

F R O S T & S U L L I V A N

FROST & SULLIVAN BEST PRACTICES AWARD

INDUSTRIAL ETHERNET SWITCHES - GLOBAL

Company of the Year 2019



FROST & SULLIVAN

2019

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Background and Company Performance

Industry Challenges

In the wake of Industry 4.0, manufacturers seek to improve processes and productivity and reduce expenses. Industry 4.0's market applications range from factory automation to agile production lines, smart manufacturing to retail inventory control and supply chain. Several have turned to standardized protocols on the factory floor, including the most preferred networking technology: Ethernet.

Once considered a solution primarily for corporate network environments, Ethernet technology has proven to be a robust alternative that can meet the unique needs of the manufacturing arena. However, as industrial Ethernet (IE) technology finds increasing use in remote field locations, Ethernet switch reliability must be robust enough to handle harsh field conditions, such as high-voltage transients, severe shock and vibration, and extreme temperatures. These challenges inhibit industrial companies attempting to upgrade to Industry 4.0. Also, significant investments in protocols, decades of competition in fieldbuses, large install bases of proprietary equipment and systems across the world that operate with different protocols across both IP and non-IP devices. Driving innovation, flexibility, and growth at a global scale in such a fragmented environment is difficult.

Additionally, the fragmented nature of the industrial automation market hinders interoperability between different manufacturer devices and machines, limiting the expansion of plant control access networks. As industrial enterprises transition to Industry 4.0, technical requirements will grow in terms of connectivity and reach. Frost & Sullivan believes transitioning industrial protocols to Ethernet would enhance interoperability and allow seamless connectivity with an expanding ecosystem of Ethernet devices inside and outside of the factory premises. Further, Ethernet is the portal to the Internet, which enables on-premises devices to communicate globally.

Moreover, as Industry 4.0 and the Internet of Things (IoT), both of which demand seamless interconnection from the smallest sensor up to enterprise-level systems and beyond—industrial Ethernet has poised to become the de-facto choice. The communication capabilities of industrial Ethernet extend beyond factory walls of an oil rig's superstructure; this information can move in both directions across all levels of the value chain, enabling a head office in another country to access real-time drilling information or a maintenance engineer six-time zones away to fine-tune the machine his company delivered and installed. It also enables traditionally separate systems to interact, such as industrial processes, energy infrastructures, and building management systems. To exploit all these benefits, Frost & Sullivan believes industrial companies should develop an effective Ethernet strategy.

Visionary Innovation & Performance and Customer Impact of Cisco

Founded in San Francisco, Cisco Systems (Cisco) develops, manufactures, and sells networking hardware, telecommunications equipment, and other high technology services and products. In three decades, the California-based multinational conglomerate achieved several market leadership positions, resulting in a proven, well-known brand name that is trusted across the globe. The company's products and services focus on three market segments: enterprise,

service provider, midsize and small business. Moreover, Cisco has distinguished itself as the ideal business partner for many industrial solution partners. Frost & Sullivan is proud to acknowledge Cisco's performance for technology once again.

Taking a Leap of Faith: Reinforcing Market Position by Anticipating Trends

Cisco is a switch pioneer, with more than two decades' experience in its product lines, ensuring its technology continues to address critical customer needs. IE switches are critical for business connectivity transformation initiatives. As a market leader in the IE switches space, Cisco continues to set the standard for new value-added network infrastructure developments.

The company's ability to anticipate, capture, and lead through market transitions defines its success. Cisco navigated several fundamental technology transitions, including cloud computing, mobility, and the IoT. These technological shifts forced the company and its customers to approach data, security, and business models differently. That means making tough decisions and immersing the company in the process of disrupting the market. As a large company with a dominating market share, it is tempting to view market disruptions as a threat, but Cisco views them as an opportunity. This attribute sets them apart on continuing to push the boundaries and expand market footprint. When a market does not transition or evolve, gaining market share is difficult as vendors struggle to take one or two market share points from competitors. Thus, Cisco transformed its entire business, expanding to capture growth, and thinking differently about the future of industrial connectivity technology.

Anticipating and staying ahead of technology and market transitions drives Cisco's evolution and reinforces its market leadership across multiple technology markets. The company leverages its strong relationships with its customers to identify new technologies that may require a leap. For example, prior to the market moving from routing to switching, Cisco engaged one of its key customers and first learned of Fast Ethernet. Through this customer engagement, Cisco identified and purchased Crescendo Communications, which was making advances in Ethernet technology, thus, simplifying the transition for Cisco while simultaneously strengthening its position in the rising market. Similarly, as the market shifted toward wireless, Cisco's customers recommended it acquire Meraki, a maker of Wi-Fi networking gear. By engaging its customer base, Cisco identifies new opportunities that are useful in making transitions and disrupting its processes.

Back to Fundamentals: Building Success on a Strong Technological Foundation

"By 2020, 50 billion devices will be connected to the Internet, creating \$19 trillion of economic value. In this world of digital newcomers toppling traditional giants, it's time to disrupt or risk being disrupted." – Cisco¹

Cisco recognizes that leadership in any industry comes from the ability to capture new opportunities through changes in the marketplace. The company's "leap of faith" approach to disruption leads to first-to-market positioning in multiple strategic ventures. Frost & Sullivan believes that Cisco—the market leader in multiple technology verticals—provides the foundation for digital transformation. It offers a robust and integrated product portfolio that enables

¹ Cisco. *"Disrupt or Be Disrupted."* 2015. Accessed September 2019.

organizations to digitize without the associated risk involved in integrating multiple point products.

Leveraging the digitalization megatrend, Cisco provides a strong technology foundation that unites business processes for digital transformation. It offers a robust and integrated product portfolio that connects people, businesses, and devices. In the 21st century, connectivity is a fundamental requirement for such digital transformation. If things cannot connect, then transformation is impossible. Traditionally, however, connectivity was siloed, creating “islands” of connected endpoints. Cisco builds openness into its technology, delivering a distributed intelligence to support the constantly evolving world.

An example of Cisco’s strong technology foundation is its IE switches, which seamlessly blend reliability, enable network endpoint and application scalability, while still maintaining robust network-wide resilience. A recent addition to its portfolio, Cisco’s Catalyst IE3x00 rugged series switches (IE3x00) exceed industrial customer’s expectations as the company designed and built this series for harsh environments and temperatures ranging from -40° to 45° Celsius (-40° to 167° Fahrenheit). The IE3x00 line features a fanless convection cooling system with no moving parts, successfully extending durability.

Also, Cisco hardened the switches to withstand vibration, shock and surge, and electrical noise, while also complying with multiple industry specifications for multiple technologies, such as automation and substation environments. The company’s IE switches natively support industrial protocols, such as Common Industrial Protocol, Ethernet/IP, and Process Field Internet, ensuring its customers operate according to the right standards, which is critical and valuable for many verticals. In fact, Cisco’s IE 2000 IP67 Series was the company’s first ruggedized switching platform to comply with the most demanding industrial standards, IP67, extending Cisco’s IOS Software features to the factory floor, rail yard or other industrial sites, even in the harshest environments.

The sum of its parts, Cisco equips its switching technology with best-in-class features that facilitate optimized performance, building value, and cost-efficiency directly into its IE switches. For example, Cisco reports one of its manufacturing customers saw its build-to-order cycle times improve by up to 25 percent with the added flexibility, and integrated plant and information technology (IT) infrastructure.² Cisco developed its IE switches with inline power, simplifying device movement, such as IP cameras, IP phones, badge readers, and wireless access points without an expensive, time-consuming electrical layout overhaul. Moreover, its zero-touch deployment lowers operational costs by automating thousands of new endpoints as part of IoT deployments. Moreover, Cisco’s IE3x00 series manages scale, lowers costs, and increases security by extending its intent-based networking to the IoT edge.

Purpose-built Value: Cisco’s Industrial Ethernet Switches

“Early field trials of the Cisco Catalyst IEx300 Rugged Series have laid the foundation for future opportunities to expand intent-based networking and with it centralized management and security to the edge of the network. We look forward to continuing to deploy Cisco’s IoT industrial solutions.” —Paul Moore, Senior Director of IT, Georgia-Pacific

² Cisco. “Cisco Industrial Ethernet Switching Portfolio.” Brochure. Accessed September 2019.

Over the last few years, Cisco's leadership in the IE switches market increased, further solidified by its aggressive product development. The company regularly innovates, building on its existing IE switches portfolio to address the constantly changing market needs. To this end, the company purpose-built its IE switches to maximize its key features, delivering valuable insights into traffic flows while simultaneously monitoring all network activity. Cisco's IE switches deploy quickly and simply, lowering operational expenses with zero-touch discover, express setup, and fast boot-up time. Moreover, the company designed and certified its IE switches for all main industrial vertical application areas, such as general industrial, oil and gas, mining, transportation, and utilities, along with associated environmental requirements and standards.

With its near-ubiquitous market position in IE switches and IoT solutions, as well as a growing portfolio of switches, few industrial enterprises will be devoid of Cisco in their network. Given its strong market position, Cisco delivers compelling value to its customers, creating its IE switches with value built into every facet. The IE switches feature a versatile, modular architecture that scales with customer IoT deployments, which helps optimize and future-proof their networking investments. Moreover, high-availability technology facilitates network-wide resilience, increasing network availability as customers scale their technologies.

Moreover, Cisco's IE switches differentiate from the competition through robust features that address market gaps and prepare customers for the future. For example, the IE switches feature full gigabit Ethernet (GE) interfaces that provide secure access for new high-speed applications in the industrial space. Cisco's Universal Power over Ethernet (UPOE+ and UPOE) extends the IEEE Power over Ethernet Plus (PoE+) standard to double the power per port to 90 watts.³ The interfaces expand to 26 GE ports by attaching one of 8 compatible modules (copper, PoE, Fiber, etc.). Cisco also delivers high-density industrial PoE with support for up to 16 PoE or PoE+ ports, and controls costs by limiting wiring, distribution panels, and circuit breakers.⁴ Cisco's high-density industrial PoE reduces equipment needs, thus requiring less space and reducing heat dissipation. Lastly, Cisco delivers true zero-configuration and simple switch replacement in case of failure through its swap-drive, which does not necessitate the networking expertise required by competing technology, facilitating fast recovery.

The company's switches are part of a complete, scalable networking solution that offers customers ease-of-management since all components of the network are built to collaborate and originate from a single manufacturer. While Cisco's Ethernet products work well in a mixed environment, pairing them with other Cisco network technologies ensures optimized security and features. The reliable and highly secure switches help disparate applications with different requirements achieve the bandwidth and efficiency from a converged IP network. More importantly, Cisco reported ongoing administrative costs could make up 70 to 75 percent of the lifetime network total cost of ownership.⁵ The company diminishes these costs through increased network performance, which results in lower operating costs and increased

³ Cisco. "Cisco UPoE+ and UPoE – Power over Ethernet." <https://www.cisco.com/c/en/us/solutions/enterprise-networks/upoe/index.html>, Accessed September 2019.

⁴ *ibid*

⁵ Cisco. "Switch on the Cisco Experience." Brochure.. https://www.cisco.com/web/AP/partners/disti/files/Sell_Sheet_2.pdf, Accessed September 2019.

productivity, steaming from reduced downtime and simplified network management and troubleshooting, thus delivering significant value to customers.

For example, Cisco's IE 4000 switch series (4000) features easy installation with up to 240 watts of PoE power budget, supporting 8-port gigabit PoE/PoE+ in a compact, self-cooled, Deutsches Institut für Normung(DIN)-Rail mounted design.⁶ Also, the 4000 series provides secure access and industry-leading convergence through Cisco's Resilient Ethernet Protocol (REP)—Cisco's tried-and-true protocol leveraged in place of the Spanning Tree Protocol.⁷ REP offers quick convergence times, works with existing hardware, configures easily, and has predictable blocked ports. Cisco's 4000 series is ideal for industrial environments, such as factories, utility substations, and intelligent transportation systems.

Additionally, Cisco developed its IE 5000 series (5000) switches to withstand the harshest industrial environments, offering the most flexible and scalable IE platform that scales with the customer's network. The 5000 series leverages high-bandwidth hardware switching with Cisco's IOS Software to deliver a highly secure and scalable access and aggregation layer deployments. It also provides Cisco's proven stackable technologies for advanced network reliability. Purpose-built to withstand extreme environments, the 5000 series is ideal for IE application where hardened products are required, including utility industries, manufacturing, energy and process control, intelligent transportation systems, oil and gas field sites, city surveillance programs, and mining. The 5000 series complements Cisco's existing portfolio with its enhanced hardware and rich feature set.

Maintaining a Legacy: Cisco's End-to-end Customer Experience

Cisco creates a longstanding partnership through a simple ethos: "Whatever it takes, we'll get the job done."⁸ As a legacy brand, Cisco finds customer experience drives its brand success and longevity. However, the definition of customer experience is evolving rapidly, starting with customer expectations. The customer expects a thoughtfully architected journey of interactions with a company's brand. Thus, Cisco's engagement with the customer shifted from focusing primarily on the post-sales stage to being inclusive of the pre-sales stages.

Additionally, there are more channels for companies to communicate and engage with their audience. To connect with customers effectively across touchpoints, Cisco consolidates content production to make an accessible, efficient, visible location, enabling market teams to focus on their target audiences while planning and producing content—as opposed to creating content first and finding a place for it later. Cisco's omni-channel process identifies relevant audiences and defines the necessary content. To achieve high customer engagement, Cisco leverages a content marketing platform for enterprises. Serving as a central node, the system connects Cisco's marketing elements and technical stack in an accessible, collaborative space. The platform strengthens Cisco by providing it the necessary visibility, coordination, and governance

⁶ Cisco. "Cisco Industrial 4000 Series Switches." Web page.

<https://www.cisco.com/c/en/us/products/switches/industrial-ethernet-4000-series-switches/index.html>. Accessed September 2019.

⁷ Ibid.

⁸ Martinez, Maria. "Our Next Step in Customer Experience." Cisco Blog. April 2, 2019. <https://blogs.cisco.com/customerexperience/intro>, Accessed September 2019

required to launch market strategies successfully and engage with customers and potential customers.

As the leading solution in the industry, Cisco's IE switches differentiate by the total ownership experience they offer the customer. Specifically, its IE switches originate from a trusted and respected provider, featuring integrated no-compromise security to ensure data protection. Cisco guarantees peace-of-mind through its comprehensive security features, such as its IOS Flexible NetFlow (NetFlow). The proprietary flow technology characterizes IP traffic and identifies its source, traffic destination, timing, and application information, all of which is critical for network availability, performance, and troubleshooting.⁹ NetFlow increases capacity planning accuracy, ensuring that resource allocation supports organizational goals. It also helps customers determine how to optimize resource usage, plan network capacity, and identify the optimal application layer for Quality of Service. NetFlow plays a critical role in network security by detecting Denial of Service attacks and network-propagated worms.

Moreover, Cisco provides software-defined segmentation through its TrustSec[®] (TrustSec), enabling customers to segment industrial devices and define security policies for each segment. It enables virtual footprints, facilitating flexible and elastic operation. TrustSec enables assets or applications to define firewall and access control rules, automating the management of those rules, thus saving significant operation effort and time. Moreover, it enables customer devices to access only specific resources and applications, isolating segments upon threat detection to prevent the spread of attacks. Finally, Cisco's IE switches include advanced security by supporting the Advanced Encryption Standard-256 with a MACsec 256-bit encryption algorithm included in all of Cisco's models. The company also supports Secure Boot and Secure Unique Device Identification support for plug-and-play, verifying hardware, and software identities.

Finally, Cisco delivers unmatched service through Cisco Entitlement (Entitlement)—a set of services and privileges customers and partners receive when purchasing a Cisco service agreement. Entitlement provides faster, more accurate service based on hardware configuration and software version. Based on the terms of a customer's services support contract, Cisco delivers access to one or more service elements, such as Technical Assistance Center support, hardware replacement, licensing for software and hardware, and access to the Cisco support website, and software downloads.

Conclusion

Due to its inherent reliability, performance, security compliance, and interoperability, Ethernet is becoming an attractive choice for connectivity in industrial fields. Unfortunately, the harsh field conditions, such as high-voltage transients, severe shock and vibration, and extreme temperatures hinder Ethernet adoption. Furthermore, in the last decade, massive technology pillars have enabled Industry 4.0—the next great industrial revolution. Developments such as cloud computing, big data, and mobile computing have given rise to the smart factory, delivering connectivity between industrial equipment and constant data flow to access and analyze centralized information.

⁹ Cisco. "Flexible NetFlow." Web page. <https://www.cisco.com/c/en/us/products/ios-nx-os-software/flexible-netflow/index.html> , Accessed September 2019.

With a history of technological expertise spanning three decades, Cisco guides manufacturers on their journey to Industry 4.0, driving the future of their industries. Cisco's solutions are designed specifically for the data, connectivity, and management requirements for IoT and Industry 4.0, delivering greater value for end-to-end information and control. The company's industrial Ethernet (IE) switches withstand the extreme environments while adhering to industrial network design, compliance, and performance requirements. Moreover, its IE switches differentiate through robust features, such as zero-configuration, fanless convection cools, and inline power, that address market gaps and prepare customers for the future. Further, the company made several strategic initiatives to engage its customers on several fronts to ensure it stays at the forefront of the industry and anticipates technology transitions.

For its unmatched resilience, fearless, innovative spirit, iron-clad market position, and strong overall performance, Cisco earns Frost & Sullivan's 2019 Global Company of the Year for the industrial Ethernet switches market.

Significance of Company of the Year

To receive the Company of the Year Award (i.e., to be recognized as a leader not only in your industry, but among non-industry peers) requires a company to demonstrate excellence in growth, innovation, and leadership. This excellence typically translates into superior performance in three key areas—demand generation, brand development, and competitive positioning—that serve as the foundation of a company’s future success and prepare it to deliver on the 2 factors that define the Company of the Year Award: Visionary Innovation and Performance, and Customer Impact).



Understanding Company of the Year

Driving demand, brand strength, and competitive differentiation all play critical roles in delivering unique value to customers. This three-fold focus, however, must ideally be complemented by an equally rigorous focus on Visionary Innovation and Performance to enhance Customer Impact.

Key Benchmarking Criteria

For the Company of the Year Award, Frost & Sullivan analysts independently evaluated each factor according to the criteria identified below.

Visionary Innovation & Performance

- Criterion 1: Addressing Unmet Needs
- Criterion 2: Visionary Scenarios through Mega Trends
- Criterion 3: Implementation Best Practices
- Criterion 4: Blue Ocean Strategy
- Criterion 5: Financial Performance

Customer Impact

- Criterion 1: Price/Performance Value
- Criterion 2: Customer Purchase Experience
- Criterion 3: Customer Ownership Experience
- Criterion 4: Customer Service Experience
- Criterion 5: Brand Equity

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 Monitor, target, and screen	Identify Award recipient candidates from around the globe	<ul style="list-style-type: none"> • Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies 	Pipeline of candidates who potentially meet all best-practice criteria
2 Perform 360-degree research	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> • Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates 	Matrix positioning of all candidates' performance relative to one another
3 Invite thought leadership in best practices	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> • Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps 	Detailed profiles of all ranked candidates
4 Initiate research director review	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> • Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles 	Final prioritization of all eligible candidates and companion best-practice positioning paper
5 Assemble panel of industry experts	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> • Share findings • Strengthen cases for candidate eligibility • Prioritize candidates 	Refined list of prioritized Award candidates
6 Conduct global industry review	Build consensus on Award candidates' eligibility	<ul style="list-style-type: none"> • Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates 	Final list of eligible Award candidates, representing success stories worldwide
7 Perform quality check	Develop official Award consideration materials	<ul style="list-style-type: none"> • Perform final performance benchmarking activities • Write nominations • Perform quality review 	High-quality, accurate, and creative presentation of nominees' successes
8 Reconnect with panel of industry experts	Finalize the selection of the best-practice Award recipient	<ul style="list-style-type: none"> • Review analysis with panel • Build consensus • Select winner 	Decision on which company performs best against all best-practice criteria
9 Communicate recognition	Inform Award recipient of Award recognition	<ul style="list-style-type: none"> • Present Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance 	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10 Take strategic action	Upon licensing, company able to share Award news with stakeholders and customers	<ul style="list-style-type: none"> • Coordinate media outreach • Design a marketing plan • Assess Award's role in future strategic planning 	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS



About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation, and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit <http://www.frost.com>.