VeEX Recognized for

2021

Customer Value Leadership

Global Terabit Ethernet
Testing Solutions Industry
Excellence in Best Practices

FROST *&* SULLIVAN

Best Practices Criteria for World-Class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each award category before determining the final award recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. VeEX excels in many of the criteria in the global terabit Ethernet Testing Solutions space.

AWARD CRITERIA

Business Impact	Customer Impact
Financial Performance	Price/Performance Value
Customer Acquisition	Customer Purchase Experience
Operational Efficiency	Customer Ownership Experience
Growth Potential	Customer Service Experience
Human Capital	Brand Equity

Robust Testing Needs for Ethernet Speeds above 100GbE

The explosive growth in high-speed and high-availability services such as connected ecosystem, 5G infrastructure, artificial intelligence (AI), the Internet of Things (IoT), and cloud computing has prompted communication industry stakeholders such as telecom operators, multi-service operators (MSOs), and hyperscalers to move towards next-generation Ethernet technologies with speeds above 100GbE. Next-generation aggregation, switching, and transport technologies are required to keep up with the rapid rise in data demand. Hyperscale data center operators have been on the edge of this technology transition, pushing others in the ecosystem, such as NEMs and semiconductor manufacturers, to develop and design components and network equipment that are advanced, highly flexible, and capable of handling higher network bandwidths.

The next-generation Ethernet technologies are more advanced and diverse than ever before, blurring the line between optimal and subpar performance. Moreover, there has been a significant acceleration in time frames between the standardization of Ethernet technologies. For instance, the Institute of Electrical and Electronics Engineers (IEEE) standardized 6 Ethernet rates (10MbE to 100GbE) in about 4 decades till 2018; however, currently, more than 6 Ethernet rates (2.5GbE to 400GbE) are standardized all at the same time. Industry think tanks are already working towards 800GbE and even 1.6TbE speeds. This trend shows that even though the Ethernet rates are scaling up to 400GbE and beyond, they are also scaling down to speeds of 2.5GbE. The verification and validation of such diverse Ethernet bandwidths are challenging and complex and require highly flexible and efficient test equipment.

The industry move to 400GbE has led to the development of several new technologies in the Ethernet landscape, such as Flexe and OTUCn FlexO, which enable carrier aggregation. 400GbE speeds require different types of transceivers, which, in turn, require a live environment for manufacture and deployment, leading to failure rate spikes. The transceivers/optical modules are crucial for enabling terabit Ethernet (TbE) speeds. High-speed Ethernet utilizes form factors such as Quad Small Formfactor Pluggable (QSFP)28, QSFP Double Density (QSFP-DD), Octal Small Formfactor Pluggable (OSFP), and C Formfactor Pluggable (CFP)8, as they are pluggable, low-power consumers and interoperable with different vendors. Moreover, upgrading network bandwidth to TbE speeds requires advanced modulation and coding. As Ethernet above 100GbE requires higher lane speeds, the traditional non-return to zero (NRZ) modulation has given way to 4-level pulse amplitude modulation (PAM4). However, the PAM4 signals are highly susceptible to noise, which results in a lower signal-to-noise ratio. Hence, analyzing noise in transceiver design becomes an essential testing factor. To accommodate for this, PAM4 uses forward error correction (FEC), an advanced coding technique, which further presents new test challenges to consider in the physical layer testing of PAM4 signals.

The industry is now moving towards mass field deployment of 400GbE speeds, with an increasing number of hyperscalers upgrading their data center capacity to cater to the rising demand for data. The mobile network operators working towards 5G deployments will be the next to embrace 400GbE for their backhaul network. Hence, there is a strong need for portable and efficient testing solutions for the seamless lab-to-field transition of 400GbE. Moreover, as the network infrastructure becomes more complex with higher Ethernet speeds and trends such as cloudification, testing vendors must ensure that their offerings are integrated and easy-to-use and manage.

Strong Financial Performance as a Result of High Operational Efficiency, Growth Potential, and Customer Acquisition Strategies

Headquartered in Fremont, California, VeEX is known for its technological expertise that translates into innovative capabilities across its product portfolio. The company is at the forefront of the market, thanks to its proven, cutting-edge solutions and commitment to developing best-in-class products with a deep understanding of current and future market trends.

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>
> *Navdeep Saboo,*
> *Industry Analyst*

The company launched the industry's first truly portable 400GbE hand-held testing solution, RXT-6400, in 2018. The RXT-6400 test module offers native PAM4 support for both OSFP & QSFP-DD transceivers and is based on the 58G PAM4-based field-programmable gate array (FPGA) technology. The module provides best-in-class signal integrity and can support Ethernet speeds from 1GbE to 400GbE, providing a future-proof testing solution capable of handling all standardized Ethernet bandwidths.

The company also offers a rack-mount solution for 400GbE, with its FPGA-based MPA® Multi-Protocol Analyzer modular test platform. The MPA offers scalability with pluggable test modules providing simultaneous independent multi-port & multi-user testing for 1GbE to 400GbE addressing demanding R&D, SVT, interop labs, manufacturing and automation applications. A native Python API facilitates seamless integration in new or existing test automation environments.

The MPM-400AR test module provides 2x simultaneous and independent 400GbE QSFP-DD ports along with 2x QSFP56 and SFP56 ports, providing a dual port traffic generation and analysis solution for 400/200/100/50/25/10GbE including 4x100GE breakout applications. FlexE testing at 100/200/400G PHY rates with L2/L3 client testing up to 400G is also supported.

The instrument provides a comprehensive feature set for transceiver benchmarking and qualification including pluggable 400G QSFP-DD coherent optics. Critical internal coherent transceiver settings and measurements are supported including wavelength and optical power tuning as well FEC and optical performance monitoring statistics. Additionally, the MPA offers multi-protocol (GbE, OTN/OTUCn, SDH/SONET, & Fibre Channel) test modules to further increase the instrument's test port density and capabilities for mixed packet optical transport applications, providing an all-in-one solution.

With its hand-held RXT-6400 and rack-mount MPA test platform, VeEX offers a complete solution for 400GbE test and validation and is helping its customers with all their verification needs, from layer 1 to layer 4 and faster lab-to-field deployments. These solutions are portable, scalable, flexible, future proof, and capable of handling current and future interfaces, rates, and technologies.

The RXT-6400 test platform offers a unique feature, the advanced optical transceiver test, which is a diagnostics transceiver testing capability. This feature gives a pass/fail indication of the transceiver (QSFP-DD or OSFP), which helps the customer quickly verify and identify problems at any specific point (transceiver, optical module, network equipment, or somewhere else along the network path) within the network. In addition, the feature keeps track of various parameters such as transceiver voltage levels, power consumption, temperature, and pre-FEC BER. All of these parameters are displayed through a histogram function for easy correlation and tracking. The flexibility and robustness of VeEX 400GbE offerings, along with the company's deep technological expertise, ensure best-in-class product quality and a full complement of features and functionality, unlike competing solutions in the market.

The company has been witnessing high growth and uptake for both its rack-mount and portable 400GbE testing solutions. In 2020, despite the pandemic, VeEX witnessed a strong double-digit revenue growth for its 400GbE offerings. The company attributes its success specifically to the strong demand for its portable RXT-6400 testing solution for field applications. Prior to 2020, 400GbE solutions were mostly in the research and development (R&D) phase, with lab testing of the components and network equipment supporting 400GbE. However, starting in 2021, 400GbE witnessed accelerated field deployments. VeEX's RXT-6400, being the industry's first and most advanced hand-held 400GbE field testing solution, is expected to witness an increased demand in the coming years. Frost & Sullivan strongly believes that the accelerated 400GbE deployments will present further growth potential for VeEX in the near future.

VeEX always pays particular attention to actual industry needs and creates awareness and buzz around its solutions. The company actively participates in the most significant industry events and conferences around the globe while also maintaining effective relations with customer verticals, which include network equipment manufacturers as well as government organizations and research centers. For instance, in March 2020, VeEX demonstrated its MPA series platform and RXT-6400 at the Ethernet Alliance's multi-vendor integration event. The company also organizes informative webinars, wherein VeEX experts from different technology domains discuss the needs and demand for next-generation Ethernet technologies and testing solutions. Such strategies have helped the company enhance its visibility among potential customer groups.

Enriching Overall Customer Experience with Strong Brand Equity and Price/Performance Value

VeEX's multinational structure with dedicated business units operating in different regions provides the company with further growth prospects. A significant amount of its revenue came from the United States but VeEX's customer acquisitions across Europe and Asia have also contributed to current revenue streams, solidifying its global profile and strengthening its brand equity across regions as customers look for vendors that provide better support on a global scale. For instance, the company is the sole supplier for portable 400GbE field solutions with various leading Tier I customers across the globe. In addition, VeEX works through a channel of global distributors to provide local support to customers worldwide. With VeEX's strong brand recognition and the expanding demand for 400GbE field testing solutions, Frost & Sullivan foresees a healthy long-term outlook in terms of revenue and earnings for VeEX.

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VeEX understands that, for field testing solutions, ease-of-use is of prime importance to the customers. However, with speeds beyond 100GbE, the test equipment becomes more complex due to additional features and protocols not being looked into for lower Ethernet speeds such as 10GbE or even 100GbE. Therefore, the company actively engages with its customers/end users and technology partners in a close dialog during the product development cycle for input and feedback on features and specifications. For instance, the advanced transceiver test capability in the company's RXT-6400 product was developed with a couple of customers who wanted to troubleshoot their QSFP-DDs quickly. Such customer engagement ensures that the major areas of concern for the customers, such as ease-of-use and interoperability, are dealt with more efficiently and effectively. Frost & Sullivan firmly believes that this kind of customer feedback mechanism and collaboration will ensure that the product development and innovation match market and customer needs.

The company offers an innovative cloud-based software license management solution, VeExpress™, which helps the customer manage the software licenses of test equipment that may be located in different parts of the world. The service is provided free of charge and lets the customer purchase or rent software licenses, share licenses among users so that it can be used by those who need it at that particular moment, get temporary licenses for solutions that are not needed on an ongoing basis, and download software updates directly from the server to the test equipment. This business model helps the customer minimize their CAPEX and optimize OPEX by efficiently managing their fleet of test equipment by utilizing and paying for only the functionalities they need. Moreover, the company offers EZ Remote functionality that allows users to quickly and securely connect to VeEX test equipment around the world without the need for VPN, port forwarding, or public IP addresses. This enables the customer to remotely connect and perform tests on equipment placed anywhere in the world with just an internet connection. Such initiatives provide customers with the best value for the price in the market.

To further enhance the customer experience and satisfaction, VeEX offers easy and flexible financing options for its products. The company has partnered with a third-party financing company that provides fast processing, flexible terms, and tax benefits. VeEX always places a strong focus on R&D and directs a significant amount of its resources for developing innovative products and enhancements to continuously enrich customer experience. For instance, the company plans to incorporate its VeSion® platform into the Ethernet testing solutions by 2022–2023. The VeSion platform has a proactive network monitoring feature that identifies potential issues before they happen. Currently, the platform is focusing on the cable TV network space.

Such an innovative customer-centric business model illustrates VeEX's excellence in providing unrivaled customer experience and satisfaction through various benefits such as user-friendliness, reduced technical complexity and OPEX, minimal testing time, and optimized network performance.

Conclusion

With 400GbE deployments gaining momentum, Frost & Sullivan firmly believes that VeEX's offerings are expected to witness significant growth. The company understands that not all 400GbE testing requirements are the same and hence, provides the appropriate tools for specific testing and environmental needs. The company offers the right set of products for varied TbE testing solutions, ranging from portable hand-held equipment to high mobility and availability solutions in data centers or solutions that address the high-density requirements in the rack-mount environment. The company's hand-held/portable field testing solution for 400GbE (RXT-6400) has garnered strong interest from all the major players in the 400GbE ecosystem. The highly differentiated and feature-rich products from VeEX offer customers highly flexible and cost-efficient testing solutions, increasing both product efficiency and customer satisfaction. Further, the company constantly creates buzz about its products through various industry events and informative webinars.

VeEX's customer-centric approach and strategies aimed towards enhancing the overall customer experience and ease-of-use further strengthen its positioning in the terabit Ethernet testing solutions landscape. The company directs significant resources towards R&D and forms strong partnerships with customers throughout the product development cycle. This has helped the company deliver high-quality products tailored to customer requirements, providing unrivaled customer value. The company's customer-focused culture that offers easy financing options; innovative test equipment management platforms such as VeExpress, VeSion, and EZ Remote functionality; 24*7 customer support; and constant customer dialogs sets the company apart from its competitors.

With its strong overall performance, VeEX earns Frost & Sullivan's 2021 Global Customer Value Leadership Award for its 400GbE testing solutions in the terabit Ethernet testing solutions industry.

What You Need to Know about the Customer Value Leadership Recognition

Frost & Sullivan's Customer Value Leadership Award recognizes the company that offers products or services customers find superior for the overall price, performance, and quality.

Best Practices Award Analysis

For the Customer Value Leadership Award, Frost & Sullivan analysts independently evaluated the criteria listed below.

Business Impact

Financial Performance: Strong overall financial performance is achieved in terms of revenues, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Commitment to quality and to customers characterize the company culture, which in turn enhances employee morale and retention

Customer Impact

Price/Performance Value: Products or services provide the best value for the price compared to similar market offerings

Customer Purchase Experience: Quality of the purchase experience assures customers that they are buying the optimal solution for addressing their unique needs and constraints

Customer Ownership Experience: Customers proudly own the company's product or service and have a positive experience throughout the life of the product or service

Customer Service Experience: Customer service is accessible, fast, stress-free, and high quality

Brand Equity: Customers perceive the brand positively and exhibit high brand loyalty

About Frost & Sullivan

Frost & Sullivan is the Growth Pipeline Company™. We power our clients to a future shaped by growth. Our Growth Pipeline as a Service™ provides the CEO and the CEO's growth team with a continuous and rigorous platform of growth opportunities, ensuring long-term success. To achieve positive outcomes, our team leverages over 60 years of experience, coaching organizations of all types and sizes across 6 continents with our proven best practices. To power your Growth Pipeline future, visit Frost & Sullivan at http://www.frost.com.

The Growth Pipeline Engine™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fuelled by the Innovation Generator™.
Learn more.

Key Impacts:

- **Growth Pipeline:** *Continuous Flow of Growth Opportunities*
- **Growth Strategies:** *Proven Best Practices*
- **Innovation Culture:** *Optimized Customer Experience*
- **ROI & Margin:** *Implementation Excellence*
- **Transformational Growth:** *Industry Leadership*

The Innovation Generator™

Our 6 analytical perspectives are crucial in capturing the broadest range of innovative growth opportunities, most of which occur at the points of these perspectives.

Analytical Perspectives:

- Mega Trend (MT)
- Business Model (BM)
- Technology (TE)
- Industries (IN)
- Customer (CU)
- Geographies (GE)