



# Alcatel 1640 FOX STM-1/4 Multi-Service Node for Customer Premises



## Broadband Optical Connectivity To The Business

Medium/large enterprises and corporates rely more and more on optical connectivity to the Metro network for their mission-critical applications.

By extending fiber optics to the business, Service Providers' telecommunication infrastructures can effectively support end-customers' business profitability, ensuring reliable services ranging from voice and data storage replication to high speed Internet Access and Ethernet Virtual Private Networks.

To fulfill such requirements, a high grade optical CPE (Customer Premises Equipment) is crucial. It has to offer the capacity and reliability to boost optical connectivity from end-customer applications to the metro network, supporting a wide differentiation of bandwidth-hungry services either TDM or Packet-based.

Alcatel 1640 FOX (Fiber Optics eXtension) is an ideal carrier-grade Optical Multi-Service CPE capable of delivering a flexible range of different services – ATM, Ethernet, Voice, TDM – supported by next generation SDH technology. Its is a compact (desktop or wall-mount) and scalable multi-service platform, which enables Service Providers to extend their service offerings and create new revenue opportunities – delivering optical access connectivity for enterprises and large businesses to the Metro.

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.

The Alcatel 1640 FOX is the Optical Multi-Service Node addressing Customer Premises applications.

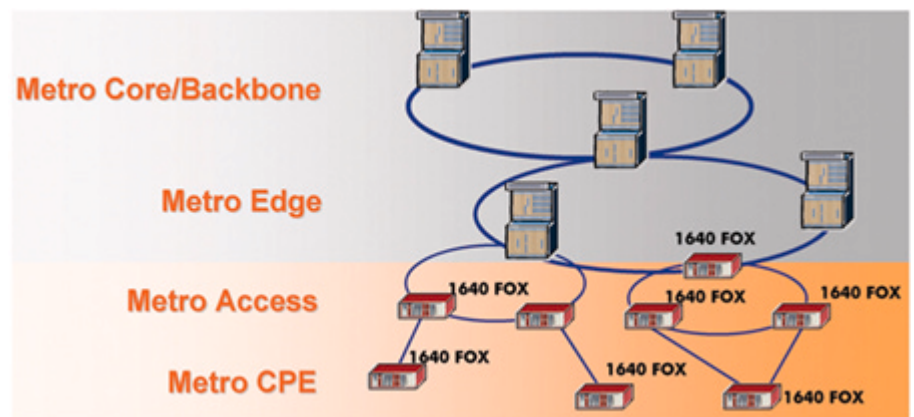


Fig. 1: How Alcatel 1640 FOX fits in the network

## A Compact, Data-Oriented, Multi-Service CPE

Alcatel 1640 FOX is a next-generation synchronous Multi-Service Node designed for carrying optical access services to customer premises over the fiber medium.

Ideally suited for wall-mount or desktop applications, thanks to its symmetrical architecture it can be configured as Terminal Multiplexer or Add Drop Multiplexer for deployment in spur, ring or meshed metro access network topologies.

Alcatel 1640 FOX provides STM-1 or STM-4 network interfaces for connection to the access network's central office. It can be equipped with a wide variety of customer interfaces: 2Mbps, 34Mbps, 45Mbps, STM-1 and STM-4 as well as Ethernet 10/100 and Gigabit Ethernet SX/LX interfaces for direct LAN interconnections.

It also supports Packet Ring Edge Aggregator capability, which provides Layer 2 Ethernet/MPLS functions with differentiated QoS.

## High-density Support for Large Uplink Capacity

The chassis of the Alcatel 1640 FOX has three card slots. One slot is for a Compact ADM-1 or ADM-4 card, which provides 2 x STM-1 or 2 x STM-4 connectivity to the optical access network, ideally suited for dual homing and high grade protection applications. The other two additional slots may host different interfaces – PDH, SDH or Packet – to serve multiple types of customer services, for example:

- > Up to 16 x 2Mbps, 34/45 Mbps
- > Up to 22 x Ethernet 10/100 Mbps
- > Up to 8 x Gigabit Ethernet SX/LX
- > ATM switch or Packet Ring/MPLS switch with elastic bandwidth tuning and traffic policing for diff-QoS

Alcatel 1640 FOX features unmatched performances in terms of both interface density and uplink capacity.

Multi-service optical protected connectivity for large enterprises is achieved – for example – by supporting simultaneously 4 x Ethernet 100Mbps full rate lines, plus 16 x 2Mbps TDM lines, plus one Gigabit Ethernet line, all 1+1 network protected.

## Multi-Service Applications

Alcatel 1640 FOX offers to operators the ability to deliver several different types of multi-protocol services and to fit into various network topologies. It can host ISA plug in modules performing Ethernet, MPLS and ATM switching functions.

The traffic originated and terminated by any customer interface may be directly mapped into SDH Virtual Containers (VCs) and transported transparently across the SDH network, or be processed by the ISA-ATM or Ethernet/MPLS switching modules for optimal aggregation and delivery of broadband data services, such as:

- > Leased Lines Services (PDH, SDH)
- > Voice Services
- > Metro Ethernet Services (Ethernet Private Lines, Ethernet L2-VPN, Internet Access)
- > DSL, LMDS, UMTS aggregation services

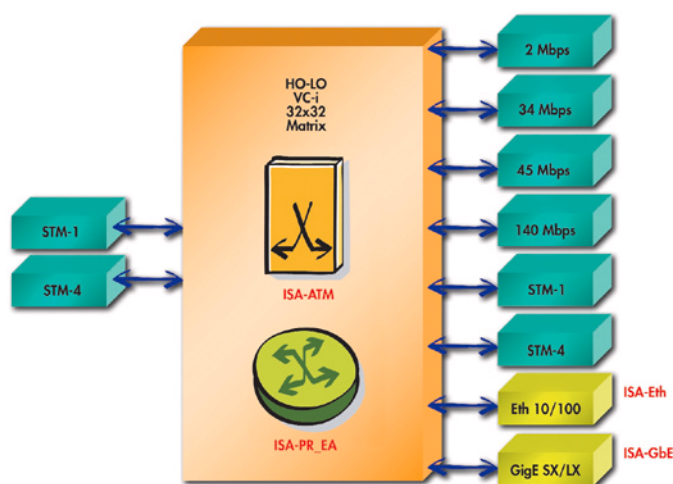
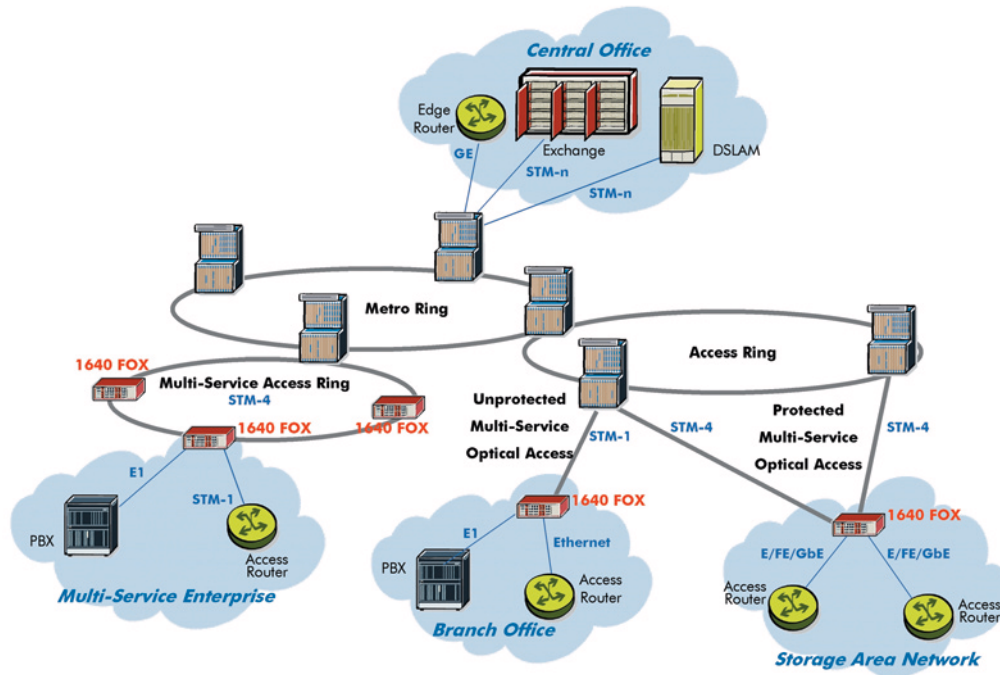


Fig. 2: Alcatel 1640 FOX block diagram

Fig. 3: Multi-service metro applications of the Alcatel 1640 FOX



The Alcatel 1640 FOX can act as an ideal multi-protocol transport device between carrier's and end-customer's networks. Besides, allowing consolidation of different traffic patterns (TDM, ATM, Ethernet, GbE) into either segregated or shared SDH Virtual Containers (pipes), it performs edge functions such as traffic shaping, policing and QoS guarantees.

Alcatel 1640 FOX may be connected to any other SDH node located in a central office or in an access ring. In the latter case Alcatel 1640 FOX may connect to the ring either as a spur of a ring node or as a ring node itself. Bi-directional working on a single fiber is available for metropolitan networks with fiber shortage.

## Network Optimization

Corporate connections to network operators' or service providers' Points Of Presence (POPs) are more and more characterized by data traffic, such as LAN switch or access router interconnects.

Alcatel 1640 FOX may be used to deliver IP or ATM backhauling services at variable bit rates, overcoming the rigidity inherent to the discrete tributary bit rates offered by SDH.

When Alcatel 1640 FOX is directly inserted into an access ring node, traffic coming from different clients can be groomed into common SDH Virtual Containers, by means of cell or packet-based statistical multiplexing.

The network operator can then optimize the transport bandwidth utilization for more revenue-generating services, minimize the interconnection costs to external data equipment and ultimately reduce investments for network upgrades.

As most of replaceable units (common parts and traffic cards) are shareable within the Optical Multi-Service Nodes family, Alcatel 1640 FOX allows carriers to balance the impact of spare holding and personnel training, which results in reduced investments and network operation costs.



## Technical Summary

### Applications

- > Terminal Multiplexer and Add Drop Multiplexer in protected or unprotected linear links, rings or meshed networks for multi-service optical access
- > Single fiber working
- > Metro Ethernet services (p2p, L2-VPN, Internet Access)

### Interfaces

- > Network interfaces: 2 x STM-1 or 2 x STM-4
- > Customer interfaces (two slots available each):
  - 16 x 2Mbps (ISDN-PRA)
  - 1 x 34Mbps
  - 1 x 45Mbps
  - 2 x STM-1 (S-1.1, L-1.1, L-1.2)
  - 1 x STM-4 (S-4.1, L-4.1, L-4.2, L-4.2JE)
  - 11 x Ethernet 10/100 Base-TX (ISA-Eth plug-in)
  - 4 x Gigabit Ethernet Base-SX/LX (ISA-GbE plug-in)

### Connectivity

- > 32x32 STM-1 equivalent full non-blocking SDH matrix (HO/LO) in all configurations
- > Unidirectional, bidirectional, broadcast connections
- > Line and VC loopbacks

### Protections

- > Linear MSP single and dual-ended
- > SNCP/I, SNCP/N
- > SNCP Drop & Continue

### Monitoring

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

### Synchronization

- > Internal oscillator  $\pm 4.6$  ppm
- > Holdover drift  $\pm 0.37$  ppm per day
- > External sources: STM-n/2Mbps ports, 1 external 2MHz/2Mbps output
- > Priority and Quality (SSM) synchronization algorithms

### Data Engines (ISA)

- > **ISA-ATM**: 600Mbps plug-in cell switch with STM-1 access on board; CBR, UBR, UBR+, VBR, GFR traffic contracts; point-to-multipoint from VC-12 up to VC4 payloads; policing and shaping; hard/soft PVCs connections (PNNI); equipment protection 1+1.
- > **ISA-PR\_EA** (Packet Ring Edge Aggregator): 1.6 Gbps plug-in switch with 4 x Ethernet 10/100 Base-TX interfaces or 1 x GE SX/LX on board; Eth/GFP and Eth/MPLS/POS ports VC-12 up to VC-4. MPLS label switch and VLAN-tag forwarding criteria. Packet classification (VLAN 802.1Q, priority 802.1p, IP-DA, IP-TOS, MPLS+exp) and dual rate leaky bucket traffic policing/metering. Integrated L2/L3 forwarding function. Ethernet Virtual Private Line and LAN Services support.
- > **ISA-Eth**: Rate-adaptive Ethernet 10/100 transport. ITU-T G.7041 GFP mapping on N x VC-12, N x VC-3, VC-4 with in service Bond.
- > **ISA-GbE**: rate-adaptive Gigabit Ethernet transport (ITU-T G.7041 GFP mapping on 1..4 x VC-4).

### Power

- > Station battery: -48 to -60 V dc
- > Ac mains: optional external AC/DC rectifier inclusive of 2h-battery backup (same cover as transmission chassis)
- > Power consumption: 35 W (typical)

### Physical Dimensions

- > Chassis size: 90W x 285H x 313D mm
- > Installation options: Desktop, wall-mount, ETSI rack

### 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
- > ESD/EMC: ETS 300 386, "Telecommunications Center" CLASS B

### Operation

- > CMISE craft terminal through RS232 at 38.4kb/s
- > Network management access through QB3 interface or Qecc G.784
- > Local and remote SW download
- > Remote inventory
- > Housekeeping: 4 inputs + 2 outputs
- > Auxiliary channels: 1 x RS-232, 1 x V.11

### Standards

#### > ITU-T/ETSI

In compliance to latest ITU-T/ETSI standards for SDH equipment

I.113, I.150, I.311, I.321, I.326, I.356, I.357, I.361, I.363.5, I.371, I.432.1, I.432.2, I.610, I.630, I.731, I.732, Q.2110 B-ISDN SAAL, Q.2130 B-ISDN SAAL, Q.2140 B-ISDN SAAL, ETS 300 298-1, ETS 300 298-2, EN 301 163-1-1, EN 301 163-2-1

#### > ATM Forum

af-bici-0013.003, af-cs-0127.000, af-nm-0020.000, af-nm-0020.001, af-nm-0095.001, af-phy-0046.000, af-phy-0064.000, af-pnni-0055.000, af-pnni-0066.000, af-pnni-0081.000, af-tm-0121.000, af-uni-0010.002

#### > IETF

MPLS (Ethernet over MPLS)

#### > IEEE

IEEE 802.3, IEEE 802.3u, IEEE 802.3x, IEEE 802.3z, 802.1q/p