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 October 31, 2019

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 001-36250

Ciena Corporation

(Exact name of registrant as specified in its charter)

Delaware (State or other jurisdiction of incorporation or organization)	**23-2725311** (I.R.S. Employer Identification No.)
7035 Ridge Road, Hanover, MD (Address of principal executive offices)	**21076** (Zip Code)

Registrant's telephone number, including area code: **(410) 694-5700**

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.01 par value	**CIEN**	**New York Stock Exchange**

Securities registered pursuant to Section 12(g) of the Act: **None**

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

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes o 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 o

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 o

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

Large accelerated filer	☑	Accelerated filer	☐	Non-accelerated filer	☐	Smaller reporting company	☐
						Emerging growth company	☐

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

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act) YES ☐ NO ☑

The aggregate market value of the registrant's Common Stock held by non-affiliates of the registrant was approximately $6.0 billion based on the closing price of the Common Stock on the New York Stock Exchange on May 3, 2019.

The number of shares of registrant's Common Stock outstanding as of December 16, 2019 was 154,054,072.

DOCUMENTS INCORPORATED BY REFERENCE

Part III of the Form 10-K incorporates by reference certain portions of the registrant's definitive proxy statement for its 2020 Annual Meeting of Stockholders to be filed with the Commission not later than 120 days after the end of the fiscal year covered by this report.

CIENA CORPORATION
ANNUAL REPORT ON FORM 10-K
FOR FISCAL YEAR ENDED OCTOBER 31, 2019

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PART I

Cautionary Note Regarding Forward-Looking Statements

This annual report contains statements that discuss future events or expectations, projections of results of operations or financial condition, changes in the markets for our products and services, trends in our business, business prospects and strategies and other "forward-looking" information. In some cases, you can identify "forward-looking statements" by words like "may," "will," "can," "should," "could," "expects," "future," "plans," "anticipates," "believes," "estimates," "predicts," "intends," "potential," "projects," "targets," or "continue" or the negative of those words and other comparable words. These statements may relate to, among other things, our competitive landscape; market conditions and growth opportunities; factors impacting our industry and markets; factors impacting the businesses of network operators and their network architectures; adoption of next-generation infrastructures that are more open, programmable and automated; our strategy, including our research and development, supply chain and go-to-market initiatives; efforts to increase application of our solutions in customer networks and to increase the reach of our business into new or growing customer and geographic markets; our backlog and seasonality in our business; expectations for our financial results, revenue, gross margin, operating expense and key operating measures in future periods; the adequacy of our sources of liquidity to satisfy our working capital needs, capital expenditures and other liquidity requirements; business initiatives including information technology ("IT") transitions or initiatives; the impact of the Tax Cuts and Jobs Act (the "Tax Act") and changes in our effective tax rates; and market risks associated with financial instruments and foreign currency exchange rates. These statements are subject to known and unknown risks, uncertainties and other factors, and actual events or results may differ materially due to factors such as:

- *our ability to execute our business and growth strategies;*
- *fluctuations in our revenue, gross margin and operating results and our financial results generally;*
- *the loss of any of our large customers, a significant reduction in their spending, or a material change in their networking or procurement strategies;*
- *the competitive environment in which we operate;*
- *market acceptance of products and services currently under development and delays in product or software development;*
- *lengthy sales cycles and onerous contract terms with communications service providers, Web-scale providers and other large customers;*
- *product performance or security problems and undetected errors;*
- *our ability to diversify our customer base and to broaden the application for our solutions in communications networks;*
- *the level of growth in network traffic and bandwidth consumption and the corresponding level of investment in network infrastructures by network operators;*
- *the international scale of our operations;*
- *fluctuations in currency exchange rates;*
- *our ability to forecast accurately demand for our products for purposes of inventory purchase practices;*
- *the impact of pricing pressure and price erosion that we regularly encounter in our markets;*
- *our ability to enforce our intellectual property rights, and costs we may incur in response to intellectual property right infringement claims made against us;*
- *the continued availability, on commercially reasonable terms, of software and other technology under third-party licenses;*
- *the potential failure to maintain the security of confidential, proprietary or otherwise sensitive business information or systems or to protect against cyber attacks;*
- *the performance of our third-party contract manufacturers;*
- *changes or disruption in components or supplies provided by third parties, including sole and limited source suppliers;*
- *our ability to manage effectively our relationships with third-party service partners and distributors;*
- *unanticipated risks and additional obligations in connection with our resale of complementary products or technology of other companies;*
- *our exposure to the credit risks of our customers and our ability to collect receivables;*
- *modification or disruption of our internal business processes and information systems;*
- *the effect of our outstanding indebtedness on our liquidity and business;*
- *volatility and uncertainty in our stock price, the capital markets and our ability to access the capital markets to raise capital;*
- *unanticipated expenses or disruptions to our operations caused by restructuring activities;*
- *our ability to attract and retain experienced and qualified personnel;*

- *disruptions to our operations caused by strategic acquisitions and investments or the inability to achieve the expected benefits and synergies of newly-acquired businesses;*
- *our ability to commercialize and grow our software business and address networking strategies including software-defined networking and network function virtualization;*
- *changes in, and the impact of, government regulations, including with respect to: the communications industry generally; the business of our customers; the use, import or export of products; and the environment, potential climate change, and other social initiatives;*
- *future legislation or executive action in the U.S. or foreign countries relating to trade regulation, including the imposition of tariffs and duties;*
- *the impact of the Tax Act, changes in tax regulations and related accounting, and changes in our effective tax rates;*
- *the write-down of goodwill, long-lived assets, or our deferred tax assets;*
- *our ability to maintain effective internal controls over financial reporting and liabilities that result from the inability to comply with corporate governance requirements; and*
- *adverse results in litigation matters.*

These are only some of the factors that may affect the forward-looking statements contained in this annual report. For a discussion identifying additional important factors that could cause actual results to vary materially from those anticipated in the forward-looking statements, see "Management's Discussion and Analysis of Financial Condition and Results of Operations" and "Risk Factors" in this annual report. You should review these risk factors for a more complete understanding of the risks associated with an investment in our securities. However, we operate in a very competitive and rapidly changing environment and new risks and uncertainties emerge, are identified or become apparent from time to time. We cannot predict all risks and uncertainties that could have an impact on the forward-looking statements contained in this annual report. You should be aware that the forward-looking statements contained in this annual report are based on our current views and assumptions. We undertake no obligation to revise or update any forward-looking statements made in this annual report to reflect events or circumstances after the date hereof or to reflect new information or the occurrence of unanticipated events, except as required by law. The forward-looking statements in this annual report are intended to be subject to protection afforded by the safe harbor for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995. Unless the context requires otherwise, references in this annual report to "Ciena," the "Company," "we," "us" and "our" refer to Ciena Corporation.

Item 1. Business

Overview

We are a networking systems, services and software company, providing solutions that enable a wide range of network operators to deploy and manage next-generation networks that deliver services to businesses and consumers. We provide hardware, software and services that support the transport, switching, aggregation, service delivery and management of video, data and voice traffic on communications networks. Our solutions are used by communications service providers, cable and multiservice operators, Web-scale providers, submarine network operators, governments, enterprises, research and education institutions and other emerging network operators.

Our solutions include our portfolio of Networking Platforms, including our Converged Packet Optical and Packet Networking products, that can be applied from the network core to end user access points, and that allow network operators to scale capacity, increase transmission speeds, allocate traffic and adapt dynamically to changing end-user service demands. We offer Platform Software that provides management and domain control of our hardware solutions and automates network lifecycle operations, including provisioning equipment and services. Through our Blue Planet® Automation Software, we enable network providers to use network data, analytics and policy-based assurance to achieve closed loop automation across multi-vendor and multi-domain network environments, streamlining key business and network processes. To complement our hardware and software products, we offer a broad range of services that help our customers build, operate and improve their networks and associated operational environments.

We refer to our complete portfolio vision as the Adaptive Network™. The Adaptive Network emphasizes a programmable network infrastructure, software control and automation capabilities, and network analytics and intelligence. By transforming network infrastructures into a dynamic, programmable environment driven by automation and analytics, network operators can realize greater business agility, dynamically adapt to changing end user service demands and rapidly introduce new revenue-generating services. They can also gain valuable real-time network insights, allowing them to optimize network operation and maximize the return on their network infrastructure investment.

Corporate Information and Access to SEC Reports

We were incorporated in Delaware in November 1992 and completed our initial public offering on February 7, 1997. Our principal executive offices are located at 7035 Ridge Road, Hanover, Maryland 21076. Our telephone number is (410) 694-5700, and our website address is www.ciena.com. We make our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K, and amendments to those reports, available free of charge in the "Investors" section of our website as soon as reasonably practicable after we file these reports with the Securities and Exchange Commission (the "SEC"). We routinely post these reports, recent news and announcements, financial results and other important information about our business on our website at www.ciena.com. Information contained on our website is not a part of this annual report.

Industry Background

Network Traffic Growth and Increased Capacity Requirements

The markets in which we sell have seen significant changes in recent years. Optical networks – which carry video, data and voice traffic by encoding digital information on multiple wavelengths of light traveling across fiber optic cables – have experienced strong traffic growth. This network traffic growth is being driven by a diverse set of communications services that often require on-demand service levels by their enterprise and consumer end users:

- *Cloud-Based Services.* Enterprises and consumers continue to replace locally-housed computing and storage by adopting a broad array of innovative cloud-based models – including Platform as a Service (PaaS), Software as a Service (SaaS) and Infrastructure as a Service (IaaS) – and an expanding range of cloud-based services that host key applications, store data, enable the viewing and downloading of content and utilize on-demand computing resources.

- *Over-the-Top ("OTT") Services and Video Streaming*. OTT content refers to video, multimedia and other applications provided directly from the content source to the viewer or end user across a third-party network. Traffic from streaming and OTT services, including high definition and ultra-high definition video, has expanded with the increased availability of, and end-user demand for, video content accessible through a variety of devices and media.

- *Mobile Traffic and Applications.* Traffic from mobile web applications, including video, internet and data services, has expanded with the proliferation of smartphones and other wireless devices. Because much of wireless traffic ultimately travels across a wireline network to reach its destination, growth in mobile communications continues to place demands upon wireline networks, including the backhaul and fronthaul portions of networks emanating from cell sites.

Emerging services and applications are further impacting or expected to impact network infrastructures, particularly at the edge of networks, where increased computing power and automation are required to meet the quality of experience required by end users. These include:

- *5G Mobile Networks*. Fifth-generation wireless broadband ("5G") technology is expected to drive meaningful increases in bandwidth and performance, enabling emerging applications and services that 4G/LTE networks cannot support. To fully capitalize on these opportunities, network operators will need to consider the demands 5G technology will place on their wireline infrastructures.

- *Fiber Deep*. Fiber deep is a network densification initiative by cable and multiservice operators that seeks to push more digital fiber-closer to the end-user and to increase potential bandwidth, computing capability and data speeds to homes and enterprises, while at the same time decreasing power, space and operating costs.

- *Internet of Things ("IoT")*. As networked connections between devices and servers grow, machine-to-machine-related traffic ("M2M") is expected to represent an increasing portion of traffic. These connections allow sharing of data that can be monitored and analyzed, including in smart grid applications, health care and safety monitoring, resource and inventory management, home entertainment, consumer appliances, connected transportation and other M2M data applications.

- *Ultra-High Definition Video ("UHD") and Virtual Reality ("VR") and Augmented Reality ("AR").* UHD video and the advent of immersive technologies like VR, AR and 360° video are likely to place further capacity and capability demands on networks as adoption of these technologies grows. Consumer electronics industries are rapidly advancing these technologies and making them more widely available and affordable to consumers.

- *Edge Computing*. Immersive cloud services and gaming using AR and VR technologies require a low latency environment to provide the required user experience. We expect network operators to increase the number and

capabilities of edge computing locations to allow these latency-sensitive workloads to be processed closer to users, which may effect network topologies and traffic patterns.

- *Machine Learning ("ML") and Artificial Intelligence ("AI")*. As broad foundational technologies that increase network intelligence and improve automation, ML and AI enable improvements in network planning, operations, user experience and trouble resolution. Adoption of these technologies, expected to continue to increase as the IoT expands and additional services are created, can be expected to be a driver of further network traffic and solutions innovation.

We believe that increased adoption of these services and applications and their performance requirements will further increase network traffic and place additional service challenges on network infrastructures.

Transition to Programmable Automated Networks

Many networks are still predominately fixed in nature and are generally managed through legacy provisioning, inventory management, planning and fulfillment systems. To address growing service demands and better manage network costs, network operators are looking to adopt next-generation infrastructures that are programmable in real-time, can be accessed and configured via common open interfaces, and are better capable of leveraging data for automation. To bridge the gap between the operational realities of today and the more responsive and adaptive network infrastructures of the future, we expect network operators to pursue strategies that include additional hardware programmability and software-centric strategies that emphasize one or more of the following:

- *Closed Loop Automation.* Network operators are seeking to reduce network operating costs and better leverage analytics, automation and control capabilities to automate end-to-end service creation and delivery. Closed loop automation is a continuous cycle of communications between the network hardware infrastructure and software elements to analyze network conditions, traffic demands, and resource availability and to determine the best placement of traffic for optimal service quality and resource utilization.

- *Software-Defined Networking ("SDN").* SDN seeks to simplify networks to create more open environments that ease management, support automation and quickly deliver customized services to end users, by enabling individual network elements to be directly programmable by standards-based software control. This results in end-to-end visibility of network flows, enabling the optimization of traffic paths and the control of data flows through a network.

- *Network Function Virtualization ("NFV")*. NFV is the separation of network services or capabilities from the physical network assets that traditionally provide these services or capabilities to end users. Network operators are increasingly looking for solutions like NFV, which enables network functions through software that runs on industry-standard servers and network and storage platforms, in order to reduce their dependence on single-purpose hardware and accelerate the time to market for new revenue-generating services.

We believe that adoption of these strategies will require network operators and their network solutions vendors to increasingly look to utilize an ecosystem of physical and virtual network resources. We expect that these network architectural approaches, in turn, will drive increased openness and interoperability of multi-vendor, multi-domain network environments, requiring an increased degree of cooperation, collaboration and interoperability among solutions providers.

Industry Consolidation

Our industry has experienced significant consolidation in recent years among our competitors, customers and suppliers alike. To drive scale and market share gains and meet the intense investment capacity required to keep pace with technology innovation, acquisition activity among competing vendors of networking solutions has increased. Among our customers, there have been significant horizontal and vertical consolidation activities by service providers and cable operators, with several such operators acquiring media and content companies. Customer consolidation can increase purchasing power and has in the past resulted in delays or reductions in network spending due to changes in strategy or leadership, the timing of regulatory approvals and debt burdens associated with such transactions. Further, significant consolidation among component suppliers may reduce the number of independent suppliers and could disrupt our supply chain and adversely impact pricing. Consolidation activity across our industry can create opportunities and challenges for our business. We expect this trend to continue and it may have a significant impact on the entire industry, including the competitive landscape, the range of sales opportunities for vendors and their supply chains.

Different Approaches to Design and Procure Network Infrastructure Solutions

Traditionally, network operators looked to purchase fully integrated network solutions including hardware, software and services from the same vendor. Today, network operators are pursuing a diverse range of approaches, or "consumption models,"

in their design and procurement of network infrastructure solutions. In addition to the traditional approach, new consumption models include the procurement or use of:

- a fully integrated hardware solution from one vendor with the separate use of a network operator's own software or another vendor's SDN-based control;
- integrated photonic line systems with open interfaces from one vendor and the separate or "disaggregated" procurement of modem technology from a different vendor; and
- open source software in concert with or as an alternative to integrated, proprietary third-party software solutions.

Network operators, including certain of our largest customers, are also pursuing the development and use of published reference designs and open source specifications for the procurement of off-the-shelf or commoditized hardware (often referred to as "white box" hardware). This commoditized hardware could be used with in-house developed data path and control software or third-party developed network operating software. Further, a number of network operators are pursuing network strategies that emphasize the deployment of smaller form factor, pluggable modem technology, typically in a switch or router platform, as an alternative to integrated optical platforms.

The consumption models that ultimately emerge and their level of adoption will depend in significant part on the circumstances and strategies of certain network operators. We expect that continued customer consideration of a variety of consumption models will require network operators and vendors alike to assess, and possibly broaden, their offerings and commercial models over time, thereby placing a premium on a vendor's ability to provide robust network solutions with the maximum amount of flexibility and choice.

Strategy

Our strategy is to leverage our technology leadership, diversify our business, expand our addressable markets, and drive the profitable growth of our business. Key elements of this strategy include:

Extend Innovation Leadership and Grow our Core Business. We are focused on using our significant research and development investment capacity to push the pace of innovation in our markets and provide market-leading offerings that promote our Adaptive Network vision through further advances in programmable hardware, analytics, and control and automation. In fiscal 2020, we expect to bring to market our fifth-generation coherent modem technology capable of delivering 800 gigabits of capacity per second over a single wavelength and to make this technology available in certain Converged Packet Optical platforms. We are focused on growing our optical and packet infrastructure business by addressing fast-growing markets and applications, including data center interconnection, packet aggregation and switching, network densification including 5G and fiber deep, and access networks and submarine networks. We are introducing Packet Networking solutions with enhanced IP/Ethernet capabilities that enable our Adaptive Network vision and expand our addressable market into additional applications and layers of the network. We are also focused on growing our attached services business to include broader service offerings and engagements involving network migration and optimization and multivendor network integration.

Increase Adoption of Blue Planet Automation Software Platform for Intelligent, Closed Loop Automated Networks. We seek to promote broader adoption of our Blue Planet Automation Software, highlighting its ability to transform network operations and management, reduce the need for manual intervention in key operational processes, and enable closed loop automation of networks as part of our Adaptive Network vision. In so doing, we believe that Blue Planet can help transform legacy networks into "service ready" networks, accelerating the creation, delivery and lifecycle management of new, cloud-based services. We are also investing in Blue Planet-related services and seek to use insights from common business, operational and networking challenges to position Blue Planet as the means by which to achieve the digital network transformation sought by our customers.

Embrace Multiple Consumption Models and Promote Choice. As network operators pursue diverging consumption models, our strategy is to offer a range of networking solutions across those models to drive the evolution of next-generation network infrastructures and to promote choice in our markets. We are currently seeking to make our technology available in both integrated systems and pluggable form factors that address the range of technical and economic requirements of network operators pursuing differing consumption models. Specifically, we are currently pursuing two distinct product development paths for our next-generation coherent optical chipset to enable this range of solutions. Separately, through our Optical Microsystems business we are pursuing sales opportunities that leverage our WaveLogic® technology as a "merchant modem" – the combination of an optical chipset or application-specific integrated circuit (ASIC) with other key optical components and sold independently of integrated systems. Merchant modem vendors often sell their modem technology in the form of an optical module or pluggable to a variety of market participants, including other original equipment manufacturers with whom we compete. By addressing multiple consumption models, we seek to secure a larger portion of the world's optical network wavelengths, expand our addressable market and access new customer verticals and applications. We expect this may require us

to continue to broaden our existing product offering beyond traditional hardware systems and to expand our commercial models over time.

Focus Diversification on High-Growth Applications and Customer Segments. We believe that the continued diversification of our business is important to address the dynamic industry environment in which we operate, to continue to grow our business, and to better withstand potential slowdowns adversely affecting particular geographies, markets or customer segments. Our strategy is to continue to diversify our solutions offerings, customer base and geographic reach to address fast-growing applications and markets. Our go-to-market strategy seeks to capture additional market share with existing customers and emerging network operators, and to displace competitors, particularly in international markets.

Customers and Markets

We sell our product and service solutions through direct and indirect sales channels to network operators in the following customer and market segments:

- *Communications Service Providers.* Our communications service provider customers, including regional, national and international wireline and wireless carriers, form our historical customer base and represent a majority of our revenue.

- *Web-scale Providers.* Our “Web-scale” provider customers – also often referred to in the market as hyper-scale providers – include internet content providers and providers of internet services and infrastructure including data centers, cloud networking, storage infrastructure and web hosting services. These providers are focused on applications such as search, social media, video, real-time communications and cloud-based service offerings, as well as other emerging network services. As significant purchasers of capacity on submarine networks and from communications service providers on a global basis, these customers can also influence networking solution alternatives by those network operators.

- *Cable and Multiservice Operators (MSO).* Our customers include regional, national and international cable and multiservice operators.

- *Submarine Network Operators.* Our customers include service providers, Web-scale providers and consortia operators of submarine communications networks across the globe.

- *Enterprises.* Our enterprise customers include large, multi-site commercial organizations, including participants in the financial, health care, transportation, utilities, energy and retail industries.

- *Government, Research and Education.* Our government customers include federal and state agencies in the United States as well as international government entities. Our research and education customers include research and education institutions around the world, as well as communities or consortia, including leaders in research, academia, industry and government.

A significant portion of our revenue is concentrated among a small number of customers. See the related discussion in “Management’s Discussion and Analysis of Financial Condition and Results of Operations – Consolidated Results of Operations – Fiscal 2019 Compared to Fiscal 2018 – Revenue” in Item 7 of this annual report, which discussion is incorporated herein by reference.

Products and Services

Networking Platforms

Our Networking Platforms segment consists of our Converged Packet Optical and Packet Networking portfolios.

Converged Packet Optical. Our Converged Packet Optical portfolio includes a range of hardware networking solutions that use our WaveLogic coherent optical technology and are optimized for the convergence of coherent optical transport, Optical Transport Network (“OTN”) switching and packet switching.

Our 6500 Packet-Optical Platform provides a flexible and scalable dense wavelength division multiplexing (“DWDM”) solution that adds capacity to core, regional, metro and submarine networks and enables efficient transport at high transmission speeds. This platform provides leading coherent wavelength capacities, from 40G to 400G, along with multi-layer control plane capabilities for scale and service differentiation. This platform, which includes several chassis sizes and a comprehensive set of line cards optimized for individual services or applications, can be used throughout the network, from customer premises to metropolitan networks, regional and core networks, and submarine cable landing sites.

Our Waveserver® family of products consists of stackable interconnect platforms that allow network operators to scale bandwidth and support high-bandwidth interconnect applications, such as high-speed data transfer, content delivery, virtual machine migration and disaster recovery/backup between data centers. Waveserver is a specialized, compact platform that is purpose-built for addressing data center and other space-constrained environments using a small footprint and low power design. With its management interfaces and open APIs, Waveserver is easy to operate and integrate into existing networks and facilitates deployment of on-demand cloud and high-capacity connectivity services.

Our 6500 Reconfigurable Line System (RLS) is a compact, simple-to-deploy, photonic layer solution that improves scalability, reduces footprint, and offers more flexibility and programmability. Its applications include long-haul and metro data center interconnection and metro and access network modernization and simplification. It provides highly dense remote optical add drop multiplexing features and amplifier configurations enabling network operators to react to unpredictable traffic requirements by scaling connectivity and capacity.

Our 5400 family of Packet-Optical Platforms consist of multi-terabit reconfigurable switching systems that consolidate the functionality of an add/drop multiplexer and a digital cross-connect into a single, high-capacity intelligent switching system. These products address both core and metro segments of communications networks and support key managed services, including Ethernet/TDM Private Line and IP services. These products provide for optical transport, traffic aggregation at the network edge and switching that are optimized for handoff at the network core.

Our entrance into the market for merchant modem opportunities is in the early stages and, as such, revenue has not been significant to date. Sales of our Optical Microsystems products are reflected within the Converged Packet Optical product line of our Networking Platforms segment.

Packet Networking. Our Packet Networking products allow customers to simplify their network designs while delivering new, revenue-generating services. These products target applications primarily from the access to metro networks, where they aggregate and switch packet-based traffic to support such applications as Ethernet business services, mobile backhaul services, and fiber deep, as well as ongoing network infrastructure scaling. Our Packet Networking products form a key element of our Adaptive IP solution, which leverages the Adaptive Network vision and our Blue Planet Automation Software to deliver end-to-end IP-based services in a more simplified and modular manner than traditional router-based IP network designs. Adaptive IP at the programmable infrastructure layer is built upon the latest generation of our Service Aware Operating System (SAOS) within our Packet Networking platforms, which adds IP capabilities targeted towards 5G, IP VPN services and fiber deep applications. Our Packet Networking products enable operators to achieve improved network cost effectiveness, including reduced costs associated with power and space, as compared to more complex, traditional IP routing network designs.

Our 3900 family of Service Delivery Platforms and our 5000 family of Service Aggregation Platforms support network access and aggregation and have been principally deployed to support business services and wireless backhaul applications. Our 3900 family of platforms are purpose-built to fit small, medium and large customer sites as well as multi-tenant office and residential buildings and allow customers to migrate toward software-based networking and services based on Network Function Virtualization. Our 5100 family provides aggregation to fill higher capacity links within both the metro access and aggregation tiers of networks, allowing operators to reduce the number of router assets required in the core.

Our 6500 Packet Transport System (“PTS”) combines packet switching, control plane operation and integrated optics. Together with our 3900 platforms, PTS enables our service provider customers to migrate their legacy TDM (SONET/SDH/PDH) services to a scalable, lower operational cost packet solution.

Our Packet Networking portfolio also includes our 8700 Packetwave Platform, a multi-terabit packet switching platform for high-density metro networks and inter-data center wide area networks. The 8700 combines packet switching and coherent WaveLogic DWDM optical transport technologies for both data center networks and metro networks.

Blue Planet Automation Software and Services

Our Blue Planet Automation Software is a comprehensive, micro-services, standards-based open software suite that allows service providers to drive optimization and increased automation of their network and IT infrastructures, accelerating delivery of services, reducing costs and enabling a more predictive, autonomous network. A number of applications can be deployed on this software platform, either individually or in any combination, including:

- *Multi-Domain Service Orchestration (MDSO).* Network infrastructures are comprised of multiple technology layers and domains – such as the data center, cloud, metro, access and core networks – and it is often complex for network operators to offer end-to-end services in this environment. Blue Planet enables service orchestration across multiple

physical and virtual network domains, multiple layers (Optical, Ethernet, IP and Mobile) and multiple hardware and software vendors.

- *Inventory ("BPI").* By integrating or "federating" data from multiple inventory systems and presenting it in a single dynamic view, BPI allows real-time visibility into the topology and status of network and service resources from end to end. Integrating with legacy operation support systems ("OSS"), BPI helps network providers simplify key operational processes such as service fulfillment, network planning and service assurance.

- *Route Optimization and Analysis ("BP ROA").* BP ROA combines routing, traffic and performance analytics for real-time monitoring of IP services across the cloud. These capabilities enable troubleshooting of latent or transient network problems and modeling to predict the impact of network infrastructure, service and workload changes to build more resilient networks.

- *NFV Orchestration ("NFVO")*. Blue Planet provides NFV management and orchestration capabilities for creating and managing virtualized network functions and data center resources. NFVO uses an open, vendor-agnostic approach that allows network operators to select and scale those virtual network functions (VNFs) they wish to offer to customers.

- *Unified Assurance & Analytics ("UAA").* UAA leverages multi-layer/multi-domain assurance and AI-powered analytics to provide insights into the health and performance of network resources and services, ensuring an end customer quality-of-experience and availability to meet dynamic service demands.

- *Blue Planet Services*. To complement our software portfolio, we offer a range of related services that include professional services for solution customization and OSS integration, software and solution support services, consulting and design, and technical support relating to our software offerings. These services are focused on enhancing network automation and network analytics, enabling multi-vendor integration and support, and implementing programmable multi-domain next-generation networks.

The Blue Planet portfolio when used together allows operators to fulfill services rapidly and to meet end-customer quality-of-experience expectations via entire services lifecycle approach, thus accelerating network operators towards their vision of self-healing and self-optimizing closed loop automation. Our entrance into the market relating to these software automation capabilities is in the early stages and, as such, revenue from our Blue Planet Automation Software and Services segment remains a small portion of our total revenue.

Platform Software and Services

Our software offerings also include our Platform Software, which provides domain control management, analytics, data and planning tools to assist customers in managing our Networking Platforms products in their networks. Our Platform Software includes:

- *Manage, Control and Plan ("MCP")*. MCP software provides SDN-based domain control of our next-generation packet and optical networks, unifying fault, configuration, accounting, performance and security (FCAPS) management of our multi-layer network infrastructure, with service management and online network planning. MCP integrates with and simplifies network operators' business processes and lifecycle operations – including equipment commissioning, service provisioning, assurance and performance monitoring.

- *OneControl Unified Management System*. OneControl is an integrated network and service management solution that supports certain of our Networking Platform products. OneControl offers end-to-end service creation, activation and assurance, and visualization of performance information for network health status. OneControl enables management functions, including network inventory, network element configuration backup, software delivery and security administration.

- *Platform Software Services.* To complement our Platform Software portfolio, we offer a range of related services that include software subscription services, consulting, network migration and integration, installation and upgrade support services, and technical support relating to our Platform Software offerings. These services are focused on enabling our customers to operate their Ciena networks most efficiently, and to modernize their operations.

Our Platform Software offering also includes planning tools and a number of legacy software solutions that support our installed base of network solutions. As we achieve further customer adoption of our MCP software platform and we transition features, functionality and customers to this platform, we expect revenue to decline for our legacy Platform Software solutions.

Global Services

To complement our Networking Platforms portfolio, we offer a broad suite of value-added services that help our customers to build, improve and operate their networks. We believe that our broad set of services offerings is a significant differentiator from our competitors. We believe that our services offerings and our close collaboration with our customers provide us with valuable insight into the network and business challenges they face, allowing us to provide services to meet their desired business outcomes. We have undertaken a multi-year transformation process to enhance our service delivery capability, streamline our services cost structure and portfolio, and include additional advanced networking services and multivendor service capabilities. Through these transformation initiatives, we believe we can improve the cost model of our services and drive greater business value for our customers.

Our Global Services portfolio includes a range of offerings to meet customer needs and maximize their network infrastructure investment throughout the network lifecycle. These include:

- *Build.* Services that ensure proper planning, design, installation, deployment and implementation of communications networks;
- *Improve.* Services that maintain and support network infrastructures and consulting and network design services to enhance network performance or migrate to next generation infrastructures; and
- *Operate.* Services that maintain or monitor network infrastructure operations.

We also provide a portfolio of training services and provide these and the services above using a combination of our internal services resources, technical support engineers, and qualified and authorized third-party service partners.

Product Development

To remain competitive, we must continually invest in and enhance our solutions offerings, adding new features and functionality and ensuring alignment with market demand. Our product development efforts seek to design and bring to market solutions that promote our Adaptive Network vision through further advances in programmable hardware, analytics, and control and automation. Through our development efforts, we seek to enable network operators to achieve improved economics and return on their network infrastructure investment, including with respect to price for performance, power consumption, space requirements and lifecycle operating costs. Our approach is also focused on designing products that address a range of emerging consumption models for networking solutions. Our current development efforts are focused upon:

- Reinforcing our coherent optical leadership with continued development that advances reach, transmission speed and spectral efficiency, while minimizing power usage, space and network element requirements;
- Executing on parallel innovation paths for the next generation of our modem technology – WaveLogic 5 Extreme (WL5e) and WaveLogic 5 Nano (WL5n) – to address customer requirements ranging from integrated systems to pluggable form factors;
- IP/Ethernet-based Packet Networking solutions to support mobile network traffic and network densification initiatives, such as 5G and fiber deep;
- Converging packet-based IP and optical network infrastructure to improve network economics and scale, and to enable new services;
- Pursuing pluggable and optical module development initiatives to support our optical microsystems business;
- Migrating legacy services to next-generation packet infrastructures;
- Advancing our software-based domain control, automation and analytics with MCP; and
- Integrating the organic and acquired elements of our Blue Planet Automation Software to enable closed loop automation.

Our research and development efforts are also geared toward portfolio optimization and engineering changes intended to drive product and manufacturing cost reductions across our platforms.

We regularly review our existing solutions offering and prospective development of new components, features or products, to determine their fit within our portfolio and broader corporate strategy. We also assess the market demand, technology evolution, prospective return on investment and growth opportunities, as well as the costs and resources necessary to develop and support these products. To ensure that our product development investments and solutions offerings are closely aligned with market demand, we continually seek input from customers and promote collaboration among our product development, marketing and sales organizations. In some cases, where we seek to utilize or gain access to complementary or emerging technologies or solutions, we may obtain technology through an acquisition or, alternatively, through initiatives with third

parties pursuant to technology licenses, original equipment manufacturer (OEM) arrangements and other strategic technology relationships or investments. In addition, we participate in industry and standards organizations and, where appropriate, incorporate information from these affiliations throughout the product development process.

Sales and Marketing

Our Global Sales and Marketing organization includes a direct sales presence that is organized geographically around the following markets: (i) United States and Canada ("North America"); (ii) Caribbean and Latin America ("CALA"); (iii) Europe, Middle East and Africa ("EMEA"); and (iv) Asia Pacific, Japan and India ("APAC"). Within each geographic area, we maintain specific teams or personnel that focus on a particular region, country, customer or market vertical. These teams include sales management, account salespersons and sales engineers, as well as services professionals and commercial management personnel, who ensure that we maintain a high-touch, consultative relationship with our customers.

We also maintain a global partner program that involves resellers, systems integrators, service providers and other third-party distributors who market and sell our products and services. We utilize these third-party channel partners to market and sell our solutions into specific geographies, applications or customer verticals. We see opportunities to leverage these relationships to expand our addressable market, while at the same time reducing the financial and operational risk of entering additional markets. For third parties in our Ciena Partner Network, we maintain a code of conduct that is available on our website and that sets forth our expectations for the high standards of ethical and legally compliant conduct we require of them in supporting our business.

To support our sales efforts, we engage in marketing activities to generate demand for our products and services. Our marketing strategy is highly focused on building our brand to create customer preference for Ciena, engaging in thought leadership programs to illustrate how our innovations solve customer business problems, and enabling our sales teams to drive customer adoption of our solutions. Our marketing team supports our sales efforts through a variety of activities, including direct customer interaction, account-based marketing campaigns, portfolio marketing, industry events, media relations, industry analyst relations, social media, trade shows, our website and other marketing vehicles for our customers and channel partners.

Operations and Supply Chain Management

Our operations personnel manage the relationships with our third-party manufacturers and global supply chain, addressing component sourcing, manufacturing, product testing and quality, and fulfillment and logistics relating to the distribution and support of our products.

We utilize a sourcing strategy that emphasizes global procurement of materials and product manufacturing in lower cost regions. We rely upon third-party contract manufacturers, with facilities in Canada, Mexico, Thailand and the United States, to manufacture, support and ship our products, and therefore are exposed to risks associated with their businesses, financial condition and the geographies in which they operate, including political risk and changes in tax and trade policy involving such countries. We also rely upon contract manufacturers and other third parties to perform design and prototype development, component procurement, full production, final assembly, testing and distribution operations. Our manufacturers procure components necessary for assembly and manufacture of our products based on our specifications, approved vendor lists, bills of materials and testing and quality standards. Our manufacturers' activity is based on rolling forecasts that we provide to them to estimate demand for our products. We work closely with our manufacturers and suppliers to manage material, quality, cost and delivery times, and we continually evaluate their services to ensure performance on a reliable and cost-effective basis. Generally, our agreements with our supply chain and contract manufacturers are frame agreements against which we place purchase orders and do not represent long-term commitments.

We currently use distribution partners to fulfill and deliver our products. We believe that our sourcing, manufacturing and distribution strategies allow us to conserve capital, lower costs of product sales, adjust quickly to changes in market demand and operate without dedicating significant resources to manufacturing-related plant and equipment.

As part of our effort to optimize our operations, we continue to focus on driving cost reductions through sourcing, rationalizing our supply chain, outsourcing or virtualizing certain activities, using lower cost geographies, and consolidating distribution sites and service logistics partners. These efforts also include process optimization initiatives, such as vendor-managed inventory, and other operational models and strategies designed to drive improved efficiencies in our sourcing, production, logistics and fulfillment.

We actively work with our third-party vendors and business partners to promote socially responsible business practices within our own business and those within our global supply chain. To that end, we have adopted the principles set forth in the Responsible Business Alliance ("RBA") Code of Conduct. The RBA Code of Conduct establishes standards to ensure working

conditions in the electronics industry supply chain are safe, that workers are treated with respect and dignity, and that business operations are environmentally responsible and conducted ethically. We promote these principles and require our suppliers to adhere to these same standards. Our Corporate Social Responsibility Report, which includes more detail about our efforts to promote responsible business practices, is available on our website.

Backlog

Generally, we make sales pursuant to purchase orders placed by customers under framework agreements that govern the general commercial terms and conditions of the sale of our products and services. These agreements do not obligate customers to purchase any minimum or guaranteed order quantities. Moreover, we are periodically awarded business for new network opportunities or network upgrades following a selection process. In calculating backlog, we only include (i) customer purchase orders for products that have not been shipped and for services that have not yet been performed; and (ii) customer orders relating to products that have been delivered and services that have been performed, but are awaiting customer acceptance under the applicable contract terms. Generally, our customers may cancel or change their orders with limited advance notice, or they may decide not to accept our products and services, although instances of both cancellation and non-acceptance are rare. Backlog may be fulfilled several quarters following receipt of a purchase order, or in the case of certain service obligations, may relate to multi-year support period. As a result, backlog should not necessarily be viewed as an accurate indicator of future revenue for any particular period.

Our backlog was $1.21 billion as of October 31, 2019 as compared to $1.26 billion as of October 31, 2018. Backlog includes product and service orders from commercial and government customers combined. Backlog at October 31, 2019 includes approximately $160.2 million primarily related to orders for products and maintenance and support services that are not expected to be filled or performed within fiscal 2020. Because backlog can be defined in different ways by different companies, our presentation of backlog may not be comparable with figures presented by other companies in our industry.

Seasonality

Like other companies in our industry, we experience quarterly fluctuations in customer activity due to seasonal considerations. We typically experience reductions in order volume toward the end of the calendar year, as the procurement cycles of some of our customers slow and network deployment activity by service providers is curtailed. This period coincides with the first quarter of our fiscal year. This seasonality in our order flows has often resulted in weaker revenue results in the first quarter of our fiscal year. These seasonal effects may not apply consistently in future periods and may not be a reliable indicator of our future revenue or results of operations.

Competition

Competition among networking solution vendors remains intense on a global basis. The markets in which we compete are characterized by rapidly advancing technologies, frequent introduction of new solutions and aggressive selling efforts, including using significant pricing pressure to displace incumbent vendors and capture market share. Competition for sales of networking solutions, including our Networking Platforms and Platform Software and Services, is dominated by a small number of very large, multi-national companies. Our competitors include Huawei, Nokia, Cisco, Juniper Networks and ZTE. As compared to us, many of these competitors have substantially greater financial, operational and marketing resources, significantly broader product offerings and more established relationships with service providers and other customer segments. Because of their scale and resources, they may be perceived to be a better fit for the procurement or network strategies of larger network operators. We also continue to compete with several smaller but established companies that offer one or more products that compete directly or indirectly with our offerings or whose products address specific niches within the markets and customer segments we address. These competitors include Infinera, ADVA and ECI, which recently announced an agreement to be acquired by Ribbon Communications. We also compete with a number of smaller companies that provide significant competition for a specific product, application, service, customer segment or geographic market.

Keeping pace with the market’s demands for technology innovation requires considerable research and development investment capacity. As a result, some of our competitors, both large and small, have chosen to rely upon merchant modem technology developed by and procured from third-party providers, including NTT Electronics (NEL), Inphi and Acacia Communications, which has agreed to be acquired by Cisco. We may compete with these providers, either indirectly as a result of their technology being a key enabling technology for our competitors, or directly in merchant modem sales opportunities.

As we promote our corporate strategy and seek increased customer adoption of our Blue Planet Automation Software, we expect to compete more directly with software vendors, IT vendors, and system integrators. Competitors for our Blue Planet Automation Software include Cisco, Nokia, Amdocs, Netcracker and Ericsson.

Across our markets and segments, the principal competitive factors can include:

- the ability to meet business needs and drive successful outcomes;
- functionality, speed, capacity, scalability and performance of network solutions;
- price for performance, cost per bit and total cost of ownership of network solutions;
- incumbency and strength of existing business relationships;
- ability to offer comprehensive networking solutions, consisting of hardware, software and services;
- time-to-market in delivering products and features;
- technology roadmap and forward innovation capacity;
- company stability and financial health;
- flexibility and openness of platforms, including ease of integration, interoperability and integrated management;
- ability to offer solutions that accommodate a range of different consumption models;
- operating costs, space requirements and power consumption of network solutions;
- software and network automation capabilities;
- manufacturing and lead-time capability; and
- services and support capabilities.

As a result of the intense environment in which we compete, winning new opportunities can often require that we agree to unfavorable commercial terms or pricing and other onerous contractual commitments. In so doing, our expectation is that we can recover or improve the economics of such relationships over time. However, these terms can adversely affect our results of operations in any period. These terms can also lengthen our revenue recognition or cash collection cycles, add start-up costs to initial sales or deployment of our solutions, require financial commitments or performance bonds and place a disproportionate allocation of risk upon us.

Our competitive landscape has been and is likely to continue to be impacted by pending trade and related matters between the U.S. and China. For example, in May 2019, the U.S. Department of Commerce amended the Export Administration Regulations by adding Huawei Technologies Co., Ltd. and certain affiliates to the “Entity List,” resulting in significant new restrictions on export, reexport and transfer of U.S. regulated technologies and products to Huawei. The U.S. has also taken steps to restrict federal agencies from doing business with, and U.S. wireless carriers from using federal subsidies to buy equipment from, Huawei and ZTE. The U.S. has also encouraged other governments to consider similar restrictions. These actions have resulted in escalating tensions between the United States and China and introduce a risk that the Chinese government may take additional steps to retaliate against U.S. industries or companies.

We also expect the competition in our industry to continue to broaden and to intensify as network operators pursue a diverse range of network strategies and consumption models. As these changes occur, we expect that our business will overlap more directly with additional networking solution suppliers, including IP router vendors, data center switch providers and other suppliers or integrators of networking technology traditionally geared toward different network applications, layers or functions. We may also face competition from system and component vendors, including those in our supply chain, who develop pluggable modem technology or other networking products based on off-the-shelf or commoditized hardware technology, referred to as “white box” hardware, particularly where a customer’s network strategy seeks to emphasize deployment of such product offerings or to adopt a disaggregated approach to the procurement of hardware and software.

Patents, Trademarks and Other Intellectual Property Rights

The success of our business and technology leadership is significantly dependent upon our proprietary and internally developed technology. We rely upon the intellectual property protections afforded by patents, copyrights, trademarks and trade secret laws to establish, maintain and enforce rights in our proprietary technologies and product branding. We regularly file applications for patents and have a significant number of patents in the United States and other countries where we do business. As of December 1, 2019, we had more than 2,000 issued patents and more than 350 pending patent applications worldwide.

Enforcing proprietary rights, especially patents, can be costly, and we cannot be certain that the steps that we are taking will detect or prevent all unauthorized use. The industry in which we compete is characterized by rapidly changing technology, a large number of patents, and frequent claims and related litigation regarding patent and other intellectual property rights. We have been subject to several claims related to patent infringement, and we have been requested to indemnify customers pursuant to contractual indemnity obligations relating to infringement claims made by third parties. Intellectual property infringement assertions could cause us to incur substantial costs, including settlement costs and legal fees in the defense of related actions. If we are not successful in defending these claims, our business could be adversely affected.

Our operating system software, Platform Software, Blue Planet Automation Software and other solutions incorporate software and components under licenses from third parties, including software subject to various open source software licenses.

Failure to obtain or maintain such licenses or other third-party intellectual property rights could affect our development efforts and market opportunities, or could require us to re-engineer our products or to obtain alternate technologies. Moreover, there is a risk that open source and other technology licenses could be construed in a manner that could impose unanticipated conditions or restrictions on our ability to commercialize our products.

Environmental Matters

Our business and operations are subject to environmental laws in various jurisdictions around the world, including the Waste Electrical and Electronic Equipment (WEEE) and Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) regulations adopted by the European Union (the “EU”). We are also subject to disclosure and related requirements that apply to the presence of “conflict minerals” in our products or supply chain. We seek to operate our business in compliance with such laws relating to the materials and content of our products and product takeback and recycling. Environmental regulation is increasing, particularly outside of the United States, and we expect that our domestic and international operations may be subject to additional environmental compliance requirements, which could require us to incur additional costs. To date, our compliance actions and costs relating to environmental regulations have not resulted in a material cost or effect on our business, results of operations or financial condition.

Our innovation efforts and our environmental sustainability initiatives are closely linked. Our product development efforts focus on innovation leadership that allows network operators to continually “do more with less.” We promote environmental sustainability through our efforts to improve the energy efficiency per gigabit of throughput in our high-performance networking solutions, as well as our initiatives to improve power, space and cooling requirements, and to reduce the total number of network elements required to operate a network. We pursue opportunities to minimize the resource impacts in our product design and sourcing, and to assess and improve efficiencies over the life cycle of our products, including packaging and distribution, and end-of-life reuse, refurbishment, and recycling. We participate in CDP climate change and water disclosures and are a member of the Responsible Business Alliance (“RBA”). We have adopted, and seek to ensure that our key direct suppliers adopt, the standards and principles set forth in the RBA Code of Conduct.

Employees and Human Capital Management

We recognize that industry and innovation leadership depend in critical part on our continued ability to recruit, motivate and retain the talented personnel that make up our global workforce. Competition for qualified personnel in our industry is intense and we maintain a progressive set of programs and initiatives designed to attract, develop and engage our human capital.

In support of these efforts, our Board of Directors oversees management’s design and execution of Ciena’s annual “people strategy.” This strategy seeks to ensure that we continue to have the talent necessary to execute on our strategic imperatives and business plans, and that we have well-aligned programs, initiatives, rewards and recognition, and support to promote these goals. Among other things, our people strategy is focused on:

- ensuring competitive, fair and transparent compensation and innovative benefits offerings;
- supporting the overall well-being of our employees from a physical, emotional, financial and social perspective;
- creating opportunities for employee growth, development, recognition, training and education; and
- promoting an inclusive and diverse workplace, where all individuals are respected and feel they belong regardless of their age, race, national origin, gender, religion, disability or sexual orientation.

Because technology is ultimately developed, marketed and sold by people, these initiatives are strategic priorities for our business. As of October 31, 2019, we had a global workforce consisting of 6,383 employees. We have not experienced any work stoppages, and we consider the relationships with our employees to be good.

Directors and Executive Officers

The table below sets forth certain information concerning our directors and executive officers:

Name	Age	Position
Patrick H. Nettles, Ph.D.	76	Executive Chairman of the Board of Directors
Gary B. Smith	59	President, Chief Executive Officer and Director
Stephen B. Alexander	60	Senior Vice President and Chief Technology Officer
Rick L. Hamilton	48	Senior Vice President, Blue Planet Software
Scott A. McFeely	56	Senior Vice President, Global Products and Services
James E. Moylan, Jr.	68	Senior Vice President and Chief Financial Officer
Andrew C. Petrik	56	Vice President and Controller
Jason M. Phipps	47	Senior Vice President, Global Sales and Marketing
David M. Rothenstein	51	Senior Vice President, General Counsel and Secretary
Bruce L. Claflin (1)(3)	68	Director
Lawton W. Fitt (2)	66	Director
Patrick T. Gallagher (1)(3)	64	Director
Devinder Kumar (2)	64	Director
T. Michael Nevens (2)	70	Director
Judith M. O'Brien (1)(3)	69	Director
Joanne B. Olsen (1)(3)	61	Director

(1) Member of the Compensation Committee

(2) Member of the Audit Committee

(3) Member of the Governance and Nominations Committee

Our Directors hold staggered terms of office, expiring as follows: Ms. O'Brien, Ms. Olsen and Mr. Smith in 2020; Mr. Claflin, Mr. Gallagher and Mr. Nevens in 2021; and Ms. Fitt and Dr. Nettles in 2022. In August 2019, Mr. Kumar was appointed to fill a newly created vacancy in Class I of the Board of Directors. Accordingly, he will stand for election at the 2020 Annual Meeting of Stockholders and, if elected by stockholders, his term of office will expire in 2022.

Patrick H. Nettles, Ph.D. has served as a Director of Ciena since April 1994 and as Executive Chairman of the Board of Directors since May 2001. From October 2000 to May 2001, Dr. Nettles was Chairman of the Board of Directors and Chief Executive Officer of Ciena, and he was President and Chief Executive Officer from April 1994 to October 2000. Dr. Nettles serves as a Trustee for the California Institute of Technology and the Georgia Tech Foundation, Inc. Dr. Nettles also serves on the board of directors of The Progressive Corporation, a publicly traded company. Dr. Nettles previously served on the boards of directors of Axcelis Technologies, Inc., where he was independent chairman of the board, Apptrigger, Inc., which was formerly known as Carrius Technologies, Inc., and Optiwind Corp.

Gary B. Smith joined Ciena in 1997 and has served as President and Chief Executive Officer since May 2001. Mr. Smith has served on Ciena's Board of Directors since October 2000. Prior to his current role, his positions with Ciena included Chief Operating Officer and Senior Vice President, Worldwide Sales. Mr. Smith previously served as Vice President of Sales and Marketing for INTELSAT and Cray Communications, Inc. Mr. Smith also serves on the board of directors of CommVault Systems, Inc., a publicly traded company, and previously served on the board of directors of Avaya Inc. Mr. Smith is a member of the President's National Security Telecommunications Advisory Committee, the Global Information Infrastructure Commission and the Center for Corporate Innovation (CCI).

Stephen B. Alexander joined Ciena in 1994 and has served as Chief Technology Officer since September 1998 and as a Senior Vice President since January 2000. Mr. Alexander has previously served as General Manager of Products and Technology and General Manager of Transport and Switching and Data Networking.

Rick L. Hamilton joined Ciena in October 2016 and has served as Senior Vice President, Blue Planet Software since February 2017. Mr. Hamilton is responsible for managing Ciena's Blue Planet Automation Software and Services portfolio. Mr. Hamilton previously served as Senior Vice President, Global Services & Automation. Prior to joining Ciena, he served as

Corporate Vice President, Professional Services for Juniper Networks from January to October 2016. From January 2004 to December 2015, Mr. Hamilton served with Cisco Systems in various services leadership positions, including most recently as Vice President, Cloud & Managed Services.

Scott A. McFeely joined Ciena in March 2010 and has served as Senior Vice President, Global Products and Services since May 2018. Mr. McFeely is responsible for all aspects of Ciena's networking portfolio including research and development activities relating to its Converged Packet Optical and Packet Networking portfolios, Platform Software and Services, product line management, supply chain operations, and Global Services. From November 2015 to May 2018, Mr. McFeely served as Senior Vice President, Networking Platforms and became an executive officer in February 2017. From March 2010 to October 2015, he served as Vice President, Global Portfolio Management and Business Operations. Mr. McFeely joined Ciena in connection with its acquisition of Nortel's Metro Ethernet Networks business, with which he spent more than 20 years in a variety of technical and management roles.

James E. Moylan, Jr. joined Ciena in 2007 and has served as Senior Vice President and Chief Financial Officer since December 2007.

Andrew C. Petrik joined Ciena in 1996 and has served as Vice President, Controller since August 1997. He also served as Treasurer from August 1997 to October 2008.

Jason M. Phipps joined Ciena in 2002 and has served as Senior Vice President, Global Sales and Marketing since February 2017. Mr. Phipps is responsible for Ciena's global sales organization and its marketing and communications functions. From January 2014 to February 2017, Mr. Phipps served as Vice President and General Manager, North America Sales, during which time he also oversaw the Global Partners & Channels practice, and from March 2011 to December 2013 he served as Vice President, Global Sales Operations. Mr. Phipps has also previously held a number of sales and marketing leadership positions with Ciena.

David M. Rothenstein joined Ciena in January 2001 and has served as Senior Vice President, General Counsel and Secretary since November 2008. Mr. Rothenstein served as Vice President and Associate General Counsel from July 2004 to October 2008 and previously as Assistant General Counsel.

Bruce L. Claflin has served as a Director of Ciena since August 2006. Mr. Claflin served as President and Chief Executive Officer of 3Com Corporation from January 2001 until his retirement in February 2006. Mr. Claflin joined 3Com as President and Chief Operating Officer in August 1998. Prior to 3Com, Mr. Claflin served as Senior Vice President and General Manager, Sales and Marketing, for Digital Equipment Corporation. Mr. Claflin also worked for 22 years at IBM, where he held various sales, marketing and management positions, including general manager of IBM PC Company's worldwide research and development, product and brand management, as well as president of IBM PC Company Americas. Mr. Claflin currently serves on the board of directors of IDEXX Laboratories, Inc., a publicly traded company, where he is the Chairman of the Nominating and Governance Committee. Mr. Claflin previously served on the board of directors of Advanced Micro Devices, Inc. ("AMD").

Lawton W. Fitt has served as a Director of Ciena since November 2000. From October 2002 to March 2005, Ms. Fitt served as Director of the Royal Academy of Arts in London. From 1979 to October 2002, Ms. Fitt was an investment banker with Goldman Sachs & Co., where she was a partner from 1994 to October 2002. Ms. Fitt currently serves on the boards of directors of Carlyle Group Management L.L.C. (the general partner of publicly traded The Carlyle Group L.P.), and of The Progressive Corporation, where she serves as Chairperson of the Board, and Micro Focus International PLC, both publicly traded companies. Ms. Fitt also serves as a director or trustee of several non-profit organizations. Ms. Fitt previously served on the boards of directors of ARM Holdings PLC and Thomson Reuters Corporation.

Patrick T. Gallagher has served as a Director of Ciena since May 2009. Since October 2007, Mr. Gallagher has served as Chairman of Harmonic Inc., a publicly traded company and global provider of high-performance video solutions to the broadcast, cable, telecommunications and managed service provider sectors. Mr. Gallagher has served as Chairman of privately held Intercloud SAS, a Paris-headquartered provider of global private cloud connectivity services, since July 2015, and as Chairman of privately held Mirabeau SAS, a French wine producer, since August 2019. From March 2008 until April 2012, Mr. Gallagher was Chairman of Ubiquisys Ltd., a leading developer and supplier of femtocells for the global 3G mobile wireless market. From January 2008 until February 2009, Mr. Gallagher was Chairman of Macro 4 plc, a global software solutions company, and from May 2006 until March 2008, served as Vice Chairman of Golden Telecom Inc., a leading facilities-based provider of integrated communications in Russia and the CIS. From 2003 until 2006, Mr. Gallagher was Executive Vice Chairman and served as Chief Executive Officer of FLAG Telecom Group and, prior to that role, held various senior management positions at British Telecom. Mr. Gallagher also previously served on the board of directors of Sollers JSC.

Devinder Kumar has served as a Director of Ciena since August 2019. Mr. Kumar currently serves as Senior Vice President, Chief Financial Officer and Treasurer of AMD, a publicly traded company, in which capacity he is responsible for AMD's global finance organization as well as global corporate services and facilities. He was appointed Chief Financial Officer in January 2013 and Treasurer in April 2015. Since he joined AMD in 1984, Mr. Kumar has progressed through several leadership positions in corporate accounting and corporate finance, including serving as interim CFO, corporate controller and assistant treasurer. He also spent 10 years in Asia as financial controller for AMD Penang and group finance director for AMD's Manufacturing Services Group across Singapore, Thailand, China and Malaysia.

T. Michael Nevens has served as a Director of Ciena since February 2014. Since 2006, Mr. Nevens has served as senior adviser to Permira Advisers, LLC, an international private equity fund. From 1980 to 2002, Mr. Nevens held various leadership positions at McKinsey & Co., most recently as a director (senior partner) and as managing partner of the firm's Global Technology Practice. He also served on the board of the McKinsey Global Institute, which conducts research on economic and policy issues. Mr. Nevens has been an adjunct professor of Corporate Governance and Strategy at the Mendoza College of Business at the University of Notre Dame. Mr. Nevens also serves as the Chairman of the board of directors of NetApp, Inc., a publicly traded company. Mr. Nevens previously served on the board of directors of Altera Corporation.

Judith M. O'Brien has served as a Director of Ciena since July 2000. Since November 2012, Ms. O'Brien has served as a partner and head or co-head of the Emerging Company Practice Group at the law firm of King & Spalding. Ms. O'Brien served as Executive Vice President and General Counsel of Obopay, Inc., a provider of mobile payment services, from November 2006 through December 2010. From February 2001 until October 2006, Ms. O'Brien served as a Managing Director at Incubic Venture Fund, a venture capital firm. From August 1980 until February 2001, Ms. O'Brien was a lawyer with Wilson Sonsini Goodrich & Rosati, where, from February 1984 to February 2001, she was a partner specializing in corporate finance, mergers and acquisitions, and general corporate matters. Ms. O'Brien serves on the boards of directors of privately held companies Theatro Labs, Inc., Inform, Inc. and MagicCube, Inc. Ms. O'Brien also previously served on the board of directors of Adaptec, Inc.

Joanne B. Olsen has served as a Director of Ciena since October 2018. Ms. Olsen previously served as Executive Vice President of Global Cloud Services and Support at Oracle from 2016 until her retirement in August 2017. In that role, she drove Oracle's cloud transformation services and support strategy, partnering with leaders across all business units. Ms. Olsen previously served as Senior Vice President and leader of Oracle's applications sales, alliances, and consulting organizations in North America from 2012 through 2016, and from 2010 through 2012 served in various general management positions at Oracle. Ms. Olsen began her career with IBM, where, between 1979 and 2010, she held a variety of executive management positions across sales, global financing and hardware. Ms. Olsen also serves on the boards of directors of Teradata Corporation and Keysight Technologies, Inc., both publicly traded companies.

Item 1A. Risk Factors

Investing in our securities involves a high degree of risk. In addition to the other information contained in this report, you should consider the following risk factors before investing in our securities.

Our revenue, gross margin and operating results can fluctuate significantly and unpredictably from quarter to quarter.

Our revenue, gross margin and results of operations can fluctuate significantly and unpredictably from quarter to quarter. Our budgeted expense levels are based on our visibility into customer spending plans and our projections of future revenue and gross margin. Visibility into customer spending levels can be uncertain, spending patterns are subject to change, and reductions in our expense levels can take significant time to implement. A significant portion of our quarterly revenue is generated from customer orders received during that same quarter (which we refer to as “book to revenue”). Accordingly, our revenue for a particular quarter is difficult to predict, and a shortfall in expected orders in any given quarter can materially adversely affect our revenue and results of operations for that quarter or future quarterly periods. Additional factors that contribute to fluctuations in our revenue, gross margin and operating results include:

- changes in spending levels or network deployment plans by customers, particularly with respect to our service provider and Web-scale provider customers;
- order timing and volume, including book to revenue orders;
- shipment and delivery timing;
- backlog levels;
- the level of competition and pricing pressure in our industry;
- the pace and impact of price erosion that we regularly encounter in our markets;
- the impact of commercial concessions or unfavorable commercial terms required to maintain incumbency or secure new opportunities with key customers;
- the mix of revenue by product segment, geography and customer in any particular quarter;
- our level of success in achieving targeted cost reductions and improved efficiencies in our supply chain;
- our incurrence of start-up costs, including lower margin phases of projects required to support initial deployments, gain new customers or enter new markets;
- our level of success in accessing new markets and obtaining new customers;
- technology-based price compression and our introduction of new platforms with improved price for performance;
- changing market, economic and political conditions, including the impact of tariffs and other trade restrictions;
- the financial stability of our customers and suppliers;
- consolidation activity among our customers, suppliers and competitors;
- the timing of revenue recognition on sales, particularly relating to large orders;
- installation service availability and readiness of customer sites;
- availability of components and manufacturing capacity;
- adverse impact of foreign exchange; and
- seasonal effects in our business.

As a result of these factors and other conditions affecting our business and operating results, we believe that quarterly comparisons of our operating results are not necessarily a good indication of possible future performance. Quarterly fluctuations from the above factors may cause our revenue, gross margin and results of operations to underperform in relation to our guidance, long-term financial targets or the expectations of financial analysts or investors, which may cause volatility or decreases in our stock price.

A small number of customers account for a significant portion of our revenue. The loss of these customers or a significant reduction in their spending could have a material adverse effect on our business and results of operations.

A significant portion of our revenue is concentrated among a small number of customers. For example, our ten largest customers contributed 59.3% of our fiscal 2019 revenue. Historically, our largest customers by revenue principally consisted of large communications service providers. For example, Verizon and AT&T accounted for approximately 12.9% and 10.9% of fiscal 2019 revenue, respectively. As a result of efforts in recent years to diversify our business, the customer segments and geographies that comprise our customer base and top customers by revenue have changed. During fiscal 2019, three Web-scale providers were among our top ten customers. Web-scale customers have been important contributors to our overall growth through both our direct sales to them, including for data center interconnection, and their indirect impact on purchases by other network operators. Consequently, our financial results and our ability to grow our business are closely correlated with the spending of a relatively small number of customers. Our business and results of operations could be materially adversely

impacted by the loss of a large customer within or outside of these customer segments as well as by reductions in spending or capital expenditure budgets, changes in network deployment plans or changes in consumption models for acquiring networking solutions by our largest customers.

Because of our concentration of revenue with communications service providers and Web-scale providers, our business and results of operations can be significantly affected by market, industry or competitive dynamics adversely affecting these customer segments. For example, communications service providers continue to face a rapidly shifting competitive landscape as cloud service operators, “over-the-top” (OTT) providers, and other content providers challenge their traditional business models and network infrastructures. These dynamics have in the past had an adverse effect on network spending levels by certain of our largest service provider customers. Several of these, including AT&T, with whom we experienced declines in annual revenue during fiscal 2017 and fiscal 2018, have announced various initiatives that seek to modify how they purchase networking infrastructure or reduce capital expenditures on network infrastructure in future periods that may adversely affect our results of operations. In addition, a number of our communications service providers and cable operator customers, including AT&T, Verizon and CenturyLink, have either recently announced significant acquisition transactions or are in the process of significant related integration activities, including the acquisition of media or content companies. Such transactions have in the past, and may in the future, result in spending delays or deferrals, or changes in preferred vendors due to changes in strategy or leadership, the timing of regulatory approvals and debt burdens associated with such transactions. Similarly, certain of our largest Web-scale customers have announced an intention to reduce capital spending in future periods and we expect our revenue from this customer segment to moderate from the level achieved in fiscal 2019. Web-scale providers are also under consumer and government scrutiny and have been the subject of regulatory and other government actions, including antitrust investigations. There can be no assurance that these government actions will not adversely impact the network spending, procurement strategies, or business practices of our Web-scale customers in a manner adverse to us. Our business and results of operations could be materially adversely affected by these factors and other market, industry or competitive dynamics adversely impacting our customers.

We face intense competition that could hurt our sales and results of operations, and we expect the competitive landscape in which we operate to continue to broaden to include additional solutions providers.

We face an intense competitive market for sales of communications networking equipment, software and services. Competition is intense on a global basis, as we and our competitors aggressively seek to capture market share and displace incumbent equipment vendors. Our industry has historically been dominated by a small number of very large vendors, some of which have substantially greater financial and marketing resources, broader product offerings and more established relationships with service providers and other customer segments than we do. In addition, to drive scale and market share gains and meet the intense investment capacity required to keep pace with technology innovation, acquisition activity among vendors of networking solutions has increased. Consolidation in our industry may result in competitors with greater resources, pricing flexibility, or other synergies, which may provide them with a competitive advantage.

Certain of our customers are adopting procurement strategies that seek to purchase a broader set of networking solutions from a single or small number of vendors. Because of their scale, resources, and a more diverse set of solution offerings, certain of our larger competitors may be perceived to be a better fit for the procurement or network operating and management strategies of these customers. We also compete with a number of smaller companies that provide significant competition for specific products, applications, customer segments or geographic markets. Due to the narrower focus of their efforts, these competitors may achieve commercial availability of their products more quickly or may be more attractive to customers in a particular product niche.

Generally, competition in our markets is based on any one or a combination of the following factors:

- the ability to meet customer business needs and drive successful outcomes;
- functionality, speed, capacity, scalability, performance, quality and reliability of solutions;
- price for performance, cost per bit and total cost of ownership of solutions;
- incumbency and strength of existing business relationships;
- ability to offer comprehensive networking solutions, consisting of hardware, software and services;
- time-to-market in delivering products and features;
- technology roadmap and forward innovation capacity and ability to deliver on network innovation;
- company stability and financial health;
- flexibility and openness of platforms, including ease of integration, interoperability and integrated management;
- ability to offer solutions that accommodate a range of emerging customer consumption models for network solutions;
- operating costs, space requirements and power consumption of network solutions;
- software and network automation and analytics capabilities;

- manufacturing and lead-time capability; and
- services and support capabilities.

Part of our strategy is to leverage our technology leadership and to aggressively capture additional market share and displace competitors, particularly with communications service providers internationally. In an effort to maintain our incumbency or to secure new customer opportunities, we have in the past, and may in the future, agree to aggressive pricing, commercial concessions and other unfavorable terms that result in low or negative gross margins on a particular order or group of orders. Competition can also result in onerous commercial and legal terms and conditions that place a disproportionate amount of risk on us.

We expect the competition in our industry to continue to broaden and to intensify, as network operators pursue a diverse range of network strategies and consumption models. As these changes occur, we expect that our business will compete more directly with additional networking solution suppliers, including IP router vendors, data center switch providers and other suppliers or integrators of networking technology. In addition, as we seek increased customer adoption of our Blue Planet Automation Software and Services, and as network operator demands for programmability, automation and analytics increase, we expect to compete more directly with software vendors and IT vendors or integrators of these solutions. We may also face competition from system and component vendors, including those in our supply chain, that develop networking products based on off-the-shelf or commoditized hardware technology, referred to as “white box” hardware, particularly where a customer’s network strategy seeks to emphasize deployment of such product offerings or adopt a disaggregated approach to the procurement of hardware and software. An increase in competitive intensity, the adoption of new consumption models, or the entry of new competitors into our markets, may adversely impact our business and results of operations. If competitive pressures increase, or if we fail to compete successfully in our markets, our business and results of operations could suffer.

Our business and operating results could be adversely affected by unfavorable changes in macroeconomic and market conditions and reductions in the level of spending by customers in response to these conditions.

Our business and operating results depend significantly on general market and economic conditions. Market volatility and weakness in the regions in which we operate have previously resulted in sustained periods of decreased demand for our products and services, which has adversely affected our operating results. Macroeconomic and market conditions could be adversely affected by a variety of political, economic or other factors in the United States and international markets, which could in turn adversely affect spending levels of our customers and their end users, and could create volatility or deteriorating conditions in the markets in which we operate. Due to our concentration of revenue in the United States, we would expect to incur a more significant impact from any adverse change in the capital spending environment or macroeconomic or market weakness in the United States. Macroeconomic uncertainty or weakness could result in:

- reductions in customer spending and delay, deferral or cancellation of network infrastructure initiatives;
- increased competition for fewer network projects and sales opportunities;
- increased pricing pressure that may adversely affect revenue, gross margin and profitability;
- decreased ability to forecast operating results and make decisions about budgeting, planning and future investments;
- increased overhead and production costs as a percentage of revenue;
- tightening of credit markets needed to fund capital expenditures by us or our customers;
- customer financial difficulty, including longer collection cycles and difficulties collecting accounts receivable or write-offs of receivables; and
- increased risk of charges relating to excess and obsolete inventories and the write-off of other intangible assets.

Reductions in customer spending in response to unfavorable or uncertain macroeconomic and market conditions, globally or in a particular region where we operate, would adversely affect our business, results of operations and financial condition.

Investment of research and development resources in communications networking technologies for which there is not an adequate market demand, or failure to sufficiently or timely invest in technologies for which there is market demand, would adversely affect our revenue and profitability.

The market for communications networking hardware and software solutions is characterized by rapidly evolving technologies, changes in market demand and increasing adoption of software-based networking solutions. We continually invest in research and development to sustain or enhance our existing hardware and software solutions and to develop or acquire new technologies including new software platforms. There is often a lengthy period between commencing these development initiatives and bringing new or improved solutions to market. During this time, technology preferences, customer demand and the markets for our solutions may move in directions that we had not anticipated. There is no guarantee that our new products, including our Blue Planet Automation Software and Services, or enhancements to other solutions, will achieve market acceptance or that the timing of market adoption will be as predicted. As a result, there is a significant possibility that some of

our development decisions, including significant expenditures on acquisitions, research and development, or investments in technologies, will not meet our expectations, and that our investment in some projects will be unprofitable. There is also a possibility that we may miss a market opportunity because we failed to invest or invested too late in a technology, product or enhancement sought by our customers or the markets into which we sell. Changes in market demand or investment priorities may also cause us to discontinue existing or planned development for new products or features, which can have a disruptive effect on our relationships with customers. If we fail to make the right investments or fail to make them at the right time, competing solutions may be more attractive in the market. As a result, our competitive position may suffer, and our revenue and profitability could be adversely affected.

We have no guaranteed purchases and regularly have to re-win business for existing customers.

Generally, our customer contracts do not require customers to purchase any minimum or guaranteed volumes, and we conduct sales through framework contracts under which customers place purchase orders for which they often have the right to modify or cancel. We must regularly compete for and win business with existing customers across all of our customer segments. In addition, Web-scale providers tend to operate on shorter procurement cycles than some of our traditional customers, which can require us to compete to re-win business with these customers more frequently than required with other customers segments. As such, there is no assurance that our incumbency will be maintained at any given customer or that our revenue levels from a customer in a particular period can be achieved in future periods. Customer spending levels can be unpredictable, and our sales to any customer could significantly decrease or cease at any time.

Network equipment sales often involve lengthy sales cycles and protracted contract negotiations that may require us to agree to commercial terms or conditions that negatively affect pricing, risk allocation, payment and the timing of revenue recognition.

Our sales efforts, particularly with communications service providers, Web-scale providers and other large customers, often involve lengthy sales cycles. These selling efforts often involve a significant commitment of time and resources that may include extensive product testing, laboratory or network certification, network or region-specific product certification and homologation requirements for deployment in networks. Even after a customer awards its business to us or decides to purchase our solutions, the length of time before deployment can vary depending on the customer’s schedule, site readiness, the size of the network deployment, the degree of custom configuration required and other factors. Additionally, these sales also often involve protracted and sometimes difficult contract negotiations in which we may deem it necessary to agree to unfavorable contractual or commercial terms that adversely affect pricing, expose us to penalties for delays or non-performance and require us to assume a disproportionate amount of risk. To maintain incumbency with key customers, we may be required to offer discounted pricing, make commercial concessions or offer less favorable terms as compared to our historical business arrangements with these customers. We may also be requested to provide deferred payment terms, vendor or third-party financing or other alternative purchase structures that extend the timing of payment. Alternatively, customers may insist on terms and conditions that we deem too onerous or not in our best interest, and we may be unable to reach a commercial agreement. As a result, we may incur substantial expense and devote time and resources to potential sales opportunities that never materialize or result in lower than anticipated sales and gross margin.

If the market for network software does not evolve in the way we anticipate or if customers do not adopt our Blue Planet Automation Software and Services, we may not be able to monetize these software assets and realize a key part of our business strategy.

A key part of our business strategy is to increase customer adoption of our Blue Planet Automation Software Platform for intelligent, closed loop automated networks. This strategy depends in significant part on our ability to commercialize and gain market adoption for our Blue Planet Automation Software and Services. If the markets relating to software solutions for network automation, including service orchestration, route optimization, analytics and assurance, and SDN or NFV, do not develop as we anticipate, or if we are unable to increase market awareness and adoption of our Blue Planet Automation Software and Services within those markets, revenue from our Blue Planet Automation Software and Services may not grow. We have a limited history in commercializing and selling these software solutions and have only recently acquired certain elements of our Blue Planet portfolio. Moreover, the market and competitive landscape for these solutions is dynamic, and it is difficult to predict important trends, including the potential growth, if any, of this market. If the market for these software solutions does not evolve in the way we anticipate or if customers do not adopt our Blue Planet Automation Software and Services, a key part of our strategy for growth would be adversely affected and our financial results may suffer.

If we are unable to adapt our business to the consumption models for networking solutions adopted by our customers and to offer attractive solutions across these consumption models, our business, competitive position and results of operations could be adversely affected.

Growing bandwidth demands and network operator efforts to reduce costs are resulting in a diverse range of approaches to the design and procurement of network infrastructure. We refer to these different approaches as “consumption models.” These consumption models can include: the traditional systems procurement of fully integrated solutions including hardware, software and services from the same vendor; the procurement of a fully integrated hardware solution from one vendor with the separate use of a network operator’s own SDN-based controller; the procurement of an integrated photonic line system with open interfaces from one vendor and the separate or “disaggregated” procurement of modem technology from a different vendor; or the development and use of published reference designs and open source specifications for the procurement of “white box” hardware to be used with open source software. In parallel, network operators are also exploring procurement alternatives for software solutions, ranging from integrated and proprietary software platforms to fully open source software.

We believe that network operators will continue to consider a variety of different consumption models. Many of these approaches are in their very early stages of development and evaluation, and the types of models and their levels of adoption will depend in significant part on the nature of the circumstances and strategies of particular network operators. Among our customers, AT&T and others are pursuing network strategies that emphasize enhanced software programmability, management and control of networks, and deployment of “white box” hardware. A number of network operators are pursuing the deployment of smaller form factor, pluggable modem technology, particularly within switching and routing solutions, as an alternative to integrated optical networking platforms. Other network operators, including certain of our Web-scale customers, are playing a leading role in the transition to software-defined networking or the standardization of communications network solutions. We believe that the potential for different approaches to the procurement of networking infrastructure will require network operators and vendors to evolve and broaden their existing solutions and commercial models over time. Adoption of a range of consumption models may also alter and broaden our competitive landscape to include other technology vendors, including routing vendors, component vendors and IT software vendors. If we are unable to adapt our business to these new consumption models and offer attractive solutions and commercial models that accommodate the range of consumption models ultimately adopted by our customers or within our markets, our business, competitive position and results of operations could be adversely affected.

We may experience delays in the development and production of our products that may negatively affect our competitive position and business.

Our hardware and software networking solutions, including our coherent optical chipset, our WaveLogic modem technology and the components thereof, are based on complex technology, and we can experience unanticipated delays in developing, manufacturing and introducing these solutions to market. Delays in product development efforts by us or our supply chain may affect our reputation with customers, affect our ability to capture market opportunities and impact the timing and level of demand for our products. Among other things, we are currently introducing our fifth generation of our coherent optical modem technology, extending our Packet Networking portfolio with additional IP features, and introducing new solutions within our Platform Software and Services and Blue Planet Automation Software and Services segments. Each step in the development cycle of our products presents serious risks of failure, rework or delay, any one of which could adversely affect the cost-effectiveness and timely development of our products. We may encounter delays relating to engineering development activities and software, design, sourcing and manufacture of critical components, and the development of prototypes. The development of new technologies may increase the complexity of supply chain management or require the acquisition, licensing or interworking with the technology of third parties. In addition, intellectual property disputes, failure of critical design elements and other execution risks may delay or even prevent the release of these products. If we do not successfully develop or produce products in a timely manner, our competitive position may suffer, and our business, financial condition and results of operations could be harmed.

We rely on third-party contract manufacturers and our business and results of operations may be adversely affected by risks associated with their businesses, financial condition and the geographies in which they operate.

We rely on third-party contract manufacturers with facilities in Canada, Mexico, Thailand and the United States to perform a substantial portion of our supply chain activities, including component sourcing, manufacturing, product testing and quality, and fulfillment and logistics relating to the distribution and support of our products. There are a number of risks associated with our dependence on contract manufacturers, including:

- reduced control over delivery schedules and planning;
- reliance on the quality assurance procedures of third parties;
- potential uncertainty regarding manufacturing yields and costs;

- availability of manufacturing capability and capacity, particularly during periods of high demand;
- risks and uncertainties associated with the locations or countries where our products are manufactured, including potential manufacturing disruptions caused by social, geopolitical or environmental factors;
- changes in U.S. law or policy governing tax, trade, manufacturing, development and investment in the countries where we currently manufacture our products, including the World Trade Organization Information Technology Agreement or other free trade agreements;
- inventory liability for excess and obsolete supply;
- limited warranties provided to us; and
- potential misappropriation of our intellectual property.

These and other risks could impair our ability to fulfill orders, harm our sales and impact our reputation with customers. If our contract manufacturers are unable or unwilling to continue manufacturing our products or components of our products, or if we experience a disruption of manufacturing or our contract manufacturers discontinue operations, we may be required to identify and qualify alternative manufacturers, which could cause us to be delayed in or unable to meet our supply requirements to our customers and result in the breach of our customer agreements. The process of qualifying a new contract manufacturer and commencing volume production is expensive and time-consuming, and if we are required to change or qualify a new contract manufacturer, we would likely experience significant business disruption and could lose revenue and damage our existing customer relationships.

Our reliance on third-party component suppliers, including sole and limited source suppliers, exposes our business to additional risk and could limit our sales, increase our costs and harm our customer relationships.

We maintain a global sourcing strategy and depend on a diverse set of third-party suppliers in international markets that comprise our supply chain. We rely on these third parties for activities relating to product design, development and support, and in the sourcing of products, components, subcomponents and related raw materials. Our products include optical and electronic components for which reliable, high-volume supply is often available only from sole or limited sources. We do not have any guarantees of supply from our third-party suppliers, and in certain cases we have limited contractual arrangements or are relying on standard purchase orders. As a result, there is no assurance that we will be able to secure the components or subsystems that we require, in sufficient quantity and quality, and on reasonable terms.

The loss of a source of supply, or lack of sufficient availability of key components, could require that we locate an alternate source or redesign our products, either of which could result in business interruption and increased costs and could negatively affect our product gross margin and results of operations. There are a number of significant technology trends or developments underway or emerging – including the Internet of Things, autonomous vehicles, and advances in mobile communications such as the emergence of 5G – that have previously resulted in, and can be expected in the future to result in, increased market demand for key raw materials or components upon which we rely. Increases in market demand or scarcity of raw materials for components have resulted, and may in the future result, in shortages in availability of important components for our solutions, product allocation challenges, deployment delays and increased cost, lead times and delivery cycle time lines.

We have experienced, and may experience in the future, consolidation among suppliers of our components. Consolidation in the optical components and semiconductor industry can result in a reduction in the number of suppliers available to us, which can negatively impact our ability to access components or the price we have to pay for such components. Moreover, our access to necessary components could be adversely impacted by evolving competitive landscapes, converging solutions offerings and competition from component vendors, including those in our supply chain, who develop competing networking products for emerging consumptions models, including pluggable modem technology or offerings based on “white box” hardware.

These and other industry, market and regulatory disruptions and challenges affecting our suppliers could expose our business to increased costs, loss or lack of supply, or discontinuation of components that can result in lost revenue, additional product costs, increased lead times and deployment delays that could harm our business and customer relationships.

The international scale of our sales and operations exposes us to additional risk and expense that could adversely affect our results of operations.

We market, sell and service our products globally, maintain personnel in numerous countries, and rely on a global supply chain for sourcing important components and manufacturing our products. Our international sales and operations are subject to inherent risks, including:

- adverse social, political and economic conditions in countries outside the United States;
- effects of adverse changes in currency exchange rates;

- greater difficulty in collecting accounts receivable and longer collection periods;
- difficulty and cost of staffing and managing foreign operations;
- higher incidence of corruption or unethical business practices;
- less protection for intellectual property rights in some countries;
- tax and customs changes that adversely impact our global sourcing strategy, manufacturing practices, transfer-pricing, or competitiveness of our products for global sales;
- compliance with certain testing, homologation or customization of products to conform to local standards;
- significant changes to free trade agreements, trade protection measures, tariffs, export compliance, domestic preference procurement requirements, qualification to transact business and additional regulatory requirements; and
- natural disasters, epidemics and acts of war or terrorism.

Our international operations are subject to complex foreign and U.S. laws and regulations, including anti-bribery and corruption laws, antitrust or competition laws, data privacy laws, such as the EU General Data Protection Regulation, and environmental regulations, among others. In particular, recent years have seen a substantial increase in anti-bribery law enforcement activity by U.S. regulators, and we currently operate and seek to operate in many parts of the world that are recognized as having greater potential for corruption. Violations of any of these laws and regulations could result in fines and penalties, criminal sanctions against us or our employees, prohibitions on the conduct of our business and on our ability to offer our products and services in certain geographies, and significant harm to our business reputation. Our policies and procedures to ensure compliance with these laws and regulations and to mitigate these risks may not protect us from all acts committed by our employees or third-party vendors, including contractors, agents and services partners. Additionally, the costs of complying with these laws (including the costs of investigations, auditing and monitoring) could adversely affect our current or future business.

The success of our international sales and operations will depend, in large part, on our ability to anticipate and manage these risks effectively. Our failure to manage any of these risks could harm our international operations, reduce our international sales, and could give rise to liabilities, costs or other business difficulties that could adversely affect our operations and financial results.

Changes in trade policy, including the imposition of tariffs and efforts to withdraw from or materially modify international trade agreements, may adversely affect our business, operations and financial condition.

The United States and various foreign governments have established certain trade and tariff requirements under which we have implemented a global approach to the sourcing and manufacture of our products, as well as distribution and fulfillment to customers around the world. Recently, the U.S. government has indicated a willingness to revise, renegotiate, or terminate various existing multilateral trade agreements and to impose new taxes on certain goods imported into the U.S. Because we rely on a global sourcing strategy and third-party contract manufacturers in markets outside of the U.S. to perform substantially all of the manufacturing of our products, such steps, if adopted, could adversely impact our business and operations, increase our costs, and make our products less competitive in the U.S. and other markets.

For example, the U.S. government has threatened to undertake a number of actions relating to trade with Mexico, including the closure of the border and the imposition of escalating tariffs on goods imported into the U.S. from Mexico. A substantial portion of our products are manufactured and distributed by third-party contract manufacturers in Mexico. If adopted, such actions could adversely impact our business and significantly disrupt our operations. These actions may also make our products less competitive in the United States and other markets. In addition, the U.S. government reached a new trade agreement with the Canadian and Mexican governments to replace the North American Free Trade Agreement (“NAFTA”) with the United States-Mexico-Canada Agreement (“USMCA”). Withdrawal from NAFTA by the U.S. or failure of these countries to ratify USMCA could similarly adversely impact our business and significantly disrupt our operations.

In addition, as a result of our global sourcing strategy, our supply chain includes certain direct and indirect suppliers based in China who supply goods to us, our manufacturers or our third-party suppliers. Recently, there have been a number of significant geopolitical events, including trade tensions and regulatory actions, involving the governments of the United States and China. The U.S. government has raised tariffs, and imposed new tariffs, on a wide range of imports of Chinese products, including component elements of our solutions and certain finished goods products that we sell. Effective September 1, 2019, a new 15% tariff was imposed on approximately $120 billion of China-origin imports covered by the so called “List 4A,” which includes certain of our products. In December 2019, the U.S. government announced that as part of a so called “Phase One” agreement between the U.S. and China on trade matters, this tariff was expected to be reduced to 7.5%.

At this time, it remains unclear what additional actions, if any, will be taken by the U.S. or other governments with respect to international trade agreements, the imposition of tariffs on goods imported into the U.S., tax policy related to international commerce, or other trade matters. Based on our manufacturing practices and locations, there can be no assurance that any future

executive or legislative action in the United States or other countries relating to tax policy and trade regulation would not adversely affect our business, operations and financial results.

Government regulation of usage, import or export of our products, or our technology within our products, changes in that regulation, or our failure to obtain required approvals for our products, could harm our international and domestic sales and adversely affect our revenue and costs of sales. Failure to comply with such regulations could result in enforcement actions, fines, penalties or restrictions on export privileges. In addition, costly tariffs on our equipment, restrictions on importation, trade protection measures and domestic preference requirements of certain countries could limit our access to these markets and harm our sales. These regulations could adversely affect the sale or use of our products, substantially increase our cost of sales and adversely affect our business and revenue.

Our reliance on certain third-party component suppliers exposes us to certain risks relating to their businesses that, in turn, could disrupt our business or limit our sales.

We are exposed to risks relating to unfavorable economic conditions, financial conditions and a wide range of challenges affecting the businesses and results of operations of our component suppliers. These challenges can affect their material costs, sales, liquidity levels, ability to continue investing in their businesses, ability to import or export goods, ability to meet development commitments and manufacturing capability. A number of our key technology vendors rely upon sales to customers, including our competitors, in China for a material portion of their revenue. In January 2018, China’s Ministry of Industry and Information Technology released its Optoelectronic Devices Industry Technology Roadmap, a five-year plan to improve China’s capabilities in the optoelectronics industry. There can be no assurance that this initiative, or similar efforts in China such as the Made in China 2025 initiatives, will not have an adverse impact on the business of our component suppliers or our access to necessary components. Separately, in May 2019, the U.S. Department of Commerce amended the Export Administration Regulations by adding Huawei Technologies Co., Ltd. and 68 of its non-U.S. affiliates to the “Entity List” for actions contrary to the national security and foreign policy interests of the United States, which amendment imposes significant new restrictions on export, reexport and transfer of U.S. regulated technologies and products to Huawei. In August, the U.S. Department of Commerce further added 46 affiliates to the Entity List (collectively, “Huawei”). Several of our third-party component suppliers, including certain sole and limited source suppliers, sell products to Huawei and, in some cases, Huawei is a significant customer for such suppliers. Any continued restriction on our suppliers’ ability to make sales to Huawei may adversely impact their businesses. Such industry, market and regulatory disruptions affecting these suppliers could, in turn, expose our business to loss or lack of supply or discontinuation of components that could result in lost revenue, additional product costs, increased lead times and deployment delays that could harm our business and customer relationships. Our business and results of operations would be negatively affected if we were to experience any significant disruption or difficulties with key suppliers affecting the price, quality, availability or timely delivery of required components. At this time, there can be no assurance regarding the scope or duration of the restrictions imposed on Huawei and any future impact on our suppliers.

Product performance problems and undetected errors affecting the performance, interoperability, reliability or security of our products could damage our business reputation and negatively affect our results of operations.

The development and production of sophisticated hardware and software for communications network equipment is highly complex. Some of our products can be fully tested only when deployed in communications networks or when carrying traffic with other equipment, and software products may contain bugs that can interfere with expected performance. As a result, undetected defects or errors, and product quality, interoperability, reliability and performance problems are often more acute for initial deployments of new products and product enhancements. We have recently launched, and are in the process of launching, a number of new hardware and software offerings, including evolutions of our WaveLogic coherent optical modem technology, Packet Networking platforms and solutions targeting access and metro networks and data center interconnect applications. Unanticipated product performance problems can relate to the design, manufacturing, installation, operation and interoperability of our products. Undetected errors can also arise as a result of defects in components, software or manufacturing, installation or maintenance services supplied by third parties, and technology acquired from or licensed by third parties. From time to time we have had to replace certain components, provide software remedies or other remediation in response to defects or bugs, and we may have to do so again in the future. Remediation of such events could materially adversely impact our business and results of operations. In addition, we may encounter unanticipated security vulnerabilities relating to our products or the activities of our supply chain. Our products are used in customer networks transmitting a range of sensitive information and any actual or perceived exposure of our solutions to malicious software or cyber-attacks could adversely affect our business and results of operations. Product performance, reliability, security and quality problems may result in some or all of the following effects:

- damage to our reputation, declining sales and order cancellations;
- increased costs to remediate defects or replace products;
- payment of liquidated damages, contractual or similar penalties, or other claims for performance failures or delays;

- increased warranty expense or estimates resulting from higher failure rates, additional field service obligations or other rework costs related to defects;
- higher charges for increased inventory obsolescence;
- costs, liabilities and claims that may not be covered by insurance coverage or recoverable from third parties; and
- delays in recognizing revenue or collecting accounts receivable.

These and other consequences relating to undetected errors affecting the quality, reliability and security of our products could negatively affect our business and results of operations.

If we fail to accurately predict demand, we may be required to write off significant amounts of inventory as a result of our inventory purchase practices and could incur additional costs or experience manufacturing delays.

To avoid delays and meet customer demand for shorter delivery terms, we place orders with our contract manufacturers and component suppliers based on forecasts of customer demand. In a number of cases these suppliers may require longer lead times for fulfillment than we have with our customers. Thus, our practice of buying inventory based on forecasted demand exposes us to the risk that our customers ultimately may not order the products we have forecast or will purchase fewer products than forecast. As a result, we may purchase inventory in anticipation of sales that ultimately do not occur. We regularly incur, on a quarterly basis, expense provisions against excess or obsolete inventory and may have difficulty forecasting inventory and customer spending. Moreover, our customer purchase agreements generally do not include any minimum purchase commitment and customers often have the right to modify, reduce or cancel purchase quantities. Our products are highly configurable, and certain new products have overlapping feature sets or application with existing products. Accordingly, it is increasingly possible that customers may forgo purchases of certain products we have inventoried in favor of a similar or newer product. We may also be exposed to inventory write-offs as a result of certain supply chain initiatives, including consolidation and transfer of key manufacturing activities. If we are required to write off or write down a significant amount of inventory, our results of operations for the applicable period would be materially adversely affected. Conversely, if we underestimate our demand, our contract manufacturers and component suppliers may have inadequate time, materials, or components required to manufacture our products. This could increase costs or delay or interrupt manufacturing of our products, resulting in delays in shipments and deferral or loss of revenues and could adversely impact customer satisfaction.

Our go-to-market activities and the distribution of our WaveLogic coherent modem technology within the merchant modem market could expose us to increased or new forms of competition, or adversely affect our existing systems business and results of operations.

We recently entered the merchant modem market to monetize our coherent optical technology, expand our addressable market and address a range of customer consumption models for networking solutions. Making our critical technology available in this manner could adversely impact the sale of products in our existing systems business. For example, our customers may choose to adopt disaggregated consumption models or third-party solutions that embed Ciena-designed optical modules instead of purchasing systems-based solutions from us. Accordingly, we may encounter situations where we are competing for opportunities in the market directly against a system from one of our competitors that incorporates Ciena-designed modules. Making this key technology available and enabling third-party sales of Ciena-designed modules may adversely affect our competitive position and increase the risk that third parties misappropriate or attempt to use our technology or related intellectual property without our authorization. These and other risks or unanticipated liabilities or costs associated with the sales of our WaveLogic coherent technology could harm our reputation and adversely affect our business and our results of operations. Our go-to-market activities and the distribution of our WaveLogic coherent technology within the merchant modem market could expose us to increased or new forms of competition, or adversely affect our systems business and results of operation.

Data security breaches and cyber-attacks could compromise our intellectual property or other sensitive information and cause significant damage to our business and reputation.

In the ordinary course of our business, we maintain on our network systems, and on the networks of our third-party providers, certain information that is confidential, proprietary or otherwise sensitive in nature. This information includes intellectual property, financial information and confidential business information relating to us and our customers, suppliers and other business partners. Companies in the technology industry have been increasingly subject to a wide variety of security incidents, cyber-attacks and other attempts to gain unauthorized access to networks or sensitive information. Our network systems and storage and other business applications, and the systems and storage and other business applications maintained by our third-party providers, have been in the past, and may be in the future, subject to attempts to gain unauthorized access, breach, malfeasance or other system disruptions. In some cases, it is difficult to anticipate or to detect immediately such incidents and the damage caused thereby. If an actual or perceived breach of security occurs in our network or any of our third-party providers' networks, we could incur significant costs and our reputation could be harmed. While we work to safeguard our internal network systems and validate the security of our third party providers to mitigate these potential risks, including through information security policies and employee awareness and training, there is no assurance that such actions will be sufficient to prevent cyber-attacks or security breaches. We have been subjected in the past to a range of incidents including phishing, emails purporting to come from a company executive or vendor seeking payment requests, and communications from look-alike corporate domains. While these have not had a material effect on our business or our network security to date, security incidents involving access or improper use of our systems, networks or products could compromise confidential or otherwise protected information, destroy or corrupt data, or otherwise disrupt our operations. These security events could also negatively impact our reputation and our competitive position and could result in litigation with third parties, regulatory action, loss of business, potential liability and increased remediation costs, any of which could have a material adverse effect on our financial condition and results of operations.

Efforts to increase our sales and capture market share in targeted international markets may be unsuccessful.

Part of our business and growth strategy is to expand our geographic reach and increase market share in international markets through a combination of direct and indirect sales resources. We are also aggressively pursuing opportunities with service provider customers in additional geographies, including EMEA and APAC. This diversification of our markets and customer base has been a significant component of the growth of our business in recent years. Our efforts to continue to increase our sales and capture market share in international markets may ultimately be unsuccessful or may adversely impact our financial results, including our gross margin. Our failure to continue to increase our sales and market share in international markets could limit our growth and could harm our results of operations.

Our intellectual property rights may be difficult and costly to enforce.

We generally rely on a combination of patents, copyrights, trademarks and trade secret laws to establish and maintain proprietary rights in our products and technology. Although we have been issued numerous patents, and other patent applications are currently pending, there can be no assurance that any of these patents or other proprietary rights will not be challenged, invalidated or circumvented, or that our rights will provide us with any competitive advantage. In addition, there can be no assurance that patents will be issued for our pending applications or that claims allowed on any patents will be sufficiently broad to protect our technology. Further, the laws of some foreign countries may not protect our proprietary rights to the same extent as do the laws of the United States.

We are subject to the risk that third parties may attempt to access, divert or use our intellectual property without authorization. Protecting against the unauthorized use of our products, technology and other proprietary rights is difficult, time-consuming and expensive, and we cannot be certain that the steps that we are taking will prevent or minimize the risks of such unauthorized use. In addition, our intellectual property strategy must continually evolve to protect our proprietary rights in new solutions, including our software solutions. Litigation may be necessary to enforce or defend our intellectual property rights or to determine the validity or scope of the proprietary rights of others. Such litigation could result in substantial cost and diversion of management time and resources, and there can be no assurance that we will obtain a successful result. Any inability to protect and enforce our intellectual property rights could harm our ability to compete effectively.

We may incur significant costs in response to claims by others that we infringe their intellectual property rights.

From time to time third parties may assert claims or initiate litigation or other proceedings related to patent, copyright, trademark and other intellectual property rights to technologies and related standards that are relevant to our business. The rate of infringement assertions by patent assertion entities is increasing, particularly in the United States. Generally, these patent owners neither manufacture nor use the patented invention directly, and they seek to derive value from their ownership solely through royalties from patent licensing programs.

We could be adversely affected by litigation, other proceedings or claims against us, as well as claims against our manufacturers, suppliers or customers, alleging infringement of third-party proprietary rights by our products and technology, or components thereof. Regardless of the merit of these claims, they can be time-consuming, divert the time and attention of our technical and management personnel, and result in costly litigation. These claims, if successful, could require us to:

- pay substantial damages or royalties;
- comply with an injunction or other court order that could prevent us from offering certain of our products;
- seek a license for the use of certain intellectual property, which may not be available on commercially reasonable terms or at all;
- develop non-infringing technology, which could require significant effort and expense and ultimately may not be successful; and
- indemnify our customers or other third parties pursuant to contractual obligations to hold them harmless or pay expenses or damages on their behalf.

Any of these events could adversely affect our business, results of operations and financial condition. Our exposure to risks associated with the use of intellectual property may increase as a result of acquisitions, as we would have a lower level of visibility into the development process with respect to the acquired technology and the steps taken to safeguard against the risks of infringing the rights of third parties.

Our products incorporate software and other technology under license from third parties, and our business would be adversely affected if this technology were no longer available to us on commercially reasonable terms.

We integrate third-party software and other technology into our operating system, network management, and intelligent automation software and other products. As a result, we may be required to license certain software or technology from third parties, including competitors. Licenses for software or other technology may not be available or may not continue to be available to us on commercially reasonable terms. Third-party licensors may insist on unreasonable financial or other terms in connection with our use of such technology. Our failure to comply with the terms of any license may result in our inability to continue to use such license, which may result in significant costs, harm our market opportunities and require us to obtain or develop a substitute technology.

Some of our solutions, including our Blue Planet Automation Software, utilize elements of open source or publicly available software. As network operators seek to enhance programmability and automation of networks, we expect that we and other communications networking solutions vendors will increasingly contribute to and use technology or open source software developed by standards settings bodies or other industry forums that seek to promote the integration of network layers and functions. The terms of such licenses could be construed in a manner that could impose unanticipated conditions or restrictions on our ability to commercialize our products. This increases our risks associated with our use of such software and may require us to seek licenses from third parties, to re-engineer our products or to discontinue the sale of such solutions. Difficulty obtaining and maintaining technology licenses with third parties may disrupt development of our products, increase our costs and adversely affect our business.

We rely on third-party resellers and distribution partners to sell our solutions, and our failure to develop and manage these relationships effectively could adversely affect our business and result of operations.

In order to sell into new markets, diversify our customer base and broaden the application for our solutions, and to complement our global field resources, we rely on a number of third-party resellers, distribution partners and sales agents, both domestic and international, and we believe that these relationships are an important part of our business. There can be no assurance that we will successfully identify and qualify these resources or that we will realize the expected benefits of these sales relationships. Our failure to effectively identify, develop and manage our third-party sales relationships could adversely affect our business, growth and result of operations. We must also assess and qualify resellers, distribution partners and sales agents under our channel programs to ensure their understanding of and willingness and ability to adhere to our Code of Business Conduct and Ethics, our Ciena Partner Network Code of Business Conduct and Ethics and ethical business practices. We may be held responsible or liable for the actions or omissions of these third parties. Actions, omissions or violations of law by our third-party sales partners or agents could have a material adverse effect on our business, operating results and financial condition.

Our failure to manage our relationships with third-party service partners effectively could adversely impact our financial results and relationships with customers.

We rely on a number of third-party service partners, both domestic and international, to complement our global service and support resources. We rely on these partners for certain installation, maintenance and support functions. In addition, as network

operators increasingly seek to rely on vendors to perform additional services relating to the design, construction and operation of their networks, the scope of work performed by our support partners is likely to increase and may include areas where we have less experience providing or managing such services. We must successfully identify, assess, train and certify qualified service partners in order to ensure the proper installation, deployment and maintenance of our products, as well as to ensure the skillful performance of other services associated with expanded solutions offerings, including site assessment and construction-related services. We must also assess and certify service partners in order to ensure their understanding of and willingness and ability to adhere to our Code of Business Conduct and Ethics, and ethical business practices. Vetting and certification of these partners can be costly and time-consuming, and certain partners may not have the same operational history, financial resources and scale as we have. Moreover, certain service partners may provide similar services for other companies, including our competitors. We may not be able to manage our relationships with our service partners effectively, and we cannot be certain that they will be able to deliver services in the manner or time required, that we will be able to maintain the continuity of their services, or that they will adhere to our approach to ethical business practices. We may also be exposed to a number of risks or challenges relating to the performance of our service partners, including:

- delays in recognizing revenue;
- liability for injuries to persons, damage to property or other claims relating to the actions or omissions of our service partners;
- our services revenue and gross margin may be adversely affected; and
- our relationships with customers could suffer.

As our service offering expands and customers look to identify vendors capable of managing, integrating and optimizing multi-domain, multi-vendor networks with unified software, our relationships with third-party service partners will become increasingly important. If we do not effectively manage our relationships with third-party service partners, or if they fail to perform these services in the manner or time required, our financial results and relationships with customers could be adversely affected.

We may be adversely affected by fluctuations in currency exchange rates.

As a company with global operations, we face exposure to movements in foreign currency exchange rates. Due to our global presence, a significant percentage of our revenue, operating expense and assets and liabilities are non-U.S. Dollar denominated and therefore subject to foreign currency fluctuation. We face exposure to currency exchange rates as a result of the growth in our non-U.S. Dollar denominated operating expense in Canada, Europe, Asia and Latin America. An increase in the value of the U.S. Dollar could increase the real cost to our customers of our products in those markets outside the United States where we sell in Dollars, and a weakened Dollar could increase the cost of local operating expenses and procurement of materials or service that we purchase in foreign currencies. From time to time, we hedge against currency exposure associated with anticipated foreign currency cash flows or assets and liabilities denominated in foreign currency. Such attempts to offset the impact of currency fluctuations are costly, and we cannot hedge against all foreign exchange rate volatility. Losses associated with these hedging instruments and the adverse effect of foreign currency exchange rate fluctuation may negatively affect our results of operations.

Changes in government regulations affecting the communications and technology industries and the businesses of our customers could harm our prospects and operating results.

The Federal Communications Commission (the “FCC”) has jurisdiction over the U.S. communications industry, and similar agencies have jurisdiction over the communication industries in other countries. Many of our largest customers, including service providers and cable and multiservice network operators, are subject to the rules and regulations of these agencies, while others participate in and benefit from government-funded programs that encourage the development of network infrastructures. These regulatory requirements and funding programs are subject to changes that may adversely impact our customers, with resulting adverse impacts on our business.

In December 2017, the FCC voted to roll back its 2015 order regulating broadband internet service providers as telecommunications service carriers under Title II of the Telecommunications Act. This decision repeals net neutrality regulations that prohibit blocking, degrading or prioritizing certain types of internet traffic and restores the light touch regulatory treatment of broadband service in place prior to 2015. Although the FCC has preempted state jurisdiction on net neutrality, at least two states, Montana and New York have already taken executive action directed at reinstating aspects of the FCC’s 2015 order. In addition, in September 2018, California passed legislation that seeks to reestablish net neutrality. Changes in regulatory requirements or uncertainty associated with the regulatory environment could delay or serve as a disincentive to investment in network infrastructures by network operators, which could adversely affect the sale of our products and services. Similarly, changes in regulatory tariff requirements or other regulations relating to pricing or terms of carriage on communications

networks could slow the development or expansion of network infrastructures and adversely affect our business, operating results, and financial condition.

In October 2019, the Supreme Court in India ruled against an industry group of India service providers in a long-standing dispute over the calculation of license and other regulatory fees owing to the Department of Telecommunications. The ruling has resulted in the possibility of significant near-term liability among these service providers, which include our customers, for amounts owing to the Department of Telecommunications in relation to these revenue-based license fees along with certain penalties and interest. There can be no assurance that this ruling, the resulting license fee interpretation and amounts owing, will not adversely affect spending by these customers or our business or sales in India.

Separately, certain of our Web-scale customers have been the subject of regulatory and other government actions, including inquiries and investigations, formal or informal, by competition authorities in the United States, Europe and other jurisdictions. In July 2019, the U.S. Department of Justice announced that it would commence an antitrust review into significant online technology platforms, and in September 2019, various state attorneys general announced antitrust investigations involving certain technology companies. In addition, certain committees of the U.S. Congress have recently held hearings to consider the businesses associated with these platforms and their impact on competition. There can be no assurance that these government actions will not adversely impact the network spending, procurement strategies, or business practices of our Web-scale customers in a manner adverse to us.

We are a party to legal proceedings, investigations and other claims or disputes, which are costly to defend and, if determined adversely to us, could require us to pay fines or damages, undertake remedial measures or prevent us from taking certain actions, any of which could adversely affect our business.

In the course of our business, we are, and in the future may be, a party to legal proceedings, investigations and other claims or disputes, which have related and may relate to subjects including commercial transactions, intellectual property, securities, employee relations, or compliance with applicable laws and regulations. A description of certain of these matters can be found in Note 25, Commitments and Contingencies, in the Notes to Consolidated Financial Statements in Item 8 of Part II of this Report. Legal proceedings and investigations are inherently uncertain and we cannot predict their duration, scope, outcome or consequences. There can be no assurance that these or any such matters that have been or may in the future be brought against us will be resolved favorably. In connection with any government investigations, in the event the government takes action against us or the parties resolve or settle the matter, we may be required to pay substantial fines or civil and criminal penalties and/or be subject to equitable remedies, including disgorgement or injunctive relief. Other legal or regulatory proceedings, including lawsuits filed by private litigants, may also follow as a consequence. These matters are likely to be expensive and time-consuming to defend, settle and/or resolve, and may require us to implement certain remedial measures that could prove costly or disruptive to our business and operations. They may also cause damage to our business reputation. The unfavorable resolution of one or more of these matters could have a material adverse effect on our business, results of operations, financial condition or cash flows.

Our exposure to the credit risks of our customers and resellers may make it difficult to collect receivables and could adversely affect our revenue and operating results.

In the course of our sales to customers and resale channel partners, we may have difficulty collecting receivables, and our business and results of operations could be exposed to risks associated with uncollectible accounts. Lack of liquidity in the capital markets, macroeconomic weakness and market volatility may increase our exposure to these credit risks. Our attempts to monitor customer payment capability and to take appropriate measures to protect ourselves may not be sufficient, and it is possible that we may have to write down or write off accounts receivable. Such write-downs or write-offs could negatively affect our operating results for the period in which they occur, and, if large, could have a material adverse effect on our revenue and operating results.

Growth of our business is dependent on the proper functioning and scalability of our internal business processes and information systems. Adoption of new systems, modifications or interruptions of services may disrupt our business, processes and internal controls.

We rely on a number of internal business processes and information systems to support key business functions, and the efficient operation of these processes and systems is critical to managing our business. Our business processes and information systems must be sufficiently scalable to support the growth of our business and may require modifications or upgrades that expose us to a number of operational risks. We continually pursue initiatives to transform and optimize our business operations through the reengineering of certain processes, investment in automation, and engagement of strategic partners or resources to assist with certain business functions. These changes require a significant investment of capital and human resources and may be costly and disruptive to our operations, and they could impose substantial demands on management time. These changes may

also require changes in our information systems, modification of internal control procedures and significant training of employees or third-party resources. There can be no assurance that our business and operations will not experience disruption in connection with system upgrades or other initiatives. Even if we do not encounter these adverse effects or disruption in our business, the design and implementation of these new systems may be more costly than anticipated.

Our IT systems, and those of third-party IT providers or business partners, may also be vulnerable to damage or disruption caused by circumstances beyond our control, including catastrophic events, power anomalies or outages, natural disasters, cyber-security related incidents, and computer system or network failures. There can be no assurance that our business systems or those of our third-party business partners will not be subject to similar incidents, exposing us to significant cost, reputational harm and disruption or damage to our business.

Outstanding indebtedness under our senior secured credit facilities may adversely affect our liquidity and results of operations and could limit our business.

We are a party to credit agreements relating to a $300 million senior secured asset-based revolving credit facility and an outstanding senior secured term loan with approximately $693.0 million repayable at maturity in fiscal 2025. The agreements governing these credit facilities contain certain covenants that limit our ability, among other things, to incur additional debt, create liens and encumbrances, pay cash dividends, redeem or repurchase stock, enter into certain acquisition transactions or transactions with affiliates, repay certain indebtedness, make investments, or dispose of assets. The agreements also include customary remedies, including the right of the lenders to take action with respect to the collateral securing the loans, that would apply should we default or otherwise be unable to satisfy our debt obligations.

Our indebtedness could have important negative consequences, including:

- increasing our vulnerability to adverse economic and industry conditions;
- limiting our ability to obtain additional financing, particularly in unfavorable capital and credit market conditions;
- debt service and repayment obligations that may adversely impact our results of operations and reduce the availability of cash resources for other business purposes;
- limiting our flexibility in planning for, or reacting to, changes in our business and the markets; and
- placing us at a possible competitive disadvantage to competitors that have better access to capital resources.

We may also enter into additional debt transactions or credit facilities, including equipment loans, working capital lines of credit, senior notes and other long-term debt, which may increase our indebtedness and result in additional restrictions on our business. In addition, major debt rating agencies regularly evaluate our debt based on a number of factors. There can be no assurance that we will be able to maintain our existing debt ratings, and failure to do so could adversely affect our cost of funds, liquidity and access to capital markets.

Significant volatility and uncertainty in the capital markets may limit our access to funding on favorable terms or at all.

The operation of our business requires significant capital. We have accessed the capital markets in the past and have successfully raised funds, including through the issuance of equity, convertible notes and other indebtedness, to increase our cash position, support our operations and undertake strategic growth initiatives. We regularly evaluate our liquidity position, debt obligations and anticipated cash needs to fund our long-term operating plans, and we may consider it necessary or advisable to raise additional capital or incur additional indebtedness in the future. If we raise additional funds through further issuance of equity or securities convertible into equity, or undertake certain transactions intended to address our existing indebtedness, our existing stockholders could suffer dilution in their percentage ownership of our company or our leverage and outstanding indebtedness could increase. Global capital markets have undergone periods of significant volatility and uncertainty in the past, and there can be no assurance that such financing alternatives will be available to us on favorable terms or at all, should we determine it necessary or advisable to seek additional capital.

The effects of the UK's potential withdrawal from membership in the European Union remain uncertain.

In June 2016, the UK held a referendum in which voters approved an exit from the EU, commonly referred to as "Brexit," and in March 2017, notified the EU that it intended to exit as provided in Article 50 of the Treaty on European Union. The terms of the withdrawal are subject to ongoing negotiation that has created significant uncertainty about the future relationship between the UK and the EU. It is possible that the level of economic activity in this region will be adversely impacted and that there will be increased regulatory and legal complexities, including those relating to tax, trade, security and employees. Such changes could be costly and potentially disruptive to our operations and business relationships in these markets. Economic uncertainty related to Brexit, including volatility in global stock markets and currency exchange rates, could adversely impact our business. In addition, there is a risk that the UK will withdraw from the EU without any agreement on the terms of the

withdrawal, which has resulted in additional uncertainty and could lead to further costs and disruptions. While we have adopted certain operational and financial measures to reduce the risks of doing business internationally, we cannot ensure that such measures will be adequate to allow us to operate without disruption or adverse impact to our business and financial results in the affected regions.

Restructuring activities could disrupt our business and affect our results of operations.

We have taken steps, including reductions in force, office closures, and internal reorganizations to reduce the cost of our operations, improve efficiencies, or realign our organization and staffing to better match our market opportunities and our technology development initiatives. We may take similar steps in the future as we seek to realize operating synergies, to achieve our target operating model and profitability objectives, or to reflect more closely changes in the strategic direction of our business. These changes could be disruptive to our business, including our research and development efforts, and could result in significant expense, including accounting charges for inventory and technology-related write-offs, workforce reduction costs and charges relating to consolidation of excess facilities. Substantial expense or charges resulting from restructuring activities could adversely affect our results of operations and use of cash in those periods in which we undertake such actions.

If we are unable to attract and retain qualified personnel, we may be unable to manage our business effectively.

Competition to attract and retain highly skilled technical, engineering and other personnel with experience in our industry is intense, and our employees have been the subject of targeted hiring by our competitors. Competition is particularly intense in certain jurisdictions where we have research and development centers, including the Silicon Valley area of northern California, and we may experience difficulty retaining and motivating existing employees and attracting qualified personnel to fill key positions. Because we rely on equity awards as a significant component of compensation, particularly for our executive team, a lack of positive performance in our stock price, reduced grant levels, or changes to our compensation program may adversely affect our ability to attract and retain key employees. In addition, none of our executive officers is bound by an employment agreement for any specific term. We have a number of workforce planning initiatives underway and our failure to manage these programs effectively could result in the loss of key personnel. Similarly, the failure to properly manage the necessary knowledge transfer required from these employee transitions could impact our ability to maintain industry and innovation leadership. The loss of members of our management team or other key personnel could be disruptive to our business and, were it necessary, it could be difficult to replace such individuals. If we are unable to attract and retain qualified personnel, we may be unable to manage our business effectively, and our operations and financial results could suffer.

Strategic acquisitions and investments could disrupt our operations and may expose us to increased costs and unexpected liabilities.

From time to time, we acquire or make investments in other technology companies, or enter into other strategic relationships, to expand the markets we address, diversify our customer base or acquire, or accelerate the development of, technology or products. To do so, we may use cash, issue equity that could dilute our current stockholders, or incur debt or assume indebtedness. Strategic transactions can involve numerous additional risks, including:

- failure to achieve the anticipated transaction benefits or the projected financial results and operational synergies;
- greater than expected acquisition and integration costs;
- disruption due to the integration and rationalization of operations, products, technologies and personnel;
- diversion of management attention;
- difficulty completing projects of the acquired company and costs related to in-process projects;
- difficulty managing customer transitions or entering into new markets;
- the loss of key employees;
- disruption or termination of business relationships with customers, suppliers, vendors, landlords, licensors and other business partners;
- ineffective internal controls over financial reporting;
- dependence on unfamiliar suppliers or manufacturers;
- assumption of or exposure to unanticipated liabilities, including intellectual property infringement or other legal claims; and
- adverse tax or accounting impact.

As a result of these and other risks, our acquisitions, investments or strategic transactions may not realize the intended benefits and may ultimately have a negative impact on our business, results of operation and financial condition.

We may be exposed to unanticipated risks and additional obligations in connection with our resale of complementary products or technology of other companies.

We have entered into agreements with strategic supply partners that permit us to distribute their products or technology. We may rely on these relationships to add complementary products or technologies, to diversify our product portfolio, or to address a particular customer or geographic market. We may enter into additional original equipment manufacturer (OEM), resale or similar strategic arrangements in the future. We may incur unanticipated costs or difficulties relating to our resale of third-party products. Our third-party relationships could expose us to risks associated with the business, financial condition, intellectual property rights and supply chain continuity of such partners, as well as delays in their development, manufacturing or delivery of products or technology. We may also be required by customers to assume warranty, indemnity, service and other commercial obligations, including potential liability to customers, greater than the commitments, if any, made to us by our technology partners. Some of our strategic supply partners are relatively small companies with limited financial resources. If they are unable to satisfy their obligations to us or our customers, we may have to expend our own resources to satisfy these obligations. Exposure to these risks could harm our reputation with key customers and could negatively affect our business and our results of operations.

Government regulations related to the environment, climate change and social initiatives could adversely affect our business and operating results.

Our operations are regulated under various federal, state, local and international laws relating to the environment and climate change. If we were to violate or become liable under these laws or regulations, we could incur fines, costs related to damage to property or personal injury and costs related to investigation or remediation activities. Our product design efforts and the manufacturing of our products are also subject to evolving requirements relating to the presence of certain materials or substances in our equipment, including regulations that make producers for such products financially responsible for the collection, treatment and recycling of certain products. For example, our operations and financial results may be negatively affected by environmental regulations, such as the Waste Electrical and Electronic Equipment (WEEE) and Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) that have been adopted by the EU. Compliance with these and similar environmental regulations may increase our cost of designing, manufacturing, selling and removing our products. The SEC requires disclosure regarding the use of “conflict minerals” mined from the Democratic Republic of the Congo and adjoining countries (the “DRC”) and disclosure with respect to procedures regarding a manufacturer’s efforts to prevent the sourcing of such minerals from the DRC. Certain of these minerals are present in our products. SEC rules implementing these requirements may have the effect of reducing the pool of suppliers that can supply “conflict free” components and parts, and we may not be able to obtain conflict free products or supplies in sufficient quantities for our operations. Because our supply chain is complex, we may face reputational challenges with our customers, stockholders and other stakeholders if we are unable to verify sufficiently the origins for the “conflict minerals” used in our products and cannot assert that our products are “conflict free.” Environmental or similar social initiatives may also make it difficult to obtain supply of compliant components or may require us to write off non-compliant inventory, which could have an adverse effect on our business and operating results.

We may be required to write down the value of certain significant assets, which would adversely affect our operating results.

We have a number of significant assets on our balance sheet as of October 31, 2019 and the value of these assets can be adversely impacted by factors related to our business and operating performance, as well as factors outside of our control. As of October 31, 2019, our balance sheet includes a $714.9 million net deferred tax asset. The value of our net deferred tax assets can be significantly impacted by changes in tax policy or our tax planning strategy. For example, the Tax Act required us to write down our net deferred tax assets by approximately $438.2 million in fiscal 2018. If any additional write downs are required, our operating results may be materially adversely affected.

As of October 31, 2019, our balance sheet also includes $297.9 million of goodwill. We test each reporting unit for impairment of goodwill on an annual basis and, between annual tests, if an event occurs or circumstances change that would, more likely than not, reduce the fair value of the reporting unit below its carrying value. As of October 31, 2019, our balance sheet also includes $455.1 million in long-lived assets, which includes $112.8 million of intangible assets. Valuation of our long-lived assets requires us to make assumptions about future sales prices and sales volumes for our products. These assumptions are used to forecast future, undiscounted cash flows on which our estimates are based. The value of our net deferred tax asset above may also be subject to change in the future, based on our actual or projected generation of future taxable income. If market conditions or our forecasts for our business or any particular operating segment change, we may be required to reassess the value of these assets. We could be required to record an impairment charge against our goodwill and long-lived assets or a valuation allowance against our deferred tax assets. Any write down of the value of these significant assets would have the effect of decreasing our earnings or increasing our losses in such period. If we are required to take a substantial write down or charge, our operating results would be materially adversely affected in such period.

Failure to maintain effective internal controls over financial reporting could have a material adverse effect on our business, operating results and stock price.

Section 404 of the Sarbanes-Oxley Act of 2002 requires that we include in our annual report a report containing management's assessment of the effectiveness of our internal controls over financial reporting as of the end of our fiscal year and a statement as to whether or not such internal controls are effective. Compliance with these requirements has resulted in, and is likely to continue to result in, significant costs and the commitment of time and operational resources. Certain ongoing initiatives, including efforts to transform business processes or to transition certain functions to third-party resources or providers, will necessitate modifications to our internal control systems, processes and related information systems as we optimize our business and operations. Our expansion into new regions could pose further challenges to our internal control systems. We cannot be certain that our current design for internal control over financial reporting, or any additional changes to be made, will be sufficient to enable management to determine that our internal controls are effective for any period, or on an ongoing basis. If we are unable to assert that our internal controls over financial reporting are effective, market perception of our financial condition and the trading price of our stock may be adversely affected, and customer perception of our business may suffer.

Our stock price is volatile.

Our common stock price has experienced substantial volatility in the past and may remain volatile in the future. Volatility in our stock price can arise as a result of a number of the factors discussed in this "Risk Factors" section. During fiscal 2019, our closing stock price ranged from a high of $45.95 per share to a low of $30.64 per share. The stock market has experienced significant price and volume fluctuation that has affected the market price of many technology companies, with such volatility often unrelated to the operating performance of these companies. Divergence between our actual results and our forward-looking guidance for such results, the published expectations of investment analysts, or the expectations of the market generally, can cause significant swings in our stock price. Our stock price can also be affected by market conditions in our industry as well as announcements that we, our competitors, vendors or our customers may make. These may include announcements by us or our competitors of financial results or changes in estimated financial results, technological innovations, the gain or loss of customers, or other strategic initiatives. Our common stock is also included in certain market indices, and any change in the composition of these indices to exclude our company would adversely affect our stock price. These and other factors affecting macroeconomic conditions or financial markets may materially adversely affect the market price of our common stock in the future.

Changes in effective tax rates and other adverse outcomes with taxing authorities could adversely affect our results of operations.

Our future effective tax rates could be subject to volatility or adversely affected by changes in tax laws, regulations, accounting principles, or interpretations thereof. The impact of income taxes on our business can also be affected by a number of items relating to our business. These may include estimates for and the actual geographic mix of our earnings; changes in the valuation of our deferred tax assets; the use or expiration of net operating losses or research and development credit arrangements applicable to us in certain geographies; and changes in our methodology for transfer pricing, valuing developed technology or conducting intercompany arrangements. On December 22, 2017, the Tax Act was signed into law and introduced significant changes to U.S. federal corporate tax law. These changes include a reduction to the federal corporate income tax rate, the current taxation of certain foreign earnings, the imposition of base-erosion prevention measures which may limit the deductions relating to certain intercompany transactions, and possible limitations on the deductibility of net interest expense or corporate debt obligations. Accounting for the income tax effects of the Tax Act requires significant judgments and estimates that are based on then current interpretations of the Tax Act and could be affected by changing interpretations of the Act, as well as additional legislation and guidance around the Act. Any refinements to tax estimates are difficult to predict and could impact our financial results. We are also subject to the continuous examination of our income tax and other returns by the Internal Revenue Service and other tax authorities and have a number of such reviews underway at any time. It is possible that tax authorities may disagree with certain positions we have taken and an adverse outcome of such a review or audit could have a negative effect on our financial position and operating results. There can be no assurance that the outcomes from such examinations, or changes in our effective tax rates, will not have an adverse effect on our business, financial condition and results of operations.

Item 1B. Unresolved Staff Comments

Not applicable.

Item 2. Properties

Overview. As of October 31, 2019, all of our properties are leased, and we do not own any real property. We lease facilities globally related to the ongoing operations of our three business segments and related functions. Our principal executive offices are located in two buildings in Hanover, Maryland.

Our largest facilities are our research and development centers located in Ottawa, Canada and Gurgaon, India. We also have engineering and/or service delivery facilities located in San Jose, California; Petaluma, California; Alpharetta, Georgia; Quebec, Canada; Austin, Texas; Pune and Bangalore, India. In addition, we lease various smaller offices in the United States, Canada, Mexico, South America, Europe, the Middle East and the Asia Pacific region to support our sales and services operations. We believe the facilities we are now using are adequate and suitable for our business requirements.

Hanover, Maryland Headquarters Lease. We entered into an agreement dated November 3, 2011, with W2007 RDG Realty, L.L.C. relating to a 15-year lease of office space for our corporate headquarters in Hanover, Maryland, consisting of an agreed-upon rentable area of approximately 154,100 square feet.

Ottawa Leases. On October 23, 2014, Ciena Canada, Inc. entered into an 18-year lease agreement for the office building located at 5050 Innovation Drive, Ottawa, Canada, consisting of a rentable area of 170,582 square feet. In addition, on April 15, 2015, Ciena Canada, Inc. entered into a 15-year lease agreement for two new office buildings adjacent to the building at 5050 Innovation Drive, located at 383 and 385 Terry Fox Drive, Ottawa, Canada, consisting of a rentable area of approximately 254,318 square feet.

Gurgaon Leases. On October 12, 2016, Ciena India Pvt. Ltd. entered into a five-year rental agreement for an office building located at Plot No. 13, Echelon Institutional Sector 32, Gurgaon, which is adjacent to another building rented by Ciena India Pvt. Ltd., located at Plot No. 14, Echelon Institutional Sector 32, Gurgaon. The Gurgaon offices consist of a rentable area of approximately 282,580 square feet.

For additional information regarding our lease obligations, see Note 25 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report.

Item 3. Legal Proceedings

As a result of the acquisition of Cyan in August 2015, we became a defendant in a securities class action lawsuit. On April 1, 2014, the first of two purported stockholder class action lawsuits was filed in the Superior Court of California, County of San Francisco, against Cyan, the members of Cyan's board of directors, Cyan's former Chief Financial Officer, and the underwriters of Cyan's initial public offering. The cases were consolidated as Beaver County Employees Retirement Fund, et al. v. Cyan, Inc. et al., Case No. CGC-14-538355. The consolidated complaint alleged violations of federal securities laws on behalf of a purported class consisting of purchasers of Cyan's common stock pursuant or traceable to the registration statement and prospectus for Cyan's initial public offering in April 2013, and sought unspecified compensatory damages and other relief. On May 19, 2015, the proposed class was certified. During the fourth quarter of fiscal 2018, the parties agreed to the terms of a settlement of the action, which settlement was subject to notice to class members and approval by the court. On August 8, 2019, the court approved the settlement and entered judgment in the case. The terms of the settlement, which include a release and dismissal of all claims against all defendants without any liability or wrongdoing attributed to them, are not material to our financial results.

As first disclosed in our Form 10-K for fiscal 2017, during that year one of our third-party vendors raised allegations about certain questionable payments to one or more individuals employed by a customer in a country in the ASEAN region. We promptly initiated an internal investigation into the matter, with the assistance of outside counsel, which investigation corroborated direct and indirect payments to one such individual and sought to determine whether the payments may have violated applicable laws and regulations, including the U.S. Foreign Corrupt Practices Act. In September 2017, we voluntarily contacted the SEC and the U.S. Department of Justice (the "DOJ") to advise them of the relevant events and the findings of our internal investigation. On December 10, 2018, the DOJ advised that it declined to prosecute this matter and that its investigation into this matter is closed. On September 9, 2019, the SEC advised that it has concluded its investigation into this matter and that its staff does not intend to recommend any enforcement action by the SEC against us.

In addition, the information set forth under the heading "Litigation" in Note 25, Commitments and Contingencies, in Notes to Consolidated Financial Statements in Item 8 of Part II of this Report, is incorporated herein by reference.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

Item 5. Market for Registrant's Common Stock, Related Stockholder Matters and Issuer Purchases of Equity Securities

(a) Our common stock is traded on the New York Stock Exchange under the stock symbol "CIEN."

As of December 16, 2019, there were approximately 881 holders of record of our common stock and 154,054,072 shares of common stock outstanding. We have never paid cash dividends on our capital stock. We currently intend to retain earnings for use in our business, and we do not anticipate paying any cash dividends in the foreseeable future.

Issuer Purchases of Equity Securities

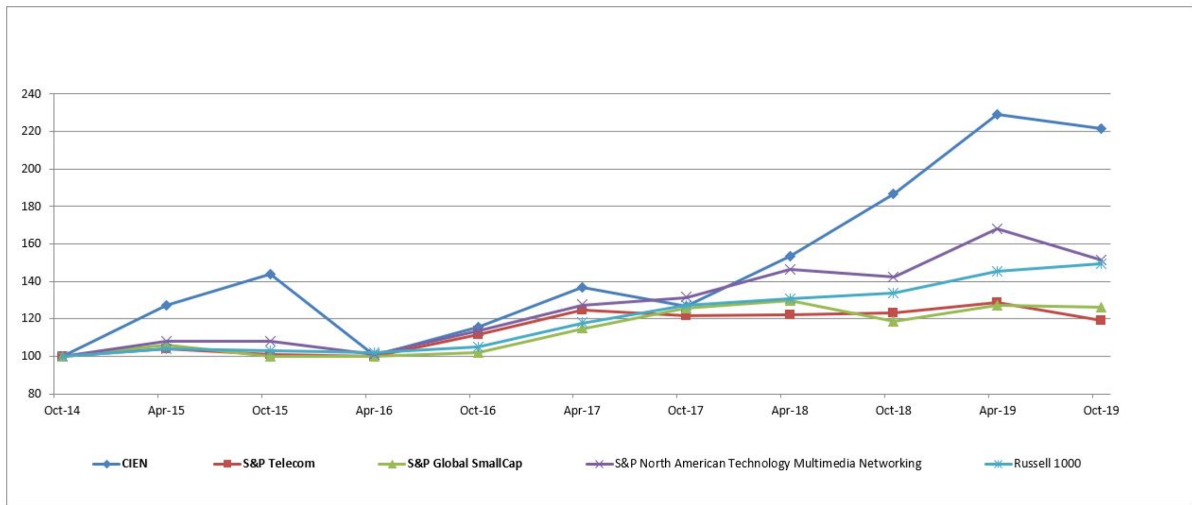
The following table provides a summary of repurchases of our common stock during the fourth quarter of fiscal 2019:

Period	Total Number of Shares Purchased (1)	Average Price Paid Per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs (1)	Approximate Dollar Value of Shares that May Yet Be Purchased Under the Plans or Programs (in Thousands)
August 1, 2019 to August 31, 2019	345,963	$ 41.64	345,963	$ 373,669
September 1, 2019 to September 30, 2019	342,893	$ 39.91	342,893	$ 359,983
October 1, 2019 to October 31, 2019	268,046	$ 37.53	268,046	$ 349,924
Total	956,902	$ 39.87	956,902	

(1) On December 13, 2018, we announced that our Board of Directors authorized a program to repurchase up to $500 million of our common stock. Shares reported in this table were repurchased under this program. The amount and timing of repurchases are subject to a variety of factors including liquidity, cash flow, stock price and general business and market conditions. The program may be modified, suspended, or discontinued at any time. See Note 20 to our Consolidated Financial Statements in Item 8 of Part II of this Report for information regarding the share repurchase program authorized by our Board of Directors.

Stock Performance Graph

The following graph shows a comparison of cumulative total returns for an investment in our common stock, the S&P North American Technology-Multimedia Networking Index and the Russell 1000 from October 31, 2014 to October 31, 2019. These comparative indices differ from those presented in our Annual Report on Form 10-K for the fiscal year ended December 31, 2018. However, for this year, we have included our current and previous indices for comparative purposes in order to allow investors to benchmark our performance as we make this transition. We believe that our current indices more closely align with our business from a market capitalization and industry perspective. Among other things, we have recently been added to the Russell 1000 index, which comprises the stocks representing the 1,000 largest publicly traded American companies as measured by market capitalization. We also currently measure our relative stock performance against the S&P North American Technology-Multimedia Networking Index for purposes of certain, performance-based market stock unit awards that have been granted to our executive officers. The S&P North American Technology-Multimedia Networking Index comprises stocks in the S&P Total Market Index that are classified under the Global Industry Classification Standard communications equipment sub-industry. This graph is not deemed to be "soliciting material" or "filed" with the SEC or subject to the liabilities of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and the graph shall not be deemed to be incorporated by reference into any prior or subsequent filing by us under the Securities Act of 1933, as amended, or the Exchange Act.



Assumes $100 invested in Ciena Corporation, the S&P North American Technology-Multimedia Networking Index, the Russell 1000, the S&P Telecom Select Index and the S&P Global SmallCap Index, respectively, on October 31, 2014 with all dividends reinvested at month-end.

(b) Not applicable.

(c) Not applicable.

Item 6. Selected Consolidated Financial Data

The following selected consolidated financial data should be read in conjunction with Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and our Consolidated Financial Statements and the notes thereto included in Item 8, “Financial Statements and Supplementary Data” in Part II of this annual report. We have a 52 or 53-week fiscal year, which ends on the Saturday nearest to the last day of October in each year. For purposes of financial statement presentation, each fiscal year is described as having ended on October 31. Fiscal 2019, 2017, 2016 and 2015 each consisted of 52 weeks, and fiscal 2018 consisted of 53 weeks.

	Year Ended October 31, (in thousands, except per share data)				
	2019 (1) (3) (4)	2018 (1) (2) (4) (5)	2017 (2) (4) (5)	2016	2015
Revenue	$ 3,572,131	$ 3,094,286	$ 2,801,687	$ 2,600,573	$ 2,445,669
Gross profit	$ 1,542,066	$ 1,314,690	$ 1,245,786	$ 1,161,576	$ 1,075,563
Income from operations	$ 346,766	$ 229,946	$ 214,722	$ 156,169	$ 100,448
Provision (benefit) for income taxes	$ 59,756	$ 493,471	$ (1,105,827)	$ 14,134	$ 12,097
Net income (loss)	$ 253,434	$ (344,690)	$ 1,261,953	$ 72,584	$ 11,667
Basic net income (loss) per common share	$ 1.63	$ (2.40)	$ 8.89	$ 0.52	$ 0.10
Diluted net income (loss) per potential common share	$ 1.61	$ (2.49)	$ 7.53	$ 0.51	$ 0.10
Weighted average basic common shares outstanding	155,720	143,738	141,997	138,312	118,416
Weighted average diluted potential common shares outstanding	157,612	143,738	169,919	150,704	120,101
Net cash provided by operating activities	$ 413,140	$ 229,261	$ 234,882	$ 289,520	$ 262,112
Cash used for repurchase of common stock - repurchase program	$ 150,076	$ 110,981	$ —	$ —	$ —
Cash, cash equivalents and investments	$ 1,023,999	$ 953,374	$ 969,429	$ 1,143,035	$ 1,021,183
Deferred tax asset, net	$ 714,942	$ 745,039	$ 1,155,104	$ 1,116	$ —
Total assets	$ 3,893,346	$ 3,756,523	$ 3,951,711	$ 2,873,575	$ 2,685,001
Short-term and long-term debt, net	$ 687,406	$ 693,450	$ 935,981	$ 1,253,682	$ 1,264,089
Total liabilities	$ 1,720,585	$ 1,827,189	$ 1,815,369	$ 2,107,234	$ 2,064,125
Stockholders’ equity	$ 2,172,761	$ 1,929,334	$ 2,136,342	$ 766,341	$ 620,876

(1) See Note 20 to our Consolidated Financial Statements in Item 8 of Part II of this Report for information regarding the share repurchase program authorized by our Board of Directors.

(2) See Note 3 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for additional information regarding the acquisitions of Packet Design, LLC (“Packet Design”) on July 2, 2018 and DonRiver Holdings, LLC (“DonRiver”) on October 1, 2018.

(3) See Note 17 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for additional information regarding changes in our short-term and long-term debt.

(4) See Note 19 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for additional information regarding changes in our weighted average basic and diluted potential common shares outstanding.

(5) Net income, deferred tax asset, net, total assets and stockholders’ equity for fiscal 2018 reflect a $472.8 million impact for the remeasurement of the net deferred tax assets and the federal transition tax and fiscal 2017 reflects a $1.2 billion deferred tax asset valuation allowance reversal. See Note 21 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for additional information.

At the beginning of fiscal 2019, we adopted Accounting Standards Codification (“ASC”) 606, a new accounting standard related to revenue recognition, using the modified retrospective method to those contracts that were not completed as of October 31, 2018. See Note 2 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for the impact of this adoption. No other factors materially affected the comparability of the information presented above.

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

The following discussion and analysis should be read in conjunction with our "Selected Consolidated Financial Data" and consolidated financial statements and notes thereto included elsewhere in this annual report.

Overview

We are a networking systems, services and software company, providing solutions that enable a wide range of network operators to deploy and manage next-generation networks that deliver services to businesses and consumers. We provide hardware, software and services that support the transport, switching, aggregation, service delivery and management of video, data and voice traffic on communications networks. Our solutions are used by communications service providers, cable and multiservice operators, Web-scale providers, submarine network operators, governments, enterprises, research and education institutions and other emerging network operators.

Our solutions include our portfolio of Networking Platforms, including our Converged Packet Optical and Packet Networking products, that can be applied from the network core to end user access points, and that allow network operators to scale capacity, increase transmission speeds, allocate traffic and adapt dynamically to changing end-user service demands. We offer Platform Software that provides management and domain control of our hardware solutions and automates network lifecycle operations, including provisioning equipment and services. Through our Blue Planet® Automation Software, we enable network providers to use network data, analytics and policy-based assurance to achieve closed loop automation across multi-vendor and multi-domain network environments, streamlining key business and network processes. To complement our hardware and software products, we offer a broad range of services that help our customers build, operate and improve their networks and associated operational environments.

We refer to our complete portfolio vision as the Adaptive Network™. The Adaptive Network emphasizes a programmable network infrastructure, software control and automation capabilities, and network analytics and intelligence. By transforming network infrastructures into a dynamic, programmable environment driven by automation and analytics, network operators can realize greater business agility, dynamically adapt to changing end user service demands and rapidly introduce new revenue-generating services. They can also gain valuable real-time network insights, allowing them to optimize network operation and maximize the return on their network infrastructure investment.

Market Opportunity

The markets in which we sell our communications networking solutions have seen significant changes in recent years, including rapid growth in bandwidth demand and network traffic, the proliferation of cloud-based services and new approaches, or "consumption models," for designing and procuring networking solutions. Emerging services and applications, including 5G mobile communications, fiber deep and the Internet of Things, are further impacting or expected to impact wireline network infrastructures, particularly at the edge of networks, where increased computing power and automation are required to provide the quality of experience demanded by end users. The business models of many network operators are under pressure to constrain their capital expenditure budgets, as they cannot grow their network spending at the rate of bandwidth growth. To address these growing service demands and better manage network cost, many network operators are looking to adopt next-generation infrastructures that are more programmable and better capable of leveraging data for network insight, analytics and automation. Other network operators are pursuing a diverse range of consumption models in their design and procurement of network infrastructure solutions. Our Adaptive Network vision and our business strategy to capitalize on these changing market dynamics include the initiatives set forth in the "Strategy" section of the description of our business in Item 1 of Part 1 of this annual report.

Revenue and Earnings Growth

During fiscal 2019, our revenue and earnings growth accelerated, as we benefited meaningfully from strong network operator demand for capacity, favorable industry and competitive dynamics, and the continued execution of our strategy. Our strategy has focused on innovation leadership, the diversification of our business and customer base, and leveraging our global scale to capture additional market share. From fiscal 2018 to fiscal 2019, our revenue grew from $3.09 billion to $3.57 billion, or approximately 15.4%, and our income from operations grew from $229.9 million to $346.8 million, or approximately 50.8%. Our results can fluctuate and, given the degree of outstanding performance of our business during fiscal 2019, we do not expect that these revenue and profit growth rates will be sustained in future periods.

Business Diversification

We continue to diversify our business across geographies, customer segments and product solutions and applications. In fiscal 2019 and for the last several years, our diversification and global scale have been key contributors to our strong revenue growth despite any challenges in a particular geography, segment or account that may have served as a meaningful revenue contributor in an earlier period. During fiscal 2019, we grew revenue in our North America, EMEA and CALA geographic regions, and across three of our four operating segments. During fiscal 2019, we also grew revenue with our largest service provider customers, particularly in North America, after recent years of declining revenues. During fiscal 2019 we also benefited meaningfully from our strong market position with leading Web-scale providers for data center interconnection applications. Sales to Web-scale provider customers, representing approximately 22% of total revenue and growing over 40% year-over-year, were an important contributor to our annual revenue growth, with certain of these customers among our largest customers by revenue for fiscal 2019. Certain of such customers have announced an intention to reduce capital spending in future periods, and we expect our revenue from Web-scale customers to moderate from the level achieved in fiscal 2019. Our revenue gains from these areas offset a meaningful revenue reduction from our APAC region during fiscal 2019. After recent years of strong growth driven by aggressive network build outs by service providers in India, capital spending in this region decreased year-over-year. We believe our business and financial performance in recent years highlights the benefits of our diverse global business and our ability to target high growth segments within our markets.

Technology Innovation

We believe that our investment capacity and our efforts to push the pace of innovation in our markets, and to provide market-leading offerings ahead of our competitors, are important competitive differentiators that have contributed to the growth of our business during fiscal 2019. We are focused on growing our optical and packet infrastructure business by addressing fast-growing markets and applications, including data center interconnection, packet aggregation and switching, network densification applications including 5G and fiber deep, and access networks and submarine networks. We are also introducing Packet Networking solutions with enhanced IP/Ethernet capabilities that enable our Adaptive Network vision and expand our addressable market into additional applications and layers of the network. Importantly, we are also executing on parallel innovation paths for the next generation of our modem technology – WaveLogic 5 Extreme (WL5e) and WaveLogic 5 Nano (WL5n) – to address customer consumption models ranging from integrated systems to pluggable form factors. Keeping pace with the market's demand for technology innovation requires considerable research and development investment capacity and expenditures. During fiscal 2019, we invested $548.1 million in research and development activities, an increase of approximately 11.5% compared to fiscal 2018. We believe that remaining competitive in our addressable geographies, markets, and customer segments depends on our continued degree of investment in innovation and our ability to offer leading solutions that enable adoption of next-generation network infrastructures and evolving consumption models for networking solutions.

Investment in Blue Planet Automation Software

We have continued to pursue both organic investments and acquisition opportunities to expand our Blue Planet Automation Software and Services portfolio and business. On November 4, 2019, after the end of fiscal 2019, we acquired privately held Centina Systems, Inc., a provider of service assurance analytics and network performance management solutions. The acquisition of Centina is intended to accelerate Blue Planet's software strategy of providing closed loop, intelligent automation solutions that help communications service providers analyze network conditions, traffic demands, and resource availability, and determine the best placement of traffic for optimal service quality and resource utilization. See Note 26 to our Consolidated Financial Statements included in Item 8 of Part II of this report.

Consolidated Results of Operations

A discussion regarding our financial condition and results of operations for fiscal 2019 compared to fiscal 2018 is presented below. A discussion regarding our financial condition and results of operations for fiscal 2018 compared to fiscal 2017 can be found under Item 7 of Part II of our Annual Report on Form 10-K for the fiscal year ended October 31, 2018, filed with the SEC on December 21, 2018 (our "2018 Annual Report"), which is available free of charge on the SEC's website at www.sec.gov and our Investor Relations website at investor.ciena.com.

Operating Segments

During fiscal 2019, we separated our previous Software and Software-Related Services segment into two stand-alone operating segments: (i) Blue Planet Automation Software and Services; and (ii) Platform Software and Services. We separated this operating segment in alignment with and recognition of our corporate strategy to further promote customer adoption of our

Blue Planet Automation Software and Services, and corresponding changes by management to our evaluation of resource allocation for and measurement of performance of this business. Accordingly, as of the end of fiscal 2019, for reporting purposes, our results of operations are presented based on the following operating segments: (i) Networking Platforms; (ii) Platform Software and Services; (iii) Blue Planet Automation Software and Services; and (iv) Global Services. Because we previously disclosed our Blue Planet Automation Software and Services and Platform Software and Services as distinct product lines in our presentation of segment revenue for our previous Software and Software-Related Services segment, our presentation of segment revenues has not significantly changed as a result of this separation. See Note 23 to our Consolidated Financial Statements included in Item 8 of Part II of this report.

Fiscal 2019 Compared to Fiscal 2018

Revenue

During fiscal 2019, approximately 16.4% of our revenue was non-U.S. Dollar denominated, primarily including sales in Euros, Japanese Yen, Canadian Dollars, Indian Rupee, British Pounds, and Brazilian Reais. During fiscal 2019 as compared to fiscal 2018, the U.S. Dollar fluctuated against these and other currencies. Consequently, our revenue reported in U.S. Dollars was slightly reduced by approximately $23.4 million, or 0.7%, as compared to fiscal 2018 due to fluctuations in foreign currency. The table below (in thousands, except percentage data) sets forth the changes in our operating segment revenue for the periods indicated:

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
Revenue:						
Networking Platforms						
Converged Packet Optical	$ 2,562,841	71.8	$ 2,194,519	70.9	$ 368,322	16.8
Packet Networking	348,477	9.8	283,499	9.2	64,978	22.9
Total Networking Platforms	2,911,318	81.6	2,478,018	80.1	433,300	17.5
Platform Software and Services	155,376	4.3	173,949	5.6	(18,573)	(10.7)
Blue Planet Automation Software and Services	54,555	1.5	26,764	0.9	27,791	103.8
Global Services						
Maintenance Support and Training	261,337	7.3	245,161	7.9	16,176	6.6
Installation and Deployment	148,233	4.1	128,829	4.2	19,404	15.1
Consulting and Network Design	41,312	1.2	41,565	1.3	(253)	(0.6)
Total Global Services	450,882	12.6	415,555	13.4	35,327	8.5
Consolidated revenue	$ 3,572,131	100.0	$ 3,094,286	100.0	$ 477,845	15.4

* Denotes % of total revenue

** Denotes % change from 2018 to 2019

- **Networking Platforms segment revenue** increased, reflecting product line sales increases of $368.3 million of our Converged Packet Optical products and $65.0 million of our Packet Networking products.
  - Converged Packet Optical sales increased, primarily reflecting sales increases of $249.7 million of our Waveserver stackable interconnect system and $193.4 million of our 6500 Packet-Optical Platform. These increases were partially offset by a sales decrease of $71.5 million of our 5410/5430 Reconfigurable Switching Systems. Waveserver sales increases reflect sales to Web-scale providers which have been an increasingly important contributor to our overall growth, and certain of these customers were among our largest customers by revenue. 6500 Packet-Optical Platform sales increases primarily reflect increased sales to communications service providers and cable and multiservice operators.

  - Packet Networking sales increased, primarily reflecting a sales increase of $99.1 million of our 6500 Packet Transport System (PTS) to a North American service provider, partially offset by sales decreases of $14.9 million of our packet networking platform independent software and $11.8 million of our 3000 and 5000 families of service delivery and aggregation switches. Part of our strategy is to continue to grow sales and reduce our concentration of revenue within our Packet Networking product line.

- **Platform Software and Services segment revenue** decreased, reflecting software sales decreases of $20.1 million due to decreases of $12.0 million and $8.1 million in sales of our legacy software and our Manage, Control and Plan ("MCP") software, respectively, partially offset by an increase of $1.5 million related to services. We continue to pursue further customer adoption of our MCP software platform and its enhanced features and functionality. As we transition existing customers as well as features and functionality from our legacy software to this platform, we expect revenue declines for our other legacy software solutions within this segment.

- **Blue Planet Automation Software and Services segment revenue** increased, reflecting software sales increases of $5.1 million and service sales increases of $22.7 million. The increase in our software and service sales include sales of $12.8 million and $16.1 million related to the Packet Design and DonRiver businesses acquired during fiscal 2018, respectively. Our entrance into the software automation market is in the early stages and, as such, revenue from our Blue Planet Automation Software platform has not been significant to date.

- **Global Services segment revenue** increased, primarily reflecting sales increases of $19.4 million of our installation and deployment services and $16.2 million of our maintenance support.

Our operating segments engage in business and operations across four geographic regions: North America; EMEA; CALA; and APAC. Results for North America include only activities in the U.S. and Canada. The following table reflects our geographic distribution of revenue principally based on the relevant location for our delivery of products and performance of services. Our revenue, when considered by geographic distribution, can fluctuate significantly, and the timing of revenue recognition for large network projects, particularly outside of North America, can result in large variations in geographic revenue results in any particular period. The table below (in thousands, except percentage data) sets forth the changes in geographic distribution of revenue for the periods indicated:

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
North America	$ 2,351,260	65.8	$ 1,886,450	61.0	$ 464,810	24.6
EMEA	566,718	15.9	464,876	15.0	101,842	21.9
CALA	152,653	4.3	140,177	4.5	12,476	8.9
APAC	501,500	14.0	602,783	19.5	(101,283)	(16.8)
Total	$ 3,572,131	100.0	$ 3,094,286	100.0	$ 477,845	15.4

* Denotes % of total revenue

** Denotes % change from 2018 to 2019

- **North America revenue** increased, reflecting increases of $453.6 million within our Networking Platforms segment, $15.4 million within our Global Services segment, and $15.9 million within our Blue Planet Automation Software and Services segment. These increases were partially offset by a decrease of $20.1 million within our Platform Software and Services segment. The Networking Platforms segment revenue increase includes a product line sales increase of $349.5 million of Converged Packet Optical products, primarily related to sales increases of $201.5 million of our 6500 Packet-Optical Platform to communication service providers and $165.9 million of our Waveserver to Web-scale providers.

- **EMEA revenue** increased, reflecting increases of $91.8 million within our Networking Platforms segment. The increase within our Networking Platforms segment primarily reflects a product line sales increase of $90.4 million of Converged Packet Optical products, primarily related to sales increases of $66.0 million of our Waveserver to Web-scale providers and $33.7 million of our 6500 Packet-Optical Platform primarily to communications submarine network operators. The increase in EMEA revenue was primarily driven by increased sales in the United Kingdom and the Netherlands.

- **CALA revenue** increased, reflecting increases of $4.3 million within our Networking Platforms segment and $5.8 million within our Global Services segment. The increase in CALA revenue primarily reflects increased sales to cable and multiservice operators and communications services providers in Mexico.
- **APAC revenue** decreased, reflecting a decrease of $116.4 million within our Networking Platforms segment partially offset by revenue increases of $6.4 million within our Blue Planet Automation Software and Services segment, $5.7 million within our Global Services segment and $3.0 million within our Platform Software and Services segment. The decrease in Networking Platforms segment revenue reflects product line decreases of $74.8 million in Converged Packet Optical sales and $41.6 million in Packet Networking sales, primarily in India and Australia. See "Risk Factors – Changes in government regulations . . ." for additional information regarding an October 2019 regulatory ruling in India that may adversely impact future spending in that geography. The decrease in Converged Packet Optical sales is primarily due to decreases of $46.4 million and $45.8 million in sales of our 6500 Packet-Optical Platform and our 5410/5430 Reconfigurable Switching Systems, respectively, partially offset by an increase of $18.3 million in sales of Waveserver. Although our APAC revenue declined, we experienced increased sales in Japan and continued to capture new market share with communications service providers in the region.

In fiscal 2019 and fiscal 2018, our top ten customers contributed 59.3% and 56.5% of revenue, respectively. Consequently, our financial results are closely correlated with the spending of a relatively small number of customers and can be significantly affected by market, industry or competitive dynamics affecting their businesses. Our reliance on a relatively small number of customers increases our exposure to changes in their spending levels, network priorities and purchasing strategies. The loss of a significant customer could have a material adverse effect on our business and results of operations, and our results of operations can fluctuate quarterly depending on sales volumes and purchasing priorities with these large customers. Verizon accounted for $459.8 million, or 12.9% of total revenue, in fiscal 2019 and $318.0 million, or 10.3% of total revenue, in fiscal 2018. Sales to AT&T were $388.7 million, or 10.9% of total revenue, in fiscal 2019, and $374.6 million, or 12.1% of total revenue, in fiscal 2018. Sales to one of our Web-scale customers were $370.6 million, or 10.4% of total revenue, in fiscal 2019. No other customer accounted for greater than 10% of our revenue in fiscal 2019 or fiscal 2018. The identity of and percentage of revenue attributable to our largest customers has varied from period to period. For example, the Web-scale provider noted above contributed greater than 10% of our revenue for the first time in fiscal 2019.

While drivers of bandwidth growth and network evolution remain strong, many of our network operator customers are under pressure to constrain their capital expenditure budgets and their businesses cannot grow their network spending at the rate of bandwidth growth. As a result, as we innovate and introduce new and more robust solutions that increase capacity or features, there is a market expectation of solutions that are more cost-effective from a price for performance perspective than existing or competing solutions. The combination of this regular technology-driven price compression, price competition in our markets and ongoing customer efforts to manage network costs can impact our growth rates and requires that we increase our volume of product shipments to maintain and grow revenue.

Cost of Goods Sold and Gross Profit

Product cost of goods sold consists primarily of amounts paid to third-party contract manufacturers, component costs, employee-related costs and overhead, shipping and logistics costs associated with manufacturing-related operations, warranty and other contractual obligations, royalties, license fees, amortization of intangible assets, cost of excess and obsolete inventory and, when applicable, estimated losses on committed customer contracts.

Services cost of goods sold consists primarily of direct and third-party costs associated with our provision of services including installation, deployment, maintenance support, consulting and training activities, and, when applicable, estimated losses on committed customer contracts. The majority of these costs relate to personnel, including employee and third-party contractor-related costs.

Our gross profit as a percentage of revenue, or "gross margin," can fluctuate due to a number of factors, particularly when viewed on a quarterly basis. Our gross margin can fluctuate and be adversely impacted depending on our revenue concentration within a particular segment, product line, geography, or customer, including our success in selling software in a particular period. Our gross margin remains highly dependent on our continued ability to drive product cost reductions relative to the price erosion that we regularly encounter in our markets. Moreover, we are often required to compete with aggressive pricing and commercial terms, and, to secure business with new and existing customers, we may agree to pricing or other unfavorable commercial terms that adversely affect our gross margin. Success in taking share and winning new business can result in additional pressure on gross margin from these pricing dynamics and the early stages of these network deployments. Early stages of new network builds also often include an increased concentration of lower margin "common" equipment, photonics sales and installation services, with the intent to improve margin as we sell channel cards and maintenance services to

customers adding capacity or services to their networks. Gross margin can be impacted by technology-based price compression and the introduction or substitution of new platforms with improved price for performance as compared to existing solutions that carry higher margins. Gross margin can also be impacted by changes in expense for excess and obsolete inventory and warranty obligations.

Service gross margin can be affected by the mix of customers and services, particularly the mix between deployment and maintenance services, geographic mix and the timing and extent of any investments in internal resources to support this business.

The tables below (in thousands, except percentage data) set forth the changes in revenue, cost of goods sold and gross profit for the periods indicated:

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
Total revenue	$ 3,572,131	100.0	$ 3,094,286	100.0	$ 477,845	15.4
Total cost of goods sold	2,030,065	56.8	1,779,596	57.5	250,469	14.1
Gross profit	$ 1,542,066	43.2	$ 1,314,690	42.5	$ 227,376	17.3

* Denotes % of total revenue

** Denotes % change from 2018 to 2019

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
Product revenue	$ 2,983,815	100.0	$ 2,565,460	100.0	$ 418,355	16.3
Product cost of goods sold	1,716,358	57.5	1,507,157	58.7	209,201	13.9
Product gross profit	$ 1,267,457	42.5	$ 1,058,303	41.3	$ 209,154	19.8

* Denotes % of product revenue

** Denotes % change from 2018 to 2019

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
Service revenue	$ 588,316	100.0	$ 528,826	100.0	$ 59,490	11.2
Service cost of goods sold	313,707	53.3	272,439	51.5	41,268	15.1
Service gross profit	$ 274,609	46.7	$ 256,387	48.5	$ 18,222	7.1

* Denotes % of service revenue

** Denotes % change from 2018 to 2019

- **Gross profit as a percentage of revenue** reflects improved product gross profit as described below. In recent periods, we have encountered fluctuations or reductions in our gross margin as a result of our strategy to leverage our technology leadership and to capture aggressively additional market share and displace competitors, with the intent to improve margin in the long term as we sell channel cards, maintenance services, and other higher margin products to customers adding capacity or services to their networks. During fiscal 2019, our gross margin benefited from the success of this ongoing strategy and the resulting favorable mix of customers, network deployments and capacity additions during the period. Continued implementation of this strategy may require that we agree to aggressive pricing, commercial concessions and other unfavorable terms, or result in an unfavorable mix of revenues from early stage deployments during a particular period, which can adversely impact gross margin.

- **Gross profit on products as a percentage of product revenue** increased, primarily due to product cost reductions, a favorable mix of customers, network deployments and capacity additions, partially offset by market-based price compression we encountered during the period.
- **Gross profit on services as a percentage of services revenue** decreased, primarily as a result of lower margins on our Blue Planet Automation software services, due to increased costs associated with additional resources to support our corporate strategy to grow our software automation business, and the impact of early stages of international network deployments.

Operating Expense

Operating expense increased in fiscal 2019 from the level reported for fiscal 2018 primarily due to increased research and development initiatives and increased selling and marketing resources.

Operating expense consists of the component elements described below.

- *Research and development expense* primarily consists of salaries and related employee expense (including share-based compensation expense), prototype costs relating to design, development, product testing, depreciation expense, and third-party consulting costs.
- *Selling and marketing expense* primarily consists of salaries, commissions and related employee expense (including share-based compensation expense) and sales and marketing support expense, including travel, demonstration units, trade show expense, and third-party consulting costs.
- *General and administrative expense* primarily consists of salaries and related employee expense (including share-based compensation expense) and costs for third-party consulting and other services.
- *Amortization of intangible assets* primarily reflects the amortization of both purchased technology and the value of customer relationships derived from our acquisitions.
- *Significant asset impairments and restructuring costs* primarily reflect actions we have taken to improve the alignment of our workforce, facilities and operating costs with perceived market opportunities, business strategies, changes in market and business conditions and significant impairments of assets.
- *Acquisition and integration costs* consist of expenses for financial, legal and accounting advisors, severance and other employee-related costs associated with our acquisitions of Packet Design and DonRiver, including costs associated with a three-year earn-out arrangement related to the DonRiver acquisition.

During fiscal 2019, approximately 50.7% of our operating expense was non-U.S. Dollar denominated, including expenses in Canadian Dollars, Indian Rupees, British Pounds and Euros. During fiscal 2019 as compared to fiscal 2018, the U.S. Dollar fluctuated against these currencies. Our operating expense reported in U.S. Dollars decreased by approximately $17.5 million, or 1.5%, as compared to fiscal 2018 due to these fluctuations.

The table below (in thousands, except percentage data) sets forth the changes in operating expense for the periods indicated:

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
Research and development	$ 548,139	15.3	$ 491,564	15.9	$ 56,575	11.5
Selling and marketing	423,046	11.8	394,060	12.7	28,986	7.4
General and administrative	174,399	4.9	160,133	5.2	14,266	8.9
Amortization of intangible assets	21,808	0.6	15,737	0.5	6,071	38.6
Acquisition and integration costs	3,370	0.1	5,111	0.2	(1,741)	(34.1)
Significant asset impairments and restructuring costs	24,538	0.7	18,139	0.6	6,399	35.3
Total operating expenses	$ 1,195,300	33.4	$ 1,084,744	35.1	$ 110,556	10.2

* Denotes % of total revenue

** Denotes % change from 2018 to 2019

- **Research and development expense** benefited by $8.1 million as a result of foreign exchange rates, net of hedging, primarily due to a stronger U.S. Dollar in relation to the Canadian Dollar and Indian Rupee. Including the effect of foreign exchange rates, research and development expenses increased by $56.6 million. This increase primarily reflects $19.9 million in employee and compensation costs, $16.9 million in professional services, $9.7 million for facility and information technology costs, $3.3 million in prototype expense and $1.0 million in technology and related expense. This increase also reflects a reduced benefit of $4.4 million for the Evolution of Networking Services through a Corridor in Quebec and Ontario for Research and Innovation ("ENCQOR") grant reimbursement. For more information on the ENCQOR grant, see Note 25 to our Consolidated Financial Statements included in Item 8 of Part II of this report.
- **Selling and marketing expense** benefited by $7.5 million as a result of foreign exchange rates primarily due to a stronger U.S. Dollar in relation to the British Pound and Canadian Dollar. Including the effect of foreign exchange rates, sales and marketing expense increased, primarily reflecting increases of $22.9 million in employee and compensation costs and $5.7 million for facilities and information technology costs.
- **General and administrative expense** increased, primarily reflecting increases of $8.7 million in employee and compensation costs and $4.0 million for bad debt expense.
- **Amortization of intangible assets** increased due to additional intangibles acquired in connection with our acquisitions of Packet Design and DonRiver during fiscal 2018.
- **Acquisition and integration costs** reflect financial, legal and accounting advisors and severance and other employment-related costs related to our acquisitions of Packet Design and DonRiver.
- **Significant asset impairments and restructuring costs** reflect global workforce reductions as part of a business optimization strategy to improve gross margin, constrain operating expense, and redesign certain business processes and unfavorable lease commitments for certain facility locations in the United States and India where we have vacated unused space.

Other Items

The table below (in thousands, except percentage data) sets forth the changes in other items for the periods indicated:

	Fiscal Year					
	2019	%*	2018	%*	Increase (decrease)	%**
Interest and other income (loss), net	$ 3,876	0.1	$ (12,029)	(0.4)	$ 15,905	(132.2)
Interest expense	$ 37,452	1.0	$ 55,249	1.8	$ (17,797)	(32.2)
Loss on extinguishment/modification of debt	$ —	—	$ (13,887)	(0.4)	$ (13,887)	100.0
Provision for income taxes	$ 59,756	1.7	$ 493,471	15.9	$ (433,715)	(87.9)

* Denotes % of total revenue

** Denotes % change from 2018 to 2019

- **Interest and other income, net** increased, reflecting a $2.8 million favorable impact of foreign exchange rates on assets and liabilities denominated in a currency other than the relevant functional currency, net of hedging activity. Interest and other income, net, in fiscal 2018 included a $12.1 million loss due to a mark to market fair value adjustment related to the conversion feature of our 3.75% Convertible Senior Notes due October 15, 2018 (the "New Notes").
- **Interest expense** decreased, primarily due to a reduction in our aggregate outstanding debt during the fourth quarter of fiscal 2018.
- **Loss on extinguishment and modification of debt** in fiscal 2018 reflects approximately $10.0 million of extinguishment of debt costs related to our conversion of our 4.0% Convertible Senior Notes due December 15, 2020 and approximately $3.8 million in debt modification costs related to our term loan refinancing.

- **Provision for income taxes** decreased, primarily due to the fiscal 2018 impact of the Tax Act, including $438.2 million in expenses for the remeasurement of our net deferred tax assets and a $34.6 million charge related to a transition tax on accumulated historical foreign earnings and their deemed repatriation to the U.S. The effective tax rate for fiscal 2019 was lower compared to fiscal 2018, primarily due to the fiscal 2018 impact of the Tax Act, including the remeasurement of our net deferred tax assets and the transition tax on accumulated historical foreign earnings and their deemed repatriation to the U.S.

Segment Profit (Loss)

The table below (in thousands, except percentage data) sets forth the changes in our segment profit (loss) for the respective periods:

	Fiscal Year			
	2019	2018	Increase (decrease)	%*
Segment profit (loss):				
Networking Platforms	$ 759,244	$ 581,113	$ 178,131	30.7
Platform Software and Services	$ 64,210	$ 78,048	$ (13,838)	(17.7)
Blue Planet Automation Software and Services	$ (17,769)	$ (8,240)	$ (9,529)	115.6
Global Services	$ 188,242	$ 172,205	$ 16,037	9.3

* Denotes % change from 2018 to 2019

- **Networking Platforms segment** profit increased, primarily due to higher sales volume and improved gross margin, as described above, partially offset by higher research and development costs.
- **Platform Software and Services segment** profit decreased, primarily due to lower sales volume, as described above.
- **Blue Planet Automation Software and Services segment** loss increased, primarily reflecting higher research and development costs and reduced gross margin on software-related services, as described above, and the impact of early stages of international network deployment.
- **Global Services segment** profit increased, primarily due to higher sales volume and improved gross margin.

The table below (in thousands) sets forth segment profit (loss) for Ciena's software operating segments for fiscal 2018 and 2017 to reflect the change in Ciena's operating segments as described in "Operating Segments" above:

	Fiscal Year			
	2018	2017	Increase (decrease)	%*
Segment profit (loss):				
Platform Software and Services	$ 78,048	$ 47,353	$ 30,695	64.8
Blue Planet Automation Software and Services	$ (8,240)	$ (14,817)	$ 6,577	(44.4)

- **Platform Software and Services segment** profit increased, primarily due to higher sales volume as described in Item 7 of Part II of our 2018 Annual Report.
- **Blue Planet Automation Software and Services segment** loss decreased, primarily reflecting higher revenues as described in Item 7 of Part II of our 2018 Annual Report, and lower research and development costs, partially offset by reduced gross margin on software-related services.

Liquidity and Capital Resources

Overview. For the fiscal year ended October 31, 2019, we generated $413.1 million of cash from operations, as our net income (adjusted for non-cash charges) of $512.7 million exceeded our working capital requirements of $99.6 million. For additional details on our cash provided by operating activities, see the discussion below under the caption "Cash Provided By Operating Activities."

Our cash, cash equivalents and investments increased by $70.6 million during fiscal 2019. The cash from operations above was partially offset by the following: (i) cash used for the payment of the debt conversion liability associated with the New Notes of $111.3 million on November 15, 2018; (ii) cash used to fund our investing activities for capital expenditures totaling $62.6 million; (iii) cash used for stock repurchase under our stock repurchase program of $150.1 million; (iv) stock repurchased upon vesting of our stock unit awards to employees relating to tax withholding of $29.1 million; and (v) cash used for payments on our term loan due September 28, 2025 (the "2025 Term Loan") of $7.0 million. Proceeds from the issuance of equity under our employee stock purchase plans provided $22.9 million in cash during fiscal 2019.

See Notes 15, 17 and 20 to our Consolidated Financial Statements included in Item 8 of Part II of this report for information relating to these transactions.

The following table sets forth changes in our cash and cash equivalents and investments in marketable debt securities (in thousands):

	October 31,		Increase
	2019	2018	(decrease)
Cash and cash equivalents	$ 904,045	$ 745,423	$ 158,622
Short-term investments in marketable debt securities	109,940	148,981	(39,041)
Long-term investments in marketable debt securities	10,014	58,970	(48,956)
Total cash and cash equivalents and investments in marketable debt securities	$ 1,023,999	$ 953,374	$ 70,625

Principal Sources of Liquidity. Our principal sources of liquidity on hand include our cash and investments, which as of October 31, 2019 totaled $1.02 billion, as well as our senior secured asset-based revolving credit facility (the "ABL Credit Facility"). The ABL Credit Facility, which we entered into with certain of our subsidiaries on October 28, 2019, replaced a predecessor senior secured asset-based revolving credit facility and provides for a total commitment of $300 million with a maturity date of October 28, 2024. We principally use the ABL Credit Facility to support the issuance of letters of credit that arise in the ordinary course of our business and thereby to reduce our use of cash required to collateralize these instruments. As of October 31, 2019, letters of credit totaling $72.9 million were outstanding under our ABL Credit Facility. There were no borrowings outstanding under the ABL Credit Facility as of October 31, 2019.

Foreign Liquidity. The amount of cash, cash equivalents and short-term investments held by our foreign subsidiaries was $73.9 million as of October 31, 2019. We intend to reinvest indefinitely our foreign earnings. If we were to repatriate these accumulated historical foreign earnings, the provisional amount of unrecognized deferred income tax liability related to foreign withholding taxes would be approximately $31.0 million. See Note 21 to our Consolidated Financial Statements included in Item 8 of Part II of this report.

Stock Repurchase Authorization. On December 13, 2018, we announced that our Board of Directors authorized a program to repurchase up to $500 million of our common stock. We repurchased $150.1 million under this program during fiscal 2019, and had $349.9 million remaining under the current authorization as of October 31, 2019. The amount and timing of repurchases are subject to a variety of factors including liquidity, cash flow, stock price and general business and market conditions. The program may be modified, suspended, or discontinued at any time.

Liquidity Position. We regularly evaluate our liquidity position, debt obligations and anticipated cash needs to fund our operating or investment plans and may consider capital raising and other market opportunities that may be available to us. We regularly evaluate alternatives to manage our capital structure and reduce our debt and may continue to opportunistically pay down or refinance our outstanding debt. Based on past performance and current expectations, we believe that cash from operations, cash, cash equivalents and investments and other sources of liquidity, including our ABL Credit Facility, will satisfy our working capital needs, capital expenditures and other liquidity requirements associated with our operations, through at least the next 12 months.

Cash Provided by Operating Activities

The following sections set forth the components of our $413.1 million of cash provided by operating activities for fiscal 2019:

Net income (adjusted for non-cash charges)

The following tables set forth (in thousands) our net income adjusted for non-cash charges during fiscal 2019:

	Year ended October 31, 2019
Net income	$ 253,434
Adjustments for non-cash charges:	
Depreciation of equipment, building, furniture and fixtures, and amortization of leasehold improvements	87,576
Share-based compensation costs	59,736
Amortization of intangible assets	35,136
Deferred taxes	19,865
Provision for doubtful accounts	6,740
Provision for inventory excess and obsolescence	28,085
Provision for warranty	23,105
Other	(910)
Net income (adjusted for non-cash charges)	$ 512,767

Working Capital

Our working capital used $99.6 million of cash during fiscal 2019. The following tables set forth (in thousands) the major components of the increase in working capital:

	Year ended October 31, 2019
Cash provided by accounts receivable	$ 65,712
Cash used in inventories	(112,941)
Cash used in prepaid expenses and other	(96,618)
Cash provided by accounts payable, accruals and other obligations	27,740
Cash provided by deferred revenue	16,480
Cash used in working capital	$ (99,627)

As compared to the end of fiscal 2018:

- The $65.7 million of cash provided by accounts receivable during fiscal 2019 reflects increased cash collection;
- The $112.9 million of cash used in inventory during fiscal 2019 primarily reflects increases in finished goods to meet customer delivery schedules;
- The $96.6 million of cash used in prepaid expenses and other during fiscal 2019 primarily reflects increases in contract assets for unbilled accounts receivable due to changes in revenue recognition for installation services and certain product sales;
- The $27.7 million of cash provided by accounts payable, accruals and other obligations during fiscal 2019 primarily reflects higher employee bonus accrual associated with our annual cash incentive compensation plan, partially offset by payout of accrued employee leave in North America in connection with a new paid time off policy; and
- The $16.5 million of cash provided by deferred revenue during fiscal 2019 represents an increase in advanced payments received from customers prior to revenue recognition.

Our days sales outstanding (“DSOs”) were 82 for fiscal 2019 as compared to 92 for fiscal 2018. Our inventory turns decreased from 5.7 turns during fiscal 2018 to 5.0 turns during fiscal 2019 due to the increase in inventory. The calculation of DSOs includes accounts receivables and contract assets for unbilled receivables included in prepaid expenses and other.

Cash paid for interest

The following tables set forth (in thousands) our interest paid during fiscal 2019:

	Year ended October 31, 2019
Term Loan due September 28, 2025[1]	30,751
Interest rate swaps[2]	2,112
ABL Credit Facilities[3]	1,620
Capital leases	5,096
Total cash paid during period	$ 39,579

(1) Interest on the 2025 Term Loan is payable periodically based on the interest period selected for borrowing. The 2025 Term Loan bears interest at LIBOR plus a spread of 2.00% subject to a minimum LIBOR rate of 0.00%. As of the end of fiscal 2019, the interest rate on the 2025 Term Loan was 3.85%.

(2) We entered into a floating-to-fixed interest rate swap that fixed the LIBOR rate of approximately $350.0 million of the principal amount of the 2025 Term Loan at 2.957% through September 2023.

(3) During fiscal 2019, we utilized the ABL Credit Facility and its predecessor to collateralize certain standby letters of credit and paid $1.6 million in commitment fees, interest expense and other administrative charges relating to these facilities.

For additional information about our term loans, ABL Credit Facility and interest rate swaps, see Notes 15, 17 and 18 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report and Item 7A of Part II of this annual report.

Contractual Obligations

The following is a summary of our future minimum payments under contractual obligations as of October 31, 2019 (in thousands):

	Total	Less than one year	One to three years	Three to five years	Thereafter
Principal due on Term Loan due September 28, 2025[1]	$ 693,000	$ 7,000	$ 14,000	$ 14,000	$ 658,000
Interest due on Term Loan due September 28, 2025[1]	156,040	26,934	53,049	52,098	23,959
Payments due under interest rate swaps[1]	15,440	3,941	7,882	3,617	—
Operating leases[2]	119,862	28,776	40,951	24,025	26,110
Purchase obligations[3]	495,150	495,150	—	—	—
Capital leases - buildings and equipment[4]	106,319	7,652	15,407	16,134	67,126
Other obligations	34	34	—	—	—
Total [5]	$ 1,585,845	$ 569,487	$ 131,289	$ 109,874	$ 775,195

(1) Interest on the 2025 Term Loan and payments due under the interest rate swaps is variable and is calculated using the rate in effect on the balance sheet date. For additional information about our term loans and the interest rate swaps, see Notes 15 and 17 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report and Item 7A of Part II of this annual report.

(2) Does not include variable insurance, taxes, maintenance and other costs that may be required by the applicable operating lease. These costs are not expected to have a material future impact.

(3) Purchase obligations relate to purchase order commitments to our contract manufacturers and component suppliers for inventory. In certain instances, we are permitted to cancel, reschedule or adjust these orders. Consequently, only a portion of the amount reported above relates to firm, non-cancelable and unconditional obligations.

(4) This represents the total minimum lease payments due for all buildings and equipment subject to capital lease accounting. It does not include variable insurance, taxes, maintenance and other costs required by the applicable capital lease. These costs are not expected to have a material future impact.

(5) As of October 31, 2019, we also had $13.1 million of other long-term obligations on our Consolidated Balance Sheet for unrecognized tax positions that are not included in this table because the timing or amount of any cash settlement with the respective tax authority cannot be reasonably estimated.

Some of our commercial commitments, including some of the future minimum payments in operating leases set forth above and certain commitments to customers, are secured by standby letters of credit collateralized under our ABL Credit Facility or restricted cash. Restricted cash balances are included in other current assets or other long-term assets depending on the duration of the underlying letter of credit obligation. The following is a summary of our commercial commitments secured by standby letters of credit by commitment expiration date as of October 31, 2019 (in thousands):

	Total	Less than one year	One to three years	Three to five years	Thereafter
Standby letters of credit	$ 72,920	$ 29,077	$ 21,741	$ 12,847	$ 9,255

Off-Balance Sheet Arrangements

We do not engage in any off-balance sheet financing arrangements. In particular, we do not have any equity interests in so-called limited purpose entities, which include special purpose entities (SPEs) and structured finance entities.

Critical Accounting Policies and Estimates

The preparation of our consolidated financial statements requires that we make estimates and judgments that affect the reported amounts of assets, liabilities, revenue and expense, and related disclosure of contingent assets and liabilities. By their nature, these estimates and judgments are subject to an inherent degree of uncertainty. On an ongoing basis, we reevaluate our estimates, including those related to share-based compensation, bad debts, inventories, intangible and other long-lived assets, goodwill, income taxes, warranty obligations, restructuring, derivatives and hedging, and contingencies and litigation. We base our estimates on historical experience and on various other assumptions that we believe to be reasonable under the circumstances. Among other things, these estimates form the basis for judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions. To the extent that there are material differences between our estimates and actual results, our consolidated financial statements will be affected.

We believe that the following critical accounting policies reflect those areas where significant judgments and estimates are used in the preparation of our consolidated financial statements.

Revenue Recognition

We recognize revenue when control of the promised products or services is transferred to its customer, in an amount that reflects the consideration to which we expect to be entitled in exchange for those products or services.

We determine revenue recognition by applying the following five-step approach:

- identification of the contract, or contracts, with a customer;
- identification of the performance obligations in the contract;
- determination of the transaction price;
- allocation of the transaction price to the performance obligations in the contract; and
- recognition of revenue when, or as, we satisfy a performance obligation.

Generally, we make sales pursuant to purchase orders placed by customers under framework agreements that govern the general commercial terms and conditions of the sale of our products and services. These purchase orders under framework agreements are used to determine the identification of the contract or contracts with this customer. Purchase orders typically include the description, quantity, and price of each product or service purchased. Purchase orders may include one-line bundled pricing for both products and services. Accordingly, purchase orders can include various combinations of products and services that are generally distinct and accounted for as separate performance obligations. We evaluate each promised product and service offering to determine whether it represents a distinct performance obligation. In doing so, we consider, among other things, customary business practices, whether the customer can benefit from the product or service on its own or together with other resources that are readily available, and whether our commitment to transfer the product or service to the customer is separately identifiable from other obligations in the purchase order. For transactions where we deliver the product or services, we are typically the principal and records revenue and costs of goods sold on a gross basis.

Purchase orders are invoiced based on the terms set forth either in the purchase order or the framework agreement, as applicable. Generally, sales of products and software licenses are invoiced upon shipment or delivery. Maintenance and software subscription services are invoiced quarterly or annually in advance of the service term. Our other service offerings are generally invoiced upon completion of the service. Payment terms and cash received typically range from 30 to 90 days from the invoicing date. Historically, we have not provided any material financing arrangements to its customers. As a practical expedient, we do not adjust the amount of consideration we will receive for the effects of a significant financing component as we expect, at contract inception, that the period between our transfer of the products or services to the customer, and customer payment for the products or services will be one year or less. Shipping and handling fees invoiced to customers are included in revenue, with the associated expense included in product cost of goods sold. We record revenue net of any associated sales taxes.

We recognize revenue upon the transfer of control of promised products or services to a customer. Transfer of control occurs once the customer has the contractual right to use the product, generally upon shipment or delivery to the customer. Transfer of control can also occur over time for services such as software subscription, maintenance, installation and various professional services as the customer receives the benefit over the contract term.

Significant Judgments

Revenue is allocated among performance obligations based on standalone selling price (“SSP”). SSP reflects the price at which we would expect to sell that product or service on a stand-alone basis at contract inception and that we would expect to be entitled to receive for the promised products or services. SSP is estimated for each distinct performance obligation, and judgment may be required in its determination. The best evidence of SSP is the observable price of a product or service when we sell the products separately in similar circumstances and to similar customers. In instances where SSP is not directly observable, we determine SSP using information that may include market conditions and other observable inputs.

We apply judgment in determining the transaction price, as we may be required to estimate variable consideration when determining the amount of revenue to recognize. Variable consideration can include various rebate, cooperative marketing, and other incentive programs that we offer to our distributors, partners and customers. When determining the amount of revenue to recognize, we estimate the expected usage of these programs, applying the expected value or most likely estimate and updates the estimate at each reporting period as actual utilization data becomes available. We also consider any customer right of return and any actual or potential payment of liquidated damages, contractual or similar penalties, or other claims for performance failures or delays in determining the transaction price, where applicable.

When transfer of control is judged to be over time for installation and professional service arrangements, we apply the input method to determine the amount of revenue to be recognized in a given period. Utilizing the input method, we recognize revenue based on the ratio of actual costs incurred to date to the total estimated costs expected to be incurred. Revenue for software subscription and maintenance is recognized ratably over the period during which the services are performed.

Our total deferred revenue for products was $27.4 million and $42.5 million as of October 31, 2019 and October 31, 2018, respectively. Our services revenue is deferred and recognized ratably over the period during which the services are to be performed. Our total deferred revenue for services was $129.5 million and $127.0 million as of October 31, 2019 and October 31, 2018, respectively.

For further discussion of revenue recognition, see Note 1 to our Consolidated Financial Statements in Item 8 of Part II of this annual report.

Business Combinations

We record acquisitions using the purchase method of accounting. All of the assets acquired, liabilities assumed, contractual contingencies and contingent consideration are recognized at their fair value as of the acquisition date. The excess of the purchase price over the estimated fair values of the net tangible and net intangible assets acquired is recorded as goodwill. The application of the purchase method of accounting for business combinations requires management to make significant estimates and assumptions in the determination of the fair value of assets acquired and liabilities assumed in order to allocate purchase price consideration properly between assets that are depreciated and amortized from goodwill. These assumptions and estimates include a market participant’s use of the asset and the appropriate discount rates for a market participant. Our estimates are based on historical experience, information obtained from the management of the acquired companies and, when appropriate, include assistance from independent third-party appraisal firms. Our significant assumptions and estimates can include, but are not limited to, the cash flows that an asset is expected to generate in the future, the appropriate weighted-average cost of capital, and the cost savings expected to be derived from acquiring an asset. These estimates are inherently uncertain and

unpredictable. In addition, unanticipated events and circumstances may occur which may affect the accuracy or validity of such estimates. During fiscal 2018, we completed the Packet Design acquisition for a purchase price of $41.1 million and the DonRiver acquisition for a purchase price of $54.2 million, including a contingent consideration component. See Note 3 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for more information regarding these transactions and the three-year earn-out arrangement in connection with the DonRiver acquisition.

Share-Based Compensation

We estimate the fair value of our restricted stock unit awards based on the fair value of our common stock on the date of grant. Our outstanding restricted stock unit awards are subject to service-based vesting conditions and/or performance-based vesting conditions. We recognize the estimated fair value of service-based awards as share-based expense ratably over the vesting period on a straight-line basis. Awards with performance-based vesting conditions require the achievement of certain financial or other performance criteria or targets as a condition to the vesting, or acceleration of vesting. We recognize the estimated fair value of performance-based awards as share-based expense over the performance period, using graded vesting, which considers each performance period or tranche separately, based on our determination of whether it is probable that the performance targets will be achieved. At the end of each reporting period, we reassess the probability of achieving the performance targets and the performance period required to meet those targets, and the expense is adjusted accordingly. Determining whether the performance targets will be achieved involves judgment, and the estimate of expense may be revised periodically based on changes in the probability of achieving the performance targets. Revisions are reflected in the period in which the estimate is changed. If any performance goals are not met, no compensation cost is ultimately recognized against that goal and, to the extent previously recognized, compensation cost is reversed.

Share-based compensation expense is taken into account based on awards granted. In the event of a forfeiture of an award, the expense related to the unvested portion of that award is reversed. Reversal of share-based compensation expense based on forfeitures can materially affect the measurement of estimated fair value of our share-based compensation. See Note 22 to our Consolidated Financial Statements in Item 8 of Part II of this annual report for information regarding our assumptions related to share-based compensation and the amount of share-based compensation expense we incurred for the periods covered in this report. As of October 31, 2019, total unrecognized compensation expense was $88.2 million, which relates to unvested restricted stock units and is expected to be recognized over a weighted-average period of 1.45 years.

We are required to record excess tax benefits or tax deficiencies related to stock-based compensation as income tax benefit or expense when share-based awards vest or are settled.

Reserve for Inventory Obsolescence

We make estimates about future customer demand for our products when establishing the appropriate reserve for excess and obsolete inventory. We write down inventory that has become obsolete or unmarketable by an amount equal to the difference between the cost of inventory and the estimated market value based on assumptions about future demand, which are affected by changes in our strategic direction, discontinuance of a product or introduction of newer versions of our products, declines in the sales of or forecasted demand for certain products, and general market conditions. Inventory write downs are a component of our product cost of goods sold. Upon recognition of the write down, a new lower cost basis for that inventory is established, and subsequent changes in facts and circumstances do not result in the restoration or increase in that newly established cost basis. In an effort to limit our exposure to delivery delays and to satisfy customer needs, we purchase inventory based on forecasted sales across our product lines. In addition, part of our research and development strategy is to promote the convergence of similar features and functionalities across our product lines. Each of these practices exposes us to the risk that our customers will not order products for which we have forecasted sales, or will purchase less than we have forecasted.

We recorded charges for excess and obsolete inventory of $28.1 million, $30.6 million and $35.5 million in fiscal 2019, 2018 and 2017, respectively. Our inventory, net of allowance for excess and obsolescence, was $345.0 million and $262.8 million as of October 31, 2019 and October 31, 2018, respectively.

Allowance for Doubtful Accounts Receivable

Our allowance for doubtful accounts receivable is based on management’s assessment, on a specific identification basis, of the collectibility of customer accounts. We perform ongoing credit evaluations of our customers and generally have not required collateral or other forms of security from customers. In determining the appropriate balance for our allowance for doubtful accounts receivable, management considers each individual customer account receivable in order to determine collectibility. In doing so, we consider creditworthiness, payment history, account activity and communication with such customer. If a customer’s financial condition changes, or if actual defaults are higher than our historical experience, we may be

required to take a charge for an allowance for doubtful accounts receivable which could have an adverse impact on our results of operations.

Our accounts receivable, net of allowance for doubtful accounts, was $724.9 million and $786.5 million as of October 31, 2019 and October 31, 2018, respectively. Our allowance for doubtful accounts was $20.1 million and $17.4 million as of October 31, 2019 and October 31, 2018, respectively.

Goodwill

Our goodwill was generated from the acquisitions of (i) Cyan during fiscal 2015, (ii) the high-speed photonics components assets of TeraXion during fiscal 2016, (iii) Packet Design on July 2, 2018, and (iv) DonRiver on October 1, 2018. The goodwill from these acquisitions is primarily related to expected synergies. Goodwill is the excess of the purchase price over the fair values assigned to the net assets acquired in a business combination. We test goodwill for impairment on an annual basis, which we have determined to be the last business day of fiscal September each year. We also test goodwill for impairment between annual tests if an event occurs or circumstances change that would, more likely than not, reduce the fair value of the reporting unit below its carrying value.

We test goodwill impairment by comparing the fair value of the reporting unit with the unit's carrying amount, including goodwill. Goodwill is allocated to reporting units based on relative fair value using a discounted cash flow model. If this test indicates that the fair value is less than the carrying value, then an impairment loss is recognized limited to the total amount of goodwill allocated to that reporting unit. A non-cash goodwill impairment charge would have the effect of decreasing earnings or increasing losses in such period. If we are required to take a substantial impairment charge, our operating results would be materially adversely affected in such period. As of October 31, 2019 and October 31, 2018, the goodwill balance was $297.9 million and $298.0 million, respectively. There were no goodwill impairments resulting from our fiscal 2019 and 2018 impairment tests and no reporting unit was determined to be at risk of failing the goodwill impairment test. See Note 13 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report.

Long-lived Assets

Our long-lived assets include equipment, building, furniture and fixtures, finite-lived intangible assets and maintenance spares. As of October 31, 2019 and October 31, 2018 these assets totaled $455.1 million and $486.0 million, net, respectively. We test long-lived assets for impairment whenever triggering events or changes in circumstances indicate that the assets' carrying amount is not recoverable from its undiscounted cash flows. Our long-lived assets are assigned to asset groups which represent the lowest level for which we identify cash flows. We measure impairment loss as the amount by which the carrying amount of the asset or asset group exceeds its fair value.

Deferred Tax Assets

Pursuant to ASC Topic 740, Income Taxes, we maintain a valuation allowance for a deferred tax asset when it is deemed to be more likely than not that some or all of the deferred tax asset will not be realized. The ultimate realization of deferred tax assets is dependent on the generation of future taxable income (including the reversals of deferred tax liabilities) during the periods in which those deferred tax assets will become deductible. In evaluating whether a valuation allowance is required under such rules, we consider all available positive and negative evidence, including prior operating results, the nature and reason for any losses, our forecast of future taxable income, utilization of tax planning strategies, and the dates on which any deferred tax assets are expected to expire. These assumptions and estimates require a significant amount of judgment and are made based on current and projected circumstances and conditions.

Quarterly, we perform an analysis to determine the likelihood of realizing our deferred tax assets and whether sufficient evidence exists to support reversal of all or a portion of the valuation allowance. During the fourth quarter of fiscal 2017, this analysis consisted of the evaluation of all available positive and negative evidence, including our improved profitability in fiscal 2016 and fiscal 2017. We also considered third-party estimates of market growth and our internal projections of future profitability as indicated in our annual update to our operating plan for fiscal 2018 and our long-term strategic forecast which were completed during the fourth quarter of fiscal 2017. We also considered our strong performance against our annual operating plans in recent years and our ability to utilize tax planning strategies. Based on this analysis, we concluded that it was more likely than not that the majority of our U.S. deferred tax assets will be realized, and we therefore reversed most of the valuation allowance against those deferred assets. This reversal resulted in a one-time, non-cash income tax benefit of $1.2 billion and a $26.0 million adjustment to additional paid-in capital. The valuation allowance balances at October 31, 2019 and October 31, 2018 were $136.0 million and $142.7 million, respectively. The corresponding net deferred tax assets were $714.9 million and $745.0 million, respectively. We will continue to evaluate future financial performance to determine whether such

performance is both sustained and significant enough to provide sufficient evidence to support reversal of all or a portion of the remaining valuation allowance. The value of our net deferred tax asset may be subject to change in the future, depending on our generation or projections of future taxable income, as well as changes in tax policy or our tax planning strategy. For further discussion, see Note 21 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report.

Warranty

Our liability for product warranties, included in other accrued liabilities, was $48.5 million and $44.7 million as of October 31, 2019 and October 31, 2018, respectively. Our products are generally covered by a warranty for periods ranging from one to five years. We accrue for warranty costs as part of our cost of goods sold based on associated material costs, technical support labor costs and associated overhead. Material cost is estimated based primarily on historical trends in the volume of product returns within the warranty period and the cost to repair or replace the equipment. Technical support labor cost is estimated based primarily on historical trends and the cost to support the customer cases within the warranty period. The provision for product warranties, net of adjustments for previous years' provisions, was $23.1 million, $21.0 million and $8.0 million for fiscal 2019, 2018 and 2017 respectively. The provision for warranty claims may fluctuate on a quarterly basis depending on the mix of products and customers in that period. If actual product failure rates, material replacement costs, service or labor costs differ from our estimates, revisions to the estimated warranty provision would be required. See Note 14 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report. An increase in warranty claims or the related costs associated with satisfying our warranty obligations could increase our cost of sales and negatively affect our gross margin.

Effects of Recent Accounting Pronouncements

See Note 1 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for information relating to our discussion of the effects of recent accounting pronouncements.

Unaudited Quarterly Results of Operations

The tables below (in thousands, except per share data) set forth the operating results in our consolidated statements of operations for each of the eight quarters in the period ended October 31, 2019. Our revenue can fluctuate from quarter to quarter as a result of a number of factors, including changes in customer spending levels or networking strategies, order timing and volume, backlog levels, timing of revenue recognition and other competitive dynamics. As our business has evolved, including the sales of our solutions to meet the "on-demand" service requirements of both our customers and their end-users, the amount of quarterly revenue that we recognize in a quarter from customer orders received in that same quarter (which we refer to as "book to revenue") has increased as compared to our historical periods. Increased reliance on book to revenue introduces a number of risks, including the inherent difficulty in forecasting the amount and timing of book to revenue in any given quarter, and may increase the likelihood of fluctuations in our results. This information is unaudited, but in our opinion reflects all adjustments (consisting only of normal recurring adjustments) that we consider necessary for a fair statement of such information in accordance with generally accepted accounting principles. The results for any quarter are not necessarily indicative of results for any future period.

	Oct. 31, 2019	Jul. 31, 2019	Apr. 30, 2019	Jan. 31, 2019	Oct. 31, 2018	Jul. 31, 2018	Apr. 30, 2018	Jan. 31, 2018
Revenue:								
Products	$ 820,007	$ 810,588	$ 710,688	$ 642,532	$ 743,867	$ 691,758	$ 604,226	$ 525,609
Services	147,980	150,018	154,323	135,995	155,489	127,059	125,752	120,526
Total revenue	967,987	960,606	865,011	778,527	899,356	818,817	729,978	646,135
Cost of goods sold:								
Products	469,945	454,921	411,050	380,442	421,583	399,886	372,568	313,120
Services	78,346	81,333	79,284	74,744	79,698	67,388	64,103	61,250
Total costs of goods sold	548,291	536,254	490,334	455,186	501,281	467,274	436,671	374,370
Gross profit	419,696	424,352	374,677	323,341	398,075	351,543	293,307	271,765
Operating expenses:								
Research and development	141,657	139,880	137,969	128,633	134,983	121,133	116,924	118,524
Selling and marketing	117,201	104,230	103,502	98,113	112,791	95,395	97,359	88,515
General and administrative	50,307	42,695	42,154	39,243	44,539	38,212	38,976	38,406
Amortization of intangible assets	5,222	5,529	5,529	5,528	4,654	3,837	3,623	3,623
Acquisition and integration costs	(735)	1,362	1,135	1,608	3,778	1,333	—	—
Significant asset impairments and restructuring costs	12,842	5,355	4,068	2,273	1,460	6,359	4,359	5,961
Total operating expenses	326,494	299,051	294,357	275,398	302,205	266,269	261,241	255,029
Income from operations	93,202	125,301	80,320	47,943	95,870	85,274	32,066	16,736
Interest and other income (loss), net	(1,183)	1,050	(244)	4,253	(13,357)	(1,543)	1,296	1,575
Interest expense	(9,136)	(9,404)	(9,471)	(9,441)	(14,873)	(13,611)	(13,031)	(13,734)
Loss on extinguishment and modification of debt	—	—	—	—	(13,887)	—	—	—
Income before income taxes	82,883	116,947	70,605	42,755	53,753	70,120	20,331	4,577
Provision (benefit) for income tax	2,552	30,198	17,867	9,139	(10,224)	19,280	6,475	477,940
Net income (loss)	$ 80,331	$ 86,749	$ 52,738	$ 33,616	$ 63,977	$ 50,840	$ 13,856	$ (473,363)
Basic net income (loss) per common share	$ 0.52	$ 0.56	$ 0.34	$ 0.22	$ 0.45	$ 0.35	$ 0.10	$ (3.29)
Diluted net income (loss) per potential common share	$ 0.51	$ 0.55	$ 0.33	$ 0.21	$ 0.34	$ 0.34	$ 0.09	$ (3.29)
Weighted average basic common shares outstanding	154,852	155,488	156,170	156,314	143,659	143,400	143,975	143,922
Weighted average diluted potential common shares outstanding	156,612	157,455	158,289	158,174	157,745	159,998	147,973	143,922

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

We are exposed to market risk related to changes in interest rates and foreign currency exchange rates. The following discussion about these market risks includes forward-looking statements. Actual results could differ materially from those projected in these forward-looking statements.

*Interest Rate Sensitivity***.** We currently hold investments in U.S. government obligations with varying maturities. See Notes 6 and 7 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for information relating to investments and fair value. These investments are sensitive to interest rate movements, and their fair value will decline as interest rates rise and increase as interest rates decline. The estimated impact on these investments of a 100 basis point (1.0%) increase in interest rates across the yield curve from rates in effect as of the balance sheet date would be a $0.6 million decline in value.

Our earnings and cash flows from operations would be exposed to changes in interest rates because of the floating rate of interest in our 2025 Term Loan if such loan was not hedged using floating-to-fixed rate interest rate swaps. See Note 15 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report. The 2025 Term Loan bears interest at LIBOR plus a spread of 2.00%, subject to a minimum LIBOR rate of 0.00%. We have entered into interest rate swap arrangements (“interest rate swaps”) that fix the LIBOR rate of approximately $350.0 million of the 2025 Term Loan principal amount at 2.957% through September 2023. As such, a 100 basis point (1.0%) increase in the LIBOR rate as of our most recent LIBOR rate setting would increase our annualized interest expense by approximately $3.4 million on our 2025 Term Loan as recognized in our Consolidated Financial Statements. See Note 17 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report for information relating to our 2025 Term Loan.

Foreign Currency Exchange Risk. As a global concern, our business and results of operations are exposed to and can be impacted by movements in foreign currency exchange rates. For example, the announcement of the UK referendum in which voters approved an exit from the EU, commonly referred to as “Brexit,” has previously caused, and may continue to cause, significant volatility in currency exchange rate fluctuations. Because we sell globally, some of our sales transactions and revenue are non-U.S. Dollar denominated, with the Canadian Dollar, Euro and Japanese Yen being our most significant foreign currency revenue exposures. If the U.S. Dollar strengthens against these currencies, our revenue for these transactions reported in U.S. Dollars would decline. For our U.S. Dollar denominated sales, an increase in the value of the U.S. Dollar would increase the real costs of our products to customers in markets outside the United States, which could impact our competitive position. During fiscal 2019, approximately 16.4% of revenue was non-U.S. Dollar denominated. During fiscal 2019 as compared to fiscal 2018, the U.S. Dollar strengthened against a number of foreign currencies, including the Euro and Brazilian Reais. Consequently, our revenue reported in U.S. Dollars was minimally impacted by approximately $23.4 million or 0.7%. As it relates to costs of goods sold, employee-related and facilities costs associated with certain manufacturing-related operations in Canada represent our primary exposure to foreign currency exchange risk.

With regard to operating expense, our primary exposure to foreign currency exchange risk relates to the Canadian Dollar, Indian Rupee and British Pound. During fiscal 2019, approximately 50.7% of our operating expense was non-U.S. Dollar denominated. If currencies strengthen against the U.S. Dollar, costs reported in U.S. Dollars will increase. During fiscal 2019, research and development expense benefited by approximately $8.1 million, net of hedging, primarily due to the weakening of the U.S. Dollar in relation to the Canadian Dollar in comparison to fiscal 2018. Also, sales and marketing expense benefited by $7.5 million, as a result of foreign exchange rates, primarily due to a weaker U.S. Dollar in relation to the Euro in fiscal 2019 in comparison to fiscal 2018.

From time to time, we use foreign currency forward contracts to reduce variability in certain forecasted non-U.S. Dollar denominated cash flows. Generally, these derivatives have maturities of 24 months or less and are designated as cash flow hedges. At the inception of the cash flow hedge, and on an ongoing basis, we assess whether the forward contract has been effective in offsetting changes in cash flows attributable to the hedged risk during the hedging period. The derivative’s net gain or loss is initially reported as a component of accumulated other comprehensive income (loss) and, upon the occurrence of the forecasted transaction, is subsequently reclassified to the line item in the Consolidated Statement of Operations to which the hedged transaction relates.

During fiscal 2019, we recorded $9.8 million in foreign currency exchange losses, as a result of monetary assets and liabilities that were transacted in a currency other than the entity’s functional currency, and the re-measurement adjustments were recorded in interest and other income (loss), net on our Consolidated Statement of Operations. From time to time, we use foreign currency forwards to hedge these balance sheet exposures. These forwards are not designated as hedges for accounting purposes, and any net gain or loss associated with these derivatives is reported in interest and other income (loss), net. During fiscal 2019, we recorded minimal gains from these derivatives. See Notes 1, 5 and 15 to our Consolidated Financial Statements included in Item 8 of Part II of this annual report.

Item 8. Financial Statements and Supplementary Data

The following is an index to the consolidated financial statements:

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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Ciena Corporation

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Ciena Corporation and its subsidiaries (the "Company") as of November 2, 2019 and November 3, 2018, and the related consolidated statements of operations, comprehensive income (loss), changes in stockholders' equity, and cash flows for each of the three years in the period ended November 2, 2019, including the related notes (collectively referred to as the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of November 2, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO).

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of November 2, 2019 and November 3, 2018, and the results of its operations and its cash flows for each of the three years in the period ended November 2, 2019 in conformity with accounting principles generally accepted in the United States of America. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of November 2, 2019, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the COSO.

Changes in Accounting Principles

As discussed in Note 1 to the consolidated financial statements, the Company changed the manner in which it accounts for revenues from contracts with customers in 2019 and the manner in which it accounts for share-based compensation in 2018.

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the Report of Management on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (ii) 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 (iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Critical Audit Matters

The critical audit matter communicated below is a matter arising from the current period audit of the consolidated financial statements that was communicated or required to be communicated to the audit committee and that (i) relates to accounts or disclosures that are material to the consolidated financial statements and (ii) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matter below, providing a separate opinion on the critical audit matter or on the accounts or disclosures to which it relates.

Reserve for Excess or Obsolete Inventory

As described in Notes 1 and 9 to the consolidated financial statements, the Company's consolidated inventory balance, net of the allowance, was $345 million as of November 2, 2019. Management establishes a reserve for excess and obsolete inventory when impairment has been identified and recorded a reserve for excess and obsolete inventory of $47 million as of November 2, 2019. Management writes down its inventory for estimated obsolescence or unmarketable inventory by an amount equal to the difference between the cost of inventory and the estimated net realizable value based on assumptions about future demand, which are affected by changes in the Company's strategic direction, discontinuance of a product or introduction of newer versions of a product, declines in the sales of or forecasted demand for certain products, and general market conditions.

The principal considerations for our determination that performing procedures relating to the reserve for excess and obsolete inventory is a critical audit matter are there was significant judgment by management when developing their estimate. This led to a high degree of auditor judgment, subjectivity, and effort to perform procedures and evaluate the audit evidence obtained relating to the assumptions regarding future demand.

Addressing the matter involved performing procedures and evaluating audit evidence in connection with forming our overall opinion on the consolidated financial statements. These procedures included testing the effectiveness of controls relating to the Company's evaluation of the reserves for excess and obsolete inventory, including controls over the assumptions used within the model. These procedures also included, among others, testing management's process for determining the reserve for excess and obsolete inventory. This included evaluating the appropriateness of the inventory reserve method and the reasonableness of the significant assumptions relating to the future demand. Evaluating the assumptions related to future demand involved evaluating whether the assumptions used were reasonable considering historical sales and expectations regarding future sales. Testing management's process for determining future demand included procedures to evaluate the reliability, completeness and relevance of management's data used in the future demand assumption. Testing the relevance and reliability of the data included evaluating the reasonableness of the long-term sales forecasts and historical activity.

/s/ PricewaterhouseCoopers LLP
Baltimore, Maryland
December 20, 2019

We have served as the Company's auditor since 1992.

CIENA CORPORATION
CONSOLIDATED BALANCE SHEETS
(in thousands, except share data)

	October 31,	
	2019	2018
ASSETS		
Current assets:		
Cash and cash equivalents	$ 904,045	$ 745,423
Short-term investments	109,940	148,981
Accounts receivable, net	724,854	786,502
Inventories, net	345,049	262,751
Prepaid expenses and other	297,914	198,945
Total current assets	2,381,802	2,142,602
Long-term investments	10,014	58,970
Equipment, building, furniture and fixtures, net	286,884	292,067
Goodwill	297,937	297,968
Other intangible assets, net	112,781	148,225
Deferred tax asset, net	714,942	745,039
Other long-term assets	88,986	71,652
Total assets	$ 3,893,346	$ 3,756,523
LIABILITIES AND STOCKHOLDERS' EQUITY (DEFICIT)		
Current liabilities:		
Accounts payable	$ 344,819	$ 340,582
Accrued liabilities and other short-term obligations	382,740	340,075
Deferred revenue	111,381	111,134
Current portion of long-term debt	7,000	7,000
Debt conversion liability	—	164,212
Total current liabilities	845,940	963,003
Long-term deferred revenue	45,492	58,323
Other long-term obligations	148,747	119,413
Long-term debt, net	680,406	686,450
Total liabilities	$ 1,720,585	$ 1,827,189
Commitments and contingencies (Note 25)		
Stockholders' equity:		
Preferred stock — par value $0.01; 20,000,000 shares authorized; zero shares issued and outstanding	—	—
Common stock — par value $0.01; 290,000,000 shares authorized; 154,403,850 and 154,318,531 shares issued and outstanding	1,544	1,543
Additional paid-in capital	6,837,714	6,881,223
Accumulated other comprehensive loss	(22,084)	(5,780)
Accumulated deficit	(4,644,413)	(4,947,652)
Total stockholders' equity	2,172,761	1,929,334
Total liabilities and stockholders' equity	$ 3,893,346	$ 3,756,523

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

CIENA CORPORATION
CONSOLIDATED STATEMENTS OF OPERATIONS
(in thousands, except per share data)

	Year Ended October 31,		
	2019	2018	2017
Revenue:			
Products	$ 2,983,815	$ 2,565,460	$ 2,318,581
Services	588,316	528,826	483,106
Total revenue	3,572,131	3,094,286	2,801,687
Cost of goods sold:			
Products	1,716,358	1,507,157	1,308,295
Services	313,707	272,439	247,606
Total cost of goods sold	2,030,065	1,779,596	1,555,901
Gross profit	1,542,066	1,314,690	1,245,786
Operating expenses:			
Research and development	548,139	491,564	475,329
Selling and marketing	423,046	394,060	356,169
General and administrative	174,399	160,133	142,604
Amortization of intangible assets	21,808	15,737	33,029
Acquisition and integration costs	3,370	5,111	—
Significant asset impairments and restructuring costs	24,538	18,139	23,933
Total operating expenses	1,195,300	1,084,744	1,031,064
Income from operations	346,766	229,946	214,722
Interest and other income (loss), net	3,876	(12,029)	913
Interest expense	(37,452)	(55,249)	(55,852)
Loss on extinguishment and modification of debt	—	(13,887)	(3,657)
Income before income taxes	313,190	148,781	156,126
Provision (benefit) for income taxes	59,756	493,471	(1,105,827)
Net income (loss)	$ 253,434	$ (344,690)	$ 1,261,953
Basic net income (loss) per common share	$ 1.63	$ (2.40)	$ 8.89
Diluted net income (loss) per potential common share	$ 1.61	$ (2.49)	$ 7.53
Weighted average basic common shares outstanding	155,720	143,738	141,997
Weighted average diluted potential common shares outstanding	157,612	143,738	169,919

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

CIENA CORPORATION
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
(in thousands)

	Year ended October 31,		
	2019	2018	2017
Net income (loss)	$ 253,434	$ (344,690)	$ 1,261,953
Change in unrealized gain (loss) on available-for-sale securities, net of tax	577	26	(590)
Change in unrealized gain (loss) on foreign currency forward contracts, net of tax	3,985	(1,674)	(295)
Change in unrealized gain (loss) on forward starting interest rate swaps, net of tax	(20,103)	6,199	6,185
Change in accumulated translation adjustments	(763)	686	8,012
Other comprehensive income (loss)	(16,304)	5,237	13,312
Total comprehensive income (loss)	$ 237,130	$ (339,453)	$ 1,275,265

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

CIENA CORPORATION
CONSOLIDATED STATEMENTS OF CHANGES IN STOCKHOLDERS' EQUITY
(in thousands, except share data)

	Common Stock Shares	Par Value	Additional Paid-in-Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total Stockholders' Equity
Balance at October 31, 2016	139,767,627	$ 1,398	$6,715,478	$ (24,329)	$(5,926,206)	$ 766,341
Net income	—	—	—	—	1,261,953	1,261,953
Other comprehensive income	—	—	—	13,312	—	13,312
Issuance of shares from employee equity plans	3,275,600	32	20,380	—	—	20,412
Share-based compensation expense	—	—	48,360	—	—	48,360
Reversal of deferred tax asset valuation allowance	—	—	25,964	—	—	25,964
Balance at October 31, 2017	143,043,227	1,430	6,810,182	(11,017)	(4,664,253)	2,136,342
Net loss	—	—	—	—	(344,690)	(344,690)
Other comprehensive income	—	—	—	5,237	—	5,237
Reclassification of cash conversion feature	—	—	(152,142)	—	—	(152,142)
Conversion of convertible notes into common shares	12,236,146	122	261,981	—	—	262,103
Repurchases of common stock - repurchase program	(4,290,801)	(44)	(110,937)	—	—	(110,981)
Issuance of shares from employee equity plans	3,484,018	37	23,090	—	—	23,127
Share-based compensation expense	—	—	52,972	—	—	52,972
Shares repurchased for tax withholdings on vesting of restricted stock units	(154,059)	(2)	(4,755)	—	—	(4,757)
Effect of adoption of new accounting standard (Note 1)	—	—	832	—	61,291	62,123
Balance at October 31, 2018	154,318,531	1,543	6,881,223	(5,780)	(4,947,652)	1,929,334
Net income	—	—	—	—	253,434	253,434
Other comprehensive loss	—	—	—	(16,304)	—	(16,304)
Repurchases of common stock - repurchase program	(3,838,466)	(38)	(150,038)	—	—	(150,076)
Issuance of shares from employee equity plans	3,112,916	31	22,916	—	—	22,947
Share-based compensation expense	—	—	59,736	—	—	59,736
Settlement of debt conversion liability	1,585,140	16	52,928	—	—	52,944
Shares repurchased for tax withholdings on vesting of restricted stock units	(774,271)	(8)	(29,051)	—	—	(29,059)
Effect of adoption of new accounting standard (Note 1)	—	—		—	49,805	49,805
Balance at October 31, 2019	154,403,850	$ 1,544	$6,837,714	$ (22,084)	$(4,644,413)	$2,172,761

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

CIENA CORPORATION
CONSOLIDATED STATEMENTS OF CASH FLOWS
(in thousands)

	Year Ended October 31,		
	2019	**2018**	**2017**
Cash flows from operating activities:			
Net income (loss)	$ 253,434	$ (344,690)	$ 1,261,953
Adjustments to reconcile net income (loss) to net cash provided by operating activities:			
Loss on extinguishment of debt	—	10,039	—
Loss on fair value of debt conversion liability	—	12,070	—
Depreciation of equipment, building, furniture and fixtures, and amortization of leasehold improvements	87,576	84,214	77,189
Share-based compensation costs	59,736	52,972	48,360
Amortization of intangible assets	35,136	25,806	45,713
Deferred taxes	19,865	463,631	(1,126,732)
Provision for doubtful accounts	6,740	2,700	18,221
Provision for inventory excess and obsolescence	28,085	30,615	35,459
Provision for warranty	23,105	20,992	7,965
Other	(910)	21,685	22,417
Changes in assets and liabilities:			
Accounts receivable	65,712	(168,357)	(66,123)
Inventories	(112,941)	(27,445)	(91,567)
Prepaid expenses and other	(96,618)	(21,425)	(33,834)
Accounts payable, accruals and other obligations	27,740	85,798	33,897
Deferred revenue	16,480	(19,344)	1,964
Net cash provided by operating activities	413,140	229,261	234,882
Cash flows used in investing activities:			
Payments for equipment, furniture, fixtures and intellectual property	(62,579)	(67,616)	(94,600)
Purchase of available for sale securities	(158,074)	(286,824)	(299,038)
Proceeds from maturities of available for sale securities	248,748	410,109	335,075
Purchase of equity investment	(2,667)	(1,767)	—
Settlement of foreign currency forward contracts, net	(1,351)	9,385	(2,810)
Acquisition of businesses, net of cash acquired	—	(82,670)	—
Net cash used in investing activities	24,077	(19,383)	(61,373)
Cash flows from financing activities:			
Proceeds from issuance of long-term debt, net	—	305,125	—
Payment of long-term debt	(7,000)	(292,730)	(233,554)
Payment for debt conversion liability	(111,268)	—	—
Payment for make-whole provision upon conversion of long-term debt	—	(13,453)	—
Payment for modification of term loans	—	—	(93,625)
Payment of debt issuance costs	(1,191)	(1,936)	(722)
Payment of capital lease obligations	(3,319)	(3,624)	(3,562)
Shares repurchased for tax withholdings on vesting of restricted stock units	(29,059)	(4,757)	—
Repurchases of common stock - repurchase program	(150,076)	(110,981)	—
Proceeds from issuance of common stock	22,947	23,127	20,412
Net cash used in financing activities	(278,966)	(99,229)	(311,051)
Effect of exchange rate changes on cash, cash equivalents and restricted cash	476	(5,856)	494
Net increase (decrease) in cash, cash equivalents and restricted cash	158,727	104,793	(137,048)
Cash, cash equivalents and restricted cash at beginning of fiscal year	745,434	640,641	777,689
Cash, cash equivalents and restricted cash at end of fiscal year	$ 904,161	$ 745,434	$ 640,641
Supplemental disclosure of cash flow information			
Cash paid during the fiscal year for interest	$ 39,579	$ 44,750	$ 47,235
Cash paid during the fiscal year for income taxes, net	$ 33,570	$ 26,900	$ 22,136
Non-cash investing and financing activities			
Purchase of equipment in accounts payable	$ 16,549	$ 5,118	$ 6,214
Building subject to capital lease	$ —	$ —	$ 50,370
Contingent consideration for acquisition of business	$ —	$ 10,900	$ —
Conversion of 3.75% convertible senior notes, due October 15, 2018 (Original) into 3,038,208 shares of common stock	$ —	$ 61,270	$ —

Conversion of 4.0% convertible senior notes, due December 15, 2020 into 9,197,943 shares of common stock, net	$	—	$	214,286	$	—
Conversion of debt conversion liability into 1,585,140 shares of common stock	$	52,944	$	—	$	—

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

CIENA CORPORATION
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

(1) CIENA CORPORATION AND SIGNIFICANT ACCOUNTING POLICIES AND ESTIMATES

Description of Business

Ciena Corporation ("Ciena" or the "Company") is a networking systems, services and software company, providing solutions that enable a wide range of network operators to deploy and manage next-generation networks that deliver services to businesses and consumers. Ciena provides hardware, software and services that support the transport, switching, aggregation, service delivery and management of video, data and voice traffic on communications networks. Ciena's solutions are used by communications service providers, cable and multiservice operators, Web-scale providers, submarine network operators, governments, enterprises, research and education institutions and other emerging network operators.

Ciena's solutions include a portfolio of Networking Platforms, including Ciena's Converged Packet Optical and Packet Networking products, that can be applied from the network core to end user access points, and that allow network operators to scale capacity, increase transmission speeds, allocate traffic and adapt dynamically to changing end-user service demands. Ciena offers Platform Software that provides management and domain control of Ciena's hardware solutions and automates network lifecycle operations, including provisioning equipment and services. Through its Blue Planet Automation Software, Ciena enables network providers to use network data, analytics and policy-based assurance to achieve closed loop automation across multi-vendor and multi-domain network environments, streamlining key business and network processes. To complement its hardware and software products, Ciena offers a broad range of services that help its customers build, operate and improve their networks and associated operational environments.

Ciena refers to its complete portfolio vision as the Adaptive Network. The Adaptive Network emphasizes a programmable network infrastructure, software control and automation capabilities, and network analytics and intelligence. By transforming network infrastructures into a dynamic, programmable environment driven by automation and analytics, network operators can realize greater business agility, dynamically adapt to changing end user service demands and rapidly introduce new revenue-generating services. They can also gain valuable real-time network insights, allowing them to optimize network operation and maximize the return on their network infrastructure investment.

Basis of Presentation

The accompanying consolidated financial statements include the accounts of Ciena and its wholly owned subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation.

Ciena has a 52 or 53 week fiscal year, which ends on the Saturday nearest to the last day of October in each year (November 2, 2019, November 3, 2018 and October 28, 2017 for the periods reported). Fiscal 2019 and fiscal 2017 each consisted of a 52-week fiscal year and fiscal 2018 consisted of a 53-week fiscal year. For purposes of financial statement presentation, each fiscal year is described as having ended on October 31.

Business Combinations

Ciena records acquisitions using the purchase method of accounting. All of the assets acquired, liabilities assumed, contractual contingencies and contingent consideration are recognized at their fair value as of the acquisition date. The excess of the purchase price over the estimated fair values of the net tangible and net intangible assets acquired is recorded as goodwill. The application of the purchase method of accounting for business combinations requires management to make significant estimates and assumptions in the determination of the fair value of assets acquired and liabilities assumed, in order to properly allocate purchase price consideration between assets that are depreciated and amortized from goodwill. These assumptions and estimates include a market participant's use of the asset and the appropriate discount rates for a market participant. Ciena's estimates are based on historical experience, information obtained from the management of the acquired companies and, when appropriate, include assistance from independent third-party appraisal firms. Significant assumptions and estimates can include, but are not limited to, the cash flows that an asset is expected to generate in the future, the appropriate weighted-average cost of capital and the cost savings expected to be derived from acquiring an asset. These estimates are inherently uncertain and unpredictable. In addition, unanticipated events and circumstances may occur which may affect the accuracy or validity of such estimates.

Use of Estimates

The preparation of the financial statements and related disclosures in conformity with Generally Accepted Accounting Principles (“GAAP”) requires management to make estimates and judgments that affect the amounts reported in the consolidated financial statements and accompanying notes. Estimates are used for selling prices for multiple element arrangements, shared-based compensation, bad debts, valuation of inventories and investments, recoverability of intangible assets, other long-lived assets and goodwill, income taxes, warranty obligations, restructuring liabilities, derivatives, contingencies and litigation. Ciena bases its estimates on historical experience and assumptions that it believes are reasonable. Actual results may differ materially from management’s estimates.

Cash and Cash Equivalents

Ciena considers all highly liquid investments purchased with original maturities of three months or less to be cash equivalents. Any restricted cash collateralizing letters of credit is included in other current assets and other long-term assets depending on the duration of the restriction.

Investments

Ciena’s investments in debt securities are classified as available-for-sale and reported at fair value, with unrealized gains and losses recorded in accumulated other comprehensive income (loss). Ciena recognizes losses in the income statement when it determines that declines in the fair value of its investments below their cost basis are other-than-temporary. In determining whether a decline in fair value is other-than-temporary, Ciena considers various factors, including market price (when available), investment ratings, the financial condition and near-term prospects of the investee, the length of time and the extent to which the fair value has been less than Ciena’s cost basis, and Ciena’s intent and ability to hold the investment until maturity or for a period of time sufficient to allow for any anticipated recovery in market value. Ciena considers all marketable debt securities that it expects to convert to cash within one year or less to be short-term investments, with all others considered to be long-term investments.

Ciena has minority equity investments in privately held technology companies that are classified in other long-term assets. These investments are carried at cost because Ciena owns less than 20% of the voting equity and does not have the ability to exercise significant influence over the company. Ciena monitors these investments for impairment and makes appropriate reductions to the carrying value when necessary. As of October 31, 2019, the combined carrying value of these investments was $10.7 million. Ciena elects to estimate the fair value at cost minus impairment, if any, plus or minus observable price changes in orderly transactions for identical or similar investments of the same issuer. Ciena has not evaluated these investments for impairment or observable price changes as there have not been any events or changes in circumstances that Ciena believes would have had a significant effect on the fair value of these investments.

Inventories

Inventories are stated at the lower of cost or market, with cost computed using standard cost, which approximates actual cost, on a first-in, first-out basis. Ciena records a provision for excess and obsolete inventory when an impairment has been identified.

Segment Reporting

Ciena’s chief operating decision maker, its chief executive officer, evaluates the Company’s performance and allocates resources based on multiple factors, including measures of segment profit (loss). Operating segments are defined as components of an enterprise that engage in business activities that may earn revenue and incur expense, for which discrete financial information is available, and for which such information is evaluated regularly by the chief operating decision maker for purposes of allocating resources and assessing performance. During fiscal 2019, we separated our previous Software and Software-Related Services segment into two stand-alone operating segments. Ciena has the following operating segments for reporting purposes: (i) Networking Platforms; (ii) Platform Software and Services; (iii) Blue Planet Automation Software and Services; and (iv) Global Services. See Note 23 below.

Goodwill

Goodwill is the excess of the purchase price over the fair values assigned to the net assets acquired in a business combination. Ciena tests goodwill for impairment on an annual basis, which it has determined to be the last business day of

fiscal September each year. Ciena also tests goodwill for impairment between annual tests if an event occurs or circumstances change that would, more likely than not, reduce the fair value of the reporting unit below its carrying value.

Ciena tests goodwill impairment by comparing the fair value of the reporting unit with the unit's carrying amount, including goodwill. If this test indicates that the fair value is less than the carrying value, then an impairment loss is recognized limited to the total amount of goodwill allocated to that reporting unit. A non-cash goodwill impairment charge would have the effect of decreasing earnings or increasing losses in such period. If Ciena is required to take a substantial impairment charge, its operating results would be materially adversely affected in such period.

Long-lived Assets

Long-lived assets include: equipment, building, furniture and fixtures; finite-lived intangible assets; and maintenance spares. Ciena tests long-lived assets for impairment whenever triggering events or changes in circumstances indicate that the asset's carrying amount is not recoverable from its undiscounted cash flows. An impairment loss is measured as the amount by which the carrying amount of the asset or asset group exceeds its fair value. Ciena's long-lived assets are assigned to asset groups that represent the lowest level for which cash flows can be identified.

Equipment, Building, Furniture and Fixtures and Internal Use Software

Equipment, building, furniture and fixtures are recorded at cost. Depreciation and amortization are computed using the straight-line method over useful lives of two years to five years for equipment and furniture and fixtures and the shorter of useful life or lease term for leasehold improvements.

Qualifying internal use software and website development costs incurred during the application development stage, which consist primarily of outside services and purchased software license costs, are capitalized and amortized straight-line over the estimated useful lives of two years to five years.

Intangible Assets

Ciena has recorded finite-lived intangible assets as a result of several acquisitions. Finite-lived intangible assets are carried at cost less accumulated amortization. Amortization is computed using the straight-line method over the expected economic lives of the respective assets, up to seven years, which approximates the use of intangible assets.

Maintenance Spares

Maintenance spares are recorded at cost. Spares usage cost is expensed ratably over four years.

Concentrations

Substantially all of Ciena's cash and cash equivalents are maintained at a small number of major U.S. financial institutions. The majority of Ciena's cash equivalents consist of money market funds. Deposits held with banks may exceed the amount of insurance provided on such deposits. Because these deposits generally may be redeemed upon demand, management believes that they bear minimal risk.

Historically, a significant percentage of Ciena's revenue has been concentrated among sales to a small number of large communications service providers and Web-scale providers. Consolidation among Ciena's customers has increased this concentration. Consequently, Ciena's accounts receivable are concentrated among these customers. See Note 23 below.

Additionally, Ciena's access to certain materials or components is dependent on sole or limited source suppliers. The inability of any of these suppliers to fulfill Ciena's supply requirements, or significant changes in supply cost, could affect future results. Ciena relies on a small number of contract manufacturers to perform the majority of the manufacturing for its products. If Ciena cannot effectively manage these manufacturers or forecast future demand, or if these manufacturers fail to deliver products or components on time, Ciena's business and results of operations may suffer.

Revenue Recognition

Ciena recognizes revenue when control of the promised products or services is transferred to its customer, in an amount that reflects the consideration to which Ciena expects to be entitled in exchange for those products or services.

Ciena determines revenue recognition by applying the following five-step approach:

- identification of the contract, or contracts, with a customer;
- identification of the performance obligations in the contract;
- determination of the transaction price;
- allocation of the transaction price to the performance obligations in the contract; and
- recognition of revenue when, or as, Ciena satisfies a performance obligation.

Generally, Ciena makes sales pursuant to purchase orders placed by customers under framework agreements that govern the general commercial terms and conditions of the sale of Ciena's products and services. These purchase orders under framework agreements are used to determine the identification of the contract or contracts with this customer. Purchase orders typically include the description, quantity, and price of each product or service purchased. Purchase orders may include one-line bundled pricing for both products and services. Accordingly, purchase orders can include various combinations of products and services that are generally distinct and accounted for as separate performance obligations. Ciena evaluates each promised product and service offering to determine whether it represents a distinct performance obligation. In doing so, Ciena considers, among other things, customary business practices, whether the customer can benefit from the product or service on its own or together with other resources that are readily available, and whether Ciena's commitment to transfer the product or service to the customer is separately identifiable from other obligations in the purchase order. For transactions where Ciena delivers the product or services, Ciena is typically the principal and records revenue and costs of goods sold on a gross basis.

Purchase orders are invoiced based on the terms set forth either in the purchase order or the framework agreement, as applicable. Generally, sales of products and software licenses are invoiced upon shipment or delivery. Maintenance and software subscription services are invoiced quarterly or annually in advance of the service term. Ciena's other service offerings are generally invoiced upon completion of the service. Payment terms and cash received typically range from 30 to 90 days from the invoicing date. Historically, Ciena has not provided any material financing arrangements to its customers. As a practical expedient, Ciena does not adjust the amount of consideration it will receive for the effects of a significant financing component as it expects, at contract inception, that the period between Ciena transfer of the products or services to the customer, and customer payment for the products or services will be one year or less. Shipping and handling fees invoiced to customers are included in revenue, with the associated expense included in product cost of goods sold. Ciena records revenue net of any associated sales taxes.

Ciena recognizes revenue upon the transfer of control of promised products or services to a customer. Transfer of control occurs once the customer has the contractual right to use the product, generally upon shipment or delivery to the customer. Transfer of control can also occur over time for services such as software subscription, maintenance, installation, and various professional services as the customer receives the benefit over the contract term.

Significant Judgments

Revenue is allocated among performance obligations based on standalone selling price ("SSP"). SSP reflects the price at which Ciena would expect to sell that product or service on a stand-alone basis at contract inception and that Ciena would expect to be entitled to receive for the promised products or services. SSP is estimated for each distinct performance obligation, and judgment may be required in its determination. The best evidence of SSP is the observable price of a product or service when Ciena sells the products separately in similar circumstances and to similar customers. In instances where SSP is not directly observable, Ciena determines SSP using information that may include market conditions and other observable inputs.

Ciena applies judgment in determining the transaction price, as Ciena may be required to estimate variable consideration when determining the amount of revenue to recognize. Variable consideration can include various rebate, cooperative marketing, and other incentive programs that Ciena offers to its distributors, partners and customers. When determining the amount of revenue to recognize, Ciena estimates the expected usage of these programs, applying the expected value or most likely estimate and updates the estimate at each reporting period as actual utilization data becomes available. Ciena also considers any customer right of return and any actual or potential payment of liquidated damages, contractual or similar penalties, or other claims for performance failures or delays in determining the transaction price, where applicable.

When transfer of control is judged to be over time for installation and professional service arrangements, Ciena applies the input method to determine the amount of revenue to be recognized in a given period. Utilizing the input method, Ciena recognizes revenue based on the ratio of actual costs incurred to date to the total estimated costs expected to be incurred. Revenue for software subscription and maintenance is recognized ratably over the period during which the services are performed.

Capitalized Contract Acquisition Costs

Ciena has considered the impact of the guidance in Accounting Standards Codification (“ASC”) 340-40, *Other Assets and Deferred Costs; Contracts with Customers*, and the interpretations of the Financial Accounting Standards Board (“FASB”) Transition Resource Group for Revenue Recognition with respect to capitalization and amortization of incremental costs of obtaining a contract. In conjunction with this interpretation, Ciena considers each customer purchase in combination with the corresponding framework agreement, if applicable, as a contract. Ciena has elected to implement the practical expedient, which allows for incremental costs to be recognized as an expense when incurred if the period of the asset recognition is one year or less. If the period of the asset recognition is greater than one year, Ciena amortizes these costs over the period of performance. Ciena considers sales commissions incurred upon receipt of purchase orders placed by customers as incremental costs to obtain such purchase orders. The practical expedient method is applied to the purchase order as a whole and thus the capitalized costs of obtaining a purchase order is applied even if the purchase order contains more than one performance obligation. In cases where a purchase order includes various distinct products or services with both short-term (one year or less) and long-term (more than a year) performance periods, the cost of commissions incurred for the total value of the purchase order is capitalized and subsequently amortized as each performance obligation is recognized.

For the additional disclosures required as part of ASC 606 see Note 2 below.

Warranty Accruals

Ciena provides for the estimated costs to fulfill customer warranty obligations upon recognition of the related revenue. Estimated warranty costs include estimates for material costs, technical support labor costs and associated overhead. Warranty is included in cost of goods sold and is determined based on actual warranty cost experience, estimates of component failure rates and management’s industry experience. Ciena’s sales contracts do not permit the right of return of the product by the customer after the product has been accepted.

Accounts Receivable, Net

Ciena’s allowance for doubtful accounts is based on its assessment, on a specific identification basis, of the collectibility of customer accounts. Ciena performs ongoing credit evaluations of its customers and generally has not required collateral or other forms of security from them. In determining the appropriate balance for Ciena’s allowance for doubtful accounts, management considers each individual customer account receivable in order to determine collectibility. In doing so, management considers creditworthiness, payment history, account activity and communication with the customer. If a customer’s financial condition changes, Ciena may be required to record an allowance for doubtful accounts for that customer, which could negatively affect its results of operations.

Research and Development

Ciena charges all research and development costs to expense as incurred. Types of expense incurred in research and development include employee compensation, prototype equipment, consulting and third-party services, depreciation, facility costs and information technology.

Government Grants

Ciena accounts for proceeds from government grants as a reduction of expense when there is reasonable assurance that Ciena has met the required conditions associated with the grant and that grant proceeds will be received. Grant benefits are recorded to the particular line item of the Consolidated Statement of Operations to which the grant activity relates. See Note 25 below.

Advertising Costs

Ciena expenses all advertising costs as incurred.

Legal Costs

Ciena expenses legal costs associated with litigation as incurred.

Share-Based Compensation Expense

Ciena measures and recognizes compensation expense for share-based awards based on estimated fair values on the date of grant. Ciena estimates the fair value of each option-based award on the date of grant using the Black-Scholes option-pricing model. This model is affected by Ciena's stock price as well as estimates regarding a number of variables, including expected stock price volatility over the expected term of the award and projected employee stock option exercise behaviors. Ciena recognizes the estimated fair value of restricted stock units subject only to service-based vesting conditions by multiplying the number of shares underlying the award by the closing price per share of Ciena common stock on the grant date. In each case, Ciena only recognizes expense in its Consolidated Statement of Operations for those stock options or restricted stock units that are expected ultimately to vest. Awards with performance-based vesting conditions (i) require the achievement of certain operational, financial or other performance criteria or targets or (ii) vest based on Ciena's total shareholder return as compared to an index of peer companies, in whole or in part. Ciena recognizes the estimated fair value of restricted stock units subject to performance-based vesting conditions other than total shareholder return by assuming the satisfaction of any performance-based objectives at the "target" level and multiplying the corresponding number of shares earned based upon such achievement by the closing price per share of Ciena common stock on the grant date. Ciena recognizes the estimated fair value of performance based awards subject to total shareholder return as compared to an index of peer companies using a Monte Carlo simulation valuation model on the date of grant. At the end of each reporting period, Ciena reassesses the probability of achieving the performance targets and the performance period required to meet those targets. See Note 22 below.

Stock Repurchase Plan

Shares repurchased pursuant to Ciena's share repurchase program are immediately retired upon purchase. Repurchased common stock is reflected as a reduction of stockholders' equity. Ciena's accounting policy related to its share repurchases is to reduce its common stock based on the par value of the shares and to reduce its capital surplus for the excess of the repurchase price over the par value. Since the inception of its share repurchase program in December 2018, Ciena has had an accumulated deficit balance; therefore, the excess over the par value has been applied to additional paid-in capital. Once Ciena has retained earnings, the excess will be charged entirely to retained earnings.

Income Taxes

Ciena accounts for income taxes using an asset and liability approach. This approach recognizes deferred tax assets and liabilities ("DTA") for the expected future tax consequences attributable to differences between the carrying amounts of assets and liabilities for financial reporting purposes and their respective tax bases, and for operating loss and tax credit carryforwards. In estimating future tax consequences, Ciena considers all expected future events other than the enactment of changes in tax laws or rates. Valuation allowances are provided if, based on the weight of the available evidence, it is more likely than not that some or all of the deferred tax assets will not be realized.

In the ordinary course of business, transactions occur for which the ultimate outcome may be uncertain. In addition, tax authorities periodically audit Ciena's income tax returns. These audits examine significant tax filing positions, including the timing and amounts of deductions and the allocation of income tax expenses among tax jurisdictions. Ciena is currently under audit in India for 2012 and 2014 through 2018, and in Canada for 2011 through 2015. Management does not expect the outcome of these audits to have a material adverse effect on Ciena's consolidated financial position, results of operations or cash flows. Ciena's major tax jurisdictions and the earliest open tax years are as follows: United States (2016), United Kingdom (2016), Canada (2011), and India (2012). Limited adjustments can be made to Federal U.S. tax returns in earlier years in order to reduce net operating loss carryforwards. Ciena classifies interest and penalties related to uncertain tax positions as a component of income tax expense.

Ciena has not provided for U.S. deferred income taxes on the cumulative unremitted earnings of its non-U.S. affiliates, as it plans to indefinitely reinvest these foreign earnings outside the U.S. As of October 31, 2019, the cumulative amount of such temporary differences for which a deferred tax liability has not been recognized totaled approximately $372.0 million. If these earnings were distributed to the U.S. in the form of dividends, or otherwise, or if the shares of the relevant foreign subsidiaries were sold or otherwise transferred, Ciena would be subject to additional U.S. income taxes (subject to an adjustment for foreign tax credits) and foreign withholding taxes.

Ciena is required to record excess tax benefits or tax deficiencies related to stock-based compensation as income tax benefit or expense when share-based awards vest or are settled.

Ciena adopted ASU 2016-09, *Improvements to Employee Share-Based Payment Accounting,* in the first quarter of fiscal 2018. In connection with the adoption of this guidance, Ciena recognized approximately $62.1 million of deferred tax assets

related to previously unrecognized tax benefits. This was recorded as a cumulative-effect adjustment to retained earnings as of the beginning of the first quarter of fiscal 2018.

The Tax Cuts and Jobs Act (the "Tax Act") includes provisions that affect Ciena in fiscal 2019, including a provision designed to tax global intangible low-taxed income ("GILTI"). An accounting policy choice is allowed to either treat taxes due on future U.S. inclusions related to GILTI in taxable income as a current-period expense when incurred (the "period cost method") or factor such amounts into the measurement of deferred taxes (the "deferred method"). The calculation of the deferred balance with respect to the new GILTI tax provisions will depend, in part, on analyzing global income to determine whether future U.S. inclusions in taxable income are expected related to GILTI and, if so, what the impact is expected to be. Ciena is electing to use the period cost method for future GILTI inclusions. Additionally, Ciena is electing to use the incremental cash tax savings approach when determining whether a valuation allowance needs to be recorded against the U.S. net operating loss ("NOL") due to the GILTI inclusions.

The Tax Act also introduced an alternative tax known as the base erosion and anti-abuse tax ("BEAT"). An accounting policy choice has been made to consider BEAT as a period cost when incurred.

Loss Contingencies

Ciena is subject to the possibility of various losses arising in the ordinary course of business. These may relate to disputes, litigation and other legal actions. Ciena considers the likelihood of loss or the incurrence of a liability, as well as Ciena's ability to estimate the amount of loss reasonably, in determining loss contingencies. An estimated loss contingency is accrued when it is probable that a liability has been incurred and the amount of loss can be reasonably estimated. Ciena regularly evaluates current information available to it in order to determine whether any accruals should be adjusted and whether new accruals are required.

Fair Value of Financial Instruments

The carrying value of Ciena's cash and cash equivalents, accounts receivable, accounts payable and accrued liabilities approximates fair market value due to the relatively short period of time to maturity. For information related to the fair value of Ciena's term loan, see Note 17 below.

Fair value for the measurement of financial assets and liabilities is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or liability. Ciena utilizes a valuation hierarchy for disclosure of the inputs for fair value measurement. This hierarchy prioritizes the inputs into three broad levels as follows:

- Level 1 inputs are unadjusted quoted prices in active markets for identical assets or liabilities;

- Level 2 inputs are quoted prices for identical or similar assets or liabilities in less active markets or model-derived valuations in which significant inputs are observable for the asset or liability, either directly or indirectly through market corroboration, for substantially the full term of the financial instrument; and

- Level 3 inputs are unobservable inputs based on Ciena's assumptions used to measure assets and liabilities at fair value. The fair values are determined based on model-based techniques using inputs Ciena could not corroborated with market data.

By distinguishing between inputs that are observable in the marketplace, and therefore more objective, and those that are unobservable, and therefore more subjective, the hierarchy is designed to indicate the relative reliability of the fair value measurements. A financial asset's or liability's classification within the hierarchy is determined based on the lowest level input that is significant to the fair value measurement.

Restructuring

From time to time, Ciena takes actions to better align its workforce, facilities and operating costs with perceived market opportunities, business strategies and changes in market and business conditions. Ciena recognizes a liability for the cost associated with an exit or disposal activity in the period in which the liability is incurred, except for one-time employee termination benefits related to a service period, typically of more than 60 days, which are accrued over the service period. See Note 4 below.

Foreign Currency

Certain of Ciena's foreign branch offices and subsidiaries use the U.S. Dollar as their functional currency because Ciena Corporation, as the U.S. parent entity, exclusively funds the operations of these branch offices and subsidiaries. For those subsidiaries using the local currency as their functional currency, assets and liabilities are translated at exchange rates in effect at the balance sheet date, and the statement of operations is translated at a monthly average rate. Resulting translation adjustments are recorded directly to a separate component of stockholders' equity. Where the monetary assets and liabilities are transacted in a currency other than the entity's functional currency, re-measurement adjustments are recorded in interest and other income (loss), net on the Consolidated Statement of Operations. See Note 5 below.

Derivatives

Ciena's 3.75% Convertible Senior Notes due October 15, 2018 (the "New Notes") included a conversion feature that was accounted for as a separate embedded derivative. The embedded conversion feature was recorded at fair value using the underlying stock price, time to maturity and expected volatility of Ciena's stock and conversion price. These changes are included in interest and other income (loss), net on the Consolidated Statement of Operations. On November 15, 2018, Ciena settled this embedded conversion feature.

From time to time, Ciena uses foreign currency forward contracts to reduce variability in certain forecasted non-U.S. Dollar denominated cash flows. Generally, these derivatives have maturities of 24 months or less. Ciena also has interest rate swap arrangements to reduce variability in certain forecasted interest expense associated with its term loan. All of these derivatives are designated as cash flow hedges. At the inception of the cash flow hedge, and on an ongoing basis, Ciena assesses whether the derivative has been effective in offsetting changes in cash flows attributable to the hedged risk during the hedging period. The derivative's net gain or loss is initially reported as a component of accumulated other comprehensive income (loss), and, upon occurrence of the forecasted transaction, is subsequently reclassified to the line item in the Consolidated Statement of Operations to which the hedged transaction relates.

Ciena records derivative instruments in the Consolidated Statements of Cash Flows within operating, investing, or financing activities consistent with the cash flows of the hedged items.

From time to time, Ciena uses foreign currency forward contracts to hedge certain balance sheet foreign exchange exposures. These forward contracts are not designated as hedges for accounting purposes, and any net gain or loss associated with these derivatives is reported in interest and other income (loss), net on the Consolidated Statement of Operations.

See Notes 7 and 15 below.

Computation of Net Income (Loss) per Share

Ciena calculates basic earnings per share by dividing earnings attributable to common stock by the weighted average number of common shares outstanding for the period. Diluted net income (loss) per potential common share ("Diluted EPS") includes other potential dilutive shares that would be outstanding if securities or other contracts to issue common stock were exercised or converted into common stock. Ciena uses a dual presentation of basic net income (loss) per common share ("Basic EPS") and Diluted EPS on the face of its income statement. A reconciliation of the numerator and denominator used for the Basic EPS and Diluted EPS computations is set forth in Note 19 below.

Software Development Costs

Ciena develops software for sale to its customers. GAAP requires the capitalization of certain software development costs that are incurred subsequent to the date technological feasibility is established and prior to the date the product is generally available for sale. The capitalized cost is then amortized using the straight-line method over the estimated life of the product. Ciena defines technological feasibility as being attained at the time a working model is completed. To date, the period between Ciena achieving technological feasibility and the general availability of such software has been short, and software development costs qualifying for capitalization have been insignificant. Accordingly, Ciena has not capitalized any software development costs.

Newly Issued Accounting Standards - Effective

Revenue Recognition

In May 2014, FASB issued Accounting Standards Codification ASC 606, *Revenue from Contracts with Customers*, a new accounting standard related to revenue recognition. ASC 606 supersedes nearly all U.S. GAAP standards on revenue recognition and eliminates industry-specific guidance. The underlying principle of ASC 606 is to recognize revenue when a customer obtains control of the promised products or services at an amount that reflects the consideration that is expected to be received in exchange for those products or services. ASC 606 also requires additional disclosures regarding the nature, amount, timing, and uncertainty of revenues and cash flows related to contracts with customers.

ASC 606 allows two methods of adoption: (i) retrospectively to each prior period presented (“full retrospective method”), or (ii) retrospectively with the cumulative effect recognized in retained earnings as of the date of adoption (“modified retrospective method”). Effective upon the start of its first quarter of fiscal 2019, Ciena adopted ASC 606 using the modified retrospective method and accordingly recognized the cumulative effect in accumulated deficit for those contracts that were not completed as of October 31, 2018. Accordingly, results for the reporting periods after October 31, 2018 are presented under ASC 606, while prior periods have not been adjusted and continue to be reported in accordance with Ciena’s historical revenue recognition practices. Refer to *Opening Balance Adjustments* below for the impact of ASC 606 adoption on Ciena’s Consolidated Financial Statements. In connection with its adoption of ASC 606, Ciena has implemented new accounting policies and processes, and incorporated such into its existing internal control environment as necessary to support the requirements of ASC 606.

Revenue Recognition Timing Differences

The adoption of ASC 606 requires Ciena to recognize revenue when the customer obtains control of promised products or services in an amount that reflects the consideration that Ciena would expect to receive in exchange for those products or services. Under the prior revenue standard, the timing of revenue recognition for delivered products or services was limited to such amount not contingent on future delivery of products or service or future performance obligations, or subject to customer-specified return or privileges. In the case of multiple element software arrangements for which vendor-specific objective evidence of undelivered maintenance did not exist, under the prior revenue standard, Ciena recognized revenue for the entire arrangement over the maintenance term. The adoption of ASC 606 requires Ciena to determine the stand-alone selling price for each of the software and software-related deliverables of such multiple element arrangements at contract inception. Consequently, under ASC 606, certain software deliverables will be recognized at a point in time rather than over a period of time. In addition, under ASC 606, certain installation and deployment, and consulting and network design services, will be recognized over a period of time rather than at a point in time.

Impact of ASC 606 Adoption

The following table summarizes the impact of adopting ASC 606 on Ciena’s Consolidated Statement of Operations (in millions):

	Year Ended October 31, 2019		
	As Reported	Adjustments	Balances without adoption of ASC 606
Total revenue	$ 3,572,131	$ (28,838)	$ 3,543,293
Total cost of goods sold	$ 2,030,065	$ (21,330)	$ 2,008,735
Net income	$ 253,434	$ (7,776)	$ 245,658
Diluted net income per potential common share	$ 1.61	$ (0.05)	$ 1.56

During fiscal 2019, the increase in revenue from adoption of ASC 606 was primarily the result of installation and deployment services revenue that was recognized over a period of time rather than at a point in time under the prior revenue recognition standard. The adoption of ASC 606 did not have a material impact to Ciena’s Consolidated Balance Sheets or any impact on net cash provided by operating activities as of October 31, 2019. See “*Revenue Recognition Timing Differences”* above. For additional information regarding ASC 606, see Note 2 below.

Opening Balance Adjustments

The following table summarizes the cumulative effect of the changes made to Ciena's Consolidated Balance Sheets in connection with the adoption of ASC 606 (in millions):

	Balance at October 31, 2018	New Revenue Recognition Standard	Adjusted Balance at November 1, 2018
ASSETS:			
Accounts receivable, net	$ 786,502	$ 12,509 (1)	$ 799,011
Inventories	$ 262,751	(2,486) (2)	$ 260,265
Prepaid expenses and other	$ 198,945	21,470 (3)	$ 220,415
Deferred tax asset, net	$ 745,039	(14,439) (4)	$ 730,600
Other long-term assets	$ 71,652	3,998 (5)	$ 75,650
Total assets	$ 3,756,523	$ 21,052	$ 3,777,575
LIABILITIES AND STOCKHOLDERS' EQUITY:			
Deferred revenue	$ 111,134	$ (14,403) (6)	$ 96,731
Long-term deferred revenue	$ 58,323	(14,350) (7)	$ 43,973
Accumulated deficit	$ (4,947,652)	49,805 (8)	$ (4,897,847)
Total liabilities and stockholders' equity	$ 3,756,523	$ 21,052	$ 3,777,575

(1) Unpaid accounts receivable and related deferred revenue related to rights and obligations in a contract are interdependent and therefore recorded net within Ciena's balance sheet. This represents an increase of $12.5 million from the reversal of certain net unpaid accounts receivable and related deferred revenue.

(2) Represents a decrease of $2.5 million in deferred costs of goods sold due to change in revenue recognition for certain product sales.

(3) Represents increases of $27.5 million in unbilled accounts receivable for change in recognizing revenue for installation services, $3.9 million in unbilled accounts receivable from change in recognizing revenue for certain product sales and $9.6 million related to short-term capitalized acquisition costs (e.g., commissions) and a decrease of $19.5 million related to prepaid cost of installation services.

(4) Represents a decrease of $14.4 million in deferred tax asset, net, related to the unrecognized income tax effects of the net adjustments from the new revenue recognition standard.

(5) Represents an increase of $4.0 million related to long-term capitalized acquisition costs (e.g., commissions).

(6) Represents decreases of $23.6 million in deferred revenue, primarily due to a change in revenue recognition for certain multiple-element software arrangements and $1.7 million in deferred revenue, primarily due to a change in revenue recognition for certain product sales, and increases of $2.7 million for a change in revenue recognition from certain maintenance services and $8.2 million from the reversal of balance sheet netting for certain unpaid invoices included in accounts receivable, net and deferred revenue.

(7) Represents a decrease of $18.6 million in long-term deferred revenue, primarily due to a change in revenue recognition for certain multiple-element software arrangements and an increase of $4.3 million from the reversal of balance sheet netting for certain unpaid invoices included in accounts receivable, net and long-term deferred revenue.

(8) Accumulated deficit impact from the adjustments noted above.

Intangibles

In August 2018, the FASB issued ASU No. 2018-15 (*"ASU 2018-15"*), *Intangibles - Goodwill and Other-Internal-Use Software*, which aligns the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software. Ciena adopted ASU 2018-15 during the first quarter of fiscal 2019. The application of this accounting standard did not have a material impact on Ciena's Consolidated Financial Statements.

Restricted Cash in Statement of Cash Flows

In November 2016, the FASB issued ASU 2016-18 *("ASU 2016-18"), Statement of Cash Flows (Topic 230): Restricted Cash*, which broadens the classification and presentation of changes in restricted cash in the statement of cash flows. Ciena adopted ASU 2016-18 during the first quarter of fiscal 2019. The application of this accounting standard update did not have a material impact on Ciena's Consolidated Statements of Cash Flows. Prior period information has been retrospectively adjusted due to the adoption of ASU 2016-18, Statement of Cash Flows, Restricted Cash at the beginning of the first quarter of fiscal 2019.

Newly Issued Accounting Standards - Not Yet Effective

In February 2016, the FASB issued ASU No. 2016-02 *("ASU 2016-02"), Leases*, which requires an entity to recognize assets and liabilities on the balance sheet for the rights and obligations created by leased assets and to provide additional disclosures. Under current GAAP, the majority of Ciena's leases for its properties are considered operating leases, and Ciena expects that the adoption of this ASU will require these leases to be recognized as assets and liabilities on Ciena's balance sheet. ASU 2016-02 is effective for Ciena beginning in the first quarter of fiscal 2020. Ciena is continuing to evaluate other possible impacts of the adoption of ASU 2016-02 on its Consolidated Financial Statements and disclosures.

Ciena will adopt this guidance on a modified retrospective basis on its effective date, November 1, 2019. This adoption will include the election of the related practical expedients. Ciena is continuing to evaluate other possible impacts of the adoption of ASU 2016-02 on its Consolidated Financial Statements and disclosures.

In June 2016, the FASB issued ASU No. 2016-13 *("ASU 2016-13"), Financial Instruments - Credit Losses*, which requires measurement and recognition of expected credit losses for financial assets held based on historical experience, current conditions, and reasonable and supportable forecasts that affect the collectibility of the reported amount. ASU 2016-13 is effective for Ciena beginning in the first quarter of fiscal 2021 and early adoption is permitted. Ciena is currently evaluating the impact of this accounting standard update on its Consolidated Financial Statements and disclosures.

In August 2018, the FASB issued ASU No. 2018-13 (*"ASU 2018-13"*), *Fair Value Measurement (Topic 820): Disclosure Framework* which modifies the disclosure requirements on fair value measurements. ASU 2018-13 is effective for Ciena beginning in the first quarter of fiscal year 2020, early adoption is permitted. Adoption of ASU 2018-13 will not have a material effect on Ciena's financial position or results of operations.

(2) REVENUE

Disaggregation of Revenue

Ciena's disaggregated revenue represents similar groups that depict the nature, amount, and timing of revenue and cash flows for Ciena's various offerings. The sales cycle, contractual obligations, customer requirements, and go-to-market strategies may differ for each of its product categories, resulting in different economic risk profiles for each category.

The tables below (in thousands) set forth Ciena's disaggregated revenue for the respective period:

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	Year Ended October 31, 2019				
	Networking Platforms	Platform Software and Services	Blue Planet Automation Software and Services	Global Services	Total
Product lines:					
Converged Packet Optical	$ 2,562,841	$ —	$ —	$ —	$ 2,562,841
Packet Networking	348,477	—	—	—	348,477
Platform Software and Services	—	155,376	—	—	155,376
Blue Planet Automation Software and Services	—	—	54,555	—	54,555
Maintenance Support and Training	—	—	—	261,337	261,337
Installation and Deployment	—	—	—	148,233	148,233
Consulting and Network Design	—	—	—	41,312	41,312
Total revenue by product line	$ 2,911,318	$ 155,376	$ 54,555	$ 450,882	$ 3,572,131
Timing of revenue recognition:					
Products and services at a point in time	$ 2,911,318	$ 55,530	$ 17,697	$ 18,802	$ 3,003,347
Products and services transferred over time	—	99,846	36,858	432,080	568,784
Total revenue by timing of revenue recognition	$ 2,911,318	$ 155,376	$ 54,555	$ 450,882	$ 3,572,131

	Year Ended October 31, 2019
Geographic Distribution:	
North America	$ 2,351,260
EMEA	566,718
CALA	152,653
APAC	501,500
Total revenue by geographic distribution	$ 3,572,131

- *Networking Platforms* reflects sales of Ciena's Converged Packet Optical and Packet Networking product lines.
  - Converged Packet Optical - includes the 6500 Packet-Optical Platform, 5430 Reconfigurable Switching System, Waveserver® stackable interconnect system, the family of CoreDirector® Multiservice Optical Switches and the OTN configuration for the 5410 Reconfigurable Switching System. This product line also includes sales of the Z-Series Packet-Optical Platform.
  - Packet Networking - includes the 3000 family of service delivery switches and service aggregation switches and the 5000 family of service aggregation switches. This product line also includes the 8700 Packetwave Platform, the Ethernet packet configuration for the 5410 Service Aggregation Switch, and the 6500 Packet Transport System (PTS), which combines packet switching, control plane operation, and integrated optics.

  The Networking Platforms segment also includes sales of operating system software and enhanced software features embedded in each of the product lines above. Revenue from this segment is included in product revenue on the Consolidated Statements of Operations. Ciena's hardware with the embedded operating system software and enhanced software features are considered distinct performance obligations for which the revenue is generally recognized upfront at a point in time upon transfer of control.

- *Platform Software and Services* provides analytics, data, and planning tools to assist customers in managing Ciena's Networking Platforms products in their networks. Ciena's platform software includes its Manage, Control and Plan (MCP) domain controller solution, OneControl Unified Management System, ON-Center® Network and Service Management Suite, Ethernet Services Manager, Optical Suite Release and Planet Operate. Platform software-related services revenue includes sales of subscription, installation, support, and consulting services related to Ciena's software platforms, operating system software and enhanced software features embedded in each of the Networking Platforms product lines above. Revenue from the software portion of this segment is included in product revenue on

the Consolidated Statements of Operations. Revenue from services portions of this segment is included in services revenue on the Consolidated Statements of Operations.

- *Blue Planet Automation Software and Services* which is a comprehensive, open software suite that allows customers to use enhanced knowledge about their networks to drive adaptive optimization of their services and operations. Ciena's Blue Planet Automation Platform includes multi-domain service orchestration (MDSO), network function virtualization (NFV), management and orchestration (NFV MANO), analytics, network health predictor (NHP), route optimization and assurance (ROA), inventory management and Ciena's SDN Multilayer Controller and virtual wide area network (V-WAN) application. Ciena acquired the NHP and ROA software solutions as a part of its acquisition of Packet Design, LLC ("Packet Design"). Ciena acquired the inventory management software solution as a part of its acquisition of DonRiver Holdings, LLC ("DonRiver"). Services revenue includes sales of subscription, installation, support, consulting and design services related to Ciena's Blue Planet Automation Platform. Revenue from the software portion of this segment is included in product revenue on the Consolidated Statements of Operations. Revenue from services portions of this segment is included in services revenue on the Consolidated Statements of Operations.

Ciena's software platform revenue typically reflects either perpetual or term-based software licenses, and these sales are considered a distinct performance obligation where revenue is generally recognized upfront at a point in time upon transfer of control. Revenue from software subscription and support are recognized ratably over the period during which the services are performed. Revenue from professional services for solution customization, software and solution support services, consulting and design, and build-operate-transfer services relating to Ciena's software offerings are recognized over time with Ciena applying the input method to determine the amount of revenue to be recognized in a given period.

- *Global Services* reflects sales of a broad range of Ciena's services for maintenance support and training, installation and deployment, and consulting and network design activities. Revenue from this segment is included in services revenue on the Consolidated Statements of Operations.

  Ciena's Global Services are considered a distinct performance obligation where revenue is generally recognized over time. Revenue from maintenance support is recognized ratably over the period during which the services are performed. Revenue from installation and deployment services and consulting and network design services are recognized over time with Ciena applying the input method to determine the amount of revenue to be recognized in a given period. Revenue from training services is generally recognized at a point in time upon completion of the service.

Contract Balances

The following table provides information about receivables, contract assets and contract liabilities (deferred revenue) from contracts with customers (in thousands):

	Balance at October 31, 2019	Adjusted Balance at November 1, 2018
Accounts receivable, net	$ 724,854	$ 799,011
Contract assets	$ 84,046	$ 31,380
Deferred revenue	$ 156,873	$ 140,704

Our contract assets represent unbilled accounts receivable where transfer of a product or service has occurred but invoicing is conditional on completion of future performance obligations. These amounts are primarily related to installation and deployment and professional services arrangements where transfer of control has occurred but Ciena has not yet invoiced the customer. Contract assets are included in prepaid expenses and other current assets in the Consolidated Balance Sheets, see Note 10 below.

Contract liabilities consist of deferred revenue and represent advanced payments against non-cancelable customer orders received prior to revenue recognition. Ciena recognized approximately $95.1 million of revenue during fiscal 2019 that was included in the deferred revenue balance at November 1, 2018. Revenue recognized due to changes in transaction price from performance obligations satisfied or partially satisfied in previous periods was immaterial during fiscal 2019.

Capitalized Contract Acquisition Costs

Capitalized contract acquisition costs consist of deferred sales commissions and were $15.7 million and $13.6 million as of October 31, 2019 and November 1, 2018, respectively, and were included in other current assets and other assets. The amortization expense associated with these costs was $18.6 million during fiscal 2019 and was included in sales and marketing expense.

Remaining Performance Obligations

Remaining Performance Obligations ("RPO") are comprised of non-cancelable customer purchase orders for products and services that are awaiting transfer of control for revenue recognition under the applicable contract terms. As of October 31, 2019, the aggregate amount of RPO was $950.0 million. As of October 31, 2019, Ciena expects approximately 83% of the RPO to be recognized as revenue within the next twelve months.

(3) BUSINESS COMBINATIONS

DonRiver Acquisition

On October 1, 2018, Ciena acquired DonRiver, a global software and services company specializing in federated network and service inventory management solutions within the service provider Operational Support Systems (OSS) environment. This transaction has been accounted for as the acquisition of a business.

During fiscal 2019 and fiscal 2018, Ciena incurred approximately $2.4 million and $3.5 million of acquisition-related costs associated with this transaction, respectively. These costs and expenses include fees associated with financial, legal and accounting advisors and other employment-related costs, including the contingent compensation portion of the three year earn-out agreement as described below. These costs were recorded in acquisition and integration costs in the Consolidated Statement of Operations.

The following table summarizes the purchase price for the acquisition (in thousands):

		Amount
Cash	$	43,283
Contingent consideration		10,900
Total purchase price	$	54,183

The following table summarizes the final purchase price allocation related to the acquisition based on the estimated fair value of the acquired assets and assumed liabilities (in thousands):

		Amount
Cash and cash equivalents	$	1,025
Accounts receivable		4,790
Prepaid expenses and other long term assets		372
Goodwill		10,453
Customer relationships and contracts		37,700
Developed technology		9,700
Deferred revenue		(193)
Other current and long term liabilities		(9,664)
Total purchase price	$	54,183

The acquisition of DonRiver includes a $28.5 million three-year earn-out arrangement that consists of both a contingent consideration element and a contingent compensation element. The contingent consideration element requires additional cash consideration to be paid based on the future revenues generally derived from the DonRiver business over a 25-month period from the acquisition date through October 31, 2020. The undiscounted amounts potentially payable by Ciena under the contingent consideration element range from $0.0 million to $15.0 million in the aggregate over the period. Any remaining

amounts earned under the contingent consideration element are payable in the first quarters of fiscal 2020 and 2021. The $10.9 million fair value of the contingent consideration element as of the acquisition date was estimated by applying the income approach based on a discounted cash flow technique using Monte Carlo simulations. See Note 7 below. The contingent compensation element of the earn-out arrangement includes an employment condition for the selling shareholders who became employees of Ciena upon the completion of the acquisition. The range of amounts that Ciena could pay under the contingent compensation element is between $0.0 million and $13.5 million in the aggregate over the period. Any amounts earned under the contingent compensation element are payable in the first quarters of fiscal 2021 and fiscal 2022. These amounts are accrued over the period earned and recorded as expense in the acquisition and integration costs line item in the Consolidated Statement of Operations. During fiscal 2019 and fiscal 2018, Ciena recorded $5.1 million and $0.4 million, of contingent compensation associated with the earn-out arrangement, respectively.

The contingent consideration liability established at closing had an acquisition date fair value of $10.9 million. As of October 31, 2019, the fair value of the contingent consideration liability was $8.1 million. A decrease of $2.8 million was recorded as a reduction to expense in the acquisitions and integrations costs line item in the Consolidated Statement of Operations. During fiscal 2019, $4.4 million of the total contingent consideration liability was earned. This payment is due during the first quarter of fiscal 2020 and is included in accrued liabilities and other short-term obligations. The remainder of the contingent consideration liability is included in Other long-term obligations on the Consolidated Balance Sheet as of October 31, 2019.

Customer relationships and contracts represent agreements with existing DonRiver customers. Customer relationships and contracts are amortized on a straight line basis over their estimated useful life of seven years. Fair value was determined using the multi-period excess earnings method based on the present value of the incremental after-tax cash flows (or “excess earnings”) attributable to customer relationships for a discrete projection period.

Developed technology represents purchased technology that had reached technological feasibility and for which DonRiver had substantially completed development as of the date of acquisition. Fair value was determined using future discounted cash flows related to the projected income stream of the developed technology for a discrete projection period. Cash flows were discounted to their present value as of the closing date. Developed technology is amortized on a straight line basis over its estimated useful life of seven years.

The goodwill generated from the acquisition of DonRiver is primarily related to expected synergies. The total goodwill amount was recorded in the previous Software and Software-Related Services segment. The goodwill related to this acquisition is not deductible for tax purposes.

Pro forma disclosures have not been included due to immateriality.

Packet Design Acquisition

On July 2, 2018, Ciena acquired Packet Design, a provider of network performance management software focused on Layer 3 network optimization, topology and route analytics, in a cash transaction for approximately $41.1 million in cash. This transaction has been accounted for as the acquisition of a business.

During fiscal 2018, Ciena incurred approximately $1.6 million of acquisition-related costs associated with this transaction. There were minimal acquisition-related costs associated with this transaction during fiscal 2019. These costs and expenses include fees associated with financial, legal and accounting advisors and severance and other employment-related costs, including payments to certain former Packet Design employees.

The following table summarizes the final purchase price allocation related to the acquisition based on the estimated fair value of the acquired assets and assumed liabilities (in thousands):

	Amount
Cash and cash equivalents	$ 642
Accounts receivable	1,525
Prepaid expenses and other	450
Equipment, furniture and fixtures	31
Goodwill	20,304
Customer relationships and contracts	2,200
Developed technology	21,900
Accounts payable	(165)
Accrued liabilities	(657)
Deferred revenue	(5,176)
Total purchase price	$ 41,054

Customer relationships and contracts represent agreements with existing Packet Design customers. Customer relationships and contracts are amortized on a straight line basis over their estimated useful life of three years.

Developed technology represents purchased technology that had reached technological feasibility and for which Packet Design had substantially completed development as of the date of acquisition. Fair value was determined using future discounted cash flows related to the projected income stream of the developed technology for a discrete projection period. Cash flows were discounted to their present value as of the closing date. Developed technology is amortized on a straight line basis over its estimated useful life of five years.

The goodwill generated from the acquisition of Packet Design is primarily related to expected synergies. The total goodwill amount was recorded in the previous Software and Software-Related Services segment. The goodwill related to this acquisition is not deductible for tax purposes.

Pro forma disclosures have not been included due to immateriality.

(4) RESTRUCTURING COSTS

Ciena has undertaken a number of restructuring activities intended to reduce expense and better align its workforce and costs with market opportunities, product development and business strategies. The following table sets forth the restructuring activity and balance of the restructuring liability accounts for the fiscal years indicated (in thousands):

	Workforce reduction	Consolidation of excess facilities	Total
Balance at October 31, 2016	$ 868	$ 1,970	$ 2,838
Additional liability recorded	5,883 (1)	5,432 (4)	11,315
Adjustment to previous estimates	—	(1,048)	(1,048)
Cash payments	(5,460)	(4,706)	(10,166)
Balance at October 31, 2017	1,291	1,648	2,939
Additional liability recorded	14,853 (2)	3,890 (5)	18,743
Cash payments	(14,036)	(3,799)	(17,835)
Balance at October 31, 2018	2,108	1,739	3,847
Additional liability recorded	13,779 (3)	10,759 (6)	24,538
Cash payments	(11,904)	(1,338)	(13,242)
Balance at October 31, 2019	$ 3,983	$ 11,160	$ 15,143
Current restructuring liabilities	$ 3,983	$ 1,484	$ 5,467
Non-current restructuring liabilities	$ —	$ 9,676	$ 9,676

(1) During fiscal 2017, Ciena recorded a charge of $5.9 million of severance and other employee-related costs associated with a workforce reduction of approximately 100 employees.

(2) During fiscal 2018, Ciena recorded a charge of $14.9 million of severance and other employee-related costs associated with a workforce reduction of approximately 240 employees.

(3) During fiscal 2019, Ciena recorded a charge of $13.8 million of severance and other employee-related costs associated with a workforce reduction of approximately 283 employees.

(4) Reflects unfavorable lease commitments and relocation costs incurred in connection with Ciena's research and development center facility transitions in Ottawa, Canada.

(5) Reflects unfavorable lease commitments in connection with a portion of facilities located in Petaluma, California and in Gurgaon, India.

(6) Reflects unfavorable lease commitments in connection with a portion of facilities located in Alpharetta, Georgia, Spokane, Washington, Durham, North Carolina and Hanover, Maryland.

(5) INTEREST AND OTHER INCOME (LOSS), NET

The components of interest and other income (loss), net, were as follows (in thousands):

	Year Ended October 31,		
	2019	2018	2017
Interest income	$ 14,410	$ 13,703	$ 6,579
Gain (loss) on non-hedge designated foreign currency forward contracts	3	6,791	(1,198)
Foreign currency exchange losses	(9,800)	(19,434)	(4,376)
Loss on fair value of debt conversion liability	—	(12,070)	—
Other	(737)	(1,019)	(92)
Interest and other income (loss), net	$ 3,876	$ (12,029)	$ 913

Ciena Corporation, as the U.S. parent entity, uses the U.S. Dollar as its functional currency; however, some of its foreign branch offices and subsidiaries use the local currency as their functional currency. During fiscal 2019, 2018 and 2017, Ciena recorded $9.8 million, $19.4 million and $4.4 million, respectively, in exchange rate losses, as a result of monetary assets and liabilities that were transacted in a currency other than the entity's functional currency, and the re-measurement adjustments were recorded in interest and other income (loss), net. For fiscal 2019, the majority of the foreign currency exchange rate losses relate to fluctuations in the Brazilian and Argentine exchange rates. From time to time, Ciena uses foreign currency forwards to hedge these balance sheet exposures. These forwards are not designated as hedges for accounting purposes, and any net gain or loss associated with these derivatives is also reported in interest and other income (loss), net. During fiscal 2019, Ciena recorded minimal gains from non-hedge designated foreign currency forward contracts. For fiscal 2018 and fiscal 2017, Ciena recorded a gain of $6.8 million, and a loss of $1.2 million respectively, from non-hedge designated foreign currency forward contracts.

(6) SHORT-TERM AND LONG-TERM INVESTMENTS

As of October 31, 2019, investments are comprised of the following (in thousands):

	October 31, 2019			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
U.S. government obligations:				
Included in short-term investments	$ 109,715	$ 225	$ —	$ 109,940
Included in long-term investments	10,017	—	(3)	10,014
	$ 119,732	$ 225	$ (3)	$ 119,954

As of October 31, 2018, investments are comprised of the following (in thousands):

	October 31, 2018			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Value
U.S. government obligations:				
Included in short-term investments	$ 139,365	$ —	$ (347)	$ 139,018
Included in long-term investments	59,029	—	(59)	58,970
	$ 198,394	$ —	$ (406)	$ 197,988
Commercial paper:				
Included in short-term investments	$ 9,963	$ —	$ —	$ 9,963
	$ 9,963	$ —	$ —	$ 9,963

The following table summarizes the legal maturities of debt investments at October 31, 2019:

	October 31, 2019	
	Amortized Cost	Estimated Fair Value
Less than one year	$ 109,715	$ 109,940
Due in 1-2 years	10,017	10,014
	$ 119,732	$ 119,954

(7) FAIR VALUE MEASUREMENTS

As of the dates indicated, the following tables summarize the fair value of assets and liabilities that were recorded at fair value on a recurring basis (in thousands):

	October 31, 2019			
	Level 1	Level 2	Level 3	Total
Assets:				
Money market funds	$ 759,114	$ —	$ —	$ 759,114
U.S. government obligations	—	119,954	—	119,954
Foreign currency forward contracts	—	1,570	—	1,570
Total assets measured at fair value	$ 759,114	$ 121,524	$ —	$ 880,638
Liabilities:				
Foreign currency forward contracts	$ —	$ 35	$ —	$ 35
Forward starting interest rate swaps	—	21,093	—	21,093
Contingent consideration	—	—	3,705	3,705
Total liabilities measured at fair value	$ —	$ 21,128	$ 3,705	$ 24,833

	October 31, 2018			
	Level 1	Level 2	Level 3	Total
Assets:				
Money market funds	$ 590,684	$ —	$ —	$ 590,684
U.S. government obligations	—	197,988	—	197,988
Commercial paper	—	69,888	—	69,888
Foreign currency forward contracts	—	133	—	133
Forward starting interest rate swaps	—	779	—	779
Total assets measured at fair value	$ 590,684	$ 268,788	$ —	$ 859,472
Liabilities:				
Foreign currency forward contracts	$ —	$ 3,231	$ —	$ 3,231
Debt conversion liability	—	164,212	—	164,212
Contingent consideration	—	—	10,900	10,900
Total liabilities measured at fair value	$ —	$ 167,443	$ 10,900	$ 178,343

As of the dates indicated, the assets and liabilities above were presented on Ciena’s Consolidated Balance Sheet as follows (in thousands):

	October 31, 2019			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents	$ 759,114	$ —	$ —	$ 759,114
Short-term investments	—	109,940	—	109,940
Prepaid expenses and other	—	1,570	—	1,570
Long-term investments	—	10,014	—	10,014
Total assets measured at fair value	$ 759,114	$ 121,524	$ —	$ 880,638
Liabilities:				
Accrued liabilities	$ —	$ 35	$ —	$ 35
Other long-term obligations	—	21,093	3,705	24,798
Total liabilities measured at fair value	$ —	$ 21,128	$ 3,705	$ 24,833

	October 31, 2018			
	Level 1	Level 2	Level 3	Total
Assets:				
Cash equivalents	$ 590,684	$ 59,925	$ —	$ 650,609
Short-term investments	—	148,981	—	148,981
Prepaid expenses and other	—	133	—	133
Long-term investments	—	58,970	—	58,970
Other long-term assets	—	779	—	779
Total assets measured at fair value	$ 590,684	$ 268,788	$ —	$ 859,472
Liabilities:				
Accrued liabilities	$ —	$ 3,231	$ —	$ 3,231
Debt conversion liability	—	164,212	—	164,212
Other long-term obligations	—	—	10,900	10,900
Total liabilities measured at fair value	$ —	$ 167,443	$ 10,900	$ 178,343

Ciena did not have any transfers between Level 1 and Level 2 fair value measurements during the periods presented.

Ciena's Level 3 liability includes $3.7 million in other long-term obligations as of October 31, 2019. This reflects a contingent consideration element of a three-year payout arrangement associated with Ciena's purchase of DonRiver in the fourth quarter of fiscal 2018. See Note 3 above.

(8) ACCOUNTS RECEIVABLE

As of October 31, 2019, one customer accounted for 12.0% of net accounts receivable. As of October 31, 2018, one customer accounted for 10.0% of net accounts receivable. Ciena has not historically experienced a significant amount of bad debt expense. During fiscal 2017, Ciena's allowance for doubtful accounts includes a provision for a significant asset impairment of $13.7 million for a trade receivable related to a single customer in the APAC region. The following table summarizes the activity in Ciena's allowance for doubtful accounts for the fiscal years indicated (in thousands):

Year ended October 31,	Beginning Balance	Provisions	Net Deductions	Ending Balance
2017	$ 3,963	$ 18,221	$ 4,604	$ 17,580
2018	$ 17,580	$ 2,700	$ 2,902	$ 17,378
2019	$ 17,378	$ 6,740	$ 4,017	$ 20,101

(9) INVENTORIES

As of the dates indicated, inventories are comprised of the following (in thousands):

	October 31,	
	2019	2018
Raw materials	$ 99,041	$ 67,468
Work-in-process	13,657	9,589
Finished goods	226,622	188,575
Deferred cost of goods sold	53,051	48,057
	392,371	313,689
Reserve for excess and obsolescence	(47,322)	(50,938)
	$ 345,049	$ 262,751

Ciena writes down its inventory for estimated obsolescence or unmarketable inventory by an amount equal to the difference between the cost of inventory and the estimated net realizable value based on assumptions about future demand, which are affected by changes in Ciena's strategic direction, discontinuance of a product or introduction of newer versions of products, declines in the sales of or forecasted demand for certain products, and general market conditions. During fiscal 2019, fiscal 2018 and fiscal 2017, Ciena recorded a provision for excess and obsolescence of $28.1 million, $30.6 million, and $35.5 million, respectively, primarily related to the decrease in the forecasted demand for certain Converged Packet Optical products. Deductions from the provision for excess and obsolete inventory relate to disposal activities.

The following table summarizes the activity in Ciena's reserve for excess and obsolete inventory for the fiscal years indicated (in thousands):

Year ended October 31,	Beginning Balance	Provisions	Disposals	Ending Balance
2017	$ 62,503	$ 35,459	$ 46,756	$ 51,206
2018	$ 51,206	$ 30,615	$ 30,883	$ 50,938
2019	$ 50,938	$ 28,085	$ 31,701	$ 47,322

(10) PREPAID EXPENSES AND OTHER

As of the dates indicated, prepaid expenses and other are comprised of the following (in thousands):

	October 31, 2019	October 31, 2018
Prepaid VAT and other taxes	$ 84,706	$ 82,518
Contract assets	84,046	—
Prepaid expenses	48,680	32,987
Product demonstration equipment, net	38,900	37,623
Other non-trade receivables	28,136	25,716
Capitalized contract acquisition costs	11,677	—
Derivative assets	1,570	133
Deferred deployment expense	125	19,342
Restricted cash	74	—
Financing receivable	—	626
	$ 297,914	$ 198,945

Depreciation of product demonstration equipment was $8.8 million, $9.0 million and $10.0 million for fiscal 2019, 2018 and 2017, respectively.

For further discussion on contract assets and capitalized contract acquisition costs, see Note 2 above.

(11) EQUIPMENT, BUILDING, FURNITURE AND FIXTURES

As of the dates indicated, equipment, building, furniture and fixtures are comprised of the following (in thousands):

	October 31, 2019	October 31, 2018
Equipment, furniture and fixtures	$ 544,012	$ 504,714
Building subject to capital lease	71,760	71,968
Leasehold improvements	94,626	94,195
	710,398	670,877
Accumulated depreciation and amortization	(423,514)	(378,810)
	$ 286,884	$ 292,067

During fiscal 2019, fiscal 2018 and fiscal 2017, Ciena recorded depreciation of equipment, building, furniture and fixtures, and amortization of leasehold improvements of $78.8 million, $75.3 million and $67.2 million, respectively.

(12) INTANGIBLE ASSETS

As of the dates indicated, intangible assets are comprised of the following (in thousands):

	October 31,					
	2019			2018		
	Gross Intangible	Accumulated Amortization	Net Intangible	Gross Intangible	Accumulated Amortization	Net Intangible
Developed technology	$ 373,526	$ (308,261)	$ 65,265	$ 373,581	$ (285,233)	$ 88,348
Patents and licenses	3,565	(2,244)	1,321	3,565	(1,958)	1,607
Customer relationships, covenants not to compete, outstanding purchase orders and contracts	374,381	(328,186)	46,195	374,620	(316,350)	58,270
Total intangible assets	$ 751,472	$ (638,691)	$ 112,781	$ 751,766	$ (603,541)	$ 148,225

The aggregate amortization expense of intangible assets was $35.1 million, $25.8 million and $45.7 million for fiscal 2019, fiscal 2018 and fiscal 2017, respectively. Expected future amortization of intangible assets for the fiscal years indicated is as follows (in thousands):

Year Ended October 31,	
2020	$ 34,008
2021	30,830
2022	24,809
2023	10,000
2024	6,948
Thereafter	6,186
	$ 112,781

(13) GOODWILL

During fiscal 2019, Ciena separated its previous Software and Software-Related Services segment into two stand-alone operating segments: Blue Planet Automation Software and Services and Platform Software and Services. Ciena was required to separate this operating segment as a result of an internal realignment to support its corporate strategy to further promote customer adoption of its Blue Planet Automation Software and Services, and corresponding changes by management to the evaluation of resource allocation for and measurement of performance of this business. Accordingly, as of the end of fiscal 2019, for reporting purposes, our results of operations are presented based on the following operating segments: (i) Networking Platforms; (ii) Platform Software and Services; (iii) Blue Planet Automation Software and Services; and (iv) Global Services.

As a result of the separation of Platform Software and Services and Blue Planet Automation Software and Services into separate operating segments, Ciena allocated the $232.2 million of goodwill previously allocated to the combined Software and Software Related-Services segment to the two separate operating segments based on each operating segments relative fair value using a discounted cash flow model. The following table presents the goodwill allocated to Ciena's operating segments as of October 31, 2019 and October 31, 2018, as well as the changes to goodwill during fiscal 2019 (in thousands):

	Balance at October 31, 2018	Reallocation	Acquisitions	Impairments	Translation	Balance at October 31, 2019
Software and Software Related Services	$ 232,185	$ (232,185)	$ —	$ —	$ —	$ —
Platform Software and Services	—	156,191	—	—	—	156,191
Blue Planet Automation Software and Services	—	75,994	—	—	—	75,994
Networking Platforms	65,783	—	—	—	(31)	65,752
Total	$ 297,968	$ —	$ —	$ —	$ (31)	$ 297,937

(14) OTHER BALANCE SHEET DETAILS

As of the dates indicated, other long-term assets are comprised of the following (in thousands):

	October 31,	
	2019	2018
Maintenance spares inventory, net	$ 55,482	$ 45,679
Cost method investments	10,727	8,056
Capitalized contract acquisition costs	3,994	—
Deferred debt issuance costs, net [1]	1,609	720
Restricted cash	42	11
Forward starting interest rate swaps	—	779
Other	17,132	16,407
	$ 88,986	$ 71,652

[1] Deferred debt issuance costs relate to Ciena's senior secured asset-based revolving credit facility (the "ABL Credit Facility") entered into during fiscal 2019 and its predecessor credit facility (described in Note 18 below). The amortization of deferred debt issuance costs for the ABL Credit Facility and its predecessor is included in interest expense, and was $0.3 million, $0.3 million and $0.3 million for fiscal 2019, fiscal 2018 and fiscal 2017, respectively.

As of the dates indicated, accrued liabilities and other short-term obligations are comprised of the following (in thousands):

	October 31,	
	2019	2018
Compensation, payroll related tax and benefits	$ 182,363	$ 140,277
Warranty	48,498	44,740
Vacation [1]	22,290	42,507
Contingent Consideration	4,372	—
Capital lease obligations	2,764	3,547
Interest payable	1,007	1,072
Other	121,446	107,932
	$ 382,740	$ 340,075

[1] Reduction is primarily due to the payout of North America vacation accruals in conjunction with Ciena's adoption of a new vacation policy during fiscal 2019.

The following table summarizes the activity in Ciena's accrued warranty for the fiscal years indicated (in thousands):

Year ended October 31,	Beginning Balance	Current Year Provisions [1]	Settlements	Ending Balance
2017	$ 52,324	$ 7,965	$ 17,833	$ 42,456
2018	$ 42,456	$ 20,992	$ 18,708	$ 44,740
2019	$ 44,740	$ 23,105	$ 19,347	$ 48,498

[1] As a result of actual failure rates lower than expected, Ciena adjusted its fiscal 2017 provisions for warranty. These adjustments for previous fiscal year provisions had the effect of reducing warranty provisions by $9.7 million for fiscal 2017. During fiscal 2018 and fiscal 2019, Ciena determined that failure rates for prior estimates remained unchanged, and accordingly did not make any adjustments for previous fiscal year provisions not yet settled. As a result, Ciena's warranty provision for fiscal 2018 and fiscal 2019 increased as compared to fiscal 2017.

As of the dates indicated, deferred revenue is comprised of the following (in thousands):

	October 31,	
	2019	2018
Products	$ 27,366	$ 42,474
Services	129,507	126,983
	156,873	169,457
Less current portion	(111,381)	(111,134)
Long-term deferred revenue	$ 45,492	$ 58,323

As of the dates indicated, other long-term obligations are comprised of the following (in thousands):

	October 31,	
	2019	2018
Capital lease obligations	$ 65,284	$ 68,245
Income tax liability	20,546	15,894
Interest rate swap liability	21,093	—
Deferred tenant allowance	6,248	7,244
Straight-line rent	5,434	6,750
Contingent consideration	3,705	10,900
Other	26,437	10,380
	$ 148,747	$ 119,413

The following is a schedule by fiscal years of future minimum lease payments under capital leases and the present value of minimum lease payments as of October 31, 2019 (in thousands):

Year Ending October 31,	Amount
2020	$ 7,652
2021	7,547
2022	7,860
2023	8,067
2024	8,067
Thereafter	67,126
Net minimum capital lease payments	106,319
Less: Amount representing interest	(38,271)
Present value of minimum lease payments	68,048
Less: Current portion of present value of minimum lease payments	(2,764)
Long-term portion of present value of minimum lease payments	$ 65,284

(15) DERIVATIVE INSTRUMENTS

Foreign Currency Derivatives

During fiscal 2019 and fiscal 2018, Ciena entered into forward contracts to hedge its foreign exchange exposure from its forecasted cash flows in order to reduce the variability in its Canadian Dollar and Indian Rupee denominated expense, which principally relates to research and development activities. The notional amount of these contracts was approximately $197.4 million and $163.2 million as of October 31, 2019 and October 31, 2018, respectively. These foreign exchange contracts have maturities of 24 months or less and have been designated as cash flow hedges.

During fiscal 2019 and fiscal 2018, in order to hedge its foreign exchange exposure from certain balance sheet items, Ciena entered into forward contracts to mitigate risk due to volatility in the Brazilian Real, Canadian Dollar, Euro, Australian Dollar,

British Pound Sterling, Mexican Peso, and Japanese Yen. The notional amount of these contracts was approximately $206.0 million and $162.6 million as of October 31, 2019 and October 31, 2018. These foreign exchange contracts have maturities of 12 months or less and have not been designated as hedges for accounting purposes.

Interest Rate Derivatives

Ciena is exposed to floating rates of LIBOR interest on its term loan borrowings (see Note 17 below) and has hedged such risk by entering into floating to fixed interest rate swap arrangements (“interest rate swaps”). During the fourth quarter of fiscal 2018, Ciena refinanced its previous term loan in the aggregate principal amount of $394.0 million, maturing on January 30, 2022 (the “2022 Term Loan”), into a new term loan due September 28, 2025 (the “2025 Term Loan”), increasing the aggregate outstanding principal to $700.0 million and extending the maturity to September 2025 (see Note 17 below). In conjunction with the refinancing, Ciena unwound its then-existing interest rate swaps for a cash gain of $6.8 million, which was recorded in Other Comprehensive Income, and entered into new floating-to-fixed interest rate swaps. The interest rate swaps fix the LIBOR rate of approximately $350.0 million of the principal amount of the 2025 Term Loan at 2.957% through September 2023. The total notional amount of these interest rate swaps in effect as of October 31, 2019 was $350.0 million.

Ciena expects the variable rate payments to be received under the terms of the interest rate swaps to offset exactly the forecasted variable rate payments on the equivalent notional amounts of the term loan. These derivative contracts have been designated as cash flow hedges.

Other information regarding Ciena’s derivatives is immaterial for separate financial statement presentation. See Notes 5 and 7 above.

Debt Conversion Liability Associated With the New Notes

The New Notes provided Ciena the option, at its election, to settle conversions of such notes for cash, shares of its common stock, or a combination of cash and shares equal to the aggregate amount due upon conversion. On August 30, 2018, Ciena notified the noteholders that it had elected to settle conversion of the New Notes in a combination of cash and shares, provided that the cash portion would not exceed an aggregate amount of $400.0 million. Ciena became obligated to settle a portion of the conversion feature in cash and reclassified the cash conversion feature from equity to a derivative liability at its current fair value of $152.1 million. As of October 31, 2018, Ciena recorded a loss of approximately $12.1 million related to the change in fair value of the embedded conversion feature. On November 15, 2018, Ciena paid approximately $111.3 million in cash and issued 1.6 million shares in settlement of this embedded conversion feature.

(16) ACCUMULATED OTHER COMPREHENSIVE INCOME

The following table summarizes the changes in accumulated balances of other comprehensive income ("AOCI"):

	Unrealized Gain/(Loss) on Available-for-Sale Securities	Unrealized Gain/(Loss) on Foreign Currency Forward Contracts	Unrealized Gain/(Loss) on Forward Starting Interest Rate Swaps	Cumulative Foreign Currency Translation Adjustment	Total
Balance at October 31, 2016	$ 139	$ (1,091)	$ (5,967)	$ (17,410)	$ (24,329)
Other comprehensive gain (loss) before reclassifications	(590)	1,290	3,669	8,012	12,381
Amounts reclassified from AOCI	—	(1,585)	2,516	—	931
Balance at October 31, 2017	(451)	(1,386)	218	(9,398)	(11,017)
Other comprehensive gain (loss) before reclassifications	26	(3,242)	6,011	686	3,481
Amounts reclassified from AOCI	—	1,568	188	—	1,756
Balance at October 31, 2018	(425)	(3,060)	6,417	(8,712)	(5,780)
Other comprehensive gain (loss) before reclassifications	577	14	(18,948)	(763)	(19,120)
Amounts reclassified from AOCI	—	3,971	(1,155)	—	2,816
Balance at October 31, 2019	$ 152	$ 925	$ (13,686)	$ (9,475)	$ (22,084)

All amounts reclassified from AOCI related to settlement (gains) losses on foreign currency forward contracts designated as cash flow hedges impacted revenue, research and development expense or sales and marketing expense on the Consolidated Statements of Operations. All amounts reclassified from AOCI related to settlement (gains) losses on forward starting interest rate swaps designated as cash flow hedges impacted interest and other income (loss), net on the Consolidated Statements of Operations.

(17) SHORT-TERM AND LONG-TERM DEBT

2025 Term Loan

The net carrying values of Ciena's term loan were comprised of the following for the fiscal periods indicated (in thousands):

	October 31, 2019				October 31, 2018
	Principal Balance	Unamortized Discount	Deferred Debt Issuance Costs	Net Carrying Value	Net Carrying Value
Term Loan Payable due September 28, 2025	$ 693,000	$ (1,958)	$ (3,636)	$ 687,406	$ 693,450

Deferred debt issuance costs deducted from the carrying amount of the term loan totaled $3.6 million at October 31, 2019 and $4.3 million at October 31, 2018. Deferred debt issuance costs are amortized using the straight-line method, which approximates the effect of the effective interest rate method, through the maturity of the term loan. The amortization of deferred debt issuance costs for this term loan is included in interest expense, and was $0.6 million and $0.7 million during fiscal 2019 and fiscal 2018, respectively.

As of October 31, 2019, the estimated fair value of the term loan was $694.7 million. Ciena's term loan is categorized as Level 2 in the fair value hierarchy. Ciena estimated the fair value of its term loan using a market approach based on observable inputs, such as current market transactions involving comparable securities.

On September 28, 2018, Ciena, as borrower, and Ciena Communications, Inc. and Ciena Government Solutions, Inc., as guarantors, entered into an Increase Joinder and Refinancing Amendment to Credit Agreement with the lenders party thereto and the Administrative Agent (the "Refinancing Agreement"), pursuant to which Ciena refinanced its the 2022 Term Loan into the 2025 Term Loan. In connection with the transaction, Ciena received a loan in the amount of $699.1 million, net of original discount, from the 2025 Term Loan and simultaneously repaid $394.0 million of outstanding principal under the 2022 Term Loan, resulting in proceeds of $305.1 million. The 2025 Term Loan requires Ciena to make installment payments of $1.75 million on a quarterly basis. Based on the continuation of existing lenders and the addition of new lenders, this arrangement was primarily accounted for as a modification of debt and, as such, $3.8 million of debt issuance costs associated with the 2025 Term Loan were expensed. The aggregate balance of $2.4 million of debt issuance costs and approximately $1.4 million of original discount from the 2022 Term Loan, $1.9 million of debt issuance costs associated with new lenders for the 2025 Term Loan, and approximately $0.9 million of original discount from the 2025 Term Loan, were included in the carrying value of the 2025 Term Loan.

The Refinancing Agreement amends Ciena's credit agreement, dated July 15, 2014, as amended (the "Credit Agreement") and provides that the 2025 Term Loan will, among other things:

- amortize in equal quarterly installments in aggregate amounts equal to 0.25% of the principal amount of the 2025 Term Loan as of September 28, 2018, with the balance payable at maturity;
- be subject to mandatory prepayment provisions upon the occurrence of certain specified events substantially similar to the 2022 Term Loan, including certain asset sales, debt issuances and receipt of annual Excess Cash Flow (as defined in the Credit Agreement);
- bear interest, at Ciena's election, at a per annum rate equal to (a) LIBOR (subject to a floor of 0.00%) plus an applicable margin of 2.00%, or (b) a base rate (subject to a floor of 1.00%) plus an applicable margin of 1.00%; and
- be repayable at any time at Ciena's election, provided that repayment of the 2025 Term Loan with proceeds of certain indebtedness prior to March 28, 2019 will require a prepayment premium of 1.00% of the aggregate principal amount of such prepayment.

(18) ABL CREDIT FACILITY

Ciena Corporation and certain of its subsidiaries are parties to the ABL Credit Facility, which provides for a total commitment of $300 million with a maturity date of October 28, 2024. The ABL Credit Facility was entered into on October 28, 2019 and replaced a predecessor senior secured asset-based revolving credit facility. Ciena principally uses the ABL Credit Facility to support the issuance of letters of credit that arise in the ordinary course of its business and thereby to reduce its use of cash required to collateralize these instruments.

As of October 31, 2019, letters of credit totaling $72.9 million were outstanding under the ABL Credit Facility. There were no borrowings outstanding under the ABL Credit Facility as of October 31, 2019.

(19) EARNINGS (LOSS) PER SHARE CALCULATION

The following tables (in thousands except per share amounts) show a reconciliation of the numerator and denominator of the Basic EPS and the Diluted EPS. Basic EPS is computed using the weighted average number of common shares outstanding. Diluted EPS is computed using the weighted average number of the following, in each case, to the extent the effect is not anti-dilutive: (i) common shares outstanding, (ii) shares issuable upon vesting of restricted stock units and (iii) shares issuable under Ciena's employee stock purchase plan and upon exercise of outstanding stock options, using the treasury stock method.

Numerator

	Year Ended October 31,		
	2019	2018	2017
Net income (loss)	$ 253,434	$ (344,690)	$ 1,261,953
Less: Loss on fair value of debt conversion liability		(12,894)	—
Add: Interest expense associated with 0.875% Convertible Senior Notes due 2017	—	—	853
Add: Interest expense associated with 3.75% Convertible Senior Notes due 2018 (Original Notes)	—	—	7,224
Add: Interest expense associated with 4.0% Convertible Senior Notes due 2020	—	—	8,691
Net income (loss) used to calculate Diluted EPS	$ 253,434	$ (357,584)	$ 1,278,721

Denominator

	Year Ended October 31,		
	2019	2018	2017
Basic weighted average shares outstanding	155,720	143,738	141,997
Add: Shares underlying outstanding stock options, employee stock purchase plan and restricted stock units	1,892	—	1,354
Add: Shares underlying 3.75% Convertible Senior Notes due 2018 (New Notes)	—	—	404
Add: Shares underlying 0.875% Convertible Senior Notes due 2017	—	—	3,032
Add: Shares underlying 3.75% Convertible Senior Notes due 2018 (Original Notes)	—	—	13,934
Add: Shares underlying 4.0% Convertible Senior Notes due 2020	—	—	9,198
Diluted weighted average shares outstanding	157,612	143,738	169,919

EPS

	Year Ended October 31,		
	2019	2018	2017
Basic EPS	$ 1.63	$ (2.40)	$ 8.89
Diluted EPS	$ 1.61	$ (2.49)	$ 7.53

The following table summarizes the weighted average shares excluded from the calculation of the denominator for Diluted EPS due to their anti-dilutive effect for the fiscal years indicated (in thousands):

	Year Ended October 31,		
	2019	2018	2017
Shares underlying stock options and restricted stock units	234	2,235	958
Add: Shares underlying 3.75% Convertible Senior Notes due 2018 (New Notes)	—	1,780 —	—
3.75% Convertible Senior Notes due October 15, 2018 (Original Notes)	—	2,883	—
4.0% Convertible Senior Notes due December 15, 2020	—	9,123	—
Total shares excluded due to anti-dilutive effect	234	16,021	958

(20) STOCKHOLDERS' EQUITY

Stock Repurchase Program

On December 13, 2018, Ciena announced that its Board of Directors authorized a program to repurchase up to $500 million of Ciena's common stock. The amount and timing of repurchases are subject to a variety of factors including liquidity,

cash flow, stock price, and general business and market conditions. The program may be modified, suspended, or discontinued at any time.

The following table summarizes activity of the stock repurchase program, reported based on trade date:

	Shares Repurchased	Weighted-Average Price per Share	Amount Repurchased (in thousands)
Cumulative balance at October 31, 2018	—	$ —	$ —
Repurchase of common stock under the stock repurchase program	3,838,466	$ 39.10	150,076
Cumulative balance at October 31, 2019	3,838,466	$ 39.10	$ 150,076

The purchase price for the shares of Ciena's stock repurchased is reflected as a reduction of common stock and additional paid-in capital.

Stock Repurchases Related to Restricted Stock Unit Tax Withholdings

Ciena repurchases shares of common stock to satisfy employee tax withholding obligations due upon vesting of stock unit awards. The purchase price of $29.1 million for the shares of Ciena's stock repurchased is reflected as a reduction to stockholders' equity. Ciena is required to allocate the purchase price of the repurchased shares as a reduction of common stock and additional paid-in capital.

(21) INCOME TAXES

For the fiscal periods indicated, the provision (benefit) for income taxes consists of the following (in thousands):

	Year Ended October 31,		
	2019	2018	2017
Provision (benefit) for income taxes:			
Current:			
Federal	$ 13,143	$ 8,327	$ —
State	16,945	8,219	6,342
Foreign	9,816	13,294	14,563
Total current	39,904	29,840	20,905
Deferred:			
Federal	31,872	475,951 (1)	(1,047,699) (1)
State	(9,159)	(8,202)	(77,429) (1)
Foreign	(2,861)	(4,118)	(1,604)
Total deferred	19,852	463,631	(1,126,732)
Provision (benefit) for income taxes	$ 59,756	$ 493,471	$ (1,105,827)

(1) The income tax expense for 2018 includes the impact of the remeasurement of the net deferred tax assets and the federal transition tax. See further discussion below. The income tax benefit for fiscal 2017 includes the reversal of a significant portion of the valuation allowance on Ciena's deferred tax assets in the U.S.

For the fiscal periods indicated, income before provision for income taxes consists of the following (in thousands):

	Year Ended October 31,		
	2019	2018	2017
United States	$ 256,461	$ 106,972	$ 114,242
Foreign	56,729	41,809	41,884
Total	$ 313,190	$ 148,781	$ 156,126

Ciena's foreign income tax as a percentage of foreign income may appear disproportionate compared to the expected tax based on the U.S. federal statutory rate and is dependent on the mix of earnings and tax rates in foreign jurisdictions.

For the periods indicated, the tax provision (benefit) reconciles to the amount computed by multiplying income before income taxes by the U.S. federal statutory rate of 21% for fiscal 2019, 23.41% for fiscal 2018 (see note below), and 35% for fiscal 2017 as follows:

	Year Ended October 31,		
	2019	2018	2017
Provision at statutory rate	21.00 %	23.41 %	35.00 %
Deferred tax assets remeasurement	— %	294.56 %	— %
Base Erosion and Anti-Abuse Tax	3.60 %	— %	— %
State taxes	2.18 %	(0.16)%	2.29 %
Foreign taxes	(0.37)%	1.22 %	(0.35)%
Research and development credit	(7.53)%	(8.80)%	(15.38)%
Non-deductible compensation	1.01 %	3.39 %	3.45 %
Fair value of debt conversion liability	— %	1.90 %	— %
Transition tax	0.29 %	23.23 %	— %
Valuation allowance	(2.13)%	(11.95)%	(739.97)%
Other	1.03 %	4.88 %	6.67 %
Effective income tax rate	19.08 %	331.68 %	(708.29)%

On December 22, 2017, the Tax Act was enacted. The Tax Act significantly revises the U.S. corporate income tax by, among other things, lowering the statutory corporate income tax rate (“federal tax rate”) from 35% to 21% effective January 1, 2018, implementing a modified territorial tax system, and imposing a mandatory one-time transition tax on accumulated earnings of foreign subsidiaries.

As a result of the decrease in the federal tax rate from 35% to 21% effective January 1, 2018, Ciena computed its income tax expense for the October 31, 2018 fiscal year using a blended federal tax rate of 23.41%. Ciena remeasured its DTA using the federal tax rate that will apply when the related temporary differences are expected to reverse.

In December 2017, the SEC issued Staff Accounting Bulletin No. 118, which addresses how a company recognizes provisional amounts when it does not have the necessary information available, prepared or analyzed (including computations) in reasonable detail to complete its accounting for the effect of the changes due to the Tax Act. The measurement period ends when a company has obtained, prepared and analyzed the information necessary to finalize its accounting, but cannot extend beyond one year. The final impact of the Tax Act may differ from the above amounts to the extent they are provisional due to changes in interpretations of the Tax Act, legislative action to address questions that arise because of the Tax Act, changes in accounting standards for income taxes and related interpretations in response to the Tax Act, and any updates or changes to estimates used in the provisional amounts. The enactment of the Tax Act resulted in Ciena recording a provisional tax expense of $472.8 million in fiscal 2018. In the first quarter of fiscal 2019, the measurement period under the Tax Act concluded, which resulted in immaterial adjustments to our provisional estimates.

Ciena is also required to make accounting policy elections as a result of the Tax Act. These include whether a valuation allowance is recorded for the estimated effect of the application of GILTI and BEAT or if these will be treated as period costs when incurred. Ciena had made the incremental cash tax cost policy election with respect to analyzing the impact of GILTI on the assessment of the realizability of net operating losses. Ciena’s analysis of the new BEAT rules, as well as the very recent regulatory guidance and how they may impact the company, continue to progress. The realizability of U.S. tax carryforwards is not impacted by the BEAT, and the BEAT is a period cost when incurred. Ciena is also required to elect to either treat taxes due on future GILTI inclusions in U.S. taxable income as a current period expense when incurred or reflect such portion of the future GILTI inclusions in U.S. taxable income that relate to existing basis differences in Ciena’s current measurement of deferred taxes. Ciena’s accounting policy election is to treat the taxes due on future U.S. inclusions in taxable income under GILTI as a period cost when incurred.

The significant components of DTA are as follows (in thousands):

	October 31,	
	2019	2018
Deferred tax assets:		
Reserves and accrued liabilities	$ 54,183	$ 40,959
Depreciation and amortization	455,007	353,838
NOL and credit carry forward	302,325	483,495
Other	39,405	9,397
Gross deferred tax assets	850,920	887,689
Valuation allowance	(135,978)	(142,650)
Deferred tax asset, net of valuation allowance	$ 714,942	$ 745,039

A reconciliation of the beginning and ending amount of unrecognized tax benefits, excluding interest and penalties, is as follows (in thousands):

	Amount
Unrecognized tax benefits at October 31, 2016	$ 30,668
Increase related to positions taken in prior period	122
Increase related to positions taken in current period	111,412
Reductions related to expiration of statute of limitations	(620)
Unrecognized tax benefits at October 31, 2017	141,582
Decrease related to positions taken in prior period	(46,400)
Increase related to positions taken in current period	2,482
Reductions related to expiration of statute of limitations	(1,301)
Unrecognized tax benefits at October 31, 2018	96,363
Increase related to positions taken in prior period	1,959
Reductions related to settlements with taxing authorities	(1,224)
Reductions related to expiration of statute of limitations	(2,494)
Unrecognized tax benefits at October 31, 2019	$ 94,604

As of October 31, 2019 and 2018, Ciena had accrued $3.0 million and $3.5 million of interest and penalties, respectively, related to unrecognized tax benefits within other long-term liabilities in the Consolidated Balance Sheets. Interest and penalties of $1.0 million and $0.6 million were recorded as a net benefit to the provision for income taxes during fiscal 2019 and fiscal 2017, respectively. During fiscal 2019, Ciena recorded a net benefit primarily as a result of a settlement with a taxing authority. During fiscal 2017, Ciena recorded a net benefit primarily as a result of recognizing a portion of previously unrecognized tax benefits. During fiscal 2018, Ciena recorded a provision for interest and penalties in its provision for income taxes of $1.1 million. If recognized, the entire balance of unrecognized tax benefits would impact the effective tax rate. Over the next 12 months, Ciena does not estimate any material changes in unrecognized income tax benefits.

Ciena has not provided for U.S. deferred income taxes on the cumulative unremitted earnings of its non-U.S. affiliates, as it plans to indefinitely reinvest these foreign earnings outside the U.S. As of October 31, 2019, the cumulative amount of such temporary differences for which a deferred tax liability has not been recognized is an estimated $372.0 million. If these earnings were distributed to the U.S., Ciena would be subject to additional foreign withholding taxes of approximately $31.0 million. Additionally, there are no other significant temporary differences for which a deferred tax liability has not been recognized.

As of October 31, 2019, Ciena continues to maintain a valuation allowance against net deferred tax assets of $136.0 million primarily related to state and foreign net operating losses and credits that Ciena estimates it will not be able to use.

The following table summarizes the activity in Ciena's valuation allowance against its gross deferred tax assets (in thousands):

Year ended October 31,		Beginning Balance		Additions		Deductions		Ending Balance
2017	$	1,489,780	$	—	$	1,303,882	$	185,898
2018	$	185,898	$	23,720	$	66,968	$	142,650
2019	$	142,650	$	27,459	$	34,131	$	135,978

As of October 31, 2019, Ciena had a $391.0 million net operating loss carry forward and a $62.0 million income tax credit carry forward which begin to expire in fiscal 2029 and fiscal 2021, respectively. Ciena's ability to use net operating losses and credit carry forwards is subject to limitations pursuant to the ownership change rules of the Internal Revenue Code Section 382.

Ciena adopted ASU 2016-09, *Improvements to Employee Share-Based Payment Accounting,* in the first quarter of fiscal 2018. In connection with the adoption of this guidance, Ciena recognized approximately $62.1 million of deferred tax assets related to previously unrecognized tax benefits. This was recorded as a cumulative-effect adjustment to retained earnings as of the beginning of the first quarter of fiscal 2018.

(22) SHARE-BASED COMPENSATION EXPENSE

Ciena has outstanding equity awards issued under its 2017 Omnibus Incentive Plan (the "2017 Plan"), its 2008 Omnibus Incentive Plan, and certain legacy equity plans and equity plans assumed as a result of previous acquisitions. All equity awards granted on or after March 23, 2017 are made exclusively from the 2017 Plan. Ciena also makes shares of its common stock available for purchase under its Amended and Restated 2003 Employee Stock Purchase Plan (the "ESPP"). Each of the 2017 Plan and the ESPP are described below.

2017 Plan

The 2017 Plan has a ten-year term and authorizes the issuance of awards including stock options, restricted stock units (RSUs), restricted stock, unrestricted stock, stock appreciation rights (SARs) and other equity and/or cash performance incentive awards to employees, directors and consultants of Ciena. Subject to certain restrictions, the Compensation Committee of the Board of Directors has broad discretion to establish the terms and conditions for awards under the 2017 Plan, including the number of shares, vesting conditions, and the required service or performance criteria. Options and SARs have a maximum term of ten years, and their exercise price may not be less than 100% of fair market value on the date of grant. Repricing of stock options and SARs is prohibited without stockholder approval. Certain change in control transactions may cause awards granted under the 2017 Plan to vest, unless the awards are continued or substituted for in connection with the transaction.

The 2017 Plan authorizes and reserves 8.9 million shares for issuance. In addition, any shares that remained available for issuance under the 2008 Plan as of March 23, 2017 were added to the 2017 Plan and are available for issuance thereunder. The number of shares available under the 2017 Plan will also be increased from time to time by: (i) the number of shares subject to outstanding awards granted under Ciena's prior equity compensation plans that are forfeited, expire or are canceled without delivery of common stock following the effective date of the 2017 Plan, and (ii) the number of shares subject to awards assumed or substituted in connection with the acquisition of another company. As of October 31, 2019, the total number of shares authorized for issuance under the 2017 Plan is 8.9 million and approximately 5.0 million shares remained available for issuance thereunder.

Stock Options

There were no stock options granted by Ciena during fiscal 2019, fiscal 2018 or fiscal 2017. Outstanding stock option awards granted to employees in prior periods are generally subject to service-based vesting conditions and vest over a four-year period. The following table is a summary of Ciena's stock option activity for the periods indicated (shares in thousands):

	Shares Underlying Options Outstanding		Weighted Average Exercise Price
Balance as of October 31, 2018	276	$	33.52
Granted	—		—
Exercised	(50)	$	24.13
Canceled	(6)	$	37.03
Balance as of October 31, 2019	220	$	35.54

The total intrinsic value of options exercised during fiscal 2019, fiscal 2018 and fiscal 2017 was $0.8 million, $2.2 million and $3.1 million, respectively.

The following table summarizes information with respect to stock options outstanding at October 31, 2019, based on Ciena's closing stock price on the last trading day of Ciena's fiscal 2019 (shares and intrinsic value in thousands):

Range of Exercise Price			Options Outstanding and Vested at October 31, 2019			
			Number of Underlying Shares	Weighted Average Remaining Contractual Life (Years)	Weighted Average Exercise Price	Aggregate Intrinsic Value
$ 6.43	—	$ 10.50	4	0.81	$ 8.42	$ 117
$ 11.34	—	$ 15.67	49	2.79	$ 13.51	1,123
$ 17.50	—	$ 19.25	11	4.6	$ 18.17	202
$ 32.06	—	$ 37.10	31	3.27	$ 36.04	28
$ 41.52	—	$ 55.63	125	3.48	$ 46.47	—
$ 6.43	—	$ 55.63	220	3.30	$ 35.54	$ 1,470

Assumptions for Option-Based Awards

Ciena recognizes the fair value of stock options as share-based compensation expense on a straight-line basis over the requisite service period. Ciena did not grant any option-based awards during fiscal 2019, fiscal 2018, or fiscal 2017.

Restricted Stock Units

A restricted stock unit is a stock award that entitles the holder to receive shares of Ciena common stock as the unit vests. Ciena's outstanding restricted stock unit awards are subject to service-based vesting conditions and/or performance-based vesting conditions. Awards subject to service-based conditions typically vest in increments over a three or four-year period. However, the 2017 Plan permits Ciena to grant service-based stock awards with a minimum one-year vesting period. Awards with performance-based vesting conditions (i) require the achievement of certain operational, financial or other performance criteria or targets or (ii) vest based on Ciena's total shareholder return as compared to an index of peer companies, in whole or in part.

Assumptions for Restricted Stock Unit Awards

Ciena recognizes the estimated fair value of performance-based awards as share-based compensation expense over the performance period, using graded vesting, which considers each performance period or tranche separately, based on Ciena's determination of whether it is probable that the performance targets will be achieved. At the end of each reporting period, Ciena reassesses the probability of achieving the performance targets and the performance period required to meet those targets.

Ciena recognizes the estimated fair value of restricted stock units subject only to service-based vesting conditions by multiplying the number of shares underlying the award by the closing price per share of Ciena common stock on the grant date. Ciena recognizes the estimated fair value of restricted stock units subject to performance-based vesting conditions other than total shareholder return by assuming the satisfaction of any performance-based objectives at the "target" level and multiplying the corresponding number of shares earned based upon such achievement by the closing price per share of Ciena common stock on the grant date.

Ciena recognizes the estimated fair value of performance based awards subject to total shareholder return as compared to an index of peer companies using a Monte Carlo simulation valuation model. Assumptions for awards granted during fiscal 2019 and fiscal 2018 included the following:

	Year Ended October 31,	
	2019	2018
Expected volatility of Ciena common stock, which is a weighted average of implied volatility and historical volatility	34.10%	34.93%
Historical volatility of Ciena common stock	36.80%	38.24%
Historical volatility of S&P Networking Index	17.39%	17.14%
Correlation coefficient	0.6251	0.6597
Expected life in years	2.87	2.89
Risk-free interest rate	2.62%	1.94%
Expected dividend yield	0.0%	0.0%

The following table is a summary of Ciena's restricted stock unit activity for the period indicated, with the aggregate fair value of the balance outstanding at the end of each period, based on Ciena's closing stock price on the last trading day of the relevant period (shares and aggregate fair value in thousands):

	Restricted Stock Units Outstanding	Weighted Average Grant Date Fair Value Per Share	Aggregate Fair Value
Balance as of October 31, 2018	4,402	$ 22.26	$ 140,943
Granted	2,057		
Vested	(2,101)		
Canceled or forfeited	(348)		
Balance as of October 31, 2019	4,010	$ 27.94	$ 146,091

As of October 31, 2019 and 2018, 0.3 million and 0.2 million of the total restricted stock units outstanding are performance based awards subject to total shareholder return, respectively. The total fair value of restricted stock units that vested and were converted into common stock during fiscal 2019, fiscal 2018 and fiscal 2017 was $79.2 million, $54.3 million and $49.5 million, respectively. The weighted average fair value of each restricted stock unit granted by Ciena during fiscal 2019, fiscal 2018 and fiscal 2017 was $34.53, $22.46 and $23.29, respectively.

The fair value of each restricted stock unit award is based on the closing price on the date of grant. Share-based expense for service-based restricted stock unit awards is recognized ratably over the vesting period on a straight-line basis.

Share-based expense for performance-based restricted stock unit awards is recognized ratably over the performance period based on Ciena's determination of whether it is probable that the performance targets will be achieved. At each reporting period, Ciena reassesses the probability of achieving the performance targets and the performance period required to meet those targets. The estimation of whether the performance targets will be achieved involves judgment, and the estimate of expense is revised periodically based on the probability of achieving the performance targets. Revisions are reflected in the period in which the estimate is changed. If any performance goals are not met, no compensation cost is ultimately recognized against that goal and, to the extent previously recognized, compensation expense is reversed.

Share-based compensation expense is recognized only for those awards that are ultimately expected to vest. In the event of a forfeiture of an award, the expense related to the unvested portion of that award is reversed. Reversal of share-based compensation expense based on forfeitures can materially affect the measurement of estimated fair value of Ciena's share-based compensation.

Amended and Restated ESPP

Under the ESPP, eligible employees may enroll in a twelve-month offer period that begins in December and June of each year. Each offer period includes two six-month purchase periods. Employees may purchase a limited number of shares of Ciena common stock at 85% of the fair market value on either the day immediately preceding the offer date or the purchase date, whichever is lower. The ESPP is considered compensatory for purposes of share-based compensation expense. Pursuant to the ESPP's "evergreen" provision, on December 31 of each year, the number of shares available under the ESPP increases by up to 0.6 million shares, provided that the total number of shares available at that time shall not exceed 8.2 million. Unless earlier terminated, the ESPP will terminate on January 24, 2023.

During fiscal 2019, fiscal 2018 and fiscal 2017, Ciena issued 1.0 million, 1.1 million and 1.0 million shares under the ESPP, respectively. At October 31, 2019, 4.5 million shares remained available for issuance under the ESPP.

Share-Based Compensation Expense

The following table summarizes share-based compensation expense for the periods indicated (in thousands):

	Year Ended October 31,		
	2019	2018	2017
Product cost of goods sold	$ 2,868	$ 2,984	$ 2,672
Service cost of goods sold	3,175	2,616	2,487
Share-based compensation expense included in cost of goods sold	6,043	5,600	5,159
Research and development	14,321	13,518	12,957
Sales and marketing	16,474	14,246	12,846
General and administrative	22,841	19,709	17,321
Share-based compensation expense included in operating expense	53,636	47,473	43,124
Share-based compensation expense capitalized in inventory, net	57	(101)	77
Total share-based compensation	$ 59,736	$ 52,972	$ 48,360

As of October 31, 2019, total unrecognized share-based compensation expense was $88.2 million which relates to unvested restricted stock units and is expected to be recognized over a weighted-average period of 1.45 years.

(23) SEGMENT AND ENTITY WIDE DISCLOSURES

Segment Reporting

Ciena has the following operating segments for reporting purposes: (i) Networking Platforms; (ii) Platform Software and Services; (iii) Blue Planet Automation Software and Services; and (iv) Global Services. During fiscal 2019, we separated our previous Software and Software-Related Services segment into two stand-alone operating segments. Because Ciena previously disclosed its Platform Software and Services and Blue Planet Automation Software and Services as distinct product lines in its presentation of segment revenue for Software and Software-Related Services, there is no significant change to our presentation of segment revenues as a result of this separation. Comparative periods have been retrospectively adjusted to disclose segment profit for Platform Software and Services and Blue Planet Automation Software and Services.

Ciena's long-lived assets, including equipment, building, furniture and fixtures, finite-lived intangible assets, and maintenance spares, are not reviewed by the chief operating decision maker for purposes of evaluating performance and allocating resources. As of October 31, 2019, equipment, building, furniture and fixtures totaling $286.9 million primarily supports asset groups within Ciena's Networking Platforms, Platform Software and Services and Blue Planet Automation Software and Services segments and Ciena's unallocated selling and general and administrative activities. As of October 31, 2019, $20.3 million of Ciena's intangible assets were assigned to asset groups within Ciena's Networking Platforms segment and $92.5 million of Ciena's intangible assets were assigned to asset groups within Ciena's Blue Planet Automation Software and Services segment. As of October 31, 2019, all of the maintenance spares totaling $55.5 million were assigned to asset groups within Ciena's Global Services segment.

Segment Revenue

The table below (in thousands, except percentage data) sets forth Ciena's segment revenue for the respective periods indicated:

	Year Ended October 31,		
	2019	2018	2017
Revenue:			
Networking Platforms			
Converged Packet Optical	$ 2,562,841	$ 2,194,519	$ 1,939,621
Packet Networking	348,477	283,499	313,089
Total Networking Platforms	2,911,318	2,478,018	2,252,710
Platform Software and Services	155,376	173,949	145,009
Blue Planet Automation Software and Services	54,555	26,764	16,110
Global Services			
Maintenance Support and Training	261,337	245,161	227,400
Installation and Deployment	148,233	128,829	117,524
Consulting and Network Design	41,312	41,565	42,934
Total Global Services	450,882	415,555	387,858
Total revenue	$ 3,572,131	$ 3,094,286	$ 2,801,687

Segment Profit (Loss)

The presentation of segment profit (loss) for fiscal 2018 and 2017 reflects the change in Ciena's software operating segments as described above. Segment profit (loss) is determined based on internal performance measures used by Ciena's chief executive officer to assess the performance of each operating segment in a given period. In connection with that assessment, the chief executive officer excludes the following items: selling and marketing costs; general and administrative costs; amortization of intangible assets; acquisition and integration costs; significant asset impairments and restructuring costs, interest and other income (loss), net; interest expense; loss on extinguishment and modification of debt; and provision (benefit) for income taxes.

The table below (in thousands) sets forth Ciena's segment profit (loss) and the reconciliation to consolidated net income (loss) during the respective periods indicated:

	Year Ended October 31,		
	2019	2018	2017
Segment profit (loss):			
Networking Platforms	$ 759,244	$ 581,113	$ 578,039
Platform Software and Services	64,210	78,048	47,353
Blue Planet Automation Software and Services	(17,769)	(8,240)	(14,817)
Global Services	188,242	172,205	159,882
Total segment profit	993,927	823,126	770,457
Less: non-performance operating expenses			
Selling and marketing	423,046	394,060	356,169
General and administrative	174,399	160,133	142,604
Amortization of intangible assets	21,808	15,737	33,029
Acquisition and integration costs	3,370	5,111	—
Significant asset impairments and restructuring costs	24,538	18,139	23,933
Add: other non-performance financial items			
Interest and other income (loss), net	3,876	(12,029)	913
Interest expense	(37,452)	(55,249)	(55,852)
Loss on extinguishment and modification of debt	—	(13,887)	(3,657)
Less: Provision (benefit) for income taxes	59,756	493,471	(1,105,827)
Total net income (loss)	$ 253,434	$ (344,690)	$ 1,261,953

Entity Wide Reporting

Ciena's operating segments each engage in business across four geographic regions: North America; Europe, Middle East and Africa ("EMEA"); Asia-Pacific, Japan and India ("APAC"); and Caribbean and Latin America ("CALA"). North America includes only activities in the United States and Canada. The following table reflects Ciena's geographic distribution of revenue principally based on the relevant location for Ciena's delivery of products and performance of services. For the periods below, Ciena's geographic distribution of revenue was as follows (in thousands):

	Year Ended October 31,		
	2019	2018	2017
North America	$ 2,351,260	$ 1,886,450	$ 1,736,047
EMEA	566,718	464,876	404,099
CALA	152,653	140,177	164,308
APAC	501,500	602,783	497,233
Total	$ 3,572,131	$ 3,094,286	$ 2,801,687

North America includes $2.25 billion, $1.77 billion and $1.63 billion of United States revenue for fiscal years ended October 31, 2019, 2018 and 2017, respectively. No other country accounted for at least 10% of total revenue for the periods presented above.

The following table reflects Ciena's geographic distribution of equipment, building, furniture and fixtures, net, with any country accounting for at least 10% of total equipment, building, furniture and fixtures, net, specifically identified. Equipment, building, furniture and fixtures, net, attributable to geographic regions outside of the United States and Canada are reflected as "Other International." For the periods below, Ciena's geographic distribution of equipment, building, furniture and fixtures, net, was as follows (in thousands):

	October 31,	
	2019	2018
Canada	$ 211,901	$ 198,028
United States	58,119	75,479
Other International	16,864	18,560
Total	$ 286,884	$ 292,067

While Ciena has benefited from the diversification of its business and customer base, its ten largest customers contributed 59.3% of fiscal 2019 revenue, 56.5% of fiscal 2018 revenue and 55.6% of fiscal 2017 revenue.

For the periods below, customers accounting for at least 10% of Ciena's revenue were as follows (in thousands):

	October 31,		
	2019	2018	2017
Verizon	$ 459,787	$ 318,013	$ 288,048
AT&T	388,704	374,576	448,943
Web-scale provider	370,577	n/a	n/a
Total	$ 1,219,068	$ 692,589	$ 736,991

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n/a Denotes revenue representing less than 10% of total revenue for the period

The Web-scale provider noted above contributed greater than 10% of total revenue for the first time in fiscal 2019 and purchased products from each of Ciena's operating segments excluding Blue Planet Automation Software and Services. The other customers identified above purchased products and services from each of Ciena's operating segments.

(24) OTHER EMPLOYEE BENEFIT PLANS

Ciena has a Defined Contribution Pension Plan that covers a majority of its Canada-based employees. The plan covers all Canada-based employees who are not part of an excluded group. Total contributions (employee and employer) cannot exceed the lesser of 18% of participant earnings and an annual dollar limit (CAD$27,230 (approximately $20,725) for 2019). This plan includes a required employer contribution of 1% for all participants and a 50% matching of participant contributions up to a total annual maximum of CAD$3,000 (approximately $2,283) per employee. During fiscal 2019, 2018 and 2017, Ciena made matching contributions of approximately CAD$5.2 million (approximately $4.0 million), CAD$5.1 million (approximately $3.9 million) and CAD$4.7 million (approximately $3.6 million), respectively.

Ciena has a 401(k) defined contribution profit sharing plan. Participants may contribute up to 60% of pre-tax compensation, subject to certain limitations. The plan includes an employer matching contribution equal to 50% of the first 6% an employee contributes each pay period. Ciena may also make discretionary annual profit contributions up to the IRS regulated limit. Ciena has made no profit sharing contributions to date. During fiscal 2019, 2018 and 2017, Ciena made matching contributions of approximately $5.9 million, $5.8 million and $5.7 million, respectively.

(25) COMMITMENTS AND CONTINGENCIES

Government Grant

During fiscal 2018, Ciena entered into agreements related to the Evolution of Networking Services through a Corridor in Quebec and Ontario for Research and Innovation project with the Canadian federal government, the government of the province of Ontario and the government of the province of Quebec to develop a 5G technology corridor between Quebec and Ontario to promote research and development, small business enterprises and entrepreneurs in Canada. Under these agreements, Ciena can receive up to an aggregate CAD$57.6 million (approximately $43.8 million) in reimbursement from the three Canadian government entities for eligible costs over a period commencing on February 20, 2017 and ending on March 31, 2022. Ciena anticipates receiving recurring disbursements over this period. Amounts received under the agreements are subject to recoupment in the event that Ciena fails to achieve certain minimum investment, employment and project milestones. As of October 31, 2019, Ciena has recorded CAD$28.9 million (approximately $22.0 million) in cumulative benefits as a reduction in research and development expense of which CAD$12.3 million (approximately $9.2 million) was recorded in fiscal 2019. As of October 31, 2019, amounts receivable from this grant were CAD$10.4 million (approximately $7.9 million).

Tax Contingencies

Ciena is subject to various tax liabilities arising in the ordinary course of business. Ciena does not expect that the ultimate settlement of these tax liabilities will have a material effect on its results of operations, financial position or cash flows.

Litigation

Ciena is subject to various legal proceedings, claims and other matters arising in the ordinary course of business, including those that relate to employment, commercial, tax and other regulatory matters. Ciena is also subject to intellectual property related claims, including claims against third parties that may involve contractual indemnification obligations on the part of Ciena. Ciena does not expect that the ultimate costs to resolve such matters will have a material effect on its results of operations, financial position or cash flows.

Lease Commitments

Ciena has certain minimum obligations under non-cancelable leases expiring on various dates through 2032 for equipment and facilities. The following table summarizes Ciena's future annual minimum lease commitments under non-cancelable leases that are not recorded on the balance sheet as of October 31, 2019 (in thousands):

	2020	2021	2022	2023	2024	Thereafter	Total
Operating leases	$ 28,776	$ 24,184	$ 16,767	$ 13,393	$ 10,632	$ 26,110	$ 119,862

Rental expense for fiscal 2019, fiscal 2018 and fiscal 2017 was approximately $22.0 million, $24.1 million and $30.9 million, respectively. In addition, Ciena paid approximately $1.3 million, $1.9 million and $2.7 million during fiscal 2019, fiscal 2018 and fiscal 2017, respectively, related to rent costs for restructured facilities and unfavorable lease commitments, which were offset against Ciena's restructuring liabilities and unfavorable lease obligations. The amount for operating lease commitments above does not include variable expenses relating to insurance, taxes, maintenance and other costs required by the applicable operating lease. These costs are not expected to have a material impact on Ciena's financial condition, results of operations or cash flows.

(26) SUBSEQUENT EVENTS

Stock Repurchase Program

From the end of the fourth quarter of fiscal 2019 through December 16, 2019, Ciena repurchased an additional 737,474 shares of its common stock, for an aggregate purchase price of $27.4 million at an average price of $37.21 per share, inclusive of repurchases pending settlement. As of December 16, 2019, Ciena has repurchased an aggregate of 4,575,940 shares and has an aggregate of $322.5 million of authorized funds remaining under its Stock Repurchase Program.

Centina Acquisition

On October 3, 2019, Ciena entered into a definitive agreement to acquire privately-held Centina Systems, Inc., a provider of service assurance analytics and network performance management solutions. The transaction closed during Ciena's first quarter of fiscal 2020.

Tax Regulations

On December 2, 2019, the U.S. Department of the Treasury released final regulations and proposed regulations under Section 59A, BEAT. BEAT, which requires certain U.S. corporations to pay a minimum tax associated with deductible payments to non-U.S. related parties, was enacted by the Tax Act. In addition, on December 2, 2019, the U.S. Department of the Treasury also released final regulations that provide additional guidance with respect to the foreign tax credit regime under the Tax Act. For the year ended October 31, 2019, Ciena recorded $11.3 million of BEAT and a benefit of $0.9 million attributable to such foreign tax credits. Ciena is in the process of reviewing these regulations and does not anticipate the impact of the new regulations will be material. Any tax effect will be recorded in Ciena's fiscal 2020 results.

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

None.

Item 9A. Controls and Procedures

Disclosure Controls and Procedures

As of the end of the period covered by this report, we carried out an evaluation under the supervision and with the participation of management, including our Chief Executive Officer and Chief Financial Officer, of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act). Based on this evaluation, our Chief Executive Officer and Chief Financial Officer concluded that our disclosure controls and procedures were effective as of the end of the period covered by this report.

Changes in Internal Control over Financial Reporting

There was no change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Securities Exchange Act of 1934, as amended) during the most recently completed fiscal quarter that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Report of Management on Internal Control Over Financial Reporting

The management of Ciena Corporation is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Securities Exchange Act of 1934).

The internal control over financial reporting at Ciena Corporation was designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with accounting principles generally accepted in the United States of America. Internal control over financial reporting 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 Ciena Corporation;
- provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with accounting principles generally accepted in the United States of America;
- provide reasonable assurance that receipts and expenditures of Ciena Corporation are being made only in accordance with authorization of management and directors of Ciena Corporation; and
- provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of assets that could have a material effect on the consolidated financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements.

Management of Ciena Corporation assessed the effectiveness of the Company's internal control over financial reporting as of October 31, 2019. Management based this assessment on criteria for effective internal control over financial reporting described in "COSO 2013 Internal Control — Integrated Framework" issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on this assessment, management determined that, as of October 31, 2019, Ciena Corporation maintained effective internal control over financial reporting. Management reviewed the results of its assessment with the Audit Committee of our Board of Directors.

PricewaterhouseCoopers LLP, independent registered public accounting firm, who audited and reported on the consolidated financial statements of Ciena Corporation included in this annual report, has also audited the effectiveness of Ciena Corporation's internal control over financial reporting as of October 31, 2019, as stated in its report appearing in Item 8 of Part II of this annual report.

/s/ Gary B. Smith	/s/ James E. Moylan, Jr.
Gary B. Smith	James E. Moylan, Jr.
President and Chief Executive Officer	Senior Vice President and Chief Financial Officer
December 20, 2019	December 20, 2019

Item 9B. Other Information

None.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Information relating to our directors and executive officers is set forth in Part I of this annual report under the caption "Item 1. Business—Directors and Executive Officers."

Additional information responsive to this item concerning our Audit Committee and regarding compliance with Section 16(a) of the Exchange Act is incorporated herein by reference from our definitive proxy statement with respect to our 2020 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Form 10-K.

As part of our system of corporate governance, our board of directors has adopted a code of ethics that is specifically applicable to our chief executive officer and senior financial officers. This Code of Ethics for Senior Financial Officers, as well as our Code of Business Conduct and Ethics, applicable to all directors, officers and employees, are available on the "Corporate Governance" page of our website at www.ciena.com. We intend to satisfy any disclosure requirement under Item 5.05 of Form 8-K regarding an amendment to, or waiver from, a provision of the Code of Ethics for Senior Financial Officers by posting such information on our website at the address above.

Item 11. Executive Compensation

Information responsive to this item is incorporated herein by reference from our definitive proxy statement with respect to our 2020 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Form 10-K.

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

Information responsive to this item is incorporated herein by reference from our definitive proxy statement with respect to our 2020 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Form 10-K.

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

Information responsive to this item is incorporated herein by reference from our definitive proxy statement with respect to our 2020 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Form 10-K.

Item 14. Principal Accountant Fees and Services

Information responsive to this item is incorporated herein by reference from our definitive proxy statement with respect to our 2020 Annual Meeting of Stockholders to be filed with the SEC within 120 days after the end of the fiscal year covered by this Form 10-K.

PART IV

Item 15. Exhibits and Financial Statement Schedules

(a) 1. The information required by this item is included in Item 8 of Part II of this annual report.

2. The information required by this item is included in Item 8 of Part II of this annual report.

3. Exhibits: See Index to Exhibits, which is incorporated by reference in this Item. The Exhibits listed in the accompanying Index to Exhibits are filed herewith or incorporated by reference as part of this annual report.

(b) Exhibits. See Index to Exhibits, which is incorporated by reference in this Item. The Exhibits listed in the accompanying Index to Exhibits are filed herewith or incorporated by reference as part of this annual report.

(c) Not applicable.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized on the 20th day of December 2019.

Ciena Corporation

By: /s/ Gary B. Smith

Gary B. Smith

President, Chief Executive Officer and Director

Table of Contents

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the registrant and in the capacities and on the date indicated.

Signatures	Title	Date
/s/ Patrick H. Nettles, Ph.D. Patrick H. Nettles, Ph.D.	Executive Chairman of the Board of Directors	December 20, 2019
/s/ Gary B. Smith Gary B. Smith (Principal Executive Officer)	President, Chief Executive Officer and Director	December 20, 2019
/s/ James E. Moylan, Jr. James E. Moylan, Jr. (Principal Financial Officer)	Sr. Vice President, Finance and Chief Financial Officer	December 20, 2019
/s/ Andrew C. Petrik Andrew C. Petrik (Principal Accounting Officer)	Vice President, Controller	December 20, 2019
/s/ Bruce L. Claflin Bruce L. Claflin	Director	December 20, 2019
/s/ Lawton W. Fitt Lawton W. Fitt	Director	December 20, 2019
/s/ Patrick T. Gallagher Patrick T. Gallagher	Director	December 20, 2019
/s/ Devinder Kumar Devinder Kumar	Director	December 20, 2019
/s/ T. Michael Nevens T. Michael Nevens	Director	December 20, 2019
/s/ Judith M. O’Brien Judith M. O’Brien	Director	December 20, 2019
/s/ Joanne B. Olsen Joanne B. Olsen	Director	December 20, 2019

INDEX TO EXHIBITS

Exhibit Number	Exhibit Description	Incorporated by Reference: Form and Registration or Commission No.	Exhibit	Filing Date	Filed Here-with (X)
3.1	Amended and Restated Certificate of Incorporation of Ciena Corporation	8-K (000-21969)	3.1	3/27/2008	
3.2	Second Amended and Restated Bylaws of Ciena Corporation	8-K (001-36250)	3.1	1/27/2017	
4.1	Specimen Stock Certificate	10-K (000-21969)	4.1	12/27/2007	
10.1	Ciena Corporation 2017 Omnibus Incentive Plan*	8-K (001-36250)	10.1	3/29/2017	
10.2	Form of Employee Restricted Stock Unit Agreement for Ciena Corporation 2017 Omnibus Incentive Plan*	10-K (001-36250)	10.2	12/21/2018	
10.3	Form of Director Restricted Stock Unit Agreement for Ciena Corporation 2017 Omnibus Incentive Plan*	10-K (001-36250)	10.3	12/21/2018	
10.4	Form of Performance Stock Unit Agreement for Ciena Corporation 2017 Omnibus Incentive Plan*	10-K (001-36250)	10.4	12/21/2018	
10.5	Form of Market Stock Unit Agreement for Ciena Corporation 2017 Omnibus Incentive Plan*	10-K (001-36250)	10.5	12/21/2018	
10.6	Ciena Corporation 2008 Omnibus Incentive Plan*	8-K (000-21969)	10.1	3/27/2008	
10.7	Amendment (No. 1) to Ciena Corporation 2008 Omnibus Incentive Plan dated April 14, 2010*	8-K (000-21969)	10.1	4/15/2010	
10.8	Amendment (No. 2) to Ciena Corporation 2008 Omnibus Incentive Plan dated March 21, 2012*	8-K (000-21969)	10.1	3/23/2012	
10.9	Amendment (No. 3) to Ciena Corporation 2008 Omnibus Incentive Plan dated April 10, 2014*	10-Q (001-36250)	10.1	6/11/2014	
10.10	Amendment (No. 4) to Ciena Corporation 2008 Omnibus Incentive Plan dated March 24, 2016*	10-Q (001-36250)	10.2	6/8/2016	
10.11	Form of 2008 Omnibus Incentive Plan Restricted Stock Unit Agreement (Employee)*	10-K (000-21969)	10.18	12/22/2011	
10.12	Form of 2008 Omnibus Incentive Plan Restricted Stock Unit Agreement (Director)*	10-Q (000-21969)	10.3	6/4/2009	
10.13	Amended and Restated Ciena Corporation Employee Stock Purchase Plan*	10-Q (001-36250)	10.1	6/7/2017	
10.14	Employee Stock Purchase Plan Enrollment Agreement*	10-Q (001-36250)	10.2	6/7/2017	
10.15	Cyan, Inc. 2006 Stock Plan*	S-1 (333-187732)	10.2.1	4/4/2013	
10.16	Cyan, Inc. 2013 Equity Incentive Plan*	S-1 (333-187732)	10.3.1	4/4/2013	
10.17	Ciena Corporation 2000 Equity Incentive Plan (Amended and Restated ONI Systems Corp. 2000 Equity Incentive Plan)*	10-K (000-21969)	10.37	12/11/2003	
10.18	Form of Restricted Stock Unit Award Agreement for directors under Ciena Corporation 2000 Equity Incentive Plan*	8-K (000-21969)	10.5	11/4/2005	
10.19	Ciena Corporation Deferred Compensation Plan, effective as of November 1, 2016*	S-8 (333-214594)	10.1	11/14/2016	
10.20	Ciena Corporation Amended and Restated Incentive Bonus Plan, as amended December 15, 2011*	10-K (000-21969)	10.26	12/22/2011	

Exhibit Number	Exhibit Description	Incorporated by Reference: Form and Registration or Commission No.	Exhibit	Filing Date	Filed Here-with (X)
10.21	Ciena Corporation U.S. Executive Severance Benefit Plan*	10-Q (000-21969)	10.1	6/9/2011	
10.22	Form of Indemnification Agreement with Directors and Executive Officers*	10-Q (000-21969)	10.1	3/3/2006	
10.23	Change in Control Severance Agreement dated November 30, 2019, between Ciena Corporation and Gary B. Smith*	—	—	—	X
10.24	Change in Control Severance Agreement dated November 30, 2019, between Ciena Corporation and Executive Officers*	—	—	—	X
10.25	Lease Agreement by and between Ciena Canada, Inc. and Innovation Blvd. II Limited dated as of October 23, 2014++	10-K (001-36250)	10.36	12/19/2014	
10.26	Amendment No. 1 to the Lease Agreement dated October 23, 2014, between Ciena Canada, Inc. and Innovations Blvd II Limited, dated April 15, 2015	8-K (001-36250)	10.3	6/3/2015	
10.27	Lease Agreement between Ciena Canada, Inc. and Innovation Blvd. II Limited, dated April 15, 2015	8-K (001-36250)	10.4	6/3/2015	
10.28	Lease Agreement dated November 3, 2011 between Ciena Corporation and W2007 RDG Realty, L.L.C.++	10-K (000-21969)	10.34	12/22/2011	
10.29	ABL Credit Agreement, dated October 28, 2019, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., Ciena Canada, Inc., Bank of America, N.A., as administrative agent, and the lenders party thereto++	8-K (001-36250)	10.1	10/31/2019	
10.30	U.S. Guaranty, dated October 28, 2019, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., Ciena Communications International, LLC, Blue Planet Software, Inc. and Bank of America, N.A., as administrative agent++	8-K (001-36250)	10.2	10/31/2019	
10.31	U.S. Security Agreement, dated October 28, 2019, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., Ciena Communications International, LLC, Blue Planet Software, Inc. and Bank of America, N.A., as administrative agent++	8-K (001-36250)	10.3	10/31/2019	
10.32	U.S. Pledge Agreement, dated October 28, 2019, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., Ciena Communications International, LLC, Blue Planet Software, Inc. and Bank of America, N.A., as administrative agent++	8-K (001-36250)	10.4	10/31/2019	
10.33	Canadian Guarantee, dated October 28, 2019, by Ciena Canada, Inc., in favor of Bank of America, N.A., as administrative agent++	8-K (001-36250)	10.5	10/31/2019	
10.34	Canadian Security Agreement, dated October 28, 2019, by and between Ciena Canada, Inc. and Bank of America, N.A., as administrative agent++	8-K (001-36250)	10.6	10/31/2019	
10.35	Intercreditor Agreement, dated October 28, 2019, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., Ciena Communications International, LLC, Blue Planet Software, Inc. and Bank of America, N.A., as administrative and collateral agent++	8-K (001-36250)	10.7	10/31/2019	
10.36	Credit Agreement, dated July 15, 2014, by and among Ciena Corporation, the lenders party thereto, and Bank of America, N.A., as Administrative Agent++	10-Q (001-36250)	10.5	9/9/2014	
10.37	First Amendment to Credit Agreement, dated July 15, 2014 and First Amendment to Certain Pledge Agreements (U.S. Pledge Agreement, dated July 15, 2014 and Canadian Pledge Agreement, dated December 12, 2014), dated April 15, 2015++	8-K (001-36250)	10.1	6/3/2015	

Exhibit Number	Exhibit Description	Incorporated by Reference: Form and Registration or Commission No.	Exhibit	Filing Date	Filed Here-with (X)
10.38	Second Amendment to Credit Agreement, dated July 15, 2014, by and among Ciena Corporation, the lenders party thereto, and Bank of America, N.A., as Administrative Agent., dated July 2, 2015++	10-Q (001-36250)	10.1	9/9/2015	
10.39	Third Amendment to Credit Agreement, dated July 15, 2015, by and among Ciena Corporation, the lenders party thereto, and Bank of America, N.A., as Administrative Agent., dated June 29, 2017++	10-Q (001-36250)	10.3	9/7/2017	
10.40	Incremental Joinder and Amendment Agreement under the Credit Agreement and Related Agreements dated as of April 25, 2016 by and between Ciena Corporation, Bank of America, N.A. as Administrative Agent, Ciena Communications, Inc. and Ciena Government Solutions, Inc.	10-Q (001-36250)	10.1	6/8/2016	
10.41	Omnibus Refinancing Amendment to Credit Agreement (dated as of July 15, 2014, as amended), Security Agreement, and Pledge Agreement, dated as of January 30, 2017, by and among Ciena Corporation, as borrower, Ciena Communications, Inc. and Ciena Government Solutions, Inc., as guarantors, Bank of America, N.A. as administrative agent, and the lenders party thereto	10-Q (001-36250)	10.1	3/8/2017	
10.42	Increase Joinder and Refinancing Amendment to Credit Agreement, dated September 28, 2018, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., Bank of America, N.A., as administrative agent, and the lenders party thereto++	8-K (001-36520)	10.1	10/1/2018	
10.43	Guaranty, dated July 15, 2014, by and among Ciena Communications, Inc., Ciena Government Solutions, Inc. and Bank of America, N.A., as Administrative Agent++	10-Q (001-36250)	10.6	9/9/2014	
10.44	Term Loan Security Agreement, dated July 15, 2014, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., and Bank of America, N.A., as Collateral Agent++	10-Q (001-36250)	10.7	9/9/2014	
10.45	Omnibus Amendment to Security Agreement and Pledge Agreement, dated September 28, 2018, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., and Bank of America, N.A., as Administrative Agent++	10-K (001-36250)	10.56	12/21/2018	
10.46	Term Loan Pledge Agreement, dated July 15, 2014, by and among Ciena Corporation, Ciena Communications, Inc., Ciena Government Solutions, Inc., and Bank of America, N.A., as Pledgee++	10-Q (001-36250)	10.8	9/9/2014	
10.47	Guaranty Supplement dated as of April 19, 2019, by Ciena Communications International, LLC, in favor of Bank of America, N.A., as Administrative Agent++	10-Q (001-36250)	10.3	6/12/2019	
10.48	Guaranty Supplement dated as of April 19, 2019, by Blue Planet Software, Inc., in favor of Bank of America, N.A., as Administrative Agent++	10-Q (001-36250)	10.4	6/12/2019	
10.49	Intellectual Property License Agreement dated as of March 19, 2010 between Ciena Luxembourg S.a.r.l. and Nortel Networks Limited#	10-Q (000-21969)	10.3	6/10/2010	
21.1	Subsidiaries of registrant	—	—	—	X
23.1	Consent of Independent Registered Public Accounting Firm	—	—	—	X
31.1	Certification of Chief Executive Officer Pursuant to Rule 13a-14(a) under the Securities Exchange Act of 1934 as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	—	—	—	X

Exhibit Number	Exhibit Description	Incorporated by Reference: Form and Registration or Commission No.	Exhibit	Filing Date	Filed Here-with (X)
31.2	Certification of Chief Financial Officer Pursuant to Rule 13a-14(a) under the Securities Exchange Act of 1934 as Adopted Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002	—	—	—	X
32.1	Certification of Chief Executive Officer Pursuant to 18 U.S.C. Section 1350 as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002	—	—	—	X
32.2	Certification of Chief Financial Officer Pursuant to 18 U.S.C. Section 1350 as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002	—	—	—	X
101.INS	Inline XBRL Instance Document - The instance document does not appear in the Interactive Data File because its XBRL tags are embedded within the Inline XBRL document.	—	—	—	X
101.SCH	Inline XBRL Taxonomy Extension Schema Document	—	—	—	X
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document	—	—	—	X
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document	—	—	—	X
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document	—	—	—	X
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document	—	—	—	X
104	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)	—	—	—	X

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* Represents management contract or compensatory plan or arrangement

++ Representations and warranties included in these agreements, as amended, were made by the parties to one another in connection with a negotiated transaction. These representations and warranties were made as of specific dates, only for purposes of these agreements and for the benefit of the parties thereto. These representations and warranties were subject to important exceptions and limitations agreed upon by the parties, including being qualified by confidential disclosures, made for the purposes of allocating contractual risk between the parties rather than establishing these matters as facts. These agreements are filed with this report only to provide investors with information regarding its terms and conditions, and not to provide any other factual information regarding Ciena or any other party thereto. Accordingly, investors should not rely on the representations and warranties contained in these agreements or any description thereof as characterizations of the actual state of facts or condition of any party, its subsidiaries or affiliates. The information in these agreements should be considered together with Ciena’s public reports filed with the SEC.

\# Certain portions of this document have been omitted based on a request for confidential treatment submitted to the SEC. The non-public information that has been omitted from this document has been separately filed with the SEC. Each redacted portion of this document is indicated by a “[*]” and is subject to the request for confidential treatment submitted to the SEC. The redacted information is confidential information of Ciena.

CIENA CORPORATION
CHANGE IN CONTROL SEVERANCE AGREEMENT

This Change in Control Severance Agreement (the "Agreement") is made by and between **Ciena Corporation**, a Delaware corporation, and **Gary B. Smith** (the "Executive"), and shall become effective on November 30, 2019.

WHEREAS, the Company (as hereinafter defined) considers it essential to foster the continuous employment of key management personnel and recognizes that the possibility of a Change in Control (as hereinafter defined) of the Company exists and that such possibility, and the uncertainty that it may cause, may result in the departure or distraction of key management personnel of the Company, to the detriment of the Company and its stockholders;

WHEREAS, the Executive is a key management employee of the Company; and

WHEREAS, the Company desires to encourage the continued employment of the Executive by the Company and wants assurance that it will have the continued dedication, loyalty and service of, and the availability of objective advice and counsel from, the Executive notwithstanding the possibility, threat or occurrence of a Change in Control.

NOW, THEREFORE, in consideration of the mutual covenants and representations contained herein and the mutual benefits derived herefrom, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Company and the Executive hereby agree as follows:

1. Certain Definitions. In addition to those terms defined elsewhere herein, when used herein, the following capitalized terms shall have the meanings indicated:

1.1. *"Board"* means the Board of Directors of the Company, as constituted from time to time.

1.2. *"Cause"* means the occurrence of any one or more of the following:

(i) the Executive's willful and continued failure substantially to perform the duties of the Executive's position (other than as a result of Disability or as a result of termination by the Executive for Good Reason) after written notice to the Executive by the Governance and Nominations Committee of the Board (or any other special committee or subcommittee appointed by the Board for such purpose) (the "Governance Committee") specifying such failure, provided that such "cause" shall have been found by a majority vote of the Governance Committee after at least seven days' written notice to the Executive specifying the failure on the part of the Executive and after an opportunity for the Executive to be heard at a meeting of the Governance Committee;

(ii) any willful act or omission by the Executive in connection with his or her responsibilities as an employee of the Company constituting dishonesty, fraud or other malfeasance, immoral conduct or gross misconduct;

(iii) any willful material violation by the Executive of the Company's Code of Business Conduct and Ethics or the Proprietary Information, Inventions and Non-Solicitation Agreement between the Company and the Executive; or

(iv) the Executive's conviction of, or plea of nolo contendere to, a felony or a crime of moral turpitude under the laws of the United States or any state thereof or any other jurisdiction in which the Company conducts business.

For purposes of this definition, no act or failure to act by the Executive shall be deemed "willful" unless effected by the Executive not in good faith and without a reasonable belief that such act or failure to act was in or not opposed to the Company's best interests.

1.3. *"Change in Control"* means the occurrence of any one of the following events:

(i) the direct or indirect sale or exchange by the stockholders of the Company of all or substantially all of the stock of the Company where the stockholders of the Company before such sale or exchange do not retain, directly or indirectly, at least a majority of the beneficial interest in the voting stock of the surviving, continuing, successor, or purchasing corporation or parent corporation thereof, as the case may be (the "Acquiring Company") after such sale or exchange;

(ii) a merger or consolidation where the stockholders of the Company before such merger or consolidation do not retain, directly or indirectly, at least a majority of the beneficial interest in the voting stock of the Acquiring Company after such merger or consolidation;

(iii) the sale, exchange, or transfer of all or substantially all of the assets of the Company (other than a sale, exchange, or transfer to one or more subsidiary corporations of the Company);

(iv) a change in the composition of the Board occurring within a two year period, as a result of which less than a majority of the directors are Incumbent Directors. "Incumbent Directors" shall mean directors who either (A) are directors of the Company as of the date hereof or (B) are elected, or nominated for election, to the Board with the affirmative votes of at least a majority of the directors of the Company at the time of such election or nomination (but will not include an individual whose election or nomination is in connection with an actual or threatened proxy contest relating to the election of directors to the Company);

(v) a liquidation or dissolution of the Company; or

(vi) any other event that the Board, in its reasonable discretion, shall determine constitutes a Change in Control.

In each case the determination of whether or not a "Change in Control" is deemed to have taken place shall be made without regard to whether such events or occurrences constituting the Change in Control were hostile or against the position of the Board, or were approved or concurred in by the Board.

1.4. *"Code"* means the Internal Revenue Code of 1986, as amended.

1.5. *"Company"* means Ciena Corporation, its affiliates and subsidiaries, and any successor as provided in Section 7.6.

1.6. *"Disability"* means either (i) "total disability" as defined for purposes of the Company's long-term disability benefit plan; or (ii) the Executive's inability, as a result of physical or mental incapacity, to perform the Executive's duties for a period of six consecutive months or for an aggregate of six months in any 12 consecutive month period.

1.7. *"Effective Date"* means the date on which a Change in Control becomes effective. In the event of a subsequent Change in Control within one year of the prior Change in Control, "Effective Date" shall be adjusted to mean the date on which the subsequent Change in Control occurs.

1.8. "*Good Reason*" means;

(i) removal from, or failure to be reappointed or reelected to the Executive's principal position immediately prior to the Effective Date or the date of a Triggering Event, as applicable (other than as a result of a promotion);

(ii) material diminution in the Executive's position, duties or responsibilities, or the assignment to the Executive of duties that are inconsistent, in a material respect, with the scope of duties and responsibilities associated with the Executive's position immediately prior to the Effective Date or the date of a Triggering Event, as applicable;

(iii) material reduction in base salary or award opportunity under any corporate incentive plan (or any successor to any such plan), or a material reduction in the level of participation in long-term incentive, benefit and other plans for senior executives as in effect immediately preceding the Effective Date or the date of a Triggering Event, as applicable, or their equivalents;

(iv) relocation of the Executive's principal workplace without the Executive's consent to a location which is more than 50 miles from the Executive's principal workplace on the Effective Date or the date of a Triggering Event, as applicable; or

(v) any failure by the Company to comply with and satisfy the requirements of Section 7.6, provided that the successor shall have received at least ten days' prior written notice from the Company or the Executive of the requirements of Section 7.6;

provided, however, that (A) the Executive has provided notice to the Company of any of the foregoing conditions within 90 days of the initial existence of the condition; (B) the Company has been given at least 30 days following receipt of such notice to cure such condition; and (C) the Executive actually terminates employment within one year following the initial existence of the condition.

1.9. *"Options"* means the Executive's options to purchase common stock of the Company (or to receive cash or property the amount or value of which is determined by reference to the price of the Company's common stock) that are (i) validly issued under any of the Company's equity incentive or stock option plans and (ii) outstanding as of the Effective Date or the date of a Triggering Event, as applicable.

1.10. *"Performance-Based Restricted Stock"* means the Executive's restricted stock (including "restricted stock units" or similar instruments of equity-based compensation or other rights to receive common stock of the Company) that is (i) validly issued under any of the Company's equity incentive plans, (ii) outstanding as of the Effective Date or the date of a Triggering Event, as applicable, and (iii) subject to performance-based vesting, including but not limited to performance conditions relating to the Company's stock price as compared to any market, index or comparable company or companies.

1.11. *"Time-Based Restricted Stock"* means the Executive's restricted stock (including "restricted stock units" or other rights to receive common stock of the Company) that is (i) validly issued under any of the Company's equity incentive plans, (ii) outstanding as of the Effective Date or the date of a Triggering Event, as applicable, and (iii) subject to time-based vesting.

1.12. *"Triggering Event"* means termination of the Executive's employment with the Company without Cause by the Company, or for Good Reason by the Executive, either (i) within 90 days prior to the Effective Date or (ii) on or within 18 months after the Effective Date. For purposes of this definition, an Executive's employment with the Company will be deemed to have terminated on the earlier of the date the Executive's employment with the Company ceases or the date that written notice of any such termination is received by the Executive or by the Company, as the case may be, even though the parties may agree in connection therewith that the Executive's employment with the Company will continue for a specified period thereafter. The failure by the Executive or the Company to set forth in any such notice sufficient facts or circumstances showing Good Reason or Cause, as the case may be, shall not waive any right of the Executive or the Company or preclude either party from asserting such facts or circumstances in the enforcement of any such right.

2. Term of Agreement.

This Agreement shall commence on the date of its execution by the Executive and shall continue in effect through November 30, 2022 (the "Term"), and may be extended upon mutual written consent of the Executive and the Company (as authorized by the Board or the Compensation Committee of the Board). Notwithstanding the foregoing:

(a) the Term shall be automatically extended without any further action if the Company is in active negotiations for, or has entered into, a definitive agreement regarding a Change in Control (a "Pending Transaction"), until the earliest to occur of (i) the date on which such negotiations have terminated without entry into a definitive agreement, (ii) the date on which such definitive agreement has terminated pursuant to its terms without occurrence of a Change in Control, or (iii) 12 months following the Effective Date of such Pending Transaction;

(b) in the event that a Change in Control occurs during the Term, this Agreement shall continue in effect for a period of 12 months following the Effective Date; and

(c) if the Executive becomes entitled to severance benefits under Section 3 during the Term, this Agreement will not terminate until all of the obligations of the parties hereto with respect to this Agreement have been satisfied.

3. Severance Benefits Upon Triggering Event.

Subject to the terms of this Agreement (including the satisfaction by the Executive of the conditions precedent set forth in Sections 4.1 and 4.2 hereof and the application of the exclusivity and non-duplication provisions of Section 6 hereof), upon a Triggering Event the Company shall pay the Executive the amounts and provide the Executive with the benefits set forth in this Section 3:

3.1. Severance Payment. The Company shall pay to the Executive a lump sum severance payment, subject to any applicable payroll or other taxes required to be withheld, equal to two and a half times the sum of (i) the Executive's annual base salary as in effect immediately prior to either the date of the Executive's termination of employment with the Company or the Effective Date, whichever is higher, and (ii) the Executive's annual target bonus or sales commissions amount(s) under any incentive plan(s) or program(s) in which the Executive participated immediately prior to either the date of the Executive's termination of employment with the Company or the Effective Date, whichever is higher. The above bonus or commissions amount shall be based on an assumed achievement of 100% of the targeted performance goal(s) for such award. Upon receipt of the above bonus amount, and subject to Section 6.2(iii) hereof, neither the Executive nor any other person claiming any payment by reason of the Executive's participation in the applicable annual bonus plan or annual sales incentive compensation plan shall have any right to any additional payment under such plan(s) or program(s) with respect to any applicable award thereunder;

3.2. Welfare Benefit and D&O Insurance. The Company shall continue the Executive's (and, where applicable, the Executive's spouse and eligible dependents') participation in the group medical, dental and vision plans maintained by the Company, on substantially the same basis as if the Executive were an employee of the Company, until the earlier of 18 months following the Executive's termination of employment with the Company or the last day of the month in which the Executive commences employment with another employer following the Executive's termination of employment with the Company (the "Coverage Period"). In the event that the Company is unable for any reason to provide for the Executive's (and, where applicable, the Executive's spouse and eligible dependents') continued participation in one or more of such plans during the Coverage Period, the Company shall pay or provide at its expense equivalent benefit coverage for the remainder of the Coverage Period. The Coverage Period shall be taken into account as a period of continuation coverage for purposes of Part 6 of Title I of the Employee Retirement Income Security Act of 1974, as amended ("ERISA"), and for purposes of any other obligation of the Company to provide any continued coverage to the Executive (and, where applicable, the Executive's spouse and eligible dependents) under any group medical, dental or vision plan. In the event that any payments under this Section 3.2 violate the non-discrimination rules or would result in the imposition of penalties under the Affordable Care Act ("ACA"), then the parties agree to modify this section as necessary in order to comply with the ACA. The Company shall continue to maintain director and officer insurance covering the Executive, and shall maintain in effect any indemnification agreements providing for indemnification of the Executive by the Company, until the applicable statute of limitations has ended;

3.3. Options and Restricted Stock. Notwithstanding the terms of any plan, program or arrangement maintained by the Company:

(a) upon the Effective Date, (i) the Executive's Options that are subject to performance-based vesting and for which the applicable performance period has not yet expired shall immediately be converted into Options with time-based vesting conditions, and (ii) the Executive's Performance-Based Restricted Stock for which the applicable performance period has not yet expired shall immediately be converted into Time-Based Restricted Stock; in each case, the applicable equity award (x) shall be converted into an amount of shares based on an assumed achievement of 100% of the targeted performance goal(s) for such award, and (y) shall be deemed to have commenced vesting on the date of grant and shall vest over the shorter of (A) four years, with 1/16th of the award vesting on each March 20, June 20, September 20 and December 20 following the date of grant, or (B) the period between the date of grant and the original final vesting date of the applicable equity award, with the award vesting proportionately over such period on each March 20, June 20, September 20 and December 20 following the date of grant;

(b) upon a Triggering Event, all of the Executive's Options, Performance-Based Restricted Stock and Time-Based Restricted Stock (including any Performance-Based Restricted Stock converted pursuant to Section 3.3(a) above), to the extent unvested, shall become immediately vested and exercisable in full; and

(c) upon a Triggering Event, the Executive must elect to exercise any unexercised and exercisable Options within the time period set forth in the applicable plan, program or arrangement under which they were granted, subject to the following requirements:

(i) If the exercise of any Option within the time period described in this Section 3.3 is prevented by the requirements of federal or state securities laws or as provided under the terms of the applicable plan, program or arrangement, then the Option shall remain exercisable until three months after the date the Executive is notified by the Company that the Option is exercisable, but in no event later than ten years after the date of grant of the Option; and

(ii) If the exercise of any Option within this time period would subject the Executive to suit under Section 16(b) of the Securities Exchange Act of 1934, the period for exercise shall be extended until the earliest to occur of (a) the tenth day following the date on which the Executive would no longer be subject to such suit, (b) the 190th day after the end of the salary continuation period, or (c) ten years after the date of grant of the Option.

3.4. Section 409A. Each of the cash payments provided pursuant to Article 3 of the Agreement shall be treated for purposes of Section 409A of the Code as a right to a series of separate and distinct payments. If the Executive is a "specified employee," as such term is defined pursuant to Section 409A of the Code and the regulations and guidance issued thereunder, and an amount payable under this Agreement constitutes deferred compensation (within the meaning of Section 409A of the Code) the payment of which is required to be delayed pursuant to the six-month delay rule set forth in Section 409A of the Code in order to avoid taxes or penalties thereunder, then such payments shall not be made until the earlier of the Executive's death or six months and one day after the Executive's last day of employment. The Company does not make any representations regarding the tax treatment to the Executive, and shall in no way be responsible for any specific tax treatment in connection with the payments provided hereunder. With respect to any amounts for which cash payment has been delayed in accordance with this Section 3.4, such amounts shall accrue interest at the applicable U.S. Treasury rate for the corresponding maturity period in effect as of the date of the Triggering Event.

4. Conditions Precedent.

4.1. Release and Waiver. The parties agree that, as a condition to the Executive's right to receive the severance payments and benefits set forth in Section 3, the Executive shall execute a general waiver and release (a "Release"), in form and substance reasonably satisfactory to the Company, within 45 days following the last day of the Executive's employment with the Company, of all claims relating to the Executive's employment by the Company and the termination of such employment, including but not limited to discrimination claims, employment-related tort claims, contract claims and claims under this Agreement (other than claims with respect to benefits under the Company's tax-qualified retirement plans, continuation of coverage or benefits solely as required by Part 6 of Title I of ERISA, or any obligation of the Company to provide future performance under Section 3). No severance payments or benefits will be paid or provided until after the last day on which the Executive could rescind all or any part of the Release and the Release has become effective, and the Company will make the lump sum severance payment pursuant to Section 3.1 and will satisfy any vesting obligations pursuant to Section 3.3(b) within ten days thereafter; provided, however, that if the period during which the Release could be signed and become effective begins in one taxable year and ends in another taxable year, then the severance payment will not be made until the beginning of the second taxable year.

4.2. Non-Competition and Non-Solicitation. The parties agree that, as a condition to the Executive's right to receive the severance payments and benefits set forth in Section 3, the Executive agrees that, for a period of 12 months following the Executive's last day of employment with the Company, the Executive will not, whether alone or as a partner, officer, director, consultant, agent, employee or stockholder of any company or other commercial enterprise, directly or indirectly, without the prior written consent of the Company:

(a) be employed or engaged by or associated with, or engage or invest in, own, manage, operate, finance, control or participate in the ownership, management, operation, financing or control of, any business or other commercial activity whose products directly compete, in whole or in part, with the products of the Company; provided, that the Executive may purchase or otherwise acquire as a passive investment up to (but not more than) one percent of any class of security of any enterprise (but without otherwise participating in the activities of such enterprise) if such securities are listed on any national or regional securities exchange or have been registered under Section 12(g) of the Securities Exchange Act of 1934; or

(b) (i) solicit or induce any employee of the Company to leave the employ of the Company, (ii) solicit business of the same or similar type being carried on by the Company from any person known by to the Executive to have purchased products or services from the Company within the 12 months prior to the Executive's last day of employment with the Company, (iii) unlawfully interfere with the Company's relationship with any person, including any person who was an employee, contractor, supplier or customer of the Company, or (iv) disparage the Company or any of its shareholders, directors, officers, employees or agents.

4.3. Construction. Section 4.2 is intended to provide the greatest restriction allowable under Cal. Bus. & Prof. Code §16601. In the event any provision hereof is determined by a court of competent jurisdiction to violate any provision of Cal. Bus. & Prof. Code §16601, that provision shall be modified to the least extent necessary to render it enforceable and the remainder of the Agreement shall remain in full force and effect.

4.4. Remedies. In the event of a breach of Section 4.1 or Section 4.2 by the Executive, then the Executive shall immediately reimburse the Company the entire gross amount of the severance benefits paid to the Executive pursuant to Section 3 up to the date of such breach. The forfeiture provisions of this Section 4.4 shall be in addition to, and not in limitation of, any other remedies available to the Company at law or in equity.

5. Limitation on Payments by the Company.

5.1. In the event it shall be determined that any payment or distribution by the Company to or for the benefit of the Executive (whether paid or payable or distributed or distributable pursuant to the terms of this Agreement or otherwise) ("Payment" or "Payments") (i) constitutes a "parachute payment" within the meaning of Section 280G

of the Code and (ii) but for this Section 5, would be subject to the excise tax imposed by Section 4999 of the Code, or any interest or penalties with respect to such excise tax (such excise tax, together with any such interest or penalties, are hereinafter collectively referred to as the "Excise Tax"), then the Payments shall be either:

(a) paid or distributed in full, or
(b) paid or distributed as to such lesser extent which would result in no portion of such Payments being subject to the Excise Tax,

whichever of the foregoing amounts, taking into account the applicable federal, state and local income taxes and the Excise Tax, results in the receipt by the Executive (on an after-tax basis) of the greatest amount of Payments, notwithstanding that all or some portion of such Payments may be taxable under Section 4999 of the Code. In the event that any reduction of Payments is made hereunder, it shall be made in the Company's sole discretion and in a manner consistent with the requirements of Section 409A of the Code.

5.2. Unless the Company and the Executive otherwise agree in writing, all determinations required to be made under this Section 5 shall be made in writing by the independent public accountants appointed for this purpose by the Company (the "Accountants") immediately prior to the Triggering Event, whose determination shall be conclusive and binding upon the Company and the Executive for all purposes. For purposes of making the calculation required by this Section 5, the Accountants may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and the Executive shall furnish to the Accountants such information and documents as the Accountants may reasonably request in order to make a determination under this Section 5. The Company shall bear all costs the Accountants may reasonably incur in connetion with any calculations contemplated by this Section 5.

6. Exclusivity and Non-Duplication.

6.1. Exclusivity. Notwithstanding any other agreement to the contrary, the parties acknowledge and agree that the severance payments and benefits provided by the Company under this Agreement:

(a) shall be the only severance or severance-related payments payable and benefits provided by the Company under any plan, program, policy or agreement, including but not limited to the Company's U.S. Executive Severance Benefit Plan, and are in full and complete satisfaction of all such liabilities of the Company; and

(b) shall be deemed to be inclusive of any notice, payments or benefits to which the Executive may be entitled under the federal Worker Adjustment and Retraining Notification (WARN) Act or other applicable plant or facility closing or mass layoff law, the *Employment Standards Act, 2000* or other applicable employment standards legislation, or any other statutory or regulatory requirement to provide notice of employment termination or entitlement to severance payments.

6.2. Non-Duplication. Notwithstanding any other agreement to the contrary, the parties acknowledge and agree that the severance payments and benefits provided by the Company under this Agreement shall be in addition to any other non-severance or non-severance-related payments or benefits under any plan, program, policy or agreement with the Company to which the Executive may otherwise be entitled as of the Triggering Event, including but not limited to (i) unpaid base salary (including accrued and unused paid time off days), (ii) unreimbursed business expenses, (iii) unpaid bonus or sales commission amounts earned under any incentive plan(s) or program(s) (provided that, in the case of the Company's Amended and Restated Incentive Bonus Plan or any successor plan, such amounts shall be limited to any unpaid bonus amounts for any then-completed performance period in accordance with the terms of such plan), (iv) amounts payable upon death or Disability, and (v) amounts payable under the Company's Deferred Compensation Plan or any retirement plans or stock purchase plans of the Company in which the Executive may participate.

7. General.

7.1. Inconsistent Provisions. This Agreement shall be in addition to, and have no effect on, the provisions of any other agreements, including without limitation indemnification agreements, confidentiality agreements and proprietary information, inventions and non-solicitation agreements, which may exist between the Company and the Executive. Notwithstanding the foregoing, to the extent that the terms and conditions of this Agreement are inconsistent with those found in any other agreement or plan to which the Company and the Executive are each a party, the terms and conditions of this Agreement shall control. Notwithstanding the provisions of any existing confidentiality and similar agreements between the Company and the Executive, the parties acknowledge and agree that the Executive shall not be held criminally or civilly liable under any federal or state trade secret law for the disclosure of a trade secret that is made (i) in confidence to a federal, state or local government official or to an attorney solely for the purpose of reporting or investigating a suspected violation of law and (ii) in a complaint or other document filed in a legal action, suit or proceeding, if such filing is made under seal.

7.2. Amendment. This Agreement may not be amended or terminated after the Effective Date or the date of a Triggering Event, as applicable. Prior to such date, the Board may, in its sole discretion, modify or amend this Agreement in any respect, provided such actions do not reduce the amount or defer the receipt of any payment or benefit provided under this Agreement.

7.3. Payment Obligations; Overdue Payments. Subject to satisfaction of the conditions precedent set forth in Sections 4.1 and 4.2, the Company's obligations to make the payments and provide the benefits to the Executive under this Agreement shall be absolute and unconditional and shall not be affected in any way by any circumstances, including, without limitation, any offset, counterclaim, recoupment, defense or other right which the Company may have against the Executive or anyone else. Each and every payment made hereunder by the Company shall be final and the Company will not seek to recover all or any part of such payment from the Executive or from whosoever may be entitled thereto, except as otherwise provided in Section 4.4. The Executive shall be entitled to receive interest at the prime rate of interest published from time to time by The Wall Street Journal on any payments under this Agreement that are 30 days overdue, provided, however, that no payments shall be deemed to be overdue until the Executive executes the Release and any rescission period with respect to such Release has expired.

7.4. At-Will Employment. The Company and the Executive acknowledge and agree that the Executive's employment by the Company is and shall continue to be at-will, as defined under applicable law, except as may otherwise be specifically provided under the terms of any written formal employment agreement or offer letter between the Company and the Executive. Nothing contained in this Agreement shall be deemed to give the Executive the right to remain employed by the Company or to interfere with the rights of the Company to terminate the Executive's employment.

7.5. No Duty to Mitigate. The Executive shall not be required to mitigate any amounts payable or arrangements made under this Agreement, nor shall any such payment or arrangement be reduced by any earnings or benefits that the Executive may receive from any other source (except as provided in the first sentence of Section 3.2).

7.6. Successors. All rights under this Agreement are personal to the Executive and, without the prior written consent of the Company, shall not be assignable by the Executive otherwise than by will or the laws of descent and distribution. This Agreement shall inure to the benefit of and be enforceable in the event of the Executive's death or disability by the Executive's legal representative. This Agreement shall inure to the benefit of and be binding upon the Company and its successors and assigns. The Company will require any successor (whether direct or indirect, by purchase, merger, consolidation or otherwise) to all or substantially all of the business and/or assets of the Company to assume expressly and agree to perform this Agreement in the same manner and to the same extent that the Company would be required to perform it if no such event resulting in a successor had taken place.

7.7. Controlling Law. This Agreement shall in all respects be governed by, and construed in accordance with, the laws of the State of Delaware (without regard to the principles of conflicts of laws).

7.8. Arbitration. DISPUTES REGARDING THE EXECUTIVE'S EMPLOYMENT WITH THE COMPANY, INCLUDING, WITHOUT LIMITATION, ANY DISPUTE HEREUNDER, WHICH CANNOT BE RESOLVED BY NEGOTIATIONS BETWEEN THE COMPANY AND THE EXECUTIVE SHALL BE SUBMITTED TO, AND SOLELY DETERMINED BY, FINAL AND BINDING ARBITRATION CONDUCTED BY JUDICIAL ARBITRATION AND MEDIATION SERVICES ("JAMS") OR ANY SUCCESSOR THERETO, IN ACCORDANCE WITH JAMS' ARBITRATION RULES FOR EMPLOYMENT DISPUTES THEN IN EFFECT, AND THE PARTIES AGREE TO BE BOUND BY THE FINAL AWARD OF THE ARBITRATOR IN ANY SUCH PROCEEDING. THE ARBITRATOR SHALL APPLY THE LAWS OF THE STATE OF DELAWARE WITH RESPECT TO THE INTERPRETATION OR ENFORCEMENT OF ANY MATTER RELATING TO THIS AGREEMENT. ARBITRATION MAY BE HELD IN BALTIMORE, MARYLAND OR SUCH OTHER PLACE AS THE PARTIES HERETO MAY MUTUALLY AGREE, AND SHALL BE CONDUCTED SOLELY BY A FORMER JUDGE. JUDGMENT UPON THE AWARD BY THE ARBITRATOR MAY BE ENTERED IN ANY COURT HAVING JURISDICTION THEREOF. The prevailing party in the arbitration, as determined by the arbitrator, shall be entitled to reimbursement of reasonable attorney's fees and disbursements incurred in such proceedings by the non-prevailing party. **BY SIGNING THIS AGREEMENT, THE PARTIES ARE GIVING UP ANY RIGHT THEY MIGHT HAVE TO SUE EACH OTHER IN COURT AND HAVE THEIR CASE DECIDED BY A JUDGE OR JURY, AND AGREE TO RESOLVE ANY AND ALL DISPUTES BY ARBITRATION**.

7.9. Severability. Any provision in this Agreement which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective only to the extent of such prohibition or unenforceability without invalidating or affecting the remaining provisions hereof, and any such prohibition or unenforceability in any jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

7.10. Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed and delivered this Agreement on the date written below.

	CIENA CORPORATION	**EXECUTIVE**
By:	/s/ David M. Rothenstein	/s/ Gary B. Smith
Name:	**David M. Rothenstein**	**Gary B. Smith**
Title:	Senior VP and General Counsel	
		Date: November 30, 2019

CIENA CORPORATION
CHANGE IN CONTROL SEVERANCE AGREEMENT

This Change in Control Severance Agreement (the "Agreement") is made by and between **Ciena Corporation**, a Delaware corporation, and **<<EXECUTIVE>>** (the "Executive"), and shall become effective on November 30, 2019.

WHEREAS, the Company (as hereinafter defined) considers it essential to foster the continuous employment of key management personnel and recognizes that the possibility of a Change in Control (as hereinafter defined) of the Company exists and that such possibility, and the uncertainty that it may cause, may result in the departure or distraction of key management personnel of the Company, to the detriment of the Company and its stockholders;

WHEREAS, the Executive is a key management employee of the Company; and

WHEREAS, the Company desires to encourage the continued employment of the Executive by the Company and wants assurance that it will have the continued dedication, loyalty and service of, and the availability of objective advice and counsel from, the Executive notwithstanding the possibility, threat or occurrence of a Change in Control.

NOW, THEREFORE, in consideration of the mutual covenants and representations contained herein and the mutual benefits derived herefrom, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Company and the Executive hereby agree as follows:

1. Certain Definitions. In addition to those terms defined elsewhere herein, when used herein, the following capitalized terms shall have the meanings indicated:

1.1. *"Board"* means the Board of Directors of the Company, as constituted from time to time.

1.2. *"Cause"* means the occurrence of any one or more of the following:

(i) the Executive's willful and continued failure substantially to perform the duties of the Executive's position (other than as a result of Disability or as a result of termination by the Executive for Good Reason) after written notice to the Executive by the Governance and Nominations Committee of the Board (or any other special committee or subcommittee appointed by the Board for such purpose) (the "Governance Committee") specifying such failure, provided that such "cause" shall have been found by a majority vote of the Governance Committee after at least seven days' written notice to the Executive specifying the failure on the part of the Executive and after an opportunity for the Executive to be heard at a meeting of the Governance Committee;

(ii) any willful act or omission by the Executive in connection with his or her responsibilities as an employee of the Company constituting dishonesty, fraud or other malfeasance, immoral conduct or gross misconduct;

(iii) any willful material violation by the Executive of the Company's Code of Business Conduct and Ethics or the Proprietary Information, Inventions and Non-Solicitation Agreement between the Company and the Executive; or

(iv) the Executive's conviction of, or plea of nolo contendere to, a felony or a crime of moral turpitude under the laws of the United States or any state thereof or any other jurisdiction in which the Company conducts business.

For purposes of this definition, no act or failure to act by the Executive shall be deemed "willful" unless effected by the Executive not in good faith and without a reasonable belief that such act or failure to act was in or not opposed to the Company's best interests.

1.3. *"Change in Control"* means the occurrence of any one of the following events:

(i) the direct or indirect sale or exchange by the stockholders of the Company of all or substantially all of the stock of the Company where the stockholders of the Company before such sale or exchange do not retain, directly or indirectly, at least a majority of the beneficial interest in the voting stock of the surviving, continuing, successor, or purchasing corporation or parent corporation thereof, as the case may be (the "Acquiring Company") after such sale or exchange;

(ii) a merger or consolidation where the stockholders of the Company before such merger or consolidation do not retain, directly or indirectly, at least a majority of the beneficial interest in the voting stock of the Acquiring Company after such merger or consolidation;

(iii) the sale, exchange, or transfer of all or substantially all of the assets of the Company (other than a sale, exchange, or transfer to one or more subsidiary corporations of the Company);

(iv) a change in the composition of the Board occurring within a two year period, as a result of which less than a majority of the directors are Incumbent Directors. "Incumbent Directors" shall mean directors who either (A) are directors of the Company as of the date hereof or (B) are elected, or nominated for election, to the Board with the affirmative votes of at least a majority of the directors of the Company at the time of such election or nomination (but will not include an individual whose election or nomination is in connection with an actual or threatened proxy contest relating to the election of directors to the Company);

(v) a liquidation or dissolution of the Company; or

(vi) any other event that the Board, in its reasonable discretion, shall determine constitutes a Change in Control.

In each case the determination of whether or not a "Change in Control" is deemed to have taken place shall be made without regard to whether such events or occurrences constituting the Change in Control were hostile or against the position of the Board, or were approved or concurred in by the Board.

1.4. *"Code"* means the Internal Revenue Code of 1986, as amended.

1.5. *"Company"* means Ciena Corporation, its affiliates and subsidiaries, and any successor as provided in Section 7.6.

1.6. *"Disability"* means either (i) "total disability" as defined for purposes of the Company's long-term disability benefit plan; or (ii) the Executive's inability, as a result of physical or mental incapacity, to perform the Executive's duties for a period of six consecutive months or for an aggregate of six months in any 12 consecutive month period.

1.7. *"Effective Date"* means the date on which a Change in Control becomes effective. In the event of a subsequent Change in Control within one year of the prior Change in Control, "Effective Date" shall be adjusted to mean the date on which the subsequent Change in Control occurs.

1.8. "*Good Reason*" means;

(i) removal from, or failure to be reappointed or reelected to the Executive's principal position immediately prior to the Effective Date or the date of a Triggering Event, as applicable (other than as a result of a promotion);

(ii) material diminution in the Executive’s position, duties or responsibilities, or the assignment to the Executive of duties that are inconsistent, in a material respect, with the scope of duties and responsibilities associated with the Executive’s position immediately prior to the Effective Date or the date of a Triggering Event, as applicable;

(iii) material reduction in base salary or award opportunity under any corporate incentive plan (or any successor to any such plan), or a material reduction in the level of participation in long-term incentive, benefit and other plans for senior executives as in effect immediately preceding the Effective Date or the date of a Triggering Event, as applicable, or their equivalents;

(iv) relocation of the Executive’s principal workplace without the Executive’s consent to a location which is more than 50 miles from the Executive’s principal workplace on the Effective Date or the date of a Triggering Event, as applicable; or

(v) any failure by the Company to comply with and satisfy the requirements of Section 7.6, provided that the successor shall have received at least ten days’ prior written notice from the Company or the Executive of the requirements of Section 7.6;

provided, however, that (A) the Executive has provided notice to the Company of any of the foregoing conditions within 90 days of the initial existence of the condition; (B) the Company has been given at least 30 days following receipt of such notice to cure such condition; and (C) the Executive actually terminates employment within one year following the initial existence of the condition.

1.9. *“Options”* means the Executive’s options to purchase common stock of the Company (or to receive cash or property the amount or value of which is determined by reference to the price of the Company’s common stock) that are (i) validly issued under any of the Company’s equity incentive or stock option plans and (ii) outstanding as of the Effective Date or the date of a Triggering Event, as applicable.

1.10. *“Performance-Based Restricted Stock”* means the Executive’s restricted stock (including “restricted stock units” or similar instruments of equity-based compensation or other rights to receive common stock of the Company) that is (i) validly issued under any of the Company’s equity incentive plans, (ii) outstanding as of the Effective Date or the date of a Triggering Event, as applicable, and (iii) subject to performance-based vesting, including but not limited to performance conditions relating to the Company’s stock price as compared to any market, index or comparable company or companies.

1.11. *“Time-Based Restricted Stock”* means the Executive’s restricted stock (including “restricted stock units” or other rights to receive common stock of the Company) that is (i) validly issued under any of the Company’s equity incentive plans, (ii) outstanding as of the Effective Date or the date of a Triggering Event, as applicable, and (iii) subject to time-based vesting.

1.12. *“Triggering Event”* means termination of the Executive's employment with the Company without Cause by the Company, or for Good Reason by the Executive, either (i) within 90 days prior to the Effective Date or (ii) on or within 12 months after the Effective Date. For purposes of this definition, an Executive's employment with the Company will be deemed to have terminated on the earlier of the date the Executive's employment with the Company ceases or the date that written notice of any such termination is received by the Executive or by the Company, as the case may be, even though the parties may agree in connection therewith that the Executive's employment with the Company will continue for a specified period thereafter. The failure by the Executive or the Company to set forth in any such notice sufficient facts or circumstances showing Good Reason or Cause, as the case may be, shall not waive any right of the Executive or the Company or preclude either party from asserting such facts or circumstances in the enforcement of any such right.

2. Term of Agreement.

This Agreement shall commence on the date of its execution by the Executive and shall continue in effect through November 30, 2022 (the “Term”), and may be extended upon mutual written consent of the Executive and

the Company (as authorized by the Board or the Compensation Committee of the Board). Notwithstanding the foregoing:

(a) the Term shall be automatically extended without any further action if the Company is in active negotiations for, or has entered into, a definitive agreement regarding a Change in Control (a "Pending Transaction"), until the earliest to occur of (i) the date on which such negotiations have terminated without entry into a definitive agreement, (ii) the date on which such definitive agreement has terminated pursuant to its terms without occurrence of a Change in Control, or (iii) 12 months following the Effective Date of such Pending Transaction;

(b) in the event that a Change in Control occurs during the Term, this Agreement shall continue in effect for a period of 12 months following the Effective Date; and

(c) if the Executive becomes entitled to severance benefits under Section 3 during the Term, this Agreement will not terminate until all of the obligations of the parties hereto with respect to this Agreement have been satisfied.

3. Severance Benefits Upon Triggering Event.

Subject to the terms of this Agreement (including the satisfaction by the Executive of the conditions precedent set forth in Sections 4.1 and 4.2 hereof and the application of the exclusivity and non-duplication provisions of Section 6 hereof), upon a Triggering Event the Company shall pay the Executive the amounts and provide the Executive with the benefits set forth in this Section 3:

3.1. Severance Payment. The Company shall pay to the Executive a lump sum severance payment, subject to any applicable payroll or other taxes required to be withheld, equal to **<<AMOUNT>>** times the sum of (i) the Executive's annual base salary as in effect immediately prior to either the date of the Executive's termination of employment with the Company or the Effective Date, whichever is higher, and (ii) the Executive's annual target bonus or sales commissions amount(s) under any incentive plan(s) or program(s) in which the Executive participated immediately prior to either the date of the Executive's termination of employment with the Company or the Effective Date, whichever is higher. The above bonus or commissions amount shall be based on an assumed achievement of 100% of the targeted performance goal(s) for such award. Upon receipt of the above bonus amount, and subject to Section 6.2(iii) hereof, neither the Executive nor any other person claiming any payment by reason of the Executive's participation in the applicable annual bonus plan or annual sales incentive compensation plan shall have any right to any additional payment under such plan(s) or program(s) with respect to any applicable award thereunder;

3.2. Welfare Benefit and D&O Insurance. The Company shall continue the Executive's (and, where applicable, the Executive's spouse and eligible dependents') participation in the group medical, dental and vision plans maintained by the Company, on substantially the same basis as if the Executive were an employee of the Company, until the earlier of **<<NUMBER>>** months following the Executive's termination of employment with the Company or the last day of the month in which the Executive commences employment with another employer following the Executive's termination of employment with the Company (the "Coverage Period"). In the event that the Company is unable for any reason to provide for the Executive's (and, where applicable, the Executive's spouse and eligible dependents') continued participation in one or more of such plans during the Coverage Period, the Company shall pay or provide at its expense equivalent benefit coverage for the remainder of the Coverage Period. The Coverage Period shall be taken into account as a period of continuation coverage for purposes of Part 6 of Title I of the Employee Retirement Income Security Act of 1974, as amended ("ERISA"), and for purposes of any other obligation of the Company to provide any continued coverage to the Executive (and, where applicable, the Executive's spouse and eligible dependents) under any group medical, dental or vision plan. In the event that any payments under this Section 3.2 violate the non-discrimination rules or would result in the imposition of penalties under the Affordable Care Act ("ACA"), then the parties agree to modify this section as necessary in order to comply with the ACA. The Company shall continue to maintain director and officer insurance covering the Executive, and shall maintain in effect any

indemnification agreements providing for indemnification of the Executive by the Company, until the applicable statute of limitations has ended;

3.3. Options and Restricted Stock. Notwithstanding the terms of any plan, program or arrangement maintained by the Company:

(a) upon the Effective Date, (i) the Executive's Options that are subject to performance-based vesting and for which the applicable performance period has not yet expired shall immediately be converted into Options with time-based vesting conditions, and (ii) the Executive's Performance-Based Restricted Stock for which the applicable performance period has not yet expired shall immediately be converted into Time-Based Restricted Stock; in each case, the applicable equity award (x) shall be converted into an amount of shares based on an assumed achievement of 100% of the targeted performance goal(s) for such award, and (y) shall be deemed to have commenced vesting on the date of grant and shall vest over the shorter of (A) four years, with 1/16th of the award vesting on each March 20, June 20, September 20 and December 20 following the date of grant, or (B) the period between the date of grant and the original final vesting date of the applicable equity award, with the award vesting proportionately over such period on each March 20, June 20, September 20 and December 20 following the date of grant;

(b) upon a Triggering Event, all of the Executive's Options, Performance-Based Restricted Stock and Time-Based Restricted Stock (including any Performance-Based Restricted Stock converted pursuant to Section 3.3(a) above), to the extent unvested, shall become immediately vested and exercisable in full; and

(c) upon a Triggering Event, the Executive must elect to exercise any unexercised and exercisable Options within the time period set forth in the applicable plan, program or arrangement under which they were granted, subject to the following requirements:

(i) If the exercise of any Option within the time period described in this Section 3.3 is prevented by the requirements of federal or state securities laws or as provided under the terms of the applicable plan, program or arrangement, then the Option shall remain exercisable until three months after the date the Executive is notified by the Company that the Option is exercisable, but in no event later than ten years after the date of grant of the Option; and

(ii) If the exercise of any Option within this time period would subject the Executive to suit under Section 16(b) of the Securities Exchange Act of 1934, the period for exercise shall be extended until the earliest to occur of (a) the tenth day following the date on which the Executive would no longer be subject to such suit, (b) the 190th day after the end of the salary continuation period, or (c) ten years after the date of grant of the Option.

3.4. Section 409A. Each of the cash payments provided pursuant to Article 3 of the Agreement shall be treated for purposes of Section 409A of the Code as a right to a series of separate and distinct payments. If the Executive is a "specified employee," as such term is defined pursuant to Section 409A of the Code and the regulations and guidance issued thereunder, and an amount payable under this Agreement constitutes deferred compensation (within the meaning of Section 409A of the Code) the payment of which is required to be delayed pursuant to the six-month delay rule set forth in Section 409A of the Code in order to avoid taxes or penalties thereunder, then such payments shall not be made until the earlier of the Executive's death or six months and one day after the Executive's last day of employment. The Company does not make any representations regarding the tax treatment to the Executive, and shall in no way be responsible for any specific tax treatment in connection with the payments provided hereunder. With respect to any amounts for which cash payment has been delayed in accordance with this Section 3.4, such amounts

shall accrue interest at the applicable U.S. Treasury rate for the corresponding maturity period in effect as of the date of the Triggering Event.

4. Conditions Precedent.

4.1. Release and Waiver. The parties agree that, as a condition to the Executive's right to receive the severance payments and benefits set forth in Section 3, the Executive shall execute a general waiver and release (a "Release"), in form and substance reasonably satisfactory to the Company, within 45 days following the last day of the Executive's employment with the Company, of all claims relating to the Executive's employment by the Company and the termination of such employment, including but not limited to discrimination claims, employment-related tort claims, contract claims and claims under this Agreement (other than claims with respect to benefits under the Company's tax-qualified retirement plans, continuation of coverage or benefits solely as required by Part 6 of Title I of ERISA, or any obligation of the Company to provide future performance under Section 3). No severance payments or benefits will be paid or provided until after the last day on which the Executive could rescind all or any part of the Release and the Release has become effective, and the Company will make the lump sum severance payment pursuant to Section 3.1 and will satisfy any vesting obligations pursuant to Section 3.3(b) within ten days thereafter; provided, however, that if the period during which the Release could be signed and become effective begins in one taxable year and ends in another taxable year, then the severance payment will not be made until the beginning of the second taxable year.

4.2. Non-Competition and Non-Solicitation. The parties agree that, as a condition to the Executive's right to receive the severance payments and benefits set forth in Section 3, the Executive agrees that, for a period of 12 months following the Executive's last day of employment with the Company, the Executive will not, whether alone or as a partner, officer, director, consultant, agent, employee or stockholder of any company or other commercial enterprise, directly or indirectly, without the prior written consent of the Company:

(a) be employed or engaged by or associated with, or engage or invest in, own, manage, operate, finance, control or participate in the ownership, management, operation, financing or control of, any business or other commercial activity whose products directly compete, in whole or in part, with the products of the Company; provided, that the Executive may purchase or otherwise acquire as a passive investment up to (but not more than) one percent of any class of security of any enterprise (but without otherwise participating in the activities of such enterprise) if such securities are listed on any national or regional securities exchange or have been registered under Section 12(g) of the Securities Exchange Act of 1934; or

(b) (i) solicit or induce any employee of the Company to leave the employ of the Company, (ii) solicit business of the same or similar type being carried on by the Company from any person known by to the Executive to have purchased products or services from the Company within the 12 months prior to the Executive's last day of employment with the Company, (iii) unlawfully interfere with the Company's relationship with any person, including any person who was an employee, contractor, supplier or customer of the Company, or (iv) disparage the Company or any of its shareholders, directors, officers, employees or agents.

4.3. Construction. Section 4.2 is intended to provide the greatest restriction allowable under Cal. Bus. & Prof. Code §16601. In the event any provision hereof is determined by a court of competent jurisdiction to violate any provision of Cal. Bus. & Prof. Code §16601, that provision shall be modified to the least extent necessary to render it enforceable and the remainder of the Agreement shall remain in full force and effect.

4.4. Remedies. In the event of a breach of Section 4.1 or Section 4.2 by the Executive, then the Executive shall immediately reimburse the Company the entire gross amount of the severance benefits paid to the Executive pursuant to Section 3 up to the date of such breach. The forfeiture provisions of this Section 4.4 shall be in addition to, and not in limitation of, any other remedies available to the Company at law or in equity.

5. Limitation on Payments by the Company.

5.1. In the event it shall be determined that any payment or distribution by the Company to or for the benefit of the Executive (whether paid or payable or distributed or distributable pursuant to the terms of this Agreement or otherwise) ("Payment" or "Payments") (i) constitutes a "parachute payment" within the meaning of Section 280G of the Code and (ii) but for this Section 5, would be subject to the excise tax imposed by Section 4999 of the Code, or any interest or penalties with respect to such excise tax (such excise tax, together with any such interest or penalties, are hereinafter collectively referred to as the "Excise Tax"), then the Payments shall be either:

(a) paid or distributed in full, or

(b) paid or distributed as to such lesser extent which would result in no portion of such Payments being subject to the Excise Tax,

whichever of the foregoing amounts, taking into account the applicable federal, state and local income taxes and the Excise Tax, results in the receipt by the Executive (on an after-tax basis) of the greatest amount of Payments, notwithstanding that all or some portion of such Payments may be taxable under Section 4999 of the Code. In the event that any reduction of Payments is made hereunder, it shall be made in the Company's sole discretion and in a manner consistent with the requirements of Section 409A of the Code.

5.2. Unless the Company and the Executive otherwise agree in writing, all determinations required to be made under this Section 5 shall be made in writing by the independent public accountants appointed for this purpose by the Company (the "Accountants") immediately prior to the Triggering Event, whose determination shall be conclusive and binding upon the Company and the Executive for all purposes. For purposes of making the calculation required by this Section 5, the Accountants may make reasonable assumptions and approximations concerning applicable taxes and may rely on reasonable, good faith interpretations concerning the application of Sections 280G and 4999 of the Code. The Company and the Executive shall furnish to the Accountants such information and documents as the Accountants may reasonably request in order to make a determination under this Section 5. The Company shall bear all costs the Accountants may reasonably incur in connetion with any calculations contemplated by this Section 5.

6. Exclusivity and Non-Duplication.

6.1. Exclusivity. Notwithstanding any other agreement to the contrary, the parties acknowledge and agree that the severance payments and benefits provided by the Company under this Agreement:

(a) shall be the only severance or severance-related payments payable and benefits provided by the Company under any plan, program, policy or agreement, including but not limited to the Company's U.S. Executive Severance Benefit Plan, and are in full and complete satisfaction of all such liabilities of the Company; and

(b) shall be deemed to be inclusive of any notice, payments or benefits to which the Executive may be entitled under the federal Worker Adjustment and Retraining Notification (WARN) Act or other applicable plant or facility closing or mass layoff law, the *Employment Standards Act, 2000* or other applicable employment standards legislation, or any other statutory or regulatory requirement to provide notice of employment termination or entitlement to severance payments.

6.2. Non-Duplication. Notwithstanding any other agreement to the contrary, the parties acknowledge and agree that the severance payments and benefits provided by the Company under this Agreement shall be in addition to any other non-severance or non-severance-related payments or benefits under any plan, program, policy or agreement with the Company to which the Executive may otherwise be entitled as of the Triggering Event, including but not limited to (i) unpaid base salary (including accrued and unused paid time off days), (ii) unreimbursed business expenses, (iii) unpaid bonus or sales commission amounts earned under any incentive plan(s) or program(s) (provided that, in

the case of the Company's Amended and Restated Incentive Bonus Plan or any successor plan, such amounts shall be limited to any unpaid bonus amounts for any then-completed performance period in accordance with the terms of such plan), (iv) amounts payable upon death or Disability, and (v) amounts payable under the Company's Deferred Compensation Plan or any retirement plans or stock purchase plans of the Company in which the Executive may participate.

7. General.

7.1. Inconsistent Provisions. This Agreement shall be in addition to, and have no effect on, the provisions of any other agreements, including without limitation indemnification agreements, confidentiality agreements and proprietary information, inventions and non-solicitation agreements, which may exist between the Company and the Executive. Notwithstanding the foregoing, to the extent that the terms and conditions of this Agreement are inconsistent with those found in any other agreement or plan to which the Company and the Executive are each a party, the terms and conditions of this Agreement shall control. Notwithstanding the provisions of any existing confidentiality and similar agreements between the Company and the Executive, the parties acknowledge and agree that the Executive shall not be held criminally or civilly liable under any federal or state trade secret law for the disclosure of a trade secret that is made (i) in confidence to a federal, state or local government official or to an attorney solely for the purpose of reporting or investigating a suspected violation of law and (ii) in a complaint or other document filed in a legal action, suit or proceeding, if such filing is made under seal.

7.2. Amendment. This Agreement may not be amended or terminated after the Effective Date or the date of a Triggering Event, as applicable. Prior to such date, the Board may, in its sole discretion, modify or amend this Agreement in any respect, provided such actions do not reduce the amount or defer the receipt of any payment or benefit provided under this Agreement.

7.3. Payment Obligations; Overdue Payments. Subject to satisfaction of the conditions precedent set forth in Sections 4.1 and 4.2, the Company's obligations to make the payments and provide the benefits to the Executive under this Agreement shall be absolute and unconditional and shall not be affected in any way by any circumstances, including, without limitation, any offset, counterclaim, recoupment, defense or other right which the Company may have against the Executive or anyone else. Each and every payment made hereunder by the Company shall be final and the Company will not seek to recover all or any part of such payment from the Executive or from whosoever may be entitled thereto, except as otherwise provided in Section 4.4. The Executive shall be entitled to receive interest at the prime rate of interest published from time to time by The Wall Street Journal on any payments under this Agreement that are 30 days overdue, provided, however, that no payments shall be deemed to be overdue until the Executive executes the Release and any rescission period with respect to such Release has expired.

7.4. At-Will Employment. The Company and the Executive acknowledge and agree that the Executive's employment by the Company is and shall continue to be at-will, as defined under applicable law, except as may otherwise be specifically provided under the terms of any written formal employment agreement or offer letter between the Company and the Executive. Nothing contained in this Agreement shall be deemed to give the Executive the right to remain employed by the Company or to interfere with the rights of the Company to terminate the Executive's employment.

7.5. No Duty to Mitigate. The Executive shall not be required to mitigate any amounts payable or arrangements made under this Agreement, nor shall any such payment or arrangement be reduced by any earnings or benefits that the Executive may receive from any other source (except as provided in the first sentence of Section 3.2).

7.6. Successors. All rights under this Agreement are personal to the Executive and, without the prior written consent of the Company, shall not be assignable by the Executive otherwise than by will or the laws of descent and distribution. This Agreement shall inure to the benefit of and be enforceable in the event of the Executive's death or disability by the Executive's legal representative. This Agreement shall inure to the benefit of and be binding upon the Company and its successors and assigns. The Company will require any successor (whether direct or indirect, by purchase, merger, consolidation or otherwise) to all or substantially all of the business and/or assets of the Company

to assume expressly and agree to perform this Agreement in the same manner and to the same extent that the Company would be required to perform it if no such event resulting in a successor had taken place.

7.7. Controlling Law. This Agreement shall in all respects be governed by, and construed in accordance with, the laws of the State of Delaware (without regard to the principles of conflicts of laws).

7.8. Arbitration. DISPUTES REGARDING THE EXECUTIVE'S EMPLOYMENT WITH THE COMPANY, INCLUDING, WITHOUT LIMITATION, ANY DISPUTE HEREUNDER, WHICH CANNOT BE RESOLVED BY NEGOTIATIONS BETWEEN THE COMPANY AND THE EXECUTIVE SHALL BE SUBMITTED TO, AND SOLELY DETERMINED BY, FINAL AND BINDING ARBITRATION CONDUCTED BY JUDICIAL ARBITRATION AND MEDIATION SERVICES ("JAMS") OR ANY SUCCESSOR THERETO, IN ACCORDANCE WITH JAMS' ARBITRATION RULES FOR EMPLOYMENT DISPUTES THEN IN EFFECT, AND THE PARTIES AGREE TO BE BOUND BY THE FINAL AWARD OF THE ARBITRATOR IN ANY SUCH PROCEEDING. THE ARBITRATOR SHALL APPLY THE LAWS OF THE STATE OF DELAWARE WITH RESPECT TO THE INTERPRETATION OR ENFORCEMENT OF ANY MATTER RELATING TO THIS AGREEMENT. ARBITRATION MAY BE HELD IN BALTIMORE, MARYLAND OR SUCH OTHER PLACE AS THE PARTIES HERETO MAY MUTUALLY AGREE, AND SHALL BE CONDUCTED SOLELY BY A FORMER JUDGE. JUDGMENT UPON THE AWARD BY THE ARBITRATOR MAY BE ENTERED IN ANY COURT HAVING JURISDICTION THEREOF. The prevailing party in the arbitration, as determined by the arbitrator, shall be entitled to reimbursement of reasonable attorney's fees and disbursements incurred in such proceedings by the non-prevailing party. **BY SIGNING THIS AGREEMENT, THE PARTIES ARE GIVING UP ANY RIGHT THEY MIGHT HAVE TO SUE EACH OTHER IN COURT AND HAVE THEIR CASE DECIDED BY A JUDGE OR JURY, AND AGREE TO RESOLVE ANY AND ALL DISPUTES BY ARBITRATION**.

7.9. Severability. Any provision in this Agreement which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective only to the extent of such prohibition or unenforceability without invalidating or affecting the remaining provisions hereof, and any such prohibition or unenforceability in any jurisdiction shall not invalidate or render unenforceable such provision in any other jurisdiction.

7.10. Counterparts. This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together will constitute one and the same instrument.

IN WITNESS WHEREOF, the parties have executed and delivered this Agreement on the date written below.

	CIENA CORPORATION	**EXECUTIVE**
By:	/s/ David M. Rothenstein	______________________
Name:	**David M. Rothenstein**	
Title:	Senior VP and General Counsel	
		Date: November 30, 2019

EXHIBIT 21.1

Subsidiary	Jurisdiction of Incorporation or Organization
Ciena Communications, Inc.	Delaware
Ciena Canada, Inc.	Canada

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (No. 333-217001, 333-91294, 333-103328, 333-123509, 333-123510, 333-149520, 333-149929, 333-166125, 333-180332, 333-180333, 333-195498 and 333-214594) and on Post Effective Amendment No. 1 on Form S-8 to Form S-4 (No. 333-204732) of Ciena Corporation of our report dated December 20, 2019 relating to the financial statements and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP
Baltimore, Maryland
December 20, 2019

EXHIBIT 31.1

CIENA CORPORATION
CERTIFICATION OF CHIEF EXECUTIVE OFFICER

I, Gary B. Smith, certify that:

1. I have reviewed this annual report of Ciena Corporation;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: December 20, 2019

/s/ Gary B. Smith

Gary B. Smith
President and Chief Executive Officer

EXHIBIT 31.2

CIENA CORPORATION
CERTIFICATION OF CHIEF FINANCIAL OFFICER

I, James E. Moylan Jr., certify that:

1. I have reviewed this annual report of Ciena Corporation;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

(a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

(b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

(c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

(d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

(a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

(b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: December 20, 2019

/s/ James E. Moylan Jr.

James E. Moylan Jr.
Senior Vice President and Chief Financial Officer

EXHIBIT 32.1

CIENA CORPORATION

Written Statement of Chief Executive Officer
Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002

The undersigned, the Chief Executive Officer of Ciena Corporation (the "Company"), hereby certifies that, to his knowledge, on the date hereof:

(a) the Report on Form 10-K of the Company for the year ended October 31, 2019 filed on the date hereof with the Securities and Exchange Commission (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(b) information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ Gary B. Smith

Gary B. Smith
President and Chief Executive Officer
December 20, 2019

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to Ciena Corporation and will be retained by Ciena Corporation and furnished to the Securities and Exchange Commission or its staff upon request.

EXHIBIT 32.2

CIENA CORPORATION

Written Statement of Chief Financial Officer
Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002

The undersigned, the Chief Financial Officer of Ciena Corporation (the "Company"), hereby certifies that, to his knowledge, on the date hereof:

(a) the Report on Form 10-K of the Company for the year ended October 31, 2019 filed on the date hereof with the Securities and Exchange Commission (the "Report") fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(b) information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

/s/ James E. Moylan Jr.

Senior Vice President and Chief Financial Officer

December 20, 2019

A signed original of this written statement required by Section 906, or other document authenticating, acknowledging, or otherwise adopting the signature that appears in typed form within the electronic version of this written statement required by Section 906, has been provided to Ciena Corporation and will be retained by Ciena Corporation and furnished to the Securities and Exchange Commission or its staff upon request.