profit	217,966	258,064	218,311	192,836	146,273
Operating expenses:					
Research and development(1)	70,974	60,677	49,210	37,155	25,481
Sales and marketing(1)	41,186	39,602	36,114	36,157	21,409
General and administrative(1)	26,840	21,563	18,215	16,453	10,346
Total operating expenses	139,000	121,842	103,539	89,765	57,236
Income from operations	78,966	136,222	114,772	103,071	89,037
Other income (expense), net	(13,028)	(13,404)	921	(1,408)	(2,942)
Income before provision for (benefit from) income taxes	65,938	122,818	115,693	101,663	86,095
Provision for (benefit from) income taxes	(7,068)	34,318	27,025	33,742	26,387
Net income	$ 73,006	$ 88,500	$ 88,668	$ 67,921	$ 59,708
Cash dividends declared per common share or common share equivalent	$ —	$ 1.7576	$ 2.9197	$ —	$ 0.3835
Net income (loss) attributable to common stockholders:					
Basic	$ 73,006	$ 11,849	$ (35,119)	$ 27,302	$ 23,287
Diluted	$ 73,006	$ 11,849	$ (35,119)	$ 30,402	$ 23,843
Net income (loss) per share attributable to common stockholders:					
Basic	$ 0.87	$ 0.34	$ (1.07)	$ 0.86	$ 0.78
Diluted	$ 0.79	$ 0.26	$ (1.07)	$ 0.78	$ 0.73
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:					
Basic	83,539	35,359	32,864	31,740	29,983
Diluted	91,877	44,972	32,864	38,809	32,683

(1) Includes stock-based compensation expense related to stock options, stock appreciation rights and restricted stock units granted to employees and non-employee consultants as follows:

	Year Ended December 31,				
	2018	2017	2016	2015	2014
	(in thousands)				
Cost of revenue	$ 249	$ 306	$ 237	$ 143	$ 161
Research and development expense	1,864	2,864	2,306	1,843	852
Sales and marketing expense	1,229	1,112	1,147	775	598
General and administrative expense	5,552	4,854	4,614	4,560	380
Total stock-based compensation expense	$ 8,894	$ 9,136	$ 8,304	$ 7,321	$ 1,991

	As of December 31,				
	2018	2017	2016	2015	2014
	(in thousands)				
Consolidated Balance Sheet Data:					
Cash and cash equivalents	$ 280,587	$ 260,820	$ 343,946	$ 92,496	$ 77,155
Working capital(1)	328,400	324,710	286,652	162,981	99,237
Total assets	474,649	469,697	583,035	283,097	230,815
Long-term debt, including current portion, net of unamortized debt issuance costs	295,459	297,615	299,751	7,795	—
Total liabilities	399,793	419,541	557,259	103,160	124,636
Convertible preferred stock	—	—	97,479	97,479	97,479
Total stockholders’ equity (deficit)	74,856	50,156	(71,703)	82,458	8,700

(1) We define working capital as current assets less current liabilities.

Item 7. Management’s Discussion and Analysis of Financial Condition and Results of Operations.

The following discussion of our financial condition and results of operations should be read together with our consolidated financial statements and related notes and other financial information included elsewhere in this Annual Report on Form 10-K. The following discussion contains forward-looking statements that reflect our plans, estimates and beliefs. Our actual results could differ materially from those discussed in the forward-looking statements. Factors that could cause or contribute to these differences include those discussed below and elsewhere in this Annual Report on Form 10-K, particularly in the section titled “Risk Factors.”

Overview

Our solutions are conceived, designed, and built to solve problems faced by our broadband service provider customers as they transform their networks to meet the growing demand for bandwidth and the introduction of new services. We offer converged solutions for next-generation centralized, distributed and virtualized architectures for cable broadband, fixed-line broadband and wireless networks. Our innovative products enable customers to cost-effectively and dynamically increase network speed, add bandwidth capacity and new services for consumers and enterprises, reduce network complexity and reduce operating and capital expenditures.

We have created a software-centric, multi-service portfolio based on our Axyom software which that enables a broad range of core and access network functions for fixed and wireless networks. These networks share a common set of core and access network functions that enable network services such as subscriber management, session management, transport security and radio frequency, or RF, management. Our Axyom software architecture allows each of these network functions to be provided and controlled, integrated or combined together, by a distinct segment of software, which can be integrated or combined together in a building block-style fashion with the segments of software responsible for each other network function. This allows us to offer network architectures that can be efficiently and rapidly tailored to meet each customer’s specific requirements, both as they exist at the time of initial implementation and as they evolve over time. While we initially focused on providing solutions for cable service providers due to our founders’ experience in the cable industry, the commonalities between new fixed and wireless network architectures have allowed us to leverage our existing Axyom software and to expand our solutions into the wireless and fixed communications markets.

We offer a scalable solution that can meet the evolving bandwidth needs of our customers and their subscribers. Our first installation in a service provider’s network frequently involves deploying our broadband products in only a portion of the provider’s network and with only a fraction of the capacity of our products enabled at the time of initial installation. Over time, our customers have generally expanded the use of our solutions to other areas of their networks to increase network capacity. Capacity expansions are accomplished either by deploying additional systems, line cards, or the sale of additional channels through the use of software. Sales of additional line cards and software-based capacity expansions generate higher gross margins than our initial hardware-based deployments.

We believe that the shift to software-centric ultra-broadband networks and fixed and wireless network convergence presents us with a compelling market opportunity. We intend to maintain our technological leadership through the enhancement of existing products and the development of new products in both our current and adjacent markets. By investing in research and development, we believe we will be well positioned to continue our rapid growth and take advantage of the large market opportunity across fixed and wireless networks. We also intend to continue to expand our sales and marketing initiatives in key geographies.

Our revenue growth is driven by technology upgrade cycles in our target markets and has been characterized by periods of rapid growth followed by periods of more moderate growth in between these upgrade cycles. As an example, during 2014 to 2017 our revenue grew at a compound annual growth rate of 18% while customers were purchasing both hardware (or integrated converged cable access platform, or CCAP) and software-based capacity from us and upgrading their networks to DOCSIS 3.1. In 2018, however, which we believe was a transition year prior to a new upgrade cycle, our revenue decreased by 15.5% to $297.1 million. We have been able to maintain strong levels of profitability throughout these upgrade cycles. Our income from operations in 2016, 2017 and 2018 has been $114.8 million, $136.2 million and $79.0 million, respectively. Our solutions are commercially deployed in more than 70 countries by more than 475 customers, including regional service providers as well as some of the world’s largest Tier 1 broadband service providers, serving millions of subscribers.

Our Business Model

We derive revenue from sales of our products and services. To date, the majority of our product revenue has come from sales of our broadband products, particularly our C100G CCAP solution, to cable operators worldwide. We generate service revenue primarily from sales of maintenance and support services, which end customers typically purchase in conjunction with our products, and, to a lesser extent, from sales of professional services and extended warranty services.

Since shipping our first products in 2005, our cumulative end-customer base has grown significantly. In particular, our revenue and installed base of equipment has increased significantly with the introduction of our CCAP solution in 2012 and our Data Over Cable Service Interface Specification, or DOCSIS, 3.1 capabilities in 2015, both of which run on our Axyom software platform.

We offer a scalable solution that can meet the evolving bandwidth needs of our customers and their subscribers.

Our sales model focuses on the following key areas:

- ***Adding New Customers***. With several thousand broadband service providers existing globally, we believe that we have opportunities for growth by acquiring new customers in all of the geographic regions in which we compete. Potential new customers include broadband service providers that provide fixed or wireless services or both. We intend to add new customers over time by continuing to invest in our technology and our sales team to capitalize on these new opportunities. Our sales team works closely with prospective customers to educate them on and demonstrate to them the technical and business merits of our products, including the ability to capture new revenue opportunities and realize cost savings through the use of our broadband solutions. We build relationships with prospective customers at multiple levels and within numerous departments in a customer's organization and, through the sales process, we strive to be a strategic business partner for our customers. We believe that the technological strengths and capabilities of our broadband solutions and the introduction and implementation of next-generation standards have been and will continue to be an important factor in our ability to add new customers.

- ***Expanding Sales to Our Existing Customer Base***. Our first installation in a service provider's network frequently involves deploying our broadband products in only a portion of the provider's network and with only a fraction of the capacity of our products enabled at the time of initial installation. Over time, our customers have generally expanded the use of our solutions to other areas of their networks to increase network capacity. Capacity expansions are accomplished either by deploying additional systems or line cards, or by our remote enablement of additional channels through the use of software. Sales of additional line cards and software-based capacity expansions generate higher gross margins than our initial hardware-based deployments.

  We work with our existing customers to identify expansion and cross-selling opportunities. Existing customers are familiar with and have benefited from the operational and economic benefits of our broadband products, and therefore, sales cycles for existing customers are generally shorter. We believe expansion and cross-selling opportunities with existing customers are significant given their existing and expected infrastructure spend as service providers leverage their investment in our platform to deliver new services to their customers.

  Our solutions are commercially deployed in over 70 countries by more than 475 customers. We expect that a substantial portion of our future sales will be follow-on sales to existing customers. During the years ended December 31, 2018, 2017 and 2016, sales to existing customers represented 99%, 97% and 74% of our revenue, respectively. Our business and results of operations will depend on our ability to sell additional products to our existing customer base.

- ***Selling New Products.*** Our results of operations have been, and we believe will continue to be, affected by our ability to quickly and effectively design and sell products with improved performance and increased functionality. As networks and standards for broadband solutions evolve, we aim to deliver new products prior to our competition. For example, the introduction of our DOCSIS 3.0 broadband solution, our CCAP solution and our DOCSIS 3.1 capabilities allowed us to obtain new customers, increase our sales to existing customers, increase our revenue and capture market share. We aim to increase our revenue by enabling customers to transition from previously deployed data and video solutions to our integrated CCAP solutions, which can incorporate DOCSIS 3.1 standards as well as our remote-PHY distributed access solution. Over the last several years, we have made substantial investments to extend our Axyom software platform and to develop small cell solutions to serve the wireless market, and we expect to generate increased revenue in the future from sales of wireless solutions to new and existing customers. Our ability to sustain our revenue growth will depend, in part, upon our sales of new products.

We market and sell our products and services through our direct global sales force, supported by sales agents, and through resellers. A majority of our revenue is derived from direct sales, which generate higher gross margins than sales made through resellers. Our sales organization includes systems engineers with deep technical expertise that provide pre-sales technical support. These systems engineers also assist with post-sales support. Our resellers receive an order from an end customer prior to placing an order with us, and we confirm the identification of or are aware of the end customer prior to accepting such orders. We use sales agents to assist our direct global sales force in the sales process with certain customers primarily located in the Latin America and Asia-Pacific regions. If a sales agent is engaged in the sales process, we receive the order directly from and sell the products and services directly to the end customer, and we pay a commission to the sales agent, calculated as a percentage of the related customer payment.

Each of our sales teams is responsible for a geographic territory and/or has responsibility for a number of major direct end-customer accounts. We have a diverse, global customer base and our revenue by geographic region fluctuates from period to period based on the timing of customer projects. The percentages of our revenue derived from customers in each geographic region were as follows:

	Year Ended December 31,		
	2018	2017	2016
Revenue by geographic region:			
North America	49.1%	57.4%	58.2%
Latin America	10.9%	11.5%	15.0%
Europe, Middle East and Africa	27.4%	17.5%	14.3%
Asia-Pacific	12.6%	13.6%	12.5%
Total	100.0%	100.0%	100.0%

Key Components of Our Results of Operations

Revenue

We generate product revenue from sales of our software-centric broadband products, including our CCAP solution and our DOCSIS 3.1 capabilities. The majority of our revenue is derived from sales of our CCAP solutions, particularly our C100G CCAP. We also generate product revenue from sales of additional line cards and software-based capacity expansions.

We generate service revenue from sales of initial maintenance and support services contracts, which are typically purchased by end customers in conjunction with our products, and from our customers' subsequent annual renewals of those contracts. We offer maintenance and support services under renewable, fee-based contracts, which include telephone support and unspecified software upgrades and updates provided on a when-and-if-available basis. To a lesser extent, we generate service revenue from sales of professional services, such as installation and configuration, and extended warranty services.

The sale of our software-centric broadband products generally includes a 90-day warranty on the software and a one-year warranty on the hardware component of the products, which includes repair or replacement of the applicable hardware. We record a warranty accrual for the initial software and hardware warranty included with our product sales and do not defer revenue. In addition, in conjunction with customers' renewals of maintenance and support services contracts, we offer an extended warranty for periods typically of one to three years for agreed-upon fees, which we record as service revenue.

Cost of Revenue

Our cost of product revenue consists primarily of the costs of procuring goods, such as chassis and line cards embedded with field programmable gate arrays, or FPGAs, from our contract manufacturers and other suppliers. In addition, cost of product revenue includes salary and benefit expenses, including stock-based compensation, for manufacturing and supply-chain management personnel, allocated facilities-related costs, estimated warranty costs, third-party logistics costs, and estimated costs associated with excess and obsolete inventory.

Our cost of service revenue includes salary and benefit expenses, including stock-based compensation, for our maintenance and support services and professional services personnel, fees incurred for subcontracted professional services provided to our customers, and allocated facilities-related costs.

Gross Profit

Our product gross profit and gross margin have been, and may in the future be, influenced by several factors, including changes in the volume of our software-centric broadband products sold, product configuration, sales of capacity expansions, geographic location of our customers, pricing due to competitive pressure, estimated warranty costs, inventory obsolescence, and favorable and unfavorable changes in inventory production volume and component costs. As some products mature, the average selling prices of those products may decline. Our service gross profit and gross margin have been, and may in the future be, influenced by the amount and timing of renewals of maintenance and support services contracts by customers, pricing due to competitive pressure and, to a lesser extent, the amount of professional services ordered by customers and performed by us. We expect that our gross margin will remain relatively stable in the near term, subject to quarter-to-quarter fluctuation, due to changes in the amount of our software-centric broadband products and capacity expansions sold.

Operating Expenses

Our operating expenses consist of research and development, sales and marketing, and general and administrative expenses.

Research and Development Expenses

Research and development expenses consist primarily of salary and benefit expenses, including stock-based compensation, for our employees engaged in research, design and development activities. Research and development expenses also include project-specific engineering services purchased from external vendors, prototype costs, depreciation expense, amortization of purchased intellectual property, allocated facilities-related costs and travel expenses.

We expect that our research and development costs will increase in the near term as we continue to make significant investments to enhance our software-centric broadband products and develop new software-centric broadband products and technologies, including our new wireless solutions.

Sales and Marketing Expenses

Sales and marketing expenses include salary and benefit expenses, including stock-based compensation, for employees and costs for contractors engaged in sales and marketing activities. Sales and marketing expenses also include commissions, calculated as a percentage of the related customer payment, to sales agents that assist us in the sales process with certain customers primarily located in the Latin America and Asia-Pacific regions. These sales agent commissions fluctuate from period to period based on the amount and timing of sales to the customers subject to sales agent commissions. Sales and marketing expenses also include marketing activities, such as trade shows, marketing programs and promotional materials, as well as allocated facilities-related costs. We are also establishing a new sales force to sell and undertake new marketing programs to promote our new wireless solutions.

We expect that our sales and marketing expenses will increase in absolute dollars while remaining relatively stable as a percentage of revenue in the near term as we continue to make investments in our sales and marketing organizations and expand our marketing programs and efforts to increase the market awareness and sales of our products and services.

General and Administrative Expenses

General and administrative expenses include salary and benefit expenses, including stock-based compensation, for employees engaged in general and administrative activities, as well as professional service fees, allocated facilities-related costs, insurance, travel and bad debt expenses related to accounts receivable.

We expect that our general and administrative expenses will increase in absolute dollars while remaining relatively stable as a percentage of revenue in the near term primarily due to our continued growth and the increased cost associated with being a public company.

Other Income (Expense), Net

Other income (expense), net consists of interest income from our investments in short-term financial instruments, such as certificates of deposit, money market mutual funds and commercial paper, and interest expense associated with our term loan facility, the mortgage on our corporate office and debt maintenance costs related to our revolving credit facility. Other income (expense), net also includes realized and unrealized gains and losses from foreign currency transactions. We hedge certain significant transactions denominated in currencies other than the U.S. dollar, and we expect to continue to do so to minimize our exposure to foreign currency fluctuations.

Provision for (Benefit from) Income Taxes

We are subject to income taxes in the United States and the foreign jurisdictions in which we do business. These foreign jurisdictions have statutory tax rates different from those in the United States. Our effective tax rates will vary depending on the relative proportion of foreign to U.S. income, the utilization of foreign tax credits and research and development tax credits, changes in corporate structure, the amount and timing of certain employee stock-based compensation transactions, changes in the valuation of our deferred tax assets and changes in tax laws and interpretations. We plan to regularly assess the likelihood of outcomes that could result from the examination of our tax returns by the U.S. Internal Revenue Service, or IRS, and other tax authorities to determine the adequacy of our income tax reserves and expense. Should actual events or results differ from our then-current expectations, charges or credits to our provision for income taxes may become necessary. Any such adjustments could have a significant effect on our results of operations.

On December 22, 2017, the Tax Cuts and Jobs Act, or the TCJA, was enacted which, among other things, lowered the U.S. corporate income tax rate to 21% from 35%, repealed the domestic production activity deductions, limited the deductibility of certain executive compensation and interest expense, and established a modified territorial system requiring a mandatory deemed repatriation tax on undistributed earnings of foreign subsidiaries. Beginning in 2018, the TCJA also requires a minimum tax on certain future earnings generated by foreign subsidiaries while providing for future tax-free repatriation of such earnings through a 100% dividends-received deduction. While the reduction in the U.S. corporate tax rate under the TCJA is not effective until 2018, under GAAP, changes in tax rates are accounted for in the period enacted. Therefore, in accordance with Accounting Standards Codification, or ASC, Topic 740, *Income Taxes*, and Staff Accounting Bulletin 118, we recognized a provisional income tax charge in the fourth quarter of 2017 of $14.1 million related to the TCJA based on our initial analysis using available information and estimates. The provisional charge is comprised of $10.0 million related to the one-time deemed repatriation of accumulated earnings of foreign subsidiaries and related withholding taxes and $4.1 million related primarily to the remeasurement of net deferred tax assets as a result of the reduction in the U.S. corporate income tax rate effected by the TCJA. As a result, applicable U.S. corporate and foreign income taxes have been provided on substantially all of our accumulated earnings of foreign subsidiaries previously considered indefinitely reinvested. The Company's accounting for the impacts of the TCJA is complete as of December 31, 2018, and the Company has not recorded any material adjustments to the provisional amounts recorded in the fourth quarter of 2017 related to the TCJA. Although the Company no longer considers these amounts provisional, the determination of the TCJA's income tax effects may change as a result of future legislation or further interpretation of the TCJA based on the publication of regulations and guidance from the Internal Revenue Service and state tax authorities.

While the intent of TCJA was to provide for a territorial tax system, effective for taxable years beginning after January 1, 2018, taxpayers are subjected to the global intangible low-taxed income provisions, or GILTI provisions. The GILTI provisions require the Company to currently recognize in U.S. taxable income, a deemed dividend inclusion of foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. During 2018 we recorded an income tax charge of $4.4 million related to GILTI. The Company has made an accounting policy election, as allowed by the SEC and FASB, to recognize the impacts of GILTI within the period incurred. Therefore, no U.S. deferred taxes are provided on GILTI inclusions of future foreign subsidiary earnings.

Results of Operations

The following tables set forth our consolidated results of operations in dollar amounts and as percentage of total revenue for the periods shown:

	Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Revenue:			
Product	$ 256,989	$ 311,896	$ 279,223
Service	40,138	39,679	36,905
Total revenue	297,127	351,575	316,128
Cost of revenue(1):			
Product	74,350	88,538	89,340
Service	4,811	4,973	8,477
Total cost of revenue	79,161	93,511	97,817
Gross profit	217,966	258,064	218,311
Operating expenses:			
Research and development(1)	70,974	60,677	49,210
Sales and marketing(1)	41,186	39,602	36,114
General and administrative(1)	26,840	21,563	18,215
Total operating expenses	139,000	121,842	103,539
Income from operations	78,966	136,222	114,772
Other income (expense), net	(13,028)	(13,404)	921
Income before provision for (benefit from) income taxes	65,938	122,818	115,693
Provision for (benefit from) income taxes	(7,068)	34,318	27,025
Net income	$ 73,006	$ 88,500	$ 88,668

(1) Includes stock-based compensation expense related to stock options, stock appreciation rights and restricted stock units granted to employees and non-employee consultants as follows:

	Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Cost of revenue	$ 249	$ 306	$ 237
Research and development expense	1,864	2,864	2,306
Sales and marketing expense	1,229	1,112	1,147
General and administrative expense	5,552	4,854	4,614
Total stock-based compensation expense	$ 8,894	$ 9,136	$ 8,304

	Year Ended December 31, 2018	2017	2016
	(as a percentage of total revenue)		
Revenue:			
Product	86%	89%	88%
Service	14	11	12
Total revenue	100	100	100
Cost of revenue:			
Product	25	25	28
Service	2	1	3
Total cost of revenue	27	27	31
Gross profit	73	73	69
Operating expenses:			
Research and development	24	17	16
Sales and marketing	14	11	11
General and administrative	9	6	6
Total operating expenses	47	35	33
Income from operations	27	39	36
Other income (expense), net	(4)	(4)	—
Income before provision for (benefit from) income taxes	22	35	37
Provision for (benefit from) income taxes	(2)	10	9
Net income	25%	25%	28%

Percentages in the table above are based on actual values. As a result, some totals may not sum due to rounding.

Year Ended December 31, 2018 Compared to Year Ended December 31, 2017

	Year Ended December 31, 2018		2017		Change	
	Amount	% of Total	Amount	% of Total	Amount	%
	(dollars in thousands)					
Revenue:						
Product	$ 256,989	86.5%	$ 311,896	88.7%	$ (54,907)	(17.6)%
Service	40,138	13.5%	39,679	11.3%	459	1.2%
Total revenue	$ 297,127	100.0%	$ 351,575	100.0%	$ (54,448)	(15.5)%
Revenue by geographic region:						
North America	$ 146,008	49.1%	$ 201,856	57.4%	$ (55,848)	(27.7)%
Latin America	32,283	10.9%	40,347	11.5%	(8,064)	(20.0)%
Europe, Middle East and Africa	81,343	27.4%	61,458	17.5%	19,885	32.4%
Asia-Pacific	37,493	12.6%	47,914	13.6%	(10,421)	(21.7)%
Total revenue	$ 297,127	100.0%	$ 351,575	100.0%	$ (54,448)	(15.5)%

The decrease in product revenue was primarily due to a decrease in sales of our products to existing customers in North America, Latin America and Asia-Pacific as a result of a decrease in the deployment of our software-centric broadband products in their networks, which we believe was primarily due to the timing of customer expenditures on network upgrades. These decreases were partially offset by an increase in sales of our software-enabled capacity expansions to customers in Europe, Middle East and Africa.

The increase in service revenue was primarily due to a $1.0 million increase in maintenance and support services revenue due to customers renewing their maintenance and support service contracts, partially offset by a $0.5 million decrease in professional services revenue due to a decrease in customer projects requiring our assistance.

Cost of Revenue and Gross Profit

	Year Ended December 31, 2018	Year Ended December 31, 2017	Change Amount	Change %
	(dollars in thousands)			
Cost of revenue:				
Product	$ 74,350	$ 88,538	$ (14,188)	(16.0)%
Service	4,811	4,973	(162)	(3.3)%
Total cost of revenue	$ 79,161	$ 93,511	$ (14,350)	(15.3)%

The decrease in cost of product revenue was primarily due to a decrease in sales of our hardware-based broadband products for customer network upgrades.

The decrease in cost of service revenue was primarily due to a decrease in subcontracted professional services.

	Year Ended December 31, 2018		Year Ended December 31, 2017		Change	
	Amount	Gross Margin	Amount	Gross Margin	Amount	Gross Margin (bps)
	(dollars in thousands)					
Gross profit:						
Product	$ 182,639	71.1%	$ 223,358	71.6%	$ (40,719)	(50)
Service	35,327	88.0%	34,706	87.5%	621	50
Total gross profit	$ 217,966	73.4%	$ 258,064	73.4%	$ (40,098)	—

The decrease in product gross margin was primarily due to a decrease in the proportion of our product revenue derived from higher margin software-based capacity expansions.

The increase in service gross margin was due to an increase in maintenance and support services revenue and a decrease in lower-margin professional services revenue.

Research and Development

	Year Ended December 31, 2018	Year Ended December 31, 2017	Change Amount	Change %
	(dollars in thousands)			
Research and development	$ 70,974	$ 60,677	$ 10,297	17.0%
Percentage of revenue	23.9%	17.3%		

The increase in research and development expense was due to a $4.6 million increase in prototype development costs for new broadband products, a $3.2 million increase in personnel-related costs (including the effect of a $1.0 million decrease in stock based compensation expense) as a result of the increase in the headcount of our research and development personnel from 399 to 430 to support the development of our new wireless and software-centric broadband products and to enhance our existing software-centric broadband products, a $1.4 million increase in depreciation expense for research and development related assets, a $0.5 million increase in software maintenance fees and a $0.4 million increase in facilities and infrastructure expenses.

Sales and Marketing

	Year Ended December 31, 2018	Year Ended December 31, 2017	Change Amount	Change %
	(dollars in thousands)			
Sales and marketing	$ 41,186	$ 39,602	$ 1,584	4.0%
Percentage of revenue	13.9%	11.3%		

The increase in sales and marketing expense was due to a $4.4 million increase in personnel-related costs due to an increase in headcount and a $0.2 million increase in marketing costs related to trade show and event expenses, which were partially offset by a $2.9 million decrease in sales agent commissions.

General and Administrative

	Year Ended December 31,		Change	
	2018	2017	Amount	%
	(dollars in thousands)			
General and administrative	$ 26,840	$ 21,563	$ 5,277	24.5%
Percentage of revenue	9.0%	6.1%		

The increase in general and administrative expense was primarily due to a $1.8 million increase in professional fees to support the requirements of being a public company, a $1.7 million increase in legal and accounting fees, $0.8 million of costs related to our follow-on public offering in April 2018, a $0.7 million increase in stock-based compensation expense, a $0.3 million increase in other taxes and a $0.1 million increase in depreciation expense for general and administrative related assets, partially offset by a $0.4 million decrease in personnel-related costs due to a decrease in bonuses.

Other Income (Expense), Net

	Year Ended December 31,		Change	
	2018	2017	Amount	%
	(dollars in thousands)			
Other income (expense), net	$ (13,028)	$ (13,404)	$ 376	(2.8)%
Percentage of revenue	(4.4)%	(3.8)%		

The increase in other income (expense) was primarily due to a $3.8 million increase in interest income due to an increase in interest rates and an increase in our portfolio of cash equivalents and a $0.7 million increase in other income, partially offset by a $2.3 million increase in interest expense attributable to an increase of interest rates on our term loan facility and a $1.8 million increase in foreign currency losses due to a decrease in the Euro to U.S. dollar exchange rate during the year ended December 31, 2018.

Provision for (Benefit from) Income Taxes

	Year Ended December 31,		Change	
	2018	2017	Amount	%
	(dollars in thousands)			
Provision for (benefit from) income taxes	$ (7,068)	$ 34,318	$ (41,386)	(120.6)%
Effective tax rate	(10.7)%	27.9%		

The 38.6% decrease in our effective tax rate includes the recognized excess tax benefits related to the vesting of restricted stock and the exercise of non-qualified stock options and incentive stock options, as well as the impact of the research and development tax credits which increased in 2018 mainly due to the excess tax benefits from share-based compensation.

Year Ended December 31, 2017 Compared to Year Ended December 31, 2016

Revenue

	Year Ended December 31,				Change	
	2017		2016			
	Amount	% of Total	Amount	% of Total	Amount	%
	(dollars in thousands)					
Revenue:						
Product	$ 311,896	88.7%	$ 279,223	88.3%	$ 32,673	11.7%
Service	39,679	11.3%	36,905	11.7%	2,774	7.5%
Total revenue	$ 351,575	100.0%	$ 316,128	100.0%	$ 35,447	11.2%
Revenue by geographic region:						
North America	$ 201,856	57.4%	$ 183,941	58.2%	$ 17,915	9.7%
Latin America	40,347	11.5%	47,314	15.0%	(6,967)	(14.7)%
Europe, Middle East and Africa	61,458	17.5%	45,205	14.3%	16,253	36.0%
Asia-Pacific	47,914	13.6%	39,668	12.5%	8,246	20.8%
Total revenue	$ 351,575	100.0%	$ 316,128	100.0%	$ 35,447	11.2%

The increase in product revenue was primarily due to an increase in sales of our products to existing customers in North America, Asia-Pacific and Europe, Middle East and Africa as a result of an increase in the deployment of our software-centric broadband products in their networks and increased sales of software-enabled capacity expansions to provide their subscribers with greater bandwidth capacity. These increases were partially offset by a decrease in sales of our software-centric broadband products in Latin America, which we believe was primarily due to the timing of customer expenditures on network upgrades.

The increase in service revenue was primarily due to a $3.8 million increase in maintenance and support services revenue due to an increase in our installed base of customers through the addition of new customers and from customers renewing their maintenance and support service contracts, partially offset by a $1.1 million decrease in professional services revenue due to a decrease in customer projects requiring our assistance.

Cost of Revenue and Gross Profit

	Year Ended December 31,		Change	
	2017	2016	Amount	%
	(dollars in thousands)			
Cost of revenue:				
Product	$ 88,538	$ 89,340	$ (802)	(0.9)%
Service	4,973	8,477	(3,504)	(41.3)%
Total cost of revenue	$ 93,511	$ 97,817	$ (4,306)	(4.4)%

The decrease in cost of product revenue was primarily due to a decrease in the proportion of our revenue derived from our hardware-based broadband products.

The decrease in cost of service revenue was primarily due to a $2.1 million decrease in subcontracted professional services and a $1.6 million decrease in personnel-related costs as a result of the transfer of certain personnel from our service and support department to our research and development department.

	Year Ended December 31,					
	2017		2016		Change	
	Amount	Gross Margin	Amount	Gross Margin	Amount	Gross Margin (bps)
	(dollars in thousands)					
Gross profit:						
Product	$ 223,358	71.6%	$ 189,883	68.0%	$ 33,475	360
Service	34,706	87.5%	28,428	77.0%	6,278	1,050
Total gross profit	$ 258,064	73.4%	$ 218,311	69.1%	$ 39,753	430

The increase in product gross margin was primarily due to an increase in the proportion of our product revenue derived from higher margin software-based capacity expansions.

The increase in service gross margin was due to an increase in maintenance and support services revenue and a decrease in lower-margin professional services revenue.

Research and Development

	Year Ended December 31,		Change	
	2017	2016	Amount	%
	(dollars in thousands)			
Research and development	$ 60,677	$ 49,210	$ 11,467	23.3%
Percentage of revenue	17.3%	15.6%		

The increase in research and development expense was due to a $8.5 million increase in personnel-related costs (including the effect of a $0.6 million increase in stock-based compensation expense) as a result of the increase in the headcount of our research and development personnel from 328 to 399 to support the development of our new wireless and software-centric broadband products and to enhance our existing software-centric broadband products, a $1.4 million increase in depreciation expense for research and development related assets, a $1.1 million increase in prototype development costs for new broadband products and a $0.5 million increase in facilities and infrastructure expenses.

Sales and Marketing

	Year Ended December 31,		Change	
	2017	2016	Amount	%
	(dollars in thousands)			
Sales and marketing	$ 39,602	$ 36,114	$ 3,488	9.7%
Percentage of revenue	11.3%	11.4%		

The increase in sales and marketing expense was due to a $3.4 million increase in sales agent commissions and a $1.0 million increase in personnel-related costs due to an increase in headcount, which were partially offset by a $0.7 million decrease in marketing costs related to a reduction in trade show and event expenses and a $0.2 million decrease in facilities and infrastructure expenses.

General and Administrative

	Year Ended December 31,		Change	
	2017	2016	Amount	%
	(dollars in thousands)			
General and administrative	$ 21,563	$ 18,215	$ 3,348	18.4%
Percentage of revenue	6.1%	5.8%		

The increase in general and administrative expense was primarily due to a $3.3 million increase in personnel-related costs due to an increase in headcount to support the continued growth in our business.

Other Income (Expense), Net

	Year Ended December 31,		Change	
	2017	2016	Amount	%
	(dollars in thousands)			
Other income (expense), net	$ (13,404)	$ 921	$ (14,325)	1555.4%
Percentage of revenue	(3.8)%	0.3%		

The change from a net other income of $0.9 million to a net other expense of $13.4 million was primarily due to a $16.6 million increase in interest expense attributable to our term loan facility entered into in December 2016, partially offset by a $1.2 million increase in interest income due to an increase in interest rates and an increase in our portfolio of cash equivalents and a $1.2 million increase in foreign currency gains due to appreciation of the Euro and the impact thereof on our foreign-denominated cash and receivables.

Provision for Income Taxes

	Year Ended December 31,		Change	
	2017	2016	Amount	%
	(dollars in thousands)			
Provision for income taxes	$ 34,318	$ 27,025	$ 7,293	27.0%
Effective tax rate	27.9%	23.4%		

The 4.5% increase in our effective tax rate includes the impact of the TCJA that resulted in an 11.5% increase in our effective tax rate, which was partially offset by an increase in the benefit of the foreign rate differential of 5.0% due to the restructuring of our international operations and an increase in research and development tax credits.

Liquidity and Capital Resources

Since our inception, we have primarily funded our operations through issuances of shares of our convertible preferred stock and cash flows from operations. In addition, on December 20, 2016, we entered into a credit agreement that included a term loan facility under which we borrowed $300.0 million and in December 2017, we closed our initial public offering, or IPO, of 6,900,000 shares of common stock and received net proceeds of $79.3 million, after deducting underwriting discounts, commissions and offering costs. The following tables set forth our cash, cash equivalents and marketable securities and working capital as of December 31, 2018, 2017 and 2016 as well as our net cash flows for the years ended December 31, 2018, 2017 and 2016:

	As of December 31,		
	2018	2017	2016
	(in thousands)		
Consolidated Balance Sheet Data:			
Cash and cash equivalents	$ 280,587	$ 260,820	$ 343,946
Working capital	328,400	324,710	286,652

	Year Ended December 31,		
	2018	2017	2016
	(in thousands)		
Consolidated Cash Flow Data:			
Net cash provided by operating activities	$ 98,545	$ 95,008	$ 110,780
Net cash (used in) provided by investing activities	(7,966)	7,575	(21,811)
Net cash (used in) provided by financing activities	(68,351)	(172,661)	149,368

As of December 31, 2018, we had cash and cash equivalents of $280.6 million and net accounts receivable of $84.2 million. We maintain a $25.0 million revolving credit facility, which was unused as of December 31, 2018.

Of our total cash and cash equivalents of $280.6 million as of December 31, 2018, $77.1 million was held by our foreign subsidiaries. The TCJA established a modified territorial system requiring a mandatory deemed repatriation tax on undistributed earnings of foreign subsidiaries. In December 2017, we recorded a provisional charge related to a one-time deemed repatriation of accumulated earnings of foreign subsidiaries and related withholding taxes. As a result, applicable U.S. corporate and foreign income taxes have been provided on substantially all of our accumulated earnings of foreign subsidiaries previously considered indefinitely reinvested. Beginning in 2018, the TCJA also requires a minimum tax on certain future earnings generated by foreign subsidiaries while providing future tax-free repatriation of such earnings through a 100% dividends-received deduction. The Company's accounting for the impacts of the TCJA is complete as of December 31, 2018, and the Company has not recorded any material adjustments to the provisional amounts recorded in the fourth quarter of 2017 related to the TCJA. Although the Company no longer considers these amounts provisional, the determination of the TCJA's income tax effects may change as a result of future legislation or further interpretation of the TCJA based on the publication of regulations and guidance from the Internal Revenue Service and state tax authorities.

While the intent of TCJA was to provide for a territorial tax system, effective for taxable years beginning after January 1, 2018, taxpayers are subjected to the GILTI provisions. The GILTI provisions require the Company to currently recognize in U.S. taxable income, a deemed dividend inclusion of foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. During 2018 we recorded an income tax charge of $4.4 million related to GILTI. The Company has made an accounting policy election, as allowed by the SEC and FASB, to recognize the impacts of GILTI within the period incurred. Therefore, no U.S. deferred taxes are provided on GILTI inclusions of future foreign subsidiary earnings.

We believe our existing cash and cash equivalents, anticipated cash flows from future operations and liquidity available from our revolving credit facility will be sufficient to meet our working capital and capital expenditure needs and debt service obligations for at least the next 12 months. Our future capital requirements may vary materially from those currently planned and will depend on many factors, including our rate of revenue growth, the timing and extent of spending on research and development efforts and other business initiatives, purchases of capital equipment to support our growth, the expansion of sales and marketing activities, expansion of our business through acquisitions or our investments in complementary products, technologies or businesses, the use of working capital to purchase additional inventory, the timing of new product introductions, market acceptance of our products and overall economic conditions. To the extent that current and anticipated future sources of liquidity are insufficient to fund our future business activities and requirements, we may be required to seek additional equity or debt financing. In the event additional financing is required from outside sources, we may not be able to raise it on terms acceptable to us or at all.

From our inception through December 31, 2018, our board of directors has declared a special dividend on five separate occasions and has approved cash payments to the holders of our stock options, stock appreciation rights, or SARs, and restricted stock units, or RSUs, as equitable adjustments in connection with these special dividends. The dividend payments totaled $0.9 million, $206.4 million and $137.4 million in the years ended December 31, 2018, 2017 and 2016, respectively. The equitable adjustment payments totaled $7.3 million, $40.2 million and $4.9 million in the years ended December 31, 2018, 2017 and 2016, respectively. As of December 31, 2018, there were $3.3 million of equitable adjustment payments that had been approved by our board of directors that had not yet been paid to the holders of our stock options, SARs and RSUs. These equitable adjustment payments will be paid to the holders of the applicable equity awards as they vest through 2021. We do not anticipate declaring cash dividends in the foreseeable future. Any future determination to declare dividends will be subject to the discretion of our board of directors and applicable law, and will depend on various factors, including our results of operations, financial condition, prospects and any other factors deemed relevant by our board of directors.

Cash Flows

Operating Activities

Our primary source of cash from operating activities has been from cash collections from our customers. We expect cash inflows from operating activities to be affected by increases in sales and timing of collections and by purchases and shipments of inventory. Our primary uses of cash from operating activities have been for personnel costs and investment in sales and marketing and research and development. We expect cash outflows from operating activities to increase as a result of further investment in research and development and sales and marketing and increases in personnel costs as we continue to enhance our products and introduce new products in an effort to continue to expand our business.

During the year ended December 31, 2018, cash provided by operating activities was $98.5 million, primarily resulting from our net income of $73.0 million, net non-cash gains of $0.7 million, and by net cash provided by changes in our operating assets and liabilities of $24.9 million. The net cash provided by changes in our operating assets and liabilities during the year ended December 31, 2018 was primarily due to a $34.7 million decrease in accounts receivable due to a decrease in sales and timing of the related collections; a $6.1 million increase in accrued expenses due to the timing of payments; and a $4.2 million increase in accounts payable primarily attributable to timing of our payments for purchases of inventory. These inflows of cash were partially offset by a $11.1 million increase in inventory due to anticipated growth in our business; a $5.1 million decrease in deferred revenue primarily due to recognition of $6.2 million of revenue upon the product acceptance by a customer in Asia-Pacific, partially offset by the deferral of revenue for customer acceptance; a $3.1 million decrease in accrued income taxes primarily due to federal research and development tax credits generated in 2018 which the Company will carryback to reduce its long-term taxes payable related to the deemed repatriation tax under the TCJA; and a $1.1 million increase in prepaid expenses and other current assets.

During the year ended December 31, 2017, cash provided by operating activities was $95.0 million, primarily resulting from our net income of $88.5 million and net non-cash charges of $32.4 million, both partially offset by net cash used by changes in our operating assets and liabilities of $25.9 million. The net cash used by changes in our operating assets and liabilities during the year ended December 31, 2017 was primarily due to a $25.7 million increase in accounts receivable due to an increase in sales and timing of the related collections; a $25.6 million decrease in deferred revenue primarily due to recognition of $14.4 million of revenue upon the product acceptance by a customer in Asia-Pacific and recognition of $8.5 million of revenue upon the expiration of a trade-in right for a customer in North America; a $6.5 million decrease in accounts payable primarily attributable to timing of our payments for purchases of inventory; and a $3.2 million decrease in accrued income taxes due to the timing of payments. These uses of cash were partially offset by a $21.9 million decrease in inventory due to shipments of our software-centric broadband products to customers; a $10.2 million increase in accrued expenses and other current liabilities, which included an increase of $8.4 million for accrued customer incentives; and a $3.5 million decrease in prepaid expenses and other current assets.

During the year ended December 31, 2016, cash provided by operating activities was $110.8 million, primarily resulting from our net income of $88.7 million, net non-cash charges of $9.1 million and net cash provided by changes in our operating assets and liabilities of $13.0 million. The net cash provided by changes in our operating assets and liabilities during the year ended December 31, 2016 was primarily due to a $17.3 million increase in deferred revenue due to the deferral of the revenue recognition for certain sales transactions due to customer acceptance provisions or future delivery obligations and an increase in sales of maintenance and support service contracts as a result of an increase in our installed base; a $15.8 million increase in accrued expenses and other current liabilities, which included an increase of $15.4 million for accrued customer incentives; a $14.5 million increase in accounts payable primarily attributable to timing of our payments for purchases of inventory; and a $6.9 million increase in accrued income taxes as a result of an increase in taxable income. These sources of cash were partially offset by a $22.8 million increase in inventory due to the anticipated growth in our business and a $16.3 million increase in accounts receivable due to an increase in sales and timing of the related collections.

Investing Activities

Our investing activities have consisted primarily of expenditures for lab and computer equipment and software to support the development of new products and increase our manufacturing capacity to meet customer demand for our products. In addition, our investing activities include expansion of and improvements to our facilities. As our business expands, we expect that we will continue to invest in these areas.

Net cash used in investing activities during the year ended December 31, 2018 was $8.0 million and consisted of purchases of property and equipment.

Net cash provided by investing activities during the year ended December 31, 2017 was $7.6 million and consisted of $14.6 million of proceeds from maturities of marketable securities, partially offset by $7.0 million for purchases of property and equipment.

Net cash used in investing activities during the year ended December 31, 2016 was $21.8 million and consisted of $14.4 million for purchases of marketable securities and $7.4 million for purchases of property and equipment.

Financing Activities

Net cash used in financing activities during the year ended December 31, 2018 was $68.3 million and consisted of repurchases of common stock of $75.1 million, dividend and equitable adjustment payments of $7.3 million, debt principal repayments of $3.3 million and offering costs of $1.1 million, partially offset by proceeds from the exercise of stock options of $14.7 million and profit disgorgement of $3.8 million by certain selling stockholders in our follow-on public offering.

Net cash used in financing activities during the year ended December 31, 2017 was $172.7 million and consisted primarily of dividend and equitable adjustment payments of $246.6 million, payment of taxes on behalf of our employees related to net share settlement of equity awards of $4.0 million, principal repayments of our term loan facility and commercial mortgage of $3.3 million and payments of initial public offering costs of $2.4 million, partially offset by proceeds received from our initial public offering, net of underwriting discounts and commissions, of $83.4 million and proceeds from the exercise of stock options of $0.3 million.

Net cash provided by financing activities during the year ended December 31, 2016 was $149.4 million and consisted primarily of net proceeds from borrowings under our term loan facility of $292.2 million and proceeds from the exercise of stock options of $0.6 million, both partially offset by dividend and equitable adjustment payments of $142.3 million and payments of initial public offering costs of $0.5 million.

Commercial Mortgage Loan

In July 2015, we entered into an $8.0 million commercial mortgage loan agreement. The annual interest rate on the loan is 3.5%, and the loan is repayable in 60 monthly installments of principal and interest based on a 20-year amortization schedule. The loan is secured by the land and building, which are our corporate offices, purchased in March 2015, and contains annual affirmative, negative and financial covenants, including maintenance of a minimum debt service ratio. We were in compliance with all the covenants of the mortgage loan as of December 31, 2018 and 2017. As of December 31, 2018 and 2017, the outstanding principal amount under the mortgage loan was $7.0 million and $7.3 million, respectively.

Term Loan and Revolving Credit Facilities

On December 20, 2016, we entered into a credit agreement with JPMorgan Chase Bank, N.A., as administrative agent, various lenders and JPMorgan Chase Bank, N.A. and Barclays Bank PLC, as joint lead arrangers and joint bookrunners, providing for:

- a term loan facility of $300.0 million and
- a revolving credit facility of up to $25.0 million in revolving credit loans and letters of credit.

As of December 31, 2018 and 2017, we had borrowings of $294.0 million and $297.0 million, respectively, outstanding under the term loan facility and we did not have any outstanding borrowings under the revolving credit facility; however, as of December 31, 2017, we had used $1.0 million under the revolving credit facility for a stand-by letter of credit that served as collateral for a stand-by letter of credit issued by Bank of America to one of our customers pursuant to a contractual performance guarantee. As of December 31, 2018, the stand-by letter of credit that served as collateral was terminated, and we did not use any amount under the revolving credit facility. In addition, we may, subject to certain conditions, including the consent of the administrative agent and the institutions providing such increases, increase the facilities by an unlimited amount so long as we are in compliance with specified leverage ratios, or otherwise by up to $70.0 million.

Borrowings under the facilities bear interest at a floating rate, which can be either a Eurodollar rate plus an applicable margin or, at our option, a base rate (defined as the highest of (x) the JPMorgan Chase, N.A. prime rate, (y) the federal funds effective rate, plus one-half percent (0.50%) per annum and (z) a one-month Eurodollar rate plus 1.00% per annum) plus an applicable margin. The applicable margin for borrowings under the term loan facility is 4.00% per annum for Eurodollar rate loans (subject to a 1.00% per annum interest rate floor) and 3.00% per annum for base rate loans. As a result of the completion of our initial public offering in December 2017, the applicable margin for borrowings under the revolving credit facility is 1.75% per annum for Eurodollar rate loans and 0.75% per annum for base rate loans, subject to reduction based on our maintaining of specified net leverage ratios. The interest rates payable under the facilities are subject to an increase of 2.00% per annum during the continuance of any payment default.

For Eurodollar rate loans, we may select interest periods of one, two, three or six months or, with the consent of all relevant affected lenders, twelve months. Interest will be payable at the end of the selected interest period, but no less frequently than every three months within the selected interest period. Interest on any base rate loan is not set for any specified period and is payable quarterly. We have the right to convert Eurodollar rate loans into base rate loans and the right to convert base rate loans into Eurodollar rate loans at our option, subject, in the case of Eurodollar rate loans, to prepayment penalties if the conversion is effected prior to the end of the applicable interest period. As of December 31, 2018, the interest rate on our borrowings under the term loan facility was 6.52% per annum, which was based on a one-month Eurodollar rate of 2.52% per annum plus the applicable margin of 4.00% per annum for Eurodollar rate loans. As of December 31, 2017, the interest rate on the term loans was 5.69% per annum, which was based on a three-month Eurodollar rate at the applicable floor of 1.69% per annum plus the applicable margin of 4.00% per annum for Eurodollar rate loans.

The revolving credit facility also requires payment of quarterly commitment fees at a rate of 0.25% per annum on the difference between committed amounts and amounts actually borrowed under the facility and customary letter of credit fees.

The term loan facility matures on December 20, 2023 and the revolving credit facility matures on December 20, 2021. The term loan facility is subject to amortization in equal quarterly installments, which commenced on March 31, 2017, of principal in an annual aggregate amount equal to 1.0% of the original principal amount of the term loans of $300.0 million, with the remaining outstanding balance payable at the date of maturity.

Voluntary prepayments of principal amounts outstanding under the term loan facility are permitted at any time; however, if a prepayment of principal is made with respect to a Eurodollar loan on a date other than the last day of the applicable interest period, we are required to compensate the lenders for any funding losses and expenses incurred as a result of the prepayment. Prior to the revolving credit facility maturity date, funds borrowed under the revolving credit facility may be borrowed, repaid and reborrowed, without premium or penalty.

In addition, we are required to make mandatory prepayments under the facilities with respect to (i) 100% of the net cash proceeds from certain asset dispositions (including casualty and condemnation events) by us or certain of our subsidiaries, subject to certain exceptions and reinvestment provisions, (ii) 100% of the net cash proceeds from the issuance or incurrence of any additional debt by us or certain of our subsidiaries, subject to certain exceptions, and (iii) 50% of our excess cash flow, as defined in the credit agreement, subject to reduction upon our achievement of specified performance targets.

The facilities are secured by, among other things, a first priority security interest, subject to permitted liens, in substantially all of our assets and all of the assets of certain of our subsidiaries and a pledge of certain of the stock of certain of our subsidiaries, in each case subject to specified exceptions. The facilities contain customary affirmative and negative covenants, including certain restrictions on our ability to pay dividends, and, with respect to the revolving credit facility, a financial covenant requiring us to maintain a specified total net leverage ratio in the event that on the last day of any fiscal quarter we have utilized more than 30% of our borrowing capacity under the facility. We were in compliance with all of the applicable covenants of the facilities as of December 31, 2018 and 2017. As of December 31, 2018 and 2017, we had not utilized more than 30% of our borrowing capacity under the revolving credit facility and compliance with the financial covenant was not applicable.

In connection with entering into the facilities in December 2016, we terminated our revolving credit facility with Bank of America. We did not have any outstanding borrowings under the Bank of America revolving credit facility at the time of termination.

Stock Repurchase Program

On August 14, 2018, we announced that our board of directors authorized the repurchase of up to $75.0 million of our common stock. During the year ended December 31, 2018, we repurchased and retired 5.2 million shares of our common stock for $75.0 million, before commissions. Stock repurchases under this program are now complete. The stock repurchase program had no expiration date, did not require us to purchase a minimum number of shares, and was able to be suspended, modified or discontinued at any time without prior notice.

Contractual Obligations and Commitments

The following table summarizes our contractual obligations and commitments as of December 31, 2018.

	Payments Due by Period				
	Total	Less than 1 Year	1 to 3 Years	3 to 5 Years	More than 5 Years
			(in thousands)		
Debt obligations—Term loans(1)	$ 388,907	$ 22,368	$ 44,193	$ 43,346	$ 279,000
Debt obligations—Commercial mortgage(2)	7,336	556	6,780	—	—
Operating leases(3)	2,668	911	1,680	77	—
Total	$ 398,911	$ 23,835	$ 52,653	$ 43,423	$ 279,000

(1) Amounts in the table reflect the contractually required principal and interest payable pursuant to outstanding borrowings under our term loan facility. For purposes of this table, the interest due under the term loan facility was calculated using an assumed interest rate of 6.52% per annum, which was the interest rate in effect as of December 31, 2018.

(2) Amounts in the table reflect the contractually required principal and interest payable pursuant to outstanding borrowings under our commercial mortgage.

(3) Amounts in the table reflect payments due for our lease of manufacturing, warehouse and office space in the United States, China, Spain and Ireland under non-cancelable operating leases that expire in 2021, 2022, 2022 and 2026, respectively. The Ireland lease provides us the right to terminate in 2021.

We enter into purchase agreements with our contract manufacturers and suppliers, generally with terms of a year or more. We have no minimum purchase requirements under these agreements.

The contractual obligations table above excludes $1.9 million of long-term taxes payable related to the mandatory deemed repatriation tax on undistributed earnings of foreign subsidiaries under the TCJA.

Critical Accounting Policies and Significant Judgments and Estimates

Our management's discussion and analysis of financial condition and results of operations is based on our consolidated financial statements included elsewhere in this Annual Report on Form 10-K, which have been prepared in accordance with accounting principles generally accepted in the United States of America, or GAAP. In preparing our consolidated financial statements, we make estimates, assumptions and judgments that can have a significant effect on our reported revenue, results of operations and net income or loss, as well as on the value of certain assets and liabilities on our balance sheet during and as of the reporting periods. These estimates, assumptions and judgments are necessary because future events and their effects on our results and the value of our assets cannot be determined with certainty and are made based on our historical experience and on other assumptions that we believe to be reasonable under the circumstances. We evaluate our estimates and assumptions on an ongoing basis. These estimates may change as new events occur or additional information is obtained, and we may periodically be faced with uncertainties, the outcomes of which are not within our control and may not be known for a prolonged period of time. As the use of estimates is inherent in the financial reporting process, actual results could differ from those estimates.

While our significant accounting policies are described in more detail in Note 2 to our consolidated financial statements included elsewhere in this Annual Report on Form 10-K, we believe that the following accounting policies are those most critical to the judgments and estimates used in the preparation of our consolidated financial statements.

Revenue Recognition

We generate revenue from sales of our broadband products, along with associated maintenance and support services, and, to a lesser extent, from sales of professional services and extended warranty services. We also generate revenue from sales of additional line cards and software-based capacity expansions. Maintenance and support services include telephone support and unspecified software upgrades and updates provided on a when-and-if-available basis.

In our consolidated statements of operations and comprehensive income, revenue from sales of broadband products and capacity expansions is classified as product revenue, and revenue from maintenance and support, professional services and extended warranty services is classified as service revenue.

We recognize revenue from sales when the following revenue recognition criteria are met:

- *Persuasive evidence of an arrangement exists*. Binding contracts and/or customer purchase orders are generally evidence of an arrangement. For professional services, evidence of an arrangement may also include information documenting the scope of work to be performed, and customer acceptance terms, if any.
- *Delivery has occurred*. For broadband products, shipping documents and customer acceptance, if applicable, verify that delivery has occurred. For software-enabled capacity expansions, delivery occurs when the additional bandwidth capacity is made available to the customer. For professional services, delivery occurs as the services are completed.
- *The sales price is fixed or determinable*. The sales price is considered fixed or determinable when the fees have been contractually agreed with the customer and are not deemed to be subject to refund, adjustment or future discounts, and when the payment terms of the transaction do not extend beyond our customary payment terms, which are one year or less.
- *Collectibility is reasonably assured*. We assess the ability to collect from our customers based on a number of factors that generally include information supplied by credit agencies, references and/or analysis of customer accounts and payment history. If collection from a customer is not considered reasonably assured, all revenue related to the customer arrangement is deferred until payment is received and all other revenue recognition criteria have been met.

When customer acceptance of the product is required and is other than perfunctory, revenue for the entire customer arrangement is deferred until the acceptance has been received.

Our products have both software and non-software (i.e., hardware) components that function together to deliver the products' essential functionality. In addition, the hardware sold generally cannot be used apart from the embedded software. As a result, all of our product and service offerings are excluded from the scope of software revenue recognition requirements and instead fall within the scope of ASC Topic 605, *Revenue Recognition*.

Many of our sales involve multiple-deliverable arrangements that include products and maintenance and support services and, on a limited basis, may also include professional services and extended warranty services. We have determined that our products, maintenance and support services, professional services and extended warranty services have standalone value to the customer because each of these deliverables is sold separately to our customers or, in the case of professional services, is sold separately by other vendors. As a result, we treat each of these deliverables as a separate unit of accounting for purposes of allocating the arrangement fee and recognizing the revenue of each unit.

For our multiple-deliverable arrangements, we allocate the arrangement fee to each deliverable based on the relative selling prices of each of the deliverables in the arrangement using the selling price hierarchy. In such circumstances, we determine the selling price of each deliverable based on vendor-specific objective evidence, or VSOE, of selling price, if it exists; otherwise, third-party evidence, or TPE, of selling price. If neither VSOE nor TPE exists, we use our best estimate of the selling price, or BESP, for the deliverable. We limit the amount of the arrangement fee allocated to deliverables to the amount that is not contingent on the future delivery of products or services or future performance obligations and the amount that is not subject to customer-specific return or refund privileges.

To date, we have not been able to establish VSOE of selling price of any of our products, maintenance and support services, professional services or extended warranty services because we have not established a history of consistently pricing each product or service within a narrow range. In addition, we are not able to determine TPE of selling price for our products or services because our various product and service offerings contain a significant level of differentiation and, therefore, comparable pricing of competitors' products and services with similar functionality cannot be obtained. As we are unable to establish selling price using VSOE or TPE, we use BESP to allocate the arrangement fee to products, maintenance and support services, professional services and extended warranty services in multiple-deliverable arrangements. The objective of BESP is to determine the price at which we would transact a sale if a product or service was sold on a standalone basis. We determine BESP of selling price for our products and services by considering multiple factors, including, but not limited to, our historical pricing practices by customer type and geographic-specific market factors.

Revenue from product sales is recognized upon delivery to the customer, or upon the later receipt of customer acceptance of the product when such acceptance is required.

Revenue from maintenance and support services is recognized ratably over the contract period, which is typically one year, but can be as long as three or five years. When customer acceptance of a product is required, the recognition of any associated maintenance and support services revenue commences only upon customer acceptance of the associated product. Revenue from extended warranty services is recognized ratably over the contract period, which is typically one to three years.

Revenue from professional services is recognized as the services are performed. Professional services generally include installation or configuration services that are not deemed to be essential to the functionality of the products. When customer acceptance is required, the recognition of any associated professional services revenue is deferred until the associated product and/or professional service is accepted by the customer.

Resellers

We market and sell our products through our direct global sales force, supported by sales agents, and through resellers. Our resellers receive an order from an end customer prior to placing an order with us, and we confirm the identification of or are aware of the end customer prior to accepting such order. We invoice the reseller an amount that reflects a reseller discount and record revenue based on the amount of the discounted arrangement fee. Our resellers do not stock inventory received from us.

When we transact with a reseller, our contractual arrangement is with the reseller and not with the end customer. Whether we transact business with and receive the order from a reseller or directly from an end customer, our revenue recognition policy and resulting pattern of revenue recognition for the order are the same.

We also use sales agents that assist us in the sales process with certain customers primarily located in the Latin America and Asia-Pacific regions. Sales agents are not resellers. If a sales agent is engaged in the sales process, we receive the order directly from and sell the products and services directly to the end customer, and we pay a commission to the sales agent, calculated as a percentage of the related customer payment. Sales agent commissions are recorded as expenses when incurred and are classified as sales and marketing expenses in our consolidated statements of operations and comprehensive income.

Deferred Revenue

Amounts billed in excess of revenue recognized are recorded as deferred revenue. Deferred revenue includes customer deposits, amounts billed for maintenance and support services contracts in advance of services being performed, amounts for trade-in right liabilities and amounts related to arrangements that have been deferred as a result of not meeting the required revenue recognition criteria as of the end of the reporting period. Deferred revenue expected to be recognized as revenue more than one year subsequent to the balance sheet date is reported within long-term liabilities in our consolidated balance sheets.

When the payment terms of a customer order extend beyond our customary payment terms, which are one year or less, we consider the arrangement to be an extended payment term arrangement and conclude that the sales price is not fixed or determinable for revenue recognition purposes. In these circumstances, we defer all revenue of the arrangement and only recognize revenue to the extent of the payment amounts that become due, provided that all other revenue recognition criteria have been met.

We defer recognition of incremental direct costs, such as cost of goods and services, until recognition of the related revenue. Such costs are classified as current assets if the related deferred revenue is classified as current, and such costs are classified as non-current assets if the related deferred revenue is classified as non-current.

Other Revenue Recognition Policies

In limited instances, we have offered future rebates to customers based on a fixed or variable percentage of actual sales volumes over specified periods. The future rebates earned based on the customer’s purchasing from us in one period may be used as credits to be applied by them against accounts receivable due to us in later periods. We account for these future rebates as a reduction of the revenue recorded for the customer’s current purchasing activity giving rise to the future rebates. The liability for these future rebates is recorded as accrued customer incentives (within accrued expenses and other current liabilities) until the credits have been applied by the customer against accounts receivable due to us or the credits expire.

When future trade-in rights are granted to customers at the time of sale, we defer a portion of the revenue recognized for the sale and account for it as a guarantee at fair value until the trade-in right is exercised or the right expires, in accordance with ASC Topic 460, *Guarantees*. Determining the fair value of the trade-in right requires us to estimate the probability of the trade-in right being exercised and the future value of the product upon trade-in. We assess and update these estimates at each reporting period, and our updates to these estimates may result in either an increase or decrease in the amount of revenue deferred.

Billings to customers for shipping costs and reimbursement of out-of-pocket expenses, including travel, lodging and meals, are recorded as revenue, and the associated costs incurred by us for those items are recorded as cost of revenue.

We exclude any taxes assessed by a governmental authority that are directly imposed on a revenue-producing transaction (e.g., sales, use and value added taxes) from our revenue and costs.

Inventories

Inventories are valued at the lower of cost or market value. Cost is computed using the first-in first-out convention. Inventories are composed of hardware and related component parts of finished goods. We establish provisions for excess and obsolete inventories after evaluating historical sales, future demand, market conditions, expected product life cycles, and current inventory levels to reduce such inventories to their estimated net realizable value. Such provisions are made in the normal course of business and charged to cost of revenue in our consolidated statements of operations and comprehensive income.

Deferred inventory costs are included within inventory in our consolidated balance sheets. Deferred inventory costs represent the cost of products that have been delivered to the customer for which revenue associated with the arrangement has been deferred as a result of not meeting all of the required revenue recognition criteria, such as receipt of customer acceptance. Until the revenue recognition criteria are met, we retain the right to a return of the underlying inventory. Deferred inventory costs are recognized as cost of revenue in our consolidated statements of operations and comprehensive income when the related revenue is recognized.

Product Warranties

Substantially all of our products are covered by a warranty for software and hardware for periods ranging from 90 days to one year. In addition, in conjunction with customers' renewals of maintenance and support contracts, we offer an extended warranty for periods typically of one to three years for agreed-upon fees. In the event of a failure of a hardware product or software covered by these warranties, we must repair or replace the software or hardware or, if those remedies are insufficient, provide a refund at our discretion. Our warranty reserve, which is included in accrued expenses and other current liabilities in our consolidated balance sheets, reflects estimated material, labor and other costs related to potential or actual software and hardware warranty claims for which we expect to incur an obligation. Our estimates of anticipated rates of warranty claims and the costs associated therewith are primarily based on historical information and future forecasts. We periodically assess the adequacy of the warranty reserve and adjust the amount as necessary. If the historical data used to calculate the adequacy of the warranty reserve are not indicative of future requirements, additional or reduced warranty reserves may be required.

Derivative Instruments

We have certain international customers that are billed in foreign currencies. To mitigate the volatility related to fluctuations in the foreign exchange rates for accounts receivable denominated in foreign currencies, we enter into foreign currency forward contracts. We do not use derivative financial instruments for speculative purposes. As of December 31, 2018, we had foreign currency forward contracts outstanding with notional amounts totaling 25.7 million euros maturing in the fiscal year ending December 31, 2019. As of December 31, 2017, we had foreign currency forward contracts outstanding with notional amounts totaling 5.9 million euros maturing in the fiscal year ending December 31, 2018.

Our foreign currency forward contracts economically hedge certain risk but are not designated as hedges for financial reporting purposes, and accordingly, all changes in the fair value of these derivative instruments are recorded as unrealized foreign currency transaction gains or losses in our consolidated statements of operations and comprehensive income as a component of other income (expense). We record all derivative instruments in the consolidated balance sheet at their fair values. As of December 31, 2018, we recorded an asset of $0.3 million and as of December 31, 2018 and 2017, we recorded a liability of $0.3 million and $0.2 million, respectively, related to outstanding foreign currency forward contracts, which were included in prepaid expenses and other current assets and in accrued expenses and other current liabilities, respectively, in the consolidated balance sheet. No asset was recorded as of December 31, 2017.

Income Taxes

We account for income taxes using the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of temporary differences between the financial statement and tax basis of assets and liabilities, as measured by enacted tax rates anticipated to be in effect when these differences reverse. This method also requires the recognition of future tax benefits to the extent that realization of such benefits is more likely than not. Deferred tax expense or benefit is the result of changes in the deferred tax assets and liabilities. We assess the likelihood that our deferred tax assets will be recovered from future taxable income and, to the extent we believe, based upon the weight of available evidence, that it is more likely than not that all or a portion of the deferred tax assets will not be realized, we establish a valuation allowance through a charge to income tax expense. We evaluate the potential for recovery of deferred tax assets by estimating the future taxable profits expected and considering prudent and feasible tax planning strategies.

We record a liability for potential payments of taxes to various tax authorities related to uncertain tax positions and other tax matters. The recorded liability is based on a determination of whether and how much of a tax benefit in our tax filings or positions is more likely than not to be realized. The amount of the benefit that may be recognized in the financial statements is the largest amount that has a greater than 50% likelihood of being realized upon ultimate settlement. To the extent that the assessment of such tax positions changes, the change in estimate is recorded in the period in which the determination is made. We establish a liability, which is included in accrued income taxes in our consolidated balance sheets, for tax-related uncertainties based on estimates of whether, and the extent to which, additional taxes will be due. These liabilities are established when we believe that certain positions might be challenged despite our belief that the tax return positions are fully supportable. We adjust the recorded liability in light of changing facts and circumstances. Our provision for income taxes includes the impact of the recorded liability and changes thereto.

We recognize interest and penalties related to uncertain tax positions within other income (expense) in our consolidated statements of operations and comprehensive income. Accrued interest and penalties are included in accrued income taxes in our consolidated balance sheets.

On December 22, 2017, the TCJA was enacted which, among other things, lowered the U.S. corporate income tax rate to 21% from 35%, repealed the domestic production activity deductions, limited the deductibility of certain executive compensation and interest expense, and established a modified territorial system requiring a mandatory deemed repatriation tax on undistributed earnings of foreign subsidiaries. Beginning in 2018, the TCJA also requires a minimum tax on certain future earnings generated by foreign subsidiaries while providing for future tax-free repatriation of such earnings through a 100% dividends-received deduction. While the reduction in the U.S. corporate tax rate under the TCJA is not effective until 2018, under GAAP, changes in tax rates are accounted for in the period enacted. As a result of the TCJA, applicable U.S. and foreign taxes have been provided on substantially all of our accumulated earnings of foreign subsidiaries previously considered indefinitely reinvested. The Company's accounting for the impacts of the TCJA is complete as of December 31, 2018, and the Company has not recorded any material adjustments to the provisional amounts recorded in the fourth quarter of 2017 related to the TCJA. Although the Company no longer considers these amounts provisional, the determination of the TCJA's income tax effects may change as a result of future legislation or further interpretation of the TCJA based on the publication of regulations and guidance from the Internal Revenue Service and state tax authorities.

While the intent of TCJA was to provide for a territorial tax system, effective for taxable years beginning after January 1, 2018, taxpayers are subjected to the GILTI provisions. The GILTI provisions require the Company to currently recognize in U.S. taxable income a deemed dividend inclusion of foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. During 2018 we recorded an income tax charge of $4.4 million related to GILTI. The Company has made an accounting policy election, as allowed by the SEC and FASB, to recognize the impacts of GILTI within the period incurred. Therefore, no U.S. deferred taxes are provided on GILTI inclusions of future foreign subsidiary earnings.

Stock-Based Compensation

We measure stock options and other stock-based awards granted to employees and directors based on the fair value on the date of the grant and recognize compensation expense of those awards, net of estimated forfeitures, over the requisite service period, which is generally the vesting period of the respective award. Generally, we issue stock options with only service-based vesting conditions and record the expense for these awards using the straight-line method.

For stock-based awards granted to non-employee consultants, compensation expense is recognized over the period during which services are rendered by such non-employee consultants until completed. At the end of each financial reporting period prior to completion of the service, the fair value of these awards is remeasured using the then-current fair value of our common stock and updated assumption inputs in the Black-Scholes option-pricing model.

We have also granted SARs to certain employees, which require us to pay in cash upon exercise an amount equal to the product of the excess of the per share fair market value of our common stock on the date of exercise over the exercise price, multiplied by the number of shares of common stock with respect to which the SAR is exercised. Because these awards may require us to settle the awards in cash, they are accounted for as a liability in our consolidated balance sheets. The liability related to these awards, as well as related compensation expense, is recognized over the period during which services are rendered until completed. Changes in the fair value of the SAR liability are estimated using the Black-Scholes option pricing model and are recorded in our consolidated statements of operations and comprehensive income. After vesting is completed, we will continue to remeasure the fair market value of the liability until the award is either exercised or canceled, with changes in the fair value of the liability recorded in our consolidated statements of operations and comprehensive income.

We estimate the fair value of each stock option and SAR grant using the Black-Scholes option-pricing model, which uses as inputs the fair value of our common stock and assumptions we make for the volatility of our common stock, the expected term of the award, the risk-free interest rate for a period that approximates the expected term of our stock options and our expected dividend yield.

Determination of Fair Value of Common Stock on Grant Dates prior to our Initial Public Offering

Given the absence of an active market for our common stock prior to our initial public offering, the estimated fair value of our common stock was determined by our board of directors at the time of each award grant based upon several factors, including its consideration of input from management, our most recently available third-party valuations of common stock and our board of directors' assessment of additional objective and subjective factors that it believed were relevant and which may have changed from the date of the most recent valuation through the date of the grant. These third-party valuations were performed in accordance with the guidance outlined in the American Institute of Certified Public Accountants' Accounting and Valuation Guide, *Valuation of Privately-Held-Company Equity Securities Issued as Compensation* using either the hybrid method or the option-pricing method, or OPM, which used a combination of income and market approaches to estimate our enterprise value. Cash is added and interest-bearing debt is subtracted from the estimated enterprise value in order to estimate the underlying equity value. The hybrid method is a probability-weighed expected return method, or PWERM, where the equity value in one or more of the scenarios is allocated using an OPM. The OPM treats common stock and preferred stock as call options on the total equity value of a company, with exercise prices based on the value thresholds at which the allocation among the various holders of a company's securities changes. Under this method, the common stock has value only if the funds available for distribution to stockholders exceed the value of the preferred stock liquidation preferences at the time of a liquidity event, such as a strategic sale or merger. The PWERM is a scenario-based methodology that estimates the fair value of common stock based upon an analysis of future values for the company, assuming various outcomes. The common stock value is based on the probability-weighted present value of expected future investment returns considering each of the possible outcomes available as well as the rights of each class of stock. The future value of the common stock under each outcome is discounted back to the valuation date at an appropriate risk-adjusted discount rate and probability weighted to arrive at an indication of value for the common stock.

Stock-Based Award Grants in Connection with and Following Our Initial Public Offering

Our board of directors approved, effective upon the commencement of trading of our common stock on the Nasdaq Global Select Market, grants of options to purchase an aggregate of 625,000 shares of common stock, with an exercise price per share equal to the estimated fair market value of our common stock on such date of grant, which our board of directors determined to be equal to the initial public offering price of our common stock, to certain of our employees and restricted stock units for an aggregate of 34,614 shares of common stock to one of our non-employee directors.

Following our initial public offering, the exercise price per share of stock-based award grants will be set at the closing price of our common stock on the Nasdaq Global Select Market on the applicable date of grant, which our board of directors believes represents the fair value of our common stock.

Emerging Growth Company Status

The Jumpstart Our Business Startups Act of 2012, or the JOBS Act, provides that an “emerging growth company” can take advantage of the extended transition period afforded by the JOBS Act for the implementation of new or revised accounting standards. However, we have elected not to “opt out” of such extended transition period, which means that when a standard is issued or revised and it has different application dates for public or private companies, we will adopt the new or revised standard at the time private companies adopt the new or revised standard, provided that we continue to be an emerging growth company. The JOBS Act provides that our decision to take advantage of the extended transition period for complying with new or revised accounting standards is irrevocable.

Off-Balance Sheet Arrangements

As of December 31, 2018, 2017 and 2016, we did not have any off-balance sheet arrangements, as defined in Item 303(a)(4)(ii) of Regulation S-K, such as the use of unconsolidated subsidiaries, structured finance, special purpose entities or variable interest entities.

Recent Accounting Pronouncements

Refer to the “Summary of Significant Accounting Policies” footnote within our consolidated financial statements included elsewhere in this Annual Report on Form 10-K for our analysis of recent accounting pronouncements that are applicable to our business.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk.

Market risk is the risk of loss to future earnings, values or future cash flows that may result from changes in the price of a financial instrument. The value of a financial instrument may change as a result of changes in interest rates, exchange rates, commodity prices, equity prices and other market changes. We are exposed to market risk related to changes in foreign currency exchange rates and interest rates. We do not use derivative financial instruments for speculative or trading purposes. However, we have entered into, and in the future expect to continue to enter into, exchange rate hedging arrangements to manage certain of the risks described below.

Foreign Currency Exchange Risk

We have accounts receivables denominated in foreign currencies, and our operations outside of the United States incur their operating expenses in foreign currencies. To date, the majority of our product sales and inventory purchases have been denominated in U.S. dollars. For our subsidiary in Ireland, the U.S. dollar is the functional currency. For each of our other foreign subsidiaries, the functional currency is the local currency. During the years ended December 31, 2018, 2017 and 2016, we incurred foreign currency transaction gains (losses) of $(0.9) million, $0.9 million and $(0.3) million, respectively, primarily related to unrealized and realized foreign currency gains (losses) for accounts receivables denominated in foreign currencies. These foreign currency transaction gains (losses) were recorded as a component of other income (expense), net in our consolidated statements of operations and comprehensive income. We believe that a 5% change in the exchange rate between the U.S. dollar and euro would not materially impact our operating results or financial position. We entered into foreign currency exchange contracts during the year ended December 31, 2018 that mature in the second and third quarters of 2019, and we expect to continue to hedge certain significant transactions denominated in currencies other than the U.S. dollar in the future.

Interest Rate Sensitivity

Our cash and cash equivalents as of December 31, 2018 consisted of cash maintained in FDIC-insured operating accounts as well as investments in money market mutual funds and certificates of deposit. We also have policies requiring us to invest in high-quality issuers, limit our exposure to any individual issuer, and ensure adequate liquidity. Our primary exposure to market risk for our cash and cash equivalents is interest income sensitivity, which is primarily affected by changes in the general level of U.S. interest rates. However, we do not believe a sudden change in the interest rates for our cash and cash equivalents would have a material impact on our financial condition, results of operations or cash flows.

We have a credit agreement that provides us with a term loan facility of $300.0 million and a revolving credit facility of up to $25.0 million in revolving credit loans and letters of credit. Borrowings under the facilities bear interest at a floating rate, which can be either a Eurodollar rate plus an applicable margin or, at our option, a base rate (defined as the highest of (x) the JPMorgan Chase, N.A. prime rate, (y) the federal funds effective rate, plus one-half percent (0.50%) per annum and (z) a one-month Eurodollar rate plus 1.00% per annum) plus an applicable margin. The applicable margin for borrowings under the term loan facility is 4.00% per annum for Eurodollar rate loans (subject to a 1.00% per annum interest rate floor) and 3.00% per annum for base rate loans. As a result of the completion of our initial public offering in December 2017, the applicable margin for borrowings under the revolving credit facility is 1.75% per annum for Eurodollar rate loans and 0.75% per annum for base rate loans, subject to reduction based on our maintaining of specified net leverage ratios.

As of December 31, 2018, we had borrowings of $294.0 million outstanding under the term loan facility, bearing interest at a rate of 6.52% per annum, which was based on a one-month Eurodollar rate of 2.52% per annum plus the applicable margin of 4.00% per annum for Eurodollar rate loans. Changes in interest rates could cause interest charges on our term loan facility to fluctuate. Based on the amount of borrowings outstanding as of December 31, 2018, an increase of 10%, or approximately 25 basis points, in the one-month Eurodollar rate as of December 31, 2018 would cause pre-tax decreases to our earnings and cash flows of approximately $0.7 million per year, assuming that such rate were to remain in effect for a year. A decrease of 10%, or approximately 25 basis points, in the one-month Eurodollar rate as of December 31, 2018 would cause pre-tax increases to our earnings and cash flows of approximately $0.7 million, assuming that such rate were to remain in effect for a year.

As of December 31, 2018, we were not exposed to interest rate risk under the revolving credit facility as a result of having no outstanding borrowings under the facility.

Inflation Risk

We do not believe that inflation has had a material effect on our business. However, if global demand for the base materials utilized in our suppliers' components were to significantly increase for the components we purchase from our suppliers to manufacture our products, our costs could become subject to significant inflationary pressures, and we may not be able to fully offset such higher costs through price increases. Our inability or failure to do so could harm our business, operating results and financial condition.

Item 8. Financial Statements and Supplementary Data.

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Audited Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Casa Systems, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Casa Systems, Inc. and its subsidiaries (the "Company") as of December 31, 2018 and 2017, and the related consolidated statements of operations and comprehensive income, of convertible preferred stock and stockholders' equity (deficit), and of cash flows for each of the three years in the period ended December 31, 2018, including the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements 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 three years in the period ended December 31, 2018 in conformity with accounting principles generally accepted in the United States of America.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated financial statements 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 of these consolidated financial statements in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. The Company is not required to have, nor were we engaged to perform, an audit of its internal control over financial reporting. As part of our audits we are required to obtain an understanding of internal control over financial reporting but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control over financial reporting. Accordingly, we express no such opinion.

Our audits 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. We believe that our audits provide a reasonable basis for our opinion.

/s/ PricewaterhouseCoopers LLP
Boston, Massachusetts
February 28, 2019

We have served as the Company's auditor since 2014.

CASA SYSTEMS, INC.

CONSOLIDATED BALANCE SHEETS
(Amounts in thousands, except per share amounts)

	December 31, 2018	December 31, 2017
Assets		
Current assets:		
Cash and cash equivalents	$ 280,587	$ 260,820
Accounts receivable, net of provision for doubtful accounts of $410 and $692 as of December 31, 2018 and 2017, respectively	81,782	122,634
Inventory	50,997	36,148
Prepaid expenses and other current assets	3,755	5,151
Prepaid income taxes	390	538
Total current assets	417,511	425,291
Property and equipment, net	29,879	29,363
Accounts receivable, net of current portion	2,388	4,710
Deferred tax assets	21,578	9,718
Other assets	3,293	615
Total assets	$ 474,649	$ 469,697
Liabilities and Stockholders' Equity		
Current liabilities:		
Accounts payable	$ 17,776	$ 15,833
Accrued expenses and other current liabilities	36,992	48,250
Accrued income taxes	958	118
Deferred revenue	31,206	34,224
Current portion of long-term debt, net of unamortized debt issuance costs	2,179	2,156
Total current liabilities	89,111	100,581
Accrued income taxes, net of current portion	4,923	8,810
Deferred revenue, net of current portion	12,479	14,691
Long-term debt, net of current portion and unamortized debt issuance costs	293,280	295,459
Total liabilities	399,793	419,541
Commitments and contingencies (Note 16)		
Stockholders' equity:		
Preferred stock, $0.001 par value; 5,000 shares authorized as of December 31, 2018 and 2017, respectively; no shares issued and outstanding as of December 31, 2018 and 2017, respectively	—	—
Common stock, $0.001 par value; 500,000 shares authorized as of December 31, 2018 and 2017, respectively; 82,961 and 81,043 shares issued and outstanding as of December 31, 2018 and 2017, respectively	83	81
Additional paid-in capital	156,939	128,798
Accumulated other comprehensive income (loss)	(1,158)	194
Accumulated deficit	(81,008)	(78,917)
Total stockholders' equity	74,856	50,156
Total liabilities and stockholders' equity	$ 474,649	$ 469,697

The accompanying notes are an integral part of these consolidated financial statements.

CASA SYSTEMS, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS AND COMPREHENSIVE INCOME
(Amounts in thousands, except per share amounts)

	Year Ended December 31, 2018	2017	2016
Revenue:			
Product	$ 256,989	$ 311,896	$ 279,223
Service	40,138	39,679	36,905
Total revenue	297,127	351,575	316,128
Cost of revenue:			
Product	74,350	88,538	89,340
Service	4,811	4,973	8,477
Total cost of revenue	79,161	93,511	97,817
Gross profit	217,966	258,064	218,311
Operating expenses:			
Research and development	70,974	60,677	49,210
Sales and marketing	41,186	39,602	36,114
General and administrative	26,840	21,563	18,215
Total operating expenses	139,000	121,842	103,539
Income from operations	78,966	136,222	114,772
Other income (expense):			
Interest income	6,259	2,439	1,208
Interest expense	(19,763)	(17,466)	(902)
Gain (loss) on foreign currency, net	(911)	886	(328)
Other income, net	1,387	737	943
Total other income (expense), net	(13,028)	(13,404)	921
Income before provision for (benefit from) income taxes	65,938	122,818	115,693
Provision for (benefit from) income taxes	(7,068)	34,318	27,025
Net income	73,006	88,500	88,668
Other comprehensive (loss) income—foreign currency translation adjustment	(1,352)	1,933	(1,525)
Comprehensive income	$ 71,654	$ 90,433	$ 87,143
Cash dividends declared per common share or common share equivalent	$ —	$ 1.7576	$ 2.9197
Net income (loss) attributable to common stockholders:			
Basic	$ 73,006	$ 11,849	$ (35,119)
Diluted	$ 73,006	$ 11,849	$ (35,119)
Net income (loss) per share attributable to common stockholders:			
Basic	$ 0.87	$ 0.34	$ (1.07)
Diluted	$ 0.79	$ 0.26	$ (1.07)
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders:			
Basic	83,539	35,359	32,864
Diluted	91,877	44,972	32,864

The accompanying notes are an integral part of these consolidated financial statements.

CASA SYSTEMS, INC.
CONSOLIDATED STATEMENTS OF CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY (DEFICIT)
(Amounts in thousands, except per share amounts)

	Series A, B and C Convertible Preferred Stock		Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Income (Loss)	Retained Earnings (Accumulated Deficit)	Total Stockholders' Equity (Deficit)
	Shares	Amount	Shares	Amount				
Balances at January 1, 2016	4,038	$ 97,479	31,806	$ 32	$ 14,719	$ (214)	$ 67,921	$ 82,458
Exercise of stock options and common stock issued upon vesting of equity awards, net of shares withheld for employee taxes	—	—	1,378	1	277	—	—	278
Foreign currency translation adjustment, net of tax of $0	—	—	—	—	—	(1,525)	—	(1,525)
Cash dividends declared ($2.9197 per share of common stock, $29.1968 per share of convertible preferred stock and $2.9197 per share to holders of stock-based awards)	—	—	—	—	(22,841)	—	(226,586)	(249,427)
Stock-based compensation	—	—	—	—	7,845	—	—	7,845
Net income	—	—	—	—	—	—	88,668	88,668
Balances at December 31, 2016	4,038	97,479	33,184	33	—	(1,739)	(69,997)	(71,703)
Conversion of convertible preferred stock into common stock upon initial public offering	(4,038)	(97,479)	40,382	40	97,439	—	—	97,479
Issuance of common stock upon initial public offering, net of underwriting discounts and commissions and offering costs incurred of $10,373	—	—	6,900	7	79,320	—	—	79,327
Exercise of stock options and common stock issued upon vesting of equity awards, net of shares withheld for employee taxes	—	—	577	1	(3,772)	—	—	(3,771)
Foreign currency translation adjustment, net of tax of $0	—	—	—	—	—	1,933	—	1,933
Cash dividends declared ($1.7576 per share of common stock, $17.5764 per share of convertible preferred stock and $1.7576 per share to holders of stock-based awards)	—	—	—	—	(52,365)	—	(97,420)	(149,785)
Stock-based compensation	—	—	—	—	8,176	—	—	8,176
Net income	—	—	—	—	—	—	88,500	88,500
Balances at December 31, 2017	—	—	81,043	81	128,798	194	(78,917)	50,156
Exercise of stock options and common stock issued upon vesting of equity awards, net of shares withheld for employee taxes	—	—	7,090	7	14,709	—	—	14,716
Foreign currency translation adjustment, net of tax of $(343)	—	—	—	—	—	(1,352)	—	(1,352)
Follow-on offering selling stockholders profit disgorgement, net of offering costs of $41	—	—	—	—	3,770	—	—	3,770
Stock repurchase program	—	—	(5,172)	(5)	—	—	(75,097)	(75,102)
Stock-based compensation	—	—	—	—	9,662	—	—	9,662
Net income	—	—	—	—	—	—	73,006	73,006
Balances at December 31, 2018	—	$ —	82,961	$ 83	$ 156,939	$ (1,158)	$ (81,008)	$ 74,856

The accompanying notes are an integral part of these consolidated financial statements.

CASA SYSTEMS, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS
(Amounts in thousands)

	Year Ended December 31, 2018	2017	2016
Cash flows from operating activities:			
Net income	$ 73,006	$ 88,500	$ 88,668
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	9,454	7,738	6,008
Stock-based compensation	8,894	9,136	8,304
Deferred income taxes	(11,517)	11,422	(6,860)
Excess and obsolete inventory valuation adjustment	(5,883)	4,115	1,674
(Decrease) Increase in provision for doubtful accounts	(282)	6	—
Changes in operating assets and liabilities:			
Accounts receivable	34,716	(25,726)	(16,273)
Inventory	(11,051)	21,859	(22,798)
Prepaid expenses and other assets	(1,084)	3,519	(3,235)
Prepaid income taxes	146	(486)	900
Accounts payable	4,197	(6,475)	14,453
Accrued expenses and other current liabilities	6,124	10,243	15,759
Accrued income taxes	(3,088)	(3,212)	6,894
Deferred revenue	(5,087)	(25,631)	17,286
Net cash provided by operating activities	98,545	95,008	110,780
Cash flows (used in) provided by investing activities:			
Purchases of property and equipment	(7,966)	(7,014)	(7,419)
Purchases of marketable securities	—	—	(14,392)
Proceeds from maturities of marketable securities	—	14,589	—
Net cash (used in) provided by investing activities	(7,966)	7,575	(21,811)
Cash flows (used in) provided by financing activities:			
Proceeds from initial public offering, net of underwriting discounts and commissions	—	83,421	—
Proceeds from issuance of debt, net of issuance costs	—	—	292,189
Principal repayments of debt	(3,304)	(3,292)	(282)
Proceeds from exercise of stock options	14,730	274	594
Payments of dividends and equitable adjustments	(7,325)	(246,634)	(142,301)
Follow-on offering selling stockholders profit disgorgement	3,811	—	—
Repurchases of common stock	(75,102)	—	—
Payments of initial public offering costs	(1,148)	(2,384)	(517)
Employee taxes paid related to net share settlement of equity awards	(13)	(4,046)	(315)
Net cash (used in) provided by financing activities	(68,351)	(172,661)	149,368
Effect of exchange rate changes on cash and cash equivalents	(1,442)	1,344	(1,279)
Net increase (decrease) in cash, cash equivalents and restricted cash	20,786	(68,734)	237,058
Cash, cash equivalents and restricted cash at beginning of year	260,820	329,554	92,496
Cash, cash equivalents and restricted cash at end of year (1)	$ 281,606	$ 260,820	$ 329,554
Supplemental disclosures of cash flow information:			
Cash paid for interest	$ 18,348	$ 16,275	$ 274
Cash paid for income taxes	$ 7,268	$ 26,297	$ 25,179
Supplemental disclosures of non-cash investing and financing activities:			
Purchases of property and equipment included in accounts payable	$ 1,255	$ 1,018	$ 869
Prepaid expenses and other current assets included in accounts payable	$ 607	$ 1,394	$ 256
Deferred offering costs included in accounts payable and accrued expenses and other current liabilities	$ —	$ 1,193	$ 947
Unpaid dividends and equitable adjustments included in accrued expenses and other current liabilities	$ 3,336	$ 10,661	$ 107,509
Release of customer incentives included in accounts receivable and accrued expenses and other current liabilities	$ 8,556	$ 15,468	$ 4,206

(1) See Note 2 of the accompanying notes for a reconciliation of the ending balance of cash, cash equivalents and restricted cash shown in these consolidated statements of cash flows.

The accompanying notes are an integral part of these consolidated financial statements.

1. Nature of Business and Basis of Presentation

Casa Systems, Inc. (the “Company”) was incorporated under the laws of the State of Delaware on February 28, 2003. The Company is a global communications technology company headquartered in Andover, Massachusetts and has wholly owned subsidiaries in China, France, Canada, Ireland, Spain, Colombia and the Netherlands.

The Company offers solutions for next-generation centralized, distributed and virtualized architectures for cable broadband, fixed-line broadband and wireless networks. The Company’s solutions enable customers to cost-effectively and dynamically increase network speed, add bandwidth capacity and new services for consumers and enterprises, reduce network complexity and reduce operating and capital expenditures.

The Company is subject to a number of risks similar to other companies of comparable size and other companies selling and providing services to the communications industry. These risks include, but are not limited to, the level of capital spending by the communications industry, a lengthy sales cycle, dependence on the development of new products and services, unfavorable economic and market conditions, competition from larger and more established companies, limited management resources, dependence on a limited number of contract manufacturers and suppliers, the rapidly changing nature of the technology used by the communications industry and reliance on resellers and sales agents. Failure by the Company to anticipate or to respond adequately to technological developments in its industry, changes in customer or supplier requirements, changes in regulatory requirements or industry standards, or any significant delays in the development or introduction of products could have a material adverse effect on the Company’s operating results, financial condition and cash flows.

In December 2017, the Company closed its initial public offering (“IPO”) of 6,900 shares of its common stock at an offering price of $13.00 per share, including 900 shares pursuant to the underwriters’ option to purchase additional shares of the Company’s common stock. The Company received net proceeds of $79,327, after deducting underwriting discounts and commissions of $6,279 and offering costs of $4,094. Upon the closing of the IPO, all 4,038 shares of the Company’s then-outstanding preferred stock automatically converted on a ten-for-one basis into an aggregate of 40,382 shares of the Company’s common stock. Upon conversion of the preferred stock, the Company reclassified $97,439 from temporary equity to additional paid-in capital and $40 from temporary equity to common stock.

On April 30, 2018, the Company closed its follow-on public offering in which certain stockholders sold 7,350 shares of the Company’s common stock at a price of $25.00 per share, before deducting underwriting discounts and commissions (the “follow-on offering”). The Company did not sell any common stock in the follow-on offering and did not receive any of the proceeds from the sale of the Company’s common stock by the selling stockholders. In connection with the sale of the Company’s common stock in the follow-on offering, certain of the selling stockholders disgorged $3,770 of profits recognized from the sale, after deducting $41 of offering costs, to the Company in accordance with Section 16(b) of the Securities Exchange Act of 1934, as amended, which was recorded as an increase in additional paid-in capital. The Company incurred $856 of transaction costs in connection with the follow-on offering, of which $815 was recorded in general and administrative expenses in the accompanying consolidated statements of operations.

The Company is an “emerging growth company,” as defined in the Jumpstart Our Business Startups Act of 2012 (the “JOBS Act”), and may remain an emerging growth company until the last day of the fiscal year following the fifth anniversary of the initial public offering, subject to specified conditions. The JOBS Act provides that an emerging growth company can take advantage of the extended transition period afforded by the JOBS Act for the implementation of new or revised accounting standards. The Company has elected not to “opt out” of such extended transition period, which means that when a standard is issued or revised and it has different application dates for public or private companies, the Company will adopt the new or revised standard at the time private companies adopt the new or revised standard, provided that the Company continues to be an emerging growth company. The JOBS Act provides that the decision to take advantage of the extended transition period for complying with new or revised accounting standards is irrevocable.

The accompanying consolidated financial statements have been prepared in accordance with accounting principles generally accepted in the United States of America (“GAAP”) and include the accounts and results of operations of the Company and its wholly owned subsidiaries. All intercompany transactions and balances have been eliminated in consolidation.

2. Summary of Significant Accounting Policies

Use of Estimates

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosures of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting periods.

Significant estimates and judgments relied upon by management in preparing these consolidated financial statements include revenue recognition, provision for doubtful accounts, reserves for excess and obsolete inventory, valuation of inventory and deferred inventory costs, the expensing and capitalization of software-related research and development costs, amortization and depreciation periods, recoverability of net deferred tax assets, valuations of uncertain tax positions, provision for income taxes, warranty allowances, the valuation of the Company's common stock and other equity instruments, and stock-based compensation expense.

Although the Company regularly reassesses the assumptions underlying these estimates, actual results could differ materially from these estimates. Changes in estimates are recorded in the period in which they become known. The Company bases its estimates on historical experience and various other assumptions that it believes to be reasonable under the circumstances existing at the time such estimates are made.

Cash, Cash Equivalents and Restricted Cash

Cash and cash equivalents include all highly liquid investments maturing within three months from the date of purchase. As of December 31, 2018 and 2017, the Company's cash and cash equivalents consisted of investments in certificates of deposit, commercial paper and money market mutual funds.

Restricted cash, which was included in other assets as of December 31, 2018, consisted of a certificate of deposit of $1,000 pledged as collateral for a stand-by letter of credit required to support a contractual obligation. The Company did not have any restricted cash as of December 31, 2017.

The following table is a reconciliation of cash, cash equivalents and restricted cash included in the accompanying consolidated balance sheets that sum to the total cash, cash equivalents and restricted cash included in the accompanying consolidated statements of cash flows.

	December 31, 2018	December 31, 2017
Cash and cash equivalents	$ 280,587	$ 260,820
Restricted cash included in other assets	1,019	—
	$ 281,606	$ 260,820

Accounts Receivable

Accounts receivable are presented net of a provision for doubtful accounts, which is an estimate of amounts that may not be collectible. Accounts receivable for arrangements with customary payment terms, which are one year or less, are recorded at invoiced amounts and do not bear interest. The Company generally does not require collateral, but the Company may, in certain instances based on its credit assessment, require full or partial prepayment prior to shipment.

For certain customers and/or for certain transactions, the Company provides extended payment arrangements to allow the customer to pay for the purchased equipment in monthly, other periodic or lump-sum payments over a period of one to five years. Certain of these arrangements are collateralized by the underlying assets during the term of the arrangement. Payments due beyond 12 months from the balance sheet date are recorded as non-current assets. In addition, amounts recorded as current and non-current accounts receivable for extended payment term arrangements at any balance sheet date have a corresponding amount recorded as deferred revenue because the Company defers the recognition of revenue for all extended payment term arrangements and only recognizes revenue to the extent of the payment amounts that become due from the customer.

Although there is no contractual interest rate for customer arrangements with extended payment terms, the Company imputes interest on the accounts receivable related to these arrangements and reduces the arrangement fee that will be recognized as revenue for the amount of the imputed interest, which is recorded as interest income over the payment term using the effective interest method. For the periods presented in the accompanying consolidated financial statements, the impact of imputing interest on revenue and interest income was insignificant.

Accounts receivable as of December 31, 2018 and 2017 consisted of the following:

	December 31,	
	2018	2017
Current portion of accounts receivable, net:		
Accounts receivable, net	$ 79,526	$ 106,114
Amounts due from related party (see Note 15)	—	13,367
Accounts receivable, extended payment arrangements	2,256	3,153
	81,782	122,634
Accounts receivable, net of current portion:		
Accounts receivable, extended payment arrangements	2,388	4,710
	$ 84,170	$ 127,344

The Company performs ongoing credit evaluations of its customers and, if necessary, provides a provision for doubtful accounts and expected losses. When assessing and recording its provision for doubtful accounts, the Company evaluates the age of its accounts receivable, current economic trends, creditworthiness of the customers, customer payment history, and other specific customer and transaction information. The Company writes off accounts receivable against the provision when it determines a balance is uncollectible and no longer actively pursues collection of the receivable. Adjustments to the provision for doubtful accounts are recorded as general and administrative expenses in the consolidated statements of operations and comprehensive income. A summary of changes in the provision for doubtful accounts for the years ended December 31, 2018, 2017 and 2016 is as follows:

	Year Ended December 31,		
	2018	2017	2016
Provision for doubtful accounts at beginning of year	$ 692	$ 690	$ 768
Provisions	—	6	—
Write-offs	(282)	(4)	(78)
Provision for doubtful accounts at end of year	$ 410	$ 692	$ 690

As of December 31, 2018 and 2017, the Company concluded that all amounts due under extended payment term arrangements were collectible and no reserve for credit losses was recorded. During the years ended December 31, 2018, 2017 and 2016, the Company did not provide a reserve for credit losses and did not write off any uncollectible receivables due under extended payment term arrangements.

Inventories

Inventories are valued at the lower of cost or market value. Cost is computed using the first-in first-out convention. Inventories are composed of hardware and related component parts of finished goods. The Company establishes provisions for excess and obsolete inventories after evaluating historical sales, future demand, market conditions, expected product life cycles, and current inventory levels to reduce such inventories to their estimated net realizable value. Such provisions are made in the normal course of business and charged to cost of revenue in the consolidated statements of operations and comprehensive income.

Deferred inventory costs are included within inventory in the consolidated balance sheets. Deferred inventory costs represent the cost of products that have been delivered to the customer for which revenue associated with the arrangement has been deferred as a result of not meeting all of the required revenue recognition criteria, such as receipt of customer acceptance. Until the revenue recognition criteria are met, the Company retains the right to a return of the underlying inventory. Deferred inventory costs are recognized as cost of revenue in the consolidated statements of operations and comprehensive income when the related revenue is recognized.

Property and Equipment

Property and equipment is stated at historical cost less accumulated depreciation. Depreciation is computed using the straight-line method over the estimated useful lives of the assets. Leasehold improvements are recorded at cost with any reimbursement from the landlord being accounted for as deferred rent, which is amortized using the straight-line method over the lease term. Costs for trial systems held and used by the Company’s customers pursuant to evaluation agreements are also included within property and equipment. Trial systems held and used by the Company’s customers are depreciated over the estimated useful life of such assets, which is two years.

Whenever a trial system is sold to a customer and the selling price is recorded as revenue, the related net book value of the trial system sold is removed from property and equipment and recorded as a cost of revenue. Maintenance and repairs expenditures are charged to expense as incurred.

Estimated useful lives of the respective property and equipment assets are as follows:

	Estimated Useful Life
Computers and purchased software	3 years
Leasehold improvements	Shorter of lease term or 7 years
Furniture and fixtures	7 years
Machinery and equipment	3 – 5 years
Building	40 years
Building improvements	5 – 40 years
Trial systems at customers’ sites	2 years

Upon retirement or sale, the cost of assets disposed of and the related accumulated depreciation are removed from the accounts and any resulting gain or loss is included in income from operations.

Impairment of Long-Lived Assets

The Company evaluates its long-lived assets, which consist primarily of property and equipment, for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets may not be recoverable. Factors that the Company considers in deciding when to perform an impairment review include significant underperformance of the business in relation to expectations, significant negative industry or economic trends and significant changes or planned changes in the use of the assets. Recoverability of assets to be held and used is measured by a comparison of the carrying amount of an asset to the future undiscounted net cash flows expected to be generated by the asset. If such assets are considered to be impaired, the impairment to be recognized is measured by the amount by which the carrying amount of the asset exceeds the fair value of the asset, less the cost to sell. No events or changes in circumstances existed to require an impairment assessment during the years ended December 31, 2018, 2017 and 2016.

Deferred Offering Costs

Deferred offering costs of $4,094, consisting of legal, professional accounting and other third-party fees related to the IPO, were reclassified to additional paid-in capital as a reduction of the proceeds upon the closing of the IPO in December 2017. Deferred offering costs of $1,148 and $2,384 were paid during the years ended December 31, 2018 and 2017, respectively.

Concentration of Risks

Financial instruments that potentially subject the Company to concentrations of credit risk consist principally of cash and cash equivalents and accounts receivable. Cash and cash equivalents consist of demand deposits, savings accounts, commercial paper, money market mutual funds, and certificates of deposit with financial institutions, which may exceed Federal Deposit Insurance Corporation limits. The Company has not experienced any losses related to its cash and cash equivalents and does not believe that it is subject to unusual credit risk beyond the normal credit risk associated with commercial banking relationships.

Significant customers are those that represent 10% or more of revenue or accounts receivable and are set forth in the following tables:

	Revenue Year Ended December 31,			Accounts Receivable, Net December 31,	
	2018	2017	2016	2018	2017
Customer A	27%	37%	23%	13%	44%
Customer B	11%	11%	10%	15%	10%
Customer C	12%	*	19%	18%	17%
Customer D	14%	*	*	28%	*

* Less than 10% of total

Customer B was a related party, Liberty Global Affiliates (see Note 15).

Certain of the components and subassemblies included in the Company's products are obtained from a single source or a limited group of suppliers. In addition, the Company primarily relies on two third parties to manufacture certain components of its products. Although the Company seeks to reduce dependence on those limited sources of suppliers and manufacturers, the partial or complete loss of certain of these sources could have a material adverse effect on the Company's operating results, financial condition and cash flows and damage its customer relationships.

Product Warranties

Substantially all of the Company's products are covered by a warranty for software and hardware for periods ranging from 90 days to one year. In addition, in conjunction with customers' renewals of maintenance and support contracts, the Company offers an extended warranty for periods typically of one to three years for agreed-upon fees. In the event of a failure of a hardware product or software covered by these warranties, the Company must repair or replace the software or hardware or, if those remedies are insufficient, and at the discretion of the Company, provide a refund. The Company's warranty reserve, which is included in accrued expenses and other current liabilities in the consolidated balance sheets, reflects estimated material, labor and other costs related to potential or actual software and hardware warranty claims for which the Company expects to incur an obligation. The Company's estimates of anticipated rates of warranty claims and the costs associated therewith are primarily based on historical information and future forecasts. The Company periodically assesses the adequacy of the warranty reserve and adjusts the amount as necessary. If the historical data used to calculate the adequacy of the warranty reserve are not indicative of future requirements, additional or reduced warranty reserves may be required.

A summary of changes in the amount reserved for warranty costs for the years ended December 31, 2018, 2017 and 2016 is as follows:

	Year Ended December 31,		
	2018	2017	2016
Warranty reserve at beginning of year	$ 1,246	$ 1,256	$ 993
Provisions	1,886	1,829	1,862
Charges	(2,206)	(1,839)	(1,599)
Warranty reserve at end of year	$ 926	$ 1,246	$ 1,256

Revenue Recognition

The Company generates revenue from sales of its broadband products, along with associated maintenance and support services, and, to a lesser extent, from sales of professional services and extended warranty services. The Company also generates revenue from sales of additional line cards and software-based capacity expansions. Maintenance and support services include telephone support and unspecified software upgrades and updates provided on a when-and-if-available basis.

In the Company's consolidated statements of operations and comprehensive income, revenue from sales of broadband products and capacity expansions is classified as product revenue, and revenue from maintenance and support, professional services and extended warranty services is classified as service revenue.

The Company recognizes revenue from sales when the following revenue recognition criteria are met:

- *Persuasive evidence of an arrangement exists*. Binding contracts and/or customer purchase orders are generally evidence of an arrangement. For professional services, evidence of an arrangement may also include information documenting the scope of work to be performed, and customer acceptance terms, if any.
- *Delivery has occurred*. For broadband products, shipping documents and customer acceptance, if applicable, verify that delivery has occurred. For software-enabled capacity expansions, delivery occurs when the additional bandwidth capacity is made available to the customer. For professional services, delivery occurs as the services are completed.
- *The sales price is fixed or determinable*. The sales price is considered fixed or determinable when the fees have been contractually agreed with the customer and are not deemed to be subject to refund, adjustment or future discounts, and when the payment terms of the transaction do not extend beyond the Company's customary payment terms, which are one year or less.

- *Collectibility is reasonably assured*. The Company assesses the ability to collect from its customers based on a number of factors that generally include information supplied by credit agencies, references and/or analysis of customer accounts and payment history. If collection from a customer is not considered reasonably assured, all revenue related to the customer arrangement is deferred until payment is received and all other revenue recognition criteria have been met.

When customer acceptance of the product is required and is other than perfunctory, revenue for the entire customer arrangement is deferred until the acceptance has been received.

The Company's products have both software and non-software (i.e., hardware) components that function together to deliver the products' essential functionality. In addition, the hardware sold generally cannot be used apart from the embedded software. As a result, all of the Company's product and service offerings are excluded from the scope of software revenue recognition requirements and instead fall within the scope of Accounting Standards Codification ("ASC") Topic 605, *Revenue Recognition*.

Many of the Company's sales involve multiple-deliverable arrangements that include products and maintenance and support services and, on a limited basis, may also include professional services and extended warranty services. The Company has determined that its products, maintenance and support services, professional services and extended warranty services have standalone value to the customer because each of these deliverables is sold separately by the Company to its customers or, in the case of professional services, is sold separately by other vendors. As a result, the Company treats each of these deliverables as a separate unit of accounting for purposes of allocating the arrangement fee and recognizing the revenue of each unit.

For its multiple-deliverable arrangements, the Company allocates the arrangement fee to each deliverable based on the relative selling prices of each of the deliverables in the arrangement using the selling price hierarchy. In such circumstances, the Company determines the selling price of each deliverable based on vendor-specific objective evidence ("VSOE") of selling price, if it exists; otherwise, third-party evidence ("TPE") of selling price. If neither VSOE nor TPE exists, the Company uses its best estimate of the selling price ("BESP") for the deliverable. The Company limits the amount of the arrangement fee allocated to deliverables to the amount that is not contingent on the future delivery of products or services or future performance obligations and the amount that is not subject to customer-specific return or refund privileges.

To date, the Company has not been able to establish VSOE of selling price of any of its products, maintenance and support services, professional services or extended warranty services because the Company has not established a history of consistently pricing each product or service within a narrow range. In addition, the Company is not able to determine TPE of selling price for its products or services because the Company's various product and service offerings contain a significant level of differentiation and, therefore, comparable pricing of competitors' products and services with similar functionality cannot be obtained. As the Company is unable to establish selling price using VSOE or TPE, the Company uses BESP to allocate the arrangement fee to products, maintenance and support services, professional services and extended warranty services in multiple-deliverable arrangements. The objective of BESP is to determine the price at which the Company would transact a sale if a product or service was sold on a standalone basis. The Company determines BESP of selling price for its products and services by considering multiple factors, including, but not limited to, its historical pricing practices by customer type and geographic-specific market factors.

Revenue from product sales is recognized upon delivery to the customer, or upon the later receipt of customer acceptance of the product when such acceptance is required.

Revenue from maintenance and support services is recognized ratably over the contract period, which is typically one year, but can be as long as three or five years. When customer acceptance of a product is required, the recognition of any associated maintenance and support services revenue commences only upon customer acceptance of the associated product. Revenue from extended warranty services is recognized ratably over the contract period, which is typically one to three years.

Revenue from professional services is recognized as the services are performed. Professional services generally include installation or configuration services that are not deemed to be essential to the functionality of the products. When customer acceptance is required, the recognition of any associated professional services revenue is deferred until the associated product and/or professional service is accepted by the customer.

Resellers

The Company markets and sell its products through its direct global sales force, supported by sales agents, and through resellers. The Company's resellers receive an order from an end customer prior to placing an order with the Company, and the Company confirms the identification of or is aware of the end customer prior to accepting such order. The Company invoices the reseller an amount that reflects a reseller discount and records revenue based on the amount of the discounted arrangement fee. The Company's resellers do not stock inventory received from the Company.

When the Company transacts with a reseller, its contractual arrangement is with the reseller and not with the end customer. Whether the Company transacts business with and receives the order from a reseller or directly from an end customer, its revenue recognition policy and resulting pattern of revenue recognition for the order are the same.

The Company also uses sales agents that assist in the sales process with certain customers primarily located in the Latin America and Asia-Pacific regions. Sales agents are not resellers. If a sales agent is engaged in the sales process, the Company receives the order directly from and sells the products and services directly to the end customer, and the Company pays a commission to the sales agent, calculated as a percentage of the related customer payment. Sales agent commissions are recorded as expenses when incurred and are classified as sales and marketing expenses in the Company's consolidated statements of operations and comprehensive income.

Deferred Revenue

Amounts billed in excess of revenue recognized are recorded as deferred revenue. Deferred revenue includes customer deposits, amounts billed for maintenance and support services contracts in advance of services being performed, amounts for trade-in right liabilities and amounts related to arrangements that have been deferred as a result of not meeting the required revenue recognition criteria as of the end of the reporting period. Deferred revenue expected to be recognized as revenue more than one year subsequent to the balance sheet date is reported within long-term liabilities in the consolidated balance sheets.

When the payment terms of a customer order extend beyond the Company's customary payment terms, which are one year or less, the Company considers the arrangement to be an extended payment term arrangement and concludes that the sales price is not fixed or determinable for revenue recognition purposes. In these circumstances, the Company defers all revenue of the arrangement and only recognizes revenue to the extent of the payment amounts that become due, provided that all other revenue recognition criteria have been met.

The Company defers recognition of incremental direct costs, such as cost of goods and services, until recognition of the related revenue. Such costs are classified as current assets if the related deferred revenue is classified as current, and such costs are classified as non-current assets if the related deferred revenue is classified as non-current.

Other Revenue Recognition Policies

In limited instances, the Company has offered future rebates to customers based on a fixed or variable percentage of actual sales volumes over specified periods. The future rebates earned based on the customer's purchasing from the Company in one period may be used as credits to be applied by them against accounts receivable due to the Company in later periods. The Company accounts for these future rebates as a reduction of the revenue recorded for the customer's current purchasing activity giving rise to the future rebates. The liability for these future rebates is recorded as accrued customer incentives (within accrued expenses and other current liabilities) until the credits have been applied by the customer against accounts receivable due to the Company or the credits expire.

When future trade-in rights are granted to customers at the time of sale, the Company defers a portion of the revenue recognized for the sale and accounts for it as a guarantee at fair value until the trade-in right is exercised or the right expires, in accordance with ASC Topic 460, *Guarantees*. Determining the fair value of the trade-in right requires the Company to estimate the probability of the trade-in right being exercised and the future value of the product upon trade-in. The Company assesses and updates these estimates each reporting period, and updates to these estimates may result in either an increase or decrease in the amount of revenue deferred. As of December 31, 2018 and 2017, no amounts for trade-in rights were deferred.

Billings to customers for shipping costs and reimbursement of out-of-pocket expenses, including travel, lodging and meals, are recorded as revenue, and the associated costs incurred by the Company for those items are recorded as cost of revenue.

The Company excludes any taxes assessed by a governmental authority that are directly imposed on a revenue-producing transaction (e.g., sales, use and value added taxes) from its revenue and costs.

Stock-Based Compensation

The Company measures stock options and other stock-based awards granted to employees and directors based on the fair value on the date of the grant and recognizes compensation expense of those awards, net of estimated forfeitures, over the requisite service period, which is generally the vesting period of the respective award. Generally, the Company issues stock options with only service-based vesting conditions and records the expense for these awards using the straight-line method.

For stock-based awards granted to non-employee consultants, compensation expense is recognized over the period during which services are rendered by such non-employee consultants until completed. At the end of each financial reporting period prior to completion of the service, the fair value of these awards is remeasured using the then-current fair value of the Company's common stock and updated assumption inputs in the Black-Scholes option-pricing model.

The Company classifies stock-based compensation expense in its consolidated statements of operations and comprehensive income in the same manner in which the award recipient's payroll costs are classified or in which the award recipient's service payments are classified.

The Company recognizes compensation expense for only the portion of awards that are expected to vest. In developing a forfeiture rate estimate, the Company has considered its historical experience to estimate pre-vesting forfeitures for service-based awards. The impact of a forfeiture rate adjustment will be recognized in full in the period of adjustment, and if the actual forfeiture rate is materially different from the Company's estimate, the Company may be required to record adjustments to stock-based compensation expense in future periods.

The fair value of each stock option grant is estimated on the date of grant using the Black-Scholes option pricing model. The Company was a private company until December 14, 2017 and lacks sufficient company-specific historical and implied volatility information for its stock. Therefore, it estimates its expected stock volatility based on the historical volatility of publicly traded peer companies and expects to continue to do so until such time as it has adequate historical data regarding the volatility of its own traded stock price. The expected term of the Company's stock options has been determined utilizing the "simplified" method for awards that qualify as "plain-vanilla" options. The expected term of stock options granted to non-employees is equal to the contractual term of the option award. The risk-free interest rate is determined by reference to the U.S. Treasury yield curve in effect at the time of grant of the award for time periods approximately equal to the expected term of the award. Expected dividend yield is based on the fact that the Company does not have a history of declaring or paying cash dividends, except for the special cash dividends declared in November 2014, June 2016, December 2016, May 2017 and November 2017 and in those circumstances the board of directors approved cash dividends to be paid to holders of the Company's stock options, stock appreciation rights ("SARs") and restricted stock units ("RSUs") upon vesting as an equitable adjustment to the holders of such instruments.

The Company has also granted SARs to certain employees, which require the Company to pay in cash upon exercise an amount equal to the product of the excess of the per share fair market value of the Company's common stock on the date of exercise over the exercise price, multiplied by the number of shares of common stock with respect to which the SAR is exercised. Because these awards may require the Company to settle the awards in cash, they are accounted for as a liability in the Company's consolidated balance sheets. The liability related to these awards, as well as related compensation expense, is recognized over the period during which services are rendered until completed. Changes in the fair value of the SAR liability are estimated using the Black-Scholes option pricing model and are recorded in the consolidated statements of operations and comprehensive income. After vesting is completed, the Company will continue to remeasure the fair market value of the liability until the award is either exercised or canceled, with changes in the fair value of the liability recorded in the consolidated statements of operations and comprehensive income.

Research and Development Costs

The Company expenses research and development costs as incurred. Costs incurred to develop software to be licensed to customers are expensed prior to the establishment of technological feasibility of the software and are capitalized thereafter until commercial release of the software. The Company has not historically capitalized software development costs as the establishment of technological feasibility typically occurs shortly before the commercial release of its software, which is embedded in its products. As such, all software development costs related to software for license to customers are expensed as incurred and included within research and development expense in the accompanying consolidated statements of operations and comprehensive income.

Advertising Costs

Advertising costs are expensed as incurred and are included in selling and marketing expense in the accompanying consolidated statements of operations and comprehensive income. Advertising expenses were not significant for any periods presented.

Foreign Currency Translation

For the Company's subsidiary in Ireland, the U.S. dollar is the functional currency. For each of the Company's other foreign subsidiaries, the functional currency is its local currency. Assets and liabilities of these foreign subsidiaries are translated into U.S. dollars using period-end exchange rates, and revenues and expenses are translated into U.S. dollars using average exchange rates in effect during each period. The effects of these foreign currency translation adjustments are included in accumulated other comprehensive income, a separate component of stockholders' equity (deficit).

Foreign currency transaction gains (losses) are included in the consolidated statements of operations and comprehensive income as a component of other income (expense) and totaled $(911), $886 and $(328) for the years ended December 31, 2018, 2017 and 2016, respectively.

Fair Value Measurements

Certain assets and liabilities are carried at fair value under GAAP. Fair value is defined as the price that would be received for an asset or the exit price that would be paid to transfer a liability in the principal or most advantageous market in an orderly transaction between market participants on the measurement date. Valuation techniques used to measure fair value must maximize the use of observable inputs and minimize the use of unobservable inputs. Financial assets and liabilities carried at fair value are to be classified and disclosed in one of the following three levels of the fair value hierarchy, of which the first two are considered observable and the last is considered unobservable:

Level 1— Quoted prices in active markets for identical assets and liabilities.

Level 2— Observable inputs (other than Level 1 quoted prices), such as quoted prices in active markets for similar assets or liabilities at the measurement date; quoted prices in markets that are not active for identical or similar assets and liabilities; or other inputs that are observable or can be corroborated by observable market data.

Level 3— Unobservable inputs that involve management judgment and are supported by little or no market activity, including pricing models, discounted cash flow methodologies and similar techniques.

The categorization of a financial instrument within the valuation hierarchy is based on the lowest level of input that is significant to the fair value measurement.

The Company's cash equivalents, marketable securities, foreign currency forward contracts and SARs are carried at fair value, determined according to the fair value hierarchy described above (see Note 6). The fair values of accounts receivable, accounts payable and accrued expenses and other current liabilities approximate their fair values due to the short-term nature of these assets and liabilities, with the exception of amounts recorded by the Company as "accounts receivable, non-current," which represent amounts billed to customers for which payment has not yet become due and for which an offsetting amount of deferred revenue has been recorded. The carrying values of the Company's debt obligations (see Note 9) as of December 31, 2018 and 2017 approximated their fair values because the debt bears interest at rates the Company would be required to pay on the issuance of debt with similar terms, based on an analysis of recent market conditions and other Company-specific factors.

Income Taxes

The Company accounts for income taxes using the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of temporary differences between the financial statement and tax basis of assets and liabilities, as measured by enacted tax rates anticipated to be in effect when these differences reverse. This method also requires the recognition of future tax benefits to the extent that realization of such benefits is more likely than not. Deferred tax expense or benefit is the result of changes in the deferred tax assets and liabilities. The Company assesses the likelihood that its deferred tax assets will be recovered from future taxable income and, to the extent it believes, based upon the weight of available evidence, that it is more likely than not that all or a portion of the deferred tax assets will not be realized, a valuation allowance is established through a charge to income tax expense. Potential for recovery of deferred tax assets is evaluated by estimating the future taxable profits expected and considering prudent and feasible tax planning strategies.

The Company records a liability for potential payments of taxes to various tax authorities related to uncertain tax positions and other tax matters. The recorded liability is based on a determination of whether and how much of a tax benefit taken by the Company in its tax filings or positions is "more likely than not" to be realized. The amount of the benefit that may be recognized in the financial statements is the largest amount that has a greater than 50% likelihood of being realized upon ultimate settlement. To the extent that the assessment of such tax positions changes, the change in estimate is recorded in the period in which the determination is made. The Company establishes a liability, which is included in accrued income taxes in the consolidated balance sheets, for tax-related uncertainties based on estimates of whether, and the extent to which, additional taxes will be due. These liabilities are established when the Company believes that certain positions might be challenged despite the Company's belief that the tax return positions are fully supportable. The recorded liability is adjusted in light of changing facts and circumstances. The provision for (benefit from) income taxes includes the impact of the recorded liability and changes thereto.

The Company recognizes interest and penalties related to uncertain tax positions within other income (expense) in the accompanying consolidated statements of operations and comprehensive income. Accrued interest and penalties are included in accrued income taxes in the consolidated balance sheets.

On December 22, 2017, the Tax Cuts and Jobs Act (the "TCJA") was enacted which, among other things, lowered the U.S. corporate income tax rate to 21% from 35%, repealed the domestic production activity deductions, limited the deductibility of certain executive compensation and interest expense, and established a modified territorial system requiring a mandatory deemed repatriation tax on undistributed earnings of foreign subsidiaries. Beginning in 2018, the TCJA also requires a minimum tax on certain future earnings generated by foreign subsidiaries while providing for future tax-free repatriation of such earnings through a 100% dividends-received deduction. While the reduction in the U.S. corporate tax rate under the TCJA is not effective until 2018, under GAAP, changes in tax rates are accounted for in the period enacted. Therefore, in accordance with ASC Topic 740, *Income Taxes*, and Staff Accounting Bulletin 118 ("SAB 118"), the Company recognized a provisional income tax charge in the fourth quarter of 2017 of $14,098 related to the TCJA based on its initial analysis using available information and estimates. The provisional charge is comprised of $10,031 related to the one-time deemed repatriation of accumulated earnings of foreign subsidiaries and related withholding taxes and $4,067 related primarily to the remeasurement of net deferred tax assets as a result of the reduction in the U.S. corporate income tax rate effected by the TCJA. As a result, applicable U.S. and foreign taxes have been provided on substantially all of the Company's accumulated earnings of foreign subsidiaries previously considered indefinitely reinvested. The Company's accounting for the impacts of the TCJA is complete as of December 31, 2018, and the Company has not recorded any material adjustments to the provisional amounts recorded in the fourth quarter of 2017 related to the TCJA. Although the Company no longer considers these amounts provisional, the determination of the TCJA's income tax effects may change as a result of future legislation or further interpretation of the TCJA based on the publication of regulations and guidance from the Internal Revenue Service and state tax authorities.

While the intent of TCJA was to provide for a territorial tax system, effective for taxable years beginning after January 1, 2018, taxpayers are subjected to the global intangible low-taxed income ("GILTI") provisions. The GILTI provisions require the Company to currently recognize in U.S. taxable income a deemed dividend inclusion of foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. During 2018, the Company recorded an income tax charge of $4.4 million related to GILTI. The Company has made an accounting policy election, as allowed by the SEC and FASB, to recognize the impacts of GILTI within the period incurred. Therefore, no U.S. deferred taxes are provided on GILTI inclusions of future foreign subsidiary earnings.

Comprehensive Income

Comprehensive income includes net income as well as other changes in stockholders' equity (deficit) that result from transactions and economic events other than those with stockholders. Comprehensive income for the periods presented consists of net income and the change in the cumulative foreign currency translation adjustment.

Net Income (Loss) per Share

The Company follows the two-class method when computing net income (loss) per share as the Company has issued shares that meet the definition of participating securities. The two-class method determines net income (loss) per share for each class of common and participating securities according to dividends declared or accumulated and participation rights in undistributed earnings. The two-class method requires income available to common stockholders for the period to be allocated between common and participating securities based upon their respective rights to receive dividends as if all income for the period had been distributed.

Basic net income (loss) per share attributable to common stockholders is computed by dividing the net income (loss) attributable to common stockholders by the weighted-average number of shares of common stock outstanding for the period. Diluted net income (loss) attributable to common stockholders is computed by adjusting net income (loss) attributable to common stockholders to reallocate undistributed earnings based on the potential impact of dilutive securities. Diluted net income (loss) per share attributable to common stockholders is computed by dividing the diluted net income (loss) attributable to common stockholders by the weighted-average number of shares of common stock outstanding for the period, including potential dilutive common shares. For purpose of this calculation, outstanding stock-based awards and convertible preferred stock are considered potential dilutive common shares.

Impact of Recently Adopted Accounting Standards

In November 2016, the FASB issued Accounting Standards Update ("ASU") 2016-18, *Statement of Cash Flows (Topic 230): Restricted Cash* ("ASU 2016-18"), which requires that amounts generally described as restricted cash or restricted cash equivalents be included with cash and cash equivalents when reconciling beginning-of-period and end-of-period total amounts shown on the statement of cash flows. The standard is effective for public companies for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The standard is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual periods beginning after December 15, 2018, and interim periods within fiscal years beginning after December 15, 2019. The Company retrospectively adopted ASU 2016-18 during the second quarter of 2018, and there was no material impact on its consolidated financial statements.

Impact of Recently Issued Accounting Standards

In May 2014, the FASB issued ASU 2014-09, *Revenue from Contracts with Customers (Topic 606)* ("ASU 2014-09"), which supersedes existing revenue recognition guidance under GAAP. The core principle of this standard is that an entity should recognize revenue to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. In August 2015, the FASB issued ASU 2015-14, *Revenue from Contracts with Customers (Topic 606): Deferral of the Effective Date*, which delays the effective date of ASU 2014-09 such that the standard is effective for public companies for annual periods beginning after December 15, 2017 and for interim periods within those fiscal years. The standard is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual reporting periods beginning after December 15, 2018. Entities are not permitted to adopt the standard earlier than the original effective date for public entities. This standard can be adopted either retrospectively to each prior reporting period presented or as a cumulative effect adjustment as of the date of adoption. In March 2016, the FASB issued ASU 2016-08, *Revenue from Contracts with Customers (Topic 606): Principal versus Agent Considerations* ("ASU 2016-08"), which further clarifies the implementation guidance on principal versus agent considerations in ASU 2014-09. In April 2016, the FASB issued ASU 2016-10, *Revenue from Contracts with Customers (Topic 606): Identifying Performance Obligations and Licensing* ("ASU 2016-10"), clarifying the implementation guidance on identifying performance obligations and licensing. In May 2016, the FASB issued ASU 2016-12, *Revenue from Contracts with Customers (Topic 606): Narrow-Scope Improvements and Practical Expedients* ("ASU 2016-12"), which clarifies the objective of the collectibility criterion, presentation of taxes collected from customers, non-cash consideration, contract modifications at transition, completed contracts at transition and how guidance in ASU 2014-09 is retrospectively applied. ASU 2016-08, ASU 2016-10 and ASU 2016-12 have the same effective dates and transition requirements as ASU 2014-09.

The Company has elected to adopt ASU 2014-09 using the modified retrospective method. The Company has preliminarily quantified the impact that the adoption would have had on contracts not completed as of the adoption date and will recognize a cumulative effect adjustment to the opening balance of retained earnings as of the adoption date. The Company expects to record a preliminary adjustment to opening retained earnings in the amount of approximately $4,000 to $5,000 primarily relates to the application of the clarified collectibility criterion to contracts that the Company had previously determined were extended payment term arrangements and recognized revenue only to the extent that payment amounts were due or received. The Company also expects to record an adjustment related to the cost of goods sold on these extended payment term arrangements, which is preliminarily estimated to be immaterial. The adoption of ASU 2014-09 will also have an impact on the Company's accounting for costs to obtain customer contracts, which relate primarily to commissions paid to the Company's sales representatives and to resellers and sales agents. The Company currently expenses commissions and costs to obtain customer contracts when incurred. Under ASU 2014-09, the Company will capitalize and amortize these costs over the expected period of benefit. The Company is finalizing an analysis of commissions and costs to obtain customer contracts for contracts not completed as of the adoption date which will result in the creation of an asset as a cumulative effect adjustment to be amortized over the expected period of benefit. The Company is in the process of finalizing the documentation of its assumptions used in quantifying the impact of adopting the new revenue standard. Therefore, the quantification and assessment disclosed herein is preliminary and subject to change. The finalization of this documentation could result in a material impact to the consolidated financial statements.

In February 2016, the FASB issued ASU 2016-02, *Leases* ("ASU 2016-02"), which will require lessees to recognize most leases on their balance sheets as a right-of-use asset with a corresponding lease liability, and lessors to recognize a net lease investment. Additional qualitative and quantitative disclosures will also be required. This guidance is effective for public companies for annual reporting periods beginning after December 15, 2018 and for interim periods within those fiscal years. This guidance is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual reporting periods beginning after December 15, 2019, and interim periods within fiscal years beginning after December 15, 2020. Early application is permitted. In July 2018, the FASB issued ASU 2018-10, *Codification Improvements to Topic 842: Leases* ("ASU 2018-10"), which affects narrow aspects of the guidance issued in the amendments in ASU 2016-02. ASU 2018-10 has the same effective dates and transition requirements as ASU 2016-02. In July 2018, the FASB issued update ASU 2018-11, *Leases (Topic 842), Targeted Improvements* ("ASU 2018-11"), which provided for an additional (and optional) transition method with which to adopt the new lease standard in ASU 2016-02. The additional method allows entities to apply the new leases standard at the adoption date and recognize a cumulative-effect adjustment to the opening balance of retained earnings in the period of adoption. Additionally, in December 2018, the FASB issued update ASU 2018-20, *Leases (Topic 842) – Narrow-Scope Improvements for Lessors* ("ASU 2018-20"), which addresses stakeholders' concerns about the operability challenges encountered in determining certain lessor costs paid by lessees directly to third parties by requiring lessors to exclude from variable payments, and thus from lease revenue, lessor costs paid by a lessee directly to a third party. The amendments in ASU 2018-20 also clarify that costs excluded from the consideration in a contract that are paid directly to a third party by a lessor and reimbursed by the lessee are lessor costs to be accounted for as variable payments. The Company is currently assessing the potential impact that the adoption of ASU 2016-02, ASU 2018-10, ASU 2018-11 and ASU 2018-20 will have on its consolidated financial statements. The Company is in the process of reviewing existing lease agreements to assess the impact this guidance may have on the consolidated financial statements. The Company currently expects that most of its operating lease commitments will be subject to the new standard and will affect the consolidated balance sheet by recognizing new right-of-use assets and operating lease liabilities upon the adoption of ASU 2016-02, which will increase the total assets and total liabilities that it reports relative to such amounts prior to adoption.

In June 2016, the FASB issued ASU 2016-13, *Measurement of Credit Losses on Financial Instruments* ("ASU 2016-13"). This guidance requires that financial assets measured at amortized cost be presented at the net amount expected to be collected. The measurement of expected credit losses is based on historical experience, current conditions and reasonable and supportable forecasts that affect the collectibility. This guidance is effective for public companies for annual reporting periods beginning after December 15, 2019 and for interim periods within those fiscal years. This guidance is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual reporting periods beginning after December 15, 2020, and interim periods within fiscal years beginning after December 15, 2021. Additionally, in November 2018, the FASB issued ASU 2018-19, *Codification Improvements to Topic 326, Financial Instruments—Credit Losses* ("ASU 2018-19"), which mitigates transition complexity by requiring that for nonpublic business entities the amendments in ASU 2016-13 are effective for fiscal years beginning after December 15, 2021, including interim periods within those fiscal years. The amendments in ASU 2018-19 also clarify that receivables arising from operating leases are not within the scope of Subtopic 326-20, but instead, should be accounted for in accordance with Topic 842, Leases. The Company is currently assessing the potential impact that the adoption of ASU 2016-13 and ASU 2018-19 will have on its consolidated financial statements.

In August 2016, the FASB issued ASU 2016-15, *Statement of Cash Flows: Classification of Certain Cash Receipts and Cash Payments* ("ASU 2016-15"), to address diversity in practice in how certain cash receipts and cash payments are presented and classified in the statement of cash flows. The standard is effective for public companies for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The standard is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual periods beginning after December 15, 2018, and interim periods within fiscal years beginning after December 15, 2019. The Company is currently assessing the potential impact that the adoption of ASU 2016-15 will have on its consolidated financial statements.

In October 2016, the FASB issued ASU 2016-16, *Income Taxes (Topic 740): Intra-Entity Transfer of Assets Other than Inventory* ("ASU 2016-16"), which requires the recognition of the income tax consequences of an intra-entity transfer of an asset, other than inventory, when the transfer occurs. The standard is effective for public companies for annual periods beginning after December 15, 2017, including interim periods within those fiscal years. The standard is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual periods beginning after December 15, 2018, and interim reporting periods within annual periods beginning after December 15, 2019. The Company is currently assessing the potential impact that the adoption of ASU 2016-16 will have on its consolidated financial statements.

In August 2017, the FASB issued ASU 2017-12, *Derivatives and Hedging—Targeted Improvements to Accounting for Hedging Activities* ("ASU 2017-12"), which aims to improve the financial reporting of hedging relationships to better portray the economic results of an entity's risk management activities in its financial statements. The standard is effective for public companies for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The standard is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual periods beginning after December 15, 2019, and interim reporting periods within annual periods beginning after December 15, 2020. The Company is currently assessing the potential impact that the adoption of ASU 2017-12 will have on its consolidated financial statements.

In June 2018, the FASB issued ASU 2018-07, *Compensation – Stock Compensation* (Topic 718) ("ASU 2018-07"), which expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. The amendments specify that Topic 718 applies to all share-based payment transactions in which a grantor acquires goods or services to be used or consumed in a grantor's own operations by issuing share-based payment awards. The standard is effective for public companies for annual periods beginning after December 15, 2018, including interim periods within those fiscal years. The standard is effective for private companies, and emerging growth companies that choose to take advantage of the extended transition periods, for annual periods beginning after December 15, 2019, and interim reporting periods within annual periods beginning after December 15, 2020. Early adoption is permitted, but no earlier than an entity's adoption date of Topic 606. The Company is currently assessing the potential impact that the adoption of ASU 2018-07 will have on its consolidated financial statements.

In August 2018, the FASB issued ASU 2018-13, *Fair Value Measurement* ("ASU 2018-13"), which modifies the disclosure requirements on fair value measurements in Topic 820, Fair Value Measurement, regarding transfers between levels of financial instruments, amounts of unrealized gains and losses included in other comprehensive income for Level 3 fair value measurements and the information used to determine the fair value of Level 3 fair value measurements. The standard is effective for both public and private companies, and emerging growth companies that chose to take advantage of the extended transition periods, for annual periods beginning after December 15, 2019, including interim periods within those fiscal years. Early adoption is permitted. The Company is currently assessing the potential impact that the adoption of ASU 2018-13 will have on its consolidated financial statements.

3. Inventory

Inventory as of December 31, 2018 and 2017 consisted of the following:

	December 31, 2018	December 31, 2017
Raw materials	$ 6,524	$ 5,135
Work in process	571	7
Finished goods:		
Manufactured finished goods	45,594	36,321
Deferred inventory costs	1,073	3,344
	53,762	44,807
Valuation adjustment for excess and obsolete inventory	(2,765)	(8,659)
	$ 50,997	$ 36,148

The decrease in the reserve for excess and obsolete inventory was primarily due to the amount of reserves released based on the respective disposition of the inventory.

4. Property and Equipment

Property and equipment as of December 31, 2018 and 2017 consisted of the following:

	December 31, 2018	December 31, 2017
Computers and purchased software	$ 15,706	$ 12,343
Leasehold improvements	1,340	1,268
Furniture and fixtures	1,949	1,752
Machinery and equipment	21,979	17,911
Land	3,091	3,091
Building	4,765	4,765
Building improvements	5,245	4,906
Trial systems at customers' sites	7,116	7,458
	61,191	53,494
Less: Accumulated depreciation and amortization	(31,312)	(24,131)
	$ 29,879	$ 29,363

During the years ended December 31, 2018, 2017 and 2016, the Company transferred trial systems from inventory into (from) property and equipment with values of $(357), $877 and $706, respectively, net of transfers of trial systems to cost of revenue. In addition, the Company transferred $371, $2,566 and $1,082 of equipment from inventory into property and equipment during the years ended December 31, 2018, 2017 and 2016, respectively.

Total depreciation and amortization expense was $9,454, $7,738 and $6,008 for the years ended December 31, 2018, 2017 and 2016, respectively.

5. Accrued Expenses and Other Current Liabilities

Accrued expenses and other current liabilities as of December 31, 2018 and 2017 consisted of the following:

	December 31, 2018	December 31, 2017
Accrued compensation and related taxes	$ 18,301	$ 22,465
Accrued warranty (see Note 2)	926	1,246
Dividends and equitable adjustments payable (see Note 10)	3,336	10,661
Accrued customer incentives (see Note 2)	5,368	8,437
Other accrued expenses	9,061	5,441
	$ 36,992	$ 48,250

6. Fair Value Measurements

The Company's cash equivalents include certificates of deposit and money market mutual funds, which are valued using Level 1 or Level 2 inputs in the fair value hierarchy. The Company's marketable securities consist of certificates of deposit, which are valued using Level 2 inputs in the fair value hierarchy. The Company's foreign currency forward contracts are valued using Level 2 inputs in the fair value hierarchy. The Company's SARs are valued using as Level 3 inputs in the fair value hierarchy based on management's judgment and the assumptions set forth in Note 12 as there is no market activity to derive an estimate of their fair value. Changes in the fair value of SARs are recorded in operating expenses in the consolidated statements of operations and comprehensive income.

The following tables present information about the fair value of the Company's financial assets and liabilities as of December 31, 2018 and 2017 and indicate the level of the fair value hierarchy utilized to determine such fair values:

	Fair Value Measurements as of December 31, 2018 Using:			
	Level 1	Level 2	Level 3	Total
Assets:				
Certificates of deposit	$ —	$ 19,873	$ —	$ 19,873
Certificates of deposit—restricted cash	—	1,019	—	1,019
Money market mutual funds	252,963	—	—	252,963
Foreign currency forward contracts	—	254	—	254
	$ 252,963	$ 21,146	$ —	$ 274,109
Liabilities:				
SARs	$ —	$ —	$ 1,387	$ 1,387
Foreign currency forward contracts	—	252	—	252
	$ —	$ 252	$ 1,387	$ 1,639

	Fair Value Measurements as of December 31, 2017 Using:			
	Level 1	Level 2	Level 3	Total
Assets:				
Certificates of deposit	$ —	$ 18,905	$ —	$ 18,905
Commercial paper	—	11,483	—	11,483
Money market mutual funds	224,555	—	—	224,555
	$ 224,555	$ 30,388	$ —	$ 254,943
Liabilities:				
SARs	$ —	$ —	$ 2,155	$ 2,155
Foreign currency forward contracts	—	150	—	150
	$ —	$ 150	2,155	$ 2,305

During the years ended December 31, 2018, 2017 and 2016 there were no transfers between Level 1, Level 2 and Level 3.

The liability for SARs in the table above consists of the fair value of the SARs granted to the Company's employees. The fair values of the SARs are based on significant inputs not observable in the market, which represents a Level 3 measurement within the fair value hierarchy. The Company's valuation of these SARs utilized the Black-Scholes option-pricing model, which incorporates assumptions and estimates to determine their fair values (see Note 12). The Company assesses these assumptions and estimates on a quarterly basis as additional information impacting the assumptions is obtained. Changes in the fair value of the SARs liability are recognized as stock-based compensation expense in the consolidated statements of operations and comprehensive income.

The following table provides a summary of changes in the fair values of the Company's SARs liability, for which fair value is determined by Level 3 inputs:

	Year Ended December 31,		
	2018	2017	2016
Fair value at beginning of the year	$ 2,155	$ 1,195	$ 737
Change in fair value	(768)	960	458
Exercises	—	—	—
Fair value at end of year	$ 1,387	$ 2,155	$ 1,195

The Company's cash, cash equivalents and restricted cash as of December 31, 2018 and 2017 consisted of the following:

	December 31, 2018	December 31, 2017
Cash	$ 7,751	$ 5,877
Cash equivalents and restricted cash:		
Certificates of deposit	19,873	18,905
Certificates of deposit—restricted cash	1,019	—
Commercial paper	—	11,483
Money market mutual funds	252,963	224,555
Total cash equivalents and restricted cash	273,855	254,943
Total cash, cash equivalents and restricted cash	$ 281,606	$ 260,820

7. Derivative Instruments

The Company has certain international customers that are billed in foreign currencies. To mitigate the volatility related to fluctuations in the foreign exchange rates for accounts receivable denominated in foreign currencies, the Company enters into foreign currency forward contracts. As of December 31, 2018, the Company had foreign currency forward contracts outstanding with notional amounts totaling 25,741 euros maturing in the second and third quarters of 2019. As of December 31, 2017, the Company had foreign currency forward contracts outstanding with notional amounts totaling 5,924 Euros maturing in the first and second quarter of 2018.

The Company's foreign currency forward contracts economically hedge certain risk but are not designated as hedges for financial reporting purposes, and accordingly, all changes in the fair value of these derivative instruments are recorded as unrealized foreign currency transaction gains or losses and are included in the consolidated statements of operations and comprehensive income as a component of other income (expense). The Company records all derivative instruments in the consolidated balance sheet at their fair values. As of December 31, 2018, the Company recorded an asset of $254 and as of December 31, 2018 and 2017, the Company recorded a liability of $252 and $150, respectively, related to outstanding foreign currency forward contracts, which were included in prepaid expenses and other current assets and in accrued expenses and other current liabilities, respectively, in the consolidated balance sheets.

8. Income Taxes

Income before the provision for (benefit from) income taxes for the years ended December 31, 2018, 2017 and 2016 consisted of the following:

	Year Ended December 31, 2018	2017	2016
United States	$ 10,527	$ 77,410	$ 106,386
Foreign	55,411	45,408	9,307
	$ 65,938	$ 122,818	$ 115,693

The provision for (benefit from) income taxes for the years ended December 31, 2018, 2017 and 2016 consisted of the following:

	Year Ended December 31,		
	2018	2017	2016
Current income tax provision:			
Federal	$ (3,457)	$ 17,498	$ 30,876
State	(181)	589	1,775
Foreign	8,087	4,809	1,234
Total current income tax provision	4,449	22,896	33,885
Deferred income tax provision (benefit):			
Federal	(10,699)	12,468	(5,802)
State	(1,108)	(1,024)	(979)
Foreign	290	(22)	(79)
Total deferred income tax provision (benefit)	(11,517)	11,422	(6,860)
Total income tax provision (benefit)	$ (7,068)	$ 34,318	$ 27,025

A reconciliation of the U.S. federal statutory rate to the Company’s effective income tax rate for the years ended December 31, 2018, 2017 and 2016 is as follows:

	Year Ended December 31,		
	2018	2017	2016
Federal statutory income tax rate	21.0%	35.0%	35.0%
State taxes, net of federal tax benefit	(0.8)	0.6	1.2
Research and development tax credits	(15.6)	(3.5)	(2.1)
Permanent differences	1.1	0.5	1.1
Domestic manufacturing deduction	—	(0.9)	(2.0)
Foreign tax rate differential	(6.6)	(7.0)	(2.0)
Equitable adjustment payments	(1.8)	(6.0)	(7.0)
Excess tax benefit from stock-based transactions	(25.2)	(1.6)	(1.2)
Foreign taxes withheld	3.3	—	—
Impact of deferred tax rate decrease under TCJA	—	3.3	—
TCJA one-time deemed repatriation of accumulated earnings of foreign subsidiaries	—	7.1	—
Global intangible low-taxed income	6.7	—	—
Withholding tax on repatriation of accumulated earnings of foreign subsidiaries	0.1	1.1	—
Valuation allowance on deferred tax assets	6.0	—	—
Other, net	1.1	(0.7)	0.4
Effective income tax rate	(10.7)%	27.9%	23.4%

The income tax effect of each type of temporary difference and carryforward as of December 31, 2018 and 2017 was as follows:

	December 31,	
	2018	2017
Deferred tax assets:		
Stock compensation	$ 2,689	$ 2,336
Tax credit carryforwards	7,599	3,737
Capitalized research and development costs	12,157	—
Inventory valuation	698	2,190
Accrued liabilities and reserves	2,473	589
Deferred revenue	3,147	5,538
Interest expense	480	—
Other	452	286
Total deferred tax assets	29,695	14,676
Valuation Allowance	(3,926)	—
Deferred tax assets, net of valuation allowance	25,769	14,676
Deferred tax liabilities:		
Depreciation and amortization	(1,266)	(2,089)
Deferred costs	(134)	(225)
Accrued liabilities and reserves	(2,572)	(2,598)
Deferred revenue	—	(46)
Prepaid expenses	(219)	—
Total deferred tax liabilities	(4,191)	(4,958)
Net deferred tax assets	$ 21,578	$ 9,718

The Company has concluded that net deferred tax assets will be recovered based upon its expectation that current and future earnings will provide sufficient taxable income to realize the recorded net tax assets. However, the realization of the Company’s net deferred tax assets cannot be assured, and to the extent that future taxable income against which these tax assets may be applied is not sufficient, some or all of the Company’s recorded net deferred tax assets would not be realizable. The Company is required to compute income tax expense in each jurisdiction in which it operates. This process requires the Company to project its current tax liability and estimate its deferred tax assets and liabilities, including tax credit carryforwards. In assessing the need for a valuation allowance against its net deferred tax assets, the Company considers its recent operating results, future taxable income projections and feasible tax planning strategies. As of December 31, 2018, the Company recorded a $3,926 valuation allowance related to its state research and development tax credit carryforwards that are not more likely than not to be realized.

On December 22, 2017, the TCJA was enacted which, among other things, lowered the U.S. corporate income tax rate to 21% from 35%, repealed the domestic production activity deductions, limited the deductibility of certain executive compensation and interest expense, and established a modified territorial system requiring a mandatory deemed repatriation tax on undistributed earnings of foreign subsidiaries. Beginning in 2018, the TCJA also required a minimum tax on certain future earnings generated by foreign subsidiaries while providing for future tax-free repatriation of such earnings through a 100% dividends-received deduction. While the reduction in the U.S. corporate tax rate under the TCJA is not effective until 2018, under GAAP, changes in tax rates are accounted for in the period enacted. Therefore, in accordance with ASC Topic 740, *Income Taxes*, and SAB 118, the Company recognized a provisional charge in the fourth quarter of 2017 of $14,098 related to the TCJA based on its initial analysis using available information and estimates. The provisional charge is comprised of $10,031 related to the one-time deemed repatriation of accumulated earnings of foreign subsidiaries and related withholding taxes and $4,067 related primarily to the remeasurement of net deferred tax assets as a result of the reduction in the U.S. corporate income tax rate effected by the TCJA. As a result, applicable U.S. and foreign taxes have been provided on substantially all of the Company’s accumulated earnings of foreign subsidiaries previously considered indefinitely reinvested. The Company’s accounting for the impacts of the TCJA is complete as of December 31, 2018, and the Company has not recorded any material adjustments to the provisional amounts recorded in the fourth quarter of 2017 related to the TCJA. Although the Company no longer considers these amounts provisional, the determination of the TCJA’s income tax effects may change as a result of future legislation or further interpretation of the TCJA based on the publication of regulations and guidance from the Internal Revenue Service and state tax authorities.

While the intent of TCJA was to provide for a territorial tax system, effective for taxable years beginning after January 1, 2018, taxpayers are subjected to the GILTI provisions. The GILTI provisions require the Company to currently recognize in U.S. taxable income a deemed dividend inclusion of foreign subsidiary earnings in excess of an allowable return on the foreign subsidiary's tangible assets. During 2018, the Company recorded an income tax charge of $4,410 related to GILTI. The Company has made an accounting policy election, as allowed by the SEC and FASB, to recognize the impacts of GILTI within the period incurred. Therefore, no U.S. deferred taxes are provided on GILTI inclusions of future foreign subsidiary earnings.

As of December 31, 2018, the Company had available state research and development tax credit carryforwards of $7,923 which begin to expire in 2030. Management believes that it is more likely than not that the Company will not realize the benefit of all of its state research and development tax credits and thus has provided a $3,926 valuation allowance relating to these tax credit carryforwards.

As of December 31, 2018, substantially all of the Company's unremitted earnings have been taxed through either the deemed repatriation tax or as GILTI income. Of the total amount of undistributed earnings, $25,722 is not indefinitely reinvested and we have recorded a $2,572 deferred tax liability and a $1,139 foreign tax credit associated with the withholding taxes on the future distribution. The remaining unremitted earnings of our foreign subsidiaries are either indefinitely reinvested or could be remitted with an immaterial tax cost.

Interest and penalties related to uncertain tax positions are recorded in the consolidated statements of operations and comprehensive income within other income (expense) and totaled $211, $14 and $14 for the years ended December 31, 2018, 2017 and 2016, respectively. The liability recorded for potential penalties and interest was $369 and $158 as of December 31, 2018 and 2017, respectively. The Company had a total recorded liability of $3,038 and $1,142 related to uncertain tax positions, inclusive of penalties and interest, as of December 31, 2018 and 2017, respectively, which is included in accrued income taxes, net of current portion in the consolidated balance sheets. As of December 31, 2018, the amount of uncertain tax benefits that, if recognized, would impact the effective income tax rate is $1,093.

The aggregate changes in the balance of gross uncertain tax positions, which excludes interest and penalties, for the years ended December 31, 2018, 2017 and 2016 were as follows:

Balance at January 1, 2016	$	318
Settlement/decreases related to tax positions taken during prior years		—
Increases related to tax positions taken during prior years		—
Increases related to tax positions taken during the current year		—
Balance at December 31, 2016		318
Settlement/decreases related to tax positions taken during prior years		—
Increases related to tax positions taken during prior years		—
Increases related to tax positions taken during the current year		1,377
Balance at December 31, 2017		1,695
Settlement/decreases related to tax positions taken during prior years		—
Increases related to tax positions taken during prior years		241
Increases related to tax positions taken during the current year		810
Balance at December 31, 2018	$	2,746

The Company and its subsidiaries file income tax returns in the U.S. federal jurisdiction as well as various states and foreign jurisdictions. The Company and certain subsidiaries have tax years that remain open and are subject to examination by tax authorities in the following major taxing jurisdictions: United States for tax years 2015 through 2018, Ireland for tax years 2014 through 2018, China for tax years 2013 through 2018 (for transfer pricing adjustments, the statute of limitation in China is ten years). The Company files income tax returns on a combined, unitary, or stand-alone basis in multiple state and local jurisdictions, which generally have statutes of limitations from three to four years. If any issues addressed in the Company's tax audits are resolved in a manner not consistent with management's expectations, the Company would be required to adjust its provision for income tax in the period such resolution occurs. Although timing of the resolution and/or closure of audits is highly uncertain, the Company does not believe it is reasonably possible that its unrecognized tax benefits will materially change in the next 12 months.

9. Debt

The aggregate principal amount of debt outstanding as of December 31, 2018 and 2017 consisted of the following:

	December 31, 2018	December 31, 2017
Term loans	$ 294,000	$ 297,000
Mortgage loan	6,958	7,261
Total principal amount of debt outstanding	$ 300,958	$ 304,261

Current and non-current debt obligations reflected in the consolidated balance sheets as of December 31, 2018 and 2017 consisted of the following:

	December 31, 2018	December 31, 2017
Current liabilities:		
Term loans	$ 3,000	$ 3,000
Mortgage loan	314	303
Current portion of principal payment obligations	3,314	3,303
Unamortized debt issuance costs, current portion	(1,135)	(1,147)
Current portion of long-term debt, net of unamortized debt issuance costs	$ 2,179	$ 2,156
Non-current liabilities:		
Term loans	$ 291,000	$ 294,000
Mortgage loan	6,644	6,958
Non-current portion of principal payment obligations	297,644	300,958
Unamortized debt issuance costs, non-current portion	(4,364)	(5,499)
Long-term debt, net of current portion and unamortized debt issuance costs	$ 293,280	$ 295,459

Term Loan and Revolving Credit Facilities

On December 20, 2016, the Company entered into a credit agreement with JPMorgan Chase Bank, N.A., as administrative agent, various lenders and JPMorgan Chase Bank, N.A. and Barclays Bank PLC providing for (i) a term loan facility of $300,000 and (ii) a revolving credit facility of up to $25,000 in revolving credit loans and letters of credit.

As of December 31, 2018 and 2017, $294,000 and $297,000 in principal amount, respectively, was outstanding under the term loan facility (the "Term Loans") and the Company did not have any outstanding borrowings under the revolving credit facility; however, as of December 31, 2017, the Company had used $1,000 under the revolving credit facility for a stand-by letter of credit that served as collateral for a stand-by letter of credit issued by Bank of America to one of the Company's customers pursuant to a contractual performance guarantee. As of December 31, 2018, the stand-by letter of credit that served as collateral was terminated, and the Company did not use any amount under the revolving credit facility. In addition, the Company may, subject to certain conditions, including the consent of the administrative agent and the institutions providing such increases, increase the facilities by an unlimited amount so long as the Company is in compliance with specified leverage ratios, or otherwise by up to $70,000.

Borrowings under the facilities bear interest at a floating rate, which can be either a Eurodollar rate plus an applicable margin or, at the Company's option, a base rate (defined as the highest of (x) the JPMorgan Chase, N.A. prime rate, (y) the federal funds effective rate, plus one-half percent (0.50%) per annum and (z) a one-month Eurodollar rate plus 1.00% per annum) plus an applicable margin. The applicable margin for borrowings under the term loan facility is 4.00% per annum for Eurodollar rate loans (subject to a 1.00% per annum interest rate floor) and 3.00% per annum for base rate loans. As a result of the completion of the Company's IPO in December 2017, the applicable margin for borrowings under the revolving credit facility is 1.75% per annum for Eurodollar rate loans and 0.75% per annum for base rate loans, subject to reduction based on the Company's maintaining of specified net leverage ratios. The interest rates payable under the facilities are subject to an increase of 2.00% per annum during the continuance of any payment default.

For Eurodollar rate loans, the Company may select interest periods of one, two, three or six months or, with the consent of all relevant affected lenders, twelve months. Interest will be payable at the end of the selected interest period, but no less frequently than every three months within the selected interest period. Interest on any base rate loan is not set for any specified period and is payable quarterly. The Company has the right to convert Eurodollar rate loans into base rate loans and the right to convert base rate loans into Eurodollar rate loans at its option, subject, in the case of Eurodollar rate loans, to prepayment penalties if the conversion is effected prior to the end of the applicable interest period. As of December 31, 2018, the interest rate on the Term Loans was 6.52% per annum, which was based on a one-month Eurodollar rate of 2.52% per annum plus the applicable margin of 4.00% per annum for Eurodollar rate loans. As of December 31, 2017, the interest rate on the Term Loans was 5.69% per annum, which was based on a three-month Eurodollar rate of 1.69% per annum plus the applicable margin of 4.00% per annum for Eurodollar rate loans.

Upon entering into the term loan facility, the Company incurred debt issuance costs of $7,811, which were initially recorded as a reduction of the debt liability and are amortized to interest expense using the effective interest method from the issuance date of the Term Loan until the maturity date. Principal payments of $3,000 were made under the term loan facility during the years ended December 31, 2018 and 2017. No principal payments were made during the year ended December 31, 2016. Interest expense, including the amortization of debt issuance costs, totaled $19,146, $16,800 and $538 for the years ended December 31, 2018, 2017 and 2016, respectively.

The revolving credit facility also requires payment of quarterly commitment fees at a rate of 0.25% per annum on the difference between committed amounts and amounts actually borrowed under the facility and customary letter of credit fees. For the years ended December 31, 2018 and 2017, interest expense related to the fee for the unused amount of the revolving credit facility totaled $62 and $61, respectively.

The Term Loans mature on December 20, 2023, and the revolving credit facility matures on December 20, 2021. The Term Loans are subject to amortization in equal quarterly installments, which commenced on March 31, 2017, of principal in an annual aggregate amount equal to 1.0% of the original principal amount of the Term Loans of $300,000, with the remaining outstanding balance payable at the date of maturity.

Voluntary prepayments of principal amounts outstanding under the term loan facility are permitted at any time; however, if a prepayment of principal is made with respect to a Eurodollar loan on a date other than the last day of the applicable interest period, the Company is required to compensate the lenders for any funding losses and expenses incurred as a result of the prepayment. Prior to the revolving credit facility maturity date, funds borrowed under the revolving credit facility may be borrowed, repaid and reborrowed, without premium or penalty.

In addition, the Company is required to make mandatory prepayments under the facilities with respect to (i) 100% of the net cash proceeds from certain asset dispositions (including casualty and condemnation events) by the Company or certain of its subsidiaries, subject to certain exceptions and reinvestment provisions, (ii) 100% of the net cash proceeds from the issuance or incurrence of any additional debt by the Company or certain of its subsidiaries, subject to certain exceptions, and (iii) 50% of the Company’s excess cash flow, as defined in the credit agreement, subject to reduction upon its achievement of specified performance targets.

The facilities are secured by, among other things, a first priority security interest, subject to permitted liens, in substantially all of the Company’s assets and all of the assets of certain of its subsidiaries and a pledge of certain of the stock of certain of its subsidiaries, in each case subject to specified exceptions. The facilities contain customary affirmative and negative covenants, including certain restrictions on the Company’s ability to pay dividends, and, with respect to the revolving credit facility, a financial covenant requiring the Company to maintain a specified total net leverage ratio in the event that on the last day of any fiscal quarter the Company has utilized more than 30% of its borrowing capacity under the facility. As of December 31, 2018 and 2017, the Company had not utilized more than 30% of its borrowing capacity under the revolving credit facility and compliance with the financial covenant was not applicable.

Commercial Mortgage Loan

On July 1, 2015, the Company entered into a commercial mortgage loan agreement in the amount of $7,950 (the “Mortgage Loan”). Borrowings under the Mortgage Loan bear interest at a rate of 3.5% per annum and are repayable in 60 monthly installments of $46, consisting of principal and interest based on a 20-year amortization schedule. The remaining amount of unpaid principal under the Mortgage Loan is due on the maturity date of July 1, 2020. Upon entering into the Mortgage Loan, the Company incurred debt issuance costs of $45, which was initially recorded as a direct deduction from the debt liability and are amortized to interest expense using the effective interest method from issuance date of the loan until the maturity date.

The Company made principal payments under the Mortgage Loan of $303, $292 and $282 during the years ended December 31, 2018, 2017 and 2016, respectively. Interest expense, including the amortization of debt issuance costs, totaled $260, $272 and $283 for the years ended December 31, 2018, 2017 and 2016, respectively.

The Mortgage Loan is secured by the land and building purchased in March 2015 and subjects the Company to various affirmative, negative and financial covenants, including maintenance of a minimum debt service ratio. The Company was in compliance with all covenants of the Mortgage Loan as of December 31, 2018 and 2017.

As of December 31, 2018, aggregate minimum future principal payments of the Company's debt are summarized as follows:

Year Ending December 31,		
2019	$	3,314
2020		9,644
2021		3,000
2022		3,000
2023		3,000
Thereafter		279,000
	$	300,958

10. Preferred Stock

Upon the closing of the Company's IPO on December 19, 2017, all shares of the Company's then-outstanding preferred stock automatically converted on a ten-for-one basis into an aggregate of 40,382 shares of the Company's common stock. In addition, the Company filed a restated certificate of incorporation, which authorized the issuance of preferred stock with rights and preferences, including voting rights, designated from time to time by the board of directors. As of December 31, 2018, there were 5,000 shares of preferred stock authorized with a par value of $0.001 per share, and no shares of preferred stock issued or outstanding.

Special Dividends to Holders of Common and Preferred Stock

November 2017 Special Dividend

On November 30, 2017, the board of directors declared a special dividend to the holders of common stock and preferred stock of record on that date, contingent upon the closing of the Company's IPO. The cash dividend declared to stockholders was $0.5802 per share of common stock, $5.8020 per share of Series B convertible preferred stock (the "Series B Preferred Stock") and $5.8020 per share of Series C convertible preferred stock (the "Series C Preferred Stock"). Related to this special dividend declared in November 2017, the Company paid $865 and $42,137 of dividends to the common and preferred stockholders during the years ended December 31, 2018 and 2017, respectively, and no dividend payments with respect to this special dividend were payable as of December 31, 2018. As of December 31, 2017, dividend payments to be made totaled $865 and were included in accrued expenses and other current liabilities in the accompanying consolidated balance sheet.

In connection with this special dividend declared in November 2017, the board of directors also approved, contingent upon the payment of the November 2017 special dividend, cash payments to be made to holders of the Company's stock options, SARs and RSUs as an equitable adjustment to the holders of such instruments in accordance with the provisions of the Company's equity incentive plans. The equitable adjustment payments to the holders of the stock options, SARs and RSUs are equal to $0.5802 per share multiplied by the net number of shares subject to outstanding equity awards after applying the treasury stock method. The cash payments to such holders will be made as their equity awards vest through fiscal year 2021. During the years ended December 31, 2018 and 2017, the Company paid $1,132 and $5,193, respectively, to the holders of such vested equity awards. As of December 31, 2018 and 2017, equitable adjustment payments to be made as equity awards vest through fiscal year 2021, net of estimated forfeitures, totaled $603 and $1,735, respectively, and were included in accrued expenses and other current liabilities in the accompanying consolidated balance sheets.

The cash dividends declared to the holders of common stock, Series B Preferred Stock and Series C Preferred Stock totaled $19,572, $1,039 and $22,391, respectively, and the equitable adjustment to the holders of stock options, SARs and RSUs, net of estimated forfeitures, totaled $6,928. The $49,930 aggregate amount of such dividends and equitable adjustments was recorded as a charge to additional paid-in capital during the year ended December 31, 2017.

May 2017 Special Dividend

On May 10, 2017, the board of directors declared and the stockholders approved a special dividend to the holders of common stock and preferred stock of record on that date. The cash dividend declared to stockholders was $1.1774 per share of common stock, $11.7744 per share of Series B Preferred Stock and $11.7744 per share of Series C Preferred Stock. Related to this special dividend declared in May 2017, the Company paid $87,133 of dividends to the common and preferred stockholders during the year ended December 31, 2017. No dividend payments with respect to this special dividend were payable as of December 31, 2018 and 2017.

In connection with the special dividend declared in May 2017, the board of directors also approved cash payments to be made to holders of the Company's stock options, SARs and RSUs as an equitable adjustment to the holders of such instruments in accordance with the provisions of the Company's equity incentive plans. The equitable adjustment payments to the holders of the stock options, SARs and RSUs are equal to $1.1774 per share multiplied by the net number of shares subject to outstanding equity awards after applying the treasury stock method. The cash payments to such holders will be made as their equity awards vest through fiscal year 2021. During the years ended December 31, 2018 and 2017, the Company paid $1,492 and $10,431 to the holders of such vested equity awards. As of December 31, 2018 and 2017, equitable adjustment payments to be made as equity awards vest through fiscal year 2021, net of estimated forfeitures, totaled $800 and $2,292, respectively, and were included in accrued expenses and other current liabilities in the accompanying consolidated balance sheets.

The cash dividends declared to the holders of common stock, Series B Preferred Stock and Series C Preferred Stock totaled $39,585, $2,108 and $45,440, respectively, and the equitable adjustment to the holders of stock options, SARs and RSUs, net of estimated forfeitures, totaled $12,723. The $99,856 aggregate amount of such dividends and equitable adjustments was recorded as a charge to additional paid-in capital (until reduced to zero) and a charge to accumulated deficit during the year ended December 31, 2017.

December 2016 Special Dividend

On December 21, 2016, the board of directors declared, and on December 29, 2016 the stockholders approved, a special dividend to the holders of common stock and preferred stock of record on December 27, 2016. The cash dividend declared to stockholders was $2.3306 per share of common stock, $23.3058 per share of Series B Preferred Stock and $23.3058 per share of Series C Preferred Stock. Related to this special dividend declared in December 2016, the Company paid $77,153 and $94,272 of dividends to the common and preferred stockholders during the years ended December 31, 2017 and 2016, respectively. No dividend payments with respect to this special dividend were payable as of December 31, 2018 and 2017.

In connection with the special dividend declared in December 2016, the board of directors also approved cash payments to be made to holders of the Company's stock options, SARs and RSUs as an equitable adjustment to the holders of such instruments in accordance with the provisions of the Company's equity incentive plans. The equitable adjustment payments to the holders of stock options, SARs and RSUs are equal to $2.3306 per share multiplied by the net number of shares subject to outstanding equity awards after applying the treasury stock method. The cash payments to such holders will be made as their equity awards vest through fiscal year 2020. During the years ended December 31, 2018 and 2017, the Company paid $3,105 and $23,395, respectively, to the holders of such vested equity awards. During the year ended December 31, 2016, no payments were made to holders of such vested equity awards. As of December 31, 2018 and 2017, equitable adjustment payments to be made as equity awards vest through fiscal year 2020, net of estimated forfeitures, totaled $1,621 and $4,726, respectively, and were included in accrued expenses and other current liabilities in the accompanying consolidated balance sheet.

The cash dividends declared to the holders of common stock, Series B Preferred Stock and Series C Preferred Stock totaled $77,311, $4,172 and $89,942, respectively, and the equitable adjustment to the holders of stock options, SARs and RSUs, net of estimated forfeitures, totaled $28,121. The $199,546 aggregate amount of such dividends and equitable adjustments was recorded as a charge to retained earnings (until reduced to zero), a charge to additional paid-in capital (until reduced to zero) and a charge to accumulated deficit during the year ended December 31, 2016.

June 2016 Special Dividend

On June 17, 2016, the board of directors declared and the stockholders approved a special dividend to the holders of common stock and preferred stock of record on that date. The cash dividend declared to stockholders was $0.5891 per share of common stock, $5.8910 per share of Series B Preferred Stock, and $5.8910 per share of Series C Preferred Stock. Related to this special dividend declared in June 2016, the Company paid $43,148 of dividends to the common and preferred stockholders during the year ended December 31, 2016. As of December 31, 2018 and 2017, no dividend payments with respect to this special dividend were payable.

In connection with the special dividend declared in June 2016, the board of directors also approved cash payments to be made to holders of the Company's stock options, SARs and RSUs as an equitable adjustment to the holders of such instruments in accordance with the provisions of the Company's equity incentive plans. The equitable adjustment payments to the holders of stock options, SARs and RSUs are equal to $0.5891 per share multiplied by the net number of shares subject to outstanding equity awards after applying the treasury stock method. The cash payments to such holders will be made as their equity awards vest through fiscal year 2020. During the years ended December 31, 2018, 2017 and 2016, the Company paid $684, $1,075 and $4,678, respectively to the holders of such vested equity awards. As of December 31, 2018 and 2017, equitable adjustment payments to be made as equity awards vest through fiscal year 2020, net of estimated forfeitures, totaled $296 and $980 and were included in accrued expenses and other current liabilities in the accompanying consolidated balance sheet.

The cash dividends declared to the holders of common stock, Series B Preferred Stock and Series C Preferred Stock totaled $19,359, $1,054 and $22,735, respectively, and the equitable adjustment to the holders of stock options, SARs and RSUs, net of estimated forfeitures, totaled $6,733. The $49,881 aggregate amount of such dividends and equitable adjustments was recorded as a charge to retained earnings during the year ended December 31, 2016.

November 2014 Special Dividend

On November 30, 2014, the board of directors declared and the stockholders approved a special dividend to the holders of common stock and preferred stock of record on that date. The cash dividend declared to stockholders was $0.3835 per share of common stock, $3.8346 per share of Series B Preferred Stock and $3.8346 per share of Series C Preferred Stock. Related to this special dividend declared in November 2014, the Company paid no dividends to the common and preferred stockholders during the years ended December 31, 2018, 2017 and 2016, and no dividend payments with respect to this special dividend were payable as of December 31, 2018 or 2017.

In connection with the special dividend declared in November 2014, the board of directors also approved cash payments to be made to holders of the Company's stock options and SARs as an equitable adjustment to the holders of such instruments in accordance with the provisions of the Company's equity incentive plans. The equitable adjustment payments to the holders of stock options and SARs are equal to $0.3835 per share multiplied by the net number of shares subject to outstanding equity awards after applying the treasury stock method. The cash payments to the holders of stock options and SARs will be made as equity awards vested through fiscal year 2018. During the years ended December 31, 2018, 2017 and 2016, the Company paid $43, $117 and $203, respectively, to the holders of stock options and SARs for vested equity awards. As of December 31, 2018 and 2017, equitable adjustment payments to be made as equity awards vested through fiscal year 2018, net of estimated forfeitures, totaled $20 and $63, respectively, and were included in accrued expenses and other current liabilities in the accompanying consolidated balance sheets.

11. Common Stock

Upon the closing of the IPO on December 19, 2017, the Company filed a restated certificate of incorporation, which authorized the Company to issue 500,000 shares of $0.001 par value common stock. Each share of common stock entitles the holder to one vote on all matters submitted to a vote of the Company's stockholders. Common stockholders are entitled to receive dividends, as may be declared by the board of directors, if any, subject to the preferential dividend rights of the preferred stock. Through December 31, 2018, except for the special cash dividends declared on November 30, 2014, June 17, 2016, December 21, 2016, May 10, 2017 and November 30, 2017 (see Note 10), no dividends have been declared by the board of directors.

As of December 31, 2018, the Company had reserved 18,747 shares of common stock for the exercise of outstanding stock options, the vesting of outstanding RSUs, and the number of shares remaining available for grant under the Company's 2017 Stock Incentive Plan (see Note 12).

Stock Split

On December 1, 2017, the Company effected a five-for-one stock split of its issued and outstanding shares of common stock and a proportional adjustment to the existing conversion ratio of each series of the Company's Convertible Preferred Stock (see Note 10). Accordingly, all share and per share amounts for all periods presented in the accompanying consolidated financial statements and notes thereto have been adjusted retroactively, where applicable, to reflect this stock split and adjustment of the preferred stock conversion ratios.

Stock Repurchase Program

On August 14, 2018, the Company announced a stock repurchase program authorizing it to repurchase up to $75,000 of the Company's common stock. During the year ended December 31, 2018, the Company repurchased and retired 5,172 shares for $75,000, before commissions. Stock repurchases under this program are now complete.

12. Stock-based Compensation

2003 Stock Incentive Plan

The Company's 2003 Stock Incentive Plan, as amended (the "2003 Plan"), provided for the grant of qualified incentive stock options, nonqualified stock options, restricted stock or other stock-based awards to the Company's employees, officers, directors, advisers and outside consultants. The number of shares authorized for grant under the 2003 Plan, as amended, was 32,500 shares. The 2003 Plan was administered by the board of directors, or at the discretion of the board of directors, by a committee of the board or by one or more executive officers of the Company. The exercise prices, vesting and other restrictions were determined at the discretion of the board of directors, or their committee or by one or more executive officers of the Company, if so delegated.

The 2003 Plan was terminated in August 2011, and the remaining 2,140 shares available for issuance under the plan at that time were transferred to the Company's 2011 Stock Incentive Plan (the "2011 Plan"). The shares of common stock underlying any awards that are forfeited, canceled, repurchased or are otherwise terminated by the Company under the 2003 Plan will be added back to the shares of common stock available for issuance under the Company's 2017 Stock Incentive Plan (the "2017 Plan").

2011 Stock Incentive Plan

The 2011 Plan provided for the Company to sell or issue common stock or restricted common stock, or to grant qualified incentive stock options, nonqualified stock options, SARs, RSUs or other stock-based awards to the Company's employees, officers, directors, advisers and outside consultants. The 2011 Plan was administered by the board of directors, or at the discretion of the board of directors, by a committee of the board. The exercise prices, vesting and other restrictions were determined at the discretion of the board of directors, or their committee if so delegated, except that the exercise price per share of stock options could not be less than 100% of the fair market value of common stock on the date of grant and the term of the stock option could not be greater than ten years. The stock options generally vest over a four-year period and expire ten years from the date of grant. Certain options provide for accelerated vesting if there is a change in control (as defined in the stock option agreements).

The 2011 Plan was terminated for the purpose of making new grants in December 2017, and the remaining 2,855 shares available for issuance under the 2011 Plan at that time were transferred to the 2017 Plan. Awards outstanding under the 2011 Plan at the time of the 2011 Plan's termination will continue to be governed by their existing terms. The shares of common stock underlying any awards that are forfeited, canceled, repurchased or are otherwise terminated by the Company under the 2011 Plan will be added back to the shares of common stock available for issuance under the 2017 Plan.

2017 Stock Incentive Plan

On November 17, 2017, the Company's board of directors adopted, and on November 30, 2017, the Company's stockholders approved, the 2017 Plan, which became effective immediately prior to the effectiveness of the registration statement for the IPO. The 2017 Plan provides for the grant of incentive stock options, nonqualified stock options, stock appreciation rights, restricted stock awards, restricted stock units and other stock-based awards. The number of shares initially reserved for issuance under the 2017 Plan is the sum of 7,161 shares, plus the number of shares (up to 18,746 shares) equal to the sum of (i) the number of shares remaining available for issuance under the 2003 Plan and 2011 Plan upon the effectiveness of the 2017 Plan and (ii) the number of shares of common stock subject to outstanding awards under the 2003 Plan and 2011 Plan that expire, terminate or are otherwise surrendered, canceled, forfeited or repurchased by the Company at their original issuance price pursuant to a contractual repurchase right. The number of shares of common stock that may be issued under the 2017 Plan will automatically increase on each January 1, beginning with the fiscal year ending December 31, 2019 and continuing for each fiscal year until, and including, the fiscal year ending December 31, 2027, equal to the least of (i) 20,000 shares, (ii) 4% of the outstanding shares of common stock on such date and (iii) an amount determined by the Company's board of directors. The shares of common stock underlying any awards that are forfeited, canceled, repurchased or are otherwise terminated by the Company under the 2017 Plan will be added back to the shares of common stock available for issuance under the 2017 Plan. The total number of shares authorized for issuance under the 2017 Plan was 10,154 shares as of December 31, 2018, of which 8,422 shares remained available for future grant.

Stock Option Valuation

The fair value of each option award is estimated on the date of grant using the Black-Scholes option-pricing model that uses the assumptions noted in the table below. Expected volatility for the Company's common stock was determined based on an average of the historical volatility of a peer group of similar public companies. The expected term of options granted was calculated using the simplified method, which represents the average of the contractual term of the option and the weighted-average vesting period of the option. The Company uses the simplified method because it does not have sufficient historical option exercise data to provide a reasonable basis upon which to estimate the expected term. The expected dividend yield is based on the fact that the Company does not have a history of paying cash dividends, except for the special dividends declared in November 2014, June 2016, December 2016, May 2017 and November 2017 (see Note 10), and in those circumstances, the board of directors approved cash dividends to be paid to holders of the Company's stock options and SARs upon vesting as an equitable adjustment to the holders of such instruments. The risk-free rate for periods within the expected life of the option is based upon the U.S. Treasury yield curve in effect at the time of grant.

In determining the exercise prices for options granted prior to the Company's IPO, the Company's board of directors considered the fair value of the common stock as of the measurement date. The fair value of the common stock was determined by the board of directors at each award grant date based upon a variety of factors, including the results obtained from an independent third-party valuation of the Company's common stock, the Company's financial position and historical financial performance, the status of technological developments within the Company's products, the composition and ability of the current management team, an evaluation or benchmark of the Company's competition, the current business climate in the marketplace, the illiquid nature of the common stock, the effect of the rights and preferences of the holders of the Company's convertible preferred stock, and the prospects of a liquidity event, among others. Subsequent to the completion of the IPO, the Company uses the closing price of its common stock as reported on the Nasdaq Global Select Market on the applicable date of grant to determine the fair value of the shares of common stock underlying stock options.

The assumptions used in the Black-Scholes option-pricing model were as follows:

	Year Ended December 31,		
	2018	2017	2016
Risk-free interest rate	2.7%–3.0%	2.0%–2.2%	1.1%–1.5%
Expected term (in years)	6.0–6.2	6.0–6.2	4.7–6.2
Expected volatility	30.6%–32.6%	33.0%–38.5%	34.2%–40.4%
Expected dividend yield	0.0%	0.0%	0.0%

Stock Options

A summary of option activity under the 2003 Plan, the 2011 Plan and the 2017 Plan for the year ended December 31, 2018 is as follows:

	Number of Shares		Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Term (in years)		Aggregate Intrinsic Value
Outstanding at January 1, 2018	15,579	$	4.55	6.18	$	205,717
Granted	749		20.78			
Exercised	(6,576)		2.24			
Forfeited	(186)		10.87			
Outstanding at December 31, 2018	9,566	$	7.29	6.35	$	61,561
Options exercisable at December 31, 2018	6,844	$	4.79	5.56	$	57,051
Vested or expected to vest at December 31, 2018	9,420	$	7.18	6.32	$	61,418

The weighted-average grant-date fair value of options granted during the years ended December 31, 2018, 2017 and 2016 was $7.59, $4.74 and $3.71 per share, respectively. Cash proceeds received upon the exercise of options were $14,730, $274 and $594 during the years ended December 31, 2018, 2017 and 2016, respectively. The intrinsic value of stock options exercised during the years ended December 31, 2018, 2017 and 2016 was $105,787, $1,915 and $5,001, respectively. The aggregate intrinsic value is calculated as the difference between the exercise price of the stock options and the fair value of the Company's common stock for those stock options that had exercise prices lower than the fair value of the Company's common stock.

Restricted Stock Units

On March 8, 2018, June 6, 2018, June 14, 2018, September 27, 2018, November 27, 2018 and December 14, 2018, the Company granted 103, 7, 83, 185, 20 and 22 RSUs, respectively, under the 2017 Plan. On January 31, 2017 and May 15, 2017, the Company granted 176 and 15 RSUs, respectively, under the 2011 Plan. On December 15, 2017, the Company granted 35 RSUs under the 2017 Plan. On March 26, 2016 and January 23, 2015, the Company granted 244 and 2,103 RSUs, respectively, under the 2011 Plan. The RSUs vest ratably over a one- to four-year period from the date of grant. The grant-date fair value of each RSU award is being recorded as stock-based compensation expense on a straight-line basis, net of estimated forfeitures, over the requisite service period for the RSUs, which is generally one to four years. The fair value of each RSU on the date of grant is the estimated fair value of the underlying common stock on the date of the grant. A summary of RSU activity under the 2011 Plan and the 2017 Plan for the year ended December 31, 2018 is as follows:

	Number of Shares		Weighted-Average Grant Date Fair Value		Aggregate Fair Value
Unvested balance at January 1, 2018	896	$	7.09		
Granted	420		18.07		
Vested	(516)		5.87	$	9,112
Forfeited	(41)		17.91		
Unvested balance at December 31, 2018	759	$	13.40		

The Company withheld 1, 310 and 37 shares of common stock in settlement of employee tax withholding obligations due upon the vesting of RSUs during the years ended December 31, 2018, 2017 and 2016, respectively.

Stock Appreciation Rights

In January 2017, the Company granted 110 SARs that allow the holder the right, upon exercise, to receive in cash the amount of the difference between the fair value of the Company's common stock at the date of exercise and the price of the underlying common stock at the date of grant of each SAR. The price of the underlying common stock on the date of grant was $12.24 per share and the grant-date fair value was $4.52 per SAR. The SARs vest over a four-year period from the date of grant and expire ten years from the date of grant. As of December 31, 2018, 240 SARs were outstanding and 35 were unvested. As of December 31, 2018, there were 205 SARs exercisable and the fair value of each SAR was $7.21 per SAR. The fair value of the SAR liability as of December 31, 2018 and 2017 was $1,387 and $2,155, respectively (see Note 6), and was included in accrued expenses and other current liabilities in the accompanying consolidated balance sheets.

Stock-Based Compensation Expense

The Company recorded stock-based compensation expense of $8,894, $9,136 and $8,304 during the years ended December 31, 2018, 2017 and 2016, respectively, which is based on the number of stock options, RSUs and SARs ultimately expected to vest. As of December 31, 2018, there was $18,405 of unrecognized compensation cost related to outstanding stock options, RSUs and SARs, which is expected to be recognized over a weighted-average period of 2.67 years.

Stock-based compensation expense related to stock options, RSUs and SARs for the years ended December 31, 2018, 2017 and 2016 was classified in the consolidated statements of operations and comprehensive income as follows:

	Year Ended December 31,		
	2018	2017	2016
Cost of revenue	$ 249	$ 306	$ 237
Research and development expenses	1,864	2,864	2,306
Sales and marketing expenses	1,229	1,112	1,147
General and administrative expenses	5,552	4,854	4,614
	$ 8,894	$ 9,136	$ 8,304

13. Net Income (Loss) per Share

Basic and diluted net income (loss) per share attributable to common stockholders was calculated as follows:

	Year Ended December 31,		
	2018	2017	2016
Numerator:			
Net income	$ 73,006	$ 88,500	$ 88,668
Cumulative dividends on convertible preferred stock	—	(5,674)	(5,884)
Dividends declared on convertible preferred stock	—	(70,977)	(117,903)
Net income (loss) attributable to common stockholders, basic and diluted	$ 73,006	$ 11,849	$ (35,119)
Denominator:			
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders, basic	83,539	35,359	32,864
Dilutive effect of stock options	8,086	9,141	—
Dilutive effect of restricted stock units	252	472	—
Weighted-average shares used to compute net income (loss) per share attributable to common stockholders, diluted	91,877	44,972	32,864
Net income (loss) per share attributable to common stockholders:			
Basic	$ 0.87	$ 0.34	$ (1.07)
Diluted	$ 0.79	$ 0.26	$ (1.07)

The following potential common shares, presented based on amounts outstanding at each period end, were excluded from the computation of diluted net income (loss) per share attributable to common stockholders for the periods presented because including them would have been anti-dilutive:

	Year Ended December 31,		
	2018	2017	2016
Convertible preferred stock (on an as-converted basis)	—	—	40,382
Options to purchase common stock	2,213	2,281	14,407
Unvested restricted stock units	168	35	1,398

14. Segment Information

The Company operates as one operating segment. Operating segments are defined as components of an enterprise for which separate financial information is regularly evaluated by the Company's chief operating decision maker, or decision-making group, in deciding how to allocate resources and assess performance. The Company has determined that its chief operating decision maker is its President and Chief Executive Officer. The Company's chief operating decision maker reviews the Company's financial information on a consolidated basis for purposes of allocating resources and assessing financial performance. Since the Company operates as one operating segment, all required financial segment information can be found in these consolidated financial statements.

The following table summarizes the Company's revenue based on the customer's location, as determined by the customer's shipping address:

	Year Ended December 31,		
	2018	2017	2016
North America:			
United States	$ 104,124	$ 143,540	$ 105,318
Canada	41,884	58,316	78,623
Total North America	146,008	201,856	183,941
Latin America	32,283	40,347	47,314
Europe, Middle East and Africa:			
Germany	45,864	13,396	1,644
Other	35,479	48,062	43,561
Total Europe, Middle East and Africa	81,343	61,458	45,205
Asia-Pacific	37,493	47,914	39,668
Total revenue(1)	$ 297,127	$ 351,575	$ 316,128

(1) Other than the United States, Germany and Canada, no individual countries represented 10% or more of the Company's total revenue for any of the periods presented.

The Company's property and equipment, net by location was as follows:

	December 31,	
	2018	2017
United States	$ 25,088	$ 24,903
China	2,623	2,612
Other	2,168	1,848
Total property and equipment, net	$ 29,879	$ 29,363

15. Related Parties

Transactions Involving Liberty Global Ventures Holding B.V. and its Affiliates

Liberty Global Ventures Holding B.V. was a principal stockholder of the Company through its ownership of common stock. Affiliates of Liberty Global Ventures Holding B.V. ("Liberty Global Affiliates") are customers of the Company. Liberty Global Affiliates ceased being a principal stockholder as of October 19, 2018, when it disposed a portion of its ownership of the Company's stock. During the periods in which it was a related party in the years ended December 31, 2018, 2017 and 2016, the Company recognized revenue of $22,252, $39,370 and $31,737, respectively, from transactions with Liberty Global Affiliates and amounts received in cash from Liberty Global Affiliates totaled $30,432, $38,273 and $29,143, respectively. As of December 31, 2017, amounts due from Liberty Global Affiliates totaled $13,367.

Consulting Agreement with Bill Styslinger

In March 2012, the Company entered into a consulting agreement with Bill Styslinger, a member of its board of directors, for the provision of sales management, corporate strategy and advisory services, which was initially scheduled to expire on January 31, 2014. The Company extended the term of the consulting agreement on two occasions, and the consulting agreement expired on December 31, 2016. In connection with Mr. Styslinger's services as a consultant, in May 2012, the Company granted Mr. Styslinger stock options for the purchase of 600 shares of common stock, at an exercise price of $1.69 per share, which vested as to one-third of the shares under the award on February 1, 2013 and in equal monthly installments thereafter for the following two years. The grant-date fair value of the award totaled $527, which was recorded by the Company as stock-based compensation expense over the vesting period of the award.

In connection with special dividends declared by the Company's board of directors in November 2014, June 2016, December 2016, May 2017 and November 2017 (see Note 10), the board of directors also approved cash payments to be made to holders of the Company's stock options, SARs and RSUs in accordance with the provisions of the Company's equity incentive plans. In connection with the special dividends declared in December 2016 and May 2017, the Company paid Mr. Styslinger $1,075 as equitable adjustments in the year ended December 31, 2017. The Company made no payments to Mr. Styslinger as equitable adjustments in the year ended December 31, 2018.

In addition, during both the years ended December 31, 2018 and 2017, the Company recognized general and administrative expenses of $205 for Mr. Styslinger's services as a non-employee director. As of December 31, 2018, $14 was due to Mr. Styslinger for his services as a non-employee director. No amount was due to Mr. Styslinger for his services as a non-employee director as of December 31, 2017.

Employment of Rongke Xie

Rongke Xie, who serves as Deputy General Manager of Guangzhou Casa Communication Technology LTD ("Casa China"), a subsidiary of the Company, is the sister of Lucy Xie, the Company's Senior Vice President of Operations and a member of the Company's board of directors. Casa China paid Rongke Xie $143, $160 and $140 in total compensation in the years ended December 31, 2018, 2017 and 2016, respectively, for her services as an employee.

In addition, during the year ended December 31, 2018, the Company granted to Rongke Xie 5 RSUs, which vest in annual installments over a four-year period. The grant-date fair value of the award totaled $100, which will be recorded as stock-based compensation expense over the vesting period of the award. During the year ended December 31, 2018, the Company recognized general and administrative expenses of $13 related to this award.

16. Commitments and Contingencies

Operating Leases

The Company leases manufacturing, warehouse and office space in the United States, China, Spain and Ireland under non-cancelable operating leases that expire in 2021, 2022, 2022 and 2026, respectively. The Ireland lease provides the Company the right to terminate in 2021. Rent expense for the years ended December 31, 2018, 2017 and 2016 was $1,029, $933 and $572, respectively. Rent expense is recorded on a straight-line basis, and, as a result, as of December 31, 2018 and 2017, the Company had a deferred rent liability of $184 and $258, respectively, which is included in accrued expenses and other current liabilities in the accompanying consolidated balance sheets.

Future minimum lease payments under non-cancelable operating leases as of December 31, 2018 were as follows:

Year Ending December 31,		
2019	$	911
2020		927
2021		753
2022		72
2023		5
Thereafter		—
	$	2,668

Indemnification

The Company has, in the ordinary course of business, agreed to defend and indemnify certain customers against third-party claims asserting infringement of certain intellectual property rights, which may include patents, copyrights, trademarks or trade secrets.

As permitted under Delaware law, the Company indemnifies its officers, directors and employees for certain events or occurrences that happen by reason of their relationship with or position held at the Company.

As of December 31, 2018 and 2017, the Company had not experienced any losses related to these indemnification obligations and no material claims were outstanding. The Company does not expect significant claims related to these indemnification obligations and, consequently, concluded that the fair value of these obligations is negligible, and no related liabilities were recorded in its consolidated financial statements.

Litigation

From time to time, and in the ordinary course of business, the Company may be subject to various claims, charges and litigation. As of December 31, 2018, the Company did not have any pending claims, charges or litigation that it expects would have a material adverse effect on its consolidated financial position, results of operations or cash flows.

17. Employee Benefit Plan

The Company has a Section 401(k) defined contribution savings plan for its employees. The plan covers substantially all employees in the United States who meet minimum age and service requirements and allows participants to defer a portion of their annual compensation on a pre-tax basis, subject to certain limitations. Company contributions to the plan may be made at the discretion of the board of directors. Effective January 1, 2014, the Company commenced matching contributions in the amount of 50% of the employee’s contributions of up to 6% of eligible wages. The Company made matching contributions to the plan of $1,630, $1,484 and $1,313 in the years ended December 31, 2018, 2017 and 2016, respectively.

18. Selected Quarterly Financial Information (Unaudited)

The following tables set forth selected unaudited quarterly consolidated statements of income data for each of the quarters in the years ended December 31, 2018 and 2017:

	Three Months Ended							
	Dec. 31, 2018	Sept. 30, 2018	June 30, 2018	Mar. 31, 2018	Dec. 31, 2017	Sept. 30, 2017	June 30, 2017	Mar. 31, 2017
	(in thousands)							
Revenue:								
Product	$ 57,446	$ 60,817	$ 58,537	$ 80,189	$ 106,741	$ 84,196	$ 55,750	$ 65,209
Service	10,379	10,689	10,185	8,885	11,221	10,063	10,875	7,520
Total revenue	67,825	71,506	68,722	89,074	117,962	94,259	66,625	72,729
Cost of revenue:								
Product	16,738	13,272	18,560	25,780	25,673	23,824	19,909	19,132
Services	1,408	1,303	761	1,339	1,336	1,442	938	1,257
Total cost of revenue	18,146	14,575	19,321	27,119	27,009	25,266	20,847	20,389
Gross profit	49,679	56,931	49,401	61,955	90,953	68,993	45,778	52,340
Operating expenses:								
Research and development	17,345	16,403	16,696	20,530	16,765	15,217	14,227	14,468
Sales and marketing	10,063	10,234	9,621	11,268	12,619	8,747	8,156	10,080
General and administrative	5,439	7,671	6,542	7,188	7,176	4,866	4,526	4,995
Total operating expenses	32,847	34,308	32,859	38,986	36,560	28,830	26,909	29,543
Income from operations	16,832	22,623	16,542	22,969	54,393	40,163	18,869	22,797
Other income (expense), net	(3,578)	(2,731)	(3,319)	(3,400)	(3,546)	(3,552)	(2,766)	(3,540)
Income before provision for (benefit from) income taxes	13,254	19,892	13,223	19,569	50,847	36,611	16,103	19,257
Provision for (benefit from) income taxes	(1,662)	995	(8,194)	1,793	21,984	12,288	(1,057)	1,103
Net income	$ 14,916	$ 18,897	$ 21,417	$ 17,776	$ 28,863	$ 24,323	$ 17,160	$ 18,154
Net income (loss) per share attributable to common stockholders:								
Basic	$ 0.18	$ 0.22	$ 0.26	$ 0.22	$ 0.10	$ 0.31	$ (0.95)	$ 0.23
Diluted	$ 0.17	$ 0.21	$ 0.23	$ 0.19	$ 0.08	$ 0.27	$ (0.95)	$ 0.20

19. Subsequent Events

Stock Repurchase Program

On February 19, 2019, the board of directors authorized the repurchase of up to $75,000 of the Company’s common stock under a stock repurchase program. The repurchase program may be superseded or discontinued at any time and has no expiration date.

NetComm Wireless

On February 21, 2019, the Company entered into a definitive agreement to acquire NetComm Wireless Limited for cash consideration of approximately $161,000 Australian dollars, or AUD ($115,300 United States dollars, or USD, based on an exchange rate of USD $0.716 per AUD $1.00 on February 21, 2019). The Company expects the transaction will close in June 2019, subject to closing conditions and required approvals.

Customer Receivable

On February 25, 2019, a customer unexpectedly announced that it had filed for reorganization under Chapter 11 of the U.S. Bankruptcy Code. As of December 31, 2018, amounts due from the customer totaled $1,255, or 1.5%, of aggregate accounts receivable. For the year ended December 31, 2018, sales to the customer represented less than 0.4% of total revenue. The Company is assessing the bankruptcy filing and may need to write off this receivable balance in a future period if the receivable is deemed uncollectible.

Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure.

None.

Item 9A. Controls and Procedures.

Evaluation of Disclosure Controls and Procedures

Our management, with the participation of our Chief Executive Officer and Chief Financial Officer, has evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a- 15(e) and 15d- 15(e) under the Securities Exchange Act of 1934, as amended, or the Exchange Act), as of the end of the period covered by this Annual Report on Form 10-K. The term "disclosure controls and procedures," as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act, means controls and other procedures of a company that are designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the Securities and Exchange Commission's rules and forms. Disclosure controls and procedures include, without limitation, controls and procedures designed to ensure that information required to be disclosed by a company in the reports that it files or submits under the Exchange Act is accumulated and communicated to the company's management, including its principal executive and principal financial officers, or persons performing similar functions, as appropriate to allow timely decisions regarding required disclosure. Our management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives and our management necessarily applies its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Based on the evaluation of our disclosure controls and procedures as of the end of the period covered by this Annual Report on Form 10-K, our principal executive officer and principal financial officer have concluded that as of such date, our disclosure controls and procedures were effective.

Management's Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting. Internal control over financial reporting is defined in Rule 13a-15(f) or 15d-15(f) promulgated under the Exchange Act as a process designed by, or under the supervision of, the company's principal executive and principal financial officers and effected by the company's board of directors, management and other personnel, 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 and includes those policies and procedures that:

- Pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the company;
- 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,
- 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. 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.

Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2018. In making this assessment, our management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) in Internal Control-Integrated 2013 Framework. Based on this assessment, our management concluded that, as of December 31, 2018, our internal control over financial reporting is effective based on those criteria.

This Annual Report on Form 10-K does not include an attestation report of our independent registered public accounting firm due to a transition period established by rules of the SEC for "emerging growth companies".

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during our most recently completed fiscal quarter that have materially affected, or are 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

The complete response to this Item regarding the backgrounds of our executive officers and directors and other information required by Items 401, 405 and 407 of Regulation S-K is expected to be incorporated by reference herein to our definitive proxy statement for our 2019 Annual Meeting of Stockholders.

Code of Business Conduct and Ethics

We have adopted a written code of business conduct and ethics that applies to our directors, officers and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. A copy of the code is available on our website, www.casa-systems.com. In addition, we intend to post on our website all disclosures that are required by law or the Nasdaq Listing Rules concerning any amendments to, or waivers from, any provision of the code.

Item 11. Executive Compensation

The information required by this Item is expected to be incorporated by reference herein to our definitive proxy statement for our 2019 Annual Meeting of Stockholders.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this Item is expected to be incorporated by reference herein to our definitive proxy statement for our 2019 Annual Meeting of Stockholders.

Item 13. Certain Relationships and Related Transactions, and Director Independence

The information required by this Item is expected to be incorporated by reference herein to our definitive proxy statement for our 2019 Annual Meeting of Stockholders.

Item 14. Principal Accounting Fees and Services

The information required by this Item is expected to be incorporated by reference herein to our definitive proxy statement for our 2019 Annual Meeting of Stockholders.

PART IV

Item 15. Exhibits, Financial Statement Schedules.

(l) Financial Statements

Our consolidated financial statements are set forth in Part II, Item 8 of this Annual Report on Form 10-K and are incorporated herein by reference.

(2) Financial Statement Schedules

All financial schedules have been omitted because the required information is either presented in the consolidated financial statements or the notes thereto or is not applicable or required.

(3) Exhibits

Exhibit Number	Description of Exhibit	Incorporated by Reference Form	File No.	Date of Filing	Exhibit Number	Filed Herewith
3.1	Restated Certificate of Incorporation of the Registrant	8-K	001-38324	12/19/2017	3.1	
3.2	By-laws of the Registrant	8-K	001-38324	12/19/2017	3.2	
4.1	Specimen Stock Certificate evidencing the shares of common stock	S-1/A	333-221658	12/4/2017	4.1	
10.1#	Form of Indemnification Agreement between the Registrant and its executive officers and directors	S-1	333-221658	11/17/2017	10.1	
10.2#	2003 Stock Incentive Plan, as amended	S-1	333-221658	11/17/2017	10.2	
10.3#	Form of Incentive Stock Option Agreement under 2003 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.3	
10.4#	Form of Nonstatutory Stock Option Agreement under 2003 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.4	
10.5#	Form of Restricted Stock Agreement under 2003 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.5	
10.6#	2011 Stock Incentive Plan, as amended	S-1	333-221658	11/17/2017	10.6	
10.7#	Form of Incentive Stock Option Agreement under 2011 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.7	
10.8#	Form of Nonstatutory Stock Option Agreement under 2011 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.8	
10.9#	Form of Restricted Stock Agreement under 2011 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.9	
10.10#	Form of Restricted Stock Unit Agreement under 2011 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.10	
10.11#	Form of Stock Appreciation Rights Agreement under 2011 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.11	
10.12#	2017 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.12	
10.13#	Form of Stock Option Agreement under 2017 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.13	
10.14#	Form of Restricted Stock Unit Agreement under 2017 Stock Incentive Plan	S-1	333-221658	11/17/2017	10.14	

10.15#	Offer Letter between the Registrant and Gary Hall, dated May 25, 2011	S-1	333-221658	11/17/2017	10.15	
10.16#	Offer Letter between the Registrant and Abraham Pucheril, dated August 18, 2012	S-1	333-221658	11/17/2017	10.16	
10.17#	Consulting Agreement between the Registrant and Bill Styslinger, dated March 5, 2012, as amended	S-1	333-221658	11/17/2017	10.17	
10.18	Mortgage, Security Agreement and Financing Statement, dated July 1, 2015, between Casa Properties LLC and Middlesex Savings Bank	S-1	333-221658	11/17/2017	10.18	
10.19	Registration Rights Agreement, dated April 26, 2010, between the Registrant and the investors party thereto	S-1	333-221658	11/17/2017	10.19	
10.20	Credit Agreement, dated as of December 20, 2016, by and among the Registrant and JPMorgan Chase Bank, N.A., as agent, and the other agents, arrangers and lenders party thereto	S-1	333-221658	11/17/2017	10.20	
10.21	Letters, dated as of February 1, 2017 and April 14, 2017, from the Registrant to the lenders party to the Credit Agreement	S-1	333-221658	11/17/2017	10.21	
10.22	Security Agreement, dated as of December 20, 2016, by and among the Registrant, each of the subsidiaries of the Registrant party thereto, and JPMorgan Chase Bank, N.A., as Collateral Agent	S-1	333-221658	11/17/2017	10.22	
10.23†	Master Purchase Agreement, dated October 31, 2013, between Time Warner Cable Enterprises LLC and Casa Systems, Inc., as amended	S-1	333-221658	11/17/2017	10.23	
10.24#	Employment Agreement, dated November 17, 2017, by and between the Registrant and Jerry Guo	S-1	333-221658	11/17/2017	10.24	
10.25#	Employment Agreement, dated November 17, 2017, by and between the Registrant and Lucy Xie	S-1	333-221658	11/17/2017	10.25	
10.26#	Employment Agreement, dated November 17, 2017, by and between the Registrant and Weidong Chen	S-1	333-221658	11/17/2017	10.26	
10.27#	Offer Letter, dated November 19, 2018, by and between the Registrant and Maurizio Nicolelli					✓
10.28	Deed, dated February 21, 2019 by and between the Registrant and NetComm Wireless Limited	8-K	001-38324	2/21/2019	10.1	
21.1	Subsidiaries of the Registrant					✓
23.1	Consent of PricewaterhouseCoopers LLP, Independent Registered Public Accounting Firm.					✓
31.1	Certification of Principal Executive Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					✓
31.2	Certification of Principal Financial Officer Pursuant to Rules 13a-14(a) and 15d-14(a) under the Securities Exchange Act of 1934, as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.					✓

32.1*	Certification of Principal Executive Officer Pursuant to 18 U.S.C. Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification of Principal Financial Officer 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

Management contracts or compensatory plans or arrangements required to be filed as an exhibit hereto pursuant to Item 15(b) of Form 10-K.

† Confidential treatment requested as to certain portions, which portions have been omitted and filed separately with the Securities and Exchange Commission.

* Furnished herewith.

Item 16. Form 10-K Summary.

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, as amended, the Registrant has duly caused this Report to be signed on its behalf by the undersigned, thereunto duly authorized**,** in the Town of Andover, Commonwealth of Massachusetts, on this 28th day of February, 2019**.**

CASA SYSTEMS, INC.

By: /s/ Jerry Guo
Jerry Guo
President, Chief Executive Officer and Chairman

Pursuant to the requirements of the Securities Exchange Act of 1934, as amended, this Report has been signed below by the following persons on behalf of the Registrant in the capacities and on the dates indicated.

Name	Title	Date
/s/ Jerry Guo **Jerry Guo**	President, Chief Executive Officer and Chairman (Principal Executive Officer)	February 28, 2019
/s/ Maurizio Nicolelli **Maurizio Nicolelli**	Chief Financial Officer (Principal Financial and Accounting Officer)	February 28, 2019
/s/ Lucy Xie **Lucy Xie**	Senior Vice President of Operations and Director	February 28, 2019
/s/ Weidong Chen **Weidong Chen**	Chief Technology Officer and Director	February 28, 2019
/s/ Susana D’Emic **Susana D’Emic**	Director	February 28, 2019
/s/ Bruce R. Evans **Bruce R. Evans**	Director	February 28, 2019
/s/ Michael T. Hayashi **Michael T. Hayashi**	Director	February 28, 2019
/s/ Daniel S. Mead **Daniel S. Mead**	Director	February 28, 2019
/s/ Bill Styslinger **Bill Styslinger**	Director	February 28, 2019
/s/ Joseph S. Tibbetts, Jr. **Joseph S. Tibbetts, Jr.**	Director	February 28, 2019

CASA

Casa Systems, Inc.
100 Old River Road
Andover, MA 01810
Telephone (978) 688-6706
Fax (978) 688-6584
Web http://www.casa-systems.com

November 17, 2018

Maurizio Nicolelli
[ ]

Dear Maurizio,

On behalf of Casa Systems, Inc. (the "Company"), I am pleased to set forth the terms of your employment with the Company:

1. You will be employed to serve on a regular, full-time basis as Chief Financial Officer effective January 4, 2019 based at Andover, MA. In this role, you will report to CEO Jerry Guo and will be responsible for Budgets, treasury, tax, accounting, financial reporting and analysis, risk management, property management plus such other duties as may from time to time be assigned to you by the Company.

2. Your starting base salary rate will be $15,384.62 paid bi-weekly, which annualized is equivalent to $400,000.12, subject to taxes and other withholdings as required by law. Such salary may be adjusted from time to time in accordance with normal business practice and in the sole discretion of the Company.

3. In 2019, you will be eligible for an annual performance incentive bonus. Your annual on-target incentive will be 1.5x your base annual salary (equivalent to $600,000.00), if all targets are achieved and prorated based on your date of hire, less applicable taxes, deductions, and withholdings. Your actual bonus payout will depend upon Casa Systems financial performance results and the assessment of your individual performance.

   Your eligibility to be considered for, and the payment of, any incentive is conditional upon you remaining an active employee of the Company through December 31, 2019, and not having served out notice to terminate your employment prior to receiving payment. Any incentive due to you will be paid on or around the first quarter of 2020.

4. You may participate in any and all bonus and benefit programs that the Company establishes and makes available to its employees from time to time, provided that you are eligible under (and subject to all provisions of) the plan documents governing those programs. The benefits made available by the Company, and the rules, terms and conditions for participation in such programs, may be changed by the Company at any time without advance notice.

5. Starting in 2019, and subject to the approval of the Board of Directors of the Company, the Company will grant to you an annual award of Restricted Stock Units ("RSU") under the Company's Stock Incentive Plan with a target valuation of $1,000,000.00 ("RSU"). The number of RSUs should be calculated on the date of grant in accordance with the company's stock valuation practices. The RSUs should be subject to all terms, vesting schedules and other provisions set forth in the company's stock incentive plan and in a separate RSU agreement (the "RSU" Agreement).

6. You will be eligible for a maximum of fifteen (15) days of vacation per calendar year subject to proration to your date of hire and to be taken at such times as may be approved by the Company. The number of vacation days for which you are eligible shall accrue at the rate of 4.62 hours per pay period that you are employed during such calendar year.

7. In the event of termination of your employment by the company without cause, subject to the company's receipt of an effective general release in a form and scope acceptable to the company within 30 days after your termination, you will be provided with the following severance package: (i) receive an amount equal to the sum of your then-current annual base salary for the year of the termination of employment, with such

amount payable in equal installments over 12 months; (ii) continue to receive an amount equal to COBRA premiums for health benefit coverage on the same terms as were applicable to you prior to the termination for a period of 12 months; (iii) One year (for the year of the termination) acceleration of vesting of your equity award specified in this offer.

8. You will be required to execute an Assignment, Invention and Non-Disclosure Agreement and a Non-Competition and Non-Solicitation Agreement in the forms attached as a condition of employment.

9. You represent that you are not bound by any employment contract, restrictive covenant or other restriction preventing you from entering into employment with or carrying out your responsibilities for the Company, or which is in any way inconsistent with the terms of this letter.

10. In accordance with federal law, you will be required to provide the Company with documentation of your identity and eligibility to work in the United States. You agree to provide to the Company, within three days following your hire date, such documentation, as required by the Immigration Reform and Control Act of 1986. Please refer to the I-9 Form enclosed for a list of acceptable documentation. You may need to obtain a work visa in order to be eligible to work in the United States. If that is the case, your employment with the Company will be conditioned upon your obtaining a work visa in a timely manner as determined by the Company.

11. This offer may be contingent upon successful completion of a pre-employment background check, pre-employment physical, and pre-employment drug test conducted in accordance with applicable federal, state, and local laws depending upon the position offered. In addition, the Company reserves the right to conduct a background screening at any time after employment begins to determine eligibility for promotion, reassignment or retention. Additional checks such as a driving record and credit report may also be made for particular job categories.

12. This letter shall not be construed as an agreement, either expressed or implied, to employ you for any stated term, and shall in no way alter the Company's policy of "employment at will", under which both you and the Company remain free to terminate the employment relationship, with or without cause, at any time, with or without notice. Similarly, nothing in this letter shall be construed as an agreement, either express or implied, to pay you any compensation or grant you any benefit beyond the end of your employment with the Company.

If you agree with the initial terms of your employment with the Company as set forth in this letter, please sign in the space provided below, enter your start date, and return a copy by email to Cheryl George in Human Resources. If you choose not to accept this offer by Tuesday, November 20, 2018, the offer will be revoked.

Very Truly Yours,

By: /s/ Lucy Xie
Name: Lucy Xie
Title: Senior Vice President

The foregoing correctly sets forth the initial terms of my at-will employment by Casa Systems, Inc.

/s/ Maurizio Nicolelli
Name: Maurizio Nicolelli

Date: 11/19/2018

Start Date: 1/4/2019

Enclosures: Assignment, Invention and Non-Disclosure Agreement
I-9 Form
Non-Competition and Non-Solicitation Agreement
Benefits Summary

Exhibit 21.1

Subsidiaries of Casa Systems, Inc.

Name of Subsidiary	Jurisdiction of Incorporation or Organization
Casa Communications Limited	Ireland
Casa Communications Technology S.L.	Spain
Casa Properties LLC	Delaware
Casa Systems B.V.	Netherlands
Casa Systems Canada Ltd.	Quebec, Canada
Casa Systems SAS	France
Casa Systems Securities Corporation	Massachusetts
Guangzhou Casa Communication Technology LTD	China
Casa Communications SAS	Colombia
Casa Technologies Limited	Hong Kong

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statement on Form S-8 (Form 333-222073) of Casa Systems Inc. of our report dated February 28, 2019, relating to the consolidated financial statements, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP
Boston, Massachusetts
February 28, 2019

Exhibit 31.1

**CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002**

I, Jerry Guo, certify that:

1. I have reviewed this Annual Report on Form 10-K of Casa Systems, Inc.;

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(s) 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; and

5. The Registrant's other certifying officer(s) 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: February 28, 2019

By: /s/ Jerry Guo
Jerry Guo
President, Chief Executive Officer and Chairman

Exhibit 31.2

CERTIFICATION PURSUANT TO
RULES 13a-14(a) AND 15d-14(a) UNDER THE SECURITIES EXCHANGE ACT OF 1934,
AS ADOPTED PURSUANT TO SECTION 302 OF THE SARBANES-OXLEY ACT OF 2002

I, Maurizio Nicolelli, certify that:

1. I have reviewed this Annual Report on Form 10-K of Casa Systems, Inc.;

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(s) 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; and

5. The Registrant's other certifying officer(s) 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: February 28, 2019

By: /s/ Maurizio Nicolelli
Maurizio Nicolelli
Chief Financial Officer

Exhibit 32.1

**CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002**

In connection with the Annual Report on Form 10-K of Casa Systems, Inc. (the "Company") for the period ended December 31, 2018, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Jerry Guo, as President, Chief Executive Officer and Chairman of the Company, hereby certify, as of the date hereof, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that, to my knowledge, the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, and the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company at the dates and for the periods indicated.

Date: February 28, 2019

By: /s/ Jerry Guo
Jerry Guo
President, Chief Executive Officer and Chairman

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350, AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report on Form 10-K of Casa Systems, Inc. (the "Company") for the period ended December 31, 2018, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Maurizio Nicolelli, as Chief Financial Officer of the Company, hereby certify, as of the date hereof, pursuant to 18 U.S.C. § 1350, as adopted pursuant to § 906 of the Sarbanes-Oxley Act of 2002, that, to my knowledge, the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934, and the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company at the dates and for the periods indicated.

Date: February 28, 2019

By: /s/ Maurizio Nicolelli
Maurizio Nicolelli
Chief Financial Officer