Infinera Instant Network

Market Impact, March 2017

Executive Summary

Infinera, a company long known for its industry-leading photonic integration, is taking another step in its journey toward cognitive networking with the introduction of Infinera Instant Network. Infinera Instant Network builds upon three of the company's foundational technologies: fourth-generation sliceable, multi-terabit, photonic integration; open, programmable network interfaces with the Xceed SDN Software Suite; and Instant Bandwidth software activation of service-ready optical capacity.

Infinera Instant Network adds support for Bandwidth License Pools, Movable Licenses and Automated Capacity Engineering. With Bandwidth License Pools, service providers can synchronize capacity activation with invoicing. With Movable Licenses, service providers can virtually eliminate stranded networking capacity and capital. With Automated Capacity Engineering, service providers can significantly compress the timeline for traffic engineering tasks that used to take weeks or months with traditional solutions.

Infinera Instant Network increases networking efficiency while decreasing opex. With future augmentations in predictive analytics and service intelligence, one can see cognitive networking coming into view.

Key Findings

- Infinera Instant Network includes support for Bandwidth License Pools, Movable Licenses and Automated Capacity Engineering.
- Instant Network is built upon a foundation of Infinera technologies: advanced photonic integration, open APIs and Instant Bandwidth.
- Bandwidth License Pools synchronize capacity activation with license invoicing for the SP.
- Bandwidth License Pools and Movable Licenses eliminate stranded capacity and capital.
- Advanced Capacity Engineering drastically reduces the capacity planning timeline and automates activities that were previously done manually and offline.

On-Demand Services

Enterprise and data center customers are looking for agile, on-demand services that enable them to purchase the networking capacity they require when, where and for the duration needed. In addition, service providers are seeking ways to enhance revenue, increase networking efficiency and minimize opex.

In response, multiple service providers announced on-demand services. In 2015, AT&T reported the expansion of its Switched Ethernet Service with Network on Demand to more than 100 cities. Telstra launched its Network on Demand service in 2015 following the acquisition of Pacnet's SDN enabled network, which is powered in part by Infinera's Open Transport Switch solution. Telstra subsequently expanded the PEN network to include 26 global points-of-presence and launched PEN Exchange, enabling on-demand circuit connectivity with other PEN customers. In late 2016, Windstream announced its intention to launch Dynamic Bandwidth services based upon Infinera's solution.

An MEF webinar (February, 2016) disclosed the results of a survey on dynamic services. Some key findings include:

- 60% of Ethernet SP respondents plan to offer dynamic services by 2018[1]
- The #1 dynamic service capability is adjusting bandwidth on demand[1]
- The #1 purchase driver for dynamic Ethernet services is faster provisioning[1]

In ACG Research's engagement with enterprise and data center customers, we continue to hear requests for dynamic, on-demand services that enable organizations to better align networking costs to bandwidth usage and revenue. Automated, agile and rapid service delivery can also enhance service providers' top-line revenue. In recent business case analyses, ACG Research has seen as much as 13% per-service increase in first-year revenue correlated to faster service launch and reduced time per service instantiation[2]. Infinera's Instant Network is directly aligned with enterprises' and data center customers' expectations for on-demand services and service providers' needs for increasing networking efficiency while at the same time decreasing operational costs.

Building on a Solid Foundation

Infinera Instant Network is delivering the next-generation of software defined capacity that has been built upon a foundation of focused investments over many years, including industry-leading photonics, programmable application interfaces and dynamic capacity enablement with Instant Bandwidth.

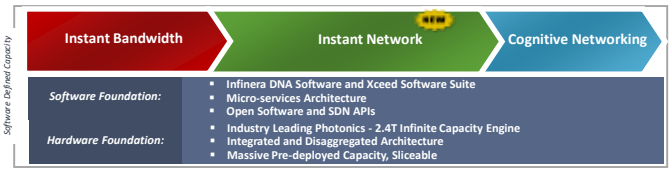

Figure 1: Infinera Foundation and Future

With the introduction of the Infinite Capacity Engine in 2016, Infinera realized its fourth-generation photonic integrated circuit (PIC). The Infinite Capacity Engine delivers 2.4 Tb/s of 100 Gb/s sliceable coherent DWDM capacity. The Infinite Capacity Engine is rolling into long-haul, subsea, metro and DCI products, including the well-known DTN-X and the industry-leading DCI appliance with the introduction of the Cloud Xpress 2.

Figure 2: 2.4 Tb/s Infinite Capacity Engine

Infinera launched the OpenDaylight-based Xceed SDN Software Suite and controller in late 2016. With an open API and unified YANG data modeling, the Xceed Software Suite brings programmable, automated networking to life. The Xceed SDN Controller can be deployed as either a stand-alone solution or in a hierarchical manner with the controller providing single domain support feeding a multi-domain orchestrator.

On top of Infinera's 500 Gb/s, third-generation PIC, Infinera launched Instant Bandwidth in 2012. Instant Bandwidth enabled service providers to pay for the PIC capacity they needed in 100 Gb/s licensed increments. Instant Bandwidth was further augmented in 2015 with a time-based variation that enabled service providers to purchase the desired capacity for a period (for example, 30 days) and then release the extra capacity when/if it was no longer needed. Time-based Instant Bandwidth

has proven incredibly useful in augmenting capacity in failure scenarios and during ad hoc events such as The World Cup. As a testament to the success of Instant Bandwidth and the value that service providers place on the ability to instantiate incremental capacity and services rapidly, more than 70 of Infinera's existing customers utilize Instant Bandwidth, including 60% of all DCI customers.

The Advent of the Instant Network

Infinera's Instant Network delivers three key enhancements on top of its battle-tested foundation: Bandwidth License Pools, Movable Licenses and Automated Capacity Engineering.

Bandwidth License Pools

As networks and services have become increasingly virtualized and sliceable, the way service providers purchase or license network components and services has begun to change. The tight relationship between underlying hardware and the software and services running on top of it has begun to fragment and disassociate. At Layer 123 SDN World Congress in October, 2016, Shawn Hakl, VP Product and New Business Innovation, Verizon, told the audience that virtual enterprise service functions must be usage-based in a pay-as-you-go model. Verizon will not deploy virtual functions that are locked or licensed to an enterprise customer. In effect, virtual function licenses must be pooled at a Verizon network level. Infinera's Bandwidth License Pools for optical capacity is analogous to Shawn's enterprise services strategy.

There are two key benefits of Bandwidth License Pools. The initial benefit is reduced time to activation. Instant Bandwidth licensing required the service provider to purchase a license before the incremental capacity could be activated. The purchase and coordination could result in hours of delay. With Bandwidth License Pools, capacity tracking is centralized and invoicing commensurate with incremental service activation. The additional benefit of Bandwidth License Pools is increased networking efficiency and capital avoidance. If a license is available in the pool and unutilized, it may be deployed anywhere in the network if underlying hardware capacity is available, resulting in generation of a $0 invoice. Underutilized capacity can also be pulled back to the pool for redistribution as needed.

Movable Licenses

The combination of Bandwidth License Pools and Movable Licenses is truly powerful. Since licenses are centralized and movable across network elements, line cards and PICs, bandwidth can flow throughout the network as needed, pulling licenses back from areas of the network that are lightly utilized while distributing incremental bandwidth and licenses to locations that need more. This flexible capacity means that networking efficiency is improved and capital expenses reduced. Bandwidth License Pools and Movable Licenses also combine to enhance networking resiliency and flexibility, moving capacity to back-up paths in the event of failure or during ad hoc bandwidth spikes for concerts or sporting events.

Automated Capacity Engineering

Anyone with experience deploying DWDM optical networks is familiar with the extensive time and effort that traffic engineers and network architects put into offline traffic route and capacity planning. It is common for optical networking vendors to supply capacity planning tools to service providers to assist the engineers with their complicated, multi-variable analysis. Infinera is taking the capabilities of offline traffic engineering and modeling tools and putting them into a micro-services-based path computation element (PCE) that will be available in 2018.

With access to centralized topology information and network state information, PCE has visibility to resource utilization and availability across the network. PCE's advanced computational analysis can take into consideration constraints beyond traditional shortest-path or least-cost metrics. Networking attributes such as availability, latency, performance, consumption, diversity, and oversubscription can all be taken into consideration by the computational engine.

In addition to shortening capacity planning cycles, PCE can help maximize networking efficiency. In today's networks, it is not uncommon for some optical paths to run at 40% or 50% of networking capacity.

The underutilization is intentional as part of path diversity planning. If two links can carry traffic between Points A and B, then in the event of failure of one of the links, network planners may want a single link to support the full capacity of the two. Such resiliency planning results in excess capital and an underutilized network most of the time. With Infinera's micro-services-based PCE and the combination of Bandwidth License Pools and Movable Licenses, service providers can avoid paying for bandwidth they are not utilizing. A 200 Gb/s link running at full capacity is the same licensing cost as two 100 Gb/s links. In the event of failure on one of the 100 Gb/s links, the bandwidth license can be reallocated to the secondary link with an increase to 200 Gb/s.

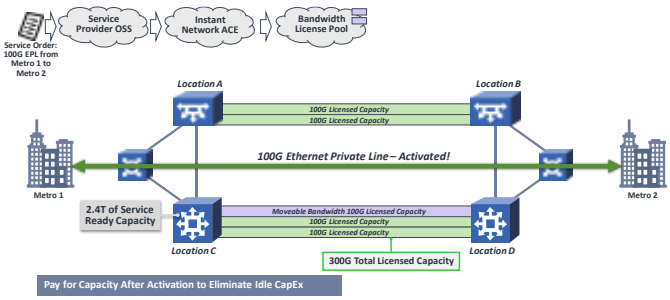

Figure 3: Rapid New Service Instantiation with ACE

Conclusion

With the introduction of Infinera Instant Network, Infinera is taking another step forward in its journey toward cognitive networking. Leveraging the experience and broad adoption of Instant Bandwidth, Infinera is augmenting its solution capabilities with Bandwidth License Pools, Movable Licenses and Automated Capacity Engineering. When combined, these capabilities enable service providers to meet enterprises' and data center customers' expectations for agile, on-demand services with the ability to purchase the networking capacity they require when, where and for the duration needed and to return that capacity when no longer required.

Instant Network also helps service providers by increasing their networking efficiency and minimizing their opex. With bandwidth license pools and movable licenses, service providers can virtually eliminate stranded networking capacity and capital. With automated capacity engineering, service providers can further control opex by compressing the timeline for traffic engineering tasks that used to take weeks or months with traditional solutions. Infinera's Instant Network is bringing cognitive networking more clearly into focus.

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Source:

1. New Dynamic, Assured Third Network Services Powered by LSO, MEF Webinars, Moderator: Stan Hubbard, February 16, 2016.

2. ACG, Multiple Business Case Analyses, 2015 to 2016.