Global System for Mobile Communications (GSM)

Nortel GSM OMC-R Fundamentals

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New in this release

The following sections detail what is new in *Nortel GSM OMC-R Fundamentals* for release V17.0.

Features

See the following sections for information about feature changes:

- Enhanced measurement report (EMR) support (21531)(17.01)
- Downlink FER measurement (27017)(17.01)
- DRX capacity increase (29248)(17.01)
- NIMS-PROPTIMA™ : BSS 17.0 standalone implementation (30693)(17.01)
- MDM R16.1 introduction and support (30780)(17.01)
- PCUSN Rebase on PCR 8.1 (30779)(17.01)
- OAM V17.0 Installation (30951)(17.01)
- BSS capacity increase for pico BTS (30956)(17.01)
- E4500/T3 support EOL - Load covered through 30951 (30998)(17.01)
- CMIP V9 upgrade for Solaris 10 (31776)(17.01)
- Support of 1800MHz CPU board for SF V890 (31819)(17.02)
- OMC Third Party Software V17 (32192)(17.01)
- Advanced Call Drop Analysis (32277)(17.01)
- OMC-R Security SSH Support (32352)(17.01)
- Usage of Sybase V15 as OMC-R database (33216)(17.01)
- BTS 6000 18000 in service TRX control (34379)(17.04)
- SF V890: New internal 146GB 15Krpm FC-AL disks (34385)(17.04)
- AMR feature lock at OMC-R (34433)(17.04)
- EDGE feature lock at OMC-R (34434)(17.04)

- BSC Optical capacity feature lock (34625)(17.04)
- BSC TCU 2G End of Life 2007 (34649)(17.04)

Enhanced measurement report (EMR) support (21531)

This feature introduces support for the GSM Measurement Information message and the Enhanced Measurement Report message into the Nortel BSS product. See 2.2 " SDO functional architecture" (page 144)

Downlink FER measurement (27017)

This feature provides the distributions at the TDMA level of measurements of radio interface. This feature provides these measurements for the transceiver (TRX) of given cells for a specified time period. See 2.2.12 "Radio distribution (RMD), interference matrix (IM) and call drop data (CDD)" (page 155).

DRX capacity increase (29248)

This feature increases the number of DRXs that are manageable through the Operations and Maintenance Center-Radio part (OMC-R). It increases the OMC-R formulas for TRX and TDMA objects per network. Thus, throughput between the OMC-R server and workstations is increased. See "DRX capacity information" (page 39) .

NIMS-PROPTIMA : BSS V17.0 standalone implementation (30693)

This feature testifies to the NIMS-PrOptima standalone compliancy with BSS17.0. See 2.1.7.1 " Presentation" (page 126).

MDM R16.1 introduction and support (30780)

This feature describes the impacts of the introduction of MDM R16.1 release on the GSM/E-GPRS OAM V17.0 hardware platform.

See impacts of this feature in the following locations:

- 3.2.1 "System software" (page 178)

PCUSN rebase on PCR 8.1 (30779)

This feature rebases the software of the Nortel GSM PCUSN on the MSS PCR 8.1 software load, allowing the PCUSN software application to take advantage of the improvements available in the PCR 8.1 load. See 2.1.12 " GPRS Management" (page 142).

OAM V17.0 installation (30951)

This feature covers the OAM installation in V17.0.

Updated NTP with information relevant to V17 hardware and software evolution.

BSS capacity increase for pico BTS (30956)

In V17.0, the objective of this feature is to recalculate the capacity of the BSS network to allow each OMC-R and BSC to support the maximum possible number of Nortel GSM BTS 1001 nodes in a network that consists entirely (or at least primarily) of GSM BTS 1001 sites.

E4500/T3 support EOL (30998)

Load Covered through feature 30951

CMIP V9 upgrade for Solaris 10 (31776)

This feature to upgrade to CMIP 9 is part of the activity that focuses on all third-party software tools that need to be updated in the OMC-R GSM product for the V17.0 release.

See impacts of this feature in the following locations:

- 3.2.1 “System software” (page 178)
- 3.8.2 “Nomenclature example” (page 209)
- 3.7 “Document references” (page 209)

Support of 1800MHz CPU board for SF V890 (31819)

This feature introduces the CPU 1800 MHz on the SF V890 for the OMC-R and the NIMS-PrOptima servers.

See impacts of this feature in the following locations:

- 1.1.2 “RoHS Compliancy” (page 21)
- 1.1.5.1 “Servers” (page 27)
- “Server / Disk array compatibility matrix” (page 29)
- “Hardened integrated server specification” (page 38)
- 1.10.2 “Nomenclature example (V17)” (page 92)

OMC third party software V17 (32192)

This feature introduces new versions for some of the OEM software packages installed on the OMC-R.

See impacts of this feature in the following locations:

- 3.2 “OMC-R software structure” (page 177)
- 3.8.2 “Nomenclature example” (page 209)

Advanced call drop analysis (32277)

This feature allows the operator to activate the retrieval of call drop data at the OMC-R, per cell.

Added SDO directory file information. See 2.2.12 “Radio distribution (RMD), interference matrix (IM) and call drop data (CDD)” (page 155).

OMC-R security SSH support (32352)

This optional feature introduces SSH v2 (Secure Shell) on OMC-R servers and workstations. The goal of this feature is to ensure that passwords and logins are not exchanged in readable text over the networks as the passwords and logins are encrypted. This feature allows users or management systems to use secure shell and file transfer.

See impacts of this feature throughout the NTP by performing a search on "SSH". Notable impacts include two new sections:

- “SSH support” (page 20)
- “OMC-R security and SSH support” (page 242)

Usage of Sybase V15 as OMC-R database (33216)

This feature creates an updated version of the Sybase server. The aim of this feature is to replace the V12 version with V15 version of Sybase. See 3.2.1 “System software” (page 178).

BTS 6000 18000 in service TRX control (34379)

This feature controls the number of in-service TRXs for the BTS 6000 and 18000, from the license mechanism. Nortel delivers a license to a customer against a proof of purchasing (purchase order or contract). See 4.3.23.2 “OMC-R Licenses and disaster recovery” (page 240).

SF V890: New internal 146GB 15Krpm FC-AL disks (34385)

This feature introduces the 146GB 15Krpm FC-AL internal disk for the OMC-R SF V890 servers. See “Hardened integrated server specification” (page 38) .

AMR feature lock at OMC-R (34433)

This feature controls the activation of the AMR feature from the license mechanism. Nortel delivers a license to a customer against a proof of purchasing (purchase order or contract). See 4.3.23.2 “OMC-R Licenses and disaster recovery” (page 240).

EDGE feature lock at OMC-R (34434)

This feature controls the activation of the EDGE feature from the license mechanism. Nortel delivers a license to a customer against a proof of purchasing (purchase order or contract). See 4.3.23.2 “OMC-R Licenses and disaster recovery” (page 240).

BSC Optical capacity feature lock (34625)

This feature introduces software modifications at the OMC-R that allow the deployment of a capacity increase for the Optical BSC. See 4.3.23.2 “OMC-R Licenses and disaster recovery” (page 240).

BSC and TCU 2G End of Life 2007 (34649)

This feature indicates the removal of the BSC 2G and TCU 2G in V17.0.

Removed references to BSC 2G and TCU 2G throughout this NTP.

Other changes

See the following sections for information about changes that are not feature-related:

GPO synthetic counters

Removed references to GPO (also known as Permanent General Manager) Synthetic counters from NTPs as well as references to files omc_nmc_formulas.dat and omc_operator_formulas.cfg.

Introduction

The architecture and reference Manual is a physical and functional description of an Operations and Maintenance Center of Radio subsystems (OMC-R) of the Global System for Mobile Communications (GSM) Network.

Prerequisites

The users must be familiar with UNIX system, the relational DataBase Management System (RDBMS) and networking principles.

Also they must be familiar with the following NTPs:

< 00 > : Nortel GSM BSS Documentation Roadmap

< 01 > : Nortel GSM BSS Overview

< 07 > : Nortel GSM BSS Fundamentals Operating Principles

< 124 > : Nortel GSM BSS Parameter Reference

< 128 > : Nortel GSM OMC-R Commands Reference Objects and Fault menus

< 129 > : Nortel GSM OMC-R Commands Reference Configuration, Performance, and Maintenance menus

< 130 > : Nortel GSM OMC-R Commands Reference Security, Administration, SMS-CB, and Help menus

Navigation

Chapter 1 “OMC-R hardware description” (page 19) is a detailed description of OMC-R hardware and functional subassemblies. It contains the following descriptions of each subassembly:

- configuration details
- communication interfaces (if any)
- connections

It also includes a detailed list of OMC-R configuration parts.

Chapter 2 “OMC-R architecture” (page 95) describes the functional aspects of OMC-R, SDO architecture and the communication structure.

Chapter 3 “OMC-R software description” (page 177) covers the software aspects. It names the software packages and their physical positions. Attendants who install new software versions must consult this section.

Chapter 4 “OMC-R administration presentation” (page 211) describes the administration of the OMC-R. It presents the administration of a standard OMC-R configuration and the functional aspects of the OMC-R administration.

Chapter 5 “OMC-R site installations” (page 245) describes the OMC-R installation site. It contains advice on the surfaces and fittings that are needed. It also contains information for equipping the site with power supplies, communication media, and furnishings. GSM network engineers and OMC-R site managers must consult this section.

Chapter 6 “OMC-R dimensioning rules” (page 255) describes OMC-R dimensioning and specifies internal and external configuration limitations".

Abbreviations:

Table 1
Abbreviations

DDS:	Tape Drive, Series DDS-4, DDS-3
DAT 72:	Tape Drive, Series DAT 72
DN:	Distinguished Name
ODIAG:	DIAGnostic Observation
OGS:	General Statistic Observation

Table 1
Abbreviations (cont'd.)

OFS:	Fast Statistic Observation
OMC-R	Operations and Maintenance Center-Radio
ORT:	Real Time Observation
PEC:	Pico BTS Enhanced Capacity (GSM BTS 1001)
RACE:	Remote ACcess Equipment
RDN:	Relative Distinguished Name
SC:	Standard Capacity (20 BSCs/1600 cells)
SVM:	Sun Volume Manager
T3:	StorEdge Disk Array
TO:	Temporary Observation
UHC:	Ultra High Capacity for Sun Fire V890 OMC-R server (40 BSCs/4800 Cells)
VHC:	Very High Capacity (40 BSCs/3200 cells) Enhanced capacity
MMI:	Man Machine Interface

The RACE PC is no longer sold.

Chapter 1 OMC-R hardware description

1.1 Overview

1.1.1 OMC-R principles

The Operations and Maintenance Center-Radio (OMC-R) manages the GSM Access Network, including the Base Station Controller (BSC), TransCoder Units (TCUs) and a wide range of Base Transceiver Stations (BTSs). The MSS-based Packet Controller Unit Server Node (PCUSN) is supported as part of the GPRS program.

The OMC-R has most of the functions found on a full Nortel Networks service Data Management, including Fault Management, Configuration, Performance, Security and Administration functions.

The OMC-R is based on a Sun client-server architecture that consists of three subsystems:

- server
- client workstations
- communication network that links the server and workstations

The OMC-R should be perceived as a subsystem itself and not as an open UNIX box. Third party software not approved or sanctioned by Nortel Networks must not be used on the OMC-R. Using third party software may jeopardize system security, integrity, and performance.

The following actions are recommended to maintain system security and performance:

- The OMC-R is a real time platform environment that must not be used as a workstation.
- Nortel Networks does not recommend that you perform any scripting on the system.
- Limit the number of users that can be logged into box.
- Root account and password must be closely guarded and controlled.

Use the Security Shell (SSH) feature to login. See "SSH support" (page 20). If your organization has not implemented the SSH feature, then use the root account and password. This option is available on OMC-R servers and workstations

- New UNIX accounts must not be created for the system. Only UNIX accounts provided must be used on the system.

CAUTION
Customer specific
Indicates that specific equipment and specific software dedicated to specific application is used and that therefore the feature is not available for all standard GSM users.

The OMC-R can be synchronized to an atomic clock through a radio signal.

SSH support

SSH support allows omc users and management systems to use secure shell and file transfer. This capability helps to ensure that logins and passwords are not exchanged in readable text over the network; the passwords are encrypted. This feature supports the use of an X-terminal and UNIX accounts. A factor to consider is that encryption of data might impose a significant toll on performance.

It is your responsibility to set up the X terminals so that they connect the OMC-R through SSH.

If the terminals used are PCs, it is necessary to install SSH client first or at least to configure the connection established via X-client so that it can use SSH..

If the PCs are running an X-terminal emulation then you must perform the following:

- Set the display variable: **set DISPLAY=localhost:0.0**
- Then run the SSH: **ssh omc@<terminal server>**. The value **<terminal server>** stands for either an OMC-R terminal server IP address or name.
- In some cases, the command line above might have to use the –X (for X11 tunnelling enabling) and –Y (for X11 authentication purposes):

  ssh -XY omc@<terminal server>
- Then the SSH server answers with a prompt showing clearly that the tunnel is set.

The SSH capability does not support network elements such as PCUSN and CEM/OMU card of BSC.

It also does not support OMC-R peripherals such as T3 device, Xyplex, LX terminal, and printers.

Nortel Networks is not responsible for installation of SSH software on X-terminals and does not provide any procedures or tools for this purpose.

1.1.1.1 Definitions

Nominal: Nominal hardware corresponds to the hardware that is currently sold to be deployed on site.

Supported: Supported hardware corresponds to hardware that is no longer sold but which can be used on further releases subject to the specific information provided.

1.1.2 RoHS Compliancy

All V17 hardware is RoHS compliant:

- SFV 890 server (1350/1500/1800 MHz.)
- Sun Ultra 45 workstation
- LX-8020S terminal server

1.1.2.1 PEC codes for OMC-R RoHS Compliancy

The PEC codes for OMC-R RoHS compliancy are contained in the following table:

RoHS Product	RoHS PEC Code
SF V890 1350 MHz	NTQQ19AY
SF V890 1500 MHz	NTQQ19KA
SF V890 1800 MHz	NTQQ19AU
Ultra 45 1600 MHz	NTQQ07MA
LX8020S	NTQQA67AA

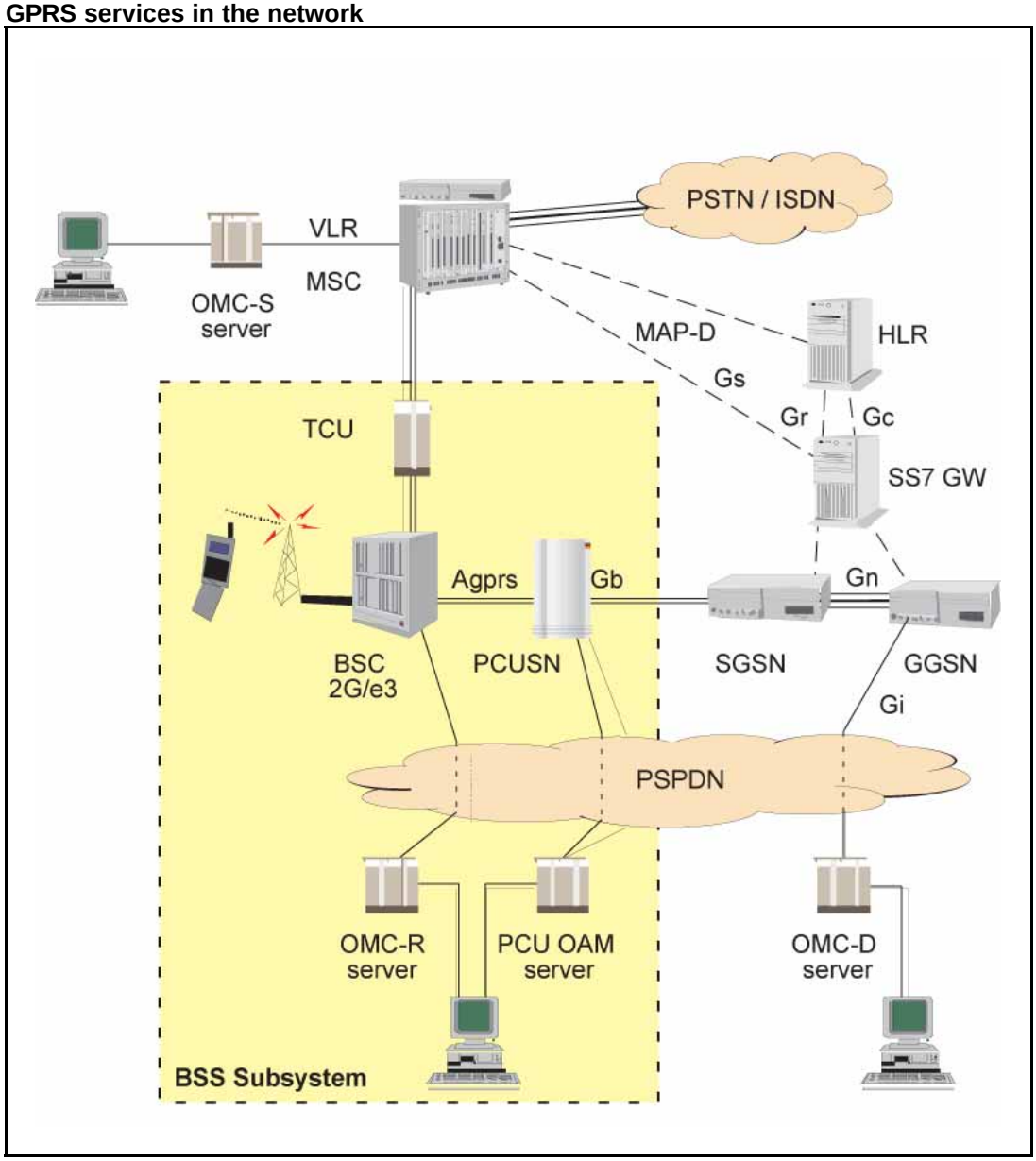
1.1.3 GPRS services

The GPRS (General Packet Radio Service) is a GSM service which aims at providing a packet based GSM radio access to external Packet Switched Public Data Networks (PSPDNs) like IP, ATM, Frame Relay or X.25.

Nortel Networks is introducing GPRS within the existing BSS network with BSC/BTS/OMC-R software upgrade only and the addition of a separate Packet Control Unit Server Node (PCUSN) element.

The GPRS services availability are resumed in Figure 1 "GPRS services in the network" (page 22).

Figure 1
GPRS services in the network



The GPRS represents the logical evolution for data services, from the current circuit oriented definition of GSM. The **packetization** of the data stream enables a more accurate tailoring of end user transmission requirements compared to the actual resources used over the air, resulting in better efficiency and a lower cost.

1.1.4 OMC-R physical architecture

1.1.4.1 Introduction to the OMC-R physical entities

The OMC-R contains the following components:

- one server
- two to 16 workstations or X terminals (see restrictions in 1.2.1.1 “Sun Fire V890” (page 36))
- zero or two alarm supervision boxes
- zero to one asynchronous terminal server
- zero to five modems
- routers, the number of which depends on the number of remote stations and their setup, can be used with remote BSC 3000
- zero or more RACEs (from V13)
- one or more X.25 switch(es)
- an Ethernet switch 100 or 1000 full duplex
- one or more OMC-R printer(s)
- two NeoClock devices (customer-specific)

The level of information provided enables the administrator to carry out the following actions:

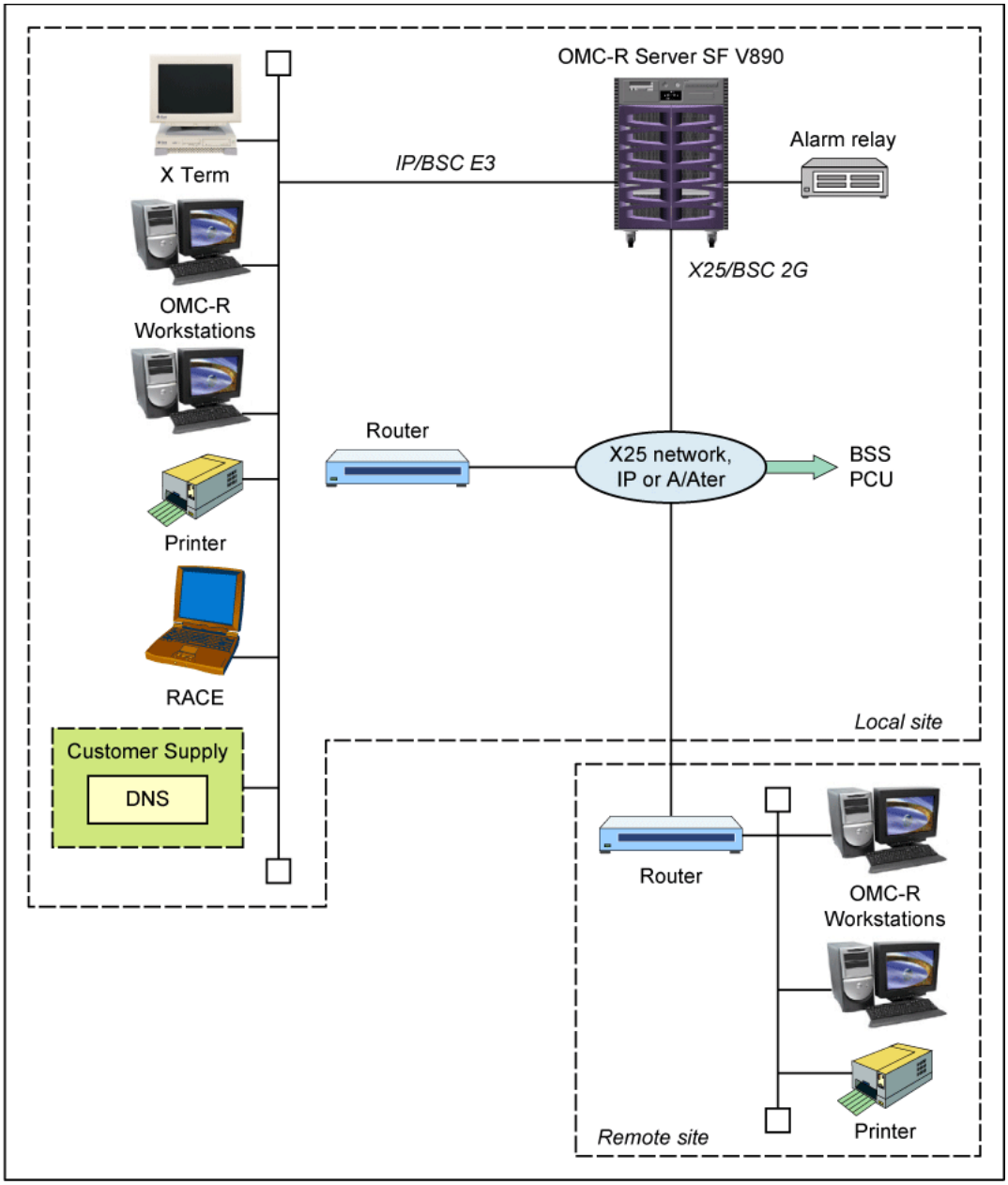
- physically identify the equipment of the OMC-R on a functional plan
- understand the technical characteristics of the equipment as well as the nature and characteristics of the interconnections
- understand the manufacturer references for management and stock maintenance purposes

The description of each physical entity is followed by an example OMC-R configuration indicating OMC-R equipment (see 1.10 “OMC-R equipment parts list” (page 92)).

The physical architecture of the OMC-R for the different types of server is presented in the figures listed in the following table:

For server type...	refer to...
Sun Fire V890	Figure 2 "Physical architecture of the OMC-R (Sun Fire V890 server)" (page 24)

Figure 2
Physical architecture of the OMC-R (Sun Fire V890 server)



1.1.4.2 Integrated Servers

The OMC-R functions on an integrated server configuration.

The following sections provide a brief description of the OMC-R integrated server configuration. For more detailed information about OMC-R servers, refer to 1.2 “OMC-R server” (page 36).

Integrated Single Server Configuration The integrated single server configuration draws on the integrated or monobox OMC-R concept. This integrated concept consists in merging the OMC-R, SDO, PCU-OAM and X-Terminal functions directly on to the same server. Separate machines are no longer required for SDO and PCU-OAM.

The integrated single server configuration is supported by one of the following two hardware configurations:

- a Sun Fire V890 server
- a Sun Fire V880 server and two T3 disk arrays.

The configuration is said to be **hardened**

With the Sun Fire V890, redundancy is built in to the server by means of redundant internal components. The configuration is said to be **hardened**.

With the Sun Fire V880, T3 disk arrays are required for mirroring purposes.

The hardened integrated Sun Fire V890 configuration is the nominal configuration for the V17.0 release.

1.1.4.3 Workstations

The workstations which support the OMC-R can be:

- **local** workstations located on the OMC-R site,
- **remote** workstations located on a remote site.

The remote stations can be dedicated to one or several OMC-Rs. In such a multi-OMC-R configuration, the remote stations can be linked to different pre-determined OMC-Rs but only to one single OMC-R at any given time.

The OMC-R MMI can also be operated on an X terminal connected to a workstation.

The workstations are equipped with the following components:

- a UNIX operating system
- one or two monitors

— one color monitor in standard configuration

— two color monitors with dedicated graphic controller board and software (GSM-R option)

CAUTION
GSM-R specific
Indicates that specific equipment and specific software (such as specific software in the BSC) dedicated to Railway application is used and that therefore the feature is not available for all standard GSM users.

- RAM memory
- an internal CD-ROM drive or DVD-ROM drive
- an internal floppy disk drive (not on SB1500 or U45)
- an external optional tape drive (DAT) (not on U45)
- a Fast-Wide SCSI controller (not on U45)

The number of supported X terminals depends on the workstation hardware (9 for SB1500 or U45).

1.1.4.4 RACE

RACE (Remote ACcess Equipment) provides assistance for end users to ensure day-to-day operations, curative maintenance, etc., from a remote site but also from OMC-R site.

The workstation MMI can be operated from a portable terminal.

In versions prior to V16, the RACE communicates with the OMC-R site through the PSTN. The access to the OMC-R is through a terminal server connected to modems. This terminal server is connected to the local OMC-R network. Since V16 access to RACE occurs through a VPN (Virtual Private Network) by logging on as a Contivity client.

Despite its capabilities, RACE shall not be considered as a replacement of a workstation or an X-Terminal. Indeed, it is an Internet technology based server application that runs on OMC-R workstations. An http server also runs on these workstations. A web browser is used on end user side to manage the information.

Up to three RACE connections can be made on the same workstation that is recommended to be a local MMI workstation.

On client side, RACE requires a web browser (MS Internet Explorer 5.0 and higher) and therefore the associated hardware able to run this browser. The recommended hardware is a high end PC. Finally, on login the end user is proposed two modes and has to choose one according to available communication bandwidth.

The RACE PC is no longer available.

1.1.4.5 Server and Workstation Communication

Servers and workstations communicate in two ways:

- local workstations are linked to server(s) by means of a local Ethernet network.
- remote workstations are linked at each site to a Local Area Network (LAN) using Ethernet. The LAN sites and the LAN servers are interconnected by means of a X.25 network and gateways (or routers) using TCP/IP-X.25.

The DNS (Domain Name System) feature allows a PLMN operator to manage dynamically all his/her intranet IP addresses including those attached to the OMC-R machines (see 4.3.16 “Integration of OMC-R with an outside DNS server” (page 229)).

An asynchronous terminal server connected to the local network completes the system architecture. It supports modems to communicate with the RACE by means of the PSTN and a virtual console to servers.

With the OMC-R, a workstation can be logically connected to a RACE, after establishing a communication by means of the PSTN using a modem and the terminal server.

1.1.5 OMC-R components description

The following sections provide information on compatibility between OMC-R hardware and the various OMC-R releases

1.1.5.1 Servers

Integrated/hardened single server compatibility matrix The Sun Fire V890 is the nominal server for release V17.0 of the OMC-R.

Description	V15.1.1	V16.0	V17.0
Sun Fire V890/HDI 4x2x 1.8 GHz, 16 GB RAM XVR-100 graphic card 12x 146 GB internal disks	—	—	nominal
Sun Fire V890/HDI 4x2x 1.5 GHz, 16 GB RAM XVR-100 graphic card 12x 146 GB internal disks	—	nominal (40;4800)	supported
Sun Fire V890/HDI 4x2x 1.35 GHz, 16 GB RAM XVR-100graphic card 12x 146 GB internal disks	nominal (30;2400)	supported (40;4800)	supported
Sun Fire V880 4x 1200 MHz, 8 GB RAM XVR-100 graphic card 6x 73 GB internal disks FC/AL PCI adaptor for T3	supported (30;2400)	supported (30;2400)	supported
Sun Fire V880 4x 900 MHz, 8 GB RAM 6x 73 GB internal disks FC/AL PCI adaptor for T3	supported (30;2400)	supported (30;2400)	not supported
E4503 400 MHz 1GB RAM, T3 460 GB	restrictions	restrictions	not supported
E4503 400 MHz 1GB RAM, A5200 162 GB	restrictions	not supported	not supported
E4503 400 MHz 1GB RAM, A5200 153 GB	restrictions	not supported	not supported
E4002 400 MHz, T3 460 GB	restrictions	not supported	not supported
E4002 400 MHz, A5200 162 GB	restrictions	not supported	not supported
E4002 400 MHz, A5200 152 GB	restrictions	not supported	not supported

Sun Fire V880 is supported only when the server machine is coupled with a T3.

Description	V15.1.1	V16.0	V17.0
Ultra Server 450X 2x400 MHz, 1 GB RAM with T3	supported (30; 2400)	supported (30; 2400)	not supported
Ultra Server 450X 2x400 MHz, 11 GB RAM I/O board 2612/2622 for A5000	supported (30; 2400)	not supported (30; 2400)	not supported

Dual server or single server compatibility matrix I/O board option 2610 is capable of managing SSA but I/O board option 2612 is required for T3.

Description	V15	V16.0 and V17.0
A5200 22 slots 2x81 GB (5) 2 x 9 x 9.1 GB 10 kRPM	not supported (need upgrade +73 GB)	not supported
A5200 22 slots 2x153 GB 2 x 9 x 9.1 GB + 12 x 73 GB 10 kRPM	supported (SC & HC) (1) (2)	not supported
A5200 22 slots 2x162 GB 2 x 9 disks x 18 GB 10 kRPM	supported (SC & HC) (2)	not supported
T3 WKG storEdge Array 460 GB 4/5 x 8 x 73 GB + hot spare (1 x 73 GB) 10 kRPM	nominal (HC & VHC) (3)	supported

(1): The 153-GB A5200 configuration is provided only as an upgrade kit for the 81-GB A5200.

(2): The 153/162-GB A5200 configuration is supported on V14.3 and later versions.

(3): Disk array is no longer available on SF V890 OMC-R configurations after V15.1.

Not available for all users

10-krpm 36-GB disks are in EOL. Replacement products are either 15-krpm 36-GB disks or 10-krpm 73-GB disks.

Server / Disk array compatibility matrix The following table shows the compatibility between the server types and the disk arrays. This compatibility also depends on GSM Access release.

Description	SSA112 16 GB	A5200 81 GB	A5200 153 GB	A5200 162 GB	T3 460 GB
Legend: C = Compatible, NC = Not compatible					
Sun Fire V890 4 x 1800 MHz, 16 GB RAM 12 x 146GB internal disks	—	—	—	—	not supported
Sun Fire V890 4 x 1500 MHz 16 GB RAM 12 x 146GB internal disks	—	—	—	—	not supported
Sun Fire V890 1350 MHz 116 GB RAM	NC	NC	NC	NC	NC
Sun Fire V880 1200 MHz 18 GB RAM	NC	NC	NC	NC	C
Sun Fire V880 900 MHz 18 GB RAM	NC	NC	NC	NC	C
Sun Ultra Server 450x 2x400 MHz 11024 MB RAM	NC	C	C	C	C
Sun Ultra Server 4002 2x400 MHz 1024 MB RAM	NC	C	C	C	C
Sun Ultra Server 4002 167 MHz or 250 MHz 512 MB or 1024 MB RAM	C	C	NC	C	C

ATTENTION
Sun ended support for the Ultra Server E4002 in March 2004. Support services for this hardware are therefore not provided for release V15 and later releases.

Description	V15	V16.0	V17.0
Sun Ultra 5 360 MHz 128 MB RAM (2)	supported	supported	supported not managed
SUN SPARC5 85 MHz (1) 110 or 170MHz (2)64 MB RAM (1)	supported	supported not managed	supported not managed
(1): End of support on January 2002 (no maintenance possible after this date). **(2): End of support on January 2003 (no maintenance possible after this date).**			

Description	V15.1	V16.0	V17.0
Sun Blade 1500 1.5 GHz, 1 GB RAM, 120 GB Disk	nominal	nominal	nominal
Sun Blade150 650 MHz, 512 MB RAM, 40 GB Disk	supported	supported	supported

1.1.5.2 Workstations

The Sun Ultra 45 is the nominal workstation for OMC-R V17.0.

Workstation compatibility matrix The following table presents the different workstations and their compatibility with the various OMC-R versions.

Description	V15.1.1	V16.0	V17.0
Sun Ultra 45, 1.6 GHz, 2GB RAM, 250 GB		nominal	nominal
Sun Blade 1500, 1.5 GHz, 1 GB RAM, 120-GB Disk	Supported	supported	supported
Sun Blade 150 650 MHz, 512 MB RAM, 80-GB Disk	Supported	supported	supported
Sun Blade 150 650 MHz, 512 MB RAM, 40-GB Disk	Supported	supported	supported
Ultra 5 400 MHz (1) 128 MB RAM	Supported	supported	not supported
Ultra 5 360 MHz (1) 128 MB RAM (2)	Supported	supported	not supported
Ultra 5 270 MHz (1) 128 MB RAM	—	not supported	not supported
(1): The Ultra 5 has been manufacture discontinued since February 2002. **(2): V16 no remote installation available from CIUS as they are on the same LAN or XLAN as CIUS.**			

Description	V15.1.1	V16.0	V17.0
Sun Ultra 45, 1.6GHz, 2GB RAM, 250 GB	—	nominal	nominal
Sun Blade 1500 1.5 GHz 1 GB RAM2 * 120 GB	nominal	supported	not supported
Sun Blade 150 650 MHz 80 GB,512 MB RAM, Multi-pack 36 GB	not supported	not supported	—
(1) Required only for Sun Enterprise 4XXX servers			

Description	V15.1.1	V16.0	V17.0
Sun Blade 150 650 MHz, 40 GB, 512 MB RAM, Multi-pack 2*36 GB	nominal (1)	not supported	not supported
Ultra 5 400 MHz, 256 MB RAM, Multi-pack 36 GB	supported	not supported	not supported
Ultra 5 360 MHz, 256 MB RAM, Multi-pack 36 GB	restrictions	not supported	not supported
Ultra 5 360 MHz256 MB RAM, Multi-pack 27 GB	not supported	not supported	not supported
(1) Required only for Sun Enterprise 4XXX servers			

Description	V15.1.1	V16.0	V17.0
Sun Ultra 45, 1.6 GHz, 2 GB RAM, 250 GB	—	not supported	nominal
Sun Blade 1500, 1.5 GHz, 1 GB RAM,2*120-GB disk	nominal SC/HC/VHC	nominal HC/VHC	not supported
Sun Blade 150 650 MHz, 512 MB RAM (1), 40-GB disk	nominal	supported	not supported
Ultra 5 400 MHz, 128 MB RAM or 256 MB RAM, Multipack 27/36 GB	supported SC/HC/VHC	not supported	not supported
Ultra 5 360 MHz, 128 MB RAM, Multipack 27/36 GB	supported SC/HC/VHC	not supported	not supported
Ultra 5 270 MHz, 128 MB RAM, Multipack 27/36 GB	not supported SC/HC	not supported	not supported
(1): Sun Blade 150 80GB does not support the SDO application			

1.1.5.3 Printer

A printer is connected to the Local Area Network.

Description	V15	V16.0	V17.0
Lexmark LNX+	supported	supported	supported
Lexmark 1650	supported	supported	supported
Lexmark 1850	supported	supported	supported
Lexmark Optra T612n	supported	supported	supported
Lexmark Optra T614n	supported	supported	supported
Lexmark Optra T620n	supported	supported	supported
Lexmark Optra T632n	nominal	nominal	nominal

1.1.5.4 Router

The router provides a gateway between the LAN (Ethernet) and the X.25 network.

Description	V15	V16.0	V17.0
Cisco 2501	supported	supported	supported
BayStack Access Node AN	supported	supported	supported
BayStack Access Node ASN	nominal	nominal	nominal

1.1.5.5 RACE in existing configurations

The RACE function is enabled by a PC. A RACE can access to the OMC-R through the PSTN. A RACE connects to the terminal server (Xyplex 1620) through the PSTN. This terminal server is connected to the OMC-R local network. Several ports of the terminal server can be used for RACE connections. Several RACE PCs can be simultaneously connected to the OMC-R through the PSTN.

To secure the access to the OMC-R, a Firewall device (optional) can be installed. The access control is based on a call-back mechanism of the caller. The firewall is a PC connected to the terminal server and to a dedicated modem.

If the Firewall device is installed, the modems connected to the terminal server are configured not to answer incoming calls. The RACE PCs must call the modem connected to the Firewall.

Description	V15	V16.0	V17.0
Dell Latitude Cpi (no longer sold)	supported	—	—

RACE in post V15.1.1 configurations

The Xyplex terminal server uses five ports which are connected to the five modems (V34 protocol) in the multitech rack and to the RACE application through the PSTN. However, the LX-8020S does not provide ports for the modems connection. You need a VPN (Virtual Private Network) to connect to the OMC-R through the LAN

The usage of the Nortel Contivity Extranet Switch equipment is strongly recommended for the remote access solution. The Nortel Networks minimum entry point recommendation is the CES 1750:

- The CES 1750 is rack mountable, providing ease of integration into a carrier environment.
- The CES 1750 is able to handle up to 500 tunnels.

For more information see W-NMS OAM Engineering guide, NTP 450-3101-638.

1.1.5.6 Modem

Each access to the PSTN requires an auto-answer modem.

Description	V15	V16.0	V17.0
TRT Sematrans 14496M	supported	supported	supported
Spectracom	supported (US market)	supported (US market)	supported (US market)
Multi-tech Systems	nominal	nominal	supported

1.1.5.7 Asynchronous terminal server

The Xyplex Maxserver is a terminal server with 20 serial asynchronous communication ports. It links the RACE by means of the Public Switched Telephone Network (PSTN).

Description	V15	V16.0	V17.0
Xyplex 1500/1600	supported	supported	supported
Xyplex 1620-002	supported	supported	supported
Xyplex 1620-014	nominal	supported	supported
MRV LX8000S	—	nominal	nominal

1.1.5.8 OMC-R cabinet

Description	V15	V16.0	V17.0
Schroff |	supported	supported	supported
SUN 72”	supported	supported	supported
Rack 900	supported	supported	nominal

1.1.5.9 Ethernet switch

The Ethernet switch isolates the OMC-R LAN of the other network.

A particular Hub that allows the switching between several devices.

Description	V15	V16.0	V17.0
Newbridge GREDT 16	supported - 10 Mbit/s	supported - 10 Mbit/s	supported - 10 Mbit/s
BayStack 350 series	supported	supported	supported
BPS 2000	nominal 100 Mbit/s	supported	supported

Description	V15	V16.0	V17.0
BPS470/BPS5510	—	nominal - 100 Mbit/s	supported
VPN 1750	—	—	nominal - 100 Mbit/s

1.1.5.10 Ethernet hub

A hub allows the connection of devices to the Ethernet network by twisted using pairs (10 Base T or 100 Base T).

All devices connected to the hub can communicate among themselves and constitute an Ethernet network that is a local OMC-R network with servers, stations, terminal server, router, printer.

Description	V15	V16.0	V17.0
BayStack 250 series	supported	supported	supported
Centercom Micro Hub	supported	supported	supported
Linkerbuilder FMSII	supported	supported	supported

1.1.5.11 NeoClock devices

The time of whole OMC-R can be synchronized according to the time of some reference time sources through the NTP (Network Time Protocol). The reference time can be obtained from OMC-R timeservers in the internal network, which are directly connected to radio clock boxes, or from external NTP servers. The Radio clock gets a reference time from an atomic clock through a radio signal and transmits it to the time server.

The radio clock box used is a version of the NeoClock used is available with two different antenna systems:

- DCF version
- France Inter version

DCF Version

This version incorporates a radio receiver that picks up the DCF77 signal broadcast by the Mainflingen transmitter located near Frankfurt (Germany). The transmitter broadcasts long waves at a frequency of 77.5 kHz. Its waves can be picked up as far as 1000 to 1500 km away from Frankfurt.

France Inter Version

This version incorporates a radio receiver that picks up the France Inter signal broadcast by the Allouis transmitter located near Bourges (France). This transmitter broadcasts long waves at a frequency of 162 kHz. Its waves can be picked up as far as 2500 to 3500 km away from Allouis.

1.1.5.12 Tapes

From release V15.1 on, the OMC-R is delivered with a DAT 72 tape drive. The following tables present information on tape drive and tape compatibility.

DDS Drives	Media	Native Capacity	Data Rate
DDS-3 Drives (introduced in 1996)	125 m MP ++	12 GB	0.7-1.5 Mbps
DDS-4 Drives (introduced in 1999)	150 m MP+ ++	20 GB	2.4-3 Mbps
DAT 72 Drives (not supported) Workstation backup done on DVD from V16 on.	170 m MP ++++	36 GB	3.0-3.5 Mbps

Tapes	DDS-3 Tape Drive	DDS-4 Tape Drive	DAT 72 Tape Drive
DDS-3 (125 m)	R/W	R/W	R/W
DDS-4 (150 m)	—	R/W	R/W
DAT 72 (170 m)	—	—	R/W

1.2 OMC-R server

Throughout the rest of the document the term server refers to the processing unit and the OMC-R server function (in the hardware sense) which integrates the processing unit and all its direct peripherals.

1.2.1 Physical description of the OMC-R server

1.2.1.1 Sun Fire V890

Configuration principle The Sun Fire V890 server enables a "monobox", integrated configuration which consists in migrating the following four roles on to the same OMC-R server machine:

- OMC-R
- PCU-OAM
- SDO
- X Terminal Server.

Server features The Sun Fire V890 is equipped with mirrored Internal Hard Disks (HDI). This **hardened** configuration consists in adding redundancy to the server and provides hot-swap/hot-plug capabilities. Powerful CPUs enable it to support both basic and enhanced capacity without the need for T3 disk arrays.

The hardware redundancy is provided by the internal component redundancy for power supplies, cooling fan trays, CPUs, memory boards, HSI boards, PCI boards, FC-AL controller boards and RAID disks. In the event of failure, these hot-pluggable and hot-swappable components can be changed without interrupting service.

Each server hosts 2 CPU/Memory boards with 2 CPUs each. In the event of a failure on one CPU, the server reboots and the Automatic System Recovery (ASR) mechanism automatically disables the faulty CPU board. The server can run with one CPU board without human intervention. ASR can configure around many failed components, thereby allowing service to be resumed.

The system is also equipped with Remote System Control (RSC) which facilitates remote and/or centralized management.

The Sun Fire V890 enables the dual-server configuration to be replaced by leveraging the following hardware-platform, Solaris 9 and Sun capabilities:

- Sun Fire V890 redundancy services
- Dynamic PCI-board reconfiguration
- (2+1) Redundancy for power supply & power cord
- Hot-plug/Hot-swap Internal Hard Disks
- Hot-plug/Hot-swap PCI boards
- Internal FC-AL disks (6 to 12)
- Solaris 9 basic features
- IPMultiPathing for IP redundancy in kernel
- Very-low-level recovery action / very close to hardware
- Live Upgrade for upgrading machine

All of these features help to provide a higher level of availability for critical applications.

Hardened integrated server specification The technical specification of the Sun Fire V890 server is as follows:

- 2x2 UltraSparc (IV 1350MHz), (IV+ 1500/1800MHz) CPUs, with 8 Mbyte of external cache memory.
- 16 GB RAM
- 12x 146-GB internal disk drives, 15000 rpm FC-AL
- 3x 11500-W power modules with three separate power cords
- 2x3 fan trays
- 1 internal Digital Video Disk-Read Only Memory (DVD-ROM) 10 drive
- 1 internal 36-GB 4-mm DAT72 Tape Drive for SCSI Interfaces
- 1 XVR100 (64MB) color graphical board
- 2 High-Speed Serial Interface / PCI HSI/P (HSI/U for RoHS compliant card) boards with 4 interfaces each
- 2 Quad Gigabytes Ethernet boards
- 1*10/100Base-T self-sensing Ethernet port
- 1 GB Ethernet port
- one SCSI interface PCI card

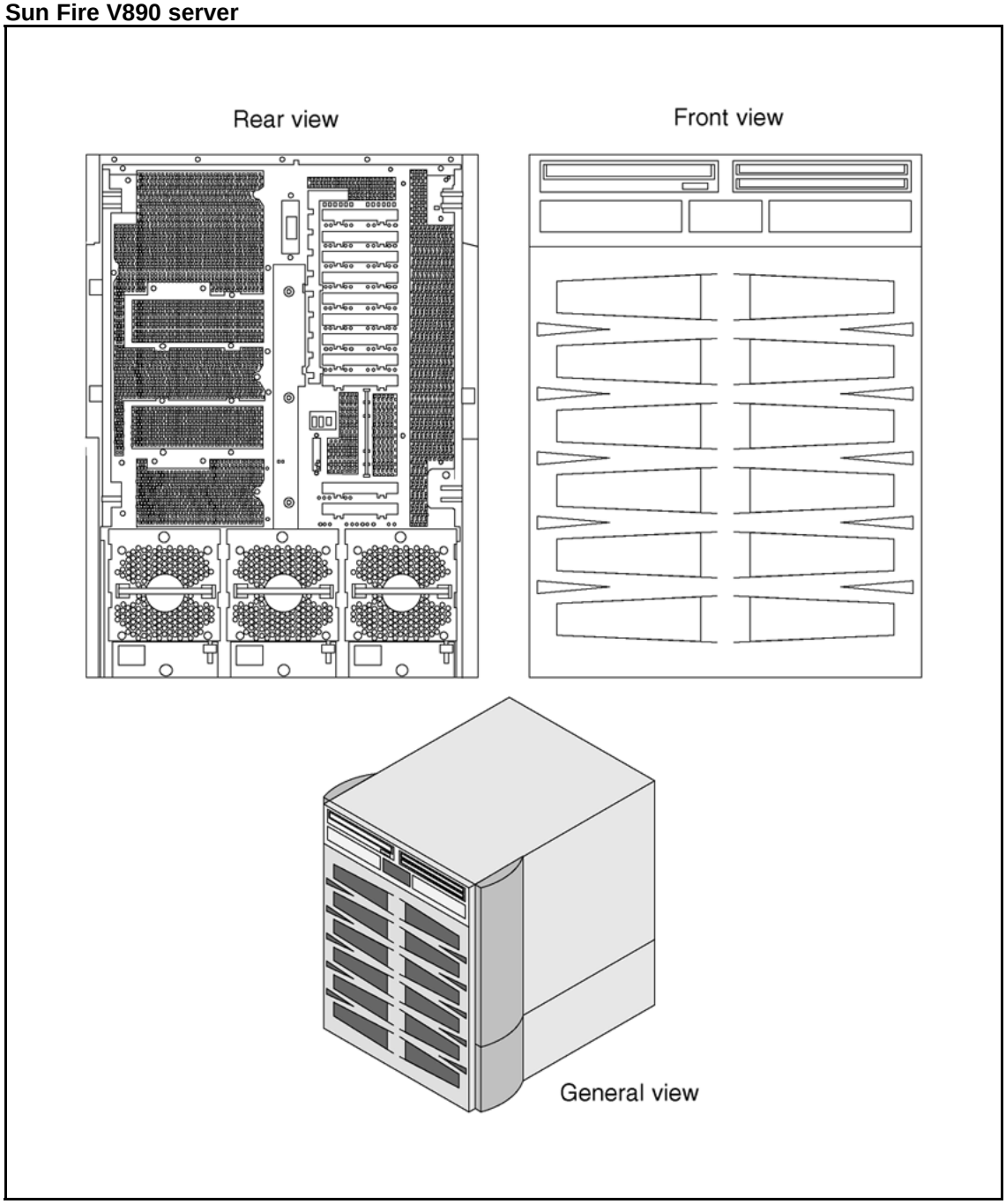
A complete Sun Fire V890 integrated OMC-R configuration can handle up to 16 workstations (local and remote combined). For the purpose of an upgrade only a CIUS workstation is required..

For more information on the Sun Fire V890 server, refer to the following Sun publications (available on the Sun Microsystems website):

- Sun Fire V890 Server Service Manual (817-3957-11),
- Sun Fire V890 Server Owner’s Guide (817-3956-11).

The Sun Fire V890 Server is presented in Figure 3 "Sun Fire V890 server" (page 39)

Figure 3
Sun Fire V890 server



3.2.1.1.4 DRX capacity information In V17 the BSC 3000 (both electrical and the optical) now supports 1500 TRX and TDMA instead of 1000.

As a result the number of DRX - driver and receiver units - per cell is now 50% higher than in V16. For more information on these values, see *Nortel GSM BSS Fundamentals - Operating Principles* (411-9001-007).

For the SF V890 only, the sizes of the disk partitions and the databases are computed with a maximum number of instances that are greater than the nominal UHC values in order to provide more flexibility in the OMC-R. This does not apply to the SF V880 configuration which supports only the nominal value. The following table provides the hard coded limits that now apply for BSC 3000.

Table 2
SF V890 enhanced dimensioning values

Objects	SF V890 UHC nominal values	Hard coded limits
Channel	230400	307200
frequencyHoppingSystem	28800	38400
LapdLink	64160	86720
PcmCircuit BSC_ 3g	17600	35200
Transceiver	28800	38400
TransceiverEquipment	28800	38400

This is especially useful for the Optical BSC which supports more PCM connectivity and can handle more DRX capacity.

1.2.1.2 Sun Fire V880

Configuration principle The Sun Fire V880 server enables a "monobox", **integrated** configuration which consists in migrating the following four roles on to the same OMC-R server machine

- OMC-R,
- PCU-OAM,
- SDO,
- X terminal.

The Sun Fire V880 has hardware disk redundancy but no software redundancy capabilities (without security hardening).

Server features The Sun Fire V880 server accommodates from two to eight UltraSPARC III processors with up to 32 GB of main memory. An integrated, fiber-channel disk subsystem supports twelve disks and a XVR-100 graphic card.

The 9.6 GB/sec. system bus, integrated I/O adapters and nine PCI slots ensure a highly scalable, well-balanced system whether the workload is I/O intensive, compute intensive, or both.

In addition to the hot-swap PCI slots, disks, power supplies and cooling fan trays, the Sun Fire V880 server offers other enhanced RAS features. These include Automatic System Recovery (ASR) and Remote System Control (RSC). ASR configures around many failed components, thereby allowing the restoral of service. RSC facilitates remote and/or centralized management.

The Sun Fire V880 characteristics allow to eradicate the dual-server configuration by taking maximum benefits from hardware platform, Solaris 8 and SUN capabilities:

- Sun Fire V880 offers basic redundancy services
- Dynamic Reconfiguration for PCI boards
- (2+1) Redundancy for power supply & power cord
- Hot-plug/Hot-swap internal Hard Disks
- Hot-plug/Hot-swap PCI boards
- Numerous internal FC-AL disks (6 to 12)
- Solaris 9 offers basic feature
- IPMultiPathing for IP redundancy in kernel
- Recovery action is made at very low level / very closed to hardware
- Live Upgrade for upgrading machine

All of these features help to provide a higher level of availability for critical applications.

Integrated server specification The technical specification of the Sun Fire V880 server is as follows:

- 2x2 UltraSparc III+ CPUs, 1200 MHz
- 8 Mbyte of external cache memory
- 8 GB RAM
- 6 x 73 Gbytes internal disk drives, 10000 RPM FC-AL
- Three 1120 W power modules with three separate power cords.
- 2x3 fan trays
- One internal Digital Video Disk-Read Only Memory (DVD-ROM) 10 drive

- One internal 4-mm DDS-4 drive (20 Gbytes) for SCSI interface
- One color graphic card PGX64 PCI
- Two High-speed Serial Interface / PCI (HSI/P)
- Two Quad Fast Ethernet PCI adaptor
- Two single Fibre Channel PCI adaptor
- One 21.inch color graphic monitor with one keyboard (optional)
- 1*10/100Base-T Self sensing Ethernet Port
- 1 Gigabit Ethernet port

ATTENTION
This hardware was introduced in V14.3.1 and requires new software activation.

A complete Sun Fire V880 integrated OMC-R configuration can handle up to 16 local or remote OMC-R stations. A minimum of two local workstations is required for upgrade purposes and only 12 out of the 16 OMC-Rs can be remote.

RESTRICTION:

Today, OMC-R graphical clients (nominal workstation or X terminal) are distributed as the following:

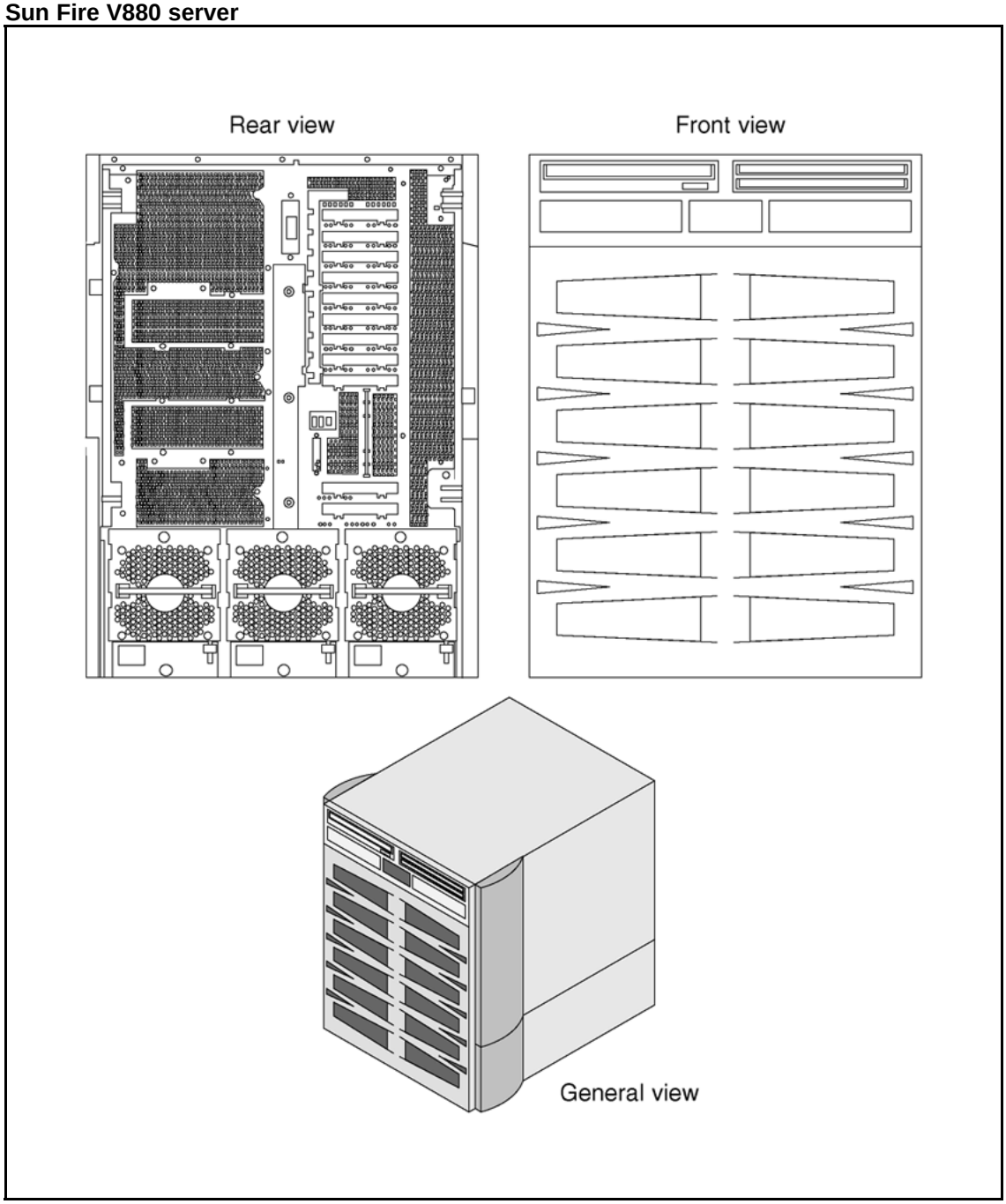
10 (X terminals on integrated OMC-R) + 6 on workstations (minimum 2 workstations on Sun Fire V880) = 16 (maximal number of graphical clients per OMC-R).

The new distribution is as follows:

2 (X terminals on integrated OMC-R) + 14 on workstations (minimum 3 SB150 workstation on Sun Fire V880) = 16 (maximal number of graphical clients per OMC-R).

The Sun Fire V880 Server is presented in Figure 4 "Sun Fire V880 server" (page 43).

Figure 4
Sun Fire V880 server



1.2.2 Color Graphic Monitor (option)

The system console consists of a Sun color graphic monitor. This is a keyboard, 19" color screen connected to the server by a video cable.

The mode line substitute graphical screen and keyboard plugged in OMC-R server for remote software console through an RS232 connection.

A dialogue terminal has a keyboard and screen that allow users to do the following actions:

- communicate with the OMC-R in work sessions
- display the data spontaneously issued by the system at any time (according to the output domain defined in the terminal profile)

1.2.3 Communication interfaces

1.2.3.1 Connection to X.25

The server HSI/S board provides a RS449 access for each X.25 port. The connection to the X.25 network modem (V35 access) occurs by a RS449/V35 interface converter. A BlackBox enables the conversion.

Each server has two BlackBox for X.25 access to the OMN network

The BlackBox is configured as DCE using a RS449 interface and as DTE using a V35 interface (See Figure 5 "Configuration of the RS449 - V35 Blackbox" (page 45)).

The LEDs on the front panel of the box indicate the interface activity.

BSC 3000 The communication between the BSS and the OMC-R can be accomplished through TCP/IP over LAN or WAN.A RS449 interface in the HSI box is reserved for the remote manager access.

1.2.3.2 Connection to Ethernet

The server is connected to the Ethernet network by a twisted pair. It connects the RJ45 port on the server to an Ethernet concentrator.

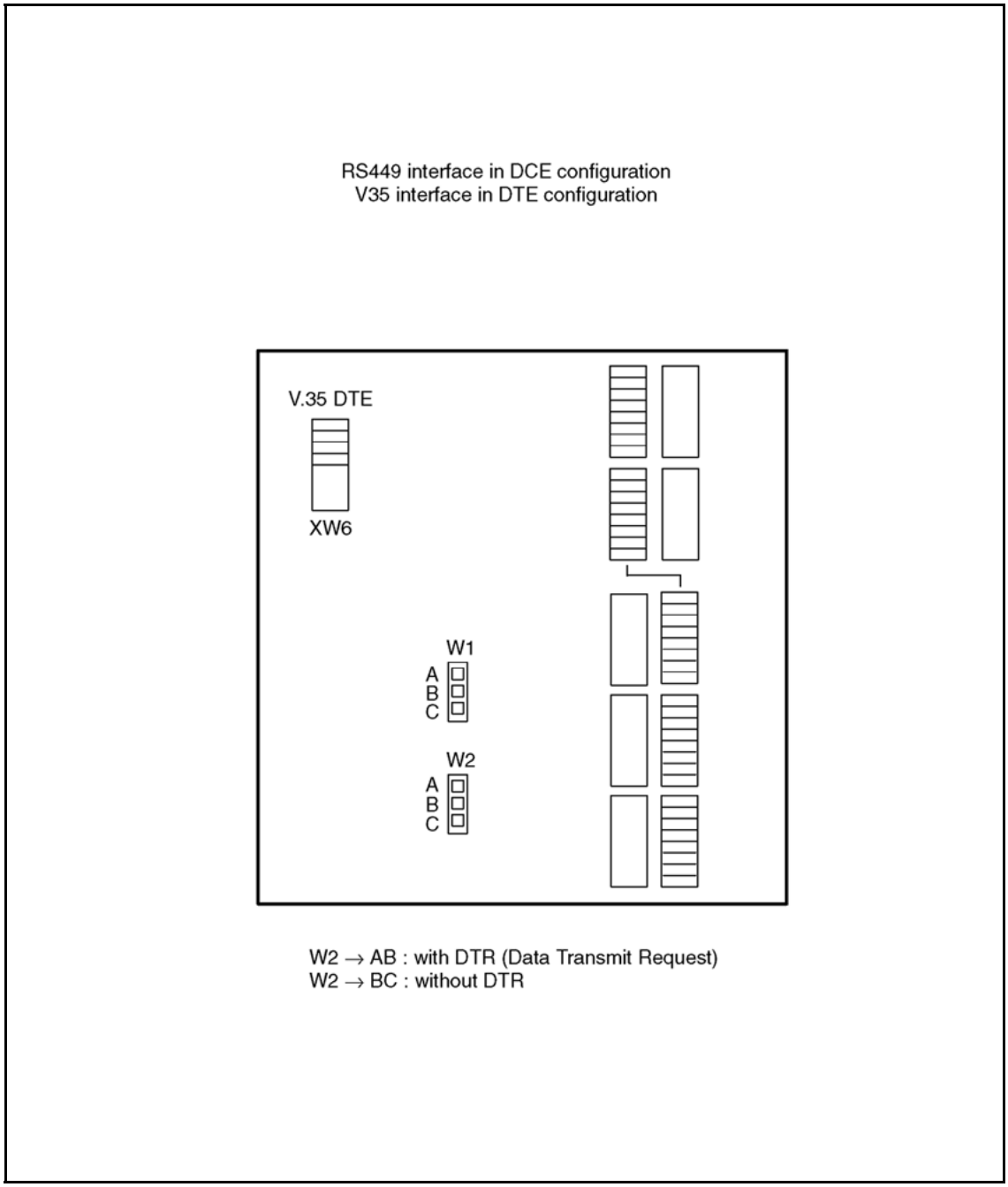
A transceiver is required for a coaxial LAN.

1.2.3.3 Connection to remote stations

The link between the remote stations occurs by using a LAN (Ethernet), then the X.25 network.

The routers perform a gateway function between the LAN and the X.25 network (see 1.5 “Routers” (page 71)).

Figure 5
Configuration of the RS449 - V35 Blackbox



1.2.4 OMC-R server connections

1.2.4.1 Sun Fire V890 server

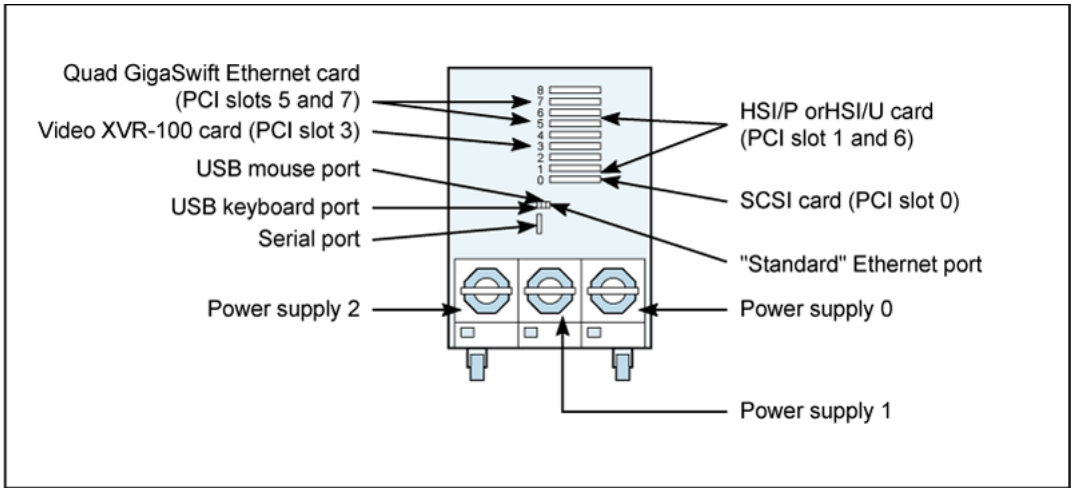
The Sun Fire V890 server connections are described in the following table, which identifies:

- the cable description
- its start point
- its finish point

The following table refers to Figure 6 "Sun Fire V890 server connections" (page 46).

CABLE (for)	START POINT	FINISH POINT
Keyboard (if used) cable	USB port	Keyboard
Mouse (if used) cable	USB port	Mouse
Video monitor (if used) cable	Video card (PCI slot 0)	Graphics monitor
Xyplex terminal cable	Serial port	Xyplex terminal server
Octopus cable	HSI card	RS449-V35 Blackbox
AC power cord 1	Power supply 1	Mains connector or an UPS
AC power cord 2	Power supply 2	Mains connector or an UPS
AC power cord 3	Power supply 3	Mains connector or an UPS
Ethernet cable	Standard ethernet port	Switch

Figure 6
Sun Fire V890 server connections



1.2.4.2 Sun Fire V880 server

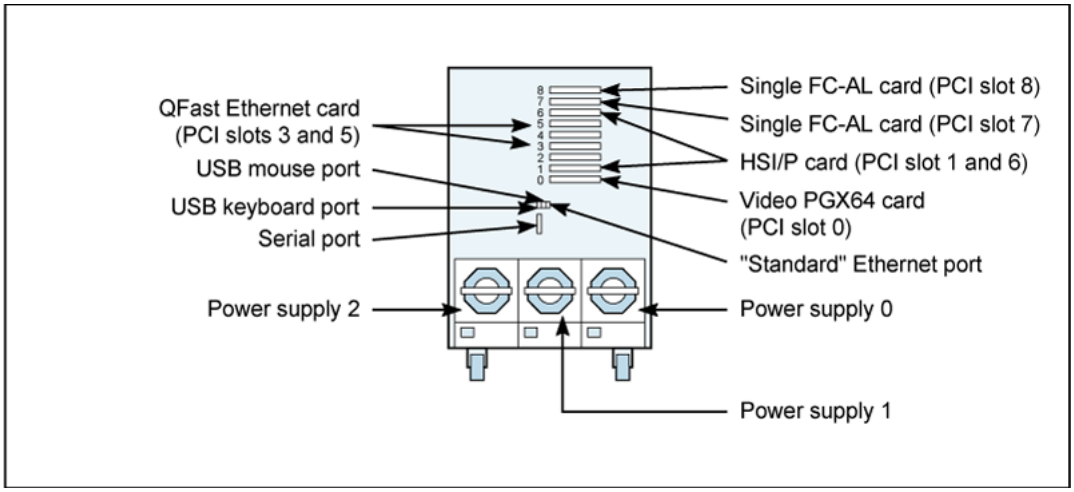
The Sun Fire V880 server connections are described in the following table, which identifies:

- the cable description
- its start point
- its finish point

The following table refers to Figure 7 "Sun Fire V880 server connections" (page 47).

CABLE	START POINT	FINISH POINT
Keyboard (if used) cable	USB port	Keyboard
Mouse (if used) cable	USB port	Mouse
Video monitor (if used) cable	Video card (PCI slot 0)	Graphics monitor
Xyplex terminal cable	Serial port	Xyplex terminal server
Octopus cable	HSI card	RS449-V35 Blackbox
AC power cord 1	Power supply 1	Mains connector or an UPS
AC power cord 2	Power supply 2	Mains connector or an UPS
AC power cord 3	Power supply 3	Mains connector or an UPS
Ethernet cable	Standard ethernet port	Switch

Figure 7
Sun Fire V880 server connections



1.2.5 Physical characteristics

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
Sun Fire V890	714	480	836	88.1 (mini) 130.9 (maxi)
Sun Fire V880	714	480	826	88.1 (mini) 130.9 (maxi)
19" color monitor	414	406	450	23
T3	139.7	444.5	469.9	30.15
BlackBox	58	203	302	1

1.3 Workstations

The physical architecture of the OMC-R contains two types of workstation:

- Local workstations
- Remote workstations

The two types of workstation differ in terms of equipment and connection mode to the OMC-R server.

1.3.1 Local workstations

Unsupported workstations in the new release can be reused as X-terminals. SDO and PCU-OAM servers are no longer required if the server is upgraded to Sun Fire V880 or V890. In such cases, the data is transferred during upgrade to the Sun Fire V880 or V890. Once the multipack has been removed, the workstation can be reused as a regular workstation.

1.3.1.1 Equipment breakdown

The **nominal** local workstations contain a processing unit based on a Sun Ultra 45 machine running on Solaris 10 1/06.

The Sun Blade 1500 workstation replaces the Sun Blade 150 and the Ultra 5 workstation which has been Manufacture Discontinued since Q4 2002.

Nominal hardware configuration: Sun Ultra 45 The basic hardware configuration for the Sun Ultra 45 the new SUN RoHS-compliant entry-level workstation is as follows:

- Up to two UltraSPARC IIIi 1.6-GHz processors; 1-MB Level 2 cache
- Up to 16 GB of registered DDR1 ECC memory in eight slots.
- System bus (Jbus): 128 bits @ 167MHz
- Choice of 2 (ATI or 3D Labs) graphics accelerators for 2-D or high-performance 3-D
- Support of 4 SAS **or** SATA disk drives

The U45 workstation does not support mixed SATA and SAS disks.

— 4 x 250 GB 7200 RPM SATA disk drive

— 4 x 146 GB 15000 RPM SAS disk drive.

- One slim dual ATAPI DVD-RW/CD-RW drive
- Integrated I/O features on the motherboard, such as:
  - — I/O bandwidth of 2GB/sec.
  - — Dual Gigabit Ethernet (10/100/1000)
  - — Six 2.0 ports (2 used for mouse and keyboard)
  - — Two PCI Express x16 graphics slots
  - — One PCI Express x8 graphics slot
  - — two PCI-X 100 MHz slots.

The U45 specified for OAM GSM has:

- 1 UltraSPARC IIIi processor
- 2 GB memory
- 1 x 250 GB SATA disk
- 1 x 2D Gfx graphics card
- 1 DVD/RW drive

Figure 8
Sun Ultra 45 workstation - front view

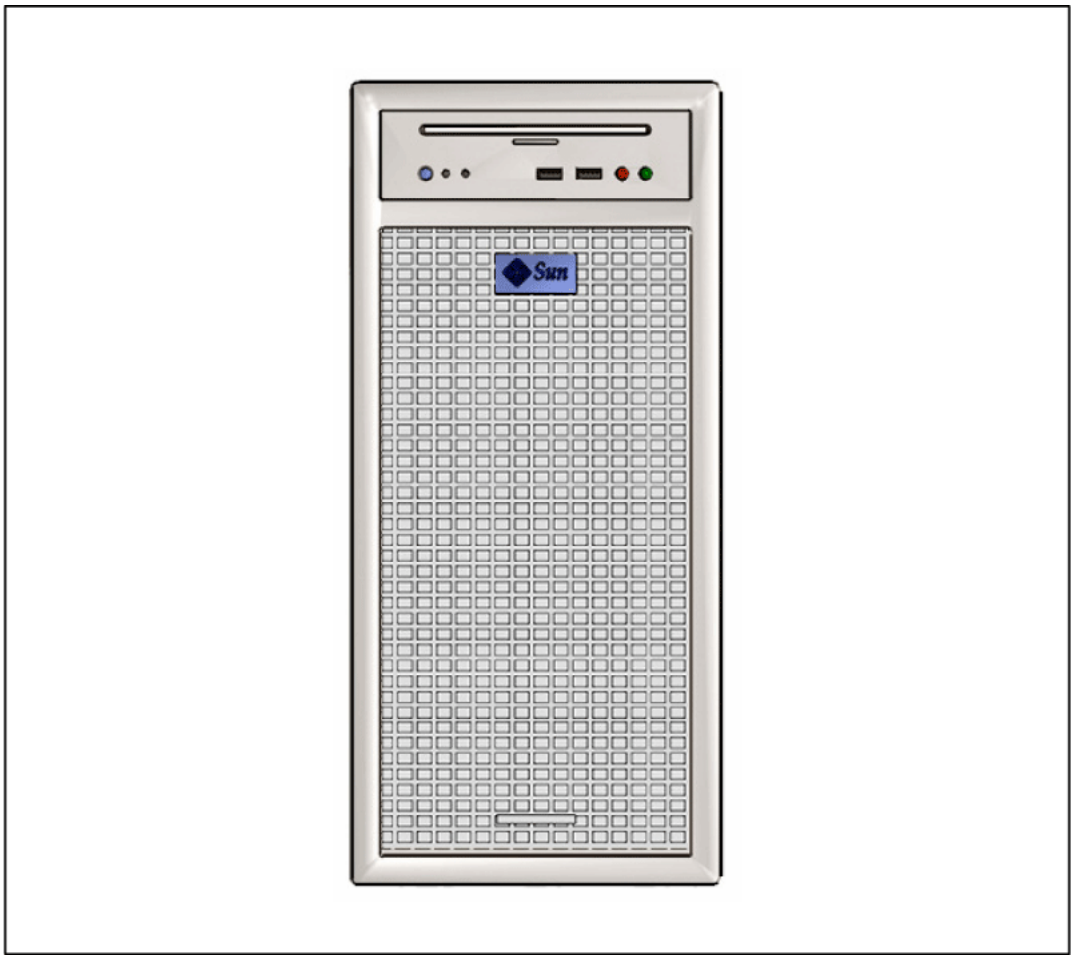
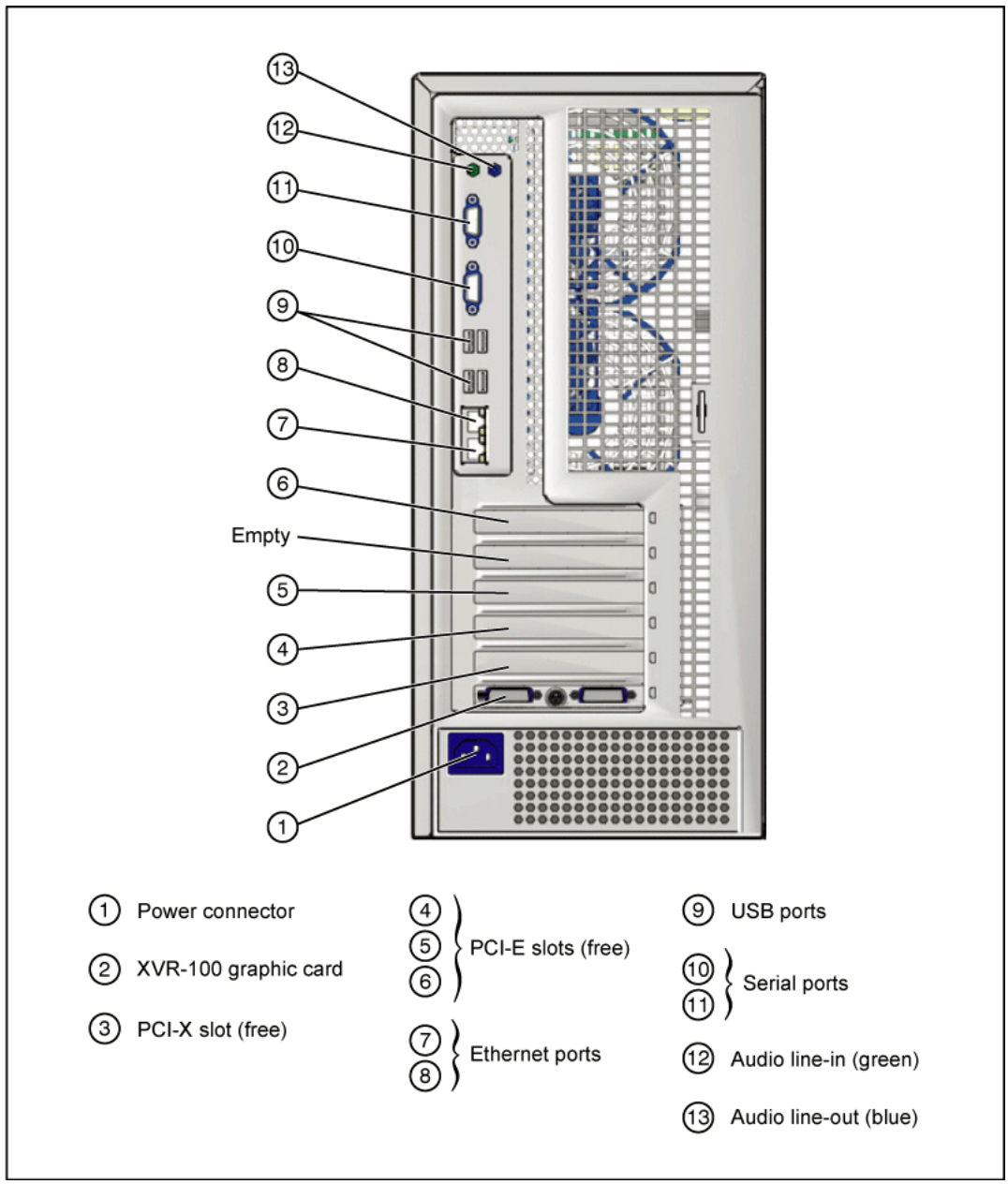


Figure 9
Sun Ultra 45 workstation - rear view

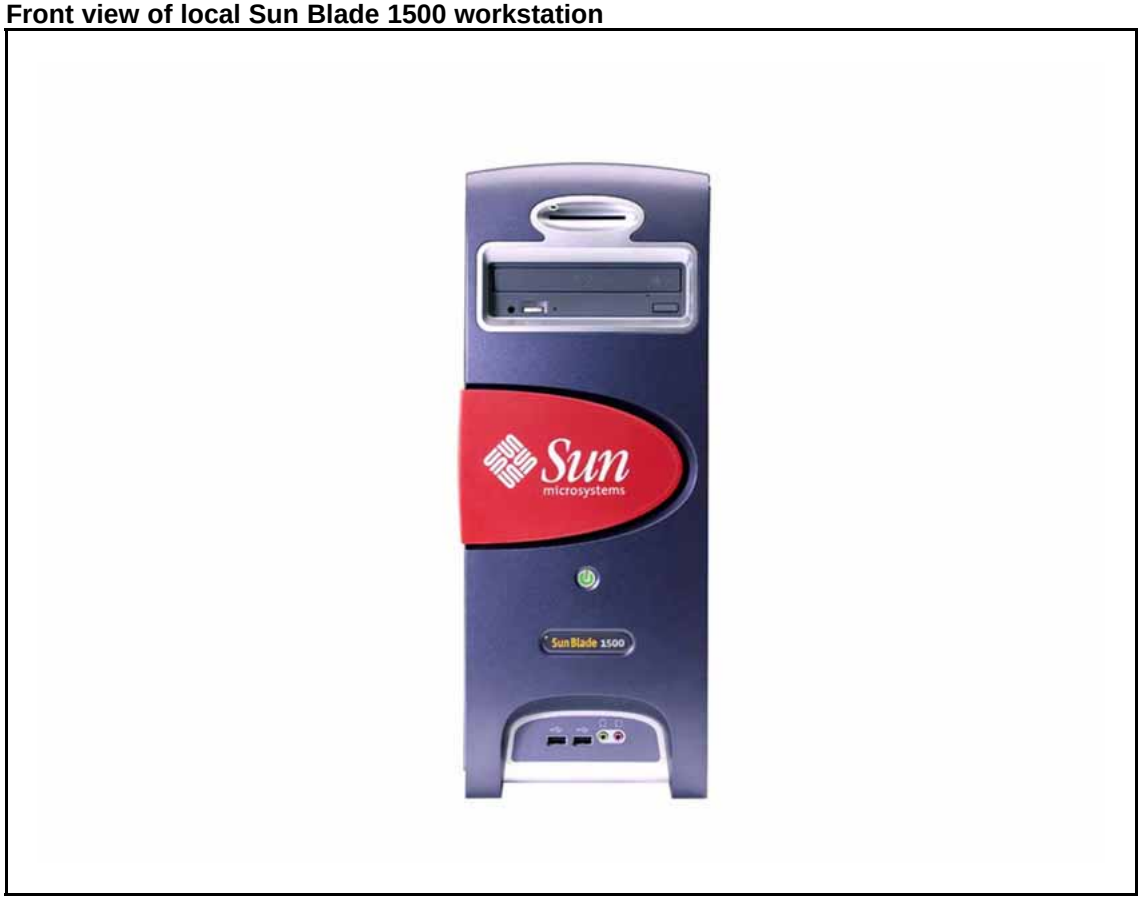


Supported hardware configuration: Sun Blade 1500 The hardware configuration of the Sun Blade 1500-S workstation is as follows:

- 1.5-GHz UltraSPARC IIIi Processor with 1 MB of Level 2 cache integrated on die
- 2 x 512 MB of RAM [Up to 2 GB ECC error correcting SDRAM (PC133)] memory
- 120-GB 7200-RPM internal hard disk
- On-board SunTM PGX64 with 8-MB 24-bit 2-D Graphic controller
- 24-bit-only true color video support up to 1280 x 1024
- 8-bit-only pseudo color video support up to 1920 x 1200
- 1 DVD-ROM drive
- Single-Channel, Single-Ended UltraSCSI Host Adapter, PCI
- Two IEEE 1394 ports and four USB ports
- External DAT 4 mm tape drive (one per site is mandatory for installation / upgrade / maintenance purpose)
- Full 64-bit hardware and software support
- Integrated on-board I/O features such as 10/100/1000 Base-T Ethernet port

Figure 10 "Front view of local Sun Blade 1500 workstation" (page 53) shows a Sun Blade 1500 local workstation.

Figure 10
Front view of local Sun Blade 1500 workstation



The **supported** local workstations contain a processing unit based on a 400 or 360-MHz Sun Ultra 5 with 128 MB of RAM.

The PCU-OAM application is hosted by Sun Blade 1500-S 1500MHz workstation with 2 x 120 GB internal disk.

1.3.1.2 Description of local workstation connections: Sun Blade 1500

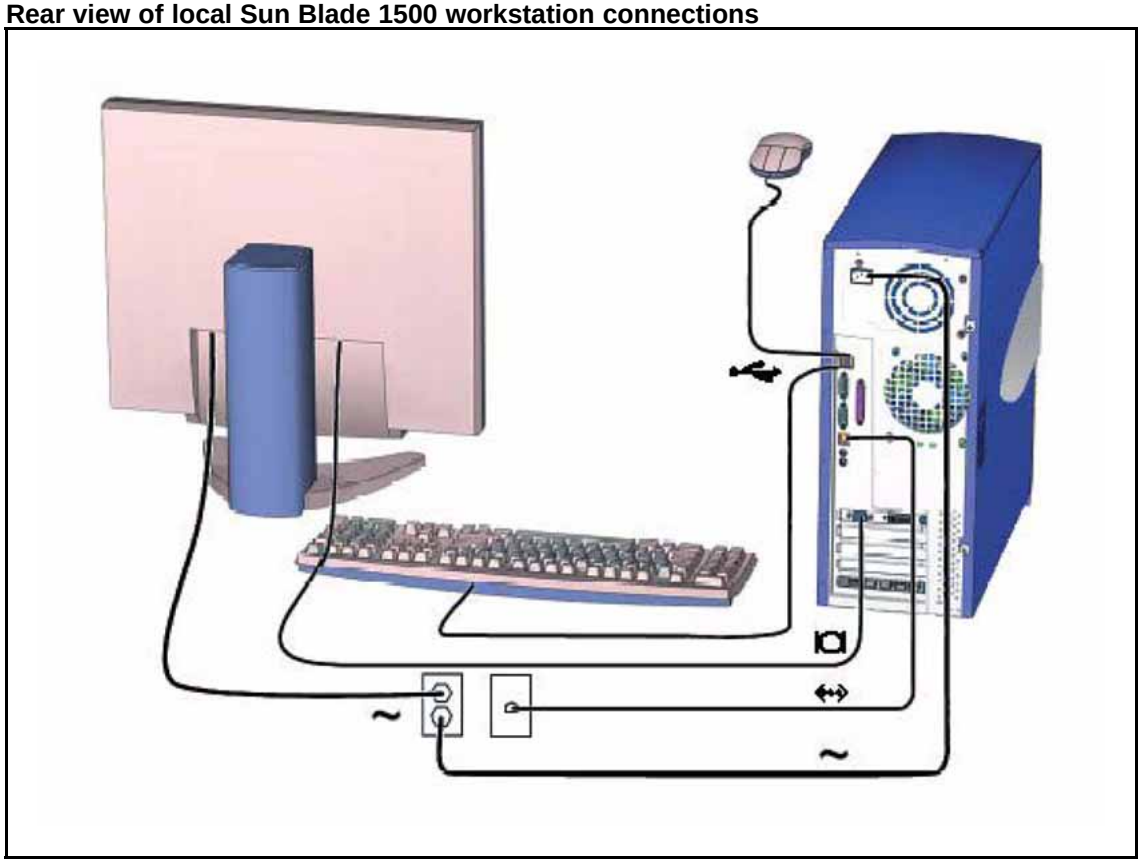
The links between the local workstation elements are described in the following table which includes:

- the cable description
- its start point
- its finish point

The following table refers to the illustrations in Figure 11 "Rear view of local Sun Blade 1500 workstation connections" (page 54).

CABLE	START POINT	FINISH POINT
Workstation power cord	Power connector on rear panel	Grounded electrical outlet
Keyboard cable	USB 1.1 connector (near fan)	Keyboard
Mouse cable	USB 1.1 connector (near fan)	Mouse
Monitor power cord	Monitor rear panel	Grounded electrical outlet
Monitor video cable	Video connector on graphics accelerator filler panel	Monitor video connector
Ethernet cable (twisted pair)	Workstation TPE plug (RJ45)	Ethernet Switch

Figure 11
Rear view of local Sun Blade 1500 workstation connections



1.3.1.3 Description of local workstation connections: Sun Blade 150

The links between the local workstation elements are described in the following table which includes:

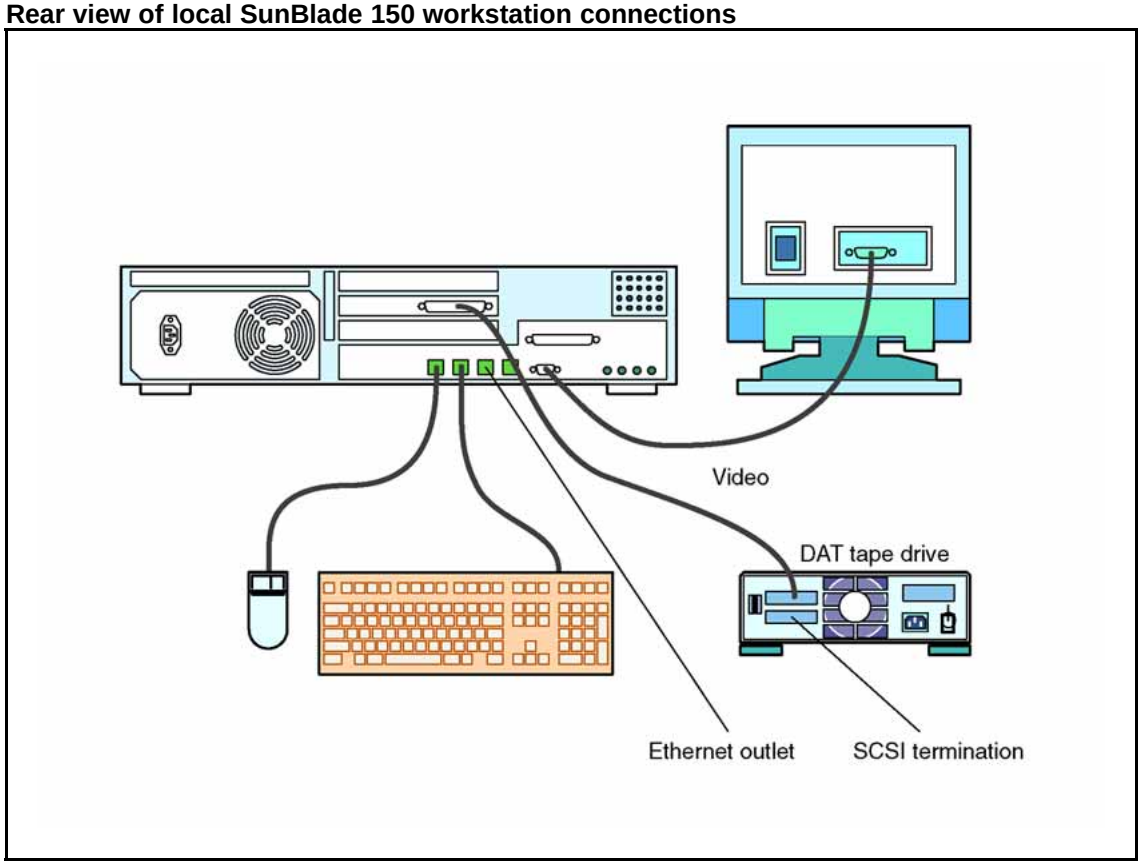
- the cable description
- its start point
- its finish point

The table refers to the illustrations in Figure 12 "Rear view of local SunBlade 150 workstation connections" (page 56).

CABLE	START POINT	FINISH POINT
Video cable 13w3	Station rear video connector	Color monitor video connector
Keyboard cable	Station keyboard connector	Station keyboard
Mouse cable	Station keyboard	Mouse
Ethernet cable	Station Ethernet plug	Hub
(Twisted pair)	(RJ45)	Hub
SCSI cable	Station rear SCSI connector	DAT tape drive SCSI plug
Serial cable (*)	Station rear serial port B	Radio clock connector
Power for station, color monitor and tape streamer	Power connector on equipment rear panel	Mains Connector or an UPS
(*) Precautionary message for serial cable to radio clock		

CAUTION
Customer specific
Indicates that specific equipment and specific software dedicated to specific application is used and that therefore the feature is not available for all standard GSM users.

Figure 12
Rear view of local SunBlade 150 workstation connections



1.3.1.4 Centralized installation and upgrade service architecture (CIUS)

In V15.0 and later releases, OMC-R installation/upgrade is implemented using a standard local workstation installed with the CIUS software.

The OMC-R software is first loaded onto this workstation (known as the CIUS server) and is then copied to all the other OMC-R workstations.

The Sun Blade 1500, Sun Blade 150 and Ultra 45 have CIUS server capability.

This workstation must have an internal disk of at least 20 GB and a LAN speed of 100 Mbps. An Ultra 45 requires a disk space of 30 GB.

Once the software install or upgrade has been implemented, the workstation resumes its original role but maintains its server services on a permanent basis.

1.3.2 Remote workstations

The equipment description is the same as that of the local workstation

1.3.3 Connection to the OMC-R server

The stations located on the same site are linked together using a local Ethernet network. CIUS requires a 100-Mbps LAN between the following pieces of hardware:

- CIUS and OMC-R servers
- CIUS and local workstations

ATTENTION
If remote workstations or local workstations (except SDO and PCU-OAM) are connected at a lower rate, the CIUS mechanism cannot be implemented within standard maintenance windows. In such cases, the dedicated procedure (DS/OMC/APP/0003) must be applied.

The server is connected to the local network using an X.25 network.

A Bay Stack Access Node is used for communication between the remote workstations and the OMC-R server. They are configured up to 384kbps for each workstation.

For redundancy reasons, two routers for a site may be required regardless of the number of workstations.

1.3.4 Physical characteristics

The table below shows the physical characteristics for the workstations and peripheral equipment described above.

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
Ultra 45	445	205	569	26.31
Sun Blade 1500	460	175	465	14.8
Sun Blade 150	118	445	464	15.4
21" color monitor	502	500	475	31
4.8 Gb 4mm Tape	77	244	264	4

1.3.5 X terminals

X terminals are made up of the following components:

- a 270-MHz Sun Ultra 5 workstation with color graphic screen
  or
- a 170-MHz SPARC5 workstation with color graphic screen

ATTENTION
The Xterm HP Envizex and Xterm HP Envizex II workstations are no longer supported.

An X terminal is connected directly through a local Ethernet network and a logical link to a workstation on a local or a remote site.

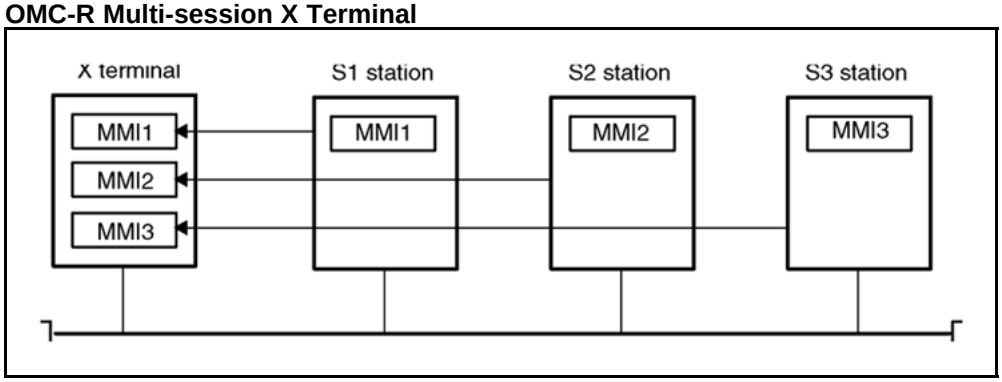
X terminals are physically connected to the OMC-R local network using an Ethernet connector. Normally, one workstation supports one or several X terminals which are configured uniquely by software.

1.3.5.1 Connection of an X terminal to an OMC-R site

The OMC-R can manage up to four X terminals per workstation.

Each X terminal can be connected to any OMC-R sites in a national network by using routers and the X.25 network. At a given time, a mono-session X terminal can only be connected to one OMC-R site, but a multi-session X terminal can be simultaneously connected to three separate OMC-R sites (see Figure 13 "OMC-R Multi-session X Terminal" (page 58)).

Figure 13
OMC-R Multi-session X Terminal

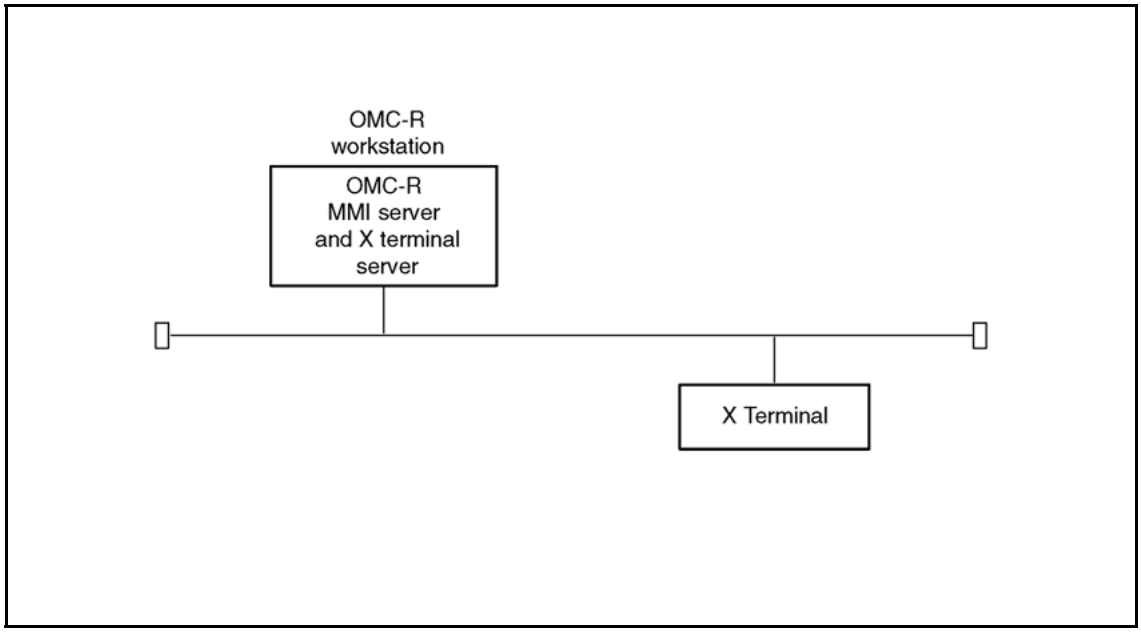


X terminals are connected to the OMC-R through workstations and have the same functions as these workstations.

Only the OMC-R MMI application (also known as the graphic application) is activated for an X terminal. It is displayed using an OMC-R MMI graphic server and an X terminal server.

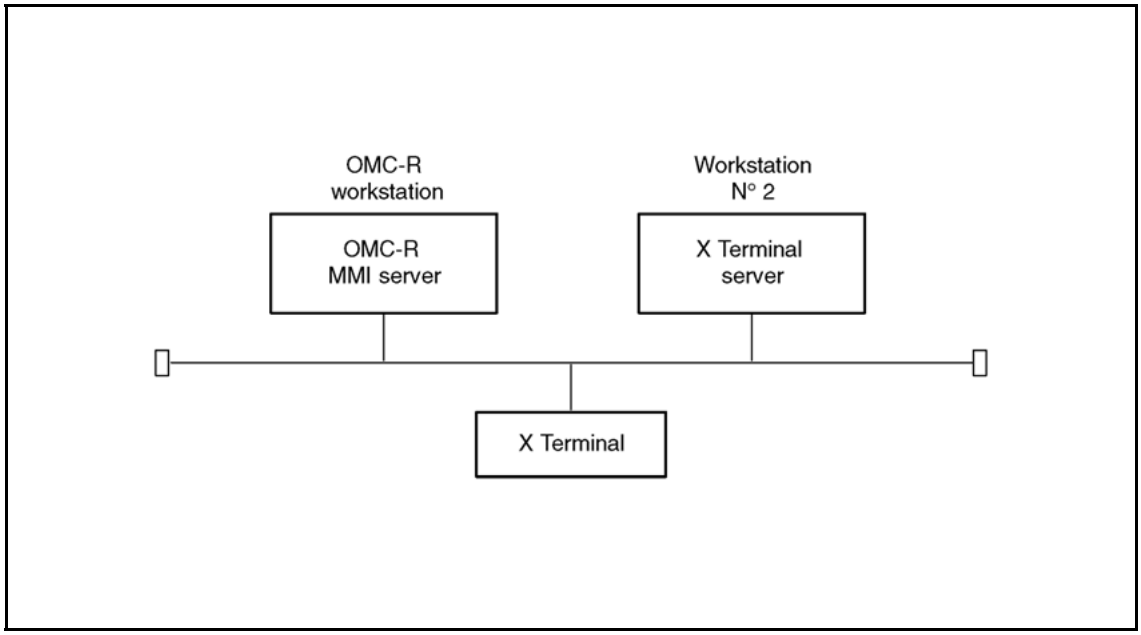
In the standard configuration, shown in Figure 14 "Standard configuration" (page 59), the X terminal server is hosted by the same OMC-R workstation.

Figure 14
Standard configuration



Another configuration, shown in Figure 15 "Configuration with X terminal outside the OMC-R" (page 59), can be used in which the X terminal is hosted by a different workstation.

Figure 15
Configuration with X terminal outside the OMC-R



A single-session X terminal (only one session is displayed on the X terminal) uses one OMC-R MMI graphic server and one X terminal server. A multi-session X terminal (several sessions are displayed on the X terminal) uses as many OMC-R MMI graphic servers as there are open sessions, plus one X terminal server.

Consequently, a user connected to an X terminal is dependent on the availability of the servers that this terminal uses, to connect to the OMC-R.

1.3.5.2 Equipment breakdown

The hardware configurations of the Sun Ultra 5 and SPARC5 X-terminal workstations are presented in the following sections.

X terminal hardware configuration: Ultra 5 The hardware configuration of the Ultra 5 X terminal is as follows:

- 270-MHz UltraSparc II processor
- 128 MB of RAM
- 8.4 or 20-GB internal disk
- 1 internal CD-ROM (48X) or DVD-ROM drive
- 1 internal floppy disk drive (one station per site)
- 1 Sun 3-button mouse
- 1 keyboard
- color monitor

X terminal hardware configuration: SPARC5 The hardware configuration of the SPARC5 X terminal is as follows:

- 170-MHz micro Sparc-II processor
- 20" color monitor
- 64 MB of RAM
- 2.01-GB Fast "SCSI-2" disk
- Internal CD-ROM drive
- Internal floppy disk drive
- Country kit (keyboard Unix universal)

1.3.5.3 Equipment connections

The connections between the X terminal elements are described in the following table, which includes the following:

- the cable description
- its start point
- its finish point

The following table refers to the illustrations in Figure 16 "Rear view of the Ultra 5 X terminal" (page 62) and Figure 17 "Rear view of the SPARC5 X terminal" (page 63).

CABLE	START POINT	FINISH POINT
Video cable	Video connector on rear face of central unit	Video connector on rear of color monitor
Keyboard cable	Keyboard connector on rear face of central unit	Keyboard
Mouse cable	Mouse connector on rear face of central unit	Mouse
Thin Ethernet, twisted pair or AUI cable	Ethernet connector on rear face of central unit	Ethernet or hub Network
Power for central unit and color monitor	Power connector on equipment rear face	Mains connector

1.3.5.4 Connection to OMC-R local network

Connection to the OMC-R local network occurs by using one of the following three Ethernet connectors on the rear face of the central unit:

- thin Ethernet (coaxial) with transceiver,
- RJ45 Ethernet connector,
- AUI Ethernet connector.

1.3.5.5 Physical characteristics

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
Ultra 5	112	436	430	18
SPARC5	78	417	409	13
Monitor	410	485	510	

Figure 16
Rear view of the Ultra 5 X terminal

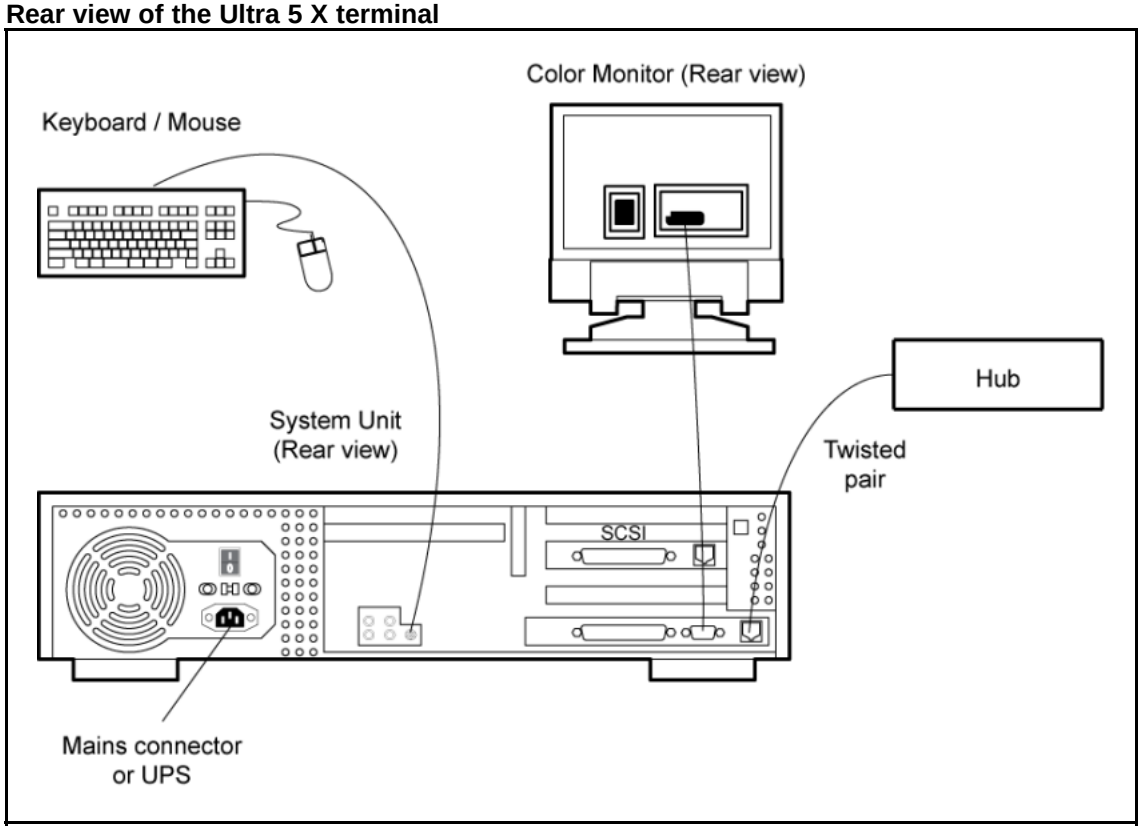
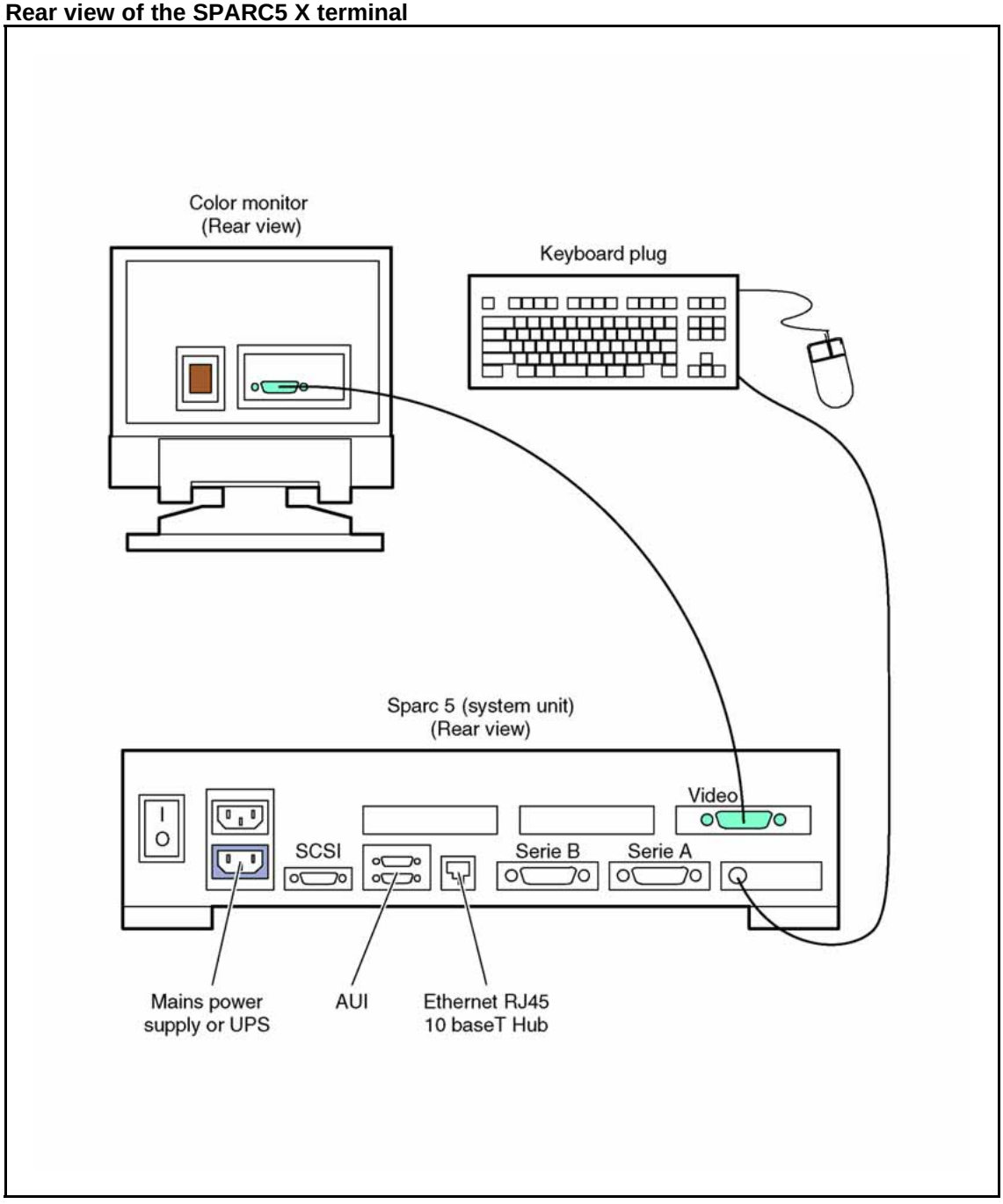


Figure 17
Rear view of the SPARC5 X terminal



1.4 Terminal server

1.4.1 Introduction

The terminal server is dedicated for one role in GSM OMC-R:

- Allowing to open a pseudo terminal connected to the SUN server serial port through a telnet connection and its 20 serial (V24) ports.

The usage of any modem (internal or external) is no longer supported with this terminal server.

Contrary to previous terminal servers (XYPLEX for example) which are now only supported, its software is stored locally, inside the LX-8020S-102 which is the nominal equipment for V17.

As a result, On the OMC-R server or station there is no longer need to store the LX-8020S-102 software, to configure any system file (like /etc/ethers), and to validate any networks protocol (like tftp).

1.4.2 Equipment description of LX-8020S-102

The LX-8020S-102 is a secure standalone communication server that is designed for applications requiring secure console or serial port management in environments requiring high-reliability and/or dual power.

The LX-8020S-102 includes the most comprehensive features, such as per port access protection, RADIUS, Secure Shell v2.0, PPP PAP/CHAP, PPP dial-back, on-board database, menus, and others.

The LX-8020S-102 console management solution enables centrally located or remote personnel to connect to the console or craft ports of any network element or server. This serial connection allows administrators to manage and configure the remote network devices and servers, as well as perform software upgrades as if attached locally.

The LX-8020S-102 is available with dual AC power supplies and provides 20 RS-232 DTE RJ45 Serial ports.

Item	Description of LX-8020S-102AC
Processor/Speeds	132 MHz RISC system board processor with integral encryption coprocessor.
Memory	16 MB Flash, 128MB SDRAM
Serial Line Speed (20)	DTE RS-232 - RJ-45 (up to 230 Kbps – default = 9600 bps)
Ethernet Interface (2)	10/100 Auto Sensing/MDI/MDIX
Height	4.3 cm (1.71 in)
Depth	25.4 cm (10.0 in)

Item	Description of LX-8020S-102AC
Width	44.4 cm (17.5 in) - fits in a 19-inch rack
Weight	LX-8020S w/modem - 3.58 kg (7.9 lbs.)
Environment	5% to 85% humidity Long Term, non condensing. Operating Temperature: 0 - 40°C (32° - 104° F) Long Term, -5 - 50°C
Power Requirements	AC - 100 - 240 VAC, 50 - 60 Hz, 0.5 Amps8040S). Dual AC Supply Unit: 38W (129 BTU).
Control Output Ratings	RTS/DTR: 5.0V @ 1.6mA (Nominal), 2.5V @ 7.6mA (Absolute Maximum)
Real Time Clock Battery	Lithium battery. Capacity is 48mAH. Power down shelf-life > 3 years at 200C.

Software delivery

By default the LX attempts to obtain IP information through the DHCP, BOOTP, or RARP loading methods. Note a DHCP, BOOTP, or RARP server must also be configured on the network to support the LX-8020S-102 unit. Otherwise, the IP address can be configured manually.

To avoid any OMC-R configuration impacts, only the manual IP configuration is used.

System login and passwords

The following user name and passwords are the defaults the first time you use the LX-8020S- 102.

- The default login username is InReach (be sure to use a capital I and R). The default login password is access.
- To enter the super user mode at the **`InReach>`** prompt, enter **`enable`**. The default password is **`system`**.

Description of cable connections

Cabling of the LX-8020S-12 may be performed as follows:

- Connect the 10/100 network CAT5 cable to the 10/100 port on the rear of the unit. The LINK LED comes on steady if the cable is properly connected. Only ETH1 is active in this release. ETH2 is not used at this time.
  The LX-8020S-102 Ethernet ports support the MDI/MDIX feature that allows you to use straight through or crossover cabling. For MDIX to function, port speed and duplex must be set to auto.

This port is set to auto negotiation by default but can be manually configured.

- Connect the provided serial port cable to the DIAG port (port 0), and the other end to your terminal. The DIAG port is on the front.
- Connect your serial network element devices (terminals, routers, etc.) to the async ports on the rear of the LX-8020S-102 and power them on.
  LX-8020S-102 serial ports provide concurrent support for RTS/CTS flow control and modem control. Refer to 451-0331D Getting Started with the LX-8000 Series.
  All LX documentations are stored on the delivered MRV CRDOM in a pdf format.
- Modem Port (Optional): Connect your phone line to the modem's RJ11 connector.

1.4.3 Equipment description of Xyplex

The Maxserver 1620 performs the function of an intelligent gateway between 20 asynchronous serial communication ports and the Ethernet.

The terminal server is in a self-contained box that is powered by 220 V and contains the following:

- front-panel mounted:
  - 4 LEDs that give visual indication of the respective activity of the equipment, the Ethernet network, the system console, and 10 LEDs that give visual indication of the respective activity of its 20 ports. LED states are described in the NTP <32>.
  - a reset switch
- rear-panel mounted:
  - power connector
  - 20 serial port connectors, type RJ45 8 way
  - 2 Ethernet connectors (AUI and RJ45)

Figure 19 "Xyplex Maxserver 1620" (page 70) shows the Maxserver 1620 front and rear faces.

The terminal server serial ports are connected to a distribution block that has 20 SUB-D, 25-way female connectors wired as DTE.

The terminal server contains a nonvolatile memory that allows it to retain its configuration.

1.4.3.1 Ethernet connection

The terminal server is directly connected to the Ethernet by one of the following:

- a transceiver by means of an Ethernet down cable connected on the AUI plug
- a Ethernet switch by means of a twisted pair connected on the RJ45 plug

1.4.3.2 Software delivery

The terminal server software is a part of the OMC-R. It is downloaded from the OMC-R when the terminal server is powered on.

1.4.3.3 Console connection

A console (screen-keyboard) is connected to a terminal server port other than the ports 1 to 6 using the distribution block for configuration verification or maintenance. The connection requires a null modem cable if the console is configured as a DTE device or a point-to-point cable if the console is configured as a DCE device.

When the keyboard "return" key is pressed one or more times, the terminal server recognizes the characteristics of the console serial link and initializes a session.

1.4.4 Description of the connections of terminal server and modem

The links between the terminal server elements are described in the following table which includes the following:

- the cable description
- its start point
- its finish point

The table refers to the illustrations in Figure 18 "Diagram of XYPLEX terminal server" (page 69):

CABLE	START POINT	FINISH POINT
Twisted pair	Terminal server 1620 Ethernet RJ45 connector	Hub
RJ45/DSUB-25 cable (x16)	Terminal server 1620 RJ45 connector	SUB-D25 connector on distribution block
RS232C cable (x5)	SUB-D25 connectors on distribution block	V34/RS232C modem connector

CABLE	START POINT	FINISH POINT
Connection modem to PSTN	SUB-D9 connector	PSTN
Power cable modem and rack	Power connector on equipment rear panel	Power supply outlet

1.4.5 Physical characteristics

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
Xyplex terminal server	44	483	297	4

Figure 18
Diagram of XYPLEX terminal server

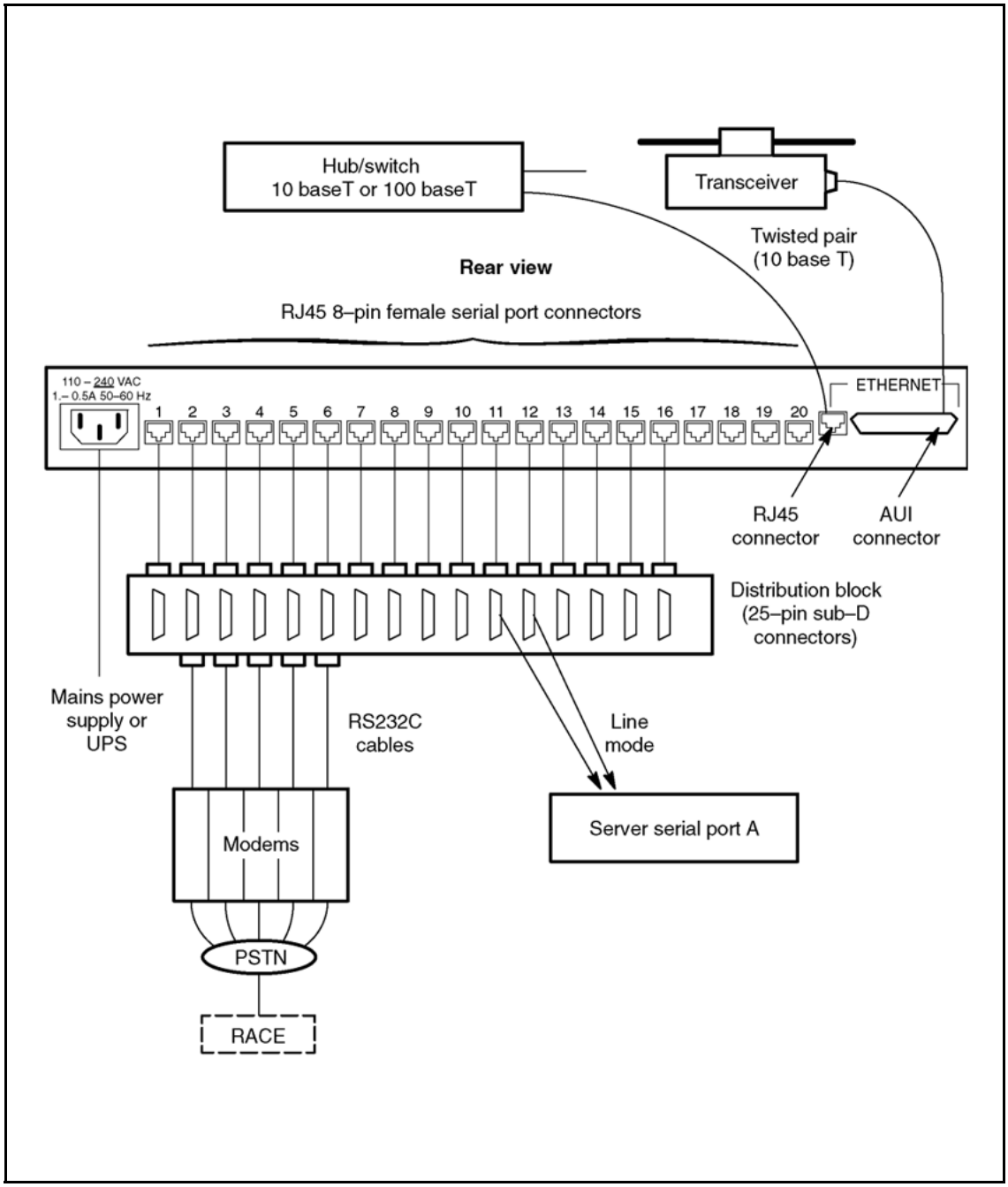
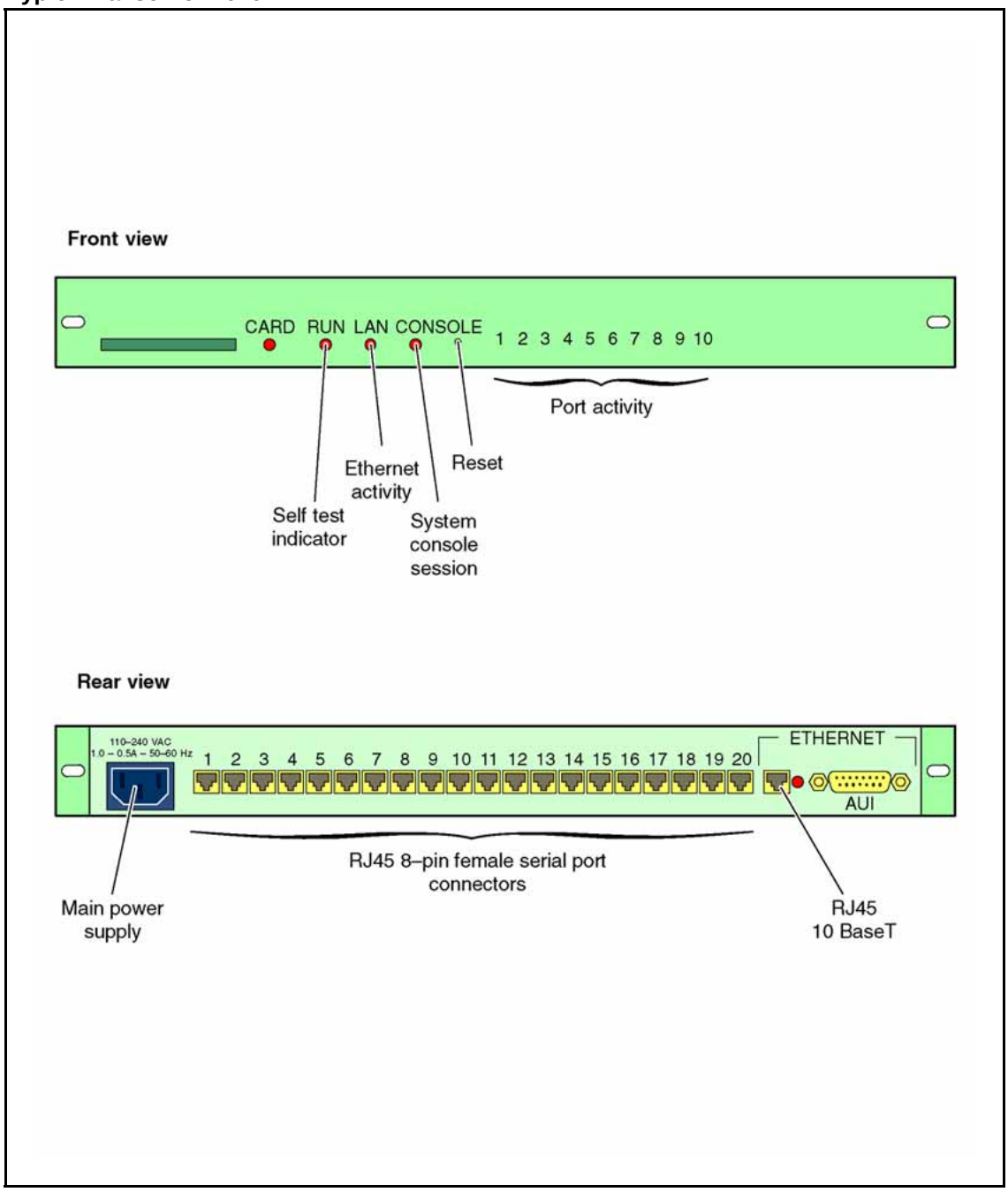


Figure 19
Xyplex Maxserver 1620



1.5 Routers

1.5.1 Overview

Within OMC-R architecture both local and remote LANs are inter connected through the X.25 network. The routers serve as bridges between the LAN (Ethernet) and X.25 network.

This type of architecture offers a number of advantages:

- OMC-R server switch over is transparent as far as remote workstations are concerned (no user involvement is required)
- cost effective remote network upgrading (only add on workstations)

1.5.2 Hardware description

The BayStack Access Stack Node router comes as an autonomous flat pack (mains power 100-240 V), equipped with the following components:

- a standard RJ45 connector for connection to the Ethernet bus
- two special-purpose 44 and 50-pin connectors for connection to the X.25 network

Figure 20 "Front View and Rear View of BayStack Access Stack Node router" (page 74) shows the front and rear panels of the BayStack Access Stack Node router.

Figure 21 "Diagram of BayStack Access Stack Node router" (page 75) outlines the major router aspects that are common on both server and remote workstation ends.

The BayStack Access Node router comes as an autonomous flat pack (mains power 100-240 V), equipped with the following components:

- a standard RJ45 connector for connection to the Ethernet bus
- two special-purpose 44-pin connectors for connection to the X.25 network. The router is delivered with a special 44-pin adapter/V35 cable (34 pins on the modem end) or a special 44-pin adapter/X.21 cable 15 pins

Figure 22 "Rear view of BayStack Access Node router" (page 76) shows the rear panel of the BayStack Access Node router.

Figure 23 "Connection of a router to an Ethernet network" (page 77) outlines the major router aspects that are common on both server and remote workstation ends.

The Cisco 2501 router comes as an autonomous flat pack (mains power 200-240 V), equipped with the following on the rear panel:

- a standard 15-pin connector for connection to the Ethernet bus
- two special-purpose 60-pin connectors for connection to the X.25 network. The router is delivered with a special 60-pin adapter/V35 cable (34 pins on the modem end) or a special 60-pin adapter/X.21 cable 15 pins
- a RJ45 console port used for router configuration (among other uses); not used by the OMC-R
- a RJ45 auxiliary port, not used by the OMC-R

Figure 24 "Diagram of Cisco 2501 router" (page 78) outlines the major Cisco 2501 router aspects that are common on both server and remote workstation ends.

Figure 25 "Front View and Rear View Cisco 2501 router" (page 79) shows the front and rear panels of the Cisco 2501 router.

1.5.3 Console connection

The operator can connect the screen-keyboard console to the RJ45 port on the router, using a RJ45/DB25 cable, to check router configuration and for maintenance purposes.

1.5.4 Configuration

Since the router is configured when the OMC-R is installed by the supplier, no further configuration is required.

1.5.5 Connections

Links between different router parts are shown in the table below under the headings:

- the cable description
- its start point
- its finish point

The following table refers to the illustrations in Figure 20 "Front View and Rear View of BayStack Access Stack Node router" (page 74) or Figure 21 "Diagram of BayStack Access Stack Node router" (page 75) to the BayStack Access Stack Node router (V13-V17 nominal):

CABLE	START POINT	FINISH POINT
44/V35 cable, no supplied by router manufacturer, or	44-pin outlet on the router	V35 modem outlet (34 pins)
50/V38 cable, no supplied by router manufacturer	50-pin outlet on the router	Modem outlet (SUB-D 15)

The following table refers to the illustrations in Figure 22 "Rear view of BayStack Access Node router" (page 76) or Figure 23 "Connection of a router to an Ethernet network" (page 77) to the BayStack router:

CABLE	START POINT	FINISH POINT
44/V35 cable, supplied by router manufacturer, or	44-pin outlet on the router	V35 modem outlet (34 pins)
44/X21 cable, supplied by routermanufacturer	44-pin outlet on the router	Modem outlet (SUB-D 15)
Router mains power supply	Mains power	Equipment rear power supply outlet

The following table refers to the illustrations in Figure 24 "Diagram of Cisco 2501 router" (page 78) or Figure 25 "Front View and Rear View Cisco 2501 router" (page 79) at the Cisco router:

CABLE	START POINT	FINISH POINT
60/V35 cable, supplied by router manufacturer, or	60-pin outlet on the router	V35 modem outlet (34 pins)
60/X21 cable, supplied by router manufacturer	60-pin outlet on the router	Modem outlet (SUB-D 15)
Twisted pair	15-pin Ethernet AUI connector RJ45 plug of the AUI/RJ45 adaptor	AUI connector of the AUI/RJ45 adaptor Hub
Router mains power supply	Mains power	Equipment rear power supply outlet

1.5.6 Physical characteristics

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
BayStack Access Node router	110 mm	445 mm	432 mm	12.3 kg

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
BayStack Access Node router	85 mm	445 mm	232 mm	5 kg
Cisco 2501 router	44mm	445 mm	268 mm	5 kg

Figure 20
Front View and Rear View of BayStack Access Stack Node router

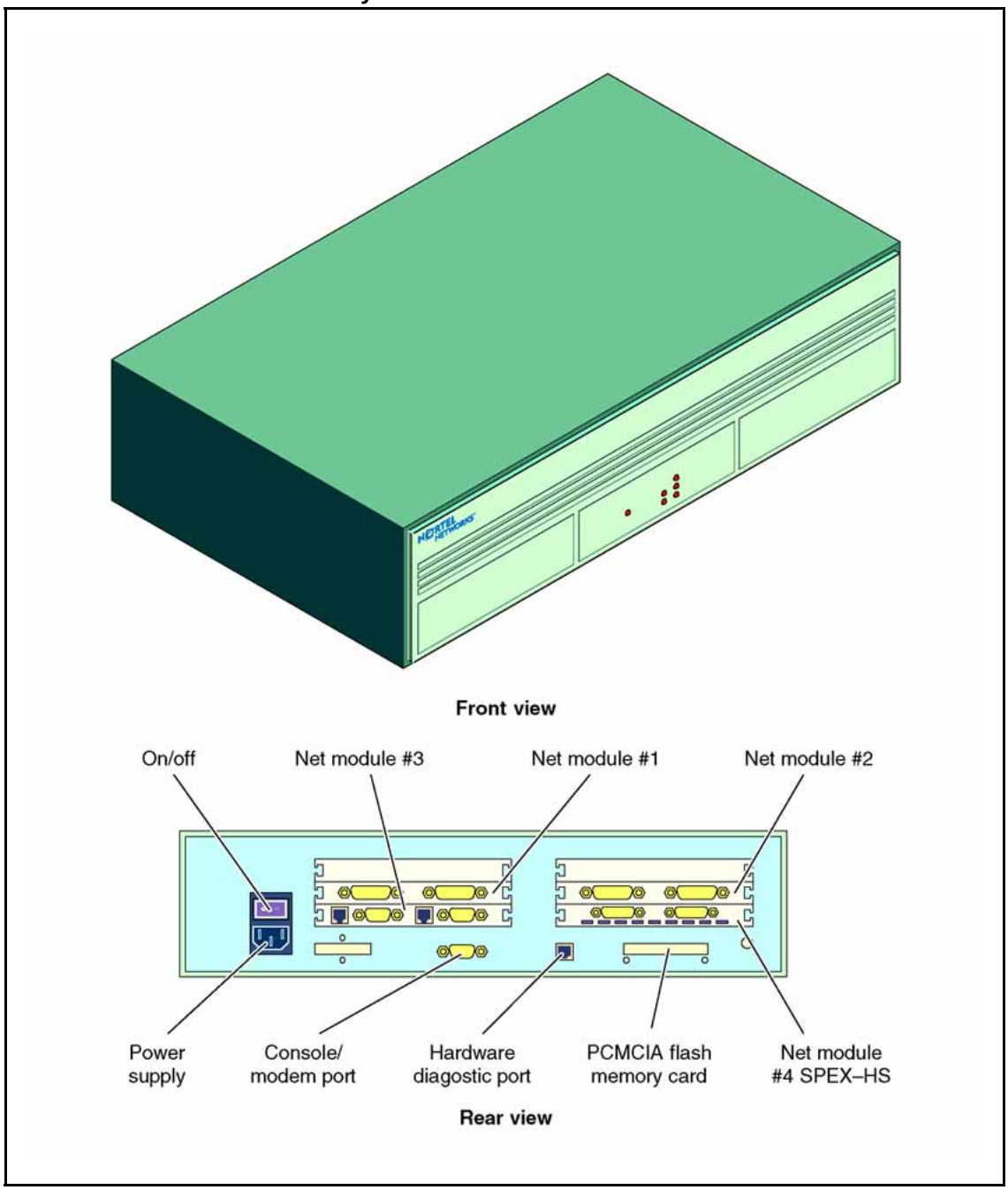


Figure 21
Diagram of BayStack Access Stack Node router

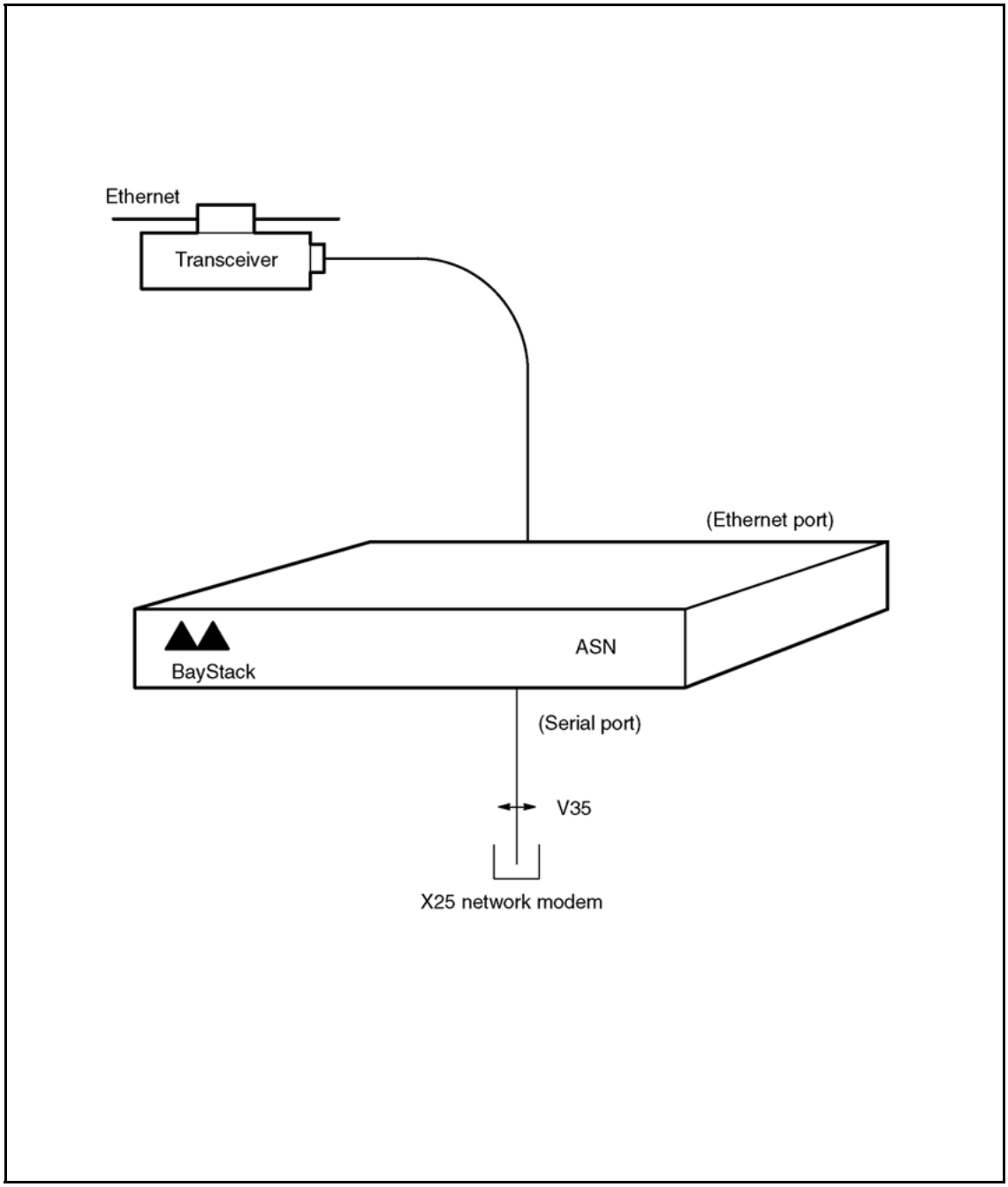


Figure 22
Rear view of BayStack Access Node router

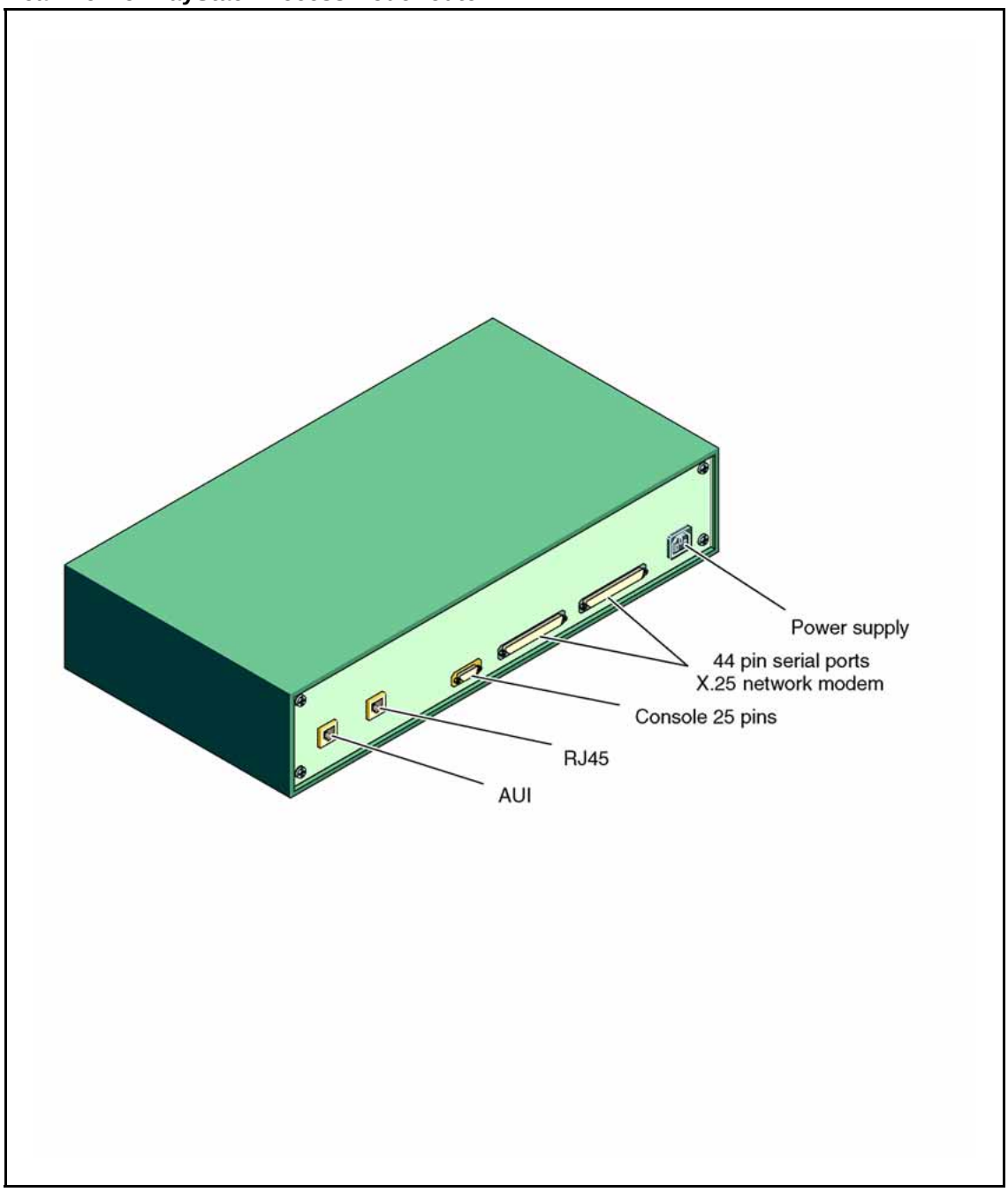


Figure 23
Connection of a router to an Ethernet network

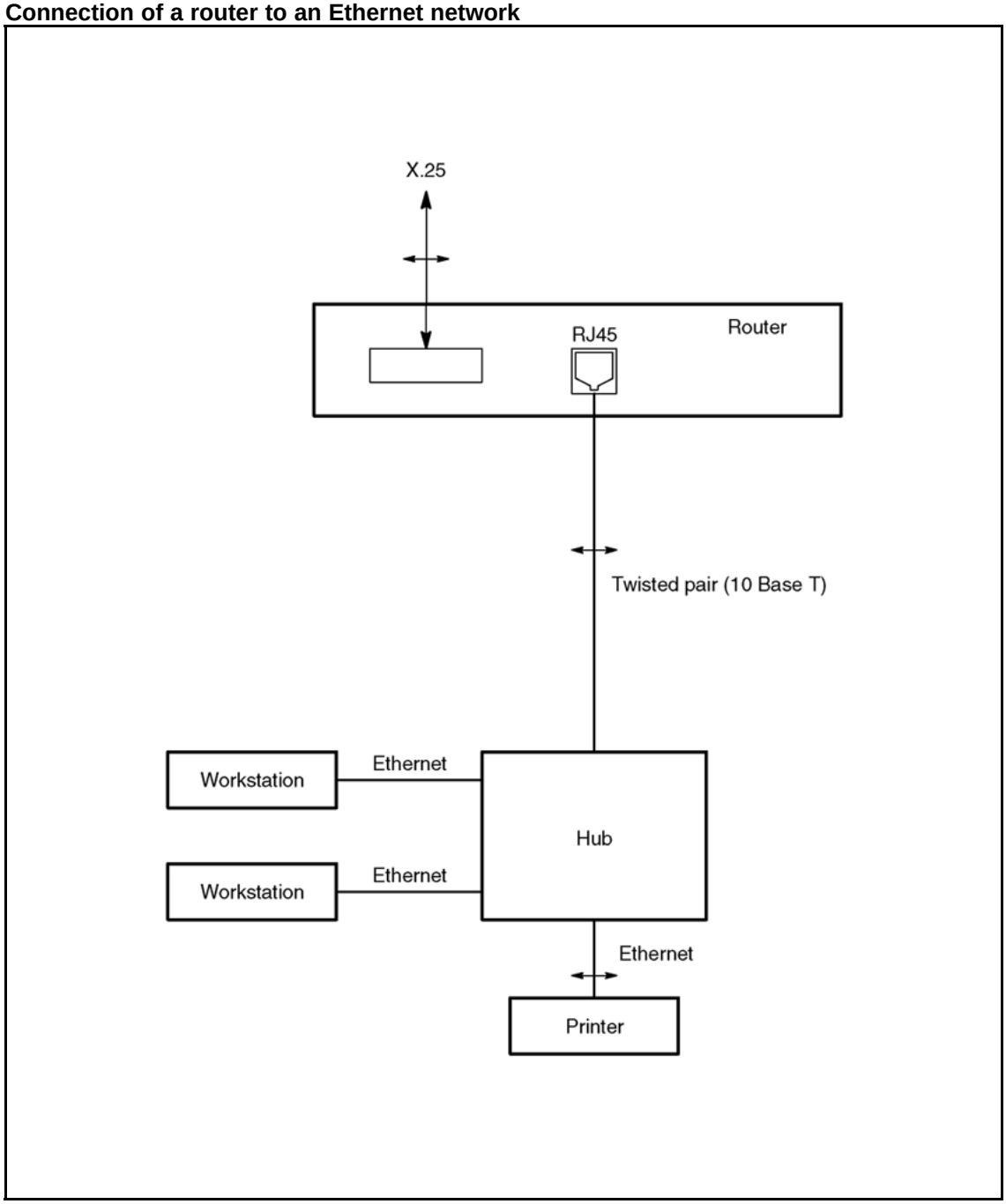


Figure 24
Diagram of Cisco 2501 router

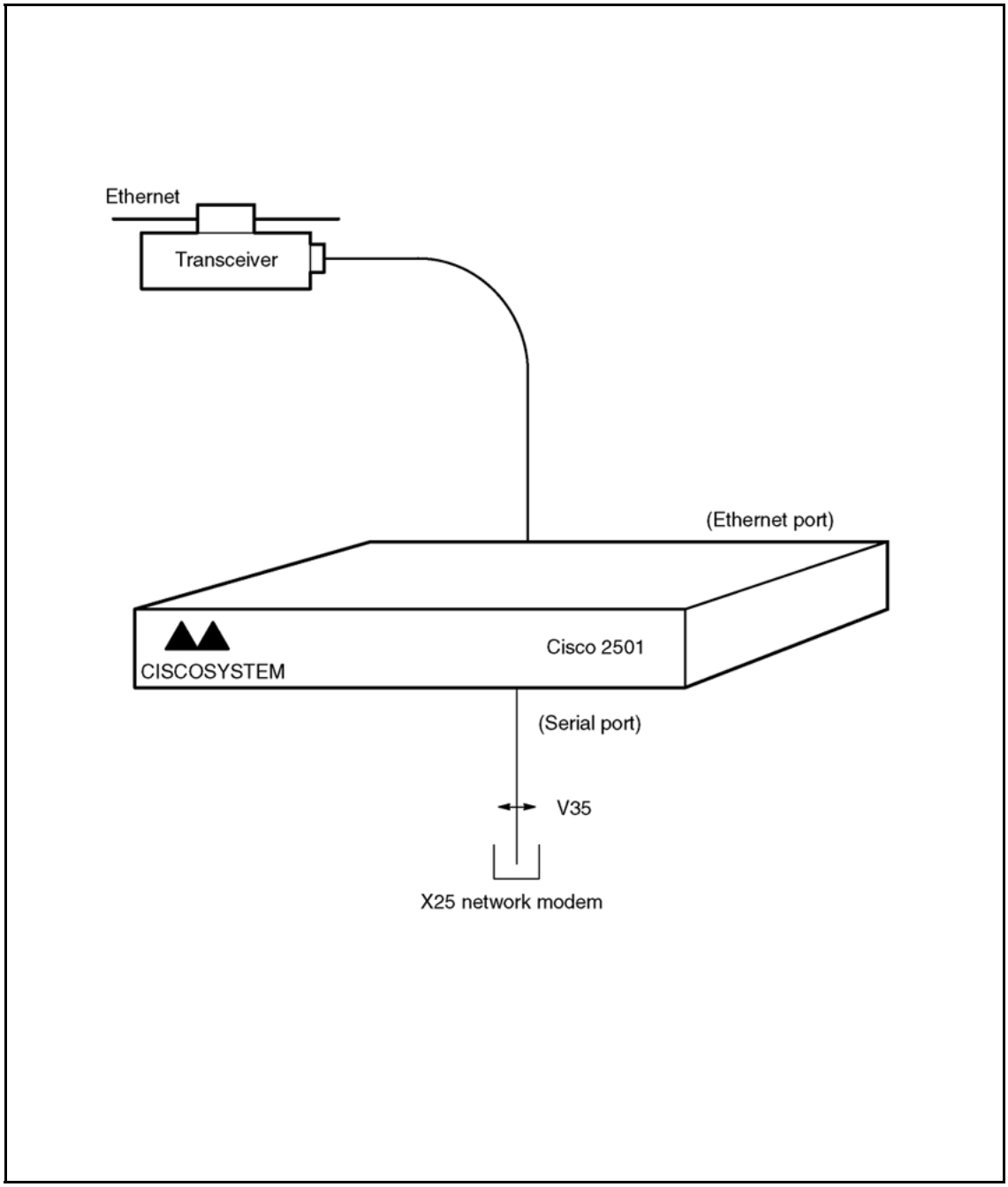


Figure 25
Front View and Rear View Cisco 2501 router

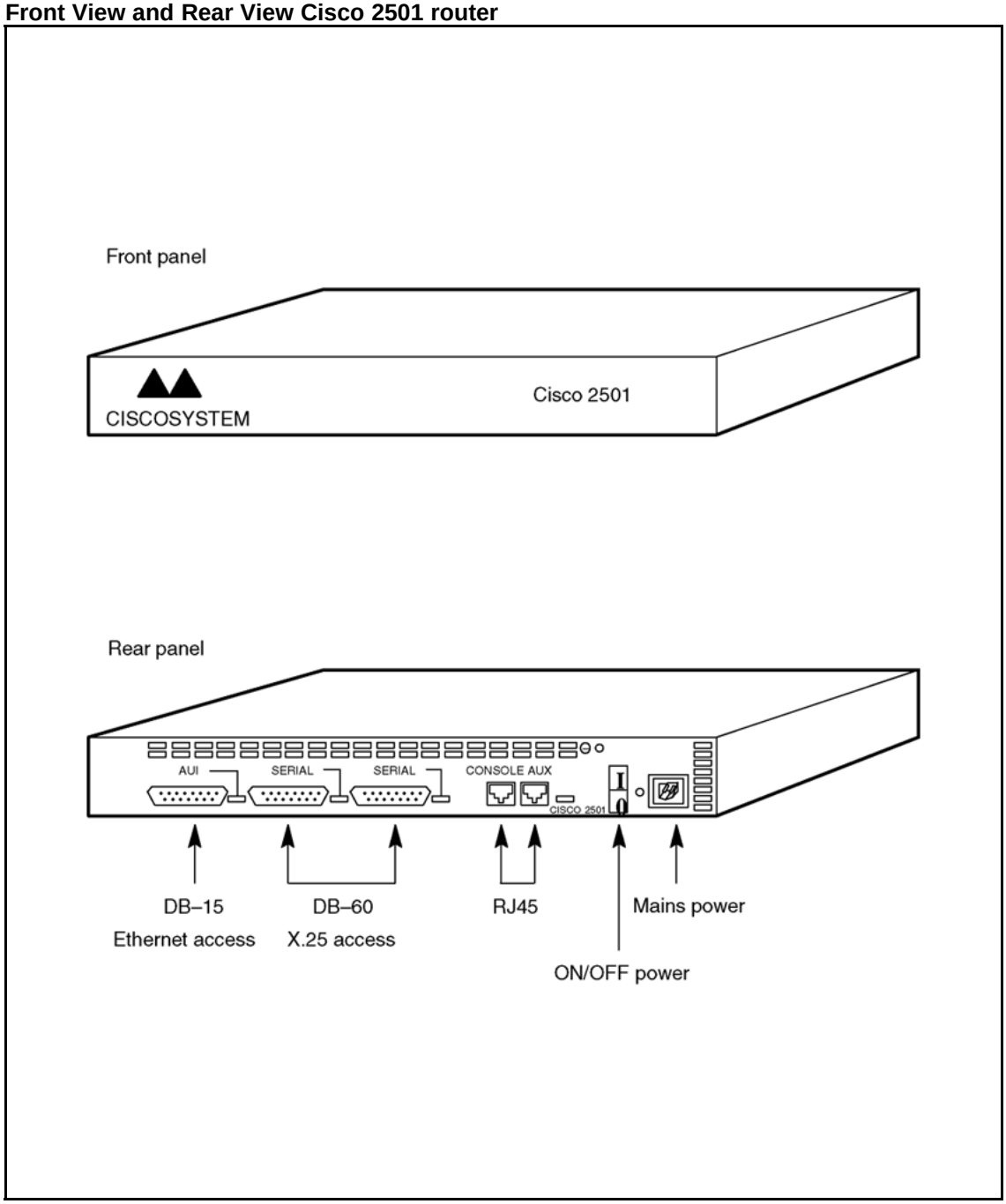
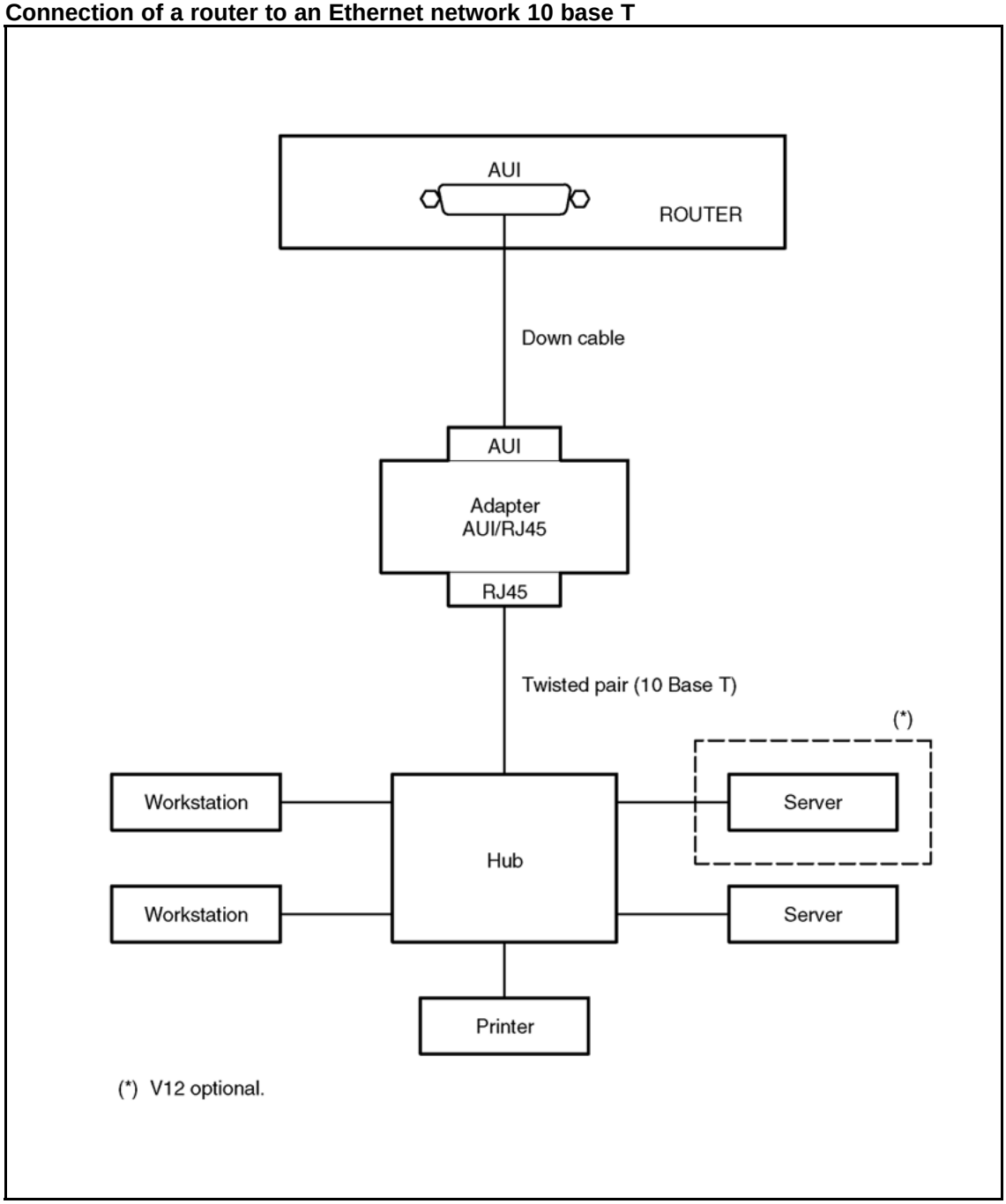


Figure 26
Connection of a router to an Ethernet network 10 base T



1.6 Firewall

The security PC (Firewall) has:

- a V34 modem Multi-tech with automatic answer
- a PC with:
  - 2 RS232 asynchronous ports
  - an UART
  - at least 10 Mbytes of available disk space
  - at least 640 kbytes of RAM
  - a pointer (mouse)

External connections of Firewall

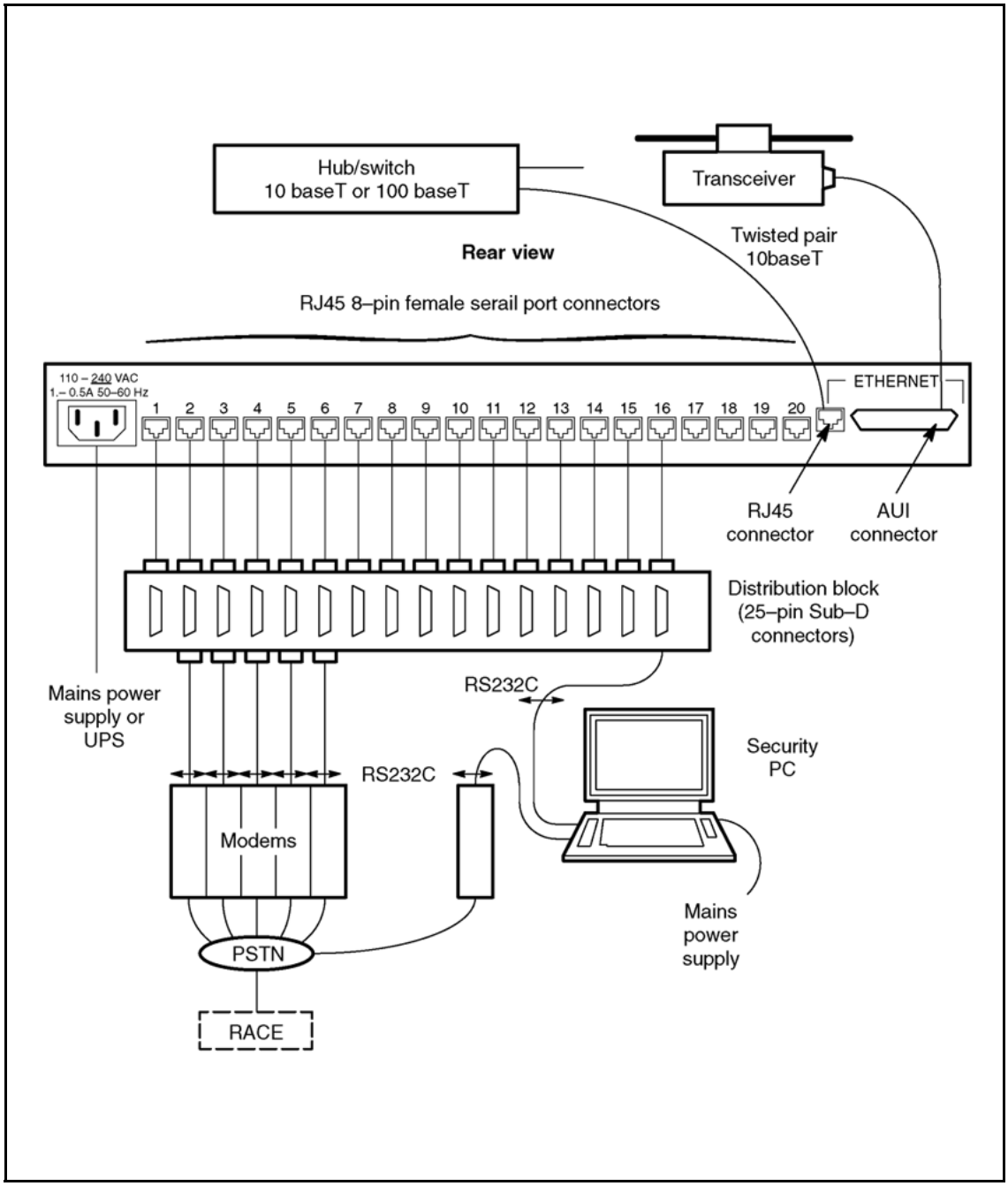
The following table gives:

- the cable description
- its start point
- its finish point

The table refers to the illustrations in Figure 27 "External connections of the security PC (Firewall)" (page 82).

CABLE	START POINT	FINISH POINT
RS232C cable (x2)	SUB-D 25 connectors on distribution block	SUB-D 9 connectors on PC
RS232C right cable	SUB-D 9 connectors on PC	Modem rack; SUB-D 25 connectors on distribution block
Power cable	Power connector	Mains power supply

Figure 27
External connections of the security PC (Firewall)



1.7 Ethernet hubs

1.7.1 Introduction

The hubs below described are:

- BayStack 350
- BayStack 250
- LinkBuilder FMS II hub and the Centrecom Micro hub

1.7.2 Connections

The following table gives:

- the cable description
- its start point
- its finish point

The connection of a router to Ethernet hub requires using an AUI/RJ45 adaptor (see Figure 26 "Connection of a router to an Ethernet network 10 base T" (page 80)).

CABLE	START POINT	FINISH POINT
Twisted pair	RJ45 Ethernet plug of the equipment	Hub (10 Base T)
Power cable	Power connector	An UPS

1.7.3 BayStack 250 Series

It is a standard stackable Ethernet hub.

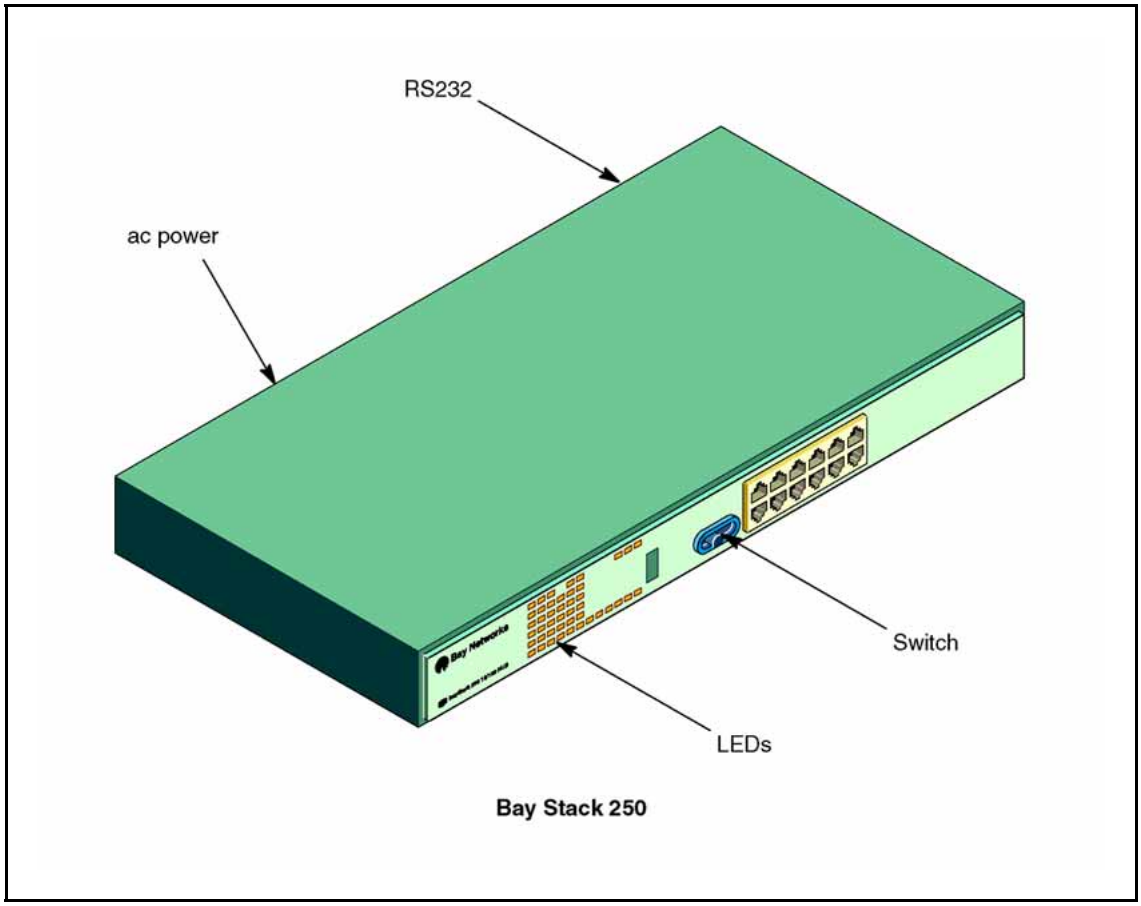
It contains a BayStack 250: 12 RJ45 ports for twisted pair 10 Base T or 100 Base T and 1 AUI port

Each port is a repeater. The ports can be active simultaneously.

A slot is available for a management module. Two chained hubs make a logical hub.

It is presented in Figure 28 "Front view of BayStack 250 hub" (page 84).

Figure 28
Front view of BayStack 250 hub



1.7.4 LinkBuilder FMS II hub (3 COM)

It is a standard stackable Ethernet hub. It can be mounted in a standard 19" rack/desk or wall mounted. It contains:

- 12 RJ45 ports for twisted pair (10 Base T)
- 1 AUI port

Each port is a repeater. The 13 ports can be active simultaneously.

A slot is available for a management module. Two LinkBuilder FMS II hubs can be chained with a bus extension cable. Two chained hubs make a logical hub.

A filtering bridge module can also be inserted.

Different cabling ways are available:

- twisted pair
- optical fiber

The FMS II hub is available in two versions: desktop or 19" rack (mounted wall possibility). It is presented in Figure 29 "Link Builder FMS 2 hub" (page 86).

1.7.5 Centrecom Micro hub (Allied Telesyn International)

This hub provides 10 Base T 8 ports (twisted pair) and an AUI port for accessing a LAN through an external transceiver.

Two leds are associated with each port indicating its activity and status. Three central leds indicate "Activity", "Collision" and "Power".

Different cabling ways are available:

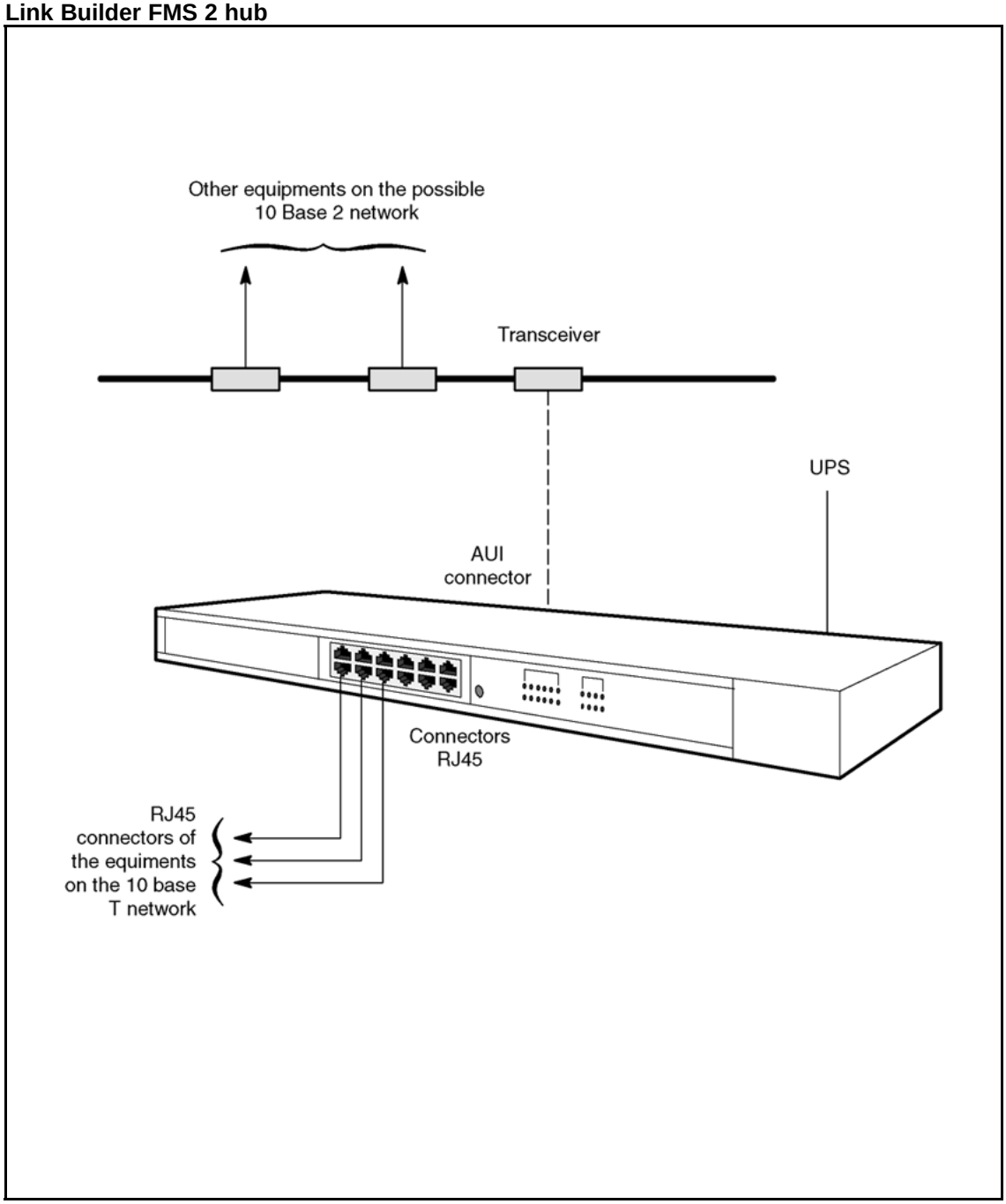
- twisted pair
- fiber optic

The Centrecom Micro hub is available in the desktop version.

1.7.6 Physical characteristics

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
BayStack 350	70.3	44.07	38.1	5
BayStack 250	44	44	22	3
Hub 12 ports	44	440	230	3
Hub 8 ports	31	211	112	1

Figure 29
Link Builder FMS 2 hub



1.8 Ethernet switch

The Ethernet switch isolates the OMC-R LAN of the other network.

The Ethernet switch is BayStack 350, 12 or 24 ports 10 or 100 Mbits/s .(V13 - V15 nominal; V16, V17 supported)

The front views are shown in Figure 30 "Front view of BayStack 350" (page 88).

Newbridge GREDT 16 Switch 16 ports ETH 10 Mbits/s (V13-17 supported)..

The view is shown in Figure 31 "Ethernet Newbridge switch" (page 89).

Figure 30
Front view of BayStack 350

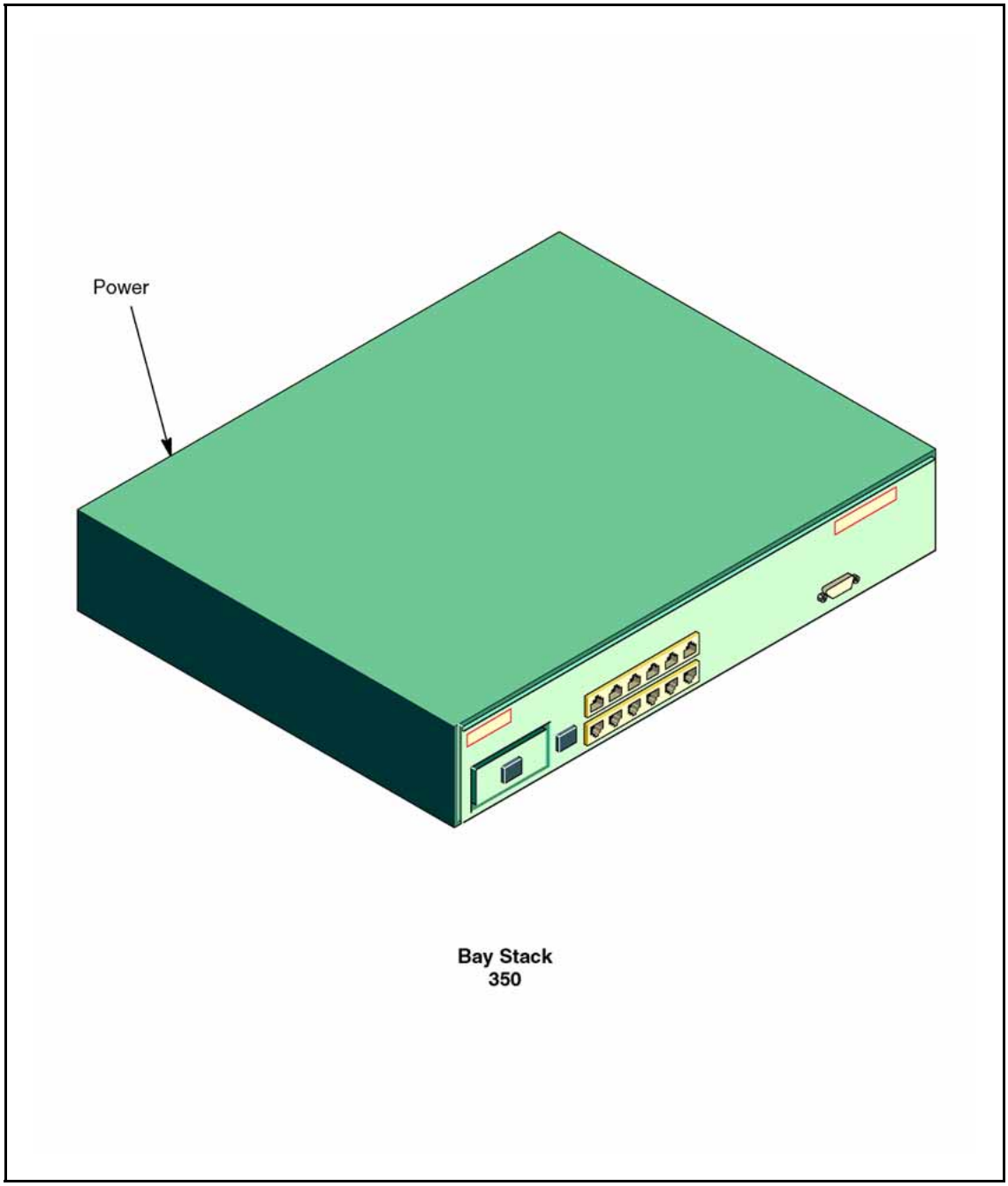
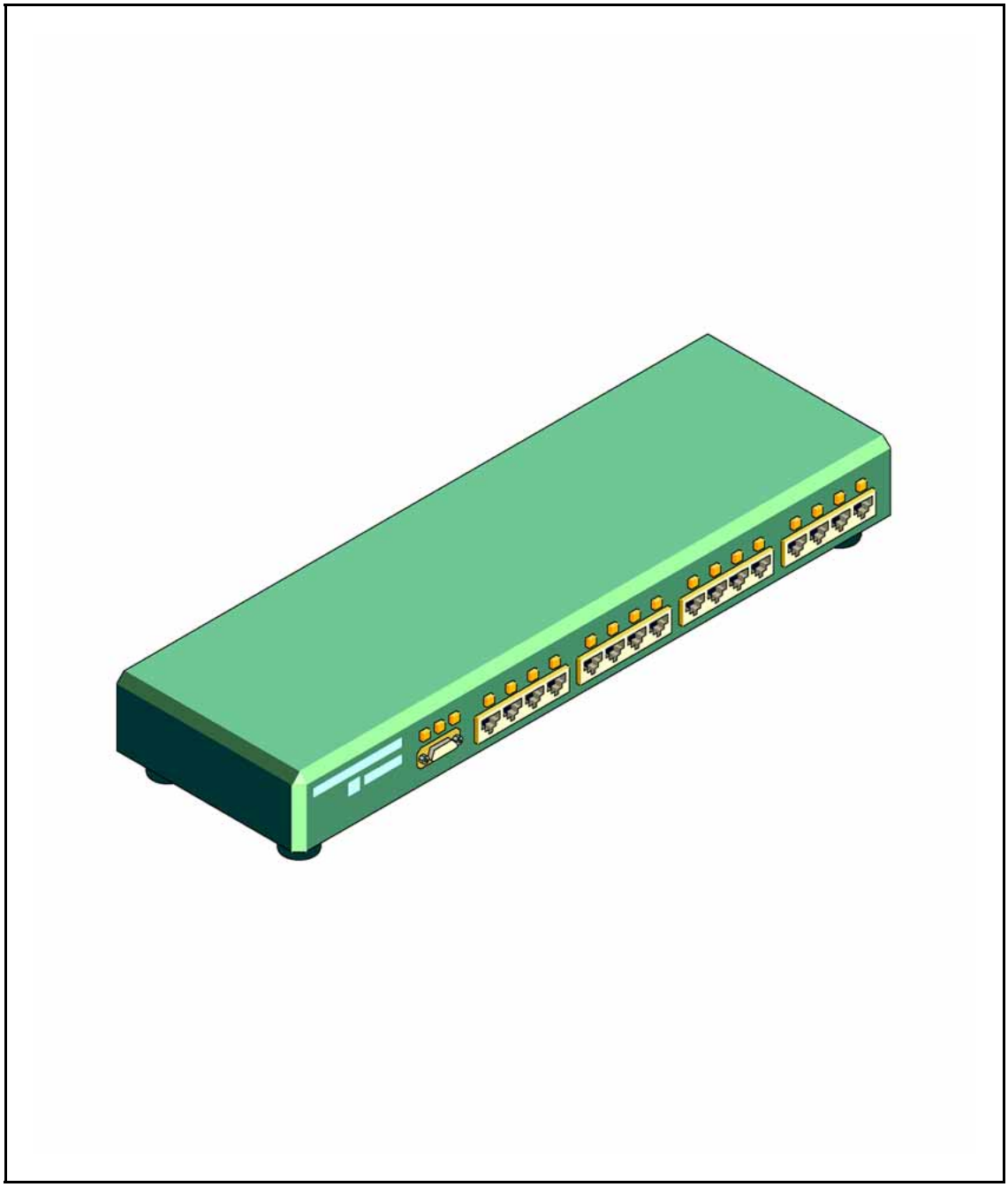


Figure 31
Ethernet Newbridge switch



Physical characteristics

EQUIPMENT	HEIGHT mm	WIDTH mm	DEPTH mm	WEIGHT kg
BayStack 1350	70.3	44.07	38.1	5
Ethernet switch GREDT16	5	44	22	5

1.9 Reference documents

Manufacturer's information can be obtained by contacting them directly through their web site. The list of equipment below includes the URLs for the major suppliers.

Documents may be ordered from the manufacturer.

1.9.1 OMC-R servers and workstations

Contact the manufacturer to find information on the following Sun products by contacting their web site at http://www.sun.com/:

- Sun Fire V890
- Sun Fire V880
- T3
- HSI
- DAT
- Sun Ultra 45
- Sun Blade 1500
- Sun Blade 150
- Ultra 5
- Sparc 5

CAUTION
GSM-R specific
Indicates that specific equipment and specific software (such as specific software in the BSC) dedicated to Railway application is used and that therefore the feature is not available for all standard GSM users.

1.9.2 Terminal servers

For information on the following terminal servers contact the manufacturer by consulting their web site at http://www.mrv.com/

- MRV LX8020S
- Xyplex servers

1.9.3 Modems

For information on modems contact the manufacturer by consulting www.multitech.com

1.9.4 Router

Information is available on the following router equipment:

- BayStack Access Stack Node Router
  Nortel product documentation is available on CD-ROM provided or by contacting the manufacturer through their web site at http://www.nortel.com.
- BayStack Access Node Router
  Nortel product documentation is available on CD-ROM provided or by contacting the manufacturer through their web site at http://www.nortel.com.
- Cisco Router
  For information on Cisco routers contact the manufacturer by consulting their web site at http://www.cisco.com

1.9.5 Hubs

Information may be found on the following hubs by contacting the manufacturer through their web site:

- BayStack 250 hub
  Installation and Reference for the BayStack series 250 Ethernet Hubs is available on the CD-ROM provided or by consulting the manufacturer through their web site at http://www.nortel.com
- Concentrator Centrecom Micro hub. Consult http://www.alliedtelesyn.com/
- LinkBuilder FMSii 3Com Stackable Ethernet hubs. Consult http://support.3com.com/software/linkbuilder_fms-fms_ii.htm

1.9.6 X.25 switches

For information concerning the Newbridge 36111 MainStreet switch consult the manufacturer through the following web site at

http://www.alcatel.com

1.9.7 Printer

An installation guide for Lexmark printers (T620n, 614n, and 612n) may be found at

http://www.lexmark.com

1.10 OMC-R equipment parts list

1.10.1 Configuration example

The nomenclature in this paragraph applies to the example configuration comprising the following:

- one server
- three local workstations (1 X terminal)
- two remote workstations on one site
- two routers
- one terminal server
- one printer
- one or two alarms boxes on the server

Contact your local sales office for references.

1.10.2 Nomenclature example (V17)

Description	Quantity
Server	
Sun Fire V890 1.8 GHz UltraSPARCIV+ processors	1
16 GB of RAM	
146-GB disk drives	12
HSI/P (or HSI/U for RoHS compliant) board (communication controller)	1
Internal DVD-ROM drive	1
Internal DAT 72 tape drive	1
Local/Remote workstations	
Sun Ultra 45 with up to two UltraSPARC IIIi 1.6GHz processors, 2GB Memory	1
16 GB of registered DDR1 ECC memory in eight slots	1
Graphics accelerators for 2-D or high-performance 3-D	1
2 GB of RAM	2
250 GB 7200 RPM SATA disk drive	2
146 GB 15000 RPM SAS disk drive	2
DVD-RW/CD-RW drive	1
PCI Express x 16 graphics slots (x 8 logically)	2
PCI-X 100 MHz slots	2
X Terminal	
Sun Ultra 5 - 270 MHz (21" screen and keyboard)	1

Description	Quantity
Ethernet switch BPS470/BPS5510	 1 or more
Modems Multi-tech system	 5
Terminal server MRV LX80205	 1
Routers BayStack Access Node ASN	 1
Printer Lexmark Optra T632N	 1
Alarm box Lorin alarm box	 1

Chapter 2 OMC-R architecture

2.1 OMC-R functional architecture

2.1.1 Introduction

The user should be familiar with the following documents before starting this paragraph: NTPs < 01 >,< 07 >,< 124 >,< 125 > and <133>.

This paragraph details the functional aspects of the OMC-R. These NTPs describe the external functions and basic definitions.

2.1.2 Functional Organization

The OMC-R includes two entities, a local manager and an agent. The two entities communicate across the Q3 interface.

The agent, called the MD-R, supports the mediation function.

It converts Q3 format messages into requests in a standard format and forwards them to the OMC-R/BSC interface. Conversely, it converts messages coming from the BSS into Q3 format messages.

The OMC-R provides the following functions:

- Man Machine Interface (MMI)
- COmmunication Management (COM)
- BSS Configuration Management (CM)
- Fault Management (FM)
- Performance Management (PM)
- Security Management (SM)
- Common Functions (CF)
- RACE management
- OMC-R databases
- GPRS management

The OMC-R is based on a set of databases further described.

Each of these functions involves an agent and a local manager.

This paragraph describes the services enabled by each function and interworking with other OMC-R functions. Refer to NTP for more details on these functions. The commands required for these functions are described in NTPs <128>, < 129 > and < 130 >.

2.1.3 Man Machine Interface (MMI)

2.1.3.1 Introduction

The man-machine interface consists of a selection of screens and commands used to access the OMC-R functions. The following distinctions are made for this interface:

- the screens preceding the "login" prompt are described in the NTP <32>.
- the OMN user screens described in NTPs <07>, < 128 >, <129> and <130>.

The man-machine interface allows users to access OMC-R operation and maintenance functions.

The MMI communication uses graphic functions to avoid the use of the keyboard whenever possible (predefined fields).

The interface is not organized as a branching structure but around different types of window, where each window represents a specific function.

There are five types of windows:

- the windows browsing easily in a set of objects, the OMC-R browser window is the main window
- object-dedicated windows that contain information directly related to the object
- permanent windows providing access to different services
- system windows providing access to system information
- other special purpose windows

Moreover, a background menu enables to start a machine.

2.1.3.2 The windows

Browser Windows This type of window allows to browse in a set of objects.

Each window represents a set of objects:

- OMC-R Browser window shows the elements making up the network, at the OMC, BSS, TCU, PCUSN, site and cell levels. This window is the main OMC-R window and it enables access to all the other windows
- Security Manager window gives access to user and station profiles
- command file Manager
- window shows the command file tree
- SMS-CB window
- Job Scheduler window for organizing jobs and their result files
- Relay Manager window
- Alarm Criteria window shows the alarm criteria, defined on the OMC-R, in a table
- the window of the EFT include on the CD-ROM in the drive of the workstation
- Use On-line JavaHelp viewer to consult the documentation.

The workspace of each user can be saved on the OMC-R when the user logs out from the OMC-R Browser.

Object-dedicated windows Window contents are directly connected to an object.

There are four types of windows:

- the object info window which display the description of any object
- the object monitor which display the description of any object
- the alarm monitor which display the current list of alarms
- the performance monitor which display the current value of several counters (ORT or OFS)

Permanent windows They are automatically opened at the user connection.

Four windows are of this type:

- the user session log where are stored the commands entered by the user during the session
- the state change window which displays all the state changes

- the user mail which gives access to all the connected users
- the window of the commands in process which displays all the commands in process for this session

System windows They are automatically opened at the user connection.

Two windows are of this type:

- the alarm banner which displays in real time the alarm counters.
- the session information window which displays the session information (terminal name, time and date of the last connection to the server).

Other windows Other windows are accessible, such as the session log which displays the history of all the commands (and the system replies) which have been executed during the current session.

2.1.3.3 Command Management

Each command issued by the user on the graphic interface is related to an alphanumeric command line, to allow for example:

- to execute a command, except the administration and security commands
- to record all the commands in a log (system log)

The MMI function on OMC-R also provides an on-line command interface using:

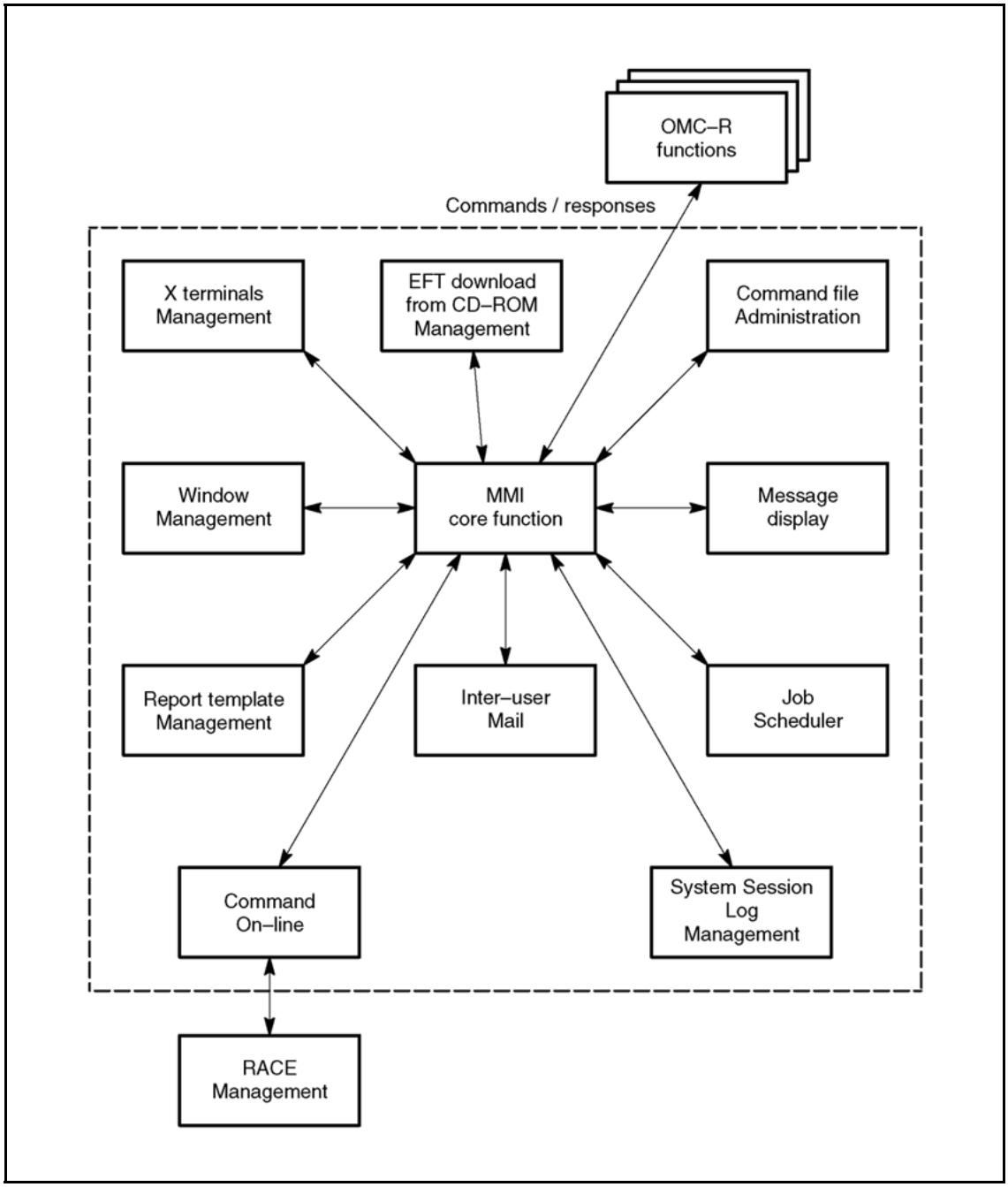
- command files
- periodic functions

CAUTION
Customer specific
Indicates that specific equipment and specific software dedicated to specific application is used and that therefore the feature is not available for all standard GSM users.

2.1.3.4 Interworking with other functions

The MMI communicates with all the functions (for example, Performance Management and Fault Management) that process Man Machine Interface commands or issue event messages as shown in Figure 32 "Functional diagram of the Man-Machine Interface" (page 99).

Figure 32
Functional diagram of the Man-Machine Interface



2.1.4 Communication Management (COM)

2.1.4.1 Introduction

COmmunication Management provides a set of services used by other OMC-R functions. These services (or sub-functions) include:

- OSI model layers
- application layers
- BSS interface
- internal mail
- communication service with a manager

2.1.4.2 Sub-function description

OSI model layers The communications are achieved by using the OSI model. For each layer, this paragraph describes the Sun products providing the External Manager/MD-R and MD-R/BSS interfaces.

Lower layers - physical layer External Manager/MD-R or MD-R/BSS interface:

- for a connection through a WAN, the interface uses the physical network connecting an external manager and a MD-R
- for a connection through a LAN, the interface uses Ethernet IEEE 802.3

Lower layers - data link layer The SunLink OSI product provides the ISO-IS-8802-2 service.

External Manager/MD-R or MD-R/BSS interface:

- for a connection through a WAN, the interface uses a LAPB link
- for a connection through a LAN, the interface uses a LCC/MAC link

Lower layers - network layer The SunLink OSI product provides the following services:

- IP protocol Internet

The network parameters for the MD-R/BSS interface are IP parameters.

Upper layers - transport layer The SunLink OSI product provides the following services:

- ISO-IS-8072 (X.214) Transport Service Definition
- ISO-IS-8073 (X.224) Connection Oriented Transport Protocol Specification

The transport Protocol Class 0 is used over a TCP/IP connection.

RFC 1006 Transport Service Access Point is used on the BSS interface.

The TPDU size for the External Manager/MD-R interface is 4096 bytes.

The TPDU size for the MD-R/BSS interface is 1024 bytes.

On both interfaces, External Manager/MD-R and MD-R/BSS, the transport class is 2.

RFC 1006 interface implements the transport over a TCP connection, class 4.

Upper layers - session layer The SunLink OSI product provides the following services:

- ISO-IS-8326 (X.215) Basic Connection Oriented Session Service Definition
- ISO-IS-8327 (X.225) Basic Connection Oriented Session Protocol Specification

The expeditive data option (default session value) is supported.

The session parameters for the External Manager/MD-R and OMC-R/MD-R interface are the Sun Link OSI default values.

Upper layers - presentation layer The following specifications are supported by the Sun Link OSI product:

- ISO-IS-8824 (X.208) Specification of Abstract Syntax Notation One
- ISO-IS-8825 (X.209) Specification of Basic Encoding Rules for abstract syntax (ASN.1)

The communication stack provides the following elements:

- ISO-IS-8822 (X.216) for the Connection Oriented Presentation Service Definition
- ISO-IS-8823 (X.226) for the Connection Oriented Presentation Protocol Specification

It provides also the following application layers:

- ISO-IS-9072-1 Remote Operations, Model Notation, and Service Definition
- ISO-IS-9072-2 Protocol Specifications
- ISO-IS-8649 For the Service Definition used by Association Control Service Element
- ISO-IS-8650 Service Definition for the Association Control Service Element

The Presentation parameters for the External Manager/MD-R and OMC-R/MD-R interface are the Sun Link OSI default values.

FTAM layer The MD-R/BSS interface uses the Kernel, Read, Write, Limited File Management, and Grouping functional units.

On the External Manager/MD-R interface, the MD-R is the FTAM responder.

On the MD-R/BSS interface, the MD-R is the FTAM initiator.

On the External Manager/MD-R interface, the communication function protects itself again the lack of resources by setting a timer to supervise the release of the established associations.

CMIS layer The CMIS elements are provided by the Sun CMIS stack. The following functional units are supported by the MD-R communication function:

- "multiple object selection"
- "filter"
- "multiple reply"

The "extended service" and "cancel-get" functional units are not supported by the MD-R communication function.

The accesses to the CMIS services are made by using a connectionless service, so that the CMIS user is not in charge of the management of the ACSE associations.

BSS interface This service is supplied by the communication function on the MD-R/BSS interface.

It provides an access over FTAM and the transport facilities on MD-R/BSS interface.

The following services are available on this interface:

- management of the BSS links
- management of the BSS associations
- request, response, and event management
- observation of the state of the transport connection

Internal mail The user mail facility manages mailboxes and special message structures. It offers a send/receive message service using mailboxes. It is used for the exchanges between the OMC-R tasks resident on the same machine or not, for the notification management between the local manager and the MD-R.

Manager/MD-R Communication This sub-function provides CMIS and /or FTAM services on the Manager/MD-R interface:

- manages a manager/MD-R connection with MD-R
- checks, validates and encodes CMIS requests from manager applications
- decodes, validates and directs notifications from the MD-R to external manager applications
- validates and encodes the CMIS of the external Manager application replies to notifications received by MD-R
- replies to local OMC-R administration demands

It also manages file transfers supported by FTAM between the Manager and MD-R.

For the local manager, the interface is by mail for decode, validate and direct notifications from the MD-R.

2.1.4.3 Interworking with other functions

The communication management sub-functions communicate with all the other OMC-R functions (see Figure 33 "MD-R system overview" (page 104) and Figure 34 "Communication Management functions" (page 105)).

Figure 33
MD-R system overview

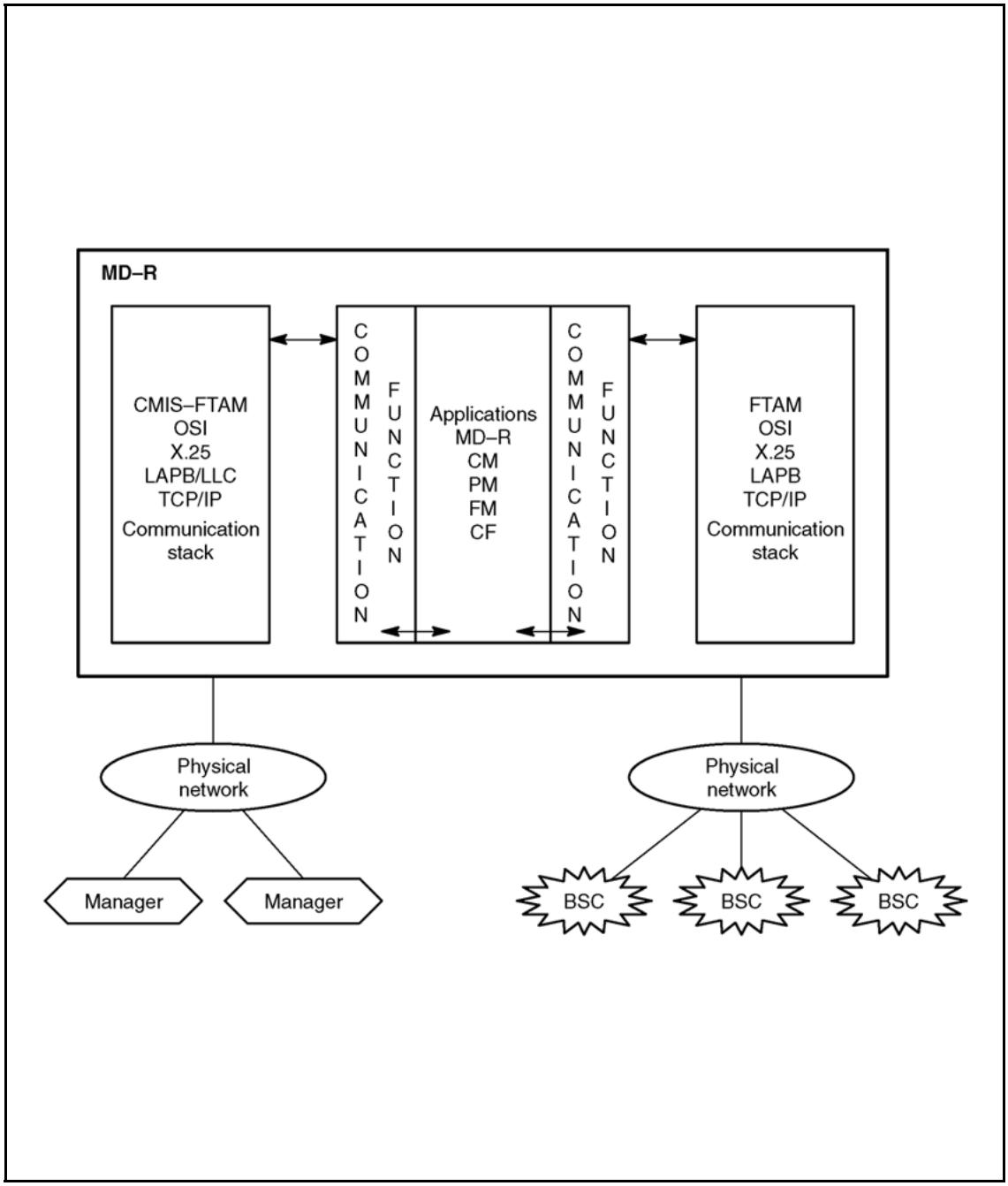
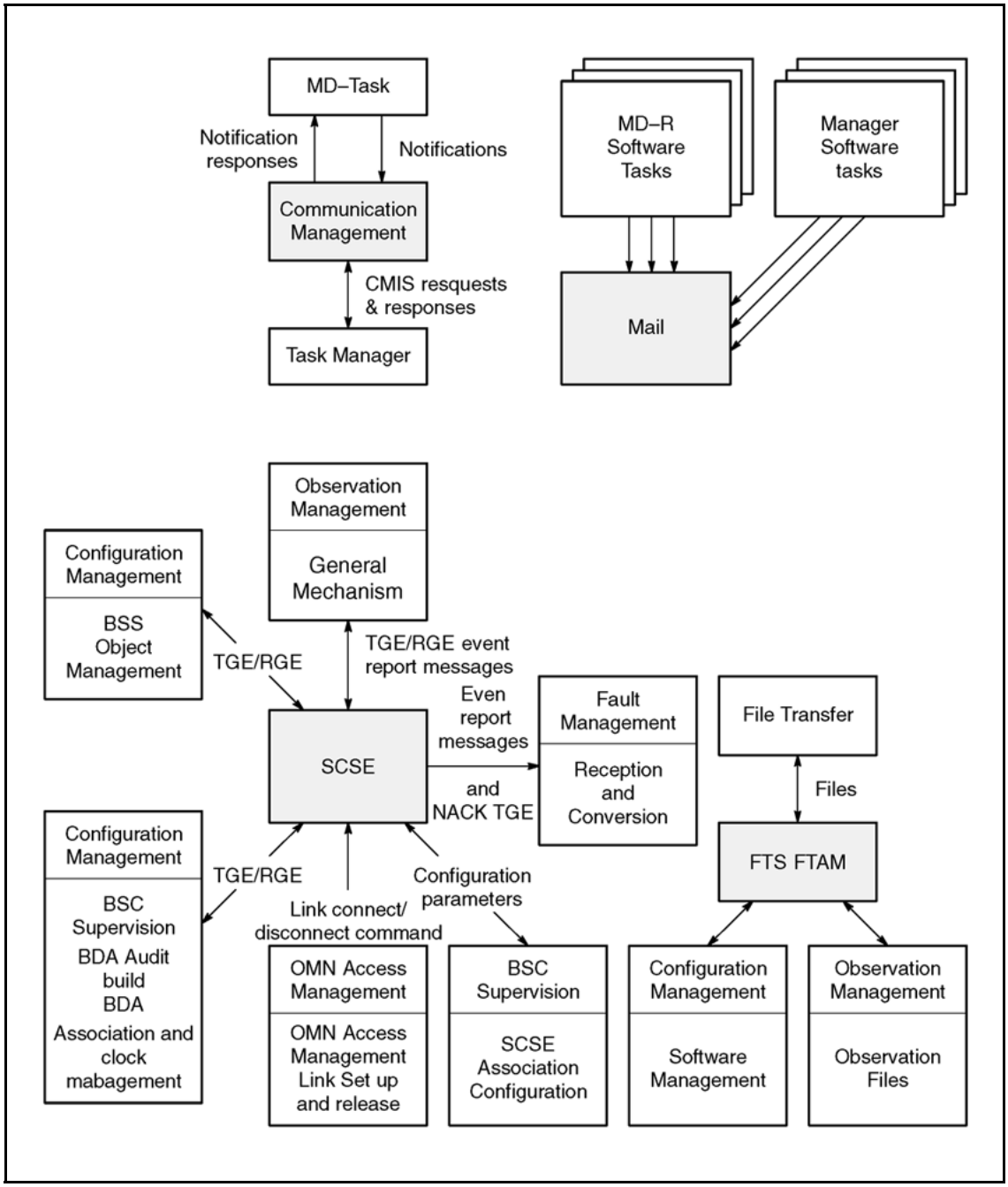


Figure 34
Communication Management functions



2.1.5 BSS Configuration Management (CM)

2.1.5.1 Introduction

The BSS Configuration Management function processes the Man Machine Interface commands on BSS objects and executes the required actions on the BDE and MIB (BDA) databases.

The function is divided into 8 sub-functions:

- BSS Object management
- BDA management
- BSC supervisor
- EFT management
- short message service
- links management
- BDE management
- network configuration tool

Each sub-function is accomplished by the manager, the MD-R or both.

2.1.5.2 Sub-function descriptions

BSS object management The management of the BSS objects processes the BSS configuration instructions defined from the MMI.

Manager This management occurs at the manager level from instructions of:

- creation:
  A creation instruction is usually translated in the sending of a M-CREATE CMIP request to the MD-R.
- deletion:
  A deletion instruction is translated in the sending of a M-DELETE CMIP request to the MD-R.
- change:
  A change instruction is translated in the sending of a M-SET CMIP request to the MD-R.
- query:
  A query instruction is translated in the sending of a M-GET CMIP request to the MD-R.
- Miscellaneous operations:
  These instructions may be for instance a hardware configuration request, actions on the Q3 bsc object. They are translated in the sending of a M-ACTION CMIP request to the MD-R.

MD-R The processing achieved at the MD-R level includes:

- CMIP request decoding
- semantic checking
- limit checking of one or various parameters involved in the instructions
- interfacing with the BDE (creation, query, update, object deletion)
- sending of TGE to the BSC and the RGEs of the management, if a command induces an access to the BDA on the related BSC
- management of the various MD-R/BSC interfaces to access to the BSCs
- replying to the manager through the communication function

MIB (BDA) Management The MIB (BDA) building of a BSC consists in creating, in the MIB (BDA) of the BSC, all the objects configured in the BDE related to this BSC. This building occurs by the MD-R from the sending of a set of BDA building TGEs containing object creation TEE.

Two types of MIB (BDA) building are available:

- off-line: which implies a service interruption at the BSC level, mandatory for some upgrade procedures
- on-line: which allows a minimum service interruption. Only the communications in process of setup or handover are lost.

For the BSC, the TGE are send to UPDATE association in the case of build on the new MIB (BDA) after a reset, otherwise are sent to TRANSAC association.

For the BSC, the on-line "build N+1" can be used after a remote software version change in order to minimize service loss after a change of BSC environment reconfiguration (example: frequency plan change). Any request is authorized on the bscMdInterface (administrativeState).

Such an action must be achieved using specific procedures.

The general MIB (BDA) audit allows a comparison of the received MIB (BDA) contents of a BSC with the BDE information related to this BSC. There are two MIBs (BDAs).

All the BSCs can be audited at the same time, while OMC cannot support more than 5 audits in parallel (cf. STO and AR documents) - even if the software does not prevent more simultaneous audits. During an audit on a BSC, only the query requests (M-GET) are allowed.

BSC supervisor This subfunction manages the relations between the BDE and the communication interface with the BSC, it occurs through the MD-R. It accomplishes the following tasks:

- processing of the message which notifies the initialization of the BSC scheduling of the operations related to the establishment and the closure of the connection with the BSC, the report build contents hardware reference which is used when are download EFT
- management of the associations for the exchange of information between OMC-R and BSC
- sequencing of the operations related to the instructions of MIB (BDA) building and audit
- broadcasting of the OMC-R time to the BSC and checking of the BSC time
- information of the MD-R about:
  - the version of the MD-R/BSC interface
  - the architecture of the BSC
  - the software version of the BSC
  - the time slot used on the A interface
  - the active chain name (only the BDE storage)

Manager This subfunction is in charge, at the manager level to:

- manage the deliveries on the manager disks:
  - create a directory on the manager disk
  - copy a delivery on the manager disk from a delivery cartridge, listing of the software versions and deletion of a delivery when it is no more necessary
  - copy a delivery from a directory by the EFT on the CD-ROM
- manage the EFTs on the MD-R disks:
  translation of the operator instructions in CMIP actions on the Q3 *md* object to:
  - create directory on the MD-R disk
  - copy the content of a delivery from the manager on the MD-R disk
  - create, list and delete EFTs on the MD-R disk. In case of the EFT deletion the system searches if software objects reference this EFT. If such a reference is found, the EFT deletion command is not sent to the MD-R
  - create EFT on the MD-R disk from a delivery cartridge

- manage the BSS software:
  - — translation of the operator commands in CMIP actions on the Q3 *software* object for the downloading of an EFT to the BSC disk or a software version change
- consult the software markers on:
  - — a BSS from CMIP actions on the Q3 *bsc* object
  - — the MD-R from CMIP actions on the Q3 *md* object
  - — the manager and the stations connected (except X terminals)

MD-R This subfunction is in charge, at the MD-R level, of:

- the software management on the MD-R disks:
  - — validation of an EFT copied by the manager
  - — listing of software versions and deletion of EFTs
- the downloading management at the MD-R level:
  - — for the BSC software:
    elaboration of the file list to be transferred
    file transfer
    acknowledgement of the BSC data files for EFT and the DLU list for the BCF EFT
  - — for the SITE, TRX and TCB software:
    semantic checking
    purge of the useless files in the BSC recipient partition
    file transfer
- the forward and backward version changes for the BSC, SITE, TRX and TCB software:
  - — semantic checking of the instruction from the BDE information, opening of a Sybase transaction, reservation, formatting and sending of a TGE
- the consultation of the BSS and MD-R markers:
  - — the objective is to identify the current software related to the running version.

EFT Name / Hardware Reference Correspondence For DRX versions earlier than V15, the correspondence between the EFT name trigram and the hardware references is hard-coded in the OMC-R according to the following table:

HARDWARE NAME	EFT NAME TRIGRAM	HARDWARE REFERENCE
COAM DRX	CDR	0x04
DCU4	TR1	0x08
ND DRX	CDR	0x11
eDRX	EDG	0x12
ND3 DRX	DRX	0x14
BTS18000 RM	ERM	0x19
BTS18000 MPRM	ERM	0x23
BTS18000 HPRM	ERM	0x1F

For DRX versions later than V15, the OMC-R manages a dynamic table that gives the correspondence between the EFT name trigram and the hardware references.

Each time a V15 EFT is downloaded on the OMC-R, the OMC-R:

- analyses the EFT,
- opens the catalogue file to read the hardware references
- updates its correspondence table with the EFT trigram / hardware references.

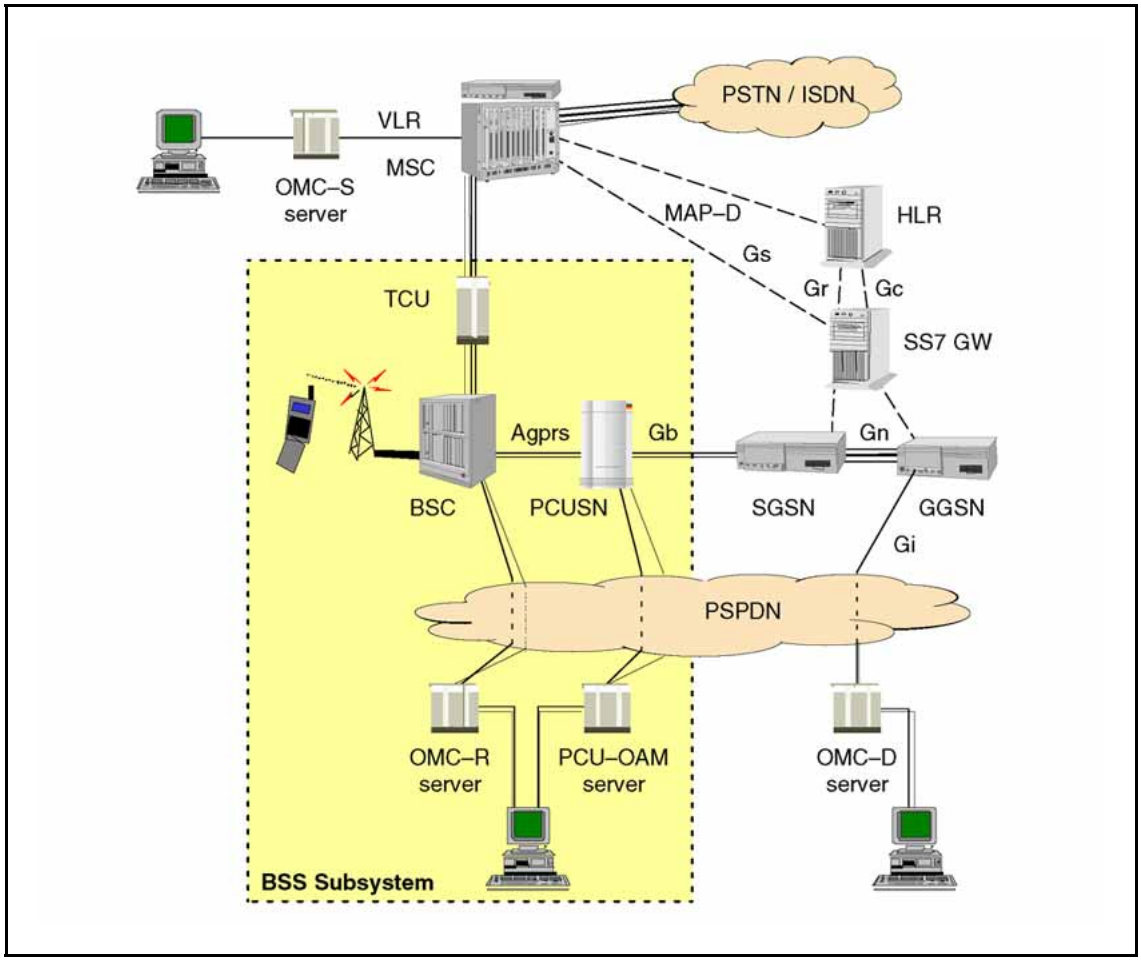
General Packet Radio Service features (GPRS) The GPRS is a GSM service which aims at providing a packet based GSM radio access to external Packet Data Networks (PDN) like IP, ATM, Frame Relay or X25.

The GPRS represents the logical evolution for data services, from the current circuit oriented definition of GSM. The "packetisation" of the data stream enables a more accurate tailoring of end user transmission requirements compared to the actual resources used over the air, resulting in better efficiency and lower cost.

Nortel Networks is introducing GPRS within the existing BSS network with BSC/BTS/OMC-R software upgrade only and the addition of a separate Packet Control Unit Server Node (PCUSN) element.

GPRS service availability is summarized in Figure 35 "GPRS services availability" (page 111):

Figure 35
GPRS services availability



Short message service (SMSCB) This service allows to cyclically broadcast short messages to the cell mobile stations. The maximum number of messages that can be broadcast in a cell at a given moment is 5.

An interface for the SMS-CB allows to send easily the same message on every cell of a list of BSCs and so that the system can update all the cells in a quicker time.

This feature concerns:

- the broadcast of the same short messages [R1] on all the cells which are managed by an OMC-R or a BSC list
- the change rate of these short messages: 13 sec are required

The current implementation about the short message broadcast involves several limitations and OAM constraints which must be raised:

- CBC/OMC-R interface throughput which must be compliant with the user activity performances
- OMC-R/BSC interface throughput which must be compliant with the number of messages (TGE) to be processed by the BSC (from 1 up to 2 TGE/sec for all transactions)
- heavy OAM constraint to update the data base CBC when network (re)configuration occurs (BTS & BSC reparenting or creation). The root cause is the cell identity syntax (bsc= x&btsSiteManager= y&bts=z) which is used by the SMS-CB commands.

Manager This subfunction is in charge, at the manager level, of:

- the short message management:
  - creation, changing, deletion, consultation and listing of short messages
- the broadcasting management:
  - broadcasting request
  - request of broadcasting end
  - providing of information related to the broadcasting in process

For all these instructions, the manager sends M-ACTION CMIP requests to the MD-R.

MD-R This subfunction is in charge, at the MD-R level, of the broadcasting of short messages sent by the manager to the cells which are related to it.

It manages the broadcasting requests, the requests for the broadcasting end and provides information related to the broadcasting in process.

Links Management This subfunction processes the operator commands related to the OMC-R / BSC links:

- creation, deletion, putting in/out of service of a link in consequence of the Manager requests on the *bscMdInterface* and *bsc* objects,
- providing SCSE with the list of the links to establish toward the BSCs,
- providing FTS with the ISO entities table.

The BSC 3000 uses IP protocol.

The creation and deletion of a *bscMdInterface* instance are processed at MD-R level in the BDE.

A *bscMdInterface* instance is created unlocked. The corresponding link is put into service when the bsc instance referring to the *bscMdInterface* instance is created. Afterwards, the link can be put into service or out of service using the modification of the administrative state of the *bscMdInterface* instance. It is to be noted that the locking of a bsc instance has no direct effect on the BSC/MD-R link. When a bsc instance is deleted, the MD-R puts automatically the link out of service.

To put a link into service consists in transmitting to SCSE a list of transport parameters to establish a connection. In case of failure, SCSE retries several times to establish a connection.

Putting a link out of service is also transmitted to SCSE. The state changes of the *bscMdInterface* object are notified to the Manager.

After the MD-R software initialization, Configuration Management tries to re-establish the MD-R/BSC links stored in the BDE which are in service.

BDE management This sub-function does the following:

- initializes the BDE - creates application tables used for processing configuration management requests, manages MD-R configuration data.
- converts BDE format after a MD-R version change
- dumps the BDE only for MD-R database (Q3 request)

The same actions are available for the manager BDE.

Network reconfiguration tool This tool allows you to reconfigure the network. The network changes involve network restructuring. This tool is implemented at the manager level.

The network operator can do the following:

- transfer a BSC from one OMC-R to another MD-R managed by the same MSC
- transfer a BTS from one BSC to another BSC managed by the same OMC-R
- transfer one BTS from one BSC to another and from one OMC-R to another
- renumber the "btsSiteManager" and "bsc" network elements (change their identification number)

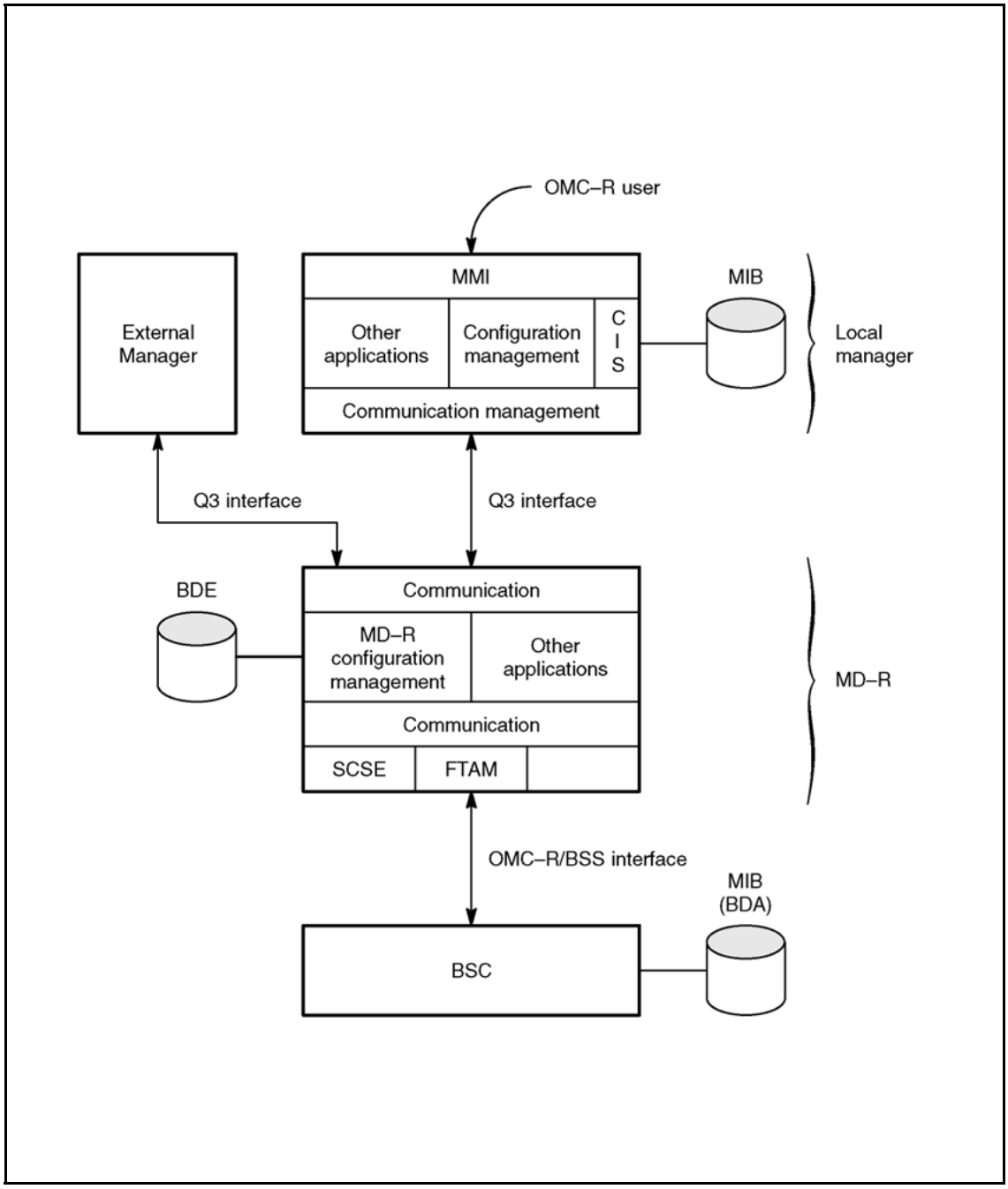
2.1.5.3 Interworking with other functions

The BSS configuration management function interacts with the following OMC-R functions:

- MMI for the network operator commands that enable the BSS object configuration
- Observation Management to check that objects exist before creating observation objects
- Fault Management to report RGE errors or no response to TGE (NACK TGE) FM sub-function (Fault Management) to provide information about the existence and event object creation or event object deletion and the administrative state of all the objects
- Communication Management to use the communication with managed system service (SCSE) and FTAM file transfers to configure and supervise communication layers with the BSC

Figure 36 "BSS Configuration Management functional diagram" (page 115) illustrates these exchanges.

Figure 36
BSS Configuration Management functional diagram



2.1.6 Fault Management (FM)

2.1.6.1 Presentation

Alarm returns indicate certain alarm states. LEDs and audible alarms for instance, inform of certain managed equipment states.

The Fault Management function treats system malfunctions and failures to supply the elements needed for maintenance actions. The function permanently monitors system operations, OMC-R stores all the event reports it receives for immediate or deferred processing and informs the user by alarms, notifications, and alarm returns to facilitate equipment reconfiguration.

Fault Management sends fault reports filtered by the EFD to the external Manager. The fault reports delivered in a standard format, are produced from the event reports issued by BSC, OMC-R.

The Fault Management function treats system malfunctions and failures to supply the elements needed for maintenance actions. The function permanently monitors system operations. OMC-R stores all the event reports it receives from PCU-OAM workstation.

All fault reports are sent to local manager.

Event reports are generated in response to the following:

- software faults (BSS, OMC-R)
- hardware faults (BSS)
- operational state changes (BSS)
- attribute value change
- user warnings (BSS, OMC-R)
- unsuccessful self test results (BSS)
- protocol error
- downgraded quality of service
- external alarms

Fault Management acts on two levels:

- MD-R to:
  - receive and set event reports at the Q3 format
  - discriminate messages (EFD) (external manager)
  - manage "mdWarning"
  - manage notifications at MD-R level and correlate the start and end of notifications (external manager)
  - manage purge events issued from BSC
  - manage the POD (Physical Object Dictionary)
- Manager to:

— manage notifications

— manage alarms (alarm loops, cleared alarm histories, counters per zone of interest)

— configure alarm criteria

— manage network state (STM)

— manage alarm returns

— manage user-notification data

— manage alarm display

— manage alarm purge

— end of user-alarms

2.1.6.2 Description of sub-functions

Event report message reception and translation This sub-function does the following:

- receives fault messages from BSS, MD-R, PCUSN and PCU-OAM functions
- analyzes received messages in standard format and translates them into standard Q3 format

It is to be noted that the actions performed on local manager side are not forwarded to MD part. Alarm processing on local manager side (alarm criteria, manual clear, OMC-R manager alarm) is not reflected in OMC-R Q3 interface. At the same time the whole information is available via OMC-R non-Q3 interface.

Message discrimination The Event Forwarding Discriminator (EFD) sorts notifications for the external managers. It decides whether the notifications are addressed to the external Manager. The discriminator is controlled by the Communication Management function.

All notifications can be forwarded to the external Manager after processing if they satisfy the filtering criteria defined in at least one of the EFD. They are forwarded by CMIS event report services.

The discriminator does not exist for the local manager, all notifications are forwarded.

mdWarning Management All the notifications received from MD applications or BSS are forwarded to the Manager. If the upper mdWarning threshold is crossed, a threshold crossing notification is issued.

The "mdwarning control" has two functions:

- Excessive error rate: this function generates an alarm when a given alarm rate is reached
- Observation counter threshold crossing: this function generates an alarm when a counter value crosses a given threshold

MD-R notification management This sub-function stores and restores specific system data used for debugging purposes, for example, that are not sent onto the Q3 interface.

It also allocates a number as each notification is created and sends that number to the Manager in the response.

BSC purge events The BSC is able to generate a special event called "purge event" generally sent after a restart or a switch-over. This event concerns only proprietary class "bsc" and "chain" and "tcu".

General mechanism

The purge event is translated by the MD-R in one or more end-of-alarm notifications called purge notifications.

When the MD-R receives this event, it retrieves all the notifications identifiers of not cease alarm and associated notification type concerned by the anomaly selector and the instance selector specified in the event.

The type of the purge notification is the same as these correlated notifications. For example, notifications of type qualityOfServiceAlarm are correlated in a purge notification with the type qualityOfServiceAlarm.

Defensive MD-R purge on correlation data saturation

Information used for notification correlation and purge event mechanisms are stored by the MD-R. The MD-R prevents eventual saturation of the disk used to store these data.

For a given BSC, when the correlated notifications raise a configurable high threshold, the MD-R activates defensive purge.

Daily MD-R purge of correlation data

Some correlation information may be never purged because some events are never cleared by the BSC or event purge may be sent late by the BSC. To avoid congestion of correlation data, the MD-R activates a daily purge which deletes all notifications older than a configurable number of days.

The message flow of Fault Management through the MD-R is shown in Figure 37 "Fault Management and the flow through the MD-R" (page 120).

Notification management The Manager handles notifications. This sub-function does the following:

- receives and stores notifications (the store time is following the disk capacity)
- displays notifications according to the zone of interest and filter
- manages notification logs

Alarm management This sub-function manages the following:

- ongoing alarm list, real-time update (select current alarms at a given moment)
- cease alarm list according to user-defined criteria
- manual alarm clearing and purging
- alarm clearing upon receipt of fault end notifications, or when the parent object is put into service or deleted
- cleared alarm histories by interest zone
- alarm counters (number of active, immediate, or deferred action alarms) by interest zone

Alarm criteria configuration management This sub-function enables the user to change the alarm criteria to eventually generate a user alarm after receiving a notification.

A criterion may be, for instance, the gravity level: immediate intervention, differed intervention or not requesting intervention apart from the working hours.

Two alarm configuration criteria are used:

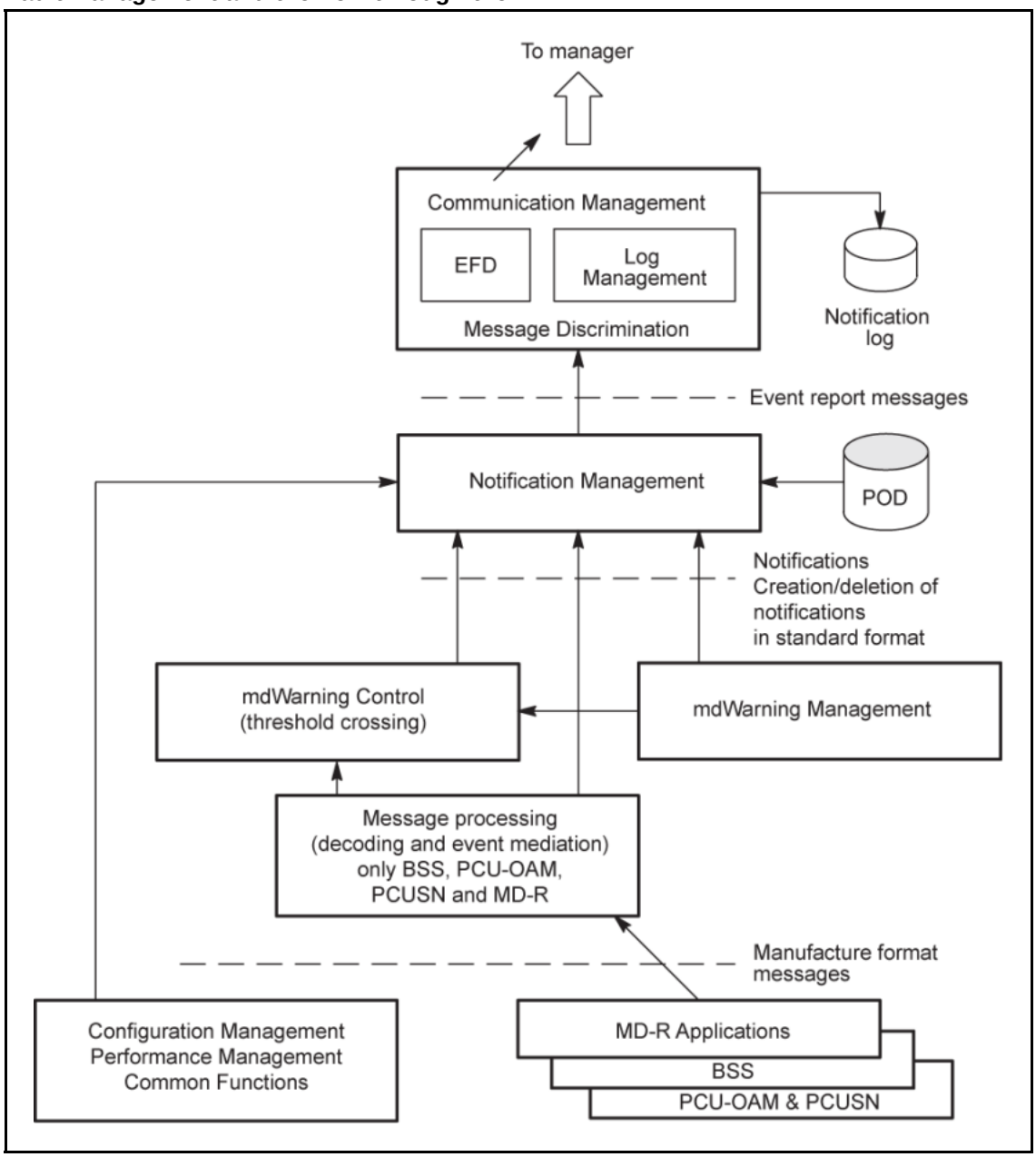
- manufacturer
- operator

For the operator configuration, three subconfigurations are available:

- day
- night
- specific

The alarm configurations can be created or changed dynamically from MMI. Manufacturer alarm criteria can be locked/unlocked only

Figure 37
Fault Management and the flow through the MD-R



STate alarm Management (STM) STM gives the MMI all the information it requires to generate graphics indicating changing network states and to reply to user commands on different network levels.

STM uses information (objects, states, alarms) supplied by from Fault Management. It is aware of all changes in the network involving the graphic display. It also processes the available information for MMI displays.

Alarm return management The alarm returns are managed by external alarm supervision boxes connected to the OMC-R servers (64 relays by box following the capacity).

Three outputs are for:

- 1: for the indication of Immediate Intervention alarms not acknowledged
- 2: for the indication of Deferred Intervention alarms not acknowledged
- 3: not used

The outputs of the other relays indicate the presence by BSC of Immediate Intervention alarms not acknowledged.

User-notification data The notification data are divided in two parts:

- data usable as filters by the operator, these data are stored in a database
- other data not used as filters by the operator, these data composed of additional information (operator and manufacturer) are stored in data files.

Alarm display The alarms are displayed in a synthetic way in the alarm window. This window presents the alarms in a short format: one or two lines per alarm.

Alarm purge The alarm database contains a maximum number of user-alarms which is not modifiable.

Automatic user-alarm purge on saturation applies when number of user-alarms reaches 95% of the maximum number of user-alarms allowed by the configuration. The oldest user-alarms are purged until this number is less or equal than 85% of this maximum number.

The alarms which are purged after 30 days without loss of information.

The operator is warned of this purge activation by a specific alarm.

The alarm raised on purge activation is not automatically cleared to allow the operator to see the problem.

The purged alarms are in the alarm log with a cessationType = purge on saturation. An alarm can be manually cleared by user. Besides alarm can be purged on database saturation.

End of user-alarms Several ways are used to cease a user alarm:

- event-triggered clearing: an event occurred and matches the criterion to cease an alarm (example: an alarm is raised on transceiver failure and is reset when the transceiver comes back into service)
- BSS purge-event: for this type of event, the following purge mechanism applies all user-alarms whose MD-R notification belongs to the set of values carried in the correlated notification field are cleared
- MD daily purge-event: for this type of event, the same purge mechanism applies
- MD daily purge-event of the correlation data: for this type of event, all user-alarms whose MD-R notification belongs to the set of values carried in the correlated notification field are cleared.

The message flow of Fault Management through the manager is shown in Figure 38 "Fault Management and the flow through manager" (page 123).

FM subsystem also uses COM sub-function for receiving fault events from BSS and forwarding fault events to EM and LM.

2.1.6.3 Relationship with other functions

The Fault Management function exchanges the following information with other OMC-R functions:

- MMI for the user commands, the system’s responses and the information required for graphic alarm and object displays
- Common Functions to purge and archive/restore
- Configuration Management to collect network information
- Configuration Management to collect and store certain types of observation data

Figure 39 "MD-R Fault Management functional diagram" (page 124) and Figure 40 "Manager Fault Management functional diagram" (page 125) show these exchanges.

Figure 38
Fault Management and the flow through manager

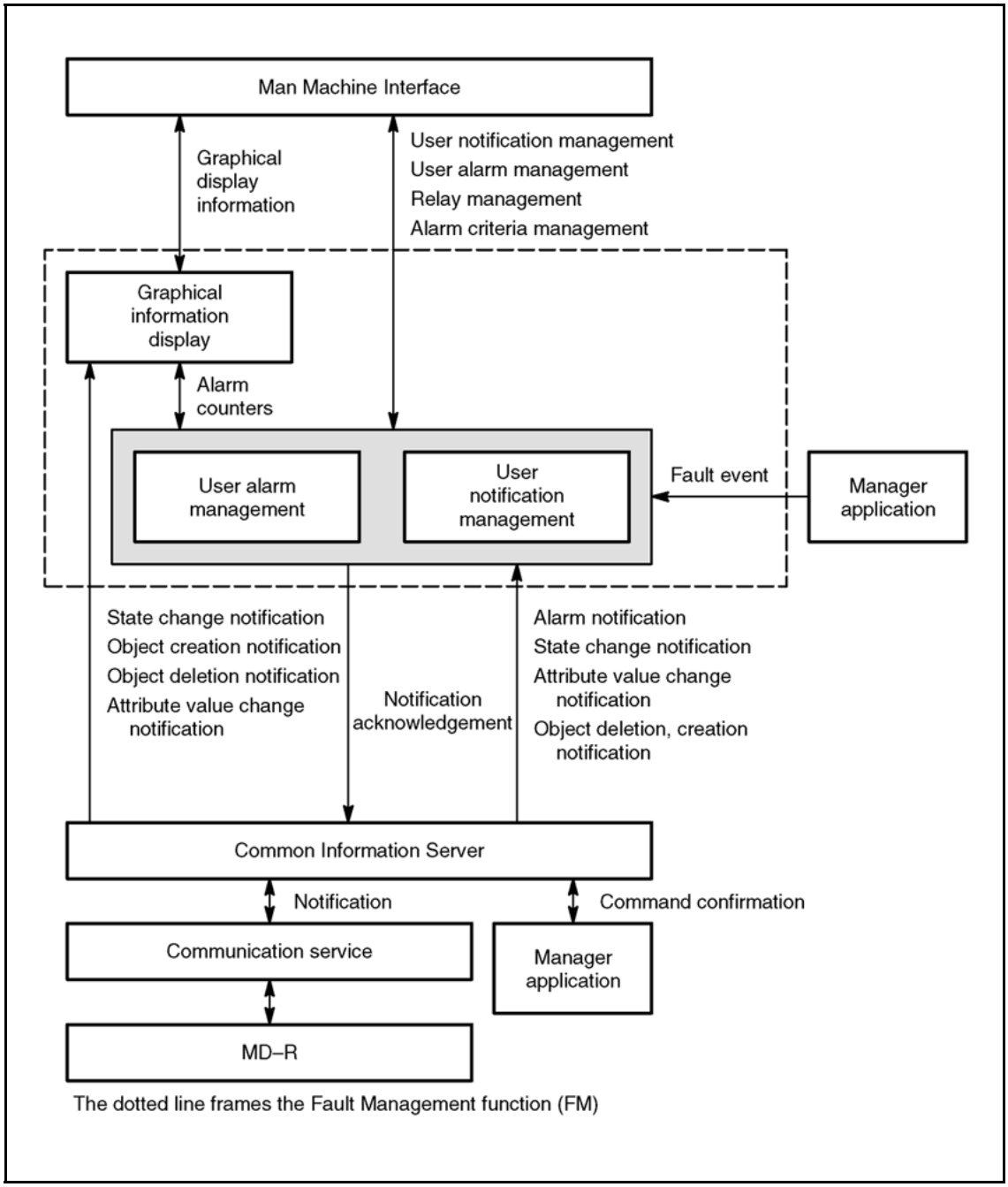


Figure 39
MD-R Fault Management functional diagram

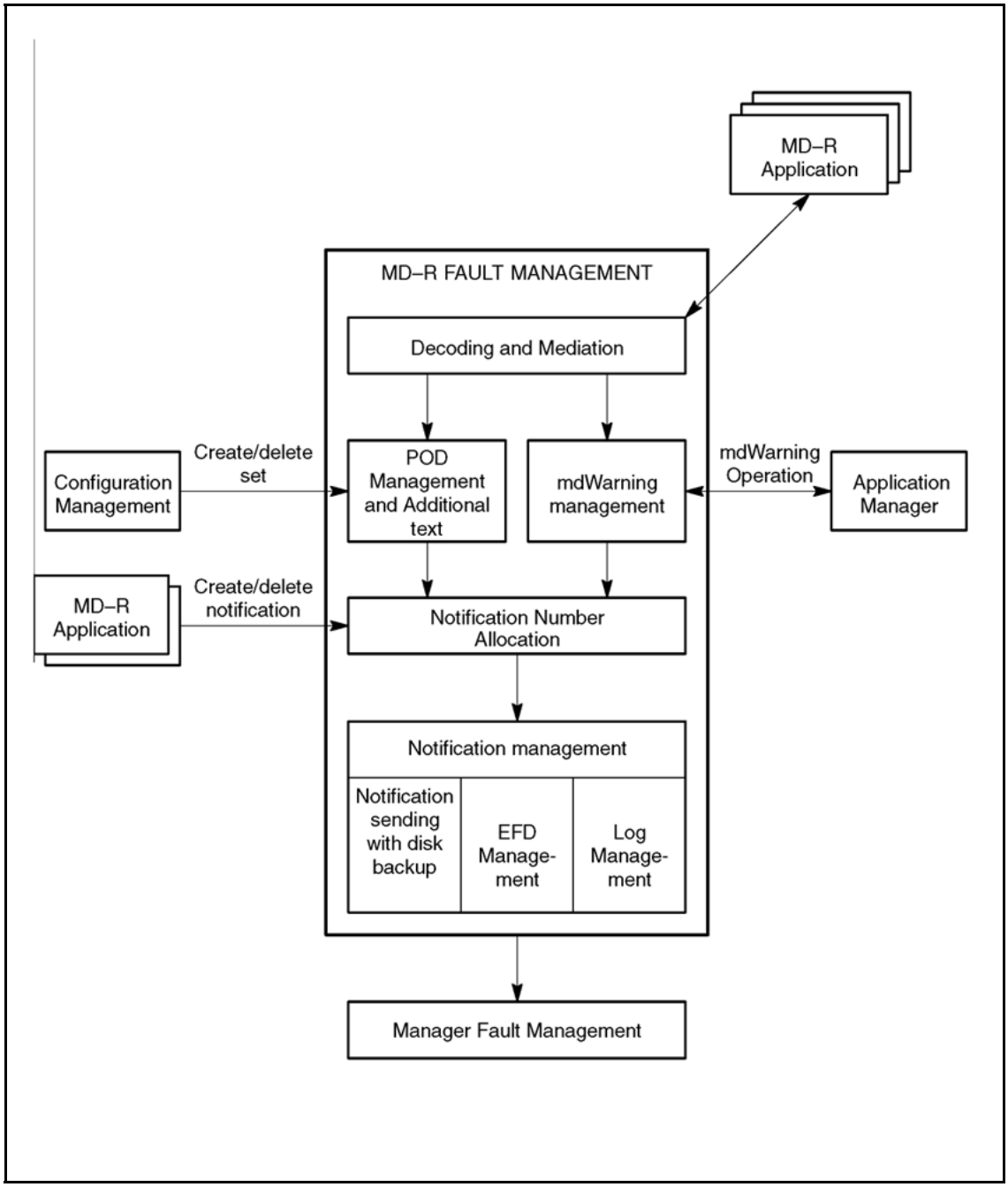
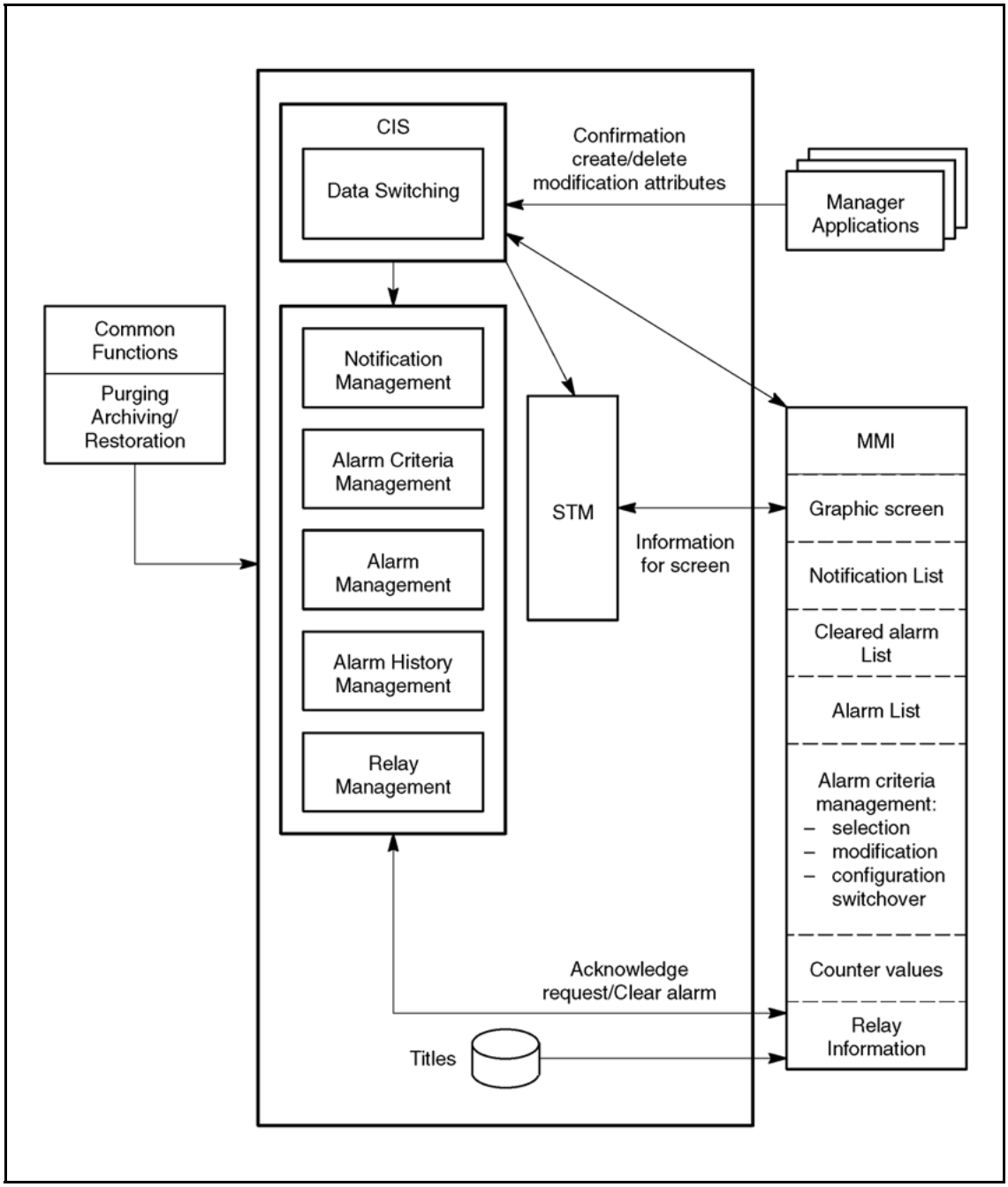


Figure 40
Manager Fault Management functional diagram



2.1.7 Performance Management (PM)

2.1.7.1 Presentation

This function collects and processes observations on BSS (GSM and GPRS services) and OMC-R. Performance Management supplies users with reports on system operating statistics. Furthermore, the Observation management function informs fault management of measured threshold crossing events.

The Performance Management function collects and stores BSS and OMC-R observation counters and provides users with raw or processed performance data. There are standard, predefined, and synthetic counters that the operator can configure.

It calculates the daily sum, chooses the busiest day of the month sum, and stores the results for observations.

It manages call tracing and call path tracing requests and the related trace results.

It collects radio distribution, call drop analysis and interference matrix files from the BSC and stores them on the SDO (in XML format).

A new Performance Management tool has been introduced: NIMS-ProOptima. It replaces the CT7100 tools for BSS and NSS.

It is designed by third-party Mycom. The load delivered by Mycom is compliant with the following BSS releases: V15.0, V15.1, V16.0 and V17.0.

NIMS-ProOptima processes with SDO format.

2.1.7.2 Observation types

The observation types are the following:

- GPO MD-R, OGS, OFS and Manager self-observation allowing the continuous collection of measurement data. The reports associated to these data are built on user request
- ORT permanent observation providing significant measurements. These data are collected on periods shorter than the permanent observation
- TO allowing the collection of measurement data on a limited time period:
  - ODIAG
  - temporary interference observation

— temporary observation of signalling links

— temporary observation of the Abis interface

The reports related to these data are built only on user request (MMI), except for the BSC ORT where the measurements are spontaneously emitted to the subscriber task.

Introduction The Performance Management allows to:

- manage the Q3 object class
  create, delete, modify and query attributes on this Q3 object class
- manage the counter of the Manager self-observation (server(s) and workstations) and build the related event reports
- manage the event reports related to the Temporary Observations or to the Manager self-observation and store the observation data on the Manager disks
- manage the ORT or OFS requests and provide the observation data related to the subscriber task for the corresponding event reports
- provide counters based on MS power class (2W or 8W, or 2 W and 8W)
- manage the call tracing and call path tracing requests and the related trace results
- transfer to the manager the observation data file stored on the MD-R, related to the permanent observation and store the related data on the local Manager disks
- calculate and store the daily sum for the GPO MD-R, OGS, OFS and the Manager self-observation
- choose and store the busiest day of the month sums for the GPO MD-R, OGS, OFS, ODIAG, and the Manager self-observation
- provide to the MMI the observation and trace reports
- calculate the synthetic counters for the OGS, OFS, ORT and OPCUSN.
- detect a threshold crossing on the synthetic counters
- Activations, deletions, actions, modifications and queries are translated on the Manager/MD-R interface by the following CMIS requests on the associated object

Observation reports For each observation type, the observation reports are the following:

- raw report
- report at interval defined by the user
- daily report
- report for the busiest day of the month

Observation records

Raw counter storage The TO counters are grouped by type of TO depending on BSC version.

The list of the raw counters for OGS, OFS, ORT and ODIAG is configured using the *bscCounterList* object class.

The list of the raw counters for ORT is set to the default counter list.

The list of the raw counters is in NTP < 125 >.

Counter semantic Each counter is identified by an object identifier or by a character string. The name is in NTP <125>.

Each counter value has a scalar, integer or real format.

Synthetic counter Synthetic counters are defined thanks to configuration files. These files are read at startup time.

The synthetic counters only apply to OGS, OFS, ORT and OPCUSN.

The Operator files may be read again on MMI function request, allowing to change the set of synthetic counters with no Manager stop.

These counters are computed on observation message reception and on user request report request and are never stored onto Manager disks. The format of the synthetic counters is the same as the raw counter format (value and validity fields).

For more details on the language description of the synthetic counters used in configuration files see NTP < 125 >.

MD-R The Performance Management function, at the MD-R level, is described below.

Introduction The aim of the Performance Management function is to:

- manage all the observation types by using the *mdScanner* or *bscCounterList* object class: activation, deactivation, attribute change and query
- manage the call tracing and call path tracing functions at the BSS level
- manage the notifications
- obtain the measuring data sent by the BSS or the MD-R
- obtain the trace records sent by BSCs
- retrieve the files containing observation records of the BSCs by the means of FTAM
- retrieve the files containing observation and trace records, radio distributions, and call drop data from the BSCs through FTAM
- decode the BSS observation records
- build the observation records to be sent to the Manager
- request the creation of logs and the event reports by using the Common Function services
- manage the threshold values and the observation counter states for OFS counters to detect eventual threshold crossings

Requests on the mdScanner object M-CREATE

This request creates an instance of the mdScanner object and starts the specified observations.

M-DELETE

This request deletes an instance of the mdScanner object. The observation may be active or not. If the observation is active, the deletion requests a stop the observation. This request does not delete the observation data (related object log instance and observation record files).

M-SET

This request changes the mdGranularityPeriod of a mdScanner object instance.

M-GET

This request reads the attribute MD-R values of a mdScanner object instance.

Requests For OGS, OFS and ORT, one CMIS request is translated in TGE on the MD-R/BSC interface.

For the Temporary Observations, the manager creates the observations with a stop time. The MD-R must so stop this observation for the end time and send the counters collected before this end time to the manager.

For all the Temporary Observations, the M-CREATE and M-DELETE, one CMIS request is accepted only if:

- the BSC/MD-R link is established
- the BSC database permits it

The above conditions are not requested for the M-GET requests on the *mdScanner* object class, as they are locally processed at the MD-R level.

Counters The relation between BSC/MD-R interface counters and MD-R/NMC interface counters is described in the NTP < 133 >.

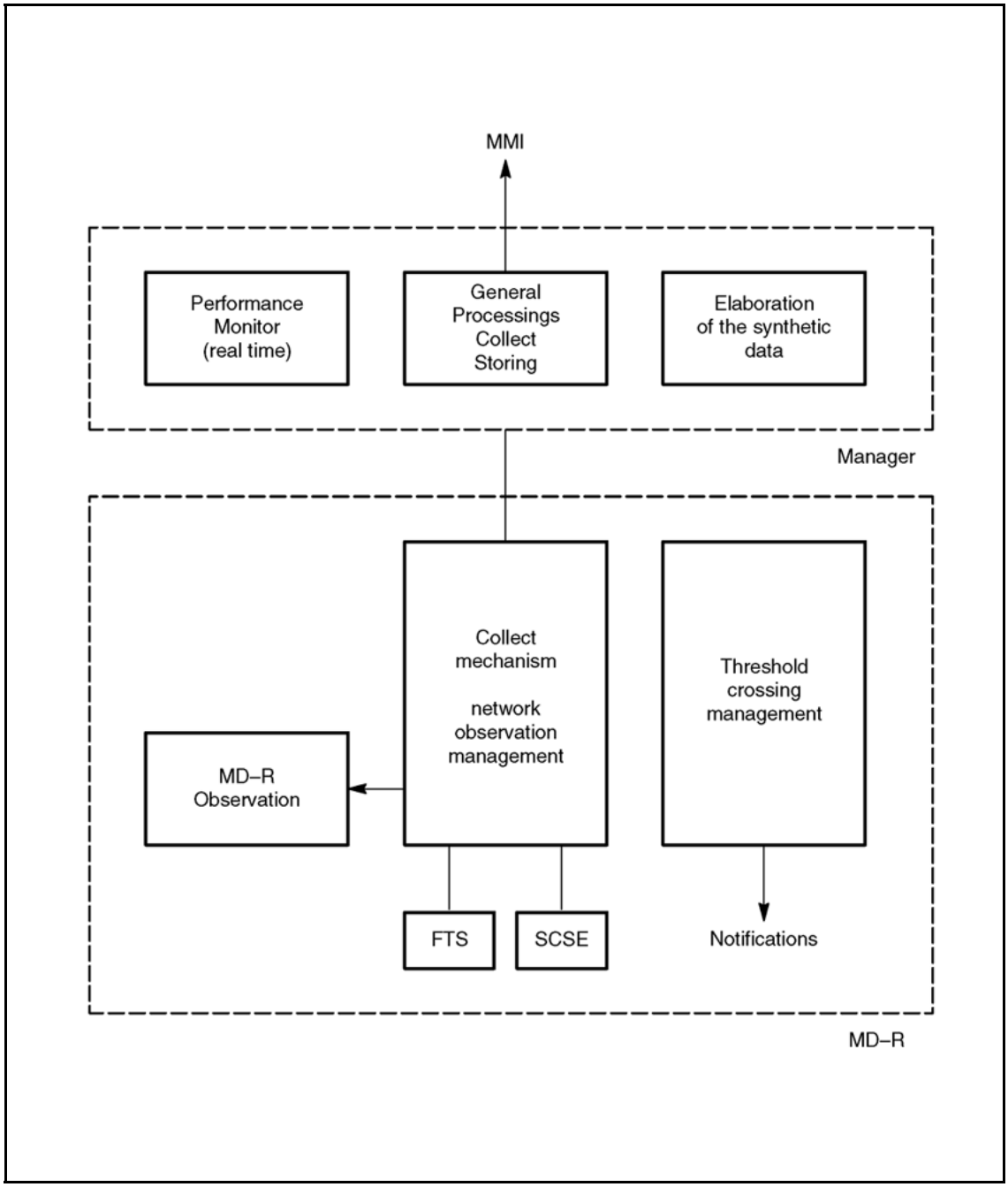
2.1.7.3 Interworking with other functions

Performance Management interacts with the following functions:

- MMI to forward user command and the system's responses to the commands.
- BSS Configuration Management to obtain permission to send service message to BSS Communication Management to communicate with the BSS
- Fault Management exchanges information with other OMC-R functions.

Figure 41 "Functional diagram of Performance Management" (page 131) shows the Performance Management function.

Figure 41
Functional diagram of Performance Management



2.1.8 Security Management (SM)

2.1.8.1 Introduction

The Security Management function manages access to OMC-R user services.

This sub-function does the following:

- processes user commands to create, update, delete and consult user profiles
- controls access to OMC-R terminals. The user's name password and authorized working times are checked when users log in to open a work session.
- manages user profile configurations
- manages user profiles:
  - — users actions are limited by command classes, output classes, and the zone of interest defined in the user's profile (a zone of interest defines a limited number of network elements, OMC-R and/or BSS (0, 1 or n), on which you are allowed to work)
  - — the session context saving mode is kept for each user. It indicates if the session context of the user is saved automatically each time the user logs out, or if it is saved only on user request
- manages periodic password changes
- monitors user inactivity times. The session is closed down if the user does not execute an MMI command during a predefined time.
- manages terminal profile. MMI uses the terminal output class and terminal zone of interest to determine the windows that are displayed on the terminal after the user closes a session
- protects the user access:
  - — After N unsuccessful attempts to log on an OMC-R workstation, the connection window is unavailable for a duration whose values increases according to an exponential law and an event is recorded.
    Unavailability time of connection = $Tx2^{(N-1)}$
    N is a number of unsuccessful connection attempts
    T = 180 seconds
    The unavailability duration is limited to 1000 seconds.
  - — A chronology of the passwords is managed by the OMC-R which forbids to use one of the last passwords.
  - — It is possible to define a list of sensitive keywords, not to be used at the beginning of a password.

All the workstations support the Security Management function without restriction.

2.1.8.2 Output class management

17 output classes have been defined and cannot be modified:

- login window: when this class is set for a terminal profile, the window used to login is displayed
- alarm window: for the authorization to display the alarm window
- performance monitor: for the authorization to display the performance monitor window
- command file manager window: for the authorization to display the command file manager window
- security manager: for the authorization to display the security manager window
- SMS-CB manager: for the authorization to display the SMS-CB manager window
- description window: for the authorization to display the description window and the object monitor
- alarm criteria view: for the authorization to display the alarm criteria view
- notification window: for the authorization to display the notification in real time
- relay manager: for the authorization to display the relay manager window
- job scheduler: for the authorization to display the job scheduler window
- UNIX: for the authorization to start a UNIX tool
- alarm log window: for the authorization to display the window used to display the alarm log
- notification log window: for the authorization to display the window used to display the notification log
- system session log window: for the authorization to display the window used to display the system session log
- trace display window: for the authorization to display the window used to display callTrace information, and to display the window used to display callPathTracing information
- topological view: for the authorization to display the window used to display the topological view if this feature is allowed

2.1.8.3 Interworking with other functions

The use of profiles (user and terminal) means that the security management function is closely related to MMI sub-functions:

- user profile command/response processing
- session control according to user profiles
- window displays according to the off-line terminal profile

2.1.9 Common Functions (CF)

2.1.9.1 Introduction

The OMC-R Common Functions regroup all the OMC-R operations and maintenance functions.

Common functions are a set of services used by other OMC-R functions. They are based on a CIS.

2.1.9.2 Presentation of the Common Information Server function (CIS)

CIS Management Since the radio network is managed through a Q3 interface, any manager (not necessarily the manager part of the OMC-R) is able to:

- create a new managed object instance
- get its attributes
- update its attributes
- delete this instance

Assuming that a manager has properly set the EFD, every manager is made aware of the changes in the network by processing the CMIS event report.

The manager part of the OMC-R is aware of the changes in the network.

The purpose of the common information server function is:

- to receive and to decode the event report sent by the MD-R
- to send each CIS event toward the related function

The management information shared between the manager and the MD-R consists of general interest information and manager information specific to a function.

The shared information of general interest need to be stored locally on the manager subsystem and consistently updated during all the running period of the OMC-R. Moreover any change on these data is notified to all functions which The manager data base is named CLDB (Common Local Data Base).

The CIS function is in charge of:

- the CLDB creation
- the store procedure creation

CLDB creation means tables, indexes, user data types, rules and triggers creation.

User commands are checked by the MMI function, and sent to the relevant manager function such as PM or CM function. The manager application translates the commands into requests, which are sent to the MD-R by using the services of the manager communication function.

Figure 42 "OMC-R manager functions overview" (page 138) sums up the position of Common Information Server in the manager architecture.

2.1.9.3 Sub-function description

These services of the Common Function include:

- archiving and restoring observation data, faults, and other data
- tape management
- Event Forwarding Discriminator (EFD) and logs management
- basic services
- internal mail

Archiving and restoring The following data are archived and restored:

- MD-R logs: observations, traces and other data
- manager logs: faults, observations, and the other data at the manager level
- BDE backup
- PCUSN views
- PCU-OAM configuration

The logs enable the data recording of the N days, N is a configuration parameter (see NTP < 125 >).

The same archive tape may be used for the data of several days. The tape can be labeled and read back.

Several types of archiving can be present on the same tape: observation logs, trace messages for a specific day.

The restoring takes place for one day.

Tape management This function includes the tape labeling, the label consultation, the listing of the archives present on a tape.

Refer to 1.1.5.12 “Tapes” (page 36) for more information on tape and tape-drive compatibility.

EFD and logs management This sub-function manages the EFD and MD-R observation logs and notifications.

An EFD instance is created at Manager level and determines the Q3 format notifications that are sent to the Manager.

An EFD can be created, consulted, and modified or its activity suspended.

A set of EFD instances are automatically created by the manager on the MD-R to provide:

- the transmission of all the alarm messages
- the transmission of all the state change messages
- the transmission of the messages related to the Performance Management (observation results, ready file indication)
- the transmission of all the messages related to the management functions (creation, deletion, change of attribute values)
- the transmission of specific notifications

A log stores notifications and observations according to criteria and for a predefined period.

A log can be consulted (attributes or contents), destroyed, archived and restored.

Basic services This function provides the following services to other OMC-R tasks:

- stack and queue management
- counter management
- task identification and management

- software trace
- access tools to database

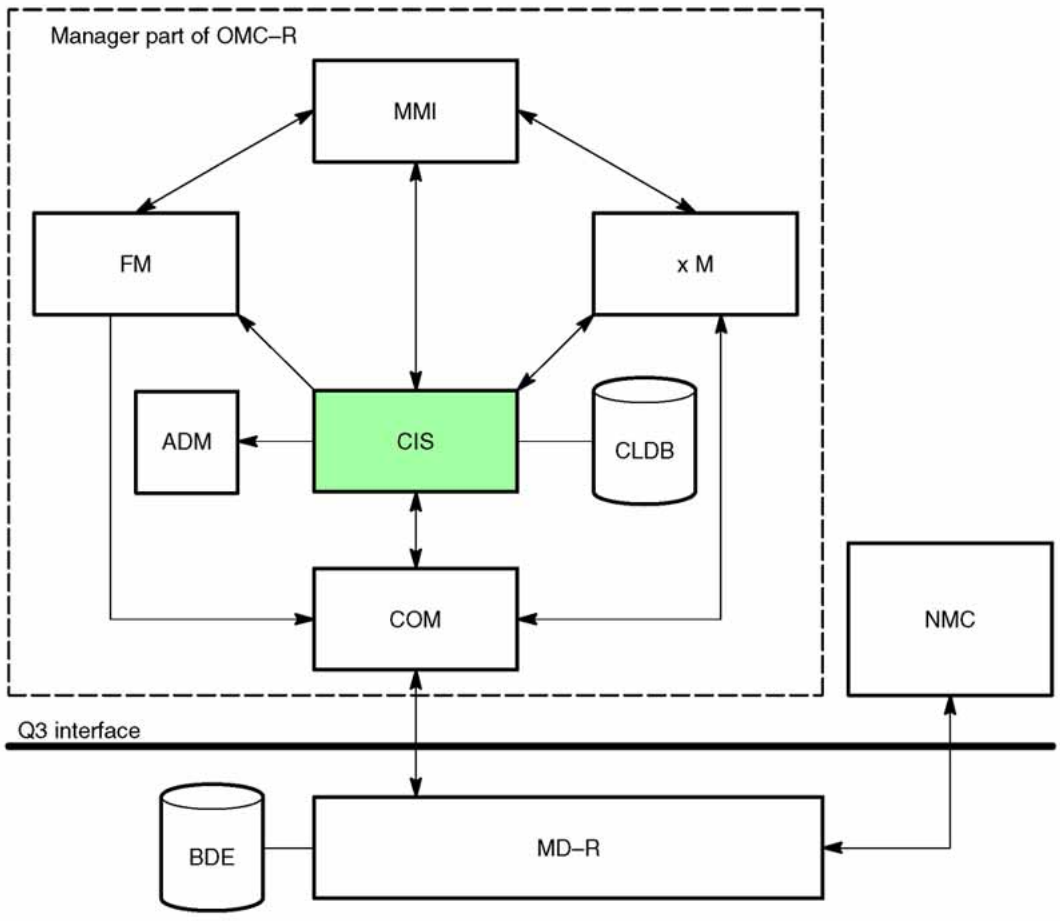
2.1.9.4 Interworking with other functions

The Common Functions communicate with the following:

- the MMI that handles user commands
- other software tasks for different services
- Performance Management and Fault Management to collect data files

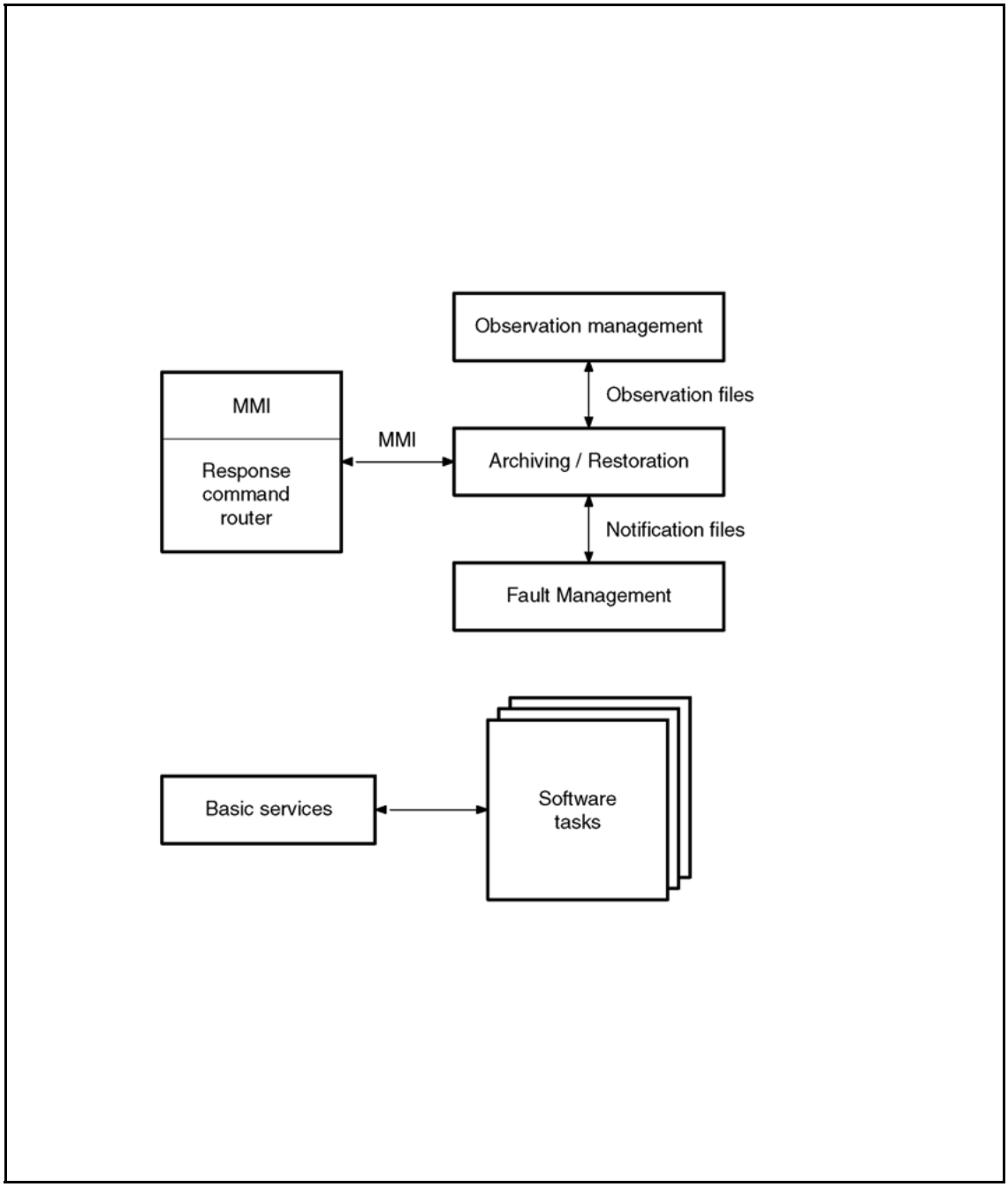
Figure 43 "Functional diagram of Common Functions" (page 139) shows these exchanges.

Figure 42
OMC-R manager functions overview



x M	:	depicts any manager application function (like CM, PM).
ADM	:	depicts the date and time management included in the administration function.
COM	:	depicts the communication services.
MMI	:	depicts the set of worstations connected to the manager function.
NMC	:	depicts anay kind of manager connected through the Q3 interface.

Figure 43
Functional diagram of Common Functions



2.1.10 RACE management

The RACE PC serves as an intelligent terminal with its own menu-driven interface and selection buttons. RACEs are connected to the OMC-R across the PSTN.

RACE access securing

A security process is used for controlling the access of a RACE to the OMC-R. This process recalls the RACE PC, after checking its phone number. It is installed on a Firewall PC (previously described).

2.1.11 OMC-R databases

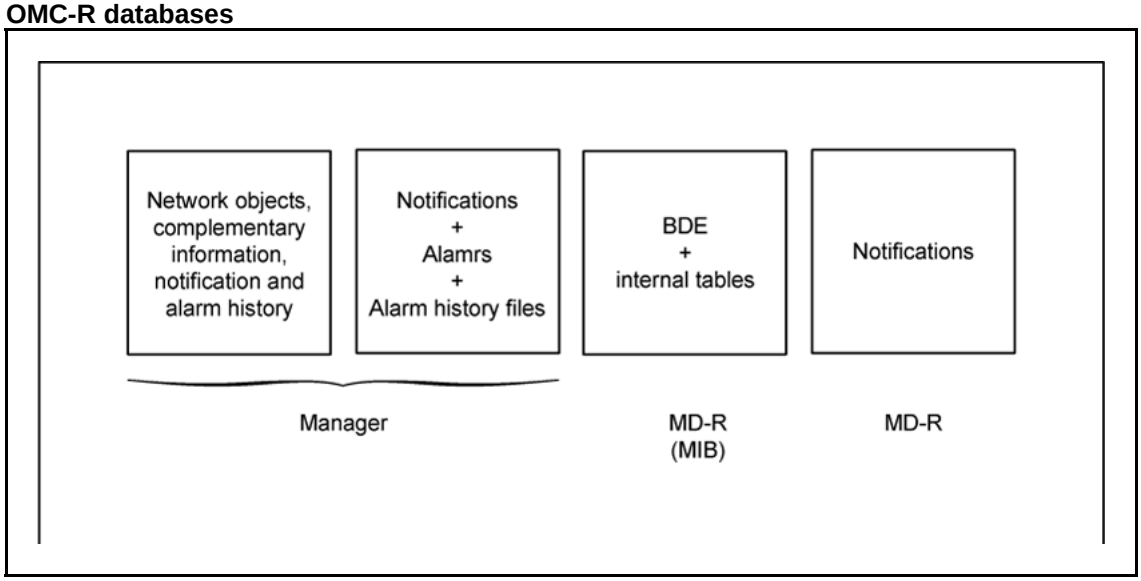
Several Sybase type databases support these functions:

- omc_db is the database of the manager containing network objects, additional information
- omc_fm_db contains the alarm notifications, the alarms and alarm history files
- cm_db integrates the operations database (BDE) containing objects and attributes and the internal tables used for internal checking or the static configuration
- md_fm_db: it contains the information for the BSC notification correlation

The omc_db and omc_fm_db bases are the manager bases. The cm_db base is the MD-R base and is the MIB of the MD-R, the md_fm_cd base is the MD-R base.

The OMC-R databases organization is given the following:

Figure 44
OMC-R databases



2.1.12 GPRS Management

In order to support GPRS service on the BSS, a network element called PCUSN (Packet Control Unit Server Node) has been introduced.

The PCUSN is managed through a specific software integrated in the server.

This new Network Element is based on a Nortel Networks Multiservice Switch based on PCR 8.1.

To manage GPRS service, PCU-OAM software must be installed on OMC-R station (PCU-OAM server) or OMC-R integrated server.

Two pieces of software are utilized on the dedicated server called GPRS PCU-OAM:

- NMS (Network Management Subsystem) also known as MDM (service Data Management) for the configuration and the fault management
- MDP (Management Data Provider), which is part of NMS, for the Performance Management

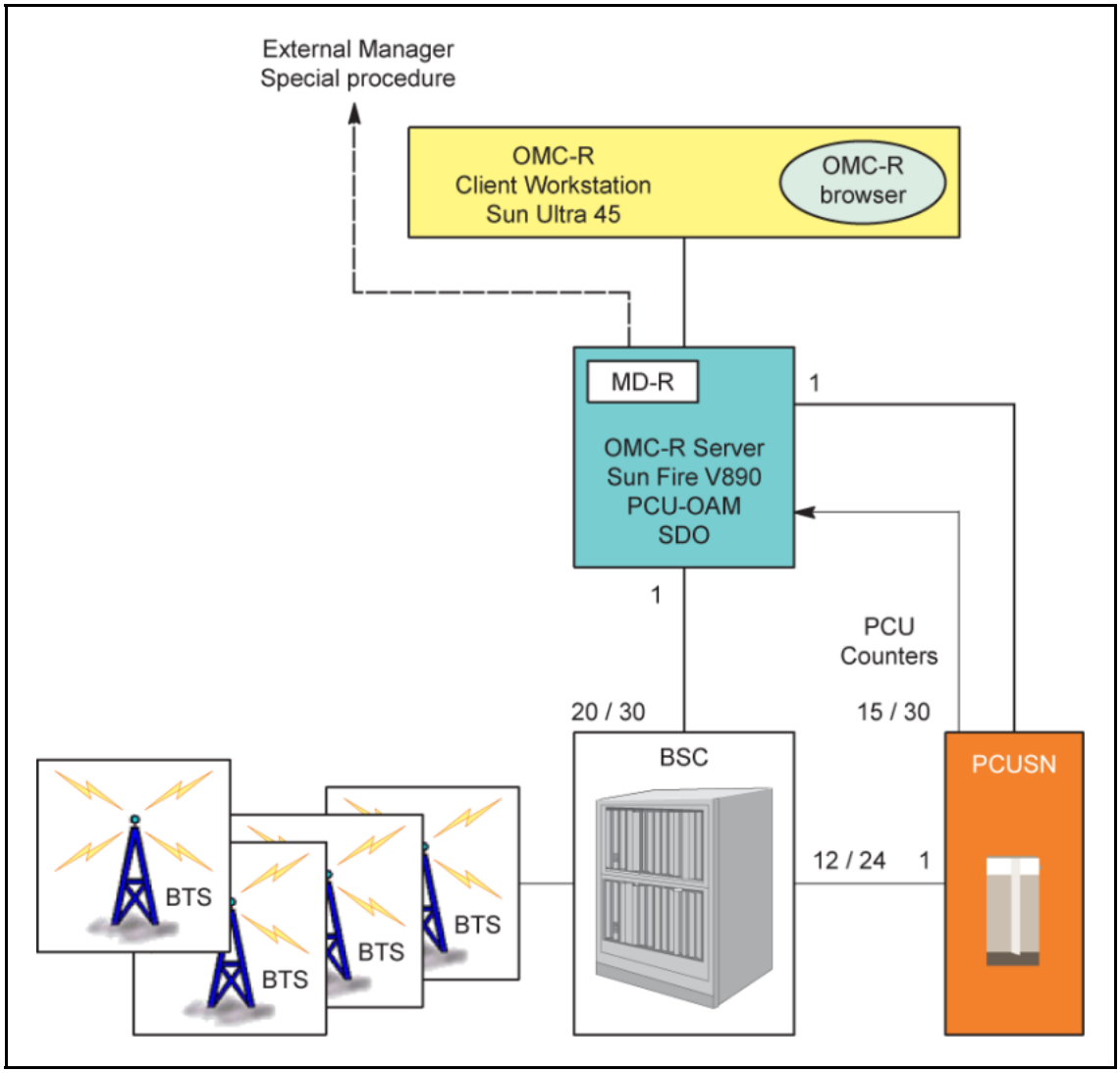
PCUSN day-to-day operations are also integrated in the OMC-R for ease to use.

- The GPRS Access Fault management is fully integrated within the GSM Access Fault management. The fault and alarms messages are forwarded in real time to the OMC-R database to be displayed on a MMI workstation. The fault and alarms messages are available on the interface Q3 and the SDO.
- Configuration management is done with MDM hosted in the OMC-R server. It allows the operator to configure the PCUSN through an emulation window on each workstation.
- Performance data are available on the SDO but not supported on Q3. The performance data files are transfered every 15 mn to the SDO.
- Other specific MDM applications are available on each MMI workstation to complete the integration of the functions of the GPRS PCUSN into the OMC-R server.

The PCUSN counters are stored during the current day and the past 3 days.

PCUSN counter availability is presented in Figure 45 "PCUSN counter availability" (page 143).

Figure 45
PCUSN counter availability



The figure presents the nominal configuration for V17.0.

2.2 SDO functional architecture

2.2.1 Presentation

The SDO presents the performance and configuration data, the fault management notifications, the workstation interest zones, the session log and the call trace data under a predefined ASCII format, for post processing applications.

The SDO is also designed to collect the data for the interference matrix, radio measurement distribution and call drop analysis.

There are two types of measurement reports: classical measurement reporting (MR) and enhanced measurement reporting (EMR).

The main difference between the two is that EMR provides more information on neighboring cells and especially 3G cells.

This paragraph describes the functional aspects of the SDO.

The SDO provides for the following:

- OMC-R data records and network configuration parameters in an ASCII readable format for peripheral OMC applications (which may use "rcp" or "ftp" UNIX commands):
  - raw counters of the OFS records
  - raw counters of the OGS records
  - raw counters of the PCU records
  - call tracing records
  - call path tracing records
  - fault and stateChange notifications
  - radio network configuration parameters
  - cellTiering records or Frequency Tiering records
  - zones of interest of the connected workstations
  - OMC-R system session log
  - distributions on radio measurements
  - call drop data
  - interference matrix data
- compute synthetic counters for OFS and OGS
- transfer OMC-R data the following ways, depending on data types and SDO configuration parameters:

— periodically (up to one day)

— at start time (only for automatic transfer mode), to recover the data records produced at the OMC-R level since the last time SDO has been stopped

— on event reception, each time a data record is received by the OMC-R

— on-demand, these transfers may apply to data collection period defined as part of one or more days using the beginSearchTime and endSearchTime input criteria.

Data types	Transfer Mode
Fault and stateChange notifications	start time on-demand 15 mn, 30 mn, 1..24 hours (2)
OFS records	start time on-demand on event reception
OGS records	start time on-demand on event reception
PCU records	start time on-demand on event reception
call tracing records	start time on-demand on event reception
call path tracing records	start time on-demand on event reception
cellTiering records	start time on-demand on event reception
radio network configuration (1)	on-demand daily (3)
zones of interest	on-demand daily (3)
OMC-R system session log	on-demand daily (3)
radio distributions	start time on-demand on event reception
call drop data	start time on-demand on event reception

Data types	Transfer Mode
interference matrix data	start time-on-demand and on event reception
(1) contents of a *dumpBde* action (2) the collect time is synchronized with quarters (for example: hh:00, hh:15, hh:30, hh:45), half hours (for example: hh:00, hh:30) or full hours (for example: hh:00) depending on the configurated collect period. (3) the hour of the collect (hh:mn) may be configurated. It is recommended this collect starts after the daily purge mechanisms has been run	

- build per record reports for:
  - observation data
  - cellTiering data
- build per period reports for:
  - fault and stateChange notifications
- build daily consolidated reports for:
  - observation data
  - call tracing data
  - call path tracing data
  - fault and stateChange notifications
- build reports for:
  - radio network configuration
  - OMC-R system session log
  - zone of interest
- administration:
  - start and stop
  - suspend and continue
  - delay management
  - survey and defense mechanisms
  - daily purge
  - defense purge
  - on-demand purge
  - data archival
  - log SDO activity

2.2.2 Fault and stateChange notifications

The fault notifications to process are defined in a dedicated configuration file. They are identified by their fault number (CODANO).

The list of fault numbers process is read at startup time.

The ASCII result file contains one line per matching fault notification.

The available fault and stateChange notification reports are:

- consolidated report on a user-defined time interval (up to 24 hours). This report is built on user request
- automatic daily report (periodically updated)

The consolidated report on a user-defined time interval and the automatic daily report are stored in the same file.

CAUTION
Risk of overwriting the daily report
An on-demand request overwrites the daily automatic report, if one exists.

By default, not all notification types are processed by SDO. The following table summarizes default settings for various types.

Notification/alarm type	Parameter name	Default value
Communication alarms	SdoCommunicationsAlarmNotif	ON
Attribute value change notifications	SdoAttributeValueChangeNotif	OFF
Environmental alarms	SdoEnvironmentalAlarmNotif	ON
Equipment alarms	SdoEquipmentAlarmNotif	ON
Object creation notifications	SdoObjectCreationNotif	OFF
Object deletion notifications	SdoObjectDeletionNotif	OFF
Processing error alarms	SdoProcessingErrorAlarmNotif	ON
Quality of service alarms	SdoQualityOfServiceAlarmNotif	ON
State change notifications	SdoStateChangeNotif	ON
Specific notifications	SdoSpecificNotif	OFF

The "Parameter name" column defines the parameter name in SDO configuration file **`/SDO/base/config/sdo_param.cfg`** that controls processing of corresponding notification type. For example, in order to exclude communication alarms from SDO notifications records, it is necessary to add the following line:

```
SdoCommunicationsAlarmNotif OFF
```

2.2.3 Data processing

The data records are transferred to the SDO disks where the associated SDO reports can be created.

For a given data type and a given BSC, when the first data record of a day is received, all the records of the previous day are processed to build the associated daily result file(s).

2.2.4 Observation records

In automatic processing mode, each time the SDO receives an OMC-R event about observation record availability, a transfer operation takes place.

The OGS, OFS and PCU records uploaded from the OMC-R are ASN.1 encoded.

The SDO decodes them, extracts the counter values according to the list of counters defined in a dedicated configuration file and builds the associated result files.

The list of counters to process is contained in **`/SDO/base/config/sdo_cntrs_list.cfg`** file, which is read at startup time.

This configuration file allows to associate a name for each counter. The SDO allows to identify the counters either by their Q3 names or by a custom counter name defined in a configuration file.

It is possible to have an additional information about counter validity in the observation reports.

Without this validity field, a not set counter has its value set to "-1". When this validity field is present, a not set counter has its value set to "0" and its validity field set to "0". A valid counter has its validity field set to "100".

Depending on configuration, the SDO may compute synthetic counters defined in configuration files. These files are read at startup time. The result format of the synthetic counters is the same as the raw counter result format (value and validity fields).

There are two configuration files per observation type:

- one is reserved for the Manufacturer counters (not editable by the user)
- the other is dedicated to the Operator counters

Depending on SDO configuration, the SDO may export only the raw counters, only the synthetic counters or both of them.

The counter values are grouped by observed object class: the counter values of these object classes may be stored into one or several result files depending on the SDO configuration. For example, it is possible to:

- store *bsc* counters in the *bsc*-level result file
- store *bts* and *transceiverZone* counters in the *bts*-level result file
- no longer produce *adjacentCellHan doverNortel*-level nor n *pcmCircuit*-level result files

If no counters or no object instances are available in an observation record for a configurated class-level file, a zero-length result file is created.

If a class-level definition is set to an empty list in the main configuration file, no result file is produced for this class-level.

These configuration parameters apply to OGS, OFS and PCU.

Depending on SDO configuration parameters, each observation data record is separated between one or more result files. Each file is associated to one or more observed object classes.

An OMC-R observation record contains observation data for only one BSC.

The available observation reports are:

- per record. This report may be built on a user request or automatically on event reception if the SDO has been configured to do it.
- consolidated observation report on a user defined time interval up to 24 hours. This report is built immediately on user request, by using the data available at the MD-R level, even if all the data is not available (for example, due to a delay in the availability of the data, or a problem with the link used to transfer the data). So, in such circumstances, the report may be incomplete.
- automatic daily observation report. This report is built when all the observation records of the BSC or PCUSN have been received for this day. That is when the first file of the next day has been received. This report is not built at fixed hour but is always complete.

The counter values are distributed into consolidated result files with the same rules as per-record result files. Each line in the consolidated result files contains one counter value per hour of the required time interval.

The daily consolidated result processing is optional and may be activated using the main configuration file. It is only available for OFS and PCU.

2.2.5 Temporal aggregation

2.2.5.1 Counter types

TOTAL counters only contain one field : **`u32 cumulatedValue`**

LOAD and VALUE counters contain the same fields but are not collected the same way by the BSC (event-driven collection for VALUE counters, periodic collection for LOAD counters). The SDO calculates an averageValue field:

- u32 cumulatedValue
- u32 nbOfEvents
- u32 minimumValue
- u32 maximumValue
- double averageValue (calculated at SDO level)

2.2.5.2 Aggregation formulas

Let 'T1' and 'T2' two consecutive observation periods (e.g. 10h00-10h15 and 10h15-10h30). For a given counter X, the temporal sum is defined as follows:

	Temporal Sum
Total	Σ T1,T2 (X.cum) = X.cumT1 + X.cumT2
Value Load	Σ T1,T2 (X.cum) = X.cumT1 + X.cumT2 Σ T1,T2(X.nbevt) = X.nbevtT1 + X.nbevtT2 Σ T1,T2 (X.avg) = Σ T1,T2 (X.cum) / Σ T1,T2(X.nbevt) Σ T1,T2 (X.max) = max(X.maxT1, X.maxT2) Σ T1,T2 (X.min) = min(X.minT1, X.minT2)

2.2.6 SDO data files compression

Due to the size of files being stored, compression algorithms (RFC 1952) are used to optimize SDO disk space usage.

The following file types are compressed:

- Distribution results:
  - — Interference matrix
  - — Call Drop-Analysis
  - — Radio Measurement Distributions

  These files are stored in compressed XML files.

- Observation reports.

These files contain counter values provided by Network Elements (BSC or PCU).

Automatic compression procedure

In the event of long term failure of an OAM link towards a NE, a file could be delivered for a day that has already been compressed. If this occurs, it is not immediately added to the tar archive, but put into the usual raw directory. During the following nightly compression routine, the content of this directory is added to the compressed file containing the previous data.

Every night, immediately after the daily purge, a compression routine is invoked which compresses all raw observation records and observation summaries of the previous day into tar.gz archives, deleting the original files afterwards. Normally only the current day of observation data is available in decompressed format. Only the files are deleted by the compression routine, not the directories, which are left empty.

Compression may be deactivated by using the SDO MMI.

As neither the SDO observation files related to the current day nor the older ones collected during the current day (for example in case of OAM link failure) is affected, there is no direct impact for tools that upload these files on a regular basis.

Impact on external interfaces

However, if the external processing tool interrupts the retrieval for a given period of time, compression must already be applied. In this case, compressed files must be uploaded and then decompressed before being processed.

Tools retrieval data only once a day may be directly impacted, depending on when this upload occurs.

SDO "purge + compression" times to deal with the data can be configured to select having the retrieval performed:

— either before purge/compression and data are provided in standard format,

— or after compression and data are available in compressed format.

ATTENTION

If files are decompressed by external tools — or manually, it must not be done on the SDO equipment itself, as it may incur use of extra disk space on it.

ASN1-formatted files, used to build regular SDO files, are not affected.

Compressed files location and naming

There are two types of monitoring data to compress; raw and daily sums. As they are stored in two different directories, there are two distinct compressed files stored in the same folder.

Compressed files are stored in the following directory:
("compressed/<Date>" directory to be created)

Where <Date> format is YYYYMMDD where YYYY = year, MM = month, DD = day.

Filenames are:

For PrOptima, If the counters data to be retrieved are not uploaded during the current day, then that data is contained by a tar/zipped file stored in a dedicated directory.

— **- obs_raw.tar.gz**

— **- obs_sum.tar.gz**

In this case, the compressed file must be uploaded, instead of the complete regular directory content. Then file decompression (using for example gzip), followed by an "untar" of the contained file restores original files to be made available for nominal processing.

2.2.6.1 Purge mechanism

The purge mechanisms applied to compressed files are those that are put in place at SDO disk level:

- daily purge to remove files older than three days
- defense purge to avoid disk saturation

2.2.7 Call tracing and call path tracing records

In automatic processing mode, each time the SDO receives an OMC-R event about call tracing or call path tracing record availability, a transfer operation takes place.

The call tracing and call path tracing records uploaded from the OMC-R are ASN.1 encoded.

The SDO decodes them, extracts the trace data according to the list defined in the main configuration file and builds the associated result files.

The configuration file is read at startup.

For each bsc, the SDO produces one daily result file per trace function (call tracing or call path tracing) and per configured trace data type:

- trace record general information
- bts information
- transceiver information
- radio channel description information
- radio channel type information
- establishment cause information
- end cause information
- bs power information

- ms power information
- timing Advance information
- msClassMark1 information
- msClassMark2 information
- msClassMark3 information
- bsic information
- cic information
- handover result information
- handover cause information
- target cell list information
- synchronization information
- bss map event information
- dtap event information
- rr event information
- abis event information
- measurement information
- power control event information
- abis extension information
- interfaces A and Ater extension information
- enhanced measurement information
- neighboring cell list information

The link between the data of the different files is possible using a common key (`traceKey`) identifying each traced communication.

Some traced communications may spread over several trace records (that is partial records). When a partial record is received without startTime (meaning it is not the first record of this communication), the SDO software looks for the `traceKey` of the associated ascendant record having a fullfilled startTime.

If no ascendant is found, a new `traceKey` is created.

The available call tracing and call path tracing reports are:

- daily report on a user request (using the available data)
- automatic daily report. A daily report is updated each time a processed call (path) tracing record contains data associated with a communication having a start Time in the same day.

Because the traceControl or callPathTrace sessions may no longer exist at the OMC-R level while their associated data are still available. When the SDO restarts and "re-synchronizes" itself by uploading OMC-R data, it may be impossible to fulfill the **traceId** field (for example: **traceControlId** or **callPathTraceId**) of communications having started during the OMC-R/SDO breakdown. These communications have their **traceId** field set to 0.

2.2.8 Network configuration data

Network configuration data includes a BDE snapshot, which is stored in several files on per-object basis.

An automatic request to generate this snapshot is issued once a day at 02:00am.

Periodicity and the time of this request can be change by specifying the **SdoDailyTimeTransfert** and **SdoNetworkDelay** parameters in SDO configuration file **/SDO/base/config/sdo_param.cfg.**

For example, to configure a hourly BDE snapshot request the following line must be added:

```
SdoNetworkDelay 60
```

In order to change the time of daily request to 06:00am, the following line must be added:

```
SdoDailyTimeTransfert 0600
```

Additionally, SDO is able to process PCM AGPRS Config Change events (codano 1525) and store them in a specific file in the same directory as other network files. For this type of data, only automatic processing mode is available. As reception periodicity of these events is unpredictable, every night the last PCM AGPRS Config file for each BSC is copied to the current day directory (preserving date and time in the file name). In this way, there is no risk of losing this data during the daily purge.

2.2.9 CellTiering data

In automatic processing mode, each time the SDO receives an OMC-R event about CellTiering statistic records availability, a transfer operation takes place.

The CellTiering records uploaded from the OMC-R are in ASCII format.

2.2.10 System session log

The OMC-R system session log is uploaded from the OMC-R and stored on the SDO disks without any change. Transfer of the session log is done once a day and its time is controlled by the same **SdoDailyTimeTransfert** parameter as network configuration data. Note that only the complete session log is available on SDO, for example, the nightly transfer concerns the session log of the previous day.

2.2.11 Zone of interest

The SDO stores the content of the zones of interest in one single result file for all the locale or remote stations which are connected and declared. A station is considered as "declared" if the OMC-R has recorded the station has already been connected.

It is possible to avoid the zone of interest processing on some stations using a dedicated configuration file.

The result file contains the Ethernet name of the station and the list of the BSC identifiers managed by the station.

Transfer of zone of interest is done once a day and its time is controlled by the same **SdoDailyTimeTransfert** parameter as network configuration data.

2.2.12 Radio distribution (RMD), interference matrix (IM) and call drop data (CDD)

Whenever a new radio distributions interference matrix or a call drop file ready event is received and processed by the server, the SDO downloads and decodes the corresponding binary file. The result, to be used by an external post processing tool, is placed on the SDO disks in XML format. The option exists that XML files can be compressed. Compression is activated by default but it can be disabled using the SDO GUI.

ATTENTION
It is not recommended to disable the compression. Disabling the compression may cause degradation of data transfer to post processing tools. As amount of data to be transferred is increased, this may significantly slow down the downloading via ftp, or other method of data transfer. This is also applicable to IM (Interference Matrix)

The storage directory is **/SDO/data/calldrop/date/<networkID=d>/<bscId>** where:

- date is the date format yyyymmdd; it corresponds to the feature deactivation date
- <networkId> is the OMC-R Id on 3 digits
- <bscId> is the BSC Id on 3 digits

The above storage directory is for CDD. For RMD it is **/SDO/data/distrib/date/<networkID=d/<BSCId>**

And for IM (Interference Matrix) it is **/SDO/data/CIBgt/YYYYMMDD/<NetworkID>/<SessionID>/<BSC>**

Where SessionID is IM session Id.

Due to XML format specifics, the SDO filtering feature is not available for radio distribution, interference matrix and call drop data. It is not possible to filter out part of parameters, because the resulting file would not be valid against the XML Schema definition. However, all other SDO functionality is the same for these data types: manual transfer and configuration with SDO GUI, daily and defense purge and SDO Mailer.

It is recommended to deactivate this feature before a BSC upgrade or a reparenting NRP activation.

Every night a special routine is invoked, which archives all radio distribution, call drop data and interference matrix files for the previous day in tar files, deleting the archived files afterwards. The same routine can be invoked at any time from command line or through SDO GUI. In case of manual archiving, the original files are deleted during the nightly processing, not immediately.

2.2.13 SDO log files

The SDO stores time stamped execution summaries (including anomalies) in a circular log file **/SDO/data/sdo.log**.

2.2.14 Automatic data purging

The following table shows the storage duration of each files at the SDO.

Data Type	Storage in uncompressed format	Storage in compressed format
Binary files in temporary directory		
BSC and PCU observation files (ASN1 encoded)	D	-
Call tracing record files (ASN1 encoded)	D	-
Call path tracing record files (ASN1 encoded)	D	-

Data Type	Storage in uncompressed format	Storage in compressed format
Radio distributions binary files	D	-
Call drop binary files	D	-
Interference matrix binary files	D	-
ASCII files in data directory		
Fault notification per-record files	D	-
BSC and PCU observation per-record files	D	D-1...D-3
BSC and PCU daily summaries	D (1)	D-1...D-3
CellTiering	D ... D-3	-
Call tracing	D ... D-3	-
Call path tracing	D ... D-3	-
Network configuration parameters	D ... D-3	-
Radio distributions(2)(3)	-	D ...D-1... D-3
Call drop(2)(3)	-	D ...D-1.. .D-3
Interference matrix(2)(3)	D	D-1 … D-3
Other files		
SDO log file	circular file	circular file

(1) The D-day summary files are only available at day D+1, so they remain only few hours on the SDO disks until the compression mechanism is triggered.

(2) If compression is activated for these data types, then it is performed on-the-fly so each XML file is compressed separately, whenever it is produced, so no data is kept in decompressed format.

(3) For the XML data types, the current day data is also compressed on-the-fly if compression is activated, however a daily tar is only generated on D+1.

2.2.15 User interface

The user interface allows the user to display the SDO configuration, to do administration tasks and to process on-demand transfers (see NTP <130>).

The following SDO configuration parameters can be modified through SDO GUI interface.

- SDO data set parameters:
  - list of counters to process
  - list of CODANOs to process

  - definition of filters
  - list of excluded workstation for ZOI report
- background processing parameters:
  - automatic transfer period for fault and stateChange notifications
  - activation or deactivation of each data type processing
- data format parameters:
  - data format parameters:
  - line separator
  - object instance format (identification format and subfield separators)
  - observation result file format (counter naming, validity field)
  - substitution separator for notifications
  - NULL value string and necessity of hexadecimal prefix for CT/CPT
  - activation of compression for observations data and XML data types
- SDO mailer parameters:
  - mailing period
  - mail server IP address
  - mail recipients (up to 5) and mail filters for each recipient

After a configuration parameter has been modified, an SDO restart is needed.

2.3 Communication structure

2.3.1 Introduction

The OMC-R physical entities, described in the previous chapter, communicate among themselves and with the OMC-R environment by means of three networks:

- the local Ethernet network linking the OMC-R server(s), local workstations, printer, X terminals, routers and terminal servers, the customer server with DNS protocol, on the one hand and the routers and remote stations at a site on the other hand
- the X.25 network which connects remote workstations and OMC-R server(s) using the routers
- the PSTN, which links the RACE to the terminal server

The OMC-R and the BSS communicate by means IP for BSC 3000. The interface formed by the link between the network and OMC-R, and the network and BSC is called the communication interface.

The OMN interface enables the OMC-R to communicate with the BSS 3000 using IP connections.

Figure 47 "Position of the OMC-R in the network" (page 161) shows the position of the OMC-R in the network. The diagram contains the following subsystems which make up the network:

- BSS: Base Station Subsystem
- NSS: Network Subsystem
- OMS: Operations and Maintenance Subsystem

An OMC-R must have its own local Ethernet network. If the OMC-R is connected to an already existing local network, a filtering bridge must isolate this network and the local OMC-R network.

In this system, information is exchanged between the following:

- local manager and MD-R
- local workstation and (active) OMC-R server
- X terminal and workstation
- (active) OMC-R server and BSC
- RACE and local workstation by means of the terminal server
- OMC-R server or workstation and printer by means of the Ethernet network

This chapter describes the communication system defined according to the ISO model and the different types of connection of the equipment to the local OMC-R Ethernet network.

2.3.2 Communication manager - MD-R

Communication between a manager and the MD-R occurs by means of an internal Q3 interface (except for the notification management).

A loopback interface has been implemented inside the CMIP layer to optimize the exchange when the agent and the manager are located on the same host. From the application point of view, the interface is a Q3 link. For file tranfer, FTAM has been replaced by UNIX link copy.

The manager is interfaced with the MD-R at level 7 as shown in the following figures:

Figure 46
Structure of the communication Manager-MDR except for the notifications

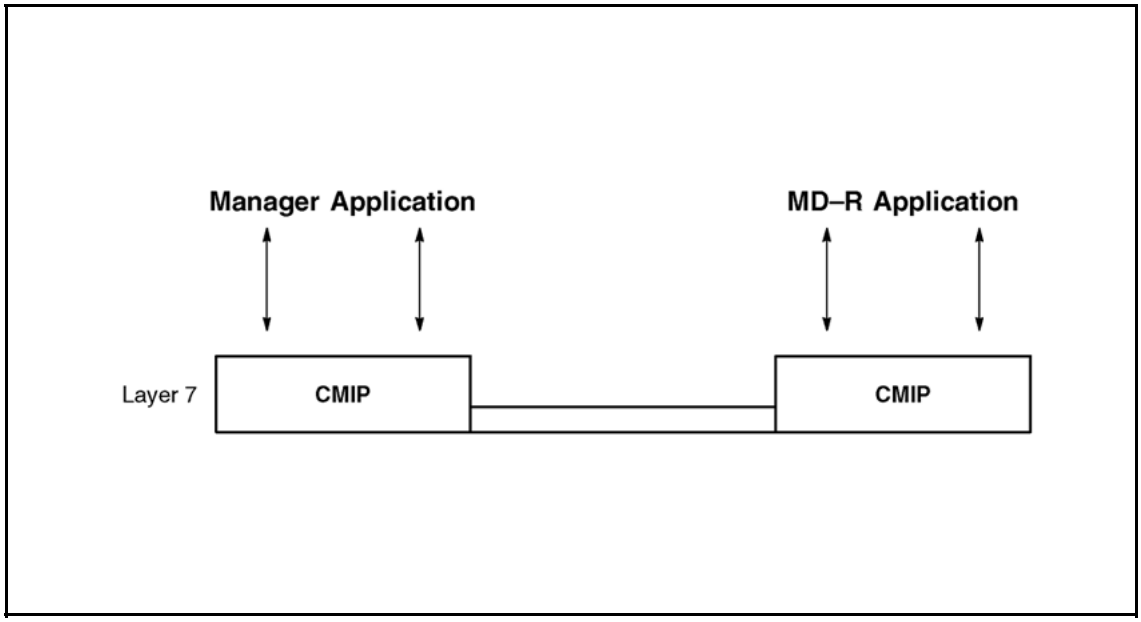
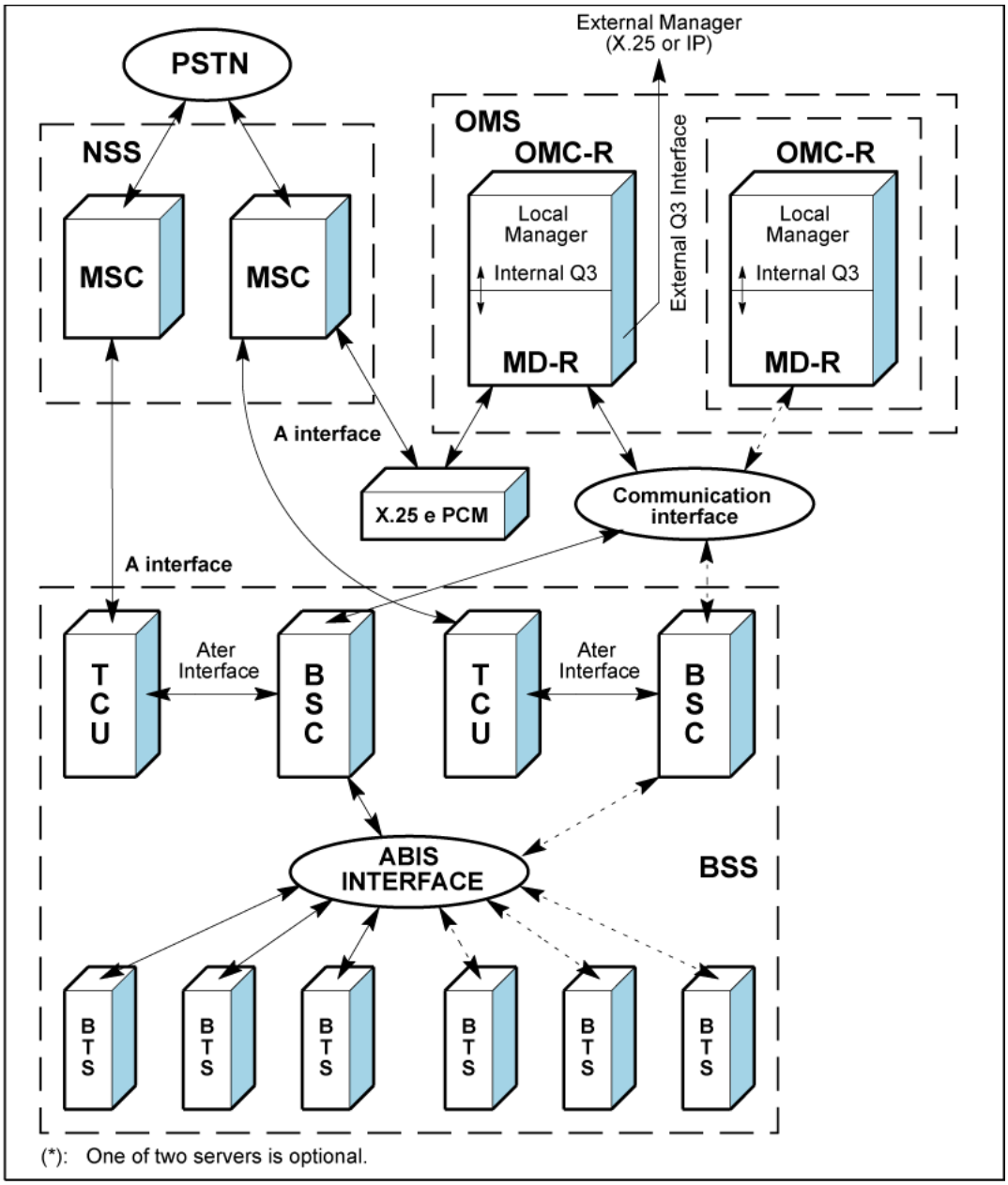


Figure 47
Position of the OMC-R in the network



2.3.3 Communication external manager - MD-R

The communication between the MD-R and an external manager occurs by means of an external Q3 interface whose communication profile is as follows (see Figure 48 "Communication structure at the external Q3 interface" (page 163)):

Layer	X.25	IP
• Layer 1:	synchronous serial link	Ethernet
• Layer 2:	LAP-B	IEE 802.3
• Layer 3:	X.25	IP
• Layer 4:	transport, class 2	TCP
• Layer 5:	session	session
• Layer 6:	presentation	presentation
• Layer 7:	FTAM and CMIP	FTAM and CMIP

2.3.4 Workstation - Server communication

In local mode, the communication between workstations and server(s) occurs by means of a local Ethernet network that uses the following protocols:

- Layer 2: Ethernet IEEE 802.3
- Layers 3 and 4: TCP/IP

The two OMC-R applications (server-station) communicate by means of the socket.

On a site, the remote stations are linked using a LAN.

The communication between remote workstations and servers uses the X.25 network by means of routers and the following protocols:

- router to router (X.25 network):
  - — Layer 2: LAP-B
  - — Layer 3: X.25-3
- remote workstations to routers or server(s) to routers (LAN):
  - — Layer 2: IEEE 802.3
  - — Layer 3: IP
- remote workstations to servers:
  - — the two OMC-R applications (server-station) communicate by means of the socket.

Figure 49 "Workstation - OMC-R server communication structure" (page 164) shows this communication structure.

Figure 48
Communication structure at the external Q3 interface

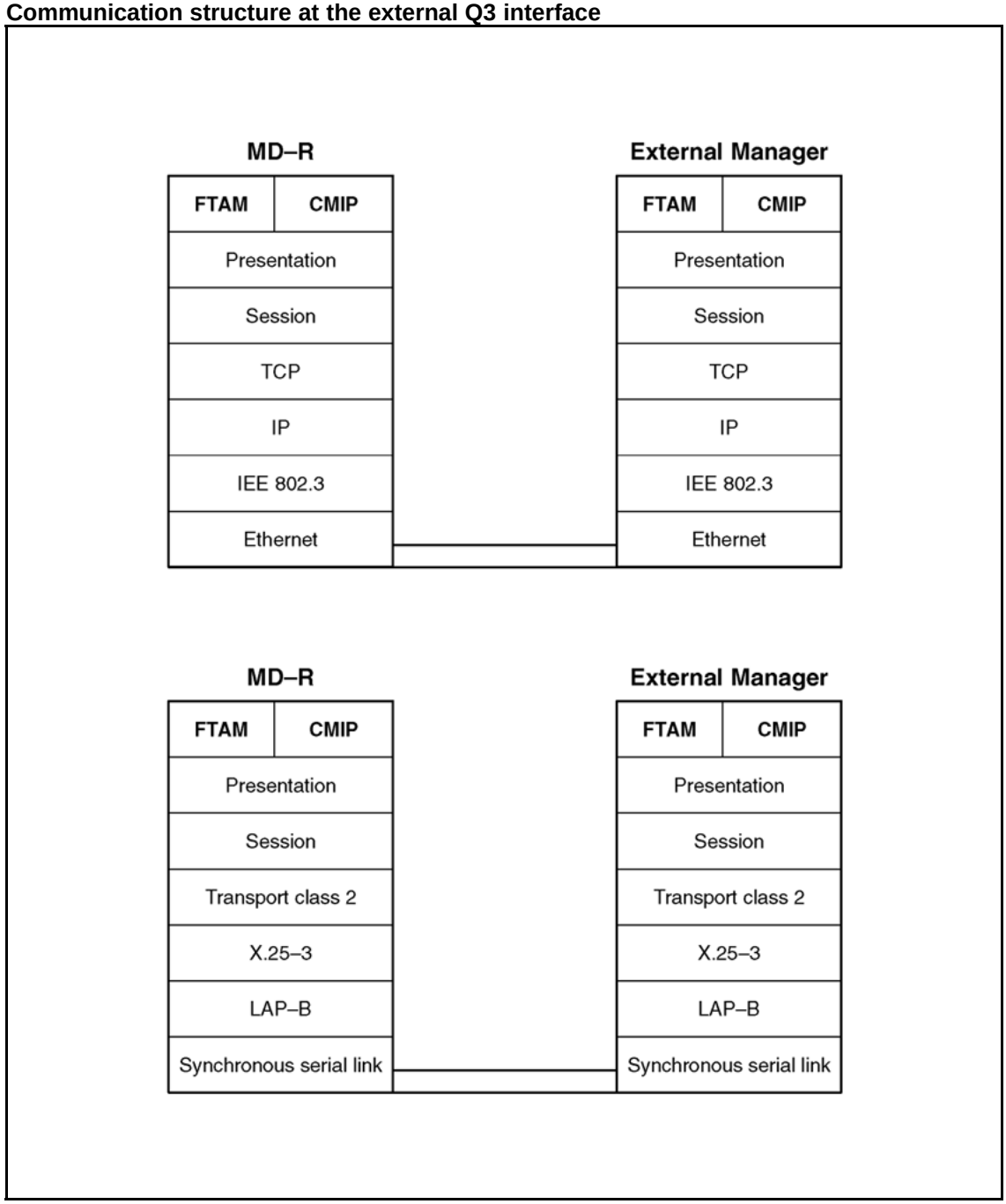
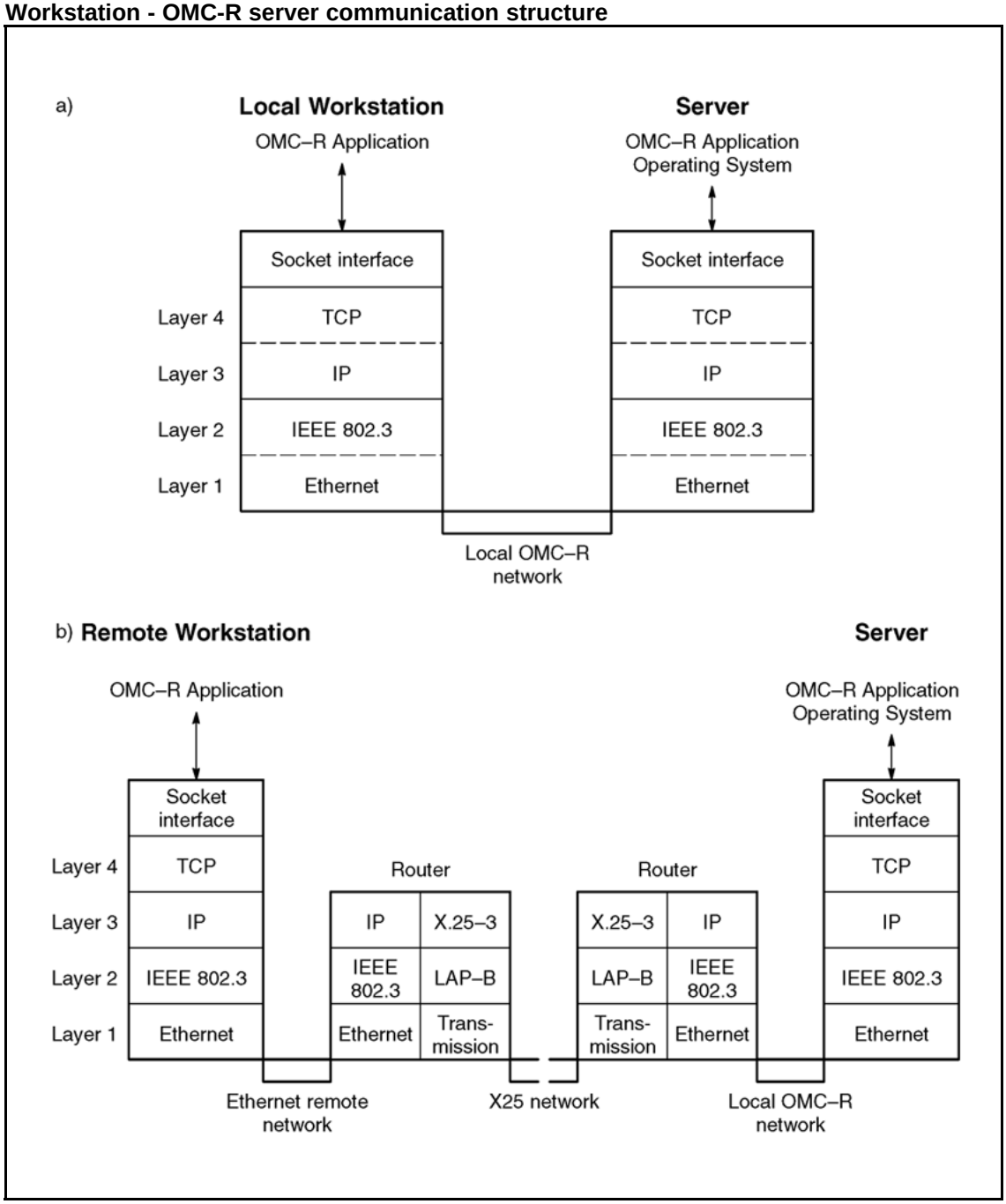


Figure 49
Workstation - OMC-R server communication structure



2.3.5 Communication workstation - X terminal

Communication between the workstation and X Terminal occurs across the local area Ethernet network with the following communication structure:

- layer 1: Ethernet
- layer 2: IEEE 802-3
- layer 3 and 4: TCP/IP

2.3.5.1 X terminal server

An X terminal server is a machine connected to several X terminals which enables the start-up of these X terminals.

This machine must have a boot X terminal software and the X11 server software. When an X terminal starts up, this software is downloaded from the X terminal server. The communication between an X terminal and the X terminal server attached to it occurs by the TFTP (Trivial File Transfer Protocol) protocol. An X terminal server is not necessarily an OMC-R workstation or an OMC-R server.

The first four communication layers are given in the Figure 50 "Workstation - X terminal communication structure" (page 166).

2.3.5.2 Graphic MMI server

To have the OMC-R graphic interface, a X terminal must be connected to a MMI graphic server. This connection occurs through the OMC local network.

To act as a MMI graphic server, an OMC-R workstation must have a 128-Mbyte memory. The graphic MMI of each X terminal is executed on the graphic MMI server.

An example of X terminal configuration is given in the Figure 51 "X Terminal configuration example" (page 166).

Figure 50
Workstation - X terminal communication structure

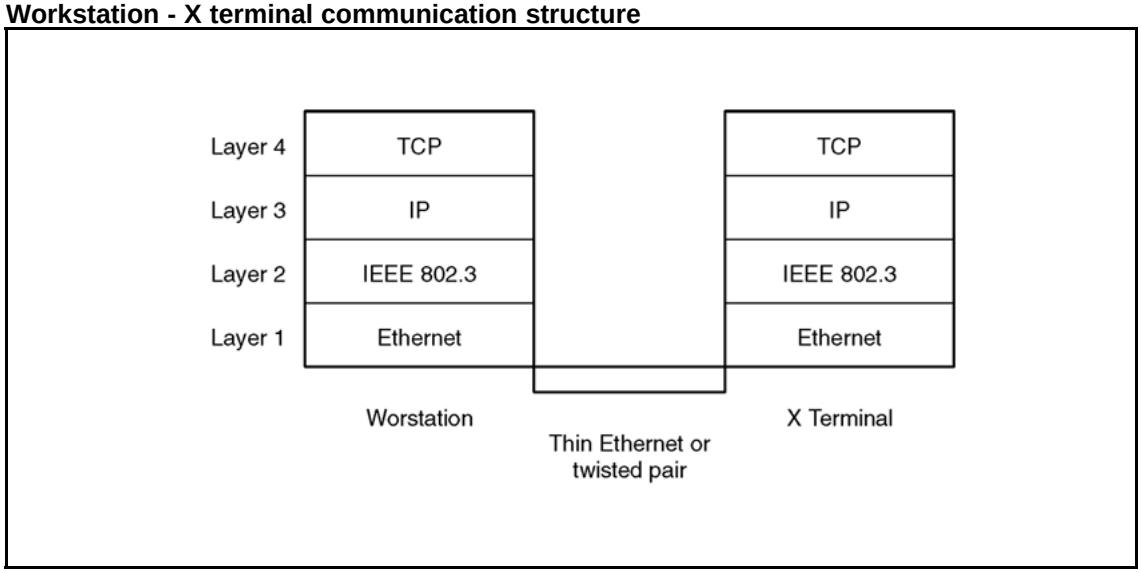
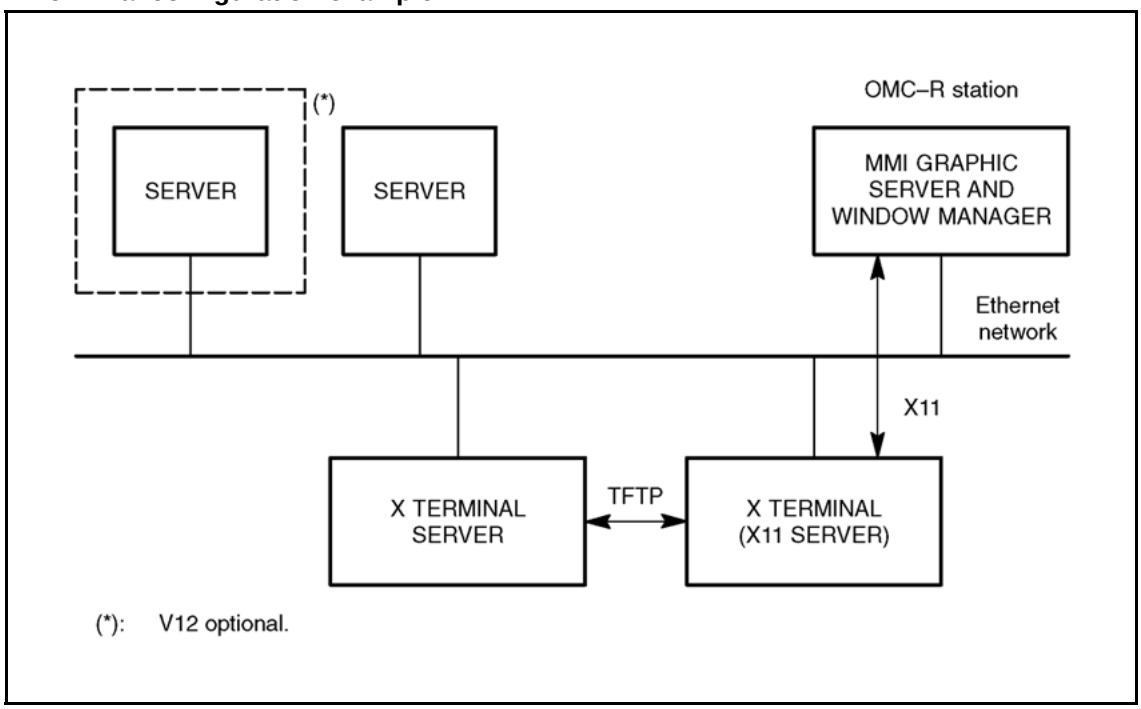


Figure 51
X Terminal configuration example



2.3.6 Server - BSC communication

The server can be connected to the BSC 3000 by an OMN proprietary interface in three ways:

- through the OMN
- by means of the Ater interface
- by means of leased lines

2.3.6.1 OMC-R BSC connection through the OMN

The OMC-R communicates with the BSC across the OMN proprietary interface. The protocols used for the server are as follows:

	Layer	IP (BSC 3000)
•	Layer 1:	Ethernet
•	layer 2:	IP
•	layer 3:	TCP
•	layer 4:	RFC1006
•	layer 5:	session
•	layer 6:	presentation
•	layer 7:	FTAM

The OMC-R application interfaces with layers 4 and 7 (see Figure 52 "Communication structure of an OMC-R server linked with BSC" (page 168)

2.3.6.2 OMC-R BSC connection through Leased Lines

BSC 3000 The connection between the OMC-R and the BSC 3000 occurs by means of a TCP/IP over Ethernet switch. This switch is connected to the various BSCs by means of Leased Lines.

Two types of TCP/IP switch can be used:

- to connect 12/24 BSCs maximum to the OMC-R (Baystack 350)
- to connect 16 BSCs maximum to the OMC-R (Newbridge)

2.3.7 Local workstation - RACE communication (from V13)

After cable connection or dial-up to the PSTN with a modem, a RACE can be connected to a local workstation by means of the terminal server.

The communication between terminal server or OMC-R server and local workstation uses the local Ethernet network and uses the following communication structure:

- Layer 2: Ethernet IEEE 802.3
- Layers 3 and 4: TCP/IP

This structure is shown in the Figure 54 "Workstation - RACE communication structure" (page 170).

2.3.8 OMC-R machine - Printer communication

Each OMC-R machine (server or station) manages its own printing jobs through the local Ethernet interface.

The communication structure is as follows (see Figure 55 "OMC-R server - printer communication structure" (page 170)):

- Layer 2: Ethernet IEEE 802.3
- Layers 3 and 4: TCP/IP

Figure 52
Communication structure of an OMC-R server linked with BSC

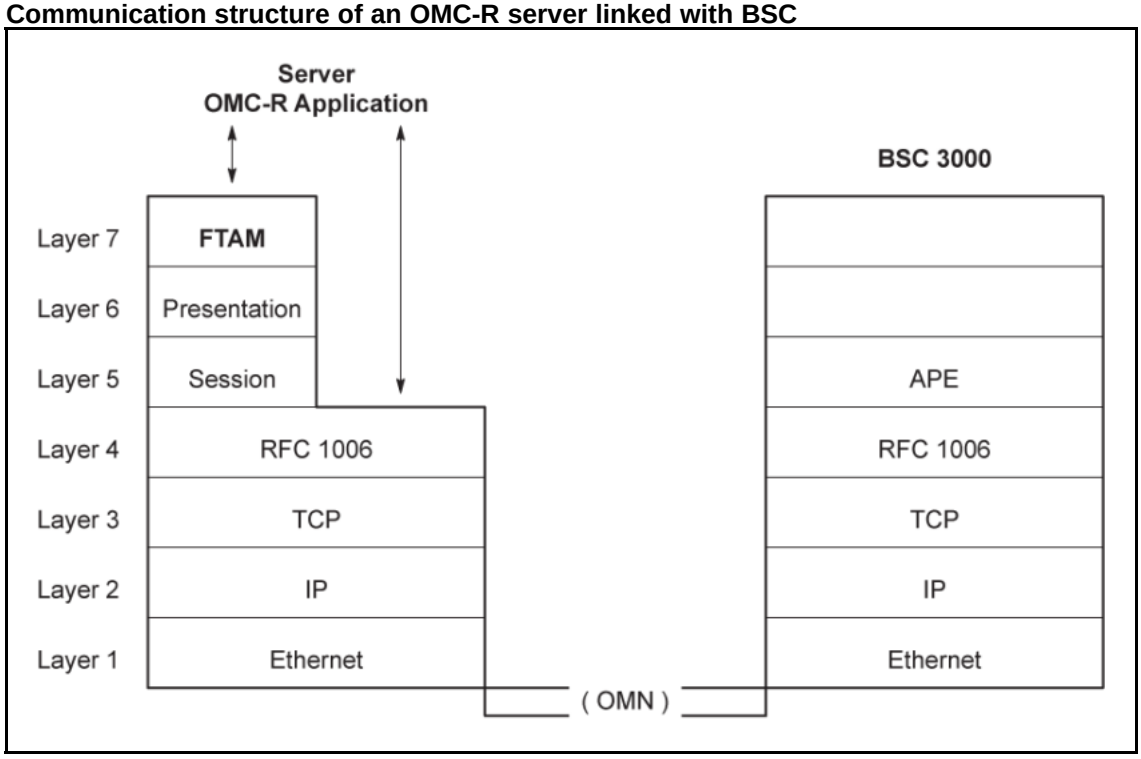


Figure 53
OMC-R/BSC connection through an interface

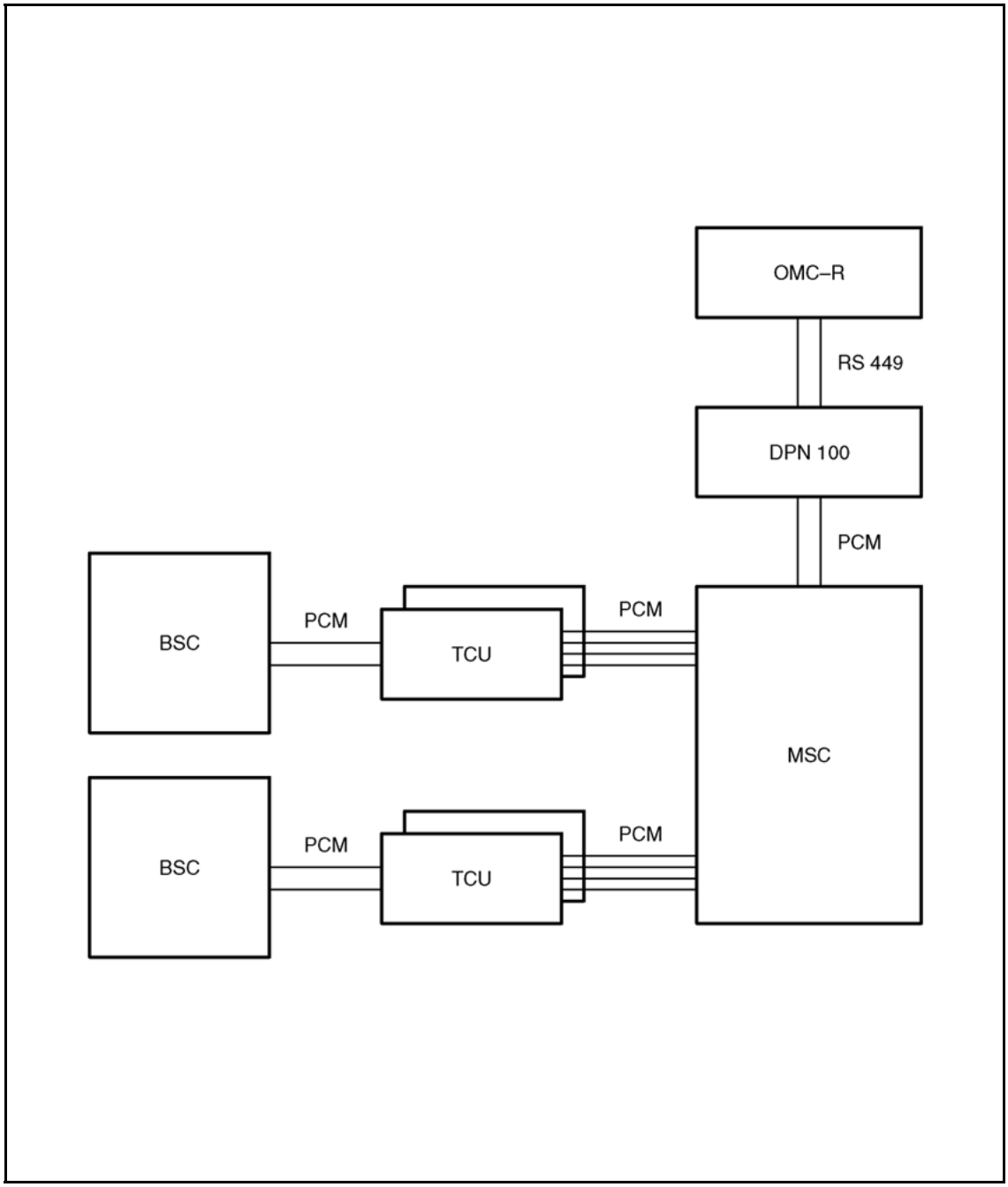


Figure 54
Workstation - RACE communication structure

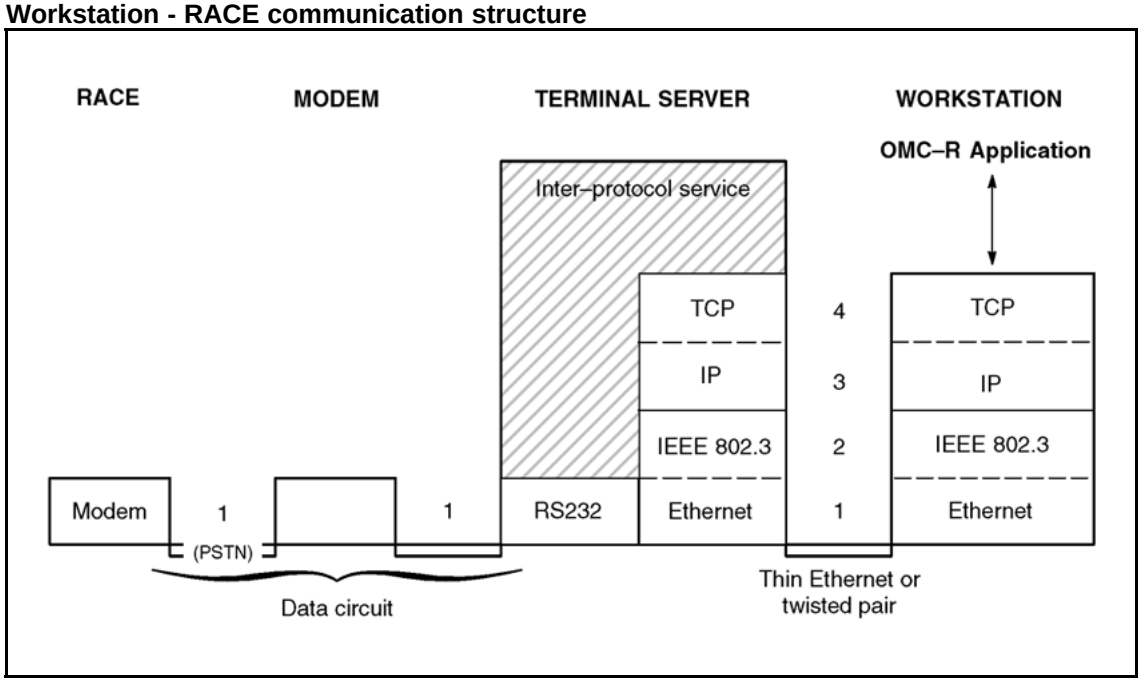
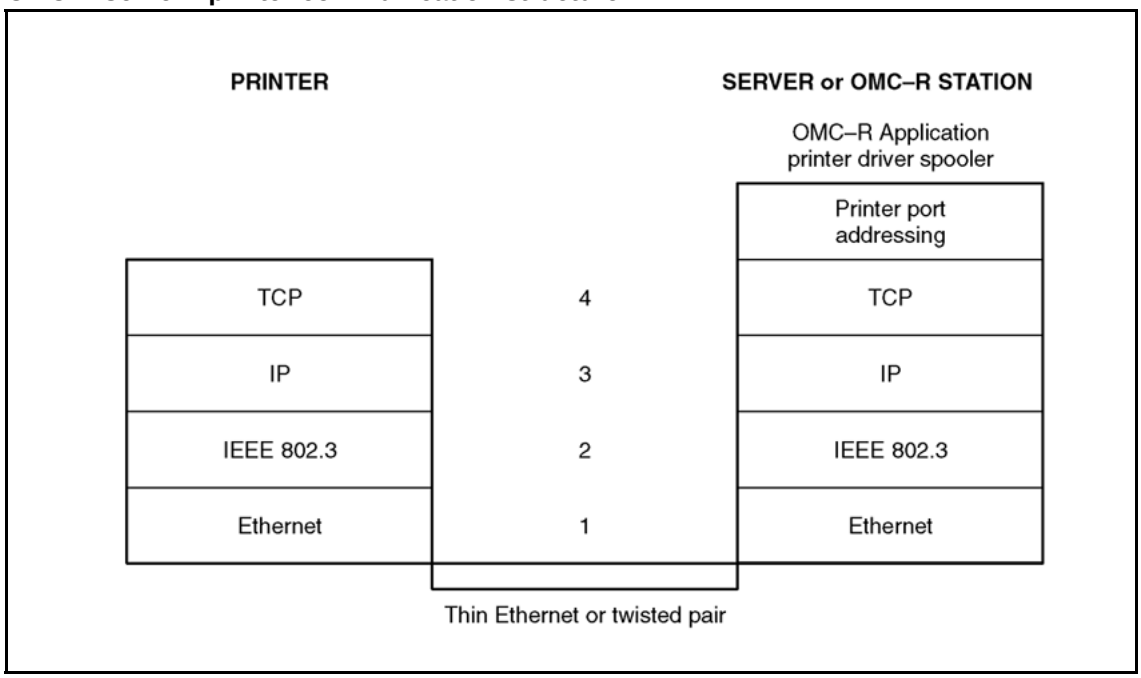


Figure 55
OMC-R server - printer communication structure



2.3.9 Connection to the local OMC-R Ethernet network

Two types of connection to the local OMC-R Ethernet network are possible:

- by a hub
- by means of transceivers

2.3.9.1 Connection to the Ethernet network by a hub

A hub is a central Ethernet switch in a twisted pair network (10 Base T or 100 Base T). All the devices can be connected in point-to-point to the hub.

An additional device can easily be added in the network by connecting it to the hub. This connection is made without using a transceiver.

One heterogeneous network (10 Base T or 100 Base T) can be connected through a hub.

The hub synopsis given in Figure 56 "Hub synopsis" (page 172).

Use in the OMC-R architecture A hub connects OMC-R devices: server(s), workstations, printers, X terminals, terminal servers and routers.

It is used in the OMC-R architecture because of:

- the easiness to connect a device
- its low cost
- the use of 10 Base T or 100 Base T cables (frequently used)

The hub can be used in an OMC-R local network or remote to connect OMC-R workstations (local or remote).

The local use of a hub is described in Figure 57 "Local use of a hub" (page 173).

The remote use of a hub is described in Figure 58 "Remote use of a hub" (page 174).

2.3.9.2 Connection to the Ethernet network through transceivers

The connection of some devices (workstations, routers, terminal servers and X terminal) to the local OMC-R Ethernet network is made in this case through transceivers. Each device is connected to a transceiver through a down cable (plugged on an AUI socket).

The other devices: server(s), printer are connected to the hub.

The transceiver provides the connection of the device to the Ethernet network and the transmission of information. This type of connection to the Ethernet network is described in the Figure 59 "Connection to the OMC-R local Ethernet network (10 Base 2)" (page 175).

Figure 56
Hub synopsis

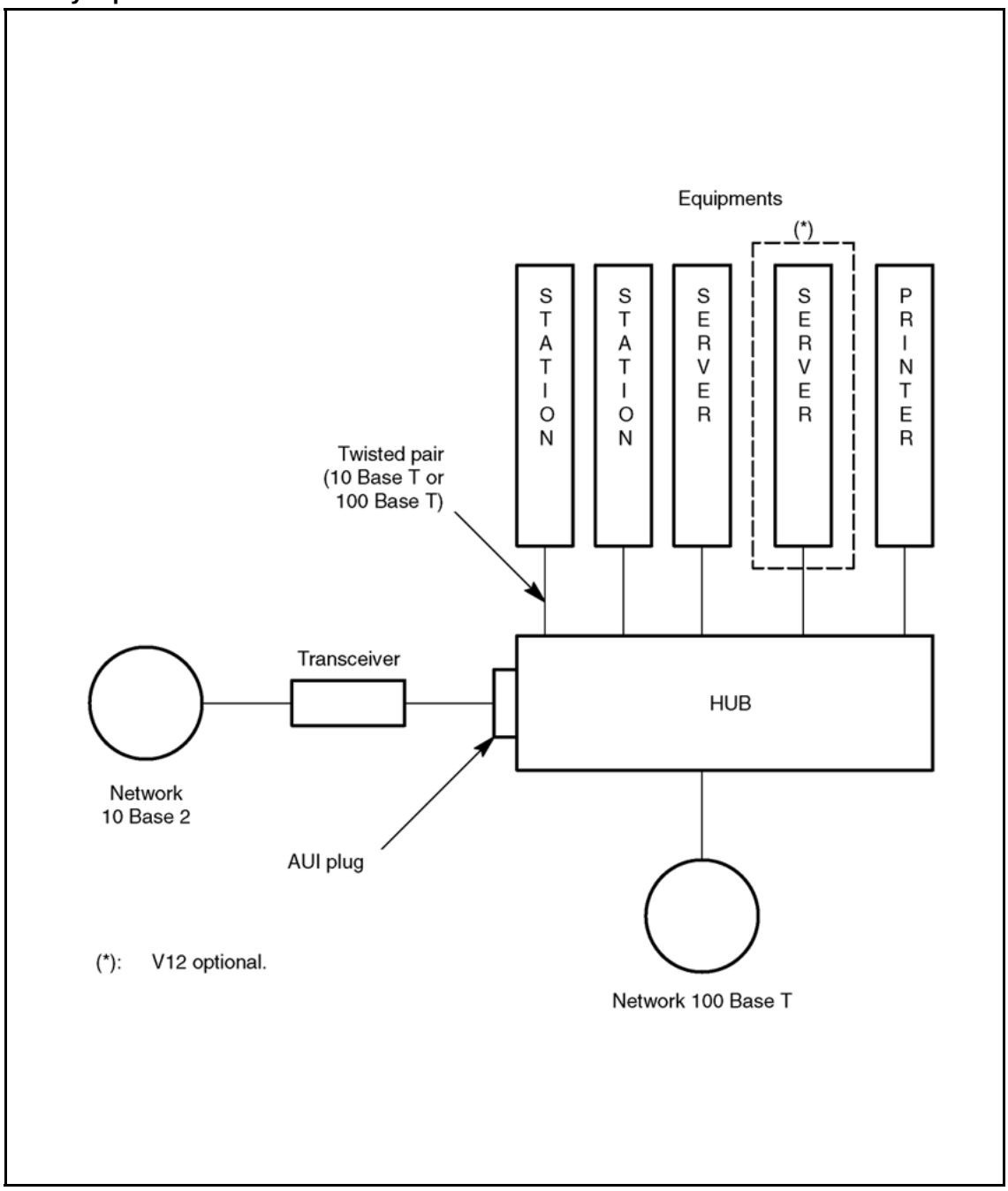


Figure 57
Local use of a hub

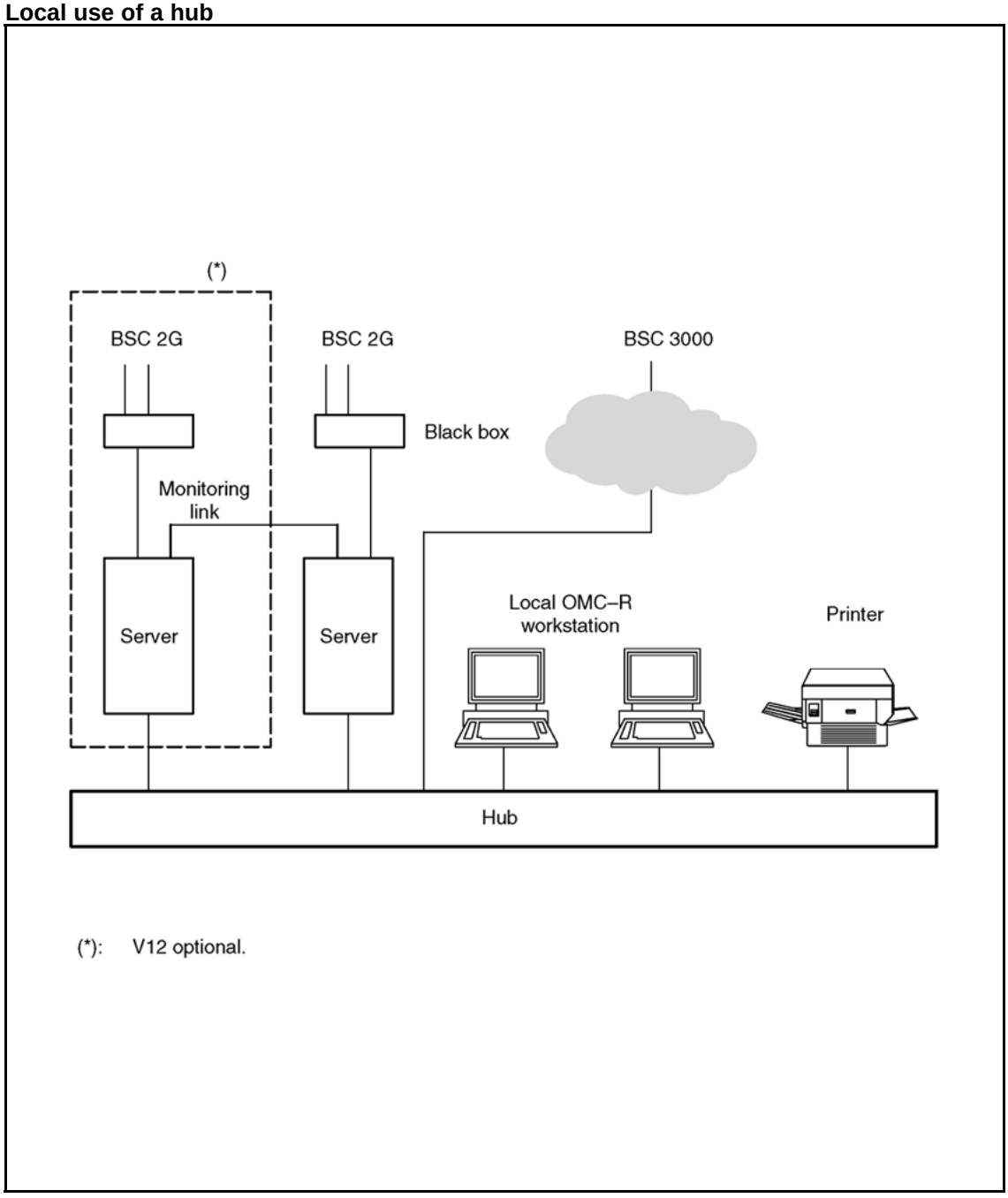


Figure 58
Remote use of a hub

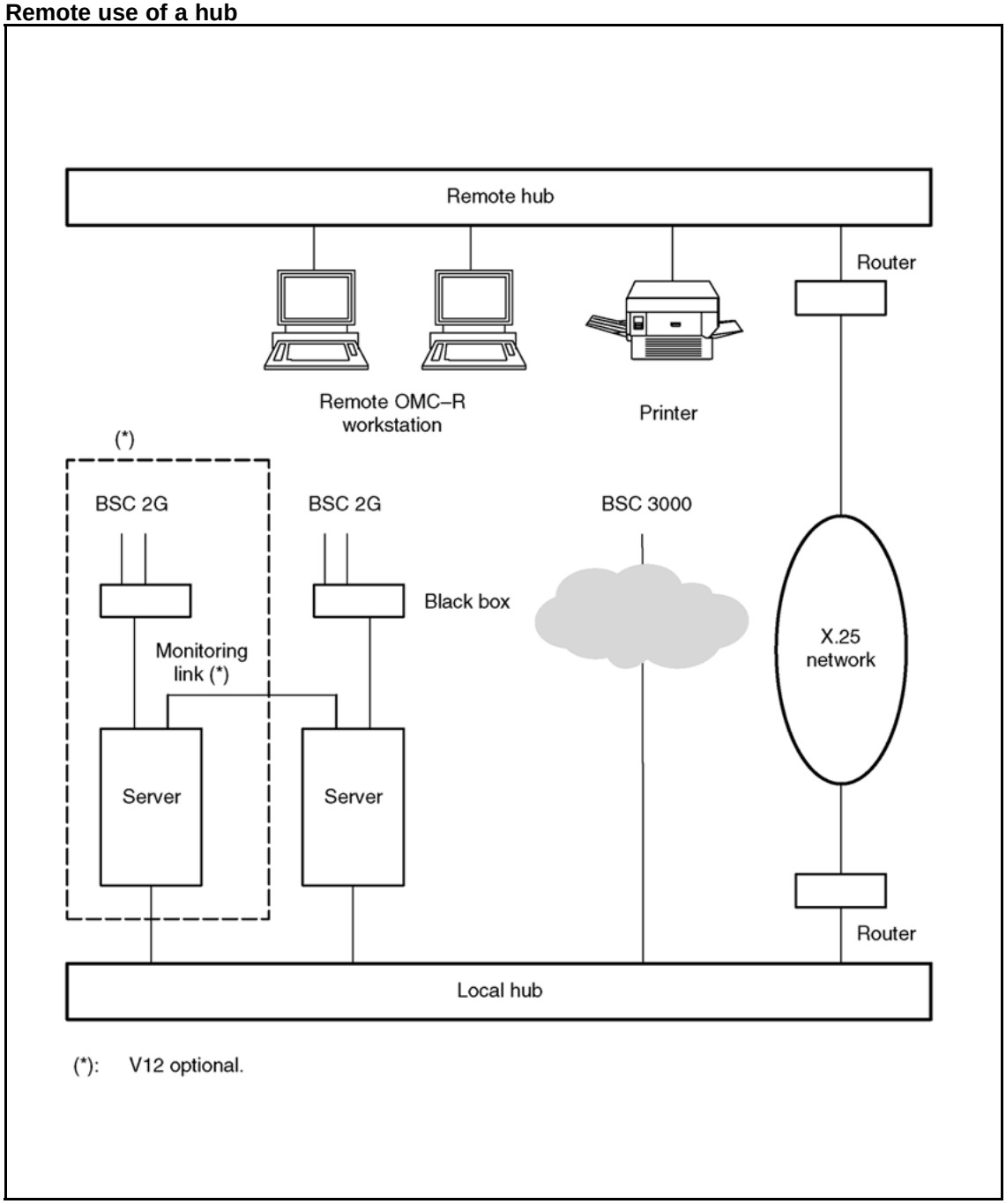
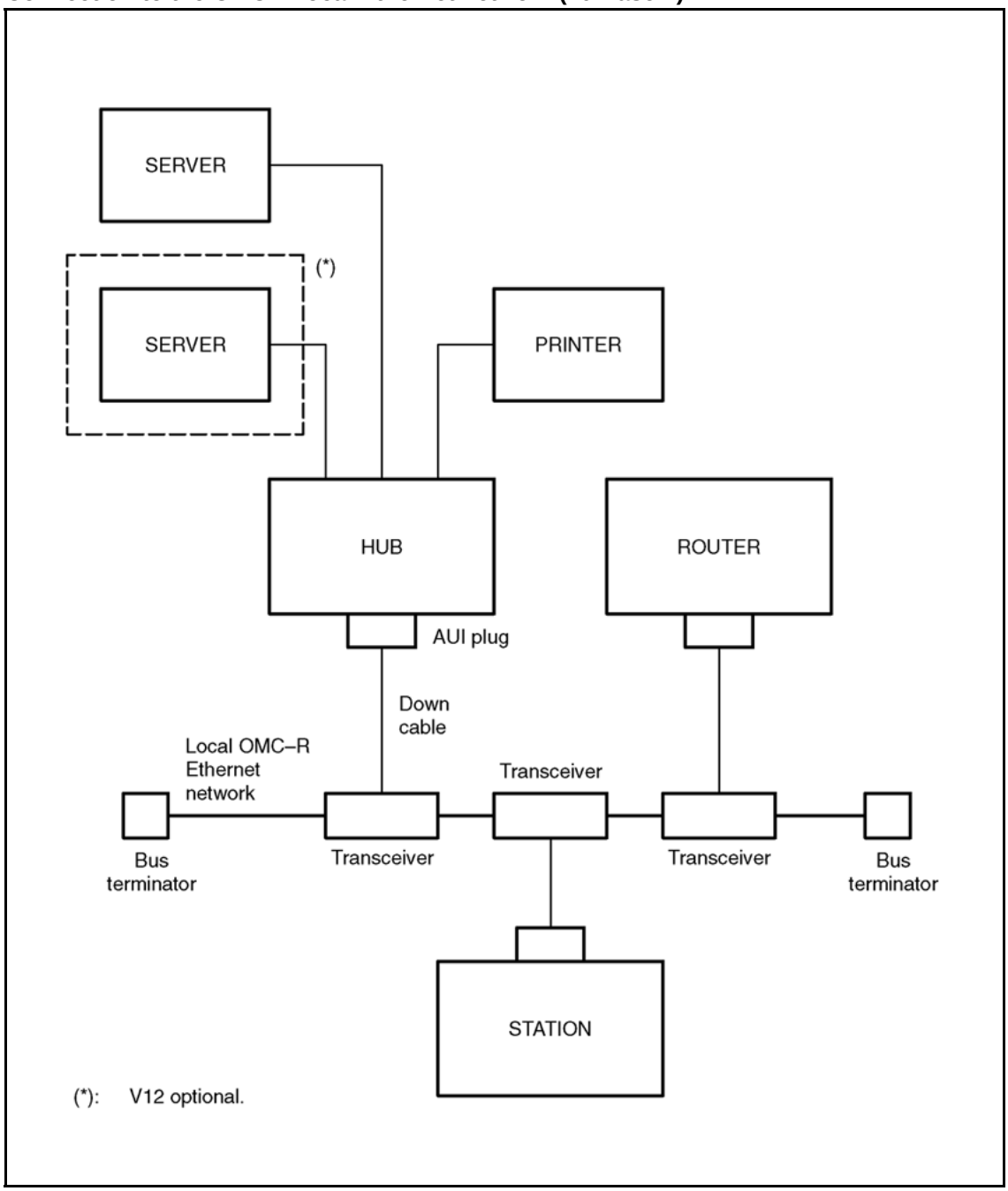


Figure 59
Connection to the OMC-R local Ethernet network (10 Base 2)



Chapter 3 OMC-R software description

3.1 Introduction

This chapter describes the software that supports the functional architecture detailed in 2.1 “OMC-R functional architecture” (page 95).

3.2 “OMC-R software structure” (page 177) lists the software packages contained in the new release in terms of the functions defined in 2.1 “OMC-R functional architecture” (page 95)

3.3 “SDO software structure” (page 190) lists the software packages contained in the new release for the SDO.

3.4 “Software distribution” (page 190) describes the software packages installed on OMC-R hardware: server(s), workstations.

3.5 “Disk organization” (page 193) describes the server and workstation disk organization.

3.6 “Static configuration” (page 203) describes the static configuration. Generic system parameters can be modified upon operator request to satisfy specific operating requirements.

3.7 “Document references” (page 209) describes the document references.

3.8 “OMC-R software parts list” (page 209) describes the software parts list.

3.2 OMC-R software structure

This paragraph describes the relationship between the functional architecture (2.1 “OMC-R functional architecture” (page 95)) and the technical definition document supplied when OMC-R software is upgraded.

Please refer to the technical definition document to obtain the current versions of the system and application software packages for the new OMC-R release.

3.2.1 System software

3.2.1.1 Server

The system software installed on the OMC-R server is as follows:

- a Sun Solaris Operating System (a UNIX operating system)
- Sun Fire V880 and V890 contain MDM R16.1 installed
- HSI Sun Link HSI 2.0: communication module driver
- Sun Link: communication software integrating X.25, OSI, FTAM and CMIP protocol management
- Sybase SQL Server and Sybase Open client Version 15.0 for all servers
- PrestoServe Version 2.4
- ATOS-Origin toolkit agent (executable)
- Sun Print printer management Software (SPE)
- Motif 2.1 is used for Solaris 9
- Acrobat Reader 3 V03.00
- ILOG Views V05.00

The following table summarizes the OEM software matrix for the Sun Fire V890 and Sun Fire V880

	Sun Fire V890	**Sun Fire V880**
Solaris	Solaris 9	Solaris 9
X25	9.2	9.2
OSI	9.0	9.0
FTAM	9	9
CMIP	9	9
Sybase	15.0.1	15.0.1

3.2.1.2 Workstations

The system software installed on OMC-R workstations is as follows:

- Sun Solaris Operating System 10 (UNIX operating system integrating Ethernet and window management)
- Acrobat Reader 7 for documentation
- ILOG Views for the Man Machine Interface
- CDE window manager for Solaris 8

If the workstation is an X terminal, the software installed is:

- CDE on the Sun Blade 1500 and Sun Blade 150
- MWM on the SPARC 5
- HP Envizex II (V13)
- The above software enables the X terminal to connect to the X server.

3.2.1.3 Terminal server

The system software installed on the terminal server is Xyplex. User configuration customizes the terminal server operations.

3.2.2 Application software

3.2.2.1 Introduction

The software that supports the functions described in the paragraph on the functional architecture (2.1 “OMC-R functional architecture” (page 95)) is broken down into seven software functions.

These functions are as follows:

- Configuration Management (CM): BSS object configuration and OMN access management function
- Performance Management (PM): observation management function
- Fault Management (FM): failure and malfunction management function
- Man-Machine Interface (MMI): MMI achieves man-machine interface layer on OMC-R workstations. It also handles OMC-R access management functions
- Communication Management (COM): communication management function between the MD-R and manager, and the MD-R and BSS
- Common Functions (CF): set of software packages shared by several user functions supporting OMC-R administration and Basic Software Functions (BSF)

This paragraph describes the release following:

- the software deliverables, classed by software function in the same order as the technical definition document. The release may contain different kinds of software components:
  - on-line application executables
  - off-line Tools
- the list of static configuration files (described in 3.6 “Static configuration” (page 203))
- the OMC-R acceptance test environment and tools for the technical level in question

3.2.2.2 Configuration Management (CM)

CM contains the following software components:

- Processing network configuration commands

  executables: *cm_autocmdV12.x*
  cm_*autocmdV15.x*
  CmCmdMgt.x

- MD-R command switch

  executable: *cm_aigui.x*

- MIB (BDA) Building

  executables: *cm_build2GV12.x*
  cm_build2GV15.x
  cm_build3G.x

- MIB (BDA) Auditing

  executables: *cm_audit2GV12.x*
  cm_audit2GV15.x
  cm_audit3G.x

- BDE dump

  executable: *cm_dumpbde.x*

- Software version manager

  executables: *cm_gesver.x*
  cm_mdversion.x
  omccm_gesver.x

  shell script: *cm_version.sh*

- Sybase trunc log file

  shell script: *trunclog.sh*

- Short message service manager

  executables: *cm_smscb.x*
  omccm_smscb.x

- BSC management

  executable: *cm_gesse.x*

- BSS Time management

  executable: *cm_clock.x*

- BSC Reconfiguration

  executable: *omccm_ut.x*

- BSC restoral

  executable: *cm_updateMP.x*
  cm_updateMP_E3.x

- Lapd link

  shell script: *cm_max_lapdL.sh*

- Network reconfiguration tools

  shell scripts: *CmUtModVal.sh*
  CmUtSubVal.sh
  cmUt.sh
  omccm_exist.sh

- OMC configuration tool

  shell scripts: *cm_configure.sh*
  cm_update.sh
  cm_simu_DownLoad.sh

- OMC upgrade

  executable: *cm_update_bd.x*

- Frequency plan change

  executable: *cm_freq_plan_change.x*

  shell scripts: *cm_freq_plan_BCHHConf.sh*
  cm_freq_plan_cleanup.sh
  cm_freq_plan_roolback.sh
  cm_checkhandovercell.sh
  cm_checkreselectioncell.sh
  cm_delmdscanners.sh
  cm_toolsNur.sh

- User tool

  shell script: *cm_ch_add_user.sh*

- Macro management

  executable: *com_macroCmd.x*

The operating commands supported by CM are listed in Paragraph 3.6 “Static configuration” (page 203) (static configuration, command class definition). The commands are detailed in the NTPs < 07 >, < 128 >, < 129 > and < 130 >.

3.2.2.3 Performance Management - PM -

PM contains the following software components:

- General counter collection and storage mechanisms

  executables: *pm_gm.x (MD-R)*
  pm_manager.x (manager)

- Manager and MD-R self observations

executables: *pm_self_obs.x*
pm_pilot_md.x
pm_pilot_mgr.x

- Observation report management

  executables: *pm_rpt_obs.x*
  pm_cpu_obs.x

- OMC configuration

  shell script: *pm_configure.sh*

- Calltrace Management

  executables: *pm_cpu_trace.x*
  pm_rpt_trace.x

- Information Counter Management

  executable: *pm_cntr_info.x*

- Tool

  executable: *efd_tool.x*

- Internal tool management

  executable: *omc_invoker.x*

- Observation editors

  executables: *cntrListEditor.sh*
  cntrSynthEditor.sh
  formsEditor.sh
  chkConsEditor.sh

- GPRS (V12):

  executable: *pm_mdp.x*

3.2.2.4 Fault Management - FM - Deliverables

The FM function contains the following software components:

- Alarm and alarm notification management

  executables: *fm_faute.x (MD-R)*
  fm_mgrNotif.x

- Network window management

  executable: *fm_mgrSAM.x*

- OMC configuration

  shell script: *fm_configure.sh*

- Management of the notifications and the historic alarms

  executable: *fm_NotifAlarmLog.x*

- Management of the fault statistics

shell script: *fm_fault_stat.sh*

- Display of notifications

  shell script: *displayNotif.sh*

- Mediation for PCU-OAM and GPRS

  executable: *fm_nms.x*

Configuration The `fm_faute.x` task uses operational configuration files. These files are created and updated for the configuration tool from the static configuration files (alarm criteria, alarm loop configuration).

3.2.2.5 Man Machine Interface - MMI -

Deliverables MMI contains the following software components:

- X terminal management

  executable: *MmiAdmTermX.x*

  shell script: *MmiRumGraphic.sh*

- Start display on X terminal

  executables: *MmiSendRunGraphic.x*

- Command file administration

  executable: *MmiCmdFile.x*

- Command execution

  executables: *MmiExecuteOneCommand.x*
  MmiLineInput.x

- Message display

  executable: *MmiDisplayMessage.x*

- Window management

  executable: *MmiGraphic.x*

- MMI kernel (command reception)

  executable: *MmiKernel.x*

- Inter-user messaging management

  executable: *MmiMailSrv.x*

- Security management

  executable: *Sm.x*

- Calendar management

  executable: *MmiScheduler.x*

- Session system log management

  executable: *MmiSystLog.x*

- OMC configuration

  shell script: *mmi_configure.sh*
- Language used on the interface

  executable: *MmiTalk.x*
- Report

  executable: *MmiReportSrv.x*
- EFT management on CD-ROM

  executable: *MmiCdEftServer.x*
- JavaHelp viewer

  shell script: MmiHelpLauncher.sh

  application: mmi_helpViewer.jar

Configuration MMI requires 4 configuration elements, described in this paragraph:

- Command class definition
- Observation report configuration
- Parameters related to the password validity duration
- Language used on the interface

3.2.2.6 Communication Management - COM -

COM contains the following software components:

- Communication service with the managed systems

  executable: *com_scse.x*
- Log manager

  executable: *com_gestlog.x*
- File transfer service

  executable: *com_fts.x*
- Q3 manager of commands from the manager

  executable: *com_manage.x*
  com_xcmd.x

  Q3 Agent: *com_osinmx.x*
- MD-R Startup/shutdown

  executable: *com_adm_nma.x*

  shell script: *com_adm_nma.sh*
- EFD restoral at startup

shell script: *com_restore_efd.sh*

- MD tree object management

  executable: *com_ommd.x*

- Network tree object management

  executable: *com_omnet.x*

- Event report securing server

  executable: *com_ssn.x*

- OMC configuration

  shell script: *com_configure.sh*

- Notification dispatching

  executable: *com_notdsp.x*

- Command for efd notification

  executable: *com_xevt.x*

3.2.2.7 Common Functions - CF -

CF contains the following software components:

- MD-R archiving

  executable: *cf_save_md.x*

- Manager archiving

  executable: *cf_save_mgr.x*

- Tool archiving

  executable: *cf_save_tool.x*

- PCU-OAM manager archiving

  executable: *cf_BackupPCUOAM_mgr.x*

  shell script: *cf_BackupPCUOAM_sh*

- Automatic file purge

  executable: *cf_ficpurge.x*

- System log and UNIX purge

  executable: *cf_cronlog.x*

- Log search

  shell script: *cf_search_logfile.sh*

- Date and time management

  of the server

  executable: *cf_timer_srv.x*

  of MD-R,

executable: *cf_dt_md.x*

of manager and stations

executable: *cf_dt_mgr.x*

- Machine reboot

  executables: *cf_reboot.x*
  cf_boot_soft.x

- OMC-R initialization, restart

  executables: *cf_init.x*
  cf_supd.x

  shell scripts: *cf_set_rights.sh*
  cf_start.sh
  cf_start_soft.sh
  cf_start_syb.sh
  cf_start_windows.sh
  cf_startup_check.sh

- OMC-R shutdown

  shell scripts: *cf_kill_appli.sh*
  cf_stop.sh
  cf_stop_soft.sh
  cf_stop_syb.sh
  cf_relance_appli. sh

- Tree structure control

  executable: *cf_access.x*

- System defense and supervision

  executable: *cf_def.x*

- Shell localization

  executable: *cf_loc_shell.x*

  shell script: *cf_libsh.sh*

- Machine state testing

  executable: *cf_ms.x*

  shell script: *cf_test_appli.sh*

- Disk mirror management (creation, loss)

  shell scripts: *cf_wait_unmirror.sh*
  cf_remirror.sh

- Mirroring tool

  shell scripts: *cf_majsecours.sh*
  cf_update_md.sh
  cf_dumpload_syb.sh
  cf_update_mgr.sh
  cf_override_passive.sh

- Suspect Sybase database management

  shell script: *cf_test_syb.sh*

- Administration tool

  executables: *cf_adm_cmd.x*

- Notification

  executable: *cf_backret_notif.x*

- Common information server

  executables: *cf_cis_dbmmi.x*
  cf_cis_dbmgt.x

- OMC protection

  executable: *cf_init_pw.x*

- Partition mounting

  executable: *cf_mount.x*

- Configuration parameter reading

  executable: *cf_param.x*

- Message sending to the defense

  executable: *cf_sndmsgdef.x*

- Sybase check

  shell script: *cf_checkdb_syb.sh*

- Sybase repair

  shell script: *cf_fmrepair_syb.sh*

- Check of Sybase configuration files and database files

  executables: *cf_setInterfSyb.x*

- Sybase startup

  executable: *cf_strtSyb.x*

  shell script: *cf_start_syb.sh*

- Message sending to stations

  shell script: *cf_wall_ws.sh*

- OMC configuration

  shell script: *cf_configure.sh*
  omc_configure.sh

- Compare bases CLBD and BDE

  executable: *cf_compdb.x*

- Maps on the station

shell scripts: *cf_map_broadcast.sh*
cf_checksum.sh

- Performances

  executables: *cf_monitor.x*
  cf_monitor_srv.x
  cf_observation.x
  cf_observation_srv.x

- Command by the manager

  executable: *cf_nos_mgr.x*

- Off-line Sybase configuration

  executable: *cf_DimSyb.x*

- Archivage of the startup failure

  executable: *cf_FatalError.x*

- Inter-server Messaging

  executable: *oam_serv.x*

- Disk array device repair:

  shell scripts: *rebuildmirror.sh*

- Router configuration tool

  executable: *confrout.x*

- Process binding tool

  executable: cf_cpubinding.x

  configuration file: cf_cpubinding.cfg

3.2.2.8 Environment and OMC-R acceptance tools

Password validity configuration The configuration file is called:

- **`/etc/passwd`**

Environment configuration The configuration files define the acceptance test environment and tools in a nominal configuration.

The following files define the acceptance test environment in /home/omc:

- .cshrc
- .cshrc_omc
- .login
- .Xdefaults
- CDE

- .history
- .rhosts

For stations managing X terminals:

- xsession
- mwm.TRMX
- .mwmrc.TRMX
- .dt/dtwmrc (from V14 for an X terminal server)

3.2.3 CPU binding service

The CPU binding service consists of two files, a configuration file and a binary file. The tool is launched through the root crontab every 5 minutes:

- The first one is a configuration file "/CMN/base/config/cf_cpubinding.cfg " which describes all the programs and the processors on which they must be executed.
- The second one is a binary file "/CMN/base/exe/cf_cpubinding.x". This program is launched by the root's crontab every five minutes to perform the supervision of tasks, assignation of tasks to the CPU. It generates a diagnostic file "/CMN/base/diagnostic/cf_cpubinding/cf_cpubinding.log".

In the log file, the program reports the execution duration, the errors met and the number of processes that were bound.

All the logs must be written in the same log file until it reaches a maximum size. The policy is to have no more than two versions of the log file, a current and a previous one.

3.2.3.1 Configuration file

The process described in the configuration file, bound to one processor, is executed only by that processor. The other process not described in this file, is managed by the operating system.

The integrated OMC-R server hardware can be either a Sun Fire V890 or a Sun Fire V880.

The CPU binding is launched by the root user crontab.

The configuration file is delivered in the OMC-R software and no modifications are possible.

3.3 SDO software structure

The paragraph describes the relationship between the functional architecture and the technical definition document.

3.3.1 Application software

The SDO disk contains the following tree structure:

- /SDO
- /SDO/base: static files, shells, executables
  - exe: executable files
  - install: install files
  - shell: shell script files

The software contains the following components:

executables:
sdo_graphic.x
sdo_lineInput.x
sdo_mailer.x
sdo_kernel.x

shell scripts:
sdo_set_acl.sh
sdo_update_cfg.sh
sdo_version.sh
sdo_compress.sh

3.4 Software distribution

3.4.1 Location of software functions

This paragraph indicates the location of each software package installed on OMC-R equipment for each software function.

3.4.2 Configuration Management (CM)

SOFTWARE COMPONENT	MANAGER	MD-R	CMN(*)	STATIONS
Switcher		X		
Audit MIB (BDA)		X		
Audit BDE			X	
Autocmd		X		
Build MIB (BDA)		X		
Frequency Plan change		X		
BSC time management		X		
BSCs management		X		
*** CMN is the directory containing the common parts to the manager and the MD-R**				

SOFTWARE COMPONENT	MANAGER	MD-R	CMN(*)	STATIONS
Software version management	X	X		
Short messages	X	X		
Manager command processing	X			
Dump BDE		X		
*** CMN is the directory containing the common parts to the manager and the MD-R**				

3.4.3 Performance Management (PM)

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
General mechanisms	X	X		
Self-observation	X	X	X	X
Observation threshold configuration		X		
Observation report	X			
Synthetic counters	X			
Call trace and call path trace	X	X		
Cell tiering statistics		X		
Call drop analysis		X		
Radio distributions		X		
Interference matrix data		X		

3.4.4 Fault Management (FM)

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
Alarm/notification management	X	X		
Network state management	X	X		

3.4.5 Man Machine Interface (MMI)

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
X terminal management				X
Command file management	X			
Message display	X			
Window management				X
Kernel	X			X
On-line commands				X
Inter-user mail	X			
Job Scheduler	X			

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
System session logs	X			
Security management	X			

3.4.6 Communication Management (COM)

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
SCSE		X		
Log manager		X		
Agent		X		
File transfer management			X	X
Q3 management on manager	X			
Command management on Q3	X			
Event management on Q3	X			
Agent start-up/shutdown		X		
EFD restoral at start-up		X		
MD object tree management		X		
Network object tree management		X		
SSN		X		

3.4.7 Common Functions (CF)

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
MD-R archiving		X		
Manager archiving	X			
Automatic file purge			X	X
System log purge			X	
Date/time management			X	X
OMC-R reboot			X	X
OMC-R initialization/start-up			X	X
OMC-R shutdown			X	X
System defense and supervision			X	X
Timeout delay server			X	X
Shell localization			X	X
Machine state tests			X	X
Suspect database test		X		
Shared information server	X			

SOFTWARE COMPONENT	MANAGER	MD-R	CMN	STATIONS
Backup/Restore			X	
Mail server (messages)			X	X

3.5 Disk organization

The organization of OMC-R hard disks is supported by the system network architecture. Each machine can transparently access the storage volumes distributed over the local area network.

3.5.1 Server disks

Each server's disk contains the following directories:

- /OMC: directory that contains specific manager parts
- /MD: directory that contains specific MD-R parts
- /CMN: directory that contains common manager and MD-R parts

/OMC directory

The tree structure is the following:

- /OMC
  - /OMC/base: static files, shells, executables
    - config: manager configuration files
    - debug: debug tools
    - diagnostic: diagnostic files
    - exe: executables,
    - install: OMC version installation files
    - lib: directory used for dynamical library
    - maps: map files
    - omcversion.cfg: OMC-R version file
    - shell: manager shell script directory
    - tmp: temporary manager files
    - tools: manager tools
  - /OMC/data: dynamic data updated on the backup server
    - calendar: directory of the calendar subfunction
    - cis: log files of the Q3 MD/manager audit
    - cm: Configuration Management function files
    - cmdFile: command files

• com:	COmmunication Management function files
• custo_config:	custom files on site
• defense:	defense log files
• eft:	transferable file set (EFT) directory
• fm:	alarm criteria and notification files
• ftam:	File Transfer subfunction directory
• mail:	inter-user mail
• perf:	Performance Management function files
• profiles:	user and station profiles
• purge:	log files of the purge subfunction
• report Template:	record files
• sessionLog:	session logs
• sybase:	directory containing the Sybase omc_db database
• time:	file
• trace_function:	trace subfunction directory

- /OMC/calendar — directory of the calendar subfunction
- /OMC/config — directory of configuration
- /OMC/cmdFile — directory of command
- /OMC/debug — directory of debug
- /OMC/diagnostic — directory of diagnostic
- /OMC/eft — directory of transferable file set (EFT)
- /OMC/exe — executable
- /OMC/ftam — directory of file transfer subfunction (FTAM)
- /OMC/install — directory used for install
- /OMC/lib — directory used for dynamical library
- /OMC/lost+found — directory of retrieved data in case of scratch
- /OMC/mail — directory of messages
- /OMC/maps: — map files
- /OMC/obs: — observation message file
- /OMC/profiles — directory of profiles
- /OMC/sessionLog — directory of session logs
- /OMC/shell — directory of shells script

- /OMC/tmp temporary directory
- /OMC/tools directory of tools
- /OMC/trace_function directory of trace subfunction

/MD directory

The tree structure is the following:

- /MD
- /MD/base: static files, shells, executables
  - config: MD-R configuration files
  - debug: debug directory
  - diagnostic: diagnostic files
  - exe: executables
  - install: MD-R version installation files
  - lib: directory used for dynamical library
  - mdversion.cfg: MD-R version file
  - shell: shell script directory
  - tmp: MD-R temporary files
  - tools: MD-R files
- /MD/data: dynamic data updated on the backup server
  - agent: file management (MIT)
  - calldrop: binary call drop files
  - CIBgt interference matrix files
  - cm: Configuration Management function files
  - com: COmmunication Management function files
  - config: manager configuration files
  - ctsc: cell tiering statistics
  - custo_config: custom files on site
  - defense: defense log files
  - distrib: binary radio distributions files
  - eft: transferable file set (EFT) directory
  - fm: correlated notifications and mdwarning files
  - log: log manager files
  - lost+found: data retrieved in case of scratch
  - perf: Performance Management function files

  - purge: log files of the purge subfunction
  - scse: files of the operated systems management function
  - sybase: directory containing the Sybase cm_db database
  - time: time management function files
- /MD/config directory of configuration
- /MD/debug directory of debug
- /MD/diagnostic directory of diagnostic
- /MD/eft directory of transferable file set (EFT)
- /MD/exe executable
- /MD/install directory used for install
- /MD/lib directory used for dynamical library
- /MD/lost+found directory of retrieved data in case of scratch
- /MD/notif: notification logs
- /MD/obs: observation message logs
- /MD/restored: used for the restoral of log objects
- /MD/scse files of the operated systems management function
- /MD/shell directory of shells script
- /MD/ssn: secured notifications
- /MD/tmp temporary directory
- /MD/tools directory of tools
- /MD/trace_function: trace subfunction directory

/CMN directory

The tree structure is:

- /CMN
- /CMN/base: static files, shells, executables
  - adm: marker files of the administration function
  - boot: executables for the UNIX machine boot
  - config: configuration files common to the manager and the MD-R
  - debug: debugger directory
  - diagnostic: diagnostic files
  - exe: executables
  - gdmo: Q3 interface GDMO files
  - install: files used for the MD-R and the manager installation

- lib: directory used for dynamical library
- lost+found: data retrieved in case of scratch
- save_rest save and restoral files
- shell: shell script directory
- tmp: temporary files
- tools: common tools

- /CMN/data: dynamic data updated on the backup server
  - config: manager configuration files
  - custo_config: custom files on site
  - perf performance directory
  - sybase: directory containing the Sybase master database
  - supervision: supervision directory
- /CMN/config directory of configuration
- /CMN/debug directory of debug
- /CMN/diagnostic directory of diagnostic
- /CMN/exe executable
- /CMN/install directory used for install
- /CMN/lib directory used for dynamical library
- /CMN/lost+found directory of retrieved data in case of scratch
- /CMN/shell directory of shells script
- /CMN/tmp temporary directory
- /CMN/tools directory of tools

3.5.1.1 Constraints: OMC-R servers

These constraints apply to Sun Fire V890 and Sun Fire V880.

Dimensioning constraints The following table presents the Base statement (STO):

Capacity	BSCs	Cells (Q3 BTS object)
High (HC)	30	2400
Very High (VHC)	40	3200 (3000 for Sun Fire V890)
*** minimum T2 for BSS Fast Statistic Observation is 30 minutes**		

The following table presents the STO constraints:

	Disk Array
	T3/HDI
MGR data	8 days (7 days + current)
MD data	4 days (3 days + current)
MGR restored data	2 days
MD restored data	1 day

Technical constraints The following table presents the technical constraints:

Server	Internal disks	Disk capacity
Sun Fire V890*	12	146 GB
Sun Fire V880	6 (only 4 are used)	73 GB

- internal disk server:
  - — the available space on internal disks is not a constraint, thus "/var" is sized for "VMCORE" tool usage. The demanded size is at least the one of the physical memory (256/1024 Mbytes).
  - — a slice of 39 Mbytes is required for SVM meta-database

3.5.1.2 OMC-R performance constraints

A certain number of disk-related measures can be taken to ensure that the OMC-R works at optimal speed.

HDI configuration With this type of configuration, the OMC-R data is located on 4 internal disks (1 disk is reserved and 1 is used for the system).

The constraints are as follows:

- /MD/scse, /MD/obs, /MD/ssn, /MD are on separate file systems
- /OMC, /MD, /PCUOAM and /SDO are on separate file systems and disks
- the 2 SYBASE raw_devices (syb_data and syb_log) are on 2 separate disks

T3 disk array configuration In view of its specific configuration (a set of disks with RAID5 hardware), there is only one "virtual" disk from a system point of view.

The only constraints are as follows:

- for an integrated server configuration, /OMC, /PCUOAM and /SDO are on separate file systems on the T3
- the 2 SYBASE raw_devices (syb_data and syb_log) are on 2 separate slices on the T3

3.5.1.3 Server disk partitioning

The following sections present partitioning information for the following hardware:

- Sun Fire V890 server disk
- Sun Fire V880 server disk

Sun Fire V890 HDI server disk partitioning The following table presents disk partitioning for the high-capacity Sun Fire V890 OMC-R servers (12x146 GB):

	Slice	SVM Meta Device	Mount Directory	Size
t0/t2	0	d5 (d6+d7)	/	1 GB
	1	d10 (d11 + d12)	swap	32 GB
	3	d15 (d16 + d17)	/usr	2 GB
	4	d20 (d21 + d22)	/opt	2 GB
	5	d25 (d26 + d27)	/var	16 GB
	6	d30 (d31 + d32)	/home	Free
	7		SVM	39.75 MB
t1/t3	0	d35 (d36 + d37)	/OMC	Free
	1	d40 (d41 + d42)	syb_data	36 GB
	7		SVM	39.75 MB
t4/t5	0	d50 (d51+ d52)	/MD/scse	99.375 MB
	1	d55 (d56+ d57)	/SDO	139850.4375 MB
	7		SVM	39.75 MB
t8/t9	0	d65 (d66+ d67)	syb_data	32773,8750 MB
	1	d70 (d71+ d72)	/PCUOAM	40495.3125 MB
	3	d75 (d76+ d77)	/MISCELLANEOUS	66680.6250 MB

	Slice	SVM Meta Device	Mount Directory	Size
	7		SVM	39.75 MB
t10/t11	0	d85 (d86+ d87)	/MD/ssn	9947.4375 MB
	1	d90 (d91+ d92)	/OMC	130002.3750 MB
	7		SVM	39.75 MB
t12/t13	0	d100 (d101+ d102)	syb_log	16386.9375 MB
	1	d105 (d106+ d107)	/MD/obs	123562.8750 MB
	7		SVM	39.75 GB

Metadevice numbers are defined in “/usr/local/maint/cfg/SUNW,Sun-Fire-V890.cfg”

Sun Fire V880 server disk partitioning The following table presents disk partitioning for the high-capacity Sun Fire V880 OMC-R servers (2x73 GB):

	Slice	SVM metadevice	Mount Directory	Size
t0/t2	0	d5 (d6+ d7)	/	1 GB
	1	d10 (d11+ d12)	swap	32 GB
	2	d15 (d16+ d17)	/usr	2 GB
	3	d15 (d16+ d17)	/opt	2 GB
	4	d25 (d26+ d27)	/var	16 GB
	5	d30 (d31+ d32)	/home	Free (*)
	6		SVM	39.75 MB
	7			
t1/t3	0	d35 (d36+ d37)	/OMC/base	Free (*)
	1	d40 (d41+ d42)	/MISCELLANEOUS	36 GB
	2		SVM	39.75 MB
/MISCELLANEOUS: reserved for future use (*) space left on the entire disk minus the other partitions				

T3 disk array device partitioning The following table presents disk partitioning for the high capacity 460 GB Sun Fire V880 OMC-R servers (7 x 73.10^9B):

	Slice	SVM meta-device	Mount Directory	Size
c1t1/c2t1	0	d5 (d6+ d7)	/OMCdata	276626 MB
	1	d10 (d11+ d12)	/SDO/data (***)	119994 MB
	3	d15 (d16+ d17)	/PCUOAM (***)	42798 MB
	4	d20 (d21+ d22)	syb_data	32774 MB
	5	d25 (d26+ d27)	syb_log	16380 MB
	7		SVM	42 MB
(***) ONLY FOR T3 USED WITH Sun Fire V880. UNUSED WITH T3 AND Sun Enterprise 45XX.				

3.5.2 Workstation disk partitioning

The disks on each workstation contain the following directories:

- /OMC: manager directory
- /CMN: common functions directory
- /SDO: add this directory which supports SDO (option)
- /PCU OAM: add this directory which supports PCU-OAM (V12)

The /OMC directory on workstations is organized in exactly the same way as the server. Sub-directory contents vary according to the software distribution.

General constraints

- /var must be able to store crash system files: set to MEM size + 64MB min.
- /home must be able to stored 7 zap files: set to 7 x 10MB (average)
- /OMC must be able to store Mmi core file: set to 512MB min.
  - /OMC nominal usage : 200 MB
  - /OMC core usage : 130 MB
- A symbolic link /CMN must be created to /OMC/CMN.

Technical constraints

OMC-R workstations:

- the Sun Blade 1500 is fitted with up to two 120-GB internal disks.
- the Sun Blade 150 is fitted with up to two 40-GB internal disks.
- the Ultra 5 is fitted with 4.3 or 8.4-GB internal disks 20 GB.

Sun Ultra 45

This section presents disk's partitioning of the OMC-R stations based on SUN U45 (250 GB internal):

	Partition	Mount directory	Size
c0t0t0s	0	/	6144 MB
	1	swap	4096 MB
	3	/var	4096 MB
	4	/OMC	2048 MB
	5	/OMC/maps	2048 MB
	6	/home	Free (219644 MB)

3.5.2.1 Sun Blade 1500

The following table presents disk partitioning for the Sun Blade 1500 OMC-R workstation (120-GB internal disk):

Disk	Partition name	Size	"Device"
int 1	/	3 GB	c0t0d0s0
	swap	2 GB	c0t0d0s1
	/var	2 GB	c0t0d0s3
	/OMC	2 GB	c0t0d0s4
	/OMC/maps	2 GB	c0t0d0s5
	/home	Free (69 GB or more)	c0t0d0s6
	(reserved for future use)	39 GB	c0t0d0s7
(*) space left on the entire disk minus the other partitions			

3.5.2.2 Sun Blade 150

The following table presents disk partitioning for the Sun Blade 150 OMC-R workstation (40 and 80-GB internal disk):

Disk	Partition name	Size	"Device"
	/	3 GB	c0t0d0s0
int 1	swap	2 GB	c0t0d0s1
	/var	1 GB	c0t0d0s3
	/OMC	1 GB	c0t0d0s4
	/OMC/maps	512 MB	c0t0d0s5
(*) space left on the entire disk minus the other partitions - used for 14-GB and greater internal disks			

Disk	Partition name	Size	"Device"
(*)	/home	35421 or more	c0t0d0s6
	not used (reserved for SVM)	39 MG	c0t0d0s7
(*) space left on the entire disk minus the other partitions - used for 14-GB and greater internal disks			

3.6 Static configuration

This paragraph contains a description of the static configuration. The information it contains enables the user to assess their own configuration needs, and address any appropriate change requests to the manufacturer.

3.6.1 Definition of static configuration parameters

Static configuration parameters describe the OMC-R configuration. These parameters can be modified off-line or on-line for DNS configuration. The new values are used when the OMC-R starts up again.

The files are:

- omc_configure.cfg
- omc_install.cfg
- omc_services.cfg

The values of static configuration parameters are reset with procedures and the use of special tools that are not supplied. The manufacturer updates these parameters according to network operator requests.

This description does not cover peripheral, OMC-R equipment configuration parameters (modems, printers, terminal server).

The static configuration applies to all OMC-R functions.

3.6.2 Man Machine Interface (MMI)

3.6.2.1 Command classes

MMC commands are divided into command classes.

The **`/OMC/data/custo_config/MmiCommandClasses.cfg`** file contains the list of commands in each class.

Defining the commands that you can access consists of declaring a list of the following command classes in the profile user:

- Class 1: all MMC commands
- Class 2: UNIX access
- Class 3: fault management

- Class 4: observation management
- Class 5: security management
- Class 6: password changes
- Class 7: configuration data displays
- Class 8: BDE/MIB (BDA) database management
- Class 9: configuration changes
- Class 10: setting the administrative state of objects
- Class 11: OMC-R administration
- Class 12: job scheduler and command file management
- Class 14: FTAM and EFT management
- Class 15: SMS-CB (Short Message Service/Cell Broadcast)
- Class 16: mail user messages

3.6.2.2 Command classes configuration

The configuration file of the command classes calls:

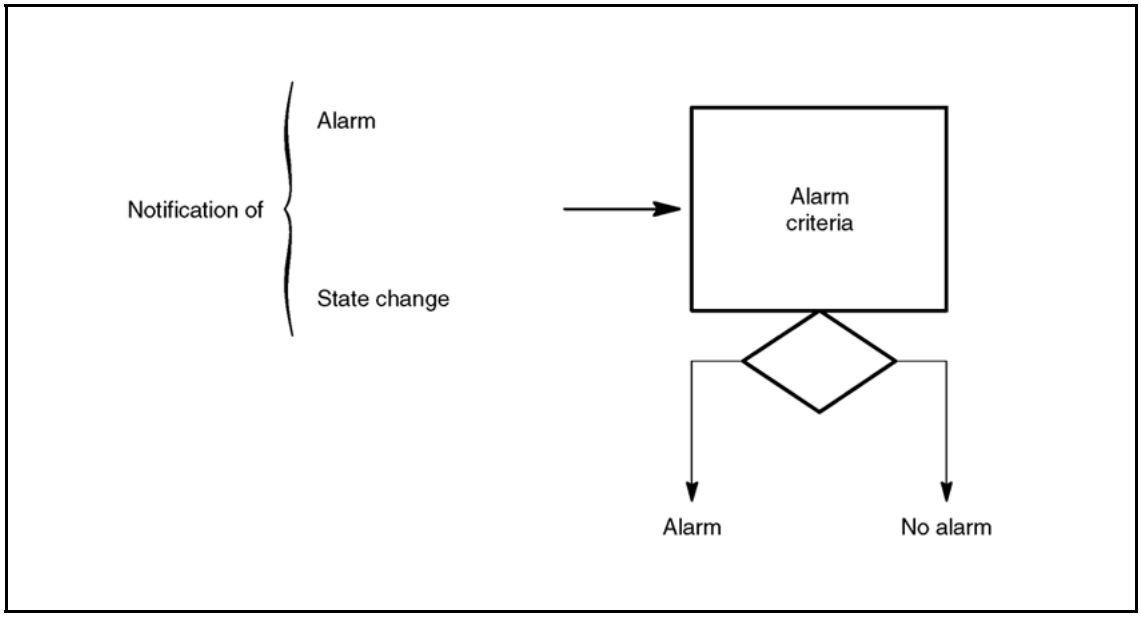
- **`MmiCommandClasses.cfg`**

3.6.3 Fault Management (FM)

3.6.3.1 Alarm configuration files

The configuration of alarm-handling criteria associates user alarms with faults issued by the BSS. Alarm criteria are used to determine whether the notifications received by the alarm management function generate or do not generate alarms (see the following: Figure 60 "Alarm generator Mechanism" (page 205)).

Figure 60
Alarm generator Mechanism



Alarms are generated by defining three configurations of alarm criteria (one configuration per file):

/OMC/data/fm/fmCritAlaDay.dat
/OMC/data/fm/fmCritAlaNight.dat
/OMC/data/fm/fmCritAlaPart.dat

The first file describes the daytime alarm configuration, the second describes the nighttime configuration and the third describes the special configuration.

A reference configuration file, **/OMC/base/coning/fmCritAlaRef.cfg**, is used in case the three previous files are mishandled.

The **/OMC/base/config/fmCritAlaDefault.cfg** file contains all default values (signature and alarm type default values, for example).

The reference configuration files must not be modified. After making changes, the file or files in question must be copied to the backup server to ensure data redundancy.

3.6.3.2 Switching criteria configurations

There are three possible ways to switch from one configuration to another:

- by MMC command. Ask the OMC-R application to switch to another alarm configuration
- by job scheduler. Ask the OMC-R to switch to a new configuration of alarm at a scheduled time
- application start-up. The OMC-R checks the current time and activates the appropriate configuration (for example, the day time configuration between 9 a.m. and 9 p.m.)

These configurations can be changed by the user in working session (by MMI). Each one can be activated at any time by the user, but only one can be activated at a given moment.

3.6.4 Performance Management

3.6.4.1 Static configuration files

The following files define observation report layout on the local machine.

These form files are located in the directories /OMC/base/config/locale/en/<xxVyy>, where <xxVyy> can be 3GV15, 3GV16 or 3GV17.

- DIAGnostic Observations:
  - **`form_ODIAG_adjC.cfg`** for an ODIAG adjacent cell report
  - **`form_ODIAG_bsc.cfg`** for an ODIAG BSC report
  - **`form_ODIAG_bts.cfg`** for an ODIAG BTS report
  - **`form_ODIAG_trZone.cfg`** for an ODIAG transceiver zone report
  - **`form_ODIAG_tcu.cfg`** for an ODIAG TCU report
  - **`form_ODIAG_tdma.cfg`** (only for 3GV16 and higher).
  - **`form_ODIAG_adjCU.cfg`** for an ODIAG adjacent cell UTRAN report (for 3GV17 and higher)
- Fast Statistic Observations:
  - **`form_OFS_adjC.cfg`** for an OFS adjacent cell report
  - **`form_OFS_bsc.cfg`** for an OFS BSC report
  - **`form_OFS_bts.cfg`** for an OFS BTS report
  - **`form_OFS_trZone.cfg`** for an OFS transceiver zone report
  - **`form_OFS_tcu.cfg`** for an OFS TCU report
  - **`form_OFS_tdma.cfg`** (only for 3GV16 and higher)
  - **`form_OFS_adjCU.cfg`** for an OFS adjacent cell UTRAN report (for 3GV17 and higher)

- General Statistic Observations:
  - **form_OGS_adjC.cfg** for an OGS adjacent cell report
  - **form_OGS_bsc.cfg** for an OGS BSC report
  - **form_OGS_bts.cfg** for an OGS BTS report
  - **form_OGS_trZone.cfg** for an OGS transceiver zone report
  - **form_OGS_tcu.cfg** for an OGS TCU report
  - **form_OGS_tdma.cfg** (only for 3GV16 and higher)
  - **form_OGS_adjCU.cfg** for an OGS adjacent cell UTRAN report (for 3GV17 and higher)
- Real Time Observations:
  - **form_ORT_bsc.cfg** for a BSC ORT
  - **form_ORT_bts.cfg** for a BTS ORT
  - **form_ORT_adjC.cfg** for an adjacent cell ORT
  - **form_ORT_tcu.cfg** for a TCU ORT
  - **form_ORT_trZone.cfg** for a tranceiver zone ORT
  - **form_ORT_tdma.cfg** (only for 3GV16 and higher)
  - **form_ORT_adjCU.cfg** for an ORT adjacent cell UTRAN report (for 3GV17 and higher)
- Default reports:
  - **form_def.cfg** contains the report to be displayed when the observation records for requested period contain no counters from needed location

3.6.4.2 Synthetic counters:

The configuration of the synthetic counters is defined in the server following files:

- Synthetic counters:
  - **/OMC/data/perf/bss_nmc_formulas.dat**
  - **/OMC/data/perf/pcu_nmc_formulas.dat**
  - User synthetic counters:

- — **/OMC/data/custo_config/config/bss_operator_formulas.cfg**
- — **/OMC/data/custo_config/config/pcu_operator_formulas.cfg**

3.6.5 SDO station static configuration

The SDO is configured using the following parameters:

- SDO static parameters:
  - — OMC-R identification
  - — list of counters to process
  - — list of fault numbers (CODANOs) to process
  - — definition of class-levels result file contents for observation
  - — definition of call tracing and call path tracing filters
- background processing parameters:
  - — automatic transfer period for fault and stateChange notifications
  - — activation of automatic daily observation processing
  - — activation of automatic daily call tracing processing
  - — activation of automatic daily call path tracing processing
  - — activation of automatic daily fault notification processing
  - — activation of automatic daily radio network configuration processing
  - — activation of automatic daily zone of interest processing
  - — activation of automatic daily OMC-R system session log processing
  - — activation of automatic cell tiering statistics processing
  - — activation of automatic daily radio distributions processing
  - — activation of automatic daily call drop processing
  - — activation of automatic daily interference matrix processing
- data format parameters:
  - — column separator
  - — line separator
  - — object instance separators (identification format and subfield separators)
  - — observation result file format (counter naming, validity field)
  - — activation of compression for XML data types

After a configuration parameter has been modified, a SDO restart is needed.

3.7 Document references

The system documentation includes the following:

- Contact Sun directly online at www.sun.com for information related to the following Sun products:
  - — Sunlink FTAM
  - — Sunlink CMIP
  - — Sunlink OSI
  - — Sunlink x.25
- For documentation on UNIX products such as Solaris, go to http://www.unix.org/ or http://www.sun.com/

3.8 OMC-R software parts list

3.8.1 Configuration example

The nomenclature in this paragraph applies to the example configuration comprising the following:

- 1 server
- 3 local workstations (1 X terminal)
- 2 remote workstations on one site
- 2 routers
- 1 terminal server for RACE (for PC requirements see NTP)
- 1 printer
- 1 external DAT 4 mm tape drive
- 2 alarms boxes on the servers

Contact your local sales office for reference.

3.8.2 Nomenclature example

Table 3
Nomenclature example software and hardware

Description	Quantity
Servers	
Server CD-ROM: Solaris 9	1
SunLink X25 Software 9.1	1

Table 3
Nomenclature example software and hardware (cont'd.)

Description	Quantity
SunLink OSI Software 9.1	1
SunLink FTAM Software 9	1
Solstice CMIP Software 9	1
Marben toolkit agent run-time	1
Sybase SQL Server System 15	1
Sybase Open Client System 15	1
Solstice Disk Suite	1
Motif Windows Manager	1
HSI card drivers	1
IlogViews	1
Acrobat Reader 7	1
Workstations	
WS CD-ROM: Solaris 10 (01/06)	3
IlogViews	3
Acrobat Reader 7	3
X Terminal	
Motif Software on SPARC 5	1
Terminal server	
Xyplex	1

Chapter 4 OMC-R administration presentation

4.1 Introduction

This chapter describes the administration of the OMC-R.

It describes the administration of a standard OMC-R configuration that includes:

- OMC-R server(s)
- disk array device
- workstations
- MMI graphics servers
- X Terminals

4.2 Administration of an OMC-R configuration

4.2.1 Configuration

An OMC-R configuration requires the following components:

- an OMC-R server that performs the mediation function and the manager function (single server configuration)
- one Sun redundant StorEdge T3 device offering their disks resource in order to automatically mirror the data (except for SFV 890).
- a set of workstations
- a set of RACEs (from V13)

The configuration of each component is described as following.

4.2.2 Equipment configuration

4.2.2.1 Disk array device

The OMC administration is able to manage a configuration including one 2 T3 disk array devices.

The disk array device is used to store all MD/OMC dynamic data handled by the OMC-R server.

SVM (Sun Volume Manager) is the operating system handling the disk array devices. SVM is in charge of:

- duplicating all the data disks onto mirror data disks. The MD/OMC applications have no longer to manage the redundant data.
- insuring the availability of the data when a failure is detected on a disk (MD/OMC start-up included). From then, the data access is performed on the associated mirror disk. The replacement and resynchronization of the failed component is allowed without stopping the MD/OMC applications.

4.2.2.2 Configuration with one server and two T3 disk array devices

The configuration is composed of a server and two T3 disk array devices. The disks within the disk array device are redundant, the mirroring of the data is transparently managed by the SVM system.

This configuration is shown in Figure 61 "OMC server with a disk array device" (page 214).

4.2.2.3 OMC-R workstations

The OMC-R administration manages a set of OMC-R workstations. These workstations contain the MMI application to provide an user interface.

There are four types of OMC-R workstation:

- the local OMC-R workstation, which is connected to the OMC-R server through the extended LAN
- the remote OMC-R workstation, which is connected to the OMC-R server through the extended LAN (The extended LAN consists of the local OMC-R Ethernet network and routers to provide access to the X.25 network.)
- the remote -OMC workstation, which can be connected successively to several OMC-R servers through an extended LAN

4.2.2.4 MMI graphics server

The OMC-R administration can manage a configuration consisting of a set of MMI graphic servers for X terminals. These graphic servers contain the MMI application (including the management of the X terminals) to provide a user interface from a X terminal.

An OMC-R workstation can be used as a MMI graphics server to provide a local user interface and its services to a set of X terminals.

There are three types of MMI graphics server:

- the local MMI server, connected to the OMC-R server through the Ethernet network
- the remote MMI server connected to the OMC-R server through the extended LAN
- the remote -OMC server that can be connected successively to several OMC-R servers through an extended LAN

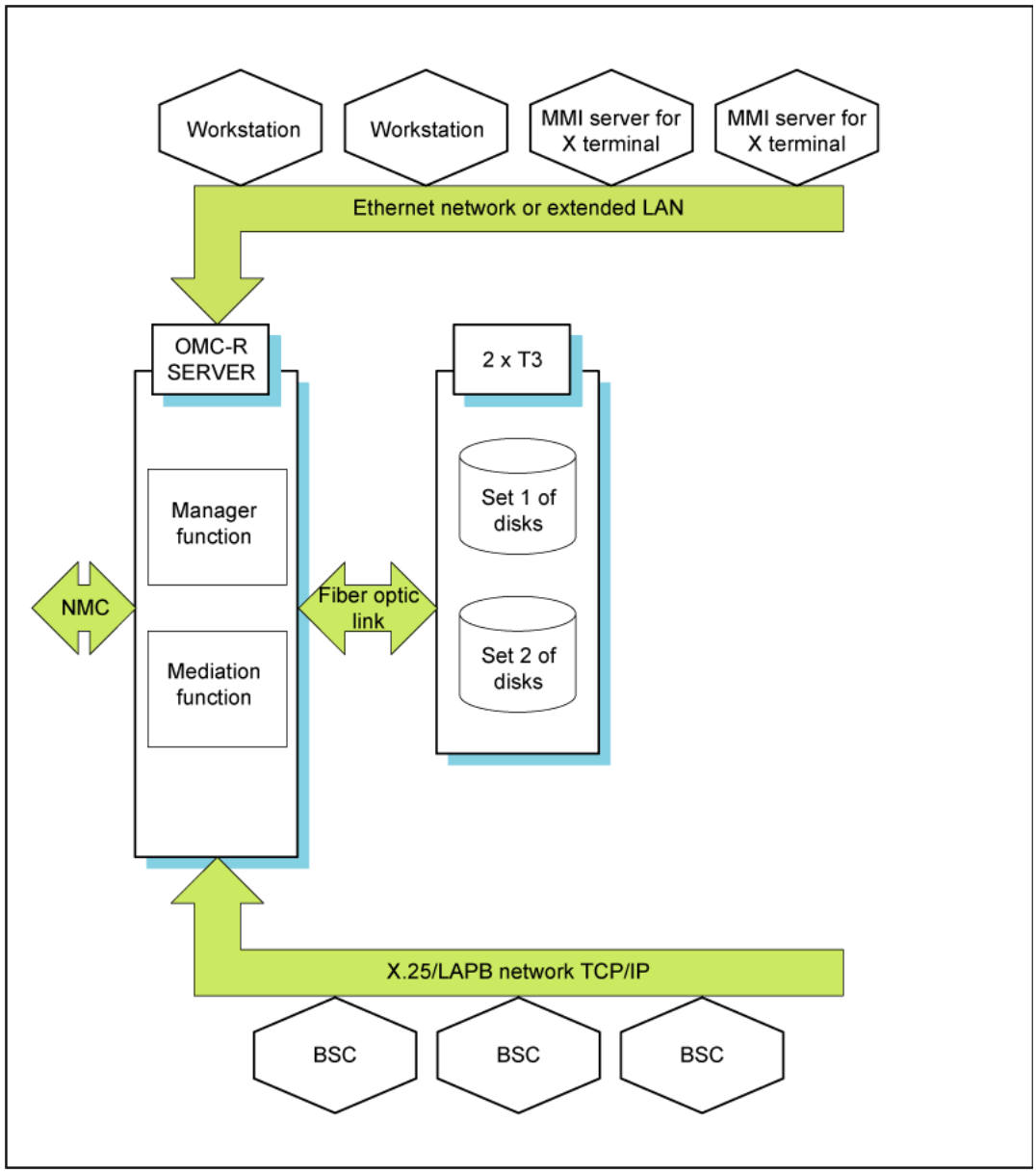
4.2.2.5 X terminals

Depending on its installation configuration, a X terminal is capable of providing an user interface at all times to one OMC-R server or to several OMC-R servers at the same time.

A X terminal is associated with one (or several) applications operating on one (or several) MMI graphics servers. The user interface appears on a X terminal by remote display. An example of an OMC-R configuration with X terminals is provided in .

An OMC-R workstation can be used as a X terminal. The workstation runs a MMI application locally, offering an user interface to one OMC-R. At the same time, a MMI graphic interface runs another application on a second OMC-R server, displayed on the workstation by remote display.

Figure 61
OMC server with a disk array device



4.3 OMC-R administration functional aspects

The "OMC-R Administration" function considers only those aspects that are associated with the operation of the OMC-R.

Its functions are essentially local and do not affect other subsystems. They include:

- starting up OMC-R applications
- shutdown of applications
- restart
- defense
- self-observation
- date and time management
- purge of operational files and data
- mirroring management
- supervision
- database integrity
- software verification (access checking)
- map broadcast
- centralized archiving/saving on disk
- OMC-R server (security specific)
- archiving/restoral
- integration of OMC-R with an outside DNS server
- collect of information for investigation purpose on the OMC-R
- Interworking with other functions
- CPU binding service
- OMC-R system patch management
- Network reconfiguration procedure

4.3.1 Starting up OMC-R applications

4.3.1.1 General rules on starting servers in mono box configuration

The OMC applications start up when one of the OMC-R servers is switched on and does not require operator involvement.

The OMC-R start-up function synchronizes the tasks on the server and workstations known to the OMC-R.

Workstations "known to the OMC-R" are the local and remote workstations defined in a disk file at system installation time.

The start-up mechanism used on the server and workstations allows them to be started up in any order. The server can be started-up before or after workstations. The workstations always wait for the server to start-up.

A remote workstation that can connect to different OMC-R sites is only "known" from the time it starts up on the OMC-R and sends a message reporting its presence. The OMC-R server returns the information that the workstation needs. This type of workstation must be started after the start-up of servers.

4.3.1.2 Start-up of a workstation

At start-up, a workstation must be able to communicate with its manager. Before synchronizing the workstation tasks, the workstation start-up function sends a message to the manager and waits for a reply. After reception of this reply, the workstation knows that the manager is ready to process its messages.

No user request is accepted on a workstation for as long as the manager and the workstation are not correctly started up.

When a workstation starts up, the icons that are displayed depend on output classes defined in the terminal profile (static configuration data).

The **OMC-R Browser** window is displayed as soon as the workstations and server are up and running.

A OMC-R workstation can be switched from an OMC-R to another by using an option of the screen background menu.

4.3.1.3 X Terminal start-up

The start-up of a X terminal is a specific procedure which does not follow the general rules of the other machines.

At the start-up of a X terminal, the MMI tasks are dynamically started on the MMI graphics server.

An application-specific synchronization dedicated to the new MMI tasks occurs in order to receive messages from other tasks and user interface commands.

When a X terminal is started up, the X terminal server connected to it displays an UNIX Login window.

4.3.1.4 RACE start-up

At start-up, a RACE remote customer establishes a connection with the RACE server and the local stations only. An HTTP server runs on these machines to provide HTTP connection.

4.3.2 Shutdown of applications

4.3.2.1 General rules

The shutdown of the OMC applications is controlled by authorized users (the access rights to services are described in the "SECURITY MANAGEMENT" paragraph of NTP < 07 >).

There are various user commands ordering to shutdown all or part of the OMC-R system :

- a command to shutdown the OMC-R application on the machine on which the user is logged
- a command to shutdown the OMC-R application
- a command to shutdown the OMC application on the entire system (manager function, stations, MMI servers for X terminal and X terminals). The shutdown is not guaranteed on the remote -OMC STATIONS because these STATIONS are not registered in the manager configuration file

Several MMI commands are available to users:

- shutdown of the active server (that allows the completion of current archiving operations)
- shutdown of the workstation that the user issuing the order is connected to
- complete shutdown of the OMC-R

A warning message on the terminals of the users concerned indicates the tasks that are shutting down.

A warning message is not displayed for users who log on after an OMC-R shutdown command is performed.

The shutdown of a machine (server or workstation) can be brutal (the execution of commands in progress is not guaranteed). However, the OMC-R manages a procedure that allows the effects of this to be minimized:

- user commands are blocked and the associations are closed if a complete shutdown of the OMC-R is requested
- if non-interruptible processing is in progress on a machine that must be stopped, the shutdown of the machine is delayed until processing is completed or until an internal timer times out

After a shutdown, the machine concerned switches to UNIX control. The OMC applications on these machines are no longer active. They can be reactivated on request.

4.3.2.2 Server shutdown

Application shutdown The application shutdown consists of stopping the entire OMC-R application.

UNIX shutdown The UNIX shutdown of a server can be carried out only after the application has been shutdown.

Power-down of a server A server can be powered down only after the UNIX operating system has been shut down.

4.3.2.3 Workstation shutdown

Application shutdown This shutdown consists of interrupting all tasks present on the workstation.

The application is stopped by using a specific menu of the application software. The procedure is described in detail in NTP < 32 >.

The user is informed of the execution of a workstation shutdown command. The user is informed of the time during which the workstation remains usable.

UNIX shutdown The UNIX operating system can be stopped only after the application has been stopped.

Power-down The system can be powered down only after the UNIX operating system has been stopped.

4.3.2.4 Shutdown of a X terminal

The shutdown of an X terminal is a specific procedure that does not comply with the general rules defined for other machines. When a X terminal is stopped, the MMI tasks executing on the MMI graphics server are dynamically stopped.

Application shutdown This shutdown consists of interrupting all tasks present on the X terminal.

4.3.2.5 RACE disconnection

When a RACE is disconnected from a specific task providing communication with the RACE allows to be stopped.

4.3.3 Restart

Several user commands allow all or part of the OMC-R system to be restarted:

- a command to restart the mediation function
- a command to restart the OMC-R application on the workstation to which the user is connected to

Restarting the mediation function requires restarting the manager function, and vice versa.

The restart command is issued after a smooth shutdown and restart of the server.

- on a defense action
- through a manual command issued by the administrator

In this case, the shutdown is brutal and the execution of a command in progress is not guaranteed.

4.3.4 Defense

The defense subfunction collects the various anomalies detected by running applications.

One configuration file is dedicated to the mediation function, another to the manager function (stations included). These configuration files can be updated off-line. Contact the manufacturer to modify these files.

4.3.4.1 Defense actions

An anomaly event is generated for all defense actions (except for "no action").

The various defense actions are:

- no action
- anomaly
- anomaly threshold
  An anomaly event is generated, indicating that a threshold has been exceeded.
- shutdown
  The server remains in operation under UNIX without any OMC-R processes running
- restart
  The MD/OMC applications are stopped and restarted on the failed machine.
- taskrestart
  The task restart feature is configured using the rgrp and rsyn fields of the tasks configuration file. The feature can be enabled or disabled using the cfTaskRestartFeature global configuration parameter. The default value is disabled.
- reboot
  The MD/OMC applications are stopped. An UNIX reboot command is initiated.

The defense sub-function stores all anomaly events in a daily file for all supervised machines.

4.3.4.2 Defense thresholds

The defense anomalies are grouped in a set of defense types. Each type of defense uses the number of anomalies collected during a configurable period. It decides on the defense action to be taken when a threshold is exceeded.

The collection period, the threshold, and the defense action can be configured off-line for each type of defense by using configuration files. The anomaly events generated include a trigger threshold. A chronological list of collected anomalies is available as a part of the additional information corresponding to each anomaly.

4.3.5 Self-observation

The OMC-R self-observation system monitors the MD-R/OMC-R components: OMC-R server, passive server, and workstations.

4.3.5.1 OMC-R self-observation

The OMC-R self-observation system includes self-observation of the mediation function and of the manager function.

This observation includes:

- collecting counters concerning the activity of the DBMS server (errors, number of write or read operations, CPU used)
- collecting counters concerning the activity of the OMC-R server (disk access, filling of partitions, CPU usage, memory and swap usage)
- collecting counters about the interface with the BSS (X.25 usage, SCSE and FTAM activity and Agent activity)

If a counter exceeds the limit assigned to it, a defense action is initiated.

Self observation of workstations

This observation includes collection of workstation activity counters: disk accesses, partition filling, CPU usage, memory and swap usage

Initiation of a defense action if a counter exceeds its associated limit.

4.3.6 Date and time management

4.3.6.1 General rules

All hosts included in the OMC-R network have the same date and time. The time of all hosts in the OMC-R network is synchronized to the time on the OMC-R server.

Furthermore, on each workstation, the date and time are updated periodically with respect to those of the manager, when a difference is detected.

The date and time of the OMC-R server are distributed periodically to the BSSs that are connected to it.

CAUTION
Customer specific
Indicates that specific equipment and specific software dedicated to specific application is used and that therefore the feature is not available for all standard GSM users.

The timeserver feature brings network time synchronization with an external reference clock. External hardware must be added to OMC-R to collect this external time reference.

4.3.6.2 Services

This sub-function provides:

- reading of the current date of the mediation function

4.3.7 Purge of operational files and data

The purge function of the OMC-R consists in deleting data and files to prevent disk saturation in Sybase data.

The purge is activated:

- periodically (once a day at 3 AM). The number of days file and data are kept on a disk, is defined by static configuration. The list of files and Sybase data that can be purged is defined by static configuration in two files (MD-R and Manager).
- automatically. The defense monitors the partitions and the database occupation. The defense activates file and data purge when an occupation threshold is reached. The list of data to be purged and the number of days to be kept are defined by static configuration in a file.
- manually (through MMI). The operator has the possibility to purge the data of trace function of the specific day or the current day.

4.3.8 Mirroring management

An OMC-R configuration includes the backup disks for redundancy purposes. These disks are located in one T3 disk array device with Sun Fire V880/T3 servers.

The OMC-R data redundancy management guarantees that the dynamic data is permanently updated on the backup disks.

When a problem associated with the permanent updating of the dynamic data is detected, the data redundancy management system is deactivated. Depending on the hardware architecture of the OMC-R (with or without disk array device), certain defense actions are undertaken, such as:

- sounding an alarm
- blocking of the server switchover system
- the procedure to update the data of the server or to repair a defective disk must be executed to reactivate the data redundancy management mechanism

4.3.8.1 Disk array device management

With this configuration, the SVM system manages mirroring.

The UNIX operating system and the MD/OMC applications are installed on the internal disks of the server. Only the data to be duplicated is located on the disk array device.

The internal disks of the T3 disk array device are described in Figure 62 "Configuration with one T3 disk array device" (page 223)

One T3 disk array device has 9 disks of 36 Gbytes.

All internal disks of the disk array devices belong to the same diskset, which is managed by the SVM system.

If an error is detected by a disk array device, access to the data is established on the associated mirror disk. The replacement and resynchronization of the defective component is possible without shutting down the OMC/MD applications.

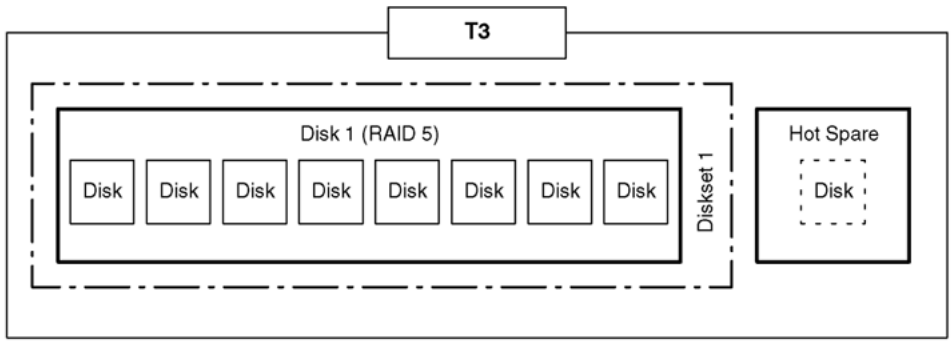
The SVM system is configured to ensure that:

- data is read alternately on the reference disks and on the associated mirror disks
- data is written in parallel on the reference disks and on the associated mirror disks

The SVM system stores the configuration and the status of disks in an internal database called metadevice state database. As this database is important to the correct operation of SVM, it is replicated in several state database replica. These state database replica are stored on local disks

and on disks belonging to the disk array device. If more than half of the state database replica are broken or corrupted, the diskset cannot be reserved by the server.

Figure 62
Configuration with one T3 disk array device



4.3.8.2 Mirrored OMC data

The mirrored OMC data consists of the mirrored data of the mediation function and of the manager function.

Mediation function mirrored data The mirrored data of the mediation function is as follows:

- databases:
  - MIB
  - Notification correlation
- and the following UNIX files:
  - call tracing files and call path tracing files
  - BSS notification file
  - mdWarning list file
  - notification correlation file
  - current notifications identification file
  - current EFT list files
  - temporary files for TGEs and the associated BSC contexts

— mediation function log files

— MIT

Manager function mirrored data The manager data mirrored on the passive server is as follows:

- databases:
  - — common Local DataBase (CLDB)
  - — call tracing and call path tracing database
  - — user notification database
  - — alarm history database
- and the following UNIX files:
  - — call tracing and call path tracing files
  - — current user alarms file
  - — user notification file containing additional information
  - — alarm criteria configuration files
  - — relay configuration file
  - — current EFT list files
  - — system session log
  - — mails between users
  - — command files
  - — scheduled jobs
  - — job results
  - — user and workstation profiles

4.3.9 Supervision

4.3.9.1 Principle

The OMC-R "Supervision" performs the following functions:

- detects an operational anomaly (missing tasks, machine failure, failed disks, failed disk array device, failed memory, X.25 problem, OSI problem, partitions full, failed Ethernet link)
- executes a restart, or a reboot
- suspends a smooth shutdown if a task is in a critical sequence

4.3.9.2 Self-supervision by the server

The following points are monitored:

Memory:	by the software that is running
Software:	by the surveillance task
	Vital tasks (defense, surveillance, message services, delay system) are monitored by the local supervision.
Internal disks:	by the software that is running
X.25:	by the local supervision task
	The task periodically monitors the activity on the X.25 links (X.25 packets, etc.).
ethernet:	by the local supervision task
	The task periodically monitors the IP activity.
CMIS:	by the local supervision task
	The task periodically monitors the activity of the CMIS provider
SYBASE:	by the software that is running
	by the local supervision that periodically monitors and the activity/status of the SYBASE

4.3.9.3 Supervision of disk array device

The server periodically obtains the status of each disk array device. A defense anomaly is generated if the status indicates an error on a disk or on a disk array device.

The following points are supervised:

Disks:	by the surveillance task.
	A defensive anomaly event is generated if the status reports a failure on a disk or on the device itself.
Disks:	by the running software.
	The running tasks can also detect a failure within a disk array device when an error is returned by a writing or reading operation. Then, a defensive anomaly event is generated to notify the returned error.
Database replica state:	by the surveillance task.
	When a state database replica (see 4.3.8.1 “Disk array device management” (page 222)) gets broken or corrupted, a defensive anomaly event is generated to notify the error.

4.3.9.4 Self-supervision of a workstation

The following points are monitored:

Memory:	by the software that is running
Software:	by the monitoring task
	Vital tasks (defense, surveillance, message services, delay system) are monitored by the local supervision.
Internal disks:	by the software that is running

4.3.9.5 Supervision of a workstation by the manager

The workstations managed by the manager poll the manager periodically. The manager generates an anomaly if a workstation fails to send this request. Another defense anomaly is generated on the manager when communication is restored.

4.3.9.6 Supervision of the manager by a workstation

The workstations managed by the manager poll the manager periodically. A workstation displays a warning message in a window of the console and on the user interface if the manager fails to respond to this request. The workstation periodically attempts to restore the communication with the manager until it succeeds. It then displays a message in the window of the console and on the user interface to report that the manager is accessible again.

4.3.10 Database integrity

The loss of integrity of a database can be detected:

- when the OMC-R application starts-up, by the application software that is running when the error manager reports a problem
- by the supervision functions when a mirroring error occurs

In both cases, a notification is issued and a defense action is taken.

4.3.11 Software verification (Access checking)

A tool allows the access rights of the MD/OMC application components to be verified. The components checked are files and directories described in a configuration file. Depending on the role of each machine, the tool compares the reference rights with the rights of the component of the machine.

The following rights are compared:

- the owner of a file or a directory
- the group of files or directories
- the access permissions

For each anomaly detected, the tool displays a message in the window of the terminal. The administrator must then modify the component with the recommended rights.

4.3.12 Installing and activating the hardened mode

Activate OAM OS Hardening to improve the security of OMC-R Operating System common network security attacks. OAM OS Hardening applies to both OMC-R servers and workstations. OAM OS Hardening provides specific OS settings which strengthen access controls, removing unused services and unused users.

You can activate, deactivate and check hardened mode on all services or part of them by a command (set_os_hardened.sh).

It is recommended that you use the OAM hardening feature in conjunction with the OMC-R Security – SSH Support feature. OMC-R Security – SSH support does not modify the OAM hardening feature so that the hardening feature encompasses the r*, telnet and ftp services.

As a result of this characteristic, it is important to note that even if the rsh service is activated and no one uses it on the OAM network, no account data can be transferred as clear text.

4.3.13 Map broadcast

This tool is provided for broadcasting MMI maps from an OMC station to the machines of the OMC configuration.

Initially, the maps are loaded on the station by an OMC administrator. The tool broadcasts the maps either to all the machines of the OMC configuration (-OMC stations not included) or to a list of determinate machines.

On the servers, the maps are loaded in a compressed format.

The tool also takes in charge of the map deletion.

4.3.14 Centralized archiving on disk and restoring from disk

This archiving provides the possibility to save OMC-R data on a centralized Network File System NFS server. The applicative data are restored partially or totally. The server allows the use of automated devices to transfer data from disk to DAT. This archiving is associated to disaster security.

4.3.15 Archiving and restoral

The administration function is in charge of saving and retrieving the operational context of the OMC server in order to:

- prevent a crash of MD/OMC requiring a partial or a complete reinstallation of the applications and their data.
- to change the hardware configuration without losing the MD/OMC data.

The concerned data are the OMC-R global configuration files useful for the OMC installation and the permanent OMC-R data also named applicative data.

The permanent OMC-R data are:

- the contain of the BDE and the CLDB (notification table excepted)
- the defense configuration files
- the purging configuration files
- the localization files
- the communication function internal configuration files
- the EFD list file
- the mdwarning list files
- the alarm criteria definition files
- the alarm semantic definition file
- the relay configuration file
- the synthetic counter definition files
- the reference counter definition file
- the FM internal configuration files
- the current PM object identifier file
- the current EFT list files
- the counter threshold list files
- the mediation function observation log files
- the MMI terminal profile list files
- the MMI user profile list files
- the command files
- the MMI internal configuration files
- the reparenting tool configuration file

- MMI maps
- the customize configuration files

The data are archived/restored by the manager archiving/restoring function either from a tape or from a file system.

The archiving operation is available:

- either from an archiving MMI user command applying to the data of backup type, the MD/OMC applications being then on-line
- or from a command tool whatever the state of MD/OMC applications (on-line or stopped)

Each gigatape or file system used can receive several archives. The limit is the capacity of the device. A temporary directory located on the MD/OMC file system is needed to extract (respectively insert) the data tables to (respectively from) BCP files during the archiving (respectively retrieval) operation.

If the MD/OMC applications are running, a backupBdeBegin notification is sent to the manager. A message is sent to the communication functions to inform them to cease temporarily any activity involving an updating of the MD/OMC data.

At the end of the archiving operation, an other message is sent to the communication functions to inform them to come back to a normal activity and a backupBdeEnd notification is sent to the manager.

The restoring operation needs the MD/OMC applications stopped. It is only available from a command tool. This operation is split in two steps, which are the retrieval of the OMC-R global configuration files and the retrieval of the permanent OMC-R data.

4.3.16 Integration of OMC-R with an outside DNS server

DNS stands for Domain Name Server

When connected to an outside DNS server, all the machines of the OMC are able to resolve all the IP addresses with the help of this server.

If the DNS is used, OMC-R server, workstations and Xyplex terminal servers are configured to behave as DNS clients :

- they no longer support local IP mapping table
- they are allowed to resolve IP addresses and IP hostnames by requesting the DNS server

The DNS server is implemented and managed by the Operator. It holds IP addresses and hostnames of each OMC-R machine.

Changes are performed on the DNS server for the IP address and on OMC-R configuration file.

The IP address of a station can be changed without halting the servers and the other stations.

The IP address of a server can be changed without halting the servers but the other server (active or passive) must be halted.

4.3.17 Collection of information for investigation purposes on the OMC-R

In order to facilitate the OMC-R trouble investigation, the server automatically collects the following information:

- the system resources used on the stations and on the server
- the context of previous server shutdown and of previous station shutdown

4.3.17.1 Collect of system resources used

System resources used on stations and server are periodically collected and saved on a local disk of the concerned machine. The following information is collected:

- the swap size
- the size of partitions
- the characteristics of UNIX processes that are running (memory size, owner)
- the state of the data base

The information collected can be analyzed on-line or off-line with a specific tool.

4.3.17.2 Collect of previous shutdown context

After two future start-ups of a server or station, the current context of the machine is cleared (diagnostic files0). This context is useful in understanding certain problems that occur on the server or on the stations.

Thus at the beginning of each server start-up, or each station start-up, a tool is automatically launched to save the current context on a local disk. The saved context reflects the state of the machine:

- at previous failed start-up
- or at previous shutdown
- or at previous restart
- or at previous reboot

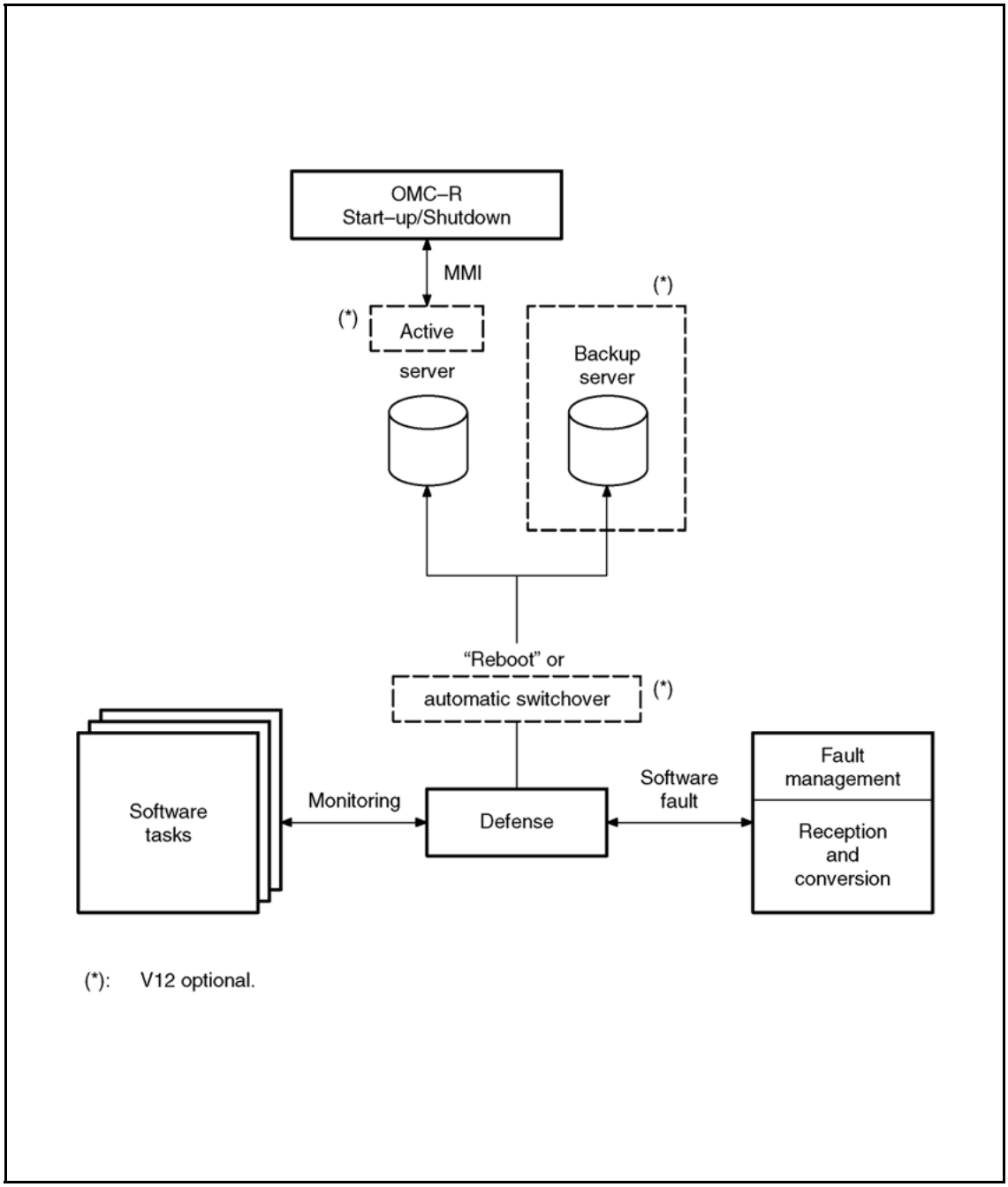
4.3.18 Interworking with other functions

The OMC-R administration communicates with the following:

- the MMI that handles user commands
- other software tasks for different services

Figure 63 "Functional diagram of the administration" (page 232) shows these exchanges.

Figure 63
Functional diagram of the administration



4.3.19 CPU binding service

A limitation on Integrated OMC-R about the X-Terminal being supported was introduced in V14 (limit is 2, was 10 initially -see table below for V16) to avoid 100% CPU used by Tx server application. To avoid that, a mechanism is added to guarantee that it does not impact the OMC-R server application: the CPU binding service.

/OMC/config/MmiConfig.cfg (Section AdminTermX)		
messagerieAddressGraphic	501	new default value
maxGraphicTask	"9"	default value
	"40"	for SFV890 only
maxGraphicTaskMultiboxes	"9"	default value
	"20"	for Ultra 45 and SB1500 only

This service allows a better use of the resources. a specified task may be assigned to a given processor allowing an identified critical task to get more resources. It is also possible to allow ple instances of the same task name to run on different CPU. The CPU binding task (cf_cpubinding.x) must be modified for that to take place.

The purpose of the CPU binding service is to assign a process to a processor as described in a configuration file. This configuration file describes all the programs and the processors on which they must be executed.

The CPU binding service runs only on an integrated OMC-R (Sun Fire V890 or Sun Fire V880 server).

4.3.20 OMC-R system patch management

Install_data is the nominal tool used to install and or apply patches automatically and plug-ins on OMC-R configuration nominally installed.

A new feature to install_data: manage automatically system patches:

- install and apply automatically system patches
- fallback system patches
- display system patch level

Install_data performs this function due to the application script delivered with the patch by the Nortel team responsible for system patches.

This automation is introduced progressively as system patches are delivered with this application script. For system patches already delivered, install_data put them on the OMC-R server.

4.3.20.1 Patches concerned

Install_data manages a class of patches named: OMC_SYSTEM. This class groups together a large number of products:

- PE_SOLARIS
- PE_SOLARIS8
- PE_MAINT
- PE_DISKFW
- PE_SFV880

Among OMC_SYSTEM patches, some cannot be automated due to single user mode or hardware intervention for instance.

The automation capability is decided by the Nortel team responsible for system patches. But even for non-automated patches, install_data enhances its installation feature: it untars the patch in the directory defined in the patch configuration file.

For the non automated patches, a patch application procedure is delivered.

4.3.20.2 System Patches Description

This delivery is provided by the Nortel team in charge of system patches.

A very important point is: all these system patches are jumbo patch, no chain is managed between them.

1. Patch tar file : PE_<xxxxxx>_Vxx_yy.zz.tar
2. Patch application scripts (if automated application):
   - — apply.sh is delivered if patch application can be automated.
   - — fallback.sh is delevered if patch fallback can be automated.

   Those scripts control that this patch can be applied on the current hardware configuration.
   Those scripts make the difference between inappropriate hardware and a patch application error.
   Those scripts can send information to install_data with the following syntax:
   - — Echo "VERB <string without carriage return>," shows command progress (displayed in real time in install_data progress window)
   - — Echo "ERR <string without carriage return>," explains the cause of fatal error

— Echo "RES <string without carriage return>," explains the result, optional (case of inappropriate hardware)

— One of the two following lines is mandatory (exit status is not used):

– Echo "OK," correct end of treatment (case of inappropriate hardware)

– Echo "KO" erroneous end of treatment

3. Absolute name of the directory where to untar the patch and the rights which must be set on this directory
4. Concerned SunOS version: install_data applies this patch only on OMC-R servers or workstations with concerned SunOS version, in one OMC-R configuration you can have machines with SunOS 5.9 and machines with SunOS 5.10.
5. Concerned machine roles, several various values are possible:

— all = all OMC-R machines

— server = active and passive server (if any)

— <role>: a list of OMC-R official roles: STATDATAEXP, STATX, OMCRCORESERV, STATXDATAEXP and STATION. . The patch is applied in each concerned machine.

INFORMATION IMPLEMENTATION Here is a formal specification of a system patch delivery:

- PE_<xxxxxx>_Vxx_yy.zz.tar including

— the patch files,

— apply.sh (if automated application)

— fallback.sh (if automated fallback)

— the file named "install_data.cfg" including:

concerned SunOS versions as result of "uname -r" (comma separated), extensive list of concerned machine roles (comma separated) e.g.:

— all (all the servers and workstations)

— server (all the servers)

— OMCRCORESERV, STATX, STATION

- reboot: yes | no; whether Unix reboot is needed after patch application.
Example of file install_data.cfg:
SunOS value is the result of "uname -r"
SunOS : 5.8
machines: machine roles concerned by this patch.
list of values (without carriage return) among:
all (all the machines), server (all the servers),

```
# any other official roles defined in omc_configure.cfg
# In this example, the patch can be applied in monobox but
# not in box.
machines: OMCRCORESERV, STATION, STATX
# Whether Unix reboot is needed after patch application
# Possible values are "yes" or "no".
reboot: yes
```

- PE_<xxxxxx>_Vxx_yy.zz.cfg:
- INST_DIR: absolute name of untar directory
- DROITS_DIR : rights to set on untar directory

4.3.21 Network reconfiguration procedure

The Network Reconfiguration Procedure (NRP) allows the user to operate and to re-configure various functions and operations. Use the SSH service instead of r*services to login unless instructed to use to the r*service for the following:

- BSC Reparenting (OMC BSC Reparenting)
- BTS Reparenting (intra OMC-R and inter OMC-R)
- PCUSN Reparenting
- Cell Tiering Activation
- Dynamic AGPRS (De) Activation Procedure
- GPRS TimeSlot Configuration Procedure
- Edge Configuration and Backhaul
- Frequency Plan Change
- Frequency Plan Change with Commanded Build Automated Procedure (Rapid Frequency Plan Change, Using build BDA on-line)
- LAC Reconfiguration
- BSC/PCUSN Dissociation Procedure
- BSS Network Configuration Check and Fix (BDE audit tool)
- PCM Reparenting
- TEI reparenting/LAPD (De) Concentration Procedure
- Add GPRS PCM Link
- Add Gb PCM Link
- Add EC1 Board
- DRX Extension
- Reconfiguring the BDA (NTP34, PE/DCL/DD/0034)

- Reconfiguring a radio entity (NTP34, PE/DCL/DD/0034)
- Creating and bringing a BSS into service (NTP34, PE/DCL/DD/0034)
- Taking out of service and deleting a cell/site/BSS (NTP34, PE/DCL/DD/0034)
- Dual Band 2 BCCH to 1 BCCH Reparenting
- PCUSN Software Upgrade Procedure
- BSS Upgrade Procedure
  - BTS software upgrading using BTS background downloading
  - BSC 3000/TCU 3000 upgrade
- BSS Maintenance Checks from the OMC-R
- EFT Check
- Preventive mnt: Automatic BDA audit (existing tool, PE/OMC/DD/0324)
- Preventive mnt: Network state photo (existing tool, PE/OMC/DD/0314)
- Preventive mnt: Hw Sw compatibility (existing tool, PE/OMC/DD/0336)
- BTS chaining (NTP34, PE/DCL/DD/0034)
- BTS chain closing/opening (NTP34, PE/DCL/DD/0034)
- BTS External Alarms Cutomization (NTP34, PE/DCL/DD/0034)
- Migrating an electrical BSC 3000 to an optical BSC 3000

4.3.22 BSC and BTS reparenting

4.3.22.1 Prerequisites

The client workstation configuration must be connected to source and target OMC-R servers.

4.3.22.2 Limitations or restrictions

The NRP tool handles up to 4 active OMC-Rs. A remote workstation does not support this tool.

This procedure is only for authorized administrative users.

4.3.22.3 Server/Client architecture

The server/client tools enables communication between the local machine and the available OMC-Rs. The tool handles up to 4 active OMC-Rs. A remote workstation does not support this tool.

CONFIGURATION SERVER

The server is in the listen mode at each OMC-R level. The server is launched by the OMC-R crontab. The tool verifies if a server is running before initialization.

By default the server uses the communication port 3456, this port can be configured during installation process. The /etc/services file is updated to declare the port usage by the application.

CLIENT

The client is called each time the application needs to:

- Execute script/tool on the OMC-R
- Get file from the OMC-R
- Put file at the OMC-R level

The client is launched through the plug-in mechanism

SECURITY

The server is in listen mode at each OMC-R level through the default communication port. through this port, only communications (between client and server) with encrypted key are authorized. For that, a security tool is implemented on each machine hosting a client and/or server tools.

The security tool interacts with:

- Reparenting tool and provides encrypted keys of administrator users and remote server tools. This is only permitted for authorized administration users and after login through the security tool.
- Server tool gives it its encrypted key and/or the result of the password (contained in the encrypted key) validity. All communications with the server tools are conditioned by the validity of the encrypted keys sent by the client tools.

All operations done by the reparenting tool through the client/server tools are indexed with encrypted keys. These keys are limited in time. Each command sent to the server tool through the client tool has a unique key and cannot be reused.

The security tool has four main roles.

4.3.22.4 Tool Design

The tool is designed in one principal module using several extensions. Each extension defines one operation.

This architecture makes the support more efficient and real time possible. If the tool is running and there is a problem with one of the modules, the modification can be done in real time in the defected module and it is taken into account immediately.

The tool uses configuration file to execute a specific procedure.

Each configuration file contains all steps to execute the procedure and the all the fallback steps in case of error.

The configuration file is updated according to the action and objects the operator is handling.

Modules delivered are:

- BSC reparenting inter OMC-R
- BTS reparenting (Inter and Intra OMC-R) from BSC 3000 to BSC 3000 BTS
- PCUSN reparenting

The module permits the reparenting of the PCUSN from one or several BSCs to another.

4.3.22.5 Log file Management

The tool creates a global log file during the initialization step. The global log file contains the trace of all operations executed by the operator (bts reparenting, bsc reparenting, ...). For each operation, the tool generates a trace log file. This log contains all the details of the steps executed during the procedure (shells, ...).

Procedure log file name /var/local/oam/ds_dnd.log

Procedure log trace file name /var/local/oam/[pid].ds_procedureName.log

4.3.22.6 Tool Windows

The operator can add up to 4 servers with connection windows. The tool displays the servers entered at the last execution.

Connection windows provide the ability to add or delete an OMC-R from the list of OMC-Rs to be controlled.

These screens are examples of what appears at the GUI, however they might evolve and are not final.

The progress connection window displays the connection progress (server/Sybase).

Progress BDE information windows: during this phase, the tool gathers the necessary information to create the explorer tree (OMC-PCUSN-BSC-BTS-TCU).

For more information on the NRP tool, refer to NTP <034>.

4.3.23 Disaster Recovery

If a disaster occurs on an OMC-R, all of the supervision is lost on that OMC-R. The disaster plan describes how an OMC-R must be configured to minimize the amount of time a loss of supervision lasts when an OMC-R fails.

The disaster plan is divided into the following three main parts:

- Configuration - allows to configure sites to perform daily backup operations that make possible the disaster plan process;
- Recovery - recovery of backed up OMC-R configuration on spare configuration to replace a destroyed OMC-R;
- Site restoral - restoration of the site that was previously destroyed.

4.3.23.1 OMC-R Configuration

Network configuration of the OMC-R equipment described in 4.2.2 “Equipment configuration” (page 211), takes into consideration potential hardware or communication failures within the network.

Disaster recovery is configured for a single server configuration.

4.3.23.2 OMC-R Licenses and disaster recovery

When performing any activity that raises the risk of an OMCR disaster, it is recommended that you immediately export the licenses of the OMC-R in question.

In the event of a sudden disaster (earthquake or fire for example), Nortel, upon your request, can provide help with licenses that may be required for a given OMC-R.

For that to happen, a backup license which is part of BDE Backup should be sent to Nortel. It is automatically created during the BDE backup to prevent the license from being accidentally lost. Such a license cannot be used as such and thus cannot be imported into an OMC-R.

ATTENTION
The back-up OMC-R does not need the licenses to monitor the network. Without any valid license, the back-up OMC-R can start, connect to, the BSC, receive the fault notifications and the observation data and accept most of the commands with the exception of the following:

- unlock commands on a TRX (The usual way to fix TRX problems is to lock then unlock the faulty TRX.)
- unlock command on a parent object (bsc, when the managing BSC is a btsSiteManager and bts)
- reset of the BDA and the BDA building

4.3.23.3 OMC-R Restoral

The restoral of the failed OMC-R consists of performing the same operations as the spare configuration:

- Look for the last available backup
- Update of cfInitOMCName in omc_configure.cfg and omc_configure.sh -fCF
- OMC-R data recovery from the NFS server

After recovering the data and the configuration files, post operation have, then, to be launched on this new server or on the network elements it has to manage:

- Update of the PCU-OAM configuration files
- If the new server belongs to a different sub-network:
  - to customize the PCUSNs to make sure they can have access to the new OMC-R server
  - To update the server routing table to have access to the PCUSNs
- Resynchronization of the PCUSNs from the server
- Regeneration of the SDO data if necessary
- Deactivation of the automatic backup on the recovery server
- Configuration of the automatic backup using the ds_AutoBackup.cfg retrieved

4.3.24 Security issues

OMC-R security is improved by means of the following items:

- OAM Login – Password modification: the feature introduces the built-in permanent user profile **oam** with the ability to change its password in order to improve the security of the OAM.

Refer to NTP 130 for the procedure.

- Encrypted OMC passwords: passwords stored on the OMC-R are now encrypted to improve security.
  A special command line option is added to the **cf_adm_cmd.x** tool so that it is able to change Sybase database user passwords and the MDP user password. Corresponding OMC-R configuration files are also to be modified during password changing.
- SSH Support: this activity helps to ensure that passwords and logins are not exchanged in readable text over the network. See "OMC-R security and SSH support" (page 242)

OMC security management

The OMC user profile named as **oam** is treated as a dedicated profile for a NRP (OAM account).

- The OAM account is a permanent user profile, such as "administrator".
- It is prohibited to change the password for OAM account during the execution of any NRP. This may lead to errors during a NRP execution.
- There is no restriction to prevent the changing of any attributes of the OAM account but it is strongly not recommended. This may lead to errors in during a NRP execution. Once any attribute is changed, a user is responsible for this change.
- The NRP can work with R- services and SSH services based on the way you configure the OMC-R. Implementation of SSH does not support password in the command line. SSH can cause some performance degradation while using NRP.

OMC installation and upgrade The OAM account with default password must be created during the OMC installation and upgraded to the appropriate version.

If during such upgrade the OAM account is present – no actions to be performed, the OAM account stays as it is.

OMC-R security and SSH support

This option helps to ensure that passwords and logins are not exchanged in readable text over the network.

SSH service (standard Solaris SSH software, which is built in OMC-R Flash Archive, with default Solaris settings) is installed during installation or upgrade state on all available machines in OMC-R configuration. During OMC-R upgrade from any earlier release to V17.0 releases, no SSH parameters and settings are kept from previous releases.

There is an automatic tool to activate the SSH Support feature. Refer to the OAM procedure DS/OMC/APP/020095, OMC-R Post-installation Configuration procedure, for steps to activate the feature.

When SSH services are deactivated, then the OAM tools switch to r-services and the use SSH is no longer available.

When SSH Services are activated, then the OAM tools use SSH, and users can use SSH in addition to existing r-services.

This activity:

- does not deactivate the r* services (rlogin and rsh for example). The r* services are reserved to trusted persons.
- does not apply to the OMC-R installation and upgrade and some maintenance operations that are interrelated with installation and upgrade.
- does not provide additional means to hide the OMC-R, UNIX or RACE passwords. (For example, it is still possible to read them from the UNIX command ps).
- does not support protection of DSA keys by a pass phrase.

The SSH support feature does not change the possibility that an individual could access UNIX and copy these keys or the server fingerprints; delete the keys; or replace them with bogus ones. It is the administrator's responsibility to restrict and protect UNIX access.

A recommendation is to use the SSH feature in conjunction with the OAM OS hardening.

4.3.25 PCUSN configuration tool

The main features of the PCUSN configuration tool are:

- Off-line PCUSN provisioning: HW and feature creation.
- On-line PCUSN creation thanks to the provisioning preparation done off-line.
- HW configuration done with wizard and equipment model library.

The configuration tool gets actual data from the PCUSN before you make any modification on the data. All previous modifications stored on the PCUSN are part of your new baseline.

Chapter 5 OMC-R site installations

5.1 Introduction

This chapter is intended for the staff of the network operator who must planning and preparing premises for OMC-R installation purposes.

The following paragraphs describe the base line requirements (surface, fittings, electrical and climatic conditions) for OMC-R equipment needs and the network access that must be installed to render the OMC-R operational.

Figure 64 "Example of an OMC-R installation" (page 246) is an example of an OMC-R installation that supports three workstations.

Figure 65 "Example of an installation of a site for remote workstations" (page 247) is an example of a site installation with two remote workstations.

Figure 66 "Example of an installation with Telnet connection" (page 248) is an example of an OMC-R installation with telnet connection.

Figure 64
Example of an OMC-R installation

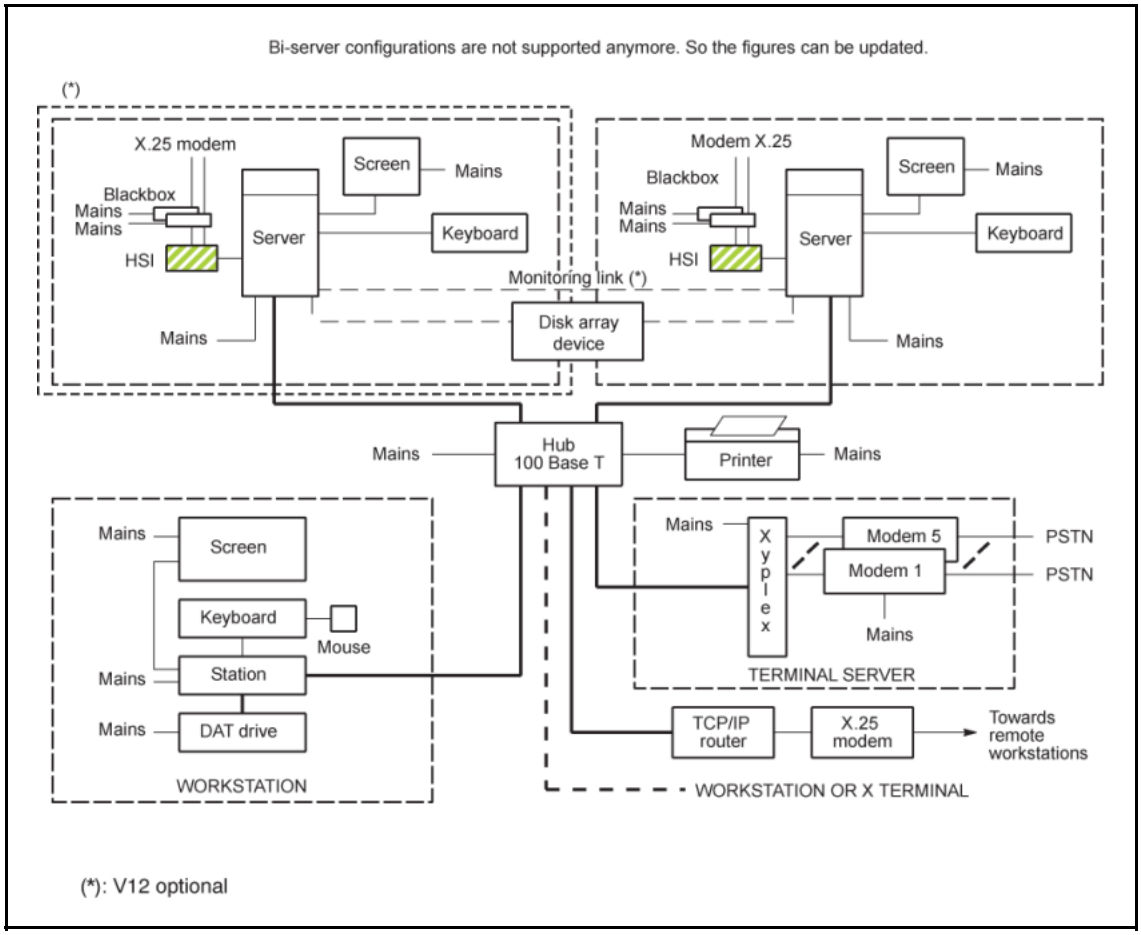


Figure 65
Example of an installation of a site for remote workstations

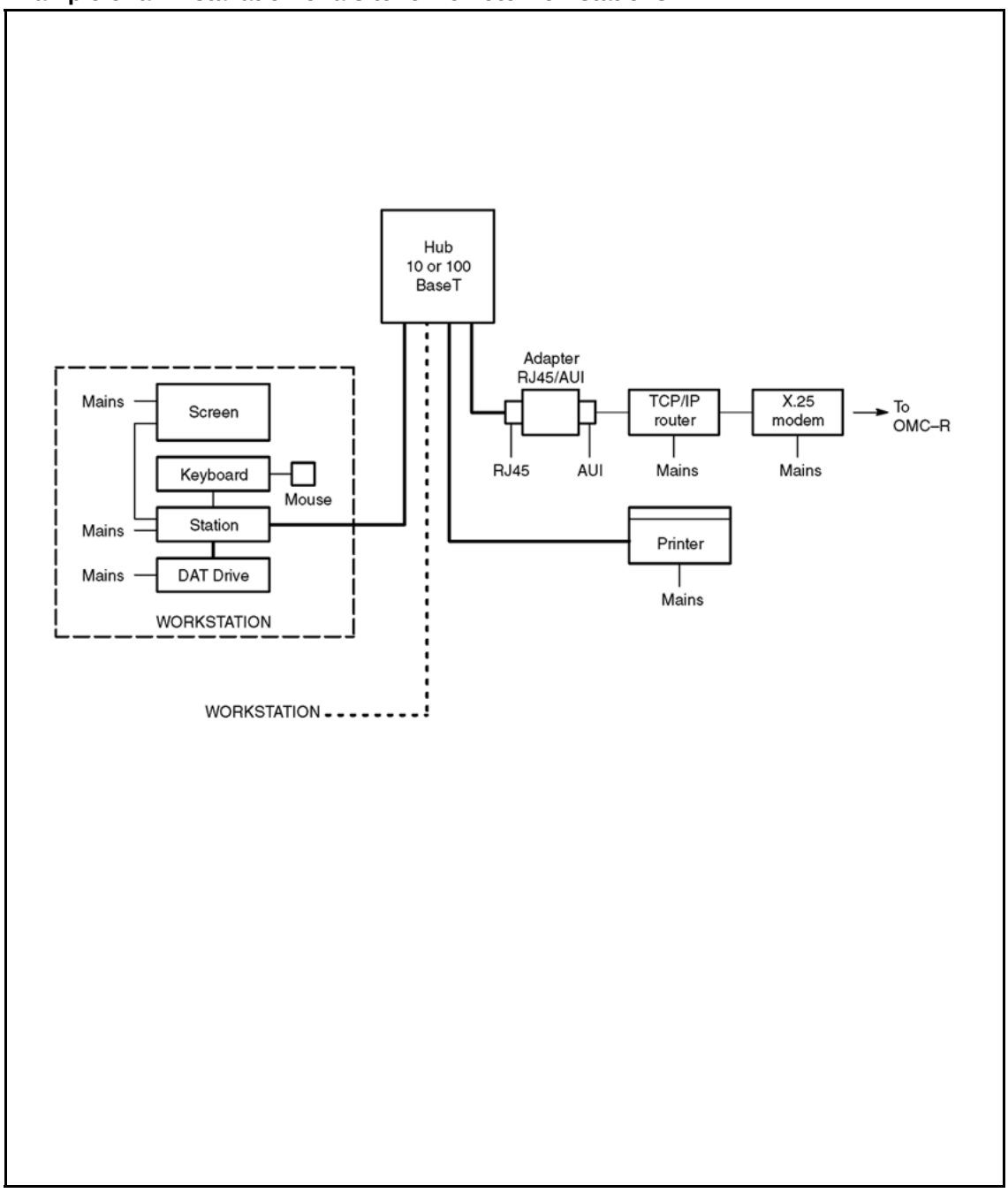
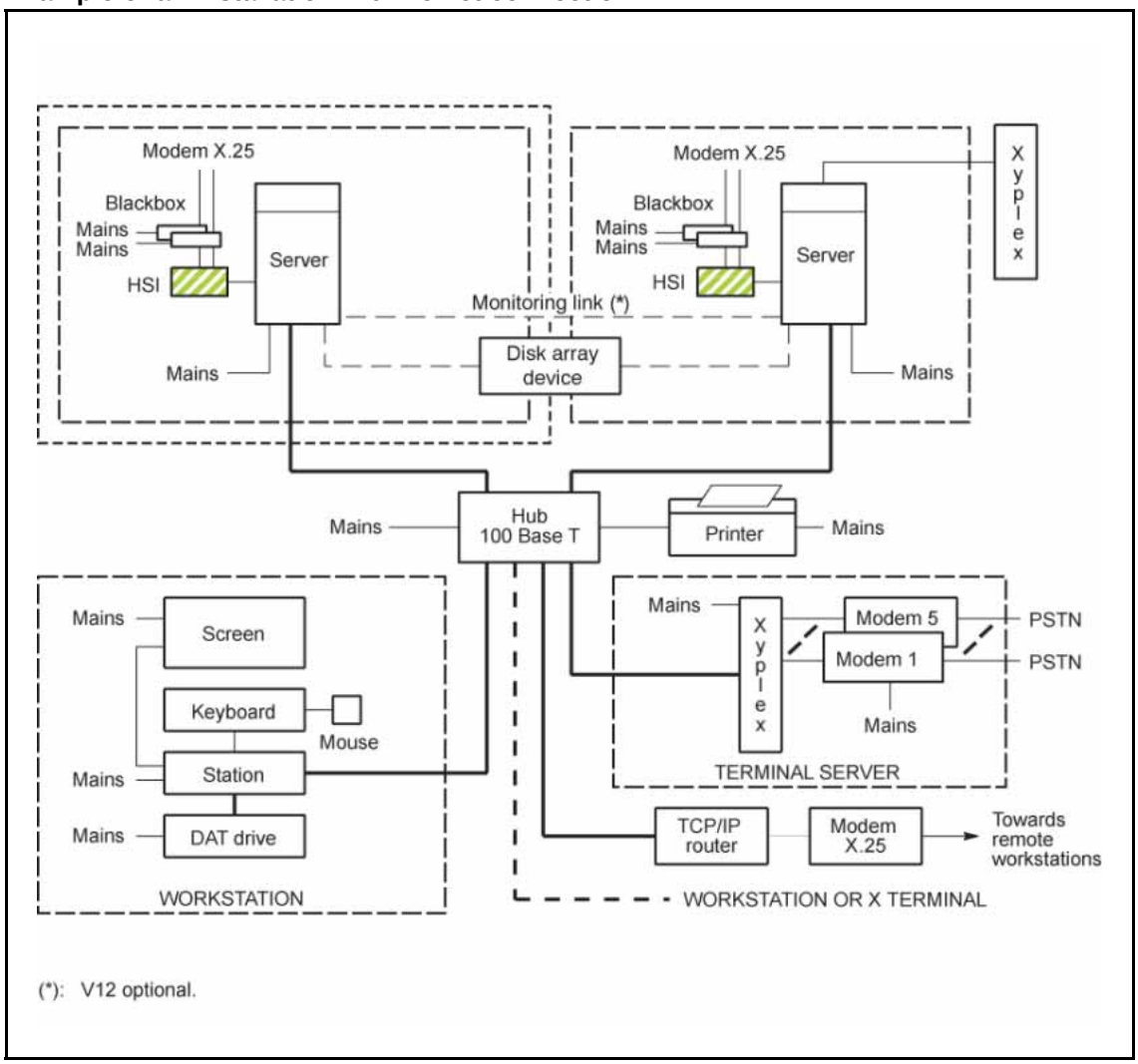


Figure 66
Example of an installation with Telnet connection



5.2 The premises

5.2.1 Surface area

The OMC-R equipment installation includes one server, one or more workstations, (see 1.2.1.1 “Sun Fire V890” (page 36)) one terminal server, one or more routers, one printer, one small rack that holds modems, and interfaces boxes.

The equipment requires relatively little floor space. The amount of space allowed for each attendant workstation is, therefore, the factor that determines room size requirements.

One workstation plus working space requires at least 6 m^2. The remaining equipment takes up 10 m^2.

Suitable OMC-R premises require a surface area of at least 28 to 46 m^2, depending on the equipment configuration.

5.2.2 Floor

A platform must be installed for passing cables (power supply, Ethernet network, Xyplex terminal server connections, modem connections to the X.25 network).

5.2.3 Partitions

Partitions must also be scheduled to phonically isolate noise producing (55 dB) servers and the printer from the rest of the room. The partition must not hamper equipment cooling.

5.2.4 Furnishings

A list of suitable furnishings is given as an example. It is designed to satisfy functional OMC-R room requirements with a certain working comfort in mind.

It includes the following:

- one table for the server, X.25 network modems and associated interface power units and routers
- one table for reach workstation
- one table for the connection rack
- a cupboard for documents
- chairs for attendants

5.3 Environmental conditions

5.3.1 Safety device

The system operator must define and install the appropriate safety devices (fire, access, electrical protection, others).

5.3.2 Ambient temperature

Premises must be air-conditioned or well ventilated because of the heat generated by OMC-R equipment and the range of temperatures that must be maintained in the equipment working environment.

Temperature requirements are as follows:

- Normal working conditions: +15° C to +35°C, with a temperature change rate 10° C/h
- Exceptional conditions: +10°C to +40°C
- Warehouse conditions: -20°C to +60°C

5.3.3 Humidity

Relative humidity with no condensation requirements are as follows:

- Normal working conditions: 20% to 80%
- Exceptional conditions: 5% to 80%
- Warehouse conditions: 5% to 95%

5.3.4 Dust

The working area must be as dust free as possible.

To guard against dust in equipment casings, all the equipment must be installed on tables to be a sufficient height off the ground.

5.4 Power supply characteristics

The equipment is supplied

- for GSM 900/1800 with 220-240 V ac
- for GSM 850/1900 with 120 or 240 V ac

and 50-60Hz by a three-wire cable (phase, neutral, earth).

The voltage tolerances are:

- Nominal 120 V ac: 108 to 127 V ac
- Nominal 220-240 V ac: 198 to 254 V ac
- Nominal 240 V ac: 216 to 254 V ac

The frequency tolerance is +5%

The power supply must be backed up for security reasons. The backup system is dimensioned to suit the maximum OMC-R configuration power supply requirements:

- one server: 3500 W (Sun Fire V890 or Sun Fire V880)
- one remote or local station: 2200 W

- Xyplex Maxserver 1620 : 120 W
- one modem : 20 W
- Printer: 825 W - 1000 W
- one router: 100 W - 460 W
- one X terminal: 240 W - 540 W

5.5 Public network connections

5.5.1 Public Switched Telephone Network (PSTN)

The OMC-R site requires access to the PSTN for the following purposes:

- Remote ACcess Equipment (RACE) connections: The number of lines depends on the number of modems that are installed. The lines may or may not be grouped. For security reasons, when lines are grouped, the anchor switching center is configured so that the first free line is not systematically selected to protect against faulty modems.
- outside calls: Site attendants require service lines; at least two must be installed.

ATTENTION
Telephone plugs must be installed close to the modem rack.

5.6 IP connections

5.6.1 Between OMC-R and BSC 3000

The interface between BSC 3000 and OMC-R is Ethernet TCP/IP. The Ethernet LAN can be 10 Mbit/s or 100 Mbit/s.

When the BSC 3000 is remote from the OMC-R, the BSC and OMC-R LANs must be interconnected through a network (X25, Frame relay, etc.) with a minimum throughput of 256 kbit/s.

The BSC 3000 offers an object oriented interface to the OMC-R, which is close to the Q3 modelization of the BSS hosted in the OMC-R database.

With the introduction of the BSC 3000, the OMC-R Q3 interface provides new objects: BSC 3000 & TCU 3000 hardware equipment objects.

5.6.2 Support of Gigabit LAN

TCP/IP over Ethernet can be used to connect the OMC-R server to:

- Clients: Workstations, SDO, PCUOAM
- Q3 External Manager
- Network elements: BSC 3000, PCUSN

The Ethernet bandwidth is 1000baseT/100baseT Full Duplex. The Sun Fire V890 can support a Gigabit LAN.

WAN

This is usually a LAN with one or more IP subnets. However, when equipment is located far from the OMC-R server, a WAN is required between the two LANs.

Two types of WAN can be considered:

- High bandwidth WAN
- Low bandwidth WAN

High bandwidth WAN

Typically, this starts at 10 Mbps.

Due to this high bandwidth, this kind of WAN looks like a LAN and it is called an XLAN.

From the OMC-R configuration point of view, machines connected through this XLAN are not different from workstations connected on the same LAN as the server.

OMC-R machines are connected to different IP subnets.

Low bandwidth WAN

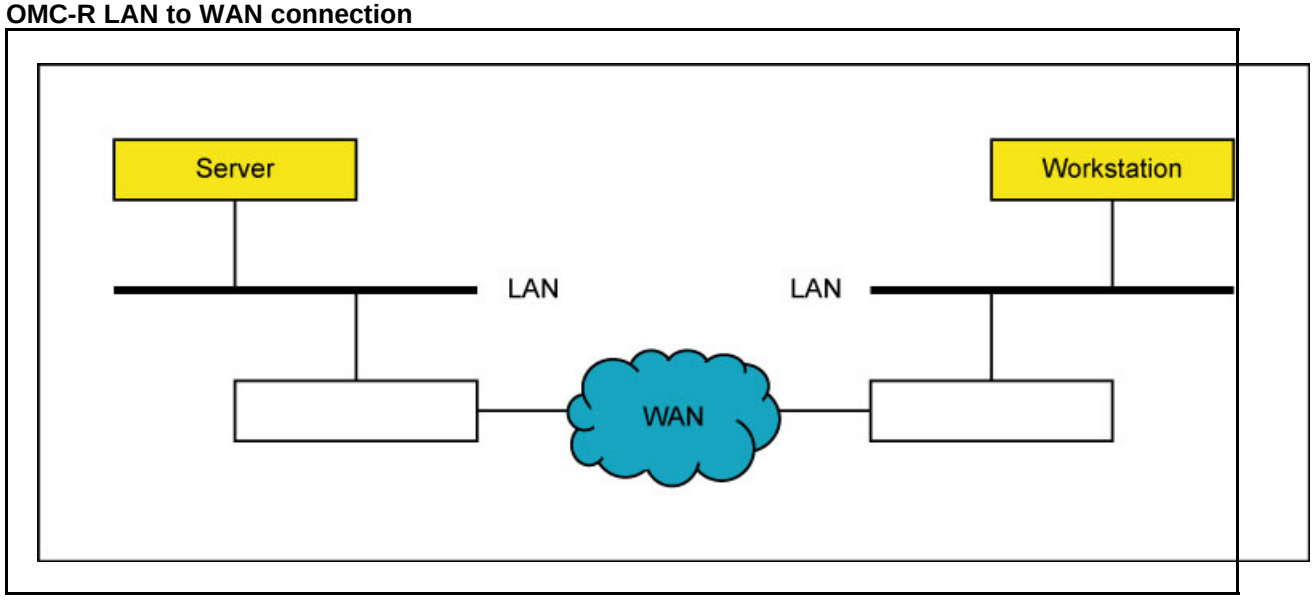
Typically, this is up to 1 Mbps.

This kind of WAN is mainly built over X25.

From the OMC-R configuration point of view, machines connected through this WAN are “remote” OMC-R workstations. They require X25 router equipment.

OMC-R machines are connected to different IP subnets.

Figure 67
OMC-R LAN to WAN connection



Chapter 6 OMC-R dimensioning rules

Refer to the following engineering document: GSM/GPRS/EDGE BSS Engineering rules (PE/DCL/DD/0138).

Global System for Mobile Communications (GSM)

Nortel GSM OMC-R Fundamentals

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