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Product Brief

Nortel Optical Metro 5100/5200 for service providers

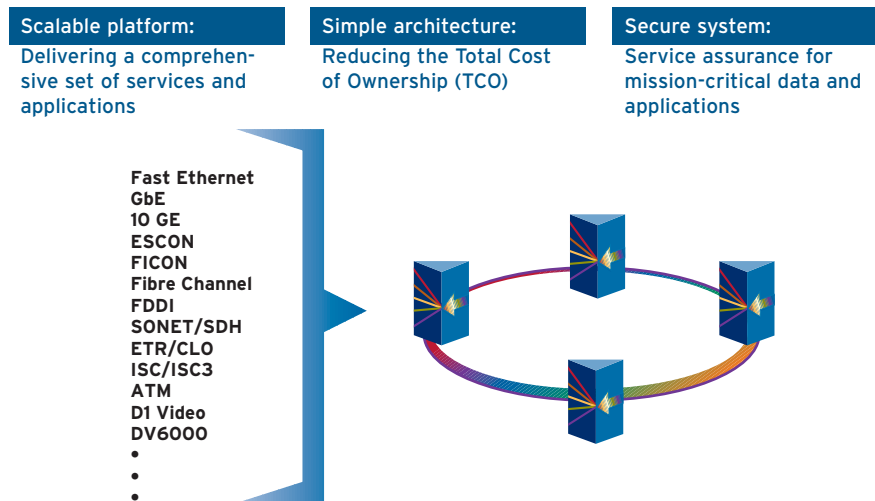
The Optical Metro 5100/5200 is the leading Metro Broadband Services delivery platform. It offers an open, scalable, high-availability (99.999 percent) architecture ideal for applications such as business continuity and disaster recovery solutions, Ethernet transport, optical storage connectivity and fiber relief. With optical-in/optical-out infrastructure, the bit rate- and protocol-independent interfaces can transport any service type either transparently over WDM (Wavelength Division Multiplexing) or mapped to GFP (Generic Framing Procedure) for transmission over existing SONET/SDH infrastructure. The Optical Metro 5100 and 5200 use common hardware interfaces and software and they integrate seamlessly with the Nortel optical portfolio as part of a true end-to-end network solution.

Managing the increasing volumes of data continuously generated by corporations today can seem like an overwhelming task. Both public and private network operators must face the uncertainty associated with forecasting and cost-effectively supporting a broad array of new high-capacity data services being demanded in metropolitan and campus area networks. Service providers require leading-edge, scalable, flexible networks to meet their growing business and data

needs. Nortel Optical Metro 5100/5200 offers such a solution. The platform supports the transparent transport of optical wavelength-based services in their native format, extending the optical connectivity from metro core to metro edge, including customer premises. As shown in Figure 1, the Optical Metro 5100/5200 delivers on three key pillars: scalability and services diversity, lowering the total cost of ownership and providing secure services transport.



Figure 1. Optical Metro 5100/5200 platform



Service flexibility with protocol independence

The versatile Optical Metro 5100/5200 platform offers significant density and flexibility options with compelling economics for service providers providing a variety of network applications, such as:

- Effective consolidation of growing voice, video and data MAN/WAN traffic onto a single platform and infrastructure
- Mix and match of a diverse set of data networking protocols for the evolving and growing network inter-site traffic needs (data center connectivity, LAN extension, etc.)
- Storage area networking (SAN) applications for business continuity and disaster recovery, including distance extension support over SONET/SDH using GFP and VCAT (Virtual Concatenation) efficiency
- Fiber relief solutions, multiplication of the services carried over a single fiber pair

The Optical Metro 5100/5200 provides the capability to network services across an open, scalable, survivable CWDM/DWDM (Coarse/Dense WDM) optical transport platform. Equipped with universal optical interfaces that can be

provisioned by bit rate, the platform provides simpler network planning, reduces network operating costs and speeds up delivery of new services. The Optical Metro 5100/5200 supports one of the most comprehensive sets of optical services and protocols, as shown in Figure 2.

Optimized shelf and wavelength utilization

Common client and line interface cards are used for the Optical Metro 5100 and 5200 which provides simpler interworking, lower sparing requirements and overall operational savings. In order to benefit from maximum wavelength usage, several sub rate multiplexing

interfaces combine different services onto a single 2.5-Gbps or 10-Gbps wavelength in order to offer the lowest cost per service. For example, as shown in Figure 3, the 10-Gbps Muxponder GE/FC offers up to 10 client interfaces, either Fibre Channel (FC)-100, FC-200, FICON or Gigabit Ethernet services, deterministically multiplexed to an aggregate capacity of 10 Gbps to be carried over the WDM line. Each client interface is mapped directly to an individual channel within the 10G signal through dedicated low-latency hardware, ensuring that the end-user's application is unaware of the transport equipment. These capabilities also contribute to the optimized utilization of the shelf real-estate space, minimizing power utilization and overall footprint.

Optical Metro 5100

The Optical Metro 5100 is a space-saving, low-power optical solution designed for smaller bandwidth requirements for metro collocation and customer premises applications, delivering 8 protected (16 unprotected) wavelengths of ITU 20 nm CWDM service per system. It features small footprint and flexible packaging with high availability and scalability. It has a simple architecture and is easy to deploy, considerably lowering operational costs.

Figure 2. Optical Metro 5100/5200 supported services and protocols (850 nm and 1310 nm interfaces)

Optical Ethernet	Optical Storage Connectivity
<ul style="list-style-type: none"> • Fast Ethernet (100 Base-FX) • Gigabit Ethernet (1000Base-SX, -LX) • 10GE WAN PHY • 10GE LAN PHY 	<ul style="list-style-type: none"> • ESCON/SBCON • FICON/FICON Express/FC-SB-2 • ISC, ISC-2, HiPerLink, ISC-3 • ETR/CLO sysplex timer • Fibre Channel - FC-12, -25, -50, -100 • Fibre Channel - FC-200
Private/Leased Line	Managed Wavelength
<ul style="list-style-type: none"> • ATM, SONET (OC-1 to OC-192) • ATM, SDH (STM-1 to STM-64) • Async FOTS, PDH - 150 Mbps, 565 Mbps • Ethernet and Storage Private Line (GFP mapping, interwork with SONET/SDH) 	<ul style="list-style-type: none"> • 8 Mbps - 2.5 Gbps flexible rate • 10 Gbps wavelengths • C CIR-601/ITU-R 601, HDTV, DVB-ASI, DV6000, PrismaDT • FDDI

The Optical Metro 5100 can also be deployed in conjunction with the Optical Metro 5200 to deliver metro access to metro core integrated solutions with complete system-to-system or ring-to-ring interconnect as shown in Figure 6, eliminating back-to-back terminals and driving capital and operational savings.

Optical Metro 5200

The Optical Metro 5200 uses the same cards and operating software as the Optical Metro 5100 while providing four times the bandwidth for larger applications. It delivers 32 protected (64 unprotected) wavelengths of DWDM service and also supports CWDM applications. The Optical Metro 5200 is a true carrier-grade platform providing flexibility and increased service velocity, with support for extended reach applications up to 600 km without electrical regeneration. Up to three Optical Metro 5200 shelves may be installed in a single 19" or 23" wide, 7-foot frame or 300 mm ETSI (European Telecommunications Standards Institute) standard frame supporting up to 24 protected or 48 unprotected wavelengths.

The Optical Metro 5100 and 5200 meet the standards set by the ETSI and the Network Equipment Building System (NEBS). The Optical Metro 5100 is also offered with an AC rectifier option while the Optical Metro 5200 provides cabinet solutions for ETSI/NEBS enterprise and carrier applications.

Optical Wizard and Network Modeling tools

The Optical Wizard is an extremely quick and easy-to-use tool which produces priced equipment lists for small and medium optical networks, based on very simple input, even in the hands of a user unfamiliar with Nortel

products. The Optical Wizard tool provides the ability to analyze input traffic demands, route traffic, allocate channels for traffic demands and automatically configure required equipment and software. The output results in a high-level design which translates into an accurate budgetary estimate.

The Network Modeling tool is a powerful visual design aid and simulation tool which can then be used to refine the design and finalize the detailed engineering of the Optical Metro 5100/5200 network. It uses sophisticated algorithms to model signal power, Optical Signal to Noise Ratio (OSNR), dispersion, fiber non-linearities, jitter, coherent crosstalk and Polarization Mode Dispersion (PMD). Simulation results guarantee the performance of a network until end-of-life and assist in the deployment, equalization and troubleshooting of the equipment in the field.

Optical Metro 5100/5200 basic architecture

Figure 7 shows the basic architecture of the Optical Metro 5100/5200 platform. Each component is described below.

> OCI (Optical Channel Interface):

The OCI performs the client adaptation and interfaces with the numerous protocols and service types available at the Metro Edge. Sub Rate Multiplexing (SRM) OCI modules are deployed for

Figure 3. 10G Muxponder GE/FC



Figure 4. Optical Metro 5100 shelf



Figure 5. Optical Metro 5200 shelf



Figure 6. Optical Metro 5100/5200 application example

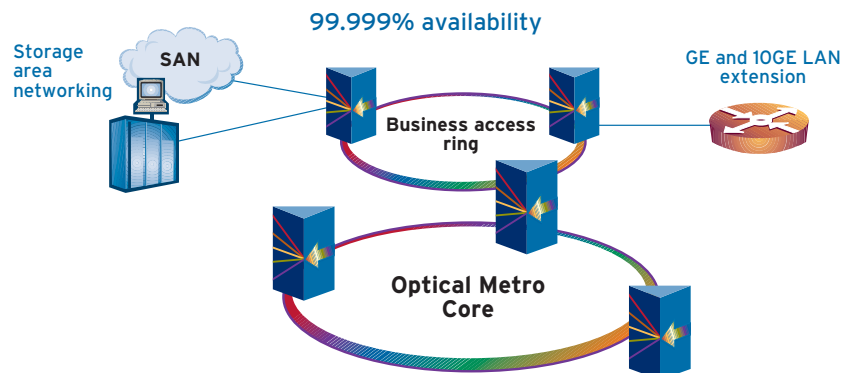
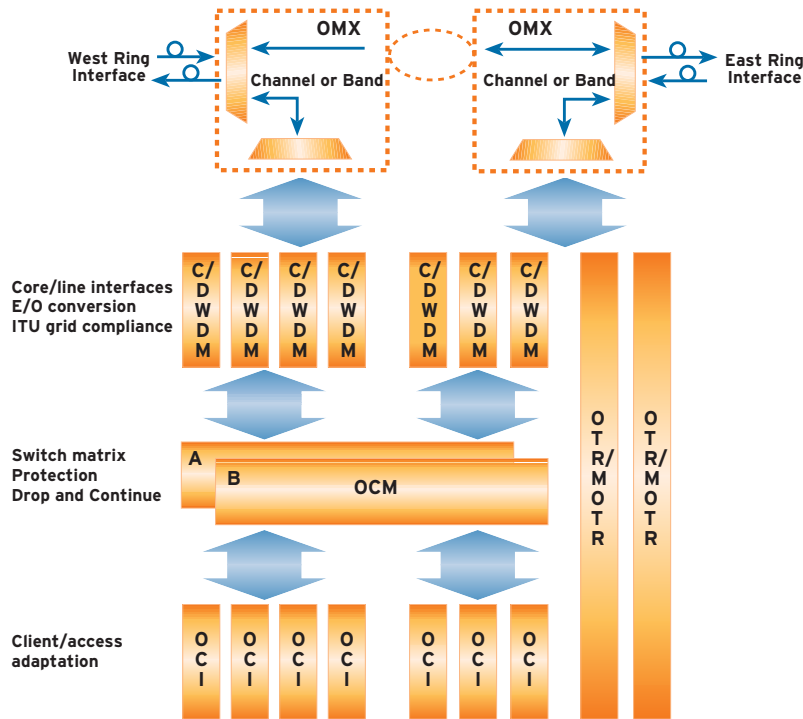


Figure 7. Optical Metro 5100/5200 basic architecture



optimal utilization of the wavelength (for example, the 8:1 ESCON or the 4:1 multi-protocol SRMs combine several services on a single wavelength). The OCI supports both single-mode and multi-mode fiber types.

➤ **Flex Rate OCLD (Optical Channel Laser and Detector):** C/DWDM interfaces which provide the line optics functionality. Supports rates from 8 Mbps to 2.5 Gbps.

➤ **OTR (Optical Transponder):** Combines the functionality of the OCI and the OCLD into a single interface. Flex Rate 2.5-Gbps OTRs and 10-Gbps OTRs are available. Like the OCI/OCLD interfaces, OTRs can be deployed in protected or unprotected applications.

➤ **MOTR (Muxponder):** Combines the functionality of the OCI SRM and the OCLD into a single interface; that is, multiplexes multiple client interfaces into a single channel and provides the WDM line adaptation, all in one card.

➤ **OCM (Optical Channel Manager):** Offers path-protection switching and manages the connections between the OCI and OCLD. The path protection switching is performed at the channel level, so other channels in the band are not disrupted when a switch occurs. Two OCM circuit packs (working and protection) are equipped in the Optical Metro 5200 shelf. This function is assumed via the backplane on the Optical Metro 5100.

➤ **OMX (Optical Multiplexer/Demultiplexer):** Each OMX module contains passive optical filters that add and drop C/DWDM channels.

➤ **SP (Shelf Processor):** Provides local management, alarm consolidation and telemetry connections, software and configuration management, shelf visibility, performance monitoring, inventory control for the shelf and system communication.

➤ **OSC (Optical Supervisory Channel):**

Provides a dedicated management channel that supplements the per-wavelength OSC, allowing highly differentiated fault sectionalization.

The Optical Metro 5200 has 16 traffic carrying slots and the Optical Metro 5100 has 4 traffic slots, any of which can house the following circuit packs: OCI, OCLD, OTR, MOTR. Additional slots are provided in each platform to carry OCM (Optical Metro 5200 only), SP and OSC cards.

Extended reach applications

The Optical Metro 5200 offers the ability to increase the reach capability of the optical layer to optimize the deployment of metro DWDM networks into the regional distances market (200 – 600 km range). With this functionality, metro DWDM point-to-point, ring or mesh networks can support extended amplified distances, at both 2.5-Gbps and 10-Gbps line rates, without the need to perform costly intermediate electrical regeneration or OEO (Optical Electrical Optical) conversions. Significant network cost savings can be realized with the extended reach capability.

Network manageability

The Optical Metro 5100/5200 is easily managed through the Optical Network Manager (formerly known as Preside), which offers comprehensive capabilities, including an intuitive GUI with full online help, a unified window into hybrid networks and topographies, as well as extensive edge-to-edge wavelength provisioning, alarm reporting and performance monitoring capabilities. TMF-814 interfaces are now being deployed into major carriers, allowing the integration of the Optical Metro 5100/5200 platforms directly into third-party OSS platforms.

For even greater flexibility, local management workstations can be connected directly to an Optical Metro 5100/5200 element via a WAN or dial-up connection. These options offer the choice between managing at the network operations center in a complete network topology scenario or locally by craft managers.

Feature summary

- **Multi-service platform:** Delivers a comprehensive set of service and applications ranging from 8 Mbps to 10 Gbps with complete bit-rate and protocol independence for service forecast tolerance
- **Reduced Total Cost of Ownership:** A simple architecture that optimizes footprint and wavelength utilization for lowest cost per service, as well as automates planning and deployment through automated processes
- **Fault-tolerant, reliable architecture:** Field-proven, carrier-grade product, built to industry standards for the support of mission-critical services (< 50 msec fault recovery, 99.999 percent system availability, OSMINE and NEBS/ETSI compliant, in-service upgrades and more)
- **Scalable platform:** Adaptable to smaller and/or larger networks with simple provisioning of wavelengths on an as-needed basis; cost-effective initial deployment with modular growth
- **Flexible networking capabilities:** Interconnected systems architecture for end-to-end effective networking, eliminating back-to-back terminals for lower capex/opex; support for all types of networking topologies, including point-to-point, ring and mesh

- **Extended reach applications:** For cost-effective wavelength transport with minimal OEO conversions, the Optical Metro 5200 supports amplified links up to 600 km at both 2.5-Gbps and 10-Gbps line rates
- **Support tools from design to deployment:** Network planning and system management tools allow the accelerated design and provisioning of the network as well as facilitate the monitoring of network performance

Key technical specifications

Supported configurations

- Optical Metro 5100: 8 CWDM wavelengths protected/16 unprotected per system
- Optical Metro 5200: 32 DWDM wavelengths protected/64 unprotected per system
- Optical amplifiers allow for 600 km regenerator free transmission
- Point-to-point, linear OADM, hubbed ring, dual-hubbed ring, meshed ring

Protection schemes

- Path switching, equipment switching, line switching, unprotected

Operational

- Optical connectors FC, SC, MT-RJ, LC

Communication ports

- 2 10Base-T (Ethernet) ports
- 1 RS-232 25-pin

External alarms (Telemetry ports):

- Optical Metro 5100: 8 inputs, 4 outputs
- Optical Metro 5200: 4 inputs, 4 outputs

Element/network management

- SNMP v1, TL-1, System Manager, Optical Network Manager

Temperature

- 32° to 131°F (0° to 55°C) relative humidity
- 5% to 95% (non-condensing)

Certifications

- Zone IV (earthquake)
- GR-63-CORE (NEBS) Telcordia
- ETS 300 019 ETSI
- OSMINE compliant

Power consumption/shelf

- Optical Metro 5100: 139 Watts typical, 202 Watts max
- Optical Metro 5200: 534 Watts typical, 730 Watts max

Power requirements (nominal)

- -48 VDC
- Minimum: -40 VDC
- Maximum: -60 VDC
- AC interface available

Shelf dimensions — Optical Metro 5100

- Height: 176 mm (6.92 in.)
- Width: 438 mm (17.25 in.)
- Depth: 297 mm (11.7 in.)
- Weight: 14.5 kg (32 lb) empty; 16.5 kg (36 lb) (fully loaded)
- Universal mounting brackets for 19" or 23" frames

Shelf dimensions — Optical Metro 5200

- Height: 489 mm (19.25 in.) (11U)
- Width: 438 mm (17.25 in.)
- Depth: 301 mm (11.85 in.)
- Weight: 23 kg (50 lb) empty; 34 kg (75 lb) fully loaded

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