

Signaltron

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5G Labs – Training Day1

Apr 2025

Confidential

Introduction

- The Department of Telecommunications (DoT) has awarded the establishment of 100 5G Use Case Labs to educational institutions across the country, with the primary objective of nurturing skills and promoting active engagement with 5G technologies among students and start-up communities.
- These labs will facilitate the development, experimentation of 5G applications in various socioeconomic verticals.
- Signaltron is providing the 5G lab infrastructure for some of these labs. gNodeB provided in 5G lab Infrastructure is the Signaltron's Sahyadri series of RAN Equipment featuring highly integrated, compact and versatile NR Base Stations delivering high capacity to enable ubiquitous connectivity to all.

Operating the gNB

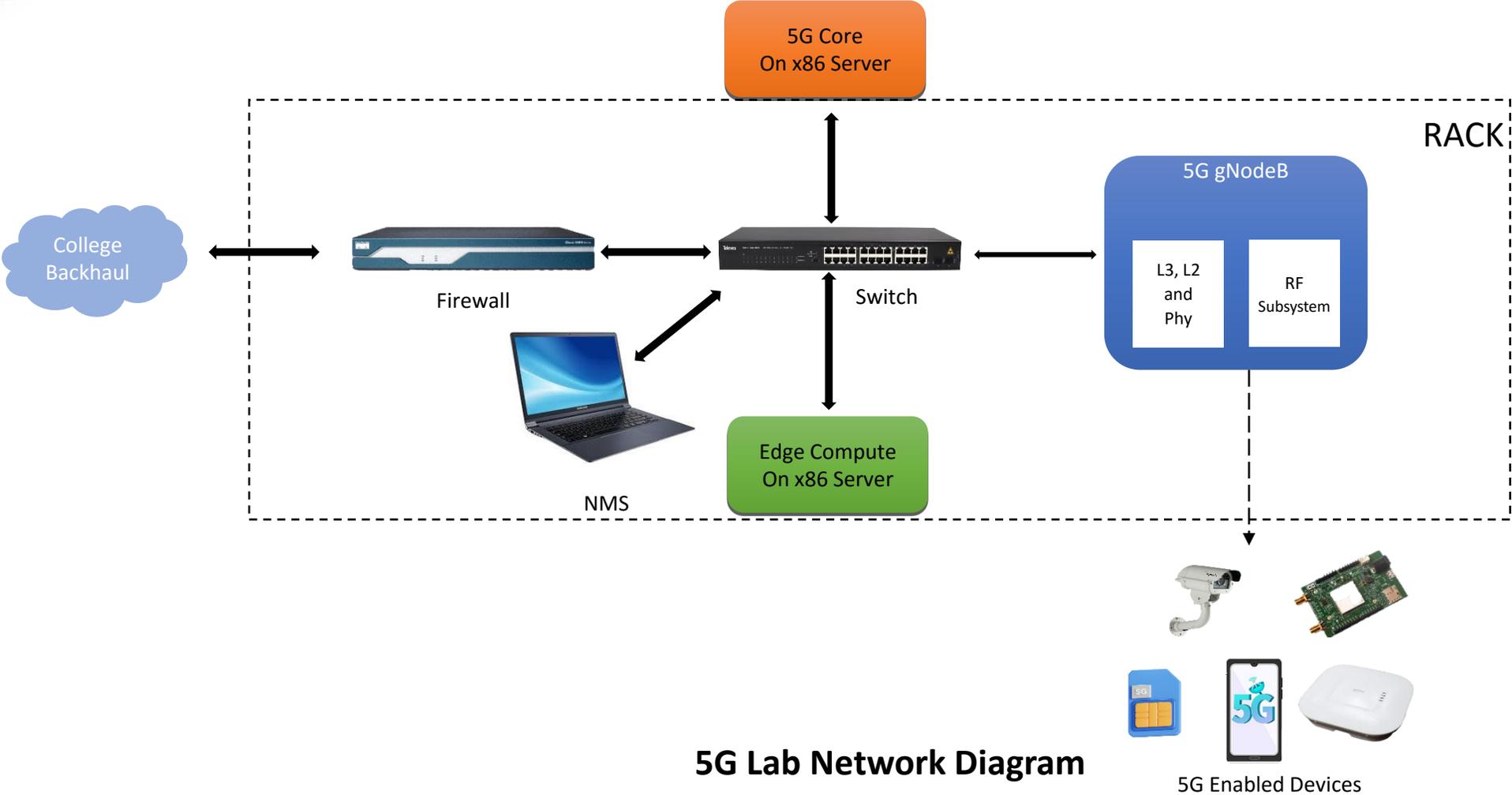
Registering of the UEs

Collection of Wireshark pcap logs and Traces.

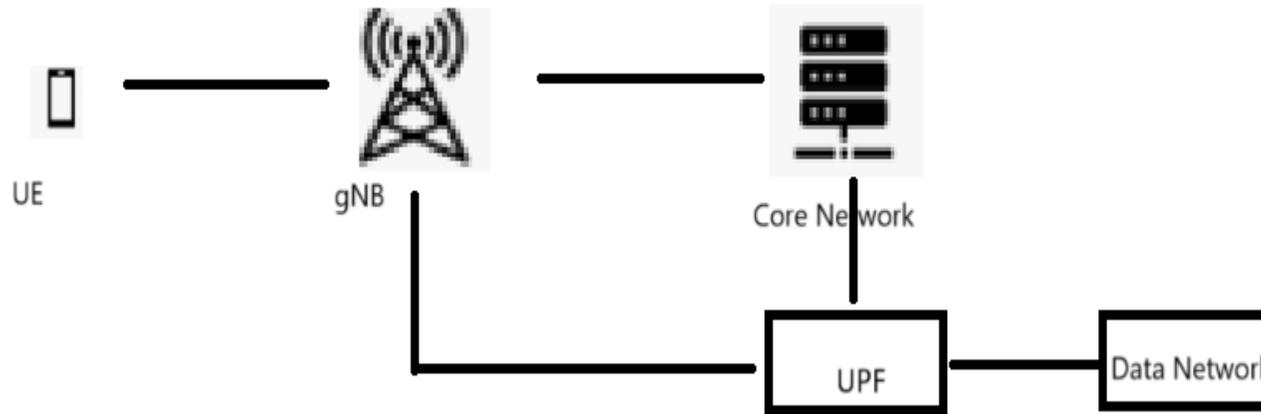
Description of Messages in Wireshark.

Core working and NMS.

Whitelisting and black listing of Users(Need to check with Niral)



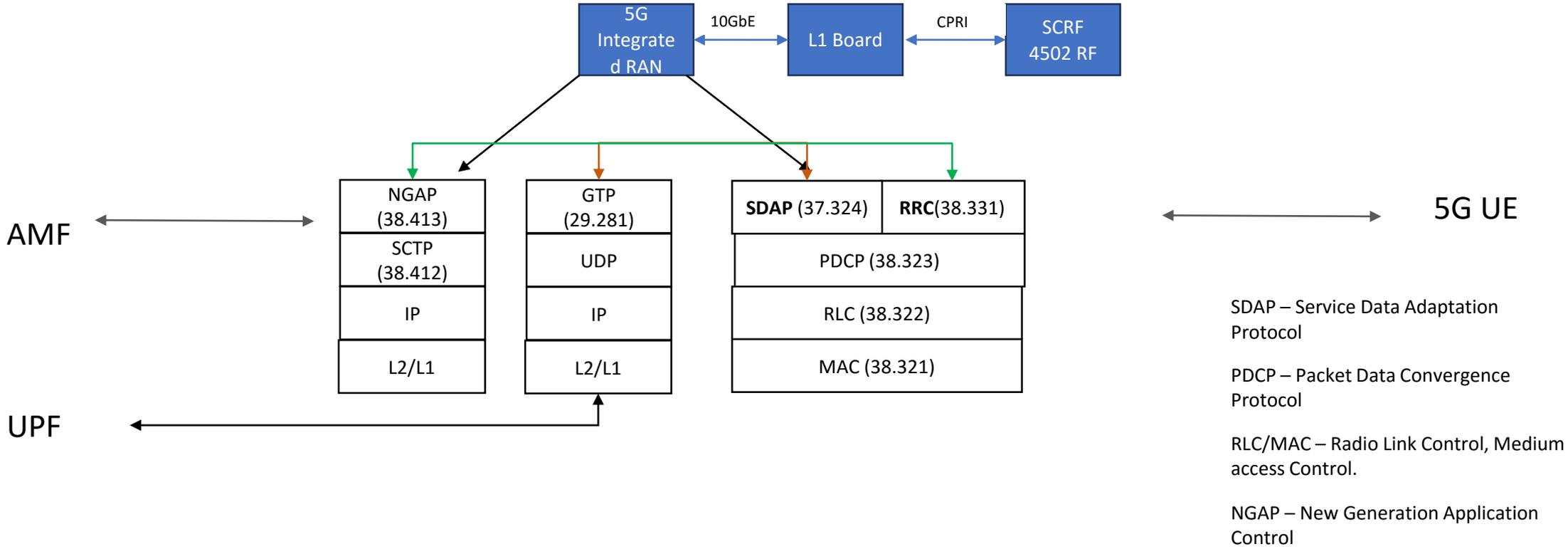
5G Lab Network Diagram



Different Network Nodes in 5G are:

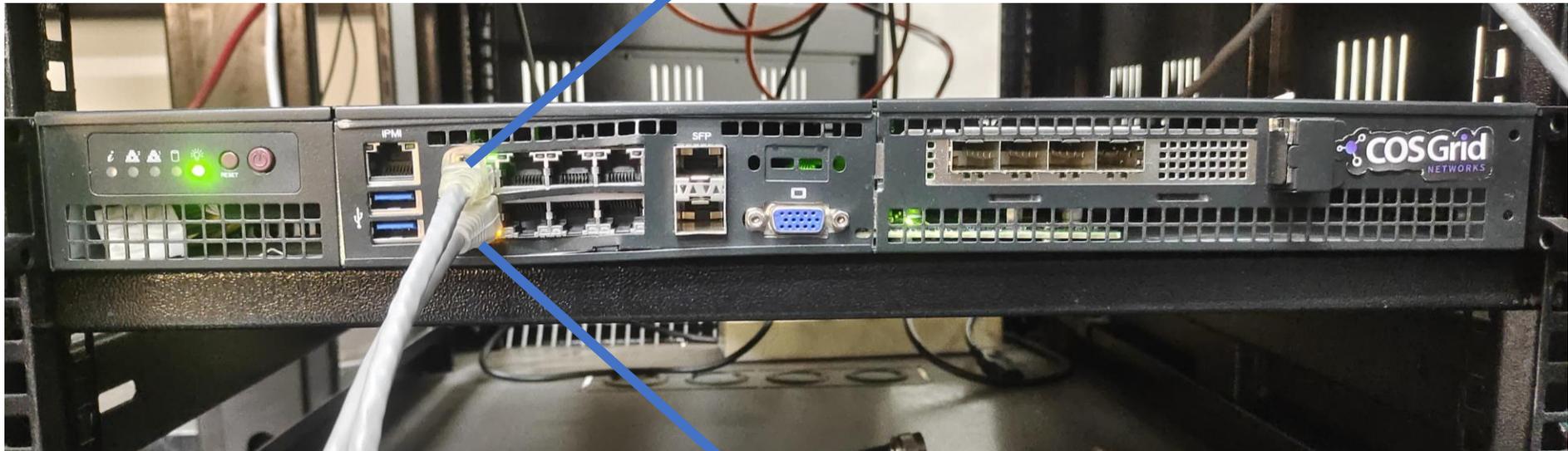
- 5G UE or 5G Smartphone
- 5G Base station also called as gNB or NG-RAN
- Core Network on the Control Plane. It consists of several Network Elements
 - AMF, SMF, NSSF
 - UDR, UDM, AUSF
 - PCF
- On the Data plane, there is User Plane Function (UPF) that connects to Data Network (Internet)

- STGNB2215 is an indigenously developed 5G base station based on Integrated RAN Architecture
- Supports 3GPP Release 15, 2x2 MIMO with support up to 100 MHz of Bandwidth in Sub-6 Band



Network Node Name	IPv4 Address
gNB	192.168.10.4
AMF	192.168.10.6
UPF	192.168.10.7
NiraIOS SDN dashboard	192.168.10.5
T1 Server (Core)	192.168.10.2
T2 Server (MEC)	192.168.10.3
Controller (in T1)	192.168.10.5
MEC VM IP	192.168.10.12
UE IP address	10.101.10.x
Core Tunnel IP	10.101.10.1

To College Network



To 24Port Switch



- 24 port Layer2 Manageable switch.
- One port of the switch is connected to the Firewall.
- All other devices (gNB, T1,T2 etc..) are connected any of the ports of the switch.





- Ensure all 5g devices (mobile phones and other devices) are in airplane mode
- Power-on the 5G rack which powers on the gNB , T1 and T2 servers.
- Turn on the firewall.
- gNB software and 5G Core software starts automatically on power-on.
- Check for “**cpri is up after reboot**” print in /tmp/bw_change.log file by giving below command in a new terminal
 - `tail -f /tmp/bw_change.log`
- Register mobile phones by turning airplane mode off

- Login to Niral NMS to check the registration status.
- url: <https://192.168.10.5>
- User: admin
- Password: admin@1234

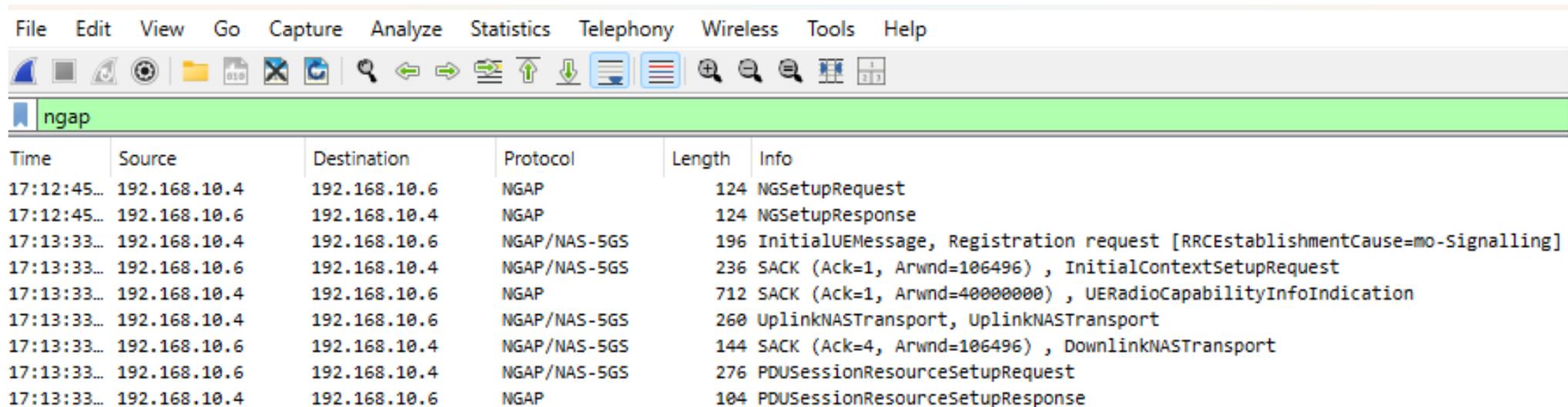
For more details refer to
Check
section 12.C of
5gLabTraning_Signaltron_V2.0.docx

The image shows two parts of the Niral Networks NMS interface. The top part is a dark-themed login page with the title 'Log In' and a prompt 'Enter your username and password to Log in'. It features input fields for 'User Name*' (with a placeholder 'user name') and 'Password*' (with a placeholder 'Enter password'), and a 'Log In' button. To the right is the Niral Networks logo. The bottom part is a light-themed dashboard titled 'Niral Controller / Overview' with a sub-header 'Overview'. It displays six summary cards: 'Core' (Active Core: 0, Highest Deployed: 0), 'Core Session' (Active PDU Sessions: 0, Highest PDU Sessions: 0), 'Radio' (Active Radio: 0, Highest Deployed: 0), 'Radio Session' (Radio PDU Sessions: 0, Highest PDU Sessions: 0), 'Device' (Active Device: 0, Highest Deployed: 0), and 'Device Session' (Device PDU Sessions: 0, Highest PDU Sessions: 0). Below these are two line graphs for 'Radio' and 'Device' activity over time, and two sections for 'Throughput' and 'Top Active Device'.

Figure 2: Dash Board Before Running Core, Radio & Device

- Figure out the equipment ip address, for mobile phone go to settings-> about phone-> status->ip address
- For other devices, give ifconfig command
- In a new terminal check if the 5g equipment pings by giving below command
 - ping <equipment ip address>

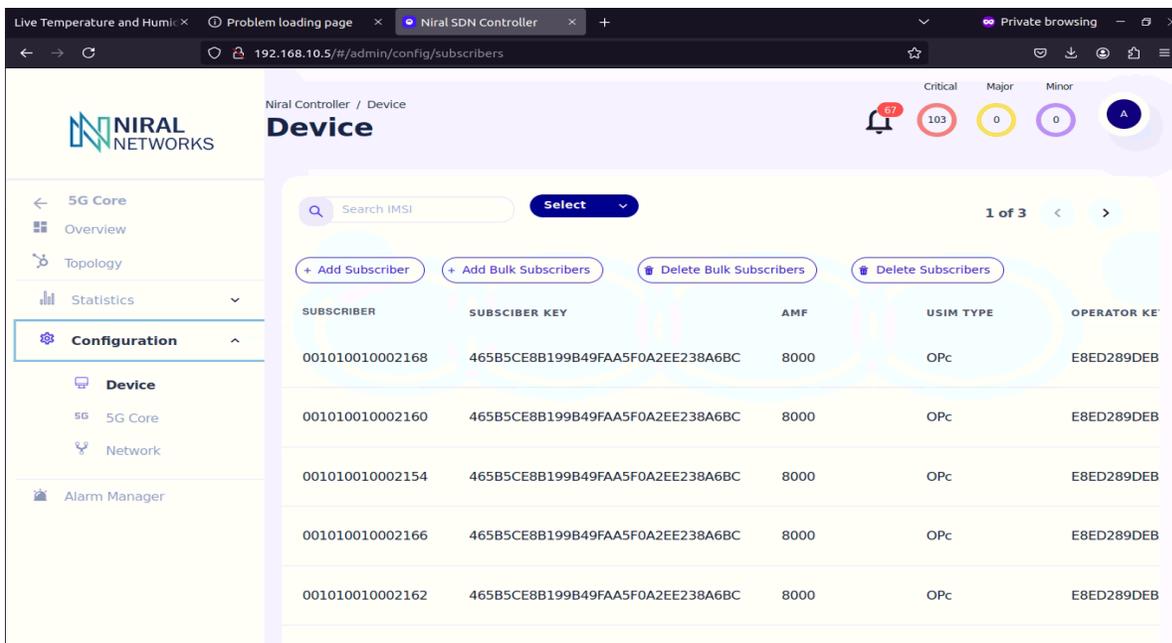
- Login to core controller to collect the wireshark logs.
 - >ssh -X user@192.168.10.5 (password:a)
 - >wireshark (collect with sctp as capture filter and then filter for NGAP)



The screenshot shows the Wireshark interface with a packet capture named 'ngap'. The interface includes a menu bar (File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Wireless, Tools, Help) and a toolbar with various icons. The main display area shows a list of captured packets with the following columns: Time, Source, Destination, Protocol, Length, and Info.

Time	Source	Destination	Protocol	Length	Info
17:12:45...	192.168.10.4	192.168.10.6	NGAP	124	NGSetupRequest
17:12:45...	192.168.10.6	192.168.10.4	NGAP	124	NGSetupResponse
17:13:33...	192.168.10.4	192.168.10.6	NGAP/NAS-5GS	196	InitialUEMessage, Registration request [RRCEstablishmentCause=mo-Signalling]
17:13:33...	192.168.10.6	192.168.10.4	NGAP/NAS-5GS	236	SACK (Ack=1, Arwnd=106496) , InitialContextSetupRequest
17:13:33...	192.168.10.4	192.168.10.6	NGAP	712	SACK (Ack=1, Arwnd=40000000) , UERadioCapabilityInfoIndication
17:13:33...	192.168.10.4	192.168.10.6	NGAP/NAS-5GS	260	UplinkNASTransport, UplinkNASTransport
17:13:33...	192.168.10.6	192.168.10.4	NGAP/NAS-5GS	144	SACK (Ack=4, Arwnd=106496) , DownlinkNASTransport
17:13:33...	192.168.10.6	192.168.10.4	NGAP/NAS-5GS	276	PDU SessionResourceSetupRequest
17:13:33...	192.168.10.4	192.168.10.6	NGAP	104	PDU SessionResourceSetupResponse

- Login to Niral NMS web page
- Search for the sim card details
- Press on the edit button
- Give an ip address in 10.101.0.x series in “UE IPV4 address”



UE IPv4 Address	UE IPv6 Address
<input type="text" value="10.101.0.3"/>	<input type="text"/>
SMF IPv4 Address	SMF IPv6 Address
<input type="text"/>	<input type="text"/>

- Switch off firewall by logging into web page
 - url: <https://192.168.10.1>
 - User: admin
 - Password: admin@321
- Shutdown gnb, T1, T2 servers manually one by one

