UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
WASHINGTON, D.C. 20549

FORM 10-K

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

For the fiscal year ended December 31, 2021

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

For the transition period from to

Commission File Number 001-38267

RIBBON COMMUNICATIONS INC.

(Exact name of Registrant as specified in its charter)

Delaware	**82-1669692**
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

6500 Chase Oaks Boulevard, Suite 100, Plano, Texas 75023
(Address of principal executive offices)(Zip Code)

(978) 614-8100
(Registrant's telephone number, including area code)

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

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, par value $0.0001	RBBN	The 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, smaller reporting company or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act.:

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

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

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report. ☒

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

The aggregate market value of the common stock held by non-affiliates of Ribbon Communications Inc. was approximately $537,874,000 based on the closing price for its common stock on The Nasdaq Global Select Market on June 30, 2021. As of March 8, 2022, the Registrant had 148,957,278 shares of common stock, $0.0001 par value, outstanding.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the definitive Proxy Statement to be delivered to stockholders in connection with the Registrant's 2022 Annual Meeting of Stockholders are incorporated by reference into Part III of this report.

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Cautionary Note Regarding Forward-Looking Statements

This report contains "forward-looking statements" within the meaning of the U.S. Private Securities Litigation Reform Act of 1995, which are subject to a number of risks and uncertainties. All statements other than statements of historical facts contained in this report, including statements regarding our future results of operations and financial position, expected benefits from our acquisition of ECI Telecom Group Ltd. and the sale of our Kandy Communications business, business strategy, plans and objectives of management for future operations and plans for future product development and manufacturing are forward-looking statements. Without limiting the foregoing, the words "anticipates", "believes", "could", "estimates", "expects", "intends", "may", "plans", "seeks" and other similar language, whether in the negative or affirmative, are intended to identify forward-looking statements, although not all forward looking statements contain these identifying words. Forward-looking statements are based on our current expectations and assumptions regarding our business, the economy and other future conditions. These statements involve known and unknown risks, uncertainties and other important factors that may cause our actual results to be materially different. We therefore caution you against relying on any of these forward-looking statements. Important factors that could cause actual results to differ materially from those in these forward-looking statements are discussed in this report, including in Item 1A., "Risk Factors" of Part I. Any forward-looking statement made by us in this report speaks only as of the date on which this report was first filed. We undertake no obligation to publicly update any forward-looking statement, whether as a result of new information, future developments or otherwise, except as may be required by law.

PART I

Item 1. Business

Company Overview

We are a leading global provider of communications technology to service providers and enterprises. We provide a broad range of software and high-performance hardware products, network solutions, and services that enable the secure delivery of data and voice communications, and high-bandwidth networking and connectivity for residential consumers and for small, medium, and large enterprises and industry verticals such as finance, education, government, utilities, and transportation. Our mission is to create a recognized global technology leader providing cloud-centric solutions that enable the secure exchange of information, with unparalleled scale, performance, and elasticity. We are headquartered in Plano, Texas, and have a global presence, with research and development, sales and support locations in over thirty-five countries around the world.

Company History

The Ribbon name was created by the merger of Sonus Networks, Inc. and GENBAND US LLC ("GENBAND") in October 2017, with both companies specializing in secure high-performance Voice Over Internet Protocol ("VoIP") technology and solutions. Prior to that, GENBAND had acquired assets of Nortel’s Carrier division in 2010, which include a world-class engineering and sales team, a broad deployment base of products and technology, and a recognized industry reputation and pedigree with customers around the world.

Since our formation in 2017, we have completed several acquisitions to strengthen and expand our portfolio of product offerings to service providers and enterprises. Recent notable acquisitions include:

- Edgewater Networks Inc. (August 2018): Expanded our portfolio of security and signaling solutions for the enterprise network edge.
- Anova Data, Inc. (February 2019): Expanded our portfolio with additional network optimization, security, and data monetization applications, enabled by an advanced Big Data Analytics and Machine Learning platform.
- ECI Telecom Group Ltd. ("ECI") (March 2020) (the "ECI Acquisition"): Further expanded our focus and strategy to include optical transport and Internet Protocol ("IP") networking, switching, and routing products and solutions, and helped us create an industry-leading communications software and networking company with a comprehensive portfolio of advanced voice, security, data and IP optical networking and transport solutions.

Industry Background

Today’s Communications Service Providers ("CSPs") and enterprises are investing in their networks to compete in an ever-changing technology and customer experience landscape driven largely by cloud computing, mobile workforces requiring hyper-connectivity, new high-performance applications and use cases, and an insatiable demand for bandwidth by end-customers and the applications they use. As a result, service providers and enterprises are adding key enabling technologies to their networks for increased flexibility, programmability, scalability, reliability, and to enable new applications and services with an expedited time to market. These investments provide a competitive advantage and bring value-added services to increase network efficiency, increase customer satisfaction and produce new revenue streams. Within these broad industry themes, investment in our products and services is driven by several key industry trends.

Increased Adoption of Cloud Communications and Collaboration

The shift to cloud-based communications began several years ago driven largely by the advantages of running applications in a virtual cloud environment and reducing dependency on on-premises computing and communications technologies. The Coronavirus Disease 2019 ("COVID-19") pandemic has accelerated this trend significantly, driven by the need for more remote working and commerce for many businesses and industries. As a result, businesses and consumers have rapidly shifted from brick-and-mortar facilities and travel to work-from-home, or hybrid work-in-the-office and work-from home, using cloud communications and collaboration platforms such as Microsoft Teams, Zoom Phone and others, and require these communications platforms to be highly secure and scalable.

Evolution of Communications Service Provider Networks

CSPs of all types continue to face challenges to their businesses because of the significant technological evolution, increasing competition, disruption by Over-the-Top ("OTT") providers (those providing video entertainment over the Internet rather than through traditional cable, telco and satellite networks), and shifts in customer expectations. They also need to drive new revenues with more digital, efficient, automated, secure, and reliable networks driven largely by software, automation, cloud networking, and other technologies such as analytics and machine-learning. All these factors are causing service providers to re-think and evolve, or even over-haul, the way networks are designed, architected, managed, and optimized to deliver services to their customers with disruptive economics. They are migrating their networks and services software to run on private and/or public clouds (referred to as the "Telco Cloud") using cloud-native technologies, architectures and operational processes with automation and concepts such as Continuous Integration and Continuous Delivery ("CI/CD"). Increasingly, network operators are also pursuing open, multi-layer optimized and disaggregated IP and Optical networking solutions, where they have the flexibility to assemble networks based on transport and control subsystems from different vendors with software-defined networking. The newest generation of broadband cellular technology ("5G"), and the corresponding promise of new revenue-generating applications and services for consumers and businesses, are key drivers of investment in the evolution of underlying mobile and fixed network infrastructures, and disruptions providing opportunity for new suppliers to be selected.

Service providers in some global regions, as mandated by governments or voluntarily, are also replacing certain incumbent vendor communications equipment and technology in their networks because of concerns for security. This presents a significant growth and market share opportunity.

Insatiable Demand for Hyper-Connectivity and Bandwidth Driven by New Services, Applications, and the Cloud

Our global information society is overflowing with telecommunications data traffic, for business, entertainment, education, surveillance, industrial control, online retail, and many other applications. These applications, increasingly delivered from the cloud, generate a huge amount of data driven largely by the video and image components. This exponential growth in data traffic is expected to continue and even accelerate, enabled by 5G upgrades to the mobile radio network. New applications will emerge, such as Reality/Virtual Reality ("R/VR"), cloud gaming, tele-health, Internet of Things ("IoT"), and Industry 4.0, all made possible by the massive bandwidth increases, low latency and highly secure infrastructure.

At the foundation, high performance Optical connections and advanced IP networking are needed to keep pace with the advancements in communications. This hyper-connectivity will be a key enabler and deliver disruptive ultra-low cost-per-bit communications within and between networks and the cloud, while also delivering on the promise of latency sensitive networking demanded by many of the applications.

Need for Reliable, Secure, High-Bandwidth Enterprise and Critical Infrastructure Communications

Companies and verticals that are classified as being part of a “critical infrastructure” are defined as those companies whose assets, systems, and networks, whether physical or virtual, are considered vital to a country’s national interest. Critical infrastructure providers are under increasing pressure to support new services, reduce carbon emission, improve security, expand automation, and increase safety. Achieving these goals requires a transition to a modernized, secure communications network that supports both IP and optical transport seamlessly. With a seamless integrated IP and optical transport solution, a critical infrastructure network operator can provide a highly reliable, secure, future proof communications solution optimized for critical industries. An essential requirement for this solution includes a security suite that incorporates state-of-the-art operational technologies protection measures, giving operators extra confidence in the security of their network.

Data is the lifeblood of any business, and it must be easily accessible across the enterprise to power business applications and to support services to end-customers. It must also be replicated across multiple locations for business continuity and disaster recovery and must be protected from inappropriate access, theft, and corruption. Enterprises deploy optical networking, secured by optical encryption, to attain the needed performance and security. Similarly, command and control groups within today’s armed forces have a need for high performance secure networks as their strategic sensors and assault systems are becoming more integrated. In this ecosystem, effective decision-making requires the pooling and analysis of data from a vast array of sensors and other information sources. The data must be delivered securely, in real-time, to wherever it is required. These solutions integrate intelligent optical transport with agile IP networking to provide a converged, secure, communication network.

Addressing the "Digital Divide" with Rural Broadband and High-Speed Internet Connectivity

Governments in many countries around the world are investing to address and help close the digital divide and extend ultra-broadband services and connectivity to underserved communities. As an example, in the United States, the Infrastructure Investment and Jobs Act, the FCC Rural Digital Opportunity Fund ("RDOF"), the 5G Fund for Rural America, and the USDA Rural Development Broadband ReConnect Program expect to provide billions of dollars in funding to deliver broadband connectivity to rural communities in the U.S. Whether working or learning from home, streaming 4K television, or playing the latest online video games, rural subscribers demand dependable, high-speed Internet access to participate and thrive in the digital world. Forward-looking service providers are taking advantage of government funding programs to expand network capacity and transform the communities they serve. Next-generation rural broadband networks help service providers grow their revenues by extending service reach and diversity, and by satisfying the massive pent-up demand for high-speed internet connectivity. Next-generation broadband networks will also leverage new technologies like fixed-wireless access, while laying the foundation for future revenue opportunities like 5G backhaul transport services.

Strategy Overview

Our mission is to create a recognized global technology leader providing open, cloud-centric solutions spanning multiple network layers that enable the secure exchange of communications and information, with unparalleled scale, performance, and elasticity. To realize this mission, we have begun the implementation of a focused strategy for our business underpinned by our transformative ECI Acquisition and migration of communications networks and software applications to the cloud.

- *Operational Integration* - A key step of the strategy includes continuing to successfully drive the integration of ECI and Ribbon to achieve best-in-class operational efficiencies. We have made significant progress and largely completed this integration in 2021, including a revamped internal organization aligned along a business unit model with regional sales teams and integrated corporate functions, as well as the addition of new experienced members to our leadership team.
- Intellectual Property and Technology Integration - Beyond operational integration, we continue to explore opportunities to blend the intellectual property and technological know-how underlying the classic Ribbon business with that acquired as part of the ECI Acquisition to develop new products and services to meet the new challenges faced by our customers.
- *Cross-Selling* - We are laser-focused on marketing and selling our combined post-acquisition broad portfolio to our global deployed base of service provider and enterprise customers to expand our presence and share of the larger IP and Optical networking and transport market and cross-sell the complete portfolio.
- *North American IP Optical Networks Market Share* - We expect to continue to unlock the value of the former ECI portfolio by growing IP Optical Networks market share in the North American market by leveraging the extensive deployment base and ongoing business that we have with service providers and enterprise customers. We have already experienced some early cross-selling successes with new IP Optical customer wins in North America announced in the second half of 2020 and in 2021.
- *Participate in the 5G Opportunity* - The ECI Acquisition has also advanced our strategy of expanding into the service provider 5G data domain with the IP Optical Networks portfolio bundled with network analytics and intelligence, and security offerings. We believe 5G is a multi-year opportunity as global service providers roll out the new capital-intensive technology and build out the needed network infrastructure over the next decade. We want to be at the forefront of preparing our customers for the deployment of 5G on two major fronts: providing for metro, backhaul and long-haul transport and networking solutions in service provider networks, industrial verticals, and critical infrastructure; and supporting their needs as new applications, including IoT and AI, become a reality with 5G.
- *Software-Centric and Cloud-Native Offerings* - The value of virtual, cloud-native, and software-driven solutions deployable in the cloud has only grown because of the COVID-19 pandemic and the migration of network services to the Telco Cloud, which underscores another area of major focus for us. As a strategy, we continue to aggressively transition a significant portion of our product portfolio and business model towards more software, cloud-native offerings with automation and as-a-Service selling model. This transition is instrumental in continuing to improve profitability and competitiveness, and growing the recurring revenue portion of our business.
- *Enterprise Offerings* - The market need and growth rate are higher at the network edge than at the core. We are focused on growing this area of our business through our overall enterprise solutions for securing communications and our IP optical network connectivity solutions, which together are typically geared towards critical infrastructure, large enterprises, and small and medium businesses, building on our partnerships with key go-to-market channels and solutions providers such as Microsoft, as well as other popular unified communications and collaboration ("UC&C")

platforms such as Zoom Phone and similar service provider UC&C offerings. We have recently created a dedicated and expanded sales force focused on the enterprise market segment.
- *Partnerships* - We continually look to form industry partnerships that will enhance our current solution offerings to our customers.
- *Focus* - We maintain a constant feedback loop to ensure we stay focused on activities that support the strategy of our main business segments and ensure our investments in research and development are directly aligned to these goals. As part of this strategy, we completed the sale of our cloud-based enterprise communications services (the "Kandy Communications Business") in December 2020 to American Virtual Cloud Technologies, Inc. ("AVCT"). We believe that the sale enables us to be even more focused on executing our service provider and enterprise strategy to the benefit of our customers while allowing AVCT to unlock Kandy's true value and strong potential and capitalize on the momentum the business has established. As part of the transaction, we became an investor in AVCT, which means that we have a continued opportunity to capitalize on the continued success of Kandy. We believe execution on this multi-faceted strategy will strengthen our financial foundation, will continue to improve our relationships and collaboration with our customers, and will further align us with our key stakeholders - customers, partners, employees, and investors.

Customers

Our customers are comprised of a diverse set of service providers and enterprises located in over 140 countries around the world. Service provider customers include telephone companies ("telcos") offering fixed and wireless communications services, cable Multi-System Operators ("MSOs") and Communications as a Service providers. Our service provider customers include many of the largest CSPs globally. Enterprise customers include small, medium, and large businesses and industry verticals such as transportation, utilities, government/public sector, finance, and education.

Customers trust us to solve their most challenging communications requirements, enabling people and devices to connect anytime, anywhere. Our customer-centric culture shapes all of our activities and inspires our team members to make a positive impact with our clients, investors, and communities.

In the year ended December 31, 2021, Verizon Communications Inc. ("Verizon") accounted for approximately 16% of our revenue. Verizon is a service provider that offers interconnect, fixed line and mobile communications services, and our software solutions are sold across their business divisions supporting their large enterprises, SMB and consumer telecommunications and cable-related offerings. Our top five customers represented approximately 34% of our revenue in the year ended December 31, 2021.

Segment Information

Effective in the fourth quarter of 2020 and in connection with the ECI Acquisition, our Chief Operating Decision Maker ("CODM") began to assess our performance based on the performance of two separate organizations within the Company: the Cloud and Edge segment ("Cloud and Edge") and the IP Optical Networks segment ("IP Optical Networks"). We had previously operated in a single segment.

Cloud and Edge Business Segment

The Cloud and Edge segment provides secure and reliable software and hardware products, solutions, and services for VoIP communications, Voice Over LTE ("VoLTE") and Voice Over 5G ("VoNR") communications, as well as UC&C services to both service provider and enterprise customers. Our Cloud and Edge products are increasingly software-centric and cloud-native for deployment on private, public, or hybrid cloud infrastructures, in data centers, on enterprise premises, and within service provider private networks.

Cloud and Edge Products and Solutions

Our Cloud and Edge portfolio delivers multiple solutions for enabling VoIP, VoLTE, VoNR, and UC&C in network, on-premises, or via the Telco Cloud for a broad range of service provider and enterprise customers. The solutions provided with this portfolio include those for:

- Securing and providing resilient connectivity and calling via direct routing for Operator Connect - Microsoft Teams, Zoom and other cloud-based UC&C applications.

- Securing contact center applications.
- Securing service provider hosted and managed unified communications ("UC") services.
- Securing network interconnects for communications services.
- Network transformation of fixed service provider voice services networks to help evolve, consolidate, and modernize legacy networks to VoIP and onto virtualized network environments or the Telco Cloud.
- Implementing IP Multimedia Subsystem ("IMS") networks required by mobile service providers for VoLTE service deployments and for 5G voice services.
- Modernizing, evolving, and securing enterprise and industry vertical UC environments, supporting both on-premises and cloud-based deployments.
- Securing voice sessions and protecting VoIP communications connectivity infrastructures, contact centers, Private Branch Exchanges ("PBX") and media servers.
- Providing identity assurance that helps mitigate robocalls, prevent fraud by determining phone caller identity, intent, and reputation.
- Analytics to provide visibility, security, and service assurance to enhance communication network operations and customer experiences.

Our Cloud and Edge market-leading product portfolio consists of two main categories – Session Border Controller ("SBC") products and Network Transformation products:

Our SBC product portfolio encompasses a full range of deployment platforms including:

- High performance carrier-grade compute platforms leveraging the latest advancements in silicon including NVIDIA GPU processors.
- Feature-rich virtualized and cloud-native software products for deployment in both private and public cloud environments such as Amazon Web Services ("AWS"), Microsoft Azure and Google Cloud Platform ("GCP").
- Fully cloud-native implementation supporting as-a-Service ("aaS") offers and business models.
- On-premises dedicated appliances that scale up and down to meet the most demanding performance and security requirements.

Our SBC portfolio consists of the following categories of products:

- Core network SBCs that are deployable by customers in their core networks, or on private or public clouds, and used to identify, manage, and protect voice communications traffic as it moves through and between communication networks. SBCs secure and interwork different voice communications protocols at IP network boundaries, both within and between service provider and enterprise networks. The portfolio also includes Policy and Routing products that work in heterogeneous voice networks and are used to intelligently manage communications sessions based on multiple policies such as least cost and Quality of Service routing, media type, source or destination, and time of day or week.
- Enterprise Session Border Controllers and Edge products, deployable on premises or in the cloud, to enable the deployment and migration to secure cloud-based UC&C applications such as Microsoft Teams, Zoom Phone and service provider UC&C offerings, as well as securing cloud contact center offerings. Enterprise SBCs provide service assurance and visibility within the enterprise for service-provider hosted and managed UC services. Offerings in this portion of our portfolio include Ribbon Connect for Microsoft Teams Direct Routing, a cloud-based aaS offering for securing calls to the public telephone network from the enterprise.
- Ribbon Call Trust™ is an aaS offering for providing identity assurance. The identity assurance portfolio, using information from deployed network elements including SBCs, helps mitigate robocalls and prevent fraud by determining phone caller identity, intent, and reputation. With this information, it is possible to help determine if a call is from a

legitimate person, for a legitimate purpose, and without malicious intent. Our customers utilize these capabilities to provide a better call experience to their end-customers.
- A cloud-native Analytics Platform with applications that aid customers in gathering actionable intelligence from their communications network elements, including SBCs in the core and edge of their networks, to provide them with network performance visibility, service assurance, security, and fraud mitigation.

Our Network Transformation product portfolio is deployed in the most demanding environments and enables the modernization of fixed, mobile and enterprise voice communications networks to support network and Telco Cloud-based services and the next generation of IP-based voice communications services and includes multiple software-centric platforms and products including:

- Signaling products that provide network signaling for communications services.
- Call Controllers that provide call processing within networks for voice communications services and applications.
- Media Gateways that perform the interworking or translation of media, or voice sessions and the corresponding network protocols both within and across VoIP and legacy communications networks and use codecs (coder-decoder) and digital signal processors to do so.
- A multi-tenant and highly scalable Application Server that enables the deployment of VoIP and UC&C services and applications.

Cloud and Edge Competition

Competition in the market for the Cloud and Edge portfolio remains strong. The market is shifting from an environment dominated by a few large telecommunications legacy hardware equipment companies, such as Ericsson LM Telephone Company ("Ericsson"), Huawei Technologies Co. Ltd. ("Huawei"), and Nokia Corporation ("Nokia"), to a market that is characterized by cloud-native software network function virtualization, hybrid private public cloud compute environments, and open interoperable interfaces. We believe this shift creates opportunities for us to differentiate and gain share from competitors such as:

- Huawei, Ericsson, Nokia, Oracle Corporation, Cisco Systems, Inc. ("Cisco") and AudioCodes Ltd. for our SBCs, Enterprise Edge products and Ribbon Connect.
- Neustar, Inc., Metaswitch Networks (acquired by Microsoft) ("Metaswitch"), First Orion Corp., Secure Logix Corporation, TransNexus, Inc. and Transaction Network Services, Inc. ("TNS") for our Identity Assurance and Call Trust offerings.
- Guavus, Inc., NETSCOUT Systems, Inc., Niometrics Pte Ltd, Empirix Inc. and Ericsson for our Analytics offerings.
- Huawei, Metaswitch, Nokia and Ericsson for our Network Transformation offerings.

Other smaller private and public companies are also focusing on similar market opportunities. Mergers among any of the above companies or other competitors, as well as additional competitors with significant financial resources entering our markets, could further intensify competition. Mergers between service providers may also increase competition for a smaller number of more concentrated customers and channels for products and solutions.

IP Optical Networks Business Segment

The global information society is generating a very high volume of telecommunications traffic for business, entertainment, education, surveillance, industrial control, and other applications. Technologies like 5G, distributed cloud computing and corresponding applications are predicted to continue this exponential traffic growth. IP and Optical networks are at the foundation of this information economy, and indeed are one of its key enablers, delivering ultra-low cost-per-bit transport and multi-service flexibility. Our IP Optical Networks segment provides high-performance, secure, and reliable hardware and software products and solutions for IP networking, switching, and routing, and optical transport. This portfolio is offered to service provider, enterprise and industry verticals with critical transport network infrastructures including utilities, government, defense, transportation and education and research.

IP Optical Networks Products and Solutions

Our IP Optical Networks portfolio delivers multiple solutions spanning access, metro, regional, and long-haul geographies, and using ring, mesh, and point-to-point topologies. IP Multiprotocol Label Switching ("MPLS") and other protocols provide a broad range of networking services for our customers. Our solutions for optical and IP transport and networking include 5G-native solutions for mobile-backhaul, metro and edge aggregation, core networking, data center interconnect, legacy network transformation and transport solutions for wholesale carriers. High availability and security also make the solutions ideal for critical infrastructure delivering mission-critical services.

Our IP Optical Networks multi-layer product portfolio consists of:

- The Apollo product line provides programmable and open Optical Transport Network ("OTN") capabilities over Dense Wavelength Division Multiplexing ("DWDM") support. The OTN layer maps Ethernet and other services into OTN bit streams for transparent optical transmission, and DWDM routes wavelengths of light containing the OTN-encapsulated bit streams across wide areas, greatly increasing the efficiency and capacity of fiber facilities. Our Apollo hardware and software products deliver reconfigurable and programmable low-latency optical transport that simultaneously speeds up provisioning of new services while maximizing traffic throughput at the lowest cost per bit. Apollo supports both capacity-reach optimized optical transmission with up to 1.2 Terabytes per second per channel, as well as power-cost optimized 400 Gigabytes per second optical transmission leveraging 400G ZR+ pluggables. The Apollo product line provides state-of-the-art transparent and flexible DWDM and OTN transport with integrated packet switching capabilities. A modular architecture allows optimized solutions across access, metro, regional, and long-haul networks. Apollo combines high performance, low-latency OTN transport, and OTN switching with software-configurable optical routing for maximum efficiency. Apollo can dynamically reconfigure optimal links in the event of fiber failures to maintain service availability. Apollo is “self-aware” with intelligent reporting for efficient and Software-Defined Networking ("SDN")-ready operations. Apollo also provides deployment choice, whether as an integrated solution or as standalone subsystems for disaggregated open architecture multivendor solutions. A key security feature of Apollo that is used broadly in critical infrastructure and enterprise deployments is Layer 1 Optical Encryption supported by standard and Post Quantum Computing algorithms.
- The Neptune product line of high-performance switching and routing solutions are optimized to provide a converged multi-access edge and the service aware routing needed for cost/performance optimized connectivity between consumers and the applications and services they are using. Neptune provides a converged multi-access edge by supporting multiple services delivered over multiple access network technologies. Ethernet interfaces ranging from Gigabit Ethernet ("GbE") through to 100GbE allow all IP/MPLS and Ethernet access networks to be supported, and pluggables providing XGS-PON, EPON and TDM circuit emulation allow PON access networks and legacy TDM access network to be supported. Traffic from the access networks is aggregated and connected to the services, applications, and compute platforms, meeting the specific service level agreements required for each service, including guaranteed latency, jitter, capacity, or reliability. To achieve this, Neptune uses a range of protocols such as IP/MPLS, MPLS-TP ("Transport Profile") and segment routing traffic engineered ("SR-TE"). As services, applications and compute platforms become increasingly distributed across the network, located in local data centers and multi-access Edge compute platforms, Neptune, in conjunction with MUSE, can dynamically route the connectivity wherever it is required, whilst still meeting the performance requirements. In addition, Neptune provides a 400G ZR+ pluggable capability, allowing it to support both single layer IP over DWDM ("IPoDWDM") connectivity or multi-layer optimized IPoOTN/DWDM connectivity, whichever best meets the network operator's needs. With these capabilities, Neptune is ideally suited for residential broadband backhaul, business services, MSOs and private enterprise networks. With Flexible Ethernet, enhanced timing and synchronization capabilities, 25GbE and 50GbE interfaces and high-capacity, high-density platforms, Neptune is also ideal for 5G deployments. These capabilities and unique form factors such as DIN-rail mounting, street cabinet deployment and environmental capabilities also make Neptune a compelling solution for mission critical enterprises.

- The Muse SDN multi-layer Domain Orchestrator and cognitive software is a suite of cloud-native applications that deliver SDN domain orchestration for underlying multi-layer Neptune IP and Apollo Optical networks. This covers complete lifecycle management and automation to speed up time to revenue, reduce Total Cost of Ownership, and facilitate integration into wider ecosystems. It is powered by a carrier-grade, cloud-native Platform as a Service ("PaaS") and works in conjunction with our LightSOFT™ network management system. Built for a 5G services world, Muse enables network operators to programmatically configure and combine hard and soft slicing technologies to create slices appropriate to different sets of 5G-enabled services and customer sub-networks. Then, using a rich set of tools, operators can design, provision, and assure a broad array of services on top of the slices. Muse's suite of advanced service and network control applications empower Service Providers to do more, through simple service creation and lifecycle management, proactive network assurance, network optimization, and automation. Muse ensures that people and systems receive the right tools to monetize the network effectively through intuitive graphical user interfaces or industry-standard Application Programmable Interfaces.

IP Optical Networks Competition

Competition in the markets addressed by our IP Optical Networks products is strong. The market is shifting from an ecosystem dominated by a few large telecommunications legacy hardware equipment companies with proprietary solutions such as Ciena Corporation ("Ciena"), Cisco, and Nokia, to a market that is characterized by a combination of closed and open solutions, software-defined networking, and dis-aggregation ready for next generation networks, services and applications including 5G, that leverage commercial technology. We believe this shift creates opportunities for us to increase our share as compared to direct competitors such as Cisco, Juniper Networks, Inc., Huawei, Nokia, Ciena, Infinera Corporation, ADVA Optical Networking SE, and Fujitsu Limited. We believe a key differentiation from these competitors is our optimized and integrated multi-layer IP optical solutions. These solutions leverage our SDN, IP routing and optical networking and control plane technologies for both IP and Optical networking layers to create a truly integrated IP Optical Network that optimizes resource utilization in real time, and provides the best overall economics to customers differentiating us from our competitors. Advanced planning algorithms design multi-layer IP Optical networks that maximize traffic handling with failure resiliency by looking holistically at all network layers, providing the best return on Capex. These multi-layer optimized networks can then meet specific customer and service needs on a case-by-case basis.

Services and Support

As service providers and enterprises increasingly adopt telco-cloud, IP-based voice, multimedia, IP and optical transport networks and 5G communications solutions for their markets, they are challenged to find the expertise to install, maintain, and repair these platforms. We have a rich history of providing a broad offering of service-based solutions to complement our products and to help service providers and enterprises grow revenues, serve customers, reduce costs, and improve productivity. Our Global Services organization provides a wide range of services to enable our customers to achieve those goals. Professional and Project Management Services include hundreds of cloud communications, VoIP, IMS voice services and IP and Optical networking specialists and partners offering technical depth, network breadth and tools to assist customers in all aspects of network modernization, design, and deployment. Our Maintenance Support offerings deliver a comprehensive support strategy for all products, applications, and solutions purchased. Our Managed Services offer proactive monitoring to keep customers' production communications running smoothly so they can concentrate on running their business. In addition, our Education Services help ensure customers have the technical knowledge and skills necessary to achieve service readiness and delivery goals to accelerate time-to-market, manage costs, and get the most out of our products and solutions that they use.

Sales and Marketing

We sell our portfolio of products and solutions to service provider and enterprise customers around the globe through both direct sales and indirectly through channel partners, including independent resellers, distributors, service providers and system integrators. Most of our sales to service providers are done directly and most sales to enterprises are done through channel partners. Our direct sales team is organized geographically and by major customers and market to support customer requirements. The sales organization is divided into two regional sales teams – one responsible for the Americas, and one responsible for EMEA (Europe, Middle East and Africa) and APAC (Asia Pacific, including India). Our sales teams sell our full portfolio of products and solutions from both segments to customers in each salesperson's assigned region. Our direct sales force and resellers are supported by a highly trained technical sales engineering staff who work closely with our customers to develop technical proposals and design systems to optimize system performance and economic benefits for our customers.

Our marketing organization is responsible for building awareness of our brand in the markets served and driving engagement with our strategies, solutions, and products. It promotes our brand and portfolio value propositions to key stakeholders, including our customers, channel partners, and prospects globally. The organization develops all of our corporate and portfolio messaging for different target audiences, and manages all customer and industry communication channels, including public relations, digital content (including for the web and social media), events, and trade shows, as well as demand generation and account-based marketing campaigns in conjunction with our sales force.

Manufacturing

We rely on global contract manufacturers and original design manufacturers to manufacture, assemble, test and ship our products. We typically utilize long-term relationships with our contract manufacturers and regularly review business relationships in an attempt to reduce cost of goods and supply risks. We employ formal quality, environmental and ethics management programs with all of our contract manufacturers.

Our leading manufacturers have presence in multiple international locations. This enables us to implement a flexible manufacturing and logistics landscape for each product line and target markets. This structure also facilitates redundancy and business continuity to mitigate risks related to adverse trade tariff, taxation, and natural disasters. Moreover, we wholly own the intellectual property related to fabrication files, assembly, testing algorithms and manufacturing operating procedures, thus reducing sole dependency on a specific contract manufacturer.

Inventory Suppliers and Sourcing

We work with strategic global suppliers for our key integrated circuit components, systems, and software. Certain of our networking products use third-party optical modules embedded on board or configured as pluggable units. These modules are designed and manufactured by leading optical technology vendors and supplied to us based on agreed-upon our controlled performance specifications.

Our policy is to purchase major components directly from original suppliers or from authorized distributors. We regularly review market trends and volume demand for newly introduced products with our suppliers and distributors to negotiate reduced component pricing as the products mature. We carefully manage end-of-sale and end-of-life transitions to maximize return on investment and minimize wasted material, while maximizing customer satisfaction. When we must source such end-of-life components from distributors and brokers, we typically encounter increased component pricing. In some cases, when such parts cannot be sourced reliably any longer in the open market, we undertake costly redesign efforts with alternative components.

In order to maintain competitive lead time for our customers, we employ sophisticated demand and supply management systems. We also utilize agility and safety stock processes to help meet higher-than-forecasted customer demand to stock raw material and sub-assembly inventory. We occasionally experience unforeseen demand drops of certain products or sub-assemblies due to technology evolution, customer consumption behavior, or shortened product lifecycle. For example, we encountered supply chain disruptions in 2021 due to component demand and logistics complications. We regularly review current inventory levels to ensure adequate reserves for excess and obsolete inventory arising from shortened product life cycle or demand drops.

Research and Development

Our global research and development ("R&D") workforce is geographically distributed across a balanced set of centers of excellence. This allows us to distribute work in a cost-effective manner and provide time-zone sensitive support to our global sales team and customers. We supplement our deep in-house expertise with a small set of long-term contracting partners, allowing us to flex up and down as required to match customer demand.

To maintain our position as a technology leader, we continue to invest in our development methodologies, leveraging and adopting industry best practices in the domains of DevOPs, Continuous Integration and Continuous Delivery ("CI/CD"), cloud-native software, Security and Test Automation.

In addition to delivering product-specific feature requests from our customers, our R&D resources that are focused on our Cloud and Edge business segment continue to focus on leading edge technology that will allow our customers to move from purpose-built appliances to fully virtualized and cloud-native solutions, including private, public, hybrid and multi-cloud deployment models as they modernize their networks. We are also investing in aaS variants of our products, fully integrated with cloud-native operational models.

Our IP Optical Networks R&D team continues to focus on empowering our customers with better performance and cost-efficient solutions, improved cost-per-bit, and reduced power and space requirements to lower operating costs. We create innovative solutions that address the exponential increases in bandwidth consumption with improving operational efficiency. Our unique value-add is demonstrated by advanced well-integrated optical and packet solutions managed by state-of-the-art cross platform SDN management system. We are also investing in open and optimized IP and Optical solutions a well as disaggregated networking solutions for our customers.

We leverage modern technologies and industry best practices across all of our products and solutions to provide security at each layer of the solution, enabling end to end security of the overall system. We continue to invest in analytics and automation to allow our customers to operate our solutions at scale with end-to-end visibility and control over the robustness, security, and efficiency of the solution.

Intellectual Property

We believe intellectual property is fundamental to our business and success, and we depend upon our ability to develop, maintain and protect our technology. We seek to safeguard our investments in technology and rely on a combination of U.S. and foreign patent, trademark, trade secret and copyright law and contractual restrictions to protect the proprietary aspects of our technology. As of December 31, 2021, we had been issued 705 patents in the U.S, which expire between 2022 and 2040, and had 33 in-process patent applications in the U.S. As of such date, we also had 300 issued patents in foreign jurisdictions, and had 27 patent applications. As of December 31, 2021, we had 32 trademarks registered in the U.S. and 117 trademarks registered in foreign jurisdictions.

In addition to the protections described above, we seek to safeguard our intellectual property by employing measures to protect against the unauthorized use or disclosure of the source and object code for our software, documentation and other written materials; licensing our software pursuant to signed license agreements, which impose restrictions on others' ability to use our software; and seeking to limit disclosure of our intellectual property by requiring employees and consultants with access to our proprietary information to execute confidentiality agreements.

We have incorporated third-party licensed technology into certain of our products and may be required to license additional technology from third parties to develop new products or to enhance existing products. Although many companies are often willing to enter into such licensing agreements, no assurance can be provided that such licenses can be negotiated on reasonable terms, or at all. The failure to enter into technology development or licensing agreements, when necessary, could limit our ability to develop new products and could harm our business.

Despite our efforts to protect our technology and proprietary rights as discussed above, unauthorized parties may still obtain and use our technology and software. We have defended, and intend to vigorously defend when necessary, our intellectual property from infringement. Other companies in the communications and technology industries frequently threaten litigation or file suit against us (directly or indirectly through customers to whom we could owe indemnification) based on allegations of infringement or other violations of intellectual property rights. We are currently subject to, and expect to face in the future, allegations that we have infringed the intellectual property rights of third parties, including those of our competitors and non-practicing entities.

Regulatory Considerations

As a company with global operations, we are subject to complex U.S. and foreign laws and regulations, including trade regulations, tariffs, import and export regulations, anti-bribery and corruption laws, antitrust or competition laws, cybersecurity, privacy and data protection, among others. In addition, our operations are also subject to a number of environmental regulations such as the Waste Electrical and Electronic Equipment Directive ("WEEE") and the Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment ("RoHS"). We have developed policies and procedures to assist us in complying with these laws and regulations. Our historical compliance costs, including those related to environmental regulations, have not resulted in a material adverse effect on our business, results of operations or financial condition. We expect the laws and regulations to which we are subject will continue to increase and the future costs of compliance with existing or new regulations could materially impact our business in the future.

Our Employees

As a global company, we continue to focus on improving our "*One Team*" approach, aligning around a work culture that reflects and expresses our values, with global processes and platforms that enable us to work efficiently across borders and functions. We aim to create a workplace that is engaging, inspiring, challenging and inclusive. We strive to be an employer of choice for our current employees and for future employees who are seeking an opportunity to join our dynamic business, positioned at the nexus of global communications technology and social transformation.

As of December 31, 2021, we had a total of 3,685 employees worldwide, located geographically as follows:

	Number of employees	Percentage of total
Asia	1,509	41 %
North America	997	27 %
EMEA	1,058	29 %
LATAM	121	3 %

Approximately 640 employees are covered by collective bargaining agreements or works councils, and we believe that our relations with the labor unions are generally good.

Our values are focused on teamwork, passion (taking pride in our achievements), being a trusted advisor to our customers, innovation and being "TRUE" - Transparent, Respectful, Unpretentious and Empowered. Engaging our employees includes aligning with these values and providing a workplace that is one in which we all work toward shared objectives that contribute to a better world and a better society. We engage our employees by providing opportunities for personal and professional growth and maintaining a culture of open communications where everyone receives constructive performance feedback and is encouraged to offer new ideas about any aspect of the work we do and our ways of doing things.

Diversity, Equity and Inclusion ("DEI"). We believe that having a diverse group of people who contribute different perspectives and viewpoints is a serious competitive advantage and critical to the success of any organization. In our most recent survey completed in 2021, 89% of employees responded that they feel comfortable working at Ribbon and 87% agreed that our employees appreciate others whose gender, backgrounds and beliefs are different from their own. We held our first annual *Global Diversity Day* in 2021 to engage employees in inspiring dialogue led by expert guest speakers on topics such as gender equality in the workplace and personal accountability for diversity.

Our DEI strategy's initial focus is on achieving stronger representation of women in a variety of roles at all levels of the organization, with an emphasis on women in management. As of December 31, 2021, the percentage of employees in each region that identified as female was as follows:

	Percentage of employees identifying as female
Asia	26 %
North America	20 %
EMEA	23 %
LATAM	18 %
Percentage of total employees identifying as female	23 %

We have established a number of goals to increase the number of women in our workforce. For 2021, we established a goal that at least 25% of our new hires identify as female and we exceeded that goal with approximately 29% of our new hires identifying as female. Longer term, we also want to improve the number of women in management roles and have established a goal of at least 30% of management roles to be held by women by 2025 (and 40% long-term) from an initial baseline of 16%.

Attracting women to technology careers has traditionally been a challenge, and we recognize the need to accelerate the hiring and advancement of women at Ribbon. To support our efforts, we have created the Ribbon Diversity Council that will develop our DEI strategy and create initiatives to deliver stronger diverse representation at Ribbon, including initiatives aimed at improving our outreach to female candidates, expanding options for professional and leadership development, and raising awareness at all levels of the organization to encourage an understanding of more balanced representation of women and other under-represented groups across the Company.

Employee Turnover and Engagement. We believe one of the best ways to monitor our overall employee engagement is through monitoring employee turnover rates, as successful employee engagement helps increase employee tenure and reduce voluntary turnover. For the year ended December 31, 2021, our voluntary employee turnover was 11.6% globally. Like many companies in our industry, this is up significantly from our historical levels. While we have generally been able to successfully backfill these positions, we continue to review the reasons provided by employees as to their departure and have taken a number of steps to address these concerns, including implanting regional salary increases to remain competitive in local markets, reviewing employee benefits, introducing selective retention programs to ensure we retain our key employees in a very competitive employment market globally and providing additional targeted employee engagement in regional locations or functions with higher attrition.

As a further way of measuring employee engagement, in 2022 we again conducted an employee pulse survey to better understand employees' views on items such as our strategy, communication and whether or not they would recommend Ribbon as a place to work. We intend to use the results from this and future surveys to look for ways to continually improve our employee engagement. In 2021, we also created Ribbon Engagement Committees, employee-led groups in each of our major locations, charged with delivering programs of locally relevant activities and events that facilitate networking, enable exchange of ideas and help enhance employee satisfaction, productivity and engagement in local communities.

Training and Development. We believe investing in our employees' professional development so that they can perform their current roles more effectively and can be prepared for roles of greater responsibility in the future. Our training programs utilize a combination of in-person and online programs and include core modules, some of which are mandatory, relating to ethical conduct, products and services, safety, human rights and anti-corruption, as well as additional tailored programs on topics such as leadership, management, project management and competency development. In 2021, we delivered approximately 18 training hours per employee across our workforce, up from approximately 12 hours in 2020.

Safety, Health and Well-being. We strive for a workplace that is free of hazards for our employees. We take care to comply with applicable safety regulations and have a strong track record for safety that we reinforce through regular training modules in all of our locations.

As a result of the ongoing COVID-19 pandemic, we have taken a number of steps to help ensure the safety and well-being of our employees. This included closing our offices and shifting most employees to work from home. We instituted a phased return to occupancy plan that provided for a gradual return of employees to our locations on a part-time basis (typically 2-3 days per week) based on the current conditions in the geographic region the office is located in, as well as local regulations. In certain locations, such as India, we also sponsored COVID-19 vaccination drives to assist employees and their families in being able to receive COVID-19 vaccines. We have provided regular communications to our employees to update them on our policies and created a COVID-19 resource site for them that includes information and resources on working from home and links to official resources from the World Health Organization, the Centers for Disease Control and others.

Community Investment. We value the communities in which we work. We encourage a service mindset among our employees wherever they are and support community involvement and engagement. To that end, since 2010, we have provided a day of paid time off for all employees to participate in our Global Day of Service during which they are encouraged to volunteer and contribute to local non-profits in their communities.

For additional information on our employees and our current engagement activities, please see our most recent sustainability report, which is available at ribboncommunications.com/company/company-policies/sustainability-report.

Corporate Governance and Social Responsibility

We are committed to operating ethically, efficiently and inclusively. We believe we contribute to the communities in which we operate through the mitigation of climate change and other global sustainable development priorities. We aim to help improve the quality of the lives of people, society and the health of the planet through leveraging our expertise in transforming networks, enhancing security and delivering world-class solutions. We believe that communications technology and continuous innovation form the backbone upon which sustainable development largely depends. Major technology trends supported by our solutions include the accelerated adoption of collaboration platforms such as Microsoft Teams and Zoom; the 5G revolution; accelerating customers' ability to transfer carbon-intensive data storage from using local physical environments to the cloud; supporting service providers’ increased network demands to allow more people to work from home; and using our analytics solutions to maximize network efficiencies.

We have taken a more strategic position to our environmental, social and governance ("ESG") practices. Our recent materiality study reviewed the expectations and requirements of both our stakeholders and our competitors to focus on the ESG practices that are most critical to our business and those where we believe we can make the largest positive impact. From this materiality study, we published a strategy which we believe will positively impact our future environmental performance, and deliver social benefits for our customers, employees and society at large. Additionally, we believe the governance improvements made as a result of our strategy will result in enhancements in our accountability and that of our suppliers and partners. We have developed three initial targets to display both our confidence in delivery and our commitment to supporting the United Nations' Sustainability Development Goals: (1) reduction of our greenhouse gas emissions by 30% by 2030; (2) improvement in our workforce diversity with a specific goal to achieve at least 30% of women in management by 2025; and (3) enhancement of controls in our supply chain to improve ethical and sustainable conduct amongst our suppliers.

We are committed to protecting the environment and preventing pollution within a product's lifecycle through responsible product design and requiring suppliers to adhere to sustainable practices. An example of this is our focus on continuously improving the power and space efficiency of our products to reduce overall energy consumption in our customers' networks at our own facilities. We align our compliance goals with component directives such as RoHS legislation in the European Union and China and with the European WEEE directive. We also hold a host of internationally recognized certifications for our global offerings, including ISO 9001: 2015 - Quality Management Systems; ISO 14001: 2015 - Environmental Management Systems; and SI 10000: 2013 - Social Responsibility (covering our sites in Israel).

It has always been paramount to our way of doing business to act with the utmost integrity, honesty and transparency. Our commitment to ethical business practices guide us in our compliance with national and international laws and regulations, including anti-corruption, anti-bribery and unfair competition, antitrust and human rights. We maintain a Code of Conduct that applies to all of our directors, employees, contractors and suppliers. We are committed to strong corporate governance practices, which include building long-term value and assuring success for our stockholders and other stakeholders, including employees, customers and the communities in which we operate.

For additional information regarding our corporate governance and our social responsibility goals and initiatives, please see “Corporate Governance” on our investor relations website (investors.ribboncommunications.com) and our most recent sustainability report, which is available at ribboncommunications.com/company/company-policies/sustainability-report.

Seasonality

We have experienced quarterly fluctuations in customer activity due to seasonal considerations. We typically experience increases in order volume in the fourth quarter due to greater spending on operating and capital expenditures by our service provider customers. We typically experience reductions in order volume toward the beginning of the calendar year, when our service provider customers are operationalizing their annual budgets and plans, which may result in lower revenue in the first quarter. These typical seasonal effects may vary. Accordingly, they should not be considered a reliable indicator of our future operating results.

Additional Information

Our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed with or furnished to the United States Securities and Exchange Commission (the “SEC”), are available free of charge through the SEC's Internet site (*http://www.sec.gov*) or our Internet site (*http://www.ribboncommunications.com*) as soon as reasonably practicable after we electronically file such material with, or furnish it to, the SEC. Information contained on, or that can be accessed through, our website does not constitute a part of this annual report and is not incorporated by reference herein.

Item 1A. Risk Factors

Our business faces significant risks and uncertainties. Certain important factors may have a material adverse effect on our business prospects, financial condition and results of operations, and they should be carefully considered. Accordingly, in evaluating our business, we encourage you to consider the following discussion of risk factors in its entirety in addition to other information contained in or incorporated by reference into this Annual Report on Form 10-K and our other public filings with the Securities and Exchange Commission (“SEC”). Other events that we do not currently anticipate or that we currently deem immaterial may also affect our business, prospects, financial condition and results of operations.

Risk Factors Summary

The following is a summary of the principal risks that could adversely affect our business, operations and financial results:

Risks Related to Our Business and Industry

- Our quarterly revenue and operating results are unpredictable and may fluctuate significantly quarter to quarter.
- The continuing COVID-19 pandemic may have a material adverse impact on our business, financial position and results of operations.
- Failure to compete successfully could impair our ability to increase revenues and/or remain profitable.
- Our future success is dependent on growing our base of customers and expanding our recurring revenue.
- Consolidation in the telecommunications industry could harm our business.
- Restructuring activities could adversely affect our ability to execute our business strategy.
- Exposure to the credit risk of some of our customers and to credit exposures in fragile financial markets could result in material losses.
- Disruptions to relationships with distributors, resellers, system integrators and other channel partners could adversely affect our revenues.
- Failure to align our strategic plan with our customers' investments, or failure of products and services to meet customers' demands, could impact our revenues.
- Failure of our products to interoperate with our customers' existing networks could result in customer losses.

- Delay in the anticipated shift to more virtualized networks, or failure for customers to adopt our new products and services focused on virtualized networks, could reduce our revenues.
- The market for some of our products depends on the availability and demand for other vendors' products.
- Failure by our strategic partners or by us in integrating products could harm our business.
- We rely on contract manufacturers.
- We rely on single or limited sources for supply of some components of our products.
- Failure to correctly estimate future requirements for end-of-life products purchased from third parties could harm our operating results or business.
- Products may have errors or defects that we find only after full deployment.
- Government sales are subject to potential delays and cutbacks, may require specific testing efforts, or impose significant compliance obligations.
- Combining ECI, or future companies, may be more difficult, costly or time-consuming than expected, and anticipated benefits and cost savings may not be realized.
- Future investments, mergers or acquisitions could be difficult to integrate, disrupt our business, dilute shareholder value and harm our financial condition.
- Failure to hire and retain key personnel could negatively impact our ability to meet our business objectives and impair future growth.
- Man-made problems, such as terrorism, and natural catastrophic events may disrupt our operations and harm our operating results.

Risks Related to Our International Operations

- Worldwide efforts to contain capital spending and global economic conditions and uncertainties may have a material adverse impact on our business.
- Growing tensions between Russia and Ukraine could materially impact our sales to customers in that region.
- Conditions in Israel may materially and adversely affect our business.
- Risks associated with our international operations could impair our ability to grow our international revenue.
- Increases in tariffs, trade restrictions or taxes on our products could have an adverse impact on our operations.
- Fluctuations in currency exchange rates could negatively impact our financial results and cash flows.
- Use and reliance upon research and development resources in global locations may expose us to unanticipated costs and/or liabilities.

Risks Related to Intellectual Property

- Our business could be jeopardized if we are unable to protect our intellectual property.
- Failure to obtain necessary licenses or ongoing maintenance and support of third-party technology at acceptable prices on acceptable terms, or at all, it could harm our operating results or business.
- A breach of the security of our information systems or those of our third-party providers could adversely affect our operating results.

Risks Related to Regulation

- Data privacy issues, including evolving laws, regulations and associated compliance, may adversely impact our business and financial results.
- Failure to comply with the Foreign Corrupt Practices Act ("FCPA") or the U.K. Bribery Act ("UKBA") could subject us to significant civil or criminal penalties.
- Governmental export and import controls could subject us to liability, require a license from the U.S. government or impair our ability to compete in international markets.
- Changes in governmental regulation, especially with respect to the telecommunications industry, could harm our operating results and future prospects.

Risks Related to Our Indebtedness and Accounting Matters

- The terms of our credit agreement could adversely affect our operating flexibility and pose risks of default, which would negatively impact our liquidity and operations.
- The value of the securities received in connection with the sale of our Kandy Communications Business is volatile and can significantly impact our financial results.
- Impairment of our goodwill or intangible assets may require us to record a significant charge to earnings.
- Failure to maintain appropriate internal controls in the future may adversely affect our stock price and our business.

General Risk Factors

- Litigation and government investigations could result in significant legal expenses and settlement payments, fines or damage awards.
- Our stock price has been and may continue to be volatile.
- We are party to a stockholders' agreement with certain stockholders which provides such stockholders with certain rights that may differ from the rights of our other stockholders.
- Delaware law and our charter documents contain provisions that could discourage or prevent a potential takeover.

For a more complete discussion of the material risks facing our business, see below.

Risks Related to our Business and Industry

Our quarterly revenue and operating results are unpredictable and may fluctuate significantly from quarter to quarter, which could adversely affect our business, results of operations and the trading price of our common stock.

Our revenue and operating results may vary significantly from quarter to quarter due to a number of factors, many of which are outside of our control and any of which may cause our stock price to fluctuate. Material factors that may affect our revenue and operating results include those discussed below under “Risks Related to our Business and Industry.”

Equipment purchases by CSPs and enterprises continue to be unpredictable. As with other telecommunications product suppliers, we typically recognize a portion of our revenue in a given quarter from sales booked and shipped in the last weeks of that quarter. As a result, delays in customer orders may result in delays in shipments and recognition of revenue beyond the end of a given quarter. Additionally, we rely on the revenue provided by certain large customers. It can be difficult for us to predict the timing of receipt of major customer orders, and we are unable to control their timing decisions. We have experienced significant variability in the spending patterns and purchasing practices of our customers on a quarterly and annual basis, and we expect that this variability will continue. Consequently, our quarterly operating results are difficult to predict, even in the short term, and a delay in an anticipated sale past the end of a particular quarter may negatively impact our results of operations for that quarter, or in some cases, that year. Therefore, we believe that quarter-to-quarter comparisons of our operating results are not a good indication of our future performance. If our revenue or operating results fall below the expectations of investors or securities analysts or below any guidance we may provide to the market, the price of our common stock could decline substantially. Such a stock price decline could also occur even if we meet our publicly stated revenue and/or earnings guidance.

A significant portion of our operating expenses is fixed in the short term. If revenue for a particular quarter is below expectations, we may not be able to reduce costs and expenses proportionally for that quarter. Any such revenue shortfall would, therefore, have a significant effect on our operating results for that quarter.

The continuing COVID-19 pandemic and resulting effects on global economic conditions may have a material adverse impact on our business, financial position and results of operations.

In 2020, a novel strain of the coronavirus (COVID-19) was declared by the World Health Organization to be a global pandemic. The COVID-19 pandemic has had a negative effect on the global economy, disrupting the various manufacturing, commodity and financial markets and increasing volatility, and has impeded global supply chains. Continuing economic uncertainties as a result of the COVID-19 pandemic may cause our customers to restrict spending or delay purchases for an indeterminate period of time. Travel restrictions imposed as a result of the pandemic have also made it more difficult to meet with existing and potential customers. In addition, our ability to deliver our solutions as agreed with our customers depends on the ability of our global contract manufacturers, vendors, licensors, and other business partners to deliver products or perform services we have procured from them. When the COVID-19 pandemic impairs the ability of our business partners to support us on a timely basis, or negatively impacts the demand for our customers’ other products and services, our ability to perform our customer contracts as well as the demand for our solutions may suffer. In addition, disruptions from the COVID-19 pandemic has included the temporary closures of some of our facilities, as well as those of our contract manufacturers, vendors and suppliers. This workforce disruption has caused, in some cases, the inability to obtain key components of our products, the disruption of logistics necessary to import, export and deliver our solutions.

Future waves and new variants of COVID-19, for which current vaccines may not be as effective or effective at all, could materially impact our business, financial position and results of operations, the degree to which will depend on future developments beyond our control. This includes the continued effect of COVID-19 on economic conditions, as well as workforce disruptions due to illness or compliance with local health and safety measures.

If we fail to compete successfully against telecommunications equipment and networking companies, our ability to increase our revenue and remain profitable will be impaired.

Competition in the telecommunications market is intense. The market is shifting from an ecosystem dominated by a few large incumbent telecommunications equipment companies, such as Ericsson LM Telephone Company, Huawei Technologies Co. Ltd. and Nokia Corporation, to a market with competitors that are characterized by network virtualization, migration to the cloud, and open interfaces. We believe this shift creates opportunities for us, as well as our direct competitors in telecommunications and networking. The shift also creates opportunities for new entrants, including some that may currently be our strategic partners, that could become competitors in the industry. See Item 1. "*Business – Competition*". Mergers among any of these or other competitors could strengthen their ability to compete against us, and additional competitors with significant financial resources entering our markets could further intensify competition.

To compete effectively, we must deliver innovative products that provide extremely high reliability and quality; deploy and scale easily and efficiently; interoperate with existing network infrastructures and multivendor solutions; provide effective network management, as well as comprehensive customer support and professional services; provide a cost-effective and space-efficient solution for enterprises and service providers; meet price competition from low cost equipment providers; and offer solutions that are timely for the market and support where the industry is heading.

Many of our current and potential competitors have significantly greater selling and marketing, technical, manufacturing, financial and other resources than we have. Further, some of our competitors sell significant amounts of other products to our current and prospective customers and have the ability to offer lower prices to win business. Our competitors' broad product portfolios, coupled with already existing relationships, may cause our customers to buy our competitors' products or harm our ability to attract new customers.

If we are unable to compete successfully against our current and future competitors, we could experience price reductions, order cancellations and loss of customers and revenue, and our operating results could be adversely affected.

Our future success is dependent on growing our base of customers and expanding our recurring revenue from our existing customers.

We rely on certain key customers, and our future success will depend on our ability to generate recurring business from our existing customers and to attract additional customers beyond our current customer base. One customer, Verizon Communications Inc., contributed approximately 16% of our revenue in the year ended December 31, 2021. Our top five customers contributed approximately 34% of our revenue in 2021. Factors that may affect our ability to grow our customer base include, but are not limited to, economic conditions that discourage potential new customers from making the capital investments required to adopt new technologies; deterioration in the general financial condition of service providers and enterprises, or their ability to raise capital or access lending sources; new product introductions by our competitors; and the success of our channel partner program. If we are unable to expand our customer base, the loss of any significant customer, or any substantial reduction in purchase orders or deferral of purchasing decisions from these customers, could materially adversely affect our results of operations and financial condition.

Consolidation in the telecommunications industry could harm our business.

The telecommunications industry, including many of our customers, has experienced consolidation, including, in the carrier space, the merger between T-Mobile US, Inc. and Sprint Corporation (April 2020) and the acquisition of Blue Face Ltd. by Comcast Corporation (January 2020). Further, consolidation has also occurred in the telecommunications supplier and vendor space, including the proposed combination of ADTRAN, Inc. and ADVA (expected to be completed in 2022), the acquisition of Acacia Communications, Inc. by Cisco Systems, Inc. (March 2021) and the closing of a strategic partnership between RingCentral, Inc. and Avaya Holdings Corp. (October 2019).

We expect this trend to continue. Consolidation among our customers may cause delays or reductions in capital expenditure plans by such customers and/or increased competitive pricing pressures as the number of available customers declines and the relative bargaining power of customers increases in relation to suppliers. Any of these factors could materially adversely affect our business.

Restructuring activities could adversely affect our ability to execute our business strategy.

We recorded net restructuring expense of $11.7 million and $16.2 million in 2021 and 2020, respectively, including severance and related costs, facilities restructuring and accelerated amortization of lease assets. In 2022, we expect to record additional restructuring expense of approximately $20 million as we look to further streamline operations and consolidate our global footprint to reflect, among other things, a greater percentage of our workforce working from home on a go-forward basis.

Our current restructuring and any future restructuring, should it become necessary for us to further restructure our business due to market conditions or other factors that reduce the demand for our products and services, could adversely affect our ability to execute our business strategy in a number of ways, including through loss of key employees; diversion of management's attention from normal daily operations of the business; diminished ability to respond to customer requirements related to both products and services; disruption of our engineering and manufacturing processes, which could adversely affect our ability to introduce new products and to deliver products both on a timely basis and in accordance with the highest quality standards; and/or reduced ability to execute effectively internal administrative processes, including the implementation of key information technology programs.

There can be no assurance that any restructuring actions we have taken in the past, or may take in the future, will improve our financial condition or results of operations.

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

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

Most of our sales are on an open credit basis, with typical payment terms of 30 to 90 days. In our IP Optical Networks segment, some payment terms may be as long as 180 days or, in limited circumstances, even longer. We evaluate and monitor individual customer payment capability in granting such open credit arrangements, maintain reserves that we believe are adequate to cover exposure for doubtful accounts, and in some cases, insure credit risk. However, there can be no assurance that our open credit customers will pay the amounts they owe us or that the reserves we maintain will be adequate to cover such credit exposure. Our sales derived through distributors, in particular, represent sources of increased credit risk as distributors tend to have more limited financial resources than other resellers and end-user customers.

Our customers' failure to pay and/or our failure to maintain sufficient reserves could have a material adverse effect on our results of operations and financial condition. Additionally, in the event that turmoil in the credit markets makes it more difficult for some customers to obtain financing, those customers' ability to pay could be adversely impacted, which in turn could have a material adverse impact on our business, results of operations and financial condition.

Disruptions to, or our failure to effectively develop relationships with and manage, distributors, resellers, system integrators and other channel partners, and the processes and procedures that support them, could adversely affect our ability to generate revenue from the sale of our products and services.

We continue to enhance our sales strategy, which we expect will include more partner sales engagements to resell our products and services through authorized distributors, value-added resellers ("VARs"), system integrators and other channel partners. Our future success is dependent upon establishing and maintaining successful relationships with a variety of distributors, VARs, system integrators and other channel partners. We may also need to pursue strategic partnerships with vendors that have broader technology or product offerings in order to compete with end-to-end solution providers. In addition, many of the enterprise markets we are pursuing require a broad network of resale partners in order to achieve effective distribution.

Many of our distribution and channel partners sell competitive products and services, and the loss of, or reduction in sales by, these partners could materially reduce our revenue. Our sales through channel partners typically involve the use of our products as components of a larger solution being implemented by systems integrators. In these instances, the purchase and sale of our products are dependent on the channel partners, who typically control the timing, prioritization and implementation of projects. If we fail to maintain relationships with our distribution, VAR and systems integration partners, fail to develop new relationships with other partners in new markets, fail to manage, train or provide incentives to our existing partners effectively, or if these partners are not successful in their sales efforts, sales of our products and services may decrease and our operating results could suffer. Moreover, if we do not have adequate personnel, experience and resources to manage the relationships with our partners and to fulfill our responsibilities under such arrangements, any such shortcomings could have a material adverse impact on our business and results of operations.

If our strategic plan, including our research and development of innovative new products and the improvement of existing products, is not aligned with our customers' investments in the evolution of their networks, or if our products and services do not meet customers' demands, customers may not buy our products or use our services.

We spend a significant amount of time, money and resources both developing new technology, products and solutions and acquiring new businesses or business assets to help keep up with rapid technology and market changes. Our strategic plan includes a continued shift in our investments from mature technologies that previously generated significant revenue for us toward certain next-generation technologies. Our choices of specific technologies to pursue, and those to de-emphasize, may prove to be inconsistent with our customers' investment spending. Moreover, if we invest in the development of technologies, products and solutions that do not function as expected, are not adopted by the industry, are not ready in time, are not accepted by our customers as quickly as anticipated or at all, mature more quickly than we anticipated or are not successful in the marketplace, our sales and earnings may suffer and, as a result, our stock price could decline.

To achieve market acceptance for our products, we must effectively anticipate, and adapt in a timely manner to, customer requirements and offer products and services that meet changing customer demands. Prospective customers may require product features and capabilities that our current products do not have. The introduction of new or enhanced products also requires that we carefully manage the transition from older products in order to minimize disruption in customer ordering patterns and ensure that adequate supplies of new products can be delivered to meet anticipated customer demand. If we fail to develop products and offer services that satisfy customer requirements or if we fail to effectively manage the transition from older products, our ability to create or increase demand for our products and services could be seriously harmed, we may lose current and prospective customers and our results of operations and financial condition could be materially adversely affected.

If our products do not interoperate with our customers' existing networks, we may not retain current customers or attract new customers.

Many of our customers will require that our products be designed to interface with their existing networks, each of which may have different specifications. Issues caused by an unanticipated lack of interoperability may result in significant warranty, support and repair costs, divert the attention of our engineering personnel from our hardware and software development efforts and cause significant customer relations problems. If our products do not interoperate with those of our customers' networks, installations could be delayed or orders for our products could be canceled, which would seriously harm our gross margins and result in loss of revenue or customers.

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

We believe the telecommunications industry remains in the early stages of transitioning to the virtualization of networks. While we anticipate that the industry shift to a software-centric cloud-based architecture is likely to happen, fundamental changes like this often take time to accelerate. In addition, our customers may adapt to such changes at varying rates. As our customers take time to determine their future network architectures, we may encounter delayed timing of orders, deferred purchasing decisions and reduced expenditures by our customers. These longer decision cycles and reduced expenditures may negatively impact our revenue or make it difficult for us to accurately predict our revenue, either of which could materially adversely affect our results of operations and cause our stock price to decline.

Virtualization of our product portfolio, particularly in our Cloud and Edge segment, to increasingly focus on software-based products could also adversely impact our revenue growth. As we virtualize our product portfolio, we expect our margins to improve due to decreased costs tied to production and sales of our appliance products, however, our revenue may decline as a result of the decreases in sales of appliance products, many of which have generated higher revenue on a per-unit basis than certain of our software products.

The market for some of our products depends on the availability and demand for other vendors' products.

Some of our products, particularly those addressing the Unified Communications market, are designed to function with other vendors' products. In these cases, demand for our products is dependent upon the availability, demand for, and sales of the other vendors' products, as well as the degree to which our products successfully interoperate with the other vendors' products and add value to the solution being provided to the customer. If the other vendors change the design of their products, delay the issuance of new releases, fail to adequately market their products, or are otherwise unsuccessful in building a market for their products, the demand for our products will be adversely affected, which could adversely affect our business, results of operations and financial condition.

Failure by our strategic partners or by us in integrating products provided by our strategic partners could harm our business.

Our solutions include the integration of products supplied by strategic partners. We rely on these strategic partners in the timely and successful deployment of our solutions to our customers. If the products provided by these partners have defects or do not operate as expected, if the services provided by these partners are not completed in a timely manner, if our partners have organizational or supply issues, or if we do not effectively integrate and support products supplied by these strategic partners, then we may have difficulty with the deployment of our solutions that may result in loss of, or delay in, revenue; increased service, support and warranty costs and a diversion of development resources; and/or network performance penalties.

In addition to cooperating with our strategic partners, such as Microsoft, on specific customer projects, we also may compete in some areas with these same partners. If these strategic partners fail to perform or choose not to cooperate with us on certain projects, in addition to the effects described above, we could experience loss of customers and market share, or fail to attract new customers.

If our contract manufacturers fail to perform, or if we change or consolidate manufacturers, we may fail to meet the demands of our customers and damage our customer relationships, which could materially adversely affect our business.

We currently rely on a number of large global contract manufacturers to assemble our products according to our specifications and to fulfill orders on a timely basis. Reliance on a third-party manufacturer involves a number of risks, including a lack of control over the manufacturing process, inventory management and the potential absence or unavailability of adequate capacity. These risks are amplified by the current supply chain disruptions being experienced globally. As we do not have the internal manufacturing capabilities, any difficulties or failures to perform by our contract manufacturers could cause delays in customer product shipments, which could negatively affect our relationships with customers and result in delayed revenue.

In addition, any future changes to or consolidations of our current contract manufacturers could lead to material shortages or delays in the supply of our products. Qualifying a new contract manufacturer to commence commercial scale production or consolidating to a reduced number of contract manufacturers are expensive and time-consuming activities and could result in a significant delay in the supply of our products, which could negatively affect our relationships with customers and result in delayed revenue.

We and our contract manufacturers rely on single or limited sources for supply of some components of our products and if we fail to adequately predict our manufacturing requirements or if our supply of any of these components is disrupted, we will be unable to ship our products in a timely manner, or at all.

We and our contract manufacturers both purchase several key components of our products. Depending upon the component, there may or may not be alternative sources of substitutes. If we overestimate our component and finished goods requirements, we could have excess inventory, which would increase our costs. If we or our contract manufacturers underestimate our requirements, we may not have an adequate supply, which could interrupt manufacturing of our products and result in delays in shipments and revenue. If any of our sole or limited source suppliers experiences capacity constraints, work stoppages or other reductions or disruptions in output, it may not be able to meet, or may choose not to meet, our delivery schedules. Moreover, we have agreed to compensate our contract manufacturers in the event of termination or cancellation of orders, discontinuance of product or excess material.

We currently do not have long-term supply contracts with our component suppliers and they are not required to supply us with components for any specified periods, in any specified quantities or at any set price, except as may be specified in a particular purchase order. In the event of a disruption or delay in supply or our inability to obtain components, we may not be able to develop an alternate source in a timely manner or at favorable prices, or at all. While we regularly monitor our inventory of supplies, a failure to find acceptable alternative sources could hurt our ability to deliver high-quality products to our customers and negatively affect our operating margins.

Reliance on our suppliers also exposes us to potential quality variations and unforeseen price increases. Any disruption in the supply of key components would seriously adversely affect our ability to meet committed delivery dates and could result in loss of customers, harm to our ability to attract new customers, or legal action. Additionally, any unforeseen increases in the prices of components could reduce our profitability or force us to increase our prices, which could result in a loss of customers or harm our ability to attract new customers and could have a material adverse effect on our results of operations. For example, in the fourth quarter of 2021, we estimate that higher component costs, expedite and production fees and logistics expenses resulting from the global supply chain disruption reduced our gross margin by approximately 220 basis points.

Our customer contracts also generally allow customers to reschedule delivery dates or cancel orders within certain time frames before shipment without penalty and outside those times frames with a penalty. Because of these and other factors, there are risks of excess or inadequate inventory that could negatively affect our expenses and results of operations.

If we are unable to correctly estimate future requirements for hardware products that we purchase from our third-party vendors that have reached the end of their life cycles, it could harm our operating results or business.

Some of the hardware products that we purchase from our third-party vendors have reached the end of their life cycles. It may be difficult for us to maintain appropriate levels of the discontinued appliances to adequately ensure that we do not have a shortage or surplus of inventory of these products. If we do not correctly forecast the demand for such appliances, we could have excess inventory and may need to write off the costs related to such purchases and such write-offs could materially adversely affect our operating results. However, if we underestimate our forecast and our customers place orders to purchase more products than are available, we may not have sufficient inventory to support their needs. If we are unable to provide our customers with enough of these products, it could make it difficult to retain certain customers, which could have a material and adverse effect on our business.

Our products may have errors or defects that we find only after full deployment.

Many of our products are sophisticated and are designed to be deployed in large and complex networks around the world. Because of the nature of our products, they can only be fully tested when substantially deployed in these networks. Some of our customers may discover errors or defects in the software or hardware, or the products may not operate as expected only after full deployment. Our customers expect us to establish a support infrastructure and maintain demanding support standards to ensure that their networks maintain high levels of availability and performance. As we continue to expand our distribution channel through distributors and resellers, we will need to rely on and support their service and support organizations. If we, or our distributors and resellers, are unable to fix errors or other performance problems that may be identified after full deployment of our products, or provide the expected level of support and service to our customers, we could experience increased service, support and warranty costs and a diversion of development resources, loss of customers, network performance penalties and/or legal actions by our customers, which could materially adversely affect our business and results of operations.

Disruptions to, or our failure to effectively develop, manage and maintain our government customer relationships could adversely affect our ability to generate revenue from these customers. Further, such government sales are subject to potential delays and cutbacks, may require specific testing efforts, or impose significant compliance obligations.

A portion of our total revenue from product sales comes from contracts with government agencies in the U.S. and other foreign countries. Disruptions to or our failure to effectively develop, manage and maintain our government customer relationships could adversely affect our ability to generate revenue from the sales to such customers. Governments routinely investigate and audit government contractors’ administrative processes, and any unfavorable audit could result in a government refusing to continue buying our products and services, a reduction of revenue or fines or civil or criminal liability if the audit uncovers improper or illegal activities, which could materially adversely impact our operating results.

Factors that could impact federal government spending on our products and services include a significant decline in, or reapportioning of, spending by the federal government customers, changes, delays or cancellations of government programs or requirements, the adoption of new laws or regulations, government shutdowns or other delays in the government budget and/or appropriations process, changes in the political climate and general economic conditions. The loss or significant curtailment of any government contracts or subcontracts, whether due to our performance or due to interruptions or changes in governmental funding, could have a material adverse effect on our business, results of operations and financial condition.

Further, sales to government customers may require specific testing efforts or impose significant compliance or certification obligations. For example, the U.S. Department of Defense ("DOD") has issued specific requirements for IP networking products for features and interoperability. In order for our products to be used to connect to the DOD network, that product must pass a series of significant tests and be certified by the Joint Interoperability Test Command (“JITC”). While certain of our products are certified by JITC, if we are unable to obtain future JITC certification as needed, our DOD sales and results of operations, may suffer.

Combining ECI, or future companies, may be more difficult, costly or time-consuming than expected and the anticipated benefits and cost savings of the ECI Acquisition, or future mergers may not be realized.

We have a history of significant mergers and acquisitions, including, most recently, the ECI Acquisition. The success of the ECI Acquisition, and any future merger or acquisition, including anticipated benefits and cost savings, will depend, in part, on our ability to successfully combine and integrate the businesses. It is possible that the integration process could result in the loss of key employees, higher than expected costs, diversion of management attention, the disruption of our ongoing businesses or inconsistencies in standards, controls, procedures and policies that adversely affect the combined company’s ability to maintain relationships with customers, vendors and employees or to achieve the anticipated benefits and cost savings of the ECI Acquisition or any future merger or acquisition.

We have incurred and will incur transaction fees, including legal, regulatory and other costs associated with closing the ECI Acquisition as well as expenses relating to formulating and implementing integration plans, including facilities and systems consolidation costs and employment-related costs. Additional unanticipated costs may be incurred in the ECI Acquisition and the integration of the two companies’ businesses, or in future acquisitions. While we expect that the elimination of duplicative operating costs as well as the realization of other efficiencies related to the integration of the businesses should allow us to offset integration-related costs over time, this net benefit may not be achieved in the near term or at all. As part of the integration process, we may also attempt to divest certain assets of the combined company, which may not be possible on favorable terms, or at all, or if successful, may change the profile of the combined company. If we experience difficulties with the integration process, the anticipated benefits of the ECI Acquisition, or any future acquisition, may not be realized fully or at all, or may take longer to realize than anticipated. The actual cost savings of the ECI Acquisition could also be less than expected.

Any future investments, mergers or acquisitions we make or enter into, as applicable, could be difficult to integrate, disrupt our business, dilute shareholder value and seriously harm our financial condition.

We have a history of significant acquisitions, including the recent ECI Acquisition, and we may merge with or acquire additional businesses, products or technologies in the future or sell a portion of our business. No assurance can be given that any future merger, acquisition or disposition will be successful or will not materially adversely affect our business, operating results or financial condition. We continue to review opportunities to merge with or acquire other businesses or technologies that would add to our existing product line, complement and enhance our current products, expand the breadth of our product and service offerings, enhance our technical capabilities or otherwise offer growth opportunities. If we enter into a merger or make acquisitions in the future, we could, among other things issue stock that would dilute existing stockholders' percentage ownership; incur significant debt or assume significant liabilities; materially reduce our cash; incur significant amortization expenses related to intangible assets; and/or incur large and immediate write-offs for in-process research and development and stock-based compensation.

Mergers, acquisitions and dispositions are inherently risky and subject to many factors outside of our control. Therefore, we cannot be certain that we would be successful in overcoming problems in connection with our past or future acquisitions. Our inability to do so could significantly harm our business, revenue, and results of operations.

Failure to hire and retain key personnel could negatively impact our ability to meet our business objectives and impair our future growth.

Our business depends upon highly skilled technical, managerial, engineering, sales, marketing and customer support personnel. Competition for these personnel is intense, especially during times of economic recovery or growth. Any failure to hire, assimilate in a timely manner and retain key qualified personnel, particularly engineering and sales personnel, could impair our growth and make it difficult to meet key objectives, such as timely and effective product introductions. In addition, our ability to attract and retain key employees could be adversely impacted if we do not have a sufficient number of shares available under the Amended and Restated 2019 Stock Incentive Plan to issue to our employees. We may not be able to locate suitable employees for any key employee who leaves or offer employment to potential replacements on reasonable terms.

Our future success also depends upon the continued services of our executive officers who have critical industry experience and relationships that we rely on to implement our business plan. None of our officers or key employees is bound by an employment agreement for any specific term. The loss of the services of any of our executive officers or key employees could delay the development and introduction of, and negatively impact our ability to sell, our products and achieve our business objectives.

Man-made problems, such as terrorism, and natural catastrophic events may disrupt our operations and harm our operating results.

The continued threat of terrorism and heightened security and military action in response to this threat, or any future acts of terrorism, may cause disruptions to the economies of the United States and other countries. Events such as work stoppages or widespread blackouts could have similar negative impacts. Such disruptions or uncertainties could result in delays or cancellations of customer orders or the manufacture or shipment of our products and have a material adverse effect on our business and results of operations.

Natural catastrophic events, such as earthquakes, fires, floods, tornadoes, or pandemics (such as the COVID-19 pandemic) may also affect our or our customers' operations. For example, we have offices located in the San Jose area of Northern California; Mexico City, Mexico; and Tokyo, Japan, regions known for seismic activity. A significant natural disaster, such as wildfires, earthquakes or floods, could have a material adverse effect on our business in these locations.

Risks Related to our International Operations

Worldwide efforts to contain capital spending and global economic conditions and uncertainties in the geopolitical environment have been and may continue to be materially adverse to our business.

A factor that significantly affects our operating results is the impact of economic conditions on the willingness of our current and potential customers to make capital investments. Given the general uncertainty regarding global economic conditions and other factors, we believe that customers have tried to maintain or improve profitability through cost control and constrained capital spending, which places additional pressure on IT departments to demonstrate acceptable return on investment. Some of our customers have canceled or delayed, and current and prospective customers may continue to cancel and delay, spending on the development or roll-out of capital and technology projects with us due to economic uncertainty and, consequently, our results of operations have been, and may continue to be, adversely affected. In addition, current uncertain worldwide economic and political environments make it increasingly difficult for us, our customers and our suppliers to accurately forecast future product demand, which could result in an inability to satisfy demand for our products and a loss of market share. Our revenue is likely to decline in such circumstances, which may result in erosion of our profit margins and significant losses.

Moreover, economic conditions worldwide may contribute to slowdowns in the communications and networking industries, as well as to specific segments and markets in which we operate, particularly the wireline sector, resulting in, among other things, reduced demand for our products and services as a result of our customers choosing to refrain from building capital intensive networks; increased price competition for our products, not only from our competitors, but also as a consequence of customers disposing of unutilized products; and risk of excess and obsolete inventories. Continuing turmoil in the geopolitical environment in many parts of the world may continue to put pressure on global economic conditions which in turn, could materially adversely affect our operating results. For example, following recent border clashes with China, India has enacted bans on the import of some goods manufactured in China. While the current import bans do not include our products, if India expands the bans to include the products we sell in India that are currently manufactured in China, we may be required to find new manufacturing locations for such products. While we have developed plans to relocate our manufacturing sites if needed, the timing required for relocation, or if we are not successful in relocating, could impact our ability to sell such products or timely deliver the products, and could result in lower or lost sales in India. The need to move manufacturing of such products could also negatively impact the margin earned on the sale of such products. If these or other sanctions are enacted, they may limit our ability to provide products and services in an important country or region for our business.

The military action between Russia and Ukraine, and the sanctions imposed as a result, could materially impact our sales to customers in that region.

For 2021, approximately 6% of our sales was to customers in Russia, Ukraine and surrounding countries. In February 2022, Russia commenced military action in Ukraine, and the uncertainty resulting from this military action and the threat for expansion of the conflict has resulted in some of our customers delaying purchases from us and is expected to result in additional delays or reductions in sales to customers in the impacted region. Further, the U.S. and other European countries have imposed sanctions against Russia in connection with the conflict. While these sanctions are in place, we believe they will severely limit, if not prohibit, our ability to sell our products and services to customers in Russia and, if expanded, could impact our ability to collect on outstanding accounts receivable from such customers. If the military action continues and the sanctions remain in place for an extended period, it could have a material impact on our financial results.

Conditions in Israel may materially and adversely affect the Company's business.

We have a significant number of employees located in Israel. As a result, political, economic and military conditions in Israel may directly affect the Company's business. In recent years, there have been hostilities between Israel and Hezbollah in Lebanon and Hamas in the Gaza Strip, both of which resulted in rockets being fired into Israel, causing casualties and disruption of economic activities. Popular uprisings in various countries in the Middle East and North Africa over the last few years has also affected the political stability of those countries and have led to a decline in the regional security situation. Such instability may also lead to deterioration in the political and trade relationships that exist between Israel and these countries. Any armed conflicts, terrorist activities or political instability involving Israel or other countries in the region could adversely affect our business, results of operations, financial condition, cash flows and prospects. Although the Israeli Government currently covers the reinstatement value of direct damages that are caused by terrorist attacks or acts of war, we cannot ensure shareholders that this coverage will be maintained or will be adequate in the event we submit a claim.

A number of countries, principally in the Middle East, still restrict doing business with Israel and Israeli companies, and additional countries may impose restrictions on doing business with Israel and Israeli companies if hostilities in Israel or political instability in the region continue or increase. In addition, there have been increased efforts by activists to cause companies and consumers to boycott Israeli goods based on Israeli Government policies. Such actions, particularly if they become more widespread, may adversely impact our ability to sell our products.

Our operations could also be disrupted by the absence for significant periods of one or more key employees or a significant number of other employees because of military service. Some of our employees in Israel are obliged to perform military reserve duty, which generally accumulates over a period of three years from several days to up to a maximum of 84 days (and up to 108 days, in special circumstances specified under applicable law) and, in certain emergency circumstances, employees may be called to immediate and unlimited active duty. In response to increases in terrorist activity, there have been periods of significant call-ups of military reservists and it is possible that there will be similar large-scale military reserve duty call-ups in the future. Any of these circumstances could have a material adverse effect on our business, results of operations, financial condition, cash flows and prospects.

We may face risks associated with our international operations that could impair our ability to grow our international revenue.

We have expanded, and expect to continue to expand, our operations in international and emerging markets. International operations are a significant part of our business, accounting for approximately 56% of total revenues in 2021. We expect such operations to continue to require significant management attention and financial resources to successfully grow. In addition, our international operations are subject to other inherent risks, including:

- greater reliance on channel partners;
- difficulties collecting accounts receivable and longer collection cycles;
- difficulties and costs of staffing and managing international operations;
- impacts of differing technical standards;
- compliance with international trade, customs and export control regulations;
- foreign government regulations limiting or prohibiting potential sales or increasing the cost of doing business in such markets, including adverse tax policies, tariffs, customs regulations, trade protection measures, export quotas and qualifications to transact business;
- foreign currency exchange controls, restrictions on repatriation of cash and changes in currency exchange rates;
- any need to adapt and localize our products for specific countries;
- our ability to effectively price our products in competitive international markets; and
- political, social and economic instability, including as a result of the fragility of global financial markets, health pandemics or epidemics and/or acts of war or terrorism.

Our international revenue, both as a percentage of total revenue and absolute dollars, may vary from one period to the next, and accordingly, current data may not be indicative of future periods. If we are unable to support our business operations in international and emerging markets, or their further expansion, while balancing the higher operational and financial risks associated with these markets, our business and results of operations could be harmed.

In addition, we may not be able to develop international market demand for our products, which could impair our ability to grow our revenue. In many international markets, long-standing relationships between potential customers and their local suppliers and protective regulations, including local content requirements and approvals, create barriers to entry. We have limited experience marketing, distributing and supporting our products in certain international locations and, to do so, we expect that we will need to develop versions of our products that comply with local standards. Moreover, difficulties in foreign financial markets and economies and of foreign financial institutions, particularly in emerging markets, could adversely affect demand from customers in the affected countries.

Increases in tariffs, trade restrictions or taxes on our products, as well as other risks of international operations, could have an adverse impact on our operations.

We manufacture certain of our appliance products and purchase a portion of our raw materials and components from suppliers in Mexico, Malaysia, China and other foreign countries. The commerce we conduct in the international marketplace makes us subject to tariffs, trade restrictions and other taxes when the raw materials or components we purchase, and the products we ship, cross international borders. Import tariffs and/or other mandates recently imposed by the United States have and could in the future lead to retaliatory actions by affected countries, including China, resulting in “trade wars,” and could significantly increase the prices on raw materials, the manufacturing of our equipment, and/or increased costs for goods imported into the United States, all of which are critical to our business. While we have developed plans to adjust manufacturing locations, if necessary, to avoid tariffs or other restrictions, any such tariffs could reduce customer demand for our products if our customers have to pay increased prices for our products as a result of such tariffs. In addition, tariff increases may have a similar impact on other suppliers and certain other customers, which could increase the negative impact on our operating results or future cash flows.

We are exposed to fluctuations in currency exchange rates that could negatively impact our financial results and cash flows.

Because a portion of our business is conducted outside the United States, we face exposure to adverse movements in foreign currency exchange rates. These exposures may change over time as business practices evolve, and they could have a material adverse impact on our financial results and cash flows. An increase in the value of the U.S. dollar could increase the real cost to our customers of our products in those markets outside the United States where we often sell in dollars, and a weakened U.S. dollar could increase the cost of local operating expenses and procurement of raw materials from sources outside the United States. Therefore, changes in the value of the U.S. dollar against other currencies will affect our revenue, income from operations, net income and the value of balance sheet items originally denominated in other currencies. There is no guarantee that our financial results will not be adversely affected by currency exchange rate fluctuations.

Our use and reliance upon research and development resources in global locations may expose us to unanticipated costs and/or liabilities.

We have research and development offices in various global locations, including the United States, Canada, India, Israel and China. Our development efforts and other operations in these locations could involve significant risks, including, among others, difficulty hiring and retaining appropriate engineering and management resources due to intense competition for such resources and resulting wage inflation; knowledge transfer related to our technology and resulting exposure to misappropriation of intellectual property or information that is proprietary to us, our customers and other third parties; and heightened exposure to changes in economic, security and global political conditions.

Difficulties resulting from the factors noted above and other risks related to our global operations could increase our expenses, impair our development efforts, harm our competitive position and damage our reputation.

Risks Related to Intellectual Property

Our business could be jeopardized if we are unable to protect our intellectual property. Additionally, in some jurisdictions, our rights may not be as strong as those we currently enjoy in the United States.

We rely on a combination of security countermeasures within our deployed products, as well as patent, copyright, trademark and trade secret laws and contractual restrictions on disclosure to protect our intellectual property rights. Despite our efforts to protect our proprietary rights, unauthorized parties may attempt to copy or otherwise misappropriate our products or technology. Monitoring unauthorized use of our products is difficult and we cannot be certain that the steps we have taken will prevent unauthorized use of our technology, particularly in foreign countries where the laws may not protect our proprietary rights as fully as in the United States. The legal systems of many foreign countries do not protect or honor intellectual property rights to the same extent as the legal system of the United States. It may be very difficult, time-consuming and costly for us to attempt to enforce our intellectual property rights, especially in these foreign jurisdictions. If competitors are able to use our technology, our ability to compete effectively could be harmed, which could have a material adverse effect on our business.

If we are unable to obtain necessary licenses or on-going maintenance and support of third-party technology at acceptable prices, on acceptable terms, or at all, it could harm our operating results or business.

We have incorporated third-party licensed technology, including open source software, into our current products. From time to time, we may be required to license additional technology from third parties to develop new products or product enhancements. Third-party licenses and on-going maintenance and support may not be available or continue to be available to us on commercially reasonable terms or may be available to us but only at significantly escalated pricing. Additionally, we may not be able to replace the functionality provided by third-party software currently offered with our products if that software becomes obsolete, defective or incompatible with future versions of our products or is not adequately maintained or updated. If we are unable to maintain or re-license any third-party licenses required in our current products or obtain any new third-party licenses to develop new products and product enhancements, or in the case of any defects in these third-party software products, we could be required to obtain substitute technology of lower quality or performance standards or at greater cost, and we may be delayed or prevented from making these products or enhancements, any of which could seriously harm our sales and the competitiveness of our products unless and until we can secure an alternative source.

A breach of the security of our information systems or those of our third-party providers could adversely affect our operating results.

We rely upon our information systems and, in certain circumstances, those of our third-party providers, such as vendors, consultants and contract manufacturers, to protect our sensitive or proprietary information and information of or about our customers, to develop and provide our products and services to customers, and to otherwise operate our business. Our information systems and those of our third-party providers are vulnerable to threats such as computer hacking, cyber-terrorism or other unauthorized activity that may result in third party access to or modification, corruption or deletion of our or our customers' sensitive or proprietary information or other disruptions to our business. Such cyberattacks and other cyber incidents are occurring more frequently, are constantly evolving, are becoming more sophisticated and can take many forms. For example, we are aware of a third party gaining unauthorized access to a portion of our network in the first quarter of 2021, although we do not believe they were able to obtain any material internal or customer data or otherwise disrupt our information systems before the intrusion was detected and remediated. While we believe that we leverage appropriate detection and prevention systems and services and that we focus on continuous improvement based upon the latest attack vectors in the industry, we cannot guarantee that there will never be any information technology system failures, including future breaches of our or our third-party providers' data security measures through a cyberattack, other cyber incident or otherwise, or the theft or loss of laptops, other mobile devices or electronic records used to back up our systems or our third-party providers' systems, which could result in a disclosure of customer, employee, or our information or otherwise disrupt our ability to function in the normal course of business by potentially causing, among other things, delays in the fulfillment or cancellation of customer orders or disruptions in the manufacture or shipment of products or delivery of services, any of which could have a material adverse effect on our operating results.

Additionally, the compromise of our information systems, or the information systems of our third party providers and our customers, could lead to unauthorized tampering with our products. Unauthorized tampering may result in, among other things, the disruption of our customers' businesses, errors or defects occurring in the software due to such unauthorized tampering, and our products not operating as expected after such unauthorized tampering. These types of security breaches could also create exposure to lawsuits, regulatory investigations, and increased legal liability. As a provider of secure real-time communications solutions, the reputational harm of any actual or perceived breach, compromise, defect or error relating to the security of our information systems and the products and services we provide may result in substantial harm to our reputation, even if the legal or regulatory impact is minimal. In addition, the costs to remediate any cyberattack could be significant. Such consequences could be exacerbated if we or our third-party providers are unable to adequately recover critical systems in a timely manner following a systems failure. Our insurance coverage may be insufficient to cover all losses related to cyberattacks.

Risks Related to Regulation

Risks associated with data privacy issues, including evolving laws, regulations and associated compliance efforts, may adversely impact our business and financial results.

Legislation in various countries around the world with regard to cybersecurity, privacy and data protection is rapidly expanding and creating a complex compliance environment. We are subject to many privacy and data protection laws and regulations in the U.S. and around the world, some of which place restrictions on our ability to process personal data across our business. For example, the General Data Protection Regulation (the “GDPR”) has caused more stringent data protection requirements in the European Union. The GDPR imposes onerous accountability obligations requiring data controllers and processors to maintain a record of their data processing and implement policies as part of its mandated privacy governance framework. It also requires data controllers to be transparent and disclose to data subjects how their personal information is to be used; imposes limitations on retention of personal data; introduces mandatory data breach notification requirements; and sets higher standards for data controllers to demonstrate that they have obtained valid consent for certain data processing activities. We are subject to the supervision of local data protection authorities in those E.U. jurisdictions where we are established or otherwise subject to the GDPR. Certain breaches of the GDPR requirements could result in substantial fines. In addition to the foregoing, a breach of the GDPR could result in regulatory investigations, reputational damage, orders to cease/change our use of data, enforcement notices, as well potential civil claims including class action type litigation where individuals suffered harm.

Similarly, California and other states have enacted privacy laws that purport to create individual privacy rights for consumers and increase the privacy and security obligations of entities handling certain personal data. These laws also provide for civil penalties for violations, as well as a private right of action for data breaches that is expected to increase data breach litigation. These laws may increase our compliance costs and potential liability. Many similar laws have been proposed at the federal level and in the other states. Any liability from our failure to comply with the requirements of these laws could adversely affect our financial condition.

We have invested, and continue to invest, human and technology resources in our GDPR compliance efforts and our data privacy compliance efforts. These compliance efforts may be time-intensive and costly. Despite those efforts, there is a risk that we may be subject to fines and penalties, litigation and reputational harm if we fail to protect the privacy of third party data or comply with the applicable regimes.

Failure to comply with the FCPA or the UKBA could subject us to significant civil or criminal penalties.

We earn a significant portion of our total revenue from international sales generated through our foreign direct and indirect operations. As a result, we are subject to the FCPA and the UKBA, which prohibit bribery in the conduct of business. The FCPA generally prohibits U.S. companies and their intermediaries from making corrupt payments to foreign officials for the purpose of obtaining or keeping business or otherwise obtaining favorable treatment and requires companies to maintain adequate record-keeping and internal accounting practices to accurately reflect the transactions of the company. The UKBA is much broader and prohibits all bribery, in both the public and private sectors. Under the FCPA and the UKBA, U.S. companies, their subsidiaries, employees, senior officers and/or directors may be held liable for actions taken by strategic or local partners or representatives. In addition, the U.S. government or the U.K. government, as applicable, may seek to hold us liable for successor liability violations committed by companies we have acquired or may in the future acquire. If we or our intermediaries fail to comply with the requirements of the FCPA and the UKBA, governmental authorities in the United States and the United Kingdom, as applicable, could seek to impose civil and/or criminal penalties, which could have a material adverse effect on our reputation, results of operations and the trading price of our common stock.

We are subject to governmental export and import controls that could subject us to liability, require a license from the U.S. government or impair our ability to compete in international markets.

Certain of our products with encryption technology are subject to export controls and may be exported only with the required level of export license or through an export license exception. Under these laws and regulations, we are responsible for obtaining all necessary licenses or other approvals, if required, for exports. If we were to fail to comply with existing or future export licensing, customs regulations, economic sanctions and other laws, we could be subject to substantial civil and criminal penalties, including fines and incarceration for responsible employees and managers, and the possible loss of export or import privileges. Similarly, various countries regulate the import of certain encryption technology and have enacted laws that could limit our ability to distribute our products or our customers' ability to implement our products in those countries.

In addition, if our distributors fail to obtain appropriate import, export or re-export licenses or permits, we may also be adversely affected through reputational harm and penalties. Obtaining export licenses can be difficult and time-consuming, and in some cases a license may not be available on a timely basis or at all. Changes in import/export regulations could also lead to delays in new product introductions or limit our ability to sell existing or future products in certain locations, which could adversely impact our business.

Export control laws and economic sanctions prohibit the shipment of certain products to embargoed or sanctioned countries, governments and persons, including Russia as a result of its military action against Ukraine. We cannot assure that a violation of these regulations will not occur, whether knowingly or inadvertently. Any such shipment could have negative consequences including government investigations, penalties, fines, civil and criminal sanctions, and reputational harm.

Regulation of the telecommunications industry, or changes in governmental regulation, interpretation or legislative reform could harm our operating results and future prospects.

The telecommunications industry is highly regulated and our business and financial condition could be adversely affected by changes in the regulations relating to the telecommunications industry. Currently, there are few laws or regulations that apply directly to access to or delivery of voice services on IP networks. We could be adversely affected by regulation of IP networks and commerce in any country where we operate, including the United States. Such regulations could include matters such as voice over the Internet or using Internet protocol, encryption technology, and access charges for service providers. The adoption of such regulations could decrease demand for our products, and at the same time increase the cost of selling our products, which could have a material adverse effect on our business and results of operations.

Risks Related to Our Indebtedness and Accounting Matters

The terms of our credit agreement could adversely affect our operating flexibility and pose risks of default, which would negatively impact our liquidity and operations.

Our Senior Secured Credit Facilities Credit Agreement, as amended, provides $500 million of commitments, comprised of a $400 million term loan (the “2020 Loan Facility”) and a $100 million revolving facility (the “2020 Revolving Credit Facility” and, together with the 2020 Loan Facility, the "2020 Credit Facility"). Terms in the 2020 Credit Facility impose limitations on our ability to, among other things, incur additional indebtedness, create liens, make acquisitions or engage in mergers, enter into transactions with affiliates, dispose of assets, make certain investments and amend or repay certain junior debt. These terms could adversely affect our operating flexibility and pose risks of default which would negatively impact our liquidity and operations. In addition, we may not be able to refinance our debt or obtain additional financing on favorable terms, or at all.

In addition, we are required to meet certain financial covenants customer for financings of this type, including a minimum Consolidated Fixed Charge Coverage Ratio and a maximum Consolidated Net Leverage Ratio (each as defined in the 2020 Credit Agreement) which are tested on a quarterly basis. The maximum Consolidated Net Leverage Ratio covenant uses our EBITDA (calculated in accordance with the 2020 Credit Agreement) for the last 12 months (as of the testing date) to determine compliance. While we remain in compliance with this covenant, sequential decreases in our EBITDA over the 12-month period compared to previous 12-month periods used for the calculation, as we experienced in the second half of 2021 and that may continue into the first quarter of 2022, could impact our ability to continue to satisfy this requirement in future periods if we are unable to obtain a waiver or further amendment to the terms of the covenant, or otherwise reduce our debt. Our failure to comply with these covenants may result in the declaration of an event of default, which could cause us to be unable to borrow under the credit facility or result in the acceleration of the maturity of indebtedness outstanding under the 2020 Credit Facility at such time.

If we are prevented from borrowing or if we are unable to extend, renew or replace the credit facilities under the 2020 Credit Facility by the maturity dates, on favorable terms, or at all, this could have a material adverse effect on our liquidity and cause our business, operations and financial condition to suffer. In addition, we may not have sufficient funds available for repayment or we may not have the ability to borrow or obtain sufficient funds to replace the indebtedness on terms acceptable to us, or at all.

The United Kingdom's Financial Conduct Authority, which regulates the London Inter-bank Offered Rate ("LIBOR"), has announced that it intends to stop encouraging or requiring banks to submit LIBOR rates after 2023, and it is unclear if LIBOR will cease to exist or if new methods of calculating LIBOR will evolve. We have the option under the 2020 Credit Facility to determine our interest rate that includes either the LIBOR rate or the base rate. While we also have the ability under our current credit facility to switch to a new or alternative benchmark rate, if LIBOR ceases to exist or the methods of calculating LIBOR change from their current form, we may no longer have the ability to elect the LIBOR rate option under the 2020 Credit Facility, and our current or future indebtedness may be adversely affected. This could impact our interest costs and our ability to borrow additional funds under the 2020 Credit Facility.

We cannot be sure that our current cash and available borrowings under our 2020 Credit Facility will be sufficient to meet our future needs. If we are unable to generate sufficient cash flows in the future, and if availability under our current facility is not sufficient to support our operations, we may need to refinance our debt or obtain additional financing. We may not be able to refinance our debt or obtain additional financing on favorable terms or at all.

The value of the securities received in connection with the sale of our cloud-based enterprise communications service is based on the ongoing operations of the acquiring company and is volatile. Quarterly fluctuations in price can significantly impact our financial results.

In connection with our sale of the Kandy Communications Business to AVCT, we received 43,778 units of AVCT securities (the "AVCT Units"), with each AVCT Unit consisting of (1) $1,000 in principal amount of AVCT's Series A-1 convertible debentures (the "Debentures"); and (ii) one warrant to purchase 100 shares of AVCT common stock, $0.0001 par value (the "Warrants. In the third quarter of 2021, the Debentures were converted, pursuant to their terms, into shares of AVCT common stock (the "AVCT Shares"). Since AVCT's common stock is publicly traded on NASDAQ, under U.S. GAAP ("GAAP"), we elected the fair value option to record our investment in AVCT, under which we value the AVCT Shares on our balance sheet based on the trading price of the AVCT common stock. Such trading price is also used to value the Warrants on an if-converted basis. We are also required under GAAP to revalue and mark to market the value of the AVCT Shares and Warrants on a quarterly basis, with any changes in value reflected in our statements of operations and, therefore, impacting our earnings. AVCT's stock price on NASDAQ has been volatile, with the closing price ranging from $0.85 to $9.26 during the year ended December 31, 2021. As a result, our financial statements may reflect significant swings in the value of the AVCT Shares and Warrants held on our balance sheet, which could have a material impact on our financial results, even though such changes in value would not reflect our current operating business.

We continue to rely on AVCT for the provision of products and services to a number of customers we jointly share. AVCT reported that as of September 30, 2021 (the last period for which AVCT has reported financial results as of the date of this Annual Report on Form 10-K), AVCT's current liabilities exceeded its current assets by $26.6 million. AVCT has announced a number of initiatives designed to increase its liquidity, including a proposed sale of its Computex business, and AVCT believes that cash from continuing operations, taken together with these initiatives, will be sufficient to continue to fund its operations. However, if such activities are not successful, AVCT may be required to take other actions that could materially negatively affect the value of our investment in AVCT. Disruptions in AVCT's operations could also result in claims by our customers for failure to satisfy contractual service requirements and/or require us to find alternative solutions in order to satisfy our customer obligations.

If our goodwill or intangible assets become impaired, we may be required to record a significant charge to earnings.

As of December 31, 2021, we had $300.9 million of goodwill and $350.7 million of intangible assets. Goodwill is tested annually for impairment and, along with our intangible assets, is also reviewed for impairment when events or changes in circumstances indicate the carrying value may not be recoverable. Based on the results of our recently completed impairment test, we determined that the carrying value of our IP Optical Networks segment exceeded its fair value and accordingly, we recorded a goodwill impairment charge of $116.0 million, which had a material impact on both our net loss and loss per share for the year ended December 31, 2021. Based on the results of our 2019 annual impairment test, we determined that our carrying value for goodwill exceeded our fair value and accordingly, we recorded a goodwill impairment charge of $164.3 million, which had a material impact on both our net loss and loss per share for the year ended December 31, 2019. Factors that may be considered a change in circumstances indicating that the carrying value of our goodwill or intangible assets may not be recoverable include significant underperformance relative to plan or long-term projections, strategic changes in business strategy, significant negative industry or economic trends, significant change in circumstances relative to a large customer, significant decline in our stock price for a sustained period and decline in our market capitalization to below net book value. Any additional material impairment of goodwill or intangible assets could adversely affect our results of operations.

If we fail to maintain appropriate internal controls in the future, we may not be able to report our financial results accurately, which may adversely affect our stock price and our business.

Section 404 of the Sarbanes-Oxley Act of 2002 and the related regulations require our management to report on, and our independent registered public accounting firm to attest to, the effectiveness of our internal control over financial reporting. We have committed and will be required to continue to commit significant financial and managerial resources in order to comply with these requirements.

Further, we are required to integrate ECI and other acquired businesses into our system of disclosure controls and procedures and internal control over financial reporting. As may be the case with other companies we acquire, prior to the ECI Acquisition, ECI was not required to implement or maintain the disclosure controls and procedures or internal control over financial reporting that are required of public companies. We cannot provide assurance as to the effectiveness of those integrations.

Internal control over financial reporting has inherent limitations, including human error, the possibility that controls could be circumvented or become inadequate because of changed conditions, and fraud. If we are unable to maintain effective internal controls, we may not have adequate or timely financial information, and we may be unable to meet our reporting obligations as a publicly traded company or comply with the requirements of the SEC or the Sarbanes-Oxley Act of 2002. This could result in a restatement of our financial statements, the imposition of sanctions, or investigation by regulatory authorities, and could cause investors to lose confidence in our reported financial information. Any such consequence or other negative effect of our inability to meet our reporting requirements or comply with legal and regulatory requirements, as well as any disclosure of an accounting, reporting or control issue, could adversely affect the trading price of our common stock and our business.

General Risk Factors

Litigation and government investigations could result in significant legal expenses and settlement payments, fines or damage awards.

From time to time, we are subject to litigation regarding intellectual property rights or other claims and have indemnification clauses in most of our customer contracts that may require us to indemnify customers against similar claims. We have also been named as a defendant in securities class action and stockholder derivative lawsuits and have also been subject to investigations by the government. We are generally obliged, to the extent permitted by law, to indemnify our current and former directors and officers who are named as defendants in these lawsuits. Defending against litigation or government investigation may require significant attention and resources of management. Regardless of the outcome, such litigation or investigation could result in significant legal expenses. At this time, it is not possible to predict the outcome of the ongoing lawsuits, including whether or not any proceedings will continue, and when or how these matters will be resolved or whether we will ultimately receive, and in what sum, amounts previously awarded as a result of these proceedings. Regardless of whether we are ultimately successful in these lawsuits, we will likely elect to continue to incur substantial legal fees in connection with these matters.

If the defenses we claim in our material litigation matters are ultimately unsuccessful, or if we are unable to achieve a favorable settlement with an adverse party or a government agency, we could be liable for large settlement payments, damage awards or fines that could have a material adverse effect on our business and results of operations.

Our stock price has been and may continue to be volatile.

Our common stock price has experienced substantial volatility in the past and may remain volatile in the future. Volatility in our stock price can arise as a result of a number of the factors discussed in this “Risk Factors” section. During 2021, our closing stock price ranged from a high of $11.14 per share to a low of $5.23 per share. The stock market has experienced significant price and volume fluctuation with such volatility often unrelated to the operating performance of these companies. Actual or perceived divergence between our actual results and our forward-looking guidance for such results, the published expectations of investment analysts, or the expectations of the market generally, can cause significant swings in our stock price. Our stock price can also be affected by market conditions in our industry as well as announcements that we, our competitors, vendors or our customers may make. These may include announcements by us or our competitors of financial results or changes in estimated financial results, technological innovations, the gain or loss of customers, or other strategic initiatives.

These and other factors affecting global economic conditions or financial markets may materially adversely affect the market price of our common stock in the future.

We are party to a stockholders' agreement with certain stockholders which provides such stockholders with certain rights that may differ from the rights of our other stockholders.

In connection with the ECI Acquisition, we entered into a First Amended and Restated Stockholders Agreement (the "Stockholders Agreement") with JPMC Heritage Parent LLC, Heritage PE (OEP) III, L.P. (together with JPMC, the "JPM Stockholders"), and ECI Holding (Hungary) Kft ("Swarth"). The Stockholders Agreement sets forth certain arrangements and contains various provisions relating to board size, board representation, standstill restrictions and transfer restrictions as further described therein, including the right of the JPM Stockholders and Swarth to each designate up to three directors for nomination to our nine-member board of directors, subject to the JPM Stockholders and Swarth maintaining certain levels of beneficial ownership of our common stock. Therefore, the JPM Stockholders and Swarth will be able to exert significant influence over matters requiring board approval, and our stockholders other than the JPM Stockholders and Swarth will have limited or no ability to influence the outcome of certain key transactions. The interests of the parties to the Stockholders Agreement may differ from those of other holders of our common stock.

Additionally, the Company entered into a First Amended and Restated Registration Rights Agreement with the JPM Stockholders and Swarth. The JPM Stockholders and Swarth collectively own approximately 52% of our common stock as of December 31, 2021, and may decide to sell their shares in bulk or from time to time, except as provided under the Stockholders Agreement, which timing we cannot control. The sale of shares by the JPM Stockholders and/or Swarth may increase the volatility of our stock price, and our stock price could decline as a result.

Delaware law and our charter documents contain provisions that could discourage or prevent a potential takeover, even if such a transaction would be beneficial to our stockholders.

Some provisions in our amended and restated certificate of incorporation, our amended and restated by-laws, as well as provisions of Delaware law, may discourage, delay or prevent a merger or acquisition that may be deemed undesirable by our Board of Directors but that a stockholder may consider favorable. These include provisions, among others,

- authorizing the Board of Directors to issue shares of preferred stock;
- limiting the persons who may call special meetings of stockholders;
- prohibiting stockholder actions by written consent;
- permitting the Board of Directors to increase the size of the Board and to fill vacancies;
- requiring a super-majority vote of our stockholders to amend our amended and restated by-laws and certain provisions of our amended and restated certificate of incorporation; and
- establishing advance notice requirements for nominations for election to the Board of Directors or for proposing matters that can be acted on by stockholders at stockholder meetings.

As a Delaware corporation, we are also subject to provisions of Delaware law, including Section 203 of the Delaware General Corporation law, which prevents some stockholders holding more than 15% of our outstanding common stock from engaging in certain business combinations without approval of the holders of substantially all of our outstanding common stock.

These provisions of our amended and restated certificate of incorporation, our amended and restated by-laws or Delaware law could have the effect of delaying or deterring a change in control that some stockholders may consider beneficial and therefore could limit the opportunity for our stockholders to receive a premium for their shares of our common stock and could also affect the price that some investors are willing to pay for our common stock.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

During 2019, we initiated a plan to consolidate and reduce the number of our facilities worldwide. This included plans to provide a new customer experience center for product demonstration and training, relocate and consolidate our laboratories, server farms and Cloud service infrastructure and condense research and development, sales, marketing, business operations and administrative functions into our new Plano campus. In February 2021, we relocated our corporate headquarters to our new facility in Plano, Texas.

We also lease smaller (under 50,000 square feet) office space in various countries around the world for sales, marketing, research and development/engineering, and customer services and support staff, as well as for warehouse purposes. We are exiting certain of these facilities. We believe our remaining facilities will be adequate for our current needs and that suitable additional space will be available as needed.

As of December 31, 2021, we maintained the following principal facilities:

Location	Principal use	Lease expiration
Plano, Texas	Corporate headquarters, sales, marketing, research and development/engineering, customer support, general and administrative	September 2032
Plano, Texas (a)	Research and development/engineering, customer support	February 2022
Westford, Massachusetts	Research and development, customer support, general and administrative	February 2022
Research Triangle Park, North Carolina	Research and development/engineering, sales, customer support, general and administrative	April 2027
Ottawa, Canada (b)	Research and development/engineering, customer support, general and administrative	December 2029
Petah Tikva, Israel (c)	Research and development/engineering, sales, service	October 2023
Petah Tikva, Israel (b)	Service, research and development/engineering, general and administrative	October 2023
Bangalore, India	Research and development/engineering, customer support, general and administrative	October 2024
Bangalore, India	Research and development/engineering, customer support, general and administrative	December 2023

(a) The Company's relocation of this facility's operations to the Plano corporate headquarters facility was completed in the first quarter of 2021.
(b) A portion of this facility was not in use at December 31, 2021 and is currently being subleased as part of a restructuring initiative.
(c) A portion of this facility was not in use at December 31, 2021; a portion of this unused space is currently being subleased as part of a restructuring initiative that covers the entire unused space.

Item 3. Legal Proceedings

We are subject to legal proceedings and claims that have not been fully resolved and that have arisen in the ordinary course of business. Our material legal proceedings are described in Part II, Item 8 of this Form 10-K in the Notes to Consolidated Financial Statements in Note 26, "Commitments and Contingencies" under the heading "Contingencies".

The outcome of litigation is inherently uncertain. If one or more legal matters were resolved against the Company in a reporting period for amounts above management's expectations, our financial condition and operating results for that reporting period could be materially adversely affected. We settled certain matters during the fourth quarter of 2021 that did not individually or in the aggregate have a material impact on our financial condition or operating results.

Item 4. Mine Safety Disclosures

Not applicable.

PART II

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

Market Information

Effective November 29, 2017, our common stock was quoted on The Nasdaq Global Select Market under the symbol "RBBN." Our common stock began publicly trading on The Nasdaq Global Select Market on October 30, 2017 under the symbol "SONS," following the merger of Sonus Networks, Inc. and GENBAND.

Holders

At March 8, 2022, there were approximately 382 holders of record of our common stock.

Recent Sales of Unregistered Securities

None.

Purchases of Equity Securities by the Issuer and Affiliated Purchasers

The following table summarizes repurchases of our common stock during the fourth quarter of 2021:

Period	Total Number of Shares Purchased (1)	Average Price Paid per Share	Total Number of Shares Purchased as Part of Publicly Announced Plans or Programs	Approximate Dollar Value of Shares that May Yet be Purchased Under the Plans or Programs
October 1, 2021 to October 31, 2021	4,522	$ 6.35	—	$ —
November 1, 2021 to November 30, 2021	7,873	$ 6.06	—	$ —
December 1, 2021 to December 31, 2021	71,009	$ 5.75	—	$ —
Total	83,404	$ 5.81	—	$ —

(1) Upon vesting of restricted stock awards, certain of our employees may return to us a portion of the newly vested shares to satisfy the tax withholding obligations that arise in connection with such vesting. During the fourth quarter of 2021, 83,404 shares of restricted stock were returned to us by employees to satisfy tax withholding obligations arising in connection with vesting of restricted stock, which shares are included in this column.

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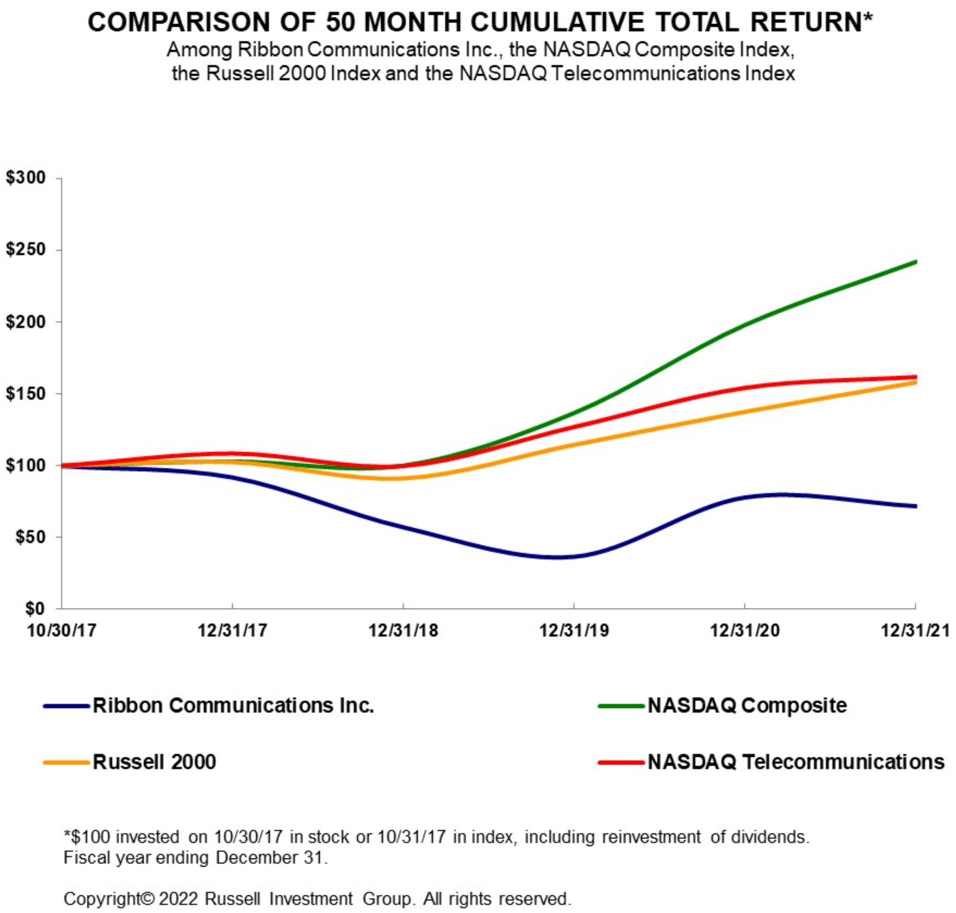
Performance Graph

The following performance graph compares the cumulative total return to stockholders for our common stock for the period from October 30, 2017 (the date Ribbon's common stock began trading on Nasdaq) through December 31, 2021 with the cumulative total return over the same period on the Nasdaq Composite Index, the Nasdaq Telecommunications Index and the Russell 2000. The comparison assumes an investment of $100 on October 30, 2017 in our common stock and in each of the indices and, in each case, assumes reinvestment of all dividends, if any. The performance shown is not necessarily indicative of future performance.

This graph is not deemed to be "filed" with the SEC or subject to the liabilities of Section 18 of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and should not be deemed to be incorporated by reference into any of our prior or subsequent filings under the Securities Act of 1933, as amended, or the Exchange Act.



	October 30, 2017	December 31, 2017	December 31, 2018	December 31, 2019	December 31, 2020	December 31, 2021
Ribbon Communications Inc.	$ 100.00	$ 92.13	$ 57.45	$ 36.95	$ 78.19	$ 72.11
Nasdaq Composite	$ 100.00	$ 102.83	$ 99.91	$ 136.58	$ 197.92	$ 241.82
Russell 2000	$ 100.00	$ 102.47	$ 91.18	$ 114.45	$ 137.30	$ 157.65
Nasdaq Telecommunications	$ 100.00	$ 108.55	$ 99.94	$ 126.88	$ 153.83	$ 161.29

Item 6. Reserved

[Reserved]

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

Overview

We are a leading global provider of communications technology to service providers and enterprises. We provide a broad range of software and high-performance hardware products, solutions and services that enable the secure delivery of data and voice communications for residential consumers and for small, medium and large enterprises and industry verticals such as finance, education, government, utilities and transportation. Our mission is to create a recognized global technology leader providing cloud-centric solutions that enable the secure exchange of information, with unparalleled scale, performance and elasticity. Headquartered in Plano, Texas, we have a global presence with research and development and/or sales and support locations in over thirty-five countries around the world.

Impact of COVID-19 on Our Business

In 2020, a novel strain of the coronavirus (COVID-19) was declared by the World Health Organization to be a global pandemic. The COVID-19 pandemic has had a negative effect on the global economy, disrupting the various manufacturing, commodity and financial markets and increasing volatility, and has impeded global supply chains, including that of our IP Optical Networks operating segment. Continued dampened global economic conditions as a result of the COVID-19 pandemic, particularly in areas experiencing slower vaccine rollout, such as Australia and India, may cause our customers to restrict spending or delay purchases for an indeterminate period of time and consequently cause our revenues to decline. In addition, our ability to deliver our solutions as agreed upon with our customers depends on the ability of our global contract manufacturers, vendors, licensors and other business partners to deliver products or perform services we have procured from them. While, to date, we have not experienced material issues, if the ongoing COVID-19 pandemic impairs the ability of our business partners to support us on a timely basis, or negatively impacts the demand for our customers' other products and services, our ability to perform our customer contracts as well as the demand for our solutions may suffer. In addition, disruptions from the COVID-19 pandemic could include, and with respect to our IP Optical Networks operating segment have included, disruption of logistics necessary to import, export and deliver our solutions. The COVID-19 pandemic continues to limit in some locations, including India, the ability of our employees to perform their work due to illness caused by the pandemic or local, state or federal orders requiring employees to remain at home. The degree to which the COVID-19 pandemic ultimately impacts our business, financial position and results of operations will depend on future developments beyond our control, including the effectiveness and timing of any vaccines, the frequency and duration of future waves of infection, the effectiveness and timing of any vaccines, the extent of actions to contain or treat the virus, how quickly and to what extent normal economic and operating conditions can resume, and the severity and duration of the global economic downturn that results from the pandemic.

As a response to the ongoing COVID-19 pandemic, we have continued to implement plans to manage our costs. We have significantly reduced travel and marketing expenses except where necessary to meet customer or regulatory needs and acted to limit discretionary spending. To the extent the business disruption continues for an extended period, additional cost management actions will be considered. Any future asset impairment charges, increases in the allowance for doubtful accounts or restructuring charges could be more likely and will be dependent on the severity and duration of this crisis.

Presentation

Unless otherwise noted, all financial amounts, excluding tabular information, in this MD&A are rounded to the nearest million dollar amount, and all percentages, excluding tabular information, are rounded to the nearest percentage point.

Reclassifications

In 2021, we reclassified amounts recorded for amortization of certain acquired intangible assets in prior presentations from Total operating expenses under the caption "Amortization of acquired intangible assets" to Total cost of revenue under the caption "Amortization of acquired technology" in the consolidated statements of operations. Our management believes this presentation aids in the comparability of our financial statements to industry peers. These reclassifications did not impact our operating income (loss), net income (loss) or earnings (loss) per share for any historical periods. These reclassifications also did not impact our consolidated balance sheets or consolidated statements of cash flows.

These reclassifications resulted in $42.3 million recorded to Amortization of acquired technology within Total cost of revenue and a $42.3 million decrease to Amortization of acquired intangible assets within Total operating expenses in the year ended December 31, 2020. The increase to Total cost of revenue decreased our gross profit as a percentage of revenue ("gross margin") by approximately five percentage points.

These reclassifications resulted in $37.6 million recorded to Amortization of acquired technology within Total cost of revenue and a $37.6 million decrease to Amortization of acquired intangible assets within Total operating expenses in the year ended December 31, 2019. The increase to Total cost of revenue decreased our gross margin by approximately seven percentage points.

New Restructuring Initiative

On February 14, 2022, our Board of Directors approved a strategic restructuring program (the "2022 Restructuring Plan") to streamline the Company's operations in order to support the Company's investment in critical growth areas. The 2022 Restructuring Plan is expected to include, among other things, charges related to a consolidation of facilities and a workforce reduction. Any potential positions eliminated in countries outside the United States will be subject to local law and consultation requirements.

We currently expect to record approximately $20 million of restructuring and related expense associated with the 2022 Restructuring Plan, including approximately $6 million related to employee severance arrangements and approximately $14 million related to the facilities consolidation. We expect that the 2022 Restructuring Plan will be substantially completed in 2022.

Business Acquisitions

ECI Telecom Group Ltd.

On March 3, 2020 (the "ECI Acquisition Date"), we completed the acquisition of ECI Telecom Group Ltd. ("ECI") in accordance with the terms of the Agreement and Plan of Merger, dated as of November 14, 2019, by and among Ribbon, an indirect wholly-owned subsidiary of Ribbon ("Merger Sub"), Ribbon Communications Israel Ltd., ECI, and ECI Holding (Hungary) Kft, pursuant to which Merger Sub merged with and into ECI, with ECI surviving such merger as a wholly-owned subsidiary of Ribbon (the "ECI Acquisition"). Prior to the ECI Acquisition Date, ECI was a privately-held global provider of end-to-end packet-optical transport and software-defined networking ("SDN") and network function virtualization ("NFV") solutions for service providers, enterprises and data center operators. Ribbon believes the ECI Acquisition positions the Company for growth and enhances its competitive strengths by expanding its product portfolio beyond solutions primarily supporting voice applications to include data applications and optical networking.

As consideration for the ECI Acquisition, we issued the ECI shareholders and certain others 32.5 million shares of Ribbon common stock with a fair value of $108.6 million (the "Stock Consideration") and paid $322.5 million of cash, comprised of $183.3 million to repay ECI's outstanding debt, including both principal and interest, and $139.2 million paid to ECI's selling shareholders (the "Cash Consideration"). In addition, ECI shareholders received $33.4 million from the sale of certain of ECI's real estate assets. Cash Consideration was financed through cash on hand and committed debt financing consisting of a new $400 million term loan facility and new $100 million revolving credit facility, which was undrawn at the ECI Acquisition Date. The ECI Acquisition has been accounted for as a business combination and the financial results of ECI have been included in our consolidated financial statements for the periods subsequent to the ECI Acquisition Date.

Anova Data, Inc.

On February 28, 2019 (the "Anova Acquisition Date"), we acquired the business and technology assets of Anova Data, Inc. ("Anova"), a private company headquartered in Westford, Massachusetts (the "Anova Acquisition"). Anova is a provider of advanced analytics solutions and its next generation products provide a cloud-native, streaming analytics platform for network and subscriber optimization and monetization. The Company believes that the Anova Acquisition will reinforce and extend Ribbon's strategy to expand into network optimization, security and data monetization via big data analytics and machine learning.

As consideration for the Anova Acquisition, we issued 2.9 million shares of our common stock with a fair value of $15.2 million to Anova's sellers and equity holders on the Anova Acquisition Date and held back an additional 330,000 shares of our common stock with a fair value of $1.7 million (the "Deferred Purchase Consideration"), of which 316,551 shares were issued after post-closing adjustments on March 4, 2020. The Deferred Purchase Consideration was included as a component of Accrued expenses and other in our consolidated balance sheet at December 31, 2019. The Anova Acquisition has been accounted for as a business combination and the financial results of Anova have been included in our consolidated financial statements for the periods subsequent to the Anova Acquisition Date.

Sale of Kandy Communications Business and Investment in AVCT

On December 1, 2020 (the "Kandy Sale Date"), we completed the sale of our Kandy Communications Business to American Virtual Cloud Technologies, Inc. ("AVCT"). AVCT purchased the assets and assumed certain liabilities associated with the Kandy Communications Business, as well as all of the outstanding interests in Kandy Communications LLC, our subsidiary (the "Kandy Sale"). The assets acquired and liabilities assumed by AVCT in connection with the Kandy Sale were primarily comprised of accounts receivable, property and equipment, trade accounts payable and employee-related accruals.

As consideration, AVCT paid us $45.0 million, subject to certain adjustments, in the form of units of AVCT's securities (the "AVCT Units"), with each AVCT Unit consisting of: $1,000 in principal amount of AVCT’s Series A-1 convertible debentures (the “Debentures”); and (ii) one warrant to purchase 100 shares of AVCT common stock, $0.0001 par value (the “Warrants”), as consideration for the Kandy Sale. We received 43,778 AVCT Units as consideration on the Kandy Sale Date.

The Debentures bore interest at a rate of 10% per annum, which was being added to the principal amount of the Debentures. The entire principal amount of each Debenture, together with accrued and unpaid interest thereon, was due and payable on the earlier of the May 1, 2023 maturity date or the occurrence of a Change in Control as defined in the definitive purchase agreement, as amended (the "Amended Kandy Agreement"). Each Debenture was convertible, in whole or in part, at any time at our option into that number of shares of AVCT common stock, calculated by dividing the principal amount being converted, together with all accrued and unpaid interest thereon, by the applicable conversion price, which initially per share was $3.45. The Debentures were subject to mandatory conversion if the AVCT stock price was at or above $6.00 per share for 40 trading days in any 60 consecutive trading day period, subject to the satisfaction of certain other conditions. The conversion price was subject to customary adjustments including, but not limited to, stock dividends, stock splits and reclassifications. As of February 19, 2021, the stock price had traded above $6.00 for 40 days within a 60 consecutive trading day period, and accordingly, on September 8, 2021 (the "Debenture Conversion Date") upon the completion of customary regulatory filings by AVCT, the Debentures were converted into 13,700,421 shares of AVCT common stock (the "Debenture Shares").

The Warrants were independent of the Debentures and entitle us to purchase 4,377,800 shares of AVCT common stock at an exercise price of $0.01 per share. The Warrants were immediately exercisable on the Kandy Sale Date and expire on December 1, 2025. We had not exercised any of the Warrants as of December 31, 2021. We were also subject to a lock-up provision which limited our ability to sell any shares of the AVCT common stock underlying the AVCT Units prior to June 1, 2021 (the "Lock-Up Period"), except in certain transactions.

We determined that the AVCT Units had a fair value of $84.9 million at the Kandy Sale Date, comprised of the Debentures with a fair value of $66.3 million and the Warrants with a fair value of $18.6 million. The value of the net assets sold to AVCT totaled $1.3 million, resulting in a gain on the sale of $83.6 million. We calculated the fair value of the Debentures using a Lattice-based valuation approach, which utilizes a binomial tree to model the different paths the price of AVCT's common stock might take over the Debentures' life by using assumptions regarding the stock price volatility and risk-free interest rate. These results were then used to calculate the fair value of the Debentures at each measurement date prior to the Debenture Conversion Date. We used the Black-Scholes valuation model for estimating the fair value of the Warrants at each measurement date. The fair value of the Warrants was affected by AVCT's stock price as well as valuation assumptions, including the volatility of AVCT's stock price, expected term of the option, risk-free interest rate and expected dividends. Both the Lattice and Black-Scholes valuation models are based on available market data, giving consideration to all of the rights and obligations of each instrument and precluding the use of "blockage" discounts or premiums in determining the fair value of a large block of financial instruments. After the expiration of the Lock-Up Period and prior to the Debenture Conversion Date, we valued the AVCT Units at each measurement date by multiplying the closing stock price of AVCT common stock by the number of shares upon conversion of the Debentures and Warrants. At December 31, 2021, we valued the Debenture Shares and Warrants (the "AVCT Investment") by multiplying the closing stock price of AVCT common stock by the number of Debenture Shares and Warrants we held.

At December 31, 2021, the fair value of the AVCT Investment was $43.9 million, comprised of $33.3 million for the Debenture Shares and $10.6 million for the Warrants. We recorded a loss of $74.8 million in the year ended December 31, 2021 arising from the change in their aggregate fair value. This amount is included as a component of Other (expense) income, net, in our consolidated statement of operations. We recorded $3.5 million of interest income in the year ended December 31, 2021, respectively, which was added to the principal amount of the Debentures prior to the Debenture Conversion Date, and which is included in Interest expense, net, in our consolidated statement of operations. At December 31, 2020, the fair value of the AVCT Units was $115.2 million. The fair value of the AVCT Investment at December 31, 2021 and the AVCT Units at December 31, 2020 are reported as Investments in our consolidated balance sheets. The AVCT Investment is classified as a Level 1 fair value measurement at December 31, 2021 and the AVCT Units are classified as Level 2 fair value measurements within the fair value hierarchy at December 31, 2020.

We evaluated the nature of our investment in AVCT for the period from the Debenture Conversion Date through December 31, 2021 and determined that it represented an approximate 15% equity interest in AVCT on a diluted basis. Accordingly, we determined that we are not the primary beneficiary of AVCT as we do not have the power to direct the activities that most significantly impact the AVCT Investment's economic performance and therefore concluded that we had neither significant influence nor a controlling interest arising from the AVCT Investment.

Litigation Settlement

On April 22, 2019, we and Metaswitch Networks Ltd., Metaswitch Networks Corp and Metaswitch Inc. (collectively, "Metaswitch") agreed to a binding mediator's proposal that resolves the six previously disclosed lawsuits between the Company and Metaswitch (the "Lawsuits"). We and Metaswitch signed a Settlement and Cross-License Agreement on May 29, 2019 (the "Royalty Agreement"). Pursuant to the terms of the Royalty Agreement, Metaswitch agreed to pay us an aggregate amount of $63.0 million, which included cash payments of $37.5 million during the second quarter of 2019 and $25.5 million payable in three installments annually, beginning June 26, 2020, with such installment payments accruing interest at a rate of 4% per year. As part of the Royalty Agreement, we and Metaswitch have (i) released the other from all claims and liabilities; (ii) licensed each party's existing patent portfolio to the other party; and (iii) requested the applicable courts to dismiss the Lawsuits. We received $37.5 million of aggregate payments from Metaswitch in the second quarter of 2019 and recorded notes receivable for future payments of $25.5 million, comprised of $8.5 million in Other current assets and $17.0 million in Other assets in our consolidated balance sheet at December 31, 2019. We recorded the $63.0 million gain in Other (expense) income, net, in our consolidated statement of operations for the year ended December 31, 2019. We received $37.5 million of aggregate payments from Metaswitch in the second quarter of 2019 and $9.5 million, including $1.0 million of interest, in the second quarter of 2020.

On July 6, 2020, we and Metaswitch signed a First Supplemental Agreement to the Settlement and Cross-License Agreement (the "Supplemental Agreement") under which Metaswitch could elect to repay the outstanding amounts under the Royalty Agreement early in exchange for a reduction of $0.25 million to the outstanding principal, from $17.0 million to $16.75 million, and the payment of no further interest by Metaswitch effective June 26, 2020. We recorded the reduction to the outstanding principal as a reduction to interest income. On July 14, 2020, Metaswitch paid us the remaining outstanding balance of $16.75 million.

Operating Segments

Our chief operating decision maker (the "CODM") is our president and chief executive officer. Effective in the fourth quarter of 2020 and in connection with the ECI Acquisition, our CODM began to assess our performance based on the performance of two separate organizations within Ribbon: the Cloud and Edge operating segment ("Cloud and Edge") and the IP Optical Networks operating segment ("IP Optical Networks"). We previously operated in a single segment, as our CODM made decisions and assessed performance at the company level, and for periods prior to the ECI Acquisition, there are no financial results for IP Optical Networks to report.

Our Cloud and Edge operating segment provides secure and reliable software and hardware products, solutions and services for Voice over Internet Protocol ("VoIP") communications, Voice over Long-Term Evolution ("VoLTE") and Voice Over 5G ("VoNR") communications, and Unified Communications and Collaboration ("UC&C") services to both service provider and enterprise customers. Our Cloud and Edge products are increasingly software-centric and cloud-native for deployment on private, public or hybrid cloud infrastructures, in data centers, on enterprise premises and within service provider networks. Our Cloud and Edge product portfolio consists of our Session Border Controller ("SBC") products and our Network Transformation ("NTR") products.

Our IP Optical Networks operating segment provides high-performance, secure solutions for IP networking and optical transport, supporting wireless networks including 5G, metro and edge aggregation, core networking, data center interconnect, legacy network transformation and transport solutions for wholesale carriers. This portfolio is offered to service provider, enterprise and industry verticals with critical transport network infrastructures including utilities, government, defense, transportation, and education and research.

Financial Overview

Financial Results

We reported a loss from operations of $117.8 million for 2021 and income from operations of $1.7 million for 2020. We reported a net loss of $177.2 million for 2021 and net income of $88.6 million for 2020.

Our revenue was $845.0 million in 2021, comprised of $556.7 million attributable to Cloud and Edge and $288.3 million attributable to IP Optical Networks. Our revenue was $843.8 million in 2020, comprised of $583.3 million attributable to Cloud and Edge and $260.5 million attributable to IP Optical Networks. Our gross profit was $444.7 million in 2021, comprised of $343.5 million attributable to Cloud and Edge and $101.2 million attributable to IP Optical Networks. Our gross profit was $450.8 million in 2020, comprised of $353.5 million attributable to Cloud and Edge and $97.4 million attributable to IP Optical Networks. Our gross margin was 52.6% in 2021 and 53.4% in 2020. In 2021, our Cloud and Edge gross margin was 61.7% and our IP Optical Networks gross margin was 35.1%. In 2020, our Cloud and Edge gross margin was 60.6% and our IP Optical Networks gross margin was 37.4%.

Our operating expenses were $562.5 million in 2021 and $449.1 million in 2020. Our 2021 operating expenses included $116.0 million for the impairment of goodwill, $28.3 million of amortization of acquired intangible assets, $7.6 million of acquisition-, disposal- and integration-related expense, and $11.7 million of restructuring and related expense. Our 2020 operating expenses included $18.6 million of amortization of acquired intangible assets, $17.2 million of acquisition-, disposal- and integration-related expense, and $16.2 million of restructuring and related expense.

We recorded stock-based compensation expense of $19.4 million in 2021 and $13.9 million in 2020.

See "Results of Operations" in this MD&A for additional discussion of our results of operations for the years ended December 31, 2021 and 2020.

Restructuring and Cost Reduction Initiatives

In 2020, we implemented a restructuring plan to eliminate certain positions and redundant facilities, primarily in connection with the ECI Acquisition, to further streamline our global footprint and improve our operations (the "2020 Restructuring Initiative"). In connection with this initiative, we have eliminated duplicate functions arising from the ECI Acquisition in support of our efforts to integrate the two companies. In connection with the 2020 Restructuring Initiative, we recorded restructuring and related expense of $4.7 million and $14.0 million in 2021 and 2020, respectively. The 2021 amount was comprised of $4.6 million for severance and related costs for approximately 60 employees and $0.1 million for variable and other facilities-related costs. The 2020 amount was comprised of $11.5 million for severance and related costs for approximately 190 employees, $2.0 million for variable and other facilities-related costs, and $0.5 million for accelerated amortization of lease assets. We expect these amounts will be fully paid in 2022. We expect to record additional restructuring and related expense approximating $1 million under the 2020 Restructuring Initiative in the aggregate for severance and planned facility consolidations.

In June 2019, we implemented a restructuring plan to further streamline our global footprint, improve our operations and enhance our customer delivery (the "2019 Restructuring Initiative"). The 2019 Restructuring Initiative includes facility consolidations, refinement of our research and development activities, and a reduction in workforce. The facility consolidations under the 2019 Restructuring Initiative (the "Facilities Initiative") include a consolidation of our North Texas sites into a single campus, housing engineering, customer training and support, and administrative functions, as well as a reduction or elimination of certain excess and duplicative facilities worldwide. In addition, we intend to substantially consolidate our global software laboratories and server farms into two lower cost North American sites. We continue to evaluate our properties included in the Facilities Initiative for accelerated amortization and/or right-of-use asset impairment. We expect that the actions under the Facilities Initiative will be completed in 2023.

In connection with the 2019 Restructuring Initiative, we recorded restructuring and related expense of $7.0 million and $2.3 million in 2021 and 2020, respectively. The amount recorded in 2021 was comprised of $5.7 million for variable and other facilities-related costs and $1.3 million of net expense for accelerated amortization of lease assets. The amount for accelerated amortization of lease assets was comprised of $3.4 million of expense and $2.1 million of income related to a lease modification for one of our restructured lease facilities. The amount recorded in 2020 was comprised of $0.5 million for severance and related costs for approximately 5 employees, $1.7 million for variable and other facilities-related costs and $0.1 million for accelerated amortization of lease assets. The amount accrued for severance and related costs was paid in 2021. We estimate that we will record nominal, if any, future expense related to this initiative.

Accelerated rent amortization is recognized from the date that we commence the plan to fully or partially vacate a facility, for which there is no intent or ability to enter into a sublease, through the final vacate date. We recorded $3.4 million and $0.6 million of expense for accelerated rent amortization in the years ended December 31, 2021 and 2020, respectively. These amounts are included as components of Restructuring and related expense, and reduced our Operating lease right-of-use assets in our consolidated balance sheets at December 31, 2021 and 2020. We continue to evaluate our properties included in the Facilities Initiative for accelerated amortization and/or right-of-use asset impairment. We may incur additional future expense if we are unable to sublease other locations included in the Facilities Initiative.

Critical Accounting Policies and Estimates

Management's discussion and analysis of the financial condition and results of operations is based upon our consolidated financial statements, which have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires us to make estimates and judgments that affect the reported amounts of assets, liabilities, revenue and expenses, and related disclosure of contingent assets and liabilities. We base our estimates and judgments on historical experience, knowledge of current conditions and beliefs of what could occur in the future given available information. We consider the following accounting policies to be both those most important to the portrayal of our financial condition and those that require the most subjective judgment. If actual results differ significantly from management's estimates and projections, there could be a material effect on our consolidated financial statements. The significant accounting policies that we believe are the most critical include revenue recognition, the valuation of inventory, debentures and warrants received as sale consideration, warranty accruals, loss contingencies and reserves, stock-based compensation, business combinations, goodwill and intangible assets and accounting for income taxes.

Revenue Recognition. We derive revenue from two primary sources: products and services. Product revenue is generated from sales of our stand-alone software, as well as software with attached hardware that function together to deliver the products' essential functionality. Both software and hardware are also sold on a standalone basis. Services include customer support (software updates and technical support), consulting, design services, installation services and training. A typical contract includes both product and services. Generally, contracts with customers contain multiple performance obligations. For these contracts, we account for individual performance obligations separately if they are distinct. The transaction price is allocated to the separate performance obligations on a relative standalone selling price basis. SSPs are typically estimated based on observable transactions when these services are sold on a standalone basis.

The software licenses typically provide a perpetual right to use our software. We also sell term-based software licenses that expire and Software-as-as-Service ("SaaS")-based software, which are referred to as subscription arrangements. We do not customize our software nor are installation services required, as the customer has a right to utilize internal resources or a third-party service company. The software and hardware are delivered before related services are provided and are functional without professional services or customer support. We have concluded that our software licenses are functional intellectual property that are distinct, as the user can benefit from the software on its own. The product revenue is typically recognized upon transfer of control or when the software is made available for download, as this is the point that the user of the software can direct the use of, and obtain substantially all of the remaining benefits from, the functional intellectual property. We begin to recognize software revenue related to the renewal of subscription software licenses at the start of the subscription period.

Service revenue includes revenue from customer support and other professional services. We offer warranties on our products. Certain of our warranties are considered to be assurance-type in nature, ensuring that the product is functioning as intended. Assurance-type warranties do not represent separate performance obligations. We also sell separately-priced maintenance service contracts which qualify as service-type warranties and represent separate performance obligations. We do not allow and have no history of accepting product returns.

Customer support includes software updates on a when-and-if-available basis, telephone support, integrated web-based support and bug fixes or patches. We sell our customer support contracts at a percentage of list or net product price related to the support. Customer support revenue is recognized ratably over the term of the customer support agreement, which is typically one year.

Our professional services include consulting, technical support, resident engineer services, design services and installation services. Because control transfers over time, revenue is recognized based on progress toward completion of the performance obligation. The method to measure progress toward completion requires judgment and is based on the nature of the products or services to be provided. We generally use the input method to measure progress for our contracts because we believe it best depicts the transfer of assets to the customer which occurs as we incur costs for the contracts. However, in some instances, we use the output method because it best depicts the transfer of asset to the customer. Under the cost-to-cost measure of progress, the progress toward completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. When the measure of progress is based upon expended labor, progress toward completion is measured as the ratio of labor time expended to date versus the total estimated labor time required to complete the performance obligation. Revenue is recorded proportionally as costs are incurred or as labor is expended. Costs to fulfill these obligations include internal labor as well as subcontractor costs.

We offer customer training courses, for which the related revenue is typically recognized as the training services are performed.

Our contracts with customers often include promises to transfer multiple products and services to the customer. Determining whether products and services are considered distinct performance obligations that should be accounted for separately versus together may require significant judgment.

Judgment is required to determine the SSP for each distinct performance obligation. In instances where SSP is not directly observable, such as when we do not sell the 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 products and services due to the stratification of those products and services by customers and circumstances. In these instances, the Company may use information such as the size of the customer and geographic region in determining the SSP.

Valuation of Inventory. We review inventory for both potential obsolescence and potential loss of value periodically. In this review, we make assumptions about the future demand for and market value of the inventory and, based on these assumptions, estimate the amount of any excess, obsolete or slow-moving inventory.

We write down our inventories if they are considered to be obsolete or at levels in excess of forecasted demand. In these cases, inventory is written down to estimated realizable value based on historical usage and expected demand. Inherent in our estimates of market value in determining inventory valuation are estimates related to economic trends, future demand for our products and technical obsolescence of our products. If future demand or market conditions are less favorable than our projections, additional inventory write-downs could be required and would be reflected in the cost of revenue in the period the revision is made. To date, we have not been required to revise any of our assumptions or estimates used in determining our inventory valuations.

We write down our evaluation equipment at the time of shipment to our customers, as it is not probable that the inventory value will be realizable.

Investments. We received Debentures and Warrants (collectively, the "AVCT Units") as consideration in connection with the Kandy Sale, which we accounted for in accordance with Accounting Standards Codification ("ASC") 820, *Fair Value Measurement* ("ASC 820"). We were subject to a lock-up provision which limited our ability to sell any shares of the AVCT common stock underlying the Debentures and the Warrants prior to June 1, 2021 (the "Lock-Up Period"), except in certain transactions. On September 8, 2021 (the "Debenture Conversion Date"), the Debentures were converted into 13,700,421 shares of AVCT common stock (the "Debenture Shares").

We calculated the fair value of the Debentures using a Lattice-based valuation approach, which utilizes a binomial tree to model the different paths the price of AVCT's common stock might take over the Debentures' life by using assumptions regarding the stock price volatility and risk-free interest rate. These results were then used to calculate the fair value of the Debentures at each measurement date. We used the Black-Scholes valuation model for estimating the fair value of the Warrants at each measurement date. The fair value of the Warrants was affected by AVCT's stock price as well as valuation assumptions, including the volatility of AVCT's stock price, expected term of the option, risk-free interest rate and expected dividends. Both the Lattice and Black-Scholes valuation models were based on available market data, giving consideration to all of the rights and obligations of each instrument and precluding the use of "blockage" discounts or premiums in determining the fair value of a large block of financial instruments. After the expiration of the Lock-Up Period and prior to the Debenture Conversion Date, the Company valued the AVCT Units at each measurement date by multiplying the closing stock price of AVCT common stock by the number of shares upon conversion of the Debentures and Warrants. Since the Debenture Conversion Date, the Company is valuing the Debenture Shares and Warrants by multiplying the closing stock price of AVCT common stock by the number of Debenture Shares and Warrants (collectively, the "AVCT Investment") it is holding at each measurement date. Adjustments to the fair values of the AVCT Units (prior to the Debenture Conversion Date) and AVCT Investment (subsequent to the Debenture Conversion Date) are included in Other (expense) income, net. The fair values of the AVCT Investment and the AVCT Units are reported as Investments in our consolidated balance sheets at December 31, 2021 and 2020, respectively.

Warranty Accruals. We record warranty liabilities for estimated costs of fulfilling our obligations under standard limited hardware and software warranties at the time of sale. The liability for standard warranties is included in Accrued expenses and other and Other long-term liabilities in our consolidated balance sheet. The specific warranty terms and conditions vary depending upon the country in which we do business, but generally include material costs, technical support, labor and associated overhead over a period ranging from one to three years. We provide for the estimated costs to fulfill customer warranty obligations for certain of our products upon recognition of the related revenue. Warranty is included as a component of Cost of revenue in our consolidated statements of operations, and is determined based on actual warranty cost experience, estimates of component failure rates and our management's industry experience. Our sales contracts do not permit the right of return of the product by the customer after the product has been accepted.

Loss Contingencies and Reserves. We are subject to ongoing business risks arising in the ordinary course of business that affect the estimation process of the carrying value of assets, the recording of liabilities and the possibility of various loss contingencies. An estimated loss contingency is accrued when it is probable that a liability has been incurred or an asset has been impaired and the amount of loss can be reasonably estimated. We regularly evaluate current information available to determine whether such amounts should be adjusted and record changes in estimates in the period they become known. We are subject to various legal claims. We reserve for legal contingencies and legal fees when the amounts are probable and reasonably estimable.

Stock-Based Compensation. Our stock-based compensation cost is measured at the grant date based on the fair value of the award and is recognized as expense over the requisite service period, which is generally the vesting period.

We use the Black-Scholes valuation model for estimating the fair value on the date of grant of employee stock options. Determining the fair value of stock option awards at the grant date requires judgment regarding certain valuation assumptions, including the volatility of our stock price, expected term of the option, risk-free interest rate and expected dividends. Changes in such assumptions and estimates could result in different fair values and could therefore impact our earnings. Such changes, however, would not impact our cash flows. The fair value of restricted stock awards, restricted stock units and performance-based awards is based upon our stock price on the grant date.

We grant performance-based stock units, some of which include a market condition, to certain of our executives. We use a Monte Carlo simulation approach to model future stock price movements based upon the risk-free rate of return, the volatility of each entity, and the pair-wise covariance between each entity. These results are then used to calculate the grant date fair values of the performance-based stock units.

The amount of stock-based compensation expense recorded in any period for unvested awards requires estimates of the amount of stock-based awards that are expected to be forfeited prior to vesting, as well as assumptions regarding the probability that performance-based stock awards without market conditions will be earned.

Business Combinations. We allocate the purchase price of acquired companies to identifiable assets acquired and liabilities assumed at their acquisition date fair values. Goodwill as of the acquisition date is measured as the excess of consideration transferred over the net of the acquisition date fair values of the assets acquired and the liabilities assumed and represents the expected future economic benefits arising from other assets acquired in the business combination that are not individually identified and separately recognized. Significant management judgments and assumptions are required in determining the fair value of assets acquired and liabilities assumed, particularly acquired intangible assets which are principally based upon estimates of the future performance and cash flows expected from the acquired business and applied discount rates. While we use our best estimates and assumptions as part of the purchase price allocation process to accurately value assets acquired and liabilities assumed at a business combination date, our estimates and assumptions are inherently uncertain and subject to refinement. If different assumptions are used, it could materially impact the purchase price allocation and our financial position and results of operations. Any adjustments to assets acquired or liabilities assumed subsequent to the purchase price allocation period are included in operating results in the period in which the adjustments are determined. Intangible assets typically are comprised of in-process research and development, developed technology, customer relationships, trade names and internal use software.

Goodwill and Intangible Assets. Goodwill is not amortized, but instead is tested for impairment annually, or more frequently if indicators of potential impairment exist. Intangible assets with estimated lives and other long-lived assets are reviewed for impairment when events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. Recoverability of intangible assets with estimated lives and other long-lived assets is measured by comparing the carrying amount of the asset to future net undiscounted pretax cash flows expected to be generated by the asset. If these comparisons indicate that an asset is not recoverable, we will recognize an impairment loss for the amount by which the carrying value of the asset exceeds the related estimated fair value.

Judgment is required in determining whether an event has occurred that may impair the value of goodwill, identifiable intangible assets or other long-lived assets. Factors that could indicate an impairment may exist include significant underperformance relative to plan or long-term projections, strategic changes in business strategy, significant negative industry or economic trends, a significant change in circumstances relative to a large customer, a significant decline in our stock price for a sustained period and a decline in our market capitalization to below net book value. We must make assumptions about future control premiums, market comparables, cash flows, operating plans, discount rates and other factors to determine recoverability.

Prior to 2020, our annual test for impairment of goodwill was completed as of November 30. Effective in 2020, we changed our annual goodwill impairment test date from November 30 to October 1. This change did not have a material impact on our consolidated financial statements.

As described above, effective in the fourth quarter of 2020, we determined that we had two operating segments: Cloud and Edge, and IP Optical Networks. For the purpose of testing goodwill for impairment, all goodwill is assigned to a reporting unit, which may be either an operating segment or a portion of an operating segment. We determined that the goodwill assigned to the Cloud and Edge reporting unit was $224.9 million and the goodwill assigned to the IP Optical Networks reporting unit was $192.0 million. We perform a fair value analysis using both an Income and Market approach, which encompasses a discounted cash flow analysis and a guideline public company analysis using selected multiples. We assess each valuation methodology based upon the relevance and availability of the data at the time the valuation is performed and the methodologies are weighted appropriately. Based on the results of our recently completed impairment test, we determined that the carrying value of our IP Optical Networks segment exceeded its fair value. We determined that the amount of the impairment was $116.0 million, and recorded an impairment charge in the fourth quarter of 2021. The impairment charge is reported separately in our consolidated statement of operations for the year ended December 31, 2021. We determined that there was no impairment of our Cloud and Edge segment. Upon completion of our 2020 annual test for goodwill impairment, we determined that there was no impairment of goodwill for either of our reporting units.

We previously operated as a single operating segment with one reporting unit and consequently we evaluated goodwill for impairment based on an evaluation of the fair value of the Company as a whole. Based on the results of our 2019 annual impairment test, we determined that our carrying value exceeded our fair value. We performed a fair value analysis using both an income and market approach as described above. We determined that the amount of the impairment was $164.3 million and recorded an impairment charge in the fourth quarter of 2019. The impairment charge is reported separately in our consolidated statement of operations for the year ended December 31, 2019.

Leases. We account for our leases in accordance with Accounting Standards Codification ("ASC") 842, *Leases* ("ASC 842"). We have operating and finance leases for corporate offices, research and development facilities, and certain equipment. Operating leases are reported separately in our consolidated balance sheets at December 31, 2021 and 2020. Assets acquired under finance leases are included in Property and equipment, net, in our consolidated balance sheets at December 31, 2021 and 2020.

We determine if an arrangement is a lease at inception. A contract is determined to contain a lease component if the arrangement provides us with a right to control the use of an identified asset. Lease agreements may include lease and non-lease components. In such instances for all classes of underlying assets, we do not separate lease and non-lease components but rather, account for the entire arrangement under leasing guidance. Leases with an initial term of 12 months or less are not recorded on the balance sheet and lease expense for these leases is recognized on a straight-line basis over the lease term.

For operating leases, lease expense for minimum fixed lease payments is recognized on a straight-line basis over the lease term. The expense for finance leases includes both interest and amortization expense components, with the interest component calculated based on the effective interest method and the amortization component calculated based on straight-line amortization of the right-of-use asset over the lease term. Lease contracts may contain variable lease costs, such as common area maintenance, utilities and tax reimbursements that vary over the term of the contract. Variable lease costs are not included in minimum fixed lease payments and as a result, are excluded from the measurement of the right-of-use assets and lease liabilities. We expense all variable lease costs as incurred.

Accounting for Income Taxes. Our provision for income taxes is comprised of a current and a deferred portion. The current income tax provision is calculated as the estimated taxes payable or refundable on tax returns for 2021. We provide for deferred income taxes resulting from temporary differences between financial and taxable income. Such differences arise primarily from tax net operating loss ("NOL") and credit carryforwards, depreciation, deferred revenue, stock-based compensation expense, accruals and reserves.

We assess the recoverability of any tax assets recorded on the balance sheet and provide any necessary valuation allowances as required. In evaluating our ability to recover our deferred tax assets, we consider all available positive and negative evidence, including our past operating results, the existence of cumulative income in the most recent years, changes in the business in which we operate and our forecast of future taxable income. In determining future taxable income, we make assumptions, including the amount of state, federal and international pre-tax operating income, the reversal of temporary differences and the implementation of feasible and prudent tax planning strategies. These assumptions require significant judgment about the forecasts of future taxable income and are consistent with the plans and estimates we are using to manage our underlying businesses. Such assessment is completed on a jurisdiction-by-jurisdiction basis.

In 2021, we released a portion of the valuation allowances of $28 million on U.S. federal attributes, including certain U.S. federal net operating loss carryforwards. Thus, at December 31, 2021, we had valuation allowances of $472 million to offset deferred tax assets of $598 million. These remaining valuation allowances primarily relate to our U.S. and Israel operations. In the event we determine it is more likely than not that we will be able to use a deferred tax asset in the future in excess of its net carrying value, the valuation allowance would be reduced, thereby increasing net earnings and increasing equity in the period such determination is made. We have recorded net deferred tax assets in some of our other international subsidiaries. These amounts could change in future periods based upon our operating results and changes in tax law.

We have provided for income taxes on the undistributed earnings of our non-U.S. subsidiaries as of December 31, 2021, excluding Ireland and Israel. These subsidiaries, excluding Ireland and Israel, are cost-plus or limited risk distributors that are not anticipated to need to use excess funds locally. Accordingly, we are required to recognize and book deferred taxes for 2021. The deferred taxes are booked on the entire outside basis differences related to the foreign subsidiaries, the largest of these differences being undistributed earnings.

We assess all material positions taken in any income tax return, including all significant uncertain positions, in all tax years that are still subject to assessment or challenge by relevant taxing authorities. Assessing an uncertain tax position begins with the initial determination of the position's sustainability and is measured at the largest amount of benefit that has a greater than 50% likelihood of being realized upon ultimate settlement. As of each balance sheet date, unresolved uncertain tax positions must be reassessed, and we determine whether (i) the factors underlying the sustainability assertion have changed and (ii) the amount of recognized tax benefit is still appropriate. The recognition and measurement of tax benefits require significant judgment. Judgments concerning the recognition and measurement of a tax benefit might change as new information becomes available.

Results of Operations

Years Ended December 31, 2021 and 2020

Revenue. Revenue for the years ended December 31, 2021 and 2020 was as follows (in thousands, except percentages):

	Year ended December 31,		Increase (decrease) from prior year	
	2021	2020	$	%
Product	$ 453,042	$ 467,912	$ (14,870)	(3.2)%
Service	391,915	375,883	16,032	4.3 %
Total revenue	$ 844,957	$ 843,795	$ 1,162	0.1 %

Segment revenue for the years ended December 31, 2021 and 2020 was as follows (in thousands):

	Year ended December 31, 2021			Year ended December 31, 2020		
	Cloud and Edge	IP Optical Networks	Total	Cloud and Edge	IP Optical Networks	Total
Product	$ 248,570	$ 204,472	$ 453,042	$ 275,445	$ 192,467	$ 467,9
Service	308,086	83,829	391,915	307,825	68,058	375,8
Total revenue	$ 556,656	$ 288,301	$ 844,957	$ 583,270	$ 260,525	$ 843,7

The decrease in our product revenue in 2021 compared to 2020 was primarily the result of $35 million of lower sales of our Cloud and Edge SBC products, coupled with the loss of $11 million of revenue due to the Kandy Sale. Supply chain and logistics issues, especially in the fourth quarter of 2021, impacted our ability to deliver products, accounting for $10 million of these lower sales and delaying these sales until 2022. These decreases were partially offset by $18 million of higher sales of our Cloud and Edge network transformation products and $12 million of IP Optical Networks products. The increase in revenue from the sale of IP Optical Networks products was attributable to a full year of revenue included in 2021, compared to ten months of revenue in 2020.

In 2021, 25% of our product revenue was attributable to sales to enterprise customers, compared to 30% in 2020. These sales were made through both our direct sales team and indirect sales channel partners. In 2021, 26% of our product revenue was from indirect sales through our channel partner program, compared to 29% in 2020.

The timing of the completion of customer projects and revenue recognition criteria satisfaction may cause our product revenue to fluctuate from one period to the next.

Service revenue is primarily comprised of software and hardware maintenance and support (“maintenance revenue”) and network design, installation and other professional services (“professional services revenue”).

Service revenue for the years ended December 31, 2021 and 2020 was comprised of the following (in thousands, except percentages):

	Year ended December 31,		Increase from prior year	
	2021	2020	$	%
Maintenance	$ 286,321	$ 274,816	$ 11,505	4.2 %
Professional services	105,594	101,067	4,527	4.5 %
Total service revenue	$ 391,915	$ 375,883	$ 16,032	4.3 %

Segment service revenue for the years ended December 31, 2021 and 2020 was comprised of the following (in thousands):

	Year ended December 31, 2021			Year ended December 31, 2020		
	Cloud and Edge	IP Optical Networks	Total	Cloud and Edge	IP Optical Networks	Total
Maintenance	$ 228,321	$ 58,000	$ 286,321	$ 229,035	$ 45,781	$ 274,81
Professional services	79,765	25,829	105,594	78,790	22,277	101,06
Total service revenue	$ 308,086	$ 83,829	$ 391,915	$ 307,825	$ 68,058	$ 375,88

Total service revenue from our Cloud and Edge segment was relatively flat in 2021 compared to 2020. Service revenue from our IP Optical Networks segment increased by $16 million in 2021 compared to 2020. IP Optical Networks maintenance revenue and professional services revenue increased by $12 million and $4 million, respectively, in 2021 and 2020. This increase is primarily attributable to the inclusion of a full year of revenue in 2021, compared to 10 months of revenue in 2020.

The following customer contributed 10% or more of our revenue in the years ended December 31, 2021 and 2020:

	Year ended December 31,	
	2021	2020
Verizon Communications Inc.	16%	15%

Revenue earned from customers domiciled outside the United States was 56% of revenue in 2021 and 55% of revenue in 2020. Due to the timing of project completions, we expect that the domestic and international components as a percentage of our revenue may fluctuate from quarter to quarter and year to year. Our total revenue for the years ended December 31, 2021 and 2020 was disaggregated geographically as follows (in thousands):

Year ended December 31, 2021	Product revenue	Service revenue (maintenance)	Service revenue (professional services)	Total revenue
United States	$ 196,058	$ 132,683	$ 47,296	$ 376,037
Europe, Middle East and Africa	138,203	79,475	30,349	248,027
Asia Pacific	92,803	41,945	18,183	152,931
Other	25,978	32,218	9,766	67,962
	$ 453,042	$ 286,321	$ 105,594	$ 844,957

Year ended December 31, 2020	Product revenue	Service revenue (maintenance)	Service revenue (professional services)	Total revenue
United States	$ 201,347	$ 132,661	$ 48,611	$ 382,619
Europe, Middle East and Africa	149,567	73,475	25,226	248,268
Asia Pacific	90,201	36,628	19,627	146,456
Other	26,797	32,052	7,603	66,452
	$ 467,912	$ 274,816	$ 101,067	$ 843,795

Our deferred product revenue was $10 million at December 31, 2021 and $8 million at December 31, 2020. Our deferred service revenue was $120 million at December 31, 2021 and $115 million at December 31, 2020. Our deferred revenue balance may fluctuate as a result of the timing of revenue recognition, customer payments, maintenance contract renewals, contractual billing rights and maintenance revenue deferrals included in multiple element arrangements.

We expect that our total revenue in 2022 will increase modestly compared to our 2021 total revenue as our strategy to grow our IP Optical market share in North America gains momentum and capital spending in India and Israel increases.

Cost of Revenue/Gross Margin. Our cost of revenue consists primarily of amounts paid to third-party manufacturers for purchased materials and services, royalties, amortization of acquired technology, inventory valuation adjustments, warranty costs, and manufacturing and services personnel and related costs. Our cost of revenue, gross profit and gross margin for the years ended December 31, 2021 and 2020 were as follows (in thousands, except percentages):

	Year ended December 31,		Increase (decrease) from prior year	
	2021	2020	$	%
Cost of revenue:				
Product	$ 214,745	$ 204,772	$ 9,973	4.9 %
Service	147,209	145,916	1,293	0.9 %
Amortization of acquired technology	38,343	42,290	(3,947)	(9.3)%
Total cost of revenue	$ 400,297	$ 392,978	$ 7,319	1.9 %
Gross profit	$ 444,660	$ 450,817	$ (6,157)	(1.4)%
Gross margin	52.6 %	53.4 %		

Our segment cost of revenue, gross profit and gross margin for the years ended December 31, 2021 and 2020 were as follows (in thousands, except percentages):

	Year ended December 31, 2021			Year ended December 31, 2020		
	Cloud and Edge	IP Optical Networks	Total	Cloud and Edge	IP Optical Networks	Total
Product	$ 79,811	$ 134,934	$ 214,745	$ 89,883	$ 114,889	$ 204,772
Service	107,677	39,532	147,209	108,985	36,931	145,916
Amortization of acquired technology	25,704	12,639	38,343	30,937	11,353	42,290
Total cost of revenue	$ 213,192	$ 187,105	$ 400,297	$ 229,805	$ 163,173	$ 392,978
Gross profit	$ 343,464	$ 101,196	$ 444,660	$ 353,465	$ 97,352	$ 450,817
Gross margin	61.7 %	35.1 %	52.6 %	60.6 %	37.4 %	53.4 %

Our gross margin decreased by one percentage point in 2021 compared to 2020. This decrease was primarily the result of higher component costs, expedite and production fees, and logistics expenses (collectively, "production costs") in both of our segments, coupled with product and customer mix, which decreased our gross margin by approximately two percentage points in the aggregate. This decrease was partially offset by the absence of costs related to our Kandy products as a result of the Kandy Sale, which increased our gross margin by approximately one percentage point.

The increase in our Cloud and Edge segment gross margin in 2021 compared to 2020 was primarily attributable to the absence of Kandy costs in the current year, partially offset by the aforementioned higher production costs in 2021. The decrease in our IP Optical segment gross margin in 2021 compared to 2020 was primarily attributable to the aforementioned higher production costs, partially offset by lower installation costs.

We believe that our gross margin may decrease in 2022 compared to 2021 as a result of higher expected sales from IP Optical Networks, which has lower margins due to the higher hardware content in their products, and higher production costs resulting from ongoing worldwide supply chain issues.

Research and Development. Research and development ("R&D") expenses consist primarily of salaries and related personnel expenses and prototype costs for the design, development, testing and enhancement of our products. Research and development expenses for the years ended December 31, 2021 and 2020 were as follows (in thousands, except percentages):

Year ended December 31,		Increase from prior year	
2021	2020	$	%
$ 194,948	$ 194,525	$ 423	0.2 %

Our research and development expenses were virtually flat in 2021 compared to 2020. Lower costs in our Cloud and Edge segment aggregated $25 million, primarily employee-related and product development costs, including the impact of the Kandy sale. These decreases were virtually offset by higher costs in our IP Optical Networks segment, primarily employee-related, product development and infrastructure -related expenses. These higher costs were primarily attributable to the inclusion of a full year of expenses in the current year, compared to ten months of expense in 2020, coupled with increased investment in our IP Optical Networks segment's product development.

Some aspects of our R&D efforts require significant short-term expenditures, the timing of which may cause significant variability in our expenses. We believe that rapid technological innovation is critical to our long-term success, and we are tailoring our investments to meet the requirements of our customers and market. We believe that our R&D expenses in 2022 will increase modestly compared to 2021, primarily due to our incremental investment in critical growth areas, partially offset by cost savings from the 2022 Restructuring Initiative.

Sales and Marketing. Sales and marketing expenses consist primarily of salaries and related personnel costs, commissions, travel and entertainment expenses, promotions, customer trial and evaluations inventory and other marketing and sales support expenses. Sales and marketing expenses for the years ended December 31, 2021 and 2020 were as follows (in thousands, except percentages):

Year ended December 31,		Increase from prior year	
2021	2020	$	%
$ 150,279	$ 139,318	$ 10,961	7.9 %

The increase in sales and marketing expenses in 2021 compared to 2020 was primarily attributable to $7 million of higher employee-related expenses, $2 million of higher consulting fees, $1 million of higher infrastructure-related costs, and $1 million of net increases in other sales and marketing expenses.

At the segment level, our IP Optical Networks segment sales and market expenses increased by $15 million in 2021, partially offset by $4 million of lower Cloud and Edge segment expenses. The increase in IP Optical Networks segment expense is primarily attributable to the inclusion of a full year of expense in the current year, compared to ten months of expense in 2020, principally employee-related, consulting and infrastructure-related costs. The decrease in Cloud and Edge segment expense was primarily attributable to lower employee-related expenses resulting from the Kandy Sale.

We believe that our sales and marketing expenses 2022 will be consistent with 2021 levels.

General and Administrative. General and administrative expenses consist primarily of salaries and related personnel costs for executive and administrative personnel, and audit, legal and other professional fees. General and administrative expenses for the years ended December 31, 2021 and 2020 were as follows (in thousands, except percentages):

Year ended December 31,		Decrease from prior year	
2021	2020	$	%
$ 53,661	$ 63,286	$ (9,625)	(15.2)%

The decrease in general and administrative expenses in the 2021 compared to 2020 was primarily attributable to $5 million of lower infrastructure-related expenses, $2 million each of lower employee- and litigation-related expenses, and $1 million of net decreases in other general and administrative expenses.

At the segment level, our Cloud and Edge segment expenses decreased by $8 million, while our IP Optical Networks segment expenses decreased by $2 million. The decrease in Cloud and Edge segment expenses was primarily attributable to lower infrastructure-related expense, the absence of approximately $2 million of litigation-related expense in the current year, and lower employee-related expenses and professional (i.e., consulting, legal and audit) fees. Lower infrastructure- and employee-related expenses for our IP Optical Networks segment were partially offset by higher general and administrative expenses resulting from the inclusion of a full year of expense in the current year, compared to ten months of expense in 2020.

We believe that our general and administrative expenses in 2022 will decrease slightly compared to our 2021 levels, primarily due to cost savings from the 2022 Restructuring Initiative.

Amortization of Acquired Intangible Assets included in Operating expenses. Amortization of acquired intangible assets included in Operating expenses for the years ended December 31, 2021 and 2020 was as follows (in thousands, except percentages):

Year ended December 31,		Increase from prior year	
2021	**2020**	**$**	**%**
$ 28,283	$ 18,620	$ 9,663	51.9 %

The increase in amortization of acquired intangible assets included in operating expenses was primarily due to the inclusion of amortization expense related to the ECI Acquisition for a full year, compared to ten months of expense in 2020, coupled with the scheduled recognition of such expense in relation to expected future cash flows, as the amortization of such intangible assets is not recorded on a straight-line basis.

Impairment of Goodwill. Our annual testing for impairment of goodwill is completed as of October 1. Based on the results of our recently completed impairment test, we determined that the carrying value of our IP Optical Networks segment exceeded its fair value, and recorded an impairment charge of $116.0 million in the fourth quarter of 2021. We determined that there was no impairment of our Cloud and Edge segment. Our annual test for impairment in 2020 did not result in an impairment for either of our two reporting units. Impairment of goodwill is reported separately in the consolidated statements of operations.

Acquisition-, Disposal- and Integration-Related. Acquisition-, disposal- and integration-related expenses include those expenses related to acquisitions that we would otherwise not have incurred. Acquisition- and disposal-related expenses include professional and services fees, such as legal, audit, consulting, paying agent and other fees. Integration-related expenses represent incremental costs related to combining the Company's systems and processes with those of acquired businesses, such as third-party consulting and other third-party services. Acquisition-, disposal- and integration-related expenses are reported separately in the consolidated statements of operations.

We recorded $7.6 million of acquisition-, disposal- and integration-related expenses in 2021, comprised of $7.1 million of integration-related expenses, $0.3 million of disposal-related expenses an $0.2 million of acquisition-related expenses. We recorded $17.2 million of acquisition-, disposal- and integration-related expenses in 2020, comprised of $13.4 million of acquisition-related expenses, $1.9 million of disposal-related expenses and $1.8 million of integration-related expenses. The acquisition-related expenses primarily related to the ECI Acquisition and, to a lesser extent, other acquisition-related activities. The disposal-related expenses related to the Kandy Sale. The integration-related expenses related to our ongoing integration activities, primarily related to the ECI Acquisition.

Restructuring and Related. We have been committed to streamlining operations and reducing operating costs by closing and consolidating certain facilities and reducing our worldwide workforce. Please see the additional discussion of our restructuring initiatives in the "Restructuring and Cost Reduction Initiatives" section of the Overview of this Management's Discussion and Analysis of Financial Condition and Results of Operations. Restructuring and related expense is reported separately in the consolidated statements of operations.

We recorded restructuring and related expense of $11.7 million in 2021, comprised of $4.6 million for severance and related costs, and $7.1 million for variable and other facilities-related costs, including $1.3 million of net expense for the accelerated amortization of lease assets. We recorded $16.2 million of restructuring and related expense in 2020, comprised of $12.0 million for severance and related costs, and $4.2 million for variable and other facilities-related costs, including $0.6 million for the accelerated amortization of lease assets.

Although we have eliminated positions as part of our restructuring initiatives, we continue to hire in certain areas that we believe are important to our future growth.

Interest Expense, net. Interest expense and interest income for the years ended December 31, 2021 and 2020 were as follows (in millions, except percentages):

	Year ended December 31,		Increase (decrease) from prior year	
	2021	2020	$	%
Interest income	$ 3,733	$ 471	$ 3,262	692.6 %
Interest expense	(19,564)	(21,513)	(1,949)	(9.1)%
	$ (15,831)	$ (21,042)	$ 5,211	(24.8)%

Interest income in 2021 primarily represents paid-in-kind interest on the Debentures prior to the Debenture Conversion Date, which was recorded as an increase to the fair value of the Debentures. Interest expense in 2021 was primarily comprised of $13.8 million of interest on our outstanding term debt and $4.8 million in the aggregate related to amortization of debt issuance costs in connection with the 2020 Credit Facility (as defined below), including the write-off of $2.5 million of capitalized debt issuance costs in connection with the Third Amendment (as defined below), and interest expense in connection with the factoring of certain accounts receivable.

Interest income in 2020 primarily represents interest earned on the outstanding note receivable from Metaswitch, which was paid in full in the third quarter of 2020. Interest expense in 2020 was primarily comprised of $14.4 million of interest on our outstanding term debt, and $4.2 million in the aggregate related to amortization of debt issuance costs, interest on other borrowings and finance leases, and interest expense in connection with the factoring of certain accounts receivable. Interest expense in 2020 also included the write-off of $2.9 million of debt issuance costs in connection with the amendment of the 2020 Credit Facility and the retirement of the 2019 Credit Facility (as defined below).

Other (Expense) Income, Net. We recorded other expense, net, aggregating $74.5 million in 2021, primarily comprised of $74.8 million of losses resulting from the change in fair value of the AVCT Units for the period from January 1, 2021 to the Debenture Conversion Date and the AVCT Investment for the period from the Debenture Conversion Date to December 31, 2021. This loss was partially offset by a gain of $2.8 million on the sale of our QualiTech business, which operates compliance testing laboratories in Israel for reliability and standardization testing for the high-tech industry, including testing in medical equipment, military equipment and vehicles ("QualiTech"). We recorded $112.7 million of net other income in 2020, primarily in connection with the Kandy Sale, which was comprised of $83.6 million from the gain on the sale, and $30.3 million related to the increase in the fair value of the AVCT Units from the Kandy Sale Date through December 31, 2020.

Income Tax Benefit (Provision). We recorded an income tax benefit of $31.0 million in 2021 and an income tax provision of $4.7 million in 2020. The benefit recorded in 2021 was primarily the result of the release of part of the valuation allowance against deferred tax assets in the U.S. and a reduction in the deferred taxes on the undistributed earnings of non-U.S. subsidiaries due to legal entity restructuring activities. The provision recorded in 2020 was primarily the result of the gain from the Kandy Sale and foreign operations.

During 2021 and 2020, we performed an analysis to determine if, based on all available evidence, we considered it more likely than not that some portion or all of the recorded deferred tax assets will not be realized in a future period. As a result of our evaluations, in 2021, we released a portion of the valuation allowance on U.S. federal net operating loss carryforwards of $28 million. As a result, for the U.S. deferred tax assets, we concluded that deferred tax assets are generally realizable, with the exception of certain federal and state net operating loss carryforwards, as well as certain tax credits, that are not anticipated to be utilized. Accordingly, we have maintained a valuation allowance on our U.S. deferred tax assets of $30.5 million. As a result of our evaluations for Israel, we maintained a valuation against our deferred tax assets in Israel.

Liquidity and Capital Resources

Our consolidated statements of cash flows are summarized as follows (in thousands):

	Year ended December 31,		
	2021	2020	Change
Net (loss) income	$ (177,185)	$ 88,591	$ (265,776)
Adjustments to reconcile net (loss) income to cash flows provided by operating activities	251,655	(17,903)	269,558
Changes in operating assets and liabilities	(55,288)	30,876	(86,164)
Net cash provided by operating activities	$ 19,182	$ 101,564	$ (82,382)
Net cash used in investing activities	$ (14,188)	$ (330,073)	$ 315,885
Net cash (used in) provided by financing activities	$ (33,683)	$ 319,303	$ (352,986)

We had cash and restricted cash aggregating $106.5 million and $135.7 million at December 31, 2021 and 2020, respectively. We had cash held by our non-U.S. subsidiaries aggregating approximately $60 million and $46 million at December 31, 2021 and 2020, respectively. If we elect to repatriate all of the funds held by our non-U.S. subsidiaries as of December 31, 2021, we do not believe that the amounts of potential withholding taxes that would arise from the repatriation would have a material effect on our liquidity.

On April 29, 2019, we, as guarantor, and Ribbon Communications Operating Company, Inc., as borrower, entered into a syndicated, amended and restated credit facility (the "2019 Credit Facility"), which replaced our previous credit facility, which we had entered into in 2018. The 2019 Credit Facility provided for a $50 million term loan facility that was advanced in full on April 29, 2019, and a $100 million revolving line of credit.

We currently maintain the Senior Secured Credit Facilities Credit Agreement (as amended, the "2020 Credit Facility"), which we entered into on March 3, 2020, by and among us, as a guarantor, Ribbon Communications Operating Company, Inc., as the borrower ("Borrower"), Citizens Bank, N.A. ("Citizens"), as administrative agent, a lender, issuing lender, swingline lender, joint lead arranger and bookrunner, Santander Bank, N.A., as a lender, joint lead arranger and bookrunner, and the other lenders party thereto (each, together with Citizens Bank, N.A. and Santander Bank, N.A., referred to individually as a "Lender", and collectively, the "Lenders"). For additional details regarding the terms of the 2020 Credit Facility, see Note 10 to our consolidated financial statements. The proceeds from the 2020 Credit Facility were used, in part, to pay off in full all obligations of the Company under the 2019 Credit Facility.

The 2020 Credit Facility provides for $500 million of commitments from the lenders to the Borrower, comprised of $400 million in term loans (the "2020 Term Loan Facility") and a $100 million facility available for revolving loans (the "2020 Revolving Credit Facility"). Under the 2020 Revolving Credit Facility, a $30 million sublimit is available for letters of credit and a $20 million sublimit is available for swingline loans. Under the 2020 Credit Facility, we were originally required to make quarterly principal payments aggregating approximately $10 million in the first year, $20 million per year for the following three years and $30 million in the last year, with the remaining balance due on the maturity date.

The indebtedness and other obligations under the 2020 Credit Facility are unconditionally guaranteed on a senior secured basis by the Company, Edgewater Networks, Inc., a wholly-owned subsidiary of the Company, and GENBAND Inc., a wholly-owned subsidiary of the Company (together, the "Guarantors"). The 2020 Credit Facility is secured by first-priority liens on substantially all of the assets of the Borrower and the Guarantors, including substantially all of the assets of the Company.

The 2020 Credit Facility requires compliance with certain financial covenants, including a minimum Consolidated Fixed Charge Coverage Ratio and a maximum Consolidated Net Leverage Ratio (each as defined in the 2020 Credit Agreement, and each tested on a quarterly basis).

In addition, the 2020 Credit Facility contains various covenants that, among other restrictions, limit our and our subsidiaries’ ability to incur or assume indebtedness; grant or assume liens; make acquisitions or engage in mergers; sell, transfer, assign or convey assets; repurchase equity and make dividend and certain other restricted payments; make investments; engage in transactions with affiliates; enter into sale and leaseback transactions; enter into burdensome agreements; change the nature of its business; modify their organizational documents; or amend or make prepayments on certain junior debt.

The 2020 Credit Facility contains events of default that are customary for a secured credit facility. If an event of default relating to bankruptcy or other insolvency events with respect to the Company or any of its subsidiaries occurs, all obligations under the 2020 Credit Facility will immediately become due and payable. If any other event of default exists under the 2020 Credit Facility, the lenders can accelerate the maturity of the obligations outstanding under the 2020 Credit Facility and exercise other rights and remedies, including charging a default rate of interest equal to 2.00% per year above the rate that would otherwise be applicable. In addition, if any event of default exists under the 2020 Credit Facility, the lenders can commence foreclosure or other actions against the collateral.

On August 18, 2020 (the "First Amendment Effective Date"), we entered into the First Amendment to the 2020 Credit Facility. Pursuant to an assignment and assumption agreement entered into by Citizens and certain affiliates of Whitehorse Capital on the First Amendment Effective Date (collectively, "HIG Whitehorse"), and consented to by Citizens and the Borrower, $75 million of the 2020 Term Loan Facility, designated as the Term B Loan (the "Term B Loan") was assigned from Citizens to HIG Whitehorse. The remaining $325 million of the 2020 Term Loan Facility that was not assigned to HIG Whitehorse was deemed the Term A Loan (the "Term A Loan" and, together with the Term B Loan, the "Amended 2020 Term Loan Facility").

The Term A Loan and amounts under the 2020 Revolving Credit Facility mature in March 2025. The Term A Loan and 2020 Revolving Credit Facility bear interest at the Borrower's option at either the LIBOR rate plus a margin ranging from 1.50% to 3.50% per year, or the base rate (the highest of the Federal Funds Effective Rate (as defined in the 2020 Credit Agreement) plus 0.50%, or the prime rate announced from time to time in The Wall Street Journal) plus a margin ranging from 0.50% to 2.50% per year (the "Applicable Margin"). The Applicable Margin varies depending on our Consolidated Net Leverage Ratio (as defined in the 2020 Credit Agreement). The base rate and the LIBOR rate are each subject to a zero percent floor. We are required to make quarterly principal payments on the Term A Loan aggregating approximately $10 million in the first year, $16 million in each of the next two years, $20 million in the fourth year and $16 million in the last year, with the final payment approximating $244 million due on the maturity date. The Borrower can prepay all amounts under the Term A Loan and the 2020 Revolving Credit Facility at any time without premium or penalty (other than customary LIBOR breakage costs), subject to certain notice requirements. The First Amendment did not change the terms applied to the Term A Loan or the Revolving Credit Facility under the 2020 Credit Facility.

The Term B Loan was scheduled to mature in March 2026 and bore interest, at the Borrower's option, at either the LIBOR rate plus a margin of 7.50% per year, or the base rate (the highest of the Federal Funds Effective Rate (as defined in the 2020 Credit Facility) plus 0.50%, or the prime rate announced from time to time in The Wall Street Journal, plus a margin of 6.50% per year. The Term B Loan had a lower rate of amortization than the Term A Loan and was subject to a 1.0% premium if voluntarily repaid in connection with a repricing transaction (as defined in the First Amendment) occurring prior to the six month anniversary of the First Amendment Effective Date. We were required to make quarterly principal payments totaling approximately $1 million in the first year and $8 million in the aggregate over the next four and a half years, with the final payment approximating $66 million due on the maturity date.

The First Amendment reduced the Borrower's ability to incur new tranches of term loans, or increases in commitments under the Amended 2020 Term Loan Facility or the 2020 Revolving Credit Facility. Specifically, such indebtedness can be incurred up to an aggregate dollar amount equal to 75% of the Company's Consolidated Adjusted EBITDA (as defined in the 2020 Credit Facility), reduced from 100% prior to the First Amendment, as of the most recently ended fiscal quarter for which financial statements have been delivered to the lenders, plus additional amounts, so long as the Borrower's Consolidated Net Leverage Ratio (as defined in the 2020 Credit Facility) does not exceed 2.25:1.00, reduced from 2.75:1.00 prior to the First Amendment. The First Amendment also reduced the amount of Unrestricted Cash (as defined in the 2020 Credit Facility) used in calculating the Borrower's Consolidated Net Leverage Ratio from $25 million to $10 million.

On December 1, 2020, we entered into a Second Amendment to the 2020 Credit Facility to obtain consent for an equity exchange with AVCT in connection with the Kandy Sale, as well as amend certain provisions of the 2020 Credit Facility.

At December 31, 2020, we had an outstanding Term A Loan balance of $318.5 million at an average interest rate of 3.4%, and the Term B Loan had an outstanding balance of $74.6 million at average interest rate of 8.40%. The 2020 Revolving Credit Facility did not have an outstanding balance but had $5.6 million of letters of credit outstanding with an interest rate of 2.5%.

On March 3, 2021 (the "Third Amendment Effective Date"), we entered into a Third Amendment to Credit Agreement (the "Third Amendment"), which further amended the 2020 Credit Facility. The Third Amendment provided for an incremental term loan facility to us in the original principal amount of $74.6 million, the proceeds of which were used on the Third Amendment Effective Date to consummate an open market purchase of all outstanding amounts under the Term B Loan. Upon the consummation of the open market purchase, the Term B Loans were assigned to the Borrower and immediately canceled, such that the outstanding amount under the Term A Loan and incremental term loan facility were combined and held by the Lenders (the "2020 Term Loan"). We are required to make quarterly principal payments on the 2020 Term Loan aggregating approximately $20 million per year in the first three years and $30 million in the fourth year, with the final payment approximating $300 million due on the maturity date.

On March 10, 2022, we entered into a Fourth Amendment to the 2020 Credit Facility (the "Fourth Amendment") to increase the Maximum Consolidated Net Leverage Ratio (as defined in the 2020 Credit Facility) to 4.25:1.00 for the first quarter of 2022 and 4.50:1.00 for the second quarter of 2022, with reductions in subsequent quarters through the third quarter of 2023, when the ratio will be fixed at 3.00:1.00. In connection with the Fourth Amendment, we made a $15.0 million prepayment that was applied to the final payment due on the maturity date.

At December 31, 2021, we had an outstanding 2020 Term Loan balance of $375.5 million at an average interest rate of 3.4% and $4.3 million of letters of credit outstanding with an interest rate of 2.5%. We were in compliance with all covenants of the 2020 Credit Facility at both December 31, 2021 and 2020.

We are exposed to financial market risk related to foreign currency fluctuations and changes in interest rates. These exposures are actively monitored by management. To manage the volatility related to the exposure to changes in interest rates, we have entered into a derivative financial instrument. Management's objective is to reduce, where it is deemed appropriate to do so, fluctuations in earnings and cash flows associated with changes in interest rates. Our policies and practices are to use derivative financial instruments only to the extent necessary to manage exposures. We do not hold or issue derivative financial instruments for trading or speculative purposes.

As a result of exposure to interest rate movements, during March 2020, we entered into an interest rate swap arrangement, which effectively converted our $400 million term loan with its variable interest rate based upon one-month LIBOR to an aggregate fixed rate of 0.904%, plus a leverage-based margin as defined in the 2020 Credit Facility. The notional amount of this swap as of December 31, 2021 was $400 million, and the swap matures on March 3, 2025, the same date the 2020 Credit Facility matures.

Our objectives in using interest rate derivatives are to add stability to interest expense and to manage our exposure to interest rate movements. To accomplish this objective, we are using an interest rate swap as part of our interest rate risk management strategy. Interest rate swaps designated as cash flow hedges involve the receipt of variable amounts from a counterparty in exchange for making fixed-rate payments over the life of the agreements without exchange of the underlying notional amount.

The effective portion of changes in the fair value of derivatives designated and that qualify as cash flow hedges is recorded in accumulated other comprehensive income (loss) in the consolidated balance sheet and is subsequently reclassified into earnings in the period that the hedged forecasted transactions affect earnings. During the years ended December 31, 2021 and 2020, such a derivative was used to hedge the variable cash flows associated with the 2020 Credit Facility. Any ineffective portion of the change in fair value of the derivative would be recognized directly in earnings. However, during the years ended December 31, 2021 and 2020, we recorded no hedge ineffectiveness.

Amounts reported in accumulated other comprehensive income (loss) related to our derivative are reclassified to interest expense as interest is accrued on our variable-rate debt. Based upon projected forward rates, we estimate as of December 31, 2021 that $2.1 million may be reclassified as an increase to interest expense over the next 12 months.

We use letters of credit, performance and bid bonds in the course of our business. At December 31, 2021, we had $30.1 million of letters of credit, bank guarantees, performance and bid bonds outstanding (collectively, the "Guarantees"), comprised of the $4.3 million of letters of credit under the 2020 Credit Facility described above (the "Letters of Credit") and $25.8 million of bank guarantees and performance and bid bonds under various uncommitted facilities (collectively, the "Other Guarantees"). At December 31, 2020, we had $32.6 million of Guarantees, comprised of $5.6 million of Letters of Credit and $27.0 million of Other Guarantees. At December 31, 2021 and 2020, we had cash collateral of $2.6 million and $2.7 million, respectively, supporting the Guarantees under our uncommitted facilities. This cash collateral is included in Restricted cash in our consolidated balance sheets at December 31, 2021 and 2020.

Our IP Optical Networks segment maintains customer receivables factoring agreements with a number of financial institutions. Under the terms of these agreements, we may transfer receivables to the financial institutions, on a non-recourse basis, provided that the financial institutions approve the receivables in advance. During the year ended December 31, 2021, we received $118.5 million of cash from the sale of certain accounts receivable and recorded $0.8 million of interest expense in connection with these transactions. During the year ended December 31, 2020, we received $119.8 million of cash from the sale of certain accounts receivable and recorded $0.9 million of interest expense in connection with these transactions.

In the second quarter of 2019, our Board approved a stock repurchase program (the "Repurchase Program") pursuant to which we could repurchase up to $75 million of our common stock prior to April 18, 2021. The Company did not repurchase any common stock in the year ended December 31, 2020 or in the period from January 1, 2021 though the expiration of the Repurchase Program on April 18, 2021.

We have no off-balance sheet arrangements that have or are reasonably likely to have a current or future material effect on our financial position, changes in financial position, revenue or expenses, results of operations, liquidity, capital expenditures or capital resources.

Cash Flows from Operating Activities

Our primary source of cash from operating activities has been from cash collections from our customers. We expect cash flows from operating activities to be affected by increases and decreases in sales volumes and timing of collections, and by purchases and shipments of inventory. Our primary uses of cash from operating activities have been for personnel costs and investment in our research and development and in our sales and marketing, and general and administrative departments.

Our operating activities provided $19 million of cash in 2021, primarily the result of higher accounts payable and deferred revenue, and lower other operating assets, coupled with our non-cash operating expenses such as the impairment of goodwill, the decrease in the fair value of the AVCT Investment, amortization of intangible assets, stock-based compensation and depreciation. These amounts were partially offset by our net loss and a non-cash gain arising from the reversal of portions of our deferred tax asset, coupled with lower accrued expenses and other long-term liabilities and higher accounts receivable and inventory. The decrease in accrued expenses and other long-term liabilities was primarily due to employee-related cash payments and payments related to facilities, professional fees and royalties.

Our operating activities provided $102 million of cash in 2020, primarily the result of our net income, lower other operating assets, inventory and accounts receivable, higher accrued expenses and other long-term liabilities, and our non-cash operating income and expenses such as the gain on the Kandy Sale, amortization of intangible assets, stock-based compensation, depreciation, and amortization of debt issuance costs. These amounts were partially offset by lower accounts payable and deferred revenue. The decrease in other operating assets was primarily due to the payments received from Metaswitch aggregating $26 million in connection with the 2019 litigation settlement and subsequent supplemental agreement to accelerate the payment of amounts outstanding. The increase in accrued expenses and other long-term liabilities was primarily due to the derivative liability we recorded in connection with our interest rate swap, which we entered into in the first quarter of 2020.

Cash Flows from Investing Activities

Our investing activities used $14 million and $330 million of cash in 2021 and 2020, respectively. Our 2021 investing activities were comprised of $17 million paid for purchases of property and equipment, partially offset by $3 million of proceeds from the sale of QualiTech. Our 2020 investing activities were comprised of $347 million of cash paid as cash consideration for ECI and $26 million paid for purchases of property and equipment, partially offset by $43 million of cash proceeds from the sale of land in connection with the ECI Acquisition.

Cash Flows from Financing Activities

Our financing activities used $34 million of cash in 2021. We received $75 million of proceeds from the incremental loan obtained in connection with the Third Amendment, which amount was used to consummate an open market purchase of all outstanding amounts under the Term B Loan. We used $92 million for principal payments of term debt, including the $75 million payoff of the Term B Loan in connection with the Third Amendment, $14 million for the payment of tax withholding obligations related to the net share settlement of restricted stock awards upon vesting, and $1 million each for principal payments of finance leases and payments of debt issuance costs.

Our financing activities provided $319 million of cash in 2020, primarily due to $479 million of proceeds from term debt, which was comprised of $400 million from the 2020 Credit Facility, $75 million from the Term B Loan under the Amended 2020 Credit Facility (concurrent with the repayment of the same amount of original debt under the 2020 Credit Facility as noted below) and $4 million of proceeds from short-term loans in China for the financing of certain export activities. These proceeds were partially offset by the repayment of the $75 million of debt that was extinguished in connection with the First Amendment, the repayment of $57 million outstanding under the 2019 Credit Facility (comprised of $8 million under the revolving credit facility and $49 million of long-term debt), the payment of $14 million of debt issuance costs in connection with the 2020 Credit Facility and the First Amendment, and the repayment of principal aggregating $10 million related to the

2020 Credit Facility and short-term loans in China. We also paid $2 million for withholding obligations related to the net share settlement of restricted stock awards upon vesting and $1 million for principal payments on finance leases.

Based on our current expectations, we believe our current cash and available borrowings under the 2020 Credit Facility will be sufficient to meet our anticipated cash needs for working capital and capital expenditures for at least twelve months. The rate at which we consume cash is dependent on the cash needs of our future operations, including our contractual obligations at December 31, 2021, primarily comprised of our debt principal and interest obligations as described above, and our operating lease and purchase obligations. Our operating lease obligations totaled $88 million at December 31, 2021, with payments aggregating $21 million in 2022, $18 million in 2023, $11 million in 2024 and $38 million thereafter. Our purchase obligations totaled $167 million at December 31, 2021, with estimated payments aggregating $139 million in 2022 and $28 million thereafter. We anticipate devoting substantial capital resources to continue our research and development efforts, to maintain our sales, support and marketing, to complete acquisition-related integration activities and for other general corporate activities. We further believe that our financial resources, along with managing discretionary expenses, will allow us to manage the ongoing impact of the COVID-19 pandemic on our business operations. Looking ahead, we have developed contingency plans to reduce costs further if the situation continues to deteriorate. The challenges posed by the COVID-19 pandemic on our business continue to evolve rapidly. Consequently, we continue to evaluate our financial position in light of future developments, particularly those relating to the COVID-19 pandemic. However, it is difficult to predict future liquidity requirements with certainty, and our cash and available borrowings under the 2020 Credit Facility may not be sufficient to meet our future needs, which would require us to refinance our debt and/or obtain additional financing. We may not be able to refinance our debt or obtain additional financing on favorable terms or at all.

Recent Accounting Pronouncements

In December 2019, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes* ("ASU 2019-12"), which modifies Accounting Standards Codification ("ASC") 740, *Income Taxes (Topic 740)*, to simplify the accounting for income taxes. ASU 2019-12 addresses the accounting for hybrid tax regimes, tax basis step-up in goodwill obtained in a transaction that is not a business combination, separate financial statements of legal entities not subject to tax, intraperiod tax allocation exception to incremental approach, ownership changes in investments - changes from a subsidiary to an equity method investment, ownership changes in investments - changes from an equity method investment to a subsidiary, interim period accounting for enacted changes in tax law and year-to-date loss limitation in interim period tax accounting. The adoption of ASU 2019-12 did not have a material impact on our consolidated financial statements upon adoption.

In October 2021, the FASB issued ASU 2021-08, *Business Combinations (Topic 805): Accounting for Contract Assets and Contract Liabilities from Contracts with Customers* ("ASU 2021-08"), which amends ASC 805, *Business Combinations (Topic 805)*, to add contract assets and contract liabilities to the list of exceptions to the recognition and measurement principles that apply to business combinations and to require that an acquiring entity recognize and measure contract assets and contract liabilities acquired in a business combination in accordance with ASC 606, *Revenue from Contracts with Customers (Topic 606)* ("ASC 606"). Under current GAAP, an acquirer generally recognizes such items at fair value on the acquisition date. While primarily related to contract assets and contract liabilities that were accounted for by the acquiree in accordance with ASC 606, ASU 2021-08 also applies to contract assets and contract liabilities from other contracts to which the provisions of ASC 606 apply, such as contract liabilities from the sale of nonfinancial assets within the scope of ASU 2017-05, *Other Income - Gains and Losses from the Derecognition of Nonfinancial Assets (Subtopic 610-20)*. ASU 2021-08 is effective for the Company January 1, 2023, with early adoption permitted. We believe that the adoption of ASU 2021-08 could have a material impact on our consolidated financial statements for periods including and subsequent to significant business acquisitions.

In January 2021 the FASB issued ASU 2021-01, *Reference Rate Reform (Topic 848): Scope* ("ASU 2021-01"), which refines the scope of ASC 848, *Reference Rate Reform*, and clarifies some of its guidance as part of the FASB's monitoring of global reference rate reform activities. ASU 2021-01 permits entities to elect certain optional expedients and exceptions when accounting for derivative contracts and certain hedging relationships affected by changes in the interest rates used for discounting cash flows, for computing variation margin settlements, and for calculating price alignment interest in connection with reference rate reform activities under way in global financial markets (the "discounting transition"). ASU 2021-01 is effective for the Company prospectively in any period through December 31, 2022 that a modification is made to the terms of the derivatives affected by the discounting transition. We do not believe the adoption of ASU 2021-01 will have a material impact on our consolidated financial statements.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

We are exposed to a variety of market risks, changes in interest rates affecting the return on our investments and foreign currency fluctuations.

To manage the volatility related to the exposure to changes in interest rates, we have entered into a derivative financial instrument. Our objective is to reduce, where it is deemed appropriate to do so, fluctuations in earnings and cash flows associated with changes in interest rates. Our policies and practices are to use derivative financial instruments only to the extent necessary to manage exposures. We do not hold or issue derivative financial instruments for trading or speculative purposes.

Amounts reported in accumulated other comprehensive income (loss) related to our derivative are reclassified to interest expense as interest is accrued on our variable-rate debt. Our derivative had a fair value of $1.8 million at December 31, 2021, comprised of $2.1 million included in Accrued expenses and other and $3.9 million included in Other assets on our consolidated balance sheet. Based upon projected forward rates, we estimate as of December 31, 2021 that $2.1 million may be reclassified as an increase to interest expense over the next twelve months.

At December 31, 2021, we had outstanding debt totaling $375.5 million. A hypothetical movement of plus or minus 50 basis points in the interest rate of our outstanding debt would have changed our interest expense by approximately $2 million for the year ended December 31, 2021.

Based on a hypothetical 10% adverse movement in all foreign currency exchange rates, our revenue and net loss for the year ended December 31, 2021 would have been adversely affected by approximately $25 million and $11 million, respectively, although the actual effects could differ materially from this hypothetical analysis.

Item 8. Financial Statements and Supplementary Data

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Ribbon Communications Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Ribbon Communications Inc. and subsidiaries (the "Company") as of December 31, 2021 and 2020, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity, and cash flows for each of the three years in the period ended December 31, 2021, and the related notes (collectively referred to as the "financial statements"). In our opinion, the financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2021 and 2020, and the results of its operations and its cash flows for each of the three years in the period ended December 31, 2021, in conformity with accounting principles generally accepted in the United States of America.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the Company's internal control over financial reporting as of December 31, 2021, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated March 11, 2022, expressed an unqualified opinion on the Company's internal control over financial reporting.

Basis for Opinion

These financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's financial statements based on our audits. We are a public accounting firm registered with the 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 audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the 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 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 financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

The critical audit matters communicated below are matters arising from the current-period audit of the 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 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 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.

Revenue Recognition — Refer to Notes 2 and 16 to the financial statements

Critical Audit Matter Description

The Company recognizes revenue from two primary sources: products and services. Generally, contracts with customers contain multiple performance obligations, consisting of products and services. For these contracts, the Company accounts for individual performance obligations separately if they are considered distinct. When an arrangement contains more than one performance obligation, the Company will allocate the transaction price to each performance obligation on a relative standalone selling price basis. The Company utilizes the observable price of goods and services when they are sold separately to similar customers in order to estimate standalone selling price.

Management is required to use judgment to develop its estimates of standalone selling price. Auditing the Company’s estimates of standalone selling price required a high degree of auditor judgment and an increased extent of effort, including the need to involve our data analytics specialists to assist in the testing of the standalone selling price analyses given the judgment required by management in this area.

How the Critical Audit Matter Was Addressed in the Audit

Our audit procedures related to the testing of management's estimation of standalone selling prices included the following, among others:

- We tested the effectiveness of controls over revenue, including those over the determination of estimated standalone selling price.
- We evaluated whether management's significant accounting policies related to the estimation of standalone selling price were appropriate.
- With the assistance of our data analytics specialists, we evaluated the estimated standalone selling price analyses prepared by the Company, including testing the underlying detail of standalone sales and the mathematical accuracy of the calculations.

Goodwill – IP Optical Networks Reporting Unit — Refer to Notes 2 and 10 to the financial statements

Critical Audit Matter Description

The Company's evaluation of goodwill for impairment involves the comparison of the fair value of each reporting unit to its carrying value. The Company used a combination of the income and market approaches to estimate reporting unit fair value. With respect to the income approach, management is required to make significant estimates and assumptions related to discount rates and forecasts of future revenue. Changes in these assumptions could have a significant impact on either the fair value, the amount of any goodwill impairment charge, or both. The goodwill balance was $417 million as of December 31, 2021, of which $192 million was allocated to the IP Optical Networks Reporting Unit ("IP Optical"). The carrying value of IP Optical exceeded its fair value as of December 31, 2021, and, therefore, $116 million of impairment was recognized.

Given the significant judgments made by management to estimate the fair value of IP Optical, performing audit procedures to evaluate the reasonableness of management's estimates and assumptions related to the selection of the discount rate and forecasts of future revenue and profit margin required a high degree of auditor judgment and an increased extent of effort, including the need to involve our fair value specialists.

How the Critical Audit Matter Was Addressed in the Audit

Our audit procedures related to the discount rate and forecasts of future revenue and profit margin, used by management to estimate the fair value of IP Optical, included the following, among others:

- We tested the effectiveness of controls over management's goodwill impairment evaluation, including those over the determination of the fair value of IP Optical, such as controls related to management's selection of the discount rate and forecasts of future revenue and profit margin.
- We evaluated management's ability to accurately forecast future revenues and profit margins by comparing actual results to management's historical forecasts.
- We evaluated the reasonableness of management's revenue and profit margin forecasts by comparing the forecasts to:
  - Historical revenues and profit margins.
  - Internal communications to management and the Board of Directors.
  - Forecasted information included in Company press releases as well as in analyst and industry reports for the Company and certain of its peer companies.
- We evaluated the impact of changes in management's forecasts from the October 1, 2021, annual measurement date to December 31, 2021.
- With the assistance of our fair value specialists, we evaluated the reasonableness of the discount rate by:
  - Testing the source information underlying the determination of the discount rate and the mathematical accuracy of the calculation.
  - Developing a range of independent estimates and comparing those to the discount rate selected by management.

/s/ Deloitte & Touche LLP

Dallas, Texas
March 11, 2022

We have served as the Company's auditor since 2005.

RIBBON COMMUNICATIONS INC.
Consolidated Balance Sheets
(in thousands, except share and per share data)

	December 31, 2021	December 31, 2020
Assets		
Current assets:		
Cash and cash equivalents	$ 103,915	$ 128,428
Restricted cash	2,570	7,269
Accounts receivable, net	282,917	237,738
Inventory	54,043	45,750
Other current assets	37,545	28,461
Total current assets	480,990	447,646
Property and equipment, net	47,685	48,888
Intangible assets, net	350,730	417,356
Goodwill	300,892	416,892
Investments	43,931	115,183
Deferred income taxes	47,287	10,651
Operating lease right-of-use assets	53,147	69,757
Other assets	23,075	20,892
	$ 1,347,737	$ 1,547,265
Liabilities and Stockholders' Equity		
Current liabilities:		
Current portion of term debt	$ 20,058	$ 15,531
Accounts payable	97,121	63,387
Accrued expenses and other	100,752	134,865
Operating lease liabilities	17,403	17,023
Deferred revenue	109,119	96,824
Total current liabilities	344,453	327,630
Long-term debt, net of current	350,217	369,035
Operating lease liabilities, net of current	55,196	72,614
Deferred revenue, net of current	20,619	26,010
Deferred income taxes	8,116	16,842
Other long-term liabilities	41,970	48,281
Total liabilities	820,571	860,412
Commitments and contingencies (Note 26)		
Stockholders' equity:		
Preferred stock, $0.01 par value; 10,000,000 shares authorized; none issued and outstanding	—	—
Common stock, 240,000,000 shares authorized, $0.0001 par value, 148,895,308 shares issued and outstanding at December 31, 2021; 145,425,248 shares issued and outstanding at December 31, 2020	15	15
Additional paid-in capital	1,875,234	1,870,256
Accumulated deficit	(1,355,661)	(1,178,476)
Accumulated other comprehensive income (loss)	7,578	(4,942)
Total stockholders' equity	527,166	686,853
	$ 1,347,737	$ 1,547,265

See notes to the consolidated financial statements.

RIBBON COMMUNICATIONS INC.
Consolidated Statements of Operations
(in thousands, except per share data)

	Year ended December 31, 2021	2020	2019
Revenue:			
Product	$ 453,042	$ 467,912	$ 262,030
Service	391,915	375,883	301,081
Total revenue	844,957	843,795	563,111
Cost of revenue:			
Product	214,745	204,772	95,774
Service	147,209	145,916	112,680
Amortization of acquired technology	38,343	42,290	37,573
Total cost of revenue	400,297	392,978	246,027
Gross profit	444,660	450,817	317,084
Operating expenses:			
Research and development	194,948	194,525	141,060
Sales and marketing	150,279	139,318	106,310
General and administrative	53,661	63,286	53,870
Amortization of acquired intangible assets	28,283	18,620	11,652
Impairment of goodwill	116,000	—	164,300
Acquisition-, disposal- and integration-related	7,632	17,164	12,953
Restructuring and related	11,653	16,235	16,399
Total operating expenses	562,456	449,148	506,544
(Loss) income from operations	(117,796)	1,669	(189,460)
Interest expense, net	(15,831)	(21,042)	(3,877)
Other (expense) income, net	(74,516)	112,690	70,444
(Loss) income before income taxes	(208,143)	93,317	(122,893)
Income tax benefit (provision)	30,958	(4,726)	(7,182)
Net (loss) income	$ (177,185)	$ 88,591	$ (130,075)
(Loss) earnings per share:			
Basic	$ (1.20)	$ 0.64	$ (1.19)
Diluted	$ (1.20)	$ 0.61	$ (1.19)
Shares used to compute (loss) earnings per share:			
Basic	147,575	138,967	109,734
Diluted	147,575	144,650	109,734

See notes to the consolidated financial statements.

RIBBON COMMUNICATIONS INC.
Consolidated Statements of Comprehensive (Loss) Income
(in thousands)

	Year ended December 31,		
	2021	2020	2019
Net (loss) income	$ (177,185)	$ 88,591	$ (130,075)
Other comprehensive income (loss), net of tax:			
Unrealized gain (loss) on interest rate swap, net of reclassifications	12,759	(10,948)	—
Foreign currency translation adjustments	(239)	894	194
Unrealized gain on available-for-sale marketable securities, net of reclassification adjustments for realized amounts	—	—	590
Employee retirement benefits	—	2,585	(1,960)
Other comprehensive income (loss), net of tax	12,520	(7,469)	(1,176)
Comprehensive (loss) income, net of tax	$ (164,665)	$ 81,122	$ (131,251)

See notes to the consolidated financial statements.

RIBBON COMMUNICATIONS INC.
Consolidated Statements of Stockholders' Equity
(in thousands, except share data)

	Common stock					
	Shares	Amount	Additional paid-in capital	Accumulated deficit	Accumulated other comprehensive income (loss)	Total stockholders' equity
Balances, January 1, 2019	**106,815,636**	**$ 11**	**$ 1,723,576**	**$ (1,136,992)**	**$ 3,703**	**$ 590,298**
Issuance of common stock in connection with employee stock purchase plan	282,646		863			863
Exercise of stock options	127,334		235			235
Vesting of restricted stock awards and units	1,504,707					—
Vesting of performance-based stock awards and units	9,466					—
Shares of restricted stock returned to the Company under net share settlements to satisfy tax withholding obligations	(240,673)		(1,193)			(1,193)
Shares issued as consideration in connection with the acquisition of Anova Data, Inc.	2,948,793		15,186			15,186
Repurchase and retirement of common stock	(975,914)		(4,536)			(4,536)
Stock-based compensation expense			12,601			12,601
Reclassification of liability to equity for bonuses converted to stock awards			1,052			1,052
Other comprehensive loss					(1,176)	(1,176)
Net loss				(130,075)		(130,075)
Balances, December 31, 2019	**110,471,995**	**11**	**1,747,784**	**(1,267,067)**	**2,527**	**483,255**
Exercise of stock options	38,288		70			70
Vesting of restricted stock awards and units	2,246,690	1				1
Vesting of performance-based stock units	323,752					—
Shares of restricted stock returned to the Company under net share settlements to satisfy tax withholding obligations	(472,028)		(1,674)			(1,674)
Shares issued as consideration in connection with the acquisition of ECI Telecom Group Ltd.	32,500,000	$ 3	108,547			108,550
Shares issued as consideration in connection with acquisition of Anova Data, Inc.	316,551		1,630			1,630
Stock-based compensation expense			13,899			13,899
Other comprehensive loss					(7,469)	(7,469)
Net income				88,591		88,591
Balances, December 31, 2020	**145,425,248**	**15**	**1,870,256**	**(1,178,476)**	**(4,942)**	**686,853**
Exercise of stock options	13,815		24			24
Vesting of restricted stock awards and units	3,653,552					—
Vesting of performance-based stock units	1,557,656					—
Shares of restricted stock returned to the Company under net share settlements to satisfy tax withholding obligations	(1,754,963)		(14,464)			(14,464)
Stock-based compensation expense			19,418			19,418
Other comprehensive income					12,520	12,520
Net loss				(177,185)		(177,185)
Balances, December 31, 2021	**148,895,308**	**$ 15**	**$ 1,875,234**	**$ (1,355,661)**	**$ 7,578**	**$ 527,166**

See notes to the consolidated financial statements.

RIBBON COMMUNICATIONS INC.
Consolidated Statements of Cash Flows
(in thousands)

	Year ended December 31,		
	2021	2020	2019
Cash flows from operating activities:			
Net (loss) income	$ (177,185)	$ 88,591	$ (130,075)
Adjustments to reconcile net (loss) income to cash flows provided by operating activities:			
Depreciation and amortization of property and equipment	16,962	17,188	11,949
Amortization of intangible assets	66,626	60,910	49,225
Amortization of debt issuance costs	4,763	5,673	360
Stock-based compensation	19,418	13,899	12,601
Impairment of goodwill	116,000	—	164,300
Deferred income taxes	(45,596)	(4,616)	5,299
Gain on sale of business	(2,772)	(83,552)	—
Decrease (increase) in fair value of investments	71,252	(30,296)	—
Reduction to deferred purchase consideration	—	(70)	(8,124)
Foreign currency exchange losses	5,002	2,961	1,090
Changes in operating assets and liabilities:			
Accounts receivable	(47,279)	9,578	(3,936)
Inventory	(9,029)	11,842	7,776
Other operating assets	9,958	44,343	(17,849)
Accounts payable	34,482	(49,561)	(16,282)
Accrued expenses and other long-term liabilities	(50,324)	20,629	(18,538)
Deferred revenue	6,904	(5,955)	(2,111)
Net cash provided by operating activities	19,182	101,564	55,685
Cash flows from investing activities:			
Purchases of property and equipment	(17,132)	(26,721)	(10,824)
Business acquisitions, net of cash acquired	—	(346,852)	—
Proceeds from sale of business	2,944	—	—
Sales/maturities of marketable securities	—	—	7,295
Proceeds from the sale of fixed assets	—	43,500	—
Net cash used in investing activities	(14,188)	(330,073)	(3,529)
Cash flows from financing activities:			
Borrowings under revolving line of credit	—	615	117,000
Principal payments on revolving line of credit	—	(8,615)	(164,000)
Proceeds from issuance of long-term debt	74,625	478,500	50,000
Principal payment of debt, related party	—	—	(24,716)
Principal payments of term debt	(92,176)	(134,188)	(1,250)
Payment of deferred purchase consideration	—	—	(21,876)
Principal payments of finance leases	(903)	(1,258)	(913)
Payment of debt issuance costs	(789)	(14,147)	(891)
Proceeds from the sale of common stock in connection with employee stock purchase plan	—	—	863
Proceeds from the exercise of stock options	24	70	235

RIBBON COMMUNICATIONS INC.
Consolidated Statements of Cash Flows (continued)
(in thousands)

	Year ended December 31,		
	2021	2020	2019
Payment of tax withholding obligations related to net share settlements of restricted stock awards	(14,464)	(1,674)	(1,193)
Repurchase of common stock	—	—	(4,536)
Net cash (used in) provided by financing activities	(33,683)	319,303	(51,277)
Effect of exchange rate changes on cash and cash equivalents	(523)	260	70
Net (decrease) increase in cash and cash equivalents	(29,212)	91,054	949
Cash, cash equivalents and restricted cash, beginning of year	135,697	44,643	43,694
Cash, cash equivalents and restricted cash, end of year	$ 106,485	$ 135,697	$ 44,643
Supplemental disclosure of cash flow information:			
Interest paid	$ 14,867	$ 15,546	$ 4,072
Income taxes paid	$ 14,447	$ 9,293	$ 4,665
Income tax refunds received	$ 1,488	$ 1,163	$ 1,757
Supplemental disclosure of non-cash investing activities:			
Capital expenditures incurred, but not yet paid	$ 2,269	$ 3,749	$ 2,566
Property and equipment acquired under finance leases	$ —	$ —	$ 1,442
Business acquisition purchase consideration - common stock issued	$ —	$ 108,550	$ 15,186
Business acquisition purchase consideration - deferred payments	$ —	$ 1,630	$ 1,700
Supplemental disclosure of non-cash financing activities:			
Total fair value of restricted stock awards, restricted stock units, performance-based stock awards and performance-based stock units on date vested	$ 40,751	$ 7,927	$ 7,422

See notes to the consolidated financial statements.

(1) NATURE OF THE BUSINESS

Ribbon Communications Inc. ("Ribbon" or the "Company") is a leading global provider of communications technology to service providers and enterprises. The Company provides a broad range of software and high-performance hardware products, network solutions, and services that enable the secure delivery of data and voice communications, and high-bandwidth networking and connectivity for residential consumers and for small, medium, and large enterprises and industry verticals such as finance, education, government, utilities, and transportation. Ribbon's mission is to create a recognized global technology leader providing cloud-centric solutions that enable the secure exchange of information, with unparalleled scale, performance, and elasticity. The Company is headquartered in Plano, Texas, and has a global presence with research and development, or sales and support locations in over thirty-five countries around the world.

(2) BASIS OF PRESENTATION AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

Basis of Presentation

The consolidated financial statements have been prepared in United States dollars, in accordance with accounting principles generally accepted in the United States ("GAAP").

On December 1, 2020 (the "Kandy Sale Date"), American Virtual Cloud Technologies, Inc. ("AVCT") completed the purchase of the Company's cloud-based enterprise service business (the "Kandy Communications Business"). The revenue and expenses of the Kandy Communications Business are excluded from the Company's consolidated financial statements for the period subsequent to the Kandy Sale Date.

On March 3, 2020 (the "ECI Acquisition Date"), the Company merged with ECI Telecom Group Ltd ("ECI") (the "ECI Acquisition"). The financial results of ECI are included in the Company's consolidated financial statements for the period subsequent to the ECI Acquisition Date.

On February 28, 2019 (the "Anova Acquisition Date"), the Company acquired the business and technology assets of Anova Data, Inc. ("Anova"). The financial results of Anova are included in the Company's consolidated financial statements for the period subsequent to the Anova Acquisition Date.

Significant Accounting Policies

Principles of Consolidation

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

Use of Estimates and Judgments

The preparation of financial statements in conformity with GAAP requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting periods. Significant estimates and judgments relied upon in preparing these consolidated financial statements include accounting for business combinations, revenue recognition for multiple element arrangements, inventory valuations, assumptions used to determine the fair value of stock-based compensation, intangible assets, goodwill, debentures and warrants, legal contingencies and recoverability of Ribbon's net deferred tax assets and the related valuation allowances. Ribbon regularly assesses these estimates and records changes in estimates in the period in which they become known. Ribbon bases its estimates on historical experience and various other assumptions that it believes to be reasonable under the circumstances. Actual results could differ from those estimates.

RIBBON COMMUNICATIONS INC.
Notes to Consolidated Financial Statements (Continued)

Reclassifications

In the fourth quarter of 2021, the Company reclassified amounts recorded for amortization of certain acquired intangible assets in prior presentations from Total operating expenses under the caption "Amortization of acquired intangible assets" to Cost of revenue under the caption "Amortization of acquired technology" in the consolidated statements of operations. The Company's management believes this presentation aids in the comparability of its financial statements to industry peers. These reclassifications did not impact operating income (loss), net income (loss) or earnings (loss) per share for any historical periods. These reclassifications also did not impact the consolidated balance sheets or statements of cash flows for any historical periods. The Company reports depreciation of property and equipment related to production activities as components of cost of revenue. These reclassifications for the years ended December 31, 2020 and 2019 were as follows (in thousands):

	Year ended December 31, 2020			Year ended December 31, 2019		
	Prior presentation	Amounts reclassified	Revised presentation	Prior presentation	Amounts reclassified	Revised presentation
Product revenue	$ 467,912		$ 467,912	$ 262,030		$ 262,030
Service revenue	375,883		375,883	301,081		301,081
Total revenue	843,795	—	843,795	563,111	—	563,111
Cost of revenue - product	204,772		204,772	95,774		95,774
Cost of revenue - service	145,916		145,916	112,680		112,680
Amortization of acquired technology	—	42,290	42,290	—	37,573	37,573
Total cost of revenue	350,688	42,290	392,978	208,454	37,573	246,027
Gross profit	493,107	(42,290)	450,817	354,657	(37,573)	317,084
Research and development	194,525		194,525	141,060		141,060
Sales and marketing	139,318		139,318	106,310		106,310
General and administrative	63,286		63,286	53,870		53,870
Amortization of acquired intangible assets	60,910	(42,290)	18,620	49,225	(37,573)	11,652
Impairment of goodwill	—		—	164,300		164,300
Acquisition-, disposal- and integration-related	17,164		17,164	12,953		12,953
Restructuring and related	16,235		16,235	16,399		16,399
Total operating expenses	491,438	(42,290)	449,148	544,117	(37,573)	506,544
Operating income (loss)	$ 1,669	$ —	$ 1,669	$ (189,460)	$ —	$ (189,460)

In addition, certain other reclassifications, not affecting previously reported net income (loss), have been made to the previously issued financial statements to conform to the current year presentation.

Business Combinations

The Company recognizes identifiable assets acquired and liabilities assumed at their acquisition date fair values. Goodwill as of the acquisition date is measured as the excess of consideration transferred over the net of the acquisition date fair values of the assets acquired and the liabilities assumed and represents the expected future economic benefits arising from other assets acquired in the business combination that are not individually identified and separately recognized. While the Company uses its best estimates and assumptions as part of the purchase price allocation process to accurately value assets acquired and liabilities assumed at the acquisition date, its estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, the Company records adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill to the extent that it identifies adjustments to the preliminary purchase price allocation. Upon the conclusion of the measurement period or final determination of the values of assets acquired and liabilities assumed, whichever comes first, any subsequent adjustments are recorded to the consolidated statements of operations.

Revenue Recognition

The Company derives revenue from two primary sources: products and services. Product revenue includes the Company's hardware and software that function together to deliver the products' essential functionality. Software and hardware are also sold on a standalone basis. Services include customer support (software updates, upgrades and technical support), consulting, design services, installation services and training. Generally, contracts with customers contain multiple performance obligations, consisting of products and services. For these contracts, the Company accounts for individual performance obligations separately if they are considered distinct.

When an arrangement contains more than one performance obligation, the Company will allocate the transaction price to each performance obligation on a relative standalone selling price basis. The Company utilizes the observable price of goods and services when they are sold separately to similar customers in order to estimate standalone selling price.

The Company's software licenses typically provide a perpetual right to use the Company's software. The Company also sells term-based software licenses that expire and Software-as-a-Service ("SaaS")-based software which are referred to as subscription arrangements. The Company does not customize its software nor are installation services required, as the customer has a right to utilize internal resources or a third-party service company. The software and hardware are delivered before related services are provided and are functional without professional services or customer support. The Company has concluded that its software licenses are functional intellectual property that are distinct, as the user can benefit from the software on its own. Product revenue is typically recognized upon transfer of control or when the software is made available for download, as this is the point the user of the software can direct the use of, and obtain substantially all of the remaining benefits from, the functional intellectual property. The Company begins to recognize software revenue related to the renewal of subscription software licenses at the start of the subscription period.

The Company offers warranties on its products. Certain of the Company's warranties are considered to be assurance-type in nature, ensuring the product is functioning as intended. Assurance-type warranties do not represent separate performance obligations. The Company also sells separately-priced maintenance service contracts which qualify as service-type warranties and represent separate performance obligations. The Company does not allow and has no history of accepting product returns.

Services revenue includes revenue from customer support and other professional services. Customer support includes software updates on a when-and-if-available basis, telephone support, integrated web-based support and bug fixes or patches. The Company sells its customer support contracts at a percentage of list or net product price. Customer support revenue is recognized ratably over the term of the customer support agreement, which is typically one year.

The Company's professional services include consulting, technical support, resident engineer services, design services and installation services. Because control transfers over time, revenue is recognized based on progress toward completion of the performance obligation. The method to measure progress toward completion requires judgment and is based on the nature of the products or services to be provided. The Company generally uses the input method to measure progress for its contracts because it believes such method best depicts the transfer of assets to the customer, which occurs as the Company incurs costs for the contracts. However, in some instances, the Company uses the output method because it best depicts the transfer of asset to the customer. Under the cost-to-cost measure of progress, the progress toward completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. When the measure of progress is based upon expended labor, progress toward completion is measured as the ratio of labor time expended to date versus the total estimated labor time required to complete the performance obligation. Revenue is recorded proportionally as costs are incurred or as labor is expended. Costs to fulfill these obligations include internal labor as well as subcontractor costs.

Customer training includes courses offered by the Company. The related revenue is typically recognized as the training services are performed.

Operating Segments

The Company's chief operating decision maker (the "CODM") is its president and chief executive officer. Effective in the fourth quarter of 2020 and in connection with the ECI Acquisition, the CODM began to assess the Company's performance based on the performance of two separate organizations within Ribbon: the Cloud and Edge segment ("Cloud and Edge") and the IP Optical Networks segment ("IP Optical Networks"). Financial information for the IP Optical Networks segment is not presented for any years prior to 2020, as this segment arose from the ECI Acquisition, and accordingly is not included in the Company's consolidated financial statements for the year ended December 31, 2019.

Financial Instruments

The carrying amounts of Ribbon's financial instruments approximate their fair values and include accounts receivable, equity securities and convertible warrants received as sale consideration, borrowings under a revolving credit facility, accounts payable and term debt.

Financial instruments with remaining maturities or that are due within one year from the balance sheet date are classified as current. Financial instruments with maturities or that are payable more than one year from the balance sheet date are classified as noncurrent.

Fair Value Option - Investment in AVCT

The Company received debentures and warrants as sale consideration in connection with the sale of the Kandy Communications Business. On September 8, 2021 (the "Debenture Conversion Date"), the debentures were converted into 13,700,421 shares of AVCT common stock (the "Debenture Shares") (see Note 4 for a discussion of the valuation of the debentures, warrants and Debenture Shares). In connection with the conversion of the debentures to the Debenture Shares, the Company elected to use the fair value option to account for its equity investment in AVCT as permitted under Accounting Standards Codification ("ASC") 825, *Financial Instruments* ("ASC 825"), which then refers to ASC 820, *Fair Value Measurement* ("ASC 820") to provide the fair value framework for valuing such investments. In accordance with ASC 820, the Company is recording the investment in AVCT at fair value, with changes in fair value recorded as a component of Other (expense) income, net, in the consolidated statements of operations.

Restricted Cash

The Company classifies as restricted cash all cash pledged as collateral to secure long-term obligations and all cash whose use is otherwise limited by contractual provisions. At December 31, 2021, the Company had $2.6 million of restricted cash, representing restricted short-term bank deposits pledged to secure certain performance and financial bonds as security for the Company's obligations under tenders, contracts and to one of its main subcontractors.

At December 31, 2020, the Company had $7.3 million of restricted cash, comprised of $4.6 million restricted in connection with a tax payment on certain fixed assets formerly held by ECI that were sold in connection with the ECI Acquisition, and $2.7 million of restricted short-term bank deposits pledged to secure certain performance and financial bonds as security for the Company's obligations under tenders, contracts and to one of its main subcontractors.

Transfers of Financial Assets

The Company's IP Optical Networks segment maintains customer receivables factoring agreements with a number of financial institutions. Under the terms of these agreements, the Company may transfer receivables to the financial institutions, on a non-recourse basis, provided that the financial institutions approve the receivables in advance. The Company maintains credit insurance policies from major insurance providers or obtains letters of credit from the customers for a majority of its factored trade receivables. The Company accounts for the factoring of its financial assets as a sale of the assets and records the factoring fees, when incurred, as a component of interest expense in the consolidated statements of operations, and the proceeds from the sales of receivables are included in cash from operating activities in the consolidated statements of cash flows.

During the year ended December 31, 2021, the Company received $118.5 million of cash from the sale of certain accounts receivable and recorded $0.8 million of interest expense in connection with these transactions. During the year ended December 31, 2020, the Company received $119.8 million of cash from the sale of certain accounts receivable and recorded $0.9 million of interest expense in connection with these transactions.

Foreign Currency Translation

For foreign subsidiaries where the functional currency is the local currency, assets and liabilities are translated into U.S.

dollars at the current exchange rate on the balance sheet date. Revenue and expenses are translated at average rates of exchange prevailing during each period. Translation adjustments for these subsidiaries are included in Accumulated other comprehensive income.

For foreign subsidiaries where the functional currency is the U.S. dollar, monetary assets and liabilities are translated into U.S. dollars at the current exchange rate on the balance sheet date. Nonmonetary assets and liabilities are remeasured into U.S. dollars at historical exchange rates. Revenue and expense items are translated at average rates of exchange prevailing during each period. Translation adjustments for these subsidiaries are included in Other expense (income), net.

Realized and unrealized foreign currency exchange gains and losses arising from transactions denominated in currencies other than the subsidiary's functional currency are reflected in earnings.

The Company records its foreign currency gains (losses) as a component of Other (expense) income, net. The Company recognized net foreign currency losses of $5.0 million, $3.0 million and $1.1 million for the years ended December 31, 2021, 2020 and 2019, respectively.

Inventory

Inventory is recorded at the lower of cost or market value using the first-in, first-out convention. The Company reduces the carrying value of inventory for those items that are potentially excess, obsolete or slow-moving based on changes in customer demand, technology developments or other economic factors.

Ribbon writes down evaluation equipment (equipment at customer sites for testing and evaluation) at the time of shipment to its customers, as it is probable that the inventory value will not be realized.

Deferred product costs represent deferred cost of revenue for product shipments to customers prior to satisfaction of Ribbon's revenue recognition criteria. The Company classifies inventory that is not expected to be consumed within one year from the balance sheet date as noncurrent and includes such inventory as a component of Other assets.

Property and Equipment

Property and equipment are stated at cost, net of accumulated depreciation. Expenditures for maintenance and repairs are charged to expense as incurred. Depreciation is computed using the straight-line method over the estimated useful lives of the related assets, which range from two to five years. Leasehold improvements are amortized over the lesser of the lease term or five years. When an asset is sold or retired, the cost and related accumulated depreciation or amortization are eliminated, and the resulting gain or loss, if any, is recognized in (Loss) income from operations in the consolidated statement of operations. The Company reviews property and equipment for impairment in the same manner as intangible assets discussed below.

Software development costs associated with internal use software are incurred in three stages of development: the preliminary project stage, the application development stage and the post-implementation stage. Costs incurred during the preliminary project and post-implementation stages are expensed as incurred. Certain qualifying costs incurred during the application development stage are capitalized as property and equipment. Internal use software is amortized on a straight-line basis over its estimated useful life of three years, beginning when the software is ready for its intended use.

Intangible Assets and Goodwill

The Company's intangible assets are comprised of in-process research and development, developed technology, customer relationships, trade names, and internal use software. Intangible assets are reviewed for impairment when events or changes in circumstances indicate that their carrying amounts may not be recoverable based upon the estimated undiscounted cash flows. Recoverability of intangible assets with estimated lives and other long-lived assets is measured by a comparison of the carrying amount of an asset or asset group to future net undiscounted cash flows expected to be generated by the asset or asset group. If these comparisons indicate that an asset is not recoverable, the Company will recognize an impairment loss for the amount by which the carrying value of the asset or asset group exceeds the related estimated fair value. Estimated fair value is based on either discounted future operating cash flows or appraised values, depending on the nature of the asset. The Company amortizes its intangible assets over their respective useful lives, with the exception of in-process research and development, which has an indefinite life until the product is generally available, at which time such asset is typically reclassified to developed technology, and the Company begins to amortize this asset. See Note 10 for additional information regarding the Company's intangible assets.

Goodwill is recorded when the consideration for an acquisition exceeds the fair value of net tangible and identifiable intangible assets acquired. Goodwill is not amortized, but instead is tested for impairment at least annually, or more frequently if indicators of potential impairment exist, by comparing the fair value of the Company's reporting unit to its carrying value.

Prior to 2020, the Company's annual test for impairment of goodwill was completed as of November 30. Effective in 2020, the Company changed its annual goodwill impairment test date from November 30 to October 1. This change did not have a material impact on the Company's consolidated financial statements.

As described above, effective in the fourth quarter of 2020, the Company determined that it has two operating segments: Cloud and Edge, and IP Optical Networks. For the purpose of testing goodwill for impairment, all goodwill is assigned to a reporting unit, which may be either an operating segment or a portion of an operating segment. The Company's reporting units are its operating segments. The Company performs a fair value analysis using both an income and market approach, which encompasses a discounted cash flow analysis and a guideline public company analysis using selected multiples. The Company assesses each valuation methodology based upon the relevance and availability of the data at the time the valuation is performed and the methodologies are weighted appropriately. Any impairment charges are reported separately in the Company's consolidated statements of operations.

Stock-Based Compensation

The Company's stock-based compensation cost is measured at the grant date based on the fair value of the award and is recognized as expense over the requisite service period, which generally represents the vesting period, and includes an estimate of the awards that will be forfeited.

The Company uses the Black-Scholes valuation model for estimating the fair value on the date of grant of stock options. The fair value of stock option awards is affected by the Company's stock price as well as valuation assumptions, including the volatility of Ribbon's stock price, expected term of the option, risk-free interest rate and expected dividends.

The Company may grant to certain of its executives performance-based stock units ("PSUs") that include a market condition. The Company uses a Monte Carlo simulation approach to model future stock price movements based upon the risk-free rate of return, the volatility of each entity and the pair-wise covariance between each entity. These results are then used to calculate the grant date fair values of the PSUs.

Concentration of Risk

The financial instruments that potentially subject Ribbon to concentrations of credit risk are cash, restricted cash and accounts receivable. The Company's cash equivalents and investments were managed by one financial institution at December 31, 2021. Historically, the Company has not experienced significant losses due to such bank depository concentration. The Company's investments at December 31, 2021 and 2020 consisted of securities of AVCT (see Note 4).

Certain components and software licenses from third parties used in Ribbon's products are procured from single sources of supply. The failure of a supplier, including a subcontractor, to deliver on schedule could delay or interrupt Ribbon's delivery of products and thereby materially adversely affect Ribbon's revenue and operating results.

Advertising Costs

Advertising costs are expensed as incurred and included as a component of Sales and marketing expense in the Company's consolidated statements of operations. Advertising expenses were $1.6 million for the year ended December 31, 2021, $0.8 million for the year ended December 31, 2020 and $0.5 million for the year ended December 31, 2019.

Loss Contingencies and Reserves

Ribbon is subject to ongoing business risks arising in the ordinary course of business, including legal claims, that affect the estimation process of the carrying value of assets, the recording of liabilities and the possibility of various loss contingencies. An estimated loss contingency is accrued when it is probable that a liability has been incurred or an asset has been impaired and the amount of loss can be reasonably estimated. Ribbon regularly evaluates current information available to determine whether such amounts should be adjusted and records changes in estimates in the period they become known.

An allowance for doubtful accounts is estimated based on the Company's assessment of the collectability of specific customer accounts.

Ribbon accrues for royalties for technology that it licenses from vendors based on established royalty rates and usage. Ribbon is periodically contacted by third parties who claim that Ribbon's products infringe on certain intellectual property of a third party. Ribbon evaluates these claims and accrues amounts when it is probable that the obligation has been incurred and the amounts are reasonably estimable.

Warranty

The Company records warranty liabilities for estimated costs of fulfilling its obligations under standard limited hardware and software warranties at the time of sale. The specific warranty terms and conditions vary depending upon the country in which the Company does business, but generally includes material costs, technical support, labor and associated overhead over a period ranging from one to three years. The Company assumed ECI's warranty liability in connection with the ECI Acquisition. At December 31, 2021, the Company's liability for product warranties was $13.1 million, of which $5.9 million was current and included in Accrued expenses and other and $7.2 million was long-term and included in Other long-term liabilities in the Company's consolidated balance sheet. At December 31, 2020, the Company's liability for product warranties was $14.9 million, of which $6.5 million was current and included in Accrued expenses and other, and $8.4 million was long-term and included in Other long-term liabilities in the Company's consolidated balance sheet.

Research and Development Grants

The Company records grants received from the Office of the Innovation Authority of the Israeli Ministry of Economics (the "IIA") as a reduction to Research and development expense. Royalties payable to the IIA are recognized pursuant to sales of related products and are included in Cost of revenue - product (see Note 26).

Accounting for Leases

The Company accounts for its leases in accordance with Accounting Standards Codification ("ASC") 842, *Leases* ("ASC 842") (see Note 21). The Company has operating and finance leases for corporate offices, research and development facilities, and certain equipment. Operating leases are reported separately in the Company's consolidated balance sheets at December 31, 2021 and 2020. Assets acquired under finance leases are included in Property and equipment, net, in the consolidated balance sheets at December 31, 2021 and 2020.

The Company determines if an arrangement is a lease at inception. A contract is determined to contain a lease component if the arrangement provides the Company with a right to control the use of an identified asset. Lease agreements may include lease and non-lease components. In such instances for all classes of underlying assets, the Company does not separate lease and non-lease components but rather, accounts for the entire arrangement under leasing guidance. Leases with an initial term of 12 months or less are not recorded on the balance sheet and lease expense for these leases is recognized on a straight-line basis over the lease term.

For operating leases, lease expense for minimum fixed lease payments is recognized on a straight-line basis over the lease term. The expense for finance leases includes both interest and amortization expense components, with the interest component calculated based on the effective interest method and the amortization component calculated based on straight-line amortization of the right-of-use asset over the lease term. Lease contracts may contain variable lease costs, such as common area maintenance, utilities and tax reimbursements that vary over the term of the contract. Variable lease costs are not included in minimum fixed lease payments and as a result, are excluded from the measurement of the right-of-use assets and lease liabilities. The Company expenses all variable lease costs as incurred.

Accounting for Income Taxes

Deferred tax assets and liabilities are recognized for the expected future consequences of events that have been reflected in the consolidated financial statements. Deferred tax assets and liabilities are determined based on the differences between the financial reporting and tax basis of assets and liabilities and operating loss carryforwards, using tax rates expected to be in effect for the years in which the differences are expected to reverse. The Company records valuation allowances to reduce deferred income tax assets to the amount that is more likely than not to be realized.

The Company has provided for income taxes on the undistributed earnings of its non-U.S. subsidiaries as of December 31, 2021, excluding Ireland and Israel. These subsidiaries, excluding Ireland and Israel, are cost-plus or limited risk distributors that are not anticipated to need to use excess funds locally. Accordingly, the Company is required to recognize and record deferred taxes in 2021. The deferred taxes are recorded on the entire outside basis differences related to the foreign subsidiaries, the largest of these differences being undistributed earnings.

The Company determines whether it is more likely than not that a tax position will be sustained upon examination. If it is not more likely than not that a position will be sustained, no amount of the benefit attributable to the position is recognized. The tax benefit to be recognized of any tax position that meets the more likely than not recognition threshold is calculated as the largest amount that is more than 50% likely of being realized upon resolution of the contingency. The Company accounts for interest and penalties related to uncertain tax positions as part of its provision for income taxes.

Defined Benefit Plans

The Company has defined benefit plans for some of its employees at various international locations. The Company recognizes retirement benefit assets or liabilities in the consolidated balance sheets reflecting the funded status of pension and other retirement benefit plans. Retirement benefit assets and liabilities are adjusted for the difference between the benefit obligations and the plan assets at fair value (measured at year-end), with the offset recorded directly to stockholders' equity through accumulated other comprehensive income (loss), net of tax. The amount recorded in stockholders' equity represents the after-tax unamortized actuarial gains or losses, unamortized transition obligations and unamortized prior service costs.

Recent Accounting Pronouncements

In December 2019, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2019-12, *Income Taxes (Topic 740): Simplifying the Accounting for Income Taxes* ("ASU 2019-12"), which modifies Accounting Standards Codification ("ASC") 740, *Income Taxes (Topic 740)*, to simplify the accounting for income taxes. ASU 2019-12 addresses the accounting for hybrid tax regimes, tax basis step-up in goodwill obtained in a transaction that is not a business combination, separate financial statements of legal entities not subject to tax, intraperiod tax allocation exception to incremental approach, ownership changes in investments - changes from a subsidiary to an equity method investment, ownership changes in investments - changes from an equity method investment to a subsidiary, interim period accounting for enacted changes in tax law and year-to-date loss limitation in interim period tax accounting. The adoption of ASU 2019-12 did not have a material impact on the Company's consolidated financial statements upon adoption.

In October 2021, the FASB issued ASU 2021-08, *Business Combinations (Topic 805): Accounting for Contract Assets and Contract Liabilities from Contracts with Customers* ("ASU 2021-08"), which amends ASC 805, *Business Combinations (Topic 805)*, to add contract assets and contract liabilities to the list of exceptions to the recognition and measurement principles that apply to business combinations and to require that an acquiring entity recognize and measure contract assets and contract liabilities acquired in a business combination in accordance with ASC 606, *Revenue from Contracts with Customers (Topic 606)* ("ASC 606"). Under current GAAP, an acquirer generally recognizes such items at fair value on the acquisition date. While primarily related to contract assets and contract liabilities that were accounted for by the acquiree in accordance with ASC 606, ASU 2021-08 also applies to contract assets and contract liabilities from other contracts to which the provisions of ASC 606 apply, such as contract liabilities from the sale of nonfinancial assets within the scope of ASU 2017-05, *Other Income - Gains and Losses from the Derecognition of Nonfinancial Assets (Subtopic 610-20)*. ASU 2021-08 is effective for the Company January 1, 2023, with early adoption permitted. The Company believes that the adoption of ASU 2021-08 could have a material impact on its consolidated financial statements for periods including and subsequent to significant business acquisitions.

In January 2021 the FASB issued ASU 2021-01, *Reference Rate Reform (Topic 848): Scope* ("ASU 2021-01"), which refines the scope of ASC 848, *Reference Rate Reform*, and clarifies some of its guidance as part of the FASB's monitoring of global reference rate reform activities. ASU 2021-01 permits entities to elect certain optional expedients and exceptions when accounting for derivative contracts and certain hedging relationships affected by changes in the interest rates used for discounting cash flows, for computing variation margin settlements, and for calculating price alignment interest in connection with reference rate reform activities under way in global financial markets (the "discounting transition"). ASU 2021-01 is effective for the Company prospectively in any period through December 31, 2022 that a modification is made to the terms of the derivatives affected by the discounting transition. The Company does not believe the adoption of ASU 2021-01 will have a material impact on its consolidated financial statements.

(3) BUSINESS ACQUISITIONS

ECI

On the ECI Acquisition Date, Ribbon completed its merger transaction with ECI in accordance with the terms of the Agreement and Plan of Merger, dated as of November 14, 2019, by and among Ribbon, ECI, an indirect wholly-owned subsidiary of Ribbon ("Merger Sub"), Ribbon Communications Israel Ltd. and ECI Holding (Hungary) Kft pursuant to which Merger Sub merged with and into ECI, with ECI surviving such merger as a wholly-owned subsidiary of Ribbon. Prior to the ECI Acquisition Date, ECI was a privately-held global provider of end-to-end packet optical transport and software-defined networking ("SDN") and network function virtualization ("NFV") solutions for service providers, enterprises and data center operators.

As consideration for ECI, Ribbon issued the ECI shareholders and certain others 32.5 million shares of Ribbon common stock with a fair value of $108.6 million (the "Stock Consideration") and paid $322.5 million of cash (the "Cash Consideration"), comprised of $183.3 million to repay ECI's outstanding debt, including both principal and interest, and $139.2 million paid to ECI's selling shareholders. In addition, ECI shareholders received $33.4 million from the sale of certain of ECI's real estate assets. Cash Consideration was financed through cash on hand and committed debt financing consisting of a new $400 million term loan facility and $100 million revolving credit facility, which was undrawn at the ECI Acquisition Date.

The ECI Acquisition has been accounted for as a business combination and the financial results of ECI have been included in the Company's consolidated financial statements for the period subsequent to the ECI Acquisition. The Company's financial results for the year ended December 31, 2020 included $260.5 million of revenue and $52.9 million of net loss attributable to ECI.

The Company finalized the valuation of acquired assets, identifiable intangible assets and certain assumed liabilities in the fourth quarter of 2020. A summary of the allocation of the purchase consideration for ECI is as follows (in thousands):

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Fair value of consideration transferred:		
Cash consideration:		
Repayment of ECI outstanding debt obligations	$	183,266
Cash paid to selling shareholders		139,244
Payment to selling shareholders from sale of ECI real estate assets		33,400
Less cash and restricted cash acquired		(9,058)
Net cash consideration		346,852
Fair value of Ribbon stock issued		108,550
Fair value of total consideration	$	455,402

Fair value of assets acquired and liabilities assumed:		
Current assets, net of cash and restricted cash acquired	$	120,203
Property and equipment		54,913
Intangible assets:		
In-process research and development		34,000
Developed technology		111,900
Customer relationships		116,000
Trade names		3,000
Goodwill		191,996
Other noncurrent assets		37,528
Deferred revenue		(4,369)
Other current liabilities		(146,618)
Deferred revenue, net of current		(3,726)
Deferred tax liability		(13,308)
Other long-term liabilities		(46,117)
	$	455,402

The valuation of the acquired intangible assets is inherently subjective and relies on significant unobservable inputs. The Company used an income approach to value the acquired in-process research and development, developed technology, customer relationships and trade name intangible assets. The valuation for each of these intangible assets was based on estimated projections of expected cash flows to be generated by the assets, discounted to the present value at discount rates commensurate with perceived risk. The valuation assumptions take into consideration the Company's estimates of customer attrition, technology obsolescence and revenue growth projections. The Company is amortizing the identifiable intangible assets arising from the ECI Acquisition in relation to the expected cash flows from the individual intangible assets over their respective useful lives, which have a weighted average life of 12.38 years (see Note 10). Goodwill results from assets that are not separately identifiable as part of the transaction and is not deductible for tax purposes.

Pro Forma Results

The following unaudited pro forma information presents the combined results of operations of Ribbon and ECI for the years ended December 31, 2020 and 2019 as if the ECI Acquisition had been completed on January 1, 2019, with adjustments to give effect to pro forma events that are directly attributable to the ECI Acquisition. These pro forma adjustments include an increase in research and development expense related to the conformance of ECI's cost capitalization policy to Ribbon's, additional amortization expense for the acquired identifiable intangible assets, a decrease in historical ECI interest expense reflecting the extinguishment of certain of ECI's debt as a result of the ECI Acquisition, and an increase in interest expense reflecting the new debt entered into by the Company in connection with the ECI Acquisition. Pro forma adjustments also include the elimination of acquisition- and integration-related costs directly attributable to the acquisition from the year ended December 31, 2020 and inclusion of such costs in the year ended December 31, 2019.

The unaudited pro forma results do not reflect any operating efficiencies or potential cost savings that may result from the consolidation of the operations of Ribbon and ECI. Accordingly, these unaudited pro forma results are presented for illustrative purposes and are not intended to represent or be indicative of the actual results of operations of the combined company that would have been achieved had the ECI Acquisition occurred at January 1, 2019, nor are they intended to represent or be indicative of future results of operations (in thousands, except per share amounts):

	Year ended December 31,	
	2020	2019
	(unaudited)	
Revenue	$ 869,002	$ 944,915
Net income (loss)	$ 97,036	$ (250,337)
Diluted earnings (loss) per share	$ 0.65	$ (1.76)

Anova Data, Inc.

On the Anova Acquisition Date, the Company acquired the business and technology assets of Anova, a private company headquartered in Westford, Massachusetts that provides advanced analytics solutions (the "Anova Acquisition"). The Anova Acquisition was completed in accordance with the terms and conditions of an asset purchase agreement, dated as of January 31, 2019 (the "Anova Asset Purchase Agreement"). The Company acquired Anova because it believed that the Anova Acquisition would reinforce and extend Ribbon's strategy to expand into network optimization, security and data monetization via big data analytics and machine learning.

As consideration for the Anova Acquisition, Ribbon issued 2.9 million shares of Ribbon common stock with a fair value of $15.2 million to Anova's sellers and equity holders on the Anova Acquisition Date and held back an additional 0.3 million shares with a fair value of $1.7 million, of which 316,551 shares were issued after post-closing adjustments on March 4, 2020. The Anova Deferred Consideration was included as a component of Accrued expenses and other current liabilities in the Company's consolidated balance sheet at December 31, 2019.

The Anova Acquisition has been accounted for as a business combination and the financial results of Anova have been included in the Company's consolidated financial statements for the period subsequent to the Anova Acquisition Date. The results for the year ended December 31, 2019 are not significant to the Company's consolidated financial statements. The Company has not provided pro forma financial information, as the historical amounts are not significant to the Company's consolidated financial statements.

As of December 31, 2019, the valuation of acquired assets, identifiable intangible assets and certain assumed liabilities was final. The purchase consideration aggregating $16.9 million has been allocated to $11.2 million of identifiable intangible assets, comprised of $5.2 million of customer relationships and $6.0 million of developed technology, and working capital items aggregating $0.2 million of net assets acquired. The remaining unallocated amount of $5.5 million has been recorded as goodwill.

The valuation of the acquired intangible assets is inherently subjective and relies on significant unobservable inputs. The Company used an income approach to value the acquired intangible assets relating to developed technology and customer relationships. The valuation for each of these intangible assets was based on estimated projections of expected cash flows to be generated by the assets, discounted to the present value at discount rates commensurate with perceived risk. The valuation assumptions take into consideration the Company's estimates of customer attrition, technology obsolescence and revenue growth projections. The Company is amortizing the identifiable intangible assets in relation to the expected cash flows from the individual intangible assets over their respective useful lives, which have a weighted average life of 6.25 years (see Note 10).

The excess of purchase consideration over net tangible and identifiable intangible assets acquired was recorded as goodwill. The goodwill is deductible for tax purposes.

Acquisition-, Disposal- and Integration-Related Expenses

Acquisition-related expenses include those expenses related to acquisitions that would otherwise not have been incurred by the Company, including professional and services fees, such as legal, audit, consulting, paying agent and other fees, and expenses related to cash payments to certain former executives of the acquired businesses in connection with their employment agreements. Disposal-related expenses are professional and services fees related to disposals of subsidiaries or portions of the business. Integration-related expenses represent incremental costs related to combining the Company and its business acquisitions, such as third-party consulting and other third-party services related to merging the previously separate companies' systems and processes.

The disposal-related expenses in the year ended December 31, 2021 relate to the Kandy Sale (as defined below). The acquisition-related professional and services fees recorded in the year ended December 31, 2020 primarily related to the ECI Acquisition and the disposal-related expenses related to the Company's sale of the Kandy Communications Business. The acquisition-related professional and services fees recorded in the year ended December 31, 2019 primarily related to the ECI Acquisition and, to a lesser extent, to the Anova Acquisition and other acquisition-related activities.

The components of Acquisition-, disposal- and integration-related expenses incurred in the years ended December 31, 2021, 2020 and 2019 were as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Professional and services fees (acquisition-related)	$ 165	$ 13,441	$ 8,657
Professional and services fees (disposal-related)	329	1,890	—
Integration-related expenses	7,138	1,833	4,296
	$ 7,632	$ 17,164	$ 12,953

(4) SALE OF KANDY COMMUNICATIONS BUSINESS

On August 5, 2020, the Company announced that it had entered into a definitive agreement (the "Kandy Purchase Agreement") with American Virtual Cloud Technologies, Inc. ("AVCT") to sell the Kandy Communications Business. Under the Kandy Purchase Agreement, AVCT would purchase the assets and assume certain liabilities associated with the Kandy Communications Business, as well as all of the outstanding interests in Kandy Communications LLC, a subsidiary of the Company (the "Kandy Sale").

On December 1, 2020, the Company completed the Kandy Sale. The assets acquired and liabilities assumed by AVCT in connection with the Kandy Sale were primarily comprised of accounts receivable, property and equipment, trade accounts payable and employee-related accruals. As consideration, AVCT paid Ribbon $45.0 million, subject to certain adjustments, in the form of units of AVCT's securities (the "AVCT Units"), with each AVCT Unit consisting of: (i) $1,000 in principal amount of AVCT's Series A-1 convertible debentures (the "Debentures"); and (ii) one warrant to purchase 100 shares of AVCT common stock, $0.0001 par value (the "Warrants"). The Company received 43,778 AVCT Units as sale consideration on the Kandy Sale Date (the "Kandy Sale Consideration").

The Debentures bore interest at a rate of 10% per annum, which was added to the principal amount of the Debenture. The entire principal amount of each Debenture, together with accrued and unpaid interest thereon, was due and payable on the earlier of the May 1, 2023 maturity date or the occurrence of a Change in Control as defined in the Kandy Purchase Agreement. Each Debenture was convertible, in whole or in part, at any time at the Company's option into that number of shares of AVCT common stock, calculated by dividing the principal amount being converted, together with all accrued and unpaid interest thereon, by the applicable conversion price, initially $3.45. The Debentures were subject to mandatory conversion if the AVCT stock price was at or above $6.00 per share for 40 trading days in any 60 consecutive trading day period, subject to the satisfaction of certain other conditions. The conversion price was subject to customary adjustments including, but not limited to, stock dividends, stock splits and reclassifications. As of February 19, 2021, the stock price had traded above $6.00 for 40 days within a 60 consecutive trading day period, and accordingly, on September 8, 2021 (the "Debenture Conversion Date"), upon the completion of customary regulatory filings by AVCT, the Debentures were converted into 13,700,421 shares of AVCT common stock (the "Debenture Shares").

The Warrants were independent of the Debentures and entitle the Company to purchase 4,377,800 shares of AVCT common stock at an exercise price of $0.01 per share. The Warrants expire on December 1, 2025, and were immediately exercisable on the Kandy Sale Date. The Company had not exercised any of the Warrants as of December 31, 2021. The Company was also subject to a lock-up provision which limited the Company's ability to sell any shares of the AVCT common stock underlying the AVCT Units prior to June 1, 2021 (the "Lock-Up Period"), except in certain transactions.

The Company determined that the AVCT Units had a fair value of $84.9 million at the Kandy Sale Date, comprised of the Debentures with a fair value of $66.3 million and the Warrants with a fair value of $18.6 million. The value of the net assets sold to AVCT totaled $1.3 million, resulting in a gain on the sale of $83.6 million. The gain on the Kandy Sale is included as a component of Other (expense) income, net, in the consolidated statement of operations for the year ended December 31, 2020. The Company calculated the fair value of the Debentures using a Lattice-based valuation approach, which utilizes a binomial tree to model the different paths the price of AVCT's common stock might take over the Debentures' life by using assumptions regarding the stock price volatility and risk-free interest rate. These results were then used to calculate the fair value of the Debentures at each measurement date. The Company used the Black-Scholes valuation model for estimating the fair value of the Warrants at each measurement date. The fair value of the Warrants is affected by AVCT's stock price as well as valuation assumptions, including the volatility of AVCT's stock price, expected term of the option, risk-free interest rate and expected dividends. Both the Lattice and Black-Scholes valuation models are based on available market data, giving consideration to all of the rights and obligations of each instrument and precluding the use of "blockage" discounts or premiums in determining the fair value of a large block of financial instruments. After the expiration of the Lock-Up Period and prior to the Debenture Conversion Date, the Company valued the AVCT Units at each measurement date by multiplying the closing stock price of AVCT common stock by the number of shares upon conversion of the Debentures and Warrants. At December 31, 2021, the Company valued the Debenture Shares and Warrants (collectively, the "AVCT Investment") by multiplying the closing stock price of AVCT common stock by the number of Debenture Shares and Warrants it held.

At December 31, 2021, the fair value of the AVCT Investment was $43.9 million. At December 31, 2020, the fair value of the AVCT Units was $115.2 million. The Company recorded a loss of $74.8 million in the year ended December 31, 2021 arising from the change in the fair value of the AVCT Investment, and recorded a gain of $30.3 million in the year ended December 31, 2020 arising from the change in the fair value of the AVCT Units. These amounts are included as components of Other (expense) income, net, in the Company's consolidated statements of operations. The Company recorded $3.5 million of interest income in the year ended December 31, 2021, which was added to the principal amount of the Debentures prior to the Debenture Conversion Date, and which is included in Interest expense, net, in the consolidated statement of operations. The fair value of the AVCT Investment at December 31, 2021 and the fair value of the AVCT Units at December 31, 2020 are reported as Investments in the Company's consolidated balance sheets. The AVCT Investment is classified as a Level 1 fair value measurement at December 31, 2021 and the AVCT Units are classified as Level 2 fair value measurements within the fair value hierarchy at December 31, 2020 (see Note 6).

The Company evaluated the nature of its investment in AVCT for the period from the Debenture Conversion Date to December 31, 2021 and determined that it represented an approximate 15% equity interest in AVCT on a diluted basis. The Company determined that it is not the primary beneficiary of AVCT as it does not have the power to direct the activities that most significantly impact the AVCT Investment's economic performance, and therefore concluded that it had neither significant influence nor a controlling interest arising from the AVCT Investment that would require consolidation as of December 31, 2021.

The results of the Kandy Communications Business are excluded from the Company's consolidated results for the period subsequent to the Kandy Sale Date.

(5) EARNINGS (LOSS) PER SHARE

Basic earnings (loss) per share is computed by dividing net income (loss) by the weighted average number of shares outstanding during the period. For periods in which the Company reports net income, diluted net income per share is determined by using the weighted average number of common and dilutive common equivalent shares outstanding during the period unless the effect is antidilutive.

The calculations of shares used to compute basic and diluted earnings (loss) per share are as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Weighted average shares outstanding—basic	147,575	138,967	109,734
Potential dilutive common shares	—	5,683	—
Weighted average shares outstanding—diluted	147,575	144,650	109,734

Options to purchase the Company's common stock and unvested restricted and performance-based stock units aggregating 10.6 million shares have not been included in the computation of diluted loss per share for the year ended December 31, 2021 because their effect would have been antidilutive. Options to purchase the Company's common stock aggregating 0.2 million shares have not been included in the computation of diluted earnings per share for the year ended December 31, 2020 because their effect would have been antidilutive. Options to purchase the Company's common stock and unvested shares of restricted and performance-based stock and stock units aggregating 4.6 million shares have not been included in the computation of diluted loss per share for the year ended December 31, 2019 because their effect would have been antidilutive.

(6) INVESTMENTS AND FAIR VALUE HIERARCHY

The Company's policy and historical practice has been to invest in debt instruments, primarily U.S. government-backed, municipal and corporate obligations, which management believes to be high quality (investment grade) credit instruments.

At December 31, 2021, the Company's investments were comprised of the AVCT Investment. At December 31, 2020, the Company's investments were comprised of the Debentures and Warrants (see Note 4).

On a quarterly basis, the Company reviews its investments, if any, to determine if there have been any events that could create a credit impairment.

Fair Value Hierarchy

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants. As such, fair value is a market-based measurement that should be determined based on assumptions that market participants would use in pricing an asset or a liability. The three-tier fair value hierarchy is based on the level of independent, objective evidence surrounding the inputs used to measure fair value. A financial instrument's categorization within the fair value hierarchy is based upon the lowest level of input that is significant to the fair value measurement. The fair value hierarchy is as follows:

Level 1. Level 1 applies to assets or liabilities for which there are quoted prices in active markets for identical assets or liabilities.

Level 2. Level 2 applies to assets or liabilities for which there are inputs that are directly or indirectly observable in the marketplace, such as quoted prices for similar assets or liabilities in active markets or quoted prices for identical assets or liabilities in markets with insufficient volume or infrequent transactions (less active markets).

Level 3. Level 3 applies to assets or liabilities for which there are unobservable inputs to the valuation methodology that are significant to the measurement of the fair value of the assets or liabilities.

The classification of each asset or liability fair value measurement within the fair value hierarchy is determined based on the lowest level input that is significant to the fair value measurement in its entirety. Market activity is presumed to be orderly in the absence of evidence of forced or disorderly sales, although such sales may still be indicative of fair value. Applicable accounting guidance precludes the use of blockage factors or liquidity adjustments due to the quantity of securities held by an entity.

The Company's marketable securities, when applicable, are valued with the assistance of valuations provided by third-party pricing services, as derived from such services' pricing models. Inputs to the models may include, but are not limited to, reported trades, executable bid and asked prices, broker/dealer quotations, prices or yields of securities with similar characteristics, benchmark curves or information pertaining to the issuer, as well as industry and economic events. The pricing services may use a matrix approach, which considers information regarding securities with similar characteristics to determine the valuation for a security. The Company is ultimately responsible for the consolidated financial statements and underlying estimates. Accordingly, the Company assesses the reasonableness of the valuations provided by the third-party pricing services by reviewing actual trade data, broker/dealer quotes and other similar data, which are obtained from quoted market prices or other sources.

(7) ACCOUNTS RECEIVABLE, NET

Accounts receivable, net, consisted of the following (in thousands):

	December 31,	
	2021	2020
Accounts receivable	$ 284,187	$ 238,514
Allowance for doubtful accounts	(1,270)	(776)
Accounts receivable, net	$ 282,917	$ 237,738

The Company's allowance for doubtful accounts activity was as follows (in thousands):

Year ended December 31,	Balance at beginning of year	Charges to expense	Charges (credits) to other accounts	Write-offs	Balance at end of year
2021	$ 776	$ 553	$ 85	$ (144)	$ 1,270
2020	$ 913	$ 686	$ 94	$ (917)	$ 776
2019	$ 669	$ 738	$ 68	$ (562)	$ 913

(8) INVENTORY

Inventory consisted of the following (in thousands):

	December 31,	
	2021	2020
On-hand final assemblies and finished goods inventories	$ 57,360	$ 46,921
Deferred cost of goods sold	1,474	1,165
	58,834	48,086
Less noncurrent portion (included in Other assets)	(4,791)	(2,336)
Current portion	$ 54,043	$ 45,750

(9) PROPERTY AND EQUIPMENT

Property and equipment consisted of the following (in thousands):

	Useful Life	December 31, 2021	December 31, 2020
Equipment	2-5 years	$ 74,769	$ 90,885
Software	2-5 years	32,804	32,244
Furniture and fixtures	3-5 years	3,188	3,092
Leasehold improvements	Shorter of the estimated lease term or useful life	34,640	37,263
		145,401	163,484
Less accumulated depreciation and amortization		(97,716)	(114,596)
Property and equipment, net		$ 47,685	$ 48,888

The Company recorded depreciation and amortization expense related to property and equipment of $17.0 million for the year ended December 31, 2021, $17.2 million for the year ended December 31, 2020 and $11.9 million for the year ended December 31, 2019. During each of these years, the Company disposed of certain property and equipment that was fully depreciated at the time of disposal, which resulted in reductions in both Cost and Accumulated depreciation.

Property and equipment under finance leases included in the amounts above were as follows (in thousands):

	December 31, 2021	December 31, 2020
Cost	$ 2,050	$ 2,908
Less accumulated depreciation	(1,763)	(1,925)
Property and equipment under finance leases, net	$ 287	$ 983

The net book values of the Company's property and equipment by geographic area were as follows (in thousands):

	December 31, 2021	December 31, 2020
United States	$ 24,683	$ 27,211
Canada	5,184	4,584
Asia/Pacific	8,174	6,078
Europe	1,157	1,171
Israel	7,859	9,613
Other	628	231
	$ 47,685	$ 48,888

(10) INTANGIBLE ASSETS AND GOODWILL

The Company's intangible assets at December 31, 2021 and 2020 consisted of the following (in thousands):

December 31, 2021	Weighted average amortization period (years)	Cost	Accumulated amortization	Net carrying value
In-process research and development	*	$ 34,000	$ —	$ 34,0
Developed technology	7.93	306,380	181,393	124,9
Customer relationships	11.86	268,140	77,653	190,4
Trade names	3.88	5,000	3,744	1,2
Internal use software	3.00	730	730	
	9.17	$ 614,250	$ 263,520	$ 350,7

December 31, 2020	Weighted average amortization period (years)	Cost	Accumulated amortization	Net carrying value
In-process research and development	*	$ 34,000	$ —	$ 34,000
Developed technology	7.93	306,380	143,050	163,330
Customer relationships	11.86	268,140	50,627	217,513
Trade names	3.88	5,000	2,487	2,513
Internal use software	3.00	730	730	—
	9.17	$ 614,250	$ 196,894	$ 417,356

* An in-process research and development intangible asset has an indefinite life until the product is generally available, at which time such asset is typically reclassified to developed technology, at which time the Company begins to amortize the asset. In the fourth quarter of 2020, the Company reclassified an in-process research and development intangible asset related to developed technology, as the associated product became generally available.

As previously discussed (see Note 2), for the year ended December 31, 2021, the Company reclassified amounts recorded for amortization of acquired intangible assets in prior period presentations from Amortization of acquired intangible assets, a component of Operating expenses, to Amortization of acquired technology, a separate line included in Cost of revenue, in the consolidated statements of operations. Total amortization of acquired intangible assets, comprised of the cost of revenue and operating expense components noted above, aggregated $66.6 million, $60.9 million and $49.2 million for the years ended December 31, 2021, 2020 and 2019 respectively.

Estimated future amortization expense for the Company's intangible assets at December 31, 2021 was as follows (in thousands):

Years ending December 31,	
2022	$ 60,449
2023	53,966
2024	46,899
2025	40,338
2026	36,489
Thereafter	112,589
	$ 350,730

Goodwill is recorded when the consideration for an acquisition exceeds the fair value of net tangible and identifiable intangible assets acquired. Effective in 2020, the Company began to perform its annual test for impairment of goodwill as of October 1. Previously, the Company's annual test for impairment of goodwill was completed as of November 30.

The Company has determined that it has two operating segments: Cloud and Edge, and IP Optical Networks. For the purpose of testing goodwill for impairment, all goodwill is assigned to a reporting unit, which may be either an operating segment or a portion of an operating segment. The Company's reporting units are its operating segments. The Company determined that the goodwill assigned to the Cloud and Edge reporting unit was $224.9 million and the goodwill assigned to the IP Optical Networks reporting unit was $192.0 million. Based on the results of the Company's recently completed impairment test, the Company determined that the carrying value of its IP Optical Networks segment exceeded its fair value. The Company determined that the amount of the impairment was $116.0 million and recorded an impairment charge in the fourth quarter of 2021. The impairment charge is reported separately in the Company's consolidated statement of operations for the year ended December 31, 2021. The Company determined that there was no impairment of its Cloud and Edge segment. Upon completion of the Company's 2020 annual test for goodwill impairment, the Company determined that there was no impairment of goodwill in either of its reporting units.

Prior to the fourth quarter of 2020, the Company operated as a single operating segment with one reporting unit and consequently evaluated goodwill for impairment based on an evaluation of the fair value of the Company as a whole. Based on the results of the Company's 2019 annual impairment test, the Company determined that its carrying value exceeded its fair value and accordingly, the Company recorded an impairment charge of $164.3 million.

At certain times during the years ended December 31, 2020 and 2019, the Company's market capitalization was below its book value. The Company regularly monitors for changes in circumstances, including changes to the Company's performance, that could result in impairment of goodwill.

The changes in the carrying value of the Company's goodwill in the years ended December 31, 2021 and 2020 were as follows (in thousands):

	Cloud and Edge	IP Optical Networks	Total
Balance at January 1, 2020 (1)	$ 224,896	$ —	$ 224,896
Acquisition of ECI	—	191,996	191,996
Balance at December 31, 2020 (1)	224,896	191,996	416,892
Impairment of goodwill	—	(116,000)	(116,000)
Balance at December 31, 2021 (1)(2)	$ 224,896	$ 75,996	$ 300,892

(1) Balance is presented net of accumulated impairment losses of $167.4 million for the Cloud and Edge segment.
(2) Balance is presented net of an impairment loss of $116.0 million for the IP Optical Networks segment.

The components of goodwill at December 31, 2020 and 2021 were as follows (in thousands):

	Cloud and Edge	IP Optical Networks	Total
Balance at December 31, 2020			
Goodwill	$ 392,302	$ 191,996	$ 584,29
Accumulated impairment losses	(167,406)	—	(167,40
	224,896	191,996	416,89
Balance at December 31, 2021			
Goodwill	$ 392,302	$ 191,996	$ 584,29
Accumulated impairment losses	(167,406)	(116,000)	(283,40
	$ 224,896	$ 75,996	$ 300,89

(11) ACCRUED EXPENSES AND OTHER

Accrued expenses and other consisted of the following (in thousands):

	December 31, 2021	December 31, 2020
Employee compensation and related costs	$ 38,040	$ 66,039
Other	62,712	68,826
	$ 100,752	$ 134,865

(12) WARRANTY

The changes in the Company's warranty accrual balance in the years ended December 31, 2021 and 2020 were as follows (in thousands):

Year ended December 31,	Balance at beginning of year	Assumed liability in connection with ECI Acquisition	Provision	Settlements	Balance at end of year
2021	$ 14,855	$ —	$ 3,777	$ (5,512)	$ 13,120
2020	$ —	$ 16,251	$ 4,687	$ (6,083)	$ 14,855

(13) RESTRUCTURING AND FACILITIES CONSOLIDATION INITIATIVES

The Company recorded restructuring and related expense aggregating $11.7 million, $16.2 million and $16.4 million in the years ended December 31, 2021, 2020 and 2019, respectively. Restructuring and related expense includes restructuring expense (primarily severance and related costs), estimated future variable lease costs for vacated properties with no intent or ability of sublease, and accelerated rent amortization expense.

For restructuring events that involve lease assets and liabilities, the Company applies lease reassessment and modification guidance and evaluates the right-of-use assets for potential impairment. If the Company plans to exit all or distinct portions of a facility and does not have the ability or intent to sublease, the Company will accelerate the amortization of each of those lease components through the vacate date. The accelerated amortization is recorded as a component of Restructuring and related expense in the Company's consolidated statements of operations. Related variable lease expenses will continue to be expensed as incurred through the vacate date, at which time the Company will reassess the liability balance to ensure it appropriately reflects the remaining liability associated with the premises and record a liability for the estimated future variable lease costs.

Accelerated amortization of lease assets is recognized from the date that the Company commences the plan to fully or partially vacate a facility, for which there is no intent or ability to enter into a sublease, through the final vacate date. Amounts of accelerated rent amortization that are included as a component of restructuring and related expense are not included in the tables below, as the liability for the total lease payments for each respective facility is included as a component of Operating lease liabilities in the Company's consolidated balance sheets at December 31, 2021 and 2020, both current and noncurrent (see Note 21). The Company may incur additional future expense if it is unable to sublease other locations included in the Facilities Initiative.

The components of restructuring and related expense for the years ended December 31, 2021, 2020 and 2019 were as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Severance and related costs	$ 4,618	$ 12,025	$ 11,179
Variable and other facilities-related costs	5,710	3,605	1,528
Accelerated amortization of lease assets due to cease-use	1,325	605	3,692
	$ 11,653	$ 16,235	$ 16,399

2020 Restructuring Initiative

In 2020, the Company implemented a restructuring plan to eliminate certain positions and redundant facilities, primarily in connection with the ECI Acquisition, to further streamline the Company's global footprint and improve its operations (the "2020 Restructuring Initiative"). The 2020 Restructuring Initiative includes facility consolidations and a reduction in workforce In connection with this initiative, the Company is eliminating functions arising from the ECI Acquisition and supporting its efforts to integrate the two companies.

The Company recorded restructuring and related expense of $4.7 million and $14.0 million in connection with the 2020 Restructuring Initiative in the years ended December 31, 2021 and 2020, respectively. The 2021 amount was comprised of $4.6 million for severance and related costs for approximately 60 employees and $0.1 million for variable and other facilities-related costs. The 2020 amount was comprised of $11.5 million for severance and related costs for approximately 190 employees, $2.0 million for variable and other facilities-related costs, and $0.5 million for accelerated amortization of lease assets. The Company expects these amounts will be fully paid in 2022. The Company expects that it will record additional restructuring and related expense approximating $1 million under the 2020 Restructuring Initiative in the aggregate for severance and planned facility consolidations. Summaries of the 2020 Restructuring Initiative accrual activity for the years ended December 31, 2021 and 2020 are as follows (in thousands):

Year ended December 31, 2021	Balance at January 1, 2021	Initiatives charged to expense	Adjustments for changes in estimate	Cash payments	Balance at December 31, 2021
Severance	$ 5,237	$ 4,618	$ —	$ (7,960)	1,895
Facilities	1,256	742	(670)	(1,268)	60
	$ 6,493	$ 5,360	$ (670)	$ (9,228)	$ 1,955

Year ended December 31, 2020	Balance at January 1, 2020	Initiatives charged to expense	Transfer to operating lease liability accounts	Cash payments	Balance at December 31, 2020
Severance	$ —	$ 11,547	$ —	$ (6,310)	5,237
Facilities	—	2,478	(535)	(687)	1,256
	$ —	$ 14,025	$ (535)	$ (6,997)	$ 6,493

2019 Restructuring and Facilities Consolidation Initiative

In June 2019, the Company implemented a restructuring plan to further streamline the Company's global footprint, improve its operations and enhance its customer delivery (the "2019 Restructuring Initiative"). The 2019 Restructuring Initiative includes facility consolidations, refinement of the Company's research and development activities, and a reduction in workforce. The facility consolidations under the 2019 Restructuring Initiative (the "Facilities Initiative") include a consolidation of the Company's North Texas sites into a single campus, housing engineering, customer training and support, and administrative functions, as well as a reduction or elimination of certain excess and duplicative facilities worldwide. In addition, the Company is substantially consolidating its global software laboratories and server farms into two lower cost North American sites. The Company continues to evaluate its properties included in the Facilities Initiative for accelerated amortization and/or right-of-use asset impairment. The Company expects that the actions under the Facilities Initiative will be completed in 2023.

In connection with the 2019 Restructuring Initiative, the Company recorded restructuring and related expense of $7.0 million, $2.3 million and $11.2 million in the years ended December 31, 2021, 2020 and 2019, respectively. The amount recorded in 2021 was comprised of $5.7 million for variable and other facilities-related costs and $1.3 million of net expense for accelerated amortization of lease assets. The amount for accelerated amortization of lease assets includes income of $2.1 million related to a lease modification for one of the Company's restructured facilities. The amount recorded in 2020 was comprised of $0.5 million for severance and related costs for approximately 5 employees, $1.7 million for variable and other facilities-related costs and $0.1 million for accelerated amortization of lease assets. The amount recorded in the year ended December 31, 2019 was comprised of $6.1 million for severance and related costs for approximately 120 employees, $1.4 million for variable and other facilities-related costs and $3.7 million for accelerated amortization of lease assets. The amount accrued for severance and related costs was paid in 2021. The Company estimates that it will record nominal, if any, future expense under the 2019 Restructuring Initiative.

Summaries of the 2019 Restructuring Initiative accrual activity for the years ended December 31, 2021 and 2020 are as follows (in thousands):

Year ended December 31, 2021	Balance at January 1, 2021	Initiatives charged to expense	Net transfer to operating lease liability accounts	Cash payments	Balance at December 31, 2021
Severance	$ 173	$ —	$ —	$ (173)	—
Facilities	766	9,006	(1,325)	(4,810)	1,594
	$ 939	$ 9,006	$ (1,325)	$ (4,983)	$ 1,594

Year ended December 31, 2020	Balance at January 1, 2020	Initiatives charged to expense	Transfer to operating lease liability accounts	Cash payments	Balance at December 31, 2020
Severance	$ 2,110	$ 536	—	$ (2,473)	173
Facilities	991	1,732	(70)	(1,887)	766
	$ 3,101	$ 2,268	(70)	$ (4,360)	$ 939

Merger Restructuring Initiative

In connection with the GENBAND Merger, the Company implemented a restructuring plan in the fourth quarter of 2017 to eliminate certain redundant positions and facilities within the combined companies (the "Merger Restructuring Initiative"). The Company recorded $21.3 million in the aggregate in connection with this initiative, including $5.2 million of restructuring and related expense in 2019, virtually all of which was for severance and related costs for approximately 40 employees. The Merger Restructuring Initiative was completed in 2020.

A summary of the Merger Restructuring Initiative accrual activity for the year ended December 31, 2020 is follows (in thousands):

Year ended December 31, 2020	Balance at January 1, 2020	Adjustments for changes in estimate	Cash payments	Balance at December 31, 2020
Severance	$ 409	$ (58)	$ (351)	$ —

Balance Sheet Classification

The current portions of accrued restructuring were $1.9 million and $6.6 million at December 31, 2021 and 2020, respectively, and are included as components of Accrued expenses in the consolidated balance sheets. The long-term portions of accrued restructuring are included as components of Other long-term liabilities in the consolidated balance sheets. The long-term portions of accrued restructuring were $1.6 million and $0.8 million at December 31, 2021 and 2020, respectively.

(14) DEBT

2018 Credit Facility

On June 24, 2018, the Company amended its previous outstanding credit facility to, among other things, permit the Edgewater Acquisition and related transactions (the "2018 Credit Facility"). The indebtedness and other obligations under the 2018 Credit Facility were unconditionally guaranteed on a senior secured basis by the Company and each other material U.S. domestic subsidiary of the Company (collectively, the "Guarantors"). The 2018 Credit Facility was secured by first-priority liens on substantially all of the assets of the Borrower and the Guarantors, including the Company.

The 2018 Credit Facility required periodic interest payments on outstanding borrowings until maturity. The Borrower could prepay all revolving loans under the 2018 Credit Facility at any time without premium or penalty (other than customary LIBOR breakage costs), subject to certain notice requirements.

Revolving loans under the 2018 Credit Facility bore interest at the Borrower’s option at either the Eurodollar (LIBOR) rate plus a margin ranging from 2.50% to 3.00% per year or the base rate (the highest of the Federal Funds rate plus 0.50%, or the prime rate announced from time to time in The Wall Street Journal) plus a margin ranging from 1.50% to 2.00% per year (such margins being referred to as the “Applicable Margin”). The Applicable Margin varied depending on the Company’s consolidated leverage ratio (as defined in the 2018 Credit Facility). The base rate and the LIBOR rate were each subject to a zero percent floor.

The Borrower was charged a commitment fee ranging from 0.25% to 0.40% per year on the daily amount of the unused portions of the commitments under the 2018 Credit Facility. Additionally, with respect to all letters of credit outstanding under the 2018 Credit Facility, the Borrower was charged a fronting fee of 0.125% per year and an outstanding letter of credit fee equal to the Applicable Margin for base rate loans ranging from 1.50% to 2.00% times the amount of the outstanding letters of credit.

The 2018 Credit Facility was superseded by the 2019 Credit Facility, which was entered into on April 29, 2019 and which is discussed below.

2019 Credit Facility

On April 29, 2019, the Company, as guarantor, and Ribbon Communications Operating Company, Inc., as borrower, entered into a syndicated, amended and restated credit facility (the "2019 Credit Facility"), which provided for a $50 million term loan facility that was advanced in full on April 29, 2019, and a $100 million revolving line of credit. The 2019 Credit Facility also included procedures for additional financial institutions to become syndicate lenders, or for any existing lender to increase its commitment under either the term loan facility or the revolving loan facility, subject to an aggregate increase of $75 million for incremental commitments under the 2019 Credit Facility. The 2019 Credit Facility was scheduled to mature in April 2024. At December 31, 2019, the Company had an outstanding term loan debt balance of $48.8 million and an outstanding revolving line of credit balance of $8.0 million with a combined average interest rate of 3.30%, and $5.4 million of outstanding letters of credit at an interest rate of 1.50%.

The indebtedness and other obligations under the 2019 Credit Facility were unconditionally guaranteed on a senior secured basis by the Company and each other material U.S. domestic subsidiary of the Company (collectively, the “Guarantors”). The 2019 Credit Facility was secured by first-priority liens on substantially all of the assets of the Borrower and the Guarantors, including the Company.

The 2019 Credit Facility required periodic interest payments on any outstanding borrowings under the facility. The Borrower could prepay all revolving loans under the 2019 Credit Facility at any time without premium or penalty (other than customary LIBOR breakage costs), subject to certain notice requirements.

Revolving loans under the 2019 Credit Facility bore interest at the Borrower’s option at either the Eurodollar (LIBOR) rate plus a margin ranging from 1.50% to 3.00% per year or the base rate (the highest of the Federal Funds rate plus 0.50%, or the prime rate announced from time to time in The Wall Street Journal) plus a margin ranging from 0.50% to 2.00% per year (such margins being referred to as the “Applicable Margin”). The Applicable Margin varied depending on the Company’s consolidated leverage ratio (as defined in the 2019 Credit Facility). The base rate and the LIBOR rate were each subject to a zero percent floor.

The 2019 Credit Facility was superseded by the 2020 Credit Facility, which was entered into on March 3, 2020, and which is discussed below.

2020 Credit Facility

On March 3, 2020, the Company entered into a Senior Secured Credit Facilities Credit Agreement (as amended, the "2020 Credit Facility"), by and among the Company, as a guarantor, Ribbon Communications Operating Company, Inc., as the borrower ("Borrower"), Citizens Bank, N.A. ("Citizens"), as administrative agent, a lender, issuing lender, swingline lender, joint lead arranger and bookrunner, Santander Bank, N.A., as a lender, joint lead arranger and bookrunner, and the other lenders party thereto (each, together with Citizens Bank, N.A. and Santander Bank, N.A., referred to individually as a "Lender", and collectively, the "Lenders"). The proceeds of the Credit Agreement were used, in part, to pay off in full all obligations of the Company under the 2019 Credit Facility.

The 2020 Credit Facility provides for $500 million of commitments from the Lenders to the Borrower, comprised of $400 million in term loans (the "2020 Term Loan Facility") and a $100 million facility available for revolving loans (the "2020 Revolving Credit Facility"). Under the 2020 Revolving Credit Facility, a $30 million sublimit is available for letters of credit and a $20 million submit is available for swingline loans. Under the 2020 Credit Facility, the Company was originally required to make quarterly principal payments aggregating approximately $10 million in the first year, $20 million per year for the following three years, and $30 million in the last year, with the remaining balance due on the maturity date. The 2020 Credit Facility also requires periodic interest payments until maturity.

RIBBON COMMUNICATIONS INC.

Notes to Consolidated Financial Statements (Continued)

The indebtedness and other obligations under the 2020 Credit Facility are unconditionally guaranteed on a senior secured basis by the Company, Edgewater Networks, Inc., a wholly-owned subsidiary of the Company, and GENBAND Inc., wholly-owned subsidiary of the Company (together, the "Guarantors"). The facilities under the 2020 Credit Facility are secured by first-priority liens on substantially all of the assets of the Borrower and the Guarantors, including substantially all of the assets of the Company.

The 2020 Credit Facility requires compliance with certain financial covenants, including a minimum Consolidated Fixed Charge Coverage Ratio and a maximum Consolidated Net Leverage Ratio (each as defined in the 2020 Credit Facility, and each tested on a quarterly basis).

In addition, the 2020 Credit Facility contains various covenants that, among other restrictions, limit the Company's and its subsidiaries' ability to incur or assume indebtedness; grant or assume liens; make acquisitions or engage in mergers; sell, transfer, assign or convey assets; repurchase equity and make dividend and certain other restricted payments; make investments; engage in transactions with affiliates; enter into sale and leaseback transactions; enter into burdensome agreements; change the nature of its business; modify their organizational documents; and amend or make prepayments on certain junior debt.

The 2020 Credit Facility contains events of default that are customary for a secured credit facility. If an event of default relating to bankruptcy or other insolvency events with respect to the Company or any of its subsidiaries occurs, all obligations under the 2020 Credit Facility will immediately become due and payable. If any other event of default occurs under the 2020 Credit Facility, the lenders may accelerate the maturity of the obligations outstanding under the 2020 Credit Facility and exercise other rights and remedies, including charging a default rate of interest equal to 2.00% per year above the rate that would otherwise be applicable. In addition, if any event of default exists under the 2020 Credit Facility, the lenders can commence foreclosure or other actions against the collateral.

On August 18, 2020 (the "First Amendment Effective Date"), the Borrowers entered into a First Amendment to the 2020 Credit Facility (the "First Amendment"). Pursuant to an assignment and assumption agreement entered into by Citizens and certain affiliates of Whitehorse Capital on the First Amendment Date (collectively, "HIG Whitehorse"), and consented to by Citizens and the Borrower, $75 million of the 2020 Term Loan Facility, designated as the Term B Loan (the "Term B Loan"), was assigned from Citizens to HIG Whitehorse as of August 18, 2020. The remaining $325 million of the 2020 Term Loan Facility that was not assigned to HIG Whitehorse was deemed the Term A Loan (the "Term A Loan" and, together with the Term B Loan, the "Amended 2020 Term Loan Facility").

The Term A Loan and the 2020 Revolving Credit Facility mature in March 2025. The Term A Loan and 2020 Revolving Credit Facility bear interest at the Borrower's option at either the LIBOR rate plus a margin ranging from 1.50% to 3.50% per year, or the base rate (the highest of the Federal Funds Effective Rate (as defined in the 2020 Credit Facility) plus 0.50%, or the prime rate announced from time to time in The Wall Street Journal) plus a margin ranging from 0.50% to 2.50% per year (the "Applicable Margin"). The Applicable Margin varies depending on the Company's Consolidated Net Leverage Ratio (as defined in the 2020 Credit Facility). The base rate and the LIBOR rate are each subject to a zero percent floor. The Company was required to make quarterly principal payments on the Term A Loan aggregating approximately $10 million in the first year, $16 million per year in each of the next two years, $20 million in the fourth year and $16 million in the last year, with the final payment approximating $244 million due on the maturity date. The Borrower could prepay all amounts under the Term A Loan and the 2020 Revolving Credit Facility at any time without premium or penalty (other than customary LIBOR breakage costs), subject to certain notice requirements.

The Term B Loan was scheduled to mature in March 2026 and bore interest, at the Borrower's option, at either the LIBOR rate plus a margin of 7.50% per year, or the base rate (the highest of the Federal Funds Effective Rate (as defined in the First Amendment) plus 0.50%, or the prime rate announced from time to time in The Wall Street Journal, plus a margin of 6.50% per year. The Term B Loan had a lower rate of amortization than the Term A Loan and was subject to a 1.0% premium if voluntarily repaid in connection with a repricing transaction (as defined in the 2020 Credit Facility) occurring prior to the six month anniversary of the First Amendment Effective Date. The Company was required to make quarterly principal payments totaling approximately $1 million in the first year and $8 million in the aggregate over the next four and a half years, with the final payment approximating $66 million.

The First Amendment reduced the Borrower's ability to incur new tranches of term loans, or increases in commitments under the Amended 2020 Term Loan Facility or the 2020 Revolving Credit Facility. Specifically, such indebtedness could be incurred up to an aggregate dollar amount equal to 75% of the Company's Consolidated Adjusted EBITDA (as defined in the 2020 Credit Facility), reduced from 100% prior to the First Amendment, as of the most recently ended fiscal quarter for which financial statements had been delivered to the lenders, plus additional amounts, so long as the Borrower's Consolidated Net Leverage Ratio (as defined in the 2020 Credit Facility) does not exceed 2.25:1.00, reduced from 2.75:1.00 under the 2020 Credit Facility. The First Amendment also reduced the amount of Unrestricted Cash (as defined in the 2020 Credit Facility) used in calculating the Borrower's Consolidated Net Leverage Ratio from $25 million to $10 million.

On December 1, 2020, the Borrowers entered into a Second Amendment to the 2020 Credit Facility to obtain consent for an equity exchange with AVCT in connection with the Kandy Sale, as well as to amend certain other provisions of the 2020 Credit Facility.

At December 31, 2020, the Company had an outstanding Term A Loan balance of $318.5 million at an average interest rate of 3.4%, and an outstanding Term B Loan balance of $74.6 million at an average interest rate of 8.4%. The 2020 Revolving Credit Facility did not have an outstanding balance but had $5.6 million of letters of credit outstanding with an interest rate of 2.5%.

On March 3, 2021 (the "Third Amendment Effective Date"), the Company, the Borrower and certain of its subsidiaries entered into a Third Amendment to Credit Agreement (the "Third Amendment"), which further amended the 2020 Credit Facility. The Third Amendment provided for an incremental term loan facility to the Borrower in the original principal amount of $74.6 million, the proceeds of which were used on the Third Amendment Effective Date to consummate an open market purchase of all outstanding amounts under the Term B Loan. Upon the consummation of the open market purchase, the Term B Loans were assigned to the Borrower and immediately cancelled, such that the outstanding amount under the Term A Loan and incremental term loan facility were combined and held by the Lenders (the "2020 Term Loan") with the same terms as the Term A Loan. The Company wrote off $2.5 million of capitalized debt issuance costs in connection with the Third Amendment, which is included in Interest expense, net, in the Company's consolidated statement of operations for the year ended December 31, 2021. The Company is required to make quarterly principal payments on the 2020 Term Loan aggregating approximately $20 million per year in the first three years and $30 million in the fourth year, with the final payment approximating $300 million due on the maturity date.

The Third Amendment increased the Borrower's ability to incur new incremental revolving commitments or term loans. Such indebtedness can be incurred up to an aggregate dollar limit equal to 100% of the Company's Consolidated Adjusted EBITDA (as defined in the 2020 Credit Facility) as of the most recently ended fiscal quarter for which financial statements have been delivered to the Lenders, plus additional amounts, so long as the Borrower's Consolidated Net Leverage Ratio (as defined in the Credit Agreement) does not exceed 2.75:1.00, increased from 2.25:1.00 under the First Amendment. The Third Amendment also increased the amount of Unrestricted Cash (as defined in the 2020 Credit Facility) used in calculating the Borrower's Consolidated Net Leverage Ratio from $10 million to $25 million.

On March 10, 2022, the Borrowers entered into a Fourth Amendment to the 2020 Credit Facility (the "Fourth Amendment") to increase the Maximum Consolidated Net Leverage Ratio (as defined in the 2020 Credit Facility) to 4.25:1.00 for the first quarter of 2022 and 4.50:1.00 for the second quarter of 2022, with reductions in subsequent quarters through the third quarter of 2023, when the ratio will be fixed at 3.00:1.00. In connection with the Fourth Amendment, the Company made a $15.0 million prepayment that was applied to the final payment due on the maturity date.

At December 31, 2021, the Company had an outstanding 2020 Term Loan balance of $375.5 million at an average interest rate of 3.4% and $4.3 million of letters of credit outstanding with an interest rate of 2.5%. The Company was in compliance with all covenants of the 2020 Credit Facility at both December 31, 2021 and 2020.

Short-Term Loan

From time to time, the Company may enter into uncommitted and unsecured short-term loans which it uses for financing exports in China. Three of these loans, aggregating $3.5 million at a weighted average interest rate of 3.97%, were entered into in March 2020, two of which were with China Zheshang Bank and one of which was with Bank of Communications Hangzhou Branch. These loans expired and were paid in full at various dates in June and July 2020. In July 2020, the Company entered into an uncommitted and unsecured short-term loan in the amount of $0.7 million at an interest rate of 4.0% with Bank of

Communications Hangzhou Branch. This loan expired and was paid in full in November 2020. The Company did not have any such short-term loans outstanding at December 31, 2021 and 2020.

Letters of Credit and Performance and Bid Bonds

The Company uses letters of credit and performance and bid bonds in the course of its business. At December 31, 2021, the Company had $30.1 million of letters of credit, bank guarantees, and performance and bid bonds outstanding (collectively, "Guarantees"), comprised of the $4.3 million of letters of credit under the 2020 Credit Agreement described above (the "Letters of Credit") and $25.8 million of bank guarantees and performance and bid bonds (collectively, the "Other Guarantees") under various uncommitted facilities. At December 31, 2020, the Company had $32.6 million of Guarantees, comprised of the $5.6 million of Letters of Credit and $27.0 million of Other Guarantees under various uncommitted facilities. At December 31, 2021 and 2020, the Company had cash collateral of $2.6 million and $2.7 million, respectively, supporting the Guarantees under its uncommitted facilities, which are reported in Restricted cash in the consolidated balance sheets.

Promissory Note

In connection with the GENBAND Merger, on October 27, 2017, the Company issued a promissory note for $22.5 million to certain of GENBAND's equityholders (the "Promissory Note"). The Promissory Note did not amortize and the principal thereon was payable in full on the third anniversary of its execution. Interest on the Promissory Note was payable quarterly in arrears and accrued at a rate of 7.5% per year for the first six months after issuance, and thereafter at a rate of 10% per year. Interest that was not paid on the interest payment date would increase the principal amount of the Promissory Note. On April 29, 2019, concurrently with the closing of the 2019 Credit Facility as discussed above, the Company repaid in full all outstanding amounts under the Promissory Note, aggregating $24.7 million. The Company did not incur any early termination penalties in connection with this repayment.

(15) DERIVATIVE INSTRUMENTS AND HEDGING ACTIVITIES

The Company is exposed to financial market risk related to foreign currency fluctuations and changes in interest rates. These exposures are actively monitored by management. To manage the volatility related to the exposure to changes in interest rates, the Company has entered into a derivative financial instrument. Management's objective is to reduce, where it is deemed appropriate to do so, fluctuations in earnings and cash flows associated with changes in interest rates. Ribbon's policies and practices are to use derivative financial instruments only to the extent necessary to manage exposures. Ribbon does not hold or issue derivative financial instruments for trading or speculative purposes.

The Company records derivatives on the balance sheet at fair value. The accounting for changes in the fair value of derivatives depends on the intended use of the derivative, whether the Company has elected to designate a derivative in a hedging relationship and apply hedge accounting and whether the hedging relationship has satisfied the criteria necessary to apply hedge accounting. Derivatives designated and qualifying as a hedge of the exposure to changes in the fair value of an asset, liability, or firm commitment attributable to a specific risk, such as interest rate risk, are considered fair value hedges. Derivatives designated and qualifying as a hedge of the exposure to variability in expected future cash flows, or other types of forecasted transactions, are considered cash flow hedges. Derivatives may also be designated as hedges of the foreign currency exposure of a net investment in a foreign operation. Hedge accounting generally provides for the matching of the timing of gain or loss recognition on the hedging instrument with the recognition of the changes in the fair value of the hedged asset or liability that are attributable to the hedged risk in a fair value hedge, or the earnings effect of the hedged forecasted transactions in a cash flow hedge. The Company may enter into derivative contracts that are intended to economically hedge certain of its risk even though hedge accounting does not apply or the Company elects not to apply hedge accounting.

Cash Flow Hedge of Interest Rate Risk

The 2020 Term Loan Facility had outstanding balances of $375.5 million and $393.1 million at December 31, 2021 and 2020, respectively. The 2020 Revolving Credit Facility was undrawn at both December 31, 2021 and 2020. Borrowings under the 2020 Credit Agreement have variable interest rates based on LIBOR (see Note 14). As a result of exposure to interest rate movements, during March 2020, the Company entered into an interest rate swap arrangement, which effectively converted its

$400 million term loan with its variable interest rate based upon one-month LIBOR to an aggregate fixed rate of 0.904%, plus a leverage-based margin as defined in the 2020 Credit Facility. The notional amount of this swap at December 31, 2021 and 2020 was $400 million, and the swap matures on March 3, 2025, the same date the 2020 Credit Facility matures.

The Company's objectives in using interest rate derivatives are to add stability to interest expense and to manage its exposure to interest rate movements. To accomplish this objective, the Company is using an interest rate swap as part of its interest rate risk management strategy. Interest rate swaps designated as cash flow hedges involve the receipt of variable amounts from a counterparty in exchange for the Company making fixed-rate payments over the life of the agreements without exchange of the underlying notional amount.

The effective portion of changes in the fair value of designated derivatives that qualify as cash flow hedges is recorded in accumulated other comprehensive income (loss) in the consolidated balance sheet and is subsequently reclassified into earnings in the period that the hedged forecasted transactions affect earnings. During the years ended December 31, 2021 and 2020, such a derivative was used to hedge the variable cash flows associated with the credit facilities under the 2020 Credit Facility, and the Company has accounted for this derivative as an effective hedge. Any ineffective portion of the change in the fair value of the derivative would be recognized directly in earnings.

Amounts reported in accumulated other comprehensive income (loss) related to the Company's derivative are reclassified to interest expense as interest is accrued on the Company's variable-rate debt. Based upon projected forward rates, the Company estimates that as of December 31, 2021, $2.1 million may be reclassified as an increase to interest expense over the next twelve months.

The impact of the Company's derivative financial instrument on its consolidated statement of comprehensive income (loss) for the years ended December 31, 2021 and 2020 was as follows (in thousands):

	Year ended December 31, 2021	2020
Gain (loss) recognized in other comprehensive income (loss) on derivative (effective portion)	$ 9,505	$ (12,671)
Amount reclassified from accumulated other comprehensive income (loss) to interest expense (effective portion)	3,254	1,723
	$ 12,759	$ (10,948)

The fair values and locations in the consolidated balance sheet at December 31, 2021 and 2020 of the Company's derivative assets (liabilities) designated as a hedging instrument were as follows (in thousands):

	Balance sheet location	December 31, 2021	2020
Interest rate derivative - liability derivative	Accrued expenses and other	$ (2,054)	$ (3,157)
Interest rate derivative - liability derivative	Other long-term liabilities	—	(7,791)
Interest rate derivative - asset derivative	Other assets	3,865	—
		$ 1,811	$ (10,948)

The Company has classified the interest rate derivative net asset of $1.8 million at December 31, 2021 and a liability of $10.9 million at December 31, 2020 respectively, as Level 2 fair value measurements within the fair value hierarchy (see Note 6).

(16) REVENUE RECOGNITION

The Company's typical performance obligations include the following:

Performance Obligation	When Performance Obligation is Typically Satisfied	When Payment is Typically Due
Software and Product Revenue		
Software licenses (perpetual or term)	Upon transfer of control; typically, when made available for download (point in time)	Generally, within 30 days of invoicing except for term licenses, which may be paid for over time
Software licenses (subscription)	Upon activation of hosted site (over time)	Generally, within 30 days of invoicing
Hardware	When control of the hardware passes to the customer; typically, upon delivery (point in time)	Generally, within 30 days of invoicing
Software upgrades	Upon transfer of control; typically, when made available for download (point in time)	Generally, within 30 days of invoicing
Customer Support Revenue		
Customer support	Ratably over the course of the support contract (over time)	Generally, within 30 days of invoicing
Professional Services		
Other professional services (excluding training services)	As work is performed (over time)	Generally, within 30 days of invoicing (upon completion of services)
Training	When the class is taught (point in time)	Generally, within 30 days of services being performed

Significant Judgments

The Company's contracts with customers often include promises to transfer multiple products and services to the customer. Determining whether products and services are considered distinct performance obligations that should be accounted for separately versus together may require significant judgment.

Judgment is required to determine the standalone selling price for each distinct performance obligation. The Company typically has more than one standalone selling price ("SSP") for individual products and services due to the stratification of those products and services by customers and circumstances. In these instances, the Company may use information such as the size of the customer and geographic region in determining the SSP.

Deferred Revenue

Deferred revenue is a contract liability representing amounts collected from or invoiced to customers in excess of revenue recognized. This results primarily from the billing of annual customer support agreements where the revenue is recognized over the term of the agreement. The value of deferred revenue will increase or decrease based on the timing of invoices and recognition of revenue.

Disaggregation of Revenue

The Company disaggregates its revenue from contracts with customers based on the nature of the products and services and the geographic regions in which each customer is domiciled. The Company's total revenue for the years ended December 31, 2021, 2020 and 2019 was disaggregated geographically as follows:

RIBBON COMMUNICATIONS INC.

Notes to Consolidated Financial Statements (Continued)

Year ended December 31, 2021	Product revenue	Service revenue (maintenance)	Service revenue (professional services)	Total revenue
United States	$ 196,058	$ 132,683	$ 47,296	$ 376,037
Europe, Middle East and Africa	138,203	79,475	30,349	248,027
Asia Pacific	92,803	41,945	18,183	152,931
Other	25,978	32,218	9,766	67,962
	$ 453,042	$ 286,321	$ 105,594	$ 844,957

Year ended December 31, 2020	Product revenue	Service revenue (maintenance)	Service revenue (professional services)	Total revenue
United States	$ 201,347	$ 132,661	$ 48,611	$ 382,619
Europe, Middle East and Africa	149,567	73,475	25,226	248,268
Asia Pacific	90,201	36,628	19,627	146,456
Other	26,797	32,052	7,603	66,452
	$ 467,912	$ 274,816	$ 101,067	$ 843,795

Year ended December 31, 2019	Product revenue	Service revenue (maintenance)	Service revenue (professional services)	Total revenue
United States	$ 170,937	$ 133,271	$ 37,085	$ 341,293
Europe, Middle East and Africa	42,262	43,186	12,279	97,727
Asia Pacific	30,617	27,798	10,721	69,136
Other	18,214	29,973	6,768	54,955
	$ 262,030	$ 234,228	$ 66,853	$ 563,111

The Company's product revenue from its direct sales program and from indirect sales through its channel partner program for the years ended December 31, 2021, 2020 and 2019 was as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Indirect sales through channel program	$ 117,065	$ 134,876	$ 94,639
Direct sales	335,977	333,036	167,391
	$ 453,042	$ 467,912	$ 262,030

The Company's product revenue from sales to enterprise customers and from sales to service provider customers for the years ended December 31, 2021, 2020 and 2019 was as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Sales to enterprise customers	$ 111,494	$ 138,469	$ 70,548
Sales to service provider customers	341,548	329,443	191,482
	$ 453,042	$ 467,912	$ 262,030

The Company's product revenue and service revenue components by segment for the years ended December 31, 2021, 2020 and 2019 was as follows (in thousands):

RIBBON COMMUNICATIONS INC.
Notes to Consolidated Financial Statements (Continued)

	Year ended December 31,		
	2021	2020	2019
Product revenue			
Cloud and Edge	248,570	275,445	262,030
IP Optical Networks	204,472	192,467	—
Total product revenue	453,042	467,912	262,030
Service revenue			
Maintenance			
Cloud and Edge	228,321	229,035	234,228
IP Optical Networks	58,000	45,781	—
Total maintenance revenue	286,321	274,816	234,228
Professional services			
Cloud and Edge	79,765	78,790	66,853
IP Optical Networks	25,829	22,277	—
Total professional services revenue	105,594	101,067	66,853
Total service revenue	391,915	375,883	301,081

Revenue Contract Balances

The timing of revenue recognition, billings and cash collections results in billed accounts receivable, unbilled receivables, which are contract assets, and customer advances and deposits, which are contract liabilities, in the Company's consolidated balance sheets. Amounts are billed as work progresses in accordance with agreed-upon contractual terms, either at periodic intervals or upon achievement of contractual milestones. Completion of services and billing may occur subsequent to revenue recognition, resulting in contract assets. The Company may receive advances or deposits from its customers before revenue is recognized, resulting in contract liabilities which are classified as deferred revenue. These assets and liabilities are reported in the Company's consolidated balance sheets on a contract-by-contract basis as of the end of each reporting period. Changes in the contract asset and liability balances during the years ended December 31, 2021 and 2020 were not materially impacted by any factors other than billing and revenue recognition. Nearly all of the Company's deferred revenue balance is related to services revenue, primarily customer support contracts. Unbilled receivables stem primarily from engagements where services have been performed; however, billing cannot occur until services are completed.

In some arrangements, the Company allows customers to pay for term-based software licenses and products over the term of the software license. The Company also sells SaaS-based software under subscription arrangements, with payment terms over the term of the SaaS agreement. Amounts recognized as revenue in excess of amounts billed are recorded as unbilled receivables. Unbilled receivables that are anticipated to be invoiced in the next twelve months are included in Accounts receivable on the Company's consolidated balance sheets. The changes in the Company's accounts receivable, unbilled receivables and deferred revenue balances for the years ended December 31, 2021 and 2020 were as follows (in thousands):

	Accounts receivable	Unbilled accounts receivable	Deferred revenue (current)	Deferred revenue (long-term)
Balance at January 1, 2021	$ 179,331	$ 58,407	$ 96,824	$ 26,010
Increase (decrease), net	29,641	15,538	12,295	(5,391)
Balance at December 31, 2021	$ 208,972	$ 73,945	$ 109,119	$ 20,619

	Accounts receivable	Unbilled accounts receivable	Deferred revenue (current)	Deferred revenu (long-term)
Balance at January 1, 2020	$ 168,502	$ 24,204	$ 100,406	$ 20,48
Increase (decrease), net	10,829	34,203	(3,582)	5,52
Balance at December 31, 2020	$ 179,331	$ 58,407	$ 96,824	$ 26,01

The Company recognized approximately $94 million of revenue in the year ended December 31, 2021 that was recorded as deferred revenue at December 31, 2020 and approximately $99 million of revenue in the year ended December 31, 2020 that was recorded as deferred revenue at December 31, 2019. Of the Company's deferred revenue reported as long-term in its consolidated balance sheet at December 31, 2021, the Company expects that approximately $12 million will be recognized as revenue in 2023, approximately $6 million will be recognized as revenue in 2024 and approximately $3 million will be recognized as revenue in 2025 and beyond.

All freight-related customer invoicing is recorded as revenue, while the shipping and handling costs that occur after control of the promised goods or services transfer to the customer are reported as fulfillment costs, a component of Cost of revenue - product in the Company's consolidated statements of operations.

Deferred Commissions Cost

Sales commissions earned by the Company's employees are considered incremental and recoverable costs of obtaining a contract with a customer. The payments related to these costs have been deferred on our consolidated balance sheet and are being amortized over the expected life of the customer contract, which is five years. At December 31, 2021 and 2020, the Company had $3.8 million and $4.1 million, respectively, of deferred sales commissions capitalized.

(17) OPERATING SEGMENT INFORMATION

The Company has two reportable segments, which are intended to align with the manner in which the business is managed: Cloud and Edge, and IP Optical Networks.

The Cloud and Edge segment provides secure and reliable software and hardware products, solutions and services for enabling Voice over Internet Protocol ("VoIP") communications, Voice over Long-Term Evolution ("VoLTE") and Voice Over 5G ("VoNR") communications and Unified Communications and Collaboration ("UC&C") within service provider and enterprise networks and from the cloud. The Cloud and Edge products are increasingly software-centric and cloud-native for deployment on private, public or hybrid cloud infrastructures, in data centers, on enterprise premises and within service provider networks. Ribbon's Cloud and Edge product portfolio consists of our Session Border Controller ("SBC") products and our Network Transformation ("NTR") products.

The IP Optical Networks segment provides high-performance, secure solutions for IP networking and optical transport, supporting wireless networks including 5G, metro and edge aggregation, core networking, data center interconnect, legacy network transformation and transport solutions for wholesale carriers. This portfolio is offered to service provider, enterprise and industry verticals with critical transport network infrastructures including utilities, government, defense, transportation, and education and research.

The Company has not provided segment asset information as such information is not provided to the CODM and accordingly, asset information is not used in assessing segment performance. Segment revenue and expense included in the tables below represent direct revenue and expense attributable to each segment. Please see Note 10 for information regarding the allocation of goodwill between segments.

The CODM utilizes revenue and adjusted gross profit to measure and assess each segment's performance. The Company calculates adjusted gross profit by excluding from cost of revenue: amortization of acquired technology, stock-based compensation, acquisition-related inventory adjustments and acquisition-related facilities adjustments, and may also exclude other items in future periods that the Company believes are not part of the Company's core business. Adjusted gross profit is not a financial measure determined in accordance with U.S. GAAP, may not be comparable to similarly titled measures used by other companies; and should not be considered a substitute for gross profit or other results reported in accordance with U.S. GAAP. See below for a reconciliation of adjusted gross profit to gross profit which is the most directly comparable U.S. GAAP measure.

Financial information for the IP Optical Networks segment is not presented for the year ended December 31, 2019, as this segment arose from the ECI Acquisition in 2020. The tables below provide revenue, adjusted gross profit and depreciation expense by reportable segment for the years ended December 31, 2021, 2020 and 2019 (in thousands):

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Notes to Consolidated Financial Statements (Continued)

	Year ended December 31,		
Revenue	**2021**	**2020**	**2019**
Segment revenue:			
Cloud and Edge	$ 556,656	$ 583,270	$ 563,111
IP Optical Networks	288,301	260,525	—
Total revenue	$ 844,957	$ 843,795	$ 563,111

	Year ended December 31,		
Adjusted gross profit	**2021**	**2020**	**2019**
Segment adjusted gross profit:			
Cloud and Edge	$ 370,504	$ 385,137	$ 355,211
IP Optical Networks	114,496	110,845	—
Total segment adjusted gross profit	485,000	495,982	355,211
Stock-based compensation expense	(1,997)	(875)	(554)
Amortization of acquired technology	(38,343)	(42,290)	(37,573)
Acquisition-related inventory and facilities adjustments	—	(2,000)	—
Gross profit	$ 444,660	$ 450,817	$ 317,084

	Year ended December 31,		
Depreciation expense	**2021**	**2020**	**2019**
Segment depreciation expense:			
Cloud and Edge	$ 12,269	$ 12,111	$ 11,949
IP Optical Networks	4,693	5,077	—
Total depreciation expense	$ 16,962	$ 17,188	$ 11,949

(18) MAJOR CUSTOMERS

The following customers contributed 10% or more of the Company's revenue in at least one of the years ended December 31, 2021, 2020 and 2019:

	Year ended December 31,		
	2021	**2020**	**2019**
Verizon Communications Inc.	16%	15%	17%
AT&T Inc.	*	*	12%

* Less than 10% of total revenue.

At December 31, 2021, one customer accounted for 10% or more of the Company's accounts receivable balance, representing approximately 15% of total accounts receivable. At December 31, 2020, one customer accounted for 10% or more of the Company's accounts receivable balance, representing approximately 12% of total accounts receivable. The Company performs ongoing credit evaluations of its customers and generally does not require collateral on accounts receivable. The Company maintains an allowance for doubtful accounts and such losses have been within management's expectations.

(19) COMMON STOCK REPURCHASES

In the second quarter of 2019, the Company's Board of Directors (the "Board") approved a stock repurchase program (the "Repurchase Program") pursuant to which the Company could repurchase up to $75 million of its common stock prior to April 18, 2021 (the "Program Expiration Date"). The stock repurchases were funded using the Company's working capital. During the year ended December 31, 2019, the Company spent $4.5 million, including transaction fees, to repurchase and retire 1.0 million shares of its common stock under the Repurchase Program. The Company did not repurchase any common stock during the year ended December 31, 2020 or in the period from January 1, 2021 through the Program Expiration Date. The Company had $70.5 million remaining for future repurchases upon the expiration of the Repurchase Program.

(20) STOCK-BASED COMPENSATION PLANS

2019 Stock Incentive Plan

At the Company's annual meeting of stockholders held on June 5, 2019, the Company's stockholders approved the Ribbon Communications Inc. Incentive Award Plan (the "2019 Plan"). The 2019 Plan had previously been approved by the Board, subject to stockholder approval. At the Company's annual meeting of stockholders held on June 2, 2020, the Company's stockholders approved an amendment to the 2019 Plan to increase the number of shares of the Company's common stock authorized for issuance under the 2019 Plan by 7.5 million shares.

Under the 2019 Plan, the Company may grant awards aggregating up to 14.5 million shares of common stock (subject to adjustment in the event of stock splits and other similar events), plus 5.1 million shares of common stock that remained available for issuance under the Company's Amended and Restated Stock Incentive Plan (the "2007 Plan") on June 5, 2019, plus any shares covered by awards under the 2007 Plan (or the Company's other prior equity compensation plans) that again become available for grant pursuant to the provisions of the 2007 Plan. The 2019 Plan provides for the grant of options to purchase the Company's common stock ("stock options"), stock appreciation rights ("SARs"), restricted stock awards ("RSAs"), performance-based stock awards ("PSAs"), restricted stock units ("RSUs"), performance-based stock units ("PSUs") and other stock- or cash-based awards. Awards can be granted under the 2019 Plan to the Company's employees, officers and non-employee directors, as well as consultants and advisors of the Company and its subsidiaries. At December 31, 2021, there were 3,985,451 shares available for future issuance under the 2019 Plan.

2007 Plan

The Company's 2007 Plan provided for the award of stock options, SARs, RSAs, RSUs, PSAs, PSUs and other stock-based awards to employees, officers, non-employee directors, consultants and advisors of the Company and its subsidiaries. On and following June 5, 2019, with the exception of shares underlying awards outstanding as of that date, no additional shares may be granted under the 2007 Plan.

2002 Stock Option Plan

In connection with the Edgewater Acquisition, the Company assumed Edgewater's Amended and Restated 2002 Stock Option Plan, converted all then-outstanding options to purchase Edgewater common stock (the "Assumed Options") to Ribbon stock options (the "Ribbon Replacement Options"), and subsequently renamed it the 2002 Stock Option Plan (the "2002 Plan"). The Ribbon Replacement Options are vesting under the same schedules as the respective Edgewater Options. The fair values of the Assumed Options were estimated using a Black-Scholes option pricing model. The Company recorded $0.7 million as additional purchase consideration for the fair value of the Assumed Options. The fair value of the Ribbon Replacement Options attributable to future service totaled $1.0 million, which will be fully expensed in 2022. At December 31, 2021, there were 105,495 shares available for future grant as stock options.

2012 Stock Incentive Plan

In connection with the acquisition of Performance Technologies, Inc. ("PT"), the Company assumed PT's 2012 Amended Performance Technologies, Incorporated Omnibus Incentive Plan, and subsequently renamed it the 2012 Stock Incentive Plan (the "2012 Plan"). In December 2014, all of the unissued shares under the 2012 Plan were transferred to the 2007 Plan. Any outstanding awards under the 2012 Plan that in the future expire, terminate, are canceled, surrendered or forfeited, or are repurchased by the Company will be returned to the 2019 Plan. Accordingly, at December 31, 2021 there were no shares available for future issuance under the 2012 Plan.

2008 Stock Incentive Plan

In connection with the acquisition of Network Equipment Technologies, Inc. ("NET"), the Company assumed NET's 2008 Equity Incentive Plan and subsequently renamed it the 2008 Stock Incentive Plan (the "2008 Plan"). In December 2014, all of the unissued shares under the 2008 Plan were transferred to the 2007 Plan. Any outstanding awards under the 2008 Plan that in the future expire, terminate, are canceled, surrendered or forfeited, or are repurchased by the Company will be returned to the 2019 Plan. Accordingly, at December 31, 2021 there were no shares available for future issuance under the 2008 Plan.

Executive Equity Arrangements

Inducement Awards

In connection with his appointment as President and Chief Executive Officer of Ribbon, and as an inducement for Bruce McClelland's ("Mr. McClelland") commencement of employment, the Company awarded Mr. McClelland sign-on equity grants, comprised of 462,963 RSUs and a PSU grant with both market service conditions (the "Inducement PSUs") on March 16, 2020. The RSUs vested and were released to Mr. McClelland on March 16, 2021. Subject to Mr. McClelland's continued employment, the Inducement PSUs are eligible to vest and be settled in up to 4,750,000 shares of Ribbon common stock upon the achievement of specified share price thresholds on or prior to September 1, 2024. The first share price threshold for Mr. McClelland's Inducement PSUs was achieved on February 26, 2021, and accordingly, 1,333,333 shares were released to him. These releases are included in the applicable tables below.

Performance-Based Stock Grants

In addition to granting RSAs and RSUs and the aforementioned Inducement PSUs, to its executives and certain of its employees, the Company also grants PSUs to certain of its executives.

PSU Grants. In 2021, 2020 and 2019, the Company granted certain of its executives (the "2021 PSUs", "2020 PSUs" and "2019 PSUs", respectively), of which 60% of each executive's PSU grant had both performance service conditions (the "Performance PSUs") and 40% had both market and service conditions (the "Market PSUs").

Each executive's Performance PSU grant is comprised of three consecutive fiscal year performance periods beginning in the year of grant (each, a "Fiscal Year Performance Period"), with one-third of the Performance PSUs attributable to each Fiscal Year Performance Period. The number of shares that will be vest for each Fiscal Year Performance Period, if any, will be based on the achievement of certain metrics related to the Company's financial performance for the applicable year on a standalone basis (each, a "Fiscal Year Performance Condition"). The Company's achievement of the goals for each Fiscal Year Performance Condition (and the number of shares of Company common stock to vest as a result thereof) are being measured on a linear sliding scale in relation to specific threshold, target and stretch performance conditions, with any shares earned vesting in the first quarter of the fiscal year following the third Performance Period of the grant, pending each executive's continued employment with the Company through that date. The number of shares of common stock underlying the Performance PSUs that can be earned will in no event exceed 200% of the Performance PSUs. Shares subject to the Performance PSUs that fail to be earned will be forfeited.

The Market PSUs have one three-year performance period, beginning January 1 in the year of grant and ending on December 31, three years thereafter (the "Market Performance Period"). The number of shares subject to the Market PSUs that will vest, if any, will be dependent upon the Company's total shareholder return ("TSR") compared with the TSR of the companies included in the Nasdaq Telecommunications Index for the applicable Market Performance Period, measured by the Compensation Committee after the Market Performance Period ends, with any shares earned vesting in the first quarter of the fiscal year following the respective Market Performance Period, pending each executive's continued employment with the Company through that date. The number of shares of common stock underlying the Market PSUs that can be earned will in no event exceed 200% of the Market PSUs. Shares subject to the Market PSUs that fail to be earned will be forfeited.

In addition, in connection with his appointment as Executive Vice President and General Manager, Packet Optical Networking, the Company granted Sam Bucci 133,333 PSUs (the "Bucci Stock Price PSUs") with both market and service conditions. Subject to Mr. Bucci's continued employment, the Bucci Stock Price PSUs were eligible to vest and be settled in shares of Ribbon common stock upon the achievement of a specific share price threshold on or prior to January 31, 2022. The price share threshold was met on February 12, 2021 and the shares vested and were released on February 15, 2021. This release is included in the applicable table below.

2021 PSUs. In the year ended December 31, 2021, the Company granted certain of its executives an aggregate of 684,425 PSUs, of which 341,359 PSUs had both performance and service conditions (the "2020 Performance PSUs"), 227,571 PSUs had both market and service conditions (the "2021 Market PSUs"), and 115,495 PSUs had both revenue performance and service conditions (the "2021 Revenue PSUs"). The three Fiscal Year Performance Periods for the 2021 Performance PSUs are the years ended December 31, 2021, 2022 and 2023 (respectively, the "2021 Performance Period", "2022 Performance Period" and "2023 Performance Period"). The 2021 Revenue PSUs had a one-year performance period, the year ended December 31, 2021, and shares earned, if any, will vest on March 15, 2022.

2020 PSUs. In 2020, the Company granted certain of its executives an aggregate of 823,369 PSUs, of which 494,020 PSUs had both performance and service conditions (the “2020 Performance PSUs”) and 329,349 had both market and service conditions (the “2020 Market PSUs”). The three Fiscal Year Performance Periods for the 2020 Performance PSUs are the years ended December 31, 2020, 2021 and 2022 (respectively, the “2020 Performance Period”, “2021 Performance Period” and “2022 Performance Period”).

2019 PSUs. In March and April 2019, the Company granted certain of its executives an aggregate of 872,073 PSUs, of which 523,244 PSUs had both performance and service conditions (the "Performance PSUs") and 348,829 PSUs had both market and service conditions (the "Market PSUs"). The three Fiscal Year Performance Periods for the 2019 Performance PSUs are the years ended December 31, 2019, 2020 and 2021 (respectively, the “2019 Performance Period”, “2020 Performance Period” and “2021 Performance Period”). In the third quarter of 2019, the Company adjusted the goals for the 2019 Performance Period to reflect the changes to the Company's calculation of certain metrics. There was no incremental expense in connection with this modification.

At December 31, 2021, the Company determined that the grant date criteria for the 2022 Performance Period and 2023 Performance Period had not been met, as the goals for these performance periods had not been established by the Company. Accordingly, no expense has been recorded related to these performance periods.

Accounting for Performance PSUs. Once the grant date criteria have been met for a Fiscal Year Performance Period, the Company records stock-based compensation expense for the respective shares underlying the PSUs based on its assessment of the probability that the respective performance condition will be achieved and the level, if any, of such achievement. The Compensation Committee determines the number of shares earned, if any, after the Company's financial results for each Fiscal Year Performance Period are finalized. Upon the determination by the Compensation Committee of the number of shares that will be received upon vesting of the related Performance PSUs, such number of shares becomes fixed and the unamortized expense is recorded through the remainder of the service period, at which time such Performance PSUs earned, if any, will vest, pending each executive's continued employment with the Company through that date.

Accounting for Market PSUs. PSUs that include a market condition require the use of a Monte Carlo simulation approach to model future stock price movements based upon the risk-free rate of return, the volatility of each entity and the pair-wise covariance between each entity. These results are then used to calculate the grant date fair values of the respective PSUs. The Company is required to record expense for the PSUs with market conditions through their respective final vesting dates regardless of the number of shares that are ultimately earned.

Employee Bonus Program

For the year ended December 31, 2021, the Company added an equity component to its cash bonus program for eligible employees, under which RSUs with a grant date fair value equal to 50% of each employee's target cash bonus were granted to each such employee ("Bonus RSUs"). Correspondingly, cash target bonuses for eligible employees were reduced by 50%. The Company implemented this program to expand the opportunities for stock ownership more broadly throughout the Company. The Bonus RSUs will vest over three years, with the final vest occurring on March 15, 2024. The Bonus RSU grants are included in the applicable table below.

Accelerated Vesting of Stock Units

In connection with the separation of several executives from the Company in the years ended December 31, 2021, 2020 and 2019, the Company accelerated the vesting of certain of their outstanding RSUs and PSUs in accordance with their respective terms of employment with the Company. At December 31, 2021, there was the potential for a portion of certain other PSUs aggregating approximately 40,000 shares to be released to two of these former executives on a pro rata basis subject to achievement of the related performance or market conditions for the performance periods through their respective 2021 separation dates.

Stock Options

The Company has not granted stock options since 2017. Outstanding stock options granted under the Company's plans expire either seven or ten years from the date of grant. The grant date fair value of stock options, adjusted for estimated forfeitures, is recognized as expense on a straight-line basis over the requisite service period, which is generally the vesting period. Forfeitures are estimated based on historical experience.

The activity related to the Company's outstanding stock options during the year ended December 31, 2021 was as follows:

	Number of Shares	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (years)	Aggregate Intrinsic Value (in thousands)
Outstanding at January 1, 2021	207,710	$ 12.69		
Exercised	(13,815)	$ 1.76		
Expired	(9,726)	$ 17.60		
Outstanding at December 31, 2021	184,169	$ 13.25	2.59	$ 174
Vested or expected to vest at December 31, 2021	184,169	$ 13.25	2.59	$ 174
Exercisable at December 31, 2021	184,134	$ 13.26	2.59	$ 174

The total intrinsic values of options exercised were $0.1 million for the year ended December 31, 2021, $0.1 million for the year ended December 31, 2020 and $0.5 million for the year ended December 31, 2019.

The Company received cash from option exercises of approximately $24,000 in the year ended December 31, 2021, $0.1 million in the year ended December 31, 2020 and $0.2 million in the year ended December 31, 2019.

Restricted Stock Grants - Restricted Stock Awards and Restricted Stock Units

The Company's outstanding restricted stock grants consist of both RSAs and RSUs. Holders of unvested RSAs have voting rights and rights to receive dividends, if declared; however, these rights are forfeited if the underlying unvested RSA shares are forfeited. Holders of unvested RSUs do not have such voting and dividend rights. The grant date fair value of restricted stock grants, adjusted for estimated forfeitures, is recognized as expense on a straight-line basis over the requisite service period. The fair value of restricted stock grants is determined based on the market value of the Company's shares on the date of grant.

The activity related to the Company's RSAs for the year ended December 31, 2021 was as follows:

	Shares	Weighted Average Grant Date Fair Value
Unvested balance at January 1, 2021	86,983	$ 7.04
Vested	(86,983)	$ 7.04
Unvested balance at December 31, 2021	—	$ —

The activity related to the Company's RSUs for the year ended December 31, 2021 was as follows:

	Shares	Weighted Average Grant Date Fair Value
Unvested balance at January 1, 2021	6,531,110	$ 3.32
Granted	3,268,789	$ 8.44
Vested	(3,566,569)	$ 3.32
Forfeited	(843,719)	$ 4.76
Unvested balance at December 31, 2021	5,389,611	$ 6.19

The total grant date fair value of vested restricted stock grant shares was $12.5 million in the year ended December 31, 2021, $11.2 million in the year ended December 31, 2020 and $9.9 million in the year ended December 31, 2019.

Performance-Based Stock Units

Holders of unvested PSUs do not have voting and dividend rights. The Company recognizes stock-based compensation expense for PSUs without market conditions on a straight-line basis, with the amount recorded based upon the expected level of achievement as of each period-end, recording cumulative adjustments in the period when the expected level of achievement changes. The Company recognizes the grant date fair value of PSUs on a graded attribution basis through the vest date of the respective awards so long as it remains probable that the related service conditions will be satisfied.

The activity related to the Company's PSUs for the year ended December 31, 2021 was as follows:

	Shares	Weighted Average Grant Date Fair Value
Unvested balance at January 1, 2021	6,035,931	$ 1.56
Granted	701,208	$ 10.11
Vested	(1,557,656)	$ 1.08
Forfeited	(191,607)	$ 6.11
Unvested balance at December 31, 2021	4,987,876	$ 2.87

The total grant date fair value of vested performance-based stock grant shares was $1.7 million in the year ended December 31, 2021, $1.8 million in the year ended December 31, 2020 and $0.1 million in the year ended December 31, 2019.

Stock-Based Compensation

The consolidated statements of operations included stock-based compensation for the years ended December 31, 2021, 2020 and 2019 as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Product cost of revenue	$ 313	$ 174	$ 76
Service cost of revenue	1,684	701	478
Research and development	4,253	2,968	1,898
Sales and marketing	7,218	4,129	3,028
General and administrative	5,950	5,927	7,121
	$ 19,418	$ 13,899	$ 12,601

There was an income tax benefit for employee stock-based compensation expense for the years ended December 31, 2021 and 2020. There was no income tax benefit for the year ended December 31, 2019 due to the valuation allowance recorded.

At December 31, 2021, there was $25.4 million, net of expected forfeitures, of unrecognized stock-based compensation expense related to unvested stock options, RSUs and PSUs. This expense is expected to be recognized over a weighted average period of approximately two years.

Common Stock Reserved

At December 31, 2021, there were 4,090,946 total shares of common stock reserved for future issuance under the Company's equity plans. However, of that amount 105,495 shares are only authorized for issuance as stock options. The Company's policy is to issue authorized but unissued shares upon the exercise of stock options, to grant restricted common stock, to settle restricted stock units and performance-based stock units.

(21) LEASES

The Company has operating and finance leases for corporate offices, research and development facilities, and certain equipment. Operating leases are reported separately in the Company's consolidated balance sheet at December 31, 2021 and 2020. Assets acquired under finance leases are included in Property and equipment, net, in the consolidated balance sheets at December 31, 2021 and 2020.

The Company determines if an arrangement is a lease at inception. A contract is determined to contain a lease component if the arrangement provides the Company with a right to control the use of an identified asset. Lease agreements may include lease and non-lease components. In such instances for all classes of underlying assets, the Company does not separate lease and non-lease components but rather, accounts for the entire arrangement under leasing guidance. Leases with an initial term of 12 months or less are not recorded on the balance sheet and lease expense for these leases is recognized on a straight-line basis over the lease term.

Right-of-use assets and lease liabilities are initially measured based on the present value of the future minimum fixed lease payments (i.e., fixed payments in the lease contract) over the lease term at the commencement date. As the Company's existing leases do not have a readily determinable implicit rate, the Company uses its incremental borrowing rate based on the information available at the commencement date in determining the present value of future minimum fixed lease payments. The Company calculates its incremental borrowing rate to reflect the interest rate that it would have to pay to borrow on a collateralized basis an amount equal to the lease payments in a similar economic environment over a similar term and considers its historical borrowing activities and market data from entities with comparable credit ratings in this determination. The measurement of the right-of-use asset also includes any lease payments made prior to the commencement date (excluding any lease incentives) and initial direct costs incurred. The Company assessed its right-of-use assets for impairment as of December 31, 2021 and 2020 and determined no impairment had occurred.

Lease terms may include options to extend or terminate the lease and the Company incorporates such options in the lease term when it has the unilateral right to make such an election and it is reasonably certain that the Company will exercise that option. In making this determination, the Company considers its prior renewal and termination history and planned usage of the assets under lease, incorporating expected market conditions.

For operating leases, lease expense for minimum fixed lease payments is recognized on a straight-line basis over the lease term. The expense for finance leases includes both interest and amortization expense components, with the interest component calculated based on the effective interest method and the amortization component calculated based on straight-line amortization of the right-of-use asset over the lease term. Lease contracts may contain variable lease costs, such as common area maintenance, utilities and tax reimbursements that vary over the term of the contract. Variable lease costs are not included in minimum fixed lease payments and as a result, are excluded from the measurement of the right-of-use assets and lease liabilities. The Company expenses all variable lease costs as incurred.

In connection with the 2020 Restructuring Initiative, the Company accelerated amortization totaling $0.8 million in the year ended December 31, 2021 for leased facilities that were vacated in 2021 as part of the consolidation of certain sites following the ECI Acquisition. The Company did not record estimated future variable lease costs in the year ended December 31, 2021 related to the 2020 Restructuring Initiative. The Company did not record any accelerated amortization or estimated future variable lease costs in the year ended December 31, 2020 related to the 2020 Restructuring Initiative.

In connection with the 2019 Restructuring Initiative, certain lease assets related to facilities are being partially or fully vacated as the Company consolidates its facilities. The Company has no plans to enter into sublease agreements for certain facilities. The Company accelerated amortization of $3.4 million, $0.6 million and $3.7 million in the years ended December 31, 2021, 2020 and 2019, respectively, for leased facilities that were vacated in the respective years. The Company also recorded liabilities aggregating $1.4 million and $0.9 million in the years ended December 31, 2021 and 2019, respectively, for all future estimated variable lease costs related to these facilities. The Company did not record liabilities for future estimated variable lease costs in the year ended December 31, 2020. This incremental accelerated amortization and accrual for all estimated future variable lease costs are included in Restructuring and related expense in the Company's consolidated statements of operations for the years ended December 31, 2021, 2020 and 2019. At December 31, 2021 and 2020, the Company had accruals of $1.6 million and $0.8 million, respectively, for all future anticipated variable lease costs related to these facilities. The Company may incur additional future expense if it is unable to sublease other locations included in the Facilities Initiative. In addition, in the year ended December 31, 2021, this accelerated amortization and provision for future estimated variable lease costs was partially offset by the recognition of $2.1 million of income in conjunction with lease amendments that modified the Company's obligation and rentable square footage at a site in North Carolina.

The Company leases its corporate offices and other facilities under operating leases, which expire at various times through 2032. In December 2020, the Company began relocating from its former leased Plano, Texas facility to its new leased facility on Chase Oaks Boulevard, also located in Plano, Texas. The Company's relocation to the new corporate headquarters was completed in the first quarter of 2021.

The Company's right-of-use lease assets and lease liabilities at December 31, 2021 and 2020 were as follows (in thousands):

	Classification	December 31, 2021	December 31, 2020
Assets:			
Operating lease assets	Operating lease right-of-use assets	$ 53,147	$ 69,757
Finance lease assets*	Property and equipment, net	287	983
Total leased assets		$ 53,434	$ 70,740
Liabilities:			
Current:			
Operating	Operating lease liabilities	$ 17,403	$ 17,023
Finance	Accrued expenses and other	503	902
Noncurrent:			
Operating	Operating lease liabilities, net of current	55,196	72,614
Finance	Other long-term liabilities	64	568
Total lease liabilities		$ 73,166	$ 91,107

* Finance lease assets were recorded net of accumulated depreciation of $1.8 million and $1.9 million at December 31, 2021 and December 31, 2020, respectively.

The components of lease expense for the years ended December 31, 2021, 2020 and 2019 were as follows (in thousands):

	Year ended December 31, 2021	2020	2019
Operating lease cost*	$ 21,828	$ 19,582	$ 13,865
Finance lease cost:			
Amortization of leased assets	695	1,200	1,106
Interest on lease liabilities	67	173	265
Short-term lease cost	13,250	20,687	19,460
Variable lease costs (costs excluded from minimum fixed lease payments)**	4,030	2,713	3,264
Sublease income	(1,496)	(1,087)	(374)
Net lease cost	$ 38,374	$ 43,268	$ 37,586

* Operating lease costs for the years ended December 31, 2021, 2020 and 2019 include $3.4 million, $0.6 million, and $3.7 million, respectively, of accelerated amortization for certain assets partially or fully vacated with no intent or ability to sublease. Operating lease cost for the year ended December 31, 2021 also includes $2.1 million of income related to a lease modification for one of these assets.

** Variable lease costs for the years ended December 31, 2021 and 2019 included accruals of $1.4 million and $0.9 million, respectively, for all future estimated variable expenses related to certain assets partially or fully vacated with no intent or ability to sublease. No such variable costs were accrued in the year ended December 31, 2020.

Cash flow information related to the Company's leases for the years ended December 31, 2021 and 2020 was as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Cash paid for amounts included in the measurement of lease liabilities:			
Operating cash flows from operating leases	$ 22,365	$ 19,161	10,559
Operating cash flows from finance leases	$ 67	$ 173	265
Financing cash flows from finance leases	$ 903	$ 1,279	913

Other information related to the Company's leases as of December 31, 2021 and 2020 was as follows (in thousands):

	December 31,	
	2021	2020
Weighted average remaining lease term (years):		
Operating leases	6.25	6.59
Finance leases	1.00	1.70
Weighted average discount rate:		
Operating leases	5.61 %	5.67 %
Finance leases	4.15 %	6.15 %

Future minimum fixed lease payments under noncancelable leases at December 31, 2021 were as follows (in thousands):

	December 31, 2021	
	Operating leases	Finance leases
2022	$ 20,729	$ 517
2023	17,970	63
2024	10,503	—
2025	7,593	—
2026	6,543	—
2027 and beyond	24,477	—
Total lease payments	87,815	580
Less: interest	(15,216)	(13)
Present value of lease liabilities	$ 72,599	$ 567

(22) EMPLOYEE DEFINED CONTRIBUTION PLANS

The Company offers 401(k) savings plans to eligible employees. The Company matches 50% of each employee's contributions to the 401(k) program up to 4% of the employee's eligible earnings, for a maximum match of 2% of eligible earnings.

The Company recorded expense related to its employee defined contribution plans aggregating $3.5 million, $3.4 million and $4.0 million in the years ended December 31, 2021, 2020 and 2019, respectively.

(23) NON-U.S. EMPLOYEE DEFINED BENEFIT PLANS

The Company has defined benefit retirement plans that cover certain employees at various international locations. The Company's policy is to contribute amounts at least sufficient to satisfy the minimum amount required by applicable law and regulations or to directly pay benefits where appropriate. Benefits under the defined benefit plans are typically based either on years of service and the employee's compensation (generally during a fixed number of years immediately before retirement) or on annual credits. The range of assumptions that are used for these non-U.S. defined benefit plans reflect the different economic environments within the various countries.

In the year ended December 31, 2020, the Company assumed ECI's defined benefit plans in connection with the ECI Acquisition. These plans exist in several international locations where severance pay is either required by law for voluntary terminations or upon reaching a statutory retirement age. The Company adopted ECI's policy to fund notional accounts each month in the name of each employee to satisfy not only the severance amounts required by the applicable laws and regulations in certain countries, but also to satisfy severance for other types of terminations not necessarily required by law, but paid in accordance with company policy. Benefits funded and paid under these plans are based upon years of service and the employees' current compensation. At the ECI Acquisition Date, ECI accounted for these plans under the shutdown approach allowed under ASC 715, *Compensation - Retirement Benefits (Topic 715)* ("ASC 715"). Beginning December 31, 2020, in order to be consistent with the accounting methodology utilized for Ribbon's other defined benefit plans, the Company began to account for the ECI assumed plans using the actuarial cost approach, which is also allowed under ASC 715 for these types of plans. The range of assumptions that are utilized for these plans reflects the different economic environments within each country where such severance indemnities are required.

In 2020, regulatory changes occurred in the Netherlands that changed the Company's defined benefit pension plan there from a participating plan to a non-participating plan. This plan amendment triggered settlement accounting, resulting in a gain of $1.6 million, which is included in Other (expense) income, net, in the Company's consolidated statement of operations for the year ended December 31, 2020. Prior to the amendment, the Company's Netherlands pension plan provided defined benefit accruals which were financed by insurance contracts that had a profit sharing feature. The pension benefits accrued were subject to future increases based on final earnings at the end of employment (the final average earnings formula). With the amendment in 2020, the final average earnings formula was frozen and the insurance contracts were converted to fully paid contracts. Following the amendment, pension accruals are now based upon a new formula that only considers current earnings (the career earnings formula) with the benefits still financed through insurance contracts. Ribbon has no further liability for pension benefits earned prior to the amendment as they are fully paid contracts. In addition, the insurance contract for the new benefit accruals has no profit sharing feature. Therefore, Ribbon has no current or future obligation to pay pension benefits promised in the Netherlands beyond the payment of premiums to the insurance company.

During the year ended December 31, 2019, in conjunction with the 2019 Restructuring Initiative, there were reductions in force that significantly reduced benefits that can be earned under the plan in one of our international locations that resulted in an immaterial curtailment loss. Settlement accounting was triggered in the year ended December 31, 2019 related to a reduction in force in one of the Company's locations in 2018, resulting in an immaterial settlement gain.

A reconciliation of the changes in the benefit obligations and fair value of the assets of the defined benefit plans for the years ended December 31, 2021 and 2020, the funded status of the plans, and the amounts recognized in the consolidated balance sheets as of December 31, 2021 and 2020 were as follows (in thousands):

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	Year ended December 31,	
	2021	2020
Changes in projected benefit obligations:		
Projected benefit obligation, beginning of year	$ 25,067	$ 11,784
Business combination	—	17,963
Service cost	1,321	1,459
Interest cost	523	46
Participant contributions	—	—
Plan amendments	(3,801)	(4,440)
Benefits and expenses paid	(1,040)	(1,976)
Net actuarial loss on obligation	4,868	231
Projected benefit obligation, end of year	$ 26,938	$ 25,067
Changes in plan assets:		
Fair value of plan assets, beginning of year	$ 14,350	$ 1,830
Business combination	—	13,188
Actual return on plan assets	981	1,077
Plan amendments	—	(588)
Employer contributions	989	798
Participant contributions	23	21
Benefits paid	(1,040)	(1,976)
Fair value of plan assets, end of year	$ 15,303	$ 14,350
Funded status at end of year	$ (11,635)	$ (10,717)
Amounts recognized in accumulated other comprehensive loss consist of:		
Net actuarial loss	$ (4,045)	$ (102)
Amounts recognized in the consolidated balance sheets consist of:		
Accrued expenses and other (current pension liability)	$ (461)	$ (435)
Other long-term liabilities (non-current pension liability)	(11,174)	(10,282)
Net amount recognized	$ (11,635)	$ (10,717)

The increase in the underfunded status of the Company's defined benefit plans at December 31, 2021 compared to December 31, 2020 was primarily the result of the larger net actuarial loss in the current year, partially offset by lower benefit payments.

Plans with underfunded or non-funded accumulated benefit obligations at December 31, 2021 and 2020 were as follows (in thousands):

	December 31,	
	2021	2020
Aggregate projected benefit obligation	$ 26,938	$ 25,067
Aggregate accumulated benefit obligation	$ 20,695	$ 20,746
Aggregate fair value of plan assets	$ 15,303	$ 14,350

Net periodic benefit costs for the years ended December 31, 2021, 2020 and 2019 were as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Service cost	$ 1,321	$ 1,459	$ 335
Interest cost	523	46	140
Expected return on plan assets	(314)	(343)	(14)
Plan asset expenses	—	20	21
Curtailment charge (credit)	—	—	13
Settlement (credit) charge	—	(1,557)	115
Amortization of net loss	81	—	—
Net periodic benefit costs	$ 1,611	$ (375)	$ 610

The Company made benefit payments of $1.0 million, $2.0 million and $0.7 million in the years ended December 31, 2021, 2020 and 2019, respectively. These benefit payments included $0.7 million of one-time lump sum payments to participants in the year ended December 31, 2019. No one-time lump sum payments were made to participants in the years ended December 31, 2021 and 2020. Expected benefit payments for the next ten years are as follows (in thousands):

Years ending December 31,	
2022	$ 2,644
2023	1,465
2024	1,230
2025	1,498
2026	1,235
2027 to 2031	10,673
	$ 18,745

The changes in plan assets and benefit obligations recognized in other comprehensive income (loss) before tax for the years ended December 31, 2021, 2020 and 2019 were as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Net (gain) loss	$ 4,045	$ (558)	$ 2,526
Settlement gain	—	(1,557)	—
Total recognized in comprehensive income (loss)	$ 4,045	$ (2,115)	$ 2,526

The Company defers all actuarial gains and losses resulting from variances between actual results and economic estimates or actuarial assumptions. The unrecognized actuarial gains and losses are recorded as unrealized pension actuarial gains (losses) in the Company's consolidated balance sheets as a component of Accumulated other comprehensive income. These unrecognized gains and losses are amortized as a component of net periodic benefit cost when the net gains and losses exceed 10% of the greater of the market value of plan assets or the projected benefit obligation at the beginning of the year. Amortization of the amount included in Accumulated other comprehensive income into net periodic benefit cost is expected to total $0.1 million for the year ended December 31, 2022.

The principal weighted average assumptions used to determine the benefit obligation at December 31, 2021 and 2020 were as follows:

	December 31,	
	2021	2020
Discount rate	2.24 %	2.16 %
Rate of compensation increase	3.90 %	2.41 %

The principal weighted average assumptions used to determine net period benefit cost for the years ended December 31, 2021, 2020 and 2019 were as follows:

	Year ended December 31,		
	2021	2020	2019
Discount rate	2.16 %	0.68 %	1.30 %
Expected long-term return on plan assets	2.06 %	0.21 %	1.12 %
Rate of compensation increase	2.41 %	2.88 %	2.83 %

Assumed discount rates are used in the measurement of the projected and accumulated benefit obligations, as well as the service and interest cost components of net periodic pension cost. Estimated discount rates reflect the rates at which the pension benefits could be effectively settled. For each defined benefit plan, the Company chooses an estimated discount rate from a readily available market index rate, based upon high-quality fixed income investments, specific to the country or economic zone in which the benefits are paid and taking into account the duration of the plan and the number of participants.

The Company's plans in both the Netherlands and Switzerland are funded through insurance contracts, which have historically provided guaranteed interest credit. The fair value of these contracts is derived from the insurance companies' assessment of the minimum value of the benefits provided by the insurance contracts. The methodology used to value these plan assets has always assumed that the value of the plan assets equals the guaranteed insured benefits. For consistency, the same discount rate used in the valuation of the benefit obligations is used to place a value on the plan assets. The assets are assumed to grow each year in line with the discount rate, and therefore, the expected return on the assets is set equal to the discount rate. The fair value of the plan assets in Switzerland was $1.7 million at December 31, 2021 and $1.6 million at December 31, 2020. Due to the plan amendment in 2020 that changed the benefit structure of the Netherlands plan, the Company no longer has any obligation related to this plan beyond the payment of insurance premiums. Therefore, there is no projected benefit obligation and no plan assets in the Netherlands as of December 31, 2020. Plan assets for the Netherlands plan totaled $0.6 million at December 31, 2019. The Company classifies the fair value of its plan assets as Level 2 in the fair value hierarchy as discussed in Note 6.

During the years ended December 31, 2021, 2020 and 2019, employees in the Netherlands and Switzerland made contributions to the respective pension plans aggregating $23,000, $21,000 and $24,000, respectively. Employee contributions to these plans are based on a fixed 5% of the relevant pensionable earnings. The Company funds these plans by contributing at least the minimum amount required by applicable regulations and as recommended by an independent actuary. During the years ended December 31, 2021, 2020 and 2019, the Company contributed $1.0 million, $0.8 million and $0.1 million, respectively, to its pension plans. The Company expects to contribute $1.2 million to its defined benefit plans in 2022.

(24) INCOME TAXES

The components of (loss) income from continuing operations before income taxes consisted of the following (in thousands):

	Year ended December 31,		
	2021	2020	2019
(Loss) income before income taxes:			
United States	$ (29,985)	$ 123,817	$ (132,887)
Foreign	(178,158)	(30,500)	9,994
	$ (208,143)	$ 93,317	$ (122,893)

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The (benefit) provision for income taxes from continuing operations consisted of the following (in thousands):

	Year ended December 31,		
	2021	2020	2019
(Benefit) provision for income taxes:			
Current:			
Federal	$ 5,033	$ 677	$ 11
State	1,836	1,310	128
Foreign	7,661	7,355	1,744
Total current	14,530	9,342	1,883
Deferred:			
Federal	1,700	30,278	9,790
State	1,444	195	1,630
Foreign	(23,484)	(16,117)	383
Change in valuation allowance	(25,148)	(18,972)	(6,504)
Total deferred	(45,488)	(4,616)	5,299
Total	$ (30,958)	$ 4,726	$ 7,182

A reconciliation of the Company's effective tax rate for continuing operations to the statutory federal rate is as follows:

	Year ended December 31,		
	2021	2020	2019
U.S. statutory income tax rate	21.0 %	21.0 %	21.0 %
State income taxes, net of federal benefit	(0.7)	1.1	(0.2)
Foreign income taxes	(1.4)	2.9	(1.0)
Foreign deemed dividends	1.9	(2.7)	(0.4)
Stock-based compensation	—	1.0	(0.7)
Tax credits	1.6	(2.8)	2.8
Uncertain tax positions	0.5	0.5	(0.2)
Valuation allowance	2.5	(20.3)	(0.7)
Goodwill amortization	—	0.6	0.4
Tax reform	—	—	(0.1)
Goodwill impairment	(11.7)	—	(25.4)
Other permanent adjustments	0.9	1.8	(1.5)
Permanent adjustments - foreign exchange	0.5	1.8	—
Other, net	(0.2)	0.2	0.2
Effective income tax rate	14.9 %	5.1 %	(5.8)%

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The following is a summary of the significant components of deferred income tax assets and liabilities (in thousands):

	December 31, 2021	December 31, 2020
Assets:		
Net operating loss carryforwards	$ 437,669	$ 447,101
Capital loss carryforward	79,716	71,182
Research and development and other tax credits	41,556	51,431
Deferred revenue	3,472	3,184
Accrued expenses	7,505	13,557
Inventory	3,102	2,603
Stock-based compensation	1,689	1,668
Fixed assets	2,710	4,613
Lease liabilities	15,250	—
Mark-to-market investments	1,714	—
Other temporary differences	3,839	4,051
	598,222	599,390
Valuation allowance	(471,515)	(496,439)
Total deferred tax assets	126,707	102,951
Liabilities:		
Intangible assets	(65,647)	(75,794)
Operating lease right-of-use assets	(10,370)	—
Mark-to-market investments	—	(17,631)
Unremitted foreign income	(11,519)	(15,717)
Total deferred tax liabilities	(87,536)	(109,142)
Total net deferred tax assets	$ 39,171	$ (6,191)

The deferred tax assets and liabilities based on tax jurisdictions are presented in the Company's consolidated balance sheets as follows:

	December 31, 2021	December 31, 2020
Deferred income taxes - noncurrent assets	$ 47,287	$ 10,651
Deferred income taxes - noncurrent liabilities	(8,116)	(16,842)
	$ 39,171	$ (6,191)

The largest changes in the year ended December 31, 2021 compared to the year ended December 31, 2020 include an increase in recognized U.S. deferred tax assets due to a release of a portion of the valuation allowances, as well as a change in mark-to-market securities related to the AVCT Investment.

At December 31, 2021, the Company had cumulative net operating losses ("NOLs") in the U.S. of $224.6 million. The Company, through the ECI Acquisition, also has $1.6 billion of Israel NOLs. The U.S. NOL carryforwards expire at various dates from 2022 through 2037. The Israel NOLs do not expire.

The Company also has available federal, state and foreign income tax credit carryforwards of $23.4 million that expire in various periods.

The Company has provided for income taxes on the undistributed earnings of its non-U.S. subsidiaries as of December 31, 2021, excluding Ireland and Israel. These subsidiaries, excluding Ireland and Israel, are cost-plus or limited risk distributors that are not anticipated to need to use excess funds locally. Accordingly, the Company is required to recognize and record deferred taxes in 2021. The deferred taxes are recorded on the entire outside basis differences related to the foreign subsidiaries, the largest of these differences being undistributed earnings. Undistributed profits of Ireland and Israel, as well as other outside basis differences in foreign subsidiaries, were indefinitely reinvested in foreign operations. Quantification of the deferred tax liability, if any, associated with indefinitely reinvested earnings and outside basis differences was not practicable.

Under the provisions of the Internal Revenue Code, the net operating losses and tax credit carryforwards are subject to review and possible adjustment by the Internal Revenue Service. Net operating losses and tax credit carryforwards may become subject to an annual limitation in the event of certain cumulative changes in the ownership of significant shareholders over a three-year period in excess of 50%, as defined under Sections 382 and 383 of the Internal Revenue Code, as well as a similar state provision. As a result of the Edgewater Acquisition in 2018, the Company acquired approximately $34 million of net operating loss carryforwards and approximately $6 million of tax credit carryforwards. As a result of the ECI Acquisition, an additional $129.6 million of NOL was acquired related to the ECI U.S. subsidiary. Edgewater and ECI U.S. incurred ownership changes as a result of their acquisition by the Company, and thus the acquired net operating losses and credits are subject to limitations under IRC Sections 382 and 383.

During 2021 and 2020, the Company performed an analysis to determine if, based on all available evidence, it considered it more likely than not that some portion or all of the recorded deferred tax assets will not be realized in a future period. As a result of the Company's evaluation, the Company concluded that there was sufficient positive evidence to release a portion of the Company's valuation allowance on its U.S. federal deferred tax assets, as the Company expects to have sufficient taxable income in future periods to utilize a portion of its net operating losses. Accordingly, the Company has maintained a valuation allowance against its U.S. deferred tax asset amounting to $30.5 million at December 31, 2021 and $73.0 million at December 31, 2020. The Company also maintains a valuation allowance against certain of its foreign deferred tax assets, predominantly Israel, amounting to approximately $441 million at December 31, 2021 and $423 million at December 31, 2020. The deferred tax assets recognized with no valuation allowance at December 31, 2021 and 2020 primarily relate to other foreign subsidiaries where recoverability is concluded to be more likely than not based on the Company's cost-plus compensation policy, as well as net operating losses and credits in the U.S. that are expected to be utilized prior to expiration.

A reconciliation of the Company's unrecognized tax benefits is as follows (in thousands):

	Year ended December 31,		
	2021	2020	2019
Unrecognized tax benefits at January 1	$ 14,054	$ 2,932	$ 3,461
Increases related to current year tax positions	4,017	485	292
Increases related to prior period tax positions	3,168	11,209	—
Decreases related to prior period tax positions	(3,426)	(572)	(821)
Unrecognized tax benefits at December 31	$ 17,813	$ 14,054	$ 2,932

The Company accounts for interest and penalties related to uncertain tax positions as part of its provision for income taxes. The Company had $21.0 million, $15.3 million and $3.6 million of unrecognized tax benefits, including penalties and interest, at December 31, 2021, 2020 and 2019, respectively. Of these amounts, $12.7 million, $13.9 million and $2.0 million represent the amount of unrecognized tax benefits that, if recognized, would impact the effective income tax rate for the years ended December 31, 2021, 2020 and 2019, respectively. The Company recorded liabilities for potential penalties and interest of $1.9 million, $0.5 million and $0.1 million for the years ended December 31, 2021, 2020 and 2019, respectively. The Company had $3.2 million and $1.3 million accrued in Other long-term liabilities for penalties and interest at December 31, 2021 and 2020, respectively. The Company believes that it is reasonably possible that certain tax positions related to its unrecognized tax benefits will be effectively settled within the next twelve months.

The Company and its subsidiaries file income tax returns in the U.S. federal jurisdiction as well as various state and foreign jurisdictions. Generally, the tax years 2017 through 2020 remain open to examination by the major taxing jurisdictions to which the Company is subject. The Company's federal NOLs generated prior to 2017 could be adjusted on examination even though the year in which the loss was generated is otherwise closed by the statute of limitations.

As of December 31, 2021, the Company had ongoing income tax audits in certain foreign countries. Management believes that an adequate provision has been recorded for any adjustments that may result from tax examinations.

(25) RELATED PARTIES

As a portion of the consideration for the GENBAND Merger, on October 27, 2017, the Company issued a promissory note for $22.5 million to certain of GENBAND's equity holders who, following the GENBAND Merger. As described in Note 14 above, the promissory note did not amortize and the principal thereon was payable in full on the third anniversary of its execution. Interest on the promissory note was payable quarterly in arrears and accrued at a rate of 7.5% per year for the first six months after issuance, and thereafter at a rate of 10% per year. On April 29, 2019, the Company repaid in full all outstanding amounts under the Promissory Note, aggregating $24.7 million. The Company did not incur any early termination penalties in connection with this repayment.

(26) COMMITMENTS AND CONTINGENCIES

Litigation Settlement

As previously disclosed, the Company was involved in six lawsuits (together, the "Lawsuits") with Metaswitch Networks Ltd., Metaswitch Networks Corp. and Metaswitch Inc. (collectively, "Metaswitch"). In five of the Lawsuits, the Company was the plaintiff, and in three of those five lawsuits, the Company was also a counterclaim defendant. In the sixth case, the Company was the defendant.

On April 22, 2019, the Company and Metaswitch agreed to a binding mediator's proposal that resolved the six Lawsuits between the Company and Metaswitch (the "Lawsuits"). The Company and Metaswitch signed a Settlement and Cross-License Agreement on May 29, 2019 (the "Royalty Agreement"). Pursuant to the terms of the Royalty Agreement, Metaswitch agreed to pay the Company an aggregate amount of $63.0 million, which included cash payments of $37.5 million during the second quarter of 2019 and $25.5 million payable in three installments annually, beginning June 26, 2020, with such installment payments accruing interest at a rate of 4% per year. As part of the Royalty Agreement, the Company and Metaswitch (i) have released the other from all claims and liabilities; (ii) have licensed each party's existing patent portfolio to the other party; and (iii) have requested the applicable courts to dismiss the Lawsuits. The $63.0 million gain from the settlement is included in Other (expense) income, net, in the Company's consolidated statement of operations for the year ended December 31, 2019, and had notes receivable for future payments of $25.5 million, comprised of $8.5 million in Other current assets and $17.0 million in Other assets in the consolidated balance sheet. The Company received $37.5 million of aggregate payments from Metaswitch in the second quarter of 2019 and $9.5 million, including $1.0 million of interest, in the second quarter of 2020.

On July 6, 2020, the Company and Metaswitch signed a First Supplemental Agreement to the Settlement and Cross-License Agreement (the "Supplemental Agreement") under which Metaswitch could elect to repay the outstanding amounts under the Royalty Agreement early in exchange for a reduction of $0.25 million to the outstanding principal, from $17.0 million to $16.75 million, and the payment of no further interest by Metaswitch effective June 26, 2020. The Company recorded the reduction to the outstanding principal as a reduction to interest income. On July 14, 2020, Metaswitch paid the Company the remaining outstanding balance of $16.75 million.

Contingencies

Liabilities for Royalty Payments to the IIA

Prior to the ECI Acquisition, ECI had received research and development grants from the IIA. The Company assumed ECI's contract with the IIA, which requires the Company to pay royalties to the IIA on proceeds from the sale of products which the Israeli government has supported by way of research and development grants. The royalties for grants prior to 2017 were calculated at the rates of 1.3% to 5.0% of the aggregated proceeds from the sale of such products developed at certain of the Company's R&D centers, up to an amount not exceeding 100% of such grants plus interest at LIBOR. Effective for grants approved in 2017 and thereafter, interest was calculated at the higher of LIBOR plus 1.5% to 2.75%. At December 31, 2021, the Company's maximum possible future royalties commitment, including $4.3 million of unpaid royalties accrued at December 31, 2021, was $34.2 million, including interest of $1.9 million, based on estimates of future product sales, grants received from the IIA and not yet repaid, and management's estimation of products still to be sold.

Litigation

On November 8, 2018, Ron Miller, a purported stockholder of the Company, filed a Class Action Complaint (the "Miller Complaint") in the United States District Court for the District of Massachusetts (the "Massachusetts District Court") against the Company and three of its former officers (collectively, the "Defendants"), claiming to represent a class of purchasers of

Sonus common stock during the period from January 8, 2015 through March 24, 2015 and alleging violations of the federal securities laws. Similar to a previous complaint entitled Sousa et al. vs. Sonus Networks, Inc. et al., which was dismissed with prejudice by an order dated June 6, 2017, the Miller Complaint claims that the Defendants made misleading forward-looking statements concerning Sonus' expected fiscal first quarter of 2015 financial performance, which statements were also the subject of an August 7, 2018 Securities and Exchange Commission Cease and Desist Order, whose findings the Company neither admitted nor denied. The Miller plaintiffs are seeking monetary damages.

After the Miller Complaint was filed, several parties filed and briefed motions seeking to be selected by the Massachusetts District Court to serve as a Lead Plaintiff in the action. On June 21, 2019, the Massachusetts District Court appointed a group as Lead Plaintiffs and the Lead Plaintiffs filed an amended complaint on July 19, 2019. On August 30, 2019, the Defendants filed a motion to dismiss the Miller Complaint and, on October 4, 2019, the Lead Plaintiffs filed an opposition to the motion to dismiss. The Defendants filed a reply to such opposition on November 1, 2019. There was an oral argument on the motion to dismiss on February 12, 2020, but to date, the court has not ruled on the motion.

In addition, the Company is often a party to disputes and legal proceedings that it considers routine and incidental to its business. Management does not expect the results of any of these actions to have a material effect on the Company's business or consolidated financial statements.

(27) SUBSEQUENT EVENT

On February 14, 2022, the Company's Board of Directors approved a strategic restructuring program (the "2022 Restructuring Plan") to streamline the Company's operations in order to support the Company's investment in critical growth areas. The 2022 Restructuring Plan is expected to include, among other things, charges related to a consolidation of facilities and a workforce reduction. Any potential positions eliminated in countries outside the United States will be subject to local law and consultation requirements.

The Company currently expects to record approximately $20 million of restructuring and related expense associated with the 2022 Restructuring Plan, including approximately $6 million related to employee severance arrangements and approximately $14 million related to the facilities consolidation. The Company expects the 2022 Restructuring Plan will be substantially completed in 2022.

(28) QUARTERLY RESULTS (UNAUDITED)

The following tables present the Company's quarterly operating results for the years ended December 31, 2021 and 2020. The information for each of these quarters is unaudited and has been prepared on the same basis as the audited consolidated financial statements. In the opinion of management, all necessary adjustments, consisting only of normal recurring adjustments, have been included to present fairly the unaudited consolidated quarterly results when read in conjunction with the Company's audited consolidated financial statements and related notes.

RIBBON COMMUNICATIONS INC.

Notes to Consolidated Financial Statements (Continued)

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(In thousands, except per share data)			
Year ended December 31, 2021				
Revenue	$ 192,772	$ 211,210	$ 210,398	$ 230,577
Cost of revenue (2)	92,286	92,483	99,744	115,784
Gross profit (2)	$ 100,486	$ 118,727	$ 110,654	$ 114,793
(Loss) income from operations	$ (12,604)	$ 12,952	$ 1,992	$ (120,136)
Net (loss) income	$ (44,687)	$ 23,241	$ (59,431)	$ (96,308)
(Loss) earnings per share (3):				
Basic	$ (0.31)	$ 0.16	$ (0.40)	$ (0.65)
Diluted	$ (0.31)	$ 0.15	$ (0.40)	$ (0.65)
Shares used in computing (loss) earnings per share:				
Basic	145,936	147,467	148,184	148,675
Diluted	145,936	154,160	148,184	148,675

	First Quarter (1)	Second Quarter	Third Quarter	Fourth Quarter
	(In thousands, except per share data)			
Year ended December 31, 2020				
Revenue	$ 157,982	$ 210,493	$ 231,118	$ 244,202
Cost of revenue (2)	76,412	98,176	107,807	110,583
Gross profit (2)	$ 81,570	$ 112,317	$ 123,311	$ 133,619
Loss (income) from operations	$ (28,740)	$ 1,592	$ 11,917	$ 16,900
Net (loss) income	$ (33,170)	$ (8,251)	$ 6,252	$ 123,760
Loss (earnings) per share (3):				
Basic	$ (0.27)	$ (0.06)	$ 0.04	$ 0.85
Diluted	$ (0.27)	$ (0.06)	$ 0.04	$ 0.81
Shares used in computing loss (earnings) per share:				
Basic	120,992	144,483	144,948	145,311
Diluted	120,992	144,483	151,680	153,441

(1) Includes the results of ECI for the period subsequent to March 3, 2020.

(2) Reflects the increases to Cost of revenue arising from the reclassification of amortization of acquired technology from amortization of acquired intangible assets within operating expenses in 2021 of $10.1 million in the first quarter, $9.7 million in the second quarter and $9.7 million in the third quarter; and in 2020 of $9.0 million in the first quarter, $11.0 million in the second quarter, $11.6 million in the third quarter and $10.7 million in the fourth quarter. See Note 2 for a discussion of the reclassification.

(3) (Loss) earnings per share is calculated independently for each of the quarters presented; accordingly, the sum of the quarterly (loss) earnings per share amounts may not equal the total calculated for the year.

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

None.

Item 9A. Controls and Procedures

Disclosure Controls and Procedures

Our management, with the participation of our principal executive officers and principal financial officer, evaluated the effectiveness of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended (the "Exchange Act")), as of the end of the period covered by this Annual Report on Form 10-K. Based on this evaluation, our principal executive officers and principal financial officer concluded that our disclosure controls and procedures were effective as of December 31, 2021.

Management's Annual Report on Internal Control over Financial Reporting

Our management, with the participation of our principal executive officers and principal financial officer, is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act. Our internal control system is designed to provide reasonable assurance to our management and Board of Directors regarding the preparation and fair presentation of published financial statements.

Our management assessed the effectiveness of our internal control over financial reporting as of December 31, 2021. In making its assessment of internal control over financial reporting, our management used the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission in *Internal Control—Integrated Framework (2013)*. Based on this assessment, management concluded that, as of December 31, 2021, our internal control over financial reporting was effective.

Deloitte & Touche LLP, an independent registered public accounting firm that audited our financial statements included in this Annual Report on Form 10-K, has issued an attestation report on management's internal control over financial reporting, which is included in this Item 9A under the caption "Report of Independent Registered Public Accounting Firm."

Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting during the fiscal quarter ended December 31, 2021 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

REPORT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

To the Stockholders and the Board of Directors of Ribbon Communications Inc.

Opinion on Internal Control over Financial Reporting

We have audited the internal control over financial reporting of Ribbon Communications Inc. and subsidiaries (the "Company") as of December 31, 2021, based on criteria established in *Internal Control —Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2021, based on criteria established *in Internal Control — Integrated Framework (2013)* issued by COSO.

We have also audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) (PCAOB), the consolidated financial statements as of and for the year ended December 31, 2021, of the Company and our report dated March 11, 2022, expressed an unqualified opinion on those financial statements.

Basis for Opinion

The Company's management is responsible 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. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the 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 audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, testing and evaluating the design and operating effectiveness of internal control based on the assessed risk, and performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control over Financial Reporting

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

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

/s/ Deloitte & Touche LLP

Dallas, Texas
March 11, 2022

Item 9B. Other Information

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections

Not applicable.

PART III

Item 10. Directors, Executive Officers and Corporate Governance

Our board of directors has adopted a Code of Conduct applicable to all officers, directors and employees, including our principal executive officer, principal financial officer, principal accounting officer or controller, or persons performing similar functions. A copy of the code is available at the Investor Relations section of our website, located at investors.ribboncommunications.com, under "Corporate Governance - Governance Highlights." We intend to make any disclosure required by law or Nasdaq Stock Market rules regarding any amendments to, or waivers from, any provisions of the code at the same location of our website.

The information required by this Item 10 is included in our definitive Proxy Statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC not later than 120 days after the end of the fiscal year ended December 31, 2021 and is incorporated herein by reference.

Item 11. Executive Compensation

The information required by this Item 11 is included in our definitive Proxy Statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC not later than 120 days after the end of the fiscal year ended December 31, 2021 and is incorporated herein by reference.

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

The information required by this Item 12 is included in our definitive Proxy Statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC not later than 120 days after the end of the fiscal year ended December 31, 2021 and is incorporated herein by reference.

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

The information required by this Item 13 is included in our definitive Proxy Statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC not later than 120 days after the end of the fiscal year ended December 31, 2021 and is incorporated herein by reference.

Item 14. Principal Accounting Fees and Services

The information required by this Item 14 will be included in our definitive Proxy Statement with respect to our 2022 Annual Meeting of Stockholders to be filed with the SEC not later than 120 days after the end of the fiscal year ended December 31, 2021 and is incorporated herein by reference.

PART IV

Item 15. Exhibit and Financial Statement Schedules

1) Financial Statements

The consolidated financial statements of the Company are listed in the index under Part II, Item 8, of this Annual Report on Form 10-K.

2) Financial Statement Schedules

None. All schedules are omitted because they are not applicable, not required under the instructions or the information is contained in the consolidated financial statements, or notes thereto, included herein.

3) List of Exhibits

The Exhibits filed as part of this Annual Report on Form 10-K are listed in the Exhibit Index immediately preceding the signature page of this Annual Report, which Exhibit Index is incorporated herein by reference.

Item 16. Form 10-K Summary

None.

EXHIBIT INDEX

Exhibit No.	Description
2.1 **	Agreement and Plan of Merger, dated June 24, 2018, by and among the Registrant, Kansas Merger Sub, Inc., Edgewater Networks, Inc. and Shareholder Representative Services LLC (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q, filed August 1, 2018 with the SEC).
2.2 **	Agreement and Plan of Merger, dated as of November 14, 2019, by and among the Registrant, Ribbon Communications Israel Ltd., Eclipse Communications Ltd., ECI Telecom Group Ltd. and ECI Holding (Hungary) Korlátolt Felelősségű Társaság (incorporated by reference to Exhibit 2.1 to the Registrant's Current Report on Form 8-K, filed November 14, 2019 with the SEC).
2.3 **	Amended and Restated Purchase Agreement, dated December 1, 2020, among Ribbon Communications Inc., Ribbon Communications Operating Company, Inc., Ribbon Communications International Limited and American Virtual Cloud Technologies, Inc. (incorporated by reference to Exhibit 2.1 to the Registrant's Current Report on Form 8-K, filed December 7, 2020 with the SEC).
3.1	Restated Certificate of Incorporation of the Registrant (incorporated by reference to Exhibit 3.2 to the Registrant's Current Report on Form 8-K12B, filed October 30, 2017 with the SEC).
3.2	Certificate of Amendment of the Restated Certificate of Incorporation of the Registrant (incorporated by reference to Exhibit 3.1 to the Registrant's Current Report on Form 8-K, filed November 28, 2017 with the SEC).
3.3	Amended and Restated By-Laws of the Registrant (incorporated by reference to Exhibit 3.3 to the Registrant's Annual Report on Form 10-K, filed March 8, 2018 with the SEC).
4.1	Description of Capital Stock (incorporated by reference to Exhibit 4.1 to the Registrant's Annual Report on Form 10-K, filed February 28, 2020).
10.1	First Amended and Restated Stockholders Agreement, dated as of March 3, 2020, by and among the Registrant, JPMC Heritage Parent LLC, Heritage PE (OEP)Heritage Parent LLC, Heritage PE (OEP) III, L.P. and ECI Holding (Hungary) Kft (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed March 3, 2020 with the SEC).
10.2	First Amended and Restated Registration Rights Agreement, dated as of March 3, 2020, by and among the Registrant, JPMC Heritage Parent LLC, Heritage PE (OEP) III, L.P. and ECI Holding (Hungary) Kft (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K, filed March 3, 2020 with the SEC).
10.3 +	Form of Indemnity Agreement for Officers and Directors (incorporated by reference to Exhibit 10.5 to the registrant's Annual Report on Form 10-K, filed March 8, 2018 with the SEC).
10.4 +	Amended and Restated 2000 Employee Stock Purchase Plan, (incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q, filed October 31, 2018 with the SEC).
10.5 +	Senior Management Cash Incentive Plan, dated October 27, 2017 (incorporated by reference to Exhibit 10.7 to the Registrant's Annual Report on Form 10-K, filed March 8, 2018 with the SEC).
10.6 +	2008 Stock Incentive Plan of the Registrant (incorporated by reference to Exhibit 99.1 to the Registrant's Registration Statement on Form S-8, filed October 31, 2017 with the SEC).
10.7 +	Form of Nonstatutory Stock Option Award Agreement Granted under the 2008 Stock Incentive Plan (incorporated by reference to Exhibit 10.29 to Sonus, Inc.'s Annual Report on Form 10-K, filed March 6, 2013 with the SEC).
10.8 +	2012 Amended Performance Technologies Incorporated Omnibus Incentive Plan (incorporated by reference to Exhibit 99.2 to the Registrant's Registration Statement on Form S-8, filed with the SEC effective October 31, 2017).
10.9 +	Form of Non-Qualified Stock Option Award Agreement Granted under the 2012 Amended Performance Technologies, Incorporated Omnibus Incentive Plan (incorporated by reference to Exhibit 10.7 to Sonus, Inc.'s Quarterly Report on Form 10-Q, filed April 29, 2014 with the SEC).
10.10 +	Amended and Restated Stock Incentive Plan of the Registrant (incorporated by reference to Exhibit 99.3 to the Registrant's Registration Statement on Form S-8, filed with the SEC on October 31, 2017).
10.11 +	Form of Nonstatutory Stock Option Award Agreement Granted under the Amended and Restated Stock Incentive Plan (incorporated by reference to Exhibit 10.2 to Sonus, Inc.'s Quarterly Report on Form 10-Q filed July 29, 2016 with the SEC).
10.12 +	Form of Restricted Stock Award Agreement Granted under the Amended and Restated Stock Incentive Plan (incorporated by reference to Exhibit 10.3 to Sonus, Inc.'s Quarterly Report on Form 10-Q, filed July 29, 2016 with the SEC).

10.13 +	Form of Restricted Stock Unit Award Agreement (Performance-Based Vesting) for Awards Granted under the Amended and Restated Stock Incentive Plan (incorporated by reference to Exhibit 10.4 to Sonus, Inc.'s Quarterly Report on Form 10-Q, filed July 29, 2016 with the SEC).
10.14 +	Form of Restricted Stock Unit Award Agreement (Time-Based Vesting) for Awards Granted under the Amended and Restated Stock Incentive Plan (incorporated by reference to Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q, filed August 1, 2018 with the SEC).
10.15 +	Edgewater Networks, Inc. Amended and Restated 2002 Stock Option Plan, effective as of April 8, 2010 (incorporated by reference to Exhibit 99.1 to the Registrant's Registration Statement on Form S-8, filed August 6, 2018 with the SEC).
10.16 +	Amendment to the Edgewater Networks, Inc. Amended and Restated 2002 Stock Option Plan, dated December 7, 2016 (incorporated by reference to Exhibit 99.2 to the Registrant's Registration Statement on Form S-8, filed August 6, 2018 with the SEC).
10.17	Senior Secured Credit Facilities Amended and Restated Credit Agreement by and among the Registrant, as a guarantor, Ribbon Communications Operating Company, Inc., as the borrower, Silicon Valley Bank, as administrative agent, issuing lender, swingline lender and joint lead arranger, Citizens Bank, N.A., as lender and joint lead arranger, SunTrust Bank, as lender and documentation agent, and the other lenders party thereto, dated April 29, 2019 (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed May 2, 2019 with the SEC).
10.18	Senior Secured Credit Facilities Credit Agreement, dated March 3, 2020, among the Company, as guarantor, Ribbon Communications Operating Company, Inc., as the borrower, Citizens Bank, N.A., as administrative agent, a lender, issuing lender, swingline lender, joint lead arrangers and bookrunner, Santander Bank, National Association, as a lender, joint lead arranger and bookrunner, and the other lenders party thereto (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed March 4, 2020 with the SEC).
10.19	First Amendment to Credit Agreement, dated August 18, 2020, among Ribbon Communications Operating Company, Inc., as the borrower and Citizens Bank, N.A., as administrative agent (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed August 24, 2020 with the SEC).
10.20	Second Amendment to Credit Agreement and Consent, dated December 1, 2020, among Ribbon Communications Operating Company, Inc., as the borrower and Citizens Bank, N.A., as administrative agent (incorporated by reference to Exhibit 10.23 to the Registrant's Annual Report on Form 10-K, filed February 26, 2021 with the SEC).
10.21	Third Amendment to Credit Agreement, dated March 3, 2021, among Ribbon Communications Operating Company, Inc., as the borrower, the guarantors party thereto, the financial institutions party thereto as lenders, and Citizens Bank, N.A., as administrative agent (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed March 4, 2021 with the SEC).
10.22 +	Amended and Restated Employment Letter Agreement dated March 31, 2021, between the Registrant and Anthony Scarfo (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K, filed April 2, 2021 with the SEC).
10.23 +	Employment Letter Agreement, dated March 31, 2021, between the Registrant and Steven Bruny (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed April 2, 2021 with the SEC).
10.24 +	Severance Agreement, dated as of January 29, 2020, among Ribbon Communications Inc., Ribbon Communications Operating Company, Inc. and Steven Bruny (incorporated by reference to Exhibit 10.1 of the Registrant's Current Report on Form 8-K, filed January 30, 2020 with the SEC).
10.25 +	Severance Agreement, dated as of January 29, 2020, among Ribbon Communications Inc., Ribbon Communications Operating Company, Inc. and Anthony Scarfo (incorporated by reference to Exhibit 10.2 of the Registrant's Current Report on Form 8-K, filed January 30, 2020 with the SEC).
10.26 +	Ribbon Communications Inc. 2019 Incentive Award Plan (incorporated by reference to Exhibit 10.1 of the Registrant's Current Report on Form 8-K, filed June 11, 2019 with the SEC).
10.27 +	Form of Non-Statutory Stock Option Award Agreement under the 2019 Incentive Award Plan (incorporated by reference to Exhibit 10.1 to the Registrant's Quarterly Report on Form 10-Q, filed October 31, 2019 with the SEC).
10.28 +	Form of Restricted Stock Award Agreement under the 2019 Incentive Award Plan (incorporated by reference to Exhibit 10.2 to the Registrant's Quarterly Report on Form 10-Q, filed October 31, 2019 with the SEC).

10.29 +	Form of Restricted Stock Unit Award Agreement (Time-Based Vesting) under the 2019 Incentive Award Plan (incorporated by reference to Exhibit 10.3 to the Registrant's Quarterly Report on Form 10-Q, filed October 31, 2019 with the SEC).
10.30 +	Form of Restricted Stock Unit Award Agreement (Performance-Based Vesting) under the 2019 Incentive Award Plan (incorporated by reference to Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q, filed October 31, 2019 with the SEC).
10.31 +	Letter Agreement, dated as of February 18, 2020, among Ribbon Communications Inc., Sonus Networks, Inc. d/b/a Ribbon Communications Operating Company, Inc. and Bruce McClelland (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed February 19, 2020 with the SEC.
10.32 +	Severance Agreement, dated February 18, 2020, among Ribbon Communications Inc., Sonus Networks, Inc. d/b/a Ribbon Communications Operating Company, Inc. and Bruce McClelland (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K, filed February 19, 2020 with the SEC).
10.33 +	Form of Restricted Stock Unit Award Agreement (Performance-Based Vesting) between Ribbon Communications Inc. and Bruce McClelland (incorporated by reference to Exhibit 10.3 to the Registrant's Current Report on Form 8-K, filed February 19, 2020 with the SEC).
10.34 +	Employment Agreement between the Registrant and Miguel Lopez, dated June 22, 2020 (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed June 23, 2020 with the SEC).
10.35 +	Severance Agreement between the Registrant and Miguel Lopez, dated June 22, 2020 (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K, filed June 23, 2020 with the SEC).
10.36 +	Form of Consent to Temporary Wage Reduction entered into with Executive Officers (incorporated by reference to Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q, filed August 6, 2020 with the SEC).
10.37 +	Ribbon Communications Inc. Amended and Restated 2019 Incentive Award Plan (incorporated by reference to Exhibit 99.1 to the Registrant's Form S-8 Registration Statement, filed June 2, 2020 with the SEC).
10.38	Amended and Restated Voting Agreement, dated December 1, 2020, by and among Ribbon Communications Operating Company, Inc., Ribbon Communications International Limited and Pensare Sponsor Group, LLC (incorporated by reference to Exhibit 10.1 to the Registrant's Current Report on Form 8-K, filed December 7, 2020 with the SEC).
10.39	Amended and Restated Voting Agreement, dated December 1, 2020, by and among Ribbon Communications Inc., Ribbon Communications Operating Company, Inc., Ribbon Communications International Limited and Stratos Management Systems Holdings, LLC (incorporated by reference to Exhibit 10.2 to the Registrant's Current Report on Form 8-K, filed December 7, 2020 with the SEC).
10.40	Investor Rights Agreement, dated December 1, 2020, by and among Ribbon Communications Inc., Pensare Sponsor Group, LLC and Stratos Management Systems Holdings, LLC (incorporated by reference to Exhibit 10.3 to the Registrant's Current Report on Form 8-K, filed December 7, 2020 with the SEC).
10.41 +	Employment Agreement, dated May 26, 2020, between the Registrant and Patrick Macken (incorporated by reference to Exhibit 10.4 to the Registrant's Quarterly Report on Form 10-Q, filed April 30, 2021 with the SEC).
10.42 +	Severance Agreement, dated May 26, 2020, between the Registrant and Patrick Macken (incorporated by reference to Exhibit 10.5 to the Registrant's Quarterly Report on Form 10-Q, filed April 30, 2021 with the SEC).
10.43 +	Employment Agreement, dated July 21, 2020, between the Registrant and Sam Bucci (incorporated by reference to Exhibit 10.6 to the Registrant's Quarterly Report on Form 10-Q, filed April 30, 2021 with the SEC).
10.44 +	Severance Agreement, dated September 7, 2020, between the Registrant and Sam Bucci (incorporated by reference to Exhibit 10.7 to the Registrant's Quarterly Report on Form 10-Q, filed April 30, 2021 with the SEC).
10.45 *	Fourth Amendment to Credit Agreement, dated March 11, 2022, among Ribbon Communications Operating Company, Inc., as the borrower, the guarantors party thereto, the financial institutions party thereto as lenders, and Citizens Bank, N.A., as administrative agent.
21.1 *	Subsidiaries of the Registrant.
23.1 *	Consent of Independent Registered Public Accounting Firm, Deloitte & Touche LLP

31.1 *	Certification of Ribbon Communications Inc. Chief Executive Officer Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2 *	Certification of Ribbon Communications Inc. Chief Executive Officer Pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1 #	Certification of Ribbon Communications Inc. Chief Executive Officer Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2 #	Certification of Ribbon Communications Inc. Chief Financial Officer Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS *	Inline XBRL Instance Document
101.SCH *	Inline XBRL Taxonomy Extension Schema
101.CAL *	Inline XBRL Taxonomy Extension Calculation Linkbase
101.DEF *	Inline XBRL Taxonomy Extension Definition Linkbase
101.LAB *	Inline XBRL Taxonomy Extension Label Linkbase
101.PRE *	Inline XBRL Taxonomy Extension Presentation Linkbase
104 *	Cover Page Interactive Data File (formatted as Inline XBRL and contained in Exhibit 101)

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* Filed herewith.

Furnished herewith.

+ Management contract or compensatory plan or arrangement filed in response to Item 15(a)(3) of the Instructions to the Annual Report on Form 10-K.

** Certain schedules and exhibits have been omitted pursuant to Item 601(b)(2) of Regulation S-K. The Registrant hereby undertakes to furnish copies of any of the omitted schedules and exhibits upon request by the U.S. Securities and Exchange Commission.

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.

RIBBON COMMUNICATIONS INC.

March 11, 2022

By: /s/ Bruce McClelland
Bruce McClelland
President and Chief Executive Officer

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:

Signature	Title	Date
/s/ Bruce McClelland Bruce McClelland	President, Chief Executive Officer and Director (Principal Executive Officer)	March 11, 2022
/s/ Miguel A. Lopez Miguel A. Lopez	Executive Vice President and Chief Financial Officer (Principal Financial Officer)	March 11, 2022
/s/ Eric Marmurek Eric Marmurek	Senior Vice President, Finance (Principal Accounting Officer)	March 11, 2022
/s/ Shaul Shani Shaul Shani	Chairman	March 11, 2022
/s/ Mariano S. de Beer Mariano S. de Beer	Director	March 11, 2022
/s/ Stewart Ewing Stewart Ewing	Director	March 11, 2022
/s/ Bruns H. Grayson Bruns H. Grayson	Director	March 11, 2022
/s/ Beatriz V. Infante Beatriz V. Infante	Director	March 11, 2022
/s/ Krish Prabhu Krish Prabhu	Director	March 11, 2022
/s/ Rick W. Smith Rick W. Smith	Director	March 11, 2022
/s/ Tanya Tamone Tanya Tamone	Director	March 11, 2022

Exhibit 10.45

Execution Version

FOURTH AMENDMENT TO CREDIT AGREEMENT

THIS FOURTH AMENDMENT TO CREDIT AGREEMENT (this "***Amendment***"), dated as of March 10, 2022, is by and among (a) **RIBBON COMMUNICATIONS OPERATING COMPANY, INC.**, a Delaware corporation formerly known as Sonus Networks, Inc. (the "***Borrower***"), (b) the Guarantors party hereto, (c) the Lenders (as hereinafter defined) party hereto, and (d) **CITIZENS BANK, N.A.**, as administrative agent for the Lenders hereunder (in such capacity, the "***Administrative Agent***"). Capitalized terms used herein and not otherwise defined herein shall have the meanings ascribed thereto in the Credit Agreement (as hereinafter defined).

W I T N E S S E T H

WHEREAS, the Loan Parties, certain banks and financial institutions from time to time party thereto (the "***Lenders***") and the Administrative Agent are parties to that certain Credit Agreement dated as of March 3, 2020 (as amended, modified, extended, restated, replaced or supplemented from time to time prior to the date hereof, the "***Existing Credit Agreement***"; and, as amended by this Amendment, the "***Credit Agreement***");

WHEREAS, the Loan Parties have requested that the Administrative Agent and the Lenders (constituting the Required Lenders) amend certain provisions of the Existing Credit Agreement, in each case on the terms and conditions set forth herein; and

WHEREAS, the Administrative Agent and the Lenders party hereto (constituting the Required Lenders) are willing to make such amendments to the Existing Credit Agreement, in each case in accordance with and subject to the terms and conditions set forth herein.

NOW, THEREFORE, in consideration of the agreements hereinafter set forth, and for other good and valuable consideration, the receipt and adequacy of which are hereby acknowledged, the parties hereto agree as follows:

ARTICLE I
AMENDMENTS TO CREDIT AGREEMENT

1.1 **Amendment**. The Maximum Consolidated Net Leverage Ratio grid set forth in Section 7.1(b) of the Existing Credit Agreement is hereby amended and restated in its entirety as follows:

Fiscal Quarter Period Ending	Maximum Consolidated Net Leverage Ratio
December 31, 2021	3.50:1.00
March 31, 2022	4.25:1.00
June 30, 2022	4.50:1.00
September 30, 2022	4.25:1.00
December 31, 2022	4.00:1.00
March 31, 2023	3.25:1.00
June 30, 2023	3.25:1.00
September 30, 2023 and each fiscal quarter ending thereafter	3.00:1.00

ARTICLE II
CONDITIONS TO EFFECTIVENESS

2.1 Closing Conditions. This Amendment shall become effective as of the day and year set forth above (the "***Amendment Effective Date***") upon satisfaction of the following conditions (in each case, in form and substance reasonably acceptable to the Administrative Agent):

(a) Executed Amendment. The Administrative Agent shall have received a copy of this Amendment duly executed by each of the Loan Parties, the Lenders constituting Required Lenders and the Administrative Agent.

(b) Prepayment. The Administrative Agent shall have received a voluntary prepayment in an aggregate amount equal to $15,000,000 (and, pursuant to Section 2.11 of the Credit Agreement, the Borrower hereby instructs the Administrative Agent to apply such prepayment to the prepayment of installments of the Term Loans in inverse order of maturity (including any amounts owed on the Term Loan Maturity Date)).

(c) Fees and Expenses. The Administrative Agent shall have received all fees required to be paid on the Amendment Effective Date, and all reasonable and documented fees and expenses for which invoices have been presented (including the reasonable and documented fees and expenses of legal counsel to the Administrative Agent to the extent invoiced in reasonable detail at least two Business Days prior to the Amendment Effective Date (except as otherwise reasonably agreed by the Borrower).

ARTICLE III
MISCELLANEOUS

3.1 Amended Terms. On and after the Amendment Effective Date, all references to the Credit Agreement in each of the Loan Documents shall hereafter mean the Credit Agreement (as defined herein). Except as specifically amended hereby or otherwise agreed, the Credit Agreement is hereby ratified and confirmed and shall remain in full force and effect according to its terms.

3.2 Representations and Warranties of Loan Parties. Each of the Loan Parties represents and warrants as follows:

(a) (i) Each Loan Party has the power and authority, and the legal right, to make, deliver and perform this Amendment; (b) each Loan Party has taken all necessary organizational or corporate action to authorize the execution, delivery and performance of this Amendment; (c) no material Governmental Approval or consent or authorization of, filing with, notice to or other act by or in respect of, any other Person is required in connection with the execution, delivery, performance, validity or enforceability of this Amendment, except Governmental Approvals, consents, authorizations, filings and notices that have been obtained or made and are in full force and effect; (d) this Amendment has been duly executed and delivered on behalf of each Loan Party party hereto; (e) this Amendment constitutes a legal, valid and binding obligation of each Loan Party party hereto, enforceable against each such Loan Party in accordance with its terms, except as enforceability may be limited by applicable bankruptcy, insolvency, reorganization, moratorium or similar laws affecting the enforcement of creditors' rights generally and by general equitable principles (whether enforcement is sought by proceedings in equity or at law).

(b) Each of the representations and warranties made by each Loan Party in or pursuant to any Loan Document (i) that is qualified by materiality is true and correct in all respects, and (ii) that is not qualified by materiality, is true and correct in all material respects, in each case, on and as of the Amendment Effective Date as if made on and as of the Amendment Effective Date, except to the extent any such representation and warranty expressly relates to an earlier date, in which case such representation and warranty shall have been true and correct in all material respects as of such earlier date (or in all respects to the extent such representation and warranty is qualified by materiality).

(c) No Default or Event of Default has occurred and is continuing as of or on the Amendment Effective Date or after giving effect to this Amendment.

(d) The Loan Documents continue to create a valid security interest in, and Lien upon, the Collateral, in favor of the Administrative Agent, for the benefit of the Secured Parties, which security interests and Liens are perfected in accordance with the terms of the Loan Documents and prior to all Liens other than Liens permitted pursuant to Section 7.3 of the Credit Agreement.

(e) Other than as set forth herein, the Obligations are not reduced or modified by this Amendment and are not subject to any offsets, defenses or counterclaims.

3.3 Reaffirmation of Obligations. Each Loan Party hereby ratifies the Credit Agreement and acknowledges and reaffirms (a) that it is bound by all terms of the Credit Agreement applicable to it, (b) that it is responsible for the observance and full performance of its respective Obligations, and (c) that the security interest granted to the Administrative Agent pursuant to the Loan Documents, as amended hereby, in all of its right, title, and interest in all then existing and thereafter acquired or arising Collateral in order to secure the payment and performance of the Obligations, is continuing and is and shall remain in full force and effect both immediately prior to and after entering into this Amendment. The parties hereto acknowledge and agree that the amendment of the Existing Credit Agreement pursuant to this Amendment and all other Loan Documents amended and/or executed and delivered in connection herewith shall not constitute a novation of the Credit Agreement and the other Loan Documents as in effect immediately prior to the Amendment Effective Date.

3.4 Loan Document. This Amendment shall constitute a Loan Document under the terms of the Credit Agreement.

3.5 Expenses. The Borrower agrees to pay all reasonable and documented out of pocket costs and fees and expenses of the Administrative Agent in connection with the preparation, execution and delivery of this Amendment, including without limitation the reasonable and documented out of pocket fees and expenses of the Administrative Agent's outside legal counsel.

3.6 Further Assurances. The Loan Parties agree to promptly take such action, upon the request of the Administrative Agent, as is necessary to carry out the intent of this Amendment.

3.7 Entirety. This Amendment and the other Loan Documents embody the entire agreement among the parties hereto and supersede all prior agreements and understandings, oral or written, if any, relating to the subject matter hereof.

3.8 Counterparts; Telecopy. This Amendment may be executed in multiple counterparts, each of which shall constitute an original but all of which when taken together shall constitute one contract. Delivery of an executed signature page counterpart hereof by telecopy, emailed pdf. or any other electronic means that reproduces an image of the actual executed signature page shall be effective as delivery of a manually executed counterpart hereof. The words "execution," "signed," "signature," "delivery," and words of like import in or relating to any document to be signed in connection with this Amendment and the transactions contemplated hereby shall be deemed to include electronic signatures, the electronic association of signatures and records on electronic platforms, deliveries or the keeping of records in electronic form, each of which shall be of the same legal effect, validity or enforceability as a manually executed signature, physical delivery thereof or the use of a paper-based recordkeeping system, as the case may be, to the extent and as provided for in any applicable law, including the Federal Electronic Signatures in Global and National Commerce Act, the New York State Electronic Signatures and Records Act, any other similar state laws based on the Uniform Electronic Transactions Act or the Uniform Commercial Code, each as amended, and the parties hereto hereby waive any objection to the contrary, provided that nothing herein shall require the Administrative Agent to accept electronic signature counterparts in any form or format after the date hereof.

3.9 No Actions, Claims, Etc. As of the date hereof, each of the Loan Parties hereby acknowledges and confirms that it has no knowledge of any actions, causes of action, claims, demands, damages and liabilities of whatever kind or nature, in law or in equity, against the Administrative Agent, the Lenders, or the Administrative Agent's or the Lenders' respective officers, employees, representatives, agents, counsel or directors arising from any action by such Persons, or failure of such Persons to act under the Credit Agreement on or prior to the date hereof.

3.10 GOVERNING LAW. THIS AMENDMENT SHALL BE GOVERNED BY, AND SHALL BE CONSTRUED AND ENFORCED IN ACCORDANCE WITH THE LAWS OF THE STATE OF NEW YORK (INCLUDING SECTIONS 5-1401 AND 5-1402 OF THE NEW YORK GENERAL OBLIGATIONS LAW).

3.11 Successors and Assigns. This Amendment shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns.

3.12 Submission to Jurisdiction; Waivers. The jurisdiction, service of process, venue and waiver of jury trial provisions set forth in Section 10.14 of the Credit Agreement are hereby incorporated by reference, *mutatis mutandis*.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be duly executed and delivered by their proper and duly authorized officers as of the day and year first above written.

BORROWER:

RIBBON COMMUNICATIONS OPERATING COMPANY, INC.

By: /s/ Miguel A. Lopez
Name: Miguel A. Lopez
Title: President and Chief Executive Officer

GUARANTORS:

RIBBON COMMUNICATIONS INC.
EDGEWATER NETWORKS, INC.
GENBAND INC.
ECI TELECOM INC.

By: /s/ Miguel A. Lopez
Name: Miguel A. Lopez
Title: President and Chief Executive Officer

ADMINISTRATIVE AGENT:

CITIZENS BANK, N.A.
as the Administrative Agent

By: /s/ Darran Wee
Name: Darran Wee
Title: Senior Vice President

[Signature Page to Fourth Amendment to Credit Agreement (Ribbon)]

LENDERS:

CITIZENS BANK, N.A., as a Lender
By: /s/ Darran Wee
Name: Darran Wee
Title: Senior Vice President

SANTANDER BANK, N.A., as a Lender
By: /s/ Irv Roa
Name: Irv Roa
Title: Managing Director

SILICON VALLEY BANK, as a Lender
By: /s/ John Ryan
Name: John Ryan
Title: Vice President

M&T Bank, as a Lender
By: /s/ Dan Lobdell
Name: Dan Lobdell
Title: Vice President

BANK OF AMERICA, N.A., as a Lender
By: /s/ Karen Virani
Name: Karen Virani
Title: Vice President

HSBC BANK USA NATIONAL ASSOCIATION, as a Lender
By: /s/ Kyle Patterson
Name: Kyle Patterson
Title: Senior Vice President

Citibank, N.A., as a Lender
By: /s/ Danio O’Hara
Name: Danio O’Hara
Title: Authorized Signor

Fifth Third Bank, National Association, as a Lender
By: /s/ Nick Meece
Name: Nick Meece
Title: Officer

JPMORGAN CHASE BANK, N.A., as a Lender
By: /s/ Vidita J. Shah
Name: Vidita Shah
Title: Vice President

BARCLAYS BANK PLC, as a Lender
By: /s/ Manuel Rubiano
Name: Manuel Rubiano
Title: Vice President

Bank of Hope, as a Lender
By: /s/ David Hill
Name: David Hill
Title: Senior Vice President

EXHIBIT 21.1

RIBBON COMMUNICATIONS INC.
SUBSIDIARIES OF THE REGISTRANT

Name	Jurisdiction of Incorporation
Laurel Networks Holdings Corporation	Delaware
Network Equipment Technologies, Inc.	Delaware
Ribbon Communications Federal Inc.	Delaware
Ribbon Communications Operating Company, Inc.	Delaware
Sonus Networks, Inc.	Delaware
GENBAND Inc.	Massachusetts
ECI de Argentina SA	Argentina
Ribbon Communications (Australia) Pty. Ltd.	Australia
Ribbon Communications Belgium SPRL	Belgium
ECI Telecom DO Brazil	Brazil
Ribbon Communications do Brasil Ltda	Brazil
Ribbon Communications Canada ULC	Canada
Ribbon Networks Communications Chile Limitada	Chile
Ribbon Communications Shanghai Co., Ltd.	China
Sonus Networks (Shanghai)	China
Hangzhou ECI Telecommunication Co. Ltd.	China
ECI Telecom Sur America Lta.	Colombia
ECI Telecom Costa Rica S.A.	Costa Rica
Ribbon Communications Czech Republic s.r.o.	Czech Republic
Ribbon Communications France EURL	France
ECI Telecom (GmbH)	Germany
ECI Telecom (HK) Ltd.	Hong Kong
Ribbon Communications Hong Kong Limited	Hong Kong
ECI Telecom India Private Limited	India
GENBAND Telecommunications Private Limited	India
Ribbon Communications Private Limited	India
Ribbon Communications Israel Limited	Israel
Enavis Networks Ltd.	Israel
ECI IT Ltd.	Israel
ECI Telecom 2000 Enterprise Ltd.	Israel
Lightscape Networks Ltd.	Israel
Ritbal Ltd.	Israel
ECI - Tadiran Syncoronous System Company (199) Ltd.	Israel
ECI Telecom Group Ltd.	Israel
ECI Telecom Ltd.	Israel
Negev Telecom Lt.	Israel
ECI WaveInno Ltd.	Israel
Ribbon Communications Italy SRL	Italy

Ribbon Communications K.K.	Japan
ECI Telecom Kenya Limited	Kenya
Ribbon Communications Malaysia Sdn. Bhd.	Malaysia
Ribbon Communications Mexico, S. de R.L. de C.V.	Mexico
GENBAND Canada B.V.	Netherlands
ECI Networks Solutions B.V.	Netherlands
GENBAND NS B.V.	Netherlands
Ribbon Communications B.V.	Netherlands
Ribbon Networks Communications B.V.	Netherlands
ECI Telecom (PH), Inc.	Philippines
ECI Telekom Polska sp.z o.o.	Poland
ECI Telecom 2005 LLC	Russia
Ribbon Communications Rus Limited Liability Company	Russia
Ribbon Networks Saudi Arabia for Information Technology	Saudi Arabia
ECI Telecom (HK) Ltd. Singapore Branch	Singapore
Ribbon Communications Singapore Pte. Ltd.	Singapore
Ribbon Communications Spain SRL	Spain
Ribbon Communications Switzerland GmbH	Switzerland
Ribbon Networks Ltd. Co.	Taiwan
ECI Telecom Ukraine LLC	Ukraine
Ribbon Networks B.V. Dubai Branch	United Arab Emirates
ECI Telecom (UK) Ltd	United Kingdom
N.E.T. Europe Ltd.	United Kingdom
Ribbon Communications UK Limited	United Kingdom

EXHIBIT 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We consent to the incorporation by reference in Registration Statement Nos. 333- 238888, 333-237224, 333-232946, 333-226624, and 333-221240 on Form S-8 of our reports dated March 11, 2022, relating to the financial statements of Ribbon Communications Inc. and the effectiveness of Ribbon Communications Inc. and subsidiaries' internal control over financial reporting, appearing in this Annual Report on Form 10-K of Ribbon Communications Inc. for the year ended December 31, 2021.

/s/ Deloitte & Touche LLP

Dallas, Texas
March 11, 2022

EXHIBIT 31.1

CERTIFICATION

I, Bruce McClelland, certify that:

1. I have reviewed this Annual Report on Form 10-K of Ribbon Communications Inc.;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 11, 2022

/s/ Bruce McClelland

Bruce McClelland
President and Chief Executive Officer
(Principal Executive Officer)

EXHIBIT 31.2

CERTIFICATION

I, Miguel A Lopez, certify that:

1. I have reviewed this Annual Report on Form 10-K of Ribbon Communications Inc.;
2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;
3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;
4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and
5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 11, 2022

/s/ Miguel A. Lopez

Miguel A. Lopez
Executive Vice President and Chief Financial Officer
(Principal Financial Officer)

EXHIBIT 32.1

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

In connection with the Annual Report on Form 10-K of Ribbon Communications Inc. (the "Company") for the period ended December 31, 2021 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Bruce McClelland, President and Chief Executive Officer of the Company, hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to his knowledge:

(1) the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 11, 2022

/s/ Bruce McClelland

Bruce McClelland
President and Chief Executive Officer
(Principal Executive Officer)

EXHIBIT 32.2

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

In connection with the Annual Report on Form 10-K of Ribbon Communications Inc. (the "Company") for the period ended December 31, 2021 as filed with the Securities and Exchange Commission on the date hereof (the "Report"), the undersigned, Miguel A. Lopez, Chief Financial Officer of the Company, hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that to his knowledge:

(1) the Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934; and

(2) the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date: March 11, 2022

/s/ Miguel A. Lopez

Miguel A. Lopez
Executive Vice President and Chief Financial Officer (Principal Financial Officer)