Marconi OMS 1600, Optical MultiService Metro

Product Description

Release 2.x

ERICSSON ≡

Since January 2006, Marconi is a member of the Ericsson group.

OMS1664 Family
Multiservice Provisioning Platform

Release 4.4

Product Description

Document code:	**1AFA 60661 AAP-BAA**
Date of issue:	08–07-2005
Issue:	4.4
Comments:	Updated to include description for JE and STM16 Amplifiable card.

TABLE OF CONTENTS

List of Figures

List of Tables

List of Abbreviations

ADM	Add-Drop Multiplexer
ALS	Automatic Laser Shutdown
APS	Automatic Protection Switching
AUX	Auxiliary (Unit, Channels, Services)
CPU	Central Processing Unit
CWDM	Coarse Wavelength Division Multiplexing
DCN	Data Communication Network
DCF	Dispersion Compensation Fibre
DWDM	Dense Wavelength Division Multiplexing
DXC	Digital Cross–Connect
EMC	ElectroMagnetic Compatibility
EOW	Engineering Order Wire
EQP	EQuipment Protection
ETSI	European Telecommunication Standardization Institute
GbE	Gigabit Ethernet
GFP	Generic Framing Procedure
GigE	Gigabit Ethernet
GMPLS	Generalized Multi Protocol Label/Lambda Switching
IP	Internet Protocol
ITU-T	International Telecommunication Union, Telecommunications Sector
LAN	Local Area Network
LAPS	Link Access Procedure – SDH
LCAS	Link Capacity Adjustment Scheme (for Virtual Concatenated signals)
LT	Local Terminal
LTU	Line Termination Unit
MS	Multiplex Section
MSH	Product name for Marconi SDH multiplexer
MSP	Multiplex Section Protection
MSPP	Multiservice Provisioning Platform
MS-SPRING	Multiplex Section-Shared Protection Ring
MV36	Marconi Communications Element Level Management System
MV38	Marconi Communications Network Level Management System
NE	Network Element
NMS	Network Management System
OMS	Optical Multi Service
PDH	Plesiochronous Digital Hierarchy
PSU	Power Supply Unit
RMON	Remote Network Monitoring Management Information Base
SDH	Synchronous Digital Hierarchy
SETG	Synchronous Equipment Timing Generator
SFP	Small Form factor Pluggable optical module
SMA	Product name for Marconi SDH multiplexer
SNCP	Sub-Network Connection Protection
SoA	Service on Access, Network Management System
SOH	Section OverHead
TCM	Tandem Connection Monitoring
TM	Terminal Multiplexer
TMN	Telecommunication Management Network
VC	Virtual Container
VLAN	Virtual Local Area Network
VPN	Virtual Private Network
WDM	Wavelength Division Multiplexing

Foreword

The product information contained herein is independent by a product release and does not refer to a defined product release. The technical information and the estimated time scales provided in this document are offered, in good faith, as an indication of Marconi's intention to evolve its Optical Networks portfolio to meet the demands of the marketplace. Unless commercially agreed, the information contained herein should not to be taken as implying any commitment or obligation on the part of Marconi.

For details concerning availability and supported features please refer to the SDH Roadmap (including full features available for R2.2).

1   INTRODUCTION

1.1   Overview

The OMS1664 family Multiservice Provisioning Platform (MSPP) enables operators to respond profitably to the demand for emerging optical broadband services. The OMS1664 enables significant network simplification, and rapid and efficient delivery of multiple services. Designed specifically for an environment of growing demand for new data services, our new compact multiservice transport and switching platform can deliver traditional and new services cost-effectively, and incrementally and in line with emerging demand.

The OMS1664 family provides a single solution for MSPP supporting legacy TDM Services, Ethernet Leased Line Services, Internet Access Services and Virtual Private LAN Services, all on a single platform. It can be deployed on large customer premises or as a metro core aggregator, offering: reduced cost per port, flexibility – service type and volume, and switched data support.

The OMS1664 family combines Marconi's next-generation SDH technology with integrated data and WDM technology, providing data aggregation and switching, as well as high-capacity solutions. This compact, integrated network node provides network simplification with the cost savings that this brings. A unique, dual SDH/data bus architecture ensures future-proofing. Essentially, the OMS1664 family can evolve, in-service, from a predominantly SDH platform to a pure data switch as and when demand emerges. The platform offers an in-service upgrade to 10 Gbit/s and has a full non-blocking, 20–60 Gbit/s, VC-12 cross-connect capability, delivering both flexibility and capacity.

The OMS1664 family comprises of a standard-size unit with high hubbing capacity and a compact unit that uses the same cards and offers the same functionality, but with less traffic card capacity. For smaller networks two versions are available with smaller switch capacity.

Finally for large networks, two product types support the 384 x STM-1 switch matrix capacity, a standard-size shelf with extremely high hubbing capacity, and a compact shelf version with the same switch capacity, but with less traffic card capacity. They both have STM-64 capability.

The OMS1664 family provides a very high density solutions reducing space and power consumption whilst offering extreme flexibility. All multiplexers can be configured as Terminal, Add/Drop and Cross-connect multiplexers to work in line, ring, star or meshed networks. To allow cost-effective solutions at the boundaries to DWDM networks with Marconi products, embedded WDM coloured interfaces are provided.

The product is based on an extremely flexible internal SDH structure. As a result, it allows a more flexible traffic card to traffic card slot assignment.

Different applications require different protection options. The OMS1664 family supports all standardised types of traffic protection and equipment protection to ensure quality of service in all situations.

To reduce the number of different equipment types for SDH and Data traffic, the OMS1664 family introduces a range of data interface cards. This includes Ethernet functionality such as Fast/Gigabit ports, Layer-2 Aggregation feature, support of Generic Framing Protocol (GFP) and Link Capacity Adjustment Scheme (LCAS), as well as virtual and contiguous concatenation.

Due to these extensive integrated data features external data equipment can be saved in many applications.

Integrated network management control is achieved by different Management systems to enable interworking in different existing network management environments. All integrated SDH/PDH and Data functionality is managed by only one network management system. For details please refer to section 6.

1.2   Features and Benefits of OMS1664 family

- The OMS1664 family of Multiplexers are able to operate in networks with aggregate transfer rates from STM-1 up to STM-64. The features are mentioned below: Two shelves with three switch plane configurations using common cards and LTU's.

- Can operate as a STM-64 / STM-16 / STM-4 / STM-1 Terminal, Add/Drop and DCX multiplexer based on the same shelf and the same plug-in cards.

- A protected blocking free TDM switching matrix at VC-12 level. The switching capacity is from 64 x STM-1 / 128 STM-1 up to 384 x STM-1.

- Supports standard PDH and SDH bit rates from 2 Mb/s up to STM-64.

- Supports WDM Coloured Interfaces to CWDM or DWDM Networks.

- Supports STM-16/64 Boosters and Pre-Amplifiers for long haul span applications.

- Traffic cards with high port density, delivering extremely high numbers of ports within an equipment:
  -    126 times 2 Mb/s
  -        6 times 34/45 Mb/s
  -     16 times Fast Ethernet
  -      2 times Gigabit Ethernet
  -      8 times Gigabit Ethernet
  -     16 times STM-1
  -      4 times STM-4

- Flexible, customer configurable interfaces on a single card, e.g. a mixture of STM-1 and STM-4 ports, hot pluggable without disruption of operation of the other interfaces. This allows saving of cards if a small mix of ports are used and gives a more scaleable and cost effective solution.

- Support for Data traffic over SDH application based on:
  -   Fast Ethernet
  -   Gigabit Ethernet

- All traffic units, all of the system cards and all Line Terminating Units (LTUs) are identical in all products of the family. This provides benefit regarding reduced inventory and spares holding.

- Flexible use of LTUs, e.g. a mixture of 34 / 45 Mb/s ports together with a single traffic card.

- Supports linear, ring, star and meshed network topologies.

- Support of Tandem Connection Monitoring (TCM) in multi-network-operator applications.

- Supports protection mechanisms such as MSP, MS-SPRing, SNCP and EQP.

- Highly protected system architecture with protected switch and clock system

- Support of housekeeping contacts (input and output) for covering management of remote locations by the network management system.

- Support of Auxiliary data channels and Engineering Order Wire function (EoW) with handset and four wire analogue interface.

- Extensive management capabilities provided with access via Marconi Communications network management system ServiceOn Optical (MV36/MV38), ServiceOn Access or Local Craft Terminal.

- Interoperability with existing products of the SMA and MSH family.

1.3 MSP Platform Benefits

Saving money all round
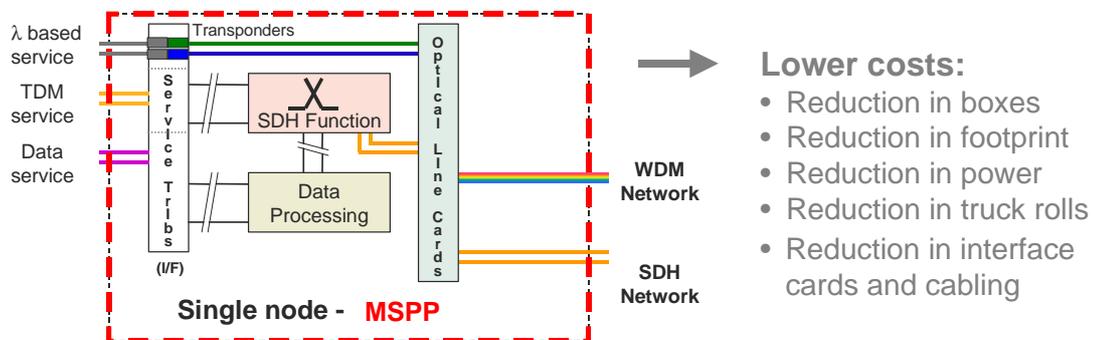
Figure 1: MSP Platform Benefits

- Retains SDH functionality for resilience, optical performance and legacy traffic.
- Data processed and mapped into SDH VCs.
- Common user interface (tributary) area.
- Scalable via internal bus architecture.
- Integrated WDM capability - e.g. coloured SFPs.
- Integrated management platform for configuration, performance and alarms.

1.4   OMS1664 Product Family Summary

The OMS1664 Family comprises two shelf sizes (standard and compact) each with three different switch plane configuratons i.e. 64 x STM-1, 128 x STM-1, and 384 x STM-1. Common cards and LTU's are used throughout, with the main difference being the shelf size and switch plane required.   This allows six possible configurations, for which their main features are described in more detail here on:

Shelf Type	Product Type	Switch Matrix (x STM-1)	Traffic Slots available (Max)	Line Capability (Max)
Standard Shelf	OMS1634	64	4x STM-8 and 4x STM-4	STM-16
	OMS1664	128	16x STM-16	STM-16
	OMS1684	384	16x STM-16	STM-64
Compact Shelf	OMS1644	64	6x STM-8	STM-16
	OMS1654	128	8x STM-16	STM-16
	OMS1674	384	8x STM-16	STM-64

Table 1:   OMS1664 Product Family Summary Table

Note: All OMS1664 Family products support the following common interfaces/cards:

<u>PDH/SDH</u>: 2M, 34/45M, STM-1 el/opt, STM-4, STM-16.
<u>Data</u>:   Fast Ethernet, Gigabit Ethernet, L2 Aggregation card (2x GE & 16x FE), Gigabit Ethernet card (8x GE ports per card).

Note: STM-64 is only supported by the OMS1684 and OMS1674.

1.5   Main Features of OMS1664 (Standard Shelf)

- Suited for covering maximum applications.

- Up to 16 highly flexible traffic slots, each of them supporting a capacity of STM-16. Each traffic slot can be used for every kind of traffic card (34 Mb/s up to STM-16, 2 Mb/s on dedicated traffic slots).

- Enables very high density interface solutions i.e. 504 x 2 Mb/s, 126 x STM-1 or 224 x Fast Ethernet

- All traffic cards (2 Mb/s up to STM-16), data cards (Fast Ethernet, Gigabit Ethernet, L2 Aggregation card), system cards (CCU, AUX/EoW) and LTU's are standard across the OMS1664 product family. The OMS1664 uses the 128 x STM-1 switch card.

1.6   Main Features of OMS1654 (Compact Shelf)

- Optimised for covering cost- and space-sensitive applications.

- Up to 8 highly flexible traffic slots, each supporting a capacity equivalent to STM-16. Four of them delivers LTU access and can be used for all cards which supports LTU access (34 Mb/s up to STM-1, FastE), 2 Mb/s on dedicated traffic slots).

- Enables high density interface solutions i.e. 126 x 2 Mb/s, 48 x STM-1 or 64 x Fast Ethernet.

- All traffic cards (2 Mb/s up to STM-16), data cards (Fast Ethernet, Gigabit Ethernet, L2 Aggregation card), system cards (CCU, AUX/EoW) and LTU's are standard across the OMS1664 product family. The OMS1654 uses the 128 x STM-1 switch card.

1.7   Main Features of OMS1644 (Compact Shelf)

- Optimised for covering smaller network applications prepared for further growing traffic demand.

- Similar to SMA Series 4 the use of core cards reduce the amount of necessary cards to build up a basic system. Each core card includes the functionality of a STM-16 line interfaces, a 64 x STM-1 switch @ VC-12 granularity and additional a synchronous equipment timing functionality (SETG). Two core cards can work in OMS1644 and deliver a protected line interface, switch and SETG.

- Up to 6 highly flexible traffic slots, each supporting a capacity equivalent to STM-8. Four of them delivers LTU access and can be used for all cards which supports LTU access (34 Mb/s up to STM-1, FastE), 2 Mb/s on dedicated traffic slots).

- Enables high density interface solutions i.e. 126 x 2 Mb/s, 32 x STM-1 or 64 x Fast Ethernet.

- All traffic cards (2 Mb/s up to STM-4), data cards (Fast Ethernet, Gigabit Ethernet, L2 Aggregation card), system cards (CCU, AUX/EoW) and LTUs are standard across the OMS1664 product family. The OMS1644 uses the Core card i.e. combined switch/line card, including the 64 x STM-1 switch matrix.

1.8   Main Features of OMS1634 (Standard Shelf)

- Optimised for covering smaller network applications prepared for further growing traffic demand, with the larger shelf capacity of the OMS1644 to offer extra traffic capability (especially PDH traffic).

- The use of core cards reduces the amount of necessary cards to build up a basic system. Each core card includes the functionality of a STM-16 line interfaces, a 64 x STM-1 switch @ VC-12 granularity and additional a synchronous equipment timing functionality (SETG). Two core cards can work in OMS1634 and deliver a protected line interface, switch and SETG.

- Up to 8 highly flexible traffic slots, with 4 slots each supporting a capacity equivalent to STM-8, and 4 slots each supporting a capacity equivalent to STM-4. All 8 of them deliver LTU access and can be used for all cards which supports LTU access (34 Mb/s up to STM-1, FastE, 2 Mb/s on dedicated traffic slots).

- Enables high density interface solutions i.e. 504 x 2 Mb/s, 32 x STM-1 or 96 x Fast Ethernet.

- All traffic cards (2 Mb/s up to STM-4), data cards (Fast Ethernet, Gigabit Ethernet, L2 Aggregation card), system cards (CCU, AUX/EoW) and LTUs are standard across the OMS1664 product family. OMS1634 uses the Core card i.e. combined switch/line card, including the 64 x STM-1 switch matrix.

1.9 Main Features of OMS1684 (Standard Shelf)

- Suited for covering maximum applications.

- Up to 16 highly flexible traffic slots, each of them supporting a capacity of STM-16. Each traffic slot can be used for every kind of traffic card (34 Mb/s up to STM-16, 2 Mb/s on dedicated traffic slots).

- Enables very high density interface solutions i.e. 504 x 2 Mb/s, 126 x STM-1 or 224 x Fast Ethernet

- All traffic cards (2 Mb/s up to STM-64), data cards (Fast Ethernet, Gigabit Ethernet, L2 Aggregation card), system cards (CCU, Switch, AUX/EoW) and LTU's are standard across the OMS1664 product family. The OMS1684 uses the 384 x STM-1 switch card.

- Additional 8 of the 16 traffic slots deliver capacity to support 4 times STM-64 interfaces (double slot width).

1.10 Main Features of OMS1674 (Compact Shelf)

- Optimised for covering cost- and space-sensitive applications.

- Up to 8 highly flexible traffic slots, each supporting a capacity equivalent to STM-16. Four of them delivers LTU access and can be used for all cards which supports LTU access (34 Mb/s up to STM-1, FastE), 2 Mb/s on dedicated traffic slots).

- Additionally 4 of that 8 traffic slots deliver capacity to support 2 times STM-64 interfaces (double slot width).

- Enables high density interface solutions i.e. 126 x 2 Mb/s, 48 x STM-1 or 64 x Fast Ethernet.

- All traffic cards (2 Mb/s up to STM-64), data cards (Fast Ethernet, Gigabit Ethernet, L2 Aggregation card), system cards (CCU, Switch, AUX/EoW) and LTUs are standard across the OMS1664 product family. The OMS1674 uses the 384 x STM-1 switch card.

1.11 Traffic Types

The OMS1664 family can carry different types of network traffic data. In addition to its capability of transferring standard SDH and PDH signals, it can also transfer / consolidate / switch / groom 10/100 Mb/s Ethernet or Gigabit Ethernet:

- **SDH** at rates of 155 Mb/s, 622 Mb/s and 2.5 Gb/s and 10 Gb/s.

- **PDH** at rates of 2 Mb/s, 34 Mb/s, 45 Mb/s.

- **Ethernet** at 10M, 100M and 1G traffic data rates traffic that offer an efficient and cost-effective means of interconnecting Ethernet devices.

2   Network Applications

2.1   General network level

Due to the increasing demand for bandwidth, the payloads of existing STM-1 and STM-4 multiplexers are exceeding their limits. An update to STM-16 multiplexer is essential to keep the network running. The OMS1664 can replace existing networks based on more stage PDH and SDH multiplexers by saving space and simultaneously increased network flexibility. Compliance with SDH standards and a common management solution also allows the OMS1664 family to be deployed in existing networks alongside current equipment. Due to its highly flexible architecture and features, it can drastically reduce the amount of equipment at one location. Additionally it delivers options to increase the network level up to STM-64. The OMS1664 family provides a solution that avoids the enormous costs of laying new fibre routes.

To illustrate the flexibility of the OMS1664 family, some special examples of network applications are shown below. Certainly, the OMS1664 family covers all standard SDH network structures like Add/Drop, Ring, Meshed and Star networks.

Below you can see a general SDH network application based on STM-64 down to STM-1 network level. The OMS1664 family in different compositions can cover all of these structures, optimised for each application in the different network levels.
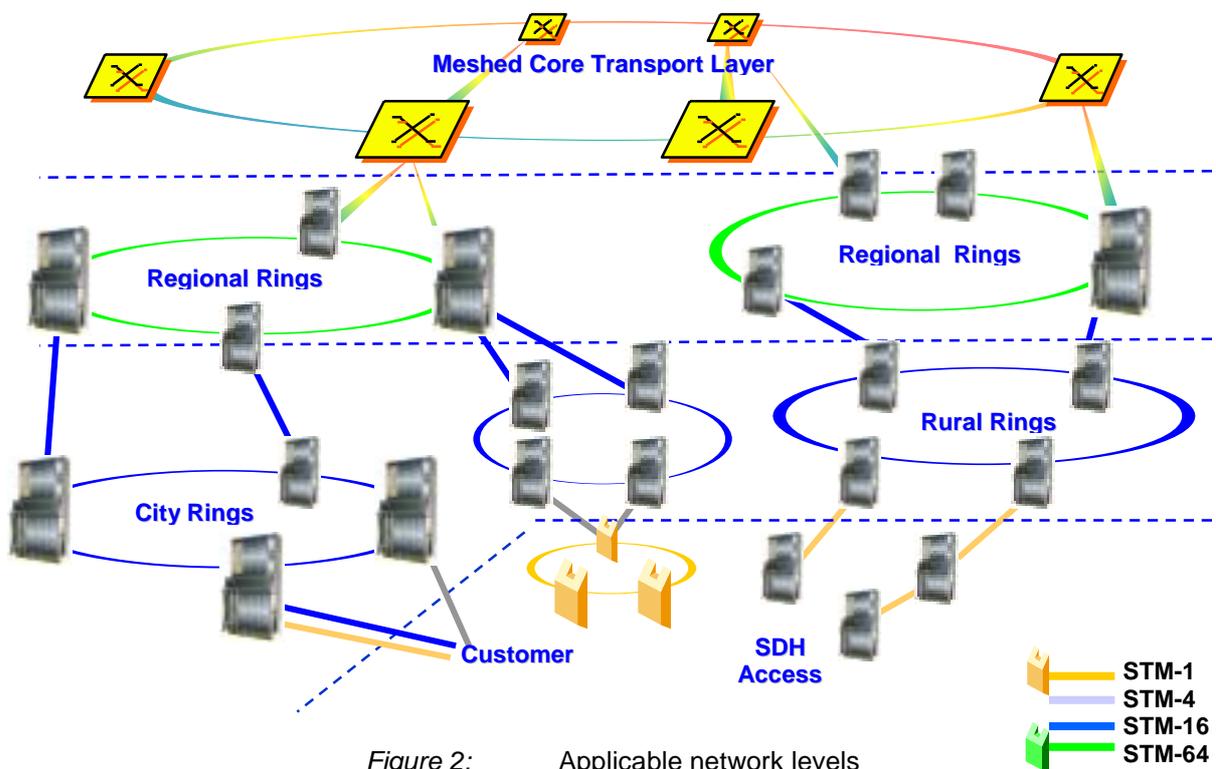
Figure 2:   Applicable network levels

2.2   Collapsing Network Layers

Layered networks are very common today. Coarse VC granularity (VC-4) multiplexers are used for the high bandwidth transport (e.g. STM-64) and at sites with PDH interfaces (e.g. 2 Mb/s), additional multiplexers with fine VC granularity (VC-12 and VC-3) into a VC-4 signal are situated.

STM-16 Rings
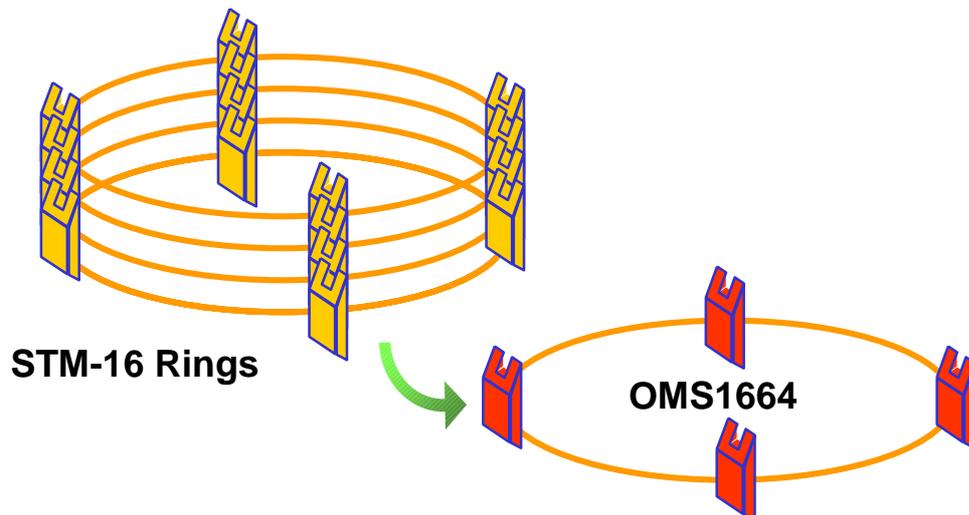
OMS1664

Figure 3:   Collapsing Network Layers

The OMS1664 family makes layered networks obsolete. The OMS1664 based network is able to transmit VC-12 and VC-3 beside VC-4 in STM-1/4/16/64 networks. Therefore the single box solution delivers dramatic network simplification and service deployment cost reduction.
It increases flexibility because OMS1664 serves almost any service without placing additional boxes. Mixed networks with VC-4 multiplexers are also possible. The OMS1664 family also enables easy upgrade from a STM-16 @ VC-12 to higher transport capacity with STM-64 by replacing the line interface and the switching card only.

2.3   STM-1 Consolidation with Bulk-2Mb Delivery

Due to continuously increasing traffic the existing 2Mb/s copper connections between villages/districts and the main PSTN switch have to be replaced by STM-1 lines or rings. Most of the STM-1s are only partly filled. To avoid transferring of "empty payload" through the network, the partly filled STM-1s should be consolidated at the edge of the network to optimise the existing network capacity. The OMS1664 is able to consolidate the used low order payload (n x VC-12 or n x VC-3) of up to 120 x STM-1 lines into one or more STM-16 signals. At the remaining PSTN switch a bulk-2M delivery will happen. The OMS1664 family is able to support up to 504 x 2M ports in only one shelf.
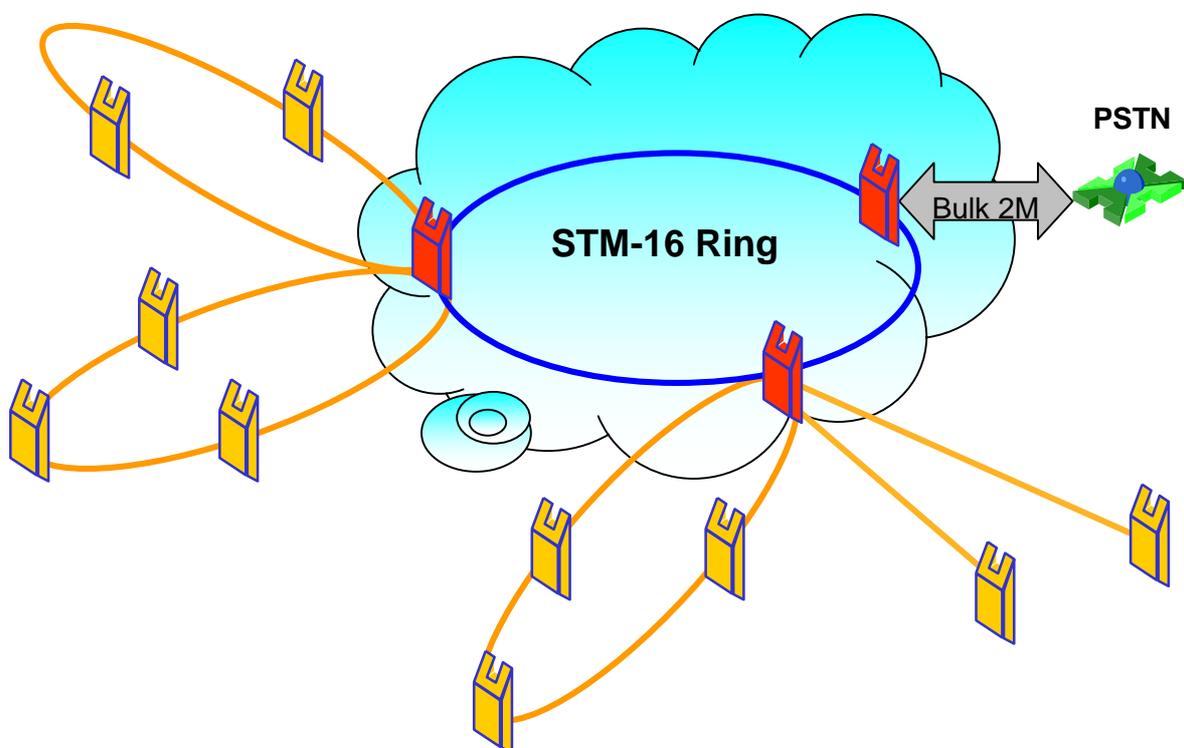
Figure 4:   Hubbing STM-1

2.4   Consolidated Ring Interconnect

Ring interconnection multiplexers connect two or more SDH ring networks to cross the traffic between the ring subscribers. The connection is based on STM-1 or STM-4 signals (also STM-16 possible).
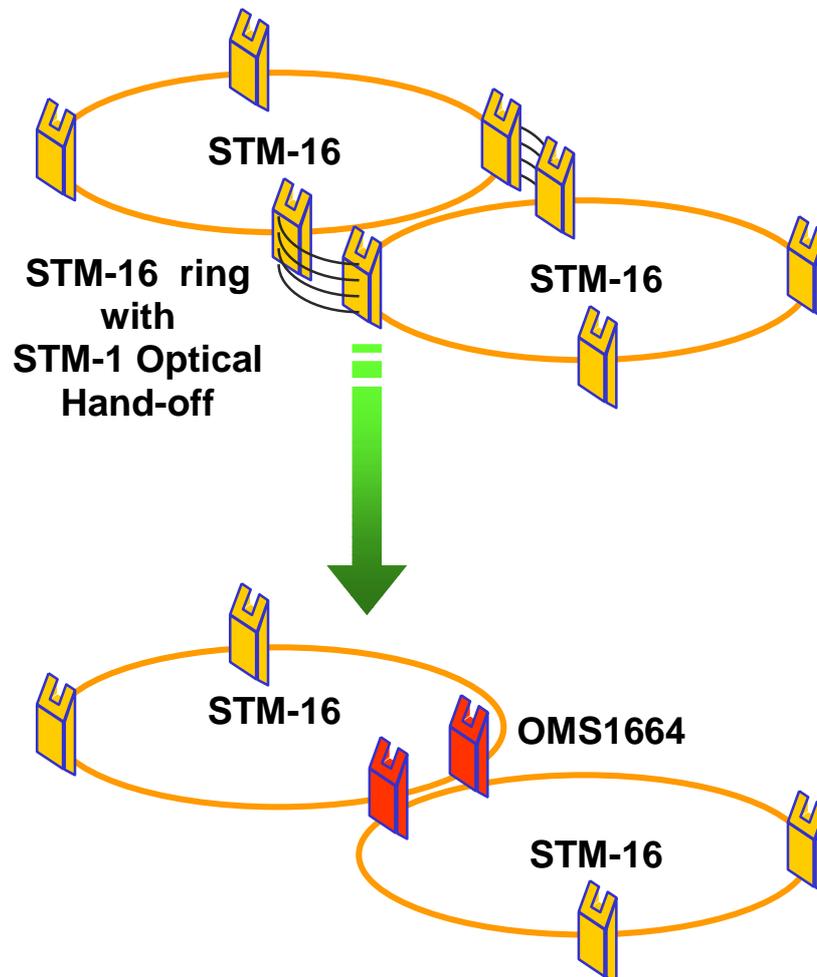
Figure 5:   STM-x ring interconnection

Replacing the traditional existing SDH Multiplexers with the OMS1664 family saves the second interconnection multiplexer, the interfaces between both multiplexers, and reduces the possibility of errors, the required space, power consumption and cost. Additionally, it reduces the numbers of managed network elements and the effort to reconfigure interconnection traffic.

Note: For STM-16: OMS1664 supports four fibre Dual Node Interconnection (DNI)
        For STM-64: OMS1664 supports two fibre Dual Node Interconnection (DNI)

2.5   Ultra Compact DXC Implementation

The OMS1664 family can be used as a DXC (digital cross connect multiplexer) on several network levels. It's possible to configure them like an STM-64, STM-16, STM-4 or STM-1 DXC, which is able to switch all signals on a VC-12 basis. The larger switch matrix for OMS1684 and OMS1674 (384 x STM-1), doubles the number of STM-1 lines (rings). The following number of aggregate lines can be used:

OMS1664 to OMS1684 **:**

STM-1	128 lines
STM-1	256 lines
STM-4	32 lines
STM-4	64 lines
STM-16	16 lines
STM-64	4 lines

OMS1674 **:**

STM-1	96 lines
STM-4	32 lines
STM-16	8 lines
STM-64	2 lines
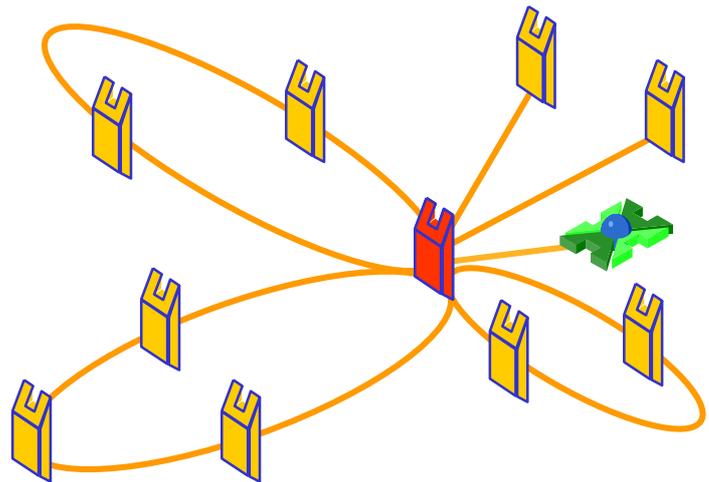
Figure 6:   Cross connect Multiplexer

2.6   Combined Ultra Compact DXC Implementation with Ring Interconnection

The flexibility of OMS1664 family, the size of switch matrix, and the large number of SDH interfaces reduces the costs of applications. For instance, the connectivity previously supplied by ring interconnection in a cross connect can be provided by a single SDH ring, giving dramatic network simplification and service deployment cost reduction.
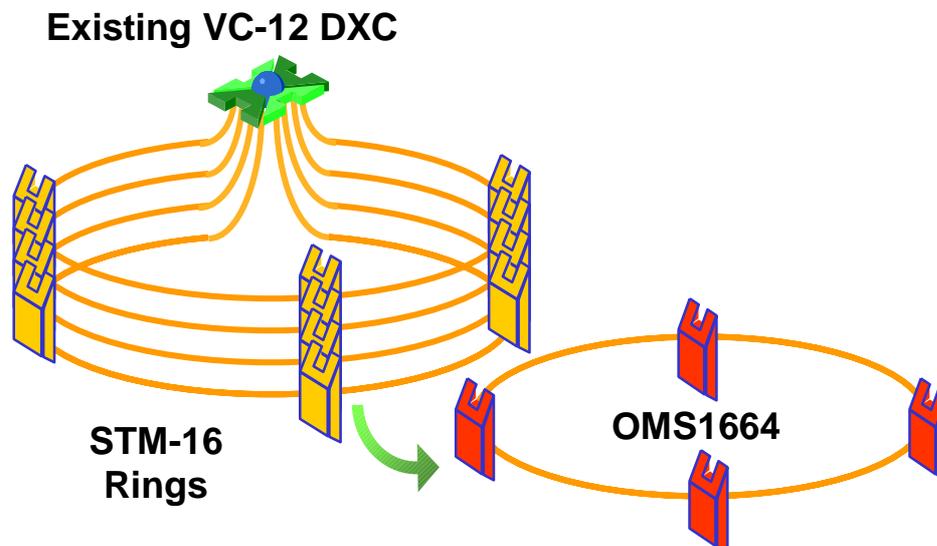
Figure 7:   Cross Connect Multiplexer

2.7 WDM Interworking

The OMS1664 family can also be equipped with STM-16 and STM-64 CWDM or WDM interfaces via SFPs, which allows direct connection to the WDM network layer without the need to use transponders, thus further reducing costs.
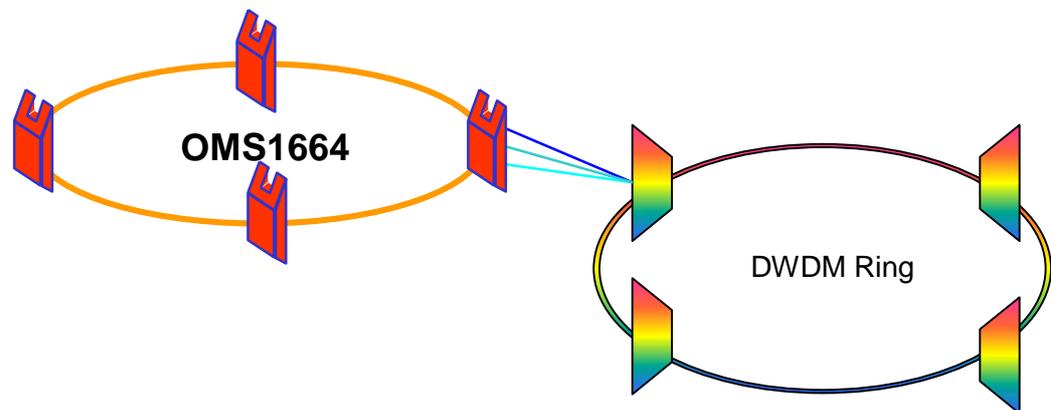
Figure 8:   WDM Interworking

2.8 Data Applications

2.8.1 Ethernet Private Line

Ethernet Private Line (EPL) is also known as Transparent LAN service. This application supports 10/100/1000M Ethernet signals. Multi-port Ethernet interfaces mean that more than one connection can be established. Each packet arriving from the end user LAN will be mapped via Generic Frame Procedure (GFP-F) into SDH virtual containers. The transfer capacity may be either a fixed or flexible leased line, resized via Link Capacity Adjustment Scheme (LCAS).
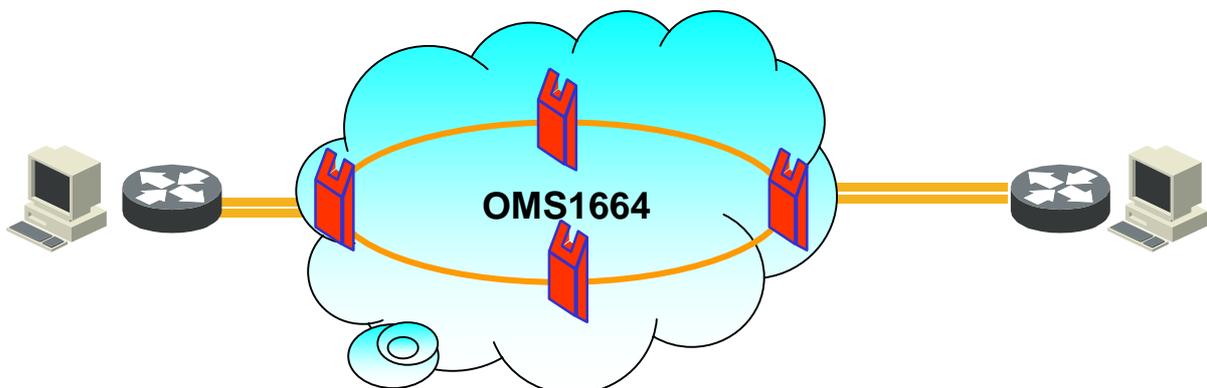
Figure 9:   Ethernet Private Line

2.8.2   Ethernet Virtual Private Line

Ethernet Virtual Private Line (EVPL) functionality supports flexible multipoint-to-multipoint configurations. Instead of using different VC groups, communication flows between location A-C and B-C may use the same VC group. In the EVPL service, the flows may share uncommitted capacity, allowing statistical gain and optimising the utilisation of network capacity.   The Multiplexed EPL service is also available, where the flows share the VC group but are both mapped into committed capacity.
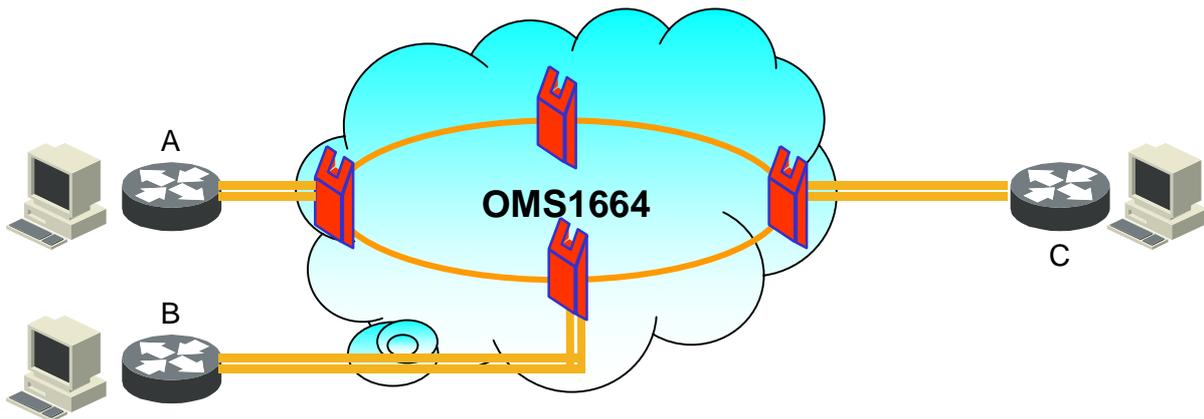
Figure 10:   Ethernet Virtual Private Line

2.8.3   Ethernet Aggregation

The Ethernet aggregation feature is able to collect traffic from several 10/100M Ethernet Access ports and aggregate them to only one combined set of flows delivered over a common interface, e.g. transfer to an Internet Service Provider (ISP). For traffic from each Ethernet Access port, as well as for traffic going to the resulting Aggregated traffic port, a virtually concatenated VC group can be defined, which can be re-sized by LCAS. The flow discrimination on the Aggregate traffic port is achieved using VLAN tags.
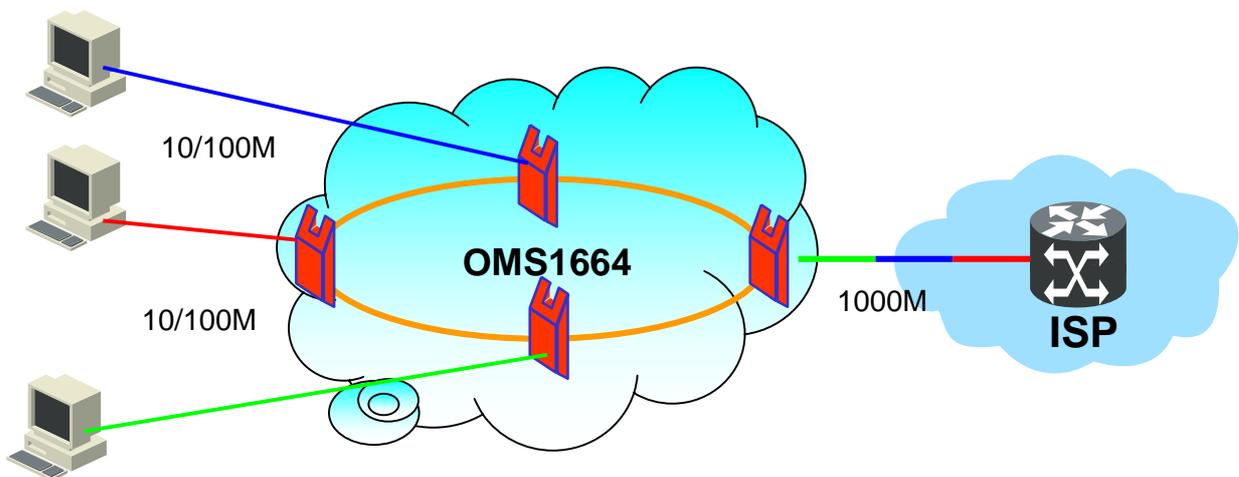
Figure 11:   Ethernet Aggregation

2.8.4 Ethernet "First Mile" Application

If the distance between the transport network and Ethernet equipment is larger than the Ethernet span (typically in customer locations), the Ethernet "first mile" enables connection distance Ethernet applications. This provides transport of Ethernet data from the customer location via optical fibre to the transport network which is formed by the OMS1664 family. The Network Termination Box (NT) at the customer location is remotely controlled by the network management.
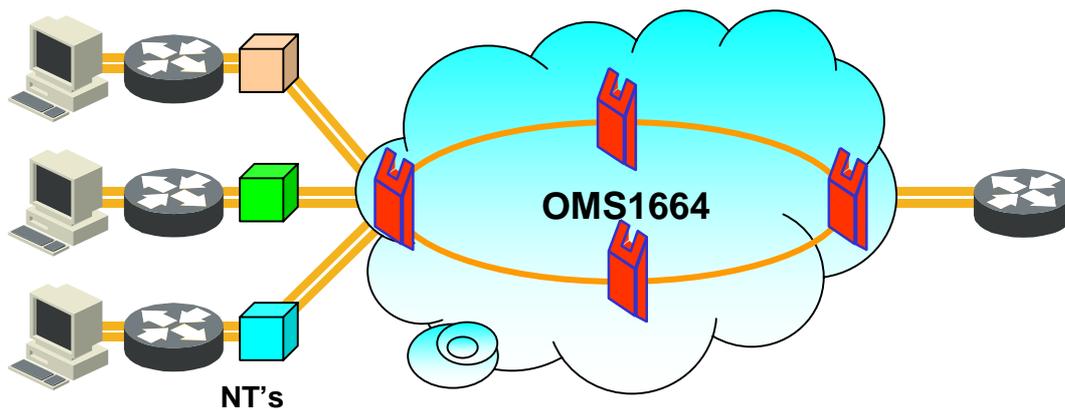
Figure 12:   Ethernet first mile

The OMS1664 family is able to support Ethernet first mile for 10/100/1000M Ethernet lines. 16 ports can be connected to a 10/100 Ethernet card or 2 ports can be connected to a Gigabit Ethernet card.

3   Product Overview

3.1   System Design

The OMS1664 family introduces a similar system design in each of the two shelves. It contains a Comms Controller Unit (CCU), an Auxiliary unit (AUX), a protected TDM switch, protected power supply LTUs with integrated power-off bridging capacity, and high capacity traffic slots.

The basic architecture of the OMS1664 family is based on a modular design solution. Depending on the amount of traffic, the available space and the cost, there is a choice of two shelves: a Standard shelf or a Compact shelf. The functionality of both shelves, of all interface cards and LTUs is fully identical. From a network provider view only the number of slots and therefore the number of supported traffic ports is different.

Compact shelf is
half the size of Standard shelf

Both shelves are able
to accommodate all the same:
- System Cards
- System LTUs
- Traffic Cards
- Traffic LTUs
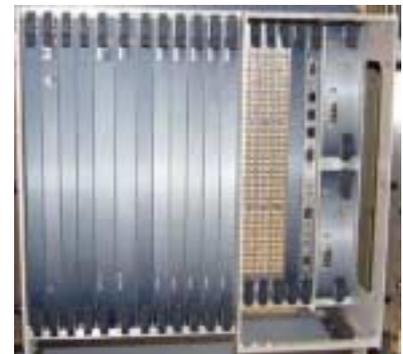
Figure 13:   Standard Shelf

Figure 14:   Compact Shelf

Additionally, the OMS1664 family doesn't distinguish between Line card and Tributary card, only between different traffic capacities like STM-4 and STM-16 etc. Each card can be used as Line or Tributary interface. Finally most of the traffic cards can be used in each slot, therefore the configuration can cover smaller and larger applications as required by the network.

3.2 Mechanical Solutions

To cover the full range of applications, from smaller up to large applications and ultimately to extended applications, OMS1664 family provides two different shelves. By combining the same units and LTUs in two shelves, OMS1664 family can provide in total six different multiplexer configuration types.

- Standard multiplexer shelf: OMS1684, OMS1664 and OMS1634
- Compact multiplexer shelf: OMS1674, OMS1654 and OMS1644

These are described in the following paragraphs.

All cards are hot-pluggable i.e. a card can be removed and inserted in service without impairing current traffic and can be configured from a local or remote terminal immediately.
Additionally each card supports fully front access to all connectors. Some connectors are located directly on the front of the card, others are accessible via the associated LTU.

3.2.1 OMS1664 Standard Multiplexer

Based on the Standard Shelf it accommodates all components and units necessary to cover large applications. It supports:

- 16 Traffic Slots
- 16 Traffic LTUs
- Protected TDM Switch Matrix (up to 128 x 128 STM-1 at VC12 level)
- Auxiliary Unit
- System LTUs for Power Supply, Clock, TMN and LCT Access

For more details about the maximum density of interfaces, please refer to the list below. Please note that this list explains the maximum number for one interface type. In practice, several different interfaces will be accommodated simultaneously in a shelf.

Interface Type	No. of ports		Comment
	per card	per shelf	
2 Mbit/s	126	504	Access via LTU in steps of 32 ports
34 / 45 Mbit/s	6	96	Configurable as: 6 x 34M, 6 x 45M, 3 x 34M + 3 x 45M
STM-1 el.	16	Up to 256	Mixture of electrically and optically ports are possible
STM-1 opt.	16	Up to 256	on a single card, modules are hot pluggable
STM-4	4	Up to64	
STM-16	1	Up to16	
CWDM	1	Up to16	CWDM SFP's plug into STM-16 SFP card
STM-64	N/A	N/A	Not supported (OMS1684 or OMS1674 required)
Fast Ethernet	16	224	2 x STM-16 line considered
Gigabit Ethernet	2	28	2 x STM-16 line considered
L2 Aggregation	2+16	28+224	2 x STM-16 line considered
Gigabit Eth. (8x)	8	64	8 x STM-16 line considered (see note1, page 29)

Table 2:   Number of interfaces offered by OMS1664

3.2.2 OMS1654 Compact Multiplexer

Based on the Compact Shelf it accommodates all components and units necessary to support medium applications. It supports:

- 8 Traffic Slots
- 4 Traffic LTUs
- Protected TDM Switch Matrix (up to 128 x 128 STM-1 at VC12 level)
- Auxiliary Unit
- System LTU for Power Supply, Clock and TMN Access

For more details about the maximum density of interfaces, please refer to the list below. Please note that this list explains the maximum number for one interface type. In practice, several different interfaces will be accommodated simultaneously in a shelf.

Interface Type	No. of ports		Comment
	per card	per shelf	
2 Mbit/s	126	126	Access via LTU in steps of 32 ports
34 / 45 Mbit/s	6	24	Configurable as: 6 x 34M, 6 x 45M, 3 x 34M + 3 x 45M
STM-1 el.	16	Up to 96	Mixture of electrically and optically ports are possible
STM-1 opt.	16	Up to 96	on a single card, modules are hot pluggable
STM-4	4	Up to 32	
STM-16	1	8	
CWDM	1	Up to 8	CWDM SFP's plug into STM-16 SFP card
STM-64	N/A	N/A	Not supported (OMS1684 or OMS1674 required)
Fast Ethernet	16	64	
Gigabit Ethernet	2	12	2 x STM-16 line considered
L2 Aggregation	2+16	12+64	2 x STM-16 line considered
Gigabit Eth. (8x)	8	24	4 x STM-16 line considered (see note1, page 29)

Table 3:   *Number of interfaces offered by* OMS1654

3.2.3   OMS1644 Compact Multiplexer

Based on Compact Shelf it accommodates all components and units necessary to support medium applications. It supports:

- 6 Traffic Slots
- 4 Traffic LTUs
- Protected TDM Switch Matrix (64 x STM-1 @ VC-12 level)
- Auxiliary Unit
- System LTU for Power Supply, Clock and TMN Access

For more details about the maximum density of interfaces, please refer to the list below. Please note that this list explains the maximum number for one interface type. In practice, several different interfaces will be accommodated simultaneously in a shelf.

Interface Type	No. of ports		Comment
	Per card	per shelf	
2 Mbit/s	126	126	Access via LTU in steps of 32 ports
34 / 45 Mbit/s	6	24	Configurable as: 6 x 34M, 6 x 45M, 3 x 34M + 3 x 45M
STM-1 el.	16	32	Mixture of electrically and optically ports are possible
STM-1 opt.	16	32	on a single card, modules are hot pluggable
STM-4	4	8	
STM-16	1	2	
CWDM	1	Up to 2	CWDM SFP's plug into STM-4/16 SFP Core card
Fast Ethernet	16	64	
Gigabit Ethernet	1	6	
L2 Aggregation	2+16	12+64	2 x Gigabit Ethernet and 16 x 10/100M Ethernet
Gigabit Eth. (8x)	8	16	2 x STM-16 line considered (see note1, page 29)

Table 4:   Number of interfaces offered by OMS1644

3.2.4 OMS1634 Standard Multiplexer

Based on Compact Shelf it accommodates all components and units necessary to support medium applications. It supports:

- 8 Traffic Slots
- 16 Traffic LTUs (Max)
- Protected TDM Switch Matrix (64 x STM-1 @ VC-12 level)
- Auxiliary Unit
- System LTU for Power Supply, Clock and TMN Access

For more details about the maximum density of interfaces, please refer to the list below. Please note that this list explains the maximum number for one interface type. In practice, several different interfaces will be accommodated simultaneously in a shelf.

Interface Type	No. of ports		Comment
	Per card	per shelf	
2 Mbit/s	126	504	Access via LTU in steps of 32 ports
34 / 45 Mbit/s	6	48	Configurable as: 6 x 34M, 6 x 45M, 3 x 34M + 3 x 45M
STM-1 el.	16	32	Mixture of electrically and optically ports are possible
STM-1 opt.	16	32	on a single card, modules are hot pluggable
STM-4	4	8	
STM-16	1	2	Line Interface Only (no STM-16 tribs allowed).
CWDM	1	Up to 2	CWDM SFP's plug into STM-4/16 SFP Core card
Fast Ethernet	16	96	64 ports, STM-8 BW slots + 32 ports, STM-4 BW slots
Gigabit Ethernet	1	8	4 ports, STM-8 BW slots + 4 ports, STM-4 BW slots (TBC)
L2 Aggregation	2+16	12+64	2 x Gigabit Ethernet and 16 x 10/100M Ethernet
Gigabit Eth. (8x)	8	32	2 x STM-16 line considered (see note1, page 29)

Table 5:   Number of interfaces offered by OMS1634

3.2.5   OMS1684 Standard Multiplexer

Based on the Standard Shelf it accommodates all components and units necessary to cover large applications. It supports:

- 16 Traffic Slots
- 16 Traffic LTUs
- Protected TDM Switch Matrix (up to 384 x 384 STM-1 at VC12 level)
- Auxiliary Unit
- System LTUs for Power Supply, Clock, TMN and LCT Access

For more details about the maximum density of interfaces, please refer to the list below. Please note that this list explains the maximum number for one interface type. In practice, several different interfaces will be accommodated simultaneously in a shelf.

Interface Type	No. of ports		Comment
	per card	per shelf	
2 Mbit/s	126	504	Access via LTU in steps of 32 ports
34 / 45 Mbit/s	6	96	Configurable as: 6 x 34M, 6 x 45M, 3 x 34M + 3 x 45M
STM-1 el.	16	Up to 256	Mixture of electrically and optically ports are possible
STM-1 opt.	16	Up to 256	on a single card, modules are hot pluggable
STM-4	4	Up to64	
STM-16	1	Up to16	
CWDM	1	Up to16	CWDM SFP's plug into STM-16 SFP card
STM-64	1	4	
DWDM	1	4	
Fast Ethernet	16	224	2 x STM-16 line considered
Gigabit Ethernet	2	28	2 x STM-16 line considered
L2 Aggregation	2+16	28+224	2 x STM-16 line considered
Gigabit Eth. (8x)	8	64	8 x STM-16 line considered (see note1, page 29)

Table 6:   Number of interfaces offered by OMS1684

3.2.6   OMS1674 Compact Multiplexer

Based on Compact Shelf it accommodates all components and units necessary to support medium applications. It supports:

- 8 Traffic Slots
- 4 Traffic LTUs
- Protected TDM Switch Matrix (up to 384 x 384 STM-1 at VC12 level)
- Auxiliary Unit
- System LTU for Power Supply, Clock and TMN Access

For more details about the maximum density of interfaces, please refer to the list below. Please note that this list explains the maximum number for one interface type. In practice, several different interfaces will be accommodated simultaneously in a shelf.

Interface Type	No. of ports		Comment
	per card	per shelf	
2 Mbit/s	126	126	Access via LTU in steps of 32 ports
34 / 45 Mbit/s	6	24	Configurable as: 6 x 34M, 6 x 45M, 3 x 34M + 3 x 45M
STM-1 el.	16	Up to 96	Mixture of electrically and optically ports are possible
STM-1 opt.	16	Up to 96	on a single card, modules are hot-pluggable
STM-4	4	Up to 32	
STM-16	1	8	
CWDM	1	Up to 8	CWDM SFP's plug into STM-16 SFP card
STM-64	1	2	
DWDM	1	2	
Fast Ethernet	16	64	
Gigabit Ethernet	2	12	2 x STM-16 line considered
L2 Aggregation	2+16	12+64	2 x STM-16 line considered
Gigabit Eth. (8x)	8	24	4 x STM-16 line considered (see note1, page 29)

Table 7:   Number of interfaces offered by OMS1674

Note 1: Ports per shelf column figures based on 50% of traffic on Ports, 50% on Line (Gigabit Ethernet x8 card).

4   Interfaces and cards

4.1   SDH Traffic Cards and LTUs

All optical SDH interfaces are according to ITU-T G.957/958 and support Automatic Laser Shutdown acc. to ITU-T G. 664. The optical connector is LC/PC and located at the front of the card.

4.1.1   Overview

SDH Units	Comment
STM-64 Card	STM-64 Line card
STM-16 Card	STM-16 Line or Tributary Card
STM-4 Card	STM-4 Line or Tributary Card
STM-1 or STM-4 Card + LTU	Flexible Multiport Card for STM-1 or STM-4
STM-1 Card + LTU	Flexible Multiport Card for STM-1

Table 8:   SDH Overview

4.1.2   Supported Application codes

Unit	SFP	No. of Ports	S/I x.1	S x.2	L x.1	L x.2	L x.3
STM-64	XFP	1	X	X		X	
STM-16	SFP	1	X		X		X
STM-4	SFP	Up to 2	X		X	X	X
STM-1/4	SFP	Up to 16xSTM-1 or 4xSTM-4	X		X	X	X
STM-1	Modules	Up to 8xSTM-1	X		X	X	

Table 9:   Supported SDH Application codes

4.1.3   STM-64 Card

The STM-64 card variants are double slot width, and OMS1684 supports 4 interfaces, whilst OMS1674 supports 2 interfaces. The optical interface is supported by use of XFP modules on the standard cards (I64.1, S64.2b, L64.2), and via fixed XFP optics for the Long Haul interfaces (V64.2b, UJE64.2/64.3).

4.1.4   DWDM Card

The STM-64 DWDM (10G) G709 card is double slot width, and OMS1684 supports 4 interfaces, whilst OMS1674 supports 2 Interfaces. The optical interface card is Tuneable across the band, 50G Spacing, 800ps/nm (100G card planned in R2.2).

4.1.5   STM-16 Card

The STM-16 card variants are one slot and can be fitted in all 16 traffic slots of the OMS1684/1664 and 8 in OMS1674/1654. The optical interface is supported by use of SFP modules, including support of the CWDM SFP's.

4.1.6   STM-16 Amplifiable Card

This is a single port fixed interface design (not SFP) with a nominal L16.2 budget. However the optical interface is designed to have extended dispersion tolerance. This allows the card to be used as a source for the Booster/Amplifier cards to provide extended reach to V16.2, U16.2 and ULJE16.2.

4.1.7   STM-16 Joint Engineered (JE) Card

This is a single port fixed interface design (not SFP) where the optical interface is designed to operate standalone over an extended reach of up to 120km.

4.1.8   STM-4 Card

The STM-4 card uses one slot and can be fitted in all 16 traffic slots in OMS1684/1664, 8 in OMS1674/1654/1634 and 6 in OMS1644. It delivers two SFP modules, allowing the card to be used with one or two optical STM-4 ports.

4.1.9   STM-1 / STM-4 Card + LTU

The flexible STM-1/4 card/LTU combination uses one card slot and one LTU slot and can be fitted in all 16 slots in OMS1684/1664, up to 8 in OMS1674/1654/1634 and up to 6 in OMS1644. In Compact shelf the number of usable LTUs is four. The card/LTU combination supports up to 8+8 SFP modules that can be configured in different options:

	Card only					Card + LTU				
STM-1	8	6	4	2	0	16	12	8	4	0
STM-4	0	1	2	3	4	0	1	2	3	4

Table 10:   No. of STM-1 / STM-4 Ports

The STM-x ports on the LTU can be protected by card protection, the STM-x ports on the card can be protected by MSP.

4.1.10 STM-1 Card + LTU

The flexible STM-1 card/LTU combination card uses one card slot and one LTU slot and can be fitted in all 16 slots in OMS1684/1664, up to 8 in OMS1674/1654/1634 and up to 6 in OMS1644. It supports up to 4+4 STM-1 modules (Card+LTU) which contain 2 STM-1 ports on each module. There are optical and electrical modules available. The modules are hot plugable. Therefore the card/LTU combination can be configured in different options:

	Card only			Card + LTU				
STM-1o	4	2	0	8	6	4	2	0
STM-1e	0	2	4	0	2	4	6	8

Table 11:   No of STM-1 electrical / optical Ports

The STM-x ports on the LTU can be protected by card protection, the STM-x ports on the card can be protected by MSP.

4.1.11 Boosters and Pre-Amps (Long Haul Applications)

A summary of the Long Haul Interfaces available for the OMS16xx family is shown in Table 12 below, including maximum distances achieved, traffic rate, and description for each type of interface. Please note the STM-64 interfaces are only applicable to OMS1684 and OMS1674.

Interface	Distance (km)	Traffic Rate	Comments
V16.2	120	STM-16	U/V 16.2 with Amp card + Low Power Booster
U16.2	160	STM-16	U/V 16.2 with Amp card + Low Power Booster + Pre-Amp
ULJE16.2	190+	STM-16	U/V 16.2 with Amp card + High Power Booster + Pre-Amp
V64	100	STM-64	V64.2 XFP card
V64.2b	120	STM-64	V64.2 XFP card + Low Power Booster
UJE64.2b	160	STM-64	V64.2 XFP card + High Power Booster + Pre-Amp

Table 12:   Long Haul Applications summary table

4.1.12 DCF's required for Long Haul Applications

For certain 10G Long Haul Applications (2.5G not normally required), fibre dispersion compensation may be required if the dispersion of the fibre link exceeds that of the OMS16xx Line Interface cards (see "OMS1664 Power Consumptions, MTBFs, Dimensions and Weights" document on the ON ND&BS enabling intranet web site for interface parameters). In which case DCF's will need to be included on the Line Interface to compensate for the extra dispersion of the link. The MHL3000 DCF's are used for this purpose, with No VOA versions being recommended as these are cheaper and have less loss than the VOA variants e.g. DCM SMF C-20 No VOA (20km) – SE: LU12WV. The No VOA variants range between 20km and 80km fibre dispersion compensation. Two DCF modules can fit into each DCF Subrack (LU10T), which can be installed in the equipment rack of the OMS16xx.

4.1.13 CWDM Interfaces and Filter Tray

The CWDM optical interfaces are supported by use of SFP modules, which plug-in to the STM-16 SFP card (1 per card). Currently there are available 8 Channels for Short Haul, and 8 Ch's for Long Haul applications.

The Filter Tray (Telect subrack 3 drawer Tray) is housed in the Rack outside the OMS16xx subrack, and contains the set of Optical Add & Drop CWDM Mux/Demux Filters which allow the CWDM channels to be Muxed/Demuxed to the aggregate Line side (single fibre pair). The filters available are shown in Table 13 below.

Mux/Demux unit (Filter)	Wavelengths	Channels
4 Ch	1531nm to 1591nm	CH 12-15
8 Ch	1471nm to 1611nm	CH 9-16 (under review)
8 Ch with expansion to 16 Ch	1471nm to 1611nm	CH 9-16
8 Ch	1311nm to 1451nm	CH 1-8

Table 13:   CWDM Filter summary table

4.2 PDH Traffic cards and LTUs

All PDH interfaces are according to ITU-T G.703/704, the connectors are 37 pin D-Sub for balanced 2M ports or Coax 1.0/2.3 for unbalanced 2M and 34/45M ports.

4.2.1 Overview

Common PDH Tributary Cards/LTUs	Comment
2M card	For each card up to four LTUs are necessary
2M LTU	Balanced and unbalanced supported
34/45M card	For each card one LTU is necessary
34/45M LTU	Configurable as 6x34M, 6x45M, 3x34M and 3x45M

Table 14: PDH Overview

4.2.2 2M Card

The 2M card uses one card slot and can be fitted in 4 slots in OMS1684/1664/1634, 1 slot in OMS1674/1654 and 1 slot in OMS1644. The slots for 2M cards are dedicated slots, which can also be used for non 2M cards where 2M is not needed to cover the target application. A 2M card delivers 126 x 2M or 32 x 2M (dependent on the variant) and needs up to four 32 x 2M LTUs for connecting the cables. The card can be protected in a 1:4 card protection mode.

4.2.3 2M LTU

The 2M LTU uses one LTU slot and can be fitted in 16 slots in OMS1684/1664/1634, 4 slots in OMS1674/1654 and 4 slots in OMS1644. The slots for 2M LTUs are dedicated slots which can also be used for non 2M LTUs where 2M is not needed to cover the target application. A 2M LTU delivers 32 x 2M. There are LTUs for balanced 2M or unbalanced 2M lines available.

4.2.4 34/45M Card

The 34/45M card uses one card slot and can be fitted in 16 slots in OMS1684/1664, 8 slots in OMS1634, 4 slots in OMS1674/1654 and 4 slots in OMS1644. The card can be protected in a 1:1 up to a 1:15 card protection mode.

4.2.5 34/45M LTU

The 34/45M LTU uses one LTU slot can be fitted in 16 slots in OMS1684/1664, 4 slots in OMS1674/1654 and 4 slots in OMS1644/1634. The LTU can be configured remotely by LCT to work in different modes: 6 times 34M or 6 times 45M or 3 times 34M and 3 times 45M.

4.3   Ethernet Traffic Units

4.3.1   Overview

These cards enable the OMS1664 family equipment to transfer Ethernet over SDH to save external Ethernet equipment and manageability from only one Network Management System. In these applications, the network provider saves on the high prices of G.703 interfaces or STM-x interfaces typically required for his own data equipment to connect them to a traditional SDH multiplexer. To allocate transport capacity according to the target application, the equipment allows the configuration of various numbers and types of VC groups. Mapping and resizing of allocated VCs will be provided acc. to ITU standards to ensure the interoperability of equipment.

Data Tributary Cards/LTUs	Comment
Fast Ethernet card	Delivers 16x10/100M in combination with a LTU (see next lines)
Fast Ethernet LTU electrical	For 10/100M Ethernet card or Layer 2 Aggregation card, supporting RJ-45
Fast Ethernet LTU optical	For 10/100M Ethernet card or Layer 2 Aggregation card, supporting SFP modules
Gigabit Ethernet card	Delivers 2 x Gigabit Ethernet ports by SFPs
Layer 2 Aggregation card	Delivers 2 x Gigabit Ethernet ports by SFPs and for 16 x 10/100M Ethernet ports by LTU (see above)
Gigabit Ethernet card (8xGigE)	Delivers 8 x Gigabit Ethernet ports by SFPs

Table 15:   Ethernet Overview

4.3.2   Fast Ethernet (FE) Card and LTU

The FE card uses one card slot and can be fitted in 16 slots in OMS1684/1664, 8 slots in OMS1634, 4 slots in OMS1674/1654 and 4 slots in OMS1644. A FE card delivers 16 x 10/100M and supports a LTUs for connecting cables or fibres. An 24 x 10/100 Ethernet Ports (SFPs) card is planned in R2.2.

10/100 Mb/s Ethernet Interfaces	Comment
Interface acc. to IEEE 802.3	10Base-T, 100Base-TX, 100Base-FX
Mapping acc. to	GFP-F (ITU-T G.7041)
Mapping into virtual container	VC-12-nv [n = 1...63] VC-3-nv [n = 1...3] VC-4
Supported frame size	Up to 1600 bytes
Resizing of transfer capacity acc. to	LCAS (ITU-T G.7042)
Connector	RJ-45 or LC

Table 16:   Technical Details of FastE Card

4.3.3   Gigabit (GigE) Ethernet Card

The GigE card uses one card slot and can be fitted in 16 times in OMS1684/1664, 8 times in OMS1674/1654/1634 and 6 times in OMS1644. A GigE card delivers 2 x Gigabit ports via two SFP modules at the front side of the card. For efficient using of SDH capacity the used VC-groups can be defined as contiguous or virtual concatenated VC group, re-sized by LCAS and the data will be mapped according to GFP-F or LAPS to be compliant with 3rd party equipment.

Gigabit Ethernet Interfaces	Comment
No. of interfaces per unit	2
Interface acc. to IEEE 802.3	1000Base-SX, 1000Base-LX/LH, 1000Base-ZX
Mapping acc. to	GFP-F (ITU-T G.7041) or LAPS (ITU-T X.86)
Mapping into virtual container	VC4-4c or VC-4-nv [n = 1...8]
Supported frame size	Up to 1600 bytes
Resizing of transfer capacity acc. to	LCAS (ITU-T G.7042)
Connector	LC

Table 17:   Technical Details of GigE Card

4.3.4   Layer 2 (L2) Aggregation Card

The L2 card uses one card slot and can be fitted in 16 slots in OMS1684/1664, 8 times in OMS1674/1654/1634 and 6 times in OMS1644. A L2 card delivers 2 x Gigabit ports via SFP modules at the front side of the card and additional 16 x 10/100M Ethernet ports via LTU.

L2 Aggregation Ethernet Interfaces	Comment
No. of Gigabit Ethernet ports per card	2
No. of Fast Ethernet ports per LTU	16
Interface acc. to IEEE 802.3	1000Base-SX, 1000Base-LX/LH, 1000Base-ZX
Mapping acc. to	GFP-F (ITU-T G.7041)
Mapping into virtual container	VC-12-nv [n = 1...46] VC-3-nv [n = 1...3] VC4-4c or VC-4-nv [n = 1...8]
Resizing of transfer capacity acc. to	LCAS (ITU-T G.7042)
Supported applications	EPL, Multiplexed EPL, EVPL, Access to IP Networks over Ethernet
Connector	LC for optical and RJ-45 for electrical connectors

Table 18:   Technical Details of L2 Card

4.3.5   Gigabit Ethernet Card (8xGigE)

The Gigabit Ethernet card uses one card slot, allowing 16 times in OMS1684/1664, 8 times in OMS1674/1654/1634 and 6 times in OMS1644. The card delivers 8 x Gigabit Ethernet ports via eight SFP modules on the front of the card.

L2 Aggregation Ethernet Interfaces	Comment
No. of ports per card	8
Supported protocolls	Fast Ethernet, Gigabit Ethernet
Interface acc. to IEEE 802.3	1000Base-SX, 1000Base-LX/LH, 1000Base-ZX
Mapping acc. to	GFP (ITU-T G.7041) GFP-F for Gigabit Ethernet
Mapping into virtual container	VC-4-nv [n = 1...7] for Gigabit Ethernet
Resizing of transfer capacity acc. to	LCAS (ITU-T G.7042) for FC and GigE
Supported applications	Point to Point
Connector	LC

Table 19:   Technical Details of GigE Card

4.4   System Units

4.4.1   Overview

Common System Units	Comment
Comms Controller Unit (CCU)	For all of OMS1664 family
TDM Switching Unit	For OMS1684/1664 and OMS1674/1654 (can be protected). Function included in Core card for OMS1644/1634 (can be protected).
AUX/EOW Unit	For all of OMS1664 family supporting Auxiliary Data Channels, EOW Handset and 4-wire interface to an external PSTN Interface box
Alarms & Auxiliary LTU	For all of OMS1664 family
Power LTU	For all of OMS1664 family (can be protected)
Management and Sync LTU	For all of OMS1664 family, delivering T3/T4 clock interfaces and TMN interface

Table 20:   System Units Overview

4.4.2   COMMS Controller Unit

The Communication and Controller Unit provides the complete microprocessor-based management system, supporting both Equipment Management Functions and Management Communications Functions**.** The Communication and Controller Unit supports the 'F' interface for Local Terminal access and the 'Qx' Ethernet interface for NMS access.

This unit supports high level control and provides access to DCC of the SOH's allowing management traffic to be directly connected to the equipment via an Ethernet interface and transported to other nodes.

It also provides the memory for system software in two memory banks. One contains the running software release, the second can be used for downloading a new system software release during operation. After completion the CCU can be instructed to switch over. For remote control of equipment locations the CCU also provides housekeeping user contacts, inputs and outputs.

4.4.3   TDM Switching Unit

All internal and external traffic passes through the TDM switch unit. In addition, data traffic is packed in VC's to transfer them to an adjacent card or to a remote multiplexer.

It can be protected to cover switch fault situations. The unit can switch each signal @ VC12 level between a source interface unit and a destination interface unit. It can also switch bi-directional signals, unidirectional signals and broadcast messages. The TDM switch size can be chosen from 64 x STM-1 to 128 x STM-1 up to 384 x STM-1.

Additional the SETS functionality is located at a TDM Switch Unit and therefore can be protected to clock the system at:

- T1   from two independent STM-N input signals per slots (in total up to 32 sources)
- T2   from two independent 2 Mb/s input signal per slots
- T3   from one of the two T3 connectors on Management and Sync LTU
- SETG   Internal oscillator with 4.6 x10^{-6} stability

Each SET also delivers a T4 signal to clock external systems. The connectors are located on the Management and Sync LTU.

4.4.4   Auxiliary Unit

Installing an Auxiliary unit provides operators with configurable access to selected OH bytes of terminated SOH's. Installing the appropriate physical interface unit will accommodate digital port interfaces for customised auxiliary data channel transport via 64kBit/s channels acc. to ITU-T G.703 or V.11 standard. Access to all interfaces is given by the AUX-LTU. Additionally a handset for Engineering Order Wire functionality and a Four-Wire Interface is available.

4.4.5   Power LTU

Distributed power supply units (PSU) operate at a nominal battery voltage of –48V and –60V. The connection to the battery can be protected. During external power break down of less than 16ms the integrated buffer capacity will ensure an error free operation.

4.4.6   Management and Sync LTU

A common LTU for Synchronisation as well as TMN and LCT access is provided.

4.4.6.1   Synchronisation Interface

Management and Sync LTU supports access for:

- Two T3 clock inputs according to G.703/G.704
- Two T4 clock outputs according to G.703/G.704

4.4.6.2   TMN and LCT (Management) Interface

The LTU provides RJ-45 connectors for TMN-LAN as well for LCT access. Additionally a D-SUB connector acc. to RS232/V.24 has been provided.

5 Protection

The OMS1664 supports a number of protection schemes. Due to the large numbers of different interface types, a decision must be made which is the best protection scheme for a particular target application.

5.1 Traffic Protection

5.1.1 Sub Network Connection Protection (SNCP)

Facilities are provided for the following protection schemes:

1+1 Sub-network Connection Protection (SNCP) by doubling the VC's and transmitting them in different directions. It supports:

- inherent SNC/I   according ITU-T G.841
- non- intrusive SNC/N   according ITU-T G.841
- TCM controlled SNC/S   according to EN 300 417-1-1

5.1.2 Multiplex Section Protection (MSP)

The OMS1664 family supports MSP acc. to ITU-T G.841 for all SDH ports. It supports 1+1 and 1:N applications in revertive, non revertive, single ended and dual ended configurations. Wait to restore time and hold off time is also supported.

5.1.3 MS-Spring Protection

The OMS1664 family supports MS-SPRING acc. to ITU-T G.841 for SDH-16 ports. 2-Fibre and 4-Fibre applications are supported by using the automatic switching protocol defined in G.841 and supports more than one ring and is only limited by the number of available interfaces.

5.1.4 Dual Node Interconnection (DNI)

The OMS1664 family supports unidirectional drop and continue for dual ring interconnection according to ITU-T G.842 and is able to close two rings using only one node.

5.2 Equipment Protection (EQP)

The OMS1664 family supports card protection for all cards that have a LTU for connection to the network. Additionally, the size of the protection group can be defined in a large range. This includes:

Card / LTU	OMS1684/1664	OMS1674/1654	OMS1644	OMS1634
2M	1:4	1:1	1:1	1:4
34/45M	1x 1:15 up to 8x:1:1	1x 1:3 up to 2x 1:1	1x 1:3 up to 2x 1:1	2x 1:1 or 2x 1:2
STM-1 el.	1x 1:8 up to 8x 1:1	1x 1:3 up to 2x 1:1	1x 1:3 up to 2x 1:1	1x 1:1

Table 21:   EQP Options

6   Network Management

Integrated network management control is achieved using ServiceOn Optical (MV36/MV38) Element and Network Managers via a 'Q' interface. It allows the OMS1664 family to be managed alongside existing Marconi supplied products.   Managed by Core 2 from R2.0 onwards.

Alternative network management control can be achieved using ServiceOn Access via a device driver. Managed by SOA release e.g. SOA 6.6 DD21 for R2.1.

Both management systems provide comprehensive range of fault, status and performance monitoring functions with configurable parameters. Interactive operator control is provided for sub-rack commissioning, traffic connection management, maintenance and diagnostics.

In-field control is provided by an 'F' interface to a PC based Local Craft Terminal.

The deployment of Ethernet over SDH cards will tend to be across an operator's entire network. In order that the Data paths are visible to the Data operations personnel, an additional software package has been developed, called ServiceOn Optical Advantage Client Circuit Centre. This allows the user to see the Data Paths carried through the SDH and DWDM networks. It can be used to maintain a list of Data Paths, along with information about the host SDH elements, the Data management systems and some customer data. As the system can be instructed as to which Element manager and which Network Element hosts the Ethernet over SDH circuit, this allows the operator to open the appropriate network element, via intelligent windowing-in, to perform either SDH or Data parameter changes.

7 Technical Specifications

7.1 Mechanical Construction

The shelves are composed of a chassis measuring as follows:

	OMS1684/1664/1634	OMS1674/1654/1644
Height	966 mm (including fan tray)	473 mm (including fan tray)
Width	450 mm	450 mm
Depth	280 mm	280 mm
Add. Height for Upper Cable Management	+ 111 mm	+ 111 mm

Table 22:   Shelf dimensions

7.2 Rack Mounting

The shelf can be housed in a standard ETSI rack - ETS EN 300 119-3 or in a 19" standard rack. Mounting brackets are available for ETSI 600mm and 900mm cabinets. The brackets for the ETSI 600mm cabinet support both ETSI and 19" hole centres. Mounting brackets are also available for true 19" cabinets.

7.3 Safety

The OMS1664 family is designed to meet the following safety standards**:**

Safety – Electrical
IEC 60950-1 IEC CB Scheme certified including:
- EN 60950-1
- AS/NZS 60950-1
- CAN/CSA / UL 60950-1 UL Listed

Safety – Optical
- BS EN 60825-1: 1994 Incorporating Amendment Nos. 1, 2 and 3
- BS EN 60825-2: 2000 – as modified by 76/224/ISH: 2001-Mar-23
- IEC 60825-1 Amendment 2: 2001-01, in accordance with 'CDRH Laser Notice No. 50' 2001-July-26. Including CDRH Accession
- ITU T G.664

7.4 Electrical Environment

The OMS1664 family conforms to European standards on Electromagnetic Compatibility:

EN 300 386 including resistibility testing:
- Radiated emissions to EN 55022 (Class B)
- Radiated susceptibility to EN 61000-4-3 (10 V/m)
- ES 201 468 "Service Level 2"
- EN 50121-4 Railway Applications subject to suitable trackside cabinet infrastructure
- EN 300 489-4 GSM. Suitable for building into suitable GSM Networks cabinet infrastructure
- FCC Part 15B

7.5 Climatic and Mechanical Environment

The climatic environmental criteria for the OMS1664 family design are based on ETSI ETS EN 300 019 standards with the following classifications:

- Storage   ETS 300-019-1-1 Class 1.2
- Transport   ETS 300-019-1-2 Class 2.3
- Operation   ETS 300-019-1-3 Class 3.2

<hr>

End of Document