5G SA NETWORK SLICING

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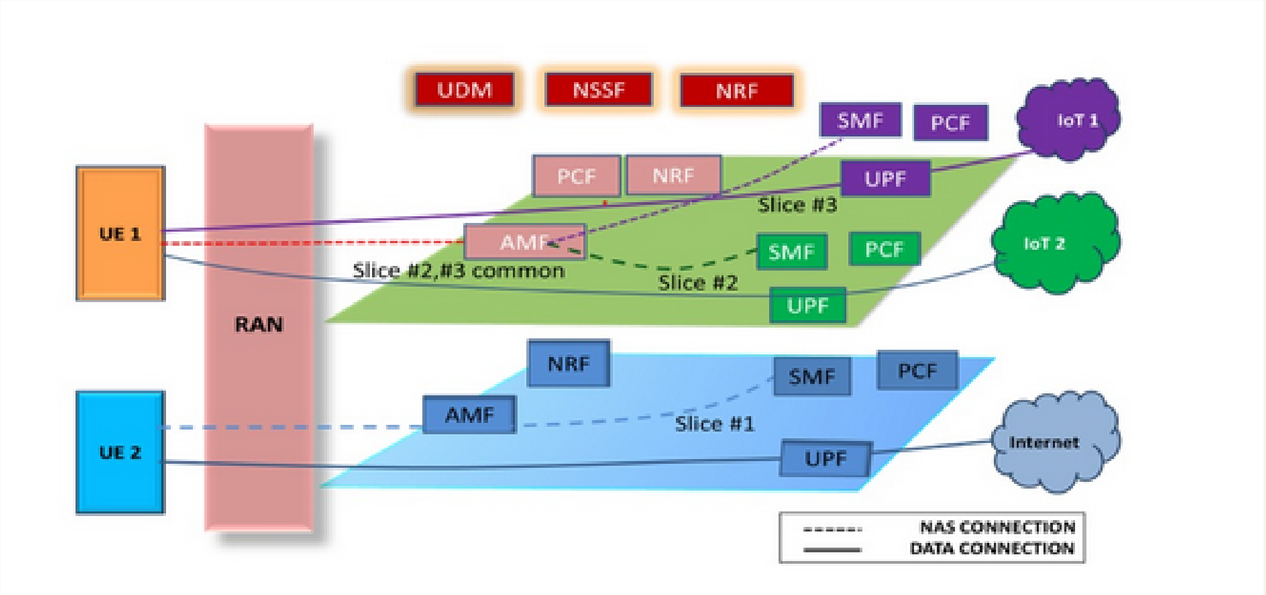
IIT Gandhinagar | 2024

Introduction

1. **What is network slicing in 5G?**

- Enables multiple virtual networks on a single physical infrastructure.

- Allows customization of throughput, latency, security, and priority for each slice.



Introduction

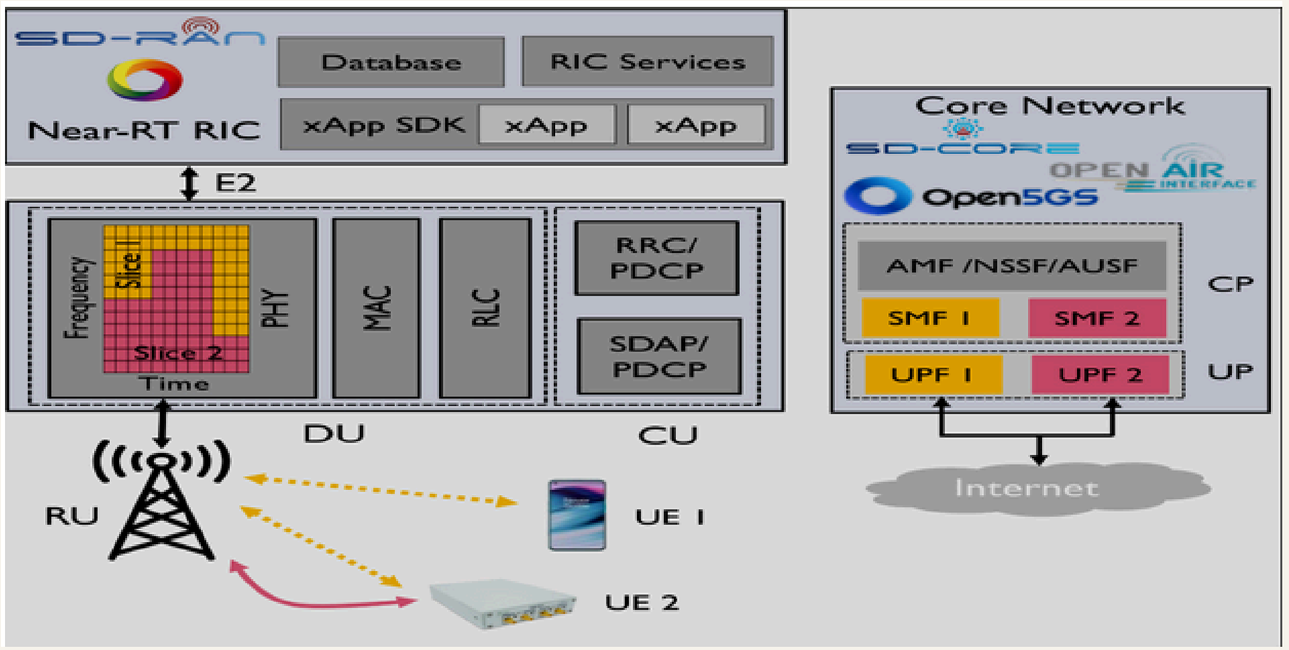
Why we need network slicing ?

- **Enhanced Security:** Isolated slices reduce the risk of cross-contamination between applications.
- **Efficiency:** Ensures optimal use of network resources
- **Flexibility:** Quick deployment of new services without physical infrastructure changes.

Related Studies

1. **Ng-RAN Slicing**

- Allocates PRBs based on QoS, network conditions, and traffic load.
- Dedicates PRBs to slices according to predefined policies, enabling dynamic allocation.
- **Projects Implementing Ng-RAN Slicing:** Open Air Interface, srsRAN, UERANSIM.

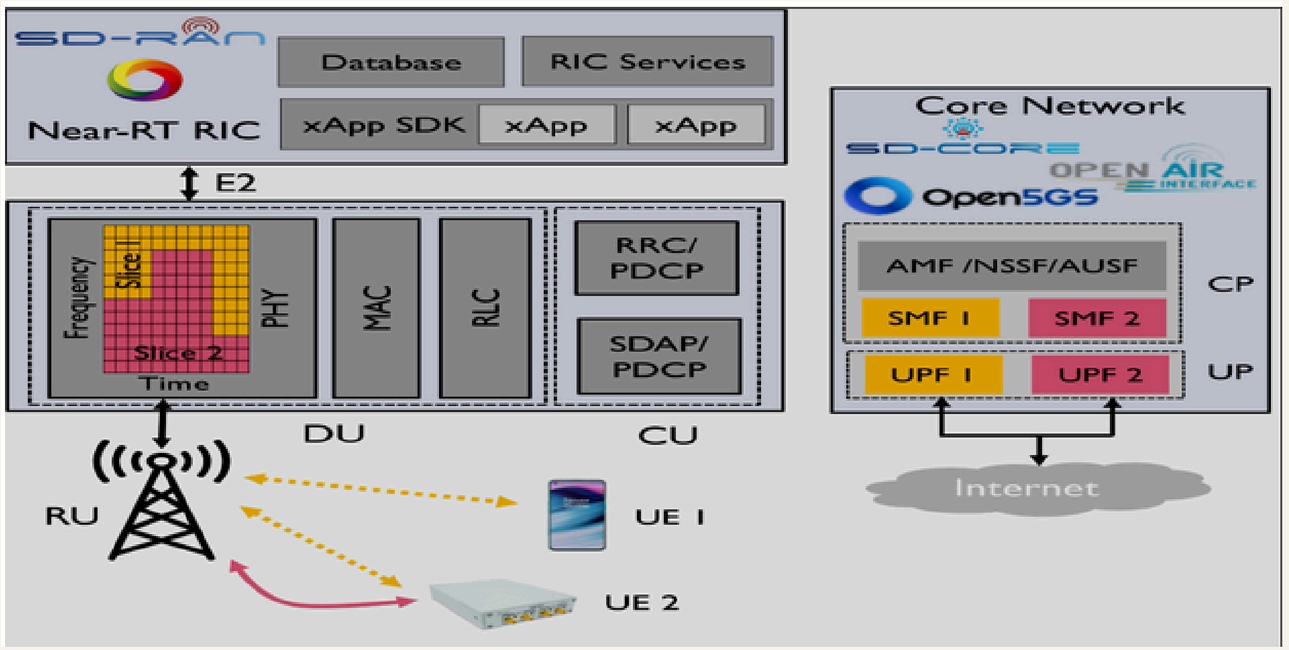


Related Studies

2. 5G Core Slicing

- Logical separation of core network functions to support multiple slices.
- Unique SMF and UPF pairs for each slice to meet specific requirements.
- **Projects Implementing 5G Core Slicing:**

  Open Air Interface, Open5Gs.



Comparison between ns3 and open5gs

ns3

Features :

- Support basic radio protocols
- Beamforming Algorithm
- Channel Modeling
- MAC Scheduling

Key limitiations :

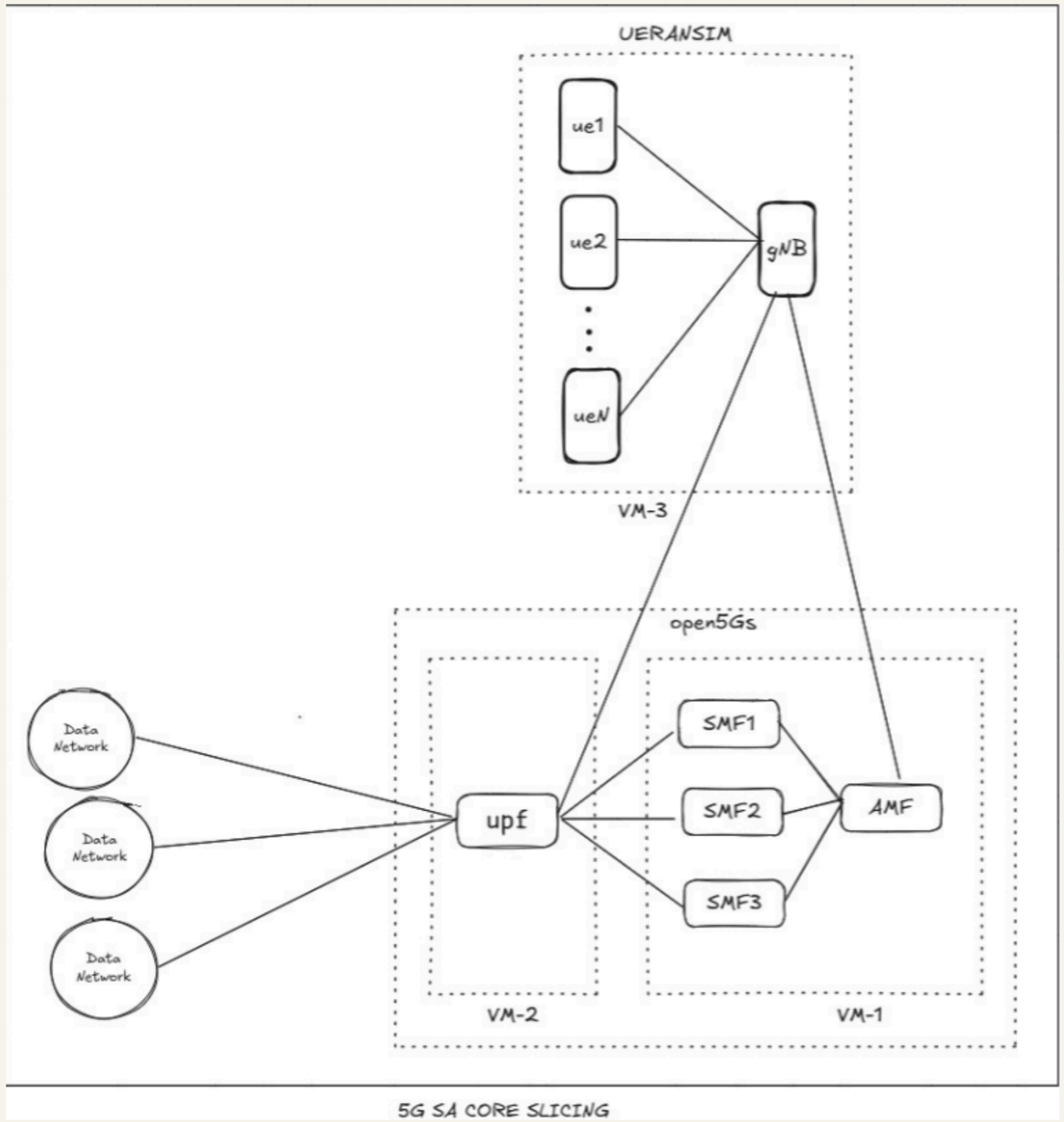
- Missing support of core 5g NFs such as amf, smf, upf, etc.
- Flexibilty issue

open5gs

Features :

- Flexible for RAN simulation
- Slice configuration interface
- support of all core network function

Simulation Setup



Simulation Setup

1. Allocation of Network Functions

VM	Role	IP address	OS	Memory(GB)	Hard disk
VM1	Open5Gs 5GS control Plane	**AMF**:- 10.240.3.9 **SMF1:** 10.240.7.238 **SMF2**: 10.240.5.60 **SMF3**: 10.240.1.42	Ubuntu 22.04	4 GB	20 GB
VM2	Open5Gs 5GS user Plane	**UPF**: 10.240.5.87	Ubuntu 22.04	4 GB	20 GB
VM3	UERANSIM gNB UERANSIM UE1 UERANSIM UE2 UERANSIM UE3	**gNB**: 10.240.1.40	Ubuntu 22.04	4 GB	20 GB

Simulation Setup

2. UE Connection Setup

UE(IMSI)	IMSI	Data Network
UE1	001010000000001	Internet1
UE2	001010000000002	Internet2
UE3	001010000000003	Internet3

3. UPF Data Network

Data Network	Data Network Interface	Subnet Range	UE Tunner Interface
Internet 1	Ogstun 1	10.45.0.0/16	uesimtun0
Internet 2	Ogstun 2	10.46.0.0/16	uesimtun1
Internet 3	Ogstun 3	10.47.0.0/16	uesimtun2

References

- https://nickvsnetworking.com/my-first-5g-core-open5gs-and-ueransim/

- https://medium.com/networkers-fiit-stu/setting-up-open5gs-a-step-by-step-guide-or-how-we-set-up-our-lab-environment-5da1c8db0439

- https://open5gs.org/open5gs/docs/guide/01-quickstart/
- https://cttc-lena.gitlab.io/
- https://www.nsnam.org/documentation/

Thank You