
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 28, 2019
OR

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

For the transition period from _____ to _____.

Commission file number 000-15867

cadence

CADENCE DESIGN SYSTEMS INC

(Exact name of registrant as specified in its charter)

Delaware

(State or Other Jurisdiction of
Incorporation or Organization)

00-0000000

(I.R.S. Employer
Identification No.)

2655 Seely Avenue, Building 5, San Jose, California

(Address of Principal Executive Offices)

95134

(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	Trading Symbol(s)	Names of Each Exchange on which Registered
Common Stock, \$0.01 par value per share	CDNS	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 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

Non-accelerated Filer

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 29, 2019 was approximately \$19,837,633,930.

On February 1, 2020, approximately 280,168,000 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 2020 Annual Meeting of Stockholders are incorporated by reference into Part III hereof.

CADENCE DESIGN SYSTEMS, INC.
ANNUAL REPORT ON FORM 10-K
FOR THE FISCAL YEAR ENDED DECEMBER 28, 2019
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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 statements using words such as “anticipates,” “believes,” “could,” “estimates,” “expects,” “forecasts,” “intends,” “may,” “plans,” “projects,” “should,” “targets,” “will” and “would,” 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.

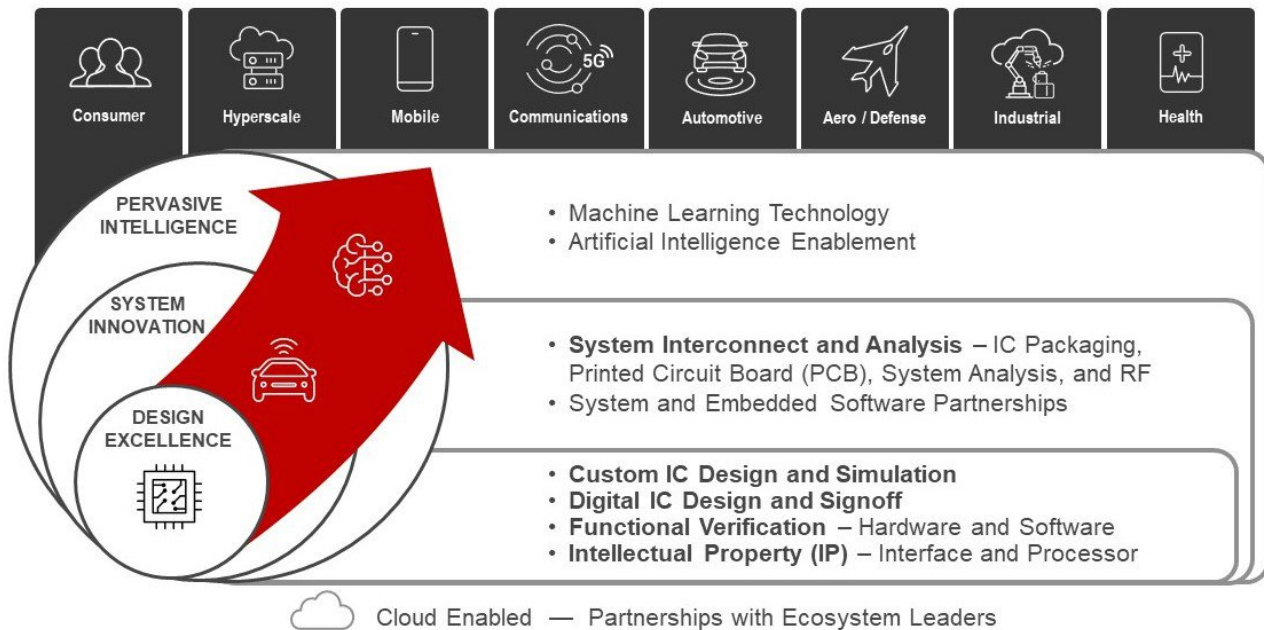
Overview

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 systems, 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 Intelligent System Design™, provides the technologies necessary for our customers to develop and optimize a complete and functional electronic product. We address the challenges posed by the needs and trends of electronic systems companies as well as semiconductor companies delivering greater portions of these systems. 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 enable Intelligent System Design across three layers as illustrated below—starting with IC and SoC design excellence, followed by system innovation, and then pervasive intelligence.

Cadence *Intelligent System Design* Strategy



The core IC and SoC design excellence requires core EDA technologies for custom IC, digital IC and signoff, and functional verification, and leverages pre-build semiconductor IP. These tools, IP and associated services are specifically designed to meet the requirements of engineers who design across analog, digital and mixed-signal domains, and perform the associated verification efforts, including validation of low-level software running on the silicon model, thereby enabling design teams to manage complexity without increasing the team size or extending the project schedule, while reducing technical risks.

The second layer of our strategy centers around system innovation. It includes tools and services used for system design of the packages that encapsulate the ICs and the PCBs, system simulation which includes electromagnetic, electro-thermal and other multi-physics analysis necessary as part of optimizing the full system’s performance, Radio Frequency (“RF”) and microwave systems, and embedded software.

The third layer of our strategy is enabling pervasive intelligence in new electronics. It starts with providing solutions and services to develop AI-enhanced systems and includes machine learning and deep learning capabilities being added to the Cadence technology portfolio to make IP and tools more automated and to produce optimized results faster, supported by cloud access to address the growing computation needs of our customers.

Business Drivers

Our products and services allow our customers to design complex and innovative electronic products which are accelerated by growing digital transformation. Demand for our technology and expertise 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 AI, edge computing, hyperscale computing including datacenter infrastructure, communications, including 5G networks, augmented reality, virtual reality, internet-of-things (“IoT”), aerospace and defense, automotive, industrial and healthcare subsystems. 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, some of our products must first be developed to exploit new manufacturing capabilities. This dependency means that we must invest significantly in product research and development (“R&D”) 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 and services have unique attributes that our customers value. In general, these attributes can be grouped into broader categories such as quality of results (“QoR”) (in terms of power consumption, performance and chip area), engineering productivity, tool performance, 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 QoR, productivity, performance and methodology.

Products and Product Strategy

Our Intelligent System Design strategy is to provide our customers with the ability to address the broad range of issues that arise as they develop electronic products. Our 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, including Custom IC and Simulation, Digital IC Design and Signoff, Functional Verification, IP, and System Interconnect and Analysis.

Custom IC Design and Simulation

Our 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 RF designs. These representations are verified using simulation tools optimized for each type of design, including the design capture environment, simulation and IC layout 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. The Virtuoso RF solution addresses the challenges of RF design across chip, package and board. Spectre® Simulator provides large-scale verification simulation. The Virtuoso System Design Platform enables engineers to design and verify concurrently across the chip, package and board.

Digital IC Design and Signoff

Digital IC design and signoff offerings are used 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” below). 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 and signoff technology suite provides a full flow to achieve power, performance, and area (“PPA”) design targets, and includes 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. 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 (“DFT”) 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 PPA 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 the Tempus™ Timing Signoff Solution, Voltus™ Power Integrity Solution, Quantus™ Extraction Solution, and Pegasus™ Physical Verification System. Our design-for-manufacturing (“DFM”) 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.

Functional Verification

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 during and after custom and analog design, and before manufacturing the circuitry, significantly reducing the risk of discovering a costly error in the completed product.

Our Verification Suite™ includes four primary verification engines, starting with the JasperGold® Formal Verification Platform and Xcelium™ Parallel Logic Simulation Platform, which are used in the early stages of design, often at the IP and subsystem level. Once the design is more mature, with early formal and simulation verification tasks performed, verification engineers deploy our Palladium® Emulation Platform and Protium™ Prototyping Platform for more complete chip verification, often running low-level embedded software on top of a model of the chip, to ensure proper functionality before silicon manufacturing.

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. Palladium provides high throughput, capacity, datacenter reliability and workgroup productivity to enable global design teams to develop advanced hardware-software systems. Protium leverages a common front end with the Palladium environment in order to move designs rapidly from emulation to the prototyping stage, allowing for software development to start weeks to months earlier.

These engines are also supported by other verification tools that provide an environment that allows for effective verification throughput, including verification planning and metric tracking, testbench automation, debugging and software-driven tests, enabling our customers to coordinate verification activities across multiple verification engines, and teams and locations for effective verification closure.

IP

Our 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 IP, including Tensilica® configurable digital signal processors (“DSPs”), vertically targeted subsystems for AI, 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, providing solutions for high speed SerDes, PCI, USB and many other standards.

We also offer a broad range of Verification IP (“VIP”) with 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 (“AVIP”), 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.

System Interconnect and Analysis

Our system interconnect and analysis offerings are used by our customers to develop PCBs and IC packages, and analyze electromagnetic, electro-thermal and other multi-physics effects.

The capabilities in the Allegro® System Interconnect Design Platform include PCB authoring and implementation, IC package and System-in-Package (“SiP”) design and signal and power integrity (“SI/PI”) analysis and PCB library design management and collaboration. The need for compact, high-performance mobile, consumer and automotive design with advanced serial interconnect is driving the technology evolution for our PCB offerings. 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.

Our technology portfolio expanded in 2019 into the growing system analysis market segment. The speed and close proximity of signals on silicon, through packages to boards, and through connectors and cables, exposes these communications to various kinds of interference, generates heat and emits electromagnetic radiation. Careful analysis is required to assure these systems will work as designed under a wide range of operating conditions and within compliance of standards and laws. The complexity of these devices and signal transmissions requires analysis and simulation throughout the product lifecycle to meet these objectives. Our Clarity™ 3D Solver for electromagnetic and power electronics analysis and simulation, as well as our Celsius™ Thermal Solver, provide the foundation for multi-physics analysis technology, with complete electrical-thermal co-simulation for electronic systems from ICs to physical enclosures.

Recent Acquisitions

Building upon Virtuoso RF technology and expertise and to better address increasing RF/microwave design activity, driven by growing use of 5G communications, our portfolio expanded with the acquisition of AWR Corporation and Integrand Software, Inc. in the first quarter of fiscal 2020.

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 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.

The Cadence Cloud portfolio, consisting of Cadence-managed and customer-managed environments for electronic product developers using the scalability of the cloud, continues to expand and now includes a broader cloud-ready set of products. Contractual arrangements with customers for both environments are time based, similar to the on-premise software license arrangements described above.

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. Some customers enter into a non-cancellable IP Access Agreement (“IPAA”), whereby the customer commits to a fixed dollar amount over a specified period of time that can be used to purchase from a list of IP products or services. In addition, for certain 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.

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

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, specialized design services engineers are assigned to internal R&D projects associated with our design IP business.

As part of our services offerings, we design advanced ICs, develop custom IP and help customers address design challenges. This enables us to target and accelerate the development of new software technology and products to satisfy current and future design requirements.

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, automotive, aerospace and defense, 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 outsourced, consultative and collaborative offerings.

Third-Party Programs and Initiatives

In addition to our products, many customers use design tools that are provided by other companies, as well as design IP available from alternative 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.

We also have a strategic partnership with Green Hills Software to provide embedded systems solutions focused on safety and security for critical applications such as aerospace and defense, automotive, industrial and medical devices.

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:

	2019		2018		2017	
	(In millions, except percentages)					
Product and maintenance	\$ 2,204	94%	\$ 1,998	93%	\$ 1,814	93%
Services	132	6%	140	7%	129	7%
Total revenue	<u>\$ 2,336</u>		<u>\$ 2,138</u>		<u>\$ 1,943</u>	

Between 85% and 90% of our revenue is characterized as recurring revenue. Revenue characterized as recurring includes revenue recognized over time from our software arrangements, services, royalties from certain IP arrangements, maintenance on IP licenses and hardware, operating leases of hardware and revenue recognized at varying points in time over the term of our IP Access Agreements.

The remainder of our revenue is characterized as upfront revenue. Up-front revenue is primarily generated by our sales of emulation and prototyping hardware and individual IP licenses. The percentage of our recurring and up-front revenue may be impacted by delivery of hardware and IP products to our customers in any single fiscal period.

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 2019 results of operations and our financial position as of December 28, 2019, see Part IV, Item 15, “Exhibits and Financial Statement Schedules.”

Backlog and Remaining Performance Obligations

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. We have elected to exclude the potential future royalty receipts from the remaining performance obligations. Contracted but unsatisfied performance obligations were approximately \$3.6 billion as of December 28, 2019, which includes \$205.7 million of non-cancellable IPAA commitments from customers where actual product selection and quantities of specific products or services are to be determined by customers at a later date. We expect to recognize approximately 55% of the revenue included in the contracted but unsatisfied performance obligations, excluding non-cancellable IPAA commitments, over the next 12 months and the remainder thereafter.

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 components, 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 IP licensed from third parties. We may have to seek new licenses or renew existing licenses for third-party software and other IP in the future. As part of performing engineering services for customers, our engineering services business uses certain software and other IP licensed from third parties, including that of our competitors.

Competition

We compete most frequently with Synopsys, Inc., Mentor Graphics Corporation, a division of Siemens AG, and ANSYS, Inc., and also with numerous other tools providers, manufacturers of electronic devices that have developed, acquired or have the capability to develop their own EDA products, technical software companies, electronics design and consulting companies, and other IP companies. These include Altium Limited, 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 email 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 2019, 2018 and 2017 were each 52-week fiscal years. Our next 53-week fiscal year will be fiscal 2020.

Employees

As of December 28, 2019, we had approximately 8,100 full-time employees.

INFORMATION ABOUT OUR EXECUTIVE OFFICERS

The following table provides information regarding our executive officers as of February 24, 2020:

Name	Age	Positions and Offices
Lip-Bu Tan	60	Chief Executive Officer and Director
John M. Wall	49	Senior Vice President and Chief Financial Officer
Anirudh Devgan	50	President
Thomas P. Beckley	62	Senior Vice President, Research and Development
James J. Cowie	55	Senior Vice President, General Counsel and Secretary
Surendra Babu Mandava	61	Senior Vice President, Research and Development
Chin-Chi Teng	54	Senior Vice President, Research and Development
Neil Zaman	51	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 has served as its Chairman since its founding. Mr. Tan serves as a director of Advanced Micro-Fabrication Equipment Inc. China (AMEC), Hewlett Packard Enterprise Company and Schneider Electric SE. 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 EDA 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 Neolinear, 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 SoC 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.

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. Spending on our products and services has grown in recent years, but the current outlook for the semiconductor industry is uncertain and may result in a decrease in spending on our products and services.

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 supplies of hardware components and products are subject to problems or delays, our future revenues and financial results could be adversely affected.

During fiscal 2019, the Bureau of Industry and Security ("BIS") of the U.S. Department of Commerce placed certain entities who are our customers on the "Entity List," limiting our ability to deliver products and services to these entities. When certain customers are on the Entity List, and in the absence of a license from the BIS, it will have a negative effect on our ability to sell products and provide services to these customers. Entity List restrictions will also encourage customers to seek substitute products from our competitors that are not subject to these restrictions or to develop their own solutions, thereby decreasing our long-term competitiveness. In addition, although customers are not prohibited from paying (and we are not restricted from collecting) for products we previously delivered to them, the credit risks associated with outstanding receivables from customers on the Entity List could increase as a result of these limitations.

We cannot predict whether or when any changes will be made that eliminate or decrease these limitations on our ability to sell products and provide services to these customers. We are unable to predict the duration of the export restrictions imposed with respect to any particular customer or the long-term effects on our business or our customers' business. Additionally, other companies may be added to the Entity List and/or be subject to trade restrictions. In addition, there may be indirect impacts to our business which we cannot reasonably quantify, including that our business may also be impacted by other trade restrictions that may be imposed by the U.S., China, or other countries. Restrictions on our ability to sell and ship our products to customers on the Entity List have had, and may continue to have, an adverse effect on our business, results of operations or financial condition.

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 more 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 DSPs that are programmed with software, requiring simultaneous design of the IC and the related software embedded on the IC;
- 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;
- adoption of cloud computing technologies with accompanying new business models for an increasing number of software categories; and
- integration and optimization of solutions for system design with core EDA technologies.

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 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 Intelligent System Design 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 strategy is meant to increase our business among electronic systems companies, which are now designing their own ICs and other electronic subsystems. Our strategy is also meant to increase our business among semiconductor companies, which are increasing their contribution to the end products into which their ICs and other electronic subsystems 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, 5G networks, augmented reality, virtual reality, IoT, aerospace and defense, and autonomous vehicle subsystems, 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.

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, and may include increases in employee headcount. 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 compete successfully 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;
- 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; and
- actions by regulators to limit the contractual terms that either we or our customers can apply to product and service offerings.

We compete most frequently with Synopsys, Inc., Mentor Graphics Corporation, a division of Siemens AG, and ANSYS, Inc., 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, technical software companies, electronics design and consulting companies, and other IP companies. These include Altium Limited, 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, technologies and businesses effectively;
- difficulties in integrating employees of an acquired company or business and the failure to retain key employees;
- 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.

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 58% during fiscal 2019, 57% during fiscal 2018 and 58% during fiscal 2017. 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 as applied to our business and corporate structure 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.

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 United States 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.

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 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 to provide greater taxing rights to jurisdictions where customers or users are located and to address additional base erosion and profits shifting issues. In addition, many countries have recently introduced new laws 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 stockholders could lose the value of their 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, expenses 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 leadership;
- 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, investigations or other regulatory actions;
- 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, services 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.

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, as well as any associated efforts to enforce such rights, including through intellectual property litigation.

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, reputation or operating results might 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 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, business interruption, 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 and heightened exposure to intellectual property theft in some countries;
- performance of national economies;
- 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;
- 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; and
- public health emergencies, such as the recent coronavirus outbreak and the subsequent public health measures, affecting our employees, suppliers, customers and our ability to provide services and maintenance in the affected regions.

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, public health emergencies, 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. Our ability to do so also depends on how well we maintain a strong workplace culture that is attractive to employees. 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 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, and we may encounter difficulties in our attempts to protect our intellectual property in foreign jurisdictions, including as a result of impacts from changes in international trade relationships. 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.

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 28, 2019, approximately 43% 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 18 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.

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 a single supplier or a limited number of 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 a single supplier or a limited number of suppliers for certain hardware components and contract manufacturers for production of our emulation and prototyping hardware products. Our reliance on single or a limited number of 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.

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.

Our business is subject to the risk of earthquakes and other catastrophic events.

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, including fires, earthquakes, flooding and other climate change-related risks, or actions by utility providers, as well as other catastrophic events such as an actual or threatened public health emergency. If a catastrophic event occurs at or near any of our offices, or utility providers or public health officials take certain actions (e.g., shut off power to our facilities or impose travel restrictions), our operations may be interrupted, which could adversely impact our business and results of operations. If a catastrophic event impacts a significant number of our customers, resulting in decreased demand for their and our products, or our ability to provide services and maintenance to our customers, our business and results of operations could be adversely impacted. For example, the continued spread of the coronavirus and related public health measures could result in further disruptions to our operations and those of our customers.

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 28, 2019, we had total outstanding indebtedness of \$346.0 million. We also had the ability to borrow an additional \$350.0 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 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 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 U.S. 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.

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.

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 and 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.

Our revolving credit facility utilizes LIBOR or various alternative methods to calculate the amount of accrued interest on any borrowings. Regulators in certain jurisdictions including the United Kingdom and the United States have announced the desire to phase out the use of LIBOR by the end of 2021. The transition from LIBOR to a new replacement benchmark is uncertain at this time and the consequences of such developments cannot be entirely predicted, but could result in an increase in the cost of our borrowings under our existing credit facility and any future borrowings.

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 28, 2019, 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.

PART II.

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

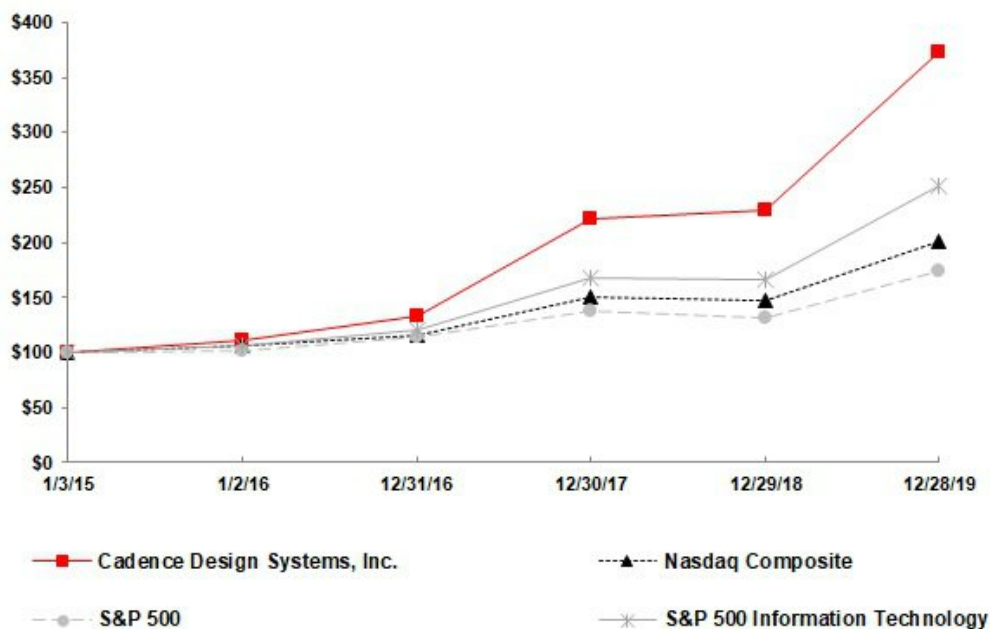
Our common stock is traded on the Nasdaq Global Select Market under the symbol CDNS. As of February 1, 2020, we had 443 registered stockholders and approximately 100,000 beneficial owners of our common stock.

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 January 3, 2015 (including reinvestment of dividends) was \$100 and tracks it each year thereafter on the last day of our fiscal year through December 28, 2019 and, for each index, on the last day of the calendar year.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*

Among Cadence Design Systems, Inc., the Nasdaq Composite Index, the S&P 500 Index and the S&P 500 Information Technology Index



*\$100 invested on 1/3/15 in stock or 12/31/14 in index, including reinvestment of dividends. Indexes calculated on month-end basis.

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	1/3/2015	1/2/2016	12/31/2016	12/30/2017	12/29/2018	12/28/2019
Cadence Design Systems, Inc.	\$ 100.00	\$ 110.52	\$ 133.94	\$ 222.09	\$ 230.16	\$ 373.29
Nasdaq Composite	100.00	106.96	116.45	150.96	146.67	200.49
S&P 500	100.00	101.38	113.51	138.29	132.23	173.86
S&P 500 Information Technology	100.00	105.92	120.59	167.42	166.94	250.89

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

Issuer Purchases of Equity Securities

At the end of fiscal 2018, approximately \$175 million remained available under our previously announced authorization to repurchase shares of our common stock. In February 2019, our Board of Directors authorized the repurchase of an additional \$500 million. 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 28, 2019, \$369 million remained available to repurchase shares of our common stock.

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 28, 2019:

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 29, 2019 – November 2, 2019	475,085	\$ 65.68	431,348	\$ 416
November 3, 2019 – November 30, 2019	372,090	\$ 67.26	347,411	\$ 392
December 1, 2019 – December 28, 2019	468,919	\$ 67.78	343,329	\$ 369
Total	<u>1,316,094</u>	<u>\$ 66.87</u>	<u>1,122,088</u>	

⁽¹⁾ Shares purchased that were not part of our publicly announced repurchase programs represent employee surrender 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.

	2019	2018	2017	2016	2015
	(In millions, except per share amounts)				
Revenue ⁽¹⁾	\$ 2,336.3	\$ 2,138.0	\$ 1,943.0	\$ 1,816.1	\$ 1,702.1
Income from operations ⁽¹⁾	491.8	396.2	324.0	244.9	285.4
Net income ^{(1) (2) (3)}	989.0	345.8	204.1	203.1	252.4
Net income per share-diluted ^{(1) (2) (3)}	3.53	1.23	0.73	0.70	0.81
Total assets ⁽³⁾	3,357.2	2,468.7	2,418.7	2,096.9	2,345.5
Debt ⁽⁴⁾	346.0	445.3	729.4	693.5	343.3
Stockholders’ equity ^{(5) (6)}	2,102.9	1,288.4	989.2	741.8	1,376.1

⁽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. Because of the adoption, results of operations for fiscal 2019 and 2018 are not comparable to the results of operations for the other fiscal years presented in the table above.

⁽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 2019, we completed intercompany transfers of certain intangible property rights to our Irish subsidiary which resulted in the establishment of a net deferred tax asset and the recognition of an income tax benefit of \$575.6 million.

⁽⁴⁾ During fiscal 2018, we prepaid the outstanding principal balance and accrued interest on our \$300.0 million 2019 Term Loan.

⁽⁵⁾ During fiscal 2016, we repurchased shares of our common stock for a total cost of \$960.3 million.

⁽⁶⁾ We have never declared or paid any cash dividends on our common stock.

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 develop electronic products. Our products and services are designed to give our customers a competitive edge in their development of electronic devices and systems, SoCs, ICs 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 Intelligent System Design™, is to provide the technologies necessary for our electronic system and semiconductor customers to develop electronic products across a variety of vertical markets including mobile, consumer, automotive, aerospace and defense, industrial and medical segments. Our products and services enable our customers to develop complex and innovative electronic products, so demand for our technology 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.

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.”

On January 15, 2020, we completed our acquisition of AWR. On February 6, 2020, we also acquired Integrand Software. The aggregate cash consideration for these acquisitions of approximately \$195 million will be allocated to the assets acquired and liabilities assumed based on their respective estimated fair values on the acquisition dates. These acquisitions enhance our technology portfolio to address growing RF/microwave design activity, driven by expanding use of 5G communications. We expect these acquisitions will result in more expenses, including amortization of acquired intangible assets, than revenue during fiscal 2020.

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

The discussion of our fiscal 2019 consolidated results of operations include year-over-year comparisons versus fiscal 2018 for revenue, cost of revenue, operating expenses, other non-operating expenses, income taxes and cash flows. For a discussion of the fiscal 2018 changes compared to fiscal 2017, see the discussion in Item 7, “Management’s Discussion and Analysis of Financial Condition and Results of Operations” in our Annual Report on Form 10-K for the fiscal year ended December 29, 2018, filed on February 27, 2019.

Results of operations for fiscal 2019, as compared to fiscal 2018, reflect the following:

- increased product and maintenance revenue resulting from overall growth in each geographic area, particularly in China and Other Asia;
- increased IP revenue;
- increased selling costs, including additional investment in technical sales support in response to our customers’ increasing technological requirements; and
- continued investment in research and development activities focused on creating and enhancing our products; and
- a non-cash tax benefit resulting from intercompany transfers of certain intangible property rights to our Irish subsidiary.

Our fiscal years are 52- or 53-week periods ending on the Saturday closest to December 31. Fiscal 2019 and 2018 were each 52-week fiscal years. Fiscal 2020 will be a 53-week fiscal year.

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.

Between 85% and 90% of our revenue is characterized as recurring revenue. Revenue characterized as recurring includes revenue recognized over time from our software arrangements, services, royalties, maintenance on IP licenses and hardware, and operating leases of hardware and revenue recognized at varying points in time over the term of our IP Access Agreements.

The remainder of our revenue is characterized as up-front revenue. Up-front revenue is primarily generated by our sales of emulation and prototyping hardware and individual IP licenses. The percentage of our recurring and up-front revenue may be impacted by delivery of hardware and IP products to our customers in any single fiscal period.

Revenue by Year

The following table shows our revenue for fiscal 2019 and 2018 and the change in revenue between years:

	2019	2018	Change	
			2019 vs. 2018	
(In millions, except percentages)				
Product and maintenance	\$ 2,204.6	\$ 1,997.9	\$ 206.7	10 %
Services	131.7	140.1	(8.4)	(6)%
Total revenue	\$ 2,336.3	\$ 2,138.0	\$ 198.3	9 %

Product and maintenance revenue increased during fiscal 2019, as compared to fiscal 2018, primarily because of increased investments by our customers in new, complex designs for their products that include the design of electronic systems for AI, 5G networks, aerospace and defense, automotive, cloud data center and other market segments. This demand has resulted in revenue growth in each geographic area and each of our five product categories. 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 2019 or 2018.

Revenue by Product Category

The following table shows the percentage of product and related maintenance revenue contributed by each of our five product categories and services during fiscal 2019 and 2018:

	2019	2018
Functional Verification, including hardware for emulation and prototyping	23%	24%
Digital IC Design and Signoff	30%	29%
Custom IC Design and Simulation	25%	26%
System Interconnect and Analysis	9%	9%
IP	13%	12%
Total	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.

Revenue by Geography

	2019	2018	Change	
			2019 vs. 2018	
	(In millions, except percentages)			
United States	\$ 982.4	\$ 924.6	\$ 57.8	6%
Other Americas	43.5	32.5	11.0	34%
China	241.5	210.2	31.3	15%
Other Asia	459.0	395.2	63.8	16%
Europe, Middle East and Africa	433.3	406.9	26.4	6%
Japan	176.6	168.6	8.0	5%
Total revenue	\$ 2,336.3	\$ 2,138.0	\$ 198.3	9%

For the primary factors contributing to the increase in revenue for each geographic area during fiscal 2019, as compared to fiscal 2018, see the general description under “Revenue by Year” above. Revenue in China increased during fiscal 2019, as compared to fiscal 2018, primarily due to an increase in revenue for IP, digital IC design and signoff, and system interconnect software products. Revenue growth in China slowed during the second half of fiscal 2019 because we were unable to deliver maintenance or support for certain customers in China due to the U.S. Department of Commerce’s designation of certain customers to the “Entity List.” We expect these restrictions will continue to impact revenue from certain customers in China in fiscal 2020.

Revenue by Geography as a Percent of Total Revenue

	2019	2018
United States	42%	43%
Other Americas	2%	2%
China	10%	10%
Other Asia	20%	18%
Europe, Middle East and Africa	18%	19%
Japan	8%	8%
Total	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

	2019	2018	Change	
			2019 vs. 2018	
	(In millions, except percentages)			
Product and maintenance	\$ 189.1	\$ 173.0	\$ 16.1	9 %
Services	77.2	85.7	(8.5)	(10)%
Total cost of revenue	\$ 266.3	\$ 258.7	\$ 7.6	3 %

The following table shows cost of revenue as a percentage of related revenue for fiscal 2019 and 2018:

	2019	2018
Product and maintenance	9%	9%
Services	59%	61%

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 2019 and 2018 is as follows:

	2019	2018	Change	
			2019 vs. 2018	
	(In millions, except percentages)			
Product and maintenance-related costs	\$ 148.1	\$ 133.8	\$ 14.3	11%
Amortization of acquired intangibles	41.0	39.2	1.8	5%
Total cost of product and maintenance	\$ 189.1	\$ 173.0	\$ 16.1	9%

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' IP or technology, and sell our products that include such acquired or licensed IP or technology.

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

	Change
	2019 vs. 2018
	(In millions)
Emulation and prototyping hardware costs	\$ 12.6
Salary, benefits and other employee-related costs	3.6
Other items	(1.9)
Total change in product and maintenance-related costs	\$ 14.3

Costs of emulation and prototyping increased during fiscal 2019, as compared to fiscal 2018, primarily due to increased reserves for inventory and the mix of products generating revenue.

Cost of Services

Cost of services primarily includes employee salary, benefits and other employee-related costs to perform work on revenue-generating projects and costs to maintain the infrastructure necessary to manage a services organization. Cost of services may fluctuate from period to period based on our utilization of design services engineers on revenue-generating projects rather than internal development projects.

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, foreign exchange rate movements, stock-based compensation, restructuring activities and the impact of our variable compensation programs that are driven by operating results.

Many of our operating expenses are transacted in various foreign currencies. We recognize lower expenses in periods when the United States dollar strengthens in value against other currencies and we recognize higher expenses when the United States dollar weakens against other currencies. For an additional description of how changes in foreign exchange rates affect our consolidated financial statements, see the discussion in Item 7A, "Quantitative and Qualitative Disclosures About Market Risk – Foreign Currency Risk."

Our operating expenses for fiscal 2019 and 2018 were as follows:

	2019	2018	Change	
			2019 vs. 2018	
	(In millions, except percentages)			
Marketing and sales	\$ 481.7	\$ 439.7	\$ 42.0	10%
Research and development	935.9	884.8	51.1	6%
General and administrative	139.8	133.4	6.4	5%
Total operating expenses	<u>\$ 1,557.4</u>	<u>\$ 1,457.9</u>	<u>\$ 99.5</u>	<u>7%</u>

Our operating expenses, as a percentage of total revenue, for fiscal 2019 and 2018 were as follows:

	2019	2018
Marketing and sales	21%	21%
Research and development	40%	41%
General and administrative	6%	6%
Total operating expenses	<u>67%</u>	<u>68%</u>

Marketing and Sales

The changes in marketing and sales expense were due to the following:

	Change	
	2019 vs. 2018	
	(In millions)	
Salary, benefits and other employee-related costs	\$	30.6
Stock-based compensation		4.4
Travel and sales meetings		2.8
Facilities and other infrastructure costs		2.4
Other items		1.8
Total change in marketing and sales expense	<u>\$</u>	<u>42.0</u>

Salary, benefits and other employee-related costs included in marketing and sales increased during fiscal 2019, as compared to fiscal 2018, primarily due to additional headcount as a result of hiring and an increase in employee incentive compensation.

Research and Development

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

	Change	
	2019 vs. 2018	
	(In millions)	
Salary, benefits and other employee-related costs	\$	33.6
Stock-based compensation		10.3
Depreciation		4.3
Product development costs		3.3
Other items		(0.4)
Total change in research and development expense	<u>\$</u>	<u>51.1</u>

Costs included in research and development increased during fiscal 2019, as compared to fiscal 2018, primarily due to additional headcount as a result of hiring.

General and Administrative

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

	Change 2019 vs. 2018 (In millions)
Professional services	\$ 4.5
University endowment	3.0
Acquisition-related costs	2.2
Bad debt expense	(4.5)
Other items	1.2
Total change in general and administrative expense	<u>\$ 6.4</u>

Professional services included in general and administrative costs increased during fiscal 2019, as compared to fiscal 2018, primarily due to consulting fees related to an internal realignment of our international operating structure. For further discussion regarding the realignment of our international operating structure, see Note 6 in the notes to the consolidated financial statements.

Amortization of Acquired Intangibles

	2019	2018	Change 2019 vs. 2018	
	(In millions, except percentages)			
Amortization of acquired intangibles	\$ 12.1	\$ 14.1	\$ (2.0)	(14)%

The decrease in amortization of acquired intangibles was due to certain intangible assets becoming fully amortized during fiscal 2019 and 2018.

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:

	2019	2018
	(In millions)	
Severance and benefits	\$ 8.6	\$ 10.3
Excess facilities	—	0.8
Total	<u>\$ 8.6</u>	<u>\$ 11.1</u>

For an additional description of our restructuring plans, see Note 13 in the notes to consolidated financial statements.

Interest Expense

Interest expense for fiscal 2019 and 2018 was comprised of the following:

	2019	2018
	(In millions)	
Contractual cash interest expense:		
2019 Term Loan	\$ —	\$ 5.3
2024 Notes	15.3	15.3
Revolving credit facility	2.4	1.1
Amortization of debt discount:		
2019 Term Loan	—	0.2
2024 Notes	0.7	0.7
Other	0.4	0.5
Total interest expense	\$ 18.8	\$ 23.1

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 (benefit) for income taxes and the effective tax rate for fiscal 2019 and 2018:

	2019	2018
	(In millions, except percentages)	
Provision (benefit) for income taxes	\$ (510.0)	\$ 30.6
Effective tax rate	(106.5)%	8.1%

During the fourth quarter of fiscal 2019, we completed intercompany transfers of certain intangible property rights to our Irish subsidiary, which resulted in the establishment of a net deferred tax asset and the recognition of an income tax benefit of \$575.6 million. We expect to be able to realize the deferred tax asset in future periods and did not provide for a valuation allowance.

This income tax benefit was partially offset by the federal, state and foreign income taxes on our fiscal 2019 income. We also recognized \$36.8 million of tax benefit related to stock-based compensation that vested or was exercised during the year.

Our provision for income taxes for fiscal 2018 primarily resulted from the federal, state and foreign income taxes on our 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. 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 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 2020 effective tax rate will be approximately 20%. We expect that our quarterly effective tax rates will vary from our fiscal 2020 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. 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 28, 2019	December 29, 2018	December 30, 2017	2019 vs. 2018	2018 vs. 2017
	(In millions)				
Cash and cash equivalents	\$ 705.2	\$ 533.3	\$ 688.1	\$ 171.9	\$ (154.8)
Net working capital	497.0	242.1	337.6	254.9	(95.5)

Cash and Cash Equivalents

As of December 28, 2019, our principal sources of liquidity consisted of \$705.2 million of cash and cash equivalents as compared to \$533.3 million as of December 29, 2018.

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

Approximately 43% of our cash and cash equivalents were held by our foreign subsidiaries as of December 28, 2019. Our cash and cash equivalents held by our foreign subsidiaries may vary from period to period due to the timing of collections and repatriation of foreign earnings. 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 increase in our net working capital as of December 28, 2019, as compared to December 29, 2018, is primarily due to improved results from operations, the timing of cash receipts from customers and disbursements made to vendors.

Cash Flows from Operating Activities

Cash flows from operating activities during fiscal 2019 and 2018 were as follows:

			Change
	2019	2018	2019 vs. 2018
	(In millions)		
Cash provided by operating activities	\$ 729.6	\$ 604.8	\$ 124.8

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 2019, as compared to fiscal 2018, 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 used for investing activities during fiscal 2019 and 2018 were as follows:

			Change
	2019	2018	2019 vs. 2018
	(In millions)		
Cash used for investing activities	\$ (105.7)	\$ (173.8)	\$ 68.1

The decrease in cash used for investing activities during fiscal 2019, as compared to fiscal 2018, was primarily due to a decrease in payments to acquire equity instruments of other entities. 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. During the first quarter of fiscal 2020, we completed two business combinations for cash consideration of approximately \$195 million, which will be classified as cash used for investing activities.

Cash Flows from Financing Activities

Cash flows used for financing activities during fiscal 2019 and 2018 were as follows:

	2019	2018	Change 2019 vs. 2018
	(In millions)		
Cash used for financing activities	\$ (443.9)	\$ (567.9)	\$ 124.0

The decrease in cash used for financing activities during fiscal 2019, as compared to fiscal 2018, was primarily due to a decrease in net cash paid for debt arrangements, partially offset by an increase in payments for repurchases of our common stock.

Other Factors Affecting Liquidity and Capital Resources

Stock Repurchase Program

In February 2019, our Board of Directors authorized the repurchase of \$500 million of our common stock. 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. As of December 28, 2019, approximately \$369.0 million remained available under this authorization. See Part II, Item 5, “Market for Registrant’s Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities” for additional information.

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 28, 2019, there were no 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 28, 2019, 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 28, 2019 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	\$ 124.8	\$ 29.3	\$ 50.1	\$ 26.0	\$ 19.4
Purchase obligations ⁽¹⁾	42.7	20.3	16.5	5.6	0.3
Long-term debt	350.0	—	—	350.0	—
Contractual interest payments	77.6	15.8	31.2	30.6	—
Current income tax payable	9.5	9.5	—	—	—
Other long-term contractual obligations ⁽²⁾	38.6	—	19.6	4.7	14.3
Total	\$ 643.2	\$ 74.9	\$ 117.4	\$ 416.9	\$ 34.0

⁽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 28, 2019 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 \$16.6 million will be paid or settled within 1 to 3 years, \$2.0 million within 3 to 5 years and \$0.1 million in more than 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 28, 2019, 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.

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 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.

During fiscal 2019, we completed intercompany transfers of certain intangible property rights to our Irish subsidiary, which resulted in the establishment of a deferred tax asset and the recognition of an income tax benefit of \$575.6 million. To determine the value of the deferred tax asset, we were required to make significant estimates in determining the fair value of the transferred IP rights. These estimates included, but are not limited to, the income and cash flows that the IP rights are expected to generate in the future, the appropriate discount rate to apply to the income and cash flow projections, and the useful lives of the IP rights. These estimates are inherently uncertain and unpredictable, and if different estimates were used, it would impact the fair value of the IP rights and the related value of the deferred tax asset and the income tax benefit recognized in fiscal 2019 and in future periods when the deferred tax asset is realized. In addition, we reviewed the need to establish a valuation allowance on the deferred tax asset of \$575.6 million by evaluating whether there is a greater than 50% likelihood that some portion or all of the deferred tax asset will not be realized. To make this judgment, we must make significant estimates and predictions of the amount and category of future taxable income from various sources and weigh all available positive and negative evidence about these possible sources of taxable income. We give greater weight to evidence that can be objectively verified. Based on our evaluation and weighting of the positive and negative evidence, we concluded that it is greater than 50% likely that the deferred tax asset of \$575.6 million will be realized in future periods and that a valuation allowance was not currently required. If, in the future, we evaluate that this deferred tax asset is not likely to be realized, an increase in the related valuation allowance could result in a material income tax expense in the period such determination is made.

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.

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

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 is effective for us in the first quarter of fiscal 2020. The adoption of this standard will not have a significant impact on our consolidated financial statements or 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. The new guidance must be applied on a prospective basis. The adoption of this standard will not have a significant impact on our consolidated financial statements or the related disclosures.

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. The adoption of this standard will not have a significant impact on our consolidated financial statements or the related disclosures.

Implementation Costs Incurred in a Cloud Computing Arrangement

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 aligns the treatment of implementation costs incurred by customers in cloud computing arrangements that are service contracts with the treatment of similar costs incurred to develop or obtain internal-use software. Under the new standard, implementation costs are deferred and presented in the same line item as a prepayment of related arrangement fees. The deferred costs are recognized over the term of the arrangement in the same line item as the related fees of the arrangement. The new standard is effective for us in the first quarter of fiscal 2020 and will be applied prospectively to costs incurred after the date of adoption. The adoption of this standard will not have a significant impact on our consolidated financial statements or the related disclosures.

Accounting for Income Taxes

In December 2019, the FASB issued ASU 2019-12, "Simplifying the Accounting for Income Taxes," which simplifies the accounting for income taxes, eliminates certain exceptions within ASC 740, Income Taxes, and clarifies certain aspects of the current guidance to promote consistency among reporting entities. The new standard is effective for fiscal years beginning after December 15, 2021. Most amendments within the standard are required to be applied on a prospective basis, while certain amendments must be applied on a retrospective or modified retrospective basis. We are currently evaluating the impacts of the provisions of this standard on our financial condition, results of operations and cash flows.

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 28, 2019. 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 2020.

	Notional Principal	Weighted Average Contract Rate
	(In millions)	
Forward Contracts:		
European Union euro	\$ 124.6	0.90
British pound	84.9	0.77
Israeli shekel	69.4	3.48
Japanese yen	35.8	108.94
Swedish krona	32.5	9.55
Chinese renminbi	30.7	7.02
Indian rupee	24.4	72.16
Taiwan dollar	10.0	30.14
Singapore dollar	7.4	1.36
Other	5.6	N/A
Total	<u>\$ 425.3</u>	
Estimated fair value	<u>\$ 3.6</u>	

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.

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 28, 2019.

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 28, 2019, there were no 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 8 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

	2019				2018			
	4 th	3 rd	2 nd	1 st	4 th	3 rd	2 nd	1 st
	(In thousands, except per share amounts)							
Revenue	\$ 599,555	\$ 579,603	\$ 580,419	\$ 576,742	\$ 569,850	\$ 532,468	\$ 518,391	\$ 517,313
Cost of revenue	73,328	60,975	61,469	70,585	76,124	60,454	58,960	63,209
Net income ⁽¹⁾	659,675	101,514	107,235	120,555	98,425	99,318	75,149	72,885
Net income per share – basic ⁽¹⁾	2.41	0.37	0.39	0.44	0.36	0.36	0.27	0.27
Net income per share – diluted ⁽¹⁾	2.36	0.36	0.38	0.43	0.35	0.35	0.27	0.26

⁽¹⁾ During the fourth quarter of fiscal 2019, we completed intercompany transfers of certain intangible property rights to our Irish subsidiary, which resulted in the establishment of a net deferred tax asset and the recognition of an income tax benefit of \$575.6 million. For further discussion regarding the realignment of our international operating structure, see Note 6 in the notes to the consolidated financial statements.

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 28, 2019.

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 28, 2019, 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 28, 2019 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 28, 2019. 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 28, 2019, 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.

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 - Delinquent Section 16(a) Reports” in Cadence’s definitive proxy statement for its 2020 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 2020 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 2020 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 2019,” “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 2020 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 2020 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 2020 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 2019 and 2018” in Cadence’s definitive proxy statement for its 2020 Annual Meeting of Stockholders.

PART IV.**Item 15. Exhibits and Financial Statement Schedules**Page

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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

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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

To the Stockholders and Board of Directors
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 28, 2019 and December 29, 2018, 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 28, 2019, and the related notes (collectively, the consolidated financial statements). We also have audited the Company's internal control over financial reporting as of December 28, 2019, 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 28, 2019 and December 29, 2018, and the results of its operations and its cash flows for each of the years in the three-year period ended December 28, 2019, 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 28, 2019 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 changed its method of accounting for leases as of December 30, 2018, due to the adoption of Financial Accounting Standards Board ("FASB") Accounting Standards Update (ASU) 2016-02, *Leases*, and changed its method of accounting for revenue recognition as of December 31, 2017, due to the adoption of FASB ASU 2014-09, *Revenue from Contracts with Customers*.

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.

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

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that: (1) relate to accounts or disclosures that are material to the consolidated financial statements and (2) involved our especially challenging, subjective, or complex judgments. The communication of critical audit matters does not alter in any way our opinion on the consolidated financial statements, taken as a whole, and we are not, by communicating the critical audit matters below, providing separate opinions on the critical audit matters or on the accounts or disclosures to which they relate.

Evaluation of the allocation of the transaction price to distinct performance obligations

As discussed in Notes 2 and 5 to the consolidated financial statements, the Company's contracts with customers often include promises to transfer to a customer multiple software or intellectual Property (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. The accounting for contracts with multiple performance obligations also requires the contract's transaction price to be allocated to each distinct performance obligation based on relative stand-alone selling price (SSP). Judgment is required to determine SSP for each distinct performance obligation as the Company rarely licenses or sells products on a standalone basis. In instances where the SSP is not directly observable because the Company does not sell the license, product or service separately, the Company determines the SSP using information that maximizes the use of observable inputs and may include market conditions.

We identified the evaluation of the allocation of the transaction price to distinct performance obligations as a critical audit matter. Specifically, with significant software license contracts that include multiple performance obligations, a high degree of auditor judgment was required to evaluate the identification of distinct performance obligations. Revenue for each of the distinct performance obligations may be recognized at different points of time or over different periods of time. In addition, evaluating SSP of the software licenses was challenging as the Company rarely licenses its software on a standalone basis and therefore a higher degree of auditor judgment was required to assess the relevance and reliability of indirect market and observable data used by the Company to determine the SSP. The allocation of the transaction price was sensitive to the determination of the SSP of software licenses.

The primary procedures we performed to address this critical audit matter included the following: We tested certain internal controls related to the identification of distinct performance obligations and the allocation of the transaction price to the performance obligations based on SSP. We selected certain sales contracts and obtained and read contract source documents. We also confirmed the terms of certain arrangements with customers. We then assessed that all distinct performance obligations were properly identified and that the total transaction price was allocated to each distinct performance obligation based on SSPs that relied on and maximized the use of observable inputs. For certain contracts that include a software license, we developed an expectation of the allocation of the transaction price and compared it to the Company's allocation.

Evaluation of the intercompany transfers of intangible property rights

As discussed in Note 6 to the consolidated financial statements, the Company completed intercompany transfers of certain intangible property rights to its Irish subsidiary during fiscal 2019. These intercompany transfers resulted in the establishment of a deferred tax asset and the recognition of an income tax benefit of \$575.6 million. The Company expects to be able to realize the deferred tax asset in future years based on projections of future taxable income and did not provide for a valuation allowance.

We identified the evaluation of the intercompany transfers of intangible property rights to the Irish subsidiary as a critical audit matter. A high degree of auditor judgment was required to evaluate the estimated fair value of the transferred intangible property rights pursuant to the relevant tax regulations. Reasonably possible changes to the key assumptions, in particular the revenue growth rate, operating margin, discount rate and terminal growth rate, could have a significant impact on the fair value. The Company's projections of future taxable income in Ireland, which supports the recognition of the deferred tax asset, are based on these same key assumptions.

The primary procedures we performed to address this critical audit matter included the following: We tested certain internal controls over the Company's estimate of the fair value of the transferred intangible property rights. This included controls over the development of the revenue growth rate, operating margin, discount rate and terminal growth rate assumptions. We compared the revenue growth rate and operating margin estimates to historical actual results and compared the estimates to analyst and industry reports. We involved valuation professionals with specialized skills and knowledge who assisted in (1) evaluating the Company's discount rate by comparing it to a discount rate range that was independently developed using publicly available market data for comparable entities, and (2) developing an estimate of the fair value of the intangible property rights using the Company's cash flow assumptions and an independently developed discount rate and terminal rate and compared the result to the Company's fair value estimate.

We also tested certain internal controls over the assessment of the recoverability of the resulting deferred tax asset, including controls over the determination of future taxable income in Ireland. We evaluated management's ability to accurately estimate taxable income in Ireland by comparing the estimates to historical taxable income in Ireland before the transfers of intangible property rights, forecasted taxable income from the transferred intangible property rights, and management's history of carrying out its stated plans. We involved income tax professionals with specialized skills and knowledge who assisted in assessing the Company's application of the relevant tax regulations.

/s/ KPMG LLP

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

Santa Clara, California
February 24, 2020

CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED BALANCE SHEETS
December 28, 2019 and December 29, 2018
(In thousands, except par value)

	As of	
	December 28, 2019	December 29, 2018
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 705,210	\$ 533,298
Receivables, net	304,546	297,082
Inventories	55,802	28,162
Prepaid expenses and other	103,785	92,550
Total current assets	1,169,343	951,092
Property, plant and equipment, net	275,855	252,630
Goodwill	661,856	662,272
Acquired intangibles, net	172,375	225,457
Deferred taxes	732,367	154,894
Other assets	345,429	222,309
Total assets	\$ 3,357,225	\$ 2,468,654
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Revolving credit facility	\$ —	\$ 100,000
Accounts payable and accrued liabilities	316,908	256,526
Current portion of deferred revenue	355,483	352,456
Total current liabilities	672,391	708,982
Long-term liabilities:		
Long-term portion of deferred revenue	73,400	48,718
Long-term debt	346,019	345,291
Other long-term liabilities	162,521	77,262
Total long-term liabilities	581,940	471,271
Commitments and contingencies (Notes 6, 7 and 18)		
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: 279,855 and 280,015, respectively	2,046,237	1,936,124
Treasury stock, at cost; 49,304 shares and 49,144 shares, respectively	(1,668,105)	(1,395,652)
Retained earnings	1,761,688	772,709
Accumulated other comprehensive loss	(36,926)	(24,780)
Total stockholders' equity	2,102,894	1,288,401
Total liabilities and stockholders' equity	\$ 3,357,225	\$ 2,468,654

See notes to consolidated financial statements.

CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED INCOME STATEMENTS
For the three fiscal years ended December 28, 2019
(In thousands, except per share amounts)

	2019	2018	2017
Revenue:			
Product and maintenance	\$ 2,204,615	\$ 1,997,887	\$ 1,813,987
Services	131,704	140,135	129,045
Total revenue	<u>2,336,319</u>	<u>2,138,022</u>	<u>1,943,032</u>
Costs and expenses:			
Cost of product and maintenance	189,146	173,011	156,676
Cost of service	77,211	85,736	80,714
Marketing and sales	481,673	439,669	419,161
Research and development	935,938	884,816	804,223
General and administrative	139,806	133,406	134,181
Amortization of acquired intangibles	12,128	14,086	14,716
Restructuring and other charges	8,621	11,089	9,406
Total costs and expenses	<u>1,844,523</u>	<u>1,741,813</u>	<u>1,619,077</u>
Income from operations	491,796	396,209	323,955
Interest expense	(18,829)	(23,139)	(25,664)
Other income, net	6,001	3,320	16,755
Income before provision (benefit) for income taxes	478,968	376,390	315,046
Provision (benefit) for income taxes	(510,011)	30,613	110,945
Net income	<u>\$ 988,979</u>	<u>\$ 345,777</u>	<u>\$ 204,101</u>
Net income per share – basic	<u>\$ 3.62</u>	<u>\$ 1.26</u>	<u>\$ 0.75</u>
Net income per share – diluted	<u>\$ 3.53</u>	<u>\$ 1.23</u>	<u>\$ 0.73</u>
Weighted average common shares outstanding – basic	<u>273,239</u>	<u>273,729</u>	<u>272,097</u>
Weighted average common shares outstanding – diluted	<u>280,515</u>	<u>281,144</u>	<u>280,221</u>

See notes to consolidated financial statements.

CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME
For the three fiscal years ended December 28, 2019
(In thousands)

	2019	2018	2017
Net income	\$ 988,979	\$ 345,777	\$ 204,101
Other comprehensive income (loss), net of tax effects:			
Foreign currency translation adjustments	(8,642)	(17,885)	19,394
Changes in unrealized holding gains or losses on available-for-sale securities, net of reclassification adjustments for realized gains and losses	—	—	1,712
Changes in defined benefit plan liabilities	(3,504)	(627)	424
Total other comprehensive income (loss), net of tax effects	(12,146)	(18,512)	21,530
Comprehensive income	<u>\$ 976,833</u>	<u>\$ 327,265</u>	<u>\$ 225,631</u>

See notes to consolidated financial statements.

CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
For the three fiscal years ended December 28, 2019
(In thousands)

	Common Stock			Retained Earnings (Accumulated Deficit)	Accumulated Other Comprehensive Income (Loss)	Total
	Shares	Par Value and Capital in Excess of Par	Treasury Stock			
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	<u>282,067</u>	<u>\$ 1,829,950</u>	<u>\$ (1,178,121)</u>	<u>\$ 341,003</u>	<u>\$ (3,630)</u>	<u>\$ 989,202</u>
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)
Stock-based compensation expense	—	167,715	—	—	—	\$ 167,715
Balance, December 29, 2018	<u>280,015</u>	<u>\$ 1,936,124</u>	<u>\$ (1,395,652)</u>	<u>\$ 772,709</u>	<u>\$ (24,780)</u>	<u>\$ 1,288,401</u>
Net income	—	—	—	988,979	—	\$ 988,979
Other comprehensive loss, net of taxes	—	—	—	—	(12,146)	\$ (12,146)
Purchase of treasury stock	(4,841)	—	(306,148)	—	—	\$ (306,148)
Issuance of common stock and reissuance of treasury stock under equity incentive plans, net of forfeitures	5,923	(57,763)	110,604	—	—	\$ 52,841
Stock received for payment of employee taxes on vesting of restricted stock	(1,242)	(13,671)	(76,909)	—	—	\$ (90,580)
Stock-based compensation expense	—	181,547	—	—	—	\$ 181,547
Balance, December 28, 2019	<u>279,855</u>	<u>\$ 2,046,237</u>	<u>\$ (1,668,105)</u>	<u>\$ 1,761,688</u>	<u>\$ (36,926)</u>	<u>\$ 2,102,894</u>

See notes to consolidated financial statements.

CADENCE DESIGN SYSTEMS, INC.
CONSOLIDATED STATEMENTS OF CASH FLOWS
For the three fiscal years ended December 28, 2019
(In thousands)

	2019	2018	2017
Cash and cash equivalents at beginning of year	\$ 533,298	\$ 688,087	\$ 465,232
Cash flows from operating activities:			
Net income	988,979	345,777	204,101
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation and amortization	122,789	118,721	115,524
Amortization of debt discount and fees	1,001	1,196	1,211
Stock-based compensation	181,547	167,715	130,023
(Gain) loss on investments, net	4,090	(2,732)	(9,454)
Deferred income taxes	(576,738)	(11,676)	79,934
Provisions for losses on receivables	632	5,102	2,623
ROU asset amortization and change in operating lease liabilities	562	—	—
Other non-cash items	428	2,607	653
Changes in operating assets and liabilities, net of effect of acquired businesses:			
Receivables	(4,718)	(87,083)	(31,032)
Inventories	(33,024)	752	5,034
Prepaid expenses and other	(11,031)	(19,622)	(25,793)
Other assets	(8,011)	(14,606)	(26,751)
Accounts payable and accrued liabilities	33,915	1,553	(25,987)
Deferred revenue	27,498	100,696	33,614
Other long-term liabilities	1,681	(3,649)	17,040
Net cash provided by operating activities	<u>729,600</u>	<u>604,751</u>	<u>470,740</u>
Cash flows from investing activities:			
Proceeds from the sale of marketable investments	—	—	833
Purchases of non-marketable investments	(33,717)	(115,839)	—
Proceeds from the sale of non-marketable investments	2,952	3,497	9,108
Purchases of property, plant and equipment	(74,605)	(61,503)	(57,901)
Cash paid in business combinations and asset acquisitions, net of cash acquired	(338)	—	(143,249)
Net cash used for investing activities	<u>(105,708)</u>	<u>(173,845)</u>	<u>(191,209)</u>
Cash flows from financing activities:			
Proceeds from revolving credit facility	150,000	100,000	135,000
Payment on revolving credit facility	(250,000)	(85,000)	(100,000)
Principal payments on term loan	—	(300,000)	—
Payment of debt issuance costs	—	—	(793)
Proceeds from issuance of common stock	52,842	40,908	48,965
Stock received for payment of employee taxes on vesting of restricted stock	(90,580)	(69,921)	(57,161)
Payments for repurchases of common stock	(306,148)	(250,059)	(100,025)
Change in book overdraft	—	(3,867)	3,867
Net cash used for financing activities	<u>(443,886)</u>	<u>(567,939)</u>	<u>(70,147)</u>
Effect of exchange rate changes on cash and cash equivalents	(8,094)	(17,756)	13,471
Increase (decrease) in cash and cash equivalents	171,912	(154,789)	222,855
Cash and cash equivalents at end of year	<u>\$ 705,210</u>	<u>\$ 533,298</u>	<u>\$ 688,087</u>
Supplemental cash flow information:			
Cash paid for interest	\$ 17,842	\$ 23,018	\$ 24,160
Cash paid for income taxes, net	41,946	68,040	59,072

See notes to consolidated financial statements.

CADENCE DESIGN SYSTEMS, INC.
NOTES TO CONSOLIDATED FINANCIAL STATEMENTS
For the three fiscal years ended December 28, 2019

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 devices and systems, systems-on-chips (“SoCs”) integrated circuits (“ICs”) 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.

Cadence’s fiscal years are 52- or 53-week periods ending on the Saturday closest to December 31. Fiscal 2019, 2018 and 2017 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

Prior period balances for deferred tax assets in Cadence’s consolidated balance sheets have been reclassified to conform to the current period presentation.

Effective the first day of fiscal 2019, Cadence adopted multiple new accounting standards. Prior periods were not retrospectively restated, so the consolidated balance sheet as of December 28, 2019 was prepared using accounting standards that were different than those in effect as of December 29, 2018. Therefore, the consolidated balance sheets as of December 28, 2019 and December 29, 2018 are not directly comparable.

Cadence also adopted multiple new accounting standards on the first day of fiscal 2018, including standards related to revenue recognition and accounting for income taxes. Prior periods were not retrospectively restated, so the consolidated balance sheets as of December 28, 2019 and December 29, 2018, are not directly comparable to the consolidated balance sheet as of December 30, 2017, nor are the results of operations for fiscal 2019 and fiscal 2018 directly comparable to the results of operations for fiscal 2017.

Recently Adopted Accounting Standards

Leases

In February 2016, the Financial Accounting Standards Board (“FASB”) issued accounting standards update (“ASU”) 2016-02, “Leases (Topic 842)” (“Topic 842”), which requires the recognition of right-of-use (“ROU”) assets and lease liabilities on the balance sheet. The most prominent of the changes in the standard is the recognition of ROU assets and lease liabilities by lessees for those leases classified as operating leases.

Cadence adopted the new standard on December 30, 2018, the first day of fiscal 2019, and used the modified retrospective approach with the effective date as the date of initial application. Consequently, prior period balances and disclosures have not been restated. Cadence elected certain practical expedients, which among other things, allowed it to carry forward prior conclusions about lease identification and classification.

Adoption of the standard resulted in the balance sheet recognition of additional lease assets and lease liabilities of approximately \$80 million; however, the adoption of the standard did not have an impact on Cadence’s beginning retained earnings, results from operations or cash flows. Additionally, the new standard did not have a material impact on the consolidated financial statements for arrangements in which Cadence is the lessor. For additional information regarding Cadence’s leases, see Note 7 in the notes to consolidated financial statements.

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 U.S. Tax Cuts and Jobs Act (the "Tax Act") on items within accumulated other comprehensive income to retained earnings. This standard became effective for Cadence on December 30, 2018, the first day of fiscal 2019. The adoption of this standard did not have a material impact on Cadence's consolidated financial statements.

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 general and administrative 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	Up to 32 years
Furniture and fixtures	3-5 years
Equipment	3-5 years

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 \$2.4 million, \$3.6 million, and \$2.2 million during fiscal 2019, 2018 and 2017, respectively.

Cadence recorded depreciation and amortization expense of \$63.3 million, \$60.4 million and \$52.9 million during fiscal 2019, 2018 and 2017, 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 2019, 2018 and 2017 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 were \$31.6 million and \$31.2 million as of December 28, 2019, and December 29, 2018, respectively, and are included in other assets in Cadence's consolidated balance sheet. Amortization of these assets was \$29.4 million and \$26.5 million during fiscal 2019 and 2018, respectively, 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 years 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.

Leases

Lessee Considerations

Cadence has operating leases primarily consisting of facilities with remaining lease terms of approximately one year to eleven years. Cadence has options to terminate many of its leases early. The lease term represents the period up to the early termination date unless it is reasonably certain that Cadence will not exercise the early termination option. For certain leases, Cadence has options to extend the lease term for additional periods ranging from one year to ten years. These renewal options are not considered in the remaining lease term unless it is reasonably certain that Cadence will exercise such options.

At inception of a contract, Cadence determines an arrangement contains a lease if the arrangement conveys the right to use an identified asset and Cadence obtains substantially all of the economic benefits from the asset and has the ability to direct the use of the asset. Leases with an initial term of twelve months or less are not recorded on the balance sheet. For lease agreements entered into or reassessed after the adoption of Topic 842, Cadence combines the lease and non-lease components in determining the lease liabilities and ROU assets. Non-lease components primarily include common-area maintenance and other management fees.

Operating lease expense is generally recognized evenly over the term of the lease. Payments under Cadence's lease agreements are primarily fixed; however, certain agreements contain rental payments that are adjusted periodically based on changes in consumer price and other indices. Changes to payments resulting from changes in indices are expensed as incurred and not included in the measurement of lease liabilities and ROU assets. Cadence's lease agreements do not provide an implicit borrowing rate, therefore an internal incremental borrowing rate is determined based on information available at lease commencement date for purposes of determining the present value of lease payments. The incremental borrowing rate represents a comparable rate to borrow on a collateralized basis over a similar term and in the economic environment where the leased asset is located. Cadence used the incremental borrowing rate on the effective date for all leases that commenced prior to that date.

Lessor Considerations

Although most of Cadence's revenue from its hardware business comes from sales of hardware, Cadence also leases its hardware products to some customers. Cadence determines the existence of a lease when the customer controls the use of the identified hardware for a period of time defined in the lease agreement.

Cadence's leases range in duration up to three years with payments generally collected in equal quarterly installments. Cadence's leases do not include termination rights or variable pricing and typically do not include purchase rights at the end of the lease. Short-term leases are usually less than two years and are classified as operating leases with revenue recognized and depreciation expensed on a straight-line basis over the term of the lease. Long-term leases are typically for three years and are classified as sales-type leases with revenue and cost of sales recognized upon delivery.

Cadence's operating leases and sales-type leases contain both lease and non-lease components. Because the pattern of revenue recognition is the same for both the lease and non-lease components in Cadence's operating leases, Cadence has elected the practical expedient to not separate lease and related non-lease components and accounts for both components under Topic 842. Cadence allocates value to the lease and non-lease components in its sales-type leases using standalone selling prices ("SSPs") similar to those used under ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," the current accounting standard governing revenue recognition. When Cadence leases its hardware in the same arrangement as software or IP, Cadence allocates value to each performance obligation using SSPs.

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.

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 as a component of retained earnings by Cadence on the reissuance of treasury stock during fiscal 2019, 2018 or 2017.

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 delivered to customers over time accounted for approximately 85% of Cadence's total revenue for fiscal 2019 and 2018.

Product and maintenance revenue includes Cadence's licenses of software and IP, sales of emulation hardware 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.

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 SSP. 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 its 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.

Some customers enter into a non-cancellable IP Access Agreement ("IPAA") whereby the customer commits to a fixed dollar amount over a specified period of time that can be used to purchase from a list of IP products or services. These arrangements do not meet the definition of a revenue contract until the customer executes a separate selection form to identify the products and services that they are purchasing. Each separate selection form under the IPAA is treated as an individual contract and accounted for based on the respective performance obligations.

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.

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 \$8.4 million, \$7.6 million and \$7.4 million during fiscal 2019, 2018 and 2017, 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, 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 accounts for the United States global intangible low-taxed income as a period expense.

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.

NOTE 3. DEBT

Cadence's outstanding debt as of December 28, 2019 and December 29, 2018 was as follows:

	December 28, 2019			December 29, 2018		
	Principal	Unamortized Discount	Carrying Value	Principal	Unamortized Discount	Carrying Value
	(In thousands)					
Revolving Credit Facility	\$ —	\$ —	\$ —	\$ 100,000	\$ —	\$ 100,000
2024 Notes	350,000	(3,981)	346,019	350,000	(4,709)	345,291
Total outstanding debt	\$ 350,000	\$ (3,981)	\$ 346,019	\$ 450,000	\$ (4,709)	\$ 445,291

Revolving Credit Facility

In January 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. 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 28, 2019 and December 29, 2018, Cadence was in compliance with all financial covenants associated with the revolving credit facility.

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 fair value of the 2024 Notes was approximately \$378.4 as of December 28, 2019.

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.

NOTE 4. RECEIVABLES, NET

Cadence's current and long-term receivables balances as of December 28, 2019 and December 29, 2018 were as follows:

	As of	
	December 28, 2019	December 29, 2018
(In thousands)		
Accounts receivable	\$ 179,250	\$ 164,223
Unbilled accounts receivable	126,165	136,795
Long-term receivables	3,082	5,972
Total receivables	308,497	306,990
Less allowance for doubtful accounts	(869)	(3,936)
Total receivables, net	<u>\$ 307,628</u>	<u>\$ 303,054</u>

Cadence's customers are primarily concentrated within the semiconductor and electronics systems industries. As of December 28, 2019, no customer accounted for 10% or more of Cadence's total receivables. As of December 29, 2018, one customer accounted for 11% of Cadence's total receivables.

Allowance for doubtful accounts

Cadence's provisions for losses on its accounts receivable during fiscal 2019, 2018 and 2017 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 28, 2019	\$ 3,936	\$ 632	\$ (3,699)	\$ 869
Year ended December 29, 2018	—	5,102	(1,166)	3,936
Year ended December 30, 2017	\$ —	\$ 2,623	\$ (2,623)	\$ —

NOTE 5. REVENUE

Cadence combines its products into five categories related to major design activities. On the first day of fiscal 2018, Cadence adopted ASU 2014-09, "Revenue from Contracts with Customers (Topic 606)," which provided a new basis of accounting for its revenue arrangements. Because of the adoption, revenue for fiscal 2019 and 2018 is not directly comparable to revenue for fiscal 2017. The following table shows the percentage of product and related maintenance revenue contributed by each of Cadence's five product categories and services for fiscal 2019 and 2018:

	2019	2018	2017
Functional Verification, including Emulation and Prototyping Hardware*	24%	24%	22%
Digital IC Design and Signoff	29%	29%	29%
Custom IC Design and Simulation	25%	26%	27%
System Interconnect and Analysis	9%	9%	10%
IP	13%	12%	12%
Total	<u>100%</u>	<u>100%</u>	<u>100%</u>

* Includes immaterial amount of revenue accounted for under leasing arrangements.

Revenue by product category 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.

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.

The accounting for contracts with multiple performance obligations requires the contract's transaction price to be allocated to each distinct performance obligation based on relative SSP. Judgment is required to determine SSP for each distinct performance obligation because Cadence rarely licenses or sells products on a standalone basis. 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 with the same term. 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 the balance sheet date 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 28, 2019 and December 29, 2018 were as follows:

	As of	
	December 28, 2019	December 29, 2018
	(In thousands)	
Contract assets	\$ 10,209	\$ 10,055
Deferred revenue	428,883	401,174

Cadence recognized revenue of \$311.8 million during fiscal 2019, and \$284.3 million during fiscal 2018, that was included in the deferred revenue balance at the beginning of each fiscal year. All other activity in deferred revenue is due to the timing of invoices in relation to the timing of revenue as described above.

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.

Remaining Performance Obligations

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. Cadence has elected to exclude the potential future royalty receipts from the remaining performance obligations. Contracted but unsatisfied performance obligations were approximately \$3.6 billion as of December 28, 2019, which included \$205.7 million of non-cancellable IPAA commitments from customers where actual product selection and quantities of specific products or services are to be determined by customers at a later date. Contracted but unsatisfied performance obligations were approximately \$3.0 billion as of December 29, 2018, which included \$60.0 million of non-cancellable IPAA commitments from customers. As of December 28, 2019, Cadence expected to recognize approximately 55% of the revenue included in the contracted but unsatisfied performance obligations, excluding non-cancellable IPAA commitments, over the next 12 months and the remainder thereafter.

Cadence recognized revenue of \$40.4 million during fiscal 2019, and \$34.3 million during fiscal 2018, 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 (benefit) for income taxes included income from the United States and from foreign subsidiaries for fiscal 2019, 2018 and 2017, was as follows:

	2019	2018	2017
	(In thousands)		
United States	\$ 139,306	\$ 58,963	\$ 81,619
Foreign subsidiaries	339,662	317,427	233,427
Total income before provision (benefit) for income taxes	\$ 478,968	\$ 376,390	\$ 315,046

Cadence's provision (benefit) for income taxes was comprised of the following items for fiscal 2019, 2018 and 2017:

	2019	2018	2017
	(In thousands)		
Current:			
Federal	\$ 15,282	\$ 902	\$ (2,193)
State and local	2,716	(1,270)	(2,097)
Foreign	48,729	42,657	35,301
Total current	66,727	42,289	31,011
Deferred:			
Federal	(9,001)	(10,324)	76,494
State and local	6,593	886	5,571
Foreign	(574,330)	(2,238)	(2,131)
Total deferred	(576,738)	(11,676)	79,934
Total provision (benefit) for income taxes	\$ (510,011)	\$ 30,613	\$ 110,945

During the fourth quarter of fiscal 2019, Cadence completed intercompany transfers of certain intangible property rights to its Irish subsidiary, which resulted in the establishment of a deferred tax asset and the recognition of an income tax benefit of \$575.6 million. Cadence expects to be able to realize the Irish deferred tax asset in future years and did not provide for a valuation allowance. Cadence considered all available positive and negative evidence, including its past operating results, forecasted earnings, future taxable income, and any prudent and feasible tax planning strategies in making this determination.

The U.S. Tax Cuts and Jobs Act (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.

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 (benefit) for income taxes for fiscal 2019 and fiscal 2018 and of 35% to income before provision for income taxes for fiscal 2017 as follows:

	2019	2018	2017
	(In thousands)		
Provision computed at federal statutory income tax rate	\$ 100,583	\$ 79,042	\$ 110,266
State and local income tax, net of federal tax effect	23,221	15,540	5,867
Intercompany transfers of intangible property rights	(575,618)	—	—
Foreign income tax rate differential	(37,786)	(37,031)	(65,296)
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	57,225	28,846	—
Stock-based compensation	(29,785)	(13,539)	(24,455)
Change in deferred tax asset valuation allowance	16,796	13,234	4,689
Tax credits	(87,793)	(72,815)	(26,789)
Non-deductible research and development expense	4,363	4,700	—
Tax effects of intra-entity transfer of assets	895	79	(8,450)
Domestic production activity deduction	—	—	(2,474)
Withholding taxes	15,865	11,535	11,225
Tax settlements, foreign	458	—	3,086
Increase (decrease) in unrecognized tax benefits	(1,303)	(1,545)	4,054
Other	2,868	3,976	6,834
Provision (benefit) for income taxes	<u>\$ (510,011)</u>	<u>\$ 30,613</u>	<u>\$ 110,945</u>
Effective tax rate	(106)%	8%	35%

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 the Securities and Exchange Commission Staff Accounting Bulletin No. 118, this amount was updated to \$65.8 million of expense during fiscal 2018.

The components of deferred tax assets and liabilities consisted of the following as of December 28, 2019 and December 29, 2018:

	As of	
	December 28, 2019	December 29, 2018
(In thousands)		
Deferred tax assets:		
Tax credit carryforwards	\$ 206,008	\$ 197,524
Reserves and accruals	47,562	43,522
Intangible assets	583,323	12,096
Capitalized research and development expense for income tax purposes	18,477	6,975
Operating loss carryforwards	6,201	15,347
Deferred income	16,704	6,580
Capital loss carryforwards	17,320	20,342
Stock-based compensation costs	15,097	15,329
Depreciation and amortization	8,721	8,759
Investments	2,459	2,900
Lease liability	25,016	—
Total deferred tax assets	946,888	329,374
Valuation allowance	(125,520)	(108,724)
Net deferred tax assets	821,368	220,650
Deferred tax liabilities:		
Intangible assets	(24,907)	(36,194)
Undistributed foreign earnings	(31,916)	(27,627)
ROU assets	(25,016)	—
Other	(8,350)	(2,497)
Total deferred tax liabilities	(90,189)	(66,318)
Total net deferred tax assets	\$ 731,179	\$ 154,332

During fiscal 2019 and 2018, Cadence maintained valuation allowances of \$125.5 million and \$108.7 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 28, 2019, Cadence's operating loss carryforwards were as follows:

	Amount	Expiration Periods
	(In thousands)	
Federal	\$ 1,059	from 2021 through 2029
California	28,820	from 2027 through 2036
Other states (tax effected, net of federal benefit)	1,853	from 2020 through 2038
Foreign (tax effected)	2,113	from 2025 through indefinite

As of December 28, 2019, Cadence had tax credit carryforwards of:

	Amount	Expiration Periods
	(In thousands)	
Federal*	\$ 100,128	from 2025 through 2039
California	72,897	indefinite
Other states	11,286	from 2020 through indefinite
Foreign	21,697	from 2035 through indefinite

*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 28, 2019, Cadence's earliest tax years that remain open to examination and the assessment of additional tax include:

Jurisdiction	Earliest Tax Year Open to Examination
United States – Federal	2015
United States – California	2015
Ireland	2015

Unrecognized Tax Benefits

The changes in Cadence's gross amount of unrecognized tax benefits during fiscal 2019, 2018 and 2017 are as follows:

	2019	2018	2017
	(In thousands)		
Unrecognized tax benefits at the beginning of the fiscal year	\$ 101,857	\$ 110,179	\$ 98,540
Gross amount of the increases (decreases) in unrecognized tax benefits of tax positions taken during a prior year*	(3,143)	(4,183)	688
Gross amount of the increases in unrecognized tax benefits as a result of tax positions taken during the current year	8,951	2,370	13,141
Amount of decreases in unrecognized tax benefits relating to settlements with taxing authorities, including the utilization of tax attributes	(380)	—	—
Reductions to unrecognized tax benefits resulting from the lapse of the applicable statute of limitations	(1,692)	(5,179)	(3,028)
Effect of foreign currency translation	448	(1,330)	838
Unrecognized tax benefits at the end of the fiscal year	<u>\$ 106,041</u>	<u>\$ 101,857</u>	<u>\$ 110,179</u>
Total amounts of unrecognized tax benefits that, if upon resolution of the uncertain tax positions would reduce Cadence's effective tax rate	<u>\$ 61,527</u>	<u>\$ 58,022</u>	<u>\$ 63,108</u>

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

It is reasonably possible that the amount of unrecognized tax positions could decrease by approximately \$10 million during the next 12 months. The potential decrease could be primarily driven by settlements with tax authorities. The actual amount could vary significantly depending on the ultimate timing and nature of any settlements.

The total amounts of interest, net of tax, and penalties recognized in the consolidated income statements as provision (benefit) for income taxes for fiscal 2019, 2018 and 2017 were as follows:

	2019	2018	2017
	(In thousands)		
Interest	\$ 490	\$ 585	\$ 1,865
Penalties	19	342	218

The total amounts of gross accrued interest and penalties recognized in the consolidated balance sheets as of December 28, 2019 and December 29, 2018 were as follows:

	As of	
	December 28, 2019	December 29, 2018
	(In thousands)	
Interest	\$ 3,500	\$ 2,699
Penalties	12	10

NOTE 7. LEASES

Operating lease expense, which includes immaterial amounts of short-term leases, variable lease costs and sublease income, was as follows during fiscal 2019, 2018 and 2017:

	2019	2018	2017
	(In thousands)		
Operating lease expense	\$ 34,709	\$ 33,717	\$ 32,089

Additional activity related to Cadence's leases during fiscal 2019 was as follows:

	2019
Cash paid for amounts included in the measurement of operating lease liabilities	\$ 34,961
ROU assets obtained in exchange for operating lease obligations	38,090

ROU lease assets and lease liabilities for Cadence's operating leases were recorded in the consolidated balance sheet as follows:

	As of December 28, 2019
	(In thousands)
Other assets	\$ 100,343
Accounts payable and accrued liabilities	25,558
Other long-term liabilities	84,782
Total lease liabilities	<u>\$ 110,340</u>
Weighted average remaining lease term (in years)	5.1
Weighted average discount rate	4.5%

Future lease payments included in the measurement of lease liabilities on the consolidated balance sheet as of December 28, 2019, for the following five fiscal years and thereafter were as follows:

	Operating Leases (In thousands)
2020	\$ 29,253
2021	29,185
2022	21,049
2023	15,474
2024	10,500
Thereafter	19,359
Total future lease payments	<u>124,820</u>
Less imputed interest	<u>(14,480)</u>
Total	<u>\$ 110,340</u>

As of December 29, 2018, future minimum lease payments, as defined under the previous lease accounting guidance of ASC Topic 840, 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	<u>\$ 112,013</u>

NOTE 8. 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 Equity 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 2019 and 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.

Non-Marketable Equity 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. Cadence holds a 16% interest in a privately held company that is accounted for using the equity method of accounting. The carrying value of this investment was \$136.3 million and \$115.9 million as of December 28, 2019 and December 29, 2018, respectively. During fiscal 2019, Cadence recorded a loss to other income, net in Cadence's consolidated income statements of \$6.9 million, which represented Cadence's proportionate share of net income from the investee, offset by amortization of basis differences.

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. The carrying value of these investments was \$1.9 million and \$2.8 million as of December 28, 2019 and December 29, 2018, respectively. During fiscal 2019, Cadence recognized net gains of \$2.1 million, of which a loss of \$0.9 million related to equity securities still held as of December 28, 2019. During fiscal 2018, Cadence recognized net gains of \$3.3 million, of which a loss of \$0.1 million related to equity securities still held as of December 29, 2018.

NOTE 9. 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 represented in-process technology), \$90.2 million of goodwill and \$19.6 million of net liabilities consisting primarily of deferred tax liabilities. Cadence will make payments to certain employees, subject to continued employment, through the fourth quarter of fiscal 2020.

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. 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 on whether to proceed with the transaction.

Acquisition-Related Transaction Costs

Transaction costs associated with acquisitions were \$2.3 million, \$0.6 million and \$1.1 million during fiscal 2019, 2018 and 2017, respectively. These costs consist of professional fees and administrative costs and were expensed as incurred in Cadence's consolidated income statements.

NOTE 10. GOODWILL AND ACQUIRED INTANGIBLES

Goodwill

The changes in the carrying amount of goodwill during fiscal 2019 and 2018 were as follows:

	Gross Carrying Amount (In thousands)
Balance as of December 30, 2017	\$ 666,009
Effect of foreign currency translation	(3,737)
Balance as of December 29, 2018	662,272
Effect of foreign currency translation	(416)
Balance as of December 28, 2019	<u>\$ 661,856</u>

Cadence completed its annual goodwill impairment test during the third quarter of fiscal 2019 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 28, 2019 were as follows, excluding intangibles that were fully amortized as of December 29, 2018:

	Gross Carrying Amount	Accumulated Amortization (In thousands)	Acquired Intangibles, Net
Existing technology	\$ 363,142	\$ (245,902)	\$ 117,240
Agreements and relationships	146,395	(112,565)	33,830
Tradenames, trademarks and patents	7,600	(5,795)	1,805
Total acquired intangibles with definite lives	517,137	(364,262)	152,875
In-process technology	19,500	—	19,500
Total acquired intangibles	<u>\$ 536,637</u>	<u>\$ (364,262)</u>	<u>\$ 172,375</u>

In-process technology as of December 28, 2019 consisted of acquired projects that, if completed, will contribute to Cadence's design IP offerings. As of December 28, 2019, these projects were expected to be completed in approximately three months. During fiscal 2019, Cadence completed certain projects previously included in in-process technology and transferred \$52.0 million to existing technology.

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

	Gross Carrying Amount	Accumulated Amortization	Acquired Intangibles, Net
	(In thousands)		
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	<u>\$ 559,144</u>	<u>\$ (333,687)</u>	<u>\$ 225,457</u>

Amortization expense from existing technology and maintenance agreements is included in cost of product and maintenance. Amortization expense for fiscal 2019, 2018 and 2017, by consolidated income statement caption, was as follows:

	2019	2018	2017
	(In thousands)		
Cost of product and maintenance	\$ 40,951	\$ 39,247	\$ 41,781
Amortization of acquired intangibles	12,128	14,086	14,716
Total amortization of acquired intangibles	<u>\$ 53,079</u>	<u>\$ 53,333</u>	<u>\$ 56,497</u>

As of December 28, 2019, the estimated amortization expense for intangible assets with definite lives was as follows for the following five fiscal years and thereafter:

	(In thousands)
2020	\$ 49,419
2021	44,758
2022	26,453
2023	13,967
2024	12,618
Thereafter	5,660
Total estimated amortization expense	<u>\$ 152,875</u>

NOTE 11. 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 2019, Cadence's stockholders approved an amendment to the Omnibus Plan to increase the number of shares of common stock authorized for issuance by 4.0 million. As of December 28, 2019, 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 period of three years to four years. 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 28, 2019, 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.

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 2019, 2018 and 2017 were as follows:

	2019	2018	2017
	(In thousands)		
Stock options	\$ 6,806	\$ 5,581	\$ 5,417
Restricted stock	164,078	153,348	117,797
ESPP	10,663	8,786	6,809
Total stock-based compensation expense	<u>\$ 181,547</u>	<u>\$ 167,715</u>	<u>\$ 130,023</u>
Income tax benefit	\$ 30,118	\$ 32,830	\$ 36,664

Stock-based compensation expense is reflected in Cadence's consolidated income statements during fiscal 2019, 2018 and 2017 as follows:

	2019	2018	2017
	(In thousands)		
Cost of product and maintenance	\$ 2,759	\$ 2,631	\$ 2,218
Cost of services	3,510	3,714	3,232
Marketing and sales	39,088	34,665	26,838
Research and development	114,656	104,353	77,222
General and administrative	21,534	22,352	20,513
Total stock-based compensation expense	<u>\$ 181,547</u>	<u>\$ 167,715</u>	<u>\$ 130,023</u>

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 2019, 2018 and 2017 were as follows:

	2019	2018	2017
Dividend yield	None	None	None
Expected volatility	24.4%	24.3%	21.2%
Risk-free interest rate	2.47%	2.54%	2.01%
Expected term (in years)	4.8	4.8	4.8
Weighted-average fair value of options granted	\$ 14.58	\$ 10.24	\$ 6.86

A summary of the changes in stock options outstanding under Cadence's equity incentive plans during fiscal 2019 is presented below:

	Shares (In thousands)	Weighted- Average Exercise Price	Weighted- Average Remaining Contractual Terms (Years)	Aggregate Intrinsic Value (In thousands)
Options outstanding as of December 29, 2018	5,414	\$ 20.51		
Granted	595	56.57		
Exercised	(1,076)	13.52		
Forfeited	—	—		
Options outstanding as of December 28, 2019	<u>4,933</u>	\$ 26.38	3.4	\$ 216,599
Options vested as of December 28, 2019	<u>3,772</u>	\$ 21.00	2.8	\$ 185,923

Cadence had total unrecognized compensation expense related to stock option grants of \$12.7 million as of December 28, 2019, 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 2019, 2018 and 2017 was:

	2019	2018	2017
	(In thousands)		
Intrinsic value of options exercised	\$ 51,625	\$ 31,109	\$ 45,643
Cash received from options exercised	14,553	11,748	22,255

Restricted Stock

Generally, restricted stock, which includes restricted stock awards and restricted stock units, vests over three years 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, market-based performance 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-based performance conditions are not ultimately met, compensation expense previously recognized is not reversed. As of December 28, 2019, Cadence had 2.2 million shares of unvested long-term, market-based performance stock awards outstanding.

Stock-based compensation expense related to performance-based and market-based performance restricted stock grants for fiscal 2019, 2018 and 2017 was as follows:

	2019	2018	2017
	(In thousands)		
Stock-based compensation expense related to performance-based restricted stock	\$ 12,640	\$ 12,868	\$ 8,224
Stock-based compensation expense related to market-based performance stock awards	7,019	2,300	1,979

A summary of the changes in restricted stock outstanding under Cadence's equity incentive plans during fiscal 2019 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 29, 2018	9,702	\$ 32.67		
Granted	4,028	53.11		
Vested	(4,799)	31.75		
Forfeited	(538)	39.66		
Unvested shares as of December 28, 2019	<u>8,393</u>	\$ 42.55	1.1	\$ 589,937

Cadence had total unrecognized compensation expense related to restricted stock grants of \$287.7 million as of December 28, 2019, which will be recognized over the remaining vesting period. The remaining weighted-average vesting period of unvested awards is 2.1 years.

The total fair value realized by employees upon vesting of restricted stock during fiscal 2019, 2018 and 2017 was:

	2019	2018	2017
	(In thousands)		
Fair value of restricted stock realized upon vesting	\$ 298,320	\$ 232,099	\$ 174,548

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 duration of six months 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. As of December 28, 2019, the total number of shares available for future issuance under the ESPP was 6.0 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 2019, 2018 and 2017 were as follows:

	2019	2018	2017
Dividend yield	None	None	None
Expected volatility	27.9%	21.1%	20.4%
Risk-free interest rate	2.23%	2.05%	0.92%
Expected term (in years)	0.5	0.5	0.5
Weighted-average fair value of options granted	\$ 14.37	\$ 9.24	\$ 6.64

Shares of common stock issued under the ESPP for fiscal 2019, 2018 and 2017 were as follows:

	2019	2018	2017
	(In thousands, except per share amounts)		
Cadence shares purchased under the ESPP	988	892	1,270
Cash received for the purchase of shares under the ESPP	\$ 38,290	\$ 29,160	\$ 26,709
Weighted-average purchase price per share	\$ 38.74	\$ 32.69	\$ 21.04

Reserved for Future Issuance

As of December 28, 2019, Cadence had reserved the following shares of authorized but unissued common stock for future issuance:

	Shares (In thousands)
Employee equity incentive plans*	15,898
Employee stock purchase plans	6,039
Directors stock plans*	905
Total	<u>22,842</u>

*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 12. STOCK REPURCHASE PROGRAMS

At the end of fiscal 2018, approximately \$175 million remained available under Cadence's previously announced authorization to repurchase shares of its common stock. In February 2019, Cadence's Board of Directors authorized the repurchase of an additional \$500 million. 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 28, 2019, approximately \$369 million remained available to repurchase shares of Cadence common stock.

The shares repurchased under Cadence's repurchase authorizations and the total cost of repurchased shares, including commissions, during fiscal 2019, 2018 and 2017 were as follows:

	2019	2018	2017
	(In thousands)		
Shares repurchased	4,841	5,934	2,495
Total cost of repurchased shares	\$ 306,148	\$ 250,059	\$ 100,025

NOTE 13. 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 2019, Cadence initiated a restructuring plan (the "2019 Restructuring Plan") and recorded restructuring and other charges of \$9.9 million related to severance payments and termination benefits. As of December 28, 2019, total liabilities related to the 2019 Restructuring Plan were \$9.1 million.

Cadence has also initiated restructuring plans in prior years, including both fiscal 2018 and fiscal 2017 (the "prior restructuring plans"). During fiscal 2019, Cadence revised certain estimates made in connection with the prior restructuring plans and recorded credits of \$1.3 million. As of December 28, 2019, total liabilities related to the prior restructuring plans were \$0.5 million.

The following table presents activity for Cadence's restructuring plans during fiscal 2019, 2018 and 2017:

	Severance and Benefits	Excess Facilities	Total
	(In thousands)		
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
Restructuring and other charges (credits), net	8,649	(28)	8,621
Cash payments	(10,714)	(420)	(11,134)
Effect of foreign currency translation	118	9	127
Balance, December 28, 2019	\$ 9,229	\$ 409	\$ 9,638

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

	As of December 28, 2019 (In thousands)
Accounts payable and accrued liabilities	\$ 9,520
Other long-term liabilities	118
Total liabilities	\$ 9,638

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 28, 2019. 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 14. OTHER INCOME, NET

Cadence's other income, net, for fiscal 2019, 2018 and 2017 was as follows:

	2019	2018	2017
	(In thousands)		
Interest income	\$ 9,509	\$ 8,070	\$ 3,879
Gains (losses) on marketable equity investments	713	(551)	520
Gains (losses) on non-marketable equity investments	(4,802)	3,300	8,934
Gains (losses) on securities in NQDC trust	5,402	(1,471)	6,145
Losses on foreign exchange	(4,111)	(5,557)	(2,920)
Other income (loss), net	(710)	(471)	197
Total other income, net	\$ 6,001	\$ 3,320	\$ 16,755

NOTE 15. 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 2019, 2018 and 2017 are as follows:

	2019	2018	2017
	(In thousands, except per share amounts)		
Net income	\$ 988,979	\$ 345,777	\$ 204,101
Weighted-average common shares used to calculate basic net income per share	273,239	273,729	272,097
Stock-based awards	7,276	7,415	8,124
Weighted-average common shares used to calculate diluted net income per share	280,515	281,144	280,221
Net income per share – basic	\$ 3.62	\$ 1.26	\$ 0.75
Net income per share – diluted	\$ 3.53	\$ 1.23	\$ 0.73

The following table presents shares of Cadence’s common stock outstanding for fiscal 2019, 2018 and 2017 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:

	2019	2018	2017
	(In thousands)		
Long-term market-based awards	1,097	50	152
Options to purchase shares of common stock	359	637	303
Non-vested shares of restricted stock	727	290	77
Total potential common shares excluded	2,183	977	532

NOTE 16. BALANCE SHEET COMPONENTS

A summary of certain balance sheet components as of December 28, 2019 and December 29, 2018 is as follows:

	As of	
	December 28, 2019	December 29, 2018
(In thousands)		
Inventories:		
Raw materials	\$ 36,637	\$ 16,392
Finished goods	19,165	11,770
Inventories	\$ 55,802	\$ 28,162
Property, plant and equipment:		
Computer equipment and related software	\$ 554,874	\$ 574,333
Buildings	126,795	126,927
Land	55,820	55,802
Leasehold, building and land improvements	106,456	108,529
Furniture and fixtures	23,425	27,087
Equipment	38,955	52,088
In-process capital assets	4,706	6,357
Total cost	911,031	951,123
Less: Accumulated depreciation and amortization	(635,176)	(698,493)
Property, plant and equipment, net	\$ 275,855	\$ 252,630
Other assets:		
Non-marketable investments	\$ 138,212	\$ 118,734
ROU lease assets*	100,343	—
Other long-term assets	106,874	103,575
Other assets	\$ 345,429	\$ 222,309
Accounts payable and accrued liabilities:		
Payroll and payroll-related accruals	\$ 200,163	\$ 192,887
Other accrued operating liabilities	116,745	63,639
Accounts payable and accrued liabilities	\$ 316,908	\$ 256,526
Other long-term liabilities:		
Operating lease liabilities*	\$ 84,782	\$ —
Other accrued liabilities	77,739	77,262
Other long-term liabilities	\$ 162,521	\$ 77,262

* Cadence adopted Topic 842, the new accounting standard for leasing arrangements on December 30, 2018, the first day of fiscal 2019. For additional information regarding Cadence's leases, see Note 7 in the notes to consolidated financial statements.

NOTE 17. 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.

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 Cadence’s debt arrangements, see Note 3 in the notes to consolidated financial statements.

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 2019.

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 28, 2019 and December 29, 2018:

Fair Value Measurements as of December 28, 2019:				
	Total	Level 1	Level 2	Level 3
	(In thousands)			
<u>Assets</u>				
Cash equivalents:				
Money market funds	\$ 445,942	\$ 445,942	\$ —	\$ —
Marketable equity securities	4,600	4,600	—	—
Securities held in NQDC trust	34,096	34,096	—	—
Foreign currency exchange contracts	3,557	—	3,557	—
Total Assets	\$ 488,195	\$ 484,638	\$ 3,557	\$ —

As of December 28, 2019, Cadence did not have any financial liabilities requiring a recurring fair value measurement.

Fair Value Measurements as of December 29, 2018:				
	Total	Level 1	Level 2	Level 3
	(In thousands)			
<u>Assets</u>				
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.

NOTE 18. COMMITMENTS AND CONTINGENCIES**Purchase Obligations**

Cadence had purchase obligations of \$42.7 million as of December 28, 2019 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 2019, 2018 or 2017.

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 2019, 2018 or 2017.

NOTE 19. 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 2019, 2018 and 2017 were as follows:

	2019	2018	2017
	(In thousands)		
Contributions to defined contribution plans	\$ 25,269	\$ 25,731	\$ 26,010

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.

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.

NOTE 20. 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.

Accumulated other comprehensive loss was comprised of the following as of December 28, 2019, and December 29, 2018:

	As of	
	December 28, 2019	December 29, 2018
	(In thousands)	
Foreign currency translation loss	\$ (29,503)	\$ (20,861)
Changes in defined benefit plan liabilities	(7,423)	(3,919)
Total accumulated other comprehensive loss	\$ (36,926)	\$ (24,780)

For fiscal 2019, 2018 and 2017, 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.

NOTE 21. SEGMENT REPORTING

Segment reporting is based on the "management approach," following the method that management organizes the company's reportable 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. Property, plant and equipment 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 2019, 2018 and 2017:

	2019	2018	2017
	(In thousands)		
Americas:			
United States	\$ 982,380	\$ 924,644	\$ 829,436
Other Americas	43,473	32,531	35,067
Total Americas	1,025,853	957,175	864,503
Asia:			
China	241,474	210,194	173,107
Other Asia	459,028	395,221	353,094
Total Asia	700,502	605,415	526,201
Europe, Middle East and Africa	433,314	406,877	385,705
Japan	176,650	168,555	166,623
Total	\$ 2,336,319	\$ 2,138,022	\$ 1,943,032

The following table presents a summary of property, plant and equipment assets by geography as of December 28, 2019, December 29, 2018 and December 30, 2017:

	As of		
	December 28, 2019	December 29, 2018	December 30, 2017
	(In thousands)		
Americas:			
United States	\$ 220,023	\$ 200,025	\$ 198,744
Other Americas	728	475	611
Total Americas	220,751	200,500	199,355
Asia:			
China	15,729	9,608	3,005
Other Asia	27,890	30,021	34,673
Total Asia	43,619	39,629	37,678
Europe, Middle East and Africa	10,474	11,784	13,615
Japan	1,011	717	694
Total	<u>\$ 275,855</u>	<u>\$ 252,630</u>	<u>\$ 251,342</u>

NOTE 22. SUBSEQUENT EVENT

On January 15, 2020, Cadence acquired all of the outstanding equity of AWR Corporation (“AWR”). On February 6, 2020, Cadence also acquired all of the outstanding equity of Integrand Software, Inc. (“Integrand”). These acquisitions enhance Cadence’s technology portfolio to address growing RF/microwave design activity, driven by expanding use of 5G communications. The aggregate cash consideration for these acquisitions of approximately \$195 million will be allocated to the assets acquired and liabilities assumed based on their respective estimated fair values on the acquisition dates. Cadence will also make payments to certain employees over a period of up to three years, subject to continued employment and other performance-based conditions. Cadence expects to complete the initial accounting for its acquisition of AWR and Integrand during the first quarter of fiscal 2020.

EXHIBIT INDEX

Exhibit Number	Exhibit Title	Form	Incorporated by Reference			Provided Herewith
			File No.	Exhibit No.	Filing Date	
3.01	The Registrant's Restated Certificate of Incorporation, as filed with the Secretary of State of the State of Delaware on May 3, 2019.	10-Q	000-15867	3.01	7/22/2019	
3.02	The Registrant's Amended and Restated Bylaws, effective as of February 5, 2020.	8-K	000-15867	3.01	2/11/2020	
4.01	Specimen Certificate of the Registrant's Common Stock.	S-4	033-43400	4.01	10/17/1991	
4.02	Base Indenture, dated October 9, 2014, between the Registrant and Wells Fargo Bank, N.A., as trustee.	8-K	000-15867	4.01	10/9/2014	
4.03	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).	8-K	000-15867	4.02	10/9/2014	
4.04	Description of the Registrant's Securities Registered Pursuant to Section 12 of the Securities Exchange Act of 1934.					X
10.01*	The Registrant's Amended and Restated 1987 Stock Incentive Plan.	S-8	333-174201	99.1	5/13/2011	
10.02*	Form of Stock Option Agreement and Form of Stock Option Exercise Request under the Registrant's 1987 Stock Incentive Plan, as amended and restated.	10-Q	001-10606	10.02	8/10/2004	
10.03*	Form of Nonstatutory Incentive Stock Award Agreement under the Registrant's 1987 Stock Incentive Plan, as amended and restated.	10-K	001-10606	10.03	3/16/2005	
10.04*	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.	10-Q	001-10606	10.02	12/11/2008	
10.05*	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.	10-Q	001-10606	10.03	12/11/2008	
10.06*	Form of Stock Option Agreement under the Registrant's 1987 Stock Incentive Plan, as amended and restated.	10-Q	001-10606	10.01	5/1/2009	
10.07*	Form of Incentive Stock Award Agreement for performance-based Incentive Stock Awards under the Registrant's 1987 Stock Incentive Plan, as amended and restated.	10-Q	001-10606	10.02	5/1/2009	
10.08*	The Registrant's 1995 Directors Stock Incentive Plan.	10-Q	001-15867	10.01	7/26/2012	
10.09*	Form of Stock Option Agreement, as currently in effect under the Registrant's 1995 Directors Stock Incentive Plan.	10-K	000-15867	10.76	2/21/2013	
10.10*	Form of Incentive Stock Award Agreement, as currently in effect under the Registrant's 1995 Directors Stock Incentive Plan.	10-K	000-15867	10.77	2/21/2013	
10.11*	The Registrant's Amended and Restated 2000 Equity Incentive Plan.	S-8	333-174200	99.1	5/13/2011	

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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	333-232761	99.01	7/23/2019
<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, as amended and restated on February 5, 2019.</u>				X
<u>10.27*</u>	<u>The Senior Executive Bonus Plan.</u>	8-K	000-15867	10.01	2/8/2019
<u>10.28*</u>	<u>The Registrant's Executive Severance Plan.</u>	8-K	001-15867	10.01	5/11/2016
<u>10.29*</u>	<u>Director Medical and Prescription Benefits Coverage Reimbursement Plan.</u>	10-Q	001-10606	10.02	4/29/2011
<u>10.30</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>10.31</u>	<u>Tensilica, Inc. 2007 Stock Incentive Plan.</u>	S-8	333-188452	99.01	5/8/2013
<u>10.32</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
<u>10.33*</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

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<u>10.34*</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>10.35*</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>10.36*</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>10.37*</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>10.38*</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>10.39*</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>10.40*</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>10.41*</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>10.42*</u>	<u>Letter, dated September 1, 2015, between the Registrant and Neil Zaman.</u>	10-K	000-15867	10.49	2/18/2016	
<u>10.43*</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>10.44*</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>10.45</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>10.46*</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>10.47*</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
<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	Inline XBRL Instance Document.					X
101.SCH	Inline XBRL Taxonomy Extension Schema Document.					X

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101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document.	X
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document.	X
101.LAB	Inline XBRL Taxonomy Extension Label Linkbase Document.	X
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document.	X
104	Cover Page Interactive Data File - The cover page from the Registrant's Annual Report on Form 10-K for the year ended December 28, 2019 is formatted in iXBRL.	

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

Item 16. Form 10-K Summary

Not applicable.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, 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 24, 2020

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 24, 2020

/s/ John M. Wall

John M. Wall

Senior Vice President and Chief Financial Officer

DATE: February 24, 2020

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:

<u>/s/ Dr. John B. Shoven</u> Dr. John B. Shoven, Chairman of the Board of Directors	February 24, 2020
<u>/s/ Mark W. Adams</u> Mark W. Adams, Director	February 24, 2020
<u>/s/ Susan L. Bostrom</u> Susan L. Bostrom, Director	February 24, 2020
<u>/s/ Dr. James D. Plummer</u> Dr. James D. Plummer, Director	February 24, 2020
<u>/s/ Dr. Alberto Sangiovanni-Vincentelli</u> Dr. Alberto Sangiovanni-Vincentelli, Director	February 24, 2020
<u>/s/ Roger S. Siboni</u> Roger S. Siboni, Director	February 24, 2020
<u>/s/ Young K. Sohn</u> Young K. Sohn, Director	February 24, 2020
<u>/s/ Mary Agnes Wilderotter</u> Mary Agnes Wilderotter, Director	February 24, 2020