PETROBRAS	TECHNICAL SPECIFICATION	Nº:	I-ET-3010.00-5517-768-PPT-006
	CLIENT: SRGE	SHEET:	1 of 18
	JOB: TELECOMMUNICATION DATA		
	AREA: -		
TIC	TITLE: TOPSIDES DATA NETWORK		INTERNAL
			OI/CS

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1. SUBJECT

1.1 This technical specification describes the minimum requirements and basic characteristics for the supply of the Data Network System to be installed into PETROBRAS FPSO unit – TOPSIDE, covering equipment, materials, software and interconnection instructions. That system will be referred as NETWORK along this document.

2. ABBREVIATIONS

ABNT	Brazilian Association of Technical Standards
AC	Alternating Current
ANATEL	Brazilian Telecommunication Authority
ANSI	American National Standards Institute
ART	Technical Responsibility Note
BGP	Border Gateway Protocol
CCR	Central Control Room
CCTV	Closed Circuit TV
CREA	Brazilian Engineering Council
CT	Cabin Terminal
DC	Direct Current
DIO	Optical Distribution Drawer
FPSO	Floating, production, storage and offloading
IEC	International Electrotechnical Commission
IEEE	Institute of Electric and Electronic Engineers
INMETRO	National Institute of Metrology
IMO	International Maritime Organization
IP	Internet Protocol
ITU	International Telecommunication Union
IPTV	Internet Protocol Television
LAN	Local Area Network
LSZH	Low Smoke Zero Halogen
MODU	Mobile Offshore Drilling Unit
MPEG	Moving Picture Expert Group
NOC	Network Operations Center
OSI	Open Systems Interconnection
OSPF	Open Short Path-First
PoE	Power Over Ethernet
QoS	Quality of Service
QoE	Quality of Experience
RF	Radio Frequency
RTP	Real Time Protocol
SNMP	Simple Network Management Protocol
SOLAS	Safety Of Life At Sea
IPTV	Internet Protocol Television
UDP	User Datagram Protocol

UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
UTP	Unshielded Twisted Pair
VAC	Volts Alternating Current
VDC	Volts Direct Current
WAN	Wide Area Network

3. REFERENCE DOCUMENTS, CODES AND STANDARDS

3.1 International Standards

a. IEC 1000-4-2: Electrostatic discharge (ESD) requirements.

b. IEC 60079: Electrical apparatus for explosive gas atmospheres - all parts.

c. IEC 60092-502: Electrical installations on ships.

d. IEC 60331: Tests for electric cables under fire conditions - circuit integrity – all parts.

e. IEC 60332: Flame-retardant characteristics of electric cables.

f. IEC 60529: Degrees of protection provided by enclosures (IP code).

g. IEC 60533: Electrical and electronic installations in ships - electromagnetic compatibility.

h. IEC 60945: Maritime navigation and radiocommunication equipment and systems – general requirements – methods of testing and required test results.

i. IEC 61000: Electromagnetic compatibility (EMC) series - all parts.

j. IEC 61892-7: Mobile and fixed offshore units - electrical installations - part 7: hazardous area.

k. ETSI TS 102 361-1: Air interface protocol.

l. ETSI TS 102 361-2: Voice and General Services and Facilities.

m. ETSI TS 102 361-3: Data Protocol.

n. ETSI TS 102 361-4: Trunking Protocol.

o. CISPR 22: Information technology equipment; Radio disturbance characteristics; Limits and methods of measurement.

p. EN 55022: Information technology equipment; Radio disturbance characteristics; Limits and methods of measurement.

q. IMO MODU Code: Code for the Construction and Equipment of Mobile Offshore Drilling Units.

r. IMO Resolution A.1021: Codes on Alerts and Indications.

s. IMO Resolution A.801: Provision of Radio Services for the Global Maritime Distress and Safety System.

t. IMO SOLAS: International Convention for the Safety of Life at Sea.

3.2 Brazilian Standards

3.2.1. INMETRO

a. INMETRO PORTARIA 115 (21/março/2022): regulamento de avaliação da conformidade de equipamentos elétricos para atmosferas potencialmente explosivas, nas condições de gases e vapores inflamáveis e poeiras combustíveis.

3.2.2. NR's – Normas Regulamentadora

a. NR-10: Segurança em instalações e serviços em eletricidade.

b. NR-37: Segurança e saúde em plataformas de petróleo.

c. It shall be followed all others NR's – Normas Regulamentadoras (Regulatory Standards) from Ministério do Trabalho (Brazilian Ministry of Labor) applicable to this Technical Specification.

3.2.3. ANATEL – Regulations of Agência Nacional de Telecomunicações.

3.2.4. DPC – Departamento de Portos e Costas.

a. NORMAM 01: Normas da Autoridade Marítima para Embarcações Empregadas na Navegação em Mar Aberto.

3.3 Classification Society

3.3.1. The detailed design shall be submitted to approval by Classification Society. The design and installation shall take into account their requirements and comments.

4. GENERAL REQUIREMENTS

4.1 CONTRACTOR shall provide all the materials to install all equipment, accessories, cables and infrastructure that compose the NETWORK.

4.2 For PETROBRAS detailed design requirements, Installation, Configuration, Tests training and Commissioning CONTRACTOR shall be complied with the

DESCRIPTIVE MEMORANDUM I-MD-3010.00-5510-760-PPT-001 – GENERAL CRITERIA FOR TELECOMMUNICATIONS DESIGN.

4.3 For telecommunications symbols, the Detailed Design shall comply with the Technical Specification: I-ET-3000.00-0000-940-P4X-002 – SYMBOLS FOR PRODUCTION UNITS DESIGN.

4.4 For telecommunications TAGs, the Detailed Design shall comply with the Technical Specification: I-ET-3000.00-1200-940-P4X-001 – TAGGING PROCEDURE FOR PRODUCTION UNITS DESIGN.

4.5 All electrical requirements for telecom package shall be in accordance with I-ET-3010.00-5140-700-P4X-003 – ELETRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE, I-ET-3010.00-5140-700-P4X-001 - SPECIFICATION FOR ELECTRICAL DESIGN FOR OFFSHORE UNITS, I-DE-3010.00-5140-700-P4X-003 - GROUNDING INSTALLATION TYPICAL DETAILS and I-ET-3010.00-5140-700-P4X-005 - REQUIREMENTS FOR HUMAN ENGINEERING DESIGN FOR ELECTRICAL SYSTEMS OF OFFSHORE UNITS.

4.6 For the cabling network used in the NETWORK, the Detailed Design shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-004 - TOPSIDE STRUCTURED CABLING NETWORK

4.7 For Topside one line diagram, the Detailed Design shall comply with TOPSIDE STRUCTURED CABLING ONE LINE DIAGRAM.

4.8 For data equipment interconnections see TOPSIDE DATA NETWORK ONE LINE DIAGRAM and HULL DATA NETWORK ONE LINE DIAGRAM.

4.9 All data equipment shall support the latest SNMP protocol version.

5. SYSTEM DEFINITIONS

5.1 The Data Network is composed of three subsystems: WAN, LAN and Secure Network. These subsystems and its interconnections are described in the Figure 1. The characteristics and requirements of the subsystem are described below:

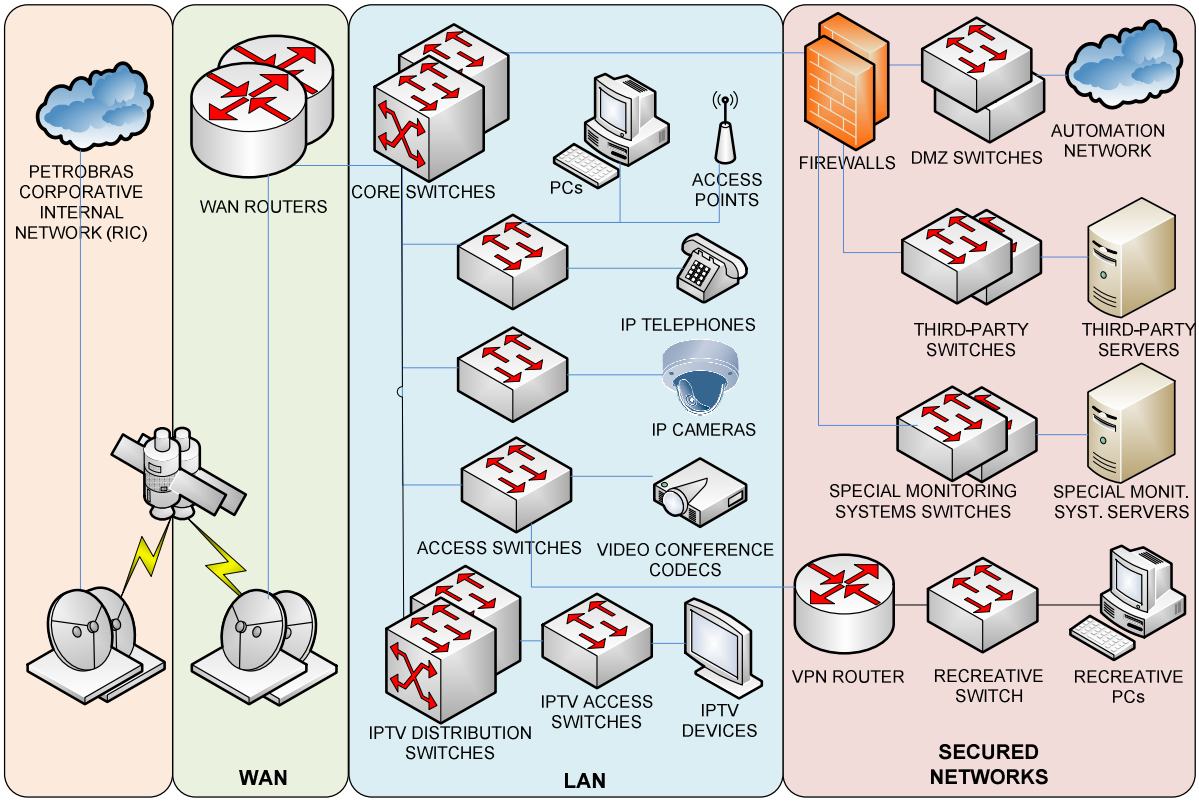

Figure 1: Network Architecture

5.2 WAN (Wide Area Network)

5.2.1. The WAN component shall be responsible for interconnecting the whole FPSO to PETROBRAS Corporative Internal Network (*Rede Interna Corporativa* – RIC). RIC is composed of WAN routers that shall be linked to independent satellite uplinks forming a high-availability architecture at first and to be interconnected to optic submarine network later.

5.2.2. The WAN shall have the following architecture below:

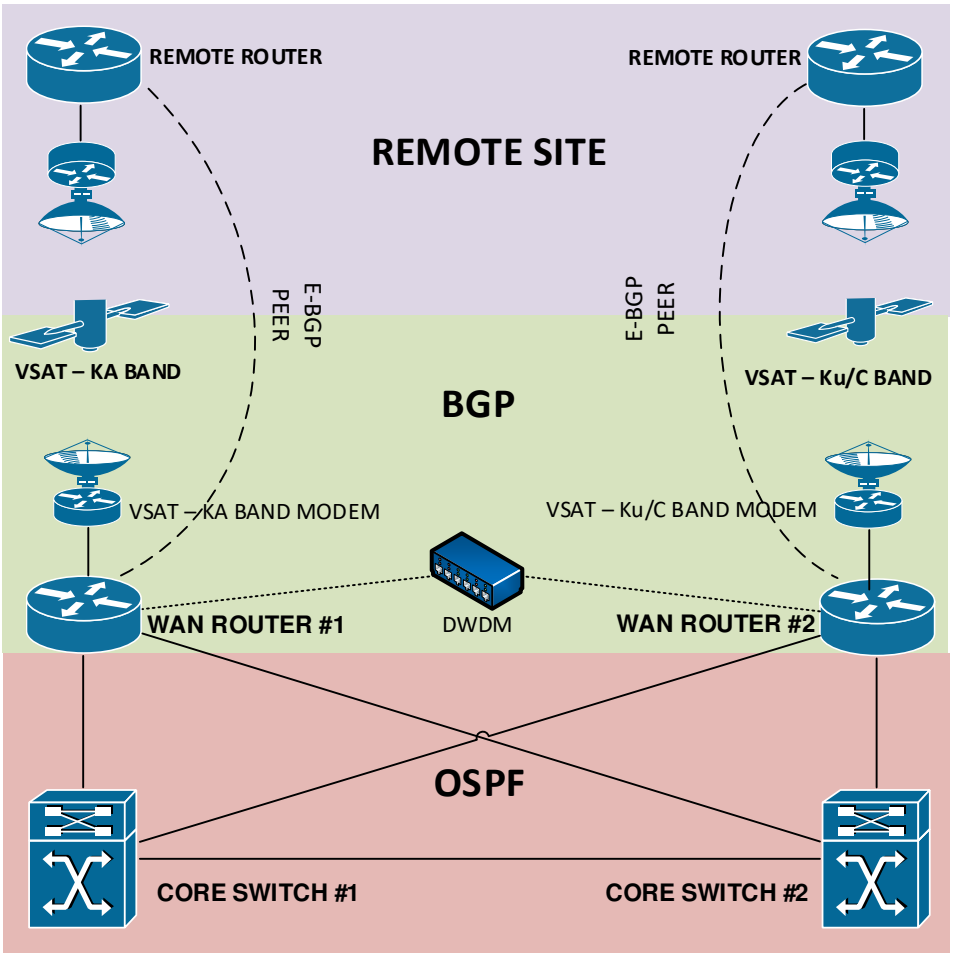

Figure 2: WAN Architecture

5.2.3. The routing protocol used between core switches and wan routers shall be OSPF. The routing protocol used between wan routers and remote routers must be BGP.

5.2.4. The BGP and OSPF configurations parameters will be informed by PETROBRAS as detailed design parameters.

5.3 LAN (Local Area Network)

5.3.1. The LAN component shall be responsible for providing data access to all IP devices like computers, laptops, access points, IP telephones, IP Cameras, videoconference codecs, servers, and so on.

5.3.2. The LAN shall be based on core/aggregation/access layers architecture model with collapsed core with aggregation layer. Core switches working in a high-availability mode shall form the core layer.

5.3.3. The access switches are either electrical or optical switches and shall have uplinks to all core switches.

5.3.4. Electrical access switches shall have PoE feature to power some devices.

5.3.5. All IPTV devices are segregated from the others IP devices through an IPTV Distribution and Access Switches.

5.4 Secure Networks

5.4.1. The secure networks component shall be responsible for providing access to automation network and servers and end-users devices through a secured/filtered connection.

5.4.2. The Secure Networks topology is detailed on the Interconnection HULL DATA NETWORK ONE LINE DIAGRAM.

5.4.3. The secured network shall be formed by firewalls, Demilitarized Zone (DMZ) switches, third-party switches, special monitoring systems switches, VPN router, recreative switch.

6. TECHNICAL REQUIREMENTS

6.1 All data equipment described in this technical specification shall be installed in appropriated rack specified in I-ET-3010.00-5517-768-PPT-004 - TOPSIDE STRUCTURED CABLING NETWORK.

6.2 All Data Network Equipment shall comply with the minimum specs below:

6.3 Electrical Access Switch

6.3.1. Each Electrical Access Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9300-48UN-A	Catalyst 9300 48-port of 5Gbps Network Advantage	1
CON-SSSNT-C930048N	SOLN SUPP 8X5XNBD Catalyst 9300 48-port of 5Gbps Network A	1
C9300-NW-A-48	C9300 Network Advantage, 48-port license	1
SC9300UK9-176	Cisco Catalyst 9300 XE 17.6 UNIVERSAL UNIVERSAL	1
PWR-C1-1100WAC-P	1100W AC 80+ platinum Config 1 Power Supply (main and redundant)	2
CAB-250V-10A-BR	Power Cord - 250V, 10A - Brazil	2
C9300-SSD-NONE	No SSD Card Selected	1
STACK-T1-50CM	50CM Type 1 Stacking Cable	1
CAB-SPWR-30CM	Catalyst Stack Power Cable 30 CM	1
TE-C9K-SW	TE agent for IOSXE on C9K	1
C9300-DNA-A-48	C9300 DNA Advantage, 48-Port Term Licenses	1
C9300-DNA-A-48-3Y	C9300 DNA Advantage, 48-Port, 3 Year Term License	1

CON-SSTCM-C93A48	SOLN SUPP SW SUBC9300 DNA Advantage	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	1
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3Y	1
D-DNAS-EXT-S-T	Cisco DNA Spaces Extend Term License for Catalyst Switches	1
D-DNAS-EXT-S-3Y	Cisco DNA Spaces Extend for Catalyst Switching - 3Year	1
TE-EMBEDDED-T	Cisco ThousandEyes Enterprise Agent IBN Embedded	1
TE-EMBEDDED-T-3Y	ThousandEyes - Enterprise Agents	1
C9300-NM-2Y	Catalyst 9300 2 x 25GE Network Module	1
SFP-10/25G-LR-S	10/25GBASE-LR SFP28 Module	2
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1

Table 1: Electrical Access Switch specs

6.3.2. CONTRACTOR shall supply additional materials described below:

Product	Description	Quantity
PWR-C1-1100WAC-P=	1100W AC 80+ platinum Config 1 Power Supply Spare	05
FAN-T2=	Fan module	05
SFP-10G-SR	10GBASE-SR SFP Module	05
GLC-SX-MMD	1000BASE-SX SFP transceiver module	05
STACK-T1-1M=	1M Type 1 Stacking Cable	05

Table 2: Additional material specs for electrical access switches

6.4 Optical Access Switch

6.4.1. Each Optical Access Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9300X-24Y-A	Catalyst 9300X 24x25G Fiber Ports, modular uplink Switch	1
CON-SSSNT-C9300XYA	SOLN SUPP 8X5XNBD Catalyst 9300X 24x25G Fiber Ports, modul	1
SC9300UK9-176	Cisco Catalyst 9300 XE 17.6 UNIVERSAL UNIVERSAL	1
PWR-C1-715WAC-P	715W AC 80+ platinum Config 1 Power Supply (main and redundant)	2
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2
C9300X-NW-A-24	C9300 Network Advantage, 24-port license	1
STACK-T1-3M	3M Type 1 Stacking Cable	1
CAB-SPWR-150CM	Catalyst Stack Power Cable 150 CM - Upgrade	1
C9300-SSD-NONE	No SSD Card Selected	1
TE-C9K-SW	TE agent for IOSXE on C9K	1
C9300X-DNA-24Y-A	C9300 DNA Advantage, Term License	1
C9300-DNA-L-A-3Y	DNA Advantage 3 Year License	1
CON-SSTCM-C930024	SOLN SUPP SW SUB C9300 DNA Advantage, Term License	1
TE-EMBEDDED-T	Cisco ThousandEyes Enterprise Agent IBN Embedded	1
TE-EMBEDDED-T-3Y	ThousandEyes - Enterprise Agents	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	1
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3Y	1

C9300-NM-2Y	Catalyst 9300 2 x 25GE Network Module	1
SFP-10/25G-LR-S	10/25GBASE-LR SFP28 Module	2
GLC-SX-MMD	1000BASE-SX SFP transceiver module	24
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1

Table 3: Optical Access Switch specs

6.5 DMZ Switch

6.5.1. Each DMZ Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9300X-48TX-A	Catalyst 9300 48-port 10G/mGig with modular uplink, data only, Network Advantage	1
CON-SSSNT-C9300XYA	SOLN SUPP 8X5XNBD Catalyst 9300X 24x25G Fiber Ports, modul	1
SC9300UK9-176	Cisco Catalyst 9300 XE 17.6 UNIVERSAL UNIVERSAL	1
PWR-C1-715WAC-P	715W AC 80+ platinum Config 1 Power Supply (main and redundant)	2
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2
C9300X-NW-A-48	C9300 Network Advantage, 48-port license	1
STACK-T1-3M	3M Type 1 Stacking Cable	1
CAB-SPWR-150CM	Catalyst Stack Power Cable 150 CM - Upgrade	1
C9300-SSD-NONE	No SSD Card Selected	1
TE-C9K-SW	TE agent for IOSXE on C9K	1
C9300X-DNA-24Y-A	C9300 DNA Advantage, Term License	1
C9300-DNA-L-A-3Y	DNA Advantage 3 Year License	1
CON-SSTCM-C930024	SOLN SUPP SW SUB C9300 DNA Advantage, Term License	1
TE-EMBEDDED-T	Cisco ThousandEyes Enterprise Agent IBN Embedded	1
TE-EMBEDDED-T-3Y	ThousandEyes - Enterprise Agents	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	1
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3Y	1
C9300X-NM-8Y	Catalyst 9300 8 x 25G/10G/1G multi-rate SFP Network Module	1
SFP-10/25G-LR-S	10/25GBASE-LR SFP28 Module	8
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1

Table 4: DMZ Switch Specs

6.6 Third-Party Switch

6.6.1. Each Third-Party Switch shall be a Cisco Catalyst C9300-24T or higher with the minimum specs below:

Product	Description	Quantity
C9300-24T-A	Catalyst 9300 24-port data only. Network Advantage	1
CON-SNT-C93002TA	SNTC-8X5XNBD Catalyst 9300	1
C9300-NW-A-24	C9300 Network Advantage, 24-port license	1
S9300UK9-1612	Cisco Catalyst 9300 XE 16.12 UNIVERSAL	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	1
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3Y	1
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1
C9300-DNA-A-24	C9300 DNA Advantage, 24-port Term Licenses	1
C9300-DNA-A-24-3Y	C9300 DNA Advantage, 24-Port, 3 Year Term License	1
C9300-NM-8X=	Catalyst 9300 8 x 10GE Network Module	1
GLC-SX-MMD	1000BASE-SX SFP transceiver module	2
PWR-C1-350WAC	350WAC power supply (main and redundant)	2
CAB-SPWR-30CM	Catalyst Stack Power Cable 30 CM	1
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2

Table 4: Optical Access Switch specs

6.7 Special Monitoring Systems Switch

6.7.1. Each Special Monitoring Systems Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9300-24T-A	Catalyst 9300 24-port data only. Network Advantage	1
CON-SNT-C93002TA	SNTC-8X5XNBD Catalyst 9300	1
C9300-NW-A-24	C9300 Network Advantage, 24-port license	1
S9300UK9-1612	Cisco Catalyst 9300 XE 16.12 UNIVERSAL	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	1
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3 Year Term License	1
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1
C9300-DNA-A-24	C9300 DNA Advantage, 24-port Term Licenses	1
C9300-DNA-A-24-3Y	C9300 DNA Advantage, 24-Port, 3 Year Term License	1
C9300-NM-8X=	Catalyst 9300 8 x 10GE Network Module	1
GLC-SX-MMD	1000BASE-SX SFP transceiver module	2
PWR-C1-350WAC	350WAC power supply (main and redundant)	2
CAB-SPWR-30CM	Catalyst Stack Power Cable 30 CM	1
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2

Table 5: Optical Access Switch specs

6.8 Firmware

6.8.1. CONTRACTOR shall be responsible for firmware/software upgrades if required during commissioning due to manufacturer suggestion (bugs and better performance detected) under PETROBRAS request.

7. SCOPE OF SUPPLY

7.1 CONTRACTOR shall be responsible for the entire Data Network package: design, engineering, manufacturing, equipment supply, install, testing, commissioning, and all documentation according with this technical specification.

7.2 The material, equipment and installation service shall be concerning the following activities.

a. Supply all equipment, material, licenses and accessories.

b. Detailed Project

c. Assembling and Configuration

d. Acceptance Tests

e. Definitive Project (As-Built)

f. Configuration services.

7.3 CONTRACTOR shall supply TOPSIDES equipment accordingly Telecom systems one line diagrams.

7.3.1. Table 1 has a preliminary minimum quantity of switches expected to be supplied. Such quantity shall be confirmed or updated by CONTRACTOR accordingly Detail Design.

Location	Equipment	Quantity
AEPR	Electrical access switches	According to Detail Design
	Optical access switches	According to Detail Design
	DMZ switch	1
	Third-party switch	1
	Special monitoring systems switch	1

Location	Equipment	Quantity
UTILITIES CLOSED MODULE	Electrical access switches	According to Detail Design
	Optical access switches	According to Detail Design

Location	Equipment	Quantity
GENERATION CLOSED MODULE	Electrical access switches	According to Detail Design
	Optical access switches	According to Detail Design

Table 6: Scope of Equipment Supply

7.4 The equipment and accessories shall attend the ingress protection degree, protection type, classifications zone and groups established by IEC / ABNT.

7.5 CONTRACTOR shall supply all equipment, cables, accessories and its must be approved and certificated by Classifying Society and technical conformity with the International and National standardization organism: ABNT, IEC and INMETRO.

7.6 The equipment and materials shall be supplied in package suitable for long periods of storage and be protected against mechanical impact and adverse weather conditions.

7.7 Topsides equipment and accessories shall be installed in M-13, M-15B and M-17.

7.7.1. Network equipment shall be installed in a 19” rack.

7.8 The Topsides Networks equipment shall be interconnected to Hull equipment accordingly topology on HULL DATA NETWORK ONE LINE DIAGRAM.

7.8.1. Hull equipment and accessories shall comply with technical specifications: I-ET-3010.00-5517-768-PPT-001 – HULL DATA NETWORK.

7.9 Every warranty, license and services purchased from CISCO manufacturer shall be transferred to Petrobras Smart Account (SA), which ID is tic.petrobras.com.br. From other vendors, whenever required, it shall be done and assessed with PETROBRAS.

8. DIMENSIONING CRITERIA

8.1 The estimated number of equipment shall take into account to the following documents:

a. I-ET-3010.00-5517-768-PPT-004 TOPSIDES STRUCTURED CABLING NETWORK

b. TOPSIDES DATA NETWORK ONE LINE DIAGRAM

8.2 Topsides data network one line diagram presents the interconnection among equipment and also shows other required equipment.

8.3 Annex presents a preliminary network topology of the entire network.

8.4 CONTRACTOR shall be responsible for sizing of quantity of Electrical and Optical Access Switches, following the rules below:

8.5 It shall be considered physical connection to all LAN points foreseen in the detail design plus, at least, 30% of ports spare per switch.

8.6 The quantities of LAN points and access switches were estimated based on Telecom systems one line diagrams.

8.7 The LAN points quantities related to PoB Management System shall be dimensioned by CONTRACTOR according to system to be proposed and developed according to I-ET-3010.00-5511-762-PPT-001: POB MANAGEMENT AND TRACKING SYSTEM.

9. COMMISSIONING

9.1 CONTRACTOR shall dispose professionals with the profiles listed below, to meet the quality of the technical service and the deadlines agreed with PETROBRAS.

9.1.1. Design and configuration: Professionals with basic manufacturer certification with at least two years of experience in configuring Network Equipment and deploying LANs & WANs. Responsible for the preparation of the projects and configuration of the equipment.

9.2 All data equipment shall be configured with parameters informed by Petrobras during Commissioning phase and under the witness of PETROBRAS Telecom Team.

9.3 ACCEPTANCE TESTS

9.3.1. Acceptance tests consist of the performance by CONTRACTOR of all tests established in the Test Plan specified herein, and PETROBRAS 'verification of compliance with the conditions set forth in the detailed design and Technical

Specifications, to certify the perfect functioning of the Corporate Network of PETROBRAS within the specified technical characteristics.

9.3.2. All configurations shall be recorded by means of tables and print screens according to each equipment.

10. ASSEMBLY AND CONFIGURATION

10.1 The assembly and configuration service consisting in execution of all the necessary activities for the placement of the equipment and the respective data network in operation, and in the accomplishment of all the activities of verification of the attendance to the specified technical characteristics, ranging from the verification and equipment supplied and unpacking them until acceptance of the local tests.

10.2 The assembly and configuration phase shall only to be started after analysis, comments and approval by PETROBRAS of all the documentation that composes the detailed design issued by CONTRACTOR.

10.3 PETROBRAS considers the assembly and configuration activity subdivided into the following stages:

10.3.1. Mechanical assembly: placement and fixation of the equipment, materials and cables that compose the system in the respective places and under the conditions provided by the detailed design.

10.3.2. Interconnection: all electrical, signal and ground connections between the equipment and materials that compose the system and the existing associated systems, including interconnections in the electrical panels.

10.3.3. Energization: activation of the electrical supply of the equipment that compose the system.

10.3.4. Configuration: execution of all programming tasks, by software and hardware (if necessary) to initialization and customization of each equipment within the specified technical characteristics, comprising:

a. Initial and basic configuration for access permission and physical interconnections.

b. Advanced configuration, including routing protocols (OSPF), DiffServ QoS, VLANs, 802.1q, 802.1p, multicast, among others, according to the Detailed Design.

c. Local tests: execution of all necessary tasks for the placement and verification of each equipment, which composes the data network, within the specified technical characteristics, according to the Test Plan.

10.4 CONTRACTOR shall, in addition to the interconnections between the equipment comprising the LAN, perform the interconnections between these equipment and the equipment of PETROBRAS network, necessary for the operation of the network.

10.5 CONTRACTOR is responsible to provide and install all accessories, including the power cables and optical and metallic cabling (patch cords, line cords, etc.), according to the detailed design.

10.6 All optical cords, cables and wires shall be fixed, tied, identified and connected in accordance with the PETROBRAS inspection guidelines.

10.7 All optical cords, wires, cables and equipment shall be identified with labels and identifications according to PETROBRAS requirements.

10.8 The connection of the switch to the Internal Optical Distributor (DIO) shall be done as follows:

10.8.1. All cables shall be identified at both ends using mechanically printed polyester labels indelibly. IDs should also be used following the colors indicated in ANSI / EIA / TIA 569.

10.8.2. It is a CONTRACTOR responsibility to install the optical cords for the interconnection of the switch ports to the DIOs.

10.8.3. The entire installation shall use only velcro for fixing and organizing cables.

11. ANNEX

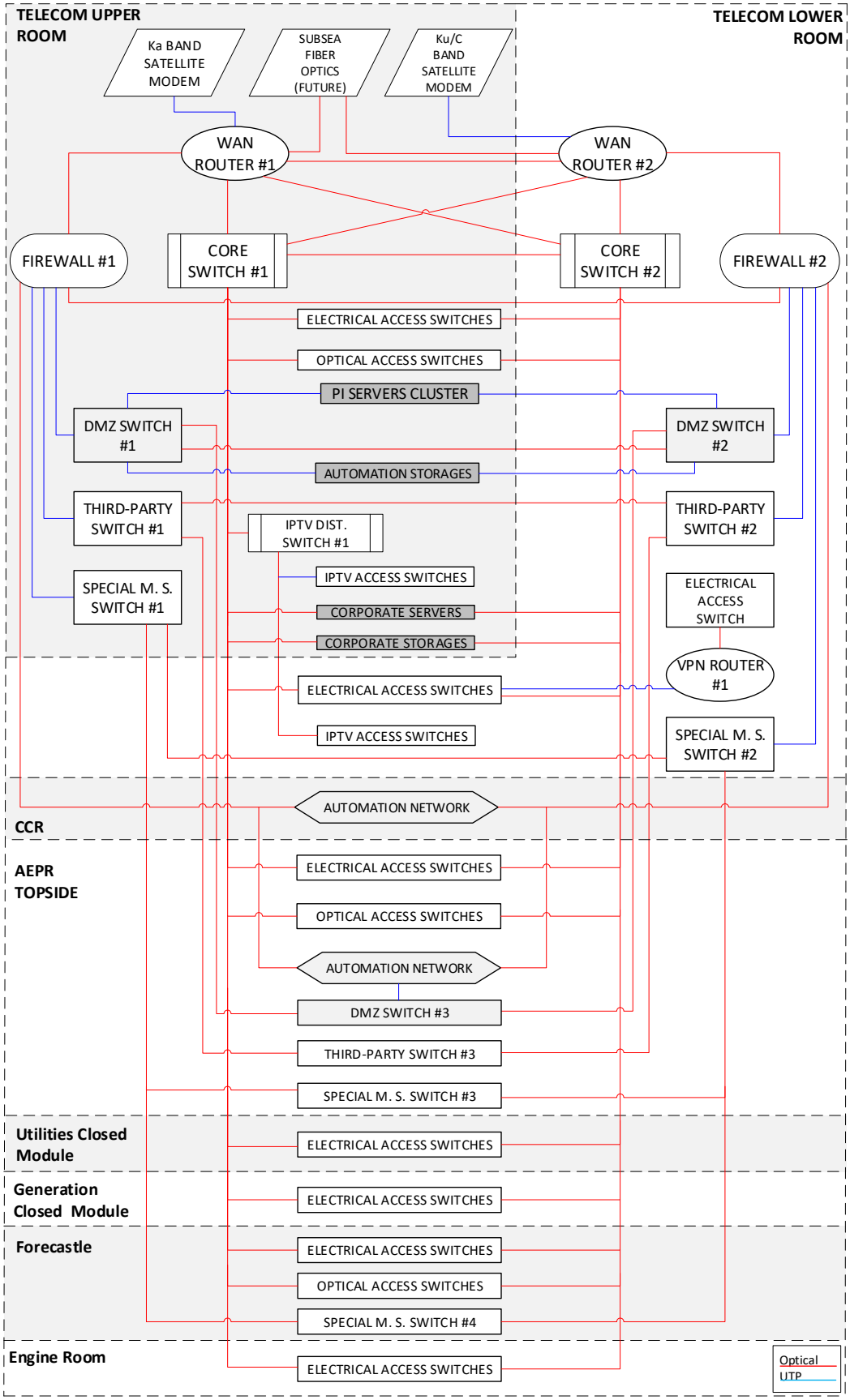

Figure 3 - Schematic network topology