

ENTERPRISE OPTICAL NETWORKS

THE TOP THREE REASONS ENTERPRISE CLOUD APPLICATIONS NEED INTELLIGENT OPTICAL NETWORKS

Introduction

Driven by the need for greater productivity and lower costs, enterprises around the globe are moving their applications to the cloud. Today, nine out of 10 enterprises are using at least one cloud application to increase productivity and reduce cost, a fact that is not surprising when you consider that 84 percent of CIOs report that they have cut application costs by moving to the cloud.¹ Compounded by the need for scalable bandwidth driven by the proliferation of large volumes of digital content and applications, enterprises are turning to a new hybrid cloud network model, with applications delivered from an abstracted cloud services layer that bridges private and public cloud infrastructures. As they migrate mission-critical applications to this new environment, enterprises are discovering the value of interconnecting their infrastructure with secure, flexible, scalable, high-capacity optical transport networks. This application note describes networking challenges that cloud-enabled enterprises face in today's digital economy, and the top reasons why intelligent optical networks are becoming critical to their success, with a direct impact on productivity and the ability to compete for long-term business success.

Reason #1: Your Company's Future Depends on Cloud

Fierce competition, shrinking budgets and cyber-attacks are top-of-mind at any enterprise. The following paragraphs briefly describe these major concerns and their impact on the enterprise's business and operational health.

- **Decrease the cost of operations:** Traditionally, more bandwidth requires more money and more complexity. The migration to the cloud is fueling unprecedented hikes in capital and operational expenditures (CapEx/OpEx), especially driven by added networking equipment and complexity.

- **Minimize downtime:** Network outages can be disastrous to enterprises, resulting in significant loss of revenue, massive disruption to business operations and a major impact on customer loyalty. The average downtime costs vary across industries, from approximately \$90,000 per hour in the media sector to about \$6.48 million per hour for large online brokerages, according to Information Management magazine.² Can any enterprise afford to be down?
- **Protect enterprise data:** Cyber-attacks and data breaches are frequent occurrences. The annual damage to the U.S. economy caused by cyber-attacks is estimated to be up to \$100 billion.³
- **Scale the network:** It can take 45 to 60 days for a simple bandwidth increase, not to mention the cost of equipment upgrades. This places a lot of pressure on enterprise IT and planning teams, especially for unexpected network events.
- **Enhance network performance:** Latency, transactions per second, and network flexibility are all key concerns enterprises must deal with when it comes to practical issues around network performance. Networks must be agile to support dynamic demand for bandwidth and any change in network topology, including connectivity to new offices or data centers.

Overcoming the above challenges requires intelligent optical networks that offer the flexibility and scale to meet bandwidth demands and ensure the highest levels of availability and security while lowering operating costs.

Reason #2: Your Stakeholders Are Building Their Future in the Cloud

Cloud-based applications are impacting multiple aspects of the enterprise business—from the products they manufacture to the services

they offer and even to the way their employees interact with each other or with customers and partners.



- **Connected products:** More products than ever are designed and manufactured to be online. 30 billion devices are expected to connect to the Internet in 2020.⁴ From connected cars to home appliances to smart sensors on city streets, manufactured products are becoming more and more sophisticated.



- **Connected services:** Service enterprises are also elevating their portfolios by leveraging wireless and wireline connectivity to provide advanced services such as remote monitoring and emergency response, intelligent home and business surveillance and many others.



- **Connected employees:** The workforce is more connected than ever before in day-to-day operations, relying on cloud applications for document management and sharing, social media-based employee interaction and video conferencing meetings and training.

Enterprises need connectivity with the highest levels of performance (high capacity, low latency, high reliability, agility, etc.) across short (local area network, or LAN), medium (wide area network, or WAN) and long distances, putting the transport network at the heart of the enterprise evolution to the cloud and the Internet of Things (IoT). From connecting employees for better collaboration and productivity

to protecting mission-critical information from day to day and during major disasters, an intelligent optical network unlocks numerous key enterprise networking applications, as described in the following section.

Reason #3: Your Vital Enterprise Networking Applications in Today's Cloud Era Need Optical Performance

Most enterprises rely on a few key networking applications that are vital to their existence, all with varying requirements. Intelligent optical networks are built to accommodate these varying requirements while maximizing performance and cost-efficiency. Some of these enterprise networking applications are listed below:

- **Enterprise Core Networks—Multi-service Aggregation:** In most enterprises, several networking protocols are used to conduct daily operations, including legacy Synchronous Optical Networking/Synchronous Digital Hierarchy (SONET/SDH) for voice switches, Fibre Channel for storage, Ethernet for LAN/WAN networking and many others. Multi-service aggregation combines all traffic into a single packet-optical platform to aggregate various services onto a single or multiple optical wavelengths to reduce networking costs and enhance enterprises' networking flexibility as depicted in Figure 1. In today's technology, single wavelengths carry 10 gigabits per second (Gb/s) to 200 Gb/s per wave, and up to 27.6 terabits per second (Tb/s) per optical fiber pair.

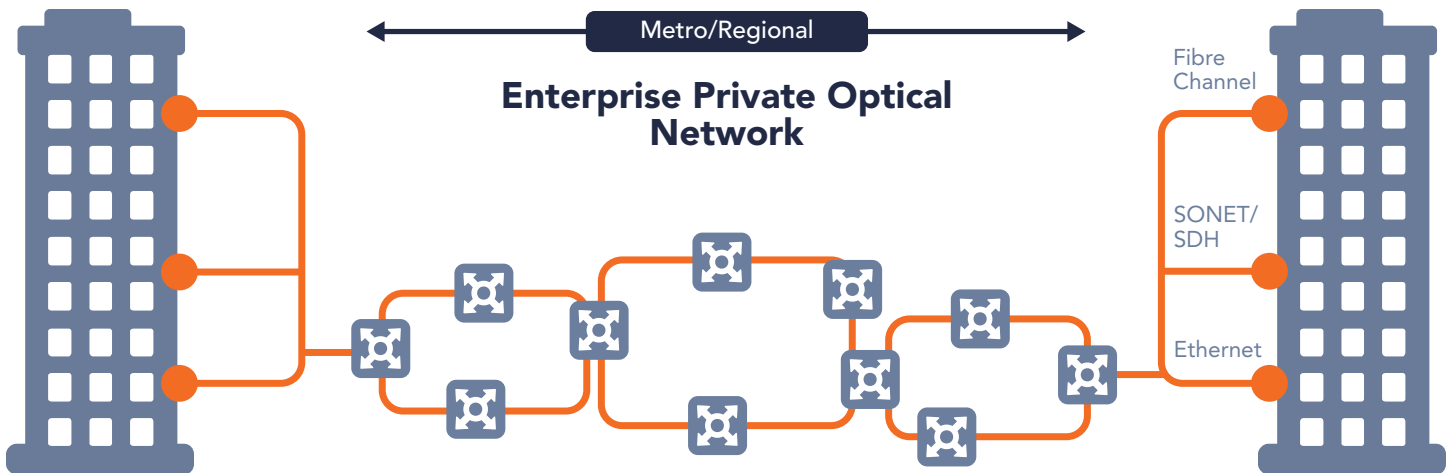


Figure 1: Enterprise Core Networks — Multi-service Aggregation

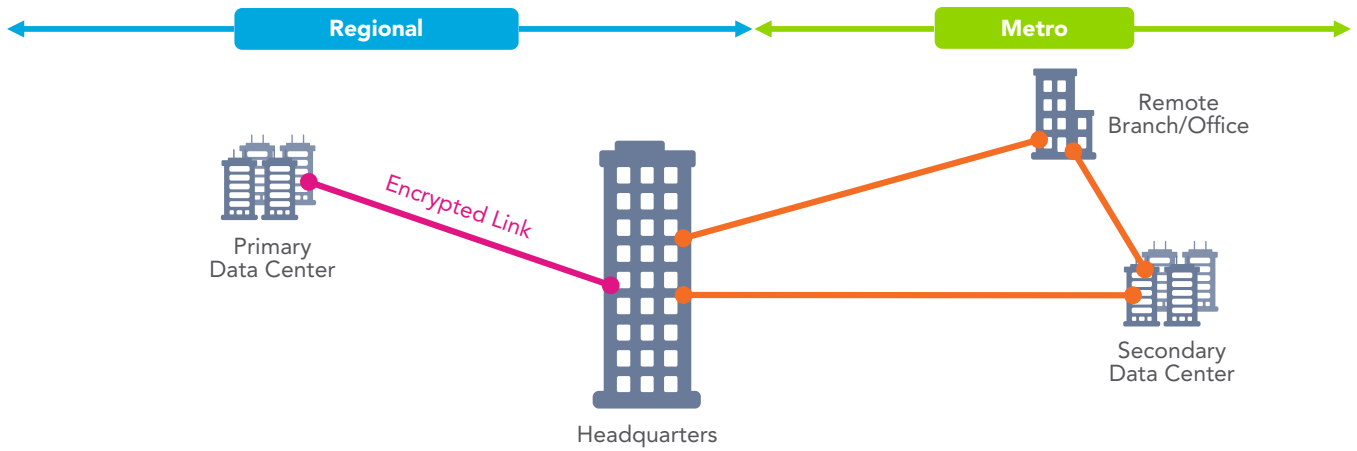


Figure 2: Enterprise Core Network Corporate/Office Interconnect

• **Enterprise Core Networks—Corporate/Office Interconnect:** Network demands of enterprise offices, warehouses and data centers vary depending on different factors such as bandwidth needs, distance, application requirements and so on. To connect smaller branch offices, retail locations and similar sites, enterprises will use a variety of services from leased circuits and traditional virtual private networks (VPNs) to newer software-defined wide area networks (SD-WANs). But in the core networks connecting their larger sites, enterprises can lower costs and gain greater flexibility and control by building their own regional, national or even international transport networks. These core links carry vital corporate and end-customer information between the corporate office and a data center, or between data centers, raising the need for in-flight encryption (Figure 2). For enterprises who depend on secure, reliable connectivity in their core networks, private intelligent optical networks prove to be a very economical yet high-performance solution, providing the

capacity, low latency, security and agility required for today’s and tomorrow’s enterprise operations.

• **Business Continuity/Disaster Recovery (BC/DR):** BC/DR describes a set of applications built to minimize the impact of downtime on an enterprise’s operations in the aftermath of an emergency (natural disasters, terrorist attacks, major disruptions to the company’s network, etc.). These applications consist of backup plans to transfer data and control access and offload other activities to one or more enterprise sites, including alternate data centers. Recovery time varies based on numerous factors, ranging from the few seconds needed to automatically transfer control and reroute traffic from primary to secondary sites once a failure or disruption is detected, to several minutes (Figure 3). Intelligent optical networks play a vital role in BC/DR applications, providing the required bandwidth and alternative routes that meet stringent latency and capacity

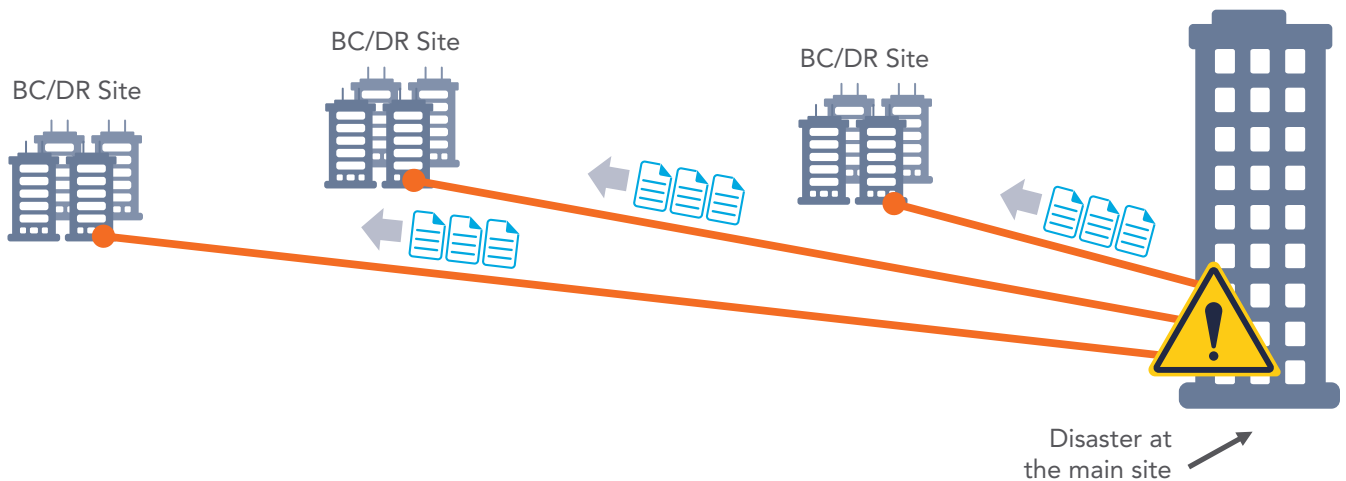


Figure 3: Business Continuity/Disaster Recovery (BC/DR)

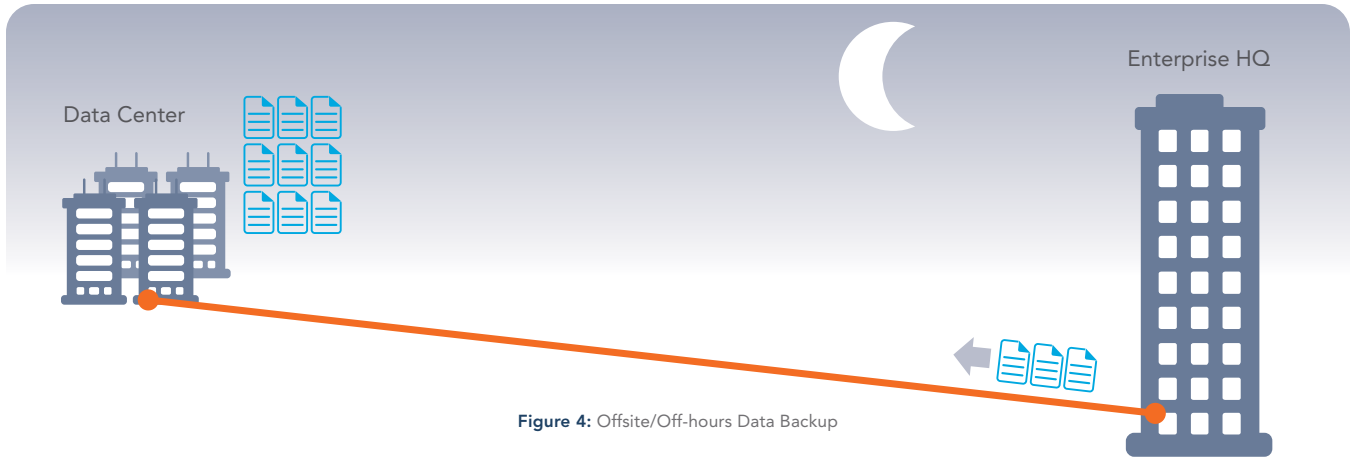


Figure 4: Offsite/Off-hours Data Backup

requirements in a very short period of time to minimize the impact on business operations. The successful deployment and operations of BC/DC applications are directly related to the performance of the optical network they rely on.

- **Offsite/Off-hours Data Backup:** This is a recurring operational procedure aimed to replicate or back up enterprise-critical data to a remote data center every day after hours (Figure 4). Typically, a large amount of data (terabits) is automatically duplicated at another remote site/data center overnight during a backup window that spans from 30 minutes to several hours. There are several methods of data backup designed to save and keep an accurate history of data changes, such as full, incremental, differential, hybrid and many others. The high capacity, low latency and task automation enabled by intelligent optical networks make a significant positive impact on the time of execution, reducing the backup window from several hours to minutes, and enabling the overall success of this application.
- **Data Mirroring:** Heavily used by enterprises that process millions of

transactions daily (e.g. retail, finance, airlines, etc.), this application is used to instantaneously duplicate the same set of processes and transactions from a primary or master site (mainframe/data center) to a secondary volume or mirroring site (Figure 5). Keeping latency below a certain threshold is often a key factor to ensure proper deployment of this application. Therefore, a high-performance intelligent optical network with low latency and low jitter (a variation of latency) is a key building block for deploying any data mirroring application. Lippis Enterprises recently conducted an extensive test for a data center interconnect (DCI) application using Infinera’s Cloud Xpress CX-100E platform and Arista Networks’ 7280SE-68 programmable switching platform. The results of this testing demonstrate:

- The CX-100E’s high performance and low latency
- End-to-end 100 Gigabit Ethernet (GbE) line-rate throughput with zero loss for any mix of traffic
- End-to-end latency under 20 microseconds (μ s) between servers in different data centers
- Up to 500 Gb/s dense wavelength-division multiplexing (DWDM) bandwidth in a single 2 rack unit (2RU) form factor
- The ability to extend over 150 kilometers (km) without any external amplification, power consumption of less than 1 watt (1 W) per Gb/s and ease of installation and operation, optimized for data center environments

The detailed report can be found [here](#).

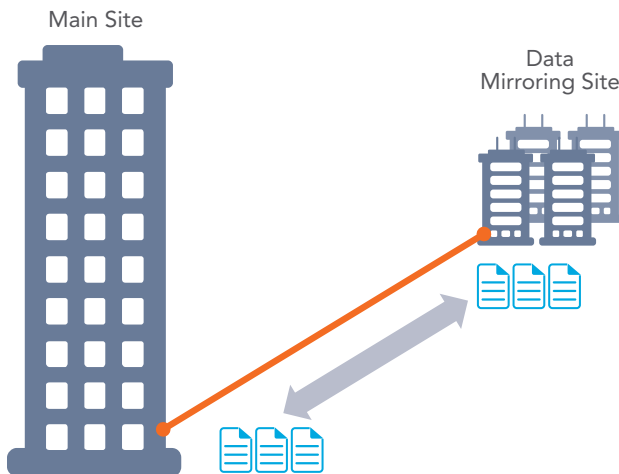


Figure 5: Data Mirroring

- **Live Migration of Virtual Machines:** Unplanned, on-demand and seasonal activities may require the shifting of virtual computing resources (a.k.a. virtual machines or VMs) to lower costs and/or increase performance. This application relies heavily on high-performance networks for real-time migration of VMs, where the network can dynamically create high-capacity connections and networking resources to migrate VMs based upon need, time of day and/or time zones (in a “follow-the-sun” manner) to enhance

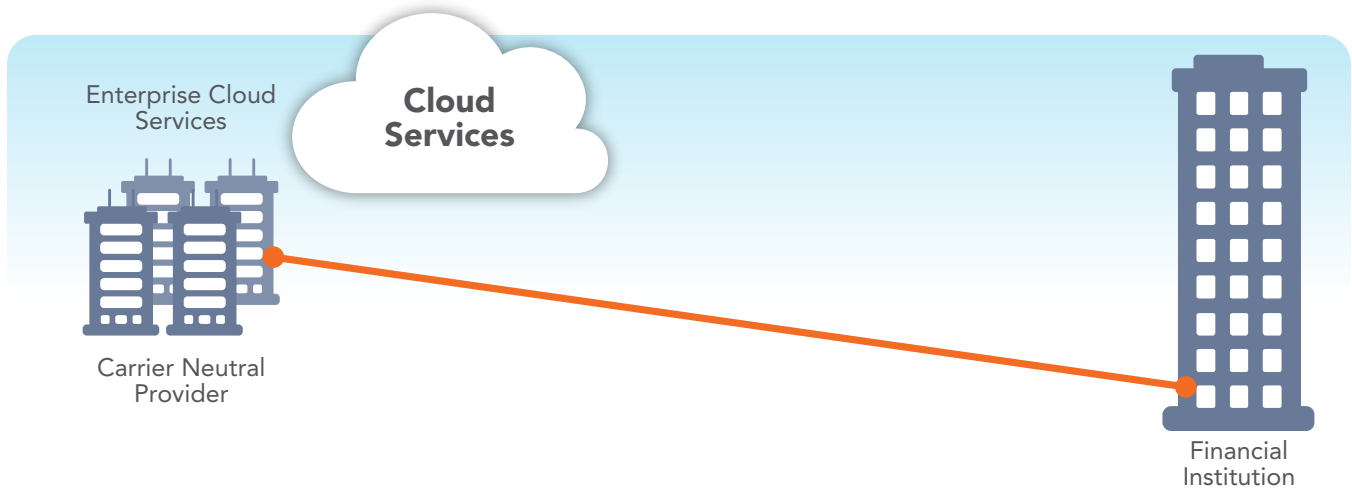


Figure 6: Enterprise Cloud Services

employee productivity, reduce costs and simplify operations (e.g. move processing power closer to applications or users as needed).

- **Cloud Service Direct Connection:** The enterprise shift to cloud is well underway and accelerating, driving the need for increased bandwidth and high performance to connect to cloud data centers and service providers. As more applications and content move to the cloud, including not only web-based customer-facing applications, but also mission-critical business applications such as customer relationship management, enterprise resource planning, and human resources, enterprises are relying more heavily on the networks that connect their enterprise sites to cloud service providers at carrier neutral facilities across the world (Figure 6). Intelligent optical networks provide the needed capacity for direct connection to cloud services with high security, low latency and simple scalability. Intelligent optical networks can also provide open interfaces such as representational state transfer (REST) application programming interfaces (APIs) that allow seamless integration of these cloud services into the enterprise’s existing IT environment and processes.

Why Consider Infinera Intelligent Transport Networks for Your Enterprise

Infinera delivers the benefits of intelligent optical networking to enterprises with its high-performance Intelligent Transport Networks. In particular, Infinera Intelligent Transport Networks are built to deliver enterprise networks that are secure, simple and cost-effective.

- **Secure:** An enterprise’s success is heavily dependent on its ability to protect its own and its customers’ data. Data breaches can trigger irreparable damage to the company’s reputation and its ability to conduct business in the future, even driving enterprises to bankruptcy. Infinera’s Intelligent Transport Networks protect the enterprise’s mission-critical data from intruders and hacking tools with features like centralized authentication and authorization, wire-speed encryption and stringent access procedures, to name just a few examples.
- **Simple:** Optical networking is not a core competency for most enterprises, so Infinera has dramatically simplified network implementation, design and operation with features like zero-touch provisioning, network auto-discovery, and intuitive graphical user interfaces. In fact, unlike other optical vendors, even complex in-service upgrades typically can be accomplished with software and a plug-and-play process rather than long testing procedures.
- **Cost-effective:** Infinera’s platforms are designed to address enterprises’ imperatives around reducing capital and operating costs. Low power consumption (as low as 0.2 W/Gb/s on the XTM Series), high density in a small footprint (saving scarce floor space) and on-demand network capacity (Infinera Instant Bandwidth) allow enterprises to significantly reduce recurring costs and defer any unnecessary capital expenditures.

Whether the objective is to lower costs, increase scalability or improve network performance, there is a right-sized Infinera platform as described below and depicted in Figure 7:

- **The XTM Series** is a family of products designed to provide multi-service aggregation and transport of enterprise services in a wide variety of applications:
 - **Multi-service:** Ethernet, Common Public Radio Interface (CPRI), SONET/SDH, Optical Transport Network (OTN), Fibre Channel
 - **Multi-rate:** from 1 Gb/s to 100 Gb/s
 - **Multi-reach:** from few meters to 1500 km
 - **Multi-layer:** Layer 0/1/2/2.5
- **The XTC-2/XTC-2E platforms** are purpose-built for scalable and efficient metro and regional networks. They offer a rich set of client services for low bandwidth with low power consumption and a compact footprint:
 - **Optimized for metro networks:** 100 Gb/s wavelength-division multiplexing (WDM), rich set of client interfaces
 - **Simple:** Point-and-click ease of use, converged WDM, OTN and packet in one platform
 - **Programmable:** Digital Network Administrator (DNA) network management system, generalized multi-protocol label switching (GMPLS) control plane, Xceed Software Suite for software-defined networking

- **The Cloud Xpress Family** is built from the ground up for connecting data centers and high-capacity point-to-point Ethernet transport applications:

- **Optimized for Ethernet:** 10 GbE/40 GbE /100 GbE
- **Secure:** Layer 1 and Layer 2 wire-speed encryption
- **Simple:** Plug-and-play

Infinera also offers a wide spectrum of professional services to help enterprises around the globe plan, deploy and maintain their mission-critical applications.

- **Deployment services:** Infinera offers a flexible suite of deployment services, allowing enterprise customers to engage only those services that best complement their existing capabilities, such as turnkey installation services, installation and commissioning, project management, pre-staging and more.

- **Maintenance services:** These services provide enterprises with the peace of mind they need to operate and maintain their networks, such as first line maintenance services (FLM), Technical Assistance Center (TAC), onsite expertise, 24x7x365 service and much more. Infinera also offers enhanced spares management services designed to provide dependable and rapid spares dispatch while minimizing the burden and cost of managing and owning spares to enterprise customers.



Figure 7: Infinera's Enterprise Platforms

Get the Infinera Experience

Infinera’s enterprise solutions offer the benefit of a vertically integrated supply chain that allows us to deliver a truly unique customer experience. We call it the Infinera Experience, delivering best-in-class products that are easy to use and operate, supported by a world-class team of experts and focused on customers’ success.

- **Technology leadership:** Infinera has pushed the physical limits through numerous technology innovations that reshaped the optical networking industry to provide unparalleled scale, flexibility and performance. A recent example is the introduction of the fourth generation of the Infinite Capacity Engine, providing a quantum leap to terabit scalability and performance: the industry’s first multi-terabit super-channel, the industry’s first multi-terabit Layer 1 encryption, lower power compared to the nearest competitor, a compact footprint, and networking flexibility through sliceable photonics and the Advanced Coherent Toolkit (ACT).
- **World-class quality:** Infinera’s technology innovations come with the highest levels of quality to ensure that your network is up and always will be. As a matter of fact, Infinera’s photonic integrated circuit (PIC)-based subsystem reliability exceeds industry standards by nine times, with line modules’ mean time between failure (MTBF) at approximately 60 years. Infinera’s PIC modules have accumulated more than 1.6 billion hours of failure-free operations.



Figure 8: The Infinera Experience Founding Principles

- **Customer-centric focus:** Infinera combines great technology with a top-down commitment to your success through global customer services capabilities and an end-to-end Intelligent Transport Network portfolio proven across the industry. You can deploy optical networks with confidence and peace of mind knowing that the Infinera team is here to do whatever it takes to help you solve your network challenges and win in your markets.
- **Time as a weapon:** Timing is critical factor in any industry, and Infinera allows you to use it as a weapon and gain a competitive edge. With Infinera, you can deploy networks with short lead times, scale bandwidth faster by adding 100 Gb/s services with the click of a mouse through Instant Bandwidth, and accelerate time to revenue through rapid response to customer demands.

Conclusion

Enterprises are undergoing a major shift in how they conduct business. Transport networks have never been more vital to enterprise success than they are today. Infinera Intelligent Transport Networks reduce operating costs, protect critical information, and provide the scalability required to meet the surging demand for bandwidth driven by cloud. Infinera designs and deploys best-in-class platforms that make networking secure, simple and cost-effective. However, unlike traditional equipment manufacturers, Infinera delivers more than equipment—it delivers the Infinera Experience, which is the unique recipe customers have come to admire as it puts them first.

For more details, contact us or visit <https://www.infinera.com/applications/enterprise-networks/>

Sources

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