CASE STUDY

BUILDING DISTRIBUTED INTERNET EXCHANGES WITH CLOUD XPRESS

infinera®

CUSTOMER TYPE
Internet Exchanges (IXs) provide colocation space, power and interconnection services linking Cloud providers, partners and customers.

CHALLENGE
Rapid expansion, multiple facilities in each metro

High-capacity needed between facilities

Scale capacity without service interruption

Simple deployment and operations

Space and power constraints

SOLUTION
Infinera Cloud Xpress, designed for metro Cloud datacenter interconnection

High density: 500 Gb/s in 2 rack units

Low-power: less than 1 Watt per Gb/s

Easy 1-2-3 provisioning, rack-and-stack capacity scaling

"Pay as you grow" point-and-click 100G bandwidth increments

RESULTS
Dramatic increase in capacity between facilities

Deployed in minutes without optical expertise

Simple connections, as easy as a cross-connect

As much as 30-60% lower operating cost

The demand for Internet Exchange (IX) services drives continued, rapid expansion of IX facilities. Leading IX providers often operate multiple facilities within a single metro area to satisfy this demand, and they want all of their facilities to be interconnected seamlessly to operate as a single, large scale, distributed IX. This requires very high capacity metro optical transport that is simple to deploy and scale, and fits the space and power constraints of an urban datacenter environment. Infinera's Cloud Xpress is proving to be an ideal fit for these requirements, and a key enabler for the distributed IX.

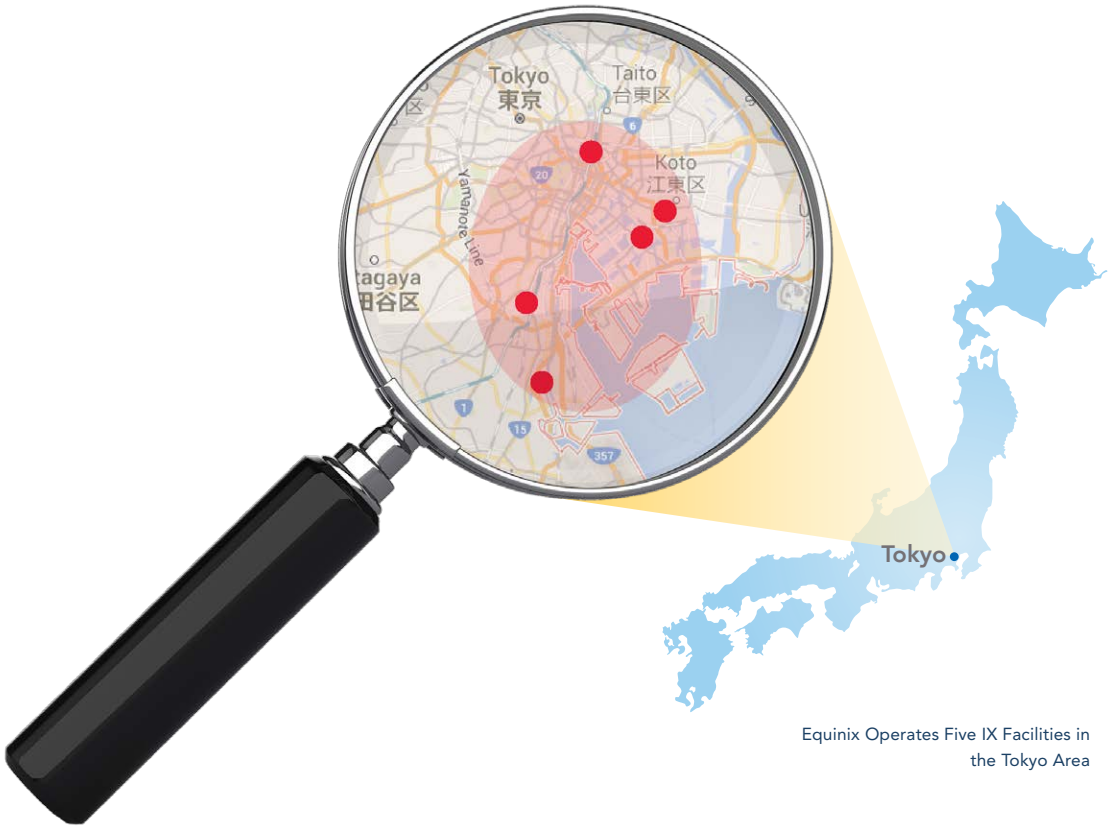
The Evolving Internet Exchange

IX is the heart of the Internet, the place where the Internet actually gets connected. Since the early days of Network Access Points shared by a few dominant backbone providers, the idea of IX has grown and transformed into a robust Metro IX ecosystem serving a wide range of companies providing cloud-based content, applications and services.

Everyone wants to be in the right IX facilities to connect to their customers, partners and providers. Traditional carriers and Internet Service Providers (ISPs) still have a major presence, while new players are increasingly prominent, including the major Internet Content Providers (ICPs) such as Google and Facebook and

"Distributed Internet exchange infrastructure is a key strategy to serve growing demand. DE-CIX in Frankfurt, LINX in London, and Equinix in major locations around the world all use dedicated network capacity interconnecting numerous sites throughout a given metro area to create virtual networking environments that nearly simulate colocation in a single building over a wider area."

—Jonathan Hjembo, Senior Analyst at TeleGeographyTelegeography



Equinix Operates Five IX Facilities in the Tokyo Area

hyperscale Cloud Platform Providers (CPPs) such as Amazon Web Services and Microsoft Azure. These large providers have the scale, resources and incentive to build their own networks into multiple major metro areas and peer directly with the fixed and mobile access providers who reach their end users. By doing so, they can better control service delivery and the quality of experience for their users—with lower latency and more predictable performance—and optimize their costs at the same time. Their expansion is a key driver of demand for metro IX services.

But beyond these big players, there are literally thousands of others. Virtually any provider offering cloud-based services needs to be in multiple IX facilities as well, and a growing subset of large enterprises are locating in IX facilities to enable their hybrid cloud IT strategies. As a result, the Metro IX ecosystem is increasingly diverse.

The IX providers are also diverse. Commercial operators such as Equinix, TelX and Interxion have built a business around carrier-neutral IX services, including highly-available colocation (rack space & power) and flexible high-capacity Ethernet interconnection. Cooperative, non-profit IX providers have also succeeded and a few of them, such as DE-CIX (in Frankfurt), AMS-IX (Amsterdam) and LINX (London) are now among the largest IX sites in the world.

The Distributed Internet Exchange Challenge

IX demands in major metro areas long ago outstripped the capacity of any single IX facility and the number of IX facilities keeps growing. With multiple colocation and Internet Exchange providers spread over dozens of physical facilities, the IX customers and providers alike face a recurring problem: how do I connect to my customer/partner/provider in a different IX facility across town?

The largest IX providers, such as Equinix, want as much of the Metro IX ecosystem as possible to live in their facilities so that they can solve that problem for their customers. Following the logic of network effects, they understand that the value of their facilities and IX services increases exponentially as they increase the number of customers and providers who are colocated there and within easy reach of each other.

To meet that objective, they continue to expand into new facilities. In some cases they are building new facilities and in other cases they expand by acquiring existing IX providers and facilities. Of Equinix's 33 metro markets, 25 markets have more than one Equinix IX facility, known as Internet Business Exchanges (IBXs). The Washington, DC, area alone has ten IBX sites, while Tokyo has five. Several other IX providers, while smaller than Equinix,

nonetheless have multiple metro markets in which they operate more than one IX facility.

Distributed IX Requirements

To connect multiple facilities into a single distributed IX, IX providers have a few critical requirements.

First is high-capacity. Within a single IX facility, customers can typically connect to each other directly using fiber-optic cross connects at 1 to 100 Gb/s, or connect via virtual private connections through the IX provider's Ethernet switching platform. For the distributed IX to work as well as a single IX, the metro optical network connecting facilities must support dozens or even hundreds of high-speed "cross connects" between facilities, and aggregated virtual private connections that together can add up to multiple terabits per second (Tb/s) of total capacity.

The distributed IX also needs that capacity to scale easily and efficiently, without major re-engineering of the optical networks or service affecting maintenance outages. Traffic within the Metro IX ecosystem shows every sign of continuing to grow faster than global Internet traffic, so capacity upgrades must be a routine and straightforward part of IX operation.

Distributed IX operators also need their metro optical transport platforms to be extremely simple to install and manage. The IX operator's core competency is datacenter management and intra-facility interconnection, not optical network engineering, so they need a system that fits into the "rack and stack" operational approach and integrates well into datacenter operations systems.

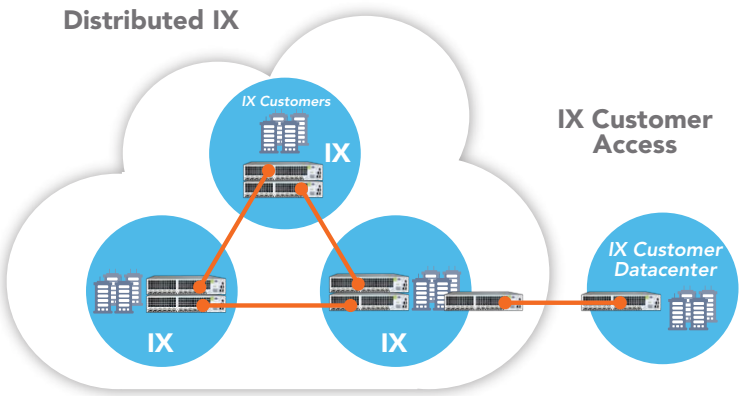
Finally, most IX facilities are like other metro datacenter environments where space and power are extremely scarce and constrained, so the metro optical infrastructure must have very high density and excellent power efficiency.

The Distributed IX Solution

The Infinera Cloud Xpress family has been designed to meet exactly these requirements for metro cloud and datacenter interconnection.

It offers very high capacity with high density and simple capacity scaling. A single 2-rack unit (RU) Cloud Xpress, leveraging Infinera's unique photonic integrated circuit (PIC) technology, delivers a 500 Gb/s superchannel of dense wavelength division multiplexing (DWDM) bandwidth on one fiber pair. The Cloud Xpress supports a variety of client interfaces including 10 GbE, 40 GbE and 100 GbE.

By racking and stacking Cloud Xpress, capacity can be easily scaled with no service interruption, delivering up to 8 Tb/s on a single fiber pair. Infinera Instant Bandwidth™ allows the activation of



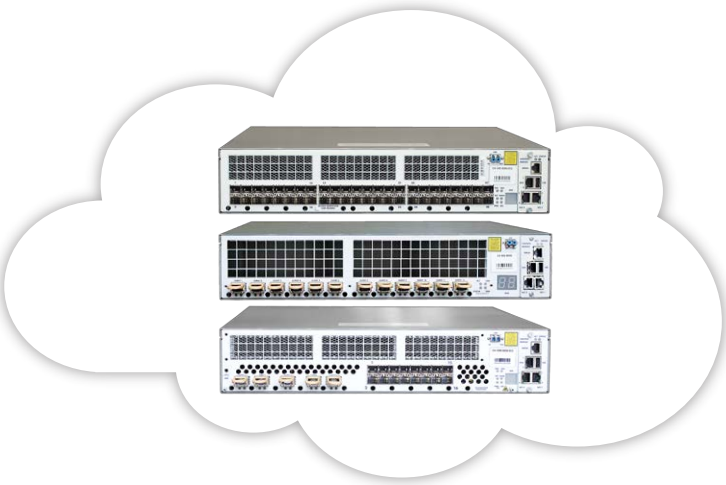
Cloud Xpress In Action: Connecting the Distributed Internet Exchange and Enabling Customer Access to IX Facilities

WDM bandwidth in 100 Gb/s increments via a few clicks of a mouse, enabling capacity scaling to be aligned precisely to the IX customers' bandwidth demands.

Cloud Xpress also enables efficient scaling with simple provisioning and open interfaces to plug into existing cloud provisioning systems using open software-defined

"As Japan's fastest growing commercial IX service, we continue to enhance our network to ensure the efficient flow of data in the metro Cloud for Internet users in Japan and globally. The Infinera Cloud Xpress allows us to interconnect all of our sites while only requiring a small amount of space and power. And the platform provides us operational benefits that massively simplify what it takes to deploy the network."

—Yoshiki Ishida, JPIX CEO



The Infinera Cloud Xpress Family, supporting 10 GbE, 40 GbE and 100 GbE

networking (SDN) application programming interfaces (APIs). Provisioning and turn up is as simple as 1-2-3.

And Cloud Xpress is very power efficient requiring less than 1 Watt per Gigabit per second (<1 W/G), and keeping power-driven operations costs low.

Results

IX providers who use Cloud Xpress to connect their distributed IX benefit in many ways.

Most importantly, they deliver on the promise to their customers that locating anywhere in any of their IX facilities enables access to customers in other facilities as simply as if they were cross-connecting across the aisle in the same building. When IX providers deploy Cloud Xpress, they can dramatically increase the capacity available between their IX facilities, enabling them to meet current demands, and also position themselves for easy network upgrades without affecting existing services.

IX providers also benefit operationally, with revolutionary simplicity and low operating costs. Cloud Xpress can be deployed in minutes, with limited training and absolutely no specialized optical expertise, so IX providers can focus on providing high-value connectivity solutions to their customers. It integrates into software-defined data center and networking systems through open APIs, reducing burdens on operations staff. And Cloud Xpress provides all of these benefits in a very compact, power-efficient appliance that can fit into space- and power-constrained data center environments and deliver as much as 30-60% lower cost than alternative solutions.

Conclusion

As demand for IX services continues to grow, leading IX providers can meet their customers' needs by building high-performance distributed Internet Exchanges. With scalable capacity, high density, low power and revolutionary simplicity and ease of use, Infinera Cloud Xpress is proving to be an ideal fit for IX provider requirements, and a key enabler for the distributed IX.

"Equinix is rapidly expanding across the globe. Cloud Xpress is an ideal solution for us to scale bandwidth in our Hong Kong and Tokyo networks and enhance our ability to connect our customers. Cloud Xpress is extremely simple to deploy and manage and fits our high-density, low power requirements. We are now looking forward to deploying the Cloud Xpress family in other markets globally to take advantage of these same scaling benefits."

—Teri Francis, vice president of technology at Equinix

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