# **VVDN MPRU**



## Medium Power Radio Unit

## **USER MANUAL**



#### **Version Control**

Name	Date	Version Number
VVDN_MPRU_Installation and Operating Guide	3 -Sep-2024	A0_03

## **Revision History**

Created By	Reviewed By	Date	Reason for Changes	Version
VVDN TEAM	VVDN QA TEAM	June-2024	Revised M plane configuration summary	Revised Version- A0_01
VVDN TEAM	VVDN QA TEAM	August-2024	Mechanical details including mounting bracket updated	A0_02
VVDN TEAM	VVDN QA TEAM	Sep-2024	CLI,GUI,FAQ & Troubleshooting section added	A0_03



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## 1. About This Document

This document would help to understand and operate the Medium Power Radio Unit.

### **1.1 Intended Audience**

The intended audiences for this document are End Users of this product.

### **1.2 Document Conventions**

The different conventions used in this document are explained in the following table:

Convention	Description
	Do not touch/handle the board without proper ESD precautionary measures.
Rotes	The board is ROHS-compliant
(((~)))	Do not turn ON the board without terminations (Not applicable if Antenna is connected)
	Alert! Hot, Do not touch Please wait for sometime for RU to get cool after turned OFF

**Table 1: Document Conventions** 

**Table 2: Abbreviations** 

Sl. No	Abbreviations	Long form
1.	DU	Distributed Unit
2.	ESD	Electrostatic discharge
3.	FPGA	Field Programmable Gate Array
4.	GPS	Global Positioning System
5.	JTAG	Joint Test Action Group
6.	LED	Light Emitting Diode
7.	РСВ	Printed Circuit Board
8.	RF	Radio Frequency
9.	RU	Radio Unit
10.	SCS	Subcarrier Spacing
11.	UART	Universal Asynchronous Receiver-Transmitter
12.	USB	Universal Serial Bus

## 2. Product Overview

The Medium Power Radio Unit (MPRU) is a single-board Optical to Radio interface solution for 5G low-power RU applications, The RU has a digital and RF section realised in a single board, and the system can be used for improving 5G network coverage and can be cascaded into multiple stages.

## 2.1 Key Features and Specifications:

- Deployment Type: Outdoor RU
- Radio Configuration: 1 CC, 100 MHz, 4Tx4R,
- IBW :200MHz
- OBW : 100MHz
- Supported Frequency bands 3400 3600 MHz, 3550 3700 MHz, 3600 3800 MHz, 3800-4000MHz
- Mode: Single Numerology, SCS 30KHz
- Antenna: External Snap on Antenna
- Front haul: 10G over SFP+
- Powered by DC (-40V to -57V)



- RF Power: 4x5W
- O-RAN Split: 7-2a

## 2.2 Device Specification:

Radio Specification				
Band	3400 - 3600 MHz, 3550 - 3700 MHz,3600 - 3800 MHz, 3800-4000MHz			
Bandwidth	100MHz			
Duplex Mode	TDD			
Modulation	QAM 256/64/16/QPSK			
Carriers	1			
SubCarrier Spacing	30KHz			
RF Output power	5 Watt/37dBm			
Connectivity	Specification			
Data Link	10G SFP+			
Interface Protocol O-RAN	FH Split 7.2			
Power Sp	ecification			
Powering	DC (-40V to -57V)			
Power Supply Configuration for RU	DC ( 48 Volt 2.5 Amps)			
Max Power Consumption	145W (max)			
Mechanical Specification				
Design Shape	Rectangle			
Product Dimension	342*253*157(mm)			
Weight	10.1kg			
Without Antenna	303*245*111(mm)			

#### **Table 3: Device Specification**



With Antenna	342*253*157(mm)	
Antenna S	pecification	
Electrical Parameters	Values	
Antenna Type	External Clip on antenna for RU	
Frequency (GHz)	3.3-3.8	
Gain (dBi)	13, +/-0.5	
Azimuth Beamwidth (°)	60, +/- 5 °	
Elevation Beamwidth (°)	20, +/-2 °	
Polarization (°)	+/- 45 °	
Electrical Fix Down tilt (°)	5° +/- 0.5 °	
Upper Sidelobe Suppression / USLS (dB)	> 15	
Return Loss (dB)	<-10	
Port to Port Isolation (dB)	> 22	
Front to Back Ratio (dB)	> 25	
Cross Polar Discrimination (dB) Boresight 0°	> 20	
Cross Polar Discrimination (dB) Sector ±60°	> 10	
Impedance (ohm)	50	
Power Handling (W)	> 50	
Mechanical Parameters	Values	
RF Ports at Bottom	4 X 4.3-10-M with pigtail 300mm	
Dimensions in mm (L x W x D)	342 x 253 x 67.5	
Number of Ports	4	
Lightning Protection	DC Ground	
Relative Humidity	5% - 95%	
Operating Temperature Range	-40 ~ +50 °C	
Clip-On provision	4 positions	
Wind Loading @ Velocity, frontal	327.0 N @ 150 km/h	
IP Rating	IP65	
Environment	t Specification	
Ambient Temperature	-5 to 40C /-40 to 55C	
Storage Temperature	-40°C to +70°C	
Humidity	5% to 95%	
Environmental	IP65	
Operating Environment	Outdoor equipment	
Thermal dissipation	Convection	



Installation Type Po	Pole
----------------------	------

#### **2.3.1 RU Product Identification Format:**

SKU	FREQ RANGE	Version	Board Serial binary identification code
SKU 1	3400 - 3600 MHz		100
SKU 2	3550 - 3700 MHz	Da	110
SKU 3	3600 - 3800 MHz	B2	101
SKU 4	3800 - 4000 MHz		111

## 2.3.2 RU Product HW Identification Format:

From the HW Side, Product Identification will be done through **Product Model No.** Example:- If the Product model no is **VMRU-Gen1-3436-XX-AI**. In this model, **"VMRU"** shows Project Name,

"Gen1" shows Hardware Generation, "**3436**" shows RU Band, and "**XX**" shows AE(Antenna External) or AI (Antenna Internal). "A" shows the RU revision. "I" shows the environmental condition (**E** - Operating Temperature 5°C to 45°C & IP31, **I** - Operating Temperature -40°C to 55°C & IP65).

MPRU Series Model Number					
Customer	Band	Model Number			
V VVDN <sup>1</sup>	3436 - Band 3400 - 3600 <b>3537 - Band 3550 - 3700</b> 3638 - Band 3600 - 3800 3840 - Band 3800 - 4000	VMRU-Gen1-3436-AE-AI VMRU-Gen1-3537-AE-AI VMRU-Gen1-3638-AE-AI VMRU-Gen1-3840-AE-AI			

**Table 4: Product identification format** 

<sup>&</sup>lt;sup>1</sup> Device name "VMRU" will be changing depends on end customer.



## 3. What's in the Box?

The following list of primary items will be present in the box:

Installation & Bring-up       Booklet/Soft copy for operational reference         Mounting       Bracket &       Mounting Bracket And Mounting Screw Kit	Radio Unit 1	Medium Power RU	
Mounting Bracket & Mounting Bracket And Mounting Screw Kit	copy for operational reference 1	Installation & Bring-up Guide	
Mounting accessories	racket And Mounting Screw Kit 1	Mounting Bracket & Mounting accessories	

#### **3.1 Default Accessories List**

The following accessories are included with RU:

Items	Description	Qty
Power connector	DC 48V power connector	1
Antenna <sup>(2)</sup>	External Clip on antenna	1

**Table 6: Device Accessories** 

#### 3.2 Add-on Accessories List

The following add-on accessories are based on the customer's requirement with RU:

Items	Description	
10G SFP Transceiver	ver Manufacturer part no: SFP-10G-SR	
10G SFP Optical Cable	Cable Length: 1.5m	1
Ethernet Cable	RJ45 Cat6 Network Ethernet Patch/LAN Cable, 3M/2M	1
USB Cable	USB Cable Console Cable – Type C USB Cable Part Number: DH-20M50052	1

#### Table 7:Add on Device Accessories

<sup>&</sup>lt;sup>2</sup> Antenna will be included depends on the model series



## 4. Outlook

Learn about MPRU hardware, assembly procedures, and how to get started with it.

## 4.1 Dimensions of Product With Antenna

Dimension LxWxH: 342\*253\*157(mm).



Fig 1: Product Dimension With Antenna







## 4.2 Dimensions of Product Without Antenna

Dimension LxWxH: 303\*245\*111(mm).



111mm





#### Fig 3: Product Dimension Without Antenna



Fig 4: Antenna and FH details

## 4.3 Connectors Required for connecting the Antenna output port of MPRU

4.3/-10 Male to N Female connector



After connecting the 4.3 connector to the radio, the user can connect to antenna / attenuators by using any N-type RF cables based on their availability.



#### GRAND U SERVER U SERVER

Netopeer-cli is installed in another test PC for M plane connection establishment, or it can be installed in the DU server.

This setup diagram is for the M-Plane connection/ E2E connection.

Note: Please make sure that all the radio antenna ports are either terminated(can be terminated with any 40 Watt terminators) or connected with any external antenna while in use.

#### 4.5 MPRU LED Notification

For all good conditions, all the Green LED will be in a stable state.

LED Blinking Status	Power LED Indications	Colour
Slow	Temperature Warning	
Fast	Factory Reset	RED
Stable	Temperature Shut Down	

## 4.4 MPRU Basic Setup Diagram



LED Blinking Status	Power LED Indications	Colour	
Slow	Software Upgrade Process		
slow	RU Booted Successfully	Crear	
Fast	Initialization Fault	Green	
Stable	Power On		

Table 8:Booting up led indication

Colour	Ν	Network LED		Status LED
	Slow	DHCP Failure	Slow	Software Upgrade Fail
			Fast	PTP Sync Fail
RED	Fast	Factory Reset	Fast	Factory Reset
	Stable	Thermal Shut Down	Stable	Thermal Shut Down
	Stable	Link Down	Stable	Power Failure
Slow Software Upgrade process		Slow	Software Upgrade process	
Green	Green Fast Link UP, Trying DHCP		Fast	Unit has detected a transceiver fault
	Stable	Link UP + DHCP Ready	Stable	PTP UP
		Table 9:Network and st	tatus led	notification



## 5. Device Setup

#### 5.1 Hardware Installation

The MPRU can be mounted on the Pole using a M10X100screw to fix the bracket as shown below. After fixing the mounting on the pole, fix the moment bracket with the help of M10X210 Nut & Bolt, then hang the device on the mounting. After installation, check for RF coverage and change the mounting location.



#### 5.1.1 Ideal mounting location

The MPRU can be installed, preferably either on the Straight Poll or Vertical wall. In Lab testing conditions, sufficient airflow shall be provided for thermal and RU performance.

#### 5.1.2 Ideal Installation Height:

Above 2.13m/7ft from the ground for vertical wall or Pole mounting.

#### 5.1.3 Mounting Screw Holes:

If mounting to a wooden surface, fix the screw directly to the surface. If mounting to a masonry surface (bricks, concrete), insert wall plugs before screwing the mounting bracket to the wall.

If mounting to a pole, fix the bracket on the pole with the help of M10X100 bolts.

#### 5.1.4 Mounting the Device:

Hang the Device on the mounting bracket with the help of two upper screws and then tighten the lower screws.



#### **5.2 WEB GUI**

Commonly used browser for GUI login

- 1. Google Chrome
- 2. Firefox

Launch a web browser from a computer or wireless device that is connected to the network. In the address field of the web browser, enter the Fronthaul IP address.

Before powering ON the RU, ensure all the RF ports are terminated/Connected with Antenna.

#### **Types of Logins**

Separate types of logins have different purposes. It is important that the user understands the difference so that the user can choose the login type as per use case. Each user has its own specific access control as per the oRAN compliance.

Username	Password
oranuser	oranuser

#### Table 10: Login credentials

If RU is configured for Static IP, then use 192.168.4.50 otherwise go for the dynamic ip assigned to eth1 interface.





#### **5.2.1 Device Information**

The device information dashboard will provide complete information about the radio unit. Once the radio unit is live, the dashboard extracts all the particulars in the Front end. Snippet attached.



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#### Fig 10: GUI Dashboard

- Model Number: Display the RU model number
- Serial Number: Display RU serial number
- **HW Version:** Display the HW version
- System Details: Display default System details incorporated with XILINX 2020.2
- MAC address: Display the RU's eth1 interface MAC address
- SW version: Display the installed SW version
- Status: Display the current status of RU Interface Mode: Display the RU IP mode whether in static or dynamic mode Link: Display the link status of eth1 Alarm: Display the count of active alarms Uptime: Display the uptime of RU
- Uplane: Display the carrier related information FOP: Display the center frequency configured in RU
   Operating Bandwidth: Display the bandwidth configured in RU
   Active: Display the carrier state ie. ACTIVE/INACTIVE
   Gain: Display the gain value configured in RU
   State: Display the carrier state of RU ie. READY/BUSY
- Low Level End Point: Display the information related to endpoints configured in RU IQ Bitwidth: Display the IQ bitwidth configured in RU Compression Type: Display the Compression technique configured in RU PRB: Display the number of PRBs configured in RU for Downlink E-AXCID: Display the e-axcid configured in RU for both tx & rx
- S-Plane: Display other parameters like SYNCE and PTP synchronization states like LOCKED, FREERUN, and HOLDOVER, Domain number, etc



#### **5.2.2** Configuration

#### a)Sync

LPRU needs to be PTP synchronized with Grandmaster for the proper data transmission. As per oRAN, MPRU is supporting LLS-C1/LLS-C3 Configuration.

To select one or more synchronization input sources. The sync container allows the RU to list via an array of synchronization sources which it is capable of supporting **PTP and SyncE**.

User can trigger the Sync-related parameters using the below-mentioned attributes:

- Domain number: Range (24-45)
- PTP Profile: Default(G\_8275\_1)
- Multicast mac Address: FORWARDABLE

*Note: MPRU is supporting only:* 

• *ITU-T standards G\_8275\_1 and G\_8275\_2 profile for the PTP synchronization. LPRU supports only Multicast PTP profiles. Click the submit button to save the configuration* 

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Fig 11: PTP configuration

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A0\_03

#### b) Fronthaul

#### 1. CU Plane Configurations in RU for Fronthaul

The MPRU supports ORAN-WG4.CUS.0-v07.00 for CU planes. This provides an option to configure the CU Plane as follows:

- VLAN Enable/Disable: VLAN Range between 0-4095
- No VLAN needed for CU plane transmission.
- No provision for S plane VLAN currently
- MAC address: MAC address shall be retrieved when connected with the RU. Enter the DU MAC address based on the deployment.
- C- PLANE & U-PLANE: enhances more feasibility to user plane configuration module is provided below based on the Yang model mentioned in the ORAN Management Plane Specification
  - DU port ID Bitmask: 65024
  - Band Selector ID Bitmask: 448
  - Component carrier ID BitMask: 56
  - RU port ID from the mentioned ranges displayed: 7
  - eAxC\_ID: 1 to 4 for Downlink or uplink or PRACH
- Click the submit button and you get a pop up mentioning your settings are saved.

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Fig 12: Fronthaul Configuration



#### 2) M Plane Configurations in RU for Fronthaul

The M-plane configuration section helps the user to configure the m-plane VLAN.

- VLAN: VLAN Range between 0-4095
- Click the submit button, and you get a pop-up mentioning your settings are saved.

#### c) ORAN

O-RAN Sections help the user to validate the below fronthaul parameters.

- Standard Maximum PRB per Ethernet frame can be allocated.
- IQ Width can range16-bit No compression and 9,12 and 14 for BFP compression as per requirement
- Type of compression can be configured depending on the requirement ie. STATIC/DYNAMIC
- The PCID for PXSCH & PRACH can be configured based on the requirement.

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#### Fig 13 : ORAN Configuration

Note: Make sure that the compression method is configured properly before sending data to MPRU from DU or DU emulator. By default, the compression method is configured as 16 bit uncompressed.



#### d) RF Calibration

RF calibration section helps the user to change following parameters

- To change the operating bandwidth of the RU and ARFCN value within the operation frequency.
- The carrier state of RU ie. ACTIVE/INACTIVE can be configured from here based on the requirement
- The gain value can be changed based on the requirement in order to adjust the output power of RU.



Fig 14: RF calibration

Once the changes are updated, copy the changes from running to startup and go for rebooting the RU to reflect the changes in RU.

LIVON	: Conternation	· •
Contraction Contra		

Fig 15: Copy-config



#### 5.2.3 Maintenance

#### 5.2.3.1 Management

The Management tab contains the below details, System

- IP Management
- Logs
- Interface Validation

#### System

System-level functions such as Reboot & Factory reset could be performed. Users can reboot or reset the radio unit from the system tab.

#### Follow the below instructions

- o Click Maintenance > Management > System >
- o Select Reboot for a soft reset of RU
- o Select Factory reset for the default setting

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Fig 16: System Management



## IP Management

IP management functions for configuring the IPv4 static & changing the interface in between dynamic/static IPs for the interface.

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Fig 17: IP management for Dynamic

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Fig 18: IP management for Static

#### Logs

The actual system log and temperature logs can be downloaded by the user for the system & temperature information. Click on the download icon for downloading the file The file will be downloaded in the aforementioned format, Sample file name and format: vvdn-gui-system-2024-11-22T06\_33\_35Z.log

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Fig 19: System Logs

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Fig 20: Temperature logs

#### **Interface Validation**

The various interface modules' status can be verified in this section of GUI.



Fig 21: Interface logs

#### 5.2.3.2 Firmware Upgrade

For the MPRU remotely, users can upgrade the firmware from any remote SFTP server. Users need to enter the valid details and credentials as follows:

- a) Username: Valid username of the SFTP server.
- b) IP Address: Remote server IP address.
- c) Password: Remote server password.
- d) File: Remote file location path where the software files are located. (.zip)
- e) **Public Key:** Public Key for the remote server needs to be validated for the software changes in MPRU. (It is optional)



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MORE AND ADDRESS AND ADDRES	<ul> <li>Anteriorete</li> <li>Colympical</li> <li>Colympical</li> <li>Colympical</li> <li>Colympical</li> </ul>	Setterer Lagrade	• 107 1 100	e sort bone 3		C Deciman	
	A Control Management I A Control Management A Control Management C Association C Association	VYDN, MPRI	MPIP Forestands" Fried for disconstruction That is from the construction		in a second		



#### 5.2.4 Performance

The Performance tab displays the throughput for Downlink & Uplink in Mbps, MAC counters, RX window statics, DL SIC

Elanas	Winter					1.0-
		Service .			Be Phinter Solition	
	1.1		-		Annual Control of Cont	T PEC
				-	Republic In	
		HELEN			All and a second	1
	1		1	0=.0	Arrow Arrow Arrow Manager Second Seco	A CONTRACT
		8.0			Transformer Transformer Transformer	
	and a second				<u>211.</u>	3
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				0- 0-	Access Sectors Access	
					dame of the second seco	3

Fig 23: Performance Counters



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#### 5.2.5 System Measurements

The Performance tab displays the CPU usage, memory usage, disk usage, device status, Temperature, Sensor Info, and Antenna output power information.

LIVUN	System Measurem	enits			1 (Cartan
Device Internation     Configuration     Maintenance	Resources CPL over 26279		Manuer Vision et.Ans	Dis Unasi 1705	
Al Performan C Series Homeowerk A Fait Melaneset D Alogs	Device Status Adam State Spawing turn Vogs Sinte Pony State Analy State		United at the second se	Température vett, net alter une in maja	17.05 % 15.05 % 30.05 % 40.05 %
	Sensor Info Sensor +cc_im vicing Salar Sensor +cc_5+0 vicing Salar	Carriert Gallia Carriert Gallia	1400 Alian	Antonna Power Stanoit Stanoit Stanoit	Solution Solution Solution Solution

Fig 24: system Measurement

#### 5.2.6 Fault Management

The fault management tab displays the active alarms in the MPRU.

LIVUN	Fault Managem	ent		P ((* **** -
O Derivable	fact-th	feet frees	fed family T	faithfile
O. Carlypensor		Conductor on all that its balance for one for an install	ALC: N	and in home as a sume
	16	Reconstruction from	CREMICAL	2008-L1-24T8030525-96-88
Event Manuferent     Event Manuferent     O Array				





#### 5.2.7 About

Details about the Manufacturer, Split version, Deployment Type, Radio Configuration, Band, Radio Configuration, Duplex Mode, SCS, RF output power, Supported Frequency range, Licence version and copyright is displayed on this "About page"

Design Information			10
Transferration (	Sector Res Desires	The second secon	MPRI I
	Internet free Station for	Specific Technologies	MIRKO
Name and a second	22	154 c Inclu	
the state of the s	Numerican Topi	Second S	
Abra	ini, adre	17 Salar Norm	
	Courses Record & 2020 control in all parts record		

Fig 26: About Page

## 6. Startup Configurations

#### 6.1. Booting up the device

- Connect the Power adapter, Voltage -48v Current 2.5 Amps
- Check for the LED indication.
- If the board is booted without error, it will indicate Power LED Status to Green.

#### 6.2. Remote Configuration

Users can connect to MPRU using a M-Plane connection. Users need a network connection to the 10G interface.

O-RU will be in static mode with IPv4 address:192.168.4.50 by default. The mode can be changed via CLI.

Steps for changing the mode via CLI are as follows:

- 1. To access CLI manager, use "telnet 192.168.4.50 8888".
- 2. Enter login credentials as username : oranuser and password : oranuser.
- 3. get-IfaceStatus: It will show the status of the management interface.



4. Set-Ipv4 Static can be used to set a static IPv4 address along with arguments IPv4 address, net mask and broadcast address. [example usage : set-Ipv4Static 192.168.4.40 255.255.255.0 192.168.4.255]

5. Set-Ipv6 Static can be used to set a static IPv6 address along with arguments IPv6 address and prefix length. [example usage : set-Ipv6 Static 3ffe:501:CAFE::A001:1012 64]

6. set-IfaceDhcp will set the interface as dynamic for both IPv4 and IPv6.

#### 6.3. Prerequisite

- Install Netopeer client in the host PC
- Network connection between MPRU and Host PC
- Host PC and MPRU should be in the same network domain.

### **6.5.Netconf Client Installation**

**Netopeer2** is a server for implementing network configuration management based on the NETCONF Protocol. This is the second generation, originally available as the <u>Netopeer project</u>. Netopeer2 is based on the NETCONF and YANG libraries - <u>libyang</u> and <u>libnetconf2</u>. The Netopeer2 server uses <u>sysrepo</u> as a NETCONF datastore implementation.

Requirements

- <u>libyang</u>
- <u>libnetconf2</u>
- <u>sysrepo</u>
- <u>netopeer2-cli</u>

#### 6.5.1. Compilation and installation:

Install necessary packages for netopeer2

sudo apt-get update sudo apt-get upgrade sudo apt-get install git sudo apt install snapd sudo snap install sysrepo-netopeer-gen sudo apt install openssl sudo apt install libssh-4 libssh-dev sudo apt install libgcrypt20-dev sudo apt install libgrypt0-++-dev sudo apt install libssl-dev sudo apt install libssl-dev sudo apt-get install zlib1g-dev sudo apt-get install build-essential sudo apt-get install g++ sudo apt-get install cmake



#### To install netopeer-cli version 2 yang modules as follows.

1.libssh (checkout to 0.7.5 branch from git repo)

\$ git clone http://git.libssh.org/projects/libssh.git \$ cd libssh; mkdir build; cd build \$ cmake .. \$ rm -rf CMakeCache.txt \$ make install \$ make install -j8 \$ make

2. libyang(<u>v1.0.240</u>)

Note : dependency on libpcre (install libpcre : sudo apt-get install libpcre3-dev libpcre3)

#### Install .tar file instead of cloning and extract

\$ cd libyang-1.0.240; mkdir build; cd build
\$ cmake ..
\$ rm -rf CMakeCache.txt
\$ make
\$ make install

3. libnetconf2(v1.1.46)

#### Install .tar file instead of cloning and extract

\$ cd libnetconf2-1.1.46
\$ mkdir build; cd build
\$ cmake ..
\$ rm -rf CMakeCache.txt
\$ make
\$ make install

4. sysrepo(v1.4.140)

#### Install .tar file instead of cloning and extract

\$ cd sysrepo-1.4.140
\$ mkdir build; cd build
\$ cmake ..
\$ rm -rf CMakeCache.txt
\$ make
\$ make install



#### 5. Netopeer server and client(<u>Version 1.1.76</u>)

#### Install .tar file instead of cloning and extract

--server installation; \$ cd netopeer2-1.1.76 \$ mkdir build; cd build \$ cmake .. \$ rm -rf CMakeCache.txt \$ sudo ldconfig \$ make \$ make install

Note : server make install may fail with the error (/usr/local/bin/sysrepoctl: error while loading shared libraries: libsysrepo.so.5: cannot open shared object file: No such file or directory CMake Warning (dev) at cmake\_install.cmake:61 (if):

given arguments: 127......etc) put ldconfig command and then proceed with make install

\$ sudo ldconfig\$ make\$ make install

#### To install netopeer-cli version 7 yang modules as follows.

1.libssh (checkout to 0.7.5 branch from git repo)
\$ git clone http://git.libssh.org/projects/libssh.git
\$ cd libssh; mkdir build; cd build
\$ cmake ..
\$ rm -rf CMakeCache.txt
\$ make install
\$ make install -j8
\$ make
2. libyang(v2.1.4)
Note : dependency on libpcre (install libpcre : sudo apt-get install libpcre3-dev libpcre3)
Install .tar file instead of cloning and extract
\$ cd libvang 2.1.4; mkdir build; cd build

\$ cd libyang-2.1.4; mkdir build; cd build \$ cmake .. \$ rm -rf CMakeCache.txt \$ make \$ make install 3. libnetconf2(v2.1.25)



Install .tar file instead of cloning and extract

\$ cd libnetconf2-2.1.25 \$ mkdir build; cd build \$ cmake .. \$ rm -rf CMakeCache.txt \$ make \$ make install 4. sysrepo(v2.2.12) Install .tar file instead of cloning and extract \$ cd sysrepo-1.4.140 \$ mkdir build; cd build \$ cmake .. \$ rm -rf CMakeCache.txt \$ make \$ make install 5. Netopeer server and client(v2.1.49) Install .tar file instead of cloning and extract --server installation; \$ cd netopeer2-2.1.49 \$ mkdir build; cd build \$ cmake ... \$ rm -rf CMakeCache.txt \$ sudo ldconfig \$ make \$ make install Note : server make install may fail with the error (/usr/local/bin/sysrepoctl: error while loading shared libraries: libsysrepo.so.5: cannot open shared object file: No such file or directory CMake Warning (dev) at cmake install.cmake:61 (if) given arguments: 127.....etc) put ldconfig command and then proceed with make install \$ sudo ldconfig \$ make \$make install

#### 6.6 Procedure

DHCP server will assign a dynamic ip to the 10G interface, then Follow below-mentioned commands for connecting via Netopeer

>netopeer2-cli >listen --ssh --login <username>

• Insert any one of the credentials in <u>table 10</u>


### 6.7 Firmware upgrade via M Plane

Note:- For reference refer ORAN spec- O-RAN.WG4.MP.0-v07.00

#### 6.7.1. Firmware upgrade using v7 yang modules

#### 6.7.1.1. Software Download

subscribe --filter-xpath /o-ran-software-management:download-event

# Download

#### >user-rpc

<software-download xmlns="urn:o-ran:software-management:1.0">

<remote-file-path>sftp://username@ip\_address:22/file\_path</remote-file-path>

<password>

<password>PASSWORD</password>

</password>

</software-download>

#### Note:

Remote File path Location: <username of Linux PC>@<IP address of Linux PC>:22/<Specify the software image location in linux PC> Password:Linux PC's Password

### 6.7.1.2.Software Install

subscribe --filter-xpath /o-ran-software-management:install-event

#### Install

#### >user-rpc

<software-install xmlns="urn:o-ran:software-management:1.0"> <slot-name>SLOT\_NUMBER(ex:swSlot2)</slot-name>

</software-install>



#### 6.7.1.3. Software Activate

	Activate	
>user-rpc		
[OB]		
<software-activate xmlns="urn:o-ran:software-managestot-name&gt;SLOT_NUMBER(ex:swSlot2)&lt;/slot-restrictions/software-activate&gt;&lt;/td&gt;&lt;td&gt;gement:1.0"> name&gt;</software-activate>		
6.7.1.4. Software Reset		

Reset

>user-rpc

<reset xmlns="urn:o-ran:operations:1.0"></reset>

### 6.8. Performance management via M Plane

#### 6.8.1.o-ran-performance-management.yang Module for V7 Netopeercli yang.

edit-config --target running --config --defop replace

<performance-measurement-objects xmlns="urn:o-ran:performance-management:1.0">

<enable-SFTP-upload>true</enable-SFTP-upload>

<enable-random-file-upload>false</enable-random-file-upload>

<remote-SFTP-uploads>

<remote-SFTP-upload-path>sftp://username@ip\_address:22/file\_upload\_path</remote-SFTP-upload-path>

<password>

<password>DU\_PASSWORD</password>

```
</password>
```



</remote-SFTP-uploads>

- <rx-window-measurement-interval>20</rx-window-measurement-interval>
- <transceiver-measurement-interval>20</transceiver-measurement-interval>
- <notification-interval>20</notification-interval>
- <file-upload-interval>20</file-upload-interval>
- <rx-window-measurement-objects>
  - <measurement-object>RX\_ON\_TIME</measurement-object>
  - <active>true/false</active>
  - <object-unit>EAXC\_ID</object-unit>
  - <report-info>MAXIMUM</report-info>
- </rx-window-measurement-objects>
- <rx-window-measurement-objects>
  - <measurement-object>RX\_EARLY</measurement-object>
  - <active>true/false</active>
  - <object-unit>EAXC\_ID</object-unit>
  - <report-info>MAXIMUM</report-info>
- </rx-window-measurement-objects>
- <rx-window-measurement-objects>
  - <measurement-object>RX\_LATE</measurement-object>
- <active>true</active>
- <object-unit>EAXC\_ID</object-unit>
- <report-info>MAXIMUM</report-info>
- </rx-window-measurement-objects>
- <rx-window-measurement-objects>
- <measurement-object>RX CORRUPT</measurement-object>
- <active>true/false</active>
- <object-unit>EAXC\_ID</object-unit>
- <report-info>MAXIMUM</report-info>
- </rx-window-measurement-objects>
- <rx-window-measurement-objects>
  - <measurement-object>RX\_TOTAL</measurement-object>
  - <active>true/false</active>
- <object-unit>EAXC ID</object-unit>
- <report-info>MAXIMUM</report-info>
- </rx-window-measurement-objects>
- <transceiver-measurement-objects>
- <measurement-object>RX\_DUPL</measurement-object>
- <active>true/false</active>
- <report-info>MAXIMUM</report-info>
- <object-unit>PORT\_NUMBER</object-unit>



- </transceiver-measurement-objects>
- <transceiver-measurement-objects>

<measurement-object>TX\_POWER</measurement-object>

<active>true/false</active>

<report-info>MAXIMUM</report-info>

<object-unit>PORT\_NUMBER</object-unit>

</transceiver-measurement-objects>

<transceiver-measurement-objects>

<measurement-object>TX\_BIAS\_COUNT</measurement-object>

<active>true/false</active>

<report-info>MAXIMUM</report-info>

<object-unit>PORT\_NUMBER</object-unit>

</transceiver-measurement-objects>

<transceiver-measurement-objects>

<measurement-object>VOLTAGE</measurement-object>

<active>true/false</active>

<report-info>MAXIMUM</report-info>

<object-unit>PORT\_NUMBER</object-unit>

</transceiver-measurement-objects>

<transceiver-measurement-objects>

<measurement-object>TEMPERATURE</measurement-object>

<active>true/false</active>

<report-info>MAXIMUM</report-info>

<object-unit>PORT\_NUMBER</object-unit>

</transceiver-measurement-objects>

</performance-measurement-objects>

Note:

**Remote File Path Location:** 

<username of Linux PC>@<IP address of Linux PC>:22/<Specify the software image location in Linux PC> Password: Linux PC's Password

- To access the Public key of the sftp server, follow the steps below
  - \$cat /etc/ssh/ssh\_host\_rsa\_key.pub



Fig 27: ssh host key



Note: Below is the RSA public key of the sftp server, in which the key that comes within the bracket is only required here.

#### ssh-rsa

[AAAAB3NzaC1yc2EAAAADAQABAAABAQDKr9yVoc2uRPc4t2SeTjIJ3qO8ZfOvFIJJoPrR3FirgWK/zPFmQ4 ugzhCThzEyTB39d/1JM5Ns81gVsw53O6b72XMBST8StYfQKLWFCjQYvotyMPfolNu9JA2a8Hpun4cA7/LPDC OPOJVW523x83XZMgKsiB4c7j1gmvCHLOVZmPLGhNcaVFXM80vGM+m4XLnAXcyOfHh2K7IUB6Htt9igxv zigxXY9PDsnZTsTQlyARh2K2Sm/7vJZZY/fRM8TfZrCo6BsY+Ljl+Frd/p9Z+mOgacsgfGkbXUbP6bl+wprxGhZ 4Nn10k7KvIHf1anaD5wgQ2NNGL0GYLAvE5V3KyF] root@CICDPC230120

### To activate performance management : Give TRUE in every <active> leaf in the xml

To deactivate performance management : Give FALSE in every <active> leaf in the xml

### 6.9. U plane configuration via M Plane

#### 6.9.1.o-ran-uplane-conf.yang Module

#### edit-config --target running --config --defop replace

<user-plane-configuration xmlns="urn:o-ran:uplane-conf:1.0"> <low-level-tx-links> <name>lltxlink0</name> <processing-element>element1</processing-element> <tx-array-carrier>txarraycarrier0</tx-array-carrier> <low-level-tx-endpoint>slltx-endpoint0</low-level-tx-endpoint> </low-level-tx-links> <low-level-tx-links> <name>lltxlink1</name> <processing-element>element1</processing-element> <tx-array-carrier>txarraycarrier0</tx-array-carrier> <low-level-tx-endpoint>slltx-endpoint1</low-level-tx-endpoint> </low-level-tx-links> <low-level-tx-links> <name>lltxlink2</name> <processing-element>element1</processing-element> <tx-array-carrier>txarraycarrier0</tx-array-carrier> <low-level-tx-endpoint>slltx-endpoint2</low-level-tx-endpoint> </low-level-tx-links> <low-level-tx-links>



<name>lltxlink3</name>

- <processing-element1</processing-element>
- <tx-array-carrier>txarraycarrier0</tx-array-carrier>
- $<\!\!low-level-tx-endpoint\!\!>\!\!slltx-endpoint3\!\!<\!\!/low-level-tx-endpoint\!\!>$
- </low-level-tx-links>

<low-level-rx-links>

<name>llrxlink0</name>

<processing-element1</processing-element>

<rx-array-carrier>rxarraycarrier0</rx-array-carrier>

<low-level-rx-endpoint>sllrx-endpoint0</low-level-rx-endpoint>

</low-level-rx-links>

<low-level-rx-links>

<name>llrxlink1</name>

<processing-element1</processing-element>

<rx-array-carrier>rxarraycarrier0</rx-array-carrier>

<low-level-rx-endpoint>sllrx-endpoint1</low-level-rx-endpoint>

</low-level-rx-links>

<low-level-rx-links>

<name>llrxlink2</name>

<processing-element1</processing-element>

<rx-array-carrier>rxarraycarrier0</rx-array-carrier>

<low-level-rx-endpoint>sllrx-endpoint2</low-level-rx-endpoint>

</low-level-rx-links>

<low-level-rx-links>

<name>llrxlink3</name>

<processing-element1</processing-element></processing-element>

<rx-array-carrier>rxarraycarrier0</rx-array-carrier>

<low-level-rx-endpoint>sllrx-endpoint3</low-level-rx-endpoint>

</low-level-rx-links>

<low-level-tx-endpoints>

<name>slltx-endpoint0</name>

<compression>

<compression-type>STATIC</compression-type>

<iq-bitwidth>16</iq-bitwidth>

</compression>

<cp-length>352</cp-length>

<cp-length-other>288</cp-length-other>

<offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center>

<number-of-prb-per-scs>

<scs>KHZ\_30</scs>

<number-of-prb>273</number-of-prb>

</number-of-prb-per-scs>

<e-axcid>



- <o-du-port-bitmask>65024</o-du-port-bitmask>
- $<\!\!\text{band-sector-bitmask}\!\!>\!\!448 \!<\!\!/\text{band-sector-bitmask}\!\!>$
- <ccid-bitmask>56</ccid-bitmask>
- $<\!\!ru\text{-}port\text{-}bitmask\!\!>\!\!7\!<\!\!/ru\text{-}port\text{-}bitmask\!\!>$
- <eaxc-id>1</eaxc-id>
- </e-axcid>
- </low-level-tx-endpoints>
- <low-level-tx-endpoints>
- <name>slltx-endpoint1</name>
- <compression>
- <compression-type>STATIC</compression-type>
- <iq-bitwidth>16</iq-bitwidth>
- </compression>
- <cp-length>352</cp-length>
- <cp-length-other>288</cp-length-other>
- <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center>
- <number-of-prb-per-scs>
- <scs>KHZ\_30</scs>
- <number-of-prb>273</number-of-prb>
- </number-of-prb-per-scs>
- <e-axcid>
- <o-du-port-bitmask>65024</o-du-port-bitmask>
- <bad-sector-bitmask>448</band-sector-bitmask>
- <ccid-bitmask>56</ccid-bitmask>
- <ru-port-bitmask>7</ru-port-bitmask>
- <eaxc-id>2</eaxc-id>
- </e-axcid>
- </low-level-tx-endpoints>
- <low-level-tx-endpoints>
- <name>slltx-endpoint2</name>
- <compression>
- <compression-type>STATIC</compression-type>
- <iq-bitwidth>16</iq-bitwidth>
- </compression>
- <cp-length>352</cp-length>
- <cp-length-other>288</cp-length-other>
- <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center>
- <number-of-prb-per-scs>
- <scs>KHZ\_30</scs>
- <number-of-prb>273</number-of-prb>
- </number-of-prb-per-scs>
- <e-axcid>
- <o-du-port-bitmask>65024</o-du-port-bitmask>
- <baddlesector-bitmask>448</band-sector-bitmask>
- <ccid-bitmask>56</ccid-bitmask>



<ru-port-bitmask>7</ru-port-bitmask> <eaxc-id>3</eaxc-id> </e-axcid> </low-level-tx-endpoints> <low-level-tx-endpoints> <name>slltx-endpoint3</name> <compression> <compression-type>STATIC</compression-type> <iq-bitwidth>16</iq-bitwidth> </compression> <cp-length>352</cp-length> <cp-length-other>288</cp-length-other> <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center> <number-of-prb-per-scs> <scs>KHZ\_30</scs> <number-of-prb>273</number-of-prb> </number-of-prb-per-scs> <e-axcid> <o-du-port-bitmask>65024</o-du-port-bitmask> <baddsector-bitmask>448</badd-sector-bitmask> <ccid-bitmask>56</ccid-bitmask> <ru-port-bitmask>7</ru-port-bitmask> <eaxc-id>4</eaxc-id> </e-axcid> </low-level-tx-endpoints> <low-level-rx-endpoints> <name>sllrx-endpoint0</name> <compression> <compression-type>STATIC</compression-type> <iq-bitwidth>16</iq-bitwidth> </compression> <cp-length>352</cp-length> <cp-length-other>288</cp-length-other> <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center> <number-of-prb-per-scs> <scs>KHZ 30</scs> <number-of-prb>273</number-of-prb> </number-of-prb-per-scs> <ul-fft-sampling-offsets> <scs>KHZ 30</scs> </ul-fft-sampling-offsets> <e-axcid> <o-du-port-bitmask>65024</o-du-port-bitmask> <baddsector-bitmask>448</badd-sector-bitmask>



```
<ccid-bitmask>56</ccid-bitmask>
  <ru-port-bitmask>7</ru-port-bitmask>
  <eaxc-id>1</eaxc-id>
 </e-axcid>
 <non-time-managed-delay-enabled>true</non-time-managed-delay-enabled>
</low-level-rx-endpoints>
<low-level-rx-endpoints>
 <name>sllrx-endpoint1</name>
 <compression>
  <compression-type>STATIC</compression-type>
  <iq-bitwidth>16</iq-bitwidth>
 </compression>
 <cp-length>352</cp-length>
 <cp-length-other>288</cp-length-other>
 <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center>
 <number-of-prb-per-scs>
  <scs>KHZ 30</scs>
  <number-of-prb>273</number-of-prb>
 </number-of-prb-per-scs>
 <ul-fft-sampling-offsets>
  <scs>KHZ_30</scs>
 </ul-fft-sampling-offsets>
 <e-axcid>
  <o-du-port-bitmask>65024</o-du-port-bitmask>
  <badd-sector-bitmask>448</badd-sector-bitmask>
  <ccid-bitmask>56</ccid-bitmask>
  <ru-port-bitmask>7</ru-port-bitmask>
  <eaxc-id>2</eaxc-id>
 </e-axcid>
 <non-time-managed-delay-enabled>true</non-time-managed-delay-enabled>
</low-level-rx-endpoints>
<low-level-rx-endpoints>
 <name>sllrx-endpoint2</name>
 <compression>
  <compression-type>STATIC</compression-type>
  <iq-bitwidth>16</iq-bitwidth>
 </compression>
 <cp-length>352</cp-length>
 <cp-length-other>288</cp-length-other>
 <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center>
 <number-of-prb-per-scs>
  <scs>KHZ 30</scs>
  <number-of-prb>273</number-of-prb>
 </number-of-prb-per-scs>
 <l
```

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<scs>KHZ 30</scs> </ul-fft-sampling-offsets> <e-axcid> <o-du-port-bitmask>65024</o-du-port-bitmask> <baddsector-bitmask>448</badd-sector-bitmask> <ccid-bitmask>56</ccid-bitmask> <ru-port-bitmask>7</ru-port-bitmask> <eaxc-id>3</eaxc-id> </e-axcid> <non-time-managed-delay-enabled>true</non-time-managed-delay-enabled> </low-level-rx-endpoints> <low-level-rx-endpoints> <name>sllrx-endpoint3</name> <compression> <compression-type>STATIC</compression-type> <iq-bitwidth>16</iq-bitwidth> </compression> <cp-length>352</cp-length> <cp-length-other>288</cp-length-other> <offset-to-absolute-frequency-center>0</offset-to-absolute-frequency-center> <number-of-prb-per-scs> <scs>KHZ 30</scs> <number-of-prb>273</number-of-prb> </number-of-prb-per-scs> <ul-fft-sampling-offsets> <scs>KHZ 30</scs> </ul-fft-sampling-offsets> <e-axcid> <o-du-port-bitmask>65024</o-du-port-bitmask> <bard-sector-bitmask>448</bard-sector-bitmask> <ccid-bitmask>56</ccid-bitmask> <ru-port-bitmask>7</ru-port-bitmask> <eaxc-id>4</eaxc-id> </e-axcid> <non-time-managed-delay-enabled>true</non-time-managed-delay-enabled> </low-level-rx-endpoints> <tx-array-carriers> <name>txarraycarrier0</name> <absolute-frequency-center>[ARFCN]</absolute-frequency-center> <center-of-channel-bandwidth>[CENTER FREQUENCY]</center-of-channel-bandwidth> <channel-bandwidth>[BANDWIDTH]</channel-bandwidth> <active>INACTIVE</active> <gain>27</gain> <downlink-radio-frame-offset>0</downlink-radio-frame-offset>

<downlink-sfn-offset>0</downlink-sfn-offset>



<rw-duplex-scheme>TDD</rw-duplex-scheme> <rw-type>NR</rw-type> </tx-array-carriers> <rx-array-carriers> <name>rxarraycarrier0</name> <absolute-frequency-center>[ARFCN]</absolute-frequency-center> <center-of-channel-bandwidth>[CENTER FREQUENCY]</center-of-channel-bandwidth> <channel-bandwidth>[BANDWIDTH]</channel-bandwidth> <active>INACTIVE</active> <downlink-radio-frame-offset>0</downlink-radio-frame-offset> <downlink-sfn-offset>0</downlink-sfn-offset> <gain-correction>0</gain-correction> <n-ta-offset>25600</n-ta-offset> </user-plane-configuration>

*Note:For 4T4R the eAxC ID mapping is PDSCH- 0,1,2,3 PUSCH-0,1,2,3 PRACH-4,5,6,7* 

ARFCN of center frequency chosen within the band eg : ARFCN : 641667, Freq : 3625.005 Mhz Bandwidth within ibw/obw can be used.

Note: We need to push the ACTIVE leaf in the U-plane each time after the RU gets synchronized.

### 6.10. Interface configuration via M Plane

6.10.1.o-ran-interface.yang Module for V7 yang modules.

edit-config --target running --config --defop merge

<interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">

<interface>

<name>eth1.100(interface\_name.valn)</name>

<type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:l2vlan</type>

<enabled>true</enabled>

<base-interface xmlns="urn:o-ran:interfaces:1.0">eth1</base-interface>

<vlan-id xmlns="urn:o-ran:interfaces:1.0">100(valn)</vlan-id>

<mac-address xmlns="urn:o-ran:interfaces:1.0">[MAC\_ADDRESS]</mac-address>



<sup>4</sup>port ren

</interface>

</interfaces>

#### 6.10.2.o-ran-interface.yang Module for V7 yang modules.

<interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">

```
<interface>
 <name>eth1(name of the eth interface)</name>
 <type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
 <enabled>true</enabled >
 <ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
  <enabled>true</enabled>
  <forwarding>false</forwarding>
  <m-plane-marking xmlns="urn:o-ran:interfaces:1.0">18</m-plane-marking>
 </ipv4>
 12-mtu xmlns="urn:o-ran:interfaces:1.0">1500</l2-mtu>
 <vlan-tagging xmlns="urn:o-ran:interfaces:1.0">true</vlan-tagging>
 <class-of-service xmlns="urn:o-ran:interfaces:1.0">
  <u-plane-marking>7</u-plane-marking>
  <c-plane-marking>7</c-plane-marking>
  <m-plane-marking>2</m-plane-marking>
  <s-plane-marking>7</s-plane-marking>
  <other-marking>1</other-marking>
        <enhanced-uplane-markings>
                <up>arking-name>uplane</up-marking-name>
                <enhanced-marking>7</enhanced-marking>
        </enhanced-uplane-markings>
 </class-of-service>
 <mac-address xmlns="urn:o-ran:interfaces:1.0">RU MAC ADDRESS</mac-address>
 <port-reference xmlns="urn:o-ran:interfaces:1.0">
  <port-name>ru-port1</port-name>
  <port-number>1</port-number>
 </port-reference>
</interface>
<interface>
 <name>eth1.100(name_of_the_vlan_interface_to_be_created)</name>
```





<type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:l2vlan</type>

<enabled>true</enabled>

<ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">

<enabled>true</enabled>

<forwarding>false</forwarding>

<address>

<ip>192.168.3.45(ip\_of\_the\_vlan\_interface)</ip>

<netmask>255.255.255.0</netmask>

</address>

<m-plane-marking xmlns="urn:o-ran:interfaces:1.0">18</m-plane-marking>

</ipv4>

<base-interface xmlns="urn:o-ran:interfaces:1.0">eth0(FH\_Interface\_MPRU)</base-interface>

<vlan-id xmlns="urn:o-ran:interfaces:1.0">100(vlan\_id)</vlan-id>

<mac-address xmlns="urn:o-ran:interfaces:1.0">RU\_MAC\_ADDRESS</mac-address>

<port-reference xmlns="urn:o-ran:interfaces:1.0">

<port-name>ru-port1</port-name>

<port-number>1</port-number>

</port-reference>

</interface>

</interfaces>

# 6.11. Processing element via M Plane

#### edit-config --target running --config --defop replace

<processing-elements xmlns="urn:o-ran:processing-element:1.0">

<transport-session-type>ETH-INTERFACE</transport-session-type>

<ru-elements>

<name>element1</name>

<transport-flow>

<interface-name>eth1.100(name\_of\_the\_vlan\_interface)</interface-name>

<eth-flow>

<ru-mac-address>RU\_MAC\_ADDRESS</ru-mac-address>

<vlan-id>100(vlan\_id)</vlan-id>

<o-du-mac-address>DU\_MAC\_ADDRESS</o-du-mac-address>

</eth-flow>



</transport-flow>

</ru-elements>

</processing-elements>

# 6.12. Transceiver configuration via M Plane



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edit-config --target running --config --defop replace

```
<port-transceivers xmlns="urn:o-ran:transceiver:1.0">
  <port-transceiver-data>
   <interface-name>eth1</interface-name>
   <port-number>1</port-number>
   <name>ru-port1</name>
   <present>true</present></present>
   <vendor-id>Syrotech
                           </vendor-id>
   <vendor-part>GOXP-8596-02 </vendor-part>
   <vendor-rev>V0</vendor-rev>
   <serial-no>SY2210-OLC0716 </serial-no>
   <SFF8472-compliance-code>rev10.2-diagnostics</SFF8472-compliance-code>
   <connector-type>lucent-connector</connector-type>
   <identifier>sfp</identifier>
   <nominal-bitrate>103</nominal-bitrate>
   <low-bitrate-margin>0</low-bitrate-margin>
   <high-bitrate-margin>0</high-bitrate-margin>
   <rx-power-type>avp</rx-power-type>
   <rx-power>0.4287</rx-power>
   <tx-power>0.5889</tx-power>
   <tx-bias-current>7.93</tx-bias-current>
   <voltage>3.3348</voltage>
  </port-transceiver-data>
 </port-transceivers>
</data>
```

### 6.13. mplane-int.yang configuration via M plane

### 6.13.1. Mplane-int.yang for v7 yang modules

edit-config --target running --config --defop replace



<mplane-info xmlns="urn:o-ran:mplane-interfaces:1.0">

<searchable-mplane-access-vlans-info>

<searchable-access-vlans>100</searchable-access-vlans>

<vlan-range>

<lowest-vlan-id>1</lowest-vlan-id>

<highest-vlan-id>4094</highest-vlan-id>

</vlan-range>

<scan-interval>100</scan-interval>

</searchable-mplane-access-vlans-info>

<m-plane-interfaces>

<m-plane-sub-interfaces>

<interface-name>eth1.100</interface-name>

<sub-interface>100</sub-interface>

</m-plane-sub-interfaces>

<m-plane-ssh-ports>

<call-home-ssh-port>4334</call-home-ssh-port>

<server-ssh-port>830</server-ssh-port>

</m-plane-ssh-ports>

<m-plane-tls-ports>

<call-home-tls-port>4335</call-home-tls-port>

<server-tls-port>6513</server-tls-port>

</m-plane-tls-ports>

</m-plane-interfaces>

<configured-client-info>

<mplane-ipv4-info>

<mplane-ipv4>ex:192.168.4.15(ip\_for\_the\_created\_vlan\_interface)</mplane-ipv4>

<port>830</port>

</mplane-ipv4-info>

<mplane-ipv6-info>

<mplane-ipv6>fe80::7a7d:f3ff:fe01:12e9</mplane-ipv6>

<port>830</port>

</mplane-ipv6-info>

<mplane-fqdn>vvdntech</mplane-fqdn>

</configured-client-info>

</mplane-info>



### 6.14. O-ran-troubleshooting configuration via M plane

#### 6.14.1. Start Troubleshooting

user-rpc

<start-troubleshooting-logs xmlns="urn:o-ran:troubleshooting:1.0"> </start-troubleshooting-logs>

#### 6.14.2. Stop Troubleshooting

user-rpc

<stop-troubleshooting-logs xmlns="urn:o-ran:troubleshooting:1.0">>

</stop-troubleshooting-logs>

Logs: The troubleshooting logs will be stored inside radio's at location: /media/sd-mmcblkop4/O-RAN/log/troubleshooting

## 6.15.o-ran-trace configuration via M plane

#### 6.15.1. Start Trace

user-rpc

<start-trace-logs xmlns="urn:o-ran:trace:1.0"> </start-trace-logs>

### 6.15.2. Stop Trace

user-rpc

<stop-trace-logs xmlns="urn:o-ran:trace:1.0">

</stop-trace-logs>

Logs: The troubleshooting logs will be stored inside radio's at location: /media/sd-mmcblkop4/O-RAN/log/trace



### 6.16. o-ran-supervision configuration via M Plane

<supervision-watchdog-reset xmlns="urn:o-ran:supervision:1.0">

<supervision-notification-interval>60</supervision-notification-interval>

<guard-timer-overhead>10</guard-timer-overhead>

</supervision-watchdog-reset>

## 6.17. o-ran-usermgmt configuration via M plane

#### edit-config --target running --config --defop replace

<data xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">

```
<users xmlns="urn:o-ran:user-mgmt:1.0">
```

<user>

- <name>oranuser</name>
- <account-type>PASSWORD</account-type>
- <enabled>true</enabled>
- </user>
- </users>
- </data>

get --filter-xpath /o-ran-usermgmt:users/user

# 6.18. o-ran-hardware configuration via M Plane

### 6.18.1. o-ran-hardware v7 yang modules.

get --filter-xpath /ietf-interfaces:interfaces

<interfaces xmlns="urn:ietf:params:xml:ns:yang:ietf-interfaces">

<interface>

<sup>&</sup>lt;data xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">



<name>lo</name>

```
<type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
```

<enabled>true</enabled>

<oper-status>up</oper-status>

<phys-address>00:00:00:00:00:00</phys-address>

<statistics>

<in-octets>200</in-octets>

<in-discards>0</in-discards>

<in-errors>0</in-errors>

<out-octets>200</out-octets>

<out-discards>0</out-discards>

<out-errors>0</out-errors>

</statistics>

<ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">

<enabled>true</enabled>

<address>

```
<ip>127.0.0.1</ip>
```

```
<netmask>255.0.0.0</netmask>
```

</address>

</ipv4>

ast-cleared xmlns="urn:o-ran:interfaces:1.0">2020-05-20T06:09:57+05:30</last-cleared>

<mac-address xmlns="urn:o-ran:interfaces:1.0">00:00:00:00:00:00</mac-address>

</interface>

<interface>

<name>eth0</name>

<type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>

<enabled>true</enabled>

<oper-status>up</oper-status>

<phys-address>98:ae:71:00:00:22</phys-address>

<statistics>

<in-octets>0</in-octets>

<in-discards>0</in-discards>

<in-errors>0</in-errors>

<out-octets>0</out-octets>

<out-discards>0</out-discards>

```
<out-errors>0</out-errors>
```



</statistics>

```
<ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">
```

<enabled>true</enabled>

<address>

<ip>192.168.1.10</ip>

<netmask>255.255.255.0</netmask>

</address>

</ipv4>

last-cleared xmlns="urn:o-ran:interfaces:1.0">2020-05-20T06:09:57+05:30</last-cleared>

mtu xmlns="urn:o-ran:interfaces:1.0">1500</l2-mtu>

<mac-address xmlns="urn:o-ran:interfaces:1.0">98:ae:71:00:00:22</mac-address>

```
<port-reference xmlns="urn:o-ran:interfaces:1.0">
```

<port-name>ru-port0</port-name>

<port-number>0</port-number>

</port-reference>

</interface>

<interface>

<name>eth1</name>

```
<type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:ethernetCsmacd</type>
```

 $<\!\!enabled\!>\!\!true<\!\!/enabled\!>$ 

```
<oper-status>up</oper-status>
```

>phys-address>98:ae:71:00:00:11</phys-address>

<statistics>

<in-octets>81552</in-octets>

<in-discards>0</in-discards>

<in-errors>0</in-errors>

<out-octets>877739</out-octets>

<out-discards>0</out-discards>

<out-errors>0</out-errors>

</statistics>

<ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">

<enabled>true</enabled>

<forwarding>false</forwarding>

<address>

<ip>192.168.4.50</ip>

<netmask>255.255.255.0</netmask>



</address>

<m-plane-marking xmlns="urn:o-ran:interfaces:1.0">18</m-plane-marking>

</ipv4>

last-cleared xmlns="urn:o-ran:interfaces:1.0">2020-05-20T06:09:57+05:30</last-cleared>

```
<l2-mtu xmlns="urn:o-ran:interfaces:1.0">1500</l2-mtu>
```

<vlan-tagging xmlns="urn:o-ran:interfaces:1.0">true</vlan-tagging>

<class-of-service xmlns="urn:o-ran:interfaces:1.0">

```
<u-plane-marking>7</u-plane-marking>
```

<c-plane-marking>7</c-plane-marking>

<m-plane-marking>2</m-plane-marking>

<s-plane-marking>7</s-plane-marking>

```
<other-marking>1</other-marking>
```

</class-of-service>

<mac-address xmlns="urn:o-ran:interfaces:1.0">98:ae:71:00:00:11</mac-address>

<port-reference xmlns="urn:o-ran:interfaces:1.0">

<port-name>ru-port1</port-name>

<port-number>1</port-number>

</port-reference>

</interface>

<interface>

<name>eth1.100</name>

<type xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-type">ianaift:l2vlan</type>

<enabled>true</enabled>

<oper-status>up</oper-status>

>phys-address>98:ae:71:00:00:11</phys-address>

<statistics>

<in-octets>0</in-octets>

<in-discards>0</in-discards>

<in-errors>0</in-errors>

<out-octets>5101</out-octets>

<out-discards>0</out-discards>

<out-errors>0</out-errors>

</statistics>

<ipv4 xmlns="urn:ietf:params:xml:ns:yang:ietf-ip">

<enabled>true</enabled>

<forwarding>false</forwarding>



```
<address>
     <ip>10.10.0.1</ip>
     <netmask>255.255.255.0</netmask>
    </address>
    <m-plane-marking xmlns="urn:o-ran:interfaces:1.0">18</m-plane-marking>
   </ipv4>
   last-cleared xmlns="urn:o-ran:interfaces:1.0">2020-05-20T06:09:57+05:30</last-cleared>
   <base-interface xmlns="urn:o-ran:interfaces:1.0">eth1</base-interface>
   <vlan-id xmlns="urn:o-ran:interfaces:1.0">100</vlan-id>
   <mac-address xmlns="urn:o-ran:interfaces:1.0">98:ae:71:00:00:11</mac-address>
   <port-reference xmlns="urn:o-ran:interfaces:1.0">
    <port-name>ru-port1</port-name>
    <port-number>1</port-number>
   </port-reference>
  </interface>
</interfaces>
</data>
```

### 6.18.2. o-ran-hardware v7 yang modules.

<hardware xmlns="urn:ietf:params:xml:ns:yang:ietf-hardware">

<component>

<energy-saving-enabled>true</energy-saving-enabled>

<last-service-date>11-08-2023</last-service-date>

<o-ran-name>ru\_hw\_component\_name</o-ran-name>

</component>

</hardware>

get ---filter-xpath /ietf-hardware:hardware



## 6.19. o-ran-operations configuration via M plane

<operational-info xmlns="urn:o-ran:operations:1.0"></operational-info>	
<clock></clock>	
<timezone-name>Asia/Kolkata</timezone-name>	
<timezone-utc-offset>+0530</timezone-utc-offset>	
<re-call-home-no-ssh-timer>60</re-call-home-no-ssh-timer>	

### 6.20. O-ran-file-management configuration via M plane

### 6.20.1 o-ran-file-management configurationFor V7 based yang modules

6.20.1.1 O-ran-file-management: file-download

subscribe --filter-xpath /o-ran-file-management:file-download-event

#### user-rpc

<file-download xmlns="urn:o-ran:file-management:1.0">

<local-logical-file-path>/home/root/</local-logical-file-path>

<remote-file-path>sftp://username@ip\_address:22/file\_path</remote-file-path>

<password>

<password>DU\_PASSWORD</password>

</password>

</file-download>

Note:

Remote File path Location: <username of Linux PC>@<IP address of Linux PC>:22/<Specify the software image location in linux PC> Password:Linux PC's Password



#### 6.20.1.2 O-ran-file-management: file-upload

#### subscribe --filter-xpath /o-ran-file-management:file-upload-event

#### user-rpc

<file-upload xmlns="urn:o-ran:file-management:1.0">

<local-logical-file-path>/home/root/name\_of\_the\_file</local-logical-file-path>

<remote-file-path>sftp://username@ip\_address:22/file\_upload\_path</remote-file-path>

<password>

<password>DU\_PASSWORD</password>

</password>

</file-upload>

Note: Remote File path Location: <username of Linux PC>@<IP address of Linux PC>:22/<Specify the software image location in linux PC> Password:Linux PC's Password

### 6.20.1.3 O-ran-file-management: retrieve-file-list

user-rpc

<retrieve-file-list xmlns="urn:o-ran:file-management:1.0">

<logical-path>/home/root/</logical-path>

<file-name-filter>\*</file-name-filter>

</retrieve-file-list>



# 7.CLI MANAGER

rootByrdn mpril: Stelnet localhost B88B Connected to localhost

Enter Login Gredentials

Username : oranuser Password : oranuser

CLI Manager Client Connected Successfully

Fig 28: CLI manager log in



emund	- Description
et-Inv4Static	- Set ipv4 interface as static
et-InvGStatic	- Set ipvG interface as static
et-IfaceDhcp	<ul> <li>Bet interface as dynamic</li> </ul>
et-IfaceStatus	Get Management Interface is static/Dynamic
et-IfaceIpType	- Get Management Interface IP type
et-IfaceIpType	- Set IP type of Management Interface
et-Swinv	<ul> <li>Get Software inventory details</li> </ul>
et-HwInv	- Get Hardware inventory details
et-SysMac	- MAC address of the box
et-Sysuptime	- System Uptime Information
et-16Status	- Get status of 1G Mac inteface
et fn status	- Get status of 10G Mac interface
et counter stats	- Sets the updated rx layer stats
et-BandWidth	- Get Bandwidth details
et-BandWidth	- Set Bandwidth for the RU in MHZ
et_dl_compression	<ul> <li>Set Downlink Compression(9/12/14/16 bit)</li> </ul>
et_dl_compression	- Get Downlink Compression
et_du_mac_address	Set the DU MAC Address
et_du_mac_address	- Get the DU MAC Address
et-EpgaRegisterVersion	- Read Epga Register details
et_pxsch_pcid	<ul> <li>Set PxSCH PCID L0 L1 L2 L3 [range 0 - 15]</li> </ul>
et_oxsch_pc1d	- Get PxSCH PCID
et_ria_ecpr1_mac_address	- Get the RU ECPRI MAC Address
et_rit_xBAR_mac_address	- Get the RU xEAR MAC Address
et-PrachFornat	<ul> <li>Get PrachFormat Detail</li> </ul>
et DL FPGA DBF5 Power	<ul> <li>Get Downlink FPGA DBFS Power</li> </ul>
et_UL_FPGA_DBFS_Power	- Get UPlink FFGA DBFS Power
et-CuPlaneVlan	<ul> <li>Set Vlan for the CU Plane in RU</li> </ul>
et-CUPlaneVlan	<ul> <li>Get Vlan for the CU Plane in RU</li> </ul>
et-dl_power_scaling	- Get dl_power scaling
et-dl_power_scaling	- Set di power scaling
et-ul_power_scaling	<ul> <li>Get ul_power scaling</li> </ul>
et-ul_power_scaling	<ul> <li>Set ul_power scaling</li> </ul>
et_ul_compression	<ul> <li>Set Uplink Compression(9/12/14/16 bit)</li> </ul>
et_ul_compression	- Get Uplink Compression
et_prach_pcid	- Get the PRACH PCID
et_prach_pcid	- Set the PRACH PCID (2 2 2 2)
et-Templevels	<ul> <li>Set the Ambient and Fault Temperature levels</li> </ul>
et traceNotif interval	<ul> <li>Get Trace Notification time interval</li> </ul>
et_traceNotif_interval	<ul> <li>Set Trace NotiFication time interval</li> </ul>
uReset	<ul> <li>RU Diagnostic Triggered Restart</li> </ul>
hangePassed	- Password change for logged in user
lear	- Clear the screen
elp	- Get detailed help
xit	<ul> <li>Quit/Disconnect with the client</li> </ul>

Fig 29: CLI Manager Functions



cui:/>	set-Ipv4Static	
Usage: Arg's:	<pre>? 1 show command usage</pre>	commands) 255.255.255.0 192.168.4.1>
CLI:/>	set-Ipv4Static 192.168.4.50 255.285.2	255.0 192.168.4.1
100.000	Paramaters Status	- Response - Configured Successfully

Fig 30: To set RU IP static

#### Eg:

- 1. set-Ipv4Static 192.168.4.50 255.255.255.0 192.168.4.1
- 2. set-Ipv4Static 192.168.2.20 255.255.0 192.168.2.1

 ELI/> Q01-IfaceStatus
 Paramaters
 - Response

 management\_interface
 - static

 ELI/> set-ifaceOhop
 - Response

 Paramaters
 - Response

 Status
 - Configured Successfully

 ELI/> get-ifaceStatus
 - Response

 management\_interface
 - Wesponse

 management\_interface
 - Wesponse



Fig 31: To get and set RU interface status

distant of s	- mesponse
ot_name	- swflecoverySlot
ot status	- VALID
tot_activation	- Talse
lot_running	- false
roduct_code	- HPRU
endor_code	- MI
ild_id	- factory_ing
illd_name	- Beta-Heloase
uild_version	- 1.0.0
oot_name	- BOOTODOJ.BIN
not_version	- 1.6.6



A0	03

slot_mme	sm6l0t1
slot_status	- VALID
slot_activation	- false
slot_running	- false
product_cod#	- MPRU
vendor_code	- <b>VN</b>
bits td_3d	- Td300bb
build_name	- Bota Heleune
build_version	- 3.8.3
boot_name	- B0073001.BIN
boot_version	- 1,0,0
boot integrity	OK.
kernel name	- 1mAge0001.ub
Kernel version	- 2.0.0
kernel_integrity	- OK
rootEs_name	- rootfs.tar.gz
rootes_version	- 5,0,0
rootFs_integrity	- OK
- metti istan	
Paramaters	- Response
slot name	- swilot2
slot_status	- VALID
slot_activation	- true
stot_rinning	- TPU#
preduct_code	- MPRU
vendor_code	
build_id	- fdaobbb
build_name	- Beta Release
build_version	- 1.0.3
boot_name	- B0012062_BIN
boot_version	- 3.9.9
boot_integrily	- 06
kerneL_nase	- 1MAge0882.ub
knuner_Anizeton	1.0.0
karnet_integrity	OK
rootFa_name	- rootfs.tar.gr
rdotFs_version	
rdotFs integrity	- 0K

Fig 32: To get RU sw version



CLI:/> get-Hwinv	
Paramaters	- Mesponse
<pre>mFg-name description model-name serial-name hardware-rev software-rev uild aper-state usage-state availability-state</pre>	- YVDN - YVDN-RU - YVDN_RU - 24041099869025 - A1-20240002 - 01-V1.0.3 - 76104fac-7dec-1100-a765-00a0c51e6bf6 - disabled - disabled - busy - FAULTY

# Fig 33: To get HW information

forming at the local	Dernents
ranaters	- Nesponse
h0 mac_address	- 98:ae:71:00:00:22
h1 mac_address	- 98:ae:71:00:00:11

# Fig 34: FH MAC address

ramaters	- Response	
		*****
ýs.	- <u>ë</u>	
175	- 13	
lutes	- 5	
conds	- 23	

# Fig 35: RU up time

CLI:/> get-10Status		
Paramaters	- Response	
16_MAC	- down	



Fig 36: 1G Status



Fig 38: RU counters



CLI:/> CLI:/> get-Bandwidth		
Barapatore	- Pressone	
Paranaters	- Response	
Bandwidth	- 100MHz	
CLI:/> set-BandWidth Correct usage is:set-BandWidth <5	6/18/15/28/38/48/58/68/78/88/99/198>	
CLT:/> set-Bandwidth 98 DONE		
GLI:/> get-Bandwidth		
**********		
Paramaters	- Response	
Bandwildth	- 98MHZ	

### Fig 39: Get and Set Bandwidth



Fig 40: Get and set DL compression



CLI:/> get_du_mac_address	
Paramatera	- Response
DU MAC Address	- 09:11:22:33:44:60
CLI:/> set_du_mac_address Invaild Argument: set_du_mac_address <mac></mac>	
CLI:/> set_du_mac_address 11:22:44:55:88:89 DONE	
CLI:/> get_du_mac_address	
Paramaters	- Response
***************************************	***************************************
DU MAC Address	- 11:22:44:55:88:89

### Fig 41: Get and Set DU MAC address







CLI:/> get-CUPlaneVlan	
Paramaters CU_Plane-Vlan	- Response - 100
CLI:/> set-CUPlaneVlan Invalid Arguments: Correct usage	is set-CUPlanevlan vlanid[Range:1-4094]
CLI:/> set-CuPlaneVlan 101 DONE	
GLI:/> get-CUPlaneVlan	
Paramaters	- Response
CU_Plane-Vlan	- 101
GLI:/>	

### Fig 43: Get and Set CU Plane VLAN





### Fig 44: Set and Get UL compression

CLI:/> get_prech_pcid	
Paramatern	- Response
LAYER 0	
LAYER 1	- 6
LAYER 2	- 7
LAYER 3	- B
CLT:/> set_prach_pcid 4 5 6 7 DONE	
cti:/> get_prech_pc1d	
	******
Paramaters	- Response
LAYER 0	- 4
LAYER 1	- 5
LAYER 2	- 6
LAVER 3	- 7

#### Fig 45: Get and Set PRACH PCID

CLI:/> help

Usage: help [ 7 | h | d | a ] Arg's: 7 : show command usage -h : same as '?'(Applicable for all commands) -d : list debug commands only -a : list all commands

Fig 46: Help



# 8.FAQ

### 8.1 How to check if RU is properly booted or not?

Check the power LED, it should be glowed with a stable green.

### 8.2 How to check if RU is getting C,U,M & S plane packets properly or not?

By hitting the below-mentioned command in the RU console & check for the M & S Plane counts

root@vvdn\_mpru: bash /etc/scripts/stat\_ru.sh

root@vvdn_mpru:~\$/etc/scripts/stat_ru.sh DOWNLINK PATH		
TOTAL_RX Packets (LSB) TOTAL_RX Packets (MSB)	MAC COUNTERS DL : 60323 : 0	
DL SI	MART INTERCONNECT COUNTERS	
Total DL Count	50156	
DL S Plane Count	137	
DL C-Plane Count	9264	
DL U-Plane Count	50693	
DL M0-Plane Count	: 62	
DL MI-Plane Count	0	
DL M2-Plane Count	0	
OL M3-Plane Count	: 0	
DL M4-Plane Count	: 8	
DL Incorrect Pkt Count	: 0	
DL DropDA_Pkt Count	: 8	
DL DropSA_Pkt Count	: 0	
DL Dropetype_Pkt Count	: 0	
RECI	IEVE COUNTERS DL	
	AYER-0	
TOTAL_RX Packets	: 58465	
RX_DUPLICATE	1.0	
RX_CORRUPT	: 0	
RX_LATE	き 長	
RX EARLY	1 O	
RX_ON-TIME	; 51442	
	ATER-1	
IUTAL KX Packets	· · · · · · · · · · · · · · · · · · ·	
RA COROLDT		
RX_CORRUP1		
RA_LAIE		



### 8.3 How to check if the SFP port is Link Up or not?

Hit the below-mentioned command in the RU's console & check whether Link is detected or not. **root@vvdn\_mpru:** ethtool eth1


root@vvdn\_mpru:~\$ethtool eth1
Settings for eth1:
Cannot get device settings: No such device
Link detected: yes
root@vvdn\_mpru:~\$

Fig 48: ethtool command

# 8.4 Can I add Switch between O-RU and GM?

Yes. But, please make sure Switch supports IEEE 1588 PTP.

# 8.5 Can I add a Switch to connect O-RU and O-DU?

Yes. Please make sure following items:

a. The L2 switch should support VLAN with tag.

b. Those ports (connected to RU & DU) should be in trunk mode and make sure both are connected to the same VLAN tag.

c. Should keep VLAN tag in those ports (DO NOT set untag)

d. Enable jumbo frames. Set frame size more than 9600 Bytes.



# 8.6 How to check if RU is PTP sync or not?

1. The SYNC status can be verified from WEB GUI Dashboard System Monitor Section /CLI SYNC - Locked (Successfully Synchronised)

LYVVDN	Device Information						- 100
	Second Se		Nature Sectors Include Rectability		Heri samu Aj Japonet Se ekser Bi-1624		
	Kan Ma Maranan Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma	nec a m OO + Antima dan	Anno Care	Scottantin partica scotta T taur	Infabri Increased Regions (Closeff) Conservative Information Sector Information Information		al.
	Selang Ten Sentes	-	SHARE FF Children Children Children Children Children Children	1,000 1,000 1,000 1,000 1,000	SPLANE Serf Latitud Dirichaeset		a . 8

Fig 49: GUI Device Information tab

2. By checking the Network & status LED of RU, it should be stable Green

# 8.7 Which PRACH format does RU support?

RU only supports short PRACH format A3,B4,C2.

## 8.8 How can we configure the DU MAC address ?



Fig 50: DU MAC address



### 8.9 How to add a VLAN ID ?

#### Change VLAN id



Fig 51: Vlan ID

## 8.10 How to change PCID for DL & UL carrier ?

#### In U Plane yang module





### Fig 52: eAxCID or PC ID

## 8.11 How to Check & Select the MAC Address for fronthaul Interface ?

Choose the eth1 MAC address for fronthaul communication, go to the board console do the ifconfig to check the eth1 MAC address

## 8.12 If you are using an INTEL E810 card, the below configuration needs to be installed.

The E810 NIC driver should be updated to 1.12.7 in order to create 2 VF's with the same MAC address. Link:https://www.intel.com/content/www/us/en/download/19630/789309/intel-network-adapter-driver-for-e810-seri es-devices-under-linux.html

### 8.13 How to change PCID for PRACH carrier ?

The PCID for the PRACH carrier can be changed by using GUI. Go to the configuration tab, in the ORAN section and configure PRACH & PXSCH pcid as per your requirement and click on submit.

-	Comprision				-
-		-			NANCAN MINI (12)
Circleson.	Martillan Densitare		PRODUCT STREET	Art Number of Street,	
Hallmann Ca	1.016		maker a	mana e	
Permanen	Colonian Tentes				
and the second second	No (or construction)	+)	(mone) a	i man D.S.	
International Contemportunity	diver.		Mana A	i mana i ki i	
- I I		+)	Contraction of the second seco		
255	Descenter from		man -		
	(Distantic)	+3			
			No. of Concession, Name		

8.14 What is the O-RAN M-Plane specification version with which VVDN MPRU is compliant?

VVDN MPRU is compliant with the ORAN WG-4 M-Plane v7.



# 9. Troubleshooting

#### 9.1 Why can DU not receive any data from RU?

Please check following items:

a. Check PTP is synced and GM's quality. You may need to check GM's status with satellites,O-RU's log and O-DU's log.

b. Check the 10GbE interface in the DU server is linked up.Also check if DU MAC address is configured correctly in RU

c. Check the 10GbE interface in the DU server is running at 10Gb speed

d. Check connectivity, make sure SFP+ module is actually inserted into the cage of the connector in the DU server.

- e. Check O-RU's log for CU Plane packet
  - e.1. Please ensure there should be not any C/U drop DL counts



oot@vvdn\_mpru:~\$/etc/scripts/stat\_ru.sh \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*DOWNLINK PATH\*\*\*\*\*\* ----- MAC COUNTERS DL TOTAL\_RX Packets (LSB) 60323 TOTAL RX Packets (MSB) .0 ----- DL SMART INTERCONNECT COUNTERS DL-PATH Total DL Count 60156 DL S-Plane Count 137 DL C-Plane Count : 9264 DL U-Plane Count 50693 DL MG-Plane Count 62 DE MI-Plane Count .8 DL M2-Plane Count 0 **DL M3-Plane** Count .0 M4-Plane Count Ð DE Incorrect Pkt Count 0 DF DropDA Pkt Count DL Ð DL DropSA\_Pkt Count θ DL Dropetype\_Pkt Count 0 -----RECIEVE COUNTERS DL -----LAYER-0 TOTAL\_RX Packets : 58465 RX DUPLICATE 0 RX CORRUPT 0 RX LATE 0 0 RX EARLY RX\_ON-TIME 51442 LAYER-1 TOTAL RX Packets : 0 θ -- RX\_DUPLICATE RX CORRUPT ÷ ---- RX\_LATE 0

#### Fig 54: SMIC counters

e.2. Make sure that there should be count for both PUSCH & PRACH on L1 side.

e.3. If you are configuring 4T4R configuration at DU end, make sure that pcid configured at RU end should be in sequence of 0,1,2,3 for PXSCH and 4,5,6,7 for PRACH.

e.4. If you are configuring for 1T1R configuration at DU end, make sure that pcid configured at RU end should be in like 0 for PXSCH and 1 for PRACH for any antenna on which you want to radiate.

f. Check if there are any late or early packets in the RU counters.

All U plane packets should be on time for the UE to connect.

If there is any late packets, check the PTP status of RU,DU and the timing and delay parameters

#### 9.2 If you have further queries about RU, where to reach ?

If you have any further questions/queries, please reach to us on <u>ru.support@vvdntech.in</u>



2.2 RF Radiation Exposure Statement This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

2.3 FCC PART 15 STATEMENT § 15.105 (Class B digital device) This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.

Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

**REGULATORY INFORMATION** 

Model Name: AMPU-MPRU-Gen 2-3537-AI-BI Contains FCC ID: 2BNMP-AMPU-MPRU