

ACTION-5G (Automated Cloud-native Testing Of NTN 5G)

Revika Anand

RA (TUDOR) & Part-time PhD student (1st Year)

Supervisors:

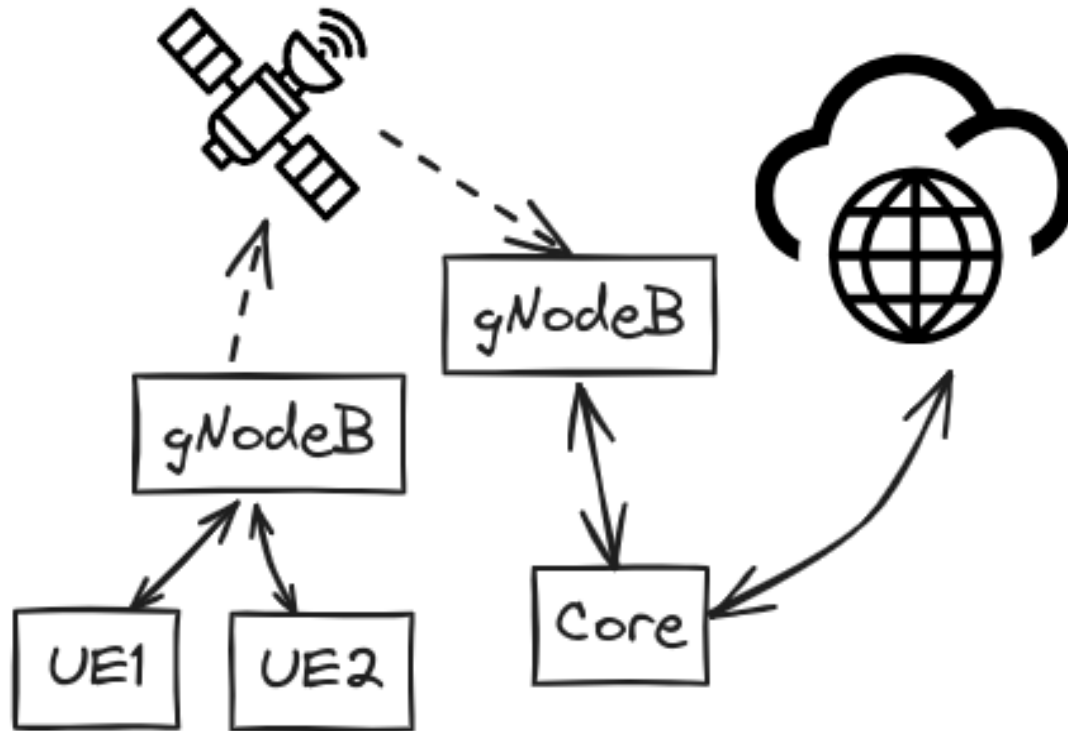
Dr. Charalampos Rotsos, Prof. Paul Smith and Prof. Nicholas Race

Towards 6G

Potential 6G Technologies	US NGA	China IMT-2030 PG	Japan B5GP	Euro Hexa-X	One6G	Finland Oulu	Samsung	Nokia	Ericsson	Huawei	MTK	Qualcomm	NTT DoCoMo	China Mobile
1 AI-Native Air Interface	○	○	○	○			○	○		○		○	○	○
AI-Native Network	○	○	○	○	○		○	○	○	○	○	○	○	○
2 New Waveform	○	○	○			○	○			○			○	
Advanced MIMO	○	○	○	○	○	○	○	○		○	○	○	○	○
Advanced Duplexing	○	○	○			○	○			○		○		
3 Reconfigurable Intelligent Surface (RIS)	○	○	○		○	○	○			○		○	○	○
Orbital Angular Momentum (OAM)	○	○					○					○	○	
Holographic Beamforming	○	○												
4 (Sub-)THz Comm. and Sensing	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Visible Light Comm.		○	○		○				○	○				○
5. Joint Comm. and Sensing (JCAS)	○	○	○	○	○	○		○		○		○	○	○
6. Autonomous Distributed Network	○	○	○	○	○	○			○	○	○	○	○	○
7. Deterministic Network	○	○			○					○				○
8. Computing-Aware Network		○	○		○	○	○		○	○	○		○	○
9. Non-Terrestrial Network	○	○	○	○			○		○	○	○		○	○
10. Multimodal Trust Network	○	○	○	○		○	○	○	○	○		○	○	
11. Near-Zero Energy Comm.	○								○		○	○		
12. Material and Device Science	○		○			○				○		○	○	
13. Semiconductor	○		○			○				○		○	○	

Non-Terrestrial Networks

Signal is amplified
and re-transmitted



Reasons to move to NTN:

- Improved connectivity
- Enhanced QoS
- Spectrum Efficiency

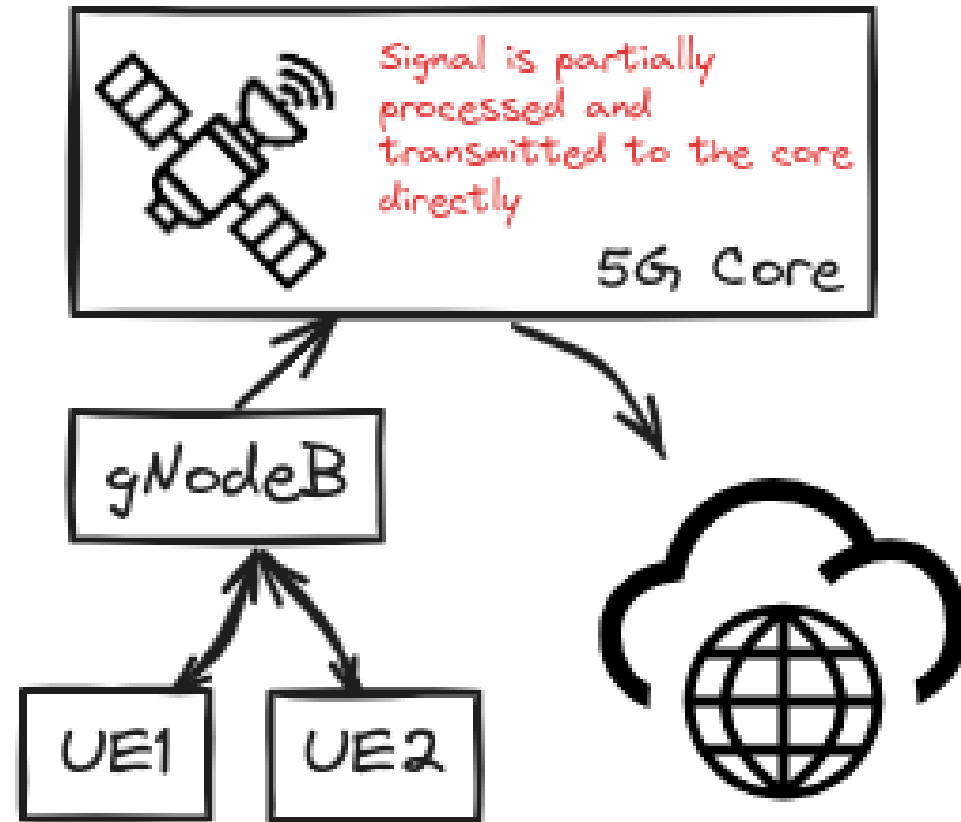
The way it's done now:

- Bent Pipe Method

Changes Introduced by NTN

Edge Cloud on Payload

- Signal from UE detected by satellite
- Depending on the NF available on the satellite, partial processing done by the satellite
- Partially processed signal relayed to the core/gNodeB



Challenges

Coverage and Signal Penetration

- Harder for the high frequency signal to propagate and penetrate certain physical barriers.

Resource Allocation and Management

- Compute limitations on satellite payload due to the radiation and other factors

Mobility and Dynamicity of the system

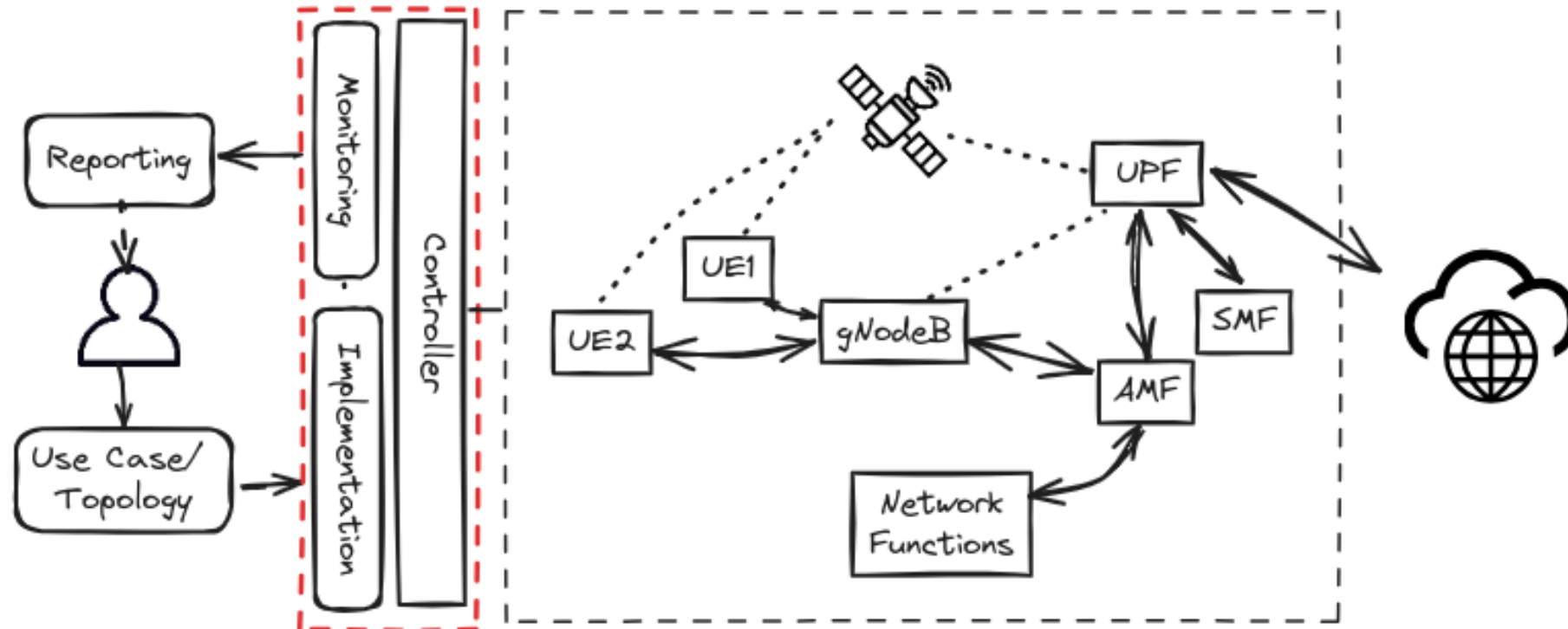
- Satellites orbit the earth at high speeds

Interoperability (Multiple vendors)

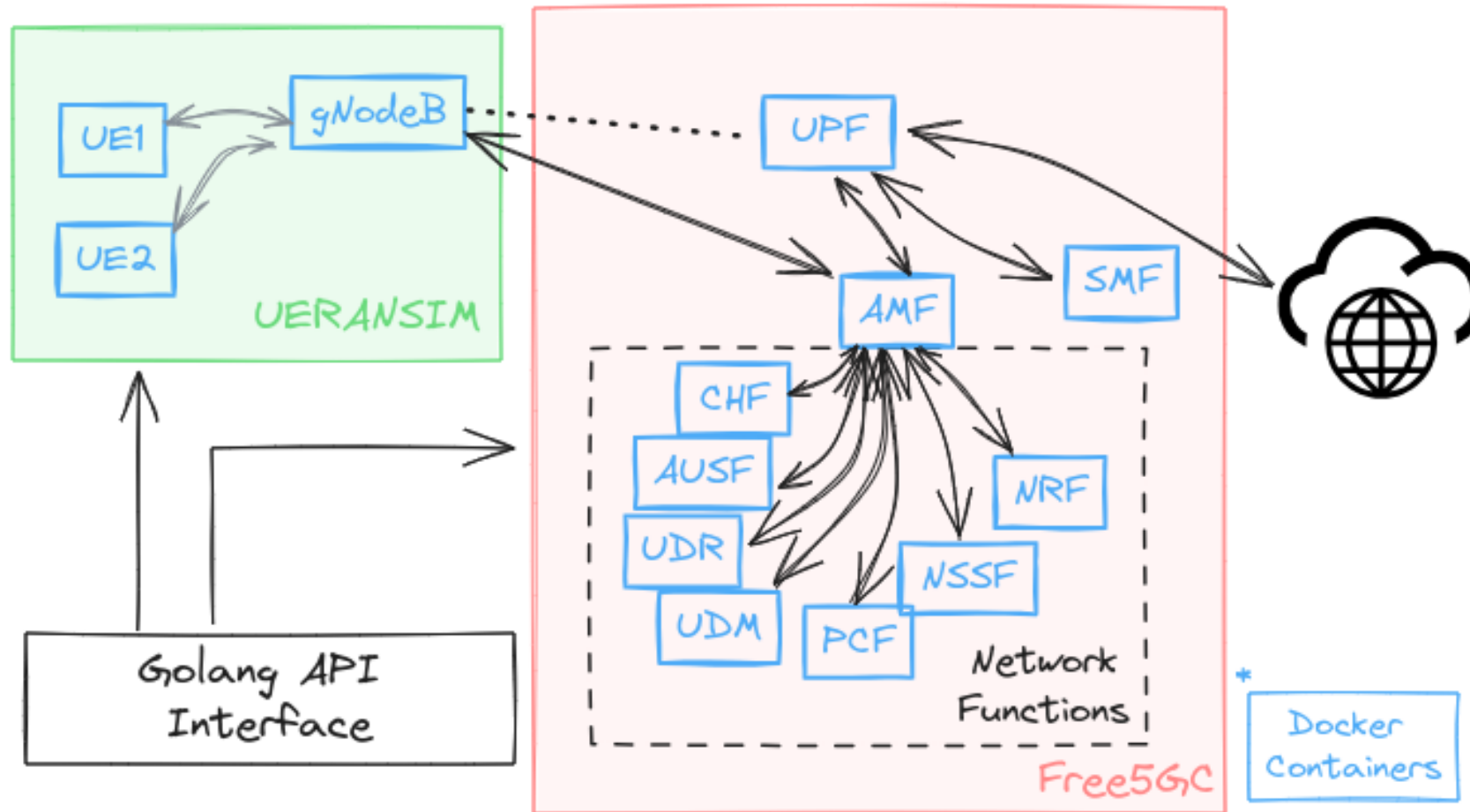
- Introduces another vendor

ACTION-5G: Dealing with these challenges!!

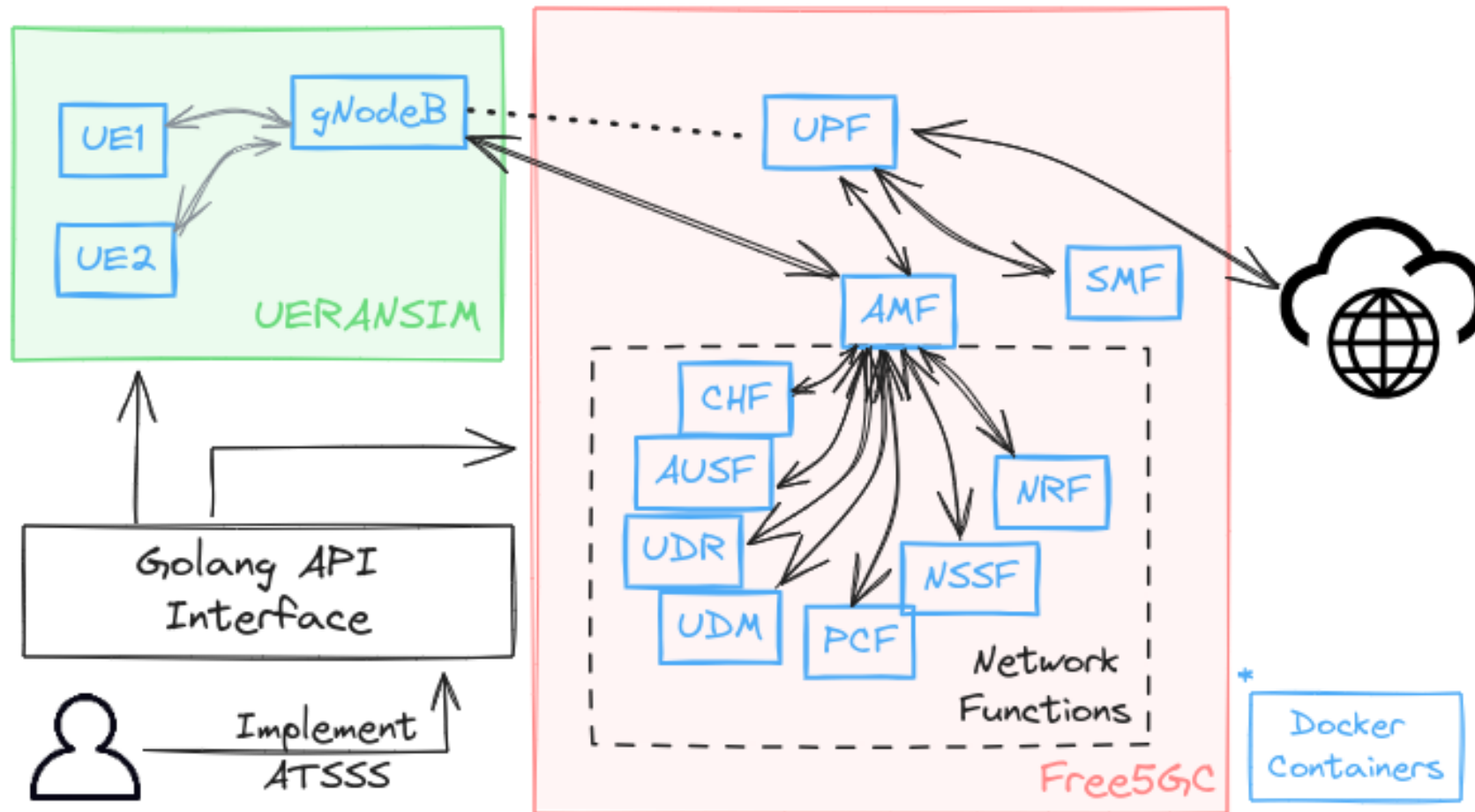
ACTION-5G can design topologies, implement link characteristics, monitor systems, and generate reports thus introducing a degree of automation to the system.



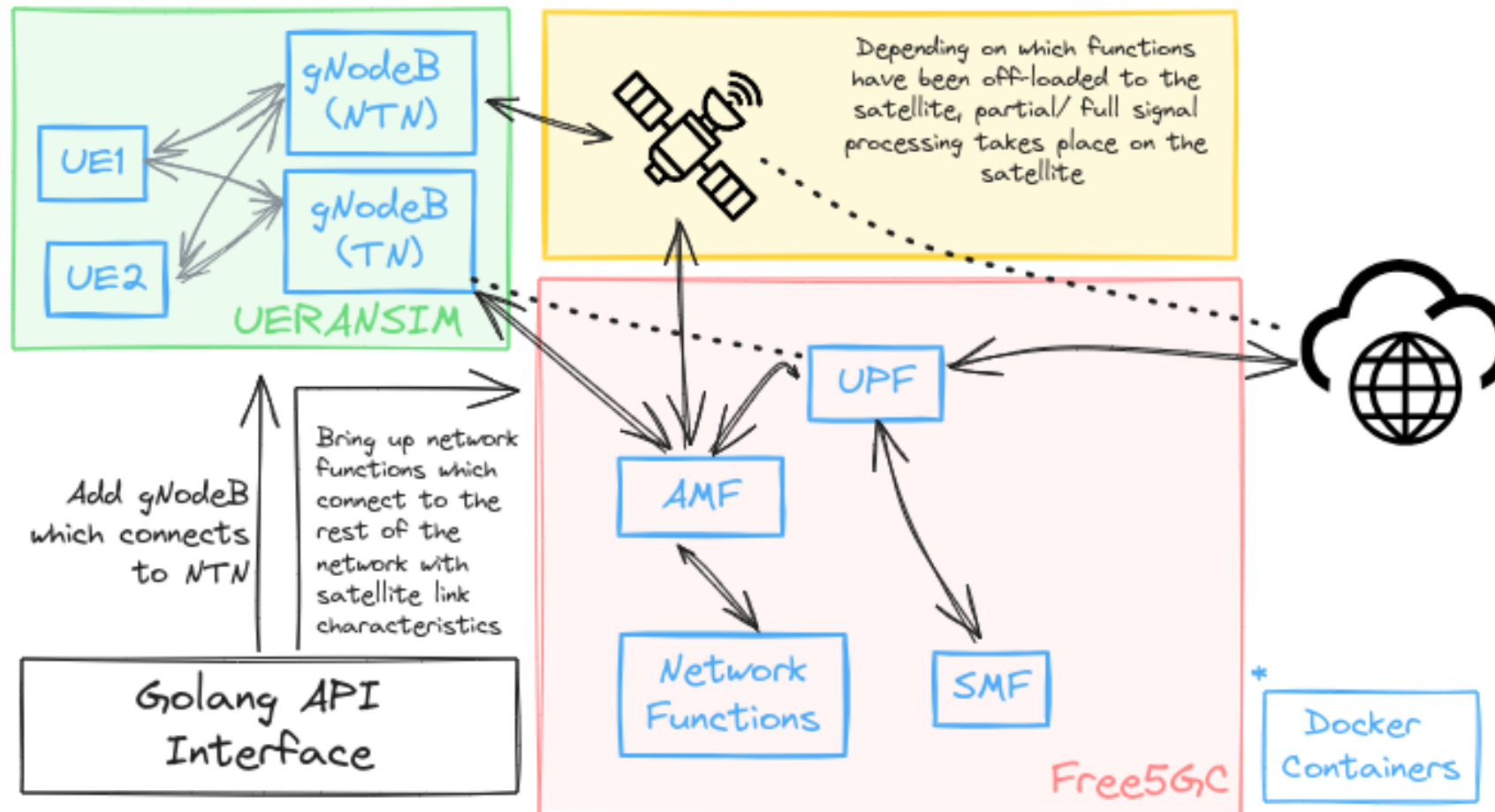
Use Case: Access Traffic Steering Switching and Splitting (ATSSS)



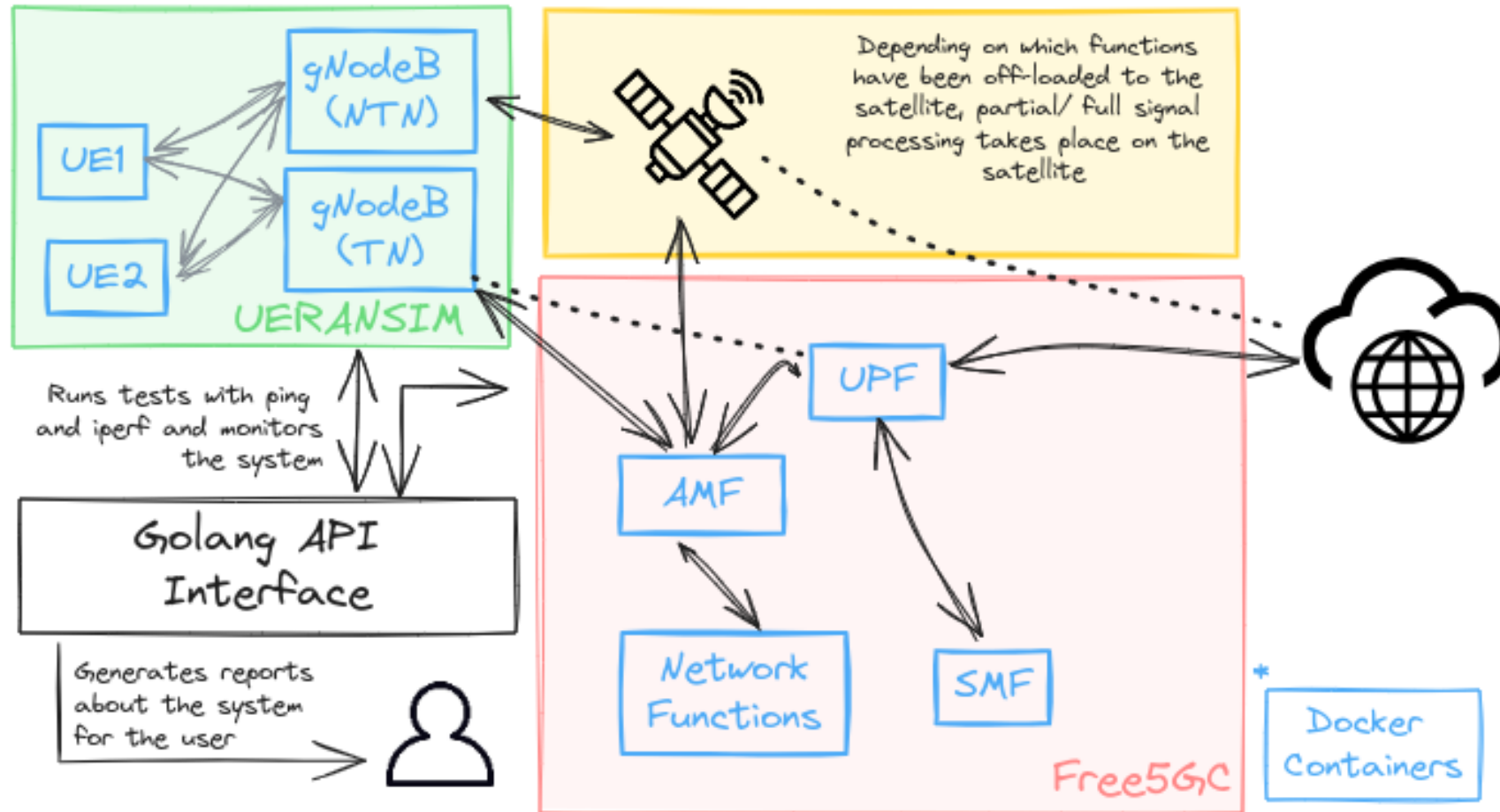
Use Case: Access Traffic Steering Switching and Splitting (ATSSS)



Use Case: Access Traffic Steering Switching and Splitting (ATSSS)



Use Case: Access Traffic Steering Switching and Splitting (ATSSS)



Conclusion

- ACTION-5G offers a robust method for testing integrated TN/NTN.
- It provides a simple API interface for:
 - Designing topologies
 - Implementing link characteristics (to replicate NTN)
 - Monitoring systems (running tests like ping, iperf etc)
 - Generating reports
- This ensures optimized performance and connectivity in 5G environments.

Thank you

Questions?