APPLICATION NOTE

ENTERPRISE OPTICAL NETWORKS

THE TOP THREE REASONS FINANCIAL INSTITUTIONS NEED INTELLIGENT TRANSPORT NETWORKS

Introduction

The financial services industry is going through a fundamental and disruptive transformation that is redefining how institutions conduct business, down to their day-to-day operations across the globe. Fierce competition among peers, the arrival of financial technology (FinTech) and the emergence of new cloud-based payment methods (e.g. mobile digital wallets, BlockChain, etc.) are forcing financial institutions to innovate, enhance service offerings and work to increase customer loyalty. Moreover, this industry draws constant scrutiny from regulators and cyber criminals.

In fact, when it comes to cyberattacks, the global financial services industry is targeted the most, with an average cost of $13.5 million per company per year,[1] not to mention the irreparable damage sustained to an institution's reputation and hence its ability to conduct business in the future. This comes at a time when these institutions are investing in security, customer service, workforce productivity improvements and customer-facing applications, with many of these investments in the cloud.

As financial institutions make this journey, one thing is becoming clear: there is a need for intelligent high-capacity optical transport to create secure, flexible, scalable and programmable infrastructure networks to help drive long-term growth plans for virtually every financial institution.

This application note describes networking challenges that financial institutions face in today's digital economy, and the top reasons why intelligent transport networks are becoming critical to their success, with a direct positive impact on productivity and the ability to compete for long-term business success.

Reason #1: Difficult Challenges

Fierce competition, cyberattacks and shrinking budgets are critical challenges at any financial institution. The following paragraphs briefly describe imperatives relating to these concerns and their impact on a financial institution's business and operational health.

- **Protect critical data:** Cyberattacks and data breaches are frequent occurrences. According to a recent Verizon Data Breach Investigation Report,[2] there were 1,368 security incidents in the financial industry in 2016.
- **Enhance network performance:** Latency, transactions per second and network flexibility are all key network performance concerns for financial institutions. Networks must be agile to support dynamic demand for bandwidth and any change in network topology, including connectivity to new offices or data centers.
- **Decrease the cost of operations:** Traditionally, more capacity for bandwidth-hungry applications requires more money and more complexity, which triggers unprecedented increases in capital and operational expenditures. Decreasing recurring costs is key to maintaining a healthy balance sheet. In PwC's latest CEO Survey, 55% of global financial services chief executive officers plan to implement a cost-reduction initiative over the coming year.[3]
- **Minimize downtime:** Network outages can be disastrous to any financial institution, resulting in significant loss of revenue, massive disruption to business operations and a major impact on customer loyalty. The average downtime cost is estimated at about $6.48 million per hour for large online brokerages, according to Information Management magazine.[4]
- **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 pressure on IT and planning teams, especially for unexpected network events.

Overcoming the above challenges requires an intelligent high-capacity optical network, one that can scale to meet bandwidth demands and ensure the highest levels of availability and security while lowering operating costs.

Reason #2: A Company's Success Depends on the Cloud

Cloud-based applications are impacting multiple aspects of any enterprise in the financial industry - from customer web portals, to new cloud-based banking services, to the way financial transactions are planned and executed.

- **Cloud-based services are key to success:** Financial institutions rely on the cloud to provide 24/7 online self-services like account management, investment education and transactions, money transfer and many more. These cloud-based services are crucial to maintain and increase customer loyalty.
- **New cloud-based players:** The emergence of new cloud-based companies is disrupting the financial industry landscape by offering new or existing financial services (such as payment tools) at lower costs. FinTech companies, often startups, deliver services including mobile payments, automated investing, peer-to-peer money lending, online insurance and many more to established financial institutions via open interfaces such as application programming interfaces (APIs). Moreover, internet and consumer electronic giants like Apple, Google, Facebook and Twitter are also becoming active in the financial services space.
- **Evolution to machine learning:** New technologies like artificial intelligence, machine learning, big data analytics and data-driven decision algorithms have started to play a role in the financial industry. As a matter of fact, BlackRock, the world's largest fund management company, recently announced[5] that it would begin using computer algorithms and artificial intelligence to make stock buying and selling decisions.
- **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 meetings and trainings conducted via video conference.

Financial institutions 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 their evolution to the cloud. From serving customers and conducting transactions 24/7, to connecting employees for better collaboration and productivity, to protecting mission-critical information day-to-day and during major disasters, an intelligent high-capacity optical network unlocks numerous key networking applications, as described in the following section.

Reason #3: Networking Applications in Today's Cloud Era Need a New Level of Optical Performance

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

- **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

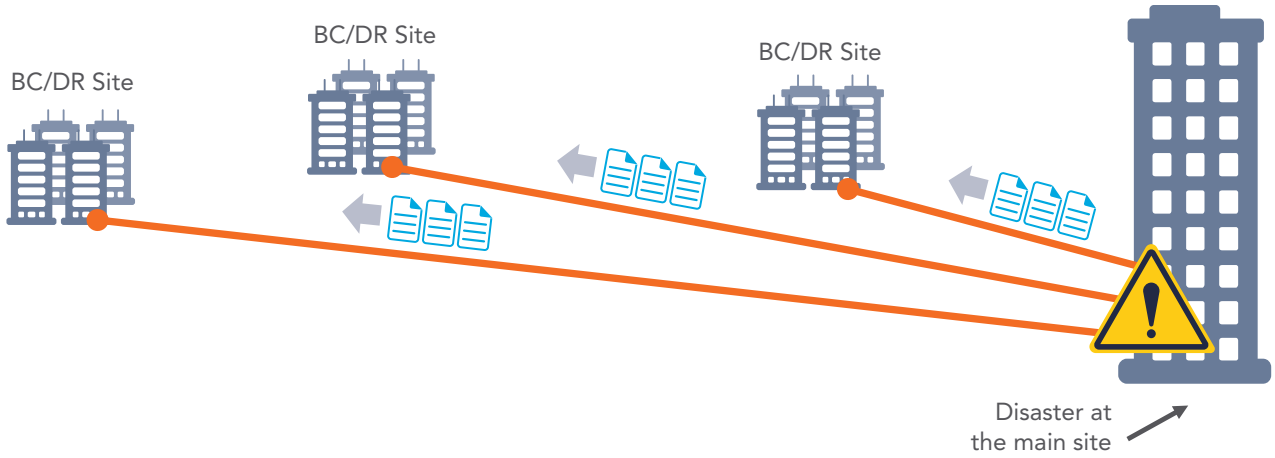

Figure 1: Business Continuity/Disaster Recovery

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 alternate sites, including 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 1). Intelligent high-capacity optical networks play a vital role in BC/DR applications, providing the required bandwidth and alternative routes that meet stringent latency and capacity requirements in a very short period of time to minimize the impact on business operations. The successful deployment and operations of BC/DR applications are directly related to the performance of the optical network that supports them.

- **Offsite/off-hours data backup:** This is a recurring operational procedure aimed to replicate or back up critical data to a remote data center every day after hours (Figure 2). Typically, a large amount of data (terabytes) is automatically duplicated at another remote site/data center overnight during a backup window that spans anywhere 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 provided by intelligent high-capacity optical networks reduce the backup window from several hours to just minutes and enable the overall success of this application.
- **Ultra-low latency for high-frequency trading (HFT):** Financial institutions, such as brokerage firms, process millions of transactions daily, and they require ultra-low-latency optical networks to complete stock transactions within milliseconds of a market-impacting event. Complex algorithms that analyze multiple markets, identify trends and execute orders based on market conditions are leveraged to

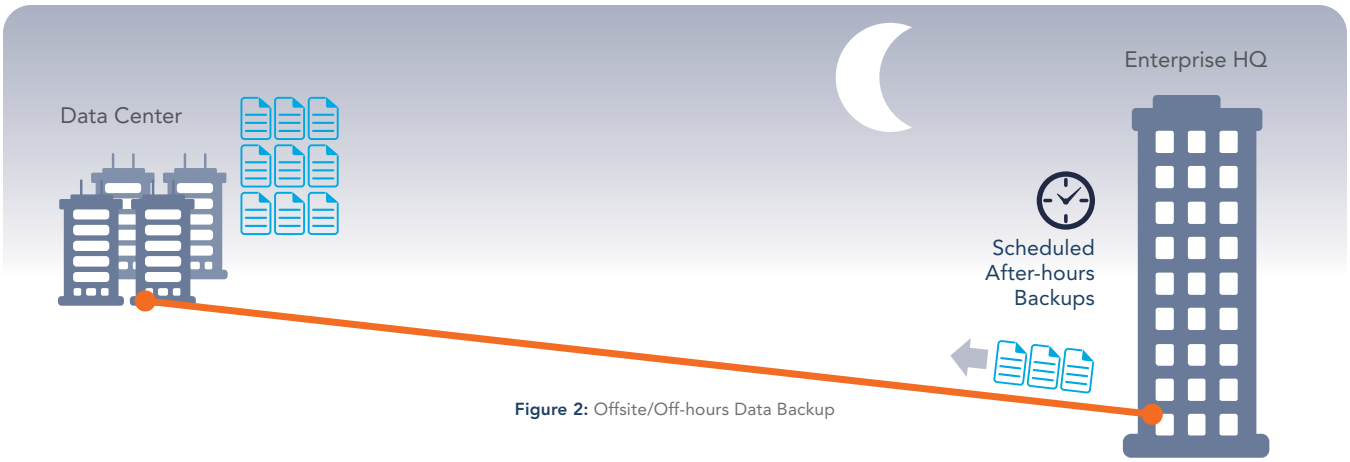

Figure 2: Offsite/Off-hours Data Backup

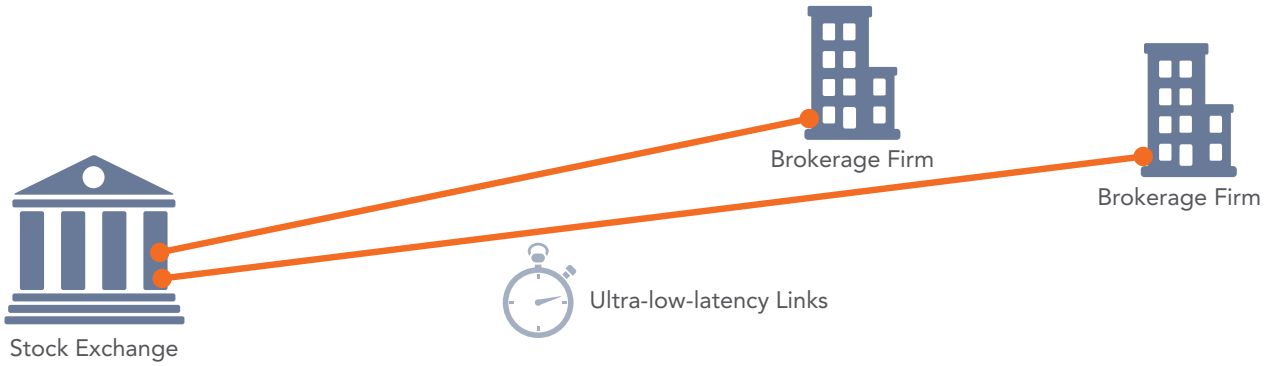

Figure 3: Ultra-low-latency Network for High-frequency Trading

operate HFT solutions, in which even the smallest level of latency can translate into millions of dollars of lost revenue (Figure 3). As a matter of fact, one major brokerage firm on Wall Street estimates that the ability to trade 1 millisecond (ms) faster could be worth $100 million a year in revenue[6].

- **Data mirroring:** Heavily used by financial institutions that process millions of transactions daily (e.g. brokerage firms, online payment processors, etc.), this application is used to instantaneously duplicate a set of processes and transactions from a primary or master site (mainframe/data center) to a secondary volume or mirroring site (Figure 4). Keeping latency below a certain threshold is a key factor in properly deploying data mirroring, so an intelligent high-capacity optical network with low latency and jitter (a variation of latency) is a key building block of deploying any such application.
- **Core Networks—Multi-service Aggregation:** In most enterprises, including financial institutions, several networking protocols are used to conduct daily operations, including legacy Synchronous Optical Networking (SONET)/Synchronous Digital Hierarchy (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, reducing networking costs and enhancing enterprises' networking flexibility, as depicted in Figure 5. Today, single wavelengths carry between 10 gigabits per second (Gb/s) and 200 Gb/s per wave, and up to 27.6 terabits per second (Tb/s) per optical fiber pair.

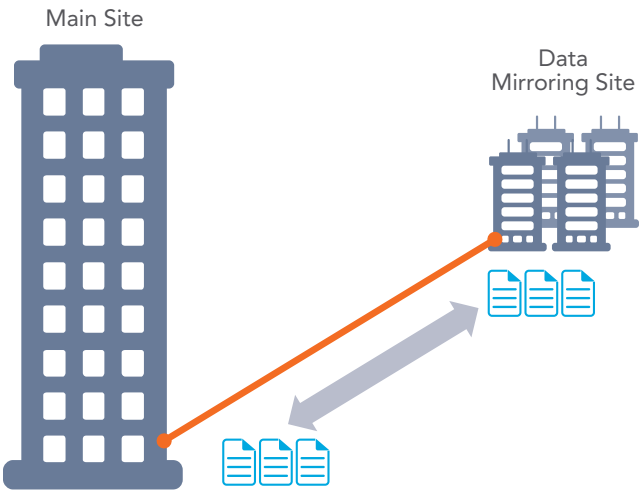

Figure 4: Data Mirroring

- **Core networks—corporate/office interconnect:** Network requirements for interconnecting offices and data centers vary depending on different factors such as bandwidth needs, distance, application requirements and so on. To connect smaller branch offices and similar sites, financial institutions 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, financial institutions can lower costs and gain greater flexibility and control by building their own regional, national and 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 6). For financial institutions that depend on secure, reliable connectivity in their core networks, private intelligent high-capacity optical networks prove to be a very economical yet high-performance solution, providing the capacity, low latency, security and agility required for the enterprise operations of today and tomorrow.
- **Cloud service direct connection:** Financial institutions' shift to cloud is well underway and accelerating, driving the need for increased bandwidth and 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

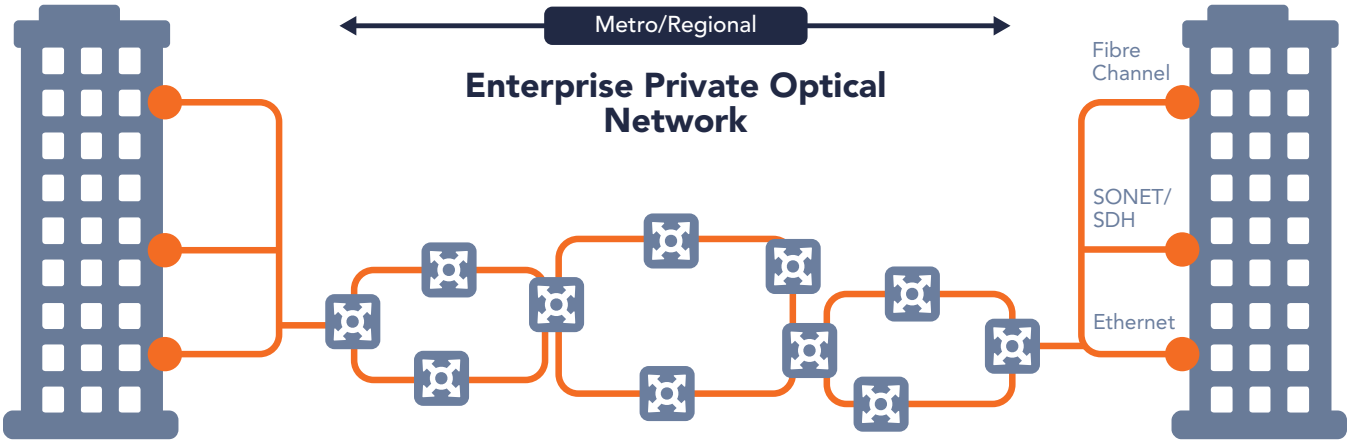

Figure 5: Core Network—Multi-service Aggregation

relationship management, enterprise resource planning and human resources, financial institutions are relying more heavily on the networks that connect their enterprise sites to cloud service providers at carrier-neutral facilities across the world (Figure 7). Intelligent high-capacity optical networks provide the needed capacity for direct connection to cloud services with high security, low latency and simple scalability. Intelligent high-capacity optical networks can also provide open interfaces such as representational state transfer (REST) APIs that allow seamless integration of these cloud services into an enterprise's existing IT environment and processes.

- **Live migration of virtual m achines**: Unplanned, on-demand and seasonal activities may require the shifting of virtual computing resources (aka virtual machines or VMs) to lower costs and/or increase performance. This application relies heavily on high-performance

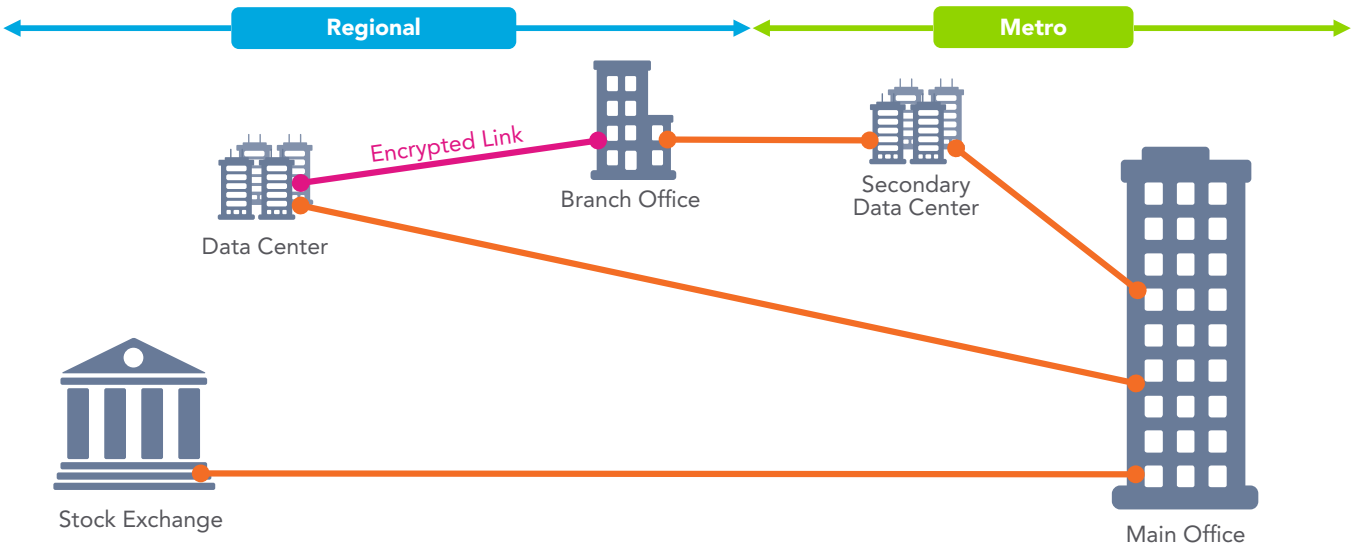

Figure 6: Enterprise Core Network Corporate/Office Interconnect

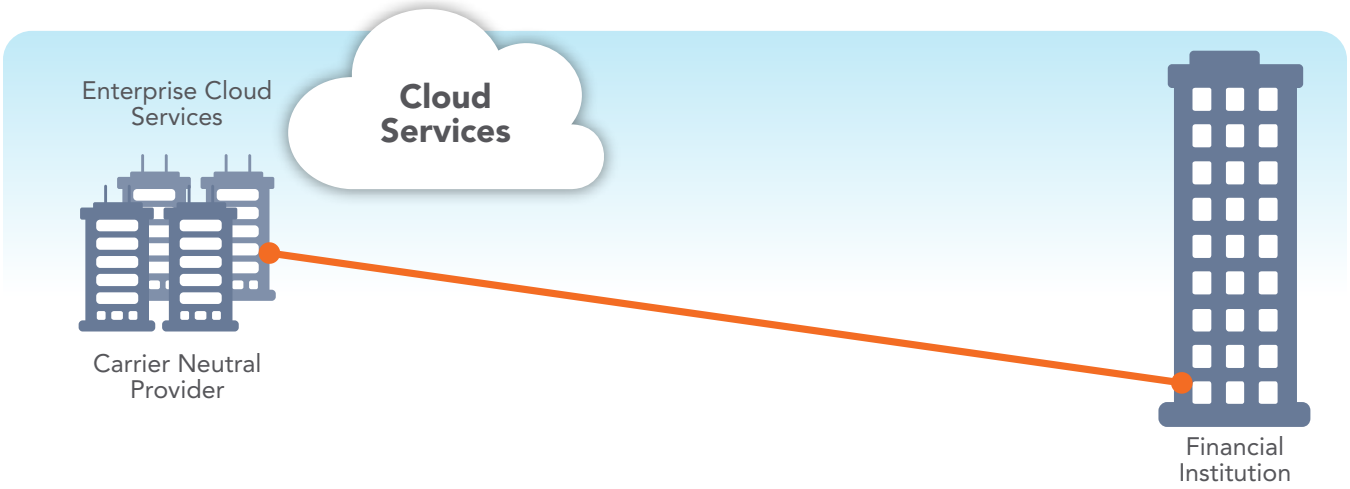

Figure 7: Enterprise Cloud Services

networks, with the network dynamically creating 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 employee productivity, reduce costs and simplify operations (e.g. move processing power closer to applications or users as needed).

Why Consider Infinera Intelligent Transport Networks

As financial institutions move toward high-bandwidth applications and the cloud, network reliability and performance become paramount. Infinera delivers innovative networking solutions that leverage the benefits of intelligent high-capacity optical networking to offer financial institutions reliability, security and simplicity while driving down operational costs.

- **Reliability:** High network reliability is key to the success of every financial institution's day-to-day operations. No financial institution can tolerate downtime, as it results in disastrous consequences for customers and the business. Infinera delivers ultra-reliable enterprise solutions that are built on a foundation of hardware and software designed to keep the network up and running regardless of disruption.
- **Security:** A financial institution'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 financial institutions' 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.
- **Simplicity:** Optical networking is not a core competency for most financial institutions, so Infinera has dramatically simplified network design, implementation and operations with features like zero-touch provisioning (ZTP), 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.

Whether the objective is to lower costs, increase scalability or improve network performance, there is a right-sized Infinera platform, as shown in Figure 8:

- **The XTM Series** of packet-optical platforms is designed for metro access, metro aggregation and metro core networks. These platforms offer leading low power and high density capabilities and feature rich support for Layer 0/1/2/2.5 services, making them ideal in enterprise applications.
  - **Ultra-low latency:** The Infinera XTM Series offers network operators a full toolbox of low-latency traffic units with Layer 1 transponders and muxponders and Layer 2 packet-optical transport switches
  - **Multi-service:** Ethernet, 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 kilometers (km)
- **Multiple chassis options:** 1 rack unit (1RU), 3RU and 11RU chassis options, enabling right-sized deployments

- **The Infinera Cloud Xpress Family** is built from the ground up to connect data centers and high-capacity point-to-point Ethernet transport applications.
  - **Secure:** Layer 1 and Layer 2 wire-speed encryption
  - **Optimized for Ethernet:** 10 Gigabit Ethernet (GbE)/40 GbE /100 GbE
  - **Simple:** Plug-and-play
- **Infinera's XTC-2 and XTC-2E platforms** are purpose-built for scalable and efficient metro and regional networks.
  - **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

As keeping latency ultra-low is key for most enterprise applications, Infinera designs and builds low-latency solutions across multiple platforms. As a matter of fact, Lippis Enterprises recently conducted an extensive test measuring end-to-end performance for a data center interconnect (DCI) solution using Infinera's Cloud Xpress CX-100E platform and Arista Networks' 7280SE-68 programmable switching platform. The results of this test demonstrate the CX-100E's high performance and low latency, including capabilities such as providing end-to-end 100 GbE line-rate throughput with zero loss for any mix of traffic, end-to-end latency under 20 microseconds between servers in different data centers, up to 500 Gb/s dense wavelength-division multiplexing (DWDM) bandwidth in a single 2RU form factor, the ability to extend over 150 km without any external amplification, power consumption of less than 1 watt per Gb/s and ease of installation and operation, optimized for data center environments. The detailed report can be found **here**.

Infinera also offers a wide spectrum of professional services to help financial institutions 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 that complement their existing capabilities, such as turnkey installation services, installation and commissioning, project management, pre-staging and more.
- **Maintenance services:** Infinera offers maintenance services that provide financial institutions with the peace of mind they need to operate and maintain their networks, such as first line maintenance (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 to enterprise customers of managing and owning spares.

Figure 8: Infinera's Enterprise Platforms

Get the Infinera Experience

Infinera's solutions for financial institutions offer the benefits of a vertically integrated supply chain that enables a truly unique customer experience. It is called the Infinera Experience, delivering best-in-class products that are easy to use and operate, supported by a world-class team of experts focused on customer success.

- **Technology leadership:** Infinera pushes physical limits through numerous technology innovations that have 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 and 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 customers' networks are up and always will be. In fact, the reliability of Infinera's photonic integrated circuit (PIC)-based subsystem exceeds industry standards by nine times, with line modules' mean time between failure at approximately 60 years.
- **Customer-centric focus:** Infinera combines great technology with a top-down commitment to customer success through global customer service capabilities and an end-to-end Intelligent Transport Network portfolio proven across the industry. Operators can deploy optical networks with confidence and peace of mind knowing that the Infinera team is here to do whatever it takes to solve network challenges and enable customers to win in their markets.
- **Time as a weapon:** Timing is critical factor in any industry, and Infinera allows customers to use it as a weapon and gain a competitive edge. With Infinera, operators 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.

Figure 9: The Infinera Experience Foundational Principles

Conclusion

Financial institutions are undergoing a major shift in how they conduct business. Intelligent high-capacity optical networks have never been more vital to their 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 more reliable, secure, simple and cost-effective. Infinera delivers more than just equipment – it delivers the Infinera Experience, a unique partnership that customers have come to admire as it puts them first.

For more details, contact Infinera or visit Infinera Enterprise Networks.

Sources

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