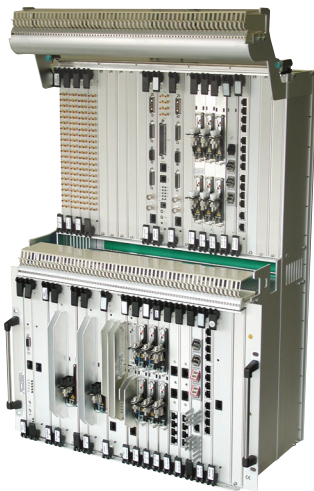


Alcatel-Lucent 1660 Synchronous Multiplexer

RELEASE 6

The Alcatel-Lucent 1660 Synchronous Multiplexer (SM) is the market-leading Synchronous Transfer Mode 64 (STM-64) multiservice provisioning platform (MSPP) for building next-generation multiservice Synchronous Digital Hierarchy (SDH) metro and regional transport networks. A single-shelf solution that integrates highly functional transport features, including SDH cross-connect and Coarse Wavelength Division Multiplexing (CWDM) add/drop functionality, the Alcatel-Lucent 1660 SM provides carrier-class, Layer 2 packet/cell switching functions, such as Ethernet, Multi-Protocol Label Switching (MPLS) and ATM. The Alcatel-Lucent 1660 SM supports Generalized MPLS (GMPLS), Ethernet Ring Protection (ERP), enhanced resiliency and flexible service interworking with intelligent optical core networks, such as those based on the Alcatel-Lucent 1678 Metro Core Connect (MCC).



With these capabilities, the Alcatel-Lucent 1660 SM addresses metro and regional applications, offering a multiservice transport platform that supports revenues from multiple broadband services, such as triple play, private line, Ethernet business services and mobile aggregation.

The Alcatel-Lucent 1660 SM is the metro-core component of the Alcatel-Lucent Optical Multi-Service Node (OMSN) product family, which also includes the Alcatel-Lucent 1662 Synchronous Multiplexer Compact (SMC), an STM-16 MSPP, and the Alcatel-Lucent 1650 SMC, an STM-4 MSPP. For offering capital and operating efficiencies, the Alcatel-Lucent OMSN products share many common features and modules.

Features

- Fully non-blocking redundant SDH matrix with:
 - 60 Gb/s (384 x 384 STM-1 equivalent) high-order (HO) throughput capacity
 - 40 Gb/s (256 x 256 STM-1 equivalent) low-order (LO) capacity
- SDH interfaces, with up to four STM-64 interfaces for double 10 Gb/s ring interconnection or Multiplex Section Protection (MSP) 1+1 configuration
- Rich-featured 10/100 Ethernet and Gigabit Ethernet (GE)
- ITU-T G.8032 v2 ERP
- E1 and E3/DS3
- MPLS-enabled Ethernet, ATM and digital video switching

- GMPLS control plane with:
 - Automated discovery and provisioning of network resources
 - Resiliency against multiple network failures
 - Enhanced connectivity to GMPLS-enabled intelligent optical core networks
- Transport for IBM® Enterprise Systems Connection (ESCON®), IBM Fibre Connection (FICON®), fiber distributed data interface (FDDI) and Fibre Channel (FC)
- CWDM multiplexer/demultiplexer (MUX/DEMUX)
- Colored STM-16 for direct interworking with Dense WDM (DWDM) systems
- ITU-T G.8032v2 ERP

- Synchronous Ethernet (SyncE) for Alcatel-Lucent Integrated Service Adapter Ethernet Switch (ISA-ES) blades linked to SDH Synchronization Status Message (SSM)

Benefits

- Supports high-capacity Plesiochronous Digital Hierarchy (PDH)/SDH service
- Provides GMPLS efficiency
 - Fast service provisioning and reduced operating expenditures (OPEX)
 - Capital expenditure (CAPEX) savings with a more fully monetized transport network
 - Increased reliability

- Supports ITU-T G.8032 v2 ERP for 100 percent increase in Ethernet over SDH (EoS) bandwidth for protected services
- Supports SyncE derived from SDH synchronization supply unit (SSU) quality
- Aggregates broadband services
 - Triple play
 - Business Ethernet: MEF (former Metro Ethernet Forum) compliant virtual LAN (VLAN) and Virtual Private LAN Service (VPLS)
- Provides Third Generation (3G) mobile backhaul
- Offers highly reliable and manageable TDM and data services
- Delivers feature transparency and operational savings with Alcatel-Lucent OMSN common components

Technical specifications

Interfaces per board

- 63 x 2 Mb/s: ISDN-PRA and retiming function
- 3 x 34/45 Mb/s switchable
- 4 x 140 Mb/s/STM-1 switchable
- 4 x STM-1: electrical, S-1.1, L-1.1, L-1.2
- 16 x STM-1 electrical/optical
- 4 x OC-3 with administrative unit (AU) 3/tributary unit (TU) 3 conversion
- 4 x STM-4: S-4.1, L-4.1, L-4.2
- 1 x STM-16: L-16.1, S-16.1, L-16.1, L-16.2
- 1 x L-16.2 colored optics DWDM
- 1 x L-16.2 colored optics CWDM
- 1 x STM-64: very short reach (VSR)/I-64.1, S-64.2b S-64.2b P1L1-2D2/JE2/JE3
- Integrated booster: +10 dB/+15 dB/+17 dB
- 4 x any sub-lambda multiplexing function (four channels in 2.5G lambda): transparent Ethernet/FE, GE, STM 4, FC, ESCON, FICON, FDDI, digital video
- Digital Video Broadcasting (DVB) ASI blade
- Up to 14 x Ethernet 10/100Base-T per ISA blade
- Up to 8 x Ethernet 10/100Base-FX per ISA blade
- Up to 4 x GE Base-SX/LX per ISA blade

Connectivity

- 384 x 384 (HO)/256 x 256 (LO) STM-1 equivalent fully non-blocking SDH fabric in all configurations
- Unidirectional, bidirectional, drop-and-continue multicast, broadcast SDH connections
- Line and virtual container (VC) loopbacks
- Virtual concatenation (VCAT) and contiguous concatenation
- 1- or 2-channel CWDM optical add/drop multiplexer (OADM) function
- 8-channel CWDM MUX/DEMUX function
- Embedded ATM star, ring and mesh topologies
- Embedded Ethernet/MPLS star, ring and mesh topologies
- Embedded Ethernet/multiple-ring topologies

Equipment protection

- Matrix, control and synchronization EPS 1+1
- ISA-ATM switch EPS 1+1
- ISA-ES16 EPS 1+1
- DVB-ASI EPS 1+1
- 63 x 2 Mb/s EPS $n+1$, maximum $n = 6$
- 3 x 34/45 Mb/s EPS $n+1$, maximum $n = 15$
- 4 x STM-1e EPS $n+1$, maximum $n = 15$
- 16 x STM-1e EPS $n+1$, maximum $n = 15$

GMPLS/ASON control plane

- Managed class of service (CoS): different levels of priority differentiated by priority mechanism
- SNCP ring closure
- TDM ring closure (2F)
- ASON/GMPLS-based multicast
- Type of path unidirectional/bidirectional
- Full portfolio of meshed service protection and restoration: SBR, GR and PRC
- Hitless reversion of nominal routes
- End-to-end management across different domains
- Maintenance support with:
 - Manual routing of traffic
 - Modification of nominal and current route
 - Shutting down of links
 - PM on path
 - SNCP selector state retrieval and manual switchover and reversion
 - In-service migration from classical centralized management to GMPLS/ASON
 - In-service upgrade with active control plane
 - Link in maintenance
 - Node in maintenance
- Link shutting down state
- Traffic parameter modify, including SRLG, priority and cost

- Priority-based preemption
- Bridge and roll
- Full operator control of dynamic GMPLS networking
- OIF UNI (OIF-UNI 2.0), OIF E-NNI 1.0 and Enhanced OIF E-NNI 1.0

Network protection

Transport

- Linear single/dual-ended 1+1 APS at STM-1/4/16/64
- Linear dual-ended $n+1$ APS at STM-1/4/16
- SNCP/I, SNCP/N
- SNCP drop-and-continue plus insertion
- Multiplex Section – Shared Protection Ring (MS-SPRing) drop-and-continue plus insertion
- 2 fiber MS-SPRing at STM-16/64
- Collapsed single-node ring interconnection
- Collapsed dual-node ring interconnection

Packet

- Dual attach: packet-ring interconnection
- ITU-T G.8032 v2 ERP

Monitoring

- Performance monitoring according to ITU-T G.784, G.826, G.821
- Path overhead monitoring (POM) on all VCs
- Supervisory unequipped trail (SUT)
- Tandem connection monitoring (TCM)
- Ethernet performance monitoring counters
 - Port/aggregate/flow
 - Incoming/outgoing

Synchronization

- Internal oscillator ± 4.6 ppm
- Holdover drift ± 0.37 ppm per day
- External sources: STM-n/2 Mb/s ports, 1 external 2 MHz/2 Mb/s output
- Priority and quality SSM synchronization algorithms
- SyncE for Alcatel-Lucent ISA-ES blades linked to SDH SSM

Data blades: ISA

ISA-ATM

- 600 Mb/s and 1.2 Gb/s cell switch with optional STM-1 access on board
- Equipment protection 1+1
- VPC/VCC switch/cross-connect
- Hard/soft PVC connections for PNNI
- Point-to-point/multipoint from E1 up to VC4-4c payloads
- Up to 252 ATM logical ports
- IMA support: maximum 126 groups/32 links
- Policing, shaping, congestion management
- CBR, UBR, UBR+, rt-VBR/nrt-VPR, GFR ATM traffic contracts
- ATM operations, administration, and maintenance (OA&M)

ISA-ES1

- 1 Gb/s throughput
- 155 Mb/s back-panel capacity
- 8 x Ethernet 10/100Base-T/FX
- GFP-F/LAPS, VCAT, LCAS
- LACP

- VC-12/VC-3/VC-4 terminations
- VC groups: maximum eight at 50/2/1
- Classification/forwarding
 - Per port
 - MAC DA: IEEE 802.3
 - C-VLAN/S-VLAN
 - IEEE 802.1p
 - DSCP/TOS
 - Ethertype
- Ethernet multicast: IGMP
- Ethernet OA&M, CFM
- Q-in-Q: IEEE 802.1Q/ad
- QoS IEEE 802.1p
- CoS
 - Guaranteed
 - Regulated
 - Best-effort
- Congestion avoidance
- STP/RSTP/MSTP/PVSTP: IEEE 802.1d/w/s
- ITU-T G.8032 v2 ERP
- Ethernet performance counters
 - Per port/aggregate/flow
 - Incoming/outgoing
 - Unicast
 - Multicast
 - Broadcast
- E-Line, E-LAN, Ethernet aggregation services in accordance with MEF

ISA-ES4

- 2.5 Gb/s throughput
- 622 Mb/s back-panel capacity
- 1 x GE using SFP, 8 x Ethernet 10/100Base-T
- GFP-F/LAPS, VCAT, LCAS
- LACP
- VC-12/VC-3/VC-4 terminations
- VC groups: maximum 16 at 63/12/4
- Classification/forwarding
 - Per port
 - MAC DA: IEEE 802.3
 - C-VLAN/S-VLAN
 - IEEE 802.1p
 - DSCP/TOS
 - Ethertype

- Ethernet multicast: IGMP
- Ethernet OA&M CFM
- Q-in-Q: IEEE 802.1Q/ad
- QoS: IEEE 802.1p
- CoS
 - Guaranteed
 - Regulated
 - Best-effort
- STP/RSTP/MSTP/PVSTP: IEEE 802.1d/w/s
- Congestion avoidance
- ITU-T G.8032 v2 ERP
- Ethernet performance counters
 - Per port/aggregate/flow
 - Incoming/outgoing
 - Unicast
 - Multicast
 - Broadcast
- E-Line, E-LAN, Ethernet aggregation services in accordance with MEF

ISA-ES16

- 4.5 Gb/s throughput
- 2.5 Gb/s back-panel capacity
- 4 x GE (SFP), 14 x Ethernet 10/100Base-T, 7 x 10/100Base-FX
- GFP-F/LAPS, VCAT, LCAS
- LACP
- VC-12/VC-3/VC-4 terminations
- VC groups: maximum 64 at 63/12/8
- Classification/forwarding
 - Per port
 - MAC DA: IEEE 802.3
 - C-VLAN/S-VLAN
 - IEEE 802.1p
 - DSCP/ToS
 - Ethertype
 - MPLS label switching (pseudowire/tunnel)
 - MPLS EXP bits
- Ethernet and MPLS multicast, IGMP
- Martini encapsulation
- Q-in-Q: IEEE 802.1Q/ad
- QoS: IEEE 802.1p, MPLS

- CoS
 - Guaranteed
 - Regulated
 - Best-effort up to eight CoS
- Policing dual-rate token bucket, metering, marking, CIR/CBS, EIR/EBS, dropping (OOP)
- Scheduling HOL, weighted-deficit round robin
- Congestion-avoidance weighted random early detection (WRED) per queue
- STP/RSTP/MSTP/PVSTP: IEEE 802.1d/w/s
- ITU-T G.8032 v2 ERP
- Ethernet and MPLS performance counters
 - Per port/aggregate/flow
 - Incoming/outgoing
 - Unicast
 - Multicast
 - Broadcast
- Ethernet OA&M CFM
- E-Line/VLL, E-LAN/VPLS, Ethernet aggregation services in accordance with MEF

DVB-ASI

Unidirectional transparent transport

- CBR MPEG-n transport stream (TS)
 - Single program TS (SPTS)
 - Multiple program TS (MPTS)
- TS rate: 1.5 Mb/s to maximum 100 Mb/s with C-12 or C-3 granularity

Physical specifications

Power

- Station battery: -48 V DC / -60 V DC
- Power consumption: 250 W (typical)

Dimensions

Rack size

- Height: 2.2 mm
- Width: 600 mm
- Depth: 300 mm

Subrack size

- Height: 650 mm
- Width: 482 mm
- Depth: 250 mm

Regulatory compliance

Environmental

- Operating conditions:
ETS 300 019, class 3.2
- Storage conditions:
ETS 300 019, class 1.2
- Transportation conditions:
ETS 300 019, class 2.2
- ESD/EMC: ETS 300 386
"Telecommunications Center"

Mechanical

- Mechanical compatibility:
ETSI ETS/E3, S9

Operational

- Alcatel-Lucent 1350 Optical Management System (OMS)
- CMISE craft terminal through TIA/EIA-232 at 38.4 kb/s
- Network management access through QB3 G.773 interface or Qecc G.784
- Protocol stack and information model: according to ITU-T G.774 and ETSI rec. ISO-OSI; IP and SNMP tunneling over OSI
- Local and remote software download
- Remote inventory
- Housekeeping: six inputs plus two outputs
- Auxiliary channels
 - EOW
 - 4 x 64 kb/s G.703
 - 4 x TIA/EIA-232
 - 4 x V.11
 - 2 x 2 Mb/s G.703

Standards

- Compliant with all the latest relevant ITU-T standards
 - G.7041
 - G.7042
 - G.707
- ETSI
- ITU-T G.8032 v2 ERP
- ATM Forum
- IETF
- IEEE
- MEF 9, MEF 14, MEF 21 certified

