Infinera DTN™ Switched WDM System

It carries 1.6 trillion bits per second

Better yet, it turns up in an hour

The world's first switched WDM system, the Infinera DTN combines the scalability of multi-wavelength optical transport with the flexibility and manageability of digital switching.

Photonic Integration

Enabling digital optical networks

Based on our breakthrough photonic integrated circuit (I-PIC™) technology, the Infinera DTN switched WDM system provides full digital access to the optical layer, offering the ultimate in network flexibility. The DTN makes it possible to rapidly scale IP-centric backbones, deliver more services to more markets, consolidate network architecture, and simplify operations. PIC technology-DWDM systems on two tiny chips—dramatically reduces the cost and complexity of optical-electronic-optical (O-E-O) conversion, and allows service providers to deploy highly scalable transport services much more quickly than is possible with traditional ROADM systems. DTN also integrates seamlessly with Infinera's ATN Metro edge Platform, providing a highly efficient, end to end optical transport solution from metro edge to water's edge.

The Infinera DTN

High-density transport with flexible digital switching

The Infinera DTN supports add/drop services from 155Mb/s through to 40Gb/s, and includes premium transport networking features such as: integrated 2.5Gb/s (ODU1) granularity digital switching and grooming for efficient and flexible bandwidth utilization; full digital performance monitoring; integrated digital service protection; and end-to-end service provisioning. We call the capabilities of digital switching and an intelligent network control plane Bandwidth Virtual-ization™. DTN operates with the Infinera Line System (ILS) and supports up to 160 C-band wavelengths on a single fiber, with 800Gb/s of DWDM capacity (80 channels, 10Gb/s each) in a full rack, or 400Gb/s (40 channels, 10Gb/s each) in a half-rack. DTN is available in both 19-inch (MTC) and 23-inch wide chassis (DTC) configurations. It can also support multi-chassis configurations across several racks to create a multi-fiber direction, multi-terabit transport system that's managed as a single network element.

Simple, Fast, and Flexible

The Infinera DTN employs pluggable 100Gb/s line cards, called Digital Line Modules (DLMs), facilitating rapid automated turn-up of DWDM capacity, 100Gb/s at a time. The DLM provides full retiming, reshaping, regeneration, and recoding services for each optical wavelength. It also provides integrated sub-wavelength electronic grooming and switching capabilities for unconstrained and reconfigurable add, drop, and express traffic through the node. The DLM also isolates all analog impairments from adjacent spans to eliminate wavelength blocking and simplify network planning. Together, these capabilities help provide more flexibility and manage-ability than other DWDM platforms or ROADM systems.

The Infinera DTN platform's use of pluggable tributary adapter modules allows high-density digital add/drop of multiple services. The DTC chassis accomodates 23-inch and ETSI racks.

The Infinera DTN™ Switched WDM System

DWDM wavelengths from each DLM are multiplexed onto the line-side fiber via the Band Multiplexing Module (BMM). The BMM optically multiplexes up to 160 wavelengths from the DLMs, along with an Optical Supervisory Channel. This allows all optical multiplexing to be performed on a single card, offering significant density advantages versus conventional systems.

Fully Reconfigurable Add/Drop

The Infinera DTN supports in-service pluggable clientside circuit packs called Tributary Adapter Modules (TAMs) that are separate from the line-side DWDM optics, enabling mix-and-match and fully flexible add/drop capabilities of client interfaces at any digital site. The native client interfaces are encapsulated in a digital wrapper before being groomed or switched by the system.

The DLM is designed to support TAMs with interfaces including 40Gb/s (OC-768, STM-256), 10Gb/s (OC-192, STM-64, 10GbE LAN, and WAN PHY), 2.5Gb/s (OC-48, STM-16), GbE, 622Mb/s (OC-12, STM-4) and 155Mb/s (OC-3, STM-1), and Fiber Channel*. Flexible tributary optical configurations are available on the TAMs through a wide selection of field-replaceable SFP/XFP interfaces, called Tributary Optical Modules (TOMs). This allows digital add/drop of multiple services, so the network can evolve as requirements change.

The DTN is a "Digital ROADM" — a ROADM which uses an electronic switch fabric rather than optical components for its reconfigurability. Because the DTN's ROADM capability is digital, it can provide bit-transparent services with rich digital performance monitoring. More importantly, as a Digital ROADM with 2.5Gb/s-granular bandwidth management, the DTN flexibly manages sub-wavelength, wavelength, or even super-wavelength services. Unlike conventional ROADMs or WSS-based "all-optical" systems, the DTN eliminates the need for muxponders or Multiservice Provisioning Platforms (MSPPs) to manage 1Gb/s and 2.5Gb/s circuits. Its digital architecture also eliminates the need for back-to-back transponders for wavelength translation.

Carrier-class Reliability and Availability

Improving network reliability is a key motivation behind the development of the Infinera DTN. Its photonic integrated circuits eliminate up to 97% of the fiber couplings in a system, a key source of failure for discrete optical components. The system architecture of the Infinera DTN also contributes to its carrier-class availability through a fully redundant control and management solution and full separation of the control plane from the data plane. It supports other system redundancy capabilities, including redudant power entry modules and cooling fans.

The Infinera DTN also supports a highly available management plane with support for redundant OSS-NE and EMS-NE communications to ensure maximum access. A high-capacity in-band Optical Supervisory

Infinera DTN Anatomy

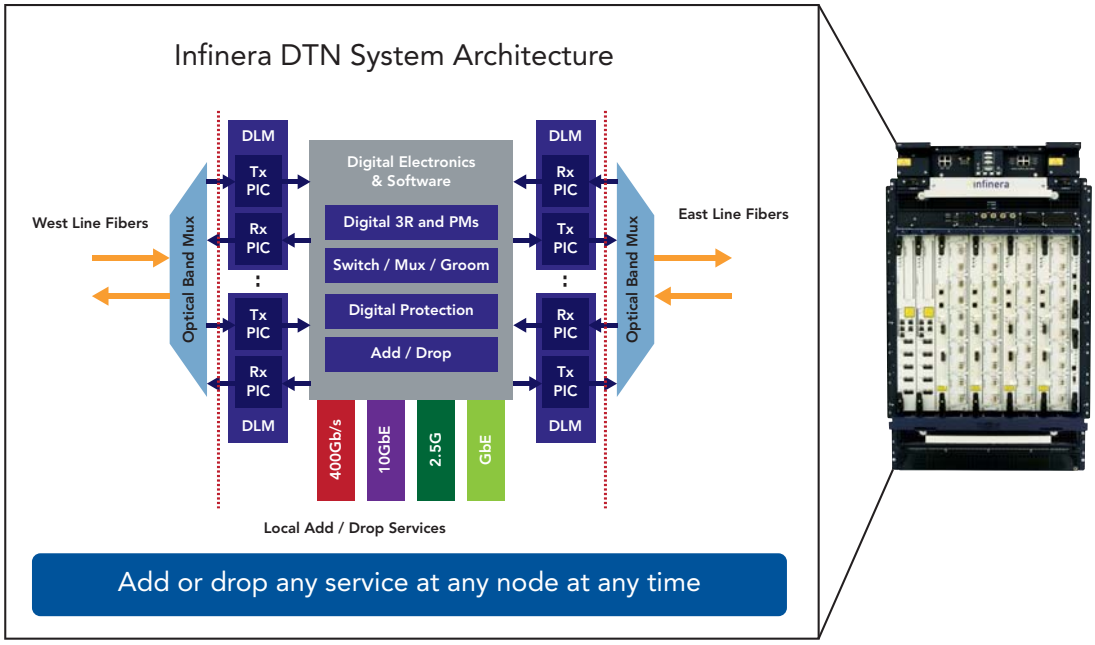
Photonic Integrated Circuits (PICs)
- 100G "WDM on a Chip"
- Affordable OEO
- Less Space, less power
- Higher reliability

Tributary Adapter Modules (TAM)
- Hot-pluggable client interfaces
- 155Mb/s to 40Gb/s, 100GbE (future)
- SONET/SDH, Ethernet, OTN, SAN

Band Multiplexing Module (BMM)
- 40, 80 and 160-λ options
- Band mux, EDFA and OSC in single card

Infinera DTN
- 2-way and 4-way Digital ROADM options
- Electrical connectivity between DLMs for multi-direction digital switching

Digital Line Module (DLM/XLM)
- 100Gb/s (OTM-10.2) DWDM line module
- G.709 and enhanced FEC
- Add/drop & grooming at 2.5Gb/s (ODU1) granularity



Channel (OSC) facilitates in-band management and control communications from a Gateway Network Element (GNE) to Subtending Network Elements (SNEs). The DTN solution supports a multi-chassis architecture that enables scalable nodal growth while maintaining a simplified and consolidated network management view of the system as a whole.

The DTN's integrated switching enables service protection and restoration to maintain service availability in the face of fiber cuts or other network outages. Infinera offers 50-millisecond "Digital SNCP" protection as well as dynamically signaled restoration for SONET/SDH, wavelength, and Ethernet-based services.

Simplify Your Network with GMPLS

Service providers seeking to reduce cost and complexity of operations will appreciate the extensive automation capabilities incorporated into the Infinera IQ® Network Operating System (IQ NOS), including a Generalized Multi-Protocol Label Switching (GMPLS) control plane that dynamically automates network topology discovery and enables end-to-end routing and provisioning. The IQ NOS also enables true Ethernet-like plug-and-play capabilities for rapid system and network turn-up and capacity expansions. The IQ NOS improves network manageability with embedded digital maintenance, digital performance monitoring, and troubleshooting capabilities for rapid fault isolation.

Carrier-class Network Management Solutions

An Infinera Digital Optical Network® system is managed with the Infinera Management Suite, a collection of robust carrier-class applications and toolsets, including:

- The Infinera Graphical Node Manager (GNM), a full-featured graphical element manager for craft access to any Infinera network element, local or remote.
- The Infinera Digital Node Administrator (DNA), a comprehensive integrated element and network management system that provides users with a graphical interface to full fault, configuration, performance, provisioning, and security management capabilities.
- The Infinera CORBA Integration SDK (CIS)* and the Infinera SNMP Fault Integration Server (FIS) are standards-compliant interfaces and SDKs for facilitating the integration of customer Operations Support Systems (OSSs) with the Infinera Digital Optical Network, automating back-office operations.
- The Infinera Network Planning System (NPS)*, an offline application for link engineering, capacity planning, what-if analysis, and optimization of greenfield and brownfield networks.

Specifications

Type	Parameter	Specification
Mechanical	Height (all)	34.95 inches / 888 mm / 20 RU / 35.5 SU
	Width	DTC: 19.50 inches / 500 mm
		MTC: 17.68 inches / 449 mm
	Depth	12.00 inches / 305 mm (from faceplate)
	Weight	Empty — 88.5 lbs / 40.3 kg (DTC)
		Fully loaded — 240 lbs / 109.1 kg (DTC)
		Empty — 82 lbs / 37.2 kg (MTC)
		Fully loaded — 233.5 lbs / 105.9 kg (MTC)
Electrical	Power Consumption	1500W (typical, fully loaded)
		2730W (maximum)
	Input Voltage Range	-40- to -60V DC
Environmental	Operating Temperature	+5° to +40° C (-5° to +55° C short term)
	Storage Temperature	-40° to 70° C
	Humidity	90% non condensing

Regulatory and Compliance

Type	Specification
Emissions	FCC Class A, CISPR Class A Compliant, CE
Environmental	NEBS Level 3
Laser Safety	ANSI Class 1 / IEC Class 1M, EN60825
Product Safety	UL/EN/IEC 60950

Infinera uses the latest technology to design its products for minimal energy use and ease of recycling.
The Infinera ATN is in compliance with the EU WEEE, RoHS 5/6, and other global environmental regulations.

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