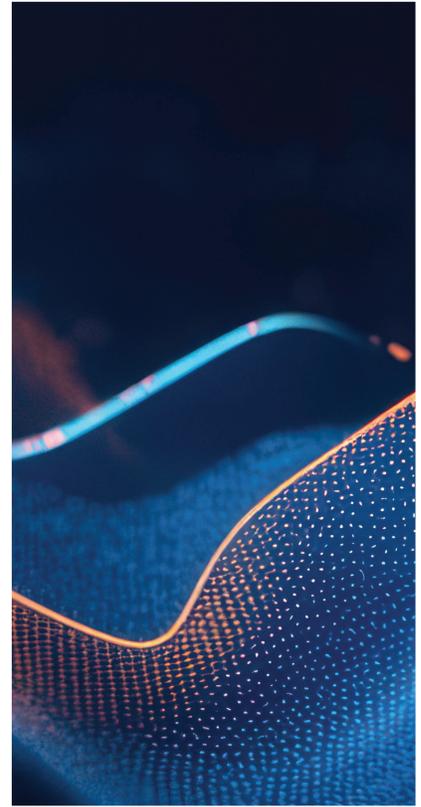
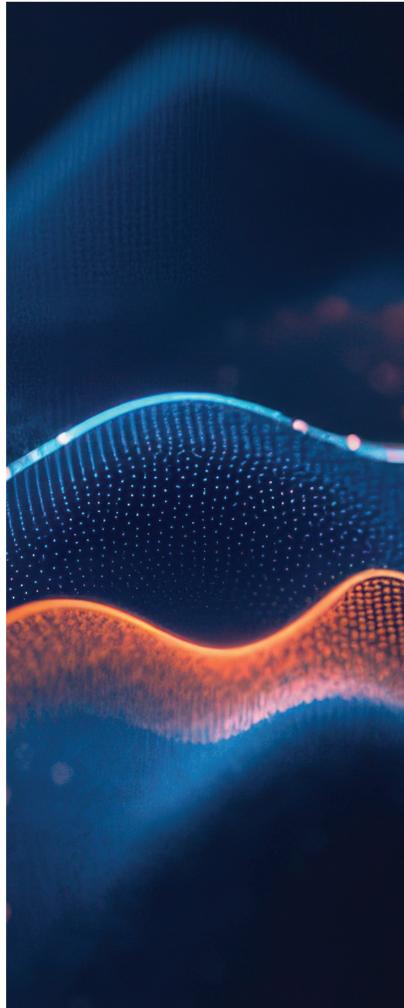


FROST & SULLIVAN  
BEST PRACTICES



2026

NORTH AMERICAN  
WAVELENGTH SERVICES

**MARKET LEADERSHIP**

LUMEN®

## Best Practices Criteria for World-class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each recognition category before determining the final recognition 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.

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

### The Transformation in the North American Wavelength Services Industry

The North American wavelength services market is being driven by enterprises accelerating digital transformation, adopting AI/ML applications, and increasing use of bandwidth-intensive workloads that require high-capacity connectivity between branches, data centers, and cloud environments. In 2024, the

*“Lumen is strengthening its market position as a provider of high-capacity, future-ready network solutions.”*

**- Amrit Singh**  
**Industry Principal**

market generated \$5.34 billion in revenue, with a projected compound annual growth rate of 6.6% from 2024 to 2029, reflecting the ongoing importance of reliable and high-speed infrastructure in digital environments. Demand is further amplified by hyperscalers and emerging neocloud providers requiring scalable data center interconnect. While 10Gbps (G) and 100G remain widely deployed, service providers reported rising demand for 400G bandwidth in 2024–25.

Looking ahead, demand for 800G is expected to surge in 2026–27, mainly pushed by rapid data center expansion and increasing AI-driven workloads. In response, providers are upgrading high-capacity routes and pre-provisioning strategic corridors near cloud and data center hubs, ensuring networks can support next-generation performance requirements and deliver the scalability enterprises need for future-ready infrastructure.

#### Technology Leverage

Lumen is a leading provider of wavelength services in North America. Its extensive fiber and optical infrastructure positions the company to meet rising demand for high-bandwidth connectivity, driven by

the rapid expansion of AI workloads, data center expansion, cloud adoption, and increasingly data-intensive enterprise applications. Building on its strong, extensive network, Lumen offers a comprehensive portfolio of network services, including business carrier Ethernet, IP VPN/MPLS, dedicated internet access, software-defined wide-area network (SD-WAN) services, network as a service (NaaS), managed services, cloud connect, adaptive virtual services, fiber-based internet, and professional services. Lumen leverages its massive fiber backbone to offer wavelength services, delivering speeds up to 400G, suitable for businesses of all sizes. Lumen’s extensive network footprint comprises 340,000 route miles and connects over 163,000 on-net buildings, delivering unparalleled reach and scalability. Beyond its North American core, Lumen’s global footprint connects customers to more than 250 Lumen data centers, 2,200 third-party facilities, and 125 optical cloud on-ramps enabling high-capacity waves for Data Center Interconnect (DCI) and seamless cloud connectivity. Serving hyperscalers, large enterprises, wholesale carriers, public sector organizations, and emerging neocloud providers, Lumen addresses the full spectrum of bandwidth-intensive needs.

A key differentiator is Lumen’s ultra-low-loss fiber network, purpose-built for next-generation workloads. As part of its nationwide expansion connecting 50 major cities, Lumen has deployed 14 million intercity fiber miles and is on track to reach 16.6 million by the end of 2025, scaling to 47 million by 2028. This

*“Lumen delivers industry-leading wavelength services over its next-generation, 400G-enabled optical network spanning more than 100,000 intercity route miles across North America.”*

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aggressive buildout positions Lumen to accommodate the explosive growth in enterprise bandwidth demand, including AI initiatives and data-heavy applications. With significant scale, proven reliability, and continued strategic investment, Lumen is strengthening its market position as a provider of high-capacity, future-ready network solutions.

In addition, Lumen’s NaaS platform strengthens its competitive position in network services by providing on-demand internet, Ethernet, and IP VPN capabilities. In August 2025, Lumen surpassed 1,000 customers on its NaaS platform, underscoring market traction. Industry validation further reinforces momentum, with MPLIFY naming Lumen the 2024 North American NaaS Service Provider of the Year.

### Product Quality

Lumen delivers industry-leading wavelength services over its next-generation, 400G-enabled optical network spanning more than 100,000 intercity route miles across North America. Built on Lumen’s ultra-low-loss fiber infrastructure, this network offers unique low-latency routes and diverse intercity gateways, enabling holistic optical fabric solutions backed by stringent SLAs for performance and resiliency. Lumen supports 10G, 100G, and 400G wavelengths to meet evolving enterprise and hyperscaler demands for high-capacity connectivity. To address varying customer needs, Lumen offers two service models: Simple Waves, providing fast, efficient bandwidth for immediate requirements, and Custom Waves, delivering tailored routing and performance configurations for complex deployments. Both options include protected and unprotected configurations as standard.

Lumen prioritizes security at the connectivity level. Its encrypted wavelength services are FIPS 140-2 compliant with AES-256 encryption, complemented by a separate security domain and two-factor

authentication. Customers maintain complete control of encryption keys through Lumen’s proprietary Key Management Tool in Control Center, an industry-first innovation that reinforces trust and compliance for data in transit.

## Growth Excellence Strategy

To reinforce its position as a provider of high-capacity infrastructure, Lumen achieved a major milestone in March 2025 by completing a 1.2 Tbps wavelength service trial with Ciena across 3,050 kilometers (1,800 miles) on its ultra-low-loss fiber network—the world’s longest non-regenerated 1.2 Tbps signal. This breakthrough validates the network’s ability to support unprecedented bandwidth demands and readiness for higher configurations, critical for AI-driven applications, real-time analytics, and hyperscale workloads. With this trial, Lumen demonstrates its commitment to delivering scalable, future-ready connectivity that empowers enterprises and cloud providers to meet the explosive growth in data traffic with speed and resilience.

## Product Differentiation

Lumen’s introduction of RapidRoutes in September 2025 marks a significant advancement in accelerating wavelength service delivery. Designed to meet the growing demand for high-capacity connectivity, RapidRoutes leverages over 48 Tbps of pre-provisioned capacity across high-demand corridors on Lumen’s next-generation 400G network. This innovation eliminates traditional design and provisioning delays, dramatically shortening the customer buying process and delivering an enhanced experience. With seamless integration into more than 300 third-party data centers and an industry-leading 20-business-day delivery SLA, RapidRoutes sets the standards for speedy delivery. Phase 1 of the rollout is complete, and Lumen plans to expand RapidRoutes to additional strategic routes and data centers in 2026, reinforcing its position as a market leader in delivering agile, scalable, and ultra-fast wavelength connectivity.

## Brand Strength

Lumen has emerged as a trusted partner for enterprises and hyperscalers seeking high-capacity, AI-ready network infrastructure. Over the past year, industry leaders such as Meta, AWS, Google, Microsoft, QTS, and Prometheus Hyperscale have partnered with Lumen to reinforce connectivity between data centers, ensuring the low-latency, high-bandwidth performance essential for next-generation AI and large-scale compute environments. These strategic collaborations further strengthen Lumen’s brand leadership. In October 2025, Lumen joined forces with Digital Realty to integrate RapidRoutes with PlatformDIGITAL, delivering up to 400G connectivity across major U.S. metros for rapid AI application deployment. Similarly, Lumen’s April 2025 partnership with Google Cloud enables private, direct fiber access up to 400G wavelengths from Google Cloud regions to enterprise sites, supporting AI workloads at scale. These alliances underscore Lumen’s ability to combine advanced technology with deep network expertise, positioning it as the preferred partner for businesses driving digital transformation and AI innovation.

## Customer Purchase Experience

Lumen provides its customers with various tools via the Control Center portal for visibility and control of network services. To support its wavelength suite, Lumen created an application called Topology Viewer, available through the Control Center portal. Featuring an intuitive graphical map interface, Topology

Viewer displays available fiber routes and enables customers to select multiple locations based on key attributes such as bandwidth, diversity, and latency. Once locations are selected, the application generates a design path, streamlining the quoting and ordering process for wavelength services.

Beyond initial deployments, Topology Viewer supports existing customers by facilitating capacity upgrades and adding new locations to existing routes, ensuring flexibility as business needs evolve. Frost & Sullivan recognizes Topology Viewer as a distinct application, empowering customers to visually design, quote, and manage routes aligned with performance and budgeting requirements.

Lumen continues to evolve its network control tools. Its Laser network diagnostic tool enables customers to visualize their existing Lumen wavelength services, along with circuit-level performance metrics such as transmit (TX)/ received (RX) light levels, round-trip delay (RTD) latency, and route miles. Furthermore, customers can perform circuit audits, initiate trouble tickets, generate reports, and a new capability launched in 2025 enables customers to interact with their wavelength's associated lasers.

The tool has two basic features. First, for protected wavelengths, customers can initiate the protection switching, from work path to protected path and vice versa. The second is a forced laser shutdown capability, which allows the user to directly turn off/on a wavelength's laser. This is beneficial during the test and turnup of a service, enabling the user to validate light levels across individual cross connects. These advancements reflect Lumen's continued commitment to transparency, offering customers greater visibility and control over their networks.

## Conclusion

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Lumen leads the Frost Radar™ for North American wavelength services, supported by strong revenue, a comprehensive portfolio, an expanding ultra-low-loss intercity fiber footprint, and superior route diversity. Differentiators such as the Topology Viewer and proactive notifications enhance customer control and assurance capabilities that many competitors lack. RapidRoutes further extends this advantage by enabling faster, automated provisioning of 400G wavelengths across diverse, ultra-low-latency paths. Strategic partnerships with Meta, AWS, Google, Digital Realty, and QTS reinforce Lumen's role as an AI-ready infrastructure provider at hyperscale demand. For its strong overall performance, Lumen Technologies is presented with Frost & Sullivan's 2026 North American Market Leadership Recognition in the Wavelength services industry.

## What You Need to Know about the Market Leadership Recognition

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Frost & Sullivan's Market Leadership Recognition is its top honor and recognizes the market participant that exemplifies visionary innovation, market-leading performance, and unmatched customer care.

### Best Practices Recognition Analysis

For the Market Leadership Recognition, 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 address a market niche through a combination of price, quality, or uniqueness 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:** Purchase experience quality assures customers that they are buying the optimal solution for 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

## Best Practices Recognition Analytics Methodology

### Inspire the World to Support True Leaders

This long-term process spans 12 months, beginning with the prioritization of the sector. It involves a rigorous approach that includes comprehensive scanning and analytics to identify key best practice trends. A dedicated team of analysts, advisors, coaches, and experts collaborates closely, ensuring thorough review and input. The goal is to maximize the company’s long-term value by leveraging unique perspectives to support each Best Practice Recognition and identify meaningful transformation and impact.

| STEP |                               | VALUE IMPACT   |  |
|------|-------------------------------|--|--|
|      |                               | WHAT   | WHY  |
| 1    | <b>Opportunity Universe</b>   | Identify Sectors with the Greatest Impact on the Global Economy          | Value to Economic Development                      |
| 2    | <b>Transformational Model</b> | Analyze Strategic Imperatives That Drive Transformation                  | Understand and Create a Winning Strategy           |
| 3    | <b>Ecosystem</b>              | Map Critical Value Chains  | Comprehensive Community that Shapes the Sector     |
| 4    | <b>Growth Generator</b>       | Data Foundation That Provides Decision Support System                    | Spark Opportunities and Accelerate Decision-making |
| 5    | <b>Growth Opportunities</b>   | Identify Opportunities Generated by Companies                            | Drive the Transformation of the Industry           |
| 6    | <b>Frost Radar</b>            | Benchmark Companies on Future Growth Potential                           | Identify Most Powerful Companies to Action         |
| 7    | <b>Best Practices</b>         | Identify Companies Achieving Best Practices in All Critical Perspectives | Inspire the World                                  |
| 8    | <b>Companies to Action</b>    | Tell Your Story to the World (BICEP*)                                    | Ecosystem Community Supporting Future Success      |

\*Board of Directors, Investors, Customers, Employees, Partners

## 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 Generator™

Frost & Sullivan's proprietary model to systematically create ongoing growth opportunities and strategies for our clients is fueled 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:

- **Megatrend (MT)**
- **Business Model (BM)**
- **Technology (TE)**
- **Industries (IN)**
- **Customer (CU)**
- **Geographies (GE)**

