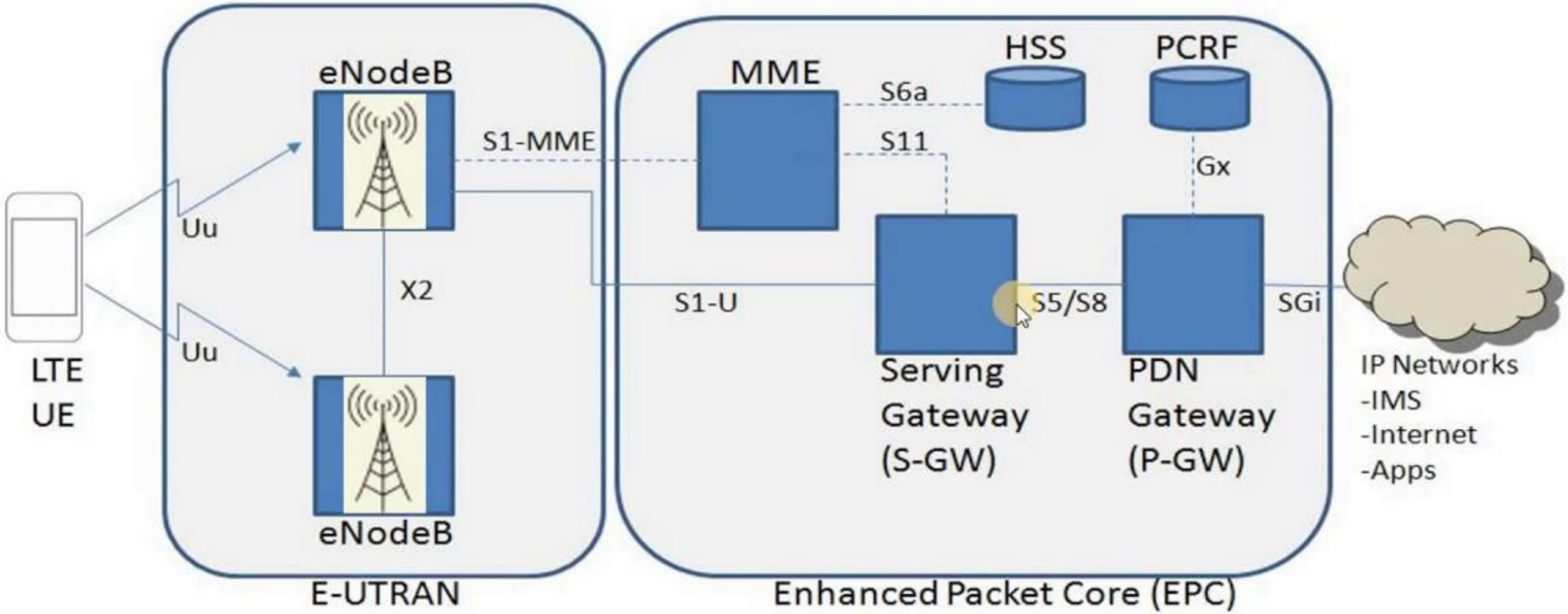

WELCOME

Introduction

4G | LTE ARCHITECTURE



Network Components

1. UE (User Equipment): The device used by the end-user to access the 4G network (e.g., smartphone, tablet).
2. eNodeB (Evolved Node B): The base station that provides radio coverage and connectivity to the UE.
3. MME (Mobility Management Entity): Responsible for managing UE mobility, authentication, and bearer management.
4. SGW (Serving Gateway): Routes user data packets and manages bearer contexts.
5. PGW (Packet Data Network Gateway): Provides connectivity to external networks (e.g., internet) and manages QoS
6. Network Interfaces

1. S1: Interface between eNodeB and MME.
2. S5: Interface between SGW and PGW.
3. S11: Interface between MME and SGW.

4G Network Architecture

1. Access Network: eNodeB provides radio access to UE.
2. Core Network: MME, SGW, and PGW manage UE mobility, data routing, and QoS.

Key Features

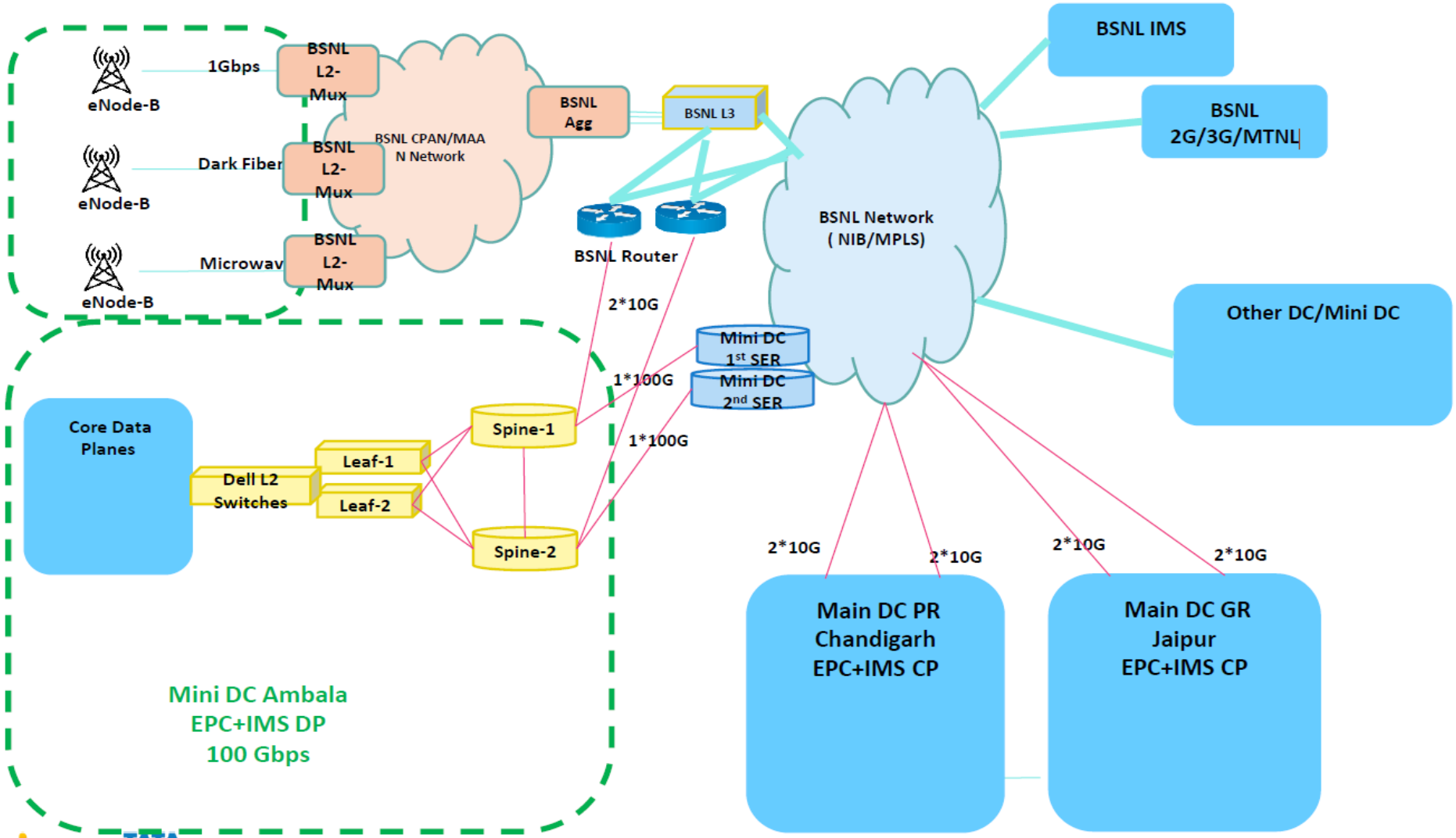
1. All-IP Network: 4G network is based on an all-IP architecture.
2. Scalability: 4G network supports high-speed data services and large numbers of users.
3. Quality of Service (QoS): 4G network provides QoS mechanisms to ensure high-quality services.

Benefits-

1. High-Speed Data: 4G network supports high-speed data services (up to 1 Gbps).
2. Low Latency: 4G network provides low latency (less than 50 ms).
3. Improved QoS: 4G network ensures high-quality services through QoS mechanisms.

Phase IX.2 4G Architecture and Plan for Transmission

4G Proposed Transmission Connectivity Scenario Haryana Circle -North Zone



Bandwidth requirement As per BTS Category

CAT A- Band 28 (700 MHz)

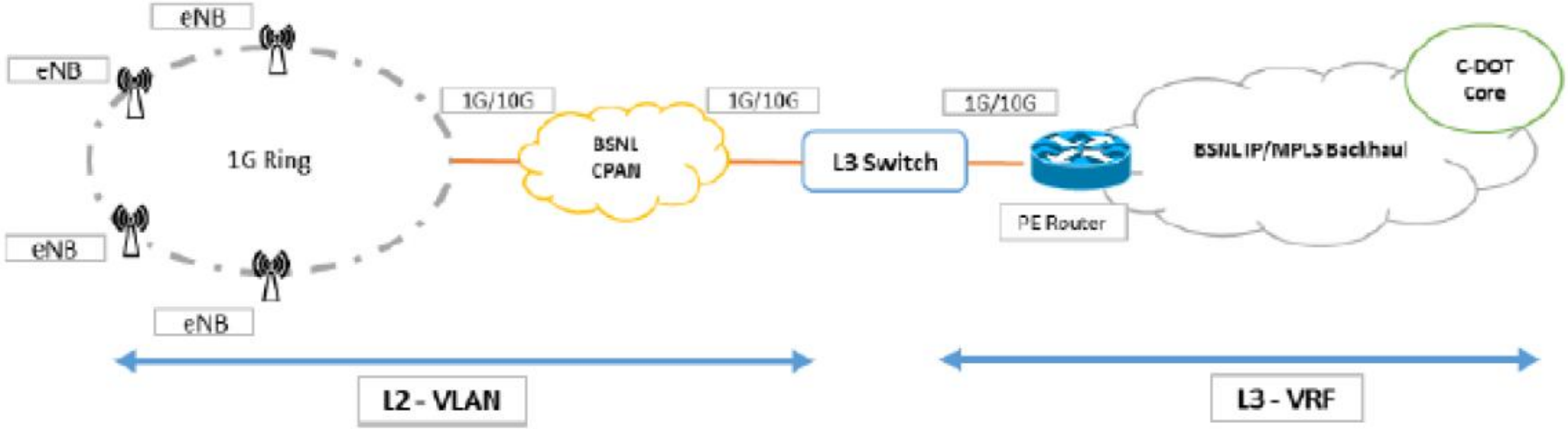
CAT B- Band 28 (700 MHz) + Band 1 (2100 MHz)

CAT C- Band 28 (700 MHz) + Band 41 (2500 MHz)

CAT D- Band 28 (700 MHz) + Band 1 (2100 MHz) + Band 41 (2500 MHz)

Category	CAT A	CAT B	CAT C	CAT D
Spectrum Type	CAT-A 2T2R FDD 700 MHz	CAT-B 2T2R FDD 700 MHz+ 2T2R FDD 2100 MHz//1800 MHz/850 MHz	CAT-C 2T2R FDD 700MHz + 4T4R TDD 2500MHz	CAT-D 2T2R FDD 700MHz + 2T2R FDD 2100/1800 MHz/850MHz + 4T4R TDD 2500MHz
Band	700	700 + 2100/1800/850	700+2500	700+2100/1800/850+2500
Type of Band	Single Band	Dual Band	Dual Band	Tri Band
Bandwidth(in Mbps)	300	600	900	1200

Site to Core Transmission connectivity

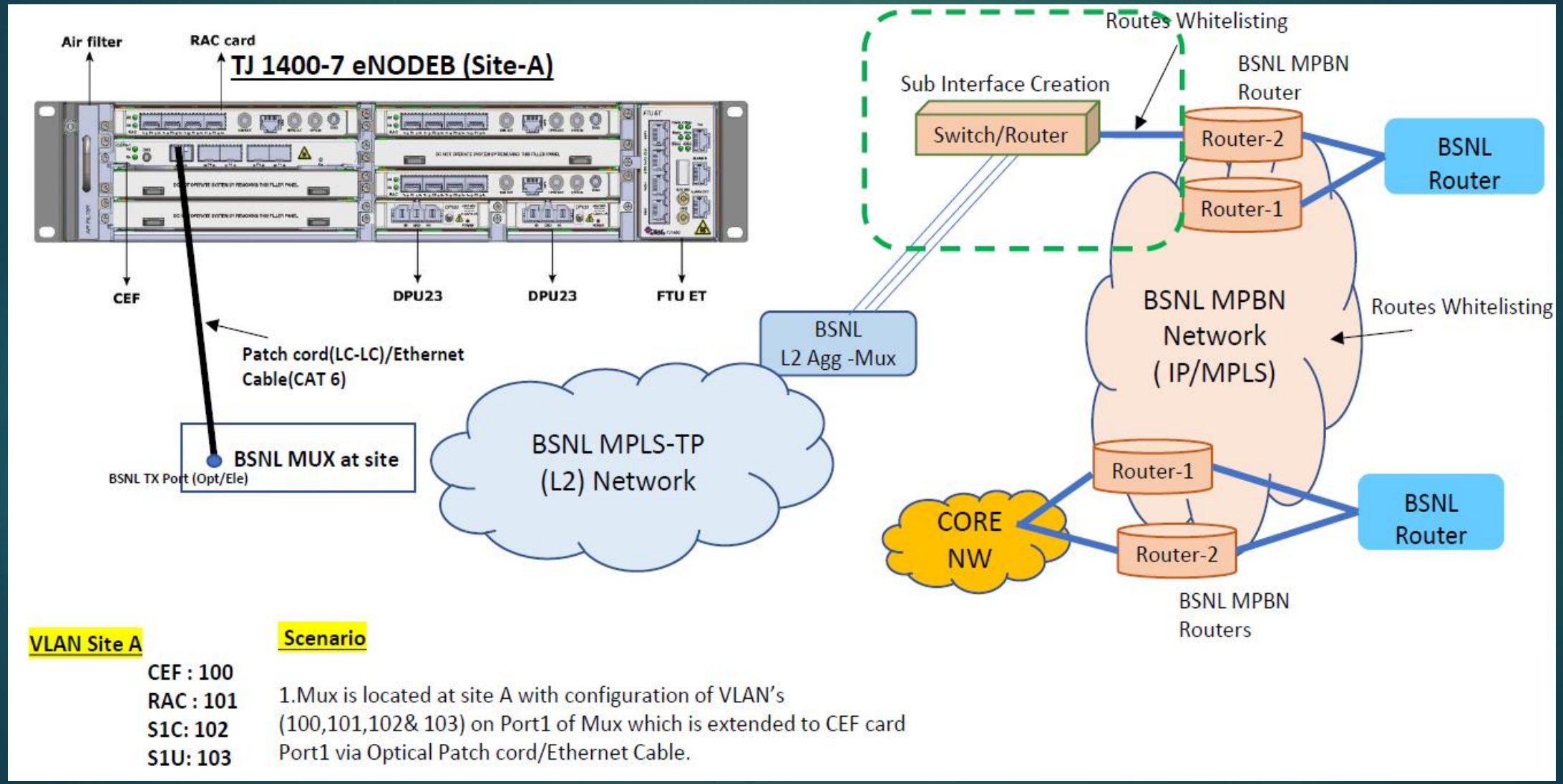


- eNB support 4 VLANs for 4 services, i.e. S1-C, S1-U, RAC-OAM and CEF-OAM
- Four different IP subnets and VLANs to be allocated to each Tejas eNB
- All eNBs to be terminated to BSNL Existing L3 Switch over 1G or 10G port Access network
- The gateway of each VLAN will reside on the BSNL L3 Switch.
- The VRF allocation to these subnets to happen as per below Table.

VLAN	IP Subnet	Service	VRF used on BSNL Router
VLAN-1 (S1-U)	Subnet-1 (S1-U)	S1-U	Media
VLAN-2 (S1-C)	Subnet-2 (S1-C)	S1-C, X2	Signal
VLAN-3 (RAC OAM)	Subnet-3 (RAC OAM)	RAC OAM	OAM
VLAN-4 (CEF OAM)	Subnet-4 (CEF OAM)	CEF OAM, SYNC	OAM

IP Subnet	Service	VRF used on BSNL Router
Subnet-1 (S1-U)	S1-U	Media
Subnet-2 (S1-C)	S1-C	Signal
Subnet-3 (EMS)	RAC OAM, CEF OAM	OAM

Connectivity of site from BSNL transmission equipment



VLAN Site A

CEF : 100
RAC : 101
S1C: 102
S1U: 103

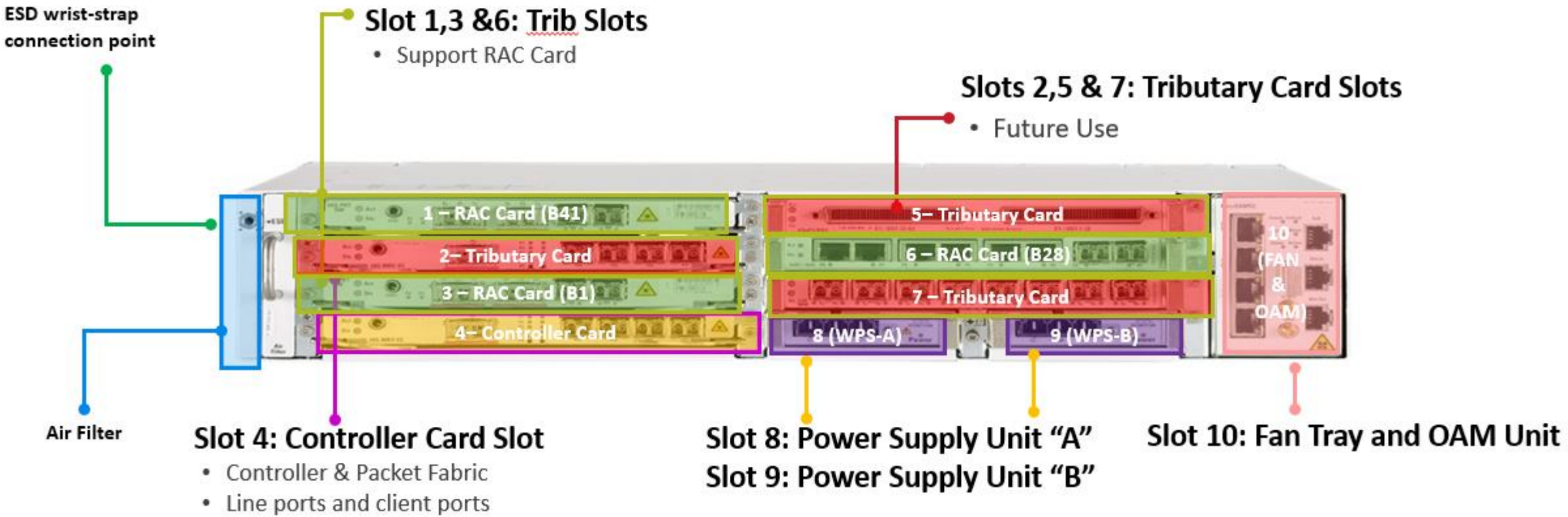
Scenario

1.Mux is located at site A with configuration of VLAN's (100,101,102& 103) on Port1 of Mux which is extended to CEF card Port1 via Optical Patch cord/Ethernet Cable.

Tejas BBU (Base Band Unit)

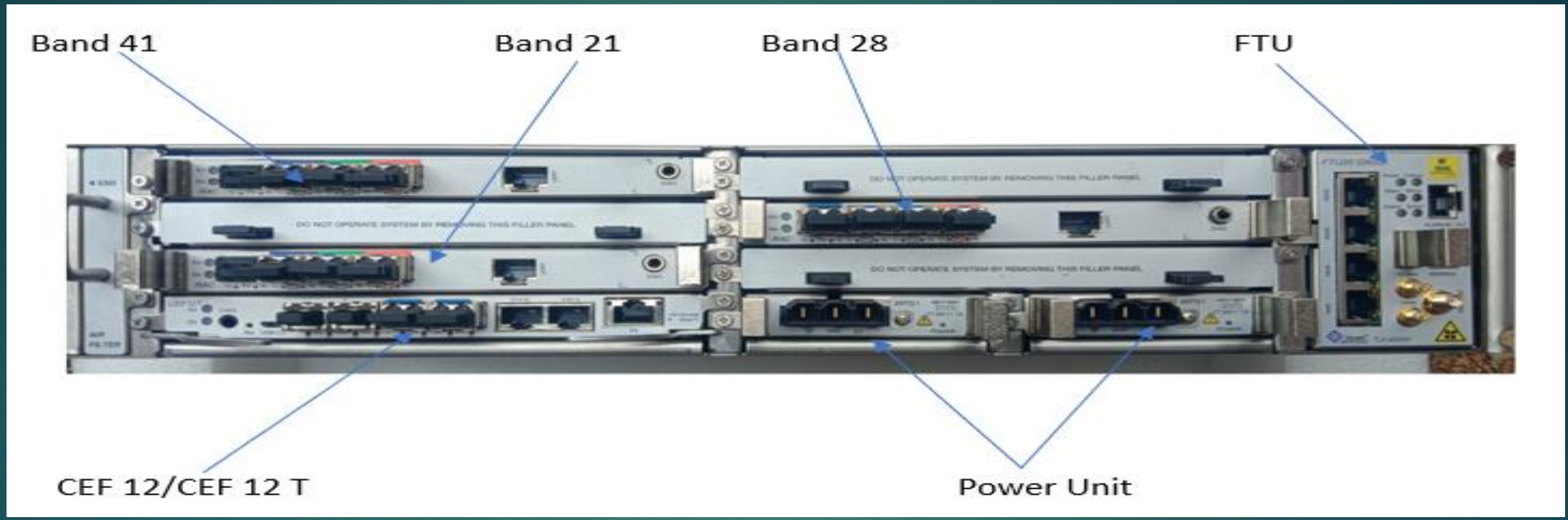
Slot ID and card population

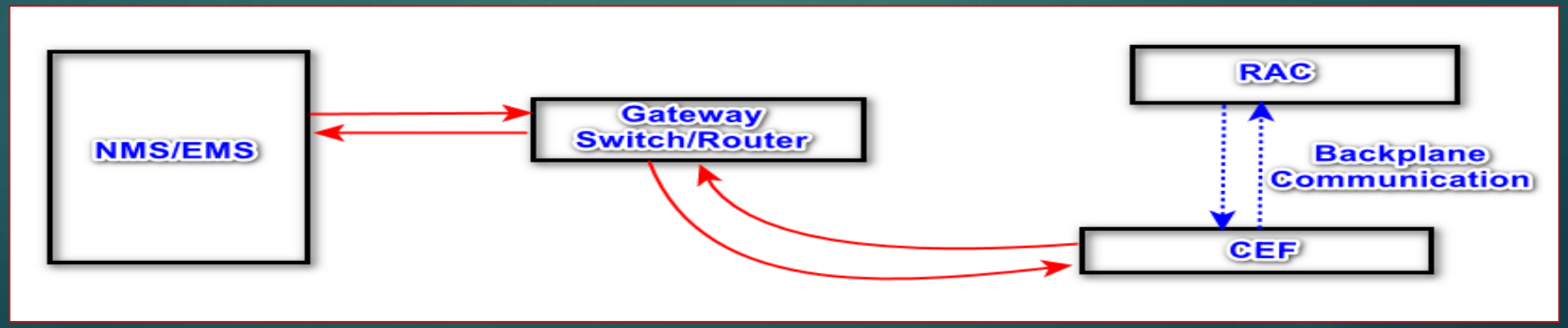
- Slot 1, 3 and 6 : RAC cards
- Slot 4: CEF
- Slot 2, 5 and 7 : Reserved
- Slot 10 : FTU20GNSS



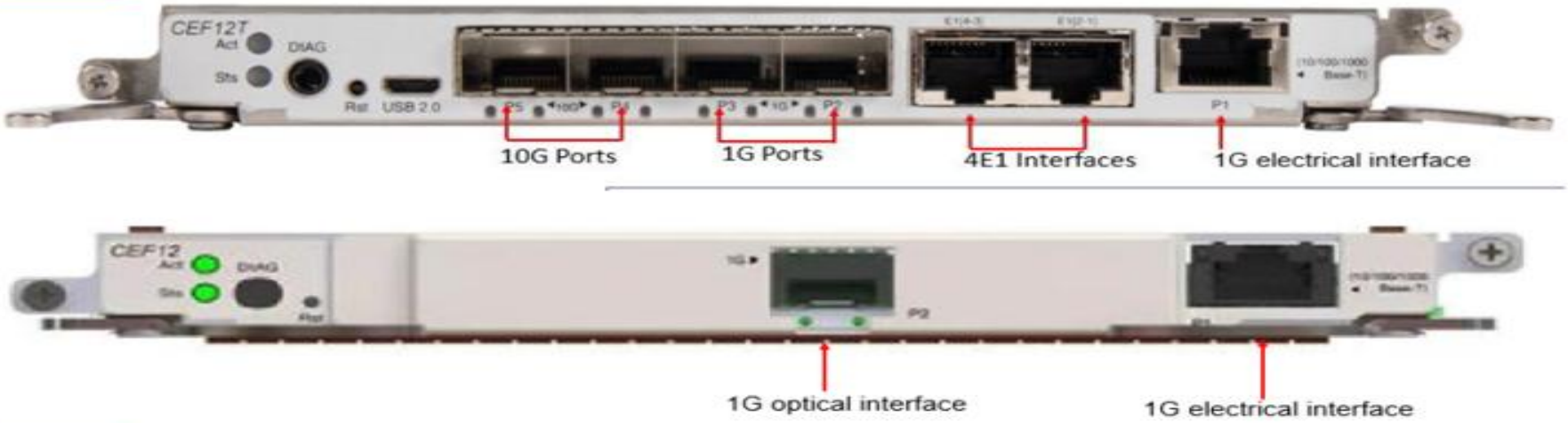
Tejas BBU (Base Band Unit)

TJ1400 –Tejas: It is the combination of CEF Card, RAC Card, FTU and Power Unit

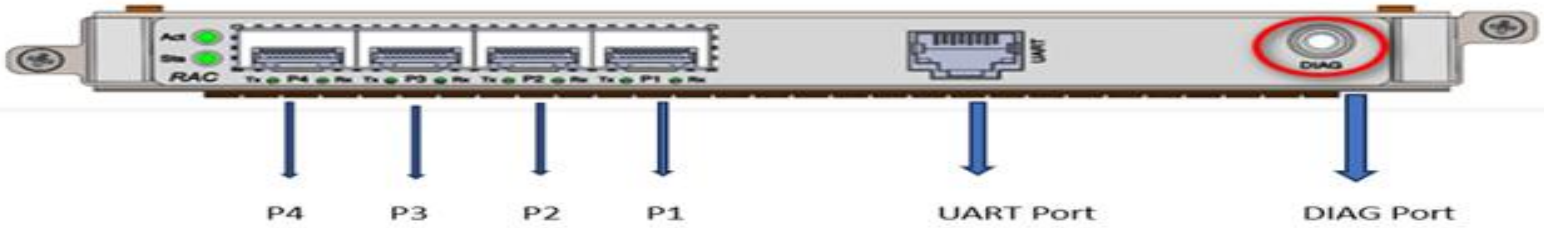




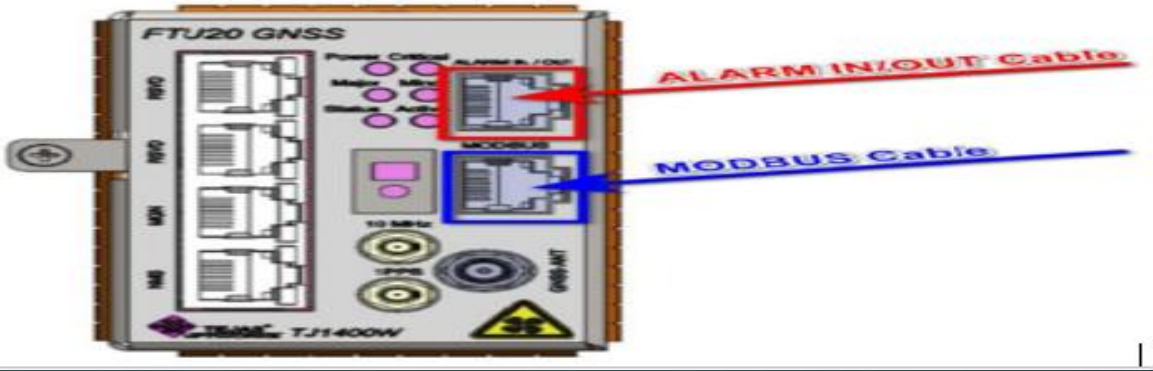
CEF Card:



RAC Card:



FTU:



CEF (Carrier Ethernet Fabric) – 12T

Ports	Supports
P1	1G Electrical (Base-T)
P2,P3	1G Optical
P4, P5	1G/10GE Optical

Interfaces
2*10G SFP+
2*1GE SFP
1*10/100/1000Base-T
4*E1

Packet Fabric Capacity
46 Gbps

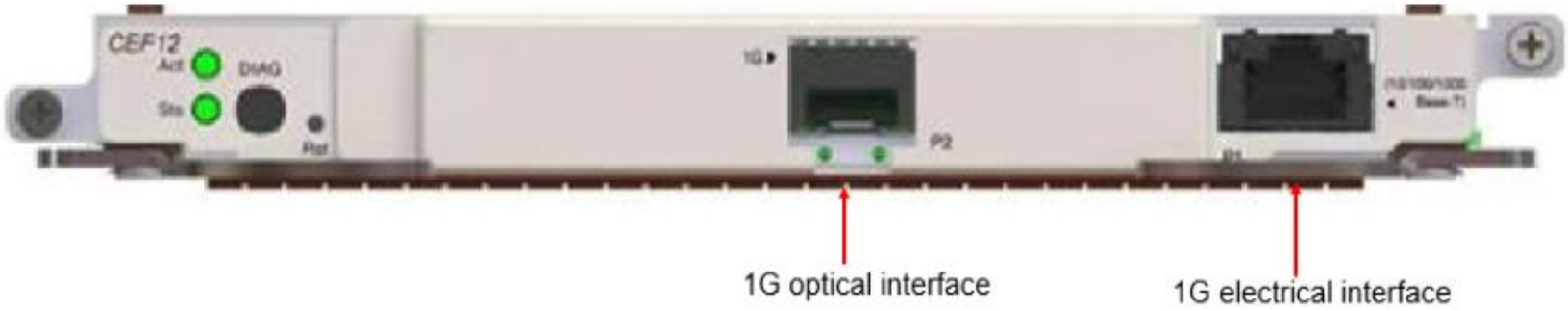
Ethernet OAM & Management
802.1ag
Y.1731
SNMPv2/v3
LLDP
Dual Stack (IPv4/IPv6) Management
IP Ping and Traceroute
Command Line Interface

Network Protection & Security
Static LAG (LACP)
Dynamic LAG (LACP)
ERPSv2
ACL

Synchronization
SyncE
1588v2*

Ethernet Switching
Vlan (802.1q) UNI
QinQ (802.1ad) UNI
Flat QoS with 8 Queue SP + DWRR Scheduling
Ingress Policing
802.1p to CoS Mapping
Ethernet (untagged (PVID) C-tagged and S-tagged)
Jumbo Frames up to 9616 bytes (in L2)

CEF (Carrier Ethernet Fabric) – 12



- CEF12 is purely controlling card function to provide backhaul to the particular enodeB w/o Transport.
- Only one 1G port (either 1G electrical or 1G Optical) will be available for interface 4G enodeB.
- Firmware for CEF12 supports max 1G payload. Which ever port activated 1st (Elect/Opt) will be used.
- Transport Functionality like ERPS ring formation or E1/1G drop for 2G/3G/Enterprise or Cascading will not be available with CEF12.
- By default, only one 1G optical SFP will be provided. Default P1 port can be used for 1G Electrical interface.

RAC Card

GigE ports for LMT connectivity

3 Nos. of CPRI interface ports To connect to Radio Head

UART

DIAG Port

Colors for Sector Identification

- Sector 0 / Alpha
- Sector 1 / Beta
- Sector 2 / Gamma
- For Antenna Count

Ports	Interface
3 CPRI Fiber ports to connect each of the 3 RRHs	• Port 1 – Sector 0 • Port 2- Sector 1 • Port 3- Sector 2
1 GiGe Ethernet Ports	• Port 4 - Commissioning & Backhaul Connectivity(Optional)
UART	• For Developer Connectivity
Debug Port	• For Developer Connectivity

RAC - card specifications

Specification	Value
MTBF	33.05 Years
Input Voltage	12V nominal
Power Consumption	• 80W (typical) • 100W (maximum)

Thank you

Adapt it with your needs and it will capture all the audience attention.