

INFINERA ATN™ METRO EDGE PLATFORM

STATE-OF-THE-ART METRO WDM EXTENSION FOR DIGITAL OPTICAL NETWORKS

Extending core Digital Optical Networks to the metro edge enables end-to-end solution benefits, with reduced capital and ownership costs, simple operations, and sub-wavelength switching and transport.

The Infinera ATN metro edge platform is a state-of-the-art CWDM/DWDM aggregation and transport solution designed with up to 40 wavelengths of 10Gb/s scalability. The ATN platform supports multiple levels of integration with the Infinera DTN™ platform, and is also used as a standalone metro WDM system.

Implementing numerous features in support of simplicity of use and operations, the Infinera ATN is a cost-effective, efficient multiservice aggregation and transport platform with simple installation and rapid service activation. Flexible service-adaption line cards, with client and line-side pluggable optics, simplify ordering and reduce module sparing requirements.

The Infinera ATN supports direct wavelength connectivity to DTN nodes, reducing equipment costs and providing unique Bandwidth Virtualization™ capabilities across integrated ATN/DTN networks. Lower equipment costs, reduced operational overhead with full end-to-end management and visibility are all benefits of the integrated ATN/DTN network solution.

High density universal platform solution

Figure 1 shows the shelf layout of the Infinera ATN platform. A compact 19" width 3RU shelf enables deployments in both ETSI and ANSI environments. A single shelf supports a range of optical filters, optical amplifiers and up to 8 multiservice Service Interface Modules (SIMs) along with common equipment. Compact cards

Key Benefits of the Infinera ATN include:

- Seamless ATN/DTN integration to simplify metro/long haul network operations and management.
- High density CWDM/DWDM metro edge platform reduces space and power footprint.
- Range of multiservice, multi-rate and aggregation line cards with pluggable optical interfaces provide a simplified operational solution with reduced sparing requirements.
- High level of automation, including control plane-enabled optical power management for simple and efficient operations.
- Micro-EDFAs provide a highly efficient optical amplifier solution for multi-span applications and for long single spans.
- Flexible optical filter options enable network cost optimization, accommodating traffic growth and changes in network traffic demands.
- End-to-end monitoring and provisioning using Infinera Digital Network Administrator (DNA) management platform.



Figure 1: Infinera ATN metro edge platform

enable very high space efficiency. Up to 8x10Gb/s services can be terminated on a single shelf, designed with the ability to extend further with subtending shelves. The design also provides very high power efficiency, lowering recurring ownership costs.

Simple Operations

The ATN metro edge platform has been conceived and designed from the outset to simplify operations. Flexible, pluggable, multiservice line cards, automatic network discovery, automated optical power management, and simplified provisioning are key attributes of the ATN platform that simplify network planning, deployment, sparing, and management.

The Infinera DNA network management platform provides an end-to-end provisioning and monitoring capability for both ATN networks and integrated ATN/DTN networks. Functions include fault management, configuration management, end-to-end performance monitoring, and service provisioning. Rapid commissioning, simplified provisioning, resource visualization, fault, and PM monitoring are all capabilities that minimize downtime and maximize utilization of network assets.

Multiservice Aggregation to 10Gb/s Wavelengths

Service providers have found that a key success factor in metro edge applications is the ability to efficiently aggregate a range of service types onto wavelengths. This enables the operator to deploy sufficient network resources to meet initial traffic demands, while still enabling efficient scalability to support future capacity growth.

The Infinera ATN platform offers a range of Service Interface Modules. These SIMs enable efficient adaptation of a range of services including SONET/SDH, OTN, Ethernet, SAN and video services. All-pluggable



Figure 2: Multiservice, fully pluggable 10Gb/s Service Interface Module.

optical interfaces simplify operations and sparing, and provide flexible usage in both CWDM and DWDM applications. Services can be carried on individual wavelengths using transponders, muxponders and ADM-on-blade modules.

The SIM-A-8-2.5GMT module (Figure 2) provides efficient multiservice aggregation to 10Gb/s wavelengths and supports 8 SFP client ports. Highly flexible and efficient, the SIM-A-8-2.5GMT supports TDM aggregation of GbE, 1/2/4G Fibre Channel and OC3/12/48 or STM1/4/16 SONET/SDH services to a 10Gb/s wavelength. OTN aggregation and framing is compatible with Infinera DTN nodes, enabling mixed ATN/DTN networks to support sub-wavelength grooming and multipoint service termination flexibility. This unique feature improves network efficiency by eliminating the stranded bandwidth problem common to other DWDM implementations.

Multipoint Ethernet Aggregation to 10Gb/s Wavelengths

An additional aggregation module, SIM-A-8-1GE, provides Ethernet ADM-on-blade function with multipoint, aggregation for full or partial-rate GbE services. The module supports 8 SFP client ports and two 10Gb/s OTN network ports and provides a highly efficient solution for ring-based aggregation of Ethernet services. Benefits of this implementation include efficient wavelength utilization in networks with multiple ring add/drop points.

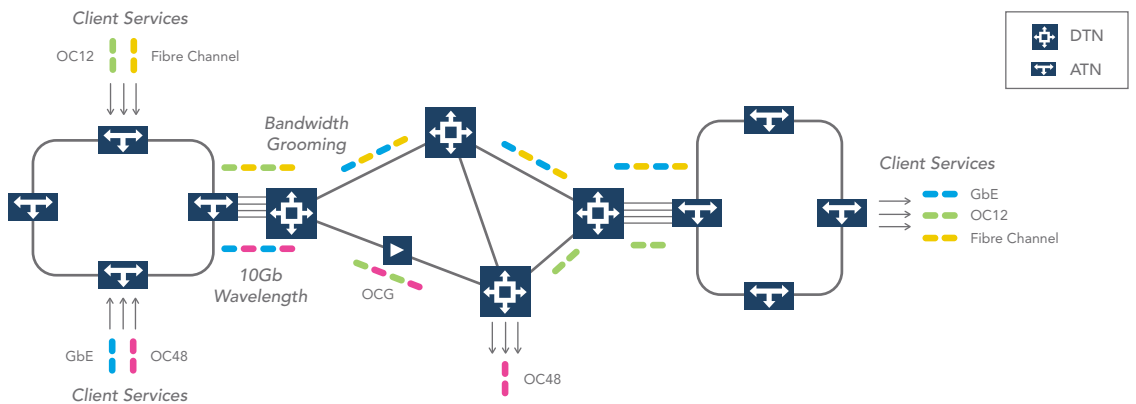


Figure 3: Multiservice aggregation, switching and transport across the integrated ATN/DTN network.

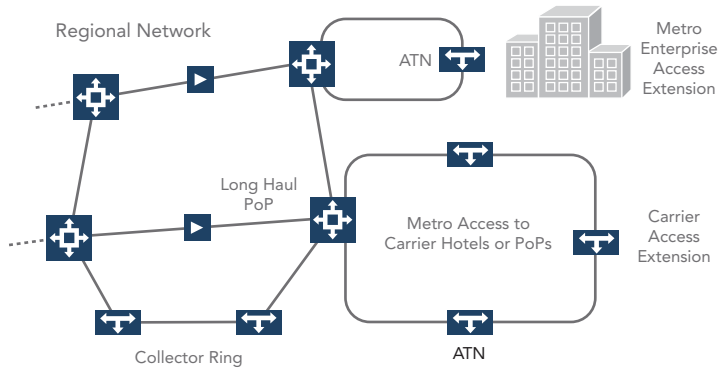


Figure 4: Regional/Long Haul Network Extension.

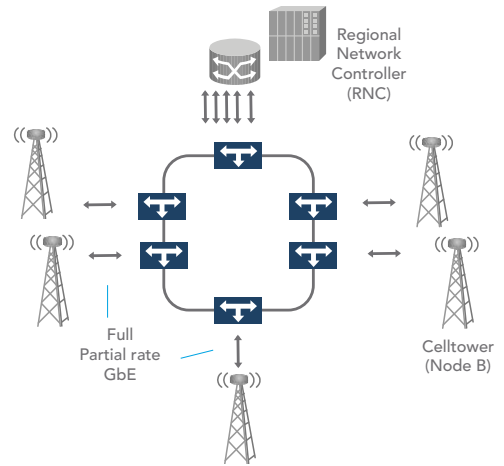


Figure 5: Ethernet wireless backhaul

Integrated ATN/DTN Networks

When deploying an integrated ATN/DTN network the operator can take advantage of unique benefits (Figure 3). For ATN nodes co-located with DTN nodes, SIMs are not needed, thereby saving cost, simplifying configuration, and reducing interconnect fibers. A common OTN frame structure for ATN and DTN enables sub-wavelength services to be distributed across the DTN network using Infinera's Bandwidth Virtualization. The services can be terminated at multiple distinct locations in the DTN network, or groomed for distribution to end points on remote ATN extension nodes. This capability reduces the need for switch ports on third party equipment at the interconnect between metro and regional networks and, in many cases, will eliminate the need for bandwidth management equipment at these locations.

Applications

The Infinera ATN platform can be used in a number of applications including regional/long-haul network extension, metro core extension, broadband backhaul, wireless backhaul and data center connectivity. A typical application for extension to regional/long-haul networks is shown above (Figure 4). In this application the ATN platform provides a cost-effective, space and power-efficient metro edge solution. This provides connectivity and aggregation for a range of service types from customer locations, or edge offices, to the regional/long haul point of presence (PoP). This application is applicable to traditional carrier or cable multiservice operator (MSO) networks.

CWDM or DWDM options are available depending on reach and scalability requirements. A key benefit when used in networks implemented with the Infinera DTN solution in the core network is the means to manage circuits and wavelengths from end to end. This

simplifies network operations, obviates the need for intermediate line cards at the interconnect point, and also removes the need for separate bandwidth management platforms at the interconnect point.

Another key application for the Infinera ATN platform is backhaul of Ethernet traffic in wireless or broadband access networks to central hub locations. Figure 5 shows an example 3G/4G wireless backhaul network application where traffic from multiple Ethernet-enabled cell sites (Node B) is aggregated onto 10Gb/s wavelengths and transported to a Regional Network Controller (RNC) location. This application will typically use the Ethernet aggregation ADM capability for efficient wavelength utilization.

Key Elements of the ATN Metro Edge Solution Include:

COMMON EQUIPMENT

ATN Chassis (ATC-A): The ATC-A is a 3RU, 19" rack-mountable chassis that houses a variety of pluggable active and passive modules. It consists of eight flex slots (1 through 8) for housing single-width and double-width SIMs or OFMs. It also contains two dedicated slots for AAM modules, and a fixed slot for the AMM ATN Management Module. The chassis also includes summary alarm LED indications and telemetry interfaces.

The ATN Passive Shelf (ATC-P): The ATC-P is an optional 2RU modular shelf that houses OFMs.

ATN Management Module (AMM): The AMM acts as the node controller. It includes Optical Supervisory Channel (OSC) optical ports

for management connectivity within the ATN network, external DCN connectivity ports and management shelf interconnection ports for multi chassis implementations.

Power Conversion Module (PCM): The PCM provides power conversion from standard -48V DC supply, or 120/220V AC supply, to the active components of the ATN nodes. Redundant modules are supported on the shelf.

A-FANTRAY: The fan tray module includes redundant fans and an air filter. It provides forced horizontal airflow across the ATC-A shelf.

SERVICE INTERFACE MODULES

Service Interface Modules (SIMs): The ATN SIMs are multiservice modules that terminate various client traffic rates and protocols, and adapt them for transport across the ATN optical line. The SIMs are all front-pluggable and support a broad range of pluggable XFP/SFPs. The range of SIM types supported include:

Tributary Optical Modules (TOMs): A variety of CWDM and DWDM pluggable optical modules at 2.5Gb/s and 10Gb/s rates provide for network wavelength adaptation on SIM or DTN TAM modules.

OPTICAL MODULES

Optical Filter Modules (OFMs): A variety of optical filter modules are designed to support wavelength aggregation, including CWDM and DWDM variants for terminal and OADM configurations. OADMs add and drop wavelengths from the line with 1 and 2 channels variants (CWDM) and 2 or 4 channels variants (DWDM) . 8ch (CWDM) and 10ch cascable (DWDM) mux/demux modules are also provided for Terminal and HUB sites.

ATN Amplifier Modules (AAMs): A variety of C-Band micro-EDFA optical amplifier modules for pre-amplifier and booster amplifier applications with up to +17dBm aggregate output power and up to 30dB gain.

Specifications

Type	Parameter	Specifications
Mechanical	Height (all)	5.25 inches/133.4 mm 3RU
	Width	17.4 inches / 441 mm
	Depth	11.5 inches / 293 mm)
	Weight	50.3 lbs / 22.8 kg fully equipped chassis
Electrical	Power Consumption	210W (typical, fully loaded chassis)
		360W (maximum)
	Input Voltage Range	120-240V AC / -40- to -60V DC
Environmental	Operating Temperature	+5° to +40° C (-5° to +55° C short term))
	Storage Temperature	-40° to 70° C
	Humidity	5% to 85 % non condensing

Regulatory and Compliance

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

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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