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1 GENERALITIES

The purpose of this document is to describe the High Level Design of the Telecom System for the PROJECT and to define the Telecom System Equipment general arrangement to elaborate the associated drawings.

The Telecom System consists of the following:

- o The TETRA Radio Network for Radio communications based on Rohill solution
- o The Fixed Telephone Network for VoIP Telephony provided by Alcatel-Lucent OmniPCX Entreprise IP-PBX
- o The LAN for Voice and Data communications built on Alcatel-Lucent Layer 3/Layer 2 switches
- o The IT sub-system
- o The Fiber Optical sub-system

1.1 OBJECT AND APPLICATION DOMAIN

This document deals with the Preliminary Work Phase of the PROJECT. It addresses the Telecommunications requirements for the Mine area including the Mine Unit and the Mine Unit office buildings.

1.2 RESPONSABLITIES

1.3 PROJECT REFERENCE DOCUMENTATION LIST

1.3.1 PROJECTS documents

Job Specification for supply Telecommunications Radio System

Telecom equipment layout Main Offices

Telecommunications –Block Diagram

Telecommunication Cabinet Arrangement Guideline Drawing

1.3.2 Alcatel-Lucent documents

Title

Title

1.4 ABBREVIATIONS

BTS   Base Transceiver Station

CS   Communication Server

2 TELECOM SYSTEMS DESCRIPTION

2.1 TELECOM SYSTEM SCOPE

The Telecom System covers:

- The TETRA Radio Network within the Mine area

- The LAN supporting VoIP Telephony communications and Data communications (office Applications, CAD, …)

- The IT sub-system (Servers, PCs, Work Stations, printers, …)

- The VOIP Telephone network

- The Optical Fibre sub-system

2.2 TELECOM NETWORK OVERVIEW

The Preliminary Work phase of the project covers the following areas of the Mine

- The unit **9**: The following facilities are accommodated into the unit 9:
  o The Main Construction Office
  o The Main guard house interconnected to the Main Construction by means of Optical Fibre
  o The HSE building interconnected to the Main Construction by means of Optical Fibre link
  o The Store office interconnected to the Main Construction by means of Optical Fibre link
  o The 9 guard house interconnected to the Store office by means of Telephone cable

- The unit **:** The TETRA sub-system is installed into the unit 1 location equipped with a 30 meters tower height. The unit 1 is interconnected to the unit 9 by means of Optical Fibre link.

The Telecom network consists of:

- **9300 Main Construction Office:**
  o Pre-installed Structured Cabling System
  o Alcatel-Lucent Layer 3/ Layer 2 Switches: Core switch and Edge switches
  o PCs, printers and IP Pones
  o IP-PBX : Alcatel-Lucent OmniPCX Entreprise (OXE)
  o Firewall: Fortinet (FORTIGATE-60B Bundle)
  o IT Servers: HP Servers
  o Optical Fibre links:
    o One (1) 12-fiber optical cable (5000m-length, single mode type) with the unit 1. The cable lead is terminated into a 24-fiber Optical Patch Panel (FOPP).
    o 100m-length optical patch cords (single mode type). They are used within the 9300 Main Construction office to connect directly (without Optical patch Panel) Edge switches of Buiding 2 & 3 to the Core Switch located in the Technical room of Building 1.
    o Three (3) 12-fiber optical cables (single mode type). They are used to connect the remote sites (HSE building, Store Office, Main guard house). Each cable lead is terminated into one 24-fiber Optical Patch Panel (FOPP).

- **HSE buiding**

- o Pre-installed Structured Cabling System
- o Alcatel-Lucent Layer 3/ Layer 2 Switches: Edge switches
- o PCs, printers and IP Phones
- o One (1) Analog Gateway for analog phones
- o Optical Fibre link: One (1) 12-fiber optical cables (single mode type) with the Main Construction Office.

- **Store Office**
  - o Pre-installed Structured Cabling System
  - o Alcatel-Lucent Layer 3/ Layer 2 Switches: Edge switches
  - o One (1) Analog Gateway for analog phones
  - o Telephone cable with the 9 guard house
  - o PCs, printers and IP Phones
  - o Optical Fibre link: Termination of the 12-fiber optical cables (single mode type) with the Main Construction Office.The cable lead is terminated into a 24-fiber Optical Patch Panel (FOPP).

- **Main Guard House**
  - o Pre-installed Structured Cabling System
  - o Alcatel-Lucent Layer 3/ Layer 2 Switches: Edge switches
  - o One (1) Analog Gateway for analog phones
  - o PCs, printers and IP Phones
  - o Optical Fibre link: Termination of the 12-fiber optical cables (single mode type) with the Main Construction Office. The cable lead is terminated into a 24-fiber Optical Patch Panel (FOPP).

- **Unit 1**
  - o TETRA Radio sub-system
  - o Alcatel-Lucent Layer 3/ Layer 2 Switches: One Core switch
  - o Firewall: Fortinet (FORTIGATE-60B Bundle)
  - o Optical link: Termination of the 12-fiber optical cable (5000m-length, single mode type) with the unit 9. The cable lead is terminated into a 24-fiber Optical Patch Panel (FOPP).
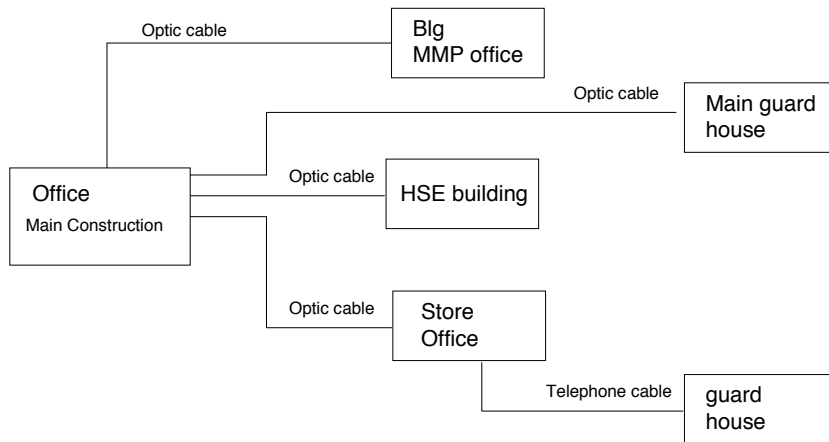
Figure 1 Network topology
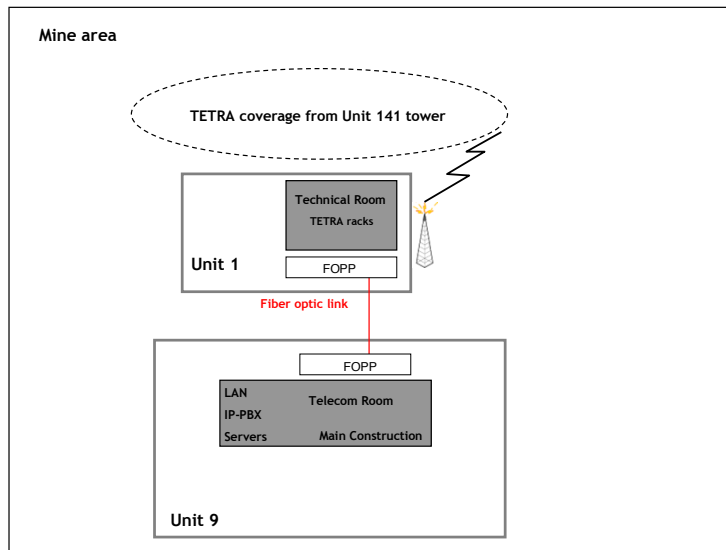
Figure 2 Unit 1 & Unit 9 interconnexion

3   TETRA RADIO NETWORK

The TETRA Radio Network refers to the Rohill TETRA Solution.

3.1 TETRA RADIO NETWORK ARCHITECTURE

3.1.1 General overview

The TETRA Radio Network includes the following components:

- TETRA BSS (Base Station System) :
    - o "TetraNode" Base Station transceiver (TBS)
    - o Antenna system

- TETRA Switch:
    - o "TetraNode" eXchange (TNX): TETRA Core Switching
    - o "TetraNode" SIP Gateway : TETRA Gateway for interconnection to the Fixed Telephone sub-system

- TETRA Management & Dispatching

- TETRA Mobile Stations
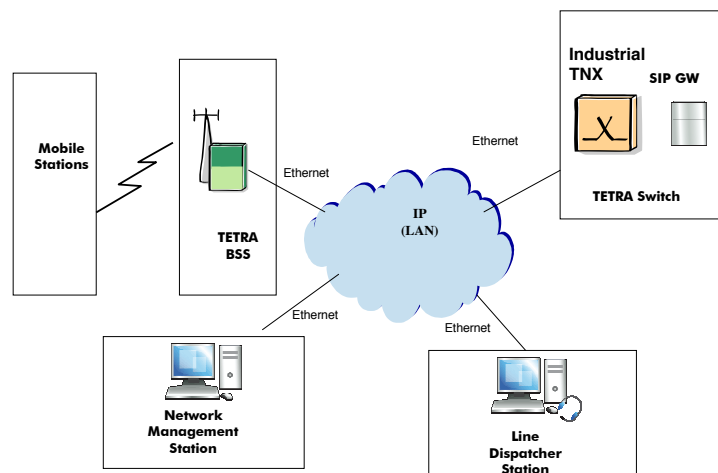
Figure 3 TETRA Radio Network General Architecture

3.2 TETRA EQUIPMENT CONFIGURATION

The TETRA Rohill solution for the Preliminary Work phase of the PROJECT is composed of two racks:

- The TETRA Swich rack with:
    - o 1 R-828 TNX switch
    - o 1 R-880 SIP Gateway for communication with the VoIP IP-PBX

- The TETRA BSS rack including

- o 1 R-8070 Base Station
- o R855 synchronisation unit
- o Antenna system

- 1 R-9 Network Management Station

- 1 Dispatcher Station

The TETRA Radio Network is interconnected to the Fixed Telephone Network through the Optical Fiber link by means of the Core switch of the Unit 141. Calls between a TETRA Mobile and a local PBX phone or an external phone number are processed through the TETRA SIP Gateway and the VoIP IP-PBX

The R8070 Base Station and associated R855 synchronisation unit power supplies are DC power supplies. A power rectifier solution from Eltek is provided to ensure that the equipment can get its power feed from an AC UPS system.

The TETRA racks are installed into the unit 141 (see TETRA Equipment Rack chapter).

The TETRA Network Management Work Station and the TETRA Dispatcher Work Station are located in the Unit 9300 in the Telecom Room.
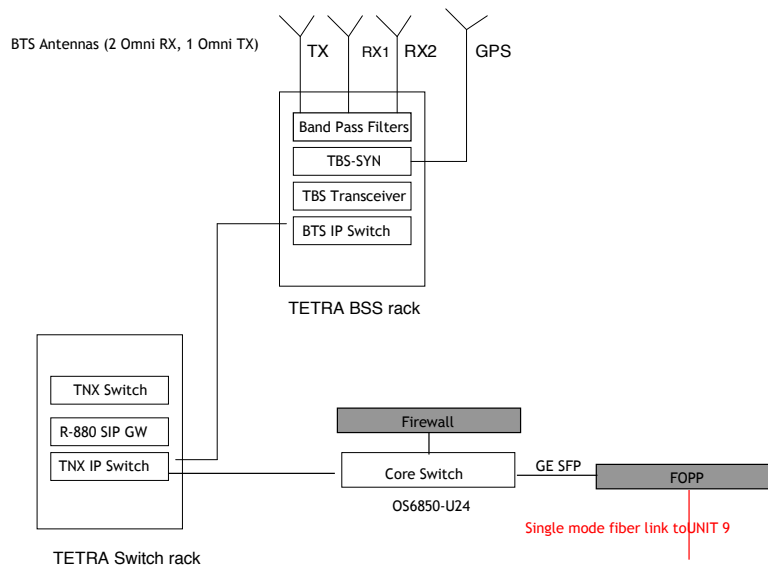
Figure 4 Unit 141 Lay out

The R-964 Four-carrier Base Station System (TETRA BSS rack) includes

- Number of transceivers: one transceiver is supplied

- Diversity option: RF distribution-Antenna for the support of the 2-RX diversity

- The Synchronization unit (GPS antenna included)

- The power supply unit

3.2.1   R-8070 TBS transceiver

The R-8070 TBS (TETRA Base Station transceiver) module is a **one carrier** TETRA transceiver (providing 4 logical channels) housed in a 2U, 19" rack mount enclosure.

The R-8070 TBS is delivered in **410 - 430 MHz** (Civil applications).

The key characteristics of the R-8070 TBS are:

- Support of up to **6-way diversity** (same feature as EADS),

- Higher output power (**40 W**, e.g. 46 dBm),

- Improved receiver inter-modulation rejection and blocking performances,

- Lower power consumption (around **25% gain**) thanks to the use of a class AB power amplifier,

- **Dual IP/Ethernet interfaces** for link redundancy (2 RJ45 10/100 BT FE),

- Improved GUI (LCD display) for local maintenance.

Figure 5 R-8070 TBS transceiver

3.2.2   R-855 TBS-SYN

The TETRA base station synchronization unit (TBS-SYN) is a 1U, 19" enclosure that provides timing and clock reference for the TETRA radio signal to **up to 16 TBSs** on a BTS site.

The synchronization unit uses an external GPS source[1] for auto-calibration and is based on OCXO oscillator. The frequency accuracy is **100 ppb** with guaranteed holdover accuracy of 200 ppb without GPS signal for 28 days (TETRA synchronization requirements are 250 ppb). Two TBS-SYN modules can be installed in a BS for redundancy purpose.

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[1] The TBS-SYN includes one GPS receiver by default. A second optional receiver can be added for redundancy.

The TBS-SYN also provides time stamps that are required in case of seamless handover support.

3.2.3   RF Distribution - Antenna

When diversity scheme is applied, the RF Distribution (including band-pass filters, combiner and duplexer) is used to connect the antennas to the transmitters / receivers.

The Antenna system is based on KATHREIN products.

3.2.4   TetraNode eXchange Industrial - TNX

The TetraNode eXchange (TNX R-828) product is the switch of the Tetra network. It provides switching and base station management capabilities

The TNX hardware is based on a CompactPCI solution running a Linux operating system. I

3.2.5   R-880 SIP Gateway

The R-880 SIP Telephony Interface provides connection to IP-PBX by means of the Session Initiation Protocol (SIP).

Figure 6 R-880 SIP Gateway

3.2.6   Radio Network Management System

The Radio Network Management system is split into a server application and client applications. The server application runs in the TNX. The TNX interfaces with the NMS clients (R-910 Network Management Station).

The Rohill NMS provides basic functionality to:

•   Configure the TETRA network,

•   Perform subscriber management (fleets and individuals) with the possibility to change priority levels,

- Monitor faults of nodes / links,

- Configure and set security policies.

The NMS client runs on Windows XP or Vista and is connected to the TNX over IP, communicating using http or https.

Figure 7 R-910 Network Management Station

3.2.7 Line Dispatcher Station

The R-915 Line Dispatcher Station (LDS) Chameleon is a PC application for monitoring and controlling calls in a TETRA Network.

4 VOIP TELEPHONE NETWORK

4.1 VOIP TELEPHONE NETWORK ARCHITECTURE

The IP Telephony communications are supported by The Alcatel-Lucent OmniPCX IP PBX Enterprise Communication solution.

4.1.1 General overview

The Alcatel-Lucent OmniPCX Enterprise Communication solution includes:

Communication Server

The Communication Server is the core of the VoIP network: It supports the Communication Server engine for the management of IP Media Gateways and provides access to a high level of telephony services.

The communication server provides:

- Support for one or several media gateways

- Service and call control for IP communication devices (IP Touch, Mobile IP Touch, multimedia PCs, SIP phones, or H.323 terminal devices)

- Service and call control for Legacy TDM communication devices (e.g. Alcatel-Lucent 9 Series phones, single line phones)

- Configuration and supervision through local or remote network management systems

Media Gateway

The IP Media Gateways manage the accesses and interfaces of a customer solution. They are controlled by the Communication Server through an IP connection.

The Media Gateway provides:

- IP connectivity with the Communication Server

- Connection to external networks (public or private), via To or E1 interface

- Connection to digital TDM phones, attendant locations (UA interfaces)

- Connection to analog devices such as fax machines (z-analog interfaces)

- Connection of DECT base stations

- Voice compression channels: G.711, G.723, G.729A

- DSP resources for media services: voice guides, conferencing, etc.

Analog Voice Gateway

For connection of analog phones, an analog voice gateway function is required. The function can be hosted within the Alcatel-Lucent Media Gateway (by the SLI16 card).

Telephones

The IPTouch 8 Series phones are connected to the VoIP PBX system directly through the IP network.

Figure 8 IP Touch 4028, 4038 and 4068 Phones

Network Management

The OmniVista 4760 supports extensive network supervision (topology and alarm management), accounting management (report generation, trend analysis) and network performance monitoring (response time, capacity, equipment load and performance, etc.) capabilities.

4.1.2 VoIP Telephone Network interfaces

The Fixed Telephone Network is interconned to the TETRA Radio Network via the optical fiber link between the Unit 141 and the Unit 9300.

4.2 TELEPHONE NETWORK CONFIGURATION

The Telephone Network consists of:

- The OmniPCX Enterprise OXE hosted in the IP Media Gateway platform located in the Office 9300 Telecom room

- Three Analog Gatreways installed respectively in the Main Guard House, the HSE buiding and the Store office.

One IP Media Gateway platform is provided with:

- one Communication Server Card (CS-2);

- one Gateway Driver board (GD-3);

- SLI16 cards that support connectivity of up to 80 analog phones (not provided in the Work Preliminary Phase).

For future network growth, expansion racks can be added, connected to the main rack by a high speed link (HSL) and if required the Communication Server function can be implemented on a dedicated hardware.

The following phones are supplied

- Alcatel-Lucent 8 Series VoIP telephones: the models 4028, 4038 and 4068

- For analog telephones for the employee rooms, the Alcatel-Lucent Temporis T170
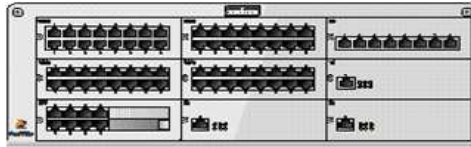
***Alcatel-Lucent OmniPCX
Enterprise RM3 (19-in. rack)***
• 9 modular slots (stackable up to
3 with RM1)
• Takes optimized hardware
modules (or/and e-CS communication
server)
• Depth: 15.75 in. (400 mm)
• Height: 6.06 in. (154 mm)
• Width: 17.40 in. (442 mm)
• Weight: 38 lb (17 kg)

•

Figure 9 OmniPCX Entreprise IP Media Gateway
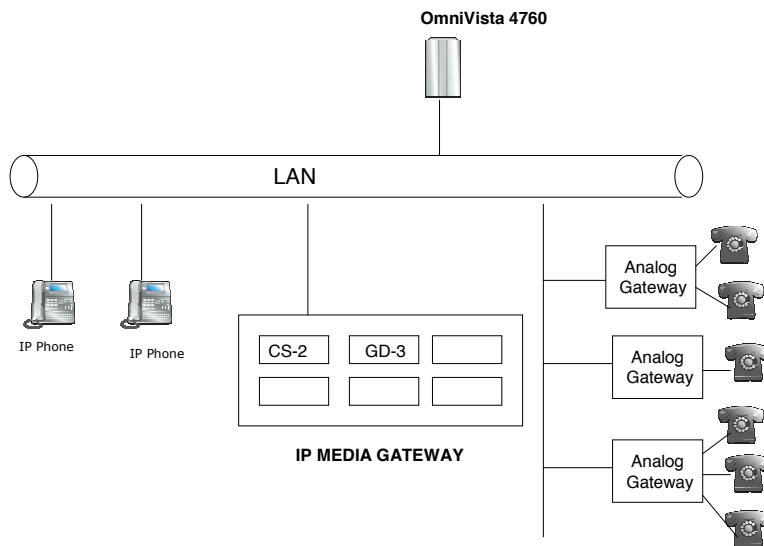
Figure 10 IP-PBX Solution

4.3 TELEPHONE EQUIPMENT

The Telephone set include:

• IP Phone Terminals: ALU Series 8 VoIP Phone IP TOUCH 4068, 4028, 4018

- Analog Phone Terminals

- The IP Phone Teminals are connected by means of RJ45 CAT6 outlets through the Structured Cabling System (see LAN cabling chapter).

Location	Type	Equipped Capacity	Expansion
Analog Phone Terminals		**26**	
	ALU T170	14	
	ALU T170	6	
	ALU T170	6	
IP Phone Terminals		**146**	
	ALU Series 8 VoIP Phone IP Touch 4068	1	
	ALU Series 8 VoIP Phone IP Touch 4028	131	
	ALU Series 8 VoIP Phone IP Touch 4018	14	

4.4 IP-PBX EQUIPMENT ARRANGEMENT

5 LAN INFRASTRUCTURE

5.1 LAN CABLING

The Structured Cabling System is built as following:

- RJ45 CAT6 Patch Panel installed in LAN cabinets as central starting point

- A set of cables connecting RJ45 CAT6 outlets

- Wall mounted RJ45 CAT6 outlets

The Structured Cabling System supply is not part of Alcatel-Lucent scope. The RJ45 patch cords between RJ45 Path Panels installed into LAN cabinets and Ethernet switches are not taken into account.

5.2   LAN ARCHITECTURE

The LAN architecture within the Unit 9 is the following:

•   One Core switch in charge of Layer 3 switching and the Aggregation/Distribution Layer 2 switching

•   Edge switches for Aggregation/Distribution Layer 2 switching located in the different areas of the Unit 9300   according to the Unit 9 Block Diagram Drawing (9806J-0453-DW-1530-601-0).

The LAN architecture within the Unit 1 involves one Core switch featuring Layer 3 switching and Layer 2 switching.

5.3   LAN EQUIPMENT CONFIGURATION

The LAN infrastructure is built up based on the following products:

•   Two Alcatel-Lucent OmniSwitch OS6850 (OS6850-U24) featuring L3 switching and L2 switching act as Core switches.These Core switches provide SFP connectors for optical links. Each OS6850-U is linked to one OmniSwitch OS6850-24 in stacking configuration mode for RJ5 connectors.

•   LAN aggregation/ distribution within the Unit 9 is supported by a combination of Alcatel-Lucent OmniSwitch OS6850-24 (24 ports) and Alcatel-Lucent OmniSwitch OS6850-P24 switches as Edge switches. The OS6850-24 switches are used for PC connectivity while the OS6850-P24 switches are dedicated to VoIP phone connectivity and support Power Over Ethernet (PoE).

5.3.1   Core Switches

The OS6850-U24X chassis is the model for the Core Switch located in the Unit 9 Technical Room and for the Core Switch located in the Unit 1.

The OS6850-U24X chassis contains the following:

•   System status and slot indicator LEDs

•   (22) unshared 1000 Base-X SFP connectors

•   (2) shared combo 1000base-X SFP connectors

•   (2) Combo RJ-45 10/100/1000Base-T

USB Port
High speed USB 2.0 port, which can be used for quick upgrades.

1000Mbps SFP
The OS6850-U24X provides 22 non-combo SFP connectors for 1000Base-X SFP connectors (1–22) and 2 combo SFP connectors for1000Base-X SFP connectors (23–24).

Console Port
The OS6850-U24X front panel provides one RJ-45 port for console connections. Console connections are used by network administrators for switch management. This female RJ-45 connector provides a DTE console connection.

XFP
The OS6850-U24X front panel provides two for 10 Gbps Small Form Factor Pluggable (XFP) transceivers.

Combo RJ-45 10/100/1000
The OS6850-U24X provides two combo 10/100/1000BaseT.

By default, when an SFP is installed in a combo port, it takes over the port number of the corresponding RJ-45 Ethernet port. In other words, if an SFP is installed in the slot labeled 24, Ethernet port 24 would no longer be available and cannot be used for 10/100/1000 traffic. This default setting is referred to as "preferred fiber." Refer to

Figure 11 OS6850-U24X

5.3.2   Edge Switches

The following edge switches are supplied:

- OS6850-24 chassis for the RJ-45 connection of IT equipment

- OS6850-P24 chassis for the RJ-45 connection of IP Phone
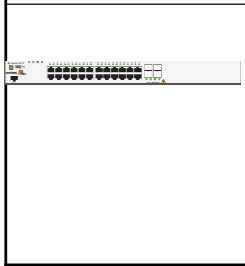
	OS6850-P24	• 24 PoE ports • 20 RJ-45 connectors configurable to 10/100/1000 Base-T • 4 MiniGBIC combo ports (port 21 - 24) • 2 10Gig stacking ports • Capacity: 44Gbps Full Duplex or 88Gbps • Throughput: 35.7 Mpps • Maximum power for POE on P24 (360W PS) is 230W (**9.6W per port**)
	OS6850-24	• 24 triple speed ports • 20 RJ-45 connectors configurable to 10/100/1000 Base-T • 4 MiniGBIC combo ports (port 21 - 24) • 2 10Gig stacking ports • Capacity: 44Gbps Full Duplex or 88Gbps • Throughput: 35.7 Mpps • Powered by 126W AC

Figure 12 OS6850 Product description

The OS6850-24 chassis contains the following:

- 20 x 10/100/ 1000 Mbps ports

- 4 combo ports: Combo ports are ports individually configurable to be 10/100/1000BaseT or 1000BaseX that can support SFP transceivers for short, long and very long distances

- 2 x 10 GE stacking ports

- 126 watt AC power supply

USB Port
High speed USB 2.0 port, which can be used for quick upgrades.

Status and Slot Indicator LEDs

Console Port
The OS6850-24 front panel provides one RJ-45 port for console connections. Console connections are used by network administrators for switch management. This female RJ-45 connector provides a DTE console connection.

10/100/1000Mbps
The OS6850-24 provides 20 fixed 0/100/1000BaseT non-combo (1–20) and 4 fixed 10/100/1000BaseT combo (21–24). These are auto-sensing and auto-MDIX and use RJ-45 connectors.

Combo SFP
The OS6850-24 provides four combo SFP connectors for 1000Base-X high-speed connections.

By default, when an SFP is installed in a combo port, it takes over the port number of the corresponding RJ-45 Ethernet port. In other words, if an SFP is installed in the slot labeled 24, Ethernet port 24 would no longer be available and cannot be used for 10/100/1000 traffic. This default setting is referred to as "preferred fiber
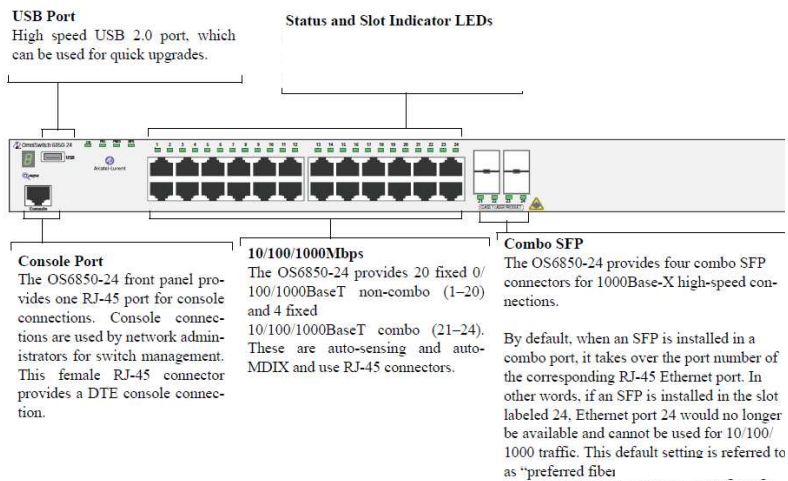
Figure 13 OS6950-24 Front Panel

5.4   LAN EQUIPMENT ARRANGEMENT
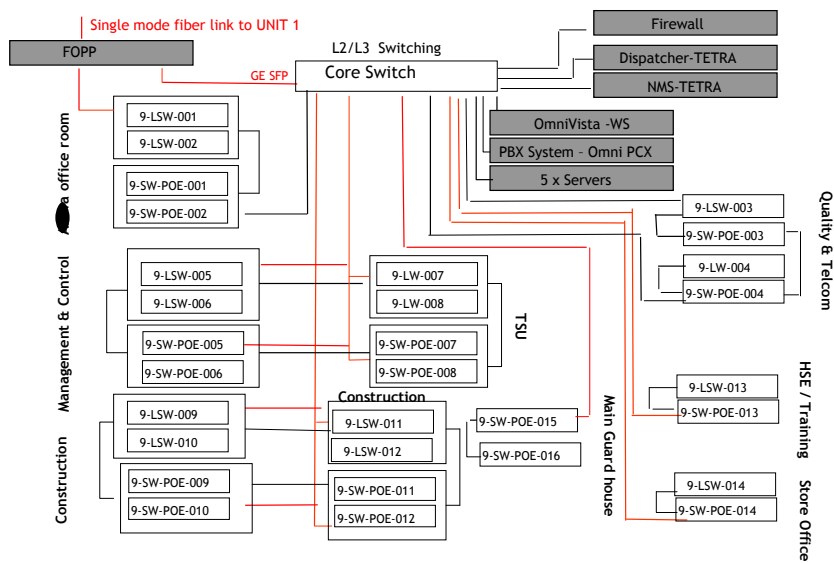
5.4.1   LAN topology

Figure 14 LAN topology

The Edge switches within the 9 Office- Main Construction (racks 9-DAK-002 and 9-DAK-003) are connected to the Core switch (rack 9-SVC-001 in Telecom room) by means of optical patch cord without optical patch panel straight switch-to-switch: **LC** connector (SFP-GIG-LX) - **LC** connector (SFP-GIG-LX) **100m length** optical patch cords are used.

The Edge switches located in the remote sites (HSE building, Store Office, Main guard house) are connected to the Core switch by means of 12-fiber single mode optical cable via optical patch panel: **LC** connector (SFP-GIG-LX) – **FC/APC** connector **1m length** optical patch cords are used to connect the switch port to the optical patch panel connector within the rack.

5.4.2   Stacking configuration mode

The stacking configuration modemakes use of the two dedicated stacking ports (A and B) from the rear panel.

The switches working in stacking configuration mode must be connected via provided stacking cables: 60cm-long HDMI stacking cables.
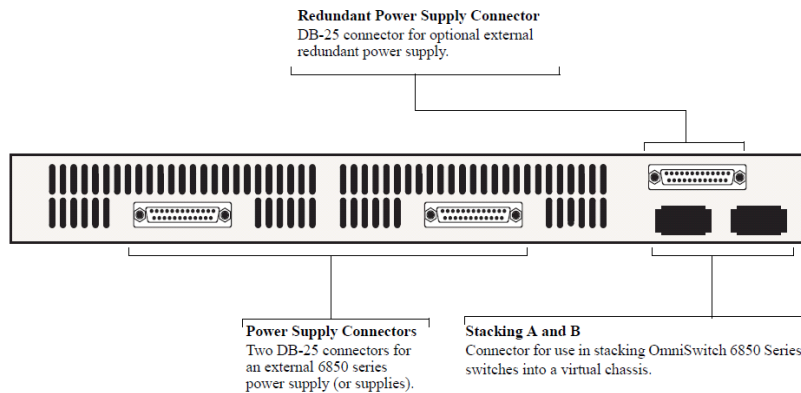
Figure 15 OmniSwitch 6850 series rear panel

5.4.3   LAN Equipment Bill of Material

Location	Material	Quantity	Switch Type
Main Construction Office	Routeur - switch Layer 3	2	OS6850-U24X + redundant power supply OS6850-BP + OS6850-24
Main Construction Office	SFP GE for router - switch layer 3	20	SFP-GIG-LX
Main Construction Office	Firewall	2	Fortinet Fortigate FG60 B
Main Construction Office	Switch PEO	9 quoted (12	OS6850-P24

		are required)	
Main Construction Office	Switch	**9 quoted (12 are required)**	OS6850-24
HSE	Switch PEO	**1**	OS6850-P24
HSE	Switch	**1**	OS6850-24
Store Office	Switch	**1**	OS6850-24
Store Office	Analog gateway 8 ports	**1**	Gateway Audiocodes
Store office	Switch PEO	**1**	OS6850-P24
Main Guard House	Analog gateway 8 ports	**1**	Gateway Audiocodes
Main Guard House	Switch PEO	**2**	OS6850-P24
	Analog gateway 12 ports	**1**	Gateway Audiocodes
	SFP GE for routers and switches	**17**	SFP-GIG-LX

5.4.4 LAN Equipment Racking

The following LAN cabinets are provided installed:

• **9300-DAK-003 Cabinet** for the LAN of the building 3/Unit 9 related to Construction offices

• **9300-DAK-002 Cabinet** for the LAN of buiding 2 /Unit 9 related to Management & project control and Sub contract Engineering TSU offices

• **9300-DAK-001 Cabinet** for the LAN of the building 1/Unit 9 related to and Quality/Telecom

• **9300-DAK-005 Cabinet** for the LAN of HSE offices /Training room

• **9300-DAK-006 Cabinet** for the Store Office

• **9300-DAK-007 Cabinet** and **9-DAK-008 Cabinet** for the Main guard house

5.4.5 LAN Equipment Naming

The Lan Equipment Naming is defined as following:

Location Name	Rack Name	Switch Name	Switch Type
Office 9- Technical room -	**9-DAK-001**	**9-LSW-001**	Edge Switch OS6850-24
		9-LSW-002	LSW-001 and LSW-002 are working in stacking configuration mode
Office 9 Technical room -	**9-DAK-001**	**9-SW-POE-001**	Edge Switch OS6850-P24

		9-SW-POE-002	working in stacking configuration mode
Office 9300- Technical room - Quality / Telecom	**9-DAK-001**	**9-LSW-003**	Edge Switch OS6850-24
		9-LSW-004	LSW-003 and LSW-004 are working in stacking configuration mode
Office 9- Technical room - Quality / Telecom	**9-DAK-001**	**9-SW-POE-003**	Edge Switch OS6850-P24
		9-SW-POE-004	SW-POE-003 and SW-POE-004 are working in stacking configuration mode
Office 9- Building 2 – Management & Project Control	**9-DAK-002**	**9-LSW-005**	Edge Switch OS6850-24
		9-LSW-006	LSW-005 and LSW-006 are working in stacking configuration mode
Office 9- Building 2 – Management & Project Control	**9-DAK-002**	**9-SW-POE-005**	Edge Switch OS6850-P24
		9-SW-POE-006	SW-POE-005 and SW-POE-006 are working in stacking configuration mode
Office 9- Building 3 – Construction	**9-DAK-003**	**9-LSW-009**	Edge Switch OS6850-24
		9-LSW-010	LSW-009 and LSW-010 are working in stacking configuration mode
Office 9- Building 3 – Construction	**9-DAK-003**	**9-SW-POE-009**	Edge Switch OS6850-P24
		9-SW-POE-010	SW-POE-009 and SW-POE-010 are working in stacking configuration mode
Office 9- Building 3 – Construction	**9-DAK-003**	**9-LSW-011**	Edge Switch OS6850-24
		9300-LSW-012	LSW-011 and LSW-012 are working in stacking configuration mode
Office 9- Building 3 – Construction	**9-DAK-003**	**9-SW-POE-011**	Edge Switch OS6850-P24
		9-SW-POE-012	SW-POE-011 and SW-POE-012 are working in stacking configuration mode
HSE building	**Wall mounted 9-DAK-005**	**9-LSW-013**	Edge Switch OS6850-24
HSE building	**Wall mounted 9-DAK-005**	**9-SW-POE-013**	Edge Switch OS6850-P24
Store Office building	**Wall mounted 9-DAK-006**	**9-LSW-014**	Edge Switch OS6850-24
Store Office building	**Wall mounted 9-DAK-006**	**9-SW-POE-014**	Edge Switch OS6850-P24
Main Guard House	**Wall mounted 9-DAK-007**	**9-SW-POE-015**	Edge Switch OS6850-P24

Main Guard House	**Wall mounted** **9-DAK-008**	**9-SW-POE-016**	Edge Switch OS6850-P24

6 IT EQUIPMENT

6.1 IT EQUIPMENT BILL OF MATERIAL

Location	Type	Number	Interface
Servers			
Technical Room	Server Hewlett Packard	5	Gigabit Ethernet with Core Swith
PCs			
	Desktop Personnal Computer HP	74	RJ45 with Edge switch
	Laptop HP	20	RJ45 with Edge switch
WorkStations			
	3D CAD WorkStation HP Z400	3	
	Review WorkStation HP Z600	4	
Printers			
	Network B&W A3/A4 Multi-function Printer/Copier	4	
	Network Color A3/A4 Multi-function Printer/Copier	4	RJ45 with Edge switch
	Multi-function Printer/Copier Maintenance	8	

6.2 IT RACKS

Location Name	Rack Name	Equipment Name	Switch Type
Office 9- Technical room	**9-SCV-001**	**9-LRT-001**	Core Switch OS6850-U24 andnCore Switch OS6850-24 are working in stacking configuration mode.
		9-LRT-002	
		9-LSW-003	Edge Switch OS6850-24
		9-SRV-001	HP Server
		9-SRV-002	HP Server
		9-SRV-003	HP Server
Office 9- Technical room	**9-SCV-002**	**9-SRV-004**	HP Server
		9-SRV-005	HP Server
		9-LFW-001	Firewall : Fortinet
		9-PBX-001	PBX

7   OPTICAL FIBER SUB-SYSTEM

7.1   BILL OF MATERIAL

Components	Quantity	Type	Remarks
Optical Patch Panel **Optic cable management**	5	19 inches-1U sub-rack with 24-fiber capacity 24 * pigtails single mode FC/APC 24* connectors FC/APC	Main Construction Office
Optical Patch Panel **Optic cable management**	1	19 inches-1U sub-rack with 24-fiber capacity 24 * pigtails single mode FC/APC 24* connectors FC/APC	HSE Buiding
Optical Patch Panel **Optic cable management**	1	19 inches-1U sub-rack with 24-fiber capacity 24 * pigtails single mode FC/APC 24* connectors FC/APC	Store Office
Optical Patch Panel **Optic cable management**	3	19 inches-1U sub-rack with 24-fiber capacity 24 * pigtails single mode FC/APC	Main guard house

		24* connectors FC/APC	
Optic patch cord 1m	100		
Optic patch cord 100m	10		
Optical jumper 3m	28		

7.2 NAMING

Location	Equipment Type	Description	Equipment Name
Unit 1	**Optical Patch panel**	Termination 12-fiber single mode optical link with the unit 9300	
9-SCV-001 (Main Construction)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the unit 141	**9-FPP-009**
9- SCV-001 (Main Construction)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the HSE Building	**9-FPP-006**
9- SCV-001 (Main Construction)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the Store Office	**9-FPP-007**
9- SCV-001 (Main Construction)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the Main guard house	**9-FPP-008**
9- DAK-005 (HSE Building)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the Main Construction	**9-FPP-012**
9- DAK-006 (Store Office)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the Main Construction	**9-FPP-013**
9- DAK-008 (Main guard house)	**Optical Patch panel**	Termination 12-fiber single mode optical link with the Main Construction	**9-FPP-014**
9- DAK-008 (Main guard house)	**Optical Patch panel**		**9-FPP-015**
9- DAK-008 (Main guard house)	**Optical Patch panel**		**9-FPP-016**

7.3 CONFIGURATION

Equipment Type	From	To	Description

Optical Patch panel	9-SCV-001 (Main Construction) 9-FPP-009	9-FPP-xxx	12-fiber single mode optical link between unit 9 and unit 141
Optical Patch panel	9-SCV-001 (Main Construction) 9-FPP-006	9-DAK-005 (HSE Building) 9-FPP-012	12-fiber single mode optical link between Telecom room and the HSE Building
Optical Patch panel	9-SCV-001 (Main Construction) 9-FPP-007	9-DAK-006 (Store Office) 9-FPP-013	12-fiber single mode optical link between Telecom room and the Store Office
Optical Patch panel	9-SCV-001 (Main Construction) 9-FPP-008	9-DAK-008 (Main guard house) 9-FPP-014	12-fiber single mode optical link between Telecom room and the Main guard house
Optical Patch panel	9300-DAK-008 (Main guard house) 9-FPP-015	9300-DAK-007 (Main guard house) 9-FPP-016	Optical patch cord FC/APC <-> FC/APC to connect Ethernet switches

8   GENERAL DRAWINGS

1) To see documents Arrangement Drawings for Operator Consoles and Desks, System Cabinet, Control Boxes, Cabinet and Panels

     3BLfor LAN and PABX for Radio

2) To see wiring drawings

     3BL for LAN and PABX 3BL for Radio

3) To see Terminal Block Diagrams

     3BL