



Alcatel 1670 SM STM-16/64 Optical Multi-Service Node

Multi-Service 10G Platform for High Capacity Metro/Core Optical Networks

In today's extremely competitive telecommunications environment, global carriers and service providers require optical network solutions capable of managing ever-growing traffic volumes at incremental costs.

Future-proof solutions capable of timely generate new revenues are demanded to simplify network complexity and enhance traffic capacity at Metro/Core boundaries, while keeping investments and operational expenditures at lowest impact on businesses.

Alcatel 1670 SM is the ideal optical multi-service building block for Next-Generation SDH Metro/Core networks. It provides both single- and multi- shelf solutions for scalable, high capacity transport provisioning platforms.

Alcatel 1670 SM delivers non-stop end-to-end global services from 140/155Mbps and Gigabit Ethernet up to 10Gbps. As member of the Alcatel Optical Multi-Service Nodes (OMSN) product family, it enables fast and enriched optical networking connectivity, continuous service availability and new competitive applications delivery at lower cost per transported bit.

Next-Generation SDH Transport and Data-Awareness Benefits

Alcatel 1670 SM High Order 10G transport platform delivers cost-effective connectivity and bandwidth management solutions to service providers. It integrates Alcatel ISA (Integrated Service Adapter) data-aware functionality to optimally adapt the transport infrastructure to data traffic patterns. Alcatel 1670 SM's distinctive design features include the following key advantages:

- > Multi-service provisioning platform for national transport backbones and Metro/Core internetworking.
- > Scalable high capacity optical solution for maximum network utility and minimum network complexity, open to meet future upgrades.
- > High robustness and resiliency for maximum service continuity in carrier-grade VC-4 level transport scenarios.
- > Optimized network resources and improved optical bandwidth efficiency at reduced investment on infrastructure assets.
- > Quick time-to-profit for new revenue-generating data services.

Alcatel's Optical Multi-Service Nodes (OMSN) provide world-class next generation SDH functionality and capacity through aggregation of broadband multi-protocol traffic patterns. Designed for metro and backbone applications, the OMSN product family offers telecom carriers and service providers the powerful solution to build intelligent optical networks and achieve the optimal balance between new competitive service offerings and traditional revenue-generating services.

Alcatel 1670 SM is the Optical Multi-Service Node addressing Metro/Core and Long Haul applications, such as:

- > Next-Generation SDH High Capacity Add Drop Multiplexer or Cross-Connect in multiple rings or meshed networks
- > Very Long and Ultra Long Haul Metro/Core networks
- > Intercontinental and Transoceanic Gateway/Office
- > Multi-service data-centric high capacity Metro/Core context
- > Multi-shelf High Capacity Clusters

- > Packet-based Gigabit Ethernet streams and high-speed IP services enabled.
- > World-class end-to-end guaranteed services and SDH/SONET interoperability in Intercontinental and Transoceanic gateway applications.
- > Direct DWDM support through 2.5G and 10G colored interfaces for cost-effective interconnection with Alcatel DWDM Long Haul Systems.
- > Full-line efficient Network Management architecture with unparalleled tools for overall network monitoring and control procedures to reduce operational costs.

All this make Alcatel 1670 SM a powerful, cost-effective multi-technology platform targeting optical Metro/Core network applications in which capacity, connectivity, service availability and end-to-end data services are success factors.

Capacity, Flexibility and Density in a Single Solution

Alcatel 1670 SM features a full non-blocking redundant SDH matrix, with single-shelf 512 x 512 STM-1 equivalent High Order capacity, clock reference and control functions. The SDH cross-connect size provides full High Order connectivity in any possible system configuration.

The single shelf system provides a large variety of transport interfaces to cover virtually every high capacity transport needs, from Ultra Short-Reach up to Ultra Long-Haul applications. Interfaces range from 140Mbps and STM-1 electrical interfaces to STM-4, STM-16, UL-64.2 and Gigabit Ethernet, with outstanding transport density per each traffic board (e.g. 16 different STM-1 electrical or optical signals are managed by the same single-slot card, that is, 256 STM-1e/o signals may be dropped within one single shelf). STM-n interfaces are mounted on plug-in modules that allow flexible combination of electrical and optical (any short or long haul type) ports on the same unit. The same degree of flexibility is provided on Gigabit

Ethernet that may host SX and LX plug-in modules in different combinations. Alcatel 1670 SM single shelf solution provides STM-64 interfaces for double 10Gbps-ring interconnection or in MSP 1+1 configuration, while colored STM-64 and STM-16 interfaces can be used for direct interworking with DWDM systems at reduced costs. Its high capacity features allow the termination of multiple subtended STM-1/4/16/64 rings within the same node. Alcatel 1670 SM features a full symmetrical architecture that means there is no distinction between aggregates and tributaries. For this reason the system fully supports Cross-Connect applications, in addition to Terminal Multiplexer and Add-Drop implementations in different topologies such as spurs, rings or mesh. Equipment's shelf is physically divided in two parts. In the lower area physical boards are located (controls, matrices and up to sixteen I/Os). The upper area hosts additional I/O access boards for maximum traffic density. Alcatel 1670 SM supports in fact "any traffic port in any slot" design approach, allowing the broadest flexibility mix according to any traffic need.



Fig. 1: Alcatel 1670 SM - Multi-Service Transport Platform

Scalable High Capacity Multi-Shelf Cluster

Alcatel 1670 SM flexibility means also capability to build up a powerful High Capacity Transmission Cluster by interconnecting many systems each other. Thanks to the built-in 10Gbps interconnection links, up to five Alcatel 1670 SM shelves may be interconnected to form one single High Capacity Transmission Hub with up to 1280x1280 STM-1 equivalents.

As an example, a cluster capacity of 1024x1024 STM-1 equivalents may be achieved by interconnecting four Alcatel 1670 SM shelves in multi-shelf configuration, all of them hosted within one single 600 x 600 rack. This is a high-density configuration for high capacity gateway offices addressing specific applications such as multiple high-speed ring closures and cross-connect functions.

Reliable and Data-Aware

Alcatel 1670 SM is the ideal solution as high capacity multi-service transport node also thanks to its resiliency features. In terms of hardware, maximum reliability is achieved by 1+1

hot stand-by protection mechanism for all common parts and electrical tributary ports. Matrix, control and synchronization functions are always duplicated. Power supply protection is inherent as the DC/DC conversion function is distributed on each card. Alcatel 1670 SM centralized control functions limit the presence of the necessary processors and software only to Control and Matrix boards for quick and easy plug-in of traffic units.

Concerning traffic protection, single/dual-ended Linear Multiplex Section Protection (MSP) and Sub-Network Connection Protection (SNCP), with Drop & Continue function are provided for improved traffic availability.

Alcatel 1670 SM is able to manage multiple STM-1, STM-4, STM-16 or STM-64 SNCP rings. Both 2 x 2f STM-64 MS-SPRings and 4f STM-64 MS-SPRing configurations are supported to deliver maximum network availability, while allowing extra traffic management. Collapsed Single and Dual Node Interconnection are supported for cost-efficient closure and interconnection of multiple rings.

Alcatel 1670 SM may be powered by ISA plug-ins to expand its capabilities of realizing intelligent multi-service transport platform functions for Long Haul Gigabit Ethernet services.

The Optical Multi-Service Nodes family consolidates the strong experience gathered by Alcatel in optical networks architectures through hundred thousands installations worldwide. That's also where true reliability comes from.

Transoceanic and Intercontinental Non-Stop Service Connectivity

Capacity and reliability are also key factors for guaranteeing worldwide networking service continuity over ultra long distances. Alcatel 1670 SM perfectly fits into international gateway and landing station environments where Core interconnection bandwidth – either SDH or SONET - from several high speed transoceanic or transcontinental network topologies need to be cost-effectively managed, consolidated and distributed towards the Metro. For these specific scenarios Alcatel 1670 SM features the “Network





Protection Equipment” (NPE) protocol scheme, which implements ITU-T G.841-Annex-A 4f MS-SPRing 10G protection performances for transoceanic applications. Only milliseconds are in fact needed to self-heal 20Gb/s worth traffic over thousands and thousands kilometers. Alcatel 1670 SM NPE mechanism augments service continuity and bandwidth efficiency in case of failures over long distances at minimum impact on network performance.

Enabling Gigabit Ethernet Connectivity for Cost-Effective Long Haul Data WANs

Alcatel 1670 SM cost-effectively supports carrier-class QoS data traffic patterns. It enables global Service Provides to deliver Metro/Core Gigabit Ethernet over SDH connectivity to tailor out of the optical bandwidth the best balance between new IP-based data services and high margin traditional voice and leased line streams. Alcatel 1670 SM can be equipped with Integrated Service Adapter (ISA) plug-in

modules that perform carrier-grade Gigabit Ethernet worldwide transport with guaranteed QoS. Two different modules are available for maximum service flexibility. The ISA-GbE plug-in board provides up to eight Gigabit Ethernet ports with flexible SX/LX modules mix. Each Gigabit Ethernet traffic stream is flexibly assigned with WAN bandwidth resources through rate-adaptive provisioning – from one up to seven VC-4s – and mapped via ITU-T G.7041 Generic Framing Procedure (GFP).

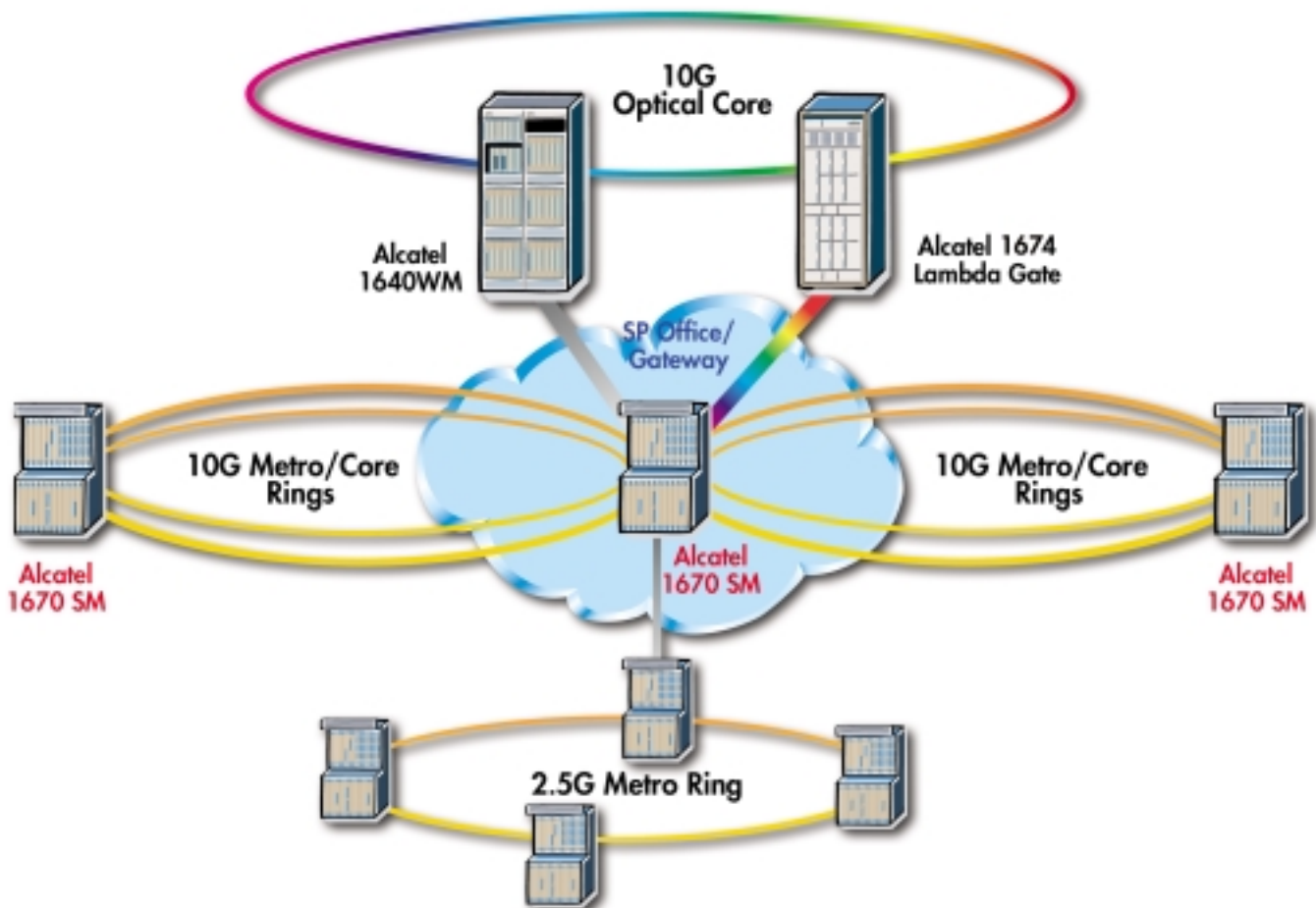


Fig. 2: Alcatel 1670 SM - High Capacity Metro/Core Gateway

Alcatel 1670 SM



These mechanisms enable Service Providers to timely deliver a flexible portfolio of standardized, end-to-end managed Gigabit Ethernet services at incremental costs, thus maximizing both network utility and profitability. Moreover, ISA-GbE fits Alcatel 1670 SM within the OMSN Metro Ethernet Solution scenario, ensuring full end-to-end support of Wide Area MPLS-based L2-VPN solutions and managed Ethernet-based revenue-generating Value Added Services (VAS) at lower cost per bit.

Whenever full-rate 1.25 Gbps Ethernet connectivity over the WAN is required, ISA-CGbE provides the distinctive capability to deliver not-buffered, full transparent Gigabit Ethernet transport. Alcatel 1670 SM ISA-CGbE enables data managed services with guaranteed QoS. The end-to-end connectivity may be realized either over SDH/SONET or WDM networks thanks to the interworking capabilities with Alcatel 1696 Metro Span 4xAny Gigabit Ethernet function.

ISA Gigabit Ethernet plug-in boards may be adapted into new or previously installed Alcatel 1670 SM as an add-on – where and when needed. This results in bandwidth management optimization and reduction of transport infrastructure costs for quick time-to-market of new data services.

OSMN Metro Ethernet carrier-class solution enables packet-based service delivering with incremental investments, as new competitive services are cost-effectively generated by exploiting the existing SDH infrastructure, thus avoiding to deploy a new unnecessary overlay public infrastructure and ultimately reducing both capital and operational expenditures.

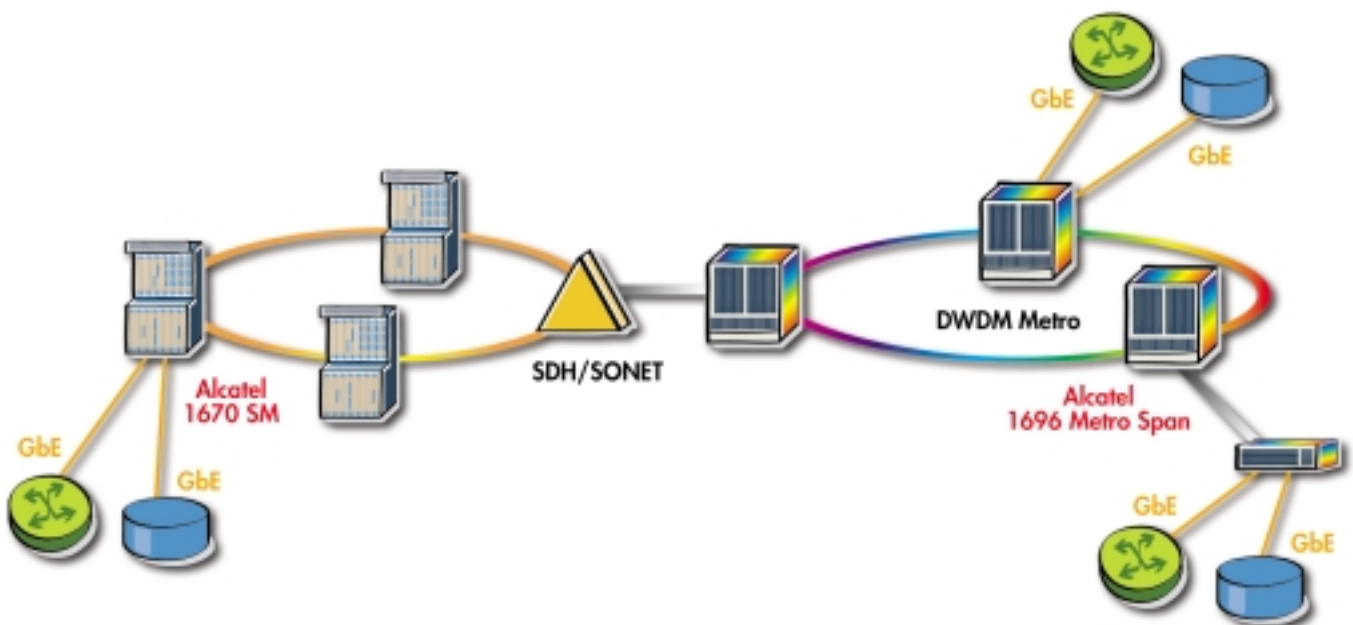


Fig. 3: Alcatel 1670 SM - Enabling end-to-end Gigabit Ethernet across multi-technology transport networks

Technical Summary

Applications

- > Next-Generation SDH High Capacity Add Drop Multiplexer or Cross-Connect in multiple rings or meshed networks
- > Very Long and Ultra Long Haul Metro/Core networks
- > Intercontinental and Transoceanic Gateway/Office
- > Multi-service data-centric high capacity Metro/Core context
- > Multi-shelf High Capacity Cluster

Interfaces

- > 4 x 140Mbps/STM-1e switchable
- > 4/16 x STM-1 (electrical, S-1.1, L-1.1, L-1.2, L-1.2JE)
- > 1/4 x STM-4 (S-4.1, L-4.1, L-4.2, L-4.2JE)
- > 1 x STM-16 (L-16.1, S-16.1, L-16.1, L-16.2, L-16.2JE1/2/3)
- > 1 x STM-16 L-16.2 colored optics DWDM
- > 1 x STM-64:
 - 10Gb/s Intra Office I-64.1
 - 10Gb/s Short and Long Haul S-64.2, L64.2
 - 10Gb/s Very Long Haul V-64.2
 - 10Gb/s Ultra Long Haul U-64.2
- > 1 x STM-64 colored (OOBFEC, 50GHz grid)
- > Integrated booster +10dB / +15dB / +17dB
- > Integrated preamplifier @ 2.5G and 10G
- > 4 x 4 x Gigabit Ethernet Base-SX/LX SFP (ISA-GbE plug-in)
- > 1 x 1.25 Gigabit Ethernet SX/LX (ISA-CGbE plug-in)

Maximum Port Capacity

- > Single-shelf configuration:
 - 4 x STM-64, 16 x STM-16, 64 x STM-4, 256 x STM-1e/o
- > Multi-shelf configuration - Single Rack example (600 x 600):
 - 16 x STM-64, 64 x STM-16, 256 x STM-4, 1024 x STM-1e/o

Connectivity

- > Single-shelf 512x512 (HO) STM-1 equivalent full non-blocking SDH matrix in all configurations
- > Up to 1280 x 1280 (HO) STM-1 equivalent capacity in multi-shelf configuration
- > unidirectional, bidirectional, broadcast connections
- > Line and VC-4 loopbacks
- > AU4-4c, AU4-16c, AU4-64c concatenation management

Equipment Protections

- > Matrix, Control and Synchronization EPS 1+1
- > 4/16 x STM-1e EPS N+1 (max N=15)

Network Protections

- > Single and dual-ended linear MSP
- > Linear 1:1 and 1:N MSP @ STM-1/4/16/64
- > SNCP/I, SNCP/N
- > SNCP Drop & Continue
- > 2f and 4f MS-SPRing protection incl. G.841 Annex B for Transoceanic applications
- > Collapsed single-node ring interconnection
- > Collapsed dual-node ring interconnection

Monitoring

- > Performance monitoring according to G.784, G.826, G.821
- > POM (Path Overhead Monitoring) on 100%VCs
- > SUT (Supervisory Unequipped Trail)
- > TCM (Tandem Connection Monitoring)
- > Ethernet performance monitoring counters

Synchronization

- > Internal oscillator ± 4.6 ppm
- > Holdover drift ± 0.37 ppm per day
- > External sources: STM-N/2MHz/2Mb input external 2MHz/2Mbps output
- > Priority and Quality (SSM) synchronization algorithms

Data Engines (ISA)

- > **ISA-GbE:** > 8 ports rate-adaptive Gigabit Ethernet SX/LX transport. ITU-T G.7041 GFP mapping on VC-4-nv, n = 1..7 with in service Bond. Flow control management acc. IEEE 802.3x.
- > **ISA-CGbE:** Full transparent 1.25 Gigabit Ethernet SX/LX transport over VC-4-8v.

Power

- > Station battery: -48 / -60 V dc
- > Power consumption per shelf: 700 W (max)

Mechanical Specifications

- > Mechanical compatibility: ETSI ETS 300 119-2
- > Rack size: 600W x 300D x 2200H mm
- > Sub-rack size: 533W x 280D x 850H mm

Environment

- > Operating condition: ETS 300 019, class 3.2
- > Storage condition: ETS 300 019, class 1.2
- > Transportation condition: ETS 300 019, class 2.2
- > EMI/EMC: ETS 300 386, "Telecommunications Centers"

Operation

- > CMISE craft terminal through RS232 at 38.4kbps and LAN
- > Network management access through QB3 G.773 interface or Qeccc G.784
- > Protocol Stack and Info Model: according to ITU-T G.774 and ETSI rec. ISO-OSI; IP and SNMP tunneling over OSI
- > Local and remote SW download
- > Remote inventory
- > Housekeeping: 8 inputs + 4 outputs
- > Auxiliary channels: EOW, 4 x 64 Kbps G.703, 4 x RS-232, 4 x V.11, 2 x 2Mbps G.703

Standards

- > **ITU-T/ETSI**
In compliance to latest ITU-T/ETSI standards for SDH equipment
- > **IEEE**
IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z

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