PETROBRAS	TECHNICAL SPECIFICATION	Nº:	I-ET-3010.00-5517-768-PPT-001
	CLIENT: SRGE		SHEET: 1 of 26
	JOB: TELECOMMUNICATION DATA		
	AREA: -		
TIC	TITLE: HULL DATA NETWORK		INTERNAL
			OI/CS

MICROSOFT WORD / V.2016 / I-ET-3010.00-5517-768-PPT-001_C.docx

INDEX OF REVISIONS

REV	DESCRIPTION AND/OR REVISED SHEETS
0	ORIGINAL ISSUE
A	REVISED WHERE INDICATED
B	REVISED WHERE INDICATED
C	INCLUDED ITEM 6.5 AND 6.14, REVISED TABLE 17

	REV. 0	REV. A	REV. B	REV. C	REV. D	REV. E	REV. F	REV. G	REV. H
DATE	APR/15/2022	OCT/25/2022	NOV/10/2022	JUL/10/2024					
DESIGN	PROJ-US	PROJ-US	PROJ-US	PROJ-US					
EXECUTION	Y3S7	Y3S7	Y3S7	Y3S7					
CHECK	CY22	CY22	CY22	CY22					
APPROVAL	X187	X187	X187	X187					

INDEX

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 – HULL, 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 Nº 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 201: 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 HULL DATA 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 HULL DATA NETWORK, the Detailed Design shall comply with the Technical Specification: I-ET-3010.00-5517-768-PPT-002 - HULL STRUCTURED CABLING NETWORK.

4.7 For Hull one line diagram, the Detailed Design shall comply with HULL DATA NETWORK ONE LINE DIAGRAM.

4.8 For VSAT System, the Detailed Design shall comply with Technical Specification: I-ET-3010.00-5512-762-PPT-001– SATTELITE SYSTEM.

4.9 For data equipment interconnections see HULL DATA NETWORK ONE LINE DIAGRAM.

4.10 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 Networks. These subsystems and its interconnections are described in Figure 1. The characteristics and requirements of the subsystem are described below.

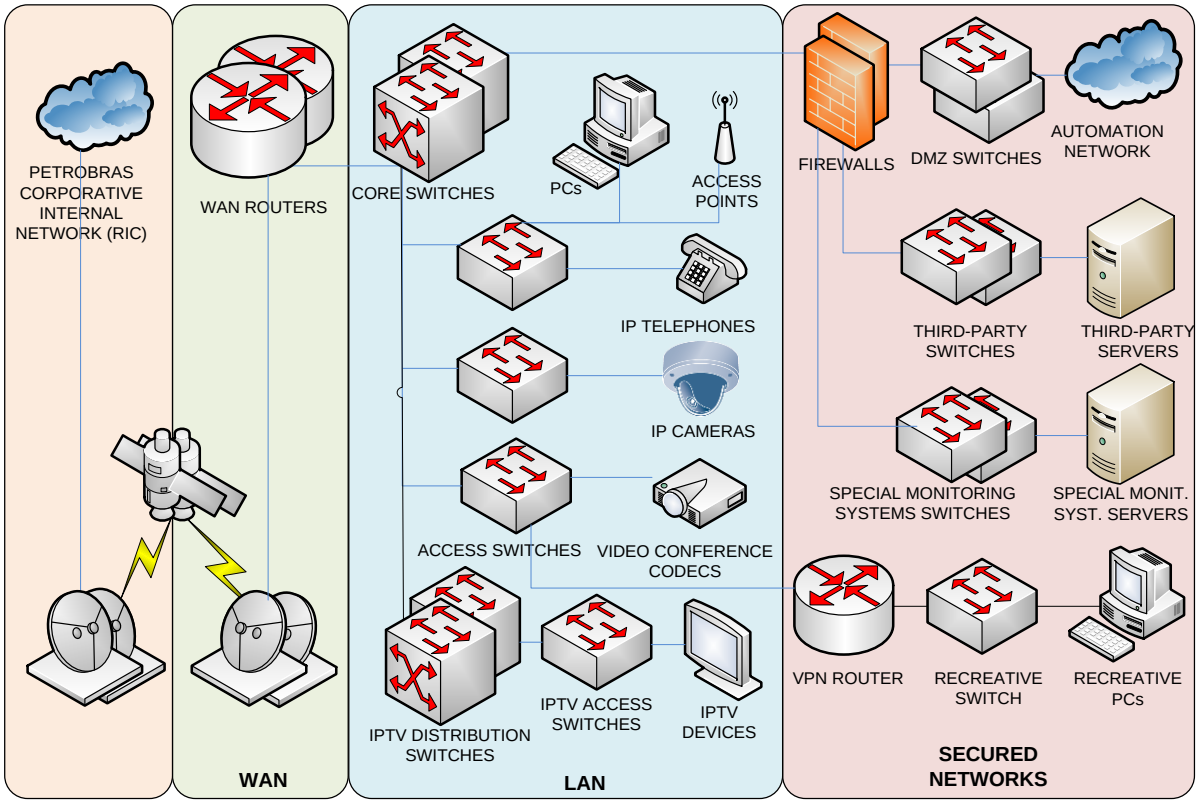

Figure 1 – Network Architecture

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:

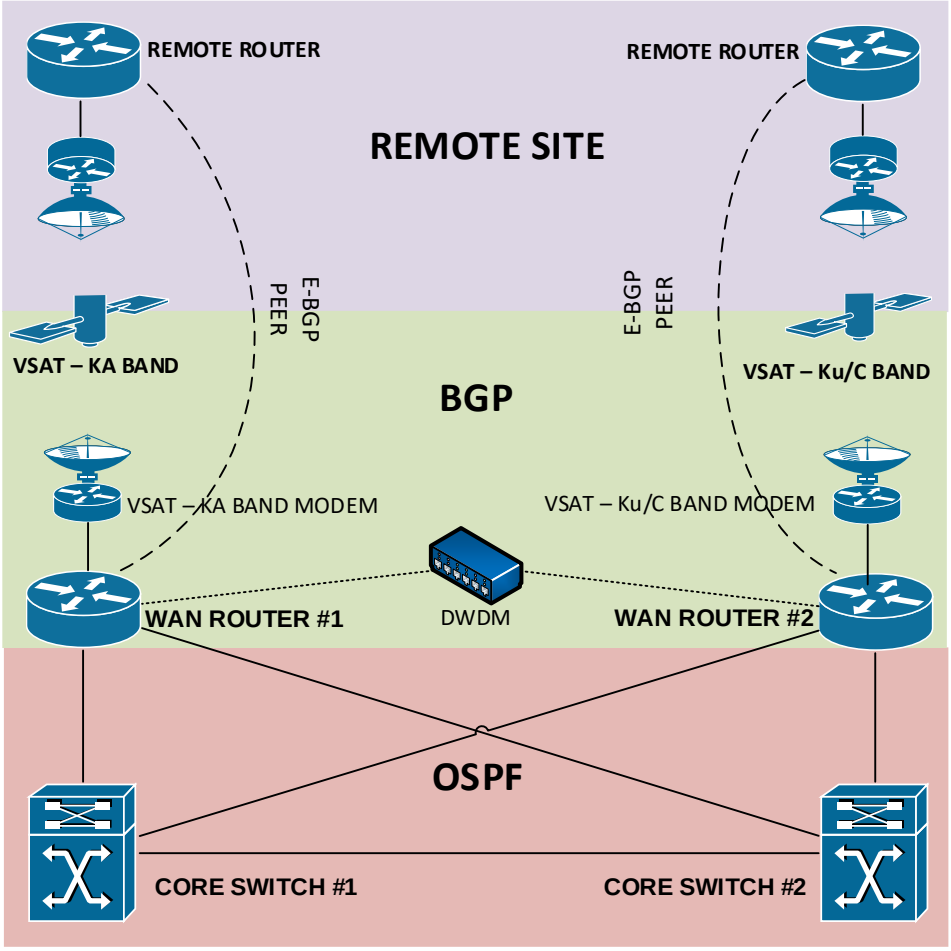

Figure 2 - WAN Architecture

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

5.2.4. The routing protocol used between wan routers and remote routers must be BGP.

5.2.5. 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, etc.

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 secured 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 Secure 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 Hull equipment and accessories shall be installed in 02 (two) different rooms: Telecom Upper Room at accommodation, close to Top deck, and Telecom Upper Room at accommodation close to CCR and Radio Room.

6.1.1. All network equipment shall be installed in 19” rack.

6.2 Topside and Automation Networks equipment and accessories shall be interconnected to Hull equipment accordingly topology detailed on Interconnection HULL DATA NETWORK ONE LINE DIAGRAM.

6.2.1. Topside equipment and accessories shall comply with technical specifications: I-ET-3010.00-5517-768-PPT-006 - TOPSIDES DATA NETWORK.

6.3 All data equipment described in this technical specification shall be installed in appropriated rack specified in I-ET-3010.00-5517-768-PPT-002 – HULL STRUCTURED CABLING NETWORK and shall comply with the minimum specs below.

6.4 WAN Router

6.4.1. Each WAN Router shall have the minimum technical specification below or higher:

Product	Description	Quantity
C8500-12X	Cisco Catalyst 8500-12X Edge Platform	1
CON-SSSNT-C85012X5	SOLN SUPP 8X5XNBD Cisco C8500-12X10GE	1
MEM-C8500-16GB	Cisco C8500 16GB DRAM	1
C8500-ACCKIT-19	Cisco C8500 Accessory Kit - 19" rack	1
C8500-RFID-1R	Cisco C8500 RFID - 1RU	1
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1
C8000-HSEC	U.S. Export Restriction Compliance license for C8000 series	1
SC8KAEPUK9-176	UNIVERSAL	1
IOSXE-CTRL-MODE	IOS XE SD-WAN boot up mode for Unified image	1
PWR-CH1-750WACR	Cisco C8500 750W AC Power Supply	1
PWR-CH1-750WACR=	Cisco C8500 750W AC Power, Spare	1
PWR-CH1-950WDCR	Cisco C8500 950W DC Power	1
PWR-CH1-950WDCR=	Cisco C8500 950W DC Power, Spare	1
CAB-C13-CBN	Cabinet Jumper Power Cord, 250 VAC 10A, C14-C13 Connectors	2
L-DNA-C8500	Cisco DNA Subscription for Catalyst 8500 Series	1
C85-12X-PF	C8500-12X Platform Selection for DNA Subscription	1
IOSXE-CTRL-MODE-PF	IOS XE SD-WAN boot up mode for Unified image -Deployment Opt	1
DNA-C-T3-A-3Y	Cisco DNA Advantage Cloud Lic 3Y - upto 10G (Aggr, 20G)	1
SVS-CDNA-T3-A3Y	Solution Support for SW - DNA Advantage Cloud Lic, T3, 3Y	1
DSTACK-T3-A	Cisco DNA Advantage Stack - upto 10G (Aggr, 20G)	1
NWSTACK-T3-A	Cisco Network Advantage Stack - upto 10G (Aggr, 20G)	1
SDWAN-UMB-ADV	Cisco Umbrella for DNA Advantage	1
SDWAN-CLOUD-PF	Cisco SDWAN Cloud Deployment Option	1
SFP-10G-SR	10GBASE-SR SFP Module	4
GLC-SX-MMD	1000BASE-SX SFP transceiver module	8

Table 2: WAN Router specs

6.5 SD-WAN Firewall

6.5.1. CONTRACTOR shall provide, install and configure 02 (two) SDWAN firewalls from Fortinet, model Fortigate 80F (FG-80F) or superior by the time of purchasing for PETROBRAS exclusive use, according to the following specifications for each equipment.

6.5.2. The equipment shall be provided with the software licenses described below:

a. Application Control

b. IPS

c. Anti-SPAM

d. Webfiltering

e. Advanced Malware Protection (AMP)

f. Industrial Services
g. SD-WAN Support
h. Basic and advanced routing support, including OSPFv2, OSPFv3, MP-BGP

6.5.3. Interfaces:

a. 2 (two) GE RJ45/SFP Shared Media Ports
b. 2 (two) WAN GE RJ45 Port
c. 6 (six) GE RJ45 Ports
d. 2 (two) GE RJ45* FortiLink Port

6.5.4. Power:

a. 12V DC, 3A with dual redundancy.
b. All SDWAN firewalls power supplies shall be powered by the Unit's UPS.

6.5.5. Accessories:

a. Rack mount tray

6.5.6. Installation requirements

a. CONTRACTOR will be responsible for equipment basic configuration with all parameters provided by PETROBRAS during the detailed design.
b. The firmware version required for data equipment shall be the latest version available by manufacturer during the commissioning phase.
c. CONTRACTOR shall provide 2 (two) GE SFP SX/LX Transceiver Module for connection with Core Switches.

6.5.7. Return Merchandise Authorization (RMA)

a. CONTRACTOR shall provide RMA and Technical Support for all equipment licenses for 5 years or along contract duration.
b. Service Level Agreement (SLA) shall be 8x5xNBD (next business day).

6.6 Core Switch

6.6.1. Each Core Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9500-48Y4C-A	Catalyst 9500 48-port x 1/10/25G + 4-port 40/100G, Advantage	1
CON-SSSNT-C9504YA4	SOLN SUPP 8X5XNBD Catalyst 9500 48-port 25/100G only, Adva	1
C9K-T1-FANTRAY	Catalyst 9500 Type 4 front to back cooling Fan	2
C9500-NW-A	C9500 Network Stack, Advantage	1
SC9500HUK9-176	Cisco Catalyst 9500H XE.17.6 UNIVERSAL	1
C9K-F1-SSD-240G	Cisco pluggable SSD storage	1
C9K-PWR-650WAC-R	650W AC Config 4 Power Supply front to back cooling	1
C9K-PWR-650WAC-R/2	650W AC Config 4 Power Supply front to back cooling	1
C9K-PWR-930WDC-R=	930W DC Config 4 Power Supply front to back cooling	1
C9K-PWR-650WAC-R=	650W AC Power Supply	1
CAB-250V-10A-BR	Power Cord - 250V, 10A - Brazil	2
PWR-2KW-DC-CBL	Power Cord - 2KW DC	2
CAB-48DC-40A-8AWG	C-Series -48VDC PSU Power Cord, 3.5M, 3 Wire, 8AWG, 40A	2
C9500-DNA-48Y4C-A	C9500 DNA Advantage, Term License	1
C9500-DNA-A-3Y	Cisco Catalyst 9500 DNA Advantage 3 Year License	1
CON-SSTCM-C9524QA	SOLN SUPP SW SUBC9500 DNA Advantage	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	3
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3Y	3
SFP-10/25G-LR-S	10/25GBASE-LR SFP28 Module	48
GLC-TE	1000BASE-T SFP	4
NETWORK-PNP-LIC	Network Plug-n-Play Connect for zero-touch device deployment	1

Table 3: Core Switch specs

6.7 Electrical Access Switch

6.7.1. 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	1
PWR-C1-715WDC=	PWR-C1-715WDC	1
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 4: Electrical Access Switch specs

6.7.2. CONTRACTOR shall supply additional materials described at Table 5:

Product	Description	Quantity
PWR-C1-1100WAC-P=	1100W AC 80+ platinum Config 1 Power Supply Spare	10
PWR-C1-715WDC=	715WDC power supply spare	10
FAN-T2=	Fan module	10
SFP-10G-SR	10GBASE-SR SFP Module	20
GLC-SX-MMD	1000BASE-SX SFP transceiver module	20
STACK-T1-1M=	1M Type 1 Stacking Cable	15

Table 5: Additional material specs for electrical access switches

6.7.3. Electrical switches for Forecastle data rack shall be delivered with only AC power supply: main and redundant ones.

6.8 Optical Access Switch

6.8.1. 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	1
PWR-C1-715WDC=	PWR-C1-715WDC	1
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 6: Optical Access Switch specs

6.8.2. Optical switches for Forecastle data rack shall be delivered with only AC power supply: main and redundant ones.

6.9 IPTV Distribution Switch

6.9.1. Each IPTV Distribution Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9500-16X-A	Catalyst 9500 16-port 10Gig switch, Advantage	1
CON-SSSNT-C95K16XA	SOLN SUPP 8X5XNBD Catalyst 9500 16-por	1
C9500-NW-A	C9500 Network Stack, Advantage	1
S9500UK9-176	Cisco Catalyst 9500 XE 17.6 UNIVERSAL	1
C9500-NM-8X	Cisco Catalyst 9500 8 x 10GE Network Module	1
PWR-C4-950WAC-R	950W AC Config 4 Power Supply front to back cooling	1
PWR-C4-950WAC-R/2	950W AC Config 4 Power Supply front to back cooling, Redundant	1
PWR-C4-950WDC-R=	950W DC Config 4 Power Supply front to back cooling, Spare	2
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2
C9500-DNA-16X-A	C9500 DNA Advantage, Term licenses	1
C9500-DNA-L-A-3Y	Cisco Catalyst 9500 DNA Advantage 3 Year License	1
CON-SSTCM-C9512QA	SOLN SUPP SW SUBC9500 DNA Advantage	1
PI-LFAS-T	Prime Infrastructure Lifecycle & Assurance Term - Smart Lic	3
PI-LFAS-AP-T-3Y	PI Dev Lic for Lifecycle & Assurance Term 3Y	3
C9500-NM-8X	Cisco Catalyst 9500 8 x 10GE Network Module	1
SFP-10G-SR	10GBASE-SR SFP 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 7: IPTV Distribution Switch specs

6.10 IPTV Access Switch

6.10.1. Each IPTV 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
C9300-NW-A-48	C9300 Network Advantage, 48-port license	1
S9300UK9-1612	Cisco Catalyst 9300 XE 16.12 UNIVERSAL	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
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-NM-8X=	Catalyst 9300 8 x 10GE Network Module	1
GLC-SX-MMD	1000BASE-SX SFP transceiver module	2
PWR-C1-1100WAC-P	1100WAC Platinum-rated power supply	1
PWR-C1-715WAC-P/2	715W AC 80+ platinum Config 1 Secondary Power Supply	1
PWR-C1-715WDC=	715WDC power supply spare	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
CON-SNT-C930048N	SNTC-8X5XNBD Catalyst 9300	1

Table 8: IPTV Access Switch specs.

6.11 Firewall

6.11.1. To comply with the PETROBRAS automation network requirements, being an extension of the existing system and to allow interoperability among all equipment of the network, it shall be purchased a next generation firewall manufactured by FORTINET with the following minimum specifications (Table 9):

FEATURE	DESCRIPTION
Ethernet Interfaces	Minimum of 08 (eight) 10/100/1000 Mbps UTP Mininum of 08 (eight) 1 Gb/s SFP FO (equipped) Mininum of 02 (two) 10 Gb/s SFP FO (equipped)
Stateful inspection throughput	Minimum of 36 Gbps
IPS throughput	Minimum of 10 Gbps
NGFW throughput	Minimum of 9.5 Gbps
Threat Protection throughput	Mininum of 7 Gbps
VPN 3DES / AES Throughput	Minimum of 20 Gbps
VPN IPsec Peers	Minimum of 2000
Encryption	AES / 3DES
Virtual Domains	Mininum of 10
VLAN's	Minimum of 50
Concurrent Sessions	Minimum of 250K

Authentication	PASSWORD, RADIUS, TACACS
Users/Nodes	Unlimited
High Availability	Active/ Active or Active/ Standby
Form Factor	Maximum of 02 RU, 19 inches Rack Mountable
Power Supply Voltage #1	100 to 240 VAC
Power Supply Voltage #2	100 to 240 VAC
CAB-250V-10A-BR	Power Cord - 250V, 10A - Brazil which supported 220VAC
Routing Protocols	OSPF, RIP v1/2, Multicast
Features	Next Generation and support for industrial protocols (SCADA, PI OSIsoft, Modbus, DNP3, IEC-60870-5-104, IEC-61850, Ethernet/IP, OPC-DA/UA/A&E, DeviceNet e Profinet)

Table 9: Firewall specs

6.12 VPN Router

6.12.1. Each VPN Router shall have the minimum technical specification below or higher:

Product	Description	Quantity
ISR4461/K9	Cisco ISR 4461 (4GE,3NIM,3SM,8G FLASH,4G DRAM)	1
SL-44-IPB-K9	IP Base License for Cisco ISR 4400 Series	1
SL-44-SEC-K9	Security License for Cisco ISR 4400 Series	1
FL-4460-PERF-K9	Performance on Demand License for 4460 Series	1
FL-4460-BOOST-K9=	Booster Performance License for 4460 Series	1
SISR44V2UK91612	Cisco ISR 4400 Series IOS XE Universal	1
SM-F-BLANK	Fixed faceplate for SM slot on Cisco 4461 ISR	1
GLC-SX-MMD	1000BASE-SX SFP transceiver module	2
PWR-4460-650-AC	650W AC Power Supply for Cisco ISR 4461	1
PWR-4460-650-AC2	Redundant 650W AC Power Supply for Cisco ISR 4461	1
PWR-4460-650-DC=	650W DC Power Supply for Cisco ISR 4461	2
CAB-250V-10A-BR	Power Cord - 250V, 10A - Brazil	2
POE-COVER-4450	Cover for empty POE slot on Cisco ISR 4450	2
SM-S-BLANK	Removable faceplate for SM slot on Cisco 2900,3900,4400 ISR	2
ACS-4460-FANASSY	Cisco ISR 4460 Fan Assembly	1
CON-SNT-ISR44619	SNTC-8X5XNBD Cisco ISR 4461	1

Table 10: VPN Router specs

6.13 DMZ Switch

6.13.1. 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	1
PWR-C1-715WDC=	PWR-C1-715WDC	1
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 11: DMZ Switch Specs

6.14 CLUSTER Switch

6.14.1. Each Cluster Switch shall have the minimum technical specification below or higher:

Product	Description	Quantity
C9300X-24TX-A	Catalyst 9300 24-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	1
PWR-C1-715WDC=	PWR-C1-715WDC	1

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 12: DMZ Switch Specs

6.15 Third-Party Switch

6.15.1. Each Third-Party 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
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	1
PWR-C1-715WDC/2	715W DC Power Supply	1
CAB-SPWR-30CM	Catalyst Stack Power Cable 30 CM	1
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2
CON-SNT-C93002TA	SNTC-8X5XNBD Catalyst 9300	1

Table 13: Third-Party Switch specs

6.16 Special Monitoring Systems Switch

6.16.1. 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
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	1
PWR-C1-715WDC/2	715W DC Power Supply	1
CAB-SPWR-30CM	Catalyst Stack Power Cable 30 CM	1
CAB-C15-CBN	Cabinet Jumper Power Cord, 250 VAC 13A, C14-C15 Connectors	2
CON-SNT-C93002TA	SNTC-8X5XNBD Catalyst 9300	1

Table 14: Special Monitoring Systems Switch specs

6.16.2. Special Monitoring switches for Forecastle data rack shall be delivered with only AC power supply: main and redundant ones.

6.17 Recreative Switch

1.1.1. Each Recreative 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
C9300-NW-A-48	C9300 Network Advantage, 48-port license	1
S9300UK9-1612	Cisco Catalyst 9300 XE 16.12 UNIVERSAL	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
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-NM-8X=	Catalyst 9300 8 x 10GE Network Module	1
GLC-SX-MMD	1000BASE-SX SFP transceiver module	2
PWR-C1-1100WAC-P	1100WAC Platinum-rated power supply	1

PWR-C1-715WAC-P/2	715W AC 80+ platinum Config 1 SecondaryPower Supply	1
PWR-C1-715WDC=	715WDC power supply spare	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
CON-SNT-C930048N	SNTC-8X5XNBD Catalyst 9300	1

Table 15: Recreative Switch specs

6.18 Firmware

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

6.19 Serial device for remote access

6.19.1. It shall be delivered, installed, configured and cabled a data device with RJ-45 serial and USB ports in each Telecom Room dedicated to allow remote access to the following equipment through their serial ports with a serial cable as long as required by the place of installation of each equipment.

6.19.2. Such device will belong to an Out Of Band (OOB) Management System dedicated to collect and aggregate serial and IP management interfaces to be remotely accessed by a separated backhaul connection, provided by a Fleet Broadband Transceiver or VSAT connection.

6.19.3. Telecom Upper and Lower rooms shall be equipped with such data device, installed, configured and fully connected to the management equipment ports of each one of the equipment minimally listed below:

TELECOM UPPER ROOM	TELECOM LOWER ROOM
VSAT Modems Ka/Ku	WAN router 02 02
VSAT antenna controllers Ka/Ku	Switch core 02
TVRO modem	PAGA-A controller unit 02
TVRO antena controller	NVR CCTV 02
WAN Router 01	PABX
Switch core 01	WI-FI controller 02
DWDM Submarine Optic Net 01 and 02	Firewall 02
LTE Radios 01 and 02	POB-A switch 02
PAGA-A controller unit 01	
NVR CCTV 01	
UHF active repeater	
WI-FI controller 01	

Firewall 01	
POB-A switch 01	

Table 16: main equipment to be interconnected

6.19.4. Serial device in Telecom Lower Room shall be interconnected to Serial device in Telecom Upper Room by Ethernet port, which device shall be interconnected to Fleet Broadband transceiver Ethernet port in Radio Room for out-of-band accesses purposes.

6.19.5. Each serial device shall have the minimal features:

a. 30 (thirty) RJ-45 serial ports interfaces

b. 10 (ten) USB serial ports interfaces

c. 02 (two) ethernet routed ports

d. 02 (two) power supplies (main and spare/redundant; at 2220VAC and/or -48 VDC)

e. 02 (two) line power cords for each power supply

f. 19” inches width standard or supplied with ear extensions for 19” inches rack installation

g. Security features: able to be accessed by SSH, to be integrated with TACACS, to have local password and to implement VPN.

h. 01 (one) serial cable as long as required to interconnect each serial device port to equipment intended to be accessed: one interface RJ-45 at serial device side and one serial interface as per equipment to be supplied according to the table previously presented. Any additional interface converter/adapter shall be provided as well if required to grant full interconnection.

i. 10 (ten) USB serial cables with at least 10 (ten) meters, with USB interfaces at both ends.

6.19.6. It shall be provided all the software, applications, documentation and accessories needed to operate the equipment.

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 HULL equipment accordingly Table 1 and the document DATA NETWORK ONE LINE DIAGRAM.

Location	Equipment	Quantity
TELECOM UPPER ROOM ACCOMODATION	WAN router	1
	CLUSTER Switch	4
	SD-WAN - firewall	1
	Core switch	1
	Electrical access switches	According to Detail Design
	Optical access switches	According to Detai Design
	IPTV distribution switch	According to Detail Design
	IPTV access switches	2
	Firewall	1
	DMZ switch	2
	Third-party switch	1
	Special monitoring systems switch	1
	Serial device for remote access	1
TELECOM LOWER ROOM ACCOMODATION	WAN router	1
	CLUSTER Switch	4
	SD-WAN - firewall	1
	Core switch	1
	Electrical access switches	According to Detail Design
	Optical access switches	According to Detail Design
	IPTV access switches	According to Detail Design
	Firewall	1
	DMZ switch	2
	Third-party switch	1
	Special monitoring systems switch	1
	Recreative access switch	1
	VPN Router	1
	Serial device for remote access	1
ENGINE ROOM	Electrical access switches	According to Detail Design
FORECASTLE	Electrical access switches	1
	Optical access switch	2
	Special monitoring systems switch	1

Table 17: 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 shall 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 All firmware/software upgrades if required during commissioning phase.

7.8 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-002 HULL STRUCTURED CABLING NETWORK

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

c. HULL DATA NETWORK ONE LINE DIAGRAM

8.2 Hull 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, Optical and IPTV Access Switches, following the rules below:

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

8.4.2. 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.

8.4.3. The quantities of LAN points and access switches were estimated based on technical specifications and one line diagram of all telecom systems.

8.4.4. 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 assessment of all the tests established in the Test Plan ran for the assembled and commissioned system specified herein. Additionally, it takes into account PETROBRAS verification and approval of detail design to certify the perfect functioning of the Corporate Network of PETROBRAS within the specified technical characteristics and requirements.

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 start 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 activation 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

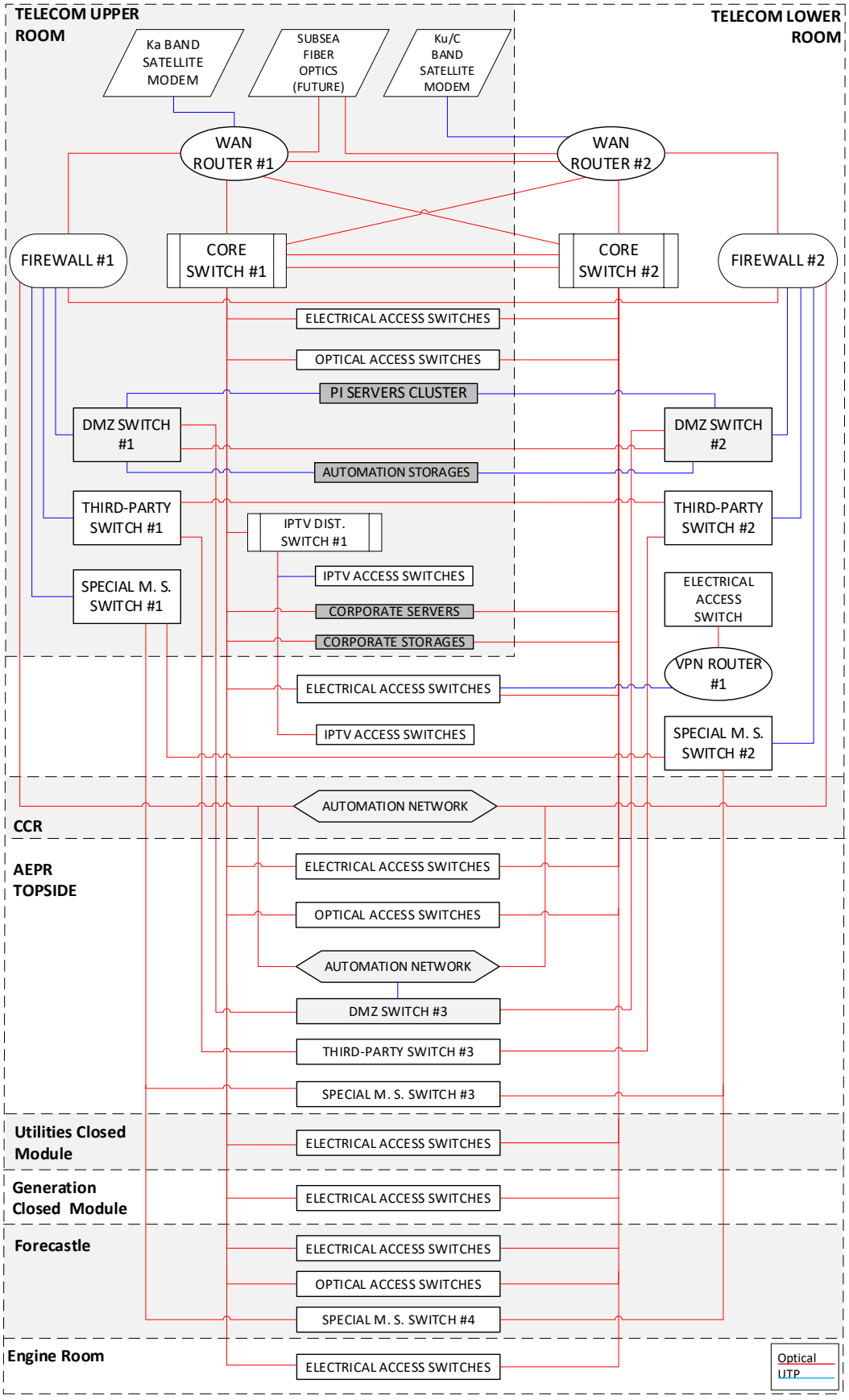

Figure 3 - Schematic network topology