

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

2024 COMPETITIVE STRATEGY LEADER

*IN THE NORTH
AMERICAN NETWORK
SERVICES INDUSTRY*

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

BEST
2024 PRACTICES
AWARD

LUMEN®

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. Lumen Technologies excels in many of the criteria in the wavelength services space.

AWARD CRITERIA	
Growth Strategy Excellence	Technology Leverage
Implementation Excellence	Price/Performance Value
Brand Strength	Customer Purchase Experience
Product Quality	Customer Ownership Experience
Product Differentiation	Customer Service Experience

Growth and Innovation in the North American Wavelength Services Market

The North American wavelength services market is growing rapidly, driven by demand for fast and low-latency connectivity. As digital transformation accelerates, the need for high-bandwidth connectivity surged, especially in industries reliant on data-heavy and latency-sensitive applications. In 2023, the market generated \$5.01 billion in revenue, with a projected compound annual growth rate of 6.6% from 2022 to 2027, reflecting the importance of reliable and high-speed infrastructure in digital environments.¹

Responding to the market trends, service providers are upgrading their network infrastructure to offer 100 gigabits (G) per second and 400G, with advancement plans for 800G wavelengths. To remain competitive, top providers offer customer-centric features such as digital self-service portals and waves-on-demand for near-instant service activation, often within 24 hours, meeting customers’ growing need for flexible and rapid connectivity.

However, challenges such as supply chain disruptions affect equipment availability, delaying network expansion and upgrades. To mitigate these impacts, some providers store essential supplies to ensure consistent service and network reliability. Security also remains a priority, with many providers offering encrypted wavelength services to protect against increasing network threats. This emphasis on secure and high-speed connections aligns with customer needs in data-sensitive sectors.

¹ Frost Radar™: Wavelength Services in North America, 2023 (Frost & Sullivan, October 2023)

With strong market demand, the North American wavelength services market is poised for steady growth through technological innovation and advanced customer service capabilities. Lumen exemplifies this trend by providing scalable, high-performance solutions and customer-centric innovations.

Lumen Technologies: Driving Connectivity with Advanced Wavelength Services

Founded in 1968 and headquartered in Louisiana, United States (US), Lumen distinguishes itself as a

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***- Ain Sarah Aishah
Best Practices Research Analyst***

market leader in North American wavelength services. The company’s robust infrastructure enables it to deliver on the increasing demand of high-bandwidth connectivity driven primarily by the exponential growth in artificial intelligence (AI), cloud connectivity, and data-intensive applications.

Lumen has spent billions to upgrade its fiber infrastructure across its entire NA footprint. The company boasts the largest Ultra Low Loss (ULL) fiber network in NA and expects to substantially increase it in the coming years, given the high demand seen for their Private Connectivity Fabric (PCF) solutions. As a key component of PCF and beneficiary of the ULL fiber network, Lumen’s NextGen Wavelength network is enabled to provide 100G/400G connectivity, spanning over

78,000 route miles. Coupled with over 2,200+ on net third-party data centers and 125 optical cloud on-ramps, this extensive network infrastructure positions Lumen to accommodate the increasing data demands of a digital-first economy.

As the AI and cloud markets continue to advance, Lumen aligns its wavelength services to meet the growing demand for high-capacity bandwidth. With their NextGen Wave Network, the company can more easily incorporate advancements in network automation and future connectoptical advancements like 800G. The company enables seamless, high-speed connectivity between cloud platforms and customer sites, supporting AI-driven applications that require rapid data processing. With businesses increasingly adopting multi-cloud and hybrid environments, Lumen’s wavelength services facilitate these needs, empowering organizations to scale and optimize their digital infrastructure.

In 2023, Lumen integrated its Network-as-a-Service (NaaS) with Equinix Fabric, allowing on-demand connectivity that adjusts bandwidth instantly.² This capability enables enterprise customers to scale their bandwidth as business needs fluctuate, mirroring the flexibility required in large-scale cloud environments. The NaaS platform expanded to 136 data centers across North America, supporting data-intensive applications with adaptable connectivity. Additionally, Lumen’s on-demand offerings, such as Lumen® Ethernet On-Demand and internet protocol virtual private network (IPVPN), provide dedicated, private connections that meet data security and compliance standards essential for industries like finance and healthcare.³ This flexibility allows clients to adopt cloud and AI technologies confidently while maintaining high levels of data protection.

² <https://news.lumen.com/2023-10-31-Lumen-takes-Network-as-a-Service-to-the-next-level-with-Equinix>

³ <https://news.lumen.com/2023-11-01-Lumen-builds-on-its-network-cloudification-vision-to-offer-burstable-on-demand-internet>

Furthermore, recognizing the importance of network security, the company provides encrypted wavelength services with layer 1 encryption, enabling secure management of encryption keys through its portal. These enhancements respond to critical need for heightened data protection, particularly for industries operating in data-sensitive environments such as government and financial services. This approach differentiates Lumen from competitors, demonstrating its commitment to enabling secure data transfers across digital infrastructure.

Through its focus on high-demand areas (e.g. AI, cloud connectivity, and security), Lumen maintains steady growth in the market. Frost & Sullivan commends the company's ability to anticipate industry needs and capitalize on technological trends, underscoring its leadership in the wavelength services sector. As organizations continue to embrace AI and cloud solutions, Lumen's strategies and innovative offerings drive its continued success, solidifying its role as a leader in digital connectivity solutions.

Customer-centric Approach: Advanced Solutions and Tools for Enhanced Experience

Lumen's competitive edge extends beyond its technological capabilities to its customer-centric solutions. The company delivers tailored wavelength solutions that meet the unique requirements of various industries, from healthcare to finance. Its emphasis on network diversity and resilience enables customers to construct robust digital networks capable of withstanding disruptions. This flexibility and reliability distinguish Lumen from its main competitors.

Lumen's commitment to scalable and customized solutions drives its success, particularly in developing flexible digital and cloud network offerings. The company is exploring a 'bulk capacity' product concept, which allows clients to reserve significant network capacity (up to 3.2 terabits on a single route) and activate services on demand through a self-service portal or application programming interface (API).⁴ If implemented, this capability enables customers (especially organizations with unpredictable demand patterns) to scale their networks in real time, enhancing efficiency and responsiveness.

Moreover, Lumen provides a service assurance application called Laser (available through its portal) that enables customers to monitor key network metrics. Using a map-like topology viewer, customers can assess their circuit inventory and view important performance data, including latency, path traversal, bit error rates, and light levels.⁵ This visibility empowers users to manage their network performance proactively, making it especially beneficial for organizations that rely on high-bandwidth applications. By offering flexible, end-to-end solutions, the company demonstrates its commitment to innovation and gives customers control over network management.

Lumen's portal enhances the customer experience by enabling clients to handle service-related tasks, from digital order placement to troubleshooting and monitoring. The company's control center's Service Diagnostics tool equips customers with operational insights into their wavelength services, while its

⁴ Frost & Sullivan's Interview with Lumen (October 2024)

⁵ Ibid.

proactive notification feature alerts customers on any service disruption, ensuring they stay informed and can act swiftly.

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- Amrit Singh
Industry Principal

Lumen’s partnership with Microsoft also underscores its internal digital transformation to elevate customer service standards. By migrating its workloads to Microsoft Azure, the company simplifies operations, reduces legacy system costs, and streamlines customer service capabilities. This shift is expected to generate over \$20 million in cash flow improvements within the next year, enhancing Lumen’s ability to invest in additional customer-centric initiatives.⁶ Furthermore, integrating Microsoft’s AI solutions across its teams allows the company to provide faster and more insightful customer service, driving improved customer experience through automation and intelligent support tools.

The NaaS integration with Equinix Fabric and enhancements in Lumen’s Internet On-Demand service enhances its customer-focused approach further, enabling customers to access and adjust bandwidth instantly through an intuitive digital portal or API. This capability allows customers to manage their services independently, reducing wait times and providing unparalleled flexibility. This instant, consumption-based service supports the real-time scalability that today’s businesses need, highlighting Lumen’s customer-centric service delivery approach. As clients gain more control over service adjustments and diagnostics, the company sets a new standard for customer service excellence, making it easier for organizations to manage complex network environments efficiently.

Lumen’s comprehensive customer-centric strategy strengthens its brand as a provider focused on customer needs. By continuously evolving its offerings and prioritizing customer empowerment, the company secures long-term growth and competitiveness in an increasingly complex digital market. Frost & Sullivan acknowledges Lumen’s innovative solutions and commitment to enhancing the customer experience, cementing its leadership in the wavelength services sector.

Strengthening Leadership: Lumen’s Network Expansion and Strategic Partnerships

Lumen strengthens its leadership in North American wavelength services through an expansive network strategy and partnerships. Covering approximately 78,000 route miles, its network includes dense fiber routes that support high capacity 400G services. The company actively expands its fiber footprint, particularly on intercity routes, to meet the anticipated demand from hyperscale clients and data center providers. In 2022, the company announced a significant investment to add six million ultra-low-loss fiber miles to connect 50 major US cities by the end of 2026.

⁶ <https://news.lumen.com/2024-07-24-Microsoft-and-Lumen-Technologies-partner-to-power-the-future-of-AI-and-enable-digital-transformation-to-benefit-hundreds-of-millions-of-customers>

The strategic partnership with Corning Incorporated (Corning) strengthens its expansion effort. This collaboration secures 10% of Corning's global fiber capacity for Lumen over the next two years, doubling the company's intercity fiber miles across the US. By integrating Corning's new generative AI fiber, capable of fitting two to four times more fiber within existing conduits, Lumen maximizes its infrastructure efficiency.⁷ This capacity supports data-heavy, AI-driven demands, solidifying Lumen's position as a preferred partner for AI-ready infrastructure in sectors such as cloud computing, finance, and healthcare.

Lumen's partnership with META, Google Cloud, Amazon Web Services (AWS), and Microsoft demonstrate its commitment to expanding network capacity and driving AI-powered innovation. Its Private Connectivity FabricSM plays a key role in these collaborations, enhancing network flexibility and scalability across all partnerships. With META, the fabric supports flexible, on-demand bandwidth for AI advancements, while with Google Cloud, it enables operational efficiencies and expands network capabilities, facilitating innovations like the Lumen Digital Twin for proactive insights. The partnership with AWS strengthens data center connectivity, meeting the high-bandwidth demands of AI workloads and generative AI applications. Additionally, the company's collaboration with Microsoft extends network capacity to address the growing data needs of Azure and OpenAI services. These initiatives position Lumen as a leading network provider for AI, with an infrastructure designed to support cloud-native and high-performance computing across platforms.

Another major competitive advantage for Lumen is its next-generation infrastructure, particularly through its 400G capabilities. As 400G adoption accelerates within the sector, the demand for high-bandwidth solutions, especially 100G, grows rapidly at an annual rate of 25% to 30% as industries such as finance, healthcare, and life sciences seek reliable and scalable connectivity. To keep pace with this trend and the rapid technological advancements in AI and cloud computing, the company plans to implement 800G channels in its network by 2025.⁸ This initiative will future-proof its infrastructure, ensuring that Lumen remains equipped to meet evolving customer bandwidth requirements and solidifying its leadership in high-capacity, AI-ready connectivity solutions.

Advancing its infrastructure further in 2024, Lumen enhanced its NaaS solution with the introduction of IPVPN and Ethernet Cloud Connect services, which offer secure high-performance private connections for businesses managing sensitive data. These services meet the increasing demand for secure cloud connections and enhanced data protection, particularly for industries like finance and healthcare. In addition, the company plans to integrate security services such as Distributed Denial of Service protection, further strengthening its network offerings.⁹ These enhancements allow businesses to adjust bandwidth on demand and ensure secure, reliable connections to multiple locations, improving scalability and overall network resilience without the need for costly hardware or frequent infrastructure upgrades.

Frost & Sullivan applauds Lumen for its consistent advancements in infrastructure, partnerships, and service innovation. The company's strategic investments in network expansion and cutting-edge technologies position it as a trusted provider of resilient, scalable network solutions. As digital demands

⁷ <https://news.lumen.com/2024-08-01-Corning-and-Lumen-Reach-Supply-Agreement-on-Next-Generation-Fiber-Optic-Cable-to-Support-Data-Center-AI-Demands>

⁸ Frost & Sullivan's Interview with Lumen (October 2024)

⁹ <https://news.lumen.com/2024-01-31-Businesses-Ask-for-Private-On-demand-Network-Connections-Lumen-Delivers>

continue to evolve, Lumen is well-positioned to lead in delivering future-proof services, ensuring long-term success in a rapidly changing digital setting.

Conclusion

Lumen advanced infrastructure and customer-centric services position the company for sustained growth in the digital and data-intensive setting. By consistently expanding its network, enhancing connectivity with on-demand and secure services, and integrating next-generation technologies, the company ensures it meets the evolving demands of industries such as finance, healthcare, and cloud computing. Its commitment to innovation, along with its ability to provide scalable, flexible, and secure services, solidifies its leadership in the wavelength services sector. Through its approach to artificial intelligence, high-capacity networking, and cutting-edge security measures, Lumen is poised to remain a top provider and trusted partner in the field.

With its strong overall performance, Lumen earns Frost & Sullivan's 2024 North American Market Leadership Award in the wavelength services industry.

What You Need to Know about the Market Leadership Recognition

Frost & Sullivan's Market Leadership Award recognizes the company that achieved the greatest market share resulting from outstanding performance, products, and services.

Best Practices Award Analysis

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

Growth Strategy Excellence: Company demonstrates an ability to consistently identify, prioritize, and pursue emerging growth opportunities

Implementation Excellence: Company processes support efficient and consistent implementation of tactics designed to support the strategy

Brand Strength: Company is respected, recognized, and remembered

Product Quality: Products or services receive high marks for performance, functionality, and reliability at every stage of the life cycle

Product Differentiation: Products or services carve out a market niche based on price, quality, or uniqueness (or some combination of the three) that other companies cannot easily replicate

Technology Leverage: Company is committed to incorporating leading-edge technologies into product offerings to enhance product performance and value

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 are proud to 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 of high quality

