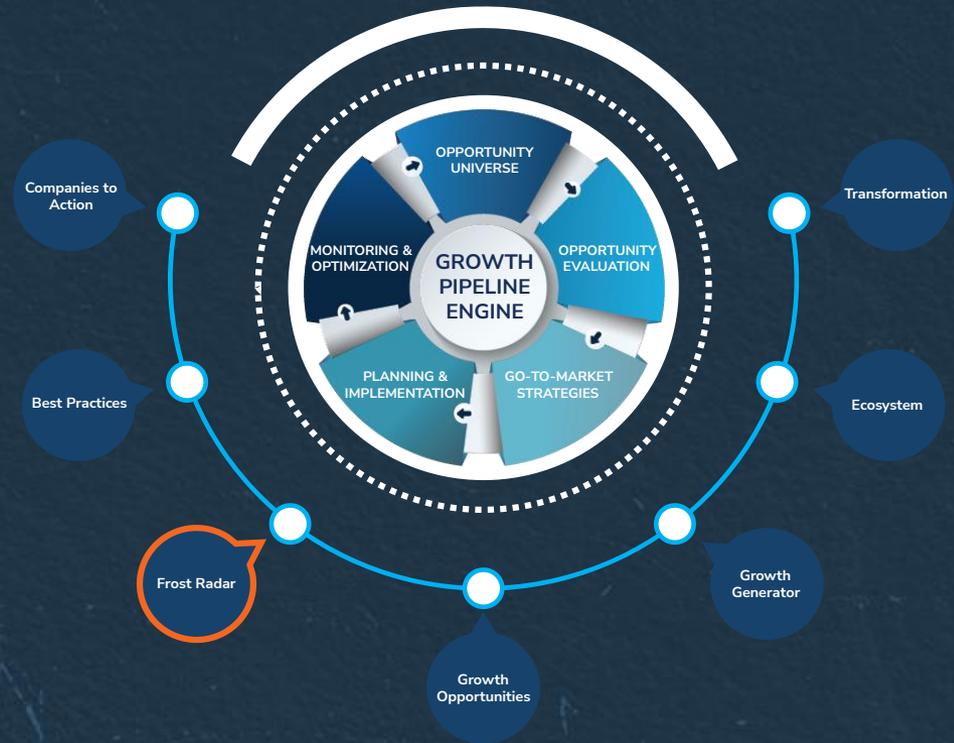# Frost Radar™: Wavelength Services in North America, 2025

A Benchmarking System to Spark Companies to Action - Innovation That Fuels New Deal Flow and Growth Pipelines
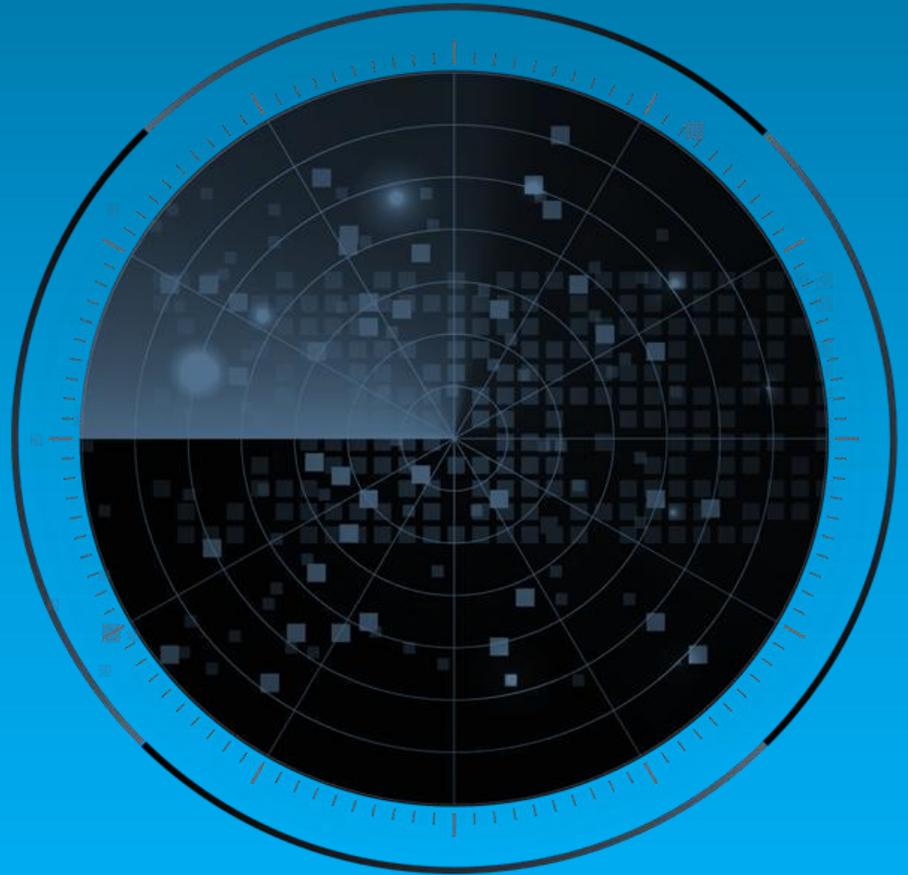
Authored by: Amrit Singh

Contributor: Stephen Thomas

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Strategic Imperative and Growth Environment

Strategic Imperative

- Wavelength services are high-speed, dedicated fiber-optic transport that is highly scalable and provides point-to-point connectivity, typically for business operations and where a massive volume of data is transmitted between data centers.

- The North American wavelength services market includes all wave services, with typical speed configurations of 1Gbps (G), 10G, 100G, and 400G, covering metro and long-haul services. Most network service providers in North America offer transparent wave services that allow customers to run any protocol over the waves.

- Ethernet over waves is the most used protocol (95%) because of benefits such as low latency. Demand for other traditional/native wave protocols (5%), including synchronous optical networking (SONET) and fiber connection (FICON), has faded in the last five years and is moving toward sunset.

- Ethernet private line (EPL) circuits with Ethernet delivered over dense wavelength division multiplexing (DWDM) infrastructure remain popular among businesses needing predictable routing and low-latency network services.

- The demand for high-speed connectivity has grown in the last two to three years. Service providers interviewed for this analysis stated that 10G and 100G are the most demanded configurations, and demand for 400G grew by double digits in 2024 compared to 2023.

- As part of their innovation initiatives, leading network service providers have enhanced their self-service portals with dynamic capabilities that allow customers to view detailed fiber route maps and plan network strategies accordingly. These portals enable customers to visually design, quote, provision, and manage routes aligned to business requirements. While still limited to top-tier wavelength providers, it is an attractive proposition from the customer's perspective.

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Strategic Imperative (continued)

- To differentiate their wavelength offerings, some providers offer waves-on-demand services that give customers 24 hours or less delivery time on existing fiber routes using a self-service portal.

- The rapid expansion of AI, hyperscale cloud, and distributed application architectures, combined with enterprise adoption of AI/machine learning (ML) and data-driven workloads, is driving demand for high-capacity wavelength services. Enterprises and hyperscalers require dedicated 100G/400G connectivity to efficiently move massive datasets across data centers, cloud regions, and enterprise networks.

- As enterprises continue to adopt AI-enabled applications, investing in 100G wavelength infrastructure becomes essential to stay competitive and future-proof operations in a data-intensive digital economy. Modern AI use cases, such as autonomous systems, large-scale language models, predictive analytics, and real-time image or video processing require robust infrastructure supporting high-speed data transfers between distributed data centers, edge devices, and cloud platforms.

- Mobile carriers are the primary driver of demand in the wholesale wavelength segment, particularly for mobile backhaul. Customers' network deployment needs and their deployment of 5G are driving growth in this space.

- Data center operators and content providers are top wavelength customers. In particular, hyperscalers, financial services, healthcare, education, and government are driving the demand. These verticals require high bandwidth as they process and manage consistently high volumes of data and content daily.

- Service providers interviewed for this analysis noted experiencing intermittent delays (maybe due to overwhelming demand) in the supply of network equipment, including switches, routers, and fiber, that interrupt route building and directly impact their entire network upgrade and expansion plan. Some network service providers have stocked equipment to address the supply chain disruption, but those that have not remain affected.

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Growth Environment

- The North American wavelength services market is in the mature stage. The primary drivers are enterprises accelerating their digital transformation initiatives, adoption of AI/ML to simplify networks and enhance business operations, use of bandwidth-intensive applications, and data center interconnections. Frost & Sullivan estimated regional wavelength services revenue at $5.34 billion as of 2024 and expects it to increase at a compound annual growth rate of 6.6% from 2024 to 2029.

- Wavelength services are essential to enterprise data center connectivity, providing the secure, reliable network architecture required to support distributed and rapidly scaling workloads. As enterprises continue to deploy data-intensive, latency-sensitive cloud/AI applications, high-bandwidth connectivity enables faster data transfer, improved application performance, and greater operational resilience across data centers and cloud environments.

- With fiber-lit buildings, network service providers can now turn up (start) services quickly on key routes instead of what used to take months, which enhances the customer experience.

- Service providers are investing in high-demand locations, such as cloud and data center hubs and key interconnection gateways, to pre-provision high-bandwidth fiber routes. By deploying 400G-ready optics and standardizing configurations on key corridors, providers can turn up services quickly, accelerate upgrades, and rapidly address/monetize AI, cloud, and data center–driven demand.

- Neocloud providers, real-time AI inferencing, and GPU-driven architectures are accelerating the demand for wavelength services, driven by the need for ultra-high-capacity, low-latency connectivity. Distributed GPU clusters and AI training and inference workloads are increasing inter-data center traffic, driving the demand for 100G/400G wavelengths across data center, edge, and cloud environments.

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Growth Environment (continued)

- To address the rapidly increasing demand for high-bandwidth connectivity, network service providers are aggressively upgrading existing routes to 400G and building new fiber routes that are 400G-ready. A limited number of providers have also deployed 800G wavelength systems, anticipating market adoption and demand acceleration in the 2026–2027 timeframe. Service providers have noted that 800G is still part of customer discussions in 2025, while, if needed, customers are using 2 X 400G ports to fulfill any 800G requirement.

- In the 2024-25 timeframe, more service providers have run field trials transporting 1.6 terabits-per-second (Tbps) of data across a single wavelength using Ciena's WaveLogic 6 Extreme (WL6e). These trials ensure their fiber network's ability to handle high bandwidths and its readiness to offer higher configurations.

- 400G/800G pluggables (optic transceivers capable of managing up to 400G/800G speeds) continue to be common for data center interconnects, enabling the optical-to-IP conversion without additional equipment. Ciena, Cisco, and Infinera are the key wavelength equipment providers in North America.

- Many network service providers offer encrypted wavelength services, whereas other providers leave it to the customer to add encryption. Encrypted and protected waves are highly valued in today's business environment as organizations generate and transmit huge amounts of data amid increasing network security threats.

Source: Frost & Sullivan

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# Frost Radar™: Wavelength Services in North America
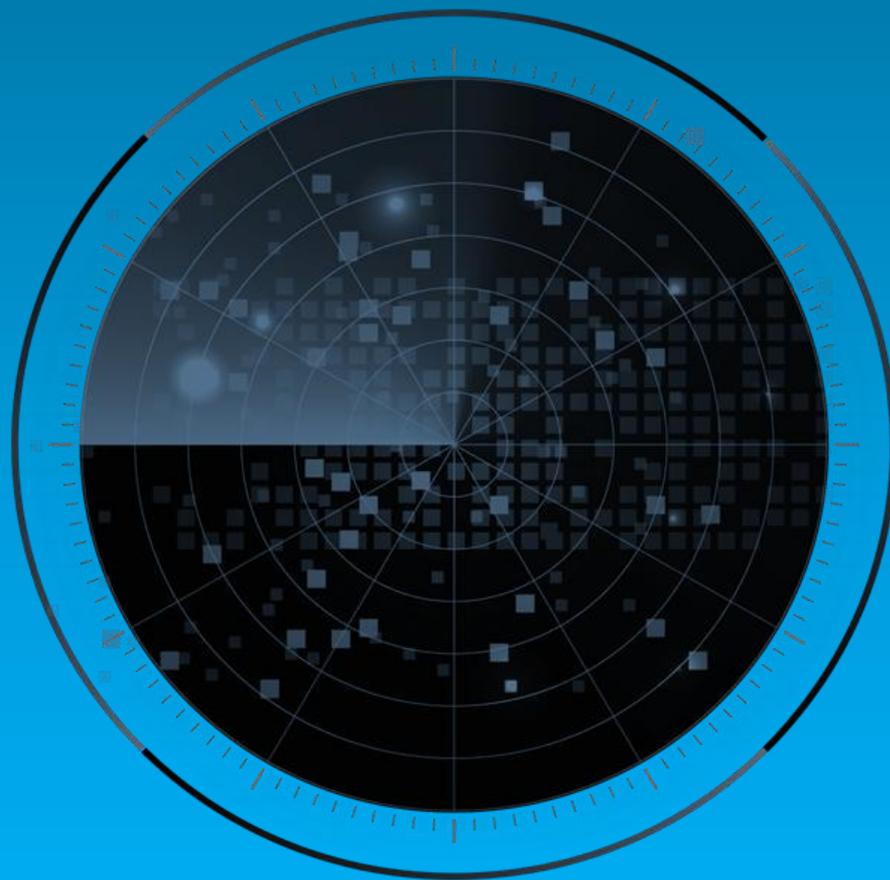
Frost Radar™: Wavelength Services in North America
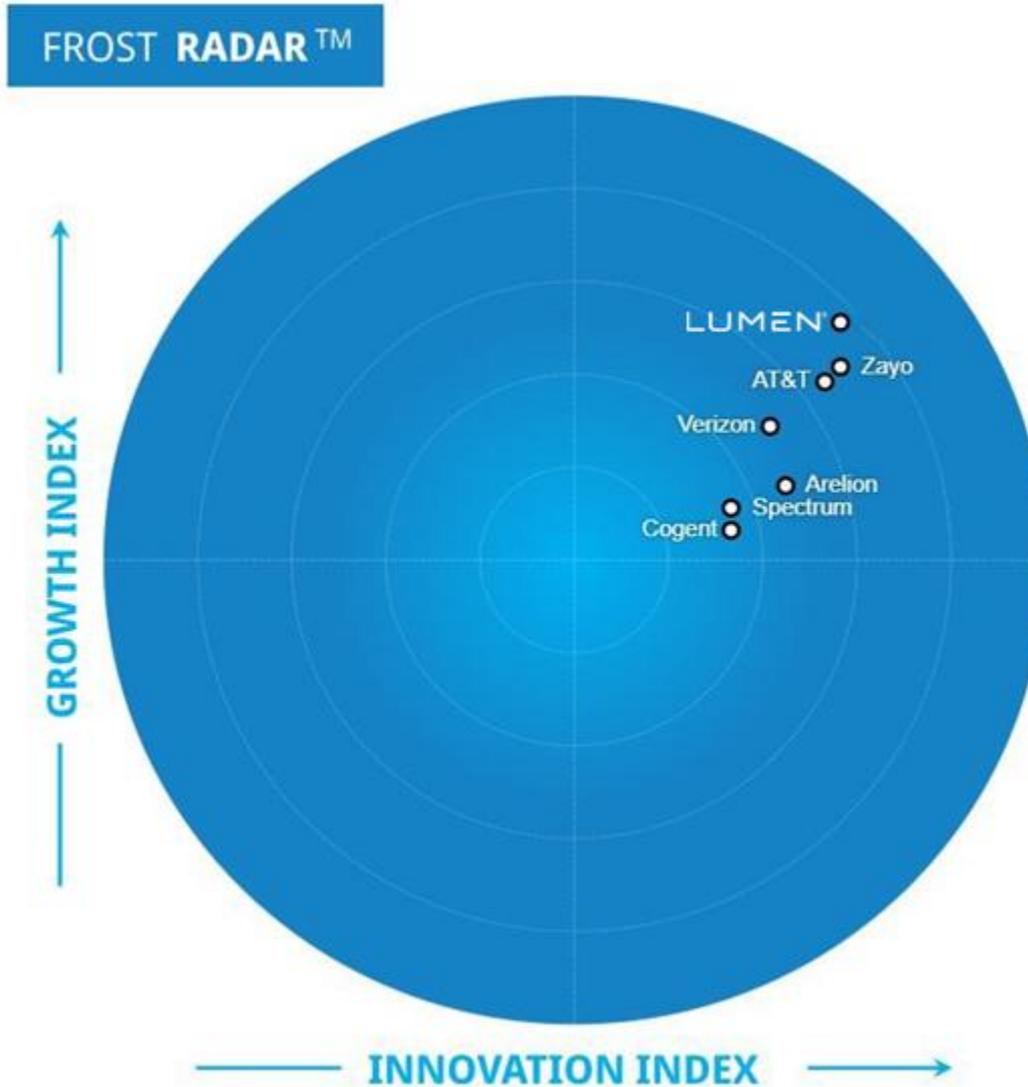
Frost Radar™ Competitive Environment

- The North American wavelength services market consists of numerous competitors, including small local, large national, and international providers. The large national and international players are long-time network service providers with an extensive network presence and cable companies leveraging their coaxial and fiber footprint to offer wavelength services. Out of 12 major service providers in this space, Frost & Sullivan independently plotted the top seven in this Frost Radar™ analysis. They were selected primarily based on their comprehensive wavelength offerings and presence in the retail and wholesale segments.

- To distinguish their wavelength services, network service providers have supplemented waves with additional services, including a tool to view fiber route maps; quote, order, and management of new wavelength services; turning up services quickly; on-demand services; pre-provisioned routes; encrypted wavelength services; and high bandwidth of 400G and 800G speeds.

- Lumen is the Frost Radar™ Growth and Innovation Index leader based on revenue, extensive network footprint, continued fiber expansion, and comprehensive wavelength services. Lumen's market-leading position is powered by its ability to provide up to 400G connectivity speeds, 100,000+ intercity route miles, a topology viewer to deliver a superior customer service, and the recent introduction of RapidRoutes (a predefined, high-demand connection for quicker provisioning).

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Frost Radar™:
Companies to Action
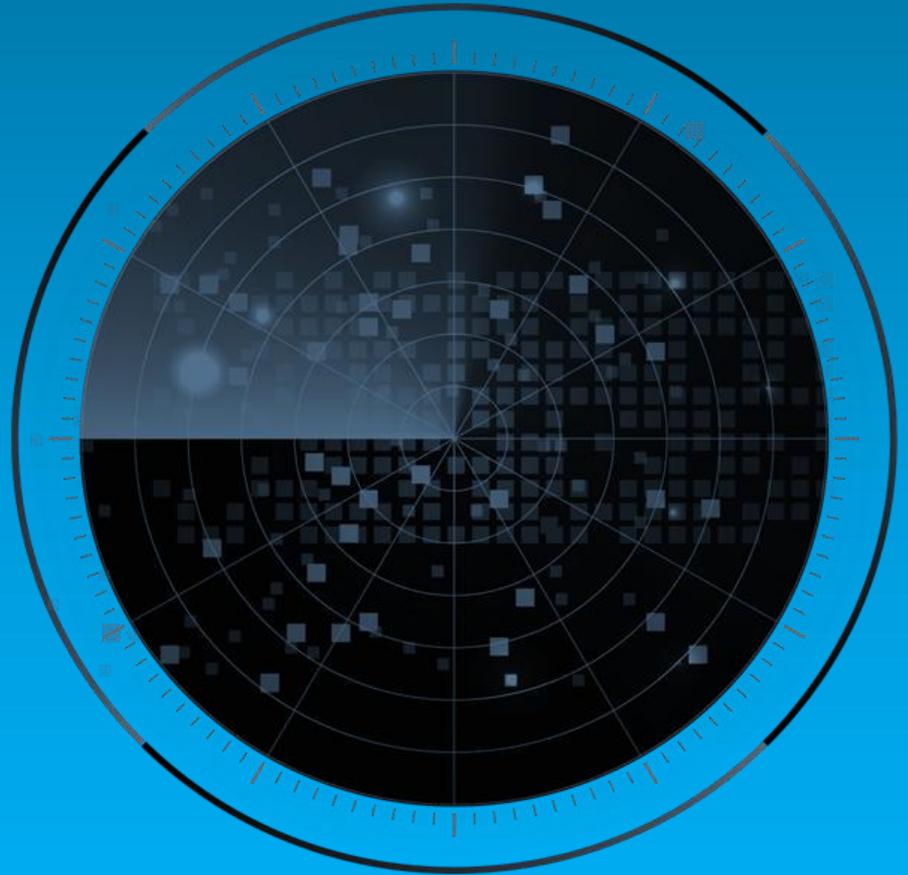
Lumen Technologies

INNOVATION

- Lumen offers 10G, 100G, and 400G wavelengths over its next-gen 400G-enabled optical network spanning 100,000+ intercity route miles across North America. Built on Lumen's ultralow-loss fiber infrastructure, it offers unique low-latency routes and diverse intercity gateways, allowing the company to build holistic optical fabric solutions with industry-leading service-level agreements for performance and resiliency.

- Lumen's wavelength services are offered as Simple Waves and Custom Waves. Simple Waves provide quick, efficient bandwidth for immediate needs, while Custom Waves provide tailored routing and performance configurations to meet complex enterprise and hyperscaler requirements. Unprotected and protected options are offered as a standard.

- For data-in-transit security, Lumen offers encrypted wavelengths, which are FIPS 140-2 certified with AES-256 encryption, and a separate security domain management with two-factor authentication. Customers manage their encryption keys via a Lumen-developed Key Management Tool in Control Center (an industry first).

- To rapidly deploy 100G/400G wavelength services, Lumen introduced RapidRoutes in September 2025. RapidRoutes encompass over 24Tbps of pre-provisioned capacity on high-demand routes across Lumen's 400G network. RapidRoutes eliminates design and delivery delays, significantly shortening the customer buying experience. It also integrates with more than 300 key third-party data centers to offer an impressive 20-business day delivery service-level agreement. Lumen has completed phase 1 of the buildout, with plans to expand RapidRoutes to other key corridors of the network and into other third-party data centers in 2026.

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Lumen Technologies (continued)

INNOVATION

- In March 2025, Lumen and Ciena completed a 1.2 Tbps wavelength service trial spanning 3,050 kilometers (1,800 miles) on its ultralow-loss fiber network, the world's longest 1.2 Tbps non-regenerated signal. It strengthens Lumen's promise to deliver high-bandwidth connectivity for AI-driven applications and network infrastructure.

- Lumen is investing to incorporate AI and automation capabilities across its Service & Operational Assurance model. The company has more than 300 automated workflows in place with a goal of 3 million runs in 2026. Real-time telemetry with proactive network intelligence has become a foundational component of Lumen's operations, along with new functions, such as automated fiber impact assessments, AI-driven packet loss analysis, and root cause analysis.

- Lumen's Control Center portal provides various tools to customers for visibility and control their wavelength services. Topology Viewer enables customers to visually design, quote, and order new wave services with selectable attributes, such as bandwidth, diversity, and term. The Service Diagnostics tool enables customers to view real-time circuit performance stats, such as bit rate error, light levels, and latency. New capabilities were added in 2025 for customers to interact/manage their protected wavelengths and turn lasers on/off on active wavelengths.

- Lumen also provides a proactive notification service for unprotected and protected wavelengths that automatically alerts customers about any disruptions affecting their wavelength services and enables them to initiate ticketing. This is offered free of charge for all customers and is an opt-in service.

Lumen Technologies (continued)

GROWTH

- Lumen offers wavelength services based on its extensive fiber network spanning 163,000 on-net buildings and approximately 340,000 route miles of fiber. While its core operations are concentrated in North America, Lumen's global reach connects customers to more than 250 Lumen data centers, 2,200 third-party data centers, and 125 optical cloud on-ramps, enabling high-capacity waves for Data Center Interconnect (DCI) and Cloud Connectivity. Lumen serves a diverse and robust customer base that includes hyperscalers, large enterprises, wholesale, public sector, mid-market, and emerging neocloud providers.

- Lumen operates North America's largest ultralow-loss fiber network. As part of its nationwide expansion connecting 50 major cities, it has already deployed 14 million intercity fiber miles and expects to end 2025 with 16.6 million fiber miles. Lumen plans to scale its intercity footprint to 47 million fiber miles by 2028, building a high-capacity, infrastructure purpose-built to power AI initiatives, data-intensive workloads, and rapidly growing enterprise bandwidth demands.

- Lumen's partnership with Corning Incorporated is advancing its efforts to interconnect AI-enabled data centers and expand its intercity fiber network across the United States. Lumen is utilizing Corning's new generative AI fiber, which can fit two to four times more fiber into existing conduits, thereby maximizing infrastructure efficiency.

- Lumen Technologies and Palantir Technologies have formed a multiyear, multimillion-dollar partnership to accelerate AI adoption for enterprises. By combining Palantir's Foundry and AI Platform with Lumen's Connectivity Fabric, the collaboration enables faster, secure deployment of AI across complex, multicloud environments.

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Lumen Technologies (continued)

GROWTH

- Over the past year, leading hyperscalers and data center operators including Meta, AWS, Microsoft, QTS, and Prometheus Hyperscale have partnered with Lumen to reinforce their infrastructure for AI innovation. These collaborations enable dedicated, high-capacity, low-latency connectivity between data centers, ensuring the performance and reliability required to power next-generation AI applications and large-scale compute environments.

- In October 2025, Lumen and Digital Realty announced a strategic partnership to deliver AI-ready, high-capacity connectivity across major US metros. Lumen's Wavelength RapidRoutes integrates with Digital Reality's PlatformDIGITAL, offering enterprise connectivity of up to 400G. This collaboration empowers organizations to rapidly prototype and deploy traditional and AI applications with the bandwidth and proximity needed to reach hyperscaler clouds, neoclouds, and other critical data center locations.

- In April 2025, Lumen engaged in a partnership with Google Cloud to design and deliver advanced cloud and network solutions to meet the demand for AI workloads from enterprise customers. The partnership includes cloud connectivity via direct fiber access, providing private connections up to 400G wavelengths from Google Cloud regions directly to customer locations including data centers, manufacturing facilities, data storehouses, and AI workload processing locations.

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Lumen Technologies (continued)

FROST PERSPECTIVE

- Lumen continues to be the leader on the Frost Radar™ for North American wavelength services based on its revenue, comprehensive wavelength service, expanding ultralow-loss intercity fiber footprint, and route diversity. Lumen's rapid 400G fiber expansion strengthens its leadership in the wavelength market, offering diverse routes that meet the needs of customers with distributed operations across the United States and EMEA.

- Lumen's RapidRoutes strengthen its market-leading position in North America by delivering faster, more automated provisioning of high-capacity 400G wavelengths across diverse, ultralow-latency routes. To stay ahead, Lumen should expand RapidRoutes coverage to additional corridors, including major metro-to-metro pairings and the DCI corridors, and continue investing in next-generation fiber and coherent optics to support future 800G/1.6T requirements.

- Lumen's Topology Viewer tool and proactive notification service remain key differentiators, as many providers lack these features. The Topology Viewer feature aligns with Lumen's goal of enhancing customer ownership and purchase experiences, which supports customer retention.

- Lumen's recent partnerships, including with Meta, Amazon Web Services, Digital Reality, and QTS, solidify its position as an AI-ready infrastructure provider.

Best Practices & Growth Opportunities
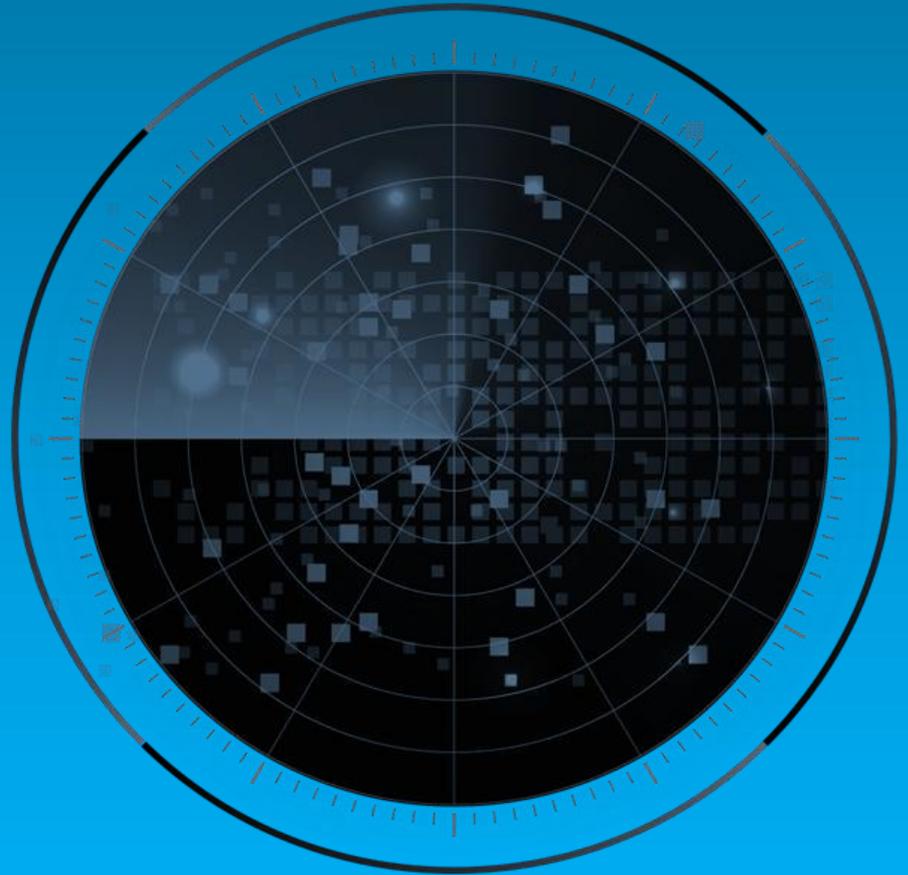
Best Practices

1 Service providers must offer high-speed wavelength services up to 400G, specifically on the high-demand, strategic routes where capacity requirements are greatest, if not across the entire network.

2 A self-service portal enables customers to manage their wavelength services, including quoting, ordering, on-demand provisioning, and upgrades/downgrades on specific routes.

3 Service providers must offer optional wavelength-level encryption, diverse routing, and differentiated service-level agreements as standard service attributes.

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Source: Frost & Sullivan

Growth Opportunities

1 AI and cloud-driven data center interconnects, emerging neocloud providers, accelerating data center builds, and enterprise adoption of AI/ML will continue to drive demand for high-capacity wavelength services.

2 Service providers must strategically invest in high-demand locations, such as cloud/data center hubs or strategic interconnection gateways, to pre-provision routes, enabling them to turn up services quickly.

3 To remain competitive, service providers must enhance their customer portal to offer value-added services, such as on-demand provisioning, API-driven orchestration, and service management. Empowering customers with more self-service improves agility, reduces operational friction, and delivers a superior customer experience.

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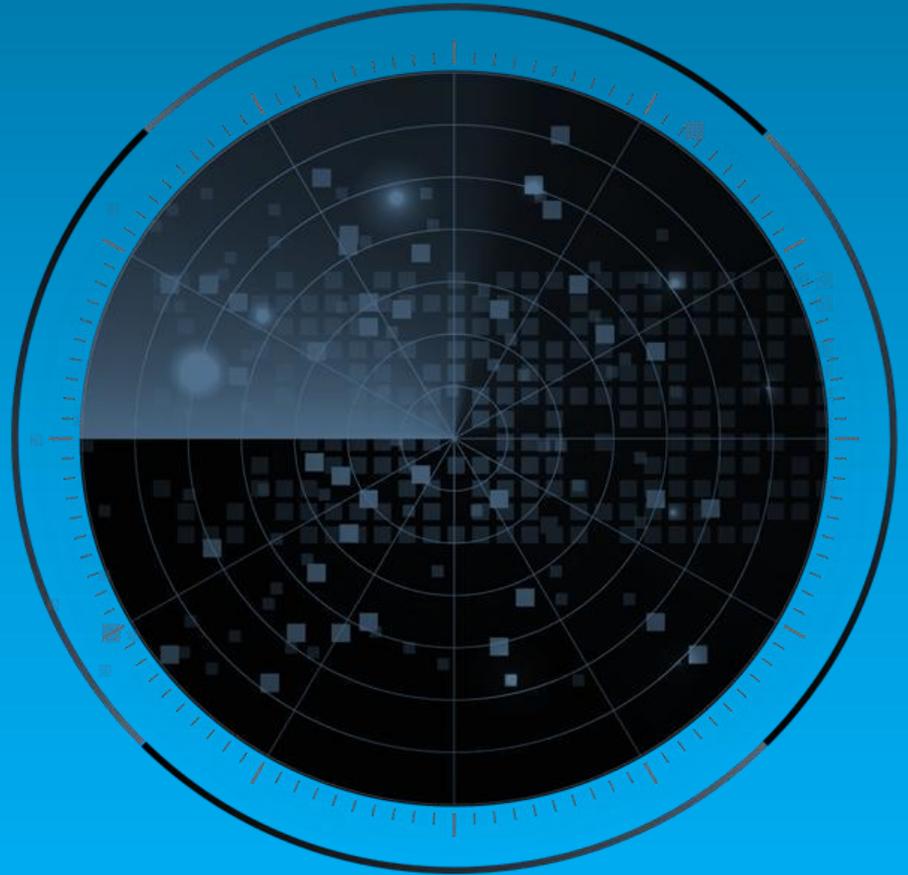
Source: Frost & Sullivan

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Frost Radar™ Analytics

Frost Radar™: Benchmarking Future Growth Potential
2 Major Indices, 10 Analytical Ingredients, 1 Platform

Growth Index

Growth Index (GI) is a measure of a company's growth performance and track record, along with its ability to develop and execute a fully aligned growth strategy and vision; a robust growth pipeline system; and effective market, competitor, and end-user focused sales and marketing strategies.

GI1

MARKET SHARE (PREVIOUS 3 YEARS)
This is a comparison of a company's market share relative to its competitors in a given market space for the previous 3 years.

GI2

REVENUE GROWTH (PREVIOUS 3 YEARS)
This is a look at a company's revenue growth rate for the previous 3 years in the market/industry/category that forms the context for the given Frost Radar™.

GI3

GROWTH PIPELINE™
This is an evaluation of the strength and leverage of a company's growth pipeline system to continuously capture, analyze, and prioritize its universe of growth opportunities.

GI4

VISION AND STRATEGY
This is an assessment of how well a company's growth strategy is aligned with its vision. Are the investments that a company is making in new products and markets consistent with the stated vision?

GI5

SALES AND MARKETING
This is a measure of the effectiveness of a company's sales and marketing efforts in helping it drive demand and achieve its growth objectives.

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Source: Frost & Sullivan

Frost Radar™: Benchmarking Future Growth Potential
2 Major Indices, 10 Analytical Ingredients, 1 Platform (continued)

Innovation Index

Innovation Index (II) is a measure of a company's ability to develop products/ services/ solutions (with a clear understanding of disruptive megatrends) that are globally applicable, are able to evolve and expand to serve multiple markets and are aligned to customers' changing needs.

II1

INNOVATION SCALABILITY
This determines whether an organization's innovations are globally scalable and applicable in both developing and mature markets, and also in adjacent and non-adjacent industry verticals.

II2

RESEARCH AND DEVELOPMENT
This is a measure of the efficacy of a company's R&D strategy, as determined by the size of its R&D investment and how it feeds the innovation pipeline.

II3

PRODUCT PORTFOLIO
This is a measure of a company's product portfolio, focusing on the relative contribution of new products to its annual revenue.

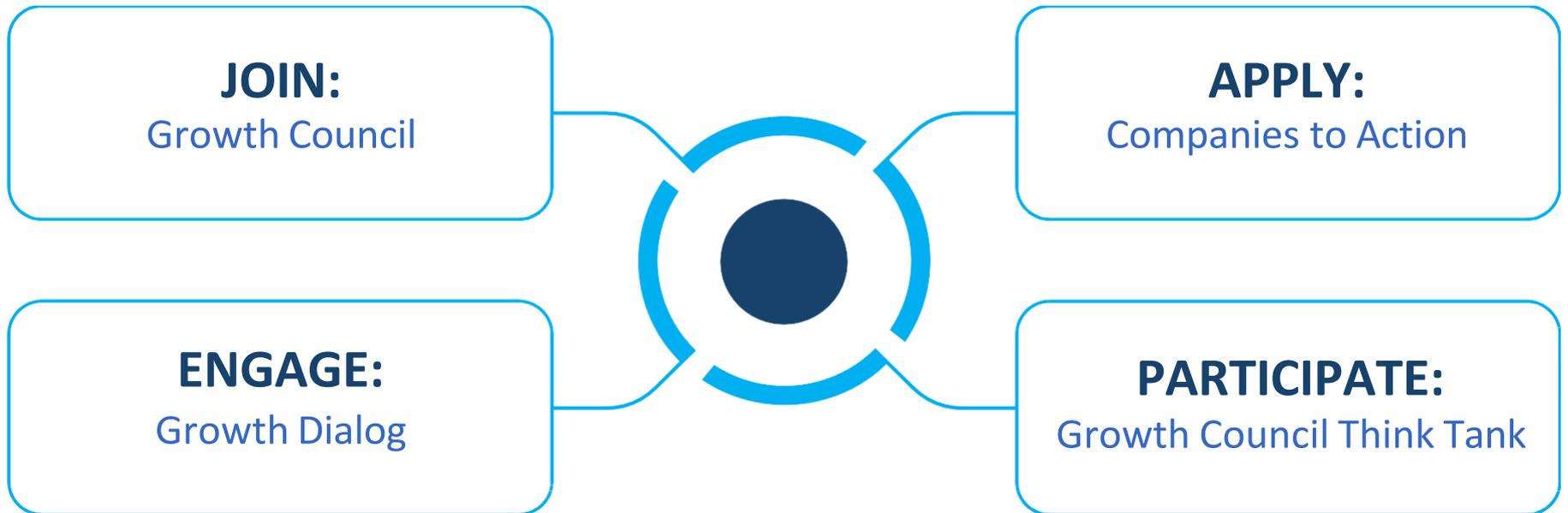**II4**

MEGATRENDS LEVERAGE
This is an assessment of a company's proactive leverage of evolving, long-term opportunities and new business models, as the foundation of its innovation pipeline. An explanation of megatrends can be found here.

II5

CUSTOMER ALIGNMENT
This evaluates the applicability of a company's products/services/solutions to current and potential customers, as well as how its innovation strategy is influenced by evolving customer needs.

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Next Steps

Transformation   Ecosystem   Growth Generator   Growth Opportunities   Frost Radar™   Best Practices   Companies to Action

JOIN:
Growth Council

APPLY:
Companies to Action

ENGAGE:
Growth Dialog

PARTICIPATE:
Growth Council Think Tank

Does your current system support rapid adaptation to emerging opportunities?

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Source: Frost & Sullivan

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