

CADENCE DESIGN SYSTEMS INC
Form 10-K
February 27, 2019
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UNITED STATES SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

(Mark One)

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 29, 2018

OR

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

For the transition period from _____ to _____.

Commission file number 000-15867

CADENCE DESIGN SYSTEMS, INC.
(Exact name of registrant as specified in its charter)

Delaware 00-0000000
(State or Other Jurisdiction of (I.R.S. Employer
Incorporation or Organization) Identification No.)

2655 Seely Avenue, Building 5, San Jose, California 95134
(Address of Principal Executive Offices) (Zip Code)

(408) 943-1234
(Registrant's Telephone Number, including Area Code)

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

Title of Each Class Names of Each Exchange on which Registered
Common Stock, \$0.01 par value per share Nasdaq Global Select Market

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

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

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

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

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

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

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

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

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

The aggregate market value of the voting and non-voting common equity held by non-affiliates computed by reference to the price at which the common equity was last sold as of the last business day of the registrant’s most recently completed second fiscal quarter ended June 30, 2018 was approximately \$12,248,414,480.

On February 2, 2019, approximately 280,385,000 shares of the Registrant’s Common Stock, \$0.01 par value, were outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the definitive proxy statement for Cadence Design Systems, Inc.’s 2019 Annual Meeting of Stockholders are incorporated by reference into Part III hereof.

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PART I.

Item 1. Business

This Annual Report on Form 10-K and the documents incorporated by reference in this Annual Report on Form 10-K contain statements that are not historical in nature, are predictive, or that depend upon or refer to future events or conditions or contain other forward-looking statements. Statements including, but not limited to, statements regarding the extent and timing of future revenues and expenses and customer demand, statements regarding the deployment of our products and services, statements regarding our reliance on third parties and other statements using words such as “anticipates,” “believes,” “could,” “estimates,” “expects,” “forecasts,” “intends,” “may,” “plans,” “projects,” “should,” “targets” and words of similar import and the negatives thereof, constitute forward-looking statements. These statements are predictions based upon our current expectations about future events. Actual results could vary materially as a result of certain factors, including but not limited to those expressed in these statements. Important risks and uncertainties that could cause actual results to differ materially from those contained in the forward-looking statements include, but are not limited to, those identified in “Proprietary Technology,” “Competition,” “Risk Factors,” “Critical Accounting Estimates,” “Results of Operations,” “Quantitative and Qualitative Disclosures About Market Risk” and “Liquidity and Capital Resources” contained in this Annual Report on Form 10-K and the risks discussed in our other Securities and Exchange Commission (“SEC”) filings.

We urge you to consider these factors carefully in evaluating the forward-looking statements contained in this Annual Report on Form 10-K. All subsequent written or oral forward-looking statements attributable to our company or persons acting on our behalf are expressly qualified in their entirety by these cautionary statements. The forward-looking statements included in this Annual Report on Form 10-K are made only as of the date of this Annual Report on Form 10-K. We do not intend, and undertake no obligation, to update these forward-looking statements.

Overview

We enable our customers to design electronic products. Our products and services are designed to give our customers a competitive edge in their development of electronic systems, integrated circuits (“ICs”), electronic devices and increasingly sophisticated manufactured products. Our products and services do this by optimizing performance, minimizing power consumption, shortening the time to bring our customers’ products to market and reducing their design, development and manufacturing costs. Our customers create and sell electronic products at differing levels of completeness. Our electronic systems customers deliver entire devices, such as smartphones, laptop computers, gaming systems, automobiles and autonomous driving, servers, cloud datacenter infrastructure, artificial intelligence (“AI”) systems, aerospace and defense, medical equipment and networking products. These systems companies internally develop, or externally purchase, the sub-components for their products, including printed circuit boards (“PCBs”), which interconnect all the hardware components, ICs, which are often referred to as computer chips, and software at various levels which runs on the hardware. Our semiconductor customers deliver ICs, which include subcategories such as memory chips, systems-on-chip (“SoCs”), analog chips, processors and other types of chips. We offer software, hardware, services and reusable IC design blocks, which are commonly referred to as intellectual property (“IP”). Systems customers use our offerings to develop and integrate software that is key to the functionality of their products, as well as to design their ICs and PCBs. Our semiconductor customers use our offerings to design, configure, analyze and verify ICs. Additionally, some customers license our IP, which accelerates their product development processes by providing pre-designed and verified circuit blocks for their ICs.

Our strategy, which we call System Design Enablement (“SDE”), is to provide the technologies necessary for our customers to develop a complete and functional electronic product. Our SDE strategy enables us to address the growing trends of electronic systems companies developing their own ICs as part of their end product systems, as well as semiconductor companies delivering greater portions of the systems into which their IC products are integrated. The development of electronic products, or their sub-components, is complex and requires many engineers using our solutions with specialized knowledge and skill. The rate of technical innovation in electronics is swift, long driven by a concept known as Moore’s Law, which more than 50 years ago predicted that the complexity of ICs would double about every 24 months. In order to make our customers successful, our products must handle this exponential growth rate in complexity, without requiring a corresponding increase in our customers’ costs. Historically, the industry that

provided the tools used by IC engineers was referred to as Electronic Design Automation (“EDA”). Today, our offerings include and extend beyond EDA tools to include SDE.

Our SDE solutions facilitate the electronic product creation process at four levels. First, our core EDA offerings enable engineers to complete tasks associated with the design, analysis and verification of ICs. Core EDA tools and services are specifically designed to meet the requirements of engineers who develop different types of ICs. The second level of SDE solutions is IP, which consists of design IP and verification IP (“VIP”). Design IP is directly integrated into the IC by the customer as part of its development process. VIP consists of technologies and methodologies useful for verifying how design IP is integrated into the IC, but VIP does not become part of the IC product. The third level of SDE solutions is System Interconnect, and includes tools and services used for the design, analysis and verification of PCBs, as well as the packages that encapsulate the ICs for electrical and physical connection to the PCB. The fourth level of SDE solutions is System Integration, which includes the engineering tasks associated with designing and analyzing systems, verifying system functionality, combining software with hardware, or developing new software for an IC or system prior to its manufacture.

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Business Drivers

Our products and services enable our customers to design complex and innovative electronic products, so demand for our products is driven by our customers' investment in new designs and products. The most promising new opportunities for us involve enabling the design of electronic systems for machine learning, edge computing, hyperscale datacenter infrastructure, 5G networks, augmented reality, virtual reality, internet-of-things, aerospace and defense and autonomous vehicle sub-systems. Large and existing electronics categories, such as datacenter servers, smartphones and networking products continue to provide business opportunities for us as customers initiate new design projects.

Underlying the requirements within any particular vertical market sector is the availability of rapidly improving IC manufacturing technology. In order for our customers to take advantage of such advancements, certain of our products must first be developed to exploit these new manufacturing capabilities. This dependency means that we must invest significantly in product research and development to keep pace with the latest manufacturing technology. The demand for new IC manufacturing technology directly impacts the demand for our newest products.

Another driver for our business is the differentiation, capabilities and benefits provided to our customers by our products. With the rapid pace of innovation comes the opportunity for our products to address key challenges associated with electronic product creation, such as power consumption, performance and cost. Our products have unique attributes that our customers value. In general, these attributes can be grouped into broader categories such as quality of results (in terms of power consumption, performance and chip area), engineering productivity, tool performance, new capabilities or methods and faster time-to-market. Our business opportunities are significantly enhanced when our offerings address these key factors. We are applying machine learning techniques within our products to enhance quality of results, productivity, performance and methodology.

Products and Product Strategy

Our strategy is to provide our customers with the ability to address the broad range of issues that arise as they develop electronic products. Our SDE solutions are comprised of products that are categorized according to the role they play in the electronic product design process. We combine our products and technologies into categories related to major design activities. The following table shows the relationship between our product categories and the SDE levels to which they relate.

Cadence Product Categories	System Design Enablement Levels			
	IC Development (Core IP EDA)	System Integration	System Interconnect	System Integration
Functional Verification (including hardware for emulation and prototyping)	ü	ü	N/A	ü
Digital IC Design and Signoff	ü	ü	N/A	ü
Custom IC Design and Simulation	ü	ü	N/A	N/A
System Interconnect and Analysis (PCB and IC package)	ü	N/A	ü	N/A
IP (includes design IP and VIP)	ü	ü	ü	ü

Functional Verification, including Emulation and Prototyping Hardware

Functional verification products are used by our customers to efficiently and effectively verify that the circuitry or the software they have designed will perform as intended. Verification takes place before implementing or manufacturing the circuitry, significantly reducing the risk of discovering an error in the completed product. Our functional verification offering consists of four primary verification engines:

- JasperGold® formal verification platform
- Xcelium™ parallel simulation platform
- Palladium® Z1 enterprise emulation platform
- Protium™ S1 FPGA-based prototyping platform

These engines are used for early bug detection, verification of block-level functionality, verification acceleration and emulation of system-level functionality, system-level power exploration, analysis and optimization and system-level prototyping for hardware/software co-verification. Our emulation hardware offering--the Palladium Z1 enterprise emulation system--provides high throughput, capacity, datacenter reliability and workgroup productivity to enable global design teams to develop advanced hardware-software systems. The Protium S1, a prototyping solution based on Field-Programmable Gate Arrays ("FPGAs"), leverages a common front end with Palladium Z1 in order to move designs rapidly from emulation to the prototyping stage for early software development.

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Also included in our functional verification offering are products that are used for verification planning and metric tracking, testbench automation, debugging and software-driven tests. These products enable our customers to coordinate verification activities across multiple teams and various specialists for verification planning and closure.

Digital IC Design and Signoff

Digital IC design offerings are used by our customers to create logical representations of a digital circuit or an IC that can be verified for correctness prior to implementation (please refer to the discussion under “Functional Verification, including Emulation and Prototyping Hardware” above). Once the logic is verified, the design representation is implemented, or converted to a format ready for silicon manufacturing, using additional software tools within this category. The manufacturing representation is also analyzed and verified. Our digital IC offerings include three major categories: logic design, physical implementation and signoff.

Our logic design offering is comprised of logic synthesis, test and equivalence checking capabilities and is typically used by customers to create and verify designs in conjunction with our functional verification capabilities. This offering provides chip planning, design, verification and test technologies and services to customers. The offering includes the Genus™ synthesis solution, a logic synthesis offering that provides fast throughput while also offering high quality results, the Stratus™ high-level synthesis solution for system-level synthesis, and the Joules™ RTL power solution, which delivers fast power analysis while preserving near-signoff accuracy. We also offer the Modus™ design-for-test software solution, which reduces SoC test time.

Our physical implementation offering comprises tools used near the end of the design process, including place and route, optimization and multi-patterning preparation. The Innovus™ implementation system is a physical implementation offering that delivers fast design turnaround time while also delivering improved power, performance and area characteristics. This offering enables customers to address the technology challenges of the latest semiconductor advanced process nodes, create a physical representation of logic models and prepare a design for signoff.

Our signoff offering is comprised of tools used to signoff the design as ready for manufacture by a semiconductor foundry, which provides certification for this step. This offering includes Tempus™ timing analysis, Voltus™ power analysis, Quantus™ QRC extraction solutions and Pegasus™ physical verification system. Our design for manufacturing products are also included in our signoff offering and are used by customers to address manufacturing and yield issues as early in the product development process as possible.

Custom IC Design and Simulation

Custom IC design and simulation offerings are used by our customers to create schematic and physical representations of circuits down to the transistor level for analog, mixed-signal, custom digital, memory and radio frequency (“RF”) designs. These representations are verified using simulation tools optimized for each type of design. The offering includes the design capture environment, simulation and IC layout capabilities within the Virtuoso® custom design platform. Other tools in the custom IC portfolio are used to prepare the designs for manufacturing.

Virtuoso Advanced Node adds functionality to the base Virtuoso package to enable the use of three-dimensional transistors (“FinFETs”), multi-patterning and other technologies required for advanced designs. Virtuoso for Electrically Aware Design introduces a new time-saving paradigm that shortens the loop between design and verification by verifying designs as they are being created. Spectre® XPS is a Fast SPICE offering that speeds verification time over previously existing solutions. Liberate™ characterization solution generates electrical cell views for timing, power and signal integrity. Virtuoso System Design Platform enables engineers to design and verify concurrently across the chip, package and board. Finally, Legato™ Memory Solution is the industry’s first integrated solution for memory design and verification, and Legato Reliability is the industry’s first complete analog IC design-for-reliability solution.

System Interconnect and Analysis

Our System Interconnect and Analysis offerings are used by our customers to develop PCBs and IC packages. The capabilities in the Allegro® system interconnect design platform include PCB authoring and implementation, IC package and System-in-Package design and signal and power integrity analysis and PCB library design management and collaboration. Certain offerings also include the simulation capability within the Virtuoso custom design platform. Sigrity™ analysis tools have been integrated with our Allegro platform, enabling a comprehensive front-to-back flow for implementation and full signal and power integrity analysis for designs featuring high speed interface protocols. These

offerings enable engineers who are responsible for the capture, layout and analysis of advanced PCB and IC packages to design high-performance electronic products across the domains of ICs, IC packages and PCBs, to increase functional density and to manage design complexity while reducing cost and time-to-market. The need for compact, high-performance mobile, consumer and automotive design with advanced serial interconnect is driving technology evolution for our PCB offering. For mainstream PCB customers, where individual or small team productivity is a focus, we provide the OrCAD® family of offerings that is primarily marketed worldwide through a network of resellers.

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IP

Our design IP offerings consist of pre-verified, customizable functional blocks, which customers integrate into their ICs to accelerate the development process and to reduce the risk of errors in the design process. We offer many types of design IP, including Tensilica® configurable digital signal processors vertically targeted subsystems for AI/machine learning, audio/voice, baseband and vision/imaging applications, controllers and physical interfaces for standard protocols and analog IP. We have significantly expanded our design IP portfolio in recent years through acquisitions and internal development. During fiscal 2018, we launched the industry's first silicon-proven, long-reach 112 gigabit Serializer/Deserializer ("SerDes") communications IP at the 7-nanometer process node and the Tensilica DNA 100 processor, a deep neural-network accelerator targeting on-device neural network inference applications.

We also offer a broad range of VIP and memory models, which model the expected behavior of many industry standard protocols when used with verification solutions and are complementary to our design IP offerings. VIP and accelerated VIP, which is used in emulation, are used across the suite of functional verification engines to verify the correct interaction with dozens of design IP interface protocols such as DDR, USB and PCI Express. Our VIP offerings are also used in system-level verification to model correct behavior of full systems interacting with their environments.

Product Arrangements

We primarily license our software using time-based licenses. Our time-based license arrangements offer customers the right to access and use all of the products delivered at the outset of an arrangement and updates throughout the entire term of the arrangement, which is generally two to three years, with no rights to return. Our updates provide for continued access to our evolving technology as our customers' designs migrate to more advanced nodes. In addition, certain time-based license arrangements include:

the right for the customer to remix among the products delivered at the outset of the arrangement, so long as the cumulative contractual value of all products in use does not exceed the total license fee determined at the outset of the arrangement; and

- use of unspecified additional products that become commercially available during the term of the arrangement.

A small portion of our software is licensed under perpetual licenses, which does not include the right to use new technology. Payment terms for time-based licenses generally provide for payments to be made over the license period and payment terms for perpetual licenses generally are net 30 days.

During fiscal 2018, we launched the Cadence Cloud portfolio, the first broad cloud portfolio for the development of electronic systems and semiconductors. The Cadence Cloud portfolio consists of our managed and customer-managed environments that enable electronic product developers to use the scalability of the cloud to securely manage the exponential increase in design complexity. Contractual arrangements with customers for both environments are time-based, similar to the on-premise software license arrangements described above. Cadence-managed environment arrangements include hardware resources accessible via cloud offerings provided by Cadence. Customer-managed environment arrangements do not include cloud hardware offerings because customers arrange for their own cloud hardware and purchase a special license from Cadence to enable cloud scalability of their on-premise software.

Our emulation and prototyping hardware products are either sold or leased to our customers. Our emulation hardware can also be accessed remotely via a Cadence-managed cloud arrangement.

We generally license our design IP under nonexclusive license agreements that provide usage rights for specific designs. In addition, for certain of our IP license agreements, we collect royalties as our customers ship their product that includes our IP to their customers.

For a further description of our license agreements, our emulation and prototyping hardware sale or lease agreements, revenue recognition policies and results of operations, please refer to the discussion under "Critical Accounting Estimates" under Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations."

Technical Support and Maintenance

Customer service and support is critical to the adoption and successful use of our products. We provide our customers with technical support and maintenance to facilitate their use of our software, hardware and IP solutions.

Services

We offer a number of services, including services related to methodology, education and hosted design solutions. These services may be sold separately or sold and performed in conjunction with the license, sale or lease of our products. As necessary, certain of our design services engineers are assigned to internal research and development projects associated with our design IP business.

As part of our services offerings, we design advanced ICs, develop custom IP and address industry design issues that may not be solved adequately by today's EDA technologies. This enables us to target and accelerate the development of new software technology and products to satisfy current and future design requirements.

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We offer engineering services to collaborate with our customers in the design of complex ICs and the implementation of key design capabilities, including low power design, IC packaging and board design, functional verification, digital implementation, analog/mixed-signal design and system-level design. The customers for these services primarily consist of semiconductor and systems companies developing products for the consumer, communications, military, aerospace and computing markets. These ICs range from digital SoCs and analog and RF designs to complex mixed-signal ICs.

In delivering methodology services, we leverage our experience and knowledge of design techniques, our products, leading practices and different design environments to improve the productivity of our customers' engineering teams. Depending on the customers' projects and needs, we work with customers using outsourcing, consultative and collaborative offerings.

Our education services offerings can be customized and include training programs that are conducted via the internet or in a classroom setting. The content of these offerings ranges from the latest IC design techniques to methodologies for using the most recent features of our EDA products. The primary focus of education services is to accelerate our customers' path to productivity in the use of our products.

Third-Party Programs and Initiatives

In addition to our products, many customers use design tools that are provided by other EDA companies, as well as design IP available from multiple suppliers. We support the use of third-party design products and design IP through our Connections[®] program and through our participation in industry groups such as the Silicon Integration Initiative and Accellera System Initiative. We actively contribute to the development and deployment of industry standards.

Product and Maintenance and Services Revenue

Revenue, and revenue as a percentage of total revenue, from our product and maintenance and services offerings for the last three fiscal years were as follows:

	2018	2017	2016
	(In millions, except percentages)		
Product and maintenance	\$1,998	93%	\$1,814
Services	140	7%	129
Total revenue	\$2,138	\$1,943	\$1,816

Our revenue mix is such that approximately 90% of our revenue is recognized over time, and the remainder of the revenue is recognized at a point in time, typically upon delivery.

For an additional description of our product and maintenance and services revenue, see the discussion under "Results of Operations" under Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations." For our fiscal 2018 results of operations and our financial position as of December 29, 2018, see Part IV, Item 15, "Exhibits and Financial Statement Schedules."

Remaining Performance Obligations and Backlog

On the first day of fiscal 2018, we adopted Accounting Standards Update ("ASU") 2014-09, "Revenue from Contracts with Customers (Topic 606)," which requires us to disclose revenue allocated to remaining performance obligations. Revenue allocated to remaining performance obligations represents the transaction price allocated to the performance obligations that are unsatisfied or partially unsatisfied as of December 29, 2018, which includes deferred revenue and amounts that will be invoiced and recognized as revenue in future periods. Contracted but unsatisfied performance obligations were approximately \$2.9 billion as of December 29, 2018, of which we expect to recognize approximately 60% as revenue over the next 12 months and the remainder thereafter.

Revenue allocated to remaining performance obligations is different from our historical backlog in that it includes fully executed contracts with future effective dates and excludes committed contracts for which the deliverables are not fully defined, whereas our historical backlog excluded fully executed contracts with future effective dates and included contracts for which the deliverables were not fully defined. Our standalone backlog was \$2.7 billion as of December 30, 2017.

The substantial majority of our remaining performance obligations consists of customer contracts for which product and maintenance revenue is recognized over the contract life. Historically, we have not experienced significant cancellations of our contracts with customers. For engineering services contracts in backlog, completion dates are

occasionally rescheduled, delaying revenue recognition under those contracts beyond the original anticipated completion date.

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Marketing and Sales

We generally market our products and provide services to existing and prospective customers through a direct sales force consisting of sales people and applications engineers. Applications engineers provide technical pre-sales and post-sales support for our products. Due to the complexity of many of our products and the system design process, the sales cycle is generally long, requiring three to six months or more. During the sales cycle, our direct sales force generally provides technical presentations, product demonstrations and support for on-site customer evaluation of our solutions. We also promote our products and services through advertising, marketing automation, trade shows, public relations and the internet. We selectively utilize value-added resellers to broaden our reach and reduce cost of sales. Our OrCAD products and certain Allegro products are primarily marketed through these channels. With respect to international sales, we generally market and support our products and services through our subsidiaries. We also use a third-party distributor to license our products and services to certain customers in Japan.

Research and Development

Our future performance depends on our ability to innovate, commercialize newly developed solutions and enhance and maintain our current products. The primary areas of our research and development align with our product categories discussed above. We must continuously re-engineer our products to solve new or increased physics challenges that arise with each successive process node and address the increase in complexity that is introduced by the resulting much larger designs. We must also keep pace with our customers' technical developments, satisfy industry standards and meet our customers' increasingly demanding performance, productivity, quality and predictability requirements. Therefore, we expect to continue to invest in research and development.

Hardware Manufacturing and Software Distribution

Our emulation and prototyping hardware, including all individual PCBs, custom ICs and FPGA-based prototyping products, is manufactured, assembled and tested by subcontractors before delivery to our customers. Software and documentation are primarily distributed to customers by secure electronic delivery, by way of the cloud or on DVD.

Proprietary Technology

Our success depends, in part, upon our proprietary technology. We generally rely on patents, copyrights, trademarks and trade secret laws, licenses and restrictive agreements to establish and protect our proprietary rights in technology and products. Many of our products include software or other intellectual property licensed from third parties. We may have to seek new licenses or renew existing licenses for third-party software and other intellectual property in the future. As part of performing engineering services for customers, our engineering services business uses certain software and other intellectual property licensed from third parties, including that of our competitors.

Competition

We compete most frequently with Synopsys, Inc. and Mentor Graphics Corporation, which was acquired by Siemens AG in 2017, and with numerous other EDA providers, manufacturers of electronic devices that have developed, acquired or have the capability to develop their own EDA products, electronics design and consulting companies, and other IP companies. These include Altium Limited, Ansys, Inc., CEVA, Inc., Keysight Technologies, Inc. and Zuken Ltd.

Certain competitive factors in the engineering services business differ from those of the products businesses. While we compete with other EDA companies in the engineering services business, our principal competitors include independent engineering service businesses. Many of these companies are also customers, and therefore use our product offerings in the delivery of their services or products.

Corporate Information

We were organized as a Delaware corporation in June 1988. Our headquarters is located at 2655 Seely Avenue, San Jose, California 95134. Our telephone number is (408) 943-1234. We use our website at www.cadence.com to communicate important information about our company, including news releases and financial information. Our website permits investors to subscribe to e-mail notification alerts when we post new material information on our website. We also make available on our investor relations webpage, free of charge, copies of our SEC filings and submissions, which can be found at the SEC's website, www.sec.gov, as soon as reasonably practicable after electronically filing or furnishing such documents with the SEC. Stockholders may also request copies of these documents by writing to our Corporate Secretary at the address above. Information on our website is not incorporated

by reference in this Annual Report on Form 10-K unless expressly noted.

Fiscal Year End

Our fiscal years are 52- or 53-week periods ending on the Saturday closest to December 31. Fiscal 2018, 2017 and 2016 were each 52-week fiscal years. Our next 53-week fiscal year will be fiscal 2020.

Employees

As of December 29, 2018, we had approximately 7,500 full-time employees.

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EXECUTIVE OFFICERS OF THE REGISTRANT

The following table provides information regarding our executive officers as of February 27, 2019:

Name	Age	Positions and Offices
Lip-Bu Tan	59	Chief Executive Officer and Director
John M. Wall	48	Senior Vice President and Chief Financial Officer
Anirudh Devgan	49	President
Thomas P. Beckley	61	Senior Vice President, Research and Development
James J. Cowie	54	Senior Vice President, General Counsel and Secretary
Surendra Babu Mandava	60	Senior Vice President, Research and Development
Chin-Chi Teng	53	Senior Vice President, Research and Development
Neil Zaman	50	Senior Vice President, Worldwide Field Operations

Our executive officers are appointed by the Board of Directors and serve at the discretion of the Board of Directors.

LIP-BU TAN has served as Chief Executive Officer of Cadence since January 2009. From January 2009 to November 2017, Mr. Tan also served as President of Cadence. Mr. Tan has been a member of the Cadence Board of Directors since February 2004. In 1987, Mr. Tan founded Walden International, an international venture capital firm, and since that time has served as its Chairman. Mr. Tan serves as a director of Aquantia Corp. and Hewlett Packard Enterprise Company. Mr. Tan has a B.S. from Nanyang University in Singapore, an M.S. in nuclear engineering from the Massachusetts Institute of Technology and an M.B.A. from the University of San Francisco.

JOHN M. WALL has served as Senior Vice President and Chief Financial Officer of Cadence since October 2017. From October 2000 to September 2017, Mr. Wall held several positions at Cadence, most recently as Corporate Vice President and Corporate Controller from April 2016 to October 2017, Vice President, Finance and Operations, Worldwide Revenue Accounting and Sales Finance from 2015 to 2016 and Vice President, Finance and Operations, EMEA and Worldwide Revenue Accounting from 2005 to 2015. Mr. Wall has an NCBS from the Institute of Technology, Tralee and is a Fellow of the Association of Chartered Certified Accountants.

ANIRUDH DEVGAN has served as President of Cadence since November 2017. From May 2012 to November 2017, Dr. Devgan held several positions at Cadence, most recently as Executive Vice President, Research and Development from March 2017 to November 2017 and Senior Vice President, Research and Development from November 2013 to March 2017. Prior to joining Cadence, from May 2005 to March 2012, Dr. Devgan served as Corporate Vice President and General Manager of the Custom Design Business Unit at Magma Design Automation, Inc., an electronic design automation company. Dr. Devgan has a B.Tech. in electrical engineering from the Indian Institute of Technology, Delhi, and an M.S. and Ph.D. in electrical and computer engineering from Carnegie Mellon University.

THOMAS P. BECKLEY has served as Senior Vice President, Research and Development of Cadence since September 2012. From April 2004 to September 2012, Mr. Beckley served as Corporate Vice President, Research and Development of Cadence. Prior to joining Cadence, Mr. Beckley served as President and Chief Executive Officer of Neoliner, Inc., a developer of auto-interactive and automated analog/RF tools and solutions for mixed-signal design that was acquired by Cadence in April 2004. Mr. Beckley has a B.S. in mathematics and physics from Kalamazoo College and an M.B.A. from Vanderbilt University.

JAMES J. COWIE has served as Senior Vice President and General Counsel of Cadence since April 2008 and Secretary of Cadence since May 2008. From August 2000 to March 2008, Mr. Cowie held several positions at Cadence, most recently as Corporate Vice President - Business Development, Associate General Counsel and Assistant Secretary. Mr. Cowie has an A.B. in economics from Duke University and a J.D. from Stanford Law School.

SURENDRA BABU MANDAVA has served as Senior Vice President, Research and Development of Cadence since January 2017. Prior to joining Cadence, Mr. Mandava served as Chief Executive Officer of Ineda Systems Inc., a low-power System-on-Chip solutions company, from November 2014 to July 2016, Vice President of Broadcom Corporation, a provider of semiconductor solutions, from November 2010 to December 2012, and President and then as Chief Executive Officer of Beceem Communications Inc., a semiconductor company, from December 2003 until it was acquired by Broadcom in November 2010. Mr. Mandava has a B.Tech. in electronics and communication engineering from the Regional Engineering College, Trichy, and a M.Tech. in electrical engineering and computer science from the Indian Institute of Technology, Kanpur.

CHIN-CHI TENG has served as Senior Vice President, Research and Development of Cadence since September 2018. From January 2002 to September 2018, Dr. Teng held several positions at Cadence, most recently as Corporate Vice President, Research and Development from June 2015 to September 2018, and Vice President, Research and Development from March 2009 to June 2015. Dr. Teng has a B.S. in electrical engineering from the National Taiwan University and a Ph.D. in electrical and computer engineering from the University of Illinois, Urbana-Champaign. NEIL ZAMAN has served as Senior Vice President, Worldwide Field Operations of Cadence since September 2015. From October 1999 to September 2015, Mr. Zaman held several positions at Cadence, most recently as Corporate Vice President, North America Field Operations. Prior to joining Cadence, Mr. Zaman held positions at Phoenix Technologies Ltd. and IBM Corporation. Mr. Zaman has a B.S. in finance from California State University, Hayward.

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Item 1A. Risk Factors

Our operations and financial results are subject to various risks and uncertainties, including those described in the sections below, that could adversely affect our business, financial condition, results of operations, cash flows, and the trading price of our common stock.

Risks Related to Our Business

Any periods of uncertainty in the global economy and international trade relations, and any potential downturn in the semiconductor and electronics industries, may negatively impact our business and reduce our bookings levels and revenue.

Purchases of our products and services are dependent upon the commencement of new design projects by IC manufacturers and electronics systems companies. The IC and electronics systems industries are cyclical and are characterized by constant and rapid technological change, rapid product obsolescence and price erosion, evolving standards, short product life cycles and wide fluctuations in product supply and demand.

The IC and electronics systems industries have also experienced significant downturns in connection with, or in anticipation of, maturing product cycles of both these industries' and their customers' products. While spending on EDA products and services has grown in recent years, the current outlook for the semiconductor industry is uncertain and may result in a decrease in spending on EDA products and services, which are a part of our overall SDE offering. While we cannot predict global economic conditions, uncertainty about future political and economic conditions, adverse changes to international trade relationships between countries in which we do business or future decline in corporate or consumer spending could negatively impact our customers' businesses, reducing the number of new chip designs and their overall research and development spending, including their spending on our products and services, and as a result decrease demand for our products and services. Decreased bookings for our products and services, customer bankruptcies, consolidation among our customers, or problems or delays with our hardware suppliers or with the supply or delivery of our hardware products could also adversely affect our ability to grow our business or adversely affect our future revenues and financial results. Our future business and financial results, including demand for our products and services, are subject to considerable uncertainty that could impact our stock price. If economic conditions or international trade relationships between countries in which we do business deteriorate in the future, or, in particular, if semiconductor or electronics systems industry revenues do not grow, the ability to export or import products or services by the semiconductor or electronics systems industry is adversely restricted, or our suppliers of our hardware components and products are subject to problems or delays, our future revenues and financial results could be adversely affected. Even if economic conditions improve for our customers after a period of decline, the positive impact on our revenues and financial results may be deferred due to cautious customer research and development spending and our mix of licenses that yield revenue recognized over time.

Customer consolidation could affect our operating results.

There has been a trend toward customer consolidation in the semiconductor industry through business combinations, including mergers, asset acquisitions and strategic partnerships. As this trend continues, it could make us dependent on fewer customers who may be able to exert increased pressure on our prices and other contract terms and could increase the portion of our total sales concentration for any single customer. Customer consolidation activity could also reduce the demand for our products and services if such customers streamline research and development or operations, reduce purchases or delay purchasing decisions. These outcomes could negatively impact our operating results and financial condition.

Our failure to respond quickly to technological developments or customers' increasing technological requirements could make our products uncompetitive and obsolete.

The industries in which we compete experience rapid technology developments, rapid changes in industry standards and customer requirements, and frequent introductions and improvements of new products. Currently, the industries we serve are experiencing the following trends:

• changes in the design and manufacturing of ICs, including migration to advanced process nodes and three-dimensional transistors, such as FinFETs, present major challenges to the semiconductor industry, particularly in IC design, design automation, design of manufacturing equipment, and the manufacturing process itself. With migration to advanced process nodes, the industry must adapt to more complex physics and manufacturing challenges

such as the need to draw features on silicon that are many times smaller than the wavelength of light used to draw the features via lithography. Models of each component's electrical properties and behavior also become more complex as do requisite analysis, design, verification and manufacturing capabilities. Novel design tools and methodologies must be invented and enhanced quickly to remain competitive in the design of electronics in the smallest nanometer ranges;

the ability to design SoCs increases the complexity of managing a design that, at the lowest level, is represented by billions of shapes on fabrication masks. In addition, SoCs typically incorporate

- microprocessors and digital signal processors that are programmed with software, requiring simultaneous design of the IC and the related software embedded on the IC;

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with the availability of seemingly endless gate capacity, there is an increase in design reuse, or the combining of off-the-shelf design IP with custom logic to create ICs or SoCs. The unavailability of a broad range of high-quality design IP (including our own) that can be reliably incorporated into a customer's design with our software products and services could lead to reduced demand for our products and services;

increased technological capability of the FPGA, which is a programmable logic chip, creates an alternative to IC implementation for some electronics companies. This could reduce demand for our IC implementation products and services;

a growing number of low-cost engineering services businesses could reduce the need for some IC companies to invest in EDA products; and

adoption of cloud computing technologies with accompanying new business models for an increasing number of software categories.

If we are unable to respond quickly and successfully to these trends, we may lose our competitive position, and our products or technologies may become obsolete. To compete successfully, we must develop, acquire or license new products and improve our existing products and processes on a schedule that keeps pace with technological developments and the requirements for products addressing a broad spectrum of designers and designer expertise in our industries. We must provide frequent and relevant updates to our software products in order to provide substantial benefit to the customer throughout the license periods because of the rapid changes in our customers' industries. The market must also accept our new and improved products. Our hardware platforms must be enhanced periodically to reduce the likelihood that a competitor surpasses the capabilities we offer. Our introduction of new products could reduce the demand and revenue of our older products or affect their pricing. We must also be able to support a range of changing computer software, hardware platforms and customer preferences. A rapid transition by our customers to different business models associated with cloud computing technologies could result in reduced revenue. We cannot guarantee that we will be successful in keeping pace with all, or any, of the customer trends.

Competitive pressures may require us to reduce our pricing, which could have an adverse effect on our results of operations.

The highly competitive markets in which we do business can put pressure on us to reduce the prices of our software, emulation and prototyping hardware and IP. If our competitors offer significant discounts on certain products in an effort to recapture or gain market share or to sell other software or hardware products, we may then need to lower our prices or offer other favorable terms to compete successfully. Any such changes would be likely to reduce our profit margins and could adversely affect our operating results. Any substantial changes to our prices and pricing policies could cause revenues to decline or be delayed as our sales force implements and our customers adjust to the new pricing policies. Some of our competitors bundle products for promotional purposes or as a long-term pricing strategy or provide guarantees of prices and product implementations. These practices could, over time, significantly constrain the prices that we can charge for our products. If we cannot offset price reductions with a corresponding increase in the number of sales or with lower spending, then the reduced revenues resulting from lower prices could have an adverse effect on our results of operations.

Our System Design Enablement strategy requires the development or acquisition of products and expertise in new areas of technology. Our inability to develop or acquire these capabilities could impede our ability to address the technical requirements in technology segments which are expected to contribute to our growth.

Our SDE strategy is meant to increase our business among electronic systems companies, which are now designing their own ICs. SDE is also meant to increase our business among semiconductor companies, which are increasing their contribution to the end products into which their ICs are incorporated. Part of this strategy involves addressing the needs of new categories of electronic systems, including hyperscale computing and infrastructure, edge computing, machine learning, augmented reality, virtual reality, internet-of-things and autonomous vehicle sub-systems, where increased investment is expected by our customers. Each of these categories requires technologies and expertise that are application-specific. If we are unable to develop or acquire the application-specific technologies and expertise necessary to address the requirements of these categories, it could impede our ability to expand our business in these categories and ultimately affect our future growth.

We have experienced varied operating results, and our operating results for any particular fiscal period are affected by the timing of revenue recognition, particularly for our emulation and prototyping hardware and IP products.

Various factors affect our operating results, and some of them are not within our control. Our operating results for any period are affected by the mix of products and services sold in a given period and the timing of revenue recognition, particularly for our emulation and prototyping hardware and IP products. In addition, we have recorded net losses in the past and may record net losses in the future. Also, our cash flows from operating activities have and will continue to fluctuate due to a number of factors, including the timing of our billings, collections, disbursements and tax payments.

A substantial portion of the product revenue related to our hardware business and our IP offerings is recognized upon delivery, and our forecasted revenue results are based, in part, on our expectations of hardware and IP to be delivered in a particular quarter. Therefore, changes in hardware and IP bookings or deliveries relative to expectations will have a more immediate impact on our revenue than changes in software or services bookings, for which revenue is generally recognized over time.

In recent years, we made significant investments to expand our IP offerings through, among other things, research and development and acquisitions. As we continue to expand our IP offerings, a portion of the revenue related to our IP bookings will be deferred until we complete and deliver the licensed IP to our customers. As a result, costs related to the research and development of the IP may be incurred prior to the recognition of the related revenue.

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Revenue related to our hardware and IP products is inherently difficult to predict because sales of our hardware and IP products depend on the commencement of new projects for the design and development of complex ICs and systems by our customers, our customers' willingness to expend capital to deploy our new and existing hardware or IP products in those projects and the availability of our new and existing hardware or IP products for delivery. Therefore, our hardware or IP sales may be delayed or may decrease if our customers delay or cancel projects because their spending is constrained or if there are problems or delays with the supply or delivery of our hardware or IP products or our hardware suppliers. Moreover, the hardware and IP markets are highly competitive, and our customers may choose to purchase a competitor's hardware or IP product based on cost, performance or other factors. These factors may result in lower revenue, which would have an adverse effect on our business, results of operations or cash flows.

A substantial proportion of our software licenses yield revenue recognized over time, which may make it difficult for us to rapidly increase our revenue in future fiscal periods.

We plan our operating expenses based on forecasted revenue, expected business needs and other factors. These expenses and the effect of long-term commitments are relatively fixed in the short term. Bookings and the related revenue are harder to forecast in a difficult economic environment. If we experience a shortfall in bookings, our operating results could differ from our expectations because we may not be able to quickly reduce our expenses in response to short-term business changes.

The methods, estimates and judgments that we use in applying our accounting policies have a significant impact on our results of operations (see "Critical Accounting Estimates" under Part II, Item 7, "Management's Discussion and Analysis of Financial Condition and Results of Operations"). Such methods, estimates and judgments are, by their nature, subject to substantial risks, uncertainties and assumptions, and factors may arise over time that may lead us to change our methods, estimates and judgments. Changes in those methods, estimates and judgments could significantly affect our results of operations.

Historical results of operations should not be viewed as reliable indicators of our future performance. If our revenue, operating results or business outlook for future periods fall short of the levels expected by us, securities analysts or investors, the trading price of our common stock could decline.

We have invested and expect to continue to invest in research and development efforts for new and existing products and technologies and technical sales support. Such investments may affect our operating results, and, if the return on these investments is lower or develops more slowly than we expect, our revenue and operating results may suffer.

We have invested and expect to continue to invest in research and development for new and existing products, technologies and services in response to our customers' increasing technological requirements. Such investments may be in related areas, such as technical sales support. These investments may involve significant time, risks and uncertainties, including the risk that the expenses associated with these investments may affect our margins and operating results and that such investments may not generate sufficient revenues to offset liabilities assumed and expenses associated with these new investments. We believe that we must continue to invest a significant amount of time and resources in our research and development efforts and technical sales support to maintain and improve our competitive position. If we do not achieve the benefits anticipated from these investments, if the achievement of these benefits is delayed, or if customers reduce or slow the need to upgrade or enhance their EDA products and design flows, our revenue and operating results may be adversely affected.

The competition in our industries is substantial, and we may not be able to continue to successfully compete in our industries.

The industries in which we do business, including software, hardware, IP and services for enabling the design of electronic products, are highly competitive and require us to identify and develop or acquire innovative and cost-competitive products, integrate them into platforms and market them in a timely manner. We may not be able to compete successfully in these industries, which could seriously harm our business, operating results or financial condition. Factors that could affect our ability to compete successfully include:

- the development by others of competitive products or platforms and engineering services, possibly resulting in a shift of customer preferences away from our products and services and significantly decreased revenue;
- aggressive pricing competition by some of our competitors may cause us to lose our competitive position, which could result in lower revenues or profitability and could adversely impact our ability to realize the revenue and

profitability forecasts for our software or emulation and prototyping hardware systems products;

- the challenges of advanced node design may lead some customers to work with more mature, less risky manufacturing processes that may reduce their need to upgrade or enhance their EDA products and design flows;
- the challenges of developing (or acquiring externally developed) technology solutions that are adequate and competitive in meeting the rapidly evolving requirements of next-generation design challenges;
- intense competition to attract acquisition targets, possibly making it more difficult for us to acquire companies or technologies at an acceptable price, or at all;
- new entrants, including larger electronic systems companies, in our business;
- the combination of our competitors or collaboration among many companies to deliver more comprehensive offerings than they could individually; and
- decisions by electronics manufacturers to perform engineering services or IP development internally, rather than purchase these services from outside vendors due to budget constraints or excess engineering capacity.

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We compete most frequently with Synopsys, Inc. and Mentor Graphics Corporation, which was acquired by Siemens AG in 2017, and also with numerous other EDA providers, manufacturers of electronic devices that have developed, acquired or have the capability to develop their own EDA products, electronics design and consulting companies, and other IP companies. These include Altium Limited, Ansys, Inc., CEVA, Inc., Keysight Technologies, Inc. and Zuken Ltd.

We have acquired and expect to acquire other companies and businesses and may not realize the expected benefits of these acquisitions.

We have acquired and expect to acquire other companies and businesses in order to expand our product offerings. Our future revenue growth and expansion of our business is dependent on our successful integration of our acquisitions.

We may incur significant costs in connection with potential transactions, including acquisitions that are not consummated. Potential and completed acquisitions involve a number of risks. If any of the following acquisition-related risks occur, our business, operating results or financial condition could be adversely impacted:

- the failure to realize, or a delay in realizing, anticipated benefits such as cost savings and revenue enhancements;
- overlapping customers and product sets that impact our ability to maintain revenue at historical rates;
- the failure to understand, compete and operate effectively in markets where we have limited experience;
- the failure to integrate and manage acquired products and businesses effectively;
- the failure to integrate and retain key employees of an acquired company or business;
- difficulties in combining previously separate companies or businesses into a single unit;
- the substantial diversion of management's attention from day-to-day business when evaluating and negotiating these transactions and integrating an acquired company or business;
- the discovery, after completion of the acquisition, of unanticipated liabilities assumed from an acquired company, business or assets, such that we cannot realize the anticipated value of the acquisition;
- difficulties related to integrating the products of an acquired company or business in, for example, distribution, engineering, licensing models or customer support areas;
- unanticipated costs; or
- unwillingness of customers of an acquired business to continue licensing or buying products from us following the acquisition.

In a number of our completed acquisitions, we have agreed to make future payments, either in the form of employee retention bonuses or contingent purchase price payments, based on the achievement of specified milestones. The performance goals pursuant to which these future payments may be made generally relate to the achievement by the acquired company or business, or by the employees who joined us with the acquired company or business, of certain specified bookings, revenue, run rate, product proliferation, product development or employee retention goals during a specified period following completion of the applicable acquisition. The specific performance goal levels and amounts and timing of employee bonuses or contingent purchase price payments vary with each acquisition. We may continue to use contingent payments in connection with acquisitions in the future and while we expect to derive value from an acquisition in excess of such contingent payment obligations, we may be required to make certain contingent payments without deriving the anticipated value.

Future acquisitions may involve issuances of stock as full or partial payment of the purchase price for the acquired company or business, grants of restricted stock, restricted stock units or stock options to employees of the acquired companies or businesses (which may be dilutive to existing stockholders), expenditure of substantial cash resources or the incurrence of a material amount of debt. These arrangements may impact our liquidity, financial position and results of operations or increase dilution of our stockholders' equity interests in the company.

We make and expect to make strategic investments and may not realize the expected benefits of these investments. We have made and expect to make strategic investments in which we have a minority equity interest and do not have operational control. These strategic investments may also involve collaboration agreements that further and complement our strategy and marketing efforts. We may not be able to realize the expected benefits of these investments, and the related collaborations may be difficult to manage without sole decision-making authority and the economic or business interests in these collaborations may become inconsistent with our interests. These challenges could have an adverse effect on our business, operating results or financial condition.

The accounting applied to strategic investments depends on a number of factors, including, but not limited to, our percentage of ownership and the level of our influence over the entity. Losses experienced by these strategic investment entities or associated impairment charges could adversely impact our operating results and the value of our investment. In addition, if these entities fail and cease operations, we may lose the value of our investment and shared profits.

Failure to obtain export licenses or restrictions on trade imposed by the United States or other countries could harm our business by rendering us unable to sell or ship products and transfer our technology outside of the United States. We must comply with regulations of the United States and of certain other countries in selling or shipping our products and transferring our technology outside the United States and to foreign nationals. Changes in these regulations or restrictions due to changes in trade relationships with the United States, including new tariffs, trade protection measures, import or export licensing requirements, sanctions, trade embargoes and other trade barriers, could harm our business, operating results or financial condition.

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The effect of foreign exchange rate fluctuations may adversely impact our revenue, expenses, cash flows and financial condition.

We have significant operations outside the United States. Our revenue from international operations as a percentage of total revenue was approximately 57% during fiscal 2018, 58% during fiscal 2017, and 54% during fiscal 2016. We expect that revenue from our international operations will continue to account for a significant portion of our total revenue. We also transact business in various foreign currencies, although the majority of our revenue contracts worldwide are denominated in U.S. dollars. Volatility of currencies in countries where we conduct business, most notably the U.S. dollar, Chinese renminbi, Japanese yen, European Union euro, British pound and Indian rupee have had and may in the future have an effect on our revenue or operating results.

Fluctuations in the rate of exchange between the U.S. dollar and the currencies of other countries where we conduct business could seriously affect our business, operating results or financial condition. For example, when a foreign currency declines in value relative to the U.S. dollar, it takes more of the foreign currency to purchase the same amount of U.S. dollars than before the change. If we price our products and services in the foreign currency, we receive fewer U.S. dollars than we did before the change. If we price our products and services in U.S. dollars, the decrease in value of the local currency results in an increase in the price for our products and services compared to those products of our competitors that are priced in local currency. This could result in our prices being uncompetitive in markets where business is transacted in the local currency. On the other hand, when a foreign currency increases in value relative to the U.S. dollar, it takes more U.S. dollars to purchase the same amount of the foreign currency. As we use the foreign currency to fund payroll costs and other operating expenses in our international operations, this results in an increase in operating expenses. Approximately 30% of our total costs and expenses are transacted in foreign currencies. Our attempts to reduce the effect of foreign currency fluctuations may be unsuccessful, and significant exchange rate movements may adversely impact our results of operations as expressed in U.S. dollars.

Our operating results could be adversely affected by an increase in our effective tax rate as a result of U.S. and foreign tax law changes, outcomes of current or future tax examinations, or by material differences between our forecasted and actual effective tax rates.

Our operations are subject to income and transaction taxes in the United States and in multiple foreign jurisdictions, with a significant amount of our foreign earnings generated by our subsidiaries organized in Ireland and Hungary.

Any significant change in our future effective tax rates could adversely impact our results of operations for future periods. Our future effective tax rates could be adversely affected by the following:

- changes in tax laws or the interpretation of such tax laws in the United States, Ireland, Hungary, the United Kingdom, China, the Republic of Korea, Japan, India or other international locations where we have operations;

- earnings being lower than anticipated in countries where we are taxed at lower rates as compared to the United States federal and state statutory tax rates;

- an increase in expenses not deductible for tax purposes;

- an increase in corporate minimum taxes;

- changes in tax benefits from stock-based compensation;

- changes in the valuation allowance against our deferred tax assets;

- changes in judgment from the evaluation of new information that results in a recognition, derecognition or change in measurement of a tax position taken in a prior period;

- increases to interest or penalty expenses classified in the financial statements as income taxes;

- new accounting standards or interpretations of such standards; or

- results of examinations by the Internal Revenue Service (“IRS”), state, and foreign tax or other governmental authorities.

The IRS and other tax authorities regularly examine our income tax returns and other non-income tax returns, such as payroll, sales, use, value-added, net worth or franchise, property, goods and services, consumption, import, stamp, and excise taxes, in both the United States and foreign jurisdictions. The calculation of our provision for income taxes and our accruals for other taxes requires us to use significant judgment and involves dealing with uncertainties in the application of complex tax laws and regulations. In determining the adequacy of our provision for income taxes, we

regularly assess the potential settlement outcomes resulting from income tax examinations. However, the final outcome of tax examinations, including the total amount payable or the timing of any such payments upon resolution of these issues, cannot be estimated with certainty. In addition, we cannot be certain that such amount will not be materially different from the amount that is reflected in our historical income tax provisions and accruals for other taxes. Should the IRS or other tax authorities assess additional taxes, penalties or interest as a result of a current or a future examination, we may be required to record charges to operations in future periods that could have a material impact on our results of operations, financial position or cash flows in the applicable period or periods.

Forecasts of our annual effective tax rate are complex and subject to uncertainty because our income tax position for each year combines the effects of estimating our annual income or loss, the mix of profits and losses earned by us and our subsidiaries in tax jurisdictions with a broad range of income tax rates, as well as benefits from available deferred tax assets, the impact of various accounting rules, our interpretations of changes in tax laws and results of tax audits. Forecasts of our annual effective tax rate do not include the anticipation of future tax law changes. In addition, we account for certain tax benefits from stock-based compensation in the period the stock compensation vests or is settled, which may cause increased variability in our quarterly effective tax rates. If there were a material difference between forecasted and actual tax rates, it could have a material impact on our results of operations.

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Tax laws, regulations, and compliance practices are evolving and may have a material adverse effect on our results of operations, cash flows and financial position.

The U.S. Tax Cuts and Jobs Act (the “Tax Act”) was enacted in December 2017, and significantly affected U.S. tax law by changing how the U.S. imposes income tax on multinational corporations. The U.S. Department of Treasury has broad authority to issue regulations and interpretative guidance that may significantly impact how we will apply the law and impact our results of operations. As additional interpretative guidance is issued by the applicable authorities, we may need to revise our provision (benefit) for income taxes in future periods. These revisions could materially affect our results of operations, cash flow and financial position. For further discussion regarding our income taxes, please refer to Part II, Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations” under the heading “Income Taxes” and Note 6 in the notes to consolidated financial statements.

Tax laws, regulations, and administrative practices in various jurisdictions are evolving and may be subject to significant changes due to economic, political, and other conditions. There are many transactions that occur during the ordinary course of business for which the ultimate tax determination is uncertain, and significant judgment is required in evaluating and estimating our provision and accruals for these taxes. Governments are increasingly focused on ways to increase tax revenues, particularly from multinational corporations, which may lead to an increase in audit activity and harsher positions taken by tax authorities. We are currently subject to tax audits in various jurisdictions and these jurisdictions may assess additional tax liabilities against us.

The Organisation for Economic Co-operation and Development (“OECD”), an international association of 36 countries, including the United States, released the final reports from its Base Erosion and Profit Shifting (“BEPS”) Action Plans, which aim to standardize and modernize global tax policies. The BEPS Action Plans propose revisions to numerous tax rules, including country-by-country reporting, permanent establishment, hybrid entities and instruments, transfer pricing, and tax treaties. The BEPS Action Plans have been or are being enacted by countries where we have operations. The European Commission (“EC”) has conducted investigations in multiple countries focusing on whether local country tax rulings provide preferential tax treatment that violates European Union state aid rules and concluded that certain countries, including Ireland, have provided illegal state aid in certain cases. The EC and OECD have also been evaluating new rules on the taxation of the digital economy companies. In addition, Taiwan, Italy, the United Kingdom, France, India and Hungary have recently introduced new rulings or proposals to tax digital transactions. These developments in tax laws and regulations, and compliance with these rules, could have a material adverse effect on our operating results, financial position and cash flows.

Our stock price has been subject to fluctuations and may continue to be subject to fluctuations.

The market price of our common stock has experienced fluctuations and may fluctuate or decline in the future, and as a result you could lose the value of your investment. The market price of our common stock may be affected by a number of factors, including:

- quarterly or annual operating or financial results or forecasts that fail to meet or are inconsistent with earlier projections or the expectations of our securities analysts or investors;
- changes in our forecasted bookings, revenue, earnings or operating cash flow estimates;
- an increase in our debt or other liabilities;
- market conditions in the electronics systems and semiconductor industries;
- announcements of a restructuring plan;
- changes in management;
- repurchases of shares of our common stock or changes to plans to repurchase shares of our common stock;
- a gain or loss of a significant customer or market segment share;
- litigation;
- announcements of a merger, acquisition or other corporate transaction; and
- announcements of new products or acquisitions of new technologies by us, our competitors or our customers.

In addition, equity markets in general, and the equities of technology companies in particular, have experienced and may experience in the future, extreme price and volume fluctuations due to, among other factors, the actions of market participants or other actions outside of our control. Such price and volume fluctuations may adversely affect the market price of our common stock for reasons unrelated to our business or operating results.

Our future revenue is dependent in part upon our installed customer base continuing to license or buy products and purchase services.

Our installed customer base has traditionally generated additional new license, service and maintenance revenues. In future periods, customers may not necessarily license or buy additional products or contract for additional services or maintenance. Our customers, many of which are large semiconductor and systems companies, often have significant bargaining power in negotiations with us. Customer consolidation can reduce the total level of purchases of our software, hardware, IP and services, and in some cases, increase customers' bargaining power in negotiations with their suppliers, including us.

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We could suffer serious harm to our business because of the infringement of our intellectual property rights by third parties or because of our infringement of the intellectual property rights of third parties.

There are numerous patents relating to our business and ecosystem. New patents are being issued at a rapid rate and are owned by EDA companies as well as entities and individuals outside the EDA industry, including parties whose income is primarily derived from infringement-related licensing and litigation. It is not always practicable to determine in advance whether a product or any of its components infringes the patent rights of others. As a result, from time to time, we may be compelled to respond to or prosecute intellectual property infringement claims to protect our rights or defend a customer's rights.

Intellectual property infringement claims, including contractual defense reimbursement obligations related to third-party claims against our customers, regardless of merit, could consume valuable management time, result in costly litigation or cause product shipment delays, all of which could seriously harm our business, operating results or financial condition. The risk of infringement and related indemnification claims associated with design IP products that are incorporated into a customer product broadly used by consumers may be higher than the risk associated with our software products. In settling these claims, we may be required to enter into royalty or licensing agreements with the third parties claiming infringement. These royalty or licensing agreements, if available, may not have terms favorable to us. Being compelled to enter into a license agreement with unfavorable terms could seriously harm our business, operating results or financial condition.

Any potential intellectual property litigation could compel us to do one or more of the following:

- pay damages (including the potential for treble damages), license fees or royalties (including royalties for past periods) to the party claiming infringement;

- stop licensing products or providing services that use the challenged intellectual property;

- obtain a license from the owner of the infringed intellectual property to sell or use the relevant technology, which license may not be available on reasonable terms, or at all; or

- redesign the challenged technology, which could be time consuming and costly, or impossible.

If we were compelled to take any of these actions, our business or operating results may suffer.

If our security measures are breached, and an unauthorized party obtains access to customer data, financial data or assets or our proprietary business information, our information systems may be perceived as being insecure, and our business and reputation could be harmed.

Our products and services involve storage, including cloud-based storage, and transmission of our proprietary information and that of our customers. We have offices throughout the world, including key research and development facilities outside of the United States. Our operations are dependent upon the connectivity of our operations throughout the world. Despite our security measures, our information technology and infrastructure may be vulnerable to cyber attacks by unauthorized third parties (which may include nation-states and individuals sponsored by them) or breaches due to employee error, malfeasance or other disruptions, which could result in unauthorized disclosure of sensitive information and could significantly interfere with our business operations. Third parties may attempt to gain unauthorized access through a variety of methods (such as the use of viruses, malware, ransomware, phishing, denial of service attacks and other cyber attacks) and corrupt the processes of the products and services that we provide. We may also be a target of malicious attacks in an attempt to gain access to our network, including our Cadence Cloud portfolio which includes both our managed and customer-managed environments, or data centers or those of our customers or end users; steal proprietary information related to our business, products, services or infrastructure; steal financial data or assets or interrupt our systems and services or those of our customers or others. Breaches of our security measures could expose us to a risk of loss or misuse of this information, loss of financial assets, litigation and potential liability. Because techniques used to obtain unauthorized access or to sabotage information systems change frequently and generally are not recognized until launched against a target, we may be unable to anticipate these techniques or to implement adequate preventive measures. In addition, if we select a vendor that uses cloud storage of information as part of their service or product offerings or are selected as a vendor for our Cadence Cloud portfolio, despite our attempts to validate the security of such services, our proprietary information may be misappropriated by third parties. In the event of an actual or perceived breach of our security, or the security of one of our vendors, the market perception of the effectiveness of our security measures could be harmed, legal or regulatory actions could be

initiated against us and we could suffer damage to our reputation or our business, or lose existing customers and our ability to obtain new customers, or suffer harm to our financial condition.

Risks associated with our international operations could adversely impact our financial condition.

A significant amount of our revenue is derived from our international operations, and we have offices throughout the world, including key research and development facilities outside of the United States. Our international operations may be subject to a number of risks, including:

- shifts in political, trade or other policies or other governmental dynamics resulting from the results of certain elections or votes, such as changes in policies pursued by the United States, China or the Republic of Korea, or changes associated with and the United Kingdom's withdrawal from the European Union;

- the adoption or expansion of government trade restrictions, including tariffs, export or import regulations, sanctions or other trade barriers;

- limitations on repatriation of earnings;

- limitations on the conversion of foreign currencies;

- reduced protection of intellectual property rights in some countries;

- performance of national economies;

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• longer collection periods for receivables and greater difficulty in collecting accounts receivable;

• difficulties in managing foreign operations;

• political and economic instability;

• unexpected changes in regulatory requirements;

• inability to continue to offer competitive compensation in certain growing regions;

• differing employment practices and labor issues;

• United States' and other governments' licensing requirements for exports, which may lengthen the sales cycle or restrict or prohibit the sale or licensing of certain products; and

• variations in costs or expenses associated with our international operations, including as a result of changes in foreign tax laws or devaluation of the U.S. dollar relative to other foreign currencies.

Some of our international research and development and other facilities are in parts of the world where there may be a greater risk of business interruption as a result of political instability, terrorist acts or military conflicts than businesses located domestically. Furthermore, this potential harm is exacerbated because damage to or disruptions at our international research and development facilities could have a more significant adverse effect on our ability to develop new or improve existing products than other businesses that may only have sales offices or other less critical operations abroad. We are not insured for losses or interruptions caused by acts of war. Furthermore, our operations are dependent upon the connectivity of our operations throughout the world. Activities that interfere with our international connectivity or operations, such as cyber hacking, the introduction of a virus into our computer systems, natural disasters, civil unrest or terrorism, could significantly interfere with our business operations.

In addition, internal controls, policies and procedures and employee training and compliance programs that we have implemented to deter prohibited practices may not prevent our employees, contractors or agents from violating or circumventing our policies and the laws and regulations applicable to our worldwide operations.

We depend upon our management team and key employees, and our failure to attract, train, motivate and retain management and key employees may make us less competitive and therefore harm our results of operations.

Our business depends upon the continued services, efforts and abilities of our senior management and other key employees. Competition for highly skilled executive officers and employees can be intense, particularly in geographic areas recognized as high technology centers such as the Silicon Valley area, where our principal offices are located, and in other locations where we maintain facilities. In addition, competition for qualified personnel, including software engineers, in the EDA, commercial electronics engineering services and IP industries has intensified.

Further, increased uncertainty regarding social, political and immigration policies in the United States and abroad may make it difficult to recruit employees with adequate experience. We may also experience increased compensation costs that are not offset by either improved productivity or higher sales. We may not be successful in recruiting new personnel and in retaining and motivating existing personnel. From time to time, there may be changes in our management team resulting from the hiring and departure of executive officers, and as a result, we may experience disruption to our business that may harm our operating results and our relationships with our employees, customers and suppliers may be adversely affected.

To attract, retain and motivate individuals with the requisite expertise, we may be required to grant large numbers of stock options or other stock-based incentive awards, which may be dilutive to existing stockholders and increase compensation expense, and pay significant base salaries and cash bonuses, which could harm our operating results.

The high cost of training new employees, not fully utilizing these employees, or losing trained employees to competing employers could also reduce our operating margins and harm our business or operating results.

In addition, applicable rules and regulations require stockholder approval for new equity compensation plans and significant amendments to existing equity compensation plans (including increases in shares available for issuance under such plans). These rules and regulations could make it more difficult for us to grant equity compensation to employees in the future. To the extent that these regulations make it more difficult or expensive to grant equity compensation to employees, we may incur increased compensation costs or find it difficult to attract, retain and motivate employees, which could materially and adversely affect our business.

We rely on our proprietary technology, as well as software and other intellectual property rights licensed to us by third parties, and we cannot assure you that the precautions taken to protect our rights will be adequate or that we will

continue to be able to adequately secure such intellectual property rights from third parties.

Our success depends, in part, upon our proprietary technology. We generally rely on patents, copyrights, trademarks, trade secrets, licenses and restrictive agreements to establish and protect our proprietary rights in technology and products. Despite the precautions we may take to protect our intellectual property, third parties have tried in the past, and may try in the future, to challenge, invalidate or circumvent these safeguards. Our patents and other intellectual property rights may not provide us with sufficient competitive advantages. Patents may not be issued on any of our pending applications and our issued patents may not be sufficiently broad to protect our technology. Furthermore, the laws of foreign countries may not protect our proprietary rights in those countries to the same extent as applicable law protects these rights in the United States. The protection of our intellectual property may require the expenditure of significant financial and managerial resources. Moreover, the steps we take to protect our intellectual property may not adequately protect our rights, or deter or prevent third parties from infringing or misappropriating our proprietary rights.

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Many of our products include software or other intellectual property licensed from third parties. We may have to seek new or renew existing licenses for such software and other intellectual property in the future. Our engineering services business holds licenses to certain software and other intellectual property owned by third parties, including that of our competitors. Our failure to obtain software, other intellectual property licenses or other intellectual property rights that are necessary or helpful for our business on favorable terms, or our need to engage in litigation over these licenses or rights, could seriously harm our business, operating results or financial condition.

We have substantial cash requirements in the United States, but a significant portion of our cash is held and generated outside of the United States, and if our cash available in the United States and the cash available under our revolving credit facility are insufficient to meet our operating expenses and debt repayment obligations in the United States, then we may be required to raise cash in ways that could negatively affect our financial condition, results of operations and the market price of our common stock.

We have significant operations outside the United States. As of December 29, 2018, approximately 75% of our cash and cash equivalents balance was held by subsidiaries outside the United States, with the remainder of the balance held by us or our subsidiaries in the United States. We believe that the combination of our U.S. cash, cash equivalents, future U.S. operating cash flows, cash available under our revolving credit facility and other cash that may be accessible to us on attractive terms are sufficient to meet our ongoing U.S. operating expenses and debt repayment obligations. Although the Tax Act may have reduced the tax impact of repatriation of foreign earnings, there are still administrative processes associated with repatriation of foreign earnings that could affect the timing of returning cash to the U.S. from non-U.S. jurisdictions. Accordingly, if our U.S. cash were insufficient to meet our future funding obligations in the United States, we could be required to seek funding sources on less attractive terms, which could negatively impact our results of operations, financial position and the market price of our common stock.

Litigation could adversely affect our financial condition or operations.

We currently are, and in the future may be, involved in various disputes and litigation that arise in the ordinary course of business. These include disputes and lawsuits related to intellectual property, including customer indemnification, mergers and acquisitions, licensing, contracts, distribution arrangements and employee relations matters. For information regarding the litigation matters in which we are currently engaged, please refer to the discussion under Part I, Item 3, “Legal Proceedings” and Note 17 in the notes to consolidated financial statements. We cannot provide any assurances that the final outcome of these lawsuits or any other proceedings that may arise in the future will not have a material adverse effect on our business, reputation, operating results, financial condition or cash flows. Litigation can be time consuming and expensive and could divert management’s time and attention from our business, which could have a material adverse effect on our revenues and operating results.

Errors or defects in our products and services could expose us to liability and harm our business.

Our customers use our products and services in designing and developing products that involve a high degree of technological complexity, each of which has its own specifications. Because of the complexity of the systems and products with which we work, some of our products and designs can be adequately tested only when put to full use in the marketplace. As a result, our customers or their end users may discover errors or defects in our software or the systems we design, or the products or systems incorporating our design and intellectual property may not operate as expected. Errors or defects could result in:

- loss of customers;
- loss of market share;
- damage to our reputation;
- failure to attract new customers or achieve market acceptance;
- diversion of development resources to resolve the problem;
- loss of or delay in revenue or payments;
- increased service costs; and
- liability for damages.

Our operating results and revenue could be adversely affected by customer payment delays, customer bankruptcies and defaults or modifications of licenses.

Occasionally, our customers file for bankruptcy or face other challenging financial or operating conditions. If our customers experience adversity in their business, they may delay or default on their payment obligations to us, request to modify contract terms, or modify or cancel plans to license our products. For instance, if our customers are not successful in generating sufficient cash or are precluded from securing financing, they may not be able to pay, or may delay payment of, accounts receivable that are owed to us, although these obligations are generally not cancelable. Our customers' inability to fulfill payment obligations, in turn, may adversely affect our revenue, operating expenses and cash flow. Additionally, our customers have, in the past, sought, and may, in the future, seek, to renegotiate pre-existing contractual commitments. Payment defaults by our customers or significant reductions in existing contractual commitments could have a material adverse effect on our financial condition and operating results.

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The long sales cycle of our products and services may cause our operating results to fluctuate unexpectedly. Generally, we have a long sales cycle that can extend up to six months or longer. The complexity and expense associated with our products and services generally require a lengthy customer education, evaluation and approval process. Consequently, we may incur substantial expenses and devote significant management effort and expense to develop potential relationships that do not result in agreements or revenue and may prevent us from pursuing other opportunities.

In addition, sales of our products and services have been and may in the future be delayed if customers delay approval or commencement of projects because of:

- the timing of customers' competitive evaluation processes; or
- customers' budgetary constraints and budget cycles.

Long sales cycles for hardware products subject us to a number of significant risks over which we have limited control, including insufficient, excess or obsolete inventory, variations in inventory valuation and fluctuations in quarterly operating results.

Our reported financial results may be adversely affected by changes in United States generally accepted accounting principles, and we may incur significant costs to adjust our accounting systems and processes to comply with significant changes.

United States generally accepted accounting principles ("U.S. GAAP") are subject to interpretation by the Financial Accounting Standards Board ("FASB"), the SEC and various bodies formed to promulgate and interpret appropriate accounting principles. We are also subject to evolving rules and regulations of the countries in which we do business. Changes to accounting standards or interpretations thereof may result in different accounting principles under U.S. GAAP that could have a significant effect on our reported financial results.

In addition, we have in the past and may in the future need to significantly change our customer contracts, accounting systems and processes when we adopt future or proposed changes in accounting principles. The cost and effect of these changes may negatively impact our results of operations during the periods of transition.

Our restructuring plans incur substantial costs and may not result in the benefits we have anticipated, possibly having a negative effect on our future operating results.

In recent fiscal years, we have initiated restructuring plans in an effort to reallocate or decrease costs by reducing our workforce and by consolidating facilities. We incur substantial costs to implement restructuring plans, and our restructuring activities may subject us to reputational risks and litigation risks and expenses. Our past restructuring plans do not provide any assurance that we will realize anticipated cost savings and other benefits or that additional restructuring plans will not be required or implemented in the future. In addition, our restructuring plans may have other consequences, such as attrition beyond our planned reduction in workforce, a negative effect on employee morale and productivity or our ability to attract highly skilled employees. Our competitors may also use our restructuring plans to seek to gain a competitive advantage over us. As a result, our restructuring plans may affect our revenue and other operating results in the future.

We depend on sole suppliers for certain hardware components and contract manufacturers for production of our emulation and prototyping hardware products, making us vulnerable to supply disruption and price fluctuation. We depend on sole suppliers for certain hardware components and contract manufacturers for production of our emulation and prototyping hardware products. Our reliance on sole suppliers and contract manufacturers could result in product delivery problems and delays and reduced control over product pricing and quality. Though we prefer to have multiple sources to procure certain key components, in some cases it is not practical or feasible to do so. We may suffer a disruption in the supply of certain hardware components if we are unable to purchase sufficient components on a timely basis or at all for any reason. Any supply or manufacturing disruption, including delay in delivery of components by our suppliers or products by our manufacturers, or the bankruptcy or shutdown of our suppliers or manufacturers, could delay our production process and prevent us from delivering completed hardware products to customers or from supplying new evaluation units to customers, which could have a negative impact on our revenue and operating results.

If we become subject to unfair hiring claims, we could be prevented from hiring needed employees, incur liability for damages and incur substantial costs in defending ourselves.

When companies in our industry lose employees to competitors, they frequently claim that these competitors have engaged in unfair hiring practices or that the employment of these persons would involve the disclosure or use of trade secrets. These claims could prevent us from hiring employees or cause us to incur liability for damages. We could also incur substantial costs in defending ourselves or our employees against these claims, regardless of their merits. Defending ourselves from these claims could also divert the attention of our management away from our operations.

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Anti-takeover defenses in our certificate of incorporation and bylaws and certain provisions under Delaware law could prevent an acquisition of our company or limit the price that investors might be willing to pay for our common stock. Our certificate of incorporation and bylaws and certain provisions of the Delaware General Corporation Law that apply to us could make it difficult for another company to acquire control of our company. For example:

Our certificate of incorporation allows our Board of Directors to issue, at any time and without stockholder approval, preferred stock with such terms as it may determine. No shares of preferred stock are currently outstanding. However, the rights of holders of any of our preferred stock that may be issued in the future may be superior to the rights of holders of our common stock.

Section 203 of the Delaware General Corporation Law generally prohibits a Delaware corporation from engaging in any business combination with a person owning 15% or more of its voting stock, or who is affiliated with the corporation and owned 15% or more of its voting stock at any time within three years prior to the proposed business combination, for a period of three years from the date the person became a 15% owner, unless specified conditions are met.

All or any one of these factors could limit the price that certain investors would be willing to pay for shares of our common stock and could allow our Board of Directors to resist, delay or prevent an acquisition of our company, even if a proposed transaction were favored by a majority of our independent stockholders.

The investment of our cash is subject to risks that may cause losses and affect the liquidity of these investments.

Our marketable investments include various money market funds and may include other investments as well.

Weakened financial markets have at times adversely impacted the general credit, liquidity, market prices and interest rates for these and other types of investments. Additionally, changes in monetary policy by the Federal Open Market Committee or other relevant regulators and concerns about the rising U.S. government debt level may cause a decrease in the purchasing power of the U.S. dollar and adversely affect our investment portfolio. The financial market and monetary risks associated with our investment portfolio may have a material adverse effect on our financial condition, liquidity, results of operations or cash flows.

We are subject to evolving corporate governance and public disclosure expectations and regulations that impact compliance costs and risks of noncompliance.

We are subject to changing rules and regulations promulgated by a number of governmental and self-regulatory organizations, including the SEC, Nasdaq, and the FASB, as well as evolving investor expectations around corporate governance, executive compensation and environmental and social practices and disclosures. These rules and regulations continue to evolve in scope and complexity, and many new requirements have been created in response to laws enacted by the U.S. and foreign governments, making compliance more difficult and uncertain. The increase in costs to comply with such evolving expectations, rules and regulations, as well as any risk of noncompliance, could adversely impact us.

Conflict minerals regulations may cause us to continue to incur additional expenses and may adversely impact our ability to conduct our business.

In August 2012, the SEC adopted new rules establishing disclosure and reporting requirements regarding the use of certain minerals referred to as “conflict minerals” in products. These rules require us to determine, disclose and report whether or not such minerals in our products originate from the Democratic Republic of the Congo or adjoining countries. We have incurred, and expect to continue to incur, costs to comply with these rules, including costs associated with conducting due diligence on our supply chain and fulfilling our reporting requirements, and we may incur costs related to changes to our products, processes or sources of supply. In addition, these rules could affect the availability of certain minerals used in the manufacture of our emulation and prototyping hardware products and IP boards (the “Covered Products”), and thus impact our ability to source, at competitive prices, certain materials that are used in the Covered Products. Finally, our customers may prefer to purchase products from vendors who claim that all minerals in their products are conflict-free, and our revenues may be harmed or we may face reputational challenges if we are unable to verify that our Covered Products are conflict-free.

Our business is subject to the risk of earthquakes and other natural disasters.

Our corporate headquarters, including certain of our research and development operations and certain of our distribution facilities, is located in the Silicon Valley area of Northern California, a region known to experience

seismic activity. If significant seismic activity were to occur, our operations may be interrupted, which could adversely impact our business and results of operations.

Our other offices in the United States and in other countries around the world may be adversely impacted by natural disasters. If a natural disaster occurs at or near any of our offices, our operations may be interrupted, which could adversely impact our business and results of operations. If a natural disaster impacts a significant number of our customers, our business and results of operations could be adversely impacted.

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Risks Related to Our Securities and Indebtedness

Our debt obligations expose us to risks that could adversely affect our business, operating results or financial condition, and could prevent us from fulfilling our obligations under such indebtedness.

As of December 29, 2018, we had total outstanding indebtedness of \$445.3 million. We also had the ability to borrow an additional \$250.0 million under our revolving credit facility, with the right to request increased capacity up to an additional \$250.0 million upon the receipt of lender commitments, for total maximum borrowings of \$600.0 million under our revolving credit facility. Subject to the limits contained in the credit agreement governing our revolving credit facility, the indenture that governs the 4.375% Senior Notes due 2024 (the “2024 Notes”) and our other debt instruments, we may be able to incur substantial additional debt from time to time to finance working capital, capital expenditures, investments or acquisitions, share repurchases or for other purposes. If we do so, the risks related to our high level of debt could intensify. Specifically, our high level of debt could have important consequences, including the following:

- making it more difficult for us to satisfy our obligations to service our debt as described above;
- limiting our ability to obtain additional financing to fund future working capital, capital expenditures, acquisitions or other general corporate requirements;
- requiring a substantial portion of our cash flows to be dedicated to debt service payments instead of other purposes, thereby reducing the amount of cash flows available for working capital, capital expenditures, acquisitions and other general corporate purposes;
- utilizing large portions of our U.S. cash to service our debt obligations because those payments are made in the United States, which may require us to repatriate cash from outside the United States;
- increasing our vulnerability to general adverse economic and industry conditions;
- exposing us to the risk of increased interest rates as certain of our borrowings, including borrowings under our revolving credit facility, are at variable rates of interest;
- limiting our flexibility in planning for and reacting to changes in the industry in which we compete;
- placing us at a disadvantage compared to other, less leveraged competitors and competitors that have greater access to capital resources;
- limiting our interest deductions for US income tax purposes; and
- increasing our cost of borrowing.

At the option of the holders of our outstanding notes, we may, under certain circumstances, be required to repurchase such notes.

Under the terms of our 2024 Notes, we may be required to repurchase for cash such notes prior to their maturity in connection with the occurrence of certain significant corporate events. Specifically, we are required to offer to repurchase such notes upon a “change of control triggering event” (as defined in the indenture related to such notes), such as a change of control accompanied by certain downgrades in the credit ratings of such notes. The repayment obligations under such notes may have the effect of discouraging, delaying or preventing a takeover of our company. If we were required to pay the 2024 Notes prior to their scheduled maturity, it could have a significant negative impact on our cash and liquidity and could impact our ability to invest financial resources in other strategic initiatives.

The terms of the agreement governing our revolving credit facility and the indenture governing our 2024 Notes restrict our current and future operations, particularly our ability to respond to changes or to take certain actions.

The agreement governing our revolving credit facility contains a number of restrictive covenants that impose significant operating and financial restrictions on us and may limit our ability to engage in acts that may be in our long-term best interest, including restrictions on our ability to:

- pay dividends or make other distributions or repurchase or redeem capital stock;
- prepay, redeem or repurchase certain debt;
- issue certain preferred stock or similar equity securities;
- make certain investments;
- incur liens;
- incur additional indebtedness and guarantee indebtedness;
- enter into sale and leaseback transactions;

enter into transactions with affiliates;

alter the businesses we conduct;

- enter into agreements restricting our subsidiaries' ability to pay dividends;
- and

consolidate, merge or sell all or substantially all of our assets.

In addition, the restrictive covenants in the agreement governing our revolving credit facility require us to maintain specified financial ratios and satisfy other financial condition tests. Our ability to meet those financial ratios and tests can be affected by events beyond our control, and we may be unable to meet them.

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A breach of the covenants or restrictions under the agreement governing our revolving credit facility could result in an event of default under the applicable indebtedness. Such a default may allow the creditors to accelerate the related debt and may result in the acceleration of any other debt to which a cross-acceleration or cross-default provision applies. In addition, an event of default under the credit agreement governing our revolving credit facility would permit the lenders under our revolving credit facility to terminate all commitments to extend further credit under that facility. In the event our lenders or note holders accelerate the repayment of our borrowings, we and our subsidiaries may not have sufficient assets to repay that indebtedness. As a result of these restrictions, we may be:

- limited in how we conduct our business;
- unable to raise additional debt or equity financing to operate during general economic or business downturns; or
- unable to compete effectively or to take advantage of new business opportunities.

The indenture governing our 2024 Notes also contains certain restrictive covenants that impose operating and financial restrictions on us and may limit our ability to engage in acts that may be in our long-term best interest, including restrictions on our ability to incur liens and to enter into sale and leaseback transactions.

These restrictions may affect our ability to grow in accordance with our strategy. In addition, our financial results, our substantial indebtedness and our credit ratings could adversely affect the availability and terms of our financing.

We may not be able to generate sufficient cash to service all of our indebtedness and may be forced to take other actions to satisfy our obligations under our indebtedness, which may not be successful.

Our ability to make scheduled payments on or refinance our debt obligations depends on our financial condition and operating performance, which are subject to prevailing economic and competitive conditions and to certain financial, business, legislative, regulatory and other factors beyond our control. We may be unable to maintain a level of cash flows from operating activities sufficient to permit us to pay the principal, premium, if any, and interest on our indebtedness.

If our cash flows and capital resources are insufficient to fund our debt service obligations, we could face substantial liquidity problems and could be forced to reduce or delay investments and capital expenditures or to dispose of material assets or operations, seek additional debt or equity capital or restructure or refinance our indebtedness. We may not be able to effect any such alternative measures, if necessary, on commercially reasonable terms or at all and, even if successful, those alternative actions may not allow us to meet our scheduled debt service obligations. The agreement governing our revolving credit facility restricts our ability to dispose of assets and use the proceeds from those dispositions and may also restrict our ability to raise debt or equity capital to be used to repay other indebtedness when it becomes due. We may not be able to consummate those dispositions or to obtain proceeds in an amount sufficient to meet any debt service obligations then due.

In addition, we conduct a substantial portion of our operations through our subsidiaries, none of which are currently guarantors of our indebtedness. Accordingly, repayment of our indebtedness is dependent on the generation of cash flow by our subsidiaries and their ability to make such cash available to us, by dividend, debt repayment or otherwise. Unless they become guarantors of our indebtedness, our subsidiaries do not have any obligation to pay amounts due on our indebtedness or to make funds available for that purpose. Our subsidiaries may not be able to, or may not be permitted to, make distributions to enable us to make payments in respect of our indebtedness. Each subsidiary is a distinct legal entity, and, under certain circumstances, legal and contractual restrictions may limit our ability to obtain cash from our subsidiaries. While the agreement governing our revolving credit facility limits the ability of our subsidiaries to incur consensual restrictions on their ability to pay dividends or make other intercompany payments to us, these limitations are subject to qualifications and exceptions. In the event that we do not receive distributions from our subsidiaries, we may be unable to make required principal and interest payments on our indebtedness.

Our inability to generate sufficient cash flows to satisfy our debt obligations, or to refinance our indebtedness on commercially reasonable terms or at all, would materially and adversely affect our financial position and results of operations and our ability to satisfy our debt obligations.

If we cannot make scheduled payments on our debt, we will be in default and holders of our debt could declare all outstanding principal and interest to be due and payable, the lenders under our revolving credit facility could terminate their commitments to loan money and we could be forced into bankruptcy or liquidation. In addition, a material default on our indebtedness could suspend our eligibility to register securities using certain registration statement

forms under SEC guidelines that permit incorporation by reference of substantial information regarding us, potentially hindering our ability to raise capital through the issuance of our securities and increasing our costs of registration. Despite our current level of indebtedness, we and our subsidiaries may incur substantially more debt. This could further exacerbate the risks to our financial condition described above.

We and our subsidiaries may incur significant additional indebtedness in the future. Although the agreement governing our revolving credit facility contains restrictions on the incurrence of additional indebtedness, these restrictions are subject to a number of qualifications and exceptions, and the additional indebtedness incurred in compliance with these restrictions could be substantial. If we incur any additional indebtedness that ranks equally with the 2024 Notes, then subject to any collateral arrangements we may enter into, the holders of that debt will be entitled to share ratably in any proceeds distributed in connection with any insolvency, liquidation, reorganization, dissolution or other winding up of our company.

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Our variable rate indebtedness subjects us to interest rate risk, which could cause our debt service obligations to increase significantly.

Borrowings under our revolving credit facility are at variable rates of interest and expose us to interest rate risk. If interest rates were to increase, our debt service obligations on our variable rate indebtedness would increase even though the amount borrowed remained the same, and our net income and cash flows, including cash available for servicing our indebtedness, would correspondingly decrease. Assuming all loans were fully drawn, we were to fully exercise our right to increase borrowing capacity under our revolving credit facility, each quarter point change in interest rates would result in a \$1.5 million change in annual interest expense on our indebtedness under our revolving credit facility. In the future, we may enter into interest rate swaps that involve the exchange of floating for fixed rate interest payments in order to reduce interest rate volatility. However, we may not maintain interest rate swaps with respect to all of our variable rate indebtedness, and any swaps we enter into may not fully mitigate our interest rate risk.

Various factors could increase our future borrowing costs or reduce our access to capital, including a lowering or withdrawal of the ratings assigned to our 2024 Notes by credit rating agencies.

We may in the future seek additional financing for a variety of reasons, and our future borrowing costs and access to capital could be affected by factors including the condition of the debt and equity markets, the condition of the economy generally, prevailing interest rates, our level of indebtedness and our business and financial condition. In addition, the 2024 Notes currently have an investment grade credit rating, and any credit rating assigned could be lowered or withdrawn entirely by a credit rating agency if, in that credit rating agency's judgment, future circumstances relating to the basis of the credit rating, such as adverse changes, so warrant. Consequently, real or anticipated changes in our credit ratings will generally affect the market value of the 2024 Notes. Any future lowering of the credit ratings of the 2024 Notes likely would make it more difficult or more expensive for us to obtain additional debt financing.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

We own land and buildings at our headquarters located in San Jose, California. We also own buildings in India. As of December 29, 2018, the total square footage of our owned buildings was approximately 1,010,000.

We lease additional facilities in the United States and various other countries. We may sublease certain of these facilities where space is not fully utilized.

We believe that these facilities are adequate for our current needs and that suitable additional or substitute space will be available as needed to accommodate any expansion of our operations.

Item 3. Legal Proceedings

From time to time, we are involved in various disputes and litigation that arise in the ordinary course of business. These include disputes and lawsuits related to intellectual property, indemnification obligations, mergers and acquisitions, licensing, contracts, distribution arrangements and employee relations matters. At least quarterly, we review the status of each significant matter and assess its potential financial exposure. If the potential loss from any claim or legal proceeding is considered probable and the amount or the range of loss can be estimated, we accrue a liability for the estimated loss. Legal proceedings are subject to uncertainties, and the outcomes are difficult to predict. Because of such uncertainties, accruals are based on our judgments using the best information available at the time. As additional information becomes available, we reassess the potential liability related to pending claims and litigation matters and may revise estimates.

Item 4. Mine Safety Disclosures

Not applicable.

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PART II.

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

Our common stock is traded on the Nasdaq Global Select Market under the symbol CDNS. As of February 2, 2019, we had 523 registered stockholders and approximately 56,000 beneficial owners of our common stock.

Stockholder Return Performance Graph

The following graph compares the cumulative 5-year total stockholder return on our common stock relative to the cumulative total return of the Nasdaq Composite Index, the S&P 500 Index and the S&P 500 Information Technology Index. The graph assumes that the value of the investment in our common stock and in each index on December 28, 2013 (including reinvestment of dividends) was \$100 and tracks it each year thereafter on the last day of our fiscal year through December 29, 2018 and, for each index, on the last day of the calendar year.

	12/28/2013	1/3/2015	1/2/2016	12/31/2016	12/30/2017	12/29/2018
Cadence Design Systems, Inc.	\$ 100.00	\$ 135.18	\$ 149.39	\$ 181.05	\$ 300.22	\$ 311.13
Nasdaq Composite	100.00	112.60	113.64	133.19	172.11	165.84
S&P 500	100.00	110.28	109.54	129.05	157.22	150.33
S&P 500 Information Technology	100.00	115.49	121.08	144.85	201.10	200.52

The stock price performance included in this graph is not necessarily indicative of future stock price performance.

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Issuer Purchases of Equity Securities

In January 2017, our Board of Directors authorized the repurchase of shares of our common stock with a value of up to \$525 million in the aggregate. As of December 29, 2018, \$175 million remained available under this authorization. In February 2019, our Board of Directors authorized the additional repurchase of shares of our common stock with a value of up to \$500.0 million in the aggregate. The actual timing and amount of repurchases are subject to business and market conditions, corporate and regulatory requirements, stock price, acquisition opportunities and other factors. The following table presents repurchases made under our current authorization and shares surrendered by employees to satisfy income tax withholding obligations during the three months ended December 29, 2018:

Period	Total Number of Shares Purchased ⁽¹⁾	Average Price Paid Per Share ⁽²⁾	Total Number of Shares Purchased as Part of Publicly Announced Plan or Program	Maximum Dollar Value of Shares Authorized for Repurchase Under Publicly Announced Plan or Program ⁽¹⁾ (In millions)
September 30, 2018 – November 3, 2018	543,900	\$ 42.64	495,543	\$ 254
November 4, 2018 – December 1, 2018	650,048	\$ 44.49	623,692	\$ 226
December 2, 2018 – December 29, 2018	1,327,657	\$ 42.61	1,203,690	\$ 175
Total	2,521,605	\$ 43.10	2,322,925	

Shares purchased that were not part of our publicly announced repurchase programs represent employee surrender ⁽¹⁾ of shares of restricted stock to satisfy employee income tax withholding obligations due upon vesting, and do not reduce the dollar value that may yet be purchased under our publicly announced repurchase programs.

⁽²⁾ The weighted average price paid per share of common stock does not include the cost of commissions.

Item 6. Selected Financial Data-Unaudited

The following selected consolidated financial data should be read in conjunction with our consolidated financial statements and the notes thereto and the information contained in Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations.” Historical results are not necessarily indicative of future results. The notes below the table are provided for comparability purposes due to adoptions of accounting pronouncements or to describe significant transactions that may not occur frequently.

	2018	2017	2016	2015	2014
	(In millions, except per share amounts)				
Revenue ⁽¹⁾	\$2,138.0	\$1,943.0	\$1,816.1	\$1,702.1	\$1,580.9
Income from operations ⁽¹⁾	396.2	324.0	244.9	285.4	206.6
Net income ^{(1) (2)}	345.8	204.1	203.1	252.4	158.9
Net income per share-diluted ^{(1) (2)}	1.23	0.73	0.70	0.81	0.52
Total assets	2,468.7	2,418.7	2,096.9	2,345.5	3,209.6
Debt ⁽³⁾	445.3	729.4	693.5	343.3	691.2
Stockholders’ equity ^{(4) (5)}	1,288.4	989.2	741.8	1,376.1	1,333.6

⁽¹⁾ On the first day of fiscal 2018, we adopted ASU 2014-09, “Revenue from Contracts with Customers (Topic 606),” which provided a new basis of accounting for our revenue arrangements during fiscal 2018. Because of the adoption, results of operations for fiscal 2018 are not comparable to the results of operations for the other fiscal years presented in the table above. For additional information regarding the adoption of this and other accounting standards at the beginning of fiscal 2018, see Note 2 in the notes to consolidated financial statements under the heading “Recently Adopted Accounting Standards.”

- (2) During fiscal 2017, we recorded a provisional income tax expense of \$96.8 million related to the income tax effects of the Tax Act, which included \$67.2 million related to the one-time transition tax on the mandatory deemed repatriation of foreign earnings. In accordance with SAB 118, we updated the one-time transition tax estimate to \$65.8 million during fiscal 2018. We finalized our other fiscal 2017 provisional estimates without change during fiscal 2018.
- (3) During fiscal 2018, we prepaid the outstanding principal balance and accrued interest on our \$300.0 million 2019 Term Loan.
- (4) During fiscal 2016, we repurchased shares of our common stock for a total cost of \$960.3 million.
- (5) We have never declared or paid any cash dividends on our common stock.

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

The following discussion should be read in conjunction with the consolidated financial statements and notes thereto included elsewhere in this Annual Report on Form 10-K and with Part I, Item 1A, "Risk Factors." Please refer to the cautionary language at the beginning of Part I of this Annual Report on Form 10-K regarding forward-looking statements.

Business Overview

We enable our customers to design electronic products. Our products and services are designed to give our customers a competitive edge in their development of electronic systems, ICs, electronic devices and increasingly sophisticated manufactured products. Our products and services do this by optimizing performance, minimizing power consumption, shortening the time to bring our customers' products to market and reducing their design, development and manufacturing costs. We offer software, hardware, services and reusable IC design blocks, which are commonly referred to as IP.

Our strategy, which we call SDE, is to provide the technologies necessary for our customers to develop a complete and functional electronic product. Our SDE strategy enables us to address the growing trends of electronic systems companies developing their own ICs as part of their end product systems, as well as semiconductor companies delivering greater portions of the systems into which their IC products are integrated. Our products and services enable our customers to design complex and innovative electronic products, so demand for our products is driven by our customers' investment in new designs and products. Historically, the industry that provided the tools used by IC engineers was referred to as EDA. Today, our offerings include and extend beyond EDA tools to include SDE.

We combine our products and technologies into categories related to major design activities:

• Functional Verification, including Emulation and Prototyping Hardware;

• Digital IC Design and Signoff;

• Custom IC Design and Simulation;

• System Interconnect and Analysis; and

• IP.

For additional information about our products, see the discussion in Item 1, "Business," under the heading "Products and Product Strategy."

We have identified certain items that management uses as performance indicators to manage our business, including revenue, certain elements of operating expenses and cash flow from operations, and we describe these items further below under the headings "Results of Operations" and "Liquidity and Capital Resources."

Results of Operations

Financial results for fiscal 2018, as compared to fiscal 2017 and 2016, reflect the following:

• the effects of adopting ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," which provided a new basis of accounting for our revenue arrangements during fiscal 2018;

• increased product and maintenance revenue resulting from overall growth in our software, hardware and IP business, particularly in the United States and Asia; and

• continued investment in research and development activities focused on creating and enhancing our products.

The adoption of Topic 606 limits the comparability of revenue and certain expenses, including sales commissions, presented in the results of operations for fiscal 2018, when compared to the fiscal 2017 and fiscal 2016. For additional information regarding the adoption of this and other accounting standards at the beginning of fiscal 2018, see Note 2 in the notes to consolidated financial statements under the heading "Recently Adopted Accounting Standards."

Our fiscal years are 52- or 53-week periods ending on the Saturday closest to December 31. Fiscal 2018, 2017 and 2016 were each 52-week fiscal years.

Revenue

We primarily generate revenue from licensing our software and IP, selling or leasing our emulation and prototyping hardware technology, providing maintenance for our software, hardware and IP, providing engineering services and earning royalties generated from the use of our IP. The timing of our revenue is significantly affected by the mix of software, hardware and IP products generating revenue in any given period and whether the revenue is recognized over time or at a point in time, upon completion of delivery.

Approximately 90% of our revenue is recognized over time, and the remainder of the resulting revenue is recognized at the point in time that control is transferred to the customer. Revenue recognized over time includes revenue from our software arrangements, services, royalties from certain IP arrangements, maintenance on IP licenses and hardware, and operating leases of hardware. Revenue recognized at a point in time is primarily generated by our sales of emulation and prototyping hardware and IP licenses. Our ability to maintain this mix in any single fiscal period may be impacted primarily by delivery of hardware and IP products to our customers.

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During fiscal 2018, we recognized revenue based on ASU 2014-09, “Revenue from Contracts with Customers (Topic 606),” whereas during fiscal 2017 and fiscal 2016, we recognized revenue based on “Revenue Recognition (Topic 605).” Therefore, the periods are not directly comparable. For additional information on the impact of the new accounting standard on our revenue, see Note 2 in the notes to consolidated financial statements under the heading “Recently Adopted Accounting Standards.”

Revenue by Year

The following table shows our revenue for fiscal 2018, 2017 and 2016 and the change in revenue between years:

	2018	2017	2016	Change	
				2018 vs.	2017 vs. 2016
				2017	
	(In millions, except percentages)				
Product and maintenance	\$1,997.9	\$1,814.0	\$1,683.8	\$183.9	10%
Services	140.1	129.0	132.3	11.1	9%
Total revenue	\$2,138.0	\$1,943.0	\$1,816.1	\$195.0	10%

Product and maintenance revenue increased during fiscal 2018, as compared to fiscal 2017, primarily because of increased investments by our customers in new, complex designs for their products resulting in revenue growth in each of our five product categories. Product and maintenance revenue may fluctuate from period to period and by geography based on demand for our hardware and IP offerings. Product and maintenance revenue increased during fiscal 2017, as compared to fiscal 2016, primarily because of growth in our software and IP businesses, partially offset by lower revenue from emulation and prototyping hardware.

Services revenue may fluctuate from period to period based on the timing of fulfillment of our services and IP performance obligations.

No one customer accounted for 10% or more of total revenue during fiscal 2018, 2017 or 2016.

Revenue by Product Group

The following table shows the percentage of product and related maintenance revenue contributed by each of our five product groups and services during fiscal 2018, 2017 and 2016:

	2018	2017	2016
Functional Verification, including hardware for emulation and prototyping	24 %	22 %	25 %
Digital IC Design and Signoff	29 %	29 %	29 %
Custom IC Design and Simulation	26 %	27 %	25 %
System Interconnect and Analysis	9 %	10 %	10 %
IP	12 %	12 %	11 %
Total	100%	100%	100%

Revenue by product group fluctuates from period to period based on demand for our products and services and our available resources to deliver and support them. Certain of our licensing arrangements allow customers the ability to remix among software products. Additionally, we have arrangements with customers that include a combination of our products, with the actual product selection and number of licensed users to be determined at a later date. For these arrangements, we estimate the allocation of the revenue to product groups based upon the expected usage of our products. The actual usage of our products by these customers may differ and, if that proves to be the case, the revenue allocation in the table above would differ.

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Revenue by Geography

	2018	2017	2016	Change			
	(In millions, except percentages)			2018 vs. 2017	2017 vs. 2016		
United States	\$924.6	\$829.4	\$832.6	\$95.2	11 %	\$(3.2)	— %
Other Americas	32.5	35.1	31.3	(2.6)	(7)%	3.8	12 %
Asia	605.4	526.2	445.5	79.2	15 %	80.7	18 %
Europe, Middle East and Africa	406.9	385.7	346.7	21.2	5 %	39.0	11 %
Japan	168.6	166.6	160.0	2.0	1 %	6.6	4 %
Total revenue	\$2,138.0	\$1,943.0	\$1,816.1	\$195.0	10 %	\$126.9	7 %

For the primary factors contributing to the increase in revenue for the United States, Asia, and Europe, Middle East and Africa during fiscal 2018, as compared to fiscal 2017, see the general description under “Revenue by Year” above. Revenue for the United States decreased during fiscal 2017, as compared to fiscal 2016, primarily due to lower revenue from emulation and prototyping hardware and services, partially offset by growth in revenue from software and IP. For the primary factors contributing to the increase in revenue for Other Americas, Asia, and Europe, Middle East and Africa and Japan during fiscal 2017, as compared to fiscal 2016, see the general description under “Revenue by Year” above.

Revenue by Geography as a Percent of Total Revenue

	2018	2017	2016
United States	43 %	42 %	46 %
Other Americas	2 %	2 %	2 %
Asia	28 %	27 %	25 %
Europe, Middle East and Africa	19 %	20 %	19 %
Japan	8 %	9 %	8 %
Total	100 %	100 %	100 %

Most of our revenue is transacted in the United States dollar. However, certain revenue transactions are denominated in foreign currencies. For an additional description of how changes in foreign exchange rates affect our consolidated financial statements, see the discussion under Item 7A, “Quantitative and Qualitative Disclosures About Market Risk – Foreign Currency Risk.”

Cost of Revenue

	2018	2017	2016	Change			
	(In millions, except percentages)			2018 vs. 2017	2017 vs. 2016		
Product and maintenance	\$173.0	\$156.7	\$183.3	\$16.3	10 %	\$(26.6)	(15)%
Services	85.7	80.7	73.2	5.0	6 %	7.5	10 %
Total cost of revenue	\$258.7	\$237.4	\$256.5	\$21.3	9 %	\$(19.1)	(7)%

The following table shows cost of revenue as a percentage of related revenue for fiscal 2018, 2017 and 2016:

	2018	2017	2016
Product and maintenance	9 %	9 %	11 %
Services	61 %	63 %	55 %

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Cost of Product and Maintenance

Cost of product and maintenance includes costs associated with the sale and lease of our emulation and prototyping hardware and licensing of our software and IP products, certain employee salary and benefits and other employee-related costs, cost of our customer support services, amortization of technology-related and maintenance-related acquired intangibles, costs of technical documentation and royalties payable to third-party vendors. Costs associated with our emulation and prototyping hardware products include components, assembly, testing, applicable reserves and overhead. These costs make our cost of emulation and prototyping hardware products higher, as a percentage of revenue, than our cost of software and IP products.

A summary of cost of product and maintenance for fiscal 2018, 2017 and 2016 is as follows:

	2018	2017	2016	Change 2018 vs. 2017		2017 vs. 2016
	(In millions, except percentages)					
Product and maintenance-related costs	\$133.8	\$114.9	\$140.9	\$18.9	16 %	\$(26.0) (18)%
Amortization of acquired intangibles	39.2	41.8	42.4	(2.6)	(6)%	(0.6) (1)%
Total cost of product and maintenance	\$173.0	\$156.7	\$183.3	\$16.3	10 %	\$(26.6) (15)%

Cost of product and maintenance depends primarily on our hardware product sales in any given period. Cost of product and maintenance is also affected by employee salary and benefits and other employee-related costs, reserves for inventory, as well as the timing and extent to which we acquire intangible assets, acquire or license third-parties' intellectual property or technology and sell our products that include such acquired or licensed intellectual property or technology.

The changes in product and maintenance-related costs were due to the following:

	Change 2018	2017	Change 2017	2016
	(In millions)			
Emulation and prototyping hardware costs	\$17.7	\$(22.9)		
Other items	1.2	(3.1)		
	\$18.9	\$(26.0)		

Costs of emulation and prototyping increased during fiscal 2018, as compared to fiscal 2017, primarily due to increased sales volume for emulation and prototyping hardware and related costs. Costs of emulation and prototyping hardware decreased during fiscal 2017, as compared to fiscal 2016, primarily due to decreased sales volume for emulation and prototyping hardware. Gross margins on our hardware products will fluctuate based on product life cycle, product competition, product mix and pricing strategies.

Cost of Services

Cost of services primarily includes employee salary, benefits and other employee-related costs to perform work on revenue-generating projects, costs to maintain the infrastructure necessary to manage a services organization, and provisions for contract losses, if any. Cost of services will fluctuate from period to period based on our utilization of design services engineers on revenue-generating projects or on internal development projects. Cost of services increased during fiscal 2018, as compared to fiscal 2017, and during fiscal 2017, as compared to fiscal 2016, primarily due to variation in the number of personnel dedicated to deliver and support our services and custom IP offerings.

Operating Expenses

Our operating expenses include marketing and sales, research and development, and general and administrative expenses. Factors that tend to cause our operating expenses to fluctuate include changes in the number of employees due to hiring and acquisitions, restructuring activities, foreign exchange rate movements, stock-based compensation and the impact of our variable compensation programs that are driven by operating results.

Stock-based compensation included in our operating expenses increased during fiscal 2018, as compared to fiscal 2017, and fiscal 2017, as compared to fiscal 2016, primarily because successive increases in the price of our common stock between grant dates have resulted in higher grant date fair values for the mix of stock awards expensed in each period. We expect stock-based compensation to increase operating expenses during fiscal 2019, as compared to fiscal 2018. For further discussion regarding stock-based compensation, see Note 10 in the notes to consolidated financial statements.

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Research and Development

The changes in research and development expense were due to the following:

	Change	
	2018	2017
	vs.	vs.
	2017	2016
	(In millions)	
Salary, benefits and other employee-related costs	\$52.5	\$44.4
Stock-based compensation	27.1	13.2
Depreciation	2.7	(0.5)
Facilities and other infrastructure costs	0.4	9.8
Materials and other pre-production costs	(1.9)	0.3
Software license and maintenance costs	(1.7)	0.6
Professional services	(0.1)	3.2
Other items	1.6	(2.1)
	\$80.6	\$68.9

We must invest significantly in product research and development to keep pace with the latest manufacturing technology. The demand for new IC manufacturing technology directly impacts the demand for our newest products and we must keep pace with our customers' technical developments, satisfy industry standards and meet our customers' increasingly demanding performance, productivity, quality and predictability requirements. Costs included in research and development increased during fiscal 2018, as compared to fiscal 2017, and during fiscal 2017, as compared to fiscal 2016, primarily due to incremental investments in research and development as a result of additional hiring and incremental costs resulting from our fiscal 2017 acquisitions.

General and Administrative

The changes in general and administrative expense were due to the following:

	Change	
	2018	2017
	vs.	vs.
	2017	2016
	(In millions)	
Salary, benefits and other employee-related costs	\$(4.6)	\$3.3
Professional services	(1.9)	4.4
Bad debt expense	2.5	2.3
Stock-based compensation	1.8	3.0
Acquisition-related costs	—	(4.9)
Other items	1.4	1.0
	\$(0.8)	\$9.1

General and administrative costs decreased during fiscal 2018, as compared to fiscal 2017, primarily due to decreases in expense related to our nonqualified deferred compensation plan that are included in salary, benefits and other employee-related costs, partially offset by increases in reserves on receivables from our customers. General and administrative costs increased during fiscal 2017, as compared to fiscal 2016, primarily due to an increase in accounting and tax services and an increase in employee salaries and benefits.

Amortization of Acquired Intangibles

	Change				
	2018	2017	2018 vs.	2017 vs. 2016	
			2017		
	(In millions, except percentages)				
Amortization of acquired intangibles	\$14.1	\$14.7	\$18.1	\$(0.6) (4)%	\$(3.4) (19)%

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The changes in amortization of acquired intangibles were due to the following:

	Change	
	2018	2017
	vs.	vs.
	2017	2016
	(In millions)	
Increase due to additions of acquired intangibles	\$0.6	\$0.3
Decrease due to completed amortization of acquired intangibles	(1.2)	(3.7)
	\$(0.6)	\$(3.4)

Restructuring and Other Charges

We have initiated restructuring plans in recent years to better align our resources with our business strategy. Because the restructuring charges and related benefits are derived from management's estimates made during the formulation of the restructuring plans, based on then-currently available information, our restructuring plans may not achieve the benefits anticipated on the timetable or at the level contemplated. Additional actions, including further restructuring of our operations, may be required in the future.

The following table presents restructuring and other charges, net for our restructuring plans:

	2018	2017	2016
	(In millions)		
Severance and Benefits	\$10.3	\$9.0	\$40.4
Excess Facilities	0.8	0.4	0.6
Total	\$11.1	\$9.4	\$41.0

For an additional description of our restructuring plans, see Note 12 in the notes to consolidated financial statements.

Interest Expense

Interest expense for fiscal 2018, 2017 and 2016 was comprised of the following:

	2018	2017	2016
	(In millions)		
Contractual cash interest expense:			
2019 Term Loan	\$5.3	\$7.6	\$5.6
2024 Notes	15.3	15.3	15.3
Revolving credit facility	1.1	1.3	1.6
Amortization of debt discount:			
2019 Term Loan	0.2	0.2	0.2
2024 Notes	0.7	0.7	0.6
Other	0.5	0.6	0.4
Total interest expense	\$23.1	\$25.7	\$23.7

During fiscal 2018, we prepaid the outstanding principal balance and accrued interest on our \$300.0 million 2019 Term Loan. For an additional description of our debt arrangements, see Note 3 in the notes to consolidated financial statements.

Income Taxes

The following table presents the provision for income taxes and the effective tax rate for fiscal 2018, 2017 and 2016:

	2018	2017	2016
	(In millions, except percentages)		
Provision for income taxes	\$30.6	\$110.9	\$34.1
Effective tax rate	8.1 %	35.2 %	14.4 %

Our provision for income taxes for fiscal 2018 primarily resulted from the federal income tax effects of the Tax Act and state and foreign income taxes on fiscal 2018 income, partially offset by \$21.3 million of tax benefit related to

stock-based compensation that vested or was exercised during the year.

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During fiscal 2018, we finalized our fiscal 2017 deemed repatriation transition tax calculation and reduced our estimate from \$67.2 million to \$65.8 million. We finalized our other fiscal 2017 provisional estimates without change. For further discussion regarding our accounting for the Tax Act, see Note 6 in the notes to the consolidated financial statements.

Our provision for income taxes for fiscal 2017 is primarily attributable to income tax effects of the Tax Act. The provisional amount related to the transition tax was \$67.2 million and the provisional amount related to the re-measurement of our U.S. deferred tax assets and liabilities for the U.S. tax rate reduction was \$25.2 million. Our provision for income taxes for fiscal 2017 included \$32.0 million of tax benefit related to stock-based compensation that vested or settled during the period.

Our provision for income taxes for fiscal 2016 is primarily attributable to federal, state and foreign income taxes on our fiscal 2016 income and includes the tax benefit resulting from the permanent reinstatement of the United States research tax credit in December 2015. During fiscal 2016, we adopted a new accounting standard related to the accounting for stock-based compensation that required all income tax effects of stock-based awards to be recognized in our consolidated income statement as the awards vest or are settled. Our provision for income taxes for fiscal 2016 includes \$17.2 million of tax benefit related to stock-based compensation that vested or settled during the period.

Our future effective tax rates may be materially impacted by tax amounts associated with our foreign earnings at rates different from the United States federal statutory rate, research credits, the tax impact of stock-based compensation, accounting for uncertain tax positions, business combinations, closure of statutes of limitations or settlement of tax audits, changes in valuation allowance and changes in tax law. A significant amount of our foreign earnings is generated by our subsidiaries organized in Ireland and Hungary. Our future effective tax rates may be adversely affected if our earnings were to be lower in countries where we have lower statutory tax rates. We currently expect that our fiscal 2019 effective tax rate will be approximately 10%. We expect that our quarterly effective tax rates will vary from our fiscal 2019 effective tax rate as a result of recognizing the income tax effects of stock-based awards in the quarterly periods that the awards vest or are settled and other items that we cannot anticipate. We may also revise our fiscal 2019 effective tax rate as a result of further analyzing the implications of the Tax Act, including future guidance issued by the U.S. Department of Treasury and the IRS. For additional discussion about how our effective tax rate could be affected by various risks, see Part I, Item 1A, "Risk Factors." For further discussion regarding our income taxes, see Note 6 in the notes to consolidated financial statements.

Liquidity and Capital Resources

	As of		Change		
	December 29, 2018	December 30, 2017	December 31, 2016	2018 vs. 2017	2017 vs. 2016
	(In millions)				
Cash and cash equivalents	\$533.3	\$ 688.1	\$ 465.2	\$(154.8)	\$222.9
Net working capital	\$242.1	\$ 337.6	\$ 116.5	\$(95.5)	\$221.1

Cash and Cash Equivalents

As of December 29, 2018, our principal sources of liquidity consisted of \$533.3 million of cash and cash equivalents as compared to \$688.1 million as of December 30, 2017.

Our primary sources of cash and cash equivalents during fiscal 2018 were cash generated from operations, proceeds from borrowings under our revolving credit facility, proceeds from the exercise of stock options and proceeds from stock purchases under our employee stock purchase plan.

Our primary uses of cash and cash equivalents during fiscal 2018 were payments related to salaries and benefits, operating expenses, principal payments on the 2019 Term Loan, repurchases of our common stock, purchases of non-marketable investments, payments on our revolving credit facility, tax payments and purchases of property, plant and equipment.

Approximately 75% of our cash and cash equivalents were held by our foreign subsidiaries as of December 29, 2018. We expect that current cash and cash equivalent balances, cash flows that are generated from operations and cash

borrowings available under our revolving credit facility will be sufficient to meet our domestic and international working capital needs, and other capital and liquidity requirements, including acquisitions and share repurchases for at least the next 12 months.

Net Working Capital

Net working capital is comprised of current assets less current liabilities, as shown on our consolidated balance sheets. The decrease in our net working capital as of December 29, 2018, as compared to December 30, 2017, is primarily due to a decrease in cash and cash equivalents and increases in current liabilities, partially offset by an increase in accounts receivable.

Table of Contents**Cash Flows from Operating Activities**

Cash flows from operating activities during fiscal 2018, 2017 and 2016 were as follows:

			Change	
	2018	2017	2016	2017
				vs.
				2016

(In millions)

Cash provided by operating activities \$604.8 \$470.7 \$444.9 \$134.1 \$25.8

Cash flows from operating activities include net income, adjusted for certain non-cash items, as well as changes in the balances of certain assets and liabilities. Our cash flows from operating activities are significantly influenced by business levels and the payment terms set forth in our customer agreements. The increase in cash flows from operating activities during fiscal 2018, as compared to fiscal 2017, and fiscal 2017, as compared to fiscal 2016, was primarily due to the improved results from operations and timing of cash receipts from customers and disbursements made to vendors.

Cash Flows from Investing Activities

Cash flows provided by (used for) investing activities during fiscal 2018, 2017 and 2016 were as follows:

			Change	
	2018	2017	2016	2017 vs.
				2016

(In millions)

Cash provided by (used for) investing activities \$(173.8) \$(191.2) \$1.4 \$17.4 \$(192.6)

The decrease in cash used for investing activities during fiscal 2018, as compared to fiscal 2017, was primarily because we did not acquire any businesses in fiscal 2018, offset by payments to acquire equity instruments of other entities. The increase in cash used for investing activities during fiscal 2017, as compared to fiscal 2016, was primarily due to an increase in cash paid for business combinations and a decrease in net proceeds from our investment portfolio. We expect to continue our investing activities, including purchasing property, plant and equipment, purchasing intangible assets, business combinations, purchasing software licenses, and making strategic investments.

Cash Flows from Financing Activities

Cash flows used for financing activities during fiscal 2018, 2017 and 2016 were as follows:

			Change	
	2018	2017	2016	2017
				vs.
				2016

(In millions)

Cash used for financing activities \$(567.9) \$(70.1) \$(592.7) \$(497.8) \$522.6

The increase in cash used for financing activities during fiscal 2018, as compared to fiscal 2017, was primarily due to the prepayment of the outstanding principal balance on our \$300.0 million 2019 Term Loan, an increase in repurchases of common stock and a decrease in net proceeds on our revolving credit facility. The decrease in cash used for financing activities during fiscal 2017, as compared to fiscal 2016, was primarily due to a decrease in payments made to repurchase shares of our common stock, partially offset by a net decrease in proceeds from borrowings.

Other Factors Affecting Liquidity and Capital Resources**Stock Repurchase Program**

In January 2017, our Board of Directors authorized the repurchase of shares of our common stock with a value of up to \$525.0 million in the aggregate. As of December 29, 2018, approximately \$175.0 million remained available under this authorization. In February 2019, our Board of Directors authorized the additional repurchase of shares of our common stock with a value of up to \$500.0 million in the aggregate. The actual timing and amount of future

repurchases are subject to business and market conditions, corporate and regulatory requirements, stock price, acquisition opportunities and other factors. See Part II, Item 5, “Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities” for additional information.

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Revolving Credit Facility

Our senior unsecured revolving credit facility provides for borrowings up to \$350.0 million, with the right to request increased capacity up to an additional \$250.0 million upon the receipt of lender commitments, for total maximum borrowings of \$600.0 million. The credit facility expires on January 28, 2022 and currently has no subsidiary guarantors. Any outstanding loans drawn under the credit facility are due at maturity on January 28, 2022.

Outstanding borrowings may be paid at any time prior to maturity. As of December 29, 2018, there were \$100.0 million of borrowings outstanding under our revolving credit facility, and we were in compliance with all financial covenants associated with the revolving credit facility.

2024 Notes

In October 2014, we issued \$350.0 million aggregate principal amount of 4.375% Senior Notes due October 15, 2024. We received net proceeds of \$342.4 million from the issuance of the 2024 Notes, net of a discount of \$1.4 million and issuance costs of \$6.2 million. Interest is payable in cash semi-annually. The 2024 Notes are unsecured and rank equal in right of payment to all of our existing and future senior indebtedness. As of December 29, 2018, we were in compliance with all covenants associated with the 2024 Notes.

For additional information relating to our debt arrangements, see Note 3 in the notes to consolidated financial statements.

Contractual Obligations

A summary of our contractual obligations as of December 29, 2018 is as follows:

	Payments Due by Period				
	Total	Less Than 1 Year	1-3 Years	3-5 Years	More Than 5 Years
	(In millions)				
Operating lease obligations	\$112.0	\$26.3	\$42.9	\$25.7	\$17.1
Purchase obligations ⁽¹⁾	24.7	18.1	5.8	0.7	0.1
Long-term debt	350.0	—	—	—	350.0
Revolving credit facility	100.0	100.0	—	—	—
Contractual interest payments	97.4	19.7	31.7	30.7	15.3
Current income tax payable	5.1	5.1	—	—	—
Other long-term contractual obligations ⁽²⁾	37.7	0.1	23.0	3.1	11.5
Total	\$726.9	\$169.3	\$103.4	\$60.2	\$394.0

⁽¹⁾ With respect to purchase obligations that are cancelable by us, this table includes the amount that would have been payable if we had canceled the obligation as of December 29, 2018 or the earliest cancellation date.

⁽²⁾ Included in other long-term contractual obligations are long-term income tax liabilities of \$18.7 million related to unrecognized tax benefits. Of the \$18.7 million, we estimate \$17.5 million will be paid or settled within 1 to 3 years and \$1.2 million within 3 to 5 years. The remaining portion of other long-term contractual obligations is primarily liabilities associated with defined benefit retirement plans and acquisitions.

Off-Balance Sheet Arrangements

As of December 29, 2018, we did not have any significant off-balance sheet arrangements, as defined in Item 303(a)(4)(ii) of SEC Regulation S-K.

Critical Accounting Estimates

In preparing our consolidated financial statements, we make assumptions, judgments and estimates that can have a significant impact on our revenue, operating income and net income, as well as on the value of certain assets and liabilities on our consolidated balance sheets. We base our assumptions, judgments and estimates on historical experience and various other factors that we believe to be reasonable under the circumstances. Actual results could differ materially from these estimates under different assumptions or conditions. At least quarterly, we evaluate our assumptions, judgments and estimates, and make changes as deemed necessary.

We believe that the assumptions, judgments and estimates involved in the accounting for income taxes, revenue recognition and business combinations have the greatest potential impact on our consolidated financial statements; therefore, we consider these to be our critical accounting estimates. For information on our significant accounting policies, see Note 2 in the notes to consolidated financial statements.

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Accounting for Income Taxes

We are subject to income taxes in the United States and numerous foreign jurisdictions. Significant judgment is required in evaluating and estimating our provision for these taxes. There are many transactions that occur during the ordinary course of business for which the ultimate tax determination is uncertain. The Tax Act has many provisions that require additional guidance on specific interpretations of the tax law changes. Our provision for income taxes could be adversely affected by our earnings being lower than anticipated in countries where we have lower statutory rates and higher than anticipated in countries where we have higher statutory rates, losses incurred in jurisdictions for which we are not able to realize the related tax benefit, changes in foreign currency exchange rates, entry into new businesses and geographies and changes to our existing businesses, acquisitions and investments, changes in our deferred tax assets and liabilities including changes in our assessment of valuation allowances, changes in the relevant tax laws or interpretations of these tax laws, and developments in current and future tax examinations.

We only recognize the tax benefit of an income tax position if we judge that it is more likely than not that the tax position will be sustained, solely on its technical merits, in a tax audit including resolution of any related appeals or litigation processes. To make this judgment, we must interpret complex and sometimes ambiguous tax laws, regulations and administrative practices. If we judge that an income tax position meets this recognition threshold, then we must measure the amount of the tax benefit to be recognized by estimating the largest amount of tax benefit that has a greater than 50% cumulative probability of being realized upon settlement with a taxing authority that has full knowledge of all of the relevant facts. It is inherently difficult and subjective to estimate such amounts, as this requires us to determine the probability of various possible settlement outcomes. We must reevaluate our income tax positions on a quarterly basis to consider factors such as changes in facts or circumstances, changes in tax law, effectively settled issues under audit, the lapse of applicable statute of limitations, and new audit activity. Such a change in recognition or measurement would result in recognition of a tax benefit or an additional charge to the tax provision. For a more detailed description of our unrecognized tax benefits, see Note 6 in the notes to consolidated financial statements.

Revenue Recognition

Our contracts with customers often include promises to transfer multiple software and/or IP licenses, hardware and services, including professional services, technical support services, and rights to unspecified updates to a customer. Determining whether licenses and services are distinct performance obligations that should be accounted for separately, or not distinct and thus accounted for together, requires significant judgment. In some arrangements, such as most of our IP license arrangements, we have concluded that the licenses and associated services are distinct from each other. In other arrangements, like our time-based software arrangements, the licenses and certain services are not distinct from each other. Our time-based software arrangements include multiple software licenses and updates to the licensed software products, as well as technical support, and we have concluded that these promised goods and services are a single, combined performance obligation.

Judgment is required to determine the stand-alone selling prices (“SSPs”) for each distinct performance obligation. We rarely license or sell products on a standalone basis, so we are required to estimate the SSP for each performance obligation. In instances where the SSP is not directly observable because we do not sell the license, product or service separately, we determine the SSP using information that may include market conditions and other observable inputs. We typically have more than one SSP for individual performance obligations due to the stratification of those items by classes of customers and circumstances. In these instances, we may use information such as the size of the customer and geographic region of the customer in determining the SSP.

Revenue is recognized over time for our combined performance obligations that include software licenses, updates, and technical support as well as for maintenance and professional services that are separate performance obligations. For our professional services, revenue is recognized over time, generally using costs incurred or hours expended to measure progress. Judgment is required in estimating project status and the costs necessary to complete projects. A number of internal and external factors can affect these estimates, including labor rates, utilization and efficiency variances and specification and testing requirement changes. For our other performance obligations recognized over time, revenue is generally recognized using a time-based measure of progress reflecting generally consistent efforts to satisfy those performance obligations throughout the arrangement term.

If a group of agreements are so closely related that they are, in effect, part of a single arrangement, such agreements are deemed to be one arrangement for revenue recognition purposes. We exercise significant judgment to evaluate the relevant facts and circumstances in determining whether the separate agreements should be accounted for separately or as, in substance, a single arrangement. Our judgments about whether a group of contracts comprise a single arrangement can affect the allocation of consideration to the distinct performance obligations, which could have an effect on results of operations for the periods involved.

We are required to estimate the total consideration expected to be received from contracts with customers. In some circumstances, the consideration expected to be received is variable based on the specific terms of the contract or based on our expectations of the term of the contract. Generally, we have not experienced significant returns or refunds to customers. These estimates require significant judgment and the change in these estimates could have an effect on our results of operations during the periods involved.

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Business Combinations

When we acquire businesses, we allocate the purchase price to the acquired tangible assets and assumed liabilities, including deferred revenue, liabilities associated with the fair value of contingent consideration and acquired identifiable intangible assets. Any residual purchase price is recorded as goodwill. The allocation of the purchase price requires us to make significant estimates in determining the fair values of these acquired assets and assumed liabilities, especially with respect to intangible assets and goodwill. These estimates are based on information obtained from management of the acquired companies, our assessment of this information, and historical experience. These estimates can include, but are not limited to, the cash flows that an acquired business is expected to generate in the future, the cash flows that specific assets acquired with that business are 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, and if different estimates were used, the purchase price for the acquisition could be allocated to the acquired assets and assumed liabilities differently from the allocation that we have made to the acquired assets and assumed liabilities. In addition, unanticipated events and circumstances may occur that may affect the accuracy or validity of such estimates, and if such events occur, we may be required to adjust the value allocated to acquired assets or assumed liabilities.

We also make significant judgments and estimates when we assign useful lives to the definite-lived intangible assets identified as part of our acquisitions. These estimates are inherently uncertain and if we used different estimates, the useful life over which we amortize intangible assets would be different. In addition, unanticipated events and circumstances may occur that may impact the useful life assigned to our intangible assets, which would impact our amortization of intangible assets expense and our results of operations.

New Accounting Standards

Leases

In February 2016, the FASB issued ASU 2016-02, “Leases (Topic 842),” requiring, among other things, the recognition of lease liabilities and corresponding right-of-use assets on the balance sheet by lessees for all leases with a term longer than 12 months. The new standard is effective for us in the first quarter of fiscal 2019. A modified retrospective approach is required, applying the new standard to leases existing as of the date of initial application. An entity may choose to apply the standard as of either its effective date or the beginning of the earliest comparative period presented in the financial statements. We adopted the new standard on December 30, 2018, the first day of fiscal 2019, and used the effective date as our date of initial application. Consequently, financial information will not be updated, and the disclosures required under the new standard will not be provided for dates and periods prior to the first quarter of fiscal 2019. We elected certain practical expedients permitted under the transition guidance within the new standard, which among other things, allowed us to carry forward our prior conclusions about lease identification and classification.

We estimate the key change upon adoption of the standard will result in balance sheet recognition of additional lease assets and lease liabilities ranging from \$75 to \$85 million as of December 30, 2018, which is based on the present value of committed lease payments. We do not expect the adoption of the new standard to have a material impact on the recognition, measurement or presentation of lease expenses within our consolidated income statements, consolidated statements of comprehensive income or consolidated statements of cash flows.

The new standard also provides updated guidance for lessor accounting; however, we do not expect the new standard to have a material effect on our financial statements for arrangements in which we are the lessor.

Credit Losses

In June 2016, the FASB issued ASU 2016-13, “Measurement of Credit Losses on Financial Instruments,” which supersedes current guidance requiring recognition of credit losses when it is probable that a loss has been incurred. The new standard requires the establishment of an allowance for estimated credit losses on financial assets, including trade and other receivables, at each reporting date. The new standard will result in earlier recognition of allowances for losses on trade and other receivables and other contractual rights to receive cash. The new standard will be effective for us in the first quarter of fiscal 2020, and early adoption is permitted. We are currently reviewing this standard to assess the impact on our consolidated financial statements and the related disclosures.

Goodwill Impairment

In January 2017, the FASB issued ASU 2017-04, “Simplifying the Test for Goodwill Impairment,” that eliminates “Step 2” from the goodwill impairment test. The new standard is effective for us in the first quarter of fiscal 2020, and early adoption is permitted. The new guidance must be applied on a prospective basis. We do not anticipate that the adoption of this standard will have a significant impact on our consolidated financial statements or the related disclosures.

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Income Tax Effects within Accumulated Other Comprehensive Income

In February 2018, the FASB issued ASU 2018-02, “Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income,” which allows a reclassification of the income tax effects of the Tax Act on items within accumulated other comprehensive income to retained earnings. The new guidance may be applied at the beginning of the period of adoption or retrospectively to each period in which the effect of the change in federal income tax rate from the Tax Act is recognized. The new standard became effective for us in the first quarter of fiscal 2019. We do not anticipate that the adoption of this standard will impact our consolidated financial statements or the related disclosures.

Stock-based Compensation

In June 2018, the FASB issued ASU 2018-07, “Improvements to Nonemployee Share-Based Payment Accounting,” to simplify the accounting for share-based transactions with nonemployees in which the grantor acquires goods or services to be used or consumed. Under the new standard, most of the guidance on recording share-based compensation granted to nonemployees will be aligned with the requirements for share-based compensation granted to employees. This standard became effective for us in the first quarter of fiscal 2019, and early adoption is permitted. We do not expect the adoption of this standard to have a material impact on our consolidated financial statements.

Fair Value Measurements

In August 2018, the FASB issued ASU 2018-13, “Disclosure Framework — Changes to the Disclosure Requirements for Fair Value Measurement,” which modifies the disclosure requirements on fair value measurements. The new standard is effective for us in the first quarter of fiscal 2020, and early adoption is permitted. While we continue to assess the potential impact of this standard, we do not expect the adoption of this standard to have a material impact on our condensed consolidated financial statements.

Internal-use Software

In August 2018, the FASB issued ASU 2018-15, “Customer’s Accounting for Implementation Costs Incurred in a Cloud Computing Arrangement That Is a Service Contract,” which clarifies the accounting for implementation costs in cloud computing arrangements. The new standard is effective for us in the first quarter of fiscal 2020, and early adoption is permitted. We are currently reviewing this standard to assess the impact on our condensed consolidated financial statements.

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Item 7A. Quantitative and Qualitative Disclosures About Market Risk

Foreign Currency Risk

A material portion of our revenue, expenses and business activities are transacted in the U.S. dollar. In certain foreign countries where we price our products and services in U.S. dollars, a decrease in value of the local currency relative to the U.S. dollar results in an increase in the prices for our products and services compared to those products of our competitors that are priced in local currency. This could result in our prices being uncompetitive in certain markets.

In certain countries where we may invoice customers in the local currency our revenues benefit from a weaker dollar and are adversely affected by a stronger dollar. The opposite impact occurs in countries where we record expenses in local currencies. In those cases, our costs and expenses benefit from a stronger dollar and are adversely affected by a weaker dollar. The fluctuations in our operating expenses outside the United States resulting from volatility in foreign exchange rates are not generally moderated by corresponding fluctuations in revenues from existing contracts.

We enter into foreign currency forward exchange contracts to protect against currency exchange risks associated with existing assets and liabilities. A foreign currency forward exchange contract acts as a hedge by increasing in value when underlying assets decrease in value or underlying liabilities increase in value due to changes in foreign exchange rates. Conversely, a foreign currency forward exchange contract decreases in value when underlying assets increase in value or underlying liabilities decrease in value due to changes in foreign exchange rates. These forward contracts are not designated as accounting hedges, so the unrealized gains and losses are recognized in other income, net, in advance of the actual foreign currency cash flows with the fair value of these forward contracts being recorded as accrued liabilities or other current assets.

We do not use forward contracts for trading purposes. Our forward contracts generally have maturities of 90 days or less. We enter into foreign currency forward exchange contracts based on estimated future asset and liability exposures, and the effectiveness of our hedging program depends on our ability to estimate these future asset and liability exposures. Recognized gains and losses with respect to our current hedging activities will ultimately depend on how accurately we are able to match the amount of foreign currency forward exchange contracts with actual underlying asset and liability exposures.

The following table provides information about our foreign currency forward exchange contracts as of December 29, 2018. The information is provided in United States dollar equivalent amounts. The table presents the notional amounts, at contract exchange rates, and the weighted average contractual foreign currency exchange rates expressed as units of the foreign currency per United States dollar, which in some cases may not be the market convention for quoting a particular currency. All of these forward contracts matured during February 2019.

	Notional Principal	Weighted Average Contract Rate
(In millions)		
Forward Contracts:		
European Union euro	\$ 120.0	0.88
British pound	97.8	0.77
Japanese yen	68.4	112.11
Israeli shekel	48.4	3.69
Swedish krona	26.5	8.98
Indian rupee	25.7	72.39
Chinese renminbi	15.0	6.95
South Korean won	12.4	1,125.29
Other	16.4	N/A
Total	\$ 430.6	
Estimated fair value	\$ 0.1	

We actively monitor our foreign currency risks, but our foreign currency hedging activities may not substantially offset the impact of fluctuations in currency exchange rates on our results of operations, cash flows and financial

position.

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Interest Rate Risk

Our exposure to market risk for changes in interest rates relates primarily to our portfolio of cash and cash equivalents and balances outstanding on our revolving credit facility, if any. We are exposed to interest rate fluctuations in many of the world's leading industrialized countries, but our interest income and expense is most sensitive to fluctuations in the general level of United States interest rates. In this regard, changes in United States interest rates affect the interest earned on our cash and cash equivalents and the costs associated with foreign currency hedges.

All highly liquid securities with a maturity of three months or less at the date of purchase are considered to be cash equivalents. The carrying value of our interest-bearing instruments approximated fair value as of December 29, 2018. Interest rates under our revolving credit facility are variable, so interest expense could be adversely affected by changes in interest rates, particularly for periods when we maintain a balance outstanding under the revolving credit facility. Interest rates for our revolving credit facility can fluctuate based on changes in market interest rates and in an interest rate margin that varies based on our consolidated leverage ratio. As of December 29, 2018, there were \$100.0 million borrowings outstanding under our revolving credit facility. For an additional description of the revolving credit facility, see Note 3 in the notes to consolidated financial statements.

Equity Price Risk

Equity Investments

We have a portfolio of equity investments that includes marketable equity securities and non-marketable investments. Our equity investments are made primarily in connection with our strategic investment program. Under our strategic investment program, from time to time, we make cash investments in companies with technologies that are potentially strategically important to us. See Note 7 in the notes to consolidated financial statements for an additional description of these investments.

Item 8. Financial Statements and Supplementary Data

The financial statements required by Item 8 are submitted as a separate section of this Annual Report on Form 10-K. See Part IV, Item 15, "Exhibits and Financial Statement Schedules."

Summary Quarterly Data-Unaudited

	2018				2017			
	4 th	3 rd	2 nd	1 st	4 th	3 rd	2 nd	1 st
	(In thousands, except per share amounts)							
Revenue ⁽¹⁾	\$569,850	\$532,468	\$518,391	\$517,313	\$501,722	\$485,398	\$479,001	\$476,911
Cost of revenue ⁽¹⁾	76,124	60,454	58,960	63,209	60,284	54,482	60,832	61,792
Net income (loss) ^{(1) (2)}	98,425	99,318	75,149	72,885	(14,442)	81,157	69,127	68,259
Net income (loss) per share - basic ^{(1) (2)}	0.36	0.36	0.27	0.27	(0.05)	0.30	0.25	0.25
Net income (loss) per share - diluted ^{(1) (2)}	0.35	0.35	0.27	0.26	(0.05)	0.29	0.25	0.25

⁽¹⁾ On the first day of fiscal 2018, we adopted ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," which provided a new basis of accounting for our revenue arrangements during fiscal 2018. Because of the adoption, results of operations for fiscal 2018 are not comparable to the results of operations for the other fiscal years presented in the table above. For additional information regarding the adoption of this and other accounting standards at the beginning of fiscal 2018, see Note 2 in the notes to consolidated financial statements under the heading "Recently Adopted Accounting Standards."

⁽²⁾ During fiscal 2017, we recorded a provisional income tax expense of \$96.8 million related to the income tax effects of the Tax Act, which included \$67.2 million related to the one-time transition tax on the mandatory deemed repatriation of foreign earnings. In accordance with SAB 118, we updated the one-time transition tax estimate to \$65.8 million during fiscal 2018. We finalized our other fiscal 2017 provisional estimates without change during fiscal 2018.

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Item 9. Changes in and Disagreements With Accountants on Accounting and Financial Disclosure
None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

As required by Rule 13a-15 of the Securities Exchange Act of 1934, as amended (the “Exchange Act”) under the supervision and with the participation of our management, including our Chief Executive Officer (“CEO”) and our Chief Financial Officer (“CFO”), we evaluated the effectiveness of the design and operation of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of December 29, 2018.

The evaluation of our disclosure controls and procedures included a review of our processes and the effect on the information generated for use in this Annual Report on Form 10-K. In the course of this evaluation, we sought to identify any material weaknesses in our disclosure controls and procedures, to determine whether we had identified any acts of fraud involving personnel who have a significant role in our disclosure controls and procedures, and to confirm that any necessary corrective action, including process improvements, was taken. This type of evaluation is done every fiscal quarter so that our conclusions concerning the effectiveness of these controls can be reported in our periodic reports filed with the SEC. The overall goals of these evaluation activities are to monitor our disclosure controls and procedures and to make modifications as necessary. We intend to maintain these disclosure controls and procedures, modifying them as circumstances warrant.

Based on their evaluation as of December 29, 2018, our CEO and CFO have concluded that our disclosure controls and procedures were effective to provide reasonable assurance that the information required to be disclosed by us in our reports filed or submitted under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in the SEC’s rules and forms and is accumulated and communicated to our management, including the CEO and CFO, as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control Over Financial Reporting

There were no changes in our internal control over financial reporting during the fiscal quarter ended December 29, 2018 that materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Inherent Limitations on Effectiveness of Controls

Our management, including our CEO and CFO, does not expect that our disclosure controls and procedures or our internal control over financial reporting will prevent or detect all errors and all fraud. Internal control over financial reporting, no matter how well conceived and operated, can provide only reasonable, not absolute, assurance that the objectives of internal control are met. Further, the design of internal control must reflect the fact that there are resource constraints, and the benefits of the control must be considered relative to their costs. While our disclosure controls and procedures and internal control over financial reporting are designed to provide reasonable assurance of their effectiveness, because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within Cadence, have been detected.

Management’s Report on Internal Control Over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting (as defined in Rule 13a-15(f) under the Exchange Act). Our management assessed the effectiveness of our internal control over financial reporting as of December 29, 2018. In making this assessment, our management used the criteria established in Internal Control-Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”). Our management has concluded that, as of December 29, 2018, our internal control over financial reporting is effective based on these criteria. Our independent registered public accounting firm, KPMG LLP, has issued an attestation report on our internal control over financial reporting, which is included in Part IV, Item 15, “Exhibits and Financial Statement Schedules.”

Item 9B. Other Information

None.

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PART III.

Item 10. Directors, Executive Officers and Corporate Governance

The information required by Item 10 as to directors is incorporated herein by reference from the sections entitled “Proposal 1 - Election of Directors” and “Security Ownership of Certain Beneficial Owners and Management - Section 16(a) Beneficial Ownership Reporting Compliance” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders. The executive officers of Cadence are listed at the end of Item 1 of Part I of this Annual Report on Form 10-K.

The information required by Item 10 as to Cadence’s code of ethics is incorporated herein by reference from the section entitled “Corporate Governance - Code of Business Conduct” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders.

The information required by Item 10 as to the director nomination process and Cadence’s Audit Committee is incorporated by reference from the section entitled “Board of Directors - Committees of the Board” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders.

Item 11. Executive Compensation

The information required by Item 11 is incorporated herein by reference from the sections entitled “Board of Directors - Components of Director Compensation,” “Board of Directors - Director Compensation for Fiscal 2018,” “Compensation Discussion and Analysis,” “Compensation Committee Report,” “Compensation Committee Interlocks and Insider Participation,” “Compensation of Executive Officers,” “Potential Payments Upon Termination or Change In Control,” and “Pay Ratio Disclosure” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders.

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

The information required by Item 12 is incorporated herein by reference from the sections entitled “Security Ownership of Certain Beneficial Owners and Management” and “Equity Compensation Plan Information” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders.

Item 13. Certain Relationships and Related Transactions and Director Independence

The information required by Item 13 is incorporated herein by reference from the sections entitled “Certain Transactions” and “Board of Directors - Director Independence” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders.

Item 14. Principal Accountant Fees and Services

The information required by Item 14 is incorporated herein by reference from the section entitled “Fees Billed to Cadence by KPMG LLP During Fiscal 2018 and 2017” in Cadence’s definitive proxy statement for its 2019 Annual Meeting of Stockholders.

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PART IV.

Item 15. Exhibits and Financial Statement Schedules

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(a) 2. Financial Statement Schedules

All financial statement schedules are omitted because they are not applicable, not required or the required information is shown in the consolidated financial statements or notes thereto.

(a) 3. Exhibits 79

The exhibits listed in the accompanying Exhibit Index are filed or incorporated by reference as part of this Annual Report on Form 10-K.

The exhibits filed or incorporated by reference as part of this Annual Report on Form 10-K contain agreements to which Cadence is a party. These agreements are included to provide information regarding their terms and are not intended to provide any other factual or disclosure information about Cadence or the other parties to the agreements. Certain of the agreements contain representations and warranties by each of the parties to the applicable agreement, and any such representations and warranties have been made solely for the benefit of the other parties to the applicable agreement as of specified dates, may apply materiality standards that are different than those applied by investors, and may be subject to important qualifications and limitations that are not necessarily reflected in the agreement.

Accordingly, these representations and warranties may not describe the actual state of affairs as of the date they were made or at any other time, and should not be relied upon as statements of factual information.

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Report of Independent Registered Public Accounting Firm

The Board of Directors and Stockholders

Cadence Design Systems, Inc.:

Opinions on the Consolidated Financial Statements and Internal Control Over Financial Reporting

We have audited the accompanying consolidated balance sheets of Cadence Design Systems, Inc. and subsidiaries (“the Company”) as of December 29, 2018 and December 30, 2017, the related consolidated income statements, statements of comprehensive income, stockholders’ equity, and cash flows for each of the years in the three-year period ended December 29, 2018, and the related notes (collectively, the “consolidated financial statements”). We also have audited the Company’s internal control over financial reporting as of December 29, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 29, 2018 and December 30, 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended December 29, 2018, in conformity with U.S. generally accepted accounting principles. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 29, 2018 based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company has changed its method of accounting for revenue recognition on December 31, 2017 due to the adoption of FASB ASU 2014-09, “Revenue from Contracts with Customers (Topic 606).”

Basis for Opinions

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

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

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

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

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

/s/ KPMG LLP

We have served as the Company's auditor since 2002.

Santa Clara, California

February 27, 2019

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CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED BALANCE SHEETS
December 29, 2018 and December 30, 2017
(In thousands, except par value)

	As of	
	December 29, 2018	December 30, 2017
ASSETS		
Current assets:		
Cash and cash equivalents	\$533,298	\$ 688,087
Receivables, net	297,082	190,426
Inventories	28,162	33,209
Prepaid expenses and other	92,550	68,266
Total current assets	951,092	979,988
Property, plant and equipment, net	252,630	251,342
Goodwill	662,272	666,009
Acquired intangibles, net	225,457	278,835
Long-term receivables	5,972	12,239
Other assets	371,231	230,301
Total assets	\$2,468,654	\$ 2,418,714
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Revolving credit facility	\$100,000	\$ 85,000
Accounts payable and accrued liabilities	256,526	221,101
Current portion of deferred revenue	352,456	336,297
Total current liabilities	708,982	642,398
Long-term liabilities:		
Long-term portion of deferred revenue	48,718	61,513
Long-term debt	345,291	644,369
Other long-term liabilities	77,262	81,232
Total long-term liabilities	471,271	787,114
Commitments and contingencies (Notes 6 and 17)		
Stockholders' equity:		
Preferred stock - \$0.01 par value; authorized 400 shares, none issued or outstanding	—	—
Common stock - \$0.01 par value; authorized 600,000 shares; issued and outstanding shares: 280,015 and 282,067, respectively	1,936,124	1,829,950
Treasury stock, at cost; 49,144 shares and 47,092 shares, respectively	(1,395,652)	(1,178,121)
Retained earnings	772,709	341,003
Accumulated other comprehensive loss	(24,780)	(3,630)
Total stockholders' equity	1,288,401	989,202
Total liabilities and stockholders' equity	\$2,468,654	\$ 2,418,714

See notes to consolidated financial statements.

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CADENCE DESIGN SYSTEMS, INC.
 CONSOLIDATED INCOME STATEMENTS
 For the three fiscal years ended December 29, 2018
 (In thousands, except per share amounts)

	2018	2017	2016
Revenue:			
Product and maintenance	\$1,997,887	\$1,813,987	\$1,683,771
Services	140,135	129,045	132,312
Total revenue	2,138,022	1,943,032	1,816,083
Costs and expenses:			
Cost of product and maintenance	173,011	156,676	183,291
Cost of service	85,736	80,714	73,201
Marketing and sales	439,669	419,161	395,194
Research and development	884,816	804,223	735,340
General and administrative	133,406	134,181	125,106
Amortization of acquired intangibles	14,086	14,716	18,095
Restructuring and other charges	11,089	9,406	40,955
Total costs and expenses	1,741,813	1,619,077	1,571,182
Income from operations	396,209	323,955	244,901
Interest expense	(23,139)	(25,664)	(23,670)
Other income, net	3,320	16,755	15,922
Income before provision for income taxes	376,390	315,046	237,153
Provision for income taxes	30,613	110,945	34,067
Net income	\$345,777	\$204,101	\$203,086
Net income per share – basic	\$1.26	\$0.75	\$0.71
Net income per share – diluted	\$1.23	\$0.73	\$0.70
Weighted average common shares outstanding – basic	273,729	272,097	284,502
Weighted average common shares outstanding – diluted	281,144	280,221	291,256

See notes to consolidated financial statements.

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CADENCE DESIGN SYSTEMS, INC.
 CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
 For the three fiscal years ended December 29, 2018
 (In thousands)

	2018	2017	2016
Net income	\$345,777	\$204,101	\$203,086
Other comprehensive income (loss), net of tax effects:			
Foreign currency translation adjustments	(17,885)	19,394	(12,801)
Changes in unrealized holding gains or losses on available-for-sale securities, net of reclassification adjustments for realized gains and losses	—	1,712	716
Changes in defined benefit plan liabilities	(627)	424	(650)
Total other comprehensive income (loss), net of tax effects	(18,512)	21,530	(12,735)
Comprehensive income	\$327,265	\$225,631	\$190,351

See notes to consolidated financial statements.

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CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
For the three fiscal years ended December 29, 2018
(In thousands)

	Common Stock			Retained	Accumulated	
	Shares	Par Value and Capital in Excess of Par	Treasury Stock	Earnings (Accumulated Deficit)	Other Comprehensive Income (Loss)	Total
Balance, January 2, 2016	309,392	\$ 1,863,086	\$(400,555)	\$ (73,991)	\$ (12,425)	\$ 1,376,115
Cumulative effect adjustment	—	364	—	7,807	—	\$ 8,171
Net income	—	—	—	203,086	—	\$ 203,086
Other comprehensive loss, net of taxes	—	—	—	—	(12,735)	\$(12,735)
Purchase of treasury stock	(40,493)	—	(960,289)	—	—	\$(960,289)
Issuance of common stock and reissuance of treasury stock under equity incentive plans, net of forfeitures	10,587	(147,074)	202,506	—	—	\$ 55,432
Stock received for payment of employee taxes on vesting of restricted stock	(1,387)	(5,512)	(31,715)	—	—	\$(37,227)
Stock-based compensation expense	—	109,217	—	—	—	\$ 109,217
Balance, December 31, 2016	278,099	\$ 1,820,081	\$(1,190,053)	\$ 136,902	\$ (25,160)	\$ 741,770
Net income	—	—	—	204,101	—	\$ 204,101
Other comprehensive income, net of taxes	—	—	—	—	21,530	\$ 21,530
Purchase of treasury stock	(2,495)	—	(100,025)	—	—	\$(100,025)
Issuance of common stock and reissuance of treasury stock under equity incentive plans, net of forfeitures	7,905	(111,982)	160,946	—	—	\$ 48,964
Stock received for payment of employee taxes on vesting of restricted stock	(1,442)	(8,172)	(48,989)	—	—	\$(57,161)
Stock-based compensation expense	—	130,023	—	—	—	\$ 130,023
Balance, December 30, 2017	282,067	\$ 1,829,950	\$(1,178,121)	\$ 341,003	\$ (3,630)	\$ 989,202
Cumulative effect adjustment	—	—	—	85,929	(2,638)	\$ 83,291
Net income	—	—	—	345,777	—	\$ 345,777
Other comprehensive loss, net of taxes	—	—	—	—	(18,512)	\$(18,512)
Purchase of treasury stock	(5,934)	—	(250,059)	—	—	\$(250,059)
Issuance of common stock and reissuance of treasury stock under equity incentive plans, net of forfeitures	5,274	(50,570)	91,478	—	—	\$ 40,908
Stock received for payment of employee taxes on vesting of restricted stock	(1,392)	(10,971)	(58,950)	—	—	\$(69,921)

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Stock-based compensation expense	—	167,715	—	—	—	\$167,715
Balance, December 29, 2018	280,015	\$1,936,124	\$(1,395,652)	\$ 772,709	\$ (24,780)	\$1,288,401

See notes to consolidated financial statements.

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CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
For the three fiscal years ended December 29, 2018
(In thousands)

	2018	2017	2016
Cash and cash equivalents at beginning of year	\$688,087	\$465,232	\$616,686
Cash flows from operating activities:			
Net income	345,777	204,101	203,086
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	118,721	115,524	119,588
Amortization of debt discount and fees	1,196	1,211	1,069
Stock-based compensation	167,715	130,023	109,217
Gain on investments, net	(1,261)	(13,869)	(4,725)
Gain on sale of property, plant and equipment	—	—	(923)
Deferred income taxes	(11,676)	79,934	(4,869)
Provisions for losses on receivables	5,102	2,623	308
Other non-cash items	1,136	5,068	4,027
Changes in operating assets and liabilities, net of effect of acquired businesses:			
Receivables	(87,083)	(31,032)	(3,607)
Inventories	752	5,034	4,934
Prepaid expenses and other	(19,622)	(25,793)	(6,903)
Other assets	(16,077)	(22,336)	(6,566)
Accounts payable and accrued liabilities	1,553	(25,987)	2,655
Deferred revenue	100,696	33,614	30,742
Other long-term liabilities	(2,178)	12,625	(3,154)
Net cash provided by operating activities	604,751	470,740	444,879
Cash flows from investing activities:			
Purchases of available-for-sale securities	—	—	(20,525)
Proceeds from the sale of available-for-sale securities	—	833	55,619
Proceeds from the maturity of available-for-sale securities	—	—	57,762
Purchases of non-marketable investments	(115,839)	—	—
Proceeds from the sale of non-marketable investments	3,497	9,108	2,917
Proceeds from the sale of property, plant and equipment	—	—	923
Purchases of property, plant and equipment	(61,503)	(57,901)	(53,712)
Cash paid in business combinations and asset acquisitions, net of cash acquired	—	(143,249)	(41,627)
Net cash provided by (used for) investing activities	(173,845)	(191,209)	1,357
Cash flows from financing activities:			
Proceeds from revolving credit facility	100,000	135,000	115,000
Payment on revolving credit facility	(85,000)	(100,000)	(65,000)
Proceeds from term loan	—	—	300,000
Principal payments on term loan	(300,000)	—	—
Payment of debt issuance costs	—	(793)	(622)
Proceeds from issuance of common stock	40,908	48,965	55,440
Stock received for payment of employee taxes on vesting of restricted stock	(69,921)	(57,161)	(37,226)
Payments for repurchases of common stock	(250,059)	(100,025)	(960,289)
Change in book overdraft	(3,867)	3,867	—
Net cash used for financing activities	(567,939)	(70,147)	(592,697)
Effect of exchange rate changes on cash and cash equivalents	(17,756)	13,471	(4,993)
Increase (decrease) in cash and cash equivalents	(154,789)	222,855	(151,454)

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Cash and cash equivalents at end of year	\$533,298	\$688,087	\$465,232
Supplemental cash flow information:			
Cash paid for interest	\$23,018	\$24,160	\$21,024
Cash paid for income taxes, net	68,040	59,072	36,823

See notes to consolidated financial statements.

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CADENCE DESIGN SYSTEMS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
For the three fiscal years ended December 29, 2018

NOTE 1. BUSINESS OVERVIEW

Cadence Design Systems, Inc. (“Cadence”) provides solutions that enable its customers to design complex and innovative electronic products. Cadence’s solutions are designed to give its customers a competitive edge in their development of electronic systems, integrated circuits (“ICs”) and electronic devices and increasingly sophisticated manufactured products, by optimizing performance, minimizing power consumption, shortening the time to bring their products to market and reducing their design, development and manufacturing costs. Cadence’s product offerings include software, hardware, services and reusable IC design blocks, which are commonly referred to as intellectual property (“IP”). Cadence also provides maintenance for its software, hardware, and IP product offerings.

NOTE 2. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Principles of Consolidation and Basis of Presentation

The consolidated financial statements include the accounts of Cadence and its subsidiaries after elimination of intercompany accounts and transactions. All consolidated subsidiaries are wholly owned by Cadence. Certain prior period balances have been reclassified to conform to the current period presentation.

Cadence’s fiscal years are 52- or 53-week periods ending on the Saturday closest to December 31. Fiscal 2017, 2016 and 2015 were each 52-week fiscal years.

Use of Estimates

Preparation of the consolidated financial statements in conformity with United States generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the consolidated financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

Comparability

Effective on the first day of fiscal 2018, Cadence adopted multiple new accounting standards. Prior periods were not retrospectively restated, so the consolidated balance sheet as of December 29, 2018 and the consolidated income statements for fiscal 2018 were prepared using accounting standards that were different than those in effect for fiscal 2017 and fiscal 2016. Therefore, the consolidated balance sheets as of December 29, 2018 are not directly comparable to the consolidated balance sheets as of December 30, 2017, nor are the results of operations for fiscal 2018 comparable to the results of operations for fiscal 2017 and fiscal 2016.

Recently Adopted Accounting Standards

Revenue from Contracts with Customers

In May 2014, the Financial Accounting Standards Board (“FASB”) issued ASU 2014-09, “Revenue from Contracts with Customers (Topic 606),” which supersedes the revenue recognition requirements in “Revenue Recognition (Topic 605)” and Subtopic 985-605 “Software - Revenue Recognition.” Topic 605 and Subtopic 985-605 are collectively referred to as “Topic 605” or “prior GAAP.” Under Topic 606, revenue is recognized when a customer obtains control of promised goods or services in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. In addition, Topic 606 requires enhanced disclosures, including disclosure of the nature, amount, timing, and uncertainty of revenue and cash flows arising from contracts with customers. The FASB issued several amendments to the standard, including updates on accounting for licenses of IP and identifying performance obligations.

Cadence adopted Topic 606 on the first day of fiscal 2018 using the modified retrospective transition method. Under this method, Cadence evaluated contracts that were in effect at the beginning of fiscal 2018 as if those contracts had been accounted for under Topic 606. Cadence did not evaluate individual modifications for those periods prior to the adoption date, but the aggregate effect of all modifications as of the adoption date and such effects are provided below. Under the modified retrospective transition approach, periods prior to the adoption date were not adjusted and continue to be reported in accordance with historical, pre-Topic 606 accounting. A cumulative catch up adjustment

was recorded to beginning retained earnings to reflect the impact of all existing arrangements under Topic 606.

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The most significant impacts of the adoption of Topic 606 were as follows:

At the adoption date, Cadence increased retained earnings by \$85.4 million for uncompleted contracts for which revenue will not be recognized in future periods under Topic 606. This revenue would otherwise have been recognized in prior periods, so the beginning balance of unbilled receivables increased by \$47.3 million, contract assets were established at \$4.0 million, deferred revenue decreased by \$57.4 million and accrued liabilities increased by \$23.3 million;

Revenue generated under Topic 606 was slightly lower than revenue would have been under Topic 605 in fiscal 2018. This is the result of a combination of factors, including the elimination of deferred revenue that, under Topic 605, would have continued to be recognized into revenue in 2018 and beyond, as well as changes in the timing of revenue recognition as discussed below. The actual effects on revenue recognized for fiscal 2018 are reported in the table below; and

Cadence capitalized \$27.3 million of incremental sales commission costs at the adoption date directly related to obtaining customer contracts and is amortizing these costs over the life of the contract.

Notwithstanding the shift from recognizing revenue under Topic 605 to doing so under Topic 606, Cadence continues to recognize revenue over time for its time-based software arrangements, which generate a majority of total revenue. Under Topic 605, Cadence could not establish vendor specific objective evidence (“VSOE”) for its undelivered elements and therefore was not able to separate its delivered software licenses from those undelivered elements, such as technical support and unspecified (when-and-if available) update rights. Topic 606 no longer requires separability of promised goods or services, such as software licenses, technical support, or unspecified update rights on the basis of VSOE. Rather, Topic 606 requires Cadence to identify the performance obligations in the contract — that is, those promised goods and services (or bundles of promised goods or services) that are distinct — and allocate the transaction price of the contract to those performance obligations on the basis of stand-alone selling prices (“SSPs”). The transaction price allocated to each performance obligation is then recognized either at a point in time or over time using an appropriate measure of progress. Under Topic 606, Cadence has concluded that its software licenses in time-based arrangements are not distinct from each other, or from its obligation to provide unspecified software updates to the licensed software throughout the license term, because the multiple software licenses represent inputs to a single, combined offering, and timely, relevant software updates are integral to maintaining the utility of the software licenses. Cadence will recognize revenue for the combined performance obligation, which also includes the coterminous technical support provided to the customer, ratably over the term of the arrangement.

In contrast to the similar accounting result for time-based software arrangements, revenue related to certain IP licenses are now recognized upon delivery under Topic 606, as opposed to over time under Topic 605, because the requirement to have VSOE for undelivered elements under prior GAAP is eliminated under Topic 606. Certain perpetual software licenses are now recognized over time under Topic 606, as opposed to upon delivery under Topic 605, because these software licenses and the when-and-if available updates provided to the customer are accounted for together as one performance obligation and recognized over time.

More judgments and estimates are required under Topic 606 than were required under Topic 605. Due to the complexity of certain contracts, the actual revenue recognition treatment required under Topic 606 for the Company’s arrangements may be dependent on contract-specific terms and may vary in some instances.

The timing of revenue recognition for hardware and professional services remained substantially unchanged.

Cadence’s overall mix of revenue recognized at a point in time versus over time remained relatively constant, with approximately 90% recognizable over time.

The following table summarizes the effects of adopting Topic 606 on Cadence’s consolidated balance sheet as of December 29, 2018:

	As reported under Topic 606 (In thousands)	Adjustments	Balances under Prior GAAP
Receivables, net	\$297,082	\$ (12,099)	\$284,983

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Prepaid expenses and other	92,550	(10,055) 82,495
Long-term receivables	5,972	(623) 5,349
Other assets	371,231	(17,013) 354,218
Accounts payable and accrued liabilities*	256,526	(17,438) 239,088
Current portion of deferred revenue	352,456	45,119	397,575
Long-term portion of deferred revenue	48,718	17,637	66,355
Retained earnings	772,709	(86,120) 686,589
Accumulated other comprehensive loss	(24,780) 1,012	(23,768)

* Cadence has certain arrangements under which consideration is received from customers prior to identifying the specific goods or services to be delivered under the contract. Cadence records an accrued liability on a contract-by-contract basis at the end of each reporting period for cash consideration received.

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The following table summarizes the effects of adopting Topic 606 on Cadence's consolidated income statement for fiscal 2018:

	As reported under Topic 606 (In thousands, except per share amounts)	Adjustments	Balances under Prior GAAP
Product and maintenance revenue	\$1,997,887	\$ 1,031	\$1,998,918
Services revenue	140,135	6,643	146,778
Cost of product and maintenance	173,011	571	173,582
Marketing and sales expense	439,669	3,947	443,616
Provision for income taxes	30,613	(2,364)	28,249
Net income	345,777	5,520	351,297
Net income per share - basic	1.26	0.02	1.28
Net income per share - diluted	1.23	0.02	1.25

Cadence's net cash provided by operating activities for fiscal 2018 did not change due to the adoption of Topic 606. The following table summarizes the effects of adopting Topic 606 on the financial statement line items of Cadence's consolidated statement of cash flows for fiscal 2018:

	As reported under Topic 606 (In thousands)	Adjustments	Balances under Prior GAAP
Net income	\$345,777	\$ 5,520	\$351,297
Adjustments to reconcile net income to net cash provided by operating activities:			
Deferred income taxes	(11,676)	(2,213)	(13,889)
Changes in operating assets and liabilities:			
Receivables	(87,083)	(28,226)	(115,309)
Prepaid expenses and other	(19,622)	5,968	(13,654)
Other assets	(16,077)	3,461	(12,616)
Accounts payable and accrued liabilities	1,553	10,100	11,653
Deferred revenue	100,696	5,390	106,086

Financial Instruments

In January 2016, the FASB issued ASU 2016-01, "Financial Instruments—Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities." Cadence adopted this standard on the first day of fiscal 2018, modifying its accounting and required disclosures for investments in equity securities, other than those accounted for using the equity method of accounting.

Prior to the adoption of the updated standard, Cadence's investment in marketable equity securities was classified as available-for-sale, and changes in the fair value of the underlying securities were reported in accumulated other comprehensive loss in the consolidated balance sheets. The new standard eliminated the available-for-sale classification for equity securities and requires changes in the fair value of Cadence's investment to be recognized through net income for fiscal 2018 and each subsequent reporting period. Upon adoption, Cadence recorded a cumulative-effect adjustment to increase retained earnings in the amount of \$2.6 million related to unrealized holding gains previously recorded in accumulated other comprehensive loss.

Cadence's non-marketable investments in equity securities consist of investments in privately-held companies and are presented as other assets in the consolidated balance sheets. Prior to the adoption of the updated standard, non-marketable investments that were not accounted for using the equity method of accounting were recorded at cost, less impairment. The new standard eliminated the cost method of accounting for investments in equity securities that

do not have readily determinable fair values and permits the election of a measurement alternative that allows such securities to be recorded at cost, less impairment, if any, plus or minus changes resulting from observable price changes in market-based transactions for an identical or similar investment of the same issuer. Cadence adopted the provisions of the new standard applicable to its investments in equity securities without a readily determinable fair value on a prospective basis and elected the measurement alternative for non-marketable investments previously accounted for under the cost method of accounting. Gains and losses resulting from observable price changes or impairment will be recorded through net income in the period incurred. For additional information regarding Cadence's investments in equity securities, see Note 7 to the consolidated financial statements.

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Income Tax

In October 2016, the FASB issued ASU 2016-16, “Income taxes (Topic 740): Intra-entity Transfers of Assets Other Than Inventory.” The new guidance requires the recognition of the income tax consequences of an intra-entity asset transfer when the transfer occurs rather than when the asset has been sold to a third party. For intra-entity transfers of inventory, the income tax effects will continue to be deferred until the inventory has been sold to a third party. Cadence adopted the new standard on the first day of fiscal 2018 using the modified retrospective transition approach and recorded a cumulative-effect adjustment to decrease retained earnings in the amount of \$8.3 million. The cumulative-effect adjustment includes the write-off of income tax consequences deferred from prior intra-entity transfers involving assets other than inventory and new deferred tax assets for amounts not recognized under U.S. GAAP. We anticipate the potential for increased volatility in future effective tax rates from the adoption of this guidance.

Stock-based Compensation

In May 2017, the FASB issued ASU 2017-09, “Compensation—Stock Compensation (Topic 718): Scope of Modification Accounting,” that provides guidance about which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting. Cadence adopted the standard on the first day of fiscal 2018. The adoption of this standard did not impact Cadence’s consolidated financial statements or the related disclosures.

Cumulative Effect Adjustments to Retained Earnings

The following table presents the cumulative effect adjustments, net of income tax effects, to beginning retained earnings for new accounting standards adopted by Cadence on the first day of fiscal 2018:

	Retained Earnings (In thousands)
Balance, December 30, 2017, as previously reported	\$ 341,003
Cumulative effect adjustment from the adoption of new accounting standards:	
Revenue from Contracts with Customers (Topic 606)*	91,640
Financial Instruments—Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities	2,638
Income taxes (Topic 740): Intra-entity Transfers of Assets Other Than Inventory	(8,349)
Balance, December 30, 2017, as adjusted	426,932
Net Income	345,777
Balance, December 29, 2018	\$ 772,709

* The cumulative effect adjustment from the adoption of Revenue from Contracts with Customers (Topic 606) is presented net of the related income tax effect of \$17.5 million.

New Accounting Standards Not Yet Adopted

Leases

In February 2016, the FASB issued ASU 2016-02, “Leases (Topic 842),” requiring, among other things, the recognition of lease liabilities and corresponding right-of-use assets on the balance sheet by lessees for all leases with a term longer than 12 months. The new standard is effective for Cadence in the first quarter of fiscal 2019. A modified retrospective approach is required, applying the new standard to leases existing as of the date of initial application. An entity may choose to apply the standard as of either its effective date or the beginning of the earliest comparative period presented in the financial statements. Cadence adopted the new standard on December 30, 2018, the first day of fiscal 2019, and used the effective date as the date of initial application. Consequently, financial information will not be updated and the disclosures required under the new standard will not be provided for dates and periods prior to the first quarter of fiscal 2019. Cadence elected certain practical expedients permitted under the transition guidance within the new standard, which among other things, allowed Cadence to carry forward its prior conclusions about lease identification and classification.

Cadence estimates the key change upon adoption of the standard will result in balance sheet recognition of additional lease assets and lease liabilities ranging from \$75 to \$85 million as of December 30, 2018, which is based on the present value of committed lease payments. Cadence does not expect the adoption of the new standard to have a material impact on the recognition, measurement or presentation of lease expenses within its consolidated income statements, consolidated statements of comprehensive income or consolidated statements of cash flows.

The new standard also provides updated guidance for lessor accounting; however, Cadence does not expect the new standard to have a material effect on its consolidated financial statements for arrangements in which it is the lessor.

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Foreign Operations

Cadence transacts business in various foreign currencies. The United States dollar is the functional currency of Cadence's consolidated entities operating in the United States and certain of its consolidated subsidiaries operating outside the United States. The functional currency for Cadence's other consolidated entities operating outside of the United States is generally the country's local currency.

Cadence translates the financial statements of consolidated entities whose functional currency is not the United States dollar into United States dollars. Cadence translates assets and liabilities at the exchange rate in effect as of the financial statement date and translates income statement accounts using an average exchange rate for the period. Cadence includes adjustments from translating assets and liabilities into United States dollars, and the effect of exchange rate changes on intercompany transactions of a long-term investment nature in stockholders' equity as a component of accumulated other comprehensive income. Cadence reports gains and losses from foreign exchange rate changes related to intercompany receivables and payables that are not of a long-term investment nature, as well as gains and losses from foreign currency transactions of a monetary nature in other income, net, in the consolidated income statements.

Concentrations of Credit Risk

Financial instruments, including derivative financial instruments, that may potentially subject Cadence to concentrations of credit risk, consist principally of cash and cash equivalents, accounts receivable, investments and forward contracts. Credit exposure related to Cadence's foreign currency forward contracts is limited to the realized and unrealized gains on these contracts.

Cash and Cash Equivalents

Cadence considers all highly liquid investments with original maturities of three months or less on the date of purchase to be cash equivalents. Book overdraft balances are recorded in accounts payable and accrued liabilities in the consolidated balance sheets and are reported as a component of cash flows from financing activities in the consolidated statement of cash flows.

Receivables

Cadence's receivables, net includes invoiced accounts receivable and the current portion of unbilled receivables. Unbilled receivables represent amounts Cadence has recorded as revenue for which payments from a customer are due over time and Cadence has an unconditional right to the payment. Cadence's accounts receivable and unbilled receivables were initially recorded at the transaction value. Cadence's long-term receivables balance includes receivable balances to be invoiced more than one year after each balance sheet date.

Allowances for Doubtful Accounts

Each fiscal quarter, Cadence assesses its ability to collect outstanding receivables, and provides allowances for a portion of its receivables when collection is not probable. Cadence analyzes the creditworthiness of its customers, historical experience, changes in customer demand and the overall economic climate in the industries that Cadence serves. Provisions are made based upon a specific review of customer receivables and are recorded in operating expenses.

Inventories

Inventories are stated at the lower of cost or net realizable value. Cadence's inventories include high technology parts and components for complex emulation and prototyping hardware systems. These parts and components are specialized in nature and may be subject to rapid technological obsolescence. While Cadence has programs to minimize the required inventories on hand and considers technological obsolescence when estimating required reserves to reduce recorded amounts to market values, it is reasonably possible that such estimates could change in the near term. Cadence's policy is to reserve for inventory in excess of 12-month demand or for other known obsolescence or realization issues.

Property, Plant and Equipment

Property, plant and equipment is stated at historical cost. Depreciation and amortization are generally provided over the estimated useful lives, using the straight-line method, as follows:

Computer equipment and related software	2-7 years
Buildings	25-32 years

Leasehold improvements	Shorter of the lease term or the estimated useful life
Building improvements and land improvements	Estimated useful life up to 32 years
Furniture and fixtures	3-5 years
Equipment	3-5 years

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Cadence capitalizes certain costs of software developed for internal use. Capitalization of software developed for internal use begins at the application development phase of the project. Amortization begins when the computer software is substantially complete and ready for its intended use. Amortization is recorded on a straight-line basis over the estimated useful life. Cadence capitalized costs of software developed for internal use of \$3.6 million, \$2.2 million, and \$3.5 million during fiscal 2018, 2017 and 2016, respectively.

Cadence recorded depreciation and amortization expense of \$60.4 million, \$52.9 million and \$52.7 million during fiscal 2018, 2017 and 2016, respectively, for property, plant and equipment.

Software Development Costs

Software development costs are capitalized beginning when a product's technological feasibility has been established by completion of a working model of the product and amortization begins when a product is available for general release to customers. The period between the achievement of technological feasibility and the general release of Cadence's products has typically been of short duration. Costs incurred during fiscal 2018, 2017 and 2016 were not material.

Deferred Sales Commissions

Cadence records an asset for the incremental costs of obtaining a contract with a customer, including direct sales commissions that are earned upon execution of the contract. Cadence uses the portfolio method to recognize the amortization expense related to these capitalized costs related to initial contracts and renewals and such expense is recognized over a period associated with the revenue of the related portfolio, which is generally two to three years for Cadence's software arrangements and upon delivery for its hardware and IP arrangements. Incremental costs related to initial contracts and renewals are amortized over the period of the arrangement in each case because Cadence pays the same commission rate for both new contracts and renewals. Deferred sales commissions are tested for impairment on an ongoing basis when events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment is recognized to the extent that the amount of deferred sales commission exceeds the remaining expected gross margin (remaining revenue less remaining direct costs) on the goods and services to which the deferred sales commission relates. Total capitalized costs as of December 29, 2018 were \$31.2 million and are included in other assets in Cadence's consolidated balance sheet. Amortization of these assets during fiscal 2018 was \$26.5 million and is included in sales and marketing expense in Cadence's consolidated income statement.

Goodwill

Cadence conducts a goodwill impairment analysis annually and as necessary if changes in facts and circumstances indicate that the fair value of Cadence's single reporting unit may be less than its carrying amount. Cadence's goodwill impairment test consists of two steps. The first step requires that Cadence compare the estimated fair value of its single reporting unit to the carrying value of the reporting unit's net assets, including goodwill. If the fair value of the reporting unit is greater than the carrying value of its net assets, goodwill is not considered to be impaired and no further testing is required. If the fair value of the reporting unit is less than the carrying value of its net assets, Cadence would be required to complete the second step of the test by analyzing the fair value of its goodwill. If the carrying value of the goodwill exceeds its fair value, an impairment charge is recorded.

Long-Lived Assets, Including Acquired Intangibles

Cadence's long-lived assets consist of property, plant and equipment and acquired intangibles. Acquired intangibles with definite lives are amortized on a straight-line basis over the estimated economic life of the underlying products and technologies, which range from two to fourteen years. Acquired intangibles with indefinite lives, or in-process technology, consists of projects that had not reached technological feasibility by the date of acquisition. Upon completion of the project, the assets are amortized over their estimated useful lives. If the project is abandoned rather than completed, the asset is written off. In-process technology is tested for impairment annually and as necessary if changes in facts and circumstances indicate that the assets might be impaired.

Cadence reviews its long-lived assets, including acquired intangibles, for impairment whenever events or changes in circumstances indicate that the carrying amount of a long-lived asset or asset group may not be recoverable.

Recoverability of an asset or asset group is measured by comparison of its carrying amount to the expected future undiscounted cash flows that the asset or asset group is expected to generate. If it is determined that the carrying amount of an asset group is not recoverable, an impairment loss is recorded in the amount by which the carrying

amount of the asset or asset group exceeds its fair value.

Investments in Equity Securities

Cadence's investments in marketable equity securities are carried at fair value as a component of prepaid expenses and other in the consolidated balance sheets. Cadence records realized and unrealized holding gains or losses as part of other income, net in the consolidated income statements.

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Cadence's non-marketable investments include its investments in privately-held companies. These investments are initially recorded at cost and are included in other assets in the consolidated balance sheets. Cadence accounts for these investments using the measurement alternative when the fair value of the investment is not readily determinable and Cadence does not have the ability to exercise significant influence or the equity method of accounting when it is determined that Cadence has the ability to exercise significant influence. For investments accounted for using the equity method of accounting, Cadence records its proportionate share of the investee's income or loss, net of the effects of any basis differences, to other income, net on a one-quarter lag in Cadence's consolidated income statements. Cadence reviews its non-marketable investments on a regular basis to determine whether its investments in these companies are other-than-temporarily impaired. Cadence considers investee financial performance and other information received from the investee companies, as well as any other available estimates of the fair value of the investee companies in its review. If Cadence determines the carrying value of an investment exceeds its fair value, and that difference is other than temporary, Cadence writes down the value of the investment to its fair value. Cadence records investment write-downs in other income, net, in the consolidated income statements.

Derivative Financial Instruments

Cadence enters into foreign currency forward exchange contracts with financial institutions to protect against currency exchange risks associated with existing assets and liabilities. A foreign currency forward exchange contract acts as a hedge by increasing in value when underlying assets decrease in value or underlying liabilities increase in value due to changes in foreign exchange rates. Conversely, a foreign currency forward exchange contract decreases in value when underlying assets increase in value or underlying liabilities decrease in value due to changes in foreign exchange rates. The forward contracts are not designated as accounting hedges and, therefore, the unrealized gains and losses are recognized in other income, net, in advance of the actual foreign currency cash flows. The fair value of these forward contracts is recorded in accrued liabilities or in other current assets. These forward contracts generally have maturities of 90 days or less.

Nonqualified Deferred Compensation Trust

Executive officers, senior management and members of Cadence's Board of Directors may elect to defer compensation payable to them under Cadence's Nonqualified Deferred Compensation Plan ("NQDC"). Deferred compensation payments are held in investment accounts and the values of the accounts are adjusted each quarter based on the fair value of the investments held in the NQDC.

The selected investments held in the NQDC accounts are carried at fair value, with the unrealized gains and losses recognized in the consolidated income statements as other income, net. These securities are classified in other assets in the consolidated balance sheets because they are not available for Cadence's use in its operations.

Cadence's obligation with respect to the NQDC trust is recorded in other long-term liabilities on the consolidated balance sheets. Increases and decreases in the NQDC trust liability are recorded as compensation expense in the consolidated income statements.

Treasury Stock

Cadence generally issues shares related to its stock-based compensation plans from shares held in treasury. When treasury stock is reissued at an amount higher than its cost, the difference is recorded as a component of capital in excess of par in the consolidated statements of stockholders' equity. When treasury stock is reissued at an amount lower than its cost, the difference is recorded as a component of capital in excess of par to the extent that gains exist to offset the losses. If there are no accumulated treasury stock gains in capital in excess of par, the losses upon reissuance of treasury stock are recorded as a component of retained earnings in the consolidated statements of stockholders' equity. There were no losses recorded by Cadence on the reissuance of treasury stock during fiscal 2018, 2017 or 2016.

Revenue Recognition

Revenue is recognized upon transfer of control of promised products or services to customers in an amount that reflects the consideration to which Cadence expects to be entitled in exchange for promised goods or services. Cadence's performance obligations are satisfied either over time or at a point in time. Revenue from performance obligations that transferred to customers over time accounted for approximately 90% of Cadence's total revenue for the fiscal year ended December 29, 2018.

Product and maintenance revenue includes Cadence's licenses of time-based and perpetual software, sales of emulation hardware, licenses of per-use IP, and the related maintenance on these licenses and sales.

Service revenue includes revenue received for performing engineering services (which are generally not related to the functionality of other licensed products), customized IP on a fixed fee basis, and sales from cloud-based solutions that provide customers with software and services over a period of time.

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Cadence enters into contracts that can include various combinations of licenses, products and services, some of which are distinct and are accounted for as separate performance obligations. For contracts with multiple performance obligations, Cadence allocates the transaction price of the contract to each performance obligation, generally on a relative basis using its standalone selling price. The stated contract value is generally the transaction price to be allocated to the separate performance obligations. Revenue is recognized net of any taxes collected from customers that are subsequently remitted to governmental authorities.

Software Revenue Recognition

Cadence's time-based license arrangements grant customers the right to access and use all of the licensed products at the outset of an arrangement and updates are generally made available throughout the entire term of the arrangement, which is generally two to three years. Cadence's updates provide continued access to evolving technology as customers' designs migrate to more advanced nodes and as our customers' technological requirements evolve. In addition, certain time-based license arrangements include remix rights and unspecified additional products that become commercially available during the term of the agreement. Payments are generally received in equal or near equal installments over the term of the agreement.

Multiple software licenses, related updates, and technical support in these time-based arrangements constitute a single, combined performance obligation and revenue is recognized over the term of the license, commencing upon the later of the effective date of the arrangement or transfer of the software license. Remix rights are not an additional promised good or service in the contract, and where unspecified additional software product rights are part of the contract with the customer, such rights are accounted for as part of the single performance obligation that includes the licenses, updates, and technical support because such rights are provided for the same period of time and have the same time-based pattern of transfer to the customer.

Hardware Revenue Recognition

Cadence generally has two performance obligations in arrangements involving the sale or lease of hardware products. The first performance obligation is to transfer the hardware product (which includes software integral to the functionality of the hardware product). The second performance obligation is to provide maintenance on hardware and its embedded software, which includes rights to technical support, hardware repairs and software updates that are all provided over the same term and have the same time-based pattern of transfer to the customer. The transaction price allocated to the hardware product is generally recognized as revenue at the time of delivery because the customer obtains control of the product at that point in time. Cadence has concluded that control generally transfers at that point in time because the customer has title to the hardware, physical possession, and a present obligation to pay for the hardware. The transaction price allocated to maintenance is recognized as revenue ratably over the maintenance term. Payments for hardware contracts are generally received upon delivery of the hardware product. Shipping and handling costs are considered fulfillment costs and are included in cost of product and maintenance in Cadence's consolidated income statements.

IP Revenue Recognition

Cadence generally licenses IP under nonexclusive license agreements that provide usage rights for specific designs. In addition, for certain of Cadence's IP license agreements, royalties are collected as customers ship their own products that incorporate Cadence IP. These arrangements generally have two performance obligations — transferring the licensed IP and associated maintenance, which includes rights to technical support and software updates that are all provided over the maintenance term and have a time-based pattern of transfer to the customer. Revenue allocated to the IP license is recognized at a point in time upon the later of the delivery of the IP or the beginning of the license period and revenue allocated to the maintenance is recognized over the maintenance term. Royalties are recognized as revenue in the quarter in which the applicable Cadence customer ships its products that incorporate Cadence IP. Payments for IP contracts are generally received upon delivery of the IP. Cadence customizes certain IP and revenue related to this customization is recognized as services revenue as described below.

Services Revenue Recognition

Revenue from service contracts is recognized over time, generally using costs incurred or hours expended to measure progress. Cadence has a history of accurately estimating project status and the costs necessary to complete projects. A number of internal and external factors can affect these estimates, including labor rates, utilization and efficiency

variances and specification and testing requirement changes. Payments for services are generally due upon milestones in the contract or upon consumption of the hourly resources.

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Stock-Based Compensation

Cadence recognizes the cost of awards of equity instruments granted to employees in exchange for their services as stock-based compensation expense. Stock-based compensation expense is measured at the grant date based on the value of the award and is recognized as expense over the requisite service period, which is typically the vesting period. Cadence recognizes stock-based compensation expense on the straight-line method for awards that only contain a service condition and on the graded-vesting method for awards that contain both a service and performance condition. Cadence recognizes the impact of forfeitures on stock-based compensation expense as they occur. The fair value of stock options and purchase rights issued under Cadence's Employee Stock Purchase Plan ("ESPP") are calculated using the Black-Scholes option pricing model. The computation of the expected volatility assumption used for new awards is based on implied volatility when the remaining maturities of the underlying traded options are at least one year. When the remaining maturities of the underlying traded options are less than one year, expected volatility is based on a weighting of historical and implied volatilities. When determining the expected term, Cadence reviews historical employee exercise behavior from options having similar vesting periods. The risk-free interest rate for the period within the expected term of the option is based on the yield of United States Treasury notes for the comparable term in effect at the time of grant. The expected dividend yield used in the calculation is zero because Cadence has not historically paid and currently does not expect to pay dividends in the foreseeable future.

Advertising

Cadence expenses the costs of advertising as incurred. Total advertising expense, including marketing programs and events, was \$7.6 million, \$7.4 million and \$8.4 million during fiscal 2018, 2017 and 2016, respectively, and is included in marketing and sales in the consolidated income statements.

Restructuring Charges

Cadence records personnel-related restructuring charges with termination benefits when the costs are both probable and estimable. Cadence records personnel-related restructuring charges with non-customary termination benefits when the plan has been communicated to the affected employees. Cadence records facilities-related restructuring charges in the period in which the affected facilities are vacated. In connection with facilities-related restructuring plans, Cadence has made a number of estimates and assumptions related to losses on excess facilities that have been vacated or consolidated, particularly the timing of subleases and sublease terms. Closure and space reduction costs included in the restructuring charges include payments required under leases less any applicable estimated sublease income after the facilities are abandoned, lease buyout costs and certain contractual costs to maintain facilities during the period after abandonment.

Cadence records estimated provisions for termination benefits and outplacement costs along with other personnel-related restructuring costs, long-term asset impairments related to abandoned assets and other costs associated with the restructuring plan. Cadence regularly evaluates the adequacy of its lease loss accruals and severance and related benefits accruals, and adjusts the balances based on actual costs incurred or changes in estimates and assumptions. Subsequent adjustments to restructuring accruals are classified in restructuring and other charges in the consolidated income statements.

Accounting for Income Taxes

Cadence accounts for the effect of income taxes in its consolidated financial statements using the asset and liability method. This process involves estimating actual current tax liabilities together with assessing carryforwards and temporary differences resulting from differing treatment of items, such as depreciation, for tax and accounting purposes. These differences result in deferred tax assets and liabilities, measured using enacted tax rates expected to apply to taxable income in the years when those temporary differences are expected to be recovered or settled. Cadence then records a valuation allowance to reduce the deferred tax assets to the amount that Cadence believes is more likely than not to be realized based on its judgment of all available positive and negative evidence. The weight given to the potential effect of negative and positive evidence is commensurate with the extent to which the strength of the evidence can be objectively verified. This assessment, which is completed on a taxing jurisdiction basis, takes into account a number of types of evidence, including the following:

- The nature and history of current or cumulative financial reporting income or losses;
- Sources of future taxable income;

- The anticipated reversal or expiration dates of the deferred tax assets; and
- Tax planning strategies.

Cadence takes a two-step approach to recognizing and measuring the financial statement benefit of uncertain tax positions. The first step is to evaluate the tax position for recognition by determining whether the weight of available evidence indicates that it is more likely than not that the tax position will be sustained on audit, including resolution of any related appeals or litigation processes. The second step is to measure the tax benefit as the largest amount that is more than 50% likely of being realized upon settlement of the audit. Cadence classifies interest and penalties on unrecognized tax benefits as income tax expense or benefit.

For additional discussion of income taxes, see Note 6 in the notes to the consolidated financial statements.

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NOTE 3. DEBT

Cadence's outstanding debt as of December 29, 2018 and December 30, 2017 was as follows:

	December 29, 2018			December 30, 2017		
	Principal	Unamortized Discount	Carrying Value	Principal	Unamortized Discount	Carrying Value
Revolving Credit Facility	\$ 100,000	\$ —	\$ 100,000	\$ 85,000	\$ —	\$ 85,000
2019 Term Loan	—	—	—	300,000	(226)	299,774
2024 Notes	350,000	(4,709)	345,291	350,000	(5,405)	344,595
Total outstanding debt	\$ 450,000	\$ (4,709)	\$ 445,291	\$ 735,000	\$ (5,631)	\$ 729,369

Revolving Credit Facility

On January 30, 2017, Cadence entered into a five-year senior unsecured revolving credit facility with a group of lenders led by JPMorgan Chase Bank, N.A., as administrative agent. The credit facility provides for borrowings up to \$350.0 million, with the right to request increased capacity up to an additional \$250.0 million upon the receipt of lender commitments, for total maximum borrowings of \$600.0 million. The credit facility expires on January 28, 2022 and has no subsidiary guarantors. Any outstanding loans drawn under the credit facility are due at maturity on January 28, 2022. Outstanding borrowings may be paid at any time prior to maturity.

Interest accrues on borrowings under the credit facility at either LIBOR plus a margin between 1.250% and 1.875% per annum or at the base rate plus a margin between 0.25% and 0.875% per annum. As of December 29, 2018, the interest rate on Cadence's credit facility was 4.07%. Interest is payable quarterly. A commitment fee ranging from 0.15% to 0.30% is assessed on the daily average undrawn portion of revolving commitments.

The credit facility contains customary negative covenants that, among other things, restrict Cadence's ability to incur additional indebtedness, grant liens, make certain investments (including acquisitions), dispose of certain assets and make certain payments, including share repurchases and dividends. In addition, the credit facility contains financial covenants that require Cadence to maintain a funded debt to EBITDA ratio not greater than 3.00 to 1, with a step up to 3.50 to 1 for one year following an acquisition by Cadence of at least \$250.0 million that results in a pro forma leverage ratio between 2.75 to 1 and 3.25 to 1. As of December 29, 2018 and December 30, 2017, Cadence was in compliance with all financial covenants associated with the revolving credit facility.

2019 Term Loan

In January 2016, Cadence entered into a \$300.0 million three-year senior unsecured non-amortizing term loan facility due on January 28, 2019 (the "2019 Term Loan") with a group of lenders led by JPMorgan Chase Bank, N.A., as administrative agent. In July 2018, Cadence prepaid the outstanding principal amount of \$300.0 million and all accrued interest.

2024 Notes

In October 2014, Cadence issued \$350.0 million aggregate principal amount of 4.375% Senior Notes due October 15, 2024 (the "2024 Notes"). Cadence received net proceeds of \$342.4 million from the issuance of the 2024 Notes, net of a discount of \$1.4 million and issuance costs of \$6.2 million. Both the discount and issuance costs are being amortized to interest expense over the term of the 2024 Notes using the effective interest method. Interest is payable in cash semi-annually in April and October. The 2024 Notes are unsecured and rank equal in right of payment to all of Cadence's existing and future senior indebtedness. The carrying value of the 2024 Notes approximates the estimated fair value as of December 29, 2018.

Cadence may redeem the 2024 Notes, in whole or in part, at a redemption price equal to the greater of (a) 100% of the principal amount of the notes to be redeemed and (b) the sum of the present values of the remaining scheduled payments of principal and interest, plus any accrued and unpaid interest, as more particularly described in the indenture governing the 2024 Notes.

The indenture governing the 2024 Notes includes customary representations, warranties and restrictive covenants, including, but not limited to, restrictions on Cadence's ability to grant liens on assets, enter into sale and lease-back transactions, or merge, consolidate or sell assets, and also includes customary events of default.

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NOTE 4. RECEIVABLES, NET

Cadence's current and long-term receivables balances as of December 29, 2018 and December 30, 2017 were as follows:

	As of	
	December 29, 2018	December 30, 2017
	(In thousands)	
Accounts receivable	\$ 164,223	\$ 119,325
Unbilled accounts receivable	136,795	71,101
Long-term receivables	5,972	12,239
Total receivables	306,990	202,665
Less allowance for doubtful accounts (3,936)	—	—
Total receivables, net	\$ 303,054	\$ 202,665

Cadence's customers are primarily concentrated within the semiconductor and electronics systems industries. As of December 29, 2018, one customer accounted for 11% of Cadence's total receivables. As of December 30, 2017, one customer accounted for 17% of Cadence's total receivables.

Allowance for doubtful accounts

Cadence's provisions for losses on its accounts receivable during fiscal 2018, 2017 and 2016 were as follows:

	Balance at Beginning of Period	Charged to Costs and Expenses	Uncollectible Accounts Written Off, Net	Balance at End of Period
Year ended December 29, 2018	\$ —	\$ 5,102	\$ (1,166)	\$ 3,936
Year ended December 30, 2017	—	2,623	(2,623)	—
Year ended December 31, 2016	\$ —	\$ 308	\$ (308)	\$ —

NOTE 5. REVENUE

Cadence combines its products and technologies into five product groups related to major design activities. The following table shows the percentage of product and related maintenance revenue contributed by each of Cadence's five product groups and services for fiscal 2018, 2017 and 2016:

	2018	2017	2016
Functional Verification, including Emulation and Prototyping Hardware	24 %	22 %	25 %
Digital IC Design and Signoff	29 %	29 %	29 %
Custom IC Design and Simulation	26 %	27 %	25 %
System Interconnect and Analysis	9 %	10 %	10 %
IP	12 %	12 %	11 %
Total	100 %	100 %	100 %

Revenue by product group fluctuates from period to period based on demand for products and services, and Cadence's available resources to deliver them. Certain of Cadence's licensing arrangements allow customers the ability to remix among software products. Cadence also has arrangements with customers that include a combination of products, with the actual product selection and number of licensed users to be determined at a later date. For these arrangements, Cadence estimates the allocation of the revenue to product groups based upon the expected usage of products.

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Significant Judgments

Cadence's contracts with customers often include promises to transfer to a customer multiple software and/or IP licenses and services, including professional services, technical support services, and rights to unspecified updates. Determining whether licenses and services are distinct performance obligations that should be accounted for separately, or not distinct and thus accounted for together, requires significant judgment. In some arrangements, such as most of Cadence's IP license arrangements, Cadence has concluded that the licenses and associated services are distinct from each other. In others, like Cadence's time-based software arrangements, the licenses and certain services are not distinct from each other. Cadence's time-based software arrangements include multiple software licenses and updates to the licensed software products, as well as technical support, and Cadence has concluded that these promised goods and services are a single, combined performance obligation.

Judgment is required to determine the SSP for each distinct performance obligation. Cadence rarely licenses or sells products on a standalone basis, so Cadence is required to estimate the SSP for each performance obligation. In instances where the SSP is not directly observable because Cadence does not sell the license, product or service separately, Cadence determines the SSP using information that maximizes the use of observable inputs and may include market conditions. Cadence typically has more than one SSP for individual performance obligations due to the stratification of those items by classes of customers and circumstances. In these instances, Cadence may use information such as the size of the customer and geographic region of the customer in determining the SSP.

Revenue is recognized over time for Cadence's combined performance obligations that include software licenses, updates, technical support and maintenance that are separate performance obligations. For Cadence's professional services, revenue is recognized over time, generally using costs incurred or hours expended to measure progress.

Judgment is required in estimating project status and the costs necessary to complete projects. A number of internal and external factors can affect these estimates, including labor rates, utilization and efficiency variances and specification and testing requirement changes. For Cadence's other performance obligations recognized over time, revenue is generally recognized using a time-based measure of progress reflecting generally consistent efforts to satisfy those performance obligations throughout the arrangement term.

If a group of agreements are so closely related that they are, in effect, part of a single arrangement, such agreements are deemed to be one arrangement for revenue recognition purposes. Cadence exercises significant judgment to evaluate the relevant facts and circumstances in determining whether the separate agreements should be accounted for separately or as, in substance, a single arrangement. Cadence's judgments about whether a group of contracts comprise a single arrangement can affect the allocation of consideration to the distinct performance obligations, which could have an effect on results of operations for the periods involved.

Cadence is required to estimate the total consideration expected to be received from contracts with customers. In limited circumstances, the consideration expected to be received is variable based on the specific terms of the contract or based on Cadence's expectations of the term of the contract. Generally, Cadence has not experienced significant returns or refunds to customers. These estimates require significant judgment and the change in these estimates could have an effect on its results of operations during the periods involved.

Contract Balances

The timing of revenue recognition may differ from the timing of invoicing to customers, and these timing differences result in receivables, contract assets, or contract liabilities (deferred revenue) on Cadence's consolidated balance sheets. For certain software, hardware and IP agreements with payment plans, Cadence records an unbilled receivable related to revenue recognized upon transfer of control because it has an unconditional right to invoice and receive payment in the future related to those transferred products or services. Cadence records a contract asset when revenue is recognized prior to invoicing and Cadence does not have the unconditional right to invoice or retains performance risk with respect to that performance obligation. Cadence records deferred revenue when revenue is recognized subsequent to invoicing. For Cadence's time-based software agreements, customers are generally invoiced in equal, quarterly amounts, although some customers prefer to be invoiced in single or annual amounts.

The contract assets indicated below are presented as prepaid expenses and other in the consolidated balance sheet and primarily relate to Cadence's rights to consideration for work completed but not billed as of December 29, 2018 on services and customized IP contracts. The contract assets are transferred to receivables when the rights become

unconditional, usually upon completion of a milestone.

Cadence's contract balances as of December 29, 2018 and December 30, 2017 were as follows:

	As of	
	December 29, 2018	December 30, 2017
	As Adjusted	
	(In thousands)	
Contract assets	\$10,055	\$ 3,964
Deferred revenue	401,174	336,060

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During fiscal 2018, Cadence recognized revenue of \$284.3 million that was included in the deferred revenue balance, as adjusted for Topic 606, as of December 30, 2017. All other activity in deferred revenue is due to the timing of invoices in relation to the timing of revenue as described above.

Revenue allocated to remaining performance obligations represents the transaction price allocated to the performance obligations that are unsatisfied, or partially unsatisfied, which includes unearned revenue and amounts that will be invoiced and recognized as revenue in future periods. The Company has elected to exclude the future royalty payments from the remaining performance obligations. Contracted but unsatisfied performance obligations were approximately \$2.9 billion as of December 29, 2018, of which Cadence expects to recognize approximately 60% of the revenue over the next 12 months and the remainder thereafter.

Payment terms and conditions vary by contract type, although terms generally include a requirement of payment within 30 to 60 days. In instances where the timing of revenue recognition differs from the timing of invoicing, Cadence has determined that its contracts generally do not include a significant financing component. The primary purpose of invoicing terms is to provide customers with simplified and predictable ways of purchasing Cadence's products and services, and not to facilitate financing arrangements.

During fiscal 2018, Cadence recognized revenue of \$34.3 million from performance obligations satisfied in previous periods. These amounts represent royalties earned during the period and exclude contracts with nonrefundable prepaid royalties. Nonrefundable prepaid royalties are recognized upon delivery of the IP because Cadence's right to the consideration is not contingent upon customers' future shipments.

NOTE 6. INCOME TAXES

Cadence's income before provision for income taxes included income from the United States and from foreign subsidiaries for fiscal 2018, 2017 and 2016, was as follows:

	2018	2017	2016
	(In thousands)		
United States	\$58,963	\$81,619	\$84,694
Foreign subsidiaries	317,427	233,427	152,459
Total income before provision for income taxes	\$376,390	\$315,046	\$237,153

Cadence's provision for income taxes was comprised of the following items for fiscal 2018, 2017 and 2016:

	2018	2017	2016
	(In thousands)		
Current:			
Federal	\$902	\$(2,193)	\$4,839
State and local	(1,270)	(2,097)	50
Foreign	42,657	35,301	34,047
Total current	42,289	31,011	38,936
Deferred:			
Federal	(10,324)	76,494	(5,291)
State and local	886	5,571	6,006
Foreign	(2,238)	(2,131)	(5,584)
Total deferred	(11,676)	79,934	(4,869)

Total provision for income taxes \$30,613 \$110,945 \$34,067

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The provision for income taxes differs from the amount estimated by applying the United States statutory federal income tax rates of 21% to income before provision for income taxes for fiscal 2018 and of 35% to income before provision for income taxes for fiscal 2017 and 2016 as follows:

	2018	2017	2016
	(In thousands)		
Provision computed at federal statutory income tax rate	\$79,042	\$110,266	\$83,003
State and local income tax, net of federal tax effect	15,540	5,867	5,534
Foreign income tax rate differential	(37,031)	(65,296)	(36,098)
Deemed repatriation transition tax	(1,409)	67,188	—
Remeasurement of U.S. deferred tax assets and liabilities	—	25,200	—
U.S. tax on foreign entities	28,846	—	—
Stock-based compensation	(13,539)	(24,455)	(13,132)
Change in deferred tax asset valuation allowance	13,234	4,689	1,243
Tax credits	(72,815)	(26,789)	(39,765)
Repatriation of foreign earnings	—	—	25,145
Non-deductible research and development expense	4,700	—	—
Tax effects of intra-entity transfer of assets	79	(8,450)	(7,661)
Domestic production activity deduction	—	(2,474)	(2,826)
Withholding taxes	11,535	11,225	9,870
Tax settlements, foreign	—	3,086	5,620
Increase in unrecognized tax benefits not included in tax settlements	(1,545)	4,054	614
Other	3,976	6,834	2,520
Provision for income taxes	\$30,613	\$110,945	\$34,067
Effective tax rate	8	% 35	% 14 %

The Tax Act was enacted in December 2017 and included several provisions that affected Cadence significantly, such as a one-time, mandatory transition tax on its previously untaxed foreign earnings and a reduction in the federal corporation income tax rate from 35% to 21% as of January 1, 2018, among others.

Cadence is required to recognize the effect of tax law changes in the period of enactment, which in the case of the Tax Act was December 2017, even though the effective date for most provisions of the Tax Act was January 1, 2018. The Securities and Exchange Commission issued Staff Accounting Bulletin No. 118 (“SAB 118”), which allowed registrants to record reasonable estimates or to apply tax laws in effect prior to the enactment of the Tax Act for a period of up to one year from the date of enactment when it did not have the necessary information available, prepared or analyzed in reasonable detail to complete its accounting for the changes in taxation.

Due to the timing of the enactment and the complexity involved in applying the provisions of the Tax Act, Cadence recorded a provisional \$67.2 million expense related to the one-time transition tax during fiscal 2017. In accordance with SAB 118, this amount was updated to \$65.8 million of expense during fiscal 2018. For purposes of SAB 118, the accounting for the tax effects of the Tax Act is complete.

Cadence adopted the new accounting standard related to stock-based compensation in fiscal 2016, which required the excess tax benefits or deficiencies to be reflected in the consolidated income statements as a component of the provision for income taxes, whereas these income tax effects were previously recognized in stockholders’ equity in the consolidated balance sheets. Total excess tax benefits recognized in the provision for income taxes in fiscal 2018, fiscal 2017 and fiscal 2016, were \$21.3 million, \$32.0 million and \$17.2 million, respectively.

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The components of deferred tax assets and liabilities consisted of the following as of December 29, 2018 and December 30, 2017:

	As of	
	December 29, 2018	December 30, 2017
	(In thousands)	
Deferred tax assets:		
Tax credit carryforwards	\$ 197,524	\$ 164,687
Reserves and accruals	43,522	42,357
Intangible assets	12,096	13,112
Capitalized research and development expense for income tax purposes	6,975	10,621
Operating loss carryforwards	15,347	20,650
Deferred income	6,580	12,178
Capital loss carryforwards	20,342	20,266
Stock-based compensation costs	15,329	15,782
Depreciation and amortization	8,759	7,665
Investments	2,900	3,201
Total deferred tax assets	329,374	310,519
Valuation allowance	(108,724)	(95,491)
Net deferred tax assets	220,650	215,028
Deferred tax liabilities:		
Intangible assets	(36,194)	(36,683)
Undistributed foreign earnings	(27,627)	(23,563)
Other	(2,497)	(2,730)
Total deferred tax liabilities	(66,318)	(62,976)
Total net deferred tax assets	\$ 154,332	\$ 152,052

During fiscal 2018 and 2017, Cadence maintained valuation allowances of \$108.7 million and \$95.5 million, respectively, on certain federal, state and foreign deferred tax assets because the realization of these deferred tax assets require future income of a specific character or amount that Cadence considered uncertain. The valuation allowance primarily relates to the following:

- Tax credits in certain states that are accumulating at a rate greater than Cadence's capacity to utilize the credits and tax credits in certain states where it is likely the credits will expire unused;
- Federal, state and foreign deferred tax assets related to investments and capital losses that can only be utilized against gains that are capital in nature; and
- Foreign tax credits that can only be fully utilized if Cadence has sufficient income of a specific character in the future.

As of December 29, 2018, Cadence's operating loss carryforwards were as follows:

	Amount	Expiration Periods
	(In thousands)	
Federal	\$ 1,374	from 2021 through 2029
California	175,541	from 2019 through 2037
Other states (tax effected, net of federal benefit)	2,333	from 2019 through 2037
Foreign (tax effected)	293	from 2025 through indefinite

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As of December 29, 2018, Cadence had tax credit carryforwards of:

	Amount (In thousands)	Expiration Periods
Federal*	\$ 108,934	from 2023 through 2038
California	61,473	indefinite
Other states	10,445	from 2019 through 2038
Foreign	16,672	from 2019 through 2038

*Certain of Cadence's foreign tax credits have yet to be realized and as a result do not yet have an expiration period.

Examinations by Tax Authorities

Taxing authorities regularly examine Cadence's income tax returns. As of December 29, 2018 Cadence's earliest tax years that remain open to examination and the assessment of additional tax include:

Jurisdiction	Earliest Tax Year Open to Examination
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United States - Federal	2015
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United States - California	2014
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Unrecognized Tax Benefits

The changes in Cadence's gross amount of unrecognized tax benefits during fiscal 2018, 2017 and 2016 are as follows:

	2018	2017	2016
	(In thousands)		
Unrecognized tax benefits at the beginning of the fiscal year	\$ 110,179	\$ 98,540	\$ 87,820
Gross amount of the increases (decreases) in unrecognized tax benefits of tax positions taken during a prior year*	(4,183)	688	(155)
Gross amount of the increases in unrecognized tax benefits as a result of tax positions taken during the current year	2,370	13,141	11,342
Reductions to unrecognized tax benefits resulting from the lapse of the applicable statute of limitations	(5,179)	(3,028)	(149)
Effect of foreign currency translation	(1,330)	838	(318)
Unrecognized tax benefits at the end of the fiscal year	\$ 101,857	\$ 110,179	\$ 98,540
Total amounts of unrecognized tax benefits that, if upon resolution of the uncertain tax positions would reduce Cadence's effective tax rate	\$ 58,022	\$ 63,108	\$ 56,248

* Includes unrecognized tax benefits of tax positions recorded in connection with acquisitions

The total amounts of interest, net of tax, and penalties recognized in the consolidated income statements as provision for income taxes for fiscal 2018, 2017 and 2016 were as follows:

	2018	2017	2016
	(In thousands)		
Interest	\$ 585	\$ 1,865	\$ 1,166
Penalties	342	218	3

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The total amounts of gross accrued interest and penalties recognized in the consolidated balance sheets as of December 29, 2018 and December 30, 2017 were as follows:

	As of	
	December 29, 2018	December 30, 2017
Interest	\$2,699	\$ 2,511
Penalties	10	151

(In thousands)

NOTE 7. INVESTMENTS

Cadence has a portfolio of equity investments that includes investments in both marketable and non-marketable securities. These investments primarily consist of cash investments in companies with technologies or services that are potentially strategically important to Cadence.

Marketable Investments

Cadence's investment in marketable equity securities consists of purchased shares of a publicly-held company and is included in prepaid expense and other in Cadence's consolidated balance sheets. During fiscal 2018, with the adoption of ASU 2016-01, changes in the fair value of these investments were recorded to other income, net in Cadence's consolidated income statements. During fiscal 2017 and fiscal 2016, changes in fair value of these investments were recorded to accumulated other comprehensive loss in Cadence's consolidated balance sheets. For additional information regarding the adoption of ASU 2016-01, see Note 2 to the consolidated financial statements under the heading "Recently Adopted Accounting Standards."

Non-Marketable investments

Cadence's investments in non-marketable equity securities generally consist of stock, convertible debt or other instruments of privately-held entities and are included in other assets on Cadence's consolidated balance sheets. For investments accounted for using the equity method of accounting, Cadence records its proportionate share of income or loss, net of the effects of any basis differences, to other income, net on a one-quarter lag in Cadence's consolidated income statements.

In December 2018, Cadence made a minority investment in a privately held company for approximately \$116 million. The investment is being accounted for using the equity method of accounting. Cadence's investments in non-marketable equity securities that are accounted for using the equity method of accounting ranged from approximately 12% to 35% equity ownership and had an aggregate carrying value of \$118.2 million and \$2.5 million as of December 29, 2018 and December 30, 2017, respectively.

Cadence also holds other non-marketable investments in privately held companies where Cadence does not have the ability to exercise significant influence and the fair value of the investments is not readily determinable. These investments are recorded at cost, less impairment, if any, plus or minus changes resulting from observable price changes in market-based transactions for identical or similar investments of the same issuer. During the fiscal year ended December 29, 2018, there were no observable price changes or impairments related to Cadence's non-marketable investments in equity securities without a readily determinable fair value. The carrying value of these investments was \$0.5 million as of December 29, 2018 and December 30, 2017.

NOTE 8. ACQUISITIONS

During fiscal 2017, Cadence completed two business combinations for total cash consideration of \$142.8 million, after taking into account cash acquired of \$4.2 million. The total purchase consideration was allocated to the assets acquired and liabilities assumed based on their respective estimated fair values on the acquisition dates. Cadence recorded a total of \$76.4 million of acquired intangible assets (of which \$71.5 million represents in-process technology), \$90.2 million of goodwill and \$19.6 million of net liabilities consisting primarily of deferred tax liabilities. Cadence will also make payments to certain employees, subject to continued employment and other performance-based conditions, through the fourth quarter of fiscal 2020.

During fiscal 2016, Cadence completed two business combinations for total cash consideration of \$42.4 million, after taking into account cash acquired of \$1.8 million. The total purchase consideration was allocated to the assets acquired and liabilities assumed based on their respective estimated fair values on the acquisition dates. Cadence

recorded a total of \$23.6 million of goodwill, \$23.2 million of acquired intangible assets and \$2.6 million of net liabilities consisting primarily of deferred revenue. Cadence will also make payments to certain employees, subject to continued employment and other conditions, through the second quarter of fiscal 2019.

A trust for the benefit of the children of Lip-Bu Tan, Cadence's Chief Executive Officer ("CEO") and director, owned less than 3% of nusemi inc, one of the companies acquired in 2017, and less than 2% of Rocketick Technologies Ltd., one of the companies acquired in 2016. Mr. Tan and his wife serve as co-trustees of the trust and disclaim pecuniary and economic interest in the trust. The Board of Directors of Cadence reviewed the transactions and concluded that it was in the best interests of Cadence to proceed with the transactions. Mr. Tan recused himself from the Board of Directors' discussion of the valuation of nusemi inc and Rocketick Technologies Ltd. and on whether to proceed with the transactions.

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Acquisition-related Transaction Costs

There were no direct transaction costs associated with acquisitions during fiscal 2018. Transaction costs associated with acquisitions were \$0.6 million and \$1.1 million during fiscal 2017 and 2016, respectively. These costs consist of professional fees and administrative costs and were expensed as incurred in Cadence's consolidated income statements.

NOTE 9. GOODWILL AND ACQUIRED INTANGIBLES

Goodwill

The changes in the carrying amount of goodwill during fiscal 2018 and 2017 were as follows:

	Gross Carrying Amount (In thousands)
Balance as of December 31, 2016	\$ 572,764
Goodwill resulting from acquisitions	90,218
Effect of foreign currency translation	3,027
Balance as of December 30, 2017	666,009
Effect of foreign currency translation	(3,737)
Balance as of December 29, 2018	\$ 662,272

Cadence completed its annual goodwill impairment test during the third quarter of fiscal 2018 and determined that the fair value of Cadence's single reporting unit substantially exceeded the carrying amount of its net assets and that no impairment existed.

Acquired Intangibles, Net

Acquired intangibles as of December 29, 2018 were as follows, excluding intangibles that were fully amortized as of December 30, 2017:

	Gross Carrying Amount (In thousands)	Accumulated Amortization	Acquired Intangibles, Net
Existing technology	\$330,500	\$(225,383)	\$ 105,117
Agreements and relationships	146,426	(100,211)	46,215
Tradenames, trademarks and patents	10,718	(8,093)	2,625
Total acquired intangibles with definite lives	487,644	(333,687)	153,957
In-process technology	71,500	—	71,500
Total acquired intangibles	\$559,144	\$(333,687)	\$ 225,457

In-process technology as of December 29, 2018 consisted of acquired projects that, if completed, will contribute to Cadence's design IP offerings. As of December 29, 2018, these projects were expected to be completed in approximately three to twelve months. During fiscal 2018, there were no transfers from in-process technology to existing technology.

Acquired intangibles as of December 30, 2017 were as follows, excluding intangibles that were fully amortized as of December 31, 2016:

	Gross Carrying Amount (In thousands)	Accumulated Amortization	Acquired Intangibles, Net
Existing technology	\$342,810	\$(199,529)	\$ 143,281
Agreements and relationships	151,063	(90,675)	60,388
Tradenames, trademarks and patents	10,918	(7,252)	3,666
Total acquired intangibles with definite lives	504,791	(297,456)	207,335
In-process technology	71,500	—	71,500
Total acquired intangibles	\$576,291	\$(297,456)	\$ 278,835

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Amortization expense from existing technology and maintenance agreements is included in cost of product and maintenance. Amortization expense for fiscal 2018, 2017 and 2016, by consolidated income statement caption, was as follows:

	2018	2017	2016
	(In thousands)		
Cost of product and maintenance	\$39,247	\$41,781	\$42,387
Amortization of acquired intangibles	14,086	14,716	18,095
Total amortization of acquired intangibles	\$53,333	\$56,497	\$60,482

Estimated amortization expense for intangible assets with definite lives for the following five fiscal years and thereafter was as follows:

	(In thousands)
2019	\$ 46,217
2020	40,612
2021	36,115
2022	17,810
2023	5,325
Thereafter	7,878
Total estimated amortization expense	\$ 153,957

NOTE 10. STOCK COMPENSATION PLANS AND STOCK-BASED COMPENSATION**Equity Incentive Plans**

Cadence's Omnibus Plan provides for the issuance of both incentive and non-qualified options, restricted stock awards, restricted stock units, stock bonuses and the rights to acquire restricted stock to both executive and non-executive employees. During fiscal 2018, Cadence's stockholders approved an amendment to the Omnibus Plan to increase the number of shares of common stock authorized for issuance by 2.0 million. As of December 29, 2018, the total number of shares available for future issuance under the Omnibus Plan was 9.4 million. Options granted under the Omnibus Plan have an exercise price not less than the fair market value of the stock on the date of grant. Options and restricted stock generally vest over a three- to four-year period. Options granted under the Omnibus Plan expire seven years from the date of grant. Vesting of restricted stock awards granted under the Omnibus Plan may require the attainment of specified performance criteria.

Cadence's 1995 Directors Stock Incentive Plan (the "Directors Plan") provides for the issuance of non-qualified options, restricted stock awards and restricted stock units to its non-employee directors. Options granted under the Directors Plan have an exercise price not less than the fair market value of the stock on the date of grant. As of December 29, 2018, the total number of shares available for future issuance under the Directors Plan was 0.5 million. Options granted under the Directors Plan expire after ten years, and options, restricted stock awards and restricted stock units vest one year from the date of grant.

Cadence has assumed certain options granted to employees of acquired companies ("Acquired Options"). The Acquired Options were assumed by Cadence outside of its stock option plans, and each option is administered under the terms of the respective original plans of the acquired companies. All of the Acquired Options have been adjusted for the price conversion under the terms of the acquisition agreement between Cadence and the relevant acquired company. If the Acquired Options are canceled, forfeited or expire, they do not become available for future grant.

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Stock-based Compensation

Stock-based compensation expense and the related income tax benefit recognized in connection with stock options, restricted stock and the ESPP during fiscal 2018, 2017 and 2016 were as follows:

	2018	2017	2016
	(In thousands)		
Stock options	\$5,581	\$5,417	\$5,649
Restricted stock	153,348	117,797	96,989
ESPP	8,786	6,809	6,579
Total stock-based compensation expense	\$167,715	\$130,023	\$109,217

Income tax benefit	\$32,830	\$36,664	\$30,980
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Stock-based compensation expense is reflected in Cadence's consolidated income statements during fiscal 2018, 2017 and 2016 as follows:

	2018	2017	2016
	(In thousands)		
Cost of product and maintenance	\$2,631	\$2,218	\$1,995
Cost of services	3,714	3,232	2,911
Marketing and sales	34,665	26,838	22,700
Research and development	104,353	77,222	64,061
General and administrative	22,352	20,513	17,550
Total stock-based compensation expense	\$167,715	\$130,023	\$109,217

Stock Options

The exercise price of each stock option granted under Cadence's employee equity incentive plans is equal to or greater than the closing price of Cadence's common stock on the date of grant. The fair value of each option grant is estimated on the date of grant using the Black-Scholes option pricing model. The weighted-average grant date fair value of options granted and the weighted-average assumptions used in the model for fiscal 2018, 2017 and 2016 were as follows:

	2018	2017	2016
Dividend yield	None	None	None
Expected volatility	24.3 %	21.2 %	31.5 %
Risk-free interest rate	2.54 %	2.01 %	1.21 %
Expected term (in years)	4.8	4.8	4.8
Weighted-average fair value of options granted	\$10.24	\$6.86	\$5.84

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A summary of the changes in stock options outstanding under Cadence's equity incentive plans during fiscal 2018 is presented below:

	Shares	Weighted-Average Exercise Price	Weighted-Average Remaining Contractual Terms (Years)	Aggregate Intrinsic Value
	(In thousands)			(In thousands)
Options outstanding as of December 30, 2017	5,783	\$ 16.56		
Granted	736	39.57		
Exercised	(993)	11.84		
Canceled and forfeited	(112)	18.83		
Options outstanding as of December 29, 2018	5,414	\$ 20.51	3.6	\$ 120,215
Options vested as of December 29, 2018	4,029	\$ 16.68	3.0	\$ 104,852

Cadence had total unrecognized compensation expense related to stock option grants of \$10.8 million as of December 29, 2018, which will be recognized over the remaining vesting period. The remaining weighted-average vesting period of unvested awards is 2.3 years.

The total intrinsic value of and cash received from options exercised during fiscal 2018, 2017 and 2016 was:

	2018	2017	2016
	(In thousands)		
Intrinsic value of options exercised	\$31,109	\$45,643	\$44,835
Cash received from options exercised	11,748	22,255	30,984

Restricted Stock

Generally, restricted stock, which includes restricted stock awards and restricted stock units, vests over three to four years and is subject to the employee's continuing service to Cadence. Stock-based compensation expense is recognized ratably over the vesting term. The vesting of certain restricted stock grants is subject to attainment of specified performance criteria. Each fiscal quarter, Cadence estimates the probability of the achievement of these performance goals and recognizes any related stock-based compensation expense using the graded-vesting method. The amount of stock-based compensation expense recognized in any one period can vary based on the attainment or expected attainment of the various performance goals. If such performance goals are not ultimately met, no compensation expense is recognized and any previously recognized compensation expense is reversed.

Certain long-term, performance-based stock awards granted to executives vest over three to five years and are subject to certain market conditions and the executive's continuing service to Cadence. Stock-based compensation expense is recognized straight-line over the vesting term. If the market conditions are not ultimately met, compensation expense previously recognized is not reversed. As of December 29, 2018, Cadence had granted a total of 1.53 million shares of long-term, performance-based stock awards to executives.

Stock-based compensation expense related to performance-based restricted stock grants for fiscal 2018, 2017 and 2016 was as follows:

	2018	2017	2016
	(In thousands)		
Stock-based compensation expense related to performance-based grants	\$12,868	\$8,224	\$9,195

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A summary of the changes in restricted stock outstanding under Cadence's equity incentive plans during fiscal 2018 is presented below:

	Shares (In thousands)	Weighted- Average Grant Date Fair Value	Weighted- Average Remaining Vesting Terms (Years)	Aggregate Intrinsic Value (In thousands)
Unvested shares as of December 30, 2017	11,968	\$ 27.11		
Granted	3,940	42.88		
Vested	(5,457)	28.49		
Forfeited	(749)	28.15		
Unvested shares as of December 29, 2018	9,702	\$ 32.67	1.1	\$ 420,464

Cadence had total unrecognized compensation expense related to restricted stock grants of \$261.6 million as of December 29, 2018, which will be recognized over the remaining vesting period. The remaining weighted-average vesting period of unvested awards is 1.9 years.

The total fair value realized by employees upon vesting of restricted stock during fiscal 2018, 2017 and 2016 was:

	2018	2017	2016
	(In thousands)		
Fair value of restricted stock realized upon vesting	\$232,099	\$174,548	\$113,114

Employee Stock Purchase Plan

Cadence provides an ESPP, as amended from time to time. A majority of Cadence employees are eligible to participate in the ESPP. Under the terms of the ESPP, for the offering period that commenced August 1, 2018, eligible employees may purchase Cadence's common stock at a price equal to 85% of the lower of the fair market value at the beginning or the end of the applicable offering period, in an amount not to exceed 10% of their annual base earnings plus bonuses and commissions, and subject to a limit in any calendar year of \$10,000. Each offering period has a six-month duration beginning on either February 1 or August 1. The purchase dates fall on the last days of the six-month offering periods. Under the ESPP and through the July 31, 2018 purchase date, participating employees could contribute up to 7% of their annual base earnings plus bonuses and commissions, subject to a limit in any calendar year of \$8,000. During fiscal 2018, Cadence's stockholders approved an amendment to Cadence's Employee Stock Purchase Plan to increase the number of shares of common stock authorized for issuance by 4.0 million. As of December 29, 2018, the total number of shares available for future issuance under the ESPP was 7.0 million.

Compensation expense is calculated using the fair value of the employees' purchase rights under the Black-Scholes option pricing model. The weighted-average grant date fair value of purchase rights granted under the ESPP and the weighted-average assumptions used in the model for fiscal 2018, 2017 and 2016 were as follows:

	2018	2017	2016
Dividend yield	None	None	None
Expected volatility	21.1 %	20.4 %	24.4 %
Risk-free interest rate	2.05 %	0.92 %	0.43 %
Expected term (in years)	0.5	0.5	0.5
Weighted-average fair value of options granted	\$9.24	\$6.64	\$4.85

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Shares of common stock issued under the ESPP for fiscal 2018, 2017 and 2016 were as follows:

	2018	2017	2016
	(In thousands, except per share amounts)		
Cadence shares purchased under the ESPP	892	1,270	1,471
Cash received for the purchase of shares under the ESPP	\$29,160	\$26,709	\$24,450
Weighted-average purchase price per share	\$32.69	\$21.04	\$16.62

Reserved for Future Issuance

As of December 29, 2018, Cadence had reserved the following shares of authorized but unissued common stock for future issuance:

	Shares (In thousands)
Employee equity incentive plans*	16,819
Employee stock purchase plans	7,027
Directors stock plans*	1,138
Total	24,984

*Includes shares reserved for: (i) issuance upon exercise of future option grants, (ii) issuance upon vesting of future restricted stock grants, (iii) outstanding but unexercised options to purchase common stock, or (iv) unvested restricted stock units.

NOTE 11. STOCK REPURCHASE PROGRAMS

In January 2017, Cadence's Board of Directors authorized the repurchase of shares of Cadence common stock with a value of up to \$525.0 million in the aggregate. The actual timing and amount of repurchases are subject to business and market conditions, corporate and regulatory requirements, stock price, acquisition opportunities and other factors. As of December 29, 2018, \$175.0 million remained available to repurchase shares of Cadence common stock under the current authorization.

The shares repurchased under Cadence's repurchase authorizations and the total cost of repurchased shares, including commissions, during fiscal 2018, 2017 and 2016 were as follows:

	2018	2017	2016
	(In thousands)		
Shares repurchased	5,934	2,495	40,493
Total cost of repurchased shares	\$250,059	\$100,025	\$960,289

NOTE 12. RESTRUCTURING AND OTHER CHARGES

Cadence has initiated restructuring plans in an effort to better align its resources with its business strategy. These restructuring plans have primarily been comprised of severance payments and termination benefits related to headcount reductions, estimated lease losses related to facilities vacated and charges related to abandoned assets. During the fourth quarter of fiscal 2018, Cadence initiated a restructuring plan (the "2018 Restructuring Plan") and recorded restructuring and other charges of \$13.8 million related to severance payments, termination benefits and estimated lease losses related to vacated facilities. As of December 29, 2018, total liabilities related to the 2018 Restructuring Plan were \$11.5 million.

Cadence also initiated restructuring plans during both fiscal 2017 and fiscal 2016 (the "prior restructuring plans"). During fiscal 2018, Cadence revised certain estimates made in connection with the prior restructuring plans and recorded credits of \$2.7 million. As of December 29, 2018, total liabilities related to the prior restructuring plans were \$0.5 million.

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The following table presents activity for Cadence's restructuring plans during fiscal 2018, 2017 and 2016:

	Severance and Benefits	Excess Facilities	Total
	(In thousands)		
Balance, January 2, 2016	\$751	\$ 386	\$1,137
Restructuring and other charges, net	40,411	544	40,955
Non-cash charges	—	(159)	(159)
Cash payments	(16,890)	(679)	(17,569)
Effect of foreign currency translation	130	(34)	96
Balance, December 31, 2016	\$24,402	\$ 58	\$24,460
Restructuring and other charges, net	9,027	379	9,406
Cash payments	(20,170)	(186)	(20,356)
Effect of foreign currency translation	276	(2)	274
Balance, December 30, 2017	\$13,535	\$ 249	\$13,784
Restructuring and other charges, net	10,268	821	11,089
Cash payments	(12,688)	(192)	(12,880)
Effect of foreign currency translation	61	(30)	31
Balance, December 29, 2018	\$11,176	\$ 848	\$12,024

The remaining liability for Cadence's restructuring plans is recorded in the consolidated balance sheet as follows:

	As of December 29, 2018 (In thousands)
Accounts payable and accrued liabilities	\$ 11,597
Other long-term liabilities	427
Total liabilities	\$ 12,024

All liabilities for severance and related benefits under Cadence's restructuring plans are included in accounts payable and accrued liabilities on Cadence's consolidated balance sheet as of December 29, 2018. Restructuring liabilities included in other long-term liabilities represent liabilities from vacated facilities, and Cadence expects to make cash payments to settle these liabilities through fiscal 2022.

NOTE 13. OTHER INCOME, NET

Cadence's other income, net, for fiscal 2018, 2017 and 2016 was as follows:

	2018	2017	2016
	(In thousands)		
Interest income	\$8,070	\$3,879	\$2,917
Gains (losses) on marketable equity investments	(551)	520	263
Gains on non-marketable equity investments	3,300	8,934	2,668
Gains (losses) on securities in NQDC trust	(1,471)	6,145	1,741
Gains (losses) on foreign exchange	(5,557)	(2,920)	6,879
Gain on sale of property, plant and equipment	—	—	923
Other income (loss), net	(471)	197	531
Total other income, net	\$3,320	\$16,755	\$15,922

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NOTE 14. NET INCOME PER SHARE

Basic net income per share is computed by dividing net income during the period by the weighted-average number of shares of common stock outstanding during that period, less unvested restricted stock awards. Diluted net income per share is impacted by equity instruments considered to be potential common shares, if dilutive, computed using the treasury stock method of accounting.

The calculations for basic and diluted net income per share for fiscal 2018, 2017 and 2016 are as follows:

	2018	2017	2016
	(In thousands, except per share amounts)		
Net income	\$345,777	\$204,101	\$203,086
Weighted-average common shares used to calculate basic net income per share	273,729	272,097	284,502
Stock-based awards	7,415	8,124	6,754
Weighted-average common shares used to calculate diluted net income per share	281,144	280,221	291,256
Net income per share - basic	\$1.26	\$0.75	\$0.71
Net income per share - diluted	\$1.23	\$0.73	\$0.70

The following table presents shares of Cadence's common stock outstanding for fiscal 2018, 2017 and 2016 that were excluded from the computation of diluted net income per share because the effect of including these shares in the computation of diluted net income per share would have been anti-dilutive:

	2018	2017	2016
	(In thousands)		
Long-term performance-based awards	50	152	1,069
Options to purchase shares of common stock	637	303	581
Non-vested shares of restricted stock	290	77	27
Total potential common shares excluded	977	532	1,677

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NOTE 15. BALANCE SHEET COMPONENTS

A summary of certain balance sheet components as of December 29, 2018 and December 30, 2017 is as follows:

	As of	
	December 29, 2018	December 30, 2017
	(In thousands)	
Inventories:		
Raw materials	\$ 16,392	\$ 17,491
Finished goods	11,770	15,718
Inventories	\$28,162	\$ 33,209
Property, plant and equipment:		
Computer equipment and related software	\$574,333	\$ 537,144
Buildings	126,927	127,478
Land	55,802	55,840
Leasehold, building and land improvements	108,529	106,173
Furniture and fixtures	27,087	27,590
Equipment	52,088	50,340
In-process capital assets	6,357	5,154
Total cost	951,123	909,719
Less: Accumulated depreciation and amortization	(698,493)	(658,377)
Property, plant and equipment, net	\$252,630	\$ 251,342
Other assets:		
Deferred income taxes	\$ 154,894	\$ 152,501
Non-marketable investments	118,734	2,992
Other long-term assets	97,603	74,808
Other assets	\$371,231	\$ 230,301
Accounts payable and accrued liabilities:		
Payroll and payroll-related accruals	\$ 192,466	\$ 164,310
Accounts payable	5,484	4,825
Accrued operating liabilities	58,576	51,966
Accounts payable and accrued liabilities	\$256,526	\$ 221,101

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NOTE 16. FAIR VALUE

Inputs to valuation techniques are observable or unobservable. Observable inputs reflect market data obtained from independent sources, while unobservable inputs reflect Cadence's market assumptions. These two types of inputs have created the following fair value hierarchy:

Level 1 – Quoted prices for identical instruments in active markets;

Level 2 – Quoted prices for similar instruments in active markets, quoted prices for identical or similar instruments in markets that are not active, and model-derived valuations in which all significant inputs and significant value drivers are observable in active markets; and

Level 3 – Valuations derived from valuation techniques in which one or more significant inputs or significant value drivers are unobservable.

This hierarchy requires Cadence to minimize the use of unobservable inputs and to use observable market data, if available, when determining fair value. Cadence recognizes transfers between levels of the hierarchy based on the fair values of the respective financial instruments at the end of the reporting period in which the transfer occurred. There were no transfers between levels of the fair value hierarchy during fiscal 2018.

The valuation techniques used to determine the fair value of Cadence's 2024 Notes are classified within Level 2 of the fair value hierarchy. For additional information relating to our debt arrangements, see Note 3 in the notes to consolidated financial statements.

On a quarterly basis, Cadence measures at fair value certain financial assets and liabilities. The fair value of financial assets and liabilities was determined using the following levels of inputs as of December 29, 2018 and December 30, 2017:

Fair Value Measurements as of
December 29, 2018:

Total	Level 1	Level 2	Level 3
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(In thousands)

Assets

Cash equivalents:

Money market funds	\$327,841	\$327,841	\$—	\$—
Marketable equity securities	3,887	3,887	—	—
Securities held in NQDC trust	27,767	27,767	—	—
Foreign currency exchange contracts	101	—	101	—
Total Assets	\$359,596	\$359,495	\$101	\$—

As of December 29, 2018, Cadence did not have any financial liabilities requiring a recurring fair value measurement.

Fair Value Measurements as of
December 30, 2017:

Total	Level 1	Level 2	Level 3
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(In thousands)

Assets

Cash equivalents:

Money market funds	\$503,934	\$503,934	\$—	\$—
Marketable equity securities	4,455	4,455	—	—
Securities held in NQDC trust	31,473	31,473	—	—
Foreign currency exchange contracts	2,937	—	2,937	—
Total Assets	\$542,799	\$539,862	\$2,937	\$—

As of December 30, 2017, Cadence did not have any financial liabilities requiring a recurring fair value measurement.

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NOTE 17. COMMITMENTS AND CONTINGENCIES

Lease Commitments

Facilities, equipment and vehicles are leased under various operating leases expiring at various dates through 2030. Certain of these leases contain renewal options and escalating rent payments. Rental expense is recognized on a straight-line basis and was as follows during fiscal 2018, 2017 and 2016:

	2018	2017	2016
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(In thousands)

Rent expense	\$33,717	\$32,089	\$28,216
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As of December 29, 2018, future minimum lease payments under non-cancelable operating leases for the following five fiscal years and thereafter were as follows:

	Operating Leases (In thousands)
2019	\$ 26,252
2020	23,130
2021	19,778
2022	14,243
2023	11,510
Thereafter	17,100
Total lease payments	\$ 112,013

Purchase Obligations

Cadence had purchase obligations of \$24.7 million as of December 29, 2018 that were associated with agreements or commitments for purchases of goods or services.

Legal Proceedings

From time to time, Cadence is involved in various disputes and litigation that arise in the ordinary course of business. These include disputes and lawsuits related to intellectual property, indemnification obligations, mergers and acquisitions, licensing, contracts, distribution arrangements and employee relations matters. At least quarterly, Cadence reviews the status of each significant matter and assesses its potential financial exposure. If the potential loss from any claim or legal proceeding is considered probable and the amount or the range of loss can be estimated, Cadence accrues a liability for the estimated loss. Legal proceedings are subject to uncertainties, and the outcomes are difficult to predict. Because of such uncertainties, accruals are based on Cadence's judgments using the best information available at the time. As additional information becomes available, Cadence reassesses the potential liability related to pending claims and litigation matters and may revise estimates.

Other Contingencies

Cadence provides its customers with a warranty on sales of hardware products, generally for a 90-day period. Cadence did not incur any significant costs related to warranty obligations during fiscal 2018, 2017 or 2016.

Cadence's product license and services agreements typically include a limited indemnification provision for claims from third parties relating to Cadence's intellectual property. If the potential loss from any indemnification claim is considered probable and the amount or the range of loss can be estimated, Cadence accrues a liability for the estimated loss. The indemnification is generally limited to the amount paid by the customer. Cadence did not incur any significant losses from indemnification claims during fiscal 2018, 2017 or 2016.

Table of Contents**NOTE 18. EMPLOYEE AND DIRECTOR BENEFIT PLANS**

Cadence maintains various defined contribution plans for its eligible U.S. and non-U.S. employees. For employees in the United States, Cadence maintains a 401(k) savings plan to provide retirement benefits through tax-deferred salary deductions and may make discretionary contributions, as determined by the Board of Directors, which cannot exceed a specified percentage of the annual aggregate salaries of those employees eligible to participate. Cadence's total contributions made to these plans during fiscal 2018, 2017 and 2016 were as follows:

2018	2017	2016
(In thousands)		

Contributions to defined contribution plans	\$25,731	\$26,010	\$24,185
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Executive Officers and Directors may also elect to defer compensation payable to them under Cadence's NQDC. Deferred compensation payments are held in investment accounts and the values of the accounts are adjusted each quarter based on the fair value of the investments held in the NQDC. These investments are classified in other assets in the consolidated balance sheets and gains and losses are recognized as other income, net in the consolidated income statements. Net recognized gains (losses) of these securities during fiscal 2018, 2017 and 2016 were as follows:

2018	2017	2016
(In thousands)		

Gains (losses) on securities held in NQDC trust	\$(1,471)	\$6,145	\$1,741
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Certain of Cadence's international subsidiaries sponsor defined benefit retirement plans. The unfunded projected benefit obligation for Cadence's defined benefit retirement plans is recorded in other long-term liabilities in the consolidated balance sheets. The unfunded projected benefit obligation for these retirement plans as of December 29, 2018, December 30, 2017 and December 31, 2016 was as follows:

December 29, 2018	December 30, 2017	December 31, 2016
(In thousands)		

Unfunded projected benefit obligation - defined benefit retirement plans	\$7,990	\$ 6,976	\$ 6,164
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NOTE 19. ACCUMULATED OTHER COMPREHENSIVE LOSS

Cadence's accumulated other comprehensive loss is comprised of the aggregate impact of foreign currency translation gains and losses and changes in defined benefit plan liabilities and is presented in Cadence's consolidated statements of comprehensive income. Aggregate changes in unrealized holding gains on available-for-sale securities net of reclassifications for realized gains and losses were also included through December 30, 2017.

On the first day of fiscal 2018, Cadence reclassified unrealized holding gains on available-for-sale securities to retained earnings in connection with the adoption of ASU 2016-01, "Financial Instruments—Overall (Subtopic 825-10): Recognition and Measurement of Financial Assets and Financial Liabilities." For additional information regarding the adoption of this accounting standard, refer to Note 2 under the heading "Recently Adopted Accounting Standards." Accumulated other comprehensive loss was comprised of the following as of December 29, 2018, and December 30, 2017:

	As of December 29, 2018	As of December 30, 2017
(In thousands)		
Foreign currency translation loss	\$(20,861)	\$(2,976)
Changes in defined benefit plan liabilities	(3,919)	(3,292)
Unrealized holding gains on available-for-sale securities	—	2,638
Total accumulated other comprehensive loss	\$(24,780)	\$(3,630)

For fiscal 2018, 2017 and 2016, there were no significant amounts related to foreign currency translation loss or changes in defined benefit plan liabilities reclassified to net income from accumulated other comprehensive loss.

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NOTE 20. SEGMENT REPORTING

Segment reporting is based on the “management approach,” following the method that management organizes the company’s operating segments for which separate financial information is made available to, and evaluated regularly by, the chief operating decision maker in allocating resources and in assessing performance. Cadence’s chief operating decision maker is its CEO, who reviews Cadence’s consolidated results as one operating segment. In making operating decisions, the CEO primarily considers consolidated financial information, accompanied by disaggregated information about revenues by geographic region.

Outside the United States, Cadence markets and supports its products and services primarily through its subsidiaries. Revenue is attributed to geography based upon the country in which the product is used or services are delivered.

Long-lived assets are attributed to geography based on the country where the assets are located.

The following table presents a summary of revenue by geography for fiscal 2018, 2017 and 2016:

	2018	2017	2016
	(In thousands)		
Americas:			
United States	\$924,644	\$829,436	\$832,583
Other Americas	32,531	35,067	31,296
Total Americas	957,175	864,503	863,879
Asia	605,415	526,201	445,500
Europe, Middle East and Africa	406,877	385,705	346,701
Japan	168,555	166,623	160,003
Total	\$2,138,022	\$1,943,032	\$1,816,083

The following table presents a summary of long-lived assets by geography as of December 29, 2018, December 30, 2017 and December 31, 2016:

	As of December 29, 2018	December 30, 2017	December 31, 2016
	(In thousands)		
Americas:			
United States	\$200,025	\$198,744	\$193,750
Other Americas	475	611	757
Total Americas	200,500	199,355	194,507
Asia	39,629	37,678	30,564
Europe, Middle East and Africa	11,784	13,615	12,692
Japan	717	694	844
Total	\$252,630	\$251,342	\$238,607

NOTE 21. SUBSEQUENT EVENTS

Non-Marketable investments

In January 2019, Cadence made an additional minority equity investment in a private company for approximately \$34 million, bringing Cadence’s total investment to approximately \$149 million. For additional information regarding Cadence’s investments, see Note 7 to the consolidated financial statements.

Stock Repurchase Authorization

In February 2019, Cadence’s Board of Directors authorized the additional repurchase of shares of Cadence’s common stock with a value of up to \$500 million in the aggregate. The actual timing and amount of future repurchases are subject to business and market conditions, corporate and regulatory requirements, stock price, acquisition opportunities and other factors.

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EXHIBIT INDEX

Exhibit Number	Exhibit Title	Incorporated by Reference			Provided Herewith
		Form	File No.	Exhibit No. Filing Date	
<u>3.01</u>	<u>Restated Certificate of Incorporation, as filed with the Secretary of State of the State of Delaware on May 13, 1998.</u>	10-Q	001-10606	3.01(j) 8/18/1998	
<u>3.02</u>	<u>Certificate of Designation for the Series A Junior Participating Preferred Stock, as amended on February 1, 2000.</u>	10-K	001-10606	4.02 3/27/2000	
<u>3.03</u>	<u>The Registrant's Amended and Restated Bylaws, effective as of February 6, 2019.</u>	8-K	000-15867	3.01 2/8/2019	
<u>4.01</u>	<u>Specimen Certificate of the Registrant's Common Stock.</u>	S-4	033-43400	4.01 10/17/1991	
<u>4.02</u>	<u>Base Indenture, dated October 9, 2014, between the Registrant and Wells Fargo Bank, N.A., as trustee.</u>	8-K	000-15867	4.01 10/9/2014	
<u>4.03</u>	<u>First Supplemental Indenture, dated October 9, 2014, between the Registrant and Wells Fargo Bank, N.A., as trustee (including the Form of 4.375% Senior Notes due 2024).</u>	8-K	000-15867	4.02 10/9/2014	
<u>10.01*</u>	<u>The Registrant's Amended and Restated 1987 Stock Incentive Plan.</u>	S-8	333-174201	99.1 5/13/2011	
<u>10.02*</u>	<u>Form of Stock Option Agreement and Form of Stock Option Exercise Request under the Registrant's 1987 Stock Incentive Plan, as amended and restated.</u>	10-Q	001-10606	10.02 8/10/2004	
<u>10.03*</u>	<u>Form of Nonstatutory Incentive Stock Award Agreement under the Registrant's 1987 Stock Incentive Plan, as amended and restated.</u>	10-K	001-10606	10.03 3/16/2005	
<u>10.04*</u>	<u>Form of Incentive Stock Award Agreement for performance-based Incentive Stock Awards granted prior to July 29, 2008, as amended and restated, under the Registrant's 1987 Stock Incentive Plan, as amended and restated.</u>	10-Q	001-10606	10.02 12/11/2008	
<u>10.05*</u>	<u>Form of Incentive Stock Award Agreement for performance-based Incentive Stock Awards to be granted subsequent to July 29, 2008 under the Registrant's 1987 Stock Incentive Plan, as amended and restated.</u>	10-Q	001-10606	10.03 12/11/2008	
<u>10.06*</u>	<u>Form of Stock Option Agreement under the Registrant's 1987 Stock Incentive Plan, as amended and restated.</u>	10-Q	001-10606	10.01 5/1/2009	
<u>10.07*</u>	<u>Form of Incentive Stock Award Agreement for performance-based Incentive Stock Awards under the Registrant's 1987 Stock Incentive Plan, as amended and restated.</u>	10-Q	001-10606	10.02 5/1/2009	
<u>10.08*</u>	<u>The Registrant's 1995 Directors Stock Incentive Plan.</u>	10-Q	001-15867	10.01 7/26/2012	
<u>10.09*</u>	<u>Form of Stock Option Agreement, as currently in effect under the Registrant's 1995 Directors Stock Incentive Plan.</u>	10-K	000-15867	10.76 2/21/2013	
<u>10.10*</u>	<u>Form of Incentive Stock Award Agreement, as currently in effect under the Registrant's 1995 Directors Stock</u>	10-K	000-15867	10.77 2/21/2013	

Incentive Plan.

10.11* The Registrant's Amended and Restated 2000 Equity S-8 333-174200 99.1 5/13/2011
Incentive Plan.

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<u>10.12*</u>	<u>Form of Incentive Stock Award Agreement under the Registrant's Amended and Restated 2000 Equity Incentive Plan.</u>	10-Q	001-10606	10.02	10/28/2011
<u>10.13*</u>	<u>Form of Restricted Stock Unit Award Agreement under the Registrant's Amended and Restated 2000 Equity Incentive Plan.</u>	10-Q	001-10606	10.03	10/28/2011
<u>10.14*</u>	<u>Form of Stock Option Agreement under the Registrant's Amended and Restated 2000 Equity Incentive Plan.</u>	10-Q	001-10606	10.04	10/28/2011
<u>10.15*</u>	<u>The Registrant's Omnibus Equity Incentive Plan, as amended and restated.</u>	S-8	333-226292	99.01	7/23/2018
<u>10.16*</u>	<u>Form of Incentive Stock Award Agreement for Non-Executive Employees and Consultants, as currently in effect under the Registrant's Omnibus Equity Incentive Plan.</u>	S-8	333-195771	99.02	5/7/2014
<u>10.17*</u>	<u>Form of Restricted Stock Unit Agreement for Non-Executive Employees and Consultants, as currently in effect under the Registrant's Omnibus Equity Incentive Plan.</u>	S-8	333-195771	99.03	5/7/2014
<u>10.18*</u>	<u>Form of Stock Option Agreement for Non-Executive Employees and Consultants, as currently in effect under the Registrant's Omnibus Equity Incentive Plan.</u>	S-8	333-195771	99.04	5/7/2014
<u>10.19*</u>	<u>Form of Incentive Stock Award Agreement for Executives, as currently in effect under the Registrant's Omnibus Equity Incentive Plan.</u>	S-8	333-195771	99.05	5/7/2014
<u>10.20*</u>	<u>Form of Restricted Stock Unit Agreement for Executives, as currently in effect under the Registrant's Omnibus Equity Incentive Plan.</u>	S-8	333-195771	99.06	5/7/2014
<u>10.21*</u>	<u>Form of Stock Option Agreement for Executives, as currently in effect under the Registrant's Omnibus Equity Incentive Plan.</u>	S-8	333-195771	99.07	5/7/2014
<u>10.22*</u>	<u>The Registrant's Amended and Restated Employee Stock Purchase Plan.</u>	S-8	333-226293	99.01	7/23/2018
<u>10.23*</u>	<u>The Registrant's 1996 Deferred Compensation Venture Investment Plan, as amended and restated effective January 1, 2001.</u>	10-K	001-10606	10.09	3/12/2002
<u>10.24*</u>	<u>The Registrant's 2002 Deferred Compensation Venture Investment Plan, as amended.</u>	10-Q	001-10606	10.32	8/10/2004
<u>10.25*</u>	<u>The Registrant's 1994 Deferred Compensation Plan, as amended and restated effective November 20, 2003 (409A Grandfathered Plan).</u>	10-K	001-10606	10.10	2/26/2008
<u>10.26*</u>	<u>The Registrant's 2009 Deferred Compensation Plan.</u>	10-K	001-10606	10.13	2/26/2008
<u>10.27*</u>	<u>Amendments Number One, Two, Three and Four of the Registrant's 2009 Deferred Compensation Plan.</u>	10-K	000-15867	10.27	2/20/2018
<u>10.28*</u>	<u>The Senior Executive Bonus Plan.</u>	8-K	000-15867	10.01	2/8/2019
<u>10.29*</u>	<u>The Registrant's Executive Severance Plan.</u>	8-K	001-15867	10.01	5/11/2016
<u>10.30*</u>	<u>Director Medical and Prescription Benefits Coverage Reimbursement Plan.</u>	10-Q	001-10606	10.02	4/29/2011
<u>10.31</u>	<u>Altos Design Automation, Inc. 2006 Stock Plan, as amended December 23, 2009.</u>	S-8	333-174202	99.1	5/13/2011
<u>10.32</u>	<u>Tensilica, Inc. 2007 Stock Incentive Plan.</u>	S-8	333-188452	99.01	5/8/2013
<u>10.33</u>	<u>C2 Design Automation (d/b/a/ Forte Design Systems) 2010 Stock Option Plan.</u>	S-8	333-194102	99.01	2/24/2014

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<u>10.34*</u>	<u>Form of Indemnity Agreement between the Registrant and its directors and executive officers, as amended and restated.</u>	10-Q	000-15867	10.01	7/25/2016	
<u>10.35*</u>	<u>Employment Agreement, effective as of July 29, 2008, between the Registrant and James J. Cowie.</u>	10-K	001-10606	10.92	3/2/2009	
<u>10.36*</u>	<u>Employment Agreement, effective as of January 8, 2009, between the Registrant and Lip-Bu Tan.</u>	10-K	001-10606	10.93	3/2/2009	
<u>10.37*</u>	<u>Employment Agreement, effective as of February 23, 2009, between the Registrant and Nimish H. Modi.</u>	10-K	001-10606	10.96	3/2/2009	
<u>10.38*</u>	<u>Form of First Amendment to Employment Agreement between the Registrant and the Registrant's named executive officers.</u>	10-Q	001-10606	10.02	7/31/2009	
<u>10.39*</u>	<u>Form of Second Amendment to Employment Agreement between the Registrant and the Registrant's named executive officers.</u>	10-K	001-10606	10.94	2/26/2010	
<u>10.40*</u>	<u>Second Amendment to Employment Agreement, effective as of March 1, 2010, between the Registrant and Lip-Bu Tan.</u>	10-K	001-10606	10.95	2/26/2010	
<u>10.41*</u>	<u>Employment Agreement, effective as of October 21, 2011, between the Registrant and Geoffrey G. Ribar.</u>	10-K	001-10606	10.77	2/24/2012	
<u>10.42*</u>	<u>Employment Agreement, effective as of September 20, 2012, between the Registrant and Thomas P. Beckley.</u>	10-K	000-15867	10.44	2/20/2014	
<u>10.43*</u>	<u>Employment Agreement, effective as of March 16, 2015, between the Registrant and Anirudh Devgan.</u>	10-Q	000-15867	10.01	4/27/2015	
<u>10.44*</u>	<u>Letter, dated September 1, 2015, between the Registrant and Neil Zaman.</u>	10-K	000-15867	10.49	2/18/2016	
<u>10.45*</u>	<u>Offer Letter, dated January 12, 2017, between the Registrant and Surendra Babu Mandava.</u>	10-K	000-15867	10.51	2/10/2017	
<u>10.46*</u>	<u>First Amendment to Employment Agreement, effective November 16, 2017, between the Registrant and Anirudh Devgan.</u>	8-K	000-15867	10.01	11/17/2017	
<u>10.47*</u>	<u>Credit Agreement, dated as of January 30, 2017, by and among the Registrant, JPMorgan Chase Bank, N.A. and other lenders party thereto.</u>	8-K	000-15867	10.01	2/1/2017	
<u>10.48*</u>	<u>Term Loan Agreement, dated as of January 28, 2016, by and among the Registrant, J.P. Morgan Securities LLC, Merrill Lynch, Pierce, Fenner & Smith Incorporated, JPMorgan Chase Bank, N.A., and other lenders party thereto.</u>	8-K	000-15867	10.01	2/3/2016	
<u>10.49*</u>	<u>Amendment No. 1 to Loan Agreement, dated as of January 30, 2017, by and among the Registrant, JPMorgan Chase Bank, N.A. and other lenders party thereto.</u>	8-K	000-15867	10.02	2/1/2017	
<u>10.50*</u>	<u>Third Amendment to Employment Agreement, effective as of March 22, 2018, between the Registrant and Lip-Bu Tan.</u>	10-Q	000-15867	10.01	4/25/2018	
<u>10.51*</u>	<u>nusemi inc. 2015 Equity Incentive Plan.</u>	S-8	333-226294	99.01	7/23/2018	
<u>21.01</u>	<u>Subsidiaries of the Registrant.</u>					X
<u>23.01</u>	<u>Independent Registered Public Accounting Firm's Consent.</u>					X

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<u>31.01</u>	<u>Certification of the Registrant’s Chief Executive Officer, Lip-Bu Tan, pursuant to Rule 13a-14 of the Securities Exchange Act of 1934.</u>	X
<u>31.02</u>	<u>Certification of the Registrant’s Chief Financial Officer, John M. Wall, pursuant to Rule 13a-14 of the Securities Exchange Act of 1934.</u>	X
<u>32.01</u>	<u>Certification of the Registrant’s Chief Executive Officer, Lip-Bu Tan, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.</u>	X
<u>32.02</u>	<u>Certification of the Registrant’s Chief Financial Officer, John M. Wall, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.</u>	X
101.INS	XBRL Instance Document.	X
101.SCH	XBRL Taxonomy Extension Schema Document.	X
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document.	X
101.DEF	XBRL Taxonomy Extension Definition Linkbase Document.	X
101.LAB	XBRL Taxonomy Extension Label Linkbase Document.	X
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document.	X

* Indicates management contract or compensatory plan or arrangement covering executive officers or directors of the Registrant.

Item 16. Form 10-K Summary

Not applicable.

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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.

CADENCE DESIGN
SYSTEMS, INC.

/s/ Lip-Bu Tan
Lip-Bu Tan
Chief Executive Officer
and Director
Dated: February 27, 2019

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 dates indicated.

/s/ Lip-Bu Tan
Lip-Bu Tan
Chief Executive Officer and Director

DATE: February 27, 2019

/s/ John M. Wall
John M. Wall
Senior Vice President and Chief Financial Officer

DATE: February 27, 2019

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POWER OF ATTORNEY

KNOW ALL PERSONS BY THESE PRESENTS, that each person whose signature appears below constitutes and appoints Lip-Bu Tan, John M. Wall and James J. Cowie, and each of them, as his or her true and lawful attorneys-in-fact and agents, with full power of substitution and resubstitution, for him or her and in his or her name, place and stead, in any and all capacities, to sign any and all amendments (including post-effective amendments) to this Report on Form 10-K, and to file the same, with all exhibits thereto, and other documents in connection therewith, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act and thing requisite and necessary to be done in connection therewith, as fully to all intents and purposes as he or she might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or any of them, or their, his or her substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

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 dates indicated:

/s/Dr. John B. Shoven February 27, 2019
Dr. John B. Shoven, Chairman of the
Board of Directors

/s/Mark W. Adams February 27, 2019
Mark W. Adams, Director

/s/Susan L. Bostrom February 27, 2019
Susan L. Bostrom, Director

/s/Dr. James D. Plummer February 27, 2019
Dr. James D. Plummer, Director

/s/Dr. Alberto Sangiovanni-Vincentelli February 27, 2019
Dr. Alberto Sangiovanni-Vincentelli,
Director

/s/Roger S. Siboni February 27, 2019
Roger S. Siboni, Director

/s/Young K. Sohn February 27, 2019
Young K. Sohn, Director

/s/Mary Agnes Wilderotter February 27, 2019
Mary Agnes Wilderotter, Director