The Alcatel 1642 EM is a multiservice CPE that highlights Ethernet/Fast Ethernet ports with Layer 2 Ethernet switching functions to enable both point-to-point (E-line) and multipoint (E-LAN) Ethernet services.

The Alcatel 1642 Edge Multiplexer (EM), part of the Alcatel Optical Multiservice Node (OMSN) family, is an ideal space-saving, next generation multiservice building block for customer premises and business locations. It enables business, residential and mission-critical communications in the metro network, providing unmatched performance for its size.

The primary applications for the Alcatel 1642 EM product are found in the following areas:

> Delivery of QoS-based Ethernet and TDM services to customer premises and business locations
> Local and metropolitan rings
> Point-to-point links with intermediate drop/insert and/or regeneration stations
> Always-on, mission-critical communication

COST-EFFECTIVE CPE FOR MULTISERVICE OPTICAL ACCESS

The extension of SDH benefits to customer premises and business locations has become an established concept. Installation of compact optical equipment (CPE) for leased-line and public/private-company services to medium and large businesses is a reality in many access networks. The benefits can be summarized in the extensive end-to-end path control and monitoring capabilities offered by SDH networks. It is worthwhile adopting SDH technology even for the delivery of Ethernet services, bringing the benefits of SDH to the transport of data services. The variety of existing and future interfaces and services can be easily mapped into the SDH transport layer, adding the reliability and flexibility of SDH transport and providing a future-safe investment in new services.

ETHERNET VPN SERVICES AND LAN INTERCONNECTION

Data-aware features integrated into the Alcatel OMSN family through integrated service adapter (ISA) plug-in modules fully address the technical requirements of today's service providers, as well as the expected need to provide telecom operators with the latest, future-safe optical provisioning platforms.

The Alcatel 1642 EM features an Ethernet/Fast Ethernet card for the transport of reliable frame-based data interconnections in point-to-point, point-to-multipoint and shared-bandwidth ring applications. The capability to map Ethernet flows into multiple SDH resources using virtual concatenation dramatically boosts the survivability of the user data connection in the event of a network failure. ISA-ES1 blades can be hosted in the Alcatel 1642 EM and enable carrier-class Ethernet VPN and aggregation services in the metro network.

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Beyond mapping business and industrial Ethernet flows onto SDH network resources through standardized mechanisms such as GFP/LAPS, VCAT and LCAS (as specified in ITU G.7041, ITU G.7042 and ITU G.707), the ISA-ES1 series cards introduce wire-speed classification, policing and scheduling capabilities on a carrier-class Ethernet switching blade.

Per-customer traffic flow management with low bandwidth granularity, traffic segregation and per-flow QoS mechanisms are supported to enable service-oriented Ethernet networking. Two different blade options are available for the ISA-ES1 to meet the required capacity and features, providing the best cost-optimized Ethernet solution for different networking applications:

> ISA-ES1 3-port version, offering 2 x FE electrical plus 1 x FE optical ports on board, providing 155 Mb/s backpanel capacity and featuring GFP, VCAT, LCAS, VLAN/Q-in-Q with QoS support.
> ISA-ES1 8-port version, offering 8 x FE electrical ports on board, with the same features as the 3-port version.

Through the integration of Ethernet-switching capability on Alcatel 1642 EM Ethernet cards, not only point-to-point, but also point-to-multipoint applications and shared-bandwidth rings can be implemented. The resources required to connect several customer and business sites to provide Ethernet LAN interconnection services are drastically reduced.

Network-infrastructures owner must manage and transport new Ethernet-based revenue-generating value added services (VAS) at the lowest cost per bit, especially in the access network, where bandwidth is limited. The shared-bandwidth ring allows sharing of bandwidth between multiple users who are accessing the ring, using, for example, only 1 x VC-3 on each link for Ethernet traffic and leaving enough bandwidth for other revenue-generating services.

The Alcatel 1642 EM's Ethernet card gives service providers and public/private companies an optimized solution for providing Ethernet LAN interconnection services with incremental investments, exploiting the existing SDH infrastructure, thus avoiding the need to deploy a new overlay infrastructure, ultimately reducing both CAPEX and OPEX.

COMPACT, FLEXIBLE, DATA-ORIENTED, FUTURE-SAFE

The Alcatel 1642 EM is based on 2 x STM-1/4 (155 to 622 Mbit/s) line interfaces, up to 18 STM-1 equivalents full non-blocking HO SDH matrix and 12 STM-1 equivalents full non-blocking LO SDH matrix, clock reference and equipment control functions, all concentrated in a 1-slot wide compact card.

The equipment's shelf is physically formed in four parts: a middle-lower area where a main control board holds an STM-1/4 ADM, the upper part with up to four upper tributary boards and the left and right parts hosting the fan and power-access board.

Figure 1- Positioning the Alcatel 1642 Edge Multiplexer in the Network
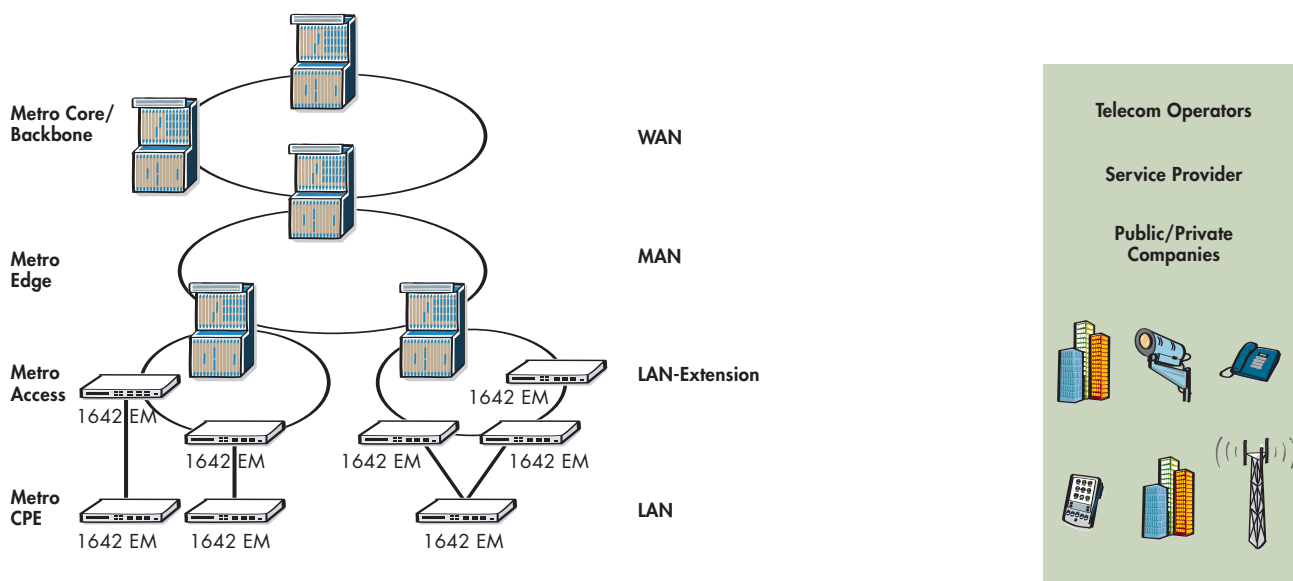
The system may be configured as an STM-1 add drop multiplexer (ADM) with a termination capacity of up to 112 x 2 Mb drop for metropolitan networks or as an STM-4 multiservice terminal multiplexer with 2 x STM-1 and 8 x E/FE interfaces, used to link several large offices to an enterprise network.

The Alcatel 1642 EM has a symmetrical architecture, allowing its application as terminal multiplexer, add-drop or mini cross-connect in spur, multiple rings or meshed topologies. All traffic ports (PDH, Ethernet or SDH) of the same type have the same functionality and behavior and there is no inherent split between tributaries and aggregates.

The Alcatel 1642 EM's resiliency makes it ideal as a multiservice transport node. In terms of hardware, the Alcatel 1642 EM has a centralized control architecture that limits the presence of processors and software to the compact ADM-1/4 card. Traffic ports have no on-board processors and may be reused from one piece of equipment to another, or retrieved from stocks without concern about software versions. The Alcatel 1642 EM also offers local and remote software downloads. In addition, service providers can also monitor subnets formed by the Alcatel 1642 EM, even in multivendor networks. Whether in telecommunications-office environments or at enterprise locations, the Alcatel 1642 EM has the right powering solution (DC or AC) and optional power redundancy can provide equipment protection.

Concerning traffic protection, sub-network connection protection (SNCP) with drop-and-continue function is provided for improved traffic availability, enabling the Alcatel 1642 EM to be inserted directly into access rings or to be connected to access rings via point-to-point, unprotected or protected links. SNCP also enables end-to-end protection of SDH paths. Dual hubbing to two distinct central-office transport nodes is also possible, e.g., via dual STM-4 uplinks.

The Alcatel 1642 EM paves the way to build unique optical-network infrastructures, supporting optimized transport and integrated networking functions for data applications, such as new Ethernet VPN services.

The Alcatel OMSN family consolidates the vast experience gathered by Alcatel in optical-network architectures through hundreds of thousands of installations worldwide. That's also where true reliability comes from.

Figure 2 - The Alcatel 1642 EMUS in Mission-Critical Communications
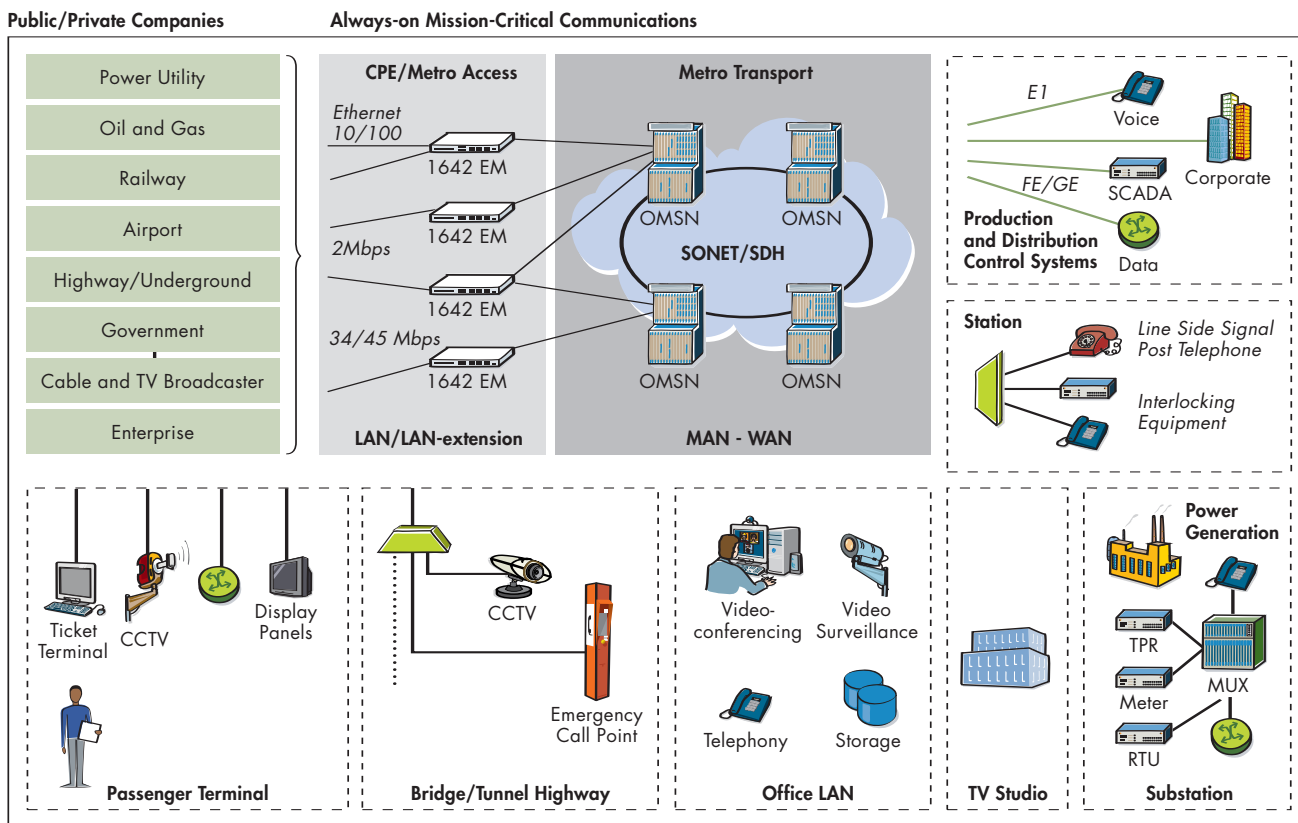
Technical Summary

Applications

> NG-SDH multiservice CPE
> Terminal multiplexer, ADM, multiple rings or meshed networks
> Multiservice metro-access context
> Stacked and subtended rings
> Private-line and Ethernet VPN services
> Single fiber working

Interfaces

> Network interfaces: Compact ADM function with 2 x STM-1 or 2 x STM-4 (S/L)
> Customer interfaces (four slots available each):
  ¬ 8/28/32 x 2 Mb/s (2 mm HM interface/RJ45/120 ohm)
  ¬ 8 x 2 Mb/s retiming (coaxial interface)
  ¬ 1 x 34/45 Mb/s
  ¬ 1 x STM-1 (electrical, S-1.1, L-1.1, or L-1.2)
  ¬ Up to 8 x Ethernet 10/100 Base-TX/FX

Connectivity

> Up to 18 x 18 STM-1 equivalent full non-blocking SDH fabric (HO) and 12 x 12 STM-1 equivalent full non-blocking SDH fabric (LO) in all configurations
> 6 x 6 STM-1 equivalent full non-blocking SDH fabric (HO/LO) in STM-1 configuration
> Unidirectional, bidirectional, broadcast connections
> Line and VC loopbacks
> Ethernet over SDH with L2 networking (e.g., VLAN/Q-in-Q) over mesh, rings, spurs

Equipment Protection

> -48 V DC power redundancy

Network Protection

> SNCP/I
> SNCP drop and continue
> MSP 1+1
> Collapsed single-node ring interconnection
> Collapsed dual-node ring interconnection

Monitoring

> Performance monitoring according to G.784, G.826, G.821
> Path overhead monitoring (POM) on 100 percent VCs
> Ethernet performance monitoring counters

Synchronization

> Internal oscillator ±4.6 ppm
> Holdover drift ±0.37 ppm per day
> External sources: STM-n/2 Mb/s ports, 1 external 2 Mb/s input/output
> Priority and quality (SSM) synchronization algorithms

Data Blades (ISA)

> Ethernet Switch (ES1):
¬ 1Gb/s throughput
¬ 155 Mb/s backpanel capacity
> ES1 8-port version:
  ¬ 8 x Ethernet 10/100Base-TX/FX
> ES1 3-port version:
  ¬ 2 x Ethernet 10/100Base-T + 1 x Ethernet 10/100Base-FX
  ¬ GFP-F/LAPS, VCAT, LCAS
  ¬ VC-12/VC-3/VC-4 terminations

¬ VC groups (maximum 8 at 21/2/1)
¬ classification/forwarding per port
¬ MAC DA 802.3, C-VLAN/S-VLAN, 802.1p
¬ Ethernet multicast
¬ Q-in-Q (802.1Q/ad)
¬ QoS 802.1p; STP/RSPT (802.1d/w/s)
¬ Ethernet performance counters per port/aggregate/flow, incoming/outgoing
¬ E-Line, E-LAN, Ethernet aggregation services

Power

> Station battery: -48 V DC, 220 V AC
> Power consumption: 40 W (typical)

Physical Dimensions

> Chassis size
  ¬ height: 88 mm
  ¬ width: 443 mm
  ¬ depth: 295 mm
> Installation options desktop: wall-mount, ETSI rack

Environment

> 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: ETSI EN300 386, "Other than Telecommunications Center" Class B

Operation

> CMISE craft terminal through RS232 at 38.4 kb/s
> Network management access through QB3 interface or Qecc G.784
> Local and remote SW download
> Remote inventory
> Housekeeping: 3 inputs plus 1 output
> Auxiliary channels: EOW, 12 x RS232

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