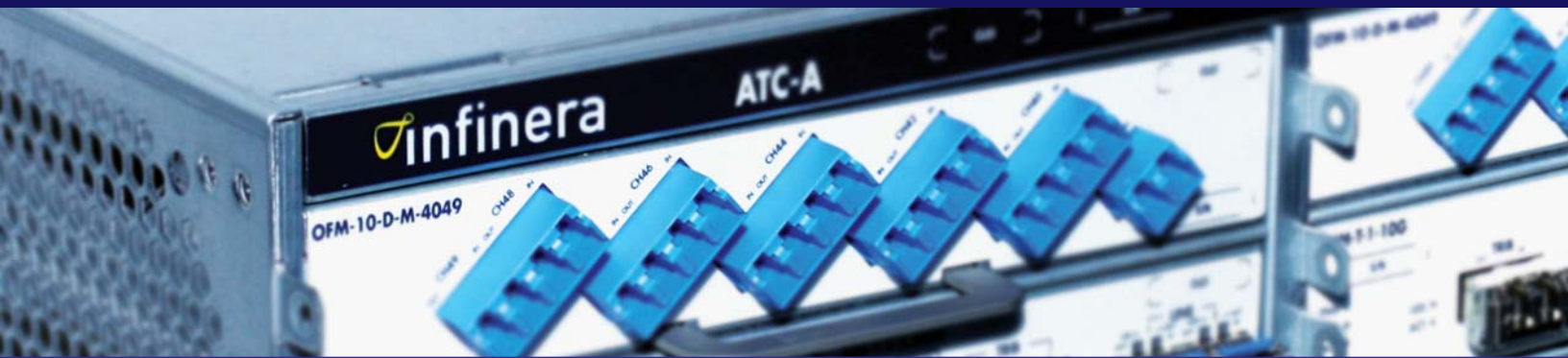


The Infinera ATN™ Metro Edge Platform



The 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 can also be used as a standalone 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 every optical interface pluggable 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 potential 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 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.



Figure 1. Infinera ATN metro edge platform.

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.
- Wide range of multiservice, multi-rate line cards with pluggable optical interfaces provide a simplified operational solution with reduced sparing requirements.
- High level of automation, including control plane-enabled autodiscovery and 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.

The Infinera ATN™ Metro Edge Platform



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 simplify the operation of the network, minimize downtime, and maximize utilization of network assets.

The Infinera Network Planning System (NPS) is a fully featured network planning tool that can be used for planning of ATN networks or integrated ATN/DTN networks. Suitable for greenfield and brownfield network planning, Infinera NPS supports efficient and optimized network migration. The NPS also provides sub-wavelength planning capability across ATN and DTN networks.

Benefits to the operator include faster installation and provisioning, improved accuracy of network planning and design, reduced misconfiguration, and lower network maintenance costs.

Multiservice Aggregation

Service providers have found that a key success factor in metro edge applications is the ability to aggregate a

range of service types onto wavelengths efficiently. This enables the operator to deploy enough wavelengths to meet initial traffic demands, while still enabling efficient scalability to support future capacity growth.



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

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 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, or, when a given add/drop location needs to support a range of service types, using muxponders. The SIM-A-8-2.5GMT module (see Figure 2) provides efficient multiservice aggregation to 10Gb/s wavelengths with 8 SFP client ports. Highly flexible and efficient, the SIM-A-8-2.5GMT supports aggregation of GbE, 1/2/4G Fibre Channel and OC3/12/48 or STM1/4/16 SONET/SDH services to a 10Gb/s wavelength. The OTU2v network side framing is compatible with Infinera DTN nodes, enabling mixed ATN/DTN networks to support sub-wavelength grooming and multi-point service termination flexibility. This unique feature improves network efficiency by eliminating the stranded bandwidth problem common to other DWDM implementations.

Integrated ATN/DTN Networks

When deploying an integrated ATN/DTN network the operator can take advantage of unique benefits (see Figure 3). For ATN nodes co-located with DTN nodes,

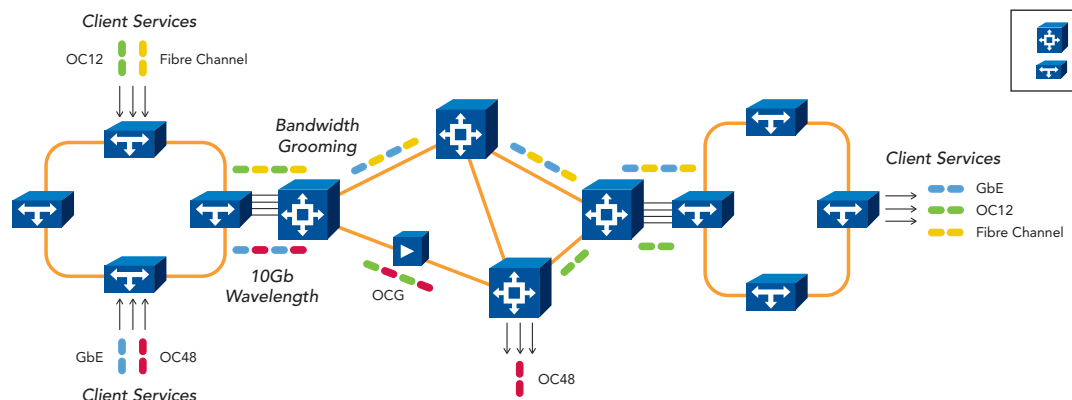


Figure 3: Multiservice aggregation, switching and transport across the integrated ATN/DTN network.

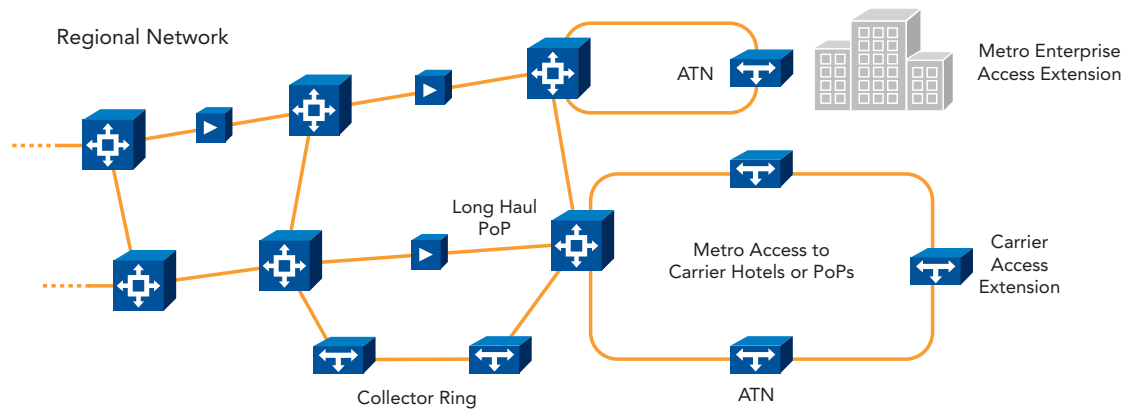


Figure 4: Regional/Long Haul Network Extension.

SIMs are not needed, thereby saving cost, simplifying configuration, and reducing interconnect fibers. A common OTU2v 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 and interconnect, metro core extension, broadband backhaul and data center connectivity. A typical application for extension to regional/long-haul networks is shown above (see 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 interme-

diated 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 metro transport for data center connectivity applications. In this application, the ATN provides cost-effective transport of GbE, 10GbE and SAN protocols. Other benefits include space and power efficiency, flexible DC and AC power options, simplified operations, flexible bandwidth scalability and reach.

Key Elements Of The ATN Metro Edge Solution Include:

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:

- SIM-T-2-2.5GM: Multi-port 2.5Gb/s multi-rate transponder with integrated network protection. Dual transponder function per compact module.
- SIM-T-1-10G: 10Gb/s multiservice transponder
- SIM-T-1-10GP: 10Gb/s multiservice transponder with integrated network protection.
- SIM-A-8-2.5GMT: Multiservice 10Gb/s muxponder module with integrated network protection.

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 line system functions, including CWDM and DWDM variants of the following functions. All filter modules are visible to the network management system. Optical Add/Drop Multiplexers for inserting/dropping wavelengths from the line with 1 and 2 channels (CWDM) and 2 or 4 channels (DWDM) are provided. 8ch (CWDM) and 10ch cascable (DWDM) mux/demux modules are also provided for Terminal and OADM 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 30dB gain.

- AAM-P1, AAM-P2: Pre-amplifier, Line-amplifier with 13dBm, 17dBm output
- AAM-B1, AAM-B2: Booster-amplifier with 13dBm, 17dBm output

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 the AAM, and a fixed slot for the ATN Management Module. The chassis also includes summary alarm LEDs and telemetry contacts.

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 to enable shelves to be cascaded.

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.

Specifications

Type	Parameter	Specification
Mechanical	Height (all)	5.25 inches / 133.4 mm / 3 RU
	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	Specification
Emissions	FCC Class A, CISPR Class A Compliant, CE
Environmental	NEBS Level 3
Laser Safety	ANSI / IEC Class1M, 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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