



# LEVERAGE

proven multiservice optical edge

## Product Brief

### Nortel Networks Optical Metro 4000 Multiservice Platform

Metropolitan networks are a difficult planning challenge, especially when you are trying to determine what services will make up the most profitable mix, and where it should be deployed.

In order to build networks for unpredictable growth while ensuring the optimized utilisation of bandwidth and existing assets, the Optical Metro 4000 solution provides in-service nodal and network scalability. Its compact footprint serves all central office, remote office, and enterprise customer premises applications.

*The Optical Metro 4000 platform is a field-proven solution for multiservice STM-4/16 SDH applications. The Optical Metro 4000 has a rich feature set developed to support multiple applications covering access, metro edge, or regional requirements. The common STM-4/16 platform provides key functional consolidation in a single network element that reduces nodal/network spending and operational costs by leveraging powerful 4/3/1 cross-connect features, a common service interface set, and operationally simple management that features a scalable data communication architecture.*

*The key benefits of the Optical Metro 4000 are realized through its simple architecture, supported by a high level of integration. The result is an application-efficient multiservice platform, which results in reduced ownership costs.*

*The Optical Metro 4000 is a proven family with more than 28,000 elements deployed globally.*

### Flexible and scalable configurations

The Optical Metro 4000 is available in two fully non-blocking VC-12 switching matrix configurations that are interchangeable and upgradeable in-service.

The Optical Metro 4150 is a hybrid STM-4/16 full access multiplexer with a switching matrix that supports a protected STM-16 interconnection and fan out, with STM-4 line aggregates. It is optimised for metro edge and managed extension applications including an extremely efficient hub node for high-density protected STM-1/4 access ring closure or spurs.

The Optical Metro 4200 is an STM-16 full-access multiplexer for metro core and regional applications and supports DWDM line interfaces.

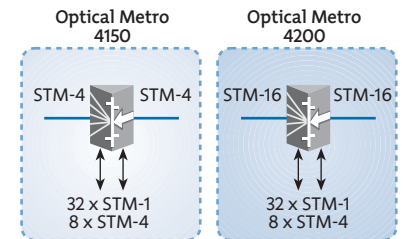
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## Platform configurations

The network elements are capable of providing full access; they support mixed payloads and can be configured for terminal multiplexer, hub, add/drop multiplexer, and regenerator. The key benefits of the Optical Metro 4000 are realized through its simple architecture supported by a high level of integration: a single multiplexer that consists of a shelf assembly, universal service slots for a common set of service tributaries, and two optimised combined aggregate-multiplexer cards that make up the Optical Metro 4150 and Optical Metro 4200 shelf configurations. The result is a simple and application-efficient platform that lowers ownership costs through:

- Multiple services/single platform
- Less staff training
- Space saving
- Lower spares holding
- Simpler, scalable network management

Figure 1.



## Standards-based Ethernet services and transport

Carriers looking to add additional Ethernet revenue services can leverage a set of high-density Ethernet port cards that map Ethernet-over-SDH using Generic Framing Procedure (ITU-T G.7041) and/or packet-over-SDH (IEEE 802.3) modes. Carriers can productise and deliver a range of new distance-independent, bandwidth-adjustable data services such as Transparent LAN. These services—defined as Ethernet Private Line services—use virtual concatenation (ITU-T G.707) to tailor the service bandwidth. For Ethernet VPN services, a card supporting an advanced Layer 2 Ethernet switch is available. Applications include secure customer-separated Ethernet VPNs (including multi-point-to-point aggregation to a data hub) using VLANs, with the option to add service provider VLANs (virtual LAN groups) for network-wide scalability.

These services are characterised by the following key values associated with SDH:

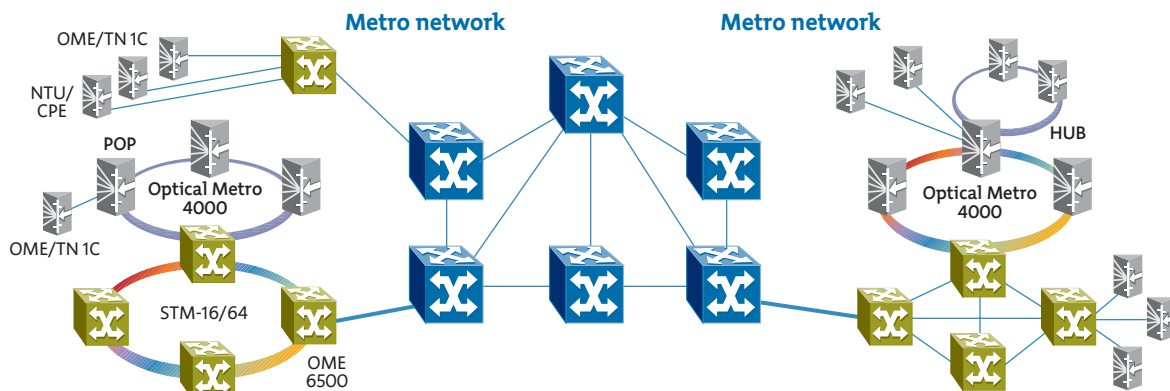
- Simple provisioning—for example, SDH service with protection options
- Designated connections over TDM channels for each port enable support of all packet traffic including latency sensitive with highest security
- SDH-like performance monitoring parameters for Ethernet services
- Optional packet processing for Quality of Service (QoS), Class of Service (CoS), traffic priority, and supporting transparency to customer address tags

## Lower ownership costs

A combination of operations-friendly attributes are built into the architecture and management to enable savings on capital and operational expenditures by standardising multiple applications and deployment:

- *Reduced spares holding*—The number of different spare units required is reduced by up to a factor of 4
- *Less staff training*—The simple architecture and common units allow field staff to quickly become familiar with the equipment, reducing required training by up to 40 percent

Figure 2. Multiservice Optical Edge



- *Operationally simple and reliable*—Powerful central management and tools that enable:
  - Simple point-and-click circuit provisioning
  - In-service centralised software updates, protecting investment throughout the field lifecycle
- *Reduced office space*—With three compact shelves per ETSI standard rack and each front access shelf providing full access to STM-4 or STM-16 for any mixed payload, the platform minimises rack space and avoids the need for additional tributary access shelves
- *In-service capacity upgrade* from STM-4 to STM-16 enables deployment of higher capacity multiplexers only where required

## Flexible network configurations

The flexible architecture and equipping rules allow the Optical Metro 4000 to be configured as:

- A terminal multiplexer
- An add/drop multiplexer
- A small cross-connect
- Hub multiplexer
- Regenerator

The service slots are universal, enabling any mix of PDH, SDH, or Ethernet services to be configured and delivered based on very simple equipping rules.

## Unique bandwidth management

The Optical Metro 4000's key differentiator lies in its fully non-blocking cross-connects for both low- and high-order traffic. For example, the Optical Metro 4150 and 4200 can close 16 STM-1 rings into a single head-end node with full VC-12 interconnection of traffic between all the rings, including ring protection. Additionally, the availability of full DCC (Data Communications Channel) on every port and the ability to hairpin connections maximise the benefits of an investment in an STM-4/16 element through full capacity utilisation for revenue services. Flexible VC-12 traffic grooming includes Time Slot Assignment (TSA) and Time Slot Inter-change (TSI). Diagnostic software loop-back speeds up commissioning and post sales operations.

## Enhanced network and service reliability with simple and robust management

The value-added management applications supporting Optical Metro 4000 deliver rapid, 'right first time' end-to-end service activation together with network-wide service assurance, dramatically speeding up time-to-revenue. They minimise service downtime and maximise utilisation of network resources.

The Optical Metro 4000 platform is fully managed by Nortel Networks Optical Manager, which provides comprehensive element, network, and service management. Full remote access to each element from the management centre including fault, inventory, performance monitoring, and configuration ensures fast deployment and rapid problem resolution, all with minimum need for site visits.

Remote software upgrades are performed without impacting live traffic, enabling in-service network upgrades from a central location.

All Nortel Networks SDH Solutions management communications to the network elements use an integral Data Communications Network (DCN), which minimises the use of external data communications equipment. Nortel Networks fully adheres to OSI networking standards, including the use of ISO ES-IS (End System–Intermediate System) and IS-IS routing protocols, so that DCN routing is self-configuring and self-healing, adapting dynamically and automatically to changes in the network.

## Optical Metro 4000 attributes

- *Standards-conforming compact multiplexer*
- *Space efficient, cost-effective, and easy to install*
- *Up to three shelves per standard ETSI rack*
- *Single card height shelf*
- *Full, flexible bandwidth management*
- *Software configurable to terminal multiplexer, add/drop multiplexer, or other configurations*
- *Easy and quick installation*
- *Remote software downloading*
- *Standard OSI (IS-IS) management communications, reducing the amount of DCN equipment necessary*
- *Full access, mixed payloads*
- *ITU G.826 performance monitoring*
- *Ethernet and storage traffic and services supported by efficient mapping using Generic Framing Procedure (GFP G.7041)*
- *G.707 Virtual Concatenation (VCAT) enables provisioning of scalable bandwidth*
- *G.LCAS Link Capacity Adjustment Scheme to ITU-T G.7042/Y.1305*
- *External alarm input and outputs for management of external devices*
- *Sophisticated and user-friendly management system (local and remote)*

## Synchronisation

- External building integrated timing supply (BITS) input/output
- Independent synchronisation and bandwidth management switching
- Shelf timing (internal, line, SDH, tributary, external)
- S1 Byte SSM
- Hitless timing reference switching
- Stratum 3 internal clock
- Inter-shelf LAN
- TCP/IP from Element Manager to head-end NE

## Operation interfaces

- Craft interfaces
  - RS-232 DCE port
- Office alarms
  - Critical, major, minor classified alarms
  - Normally open, closed contacts
  - Visual and audible alarms, shelf LEDs
- User-defined external alarms
  - 8 inputs, 5 outputs
- Network Element Ethernet LAN
  - TCP/IP to Element Manager to NE
- Central office (CO) LAN
  - Two twisted pair Ethernet interfaces, for connection to a local Element Controller and inter-shelf connection
- User security
  - User ID login, four security levels; auto-logout; network element-based security

## Key technical specifications

<b>Tributary services</b>	<ul style="list-style-type: none"> <li>• 8 STM-4o interfaces per shelf (full DCC on all ports)</li> <li>• 32 STM-1o/1e interfaces per shelf (full DCC on all ports)</li> <li>• Dual port STM-1o interface</li> <li>• STM-1e/140 Mbps interface</li> <li>• 34/45 Mbps VC-3 interface (3 ports)</li> </ul>	<ul style="list-style-type: none"> <li>• 1+1 card protection on 34/45 Mbps</li> <li>• 32 port E1 interface</li> <li>• 8, 10/100 Base-T ports (GFP/POS)</li> <li>• 8, 10/100 Base-T ports (POS)</li> </ul>
<b>Protection schemes</b>	<ul style="list-style-type: none"> <li>• 1+1 card protection on STM-1e interface</li> <li>• 1+1 MSP on STM-4o interface</li> <li>• 1+1 MSP on STM-1o interface</li> </ul>	<ul style="list-style-type: none"> <li>• 1+1 MSP on STM-1e interface</li> <li>• 1+1 card protection on STM-1e/140 Mbps interface</li> <li>• 1:N protection for E1 via the dense access shelf</li> </ul>
<b>Ethernet Interface specifications</b>	<b>EPL100 8 port card—per port selection for GFP or POS</b>	
	<ul style="list-style-type: none"> <li>• Transparent port GFP ITU G.7041</li> <li>• Transparent port POS (PPP/BCP RFC 2878, 1638)</li> <li>• Wire speed and VCAT (G.7071) VC-12-nv, VC-3-nv, VC-4 protection or unprotected</li> <li>• Supports IEEE 802.3 auto-negotiation, flow control, and full duplex/half duplex</li> <li>• Support for Ethernet baby jumbo packets</li> <li>• Transparent to Layer 2 protocols such as VLANs, STP, Link Aggregation, and MLT allowing the full features of Layer 2/Layer 3 devices to be used as though they were locally connected</li> <li>• Common configuration management with SDH services from Element Controller</li> <li>• Data oriented reports, e.g., errors per frame and SDH-like PMs such as error seconds, severely error seconds and unavailable seconds for Ethernet Service</li> </ul>	
<b>OPE 100 Ethernet Switch card with POS interfaces</b>	<b>OPE 100 card with Ethernet Layer 2 switch for VPN services</b>	
	<ul style="list-style-type: none"> <li>• Wire-speed 10/100 Base T/TX</li> <li>• Virtual concatenation at VC-12-v, VC-3-nv or direct VC-4</li> <li>• IEEE 802.3/3u and 802.3x full duplex</li> <li>• Bridging conforming to IEEE 802.1D (Spanning Tree), 802.1Q (port based and tagged VLANs), 802.1P (Priority and QoS)</li> <li>• POS RFC 1638, 1661, 1662, 2615 (PPP over SDH)</li> <li>• Out-of-band management RIPv2, GRE, integrated IS-IS</li> <li>• In-band management SNMPv1, MIB1, Bridges MIB1 (RFCs 1493, 1575, 1643), RMON MIB (RFC 1757)</li> </ul>	
<b>Connectors</b>	<ul style="list-style-type: none"> <li>• Optical FC/PC, LC, DS-3/STM-1e BT Type 43</li> <li>• Ethernet 10/100Base-T RJ-45, E1 G.703 120 ohm symmetrical/balanced type, and 75 ohm coaxial pair type</li> </ul>	
<b>Supported configurations</b>	<ul style="list-style-type: none"> <li>• MSPP hub applications                             <ul style="list-style-type: none"> <li>– STM-1/4 ring closure</li> <li>– Fully non blocking VC-12 local cross-connect</li> <li>– Sub Network Connection Protection Rings (SNC-P)</li> <li>– Linear Point-to-Point 1+1 MSP</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Conventional add-drop multiplexer</li> <li>• ADM configured as regenerator</li> <li>• Terminal multiplexers</li> </ul>
<b>Bandwidth management</b>	<ul style="list-style-type: none"> <li>• Time Slot Assignment (TSA) with VC-12 granularity</li> <li>• Time Slot Interchange (TSI) with VC-12 Granularity</li> <li>• Hair-pinning connections</li> <li>• Diagnostic software loop-backs</li> </ul>	
<b>Shelf characteristics</b>	<ul style="list-style-type: none"> <li>• Height: approximately 550mm (Including fibre tray)</li> <li>• Depth: 280mm (including doors/covers)</li> <li>• Width: 450 mm (excluding mounting flanges )</li> <li>• Weight: 25 kg approximately</li> <li>• Universal mounting brackets for 19" and ETSI frames</li> </ul>	<p><i>Multiplexer subrack will conform to the following:</i></p> <ul style="list-style-type: none"> <li>• ETSI prETS 300-119 part 3 and 19" equipment practices</li> <li>• ETSI prETS 300-119 part 4</li> </ul>
<b>Operating conditions</b>	<ul style="list-style-type: none"> <li>• Temperature: -5°C to 45°C for 2 sub-racks in ETSI rack 0°C to 40°C for 3 sub-racks in ETSI rack fan cooled</li> <li>• Relative humidity: 20% to 55% relative humidity, no condensation</li> <li>• Earthquake: Zone IV EMI/RFI: FCC Class A</li> <li>• Battery range: -38 to -75 V DC</li> <li>• Power consumption: 250 W typically</li> </ul>	

Nortel Networks is an industry leader and innovator focused on transforming how the world communicates and exchanges information. The company is supplying its service provider and enterprise customers with communications technology and infrastructure to enable value-added IP data, voice and multimedia services spanning Wireless Networks, Wireline Networks, Enterprise Networks, and Optical Networks. As a global company, Nortel Networks does business in more than 150 countries. More information about Nortel Networks can be found on the web at:

[www.nortelnetworks.com](http://www.nortelnetworks.com)

For more information, contact your Nortel Networks representative, or call 1-800-4 NORTEL or 1-800-466-7835 from anywhere in North America.

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NN109641-092704

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