

## XCEED SOFTWARE SUITE

# XCEED APPLICATIONS: UNLOCKING SDN BUSINESS VALUE

## Introduction

**Software-defined Networking (SDN)** has the potential to enable network operators to transform their business by automating operations, optimizing multi-layer networks and creating dynamic and innovative services. Infinera's Xceed Software Suite is an open, purpose-built multi-layer SDN platform with revenue-ready applications, leveraging the scalability, flexibility, and programmability of Infinera Intelligent Transport Networks. This application note introduces Xceed Applications and examines the commercial value of two initial offerings: Xceed Dynamic Bandwidth and Xceed Instant Virtual Networks (IVN).

## Introducing Xceed Applications

Xceed Applications utilize the Infinera Xceed Multi-layer SDN Platform and its unique microservices to create dynamic, on-demand services

over Infinera Intelligent Transport Networks. Empowering network operators to realize the commercial value of SDN, Xceed Applications help make the transition from traditional, static service creation to an open and agile model for delivering SDN-based on-demand services.

Leveraging application programming interfaces (APIs) provided by the Xceed Multi-layer SDN Platform, Xceed Applications use open source SDN control functions and microservices developed by Infinera, its customers and third parties to achieve service differentiation. Microservices provide the underlying tools for defining service characteristics and optimizing application performance and scale—not just for Xceed Applications but for any operator-developed or third-party application integrated into the Xceed Multi-layer SDN Platform. The microservices building block within Xceed helps provide continuous improvements and new capabilities, aligning with the DevOps model of rapid service delivery.

Xceed Applications span the optical, digital and packet layers and are deployable across Infinera metro and core packet-optical networks, providing the flexibility to add on-demand characteristics to a wide range of end-user services. Leveraging standards-based YANG information models, Xceed Applications can be integrated into third-party orchestrators and operational support system (OSS) environments.

## Xceed Dynamic Bandwidth

Dynamic Bandwidth provides end-users with on-demand provisioning of Optical Transport Networks (OTN), including ODUFlex and

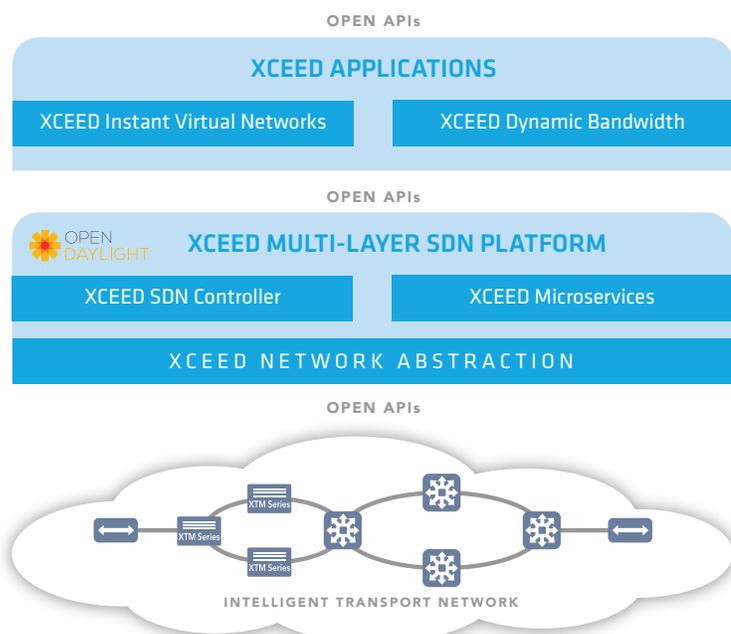


Figure 1: Xceed Software Suite

Metro Ethernet Forum (MEF)-compliant Ethernet services. Dynamic Bandwidth can be deployed for a wide variety of use cases, including:

- Customer self-provisioned connectivity services, such as scheduled capacity for virtual machine replication between data centers, enabled by Xceed Bandwidth Calendaring.
- Advanced, policy-based service routing, such as minimum-latency routing for delay-sensitive applications, enabled by the Xceed Multi-layer Path Computation Engine microservice.
- Automated, dynamic service optimization and restoration, ensuring service availability and performance under changing network conditions.

Dynamic Bandwidth services can be created in minutes, as network operators invoke Infinera’s open APIs or use the Xceed graphical user interface to determine network policies, provision services and monitor and analyze network performance. Xceed Dynamic Bandwidth provides open API access to the YANG model representing the multi-layer transport network delivering the service. In addition, Dynamic Bandwidth exposes a unified information model for facilitating end-to-end provisioning over multi-domain networks.

With Xceed Dynamic Bandwidth, the flexibility of Infinera Intelligent Transport Networks can be harnessed for programmable, on-demand capacity activation, creating an elastic environment that results in faster service provisioning, more efficient use of resources and improved network utilization. In an SDN environment, the optical

transport layer becomes more responsive and adaptive to varying or unpredictable traffic demands and serves as the foundation upon which new multi-layer optimization applications can be constructed.

### Instant Virtual Networks

The Xceed Instant Virtual Networks (IVN) application facilitates network virtualization, enabling network operators to define virtual transport network topologies overlaid on a shared physical network infrastructure. With Layer 1 (OTN) IVN, multiple virtual transport network overlays can be established, each of which operates as a standalone transport network with integrated OTN switching, optical routing, and protection capabilities. In creating an IVN, service providers create isolated virtual environments in which network activities (e.g., provisioning, dynamic protection, etc.) are segregated from other IVN instances. As is the case with Dynamic Bandwidth, each IVN uses Xceed’s multi-layer path computation element (PCE) for intelligent service routing, re-grooming and dynamic restoration for network resiliency.

Each Layer 1 IVN instance comprises virtual OTN switching nodes and virtual transport links with dedicated capacity and its own private PCE instance. The IVN application maintains the mapping between the logical constructs and the physical network resources. Virtual transport links can span multiple physical links and are presented to the IVN customer as a single logical link with its own transport link

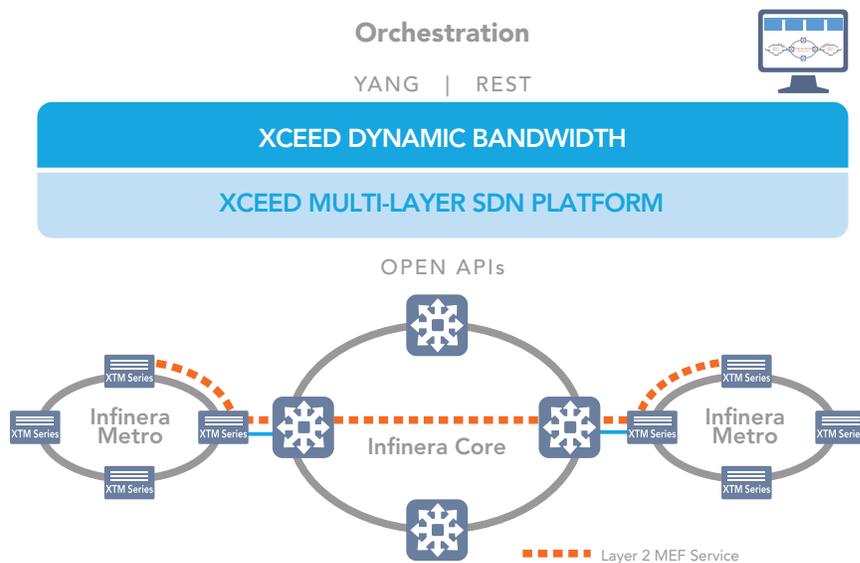


Figure 2: Xceed Dynamic Bandwidth

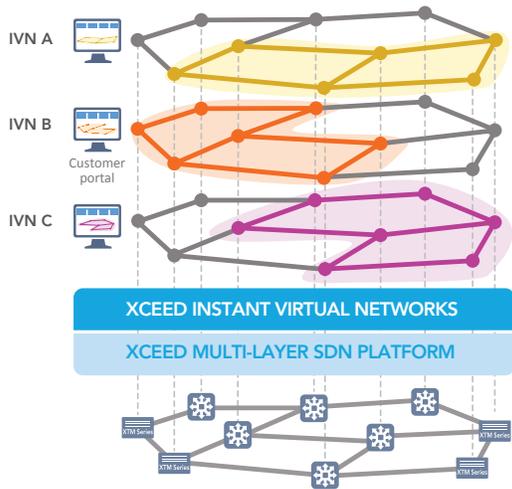


Figure 3: Xceed Instant Virtual Networks

characteristics, including bandwidth, latency and routing metrics. The topology is administratively defined and configured via the IVN application, and can be modified based on IVN customer needs. Physical ports are identified and associated with the IVN, providing the ingress and egress points for supporting transparent OTN circuit-

based services. These constructs define a virtual transport network topology, over which the IVN customer can provision and manage its own services.

The power of Xceed IVN is the myriad use cases operators can address with differentiated services in an open, programmable network environment. As an alternative to basic OTN wavelength services, IVNs allow network operators to build private OTN networks tailored to one application or a range of services, each with differing service level agreements (SLAs). As a result, IVNs can be offered on a wholesale or retail basis to any service provider or enterprise that needs a highly flexible, transparent optical network that can carry packet-based services efficiently in ODUflex containers. Figure 3 shows how multiple IVNs are established on a single physical network, and Figure 4 shows several examples of IVN use cases.

In IVN A, a wholesale customer, such as a cloud service provider or an internet content provider, uses the IVN to interconnect data centers, enabling rapid scaling and reconfiguration of bandwidth as traffic patterns change.

In IVN B, an enterprise customer, such as a large financial institution or retailer, overlays its own partial mesh multi-protocol label switching (MPLS) virtual private network (VPN) on top of the IVN, gaining the benefits of full network control without the capital expenditures or

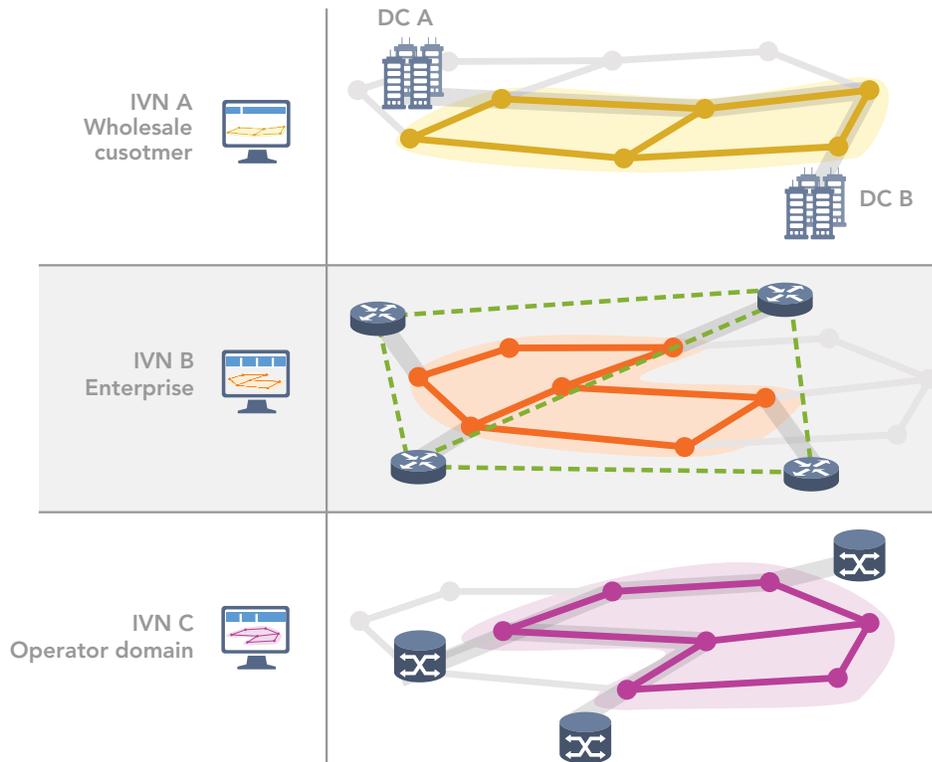


Figure 4: Examples of Xceed IVNs

management burdens of owning and operating a dedicated private network.

The network operator uses IVN C in order to provide a logically isolated transport domain for Metro Ethernet Services such as Ethernet Private Line (EPL) and Ethernet Local Area Network (E-LAN), enabling the operator's Ethernet service managers to have control over transport policies and capacity management to deliver rapid provisioning and SLA compliance.

## Conclusion

Infinera developed Xceed Applications to help network operators realize the business value of SDN. Working in harmony with Xceed Multi-layer SDN Platform, Xceed Applications enable network

operators to transform basic connectivity services into highly flexible, on-demand services that drive revenue growth and increase customer loyalty. Delivery of Xceed Applications is made simple and flexible when deployed over Infinera's Intelligent Transport Networks. By leveraging the scale, programmability and flexibility of Infinera metro and core network solutions, network operators can commercialize Xceed Applications quickly and easily, capitalizing on the growth of on-demand, cloud-based connectivity and content services.

Learn more at [www.infinera.com/xceed](http://www.infinera.com/xceed)

Global Headquarters  
140 Caspian Court  
Sunnyvale, CA 94089  
USA  
Tel: 1 408 572 5200  
Fax: 1 408 572 5454  
[www.infinera.com](http://www.infinera.com)

US Sales Contacts  
[infinera.com/contact-us](http://infinera.com/contact-us)

Asia and Pacific Rim  
Infinera Asia Limited  
8th floor  
Samsung Hub  
3 Church Street  
Singapore 049483  
Tel: +65 6408 3320  
[infinera.com/contact-us](http://infinera.com/contact-us)

Europe, Middle East,  
Africa  
Infinera Limited  
125 Finsbury Pavement  
London EC2A 1NQ,  
United Kingdom  
Tel: +44 207 065 1340  
[infinera.com/contact-us](http://infinera.com/contact-us)

Customer Service and  
Technical Support  
North America  
Tel: 877 INF 5288  
Outside North America  
Tel: 1 408 572 5288  
[infinera.com/contact-us](http://infinera.com/contact-us)

