Prototyping LTE-WiFi Interworking on a Single SDR Platform

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Workshop on Next-Generation Wireless (WNGW) with ns-3

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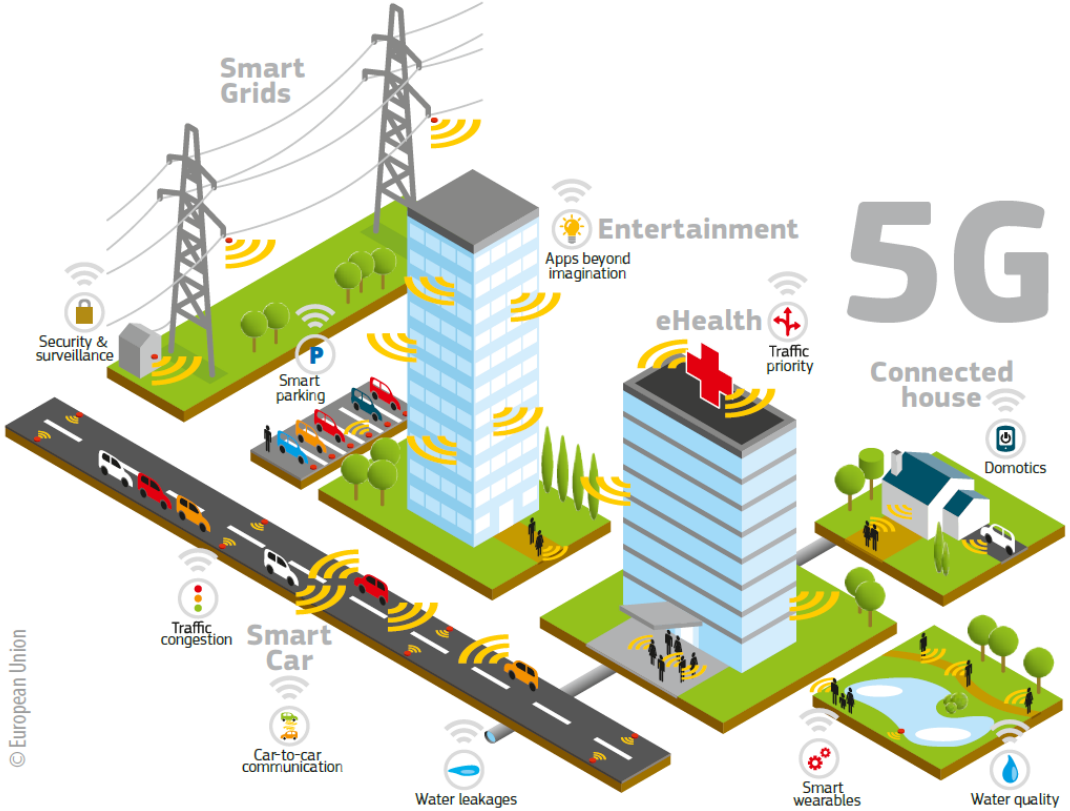
Challenges in Future Wireless Networks



New 5G use cases will bring unprecedented diversity and density to future wireless networks

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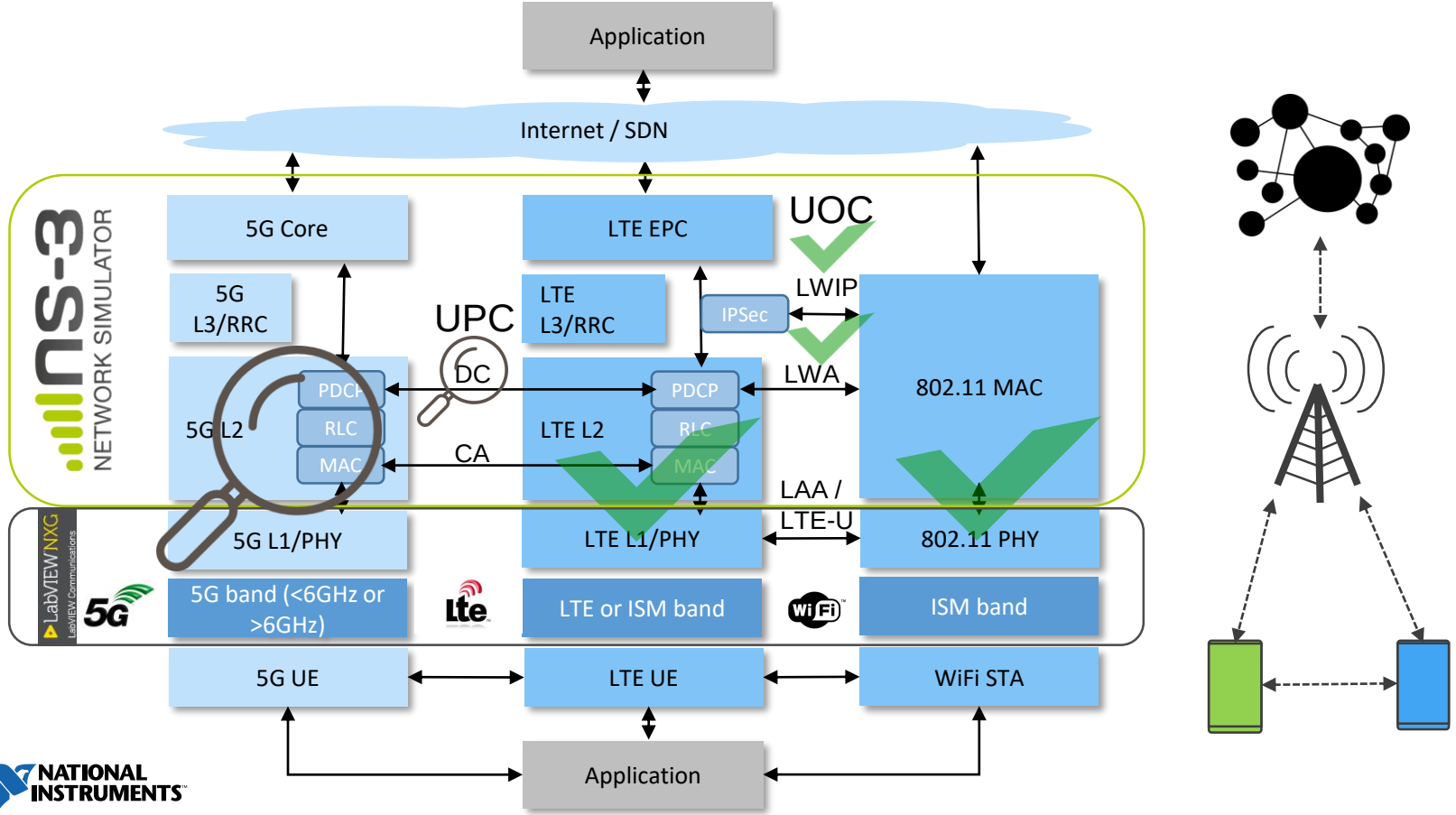
NI‘s Multi-RAT Platform Vision for Research



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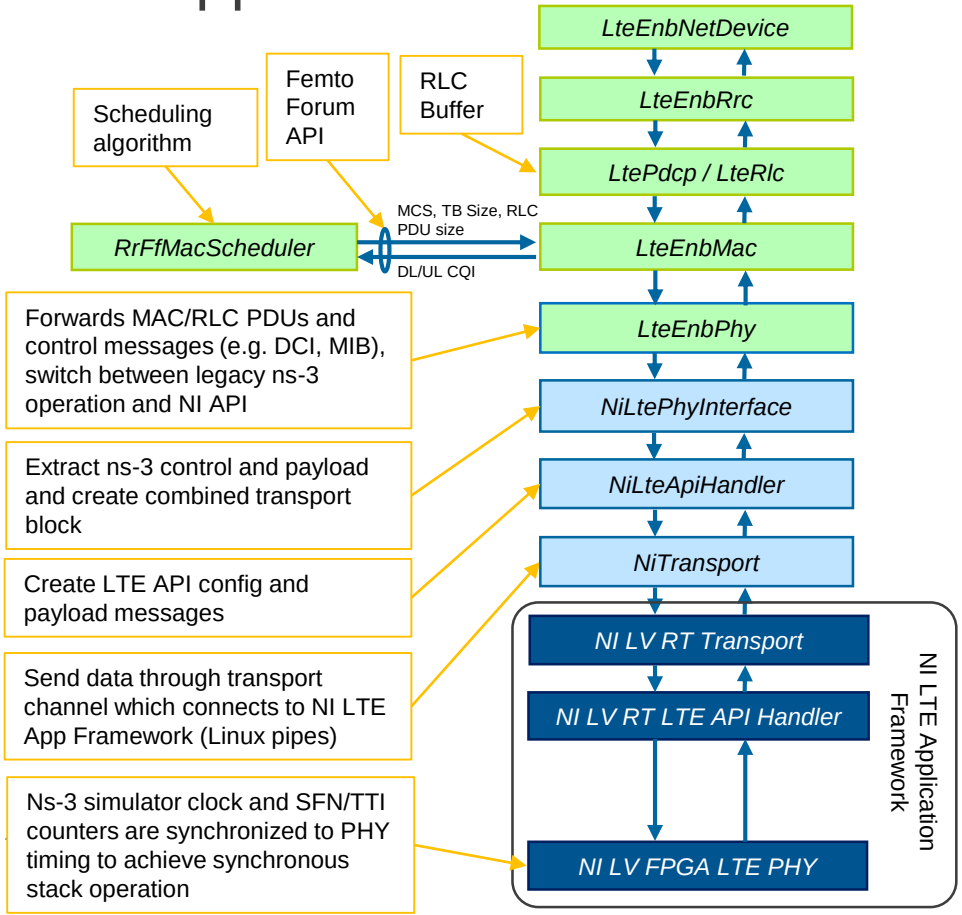
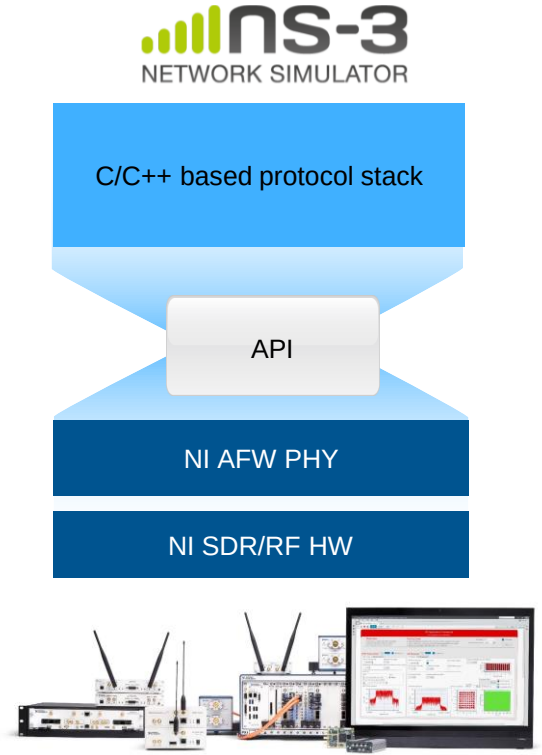
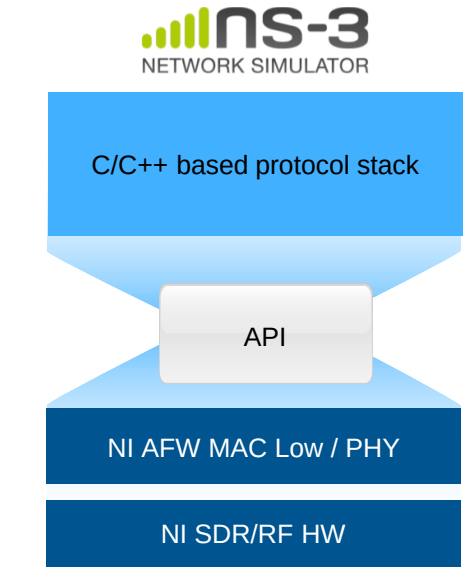
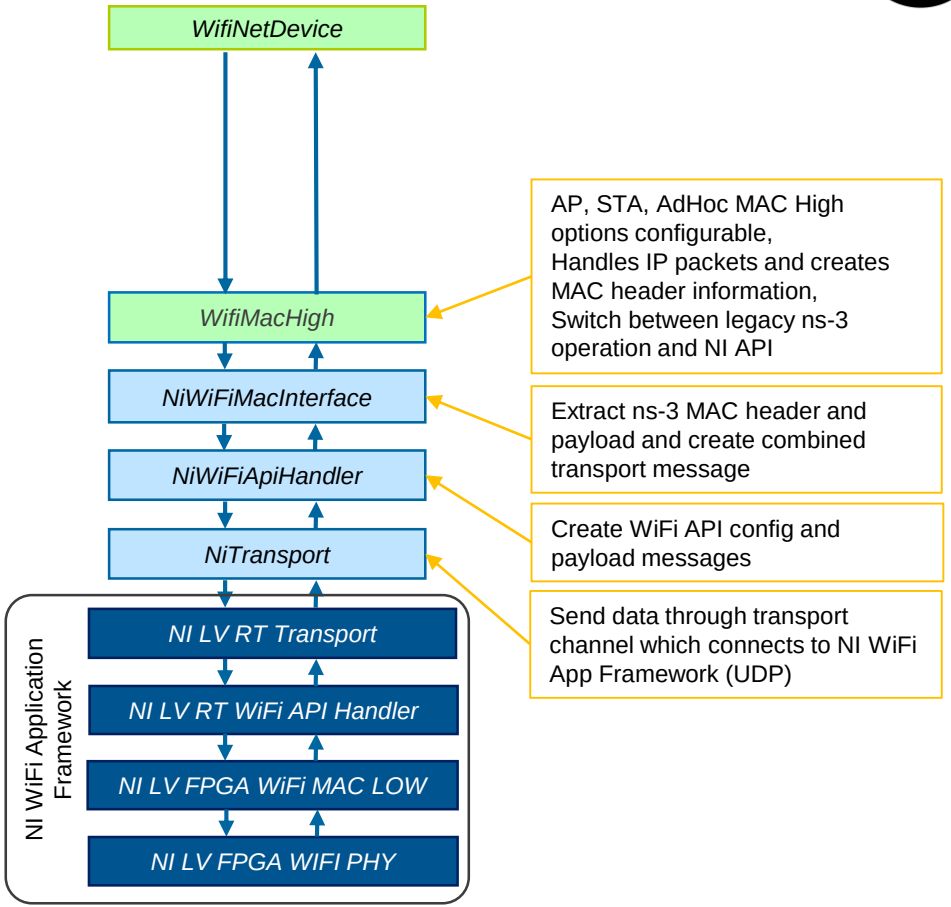
Flexible API Concept to Connect Upper Layer to NI Application Frameworks



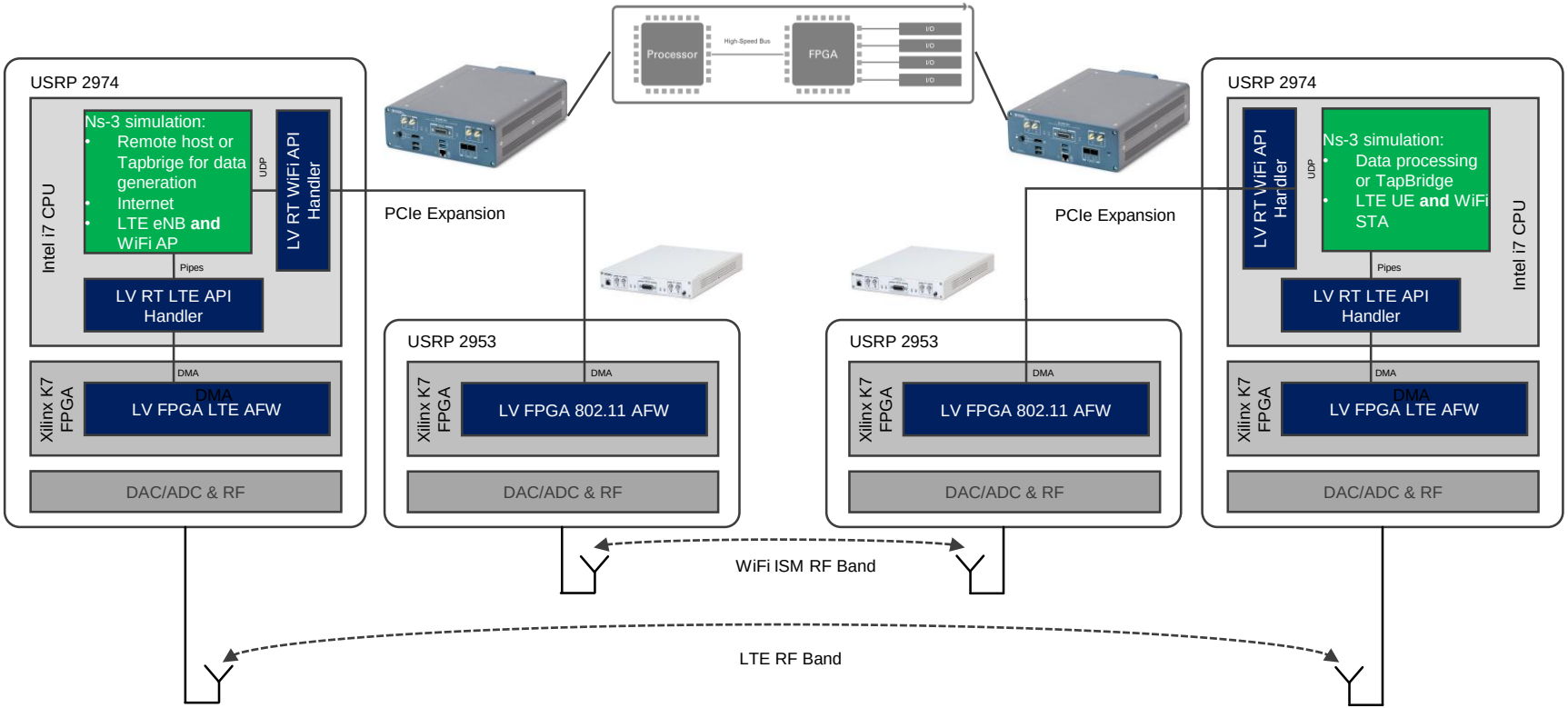


Flexible API Concept to Connect Upper Layer to NI Application Frameworks





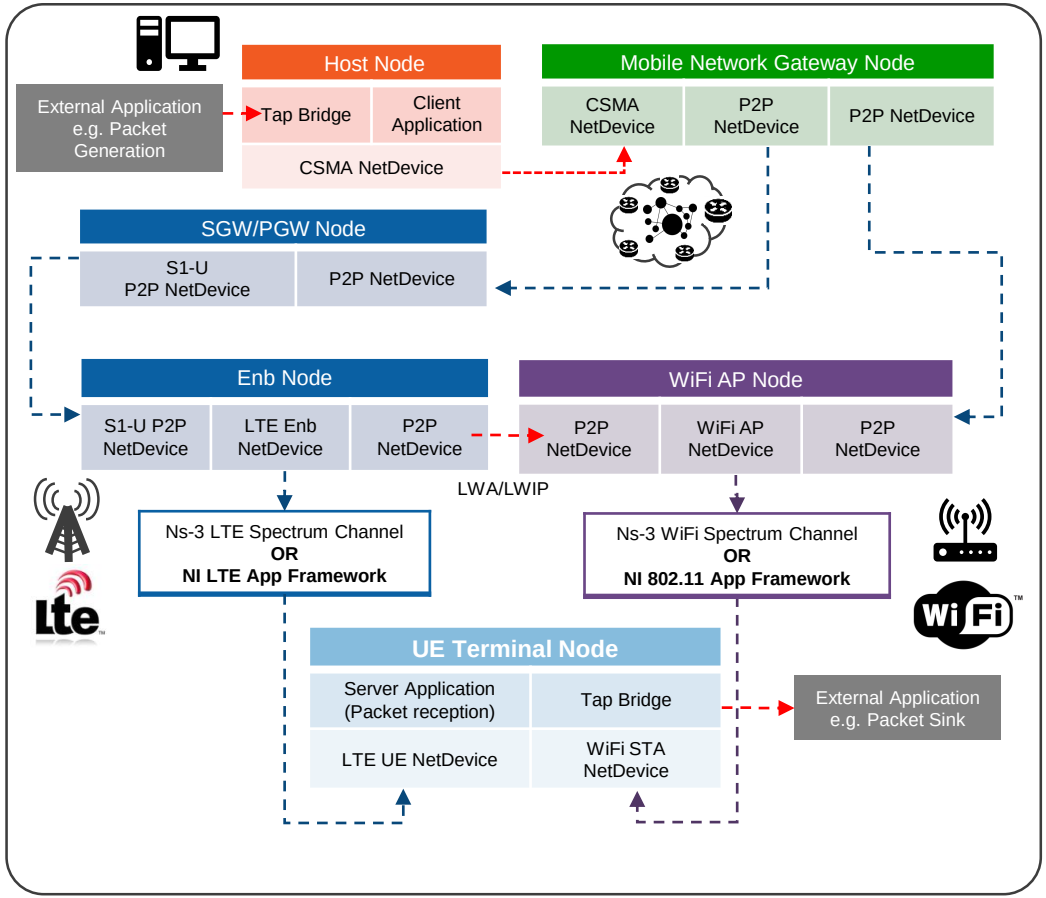
SDR Hardware partitioning



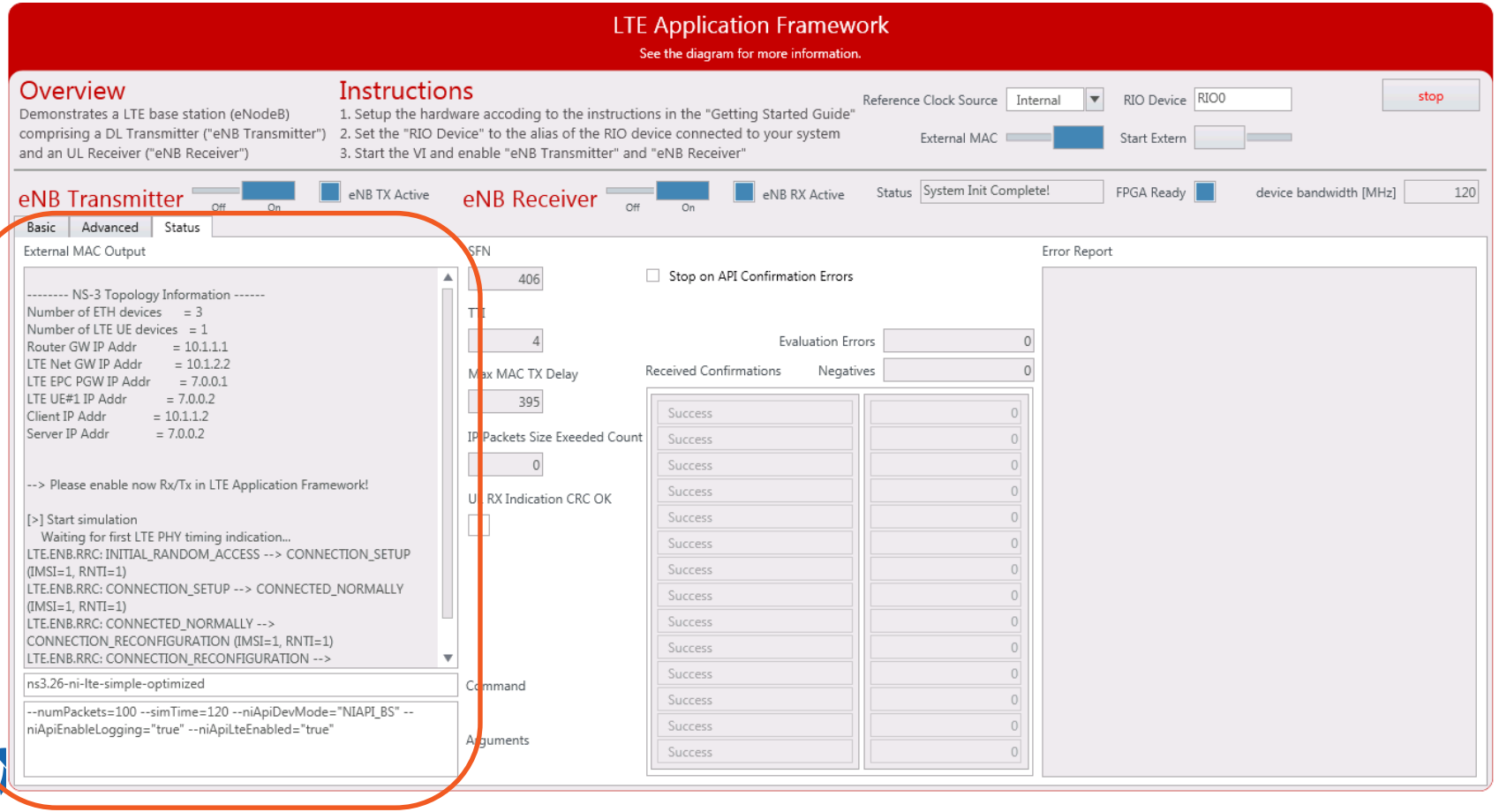
→ Mutual benefit: Combing Multi-RAT strengths of ns-3 and NI SDR

NS-3 End-to-End Multi-RAT Scenario

- Internet emulation using nodes connected via ETH/CSMA
- Mobile network gateway connects LTE and WiFi access networks to internet via P2P
- LTE and WiFi access networks can run in parallel supporting interworking options
- Terminal includes LTE and WiFi network interfaces as in real devices
- External traffic possible through Tap Bridge

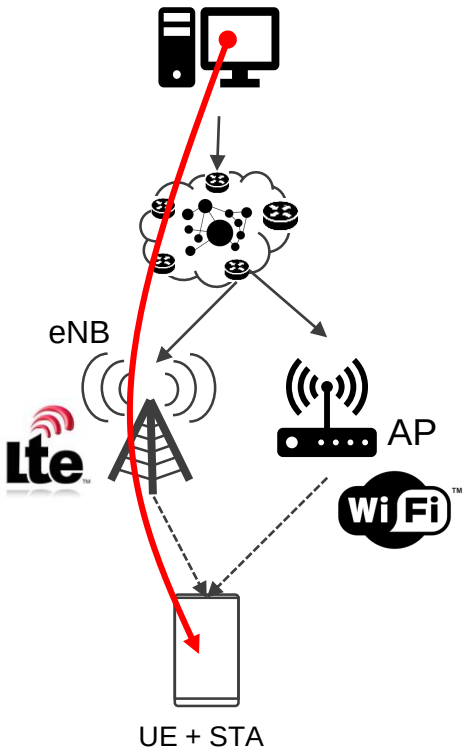


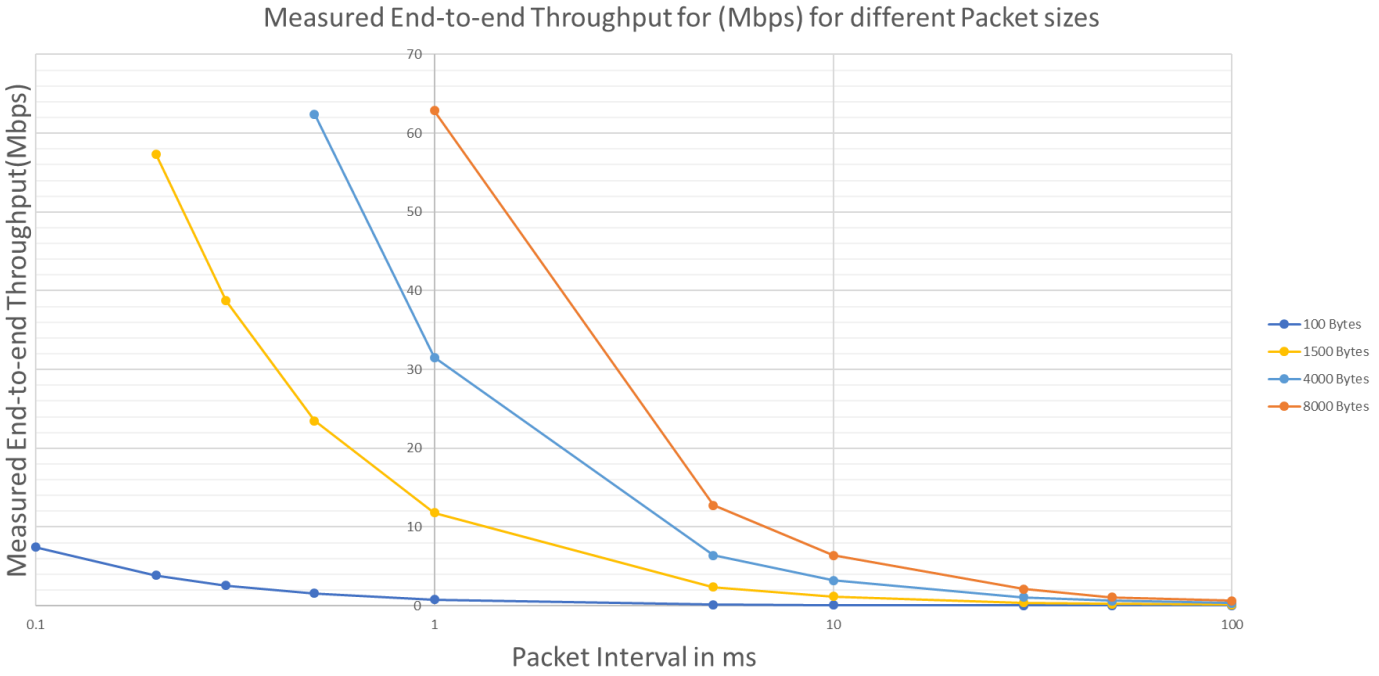
Integration within LTE Application Framework



ns-3 console output

Measurement of End-to-End Throughput - LTE

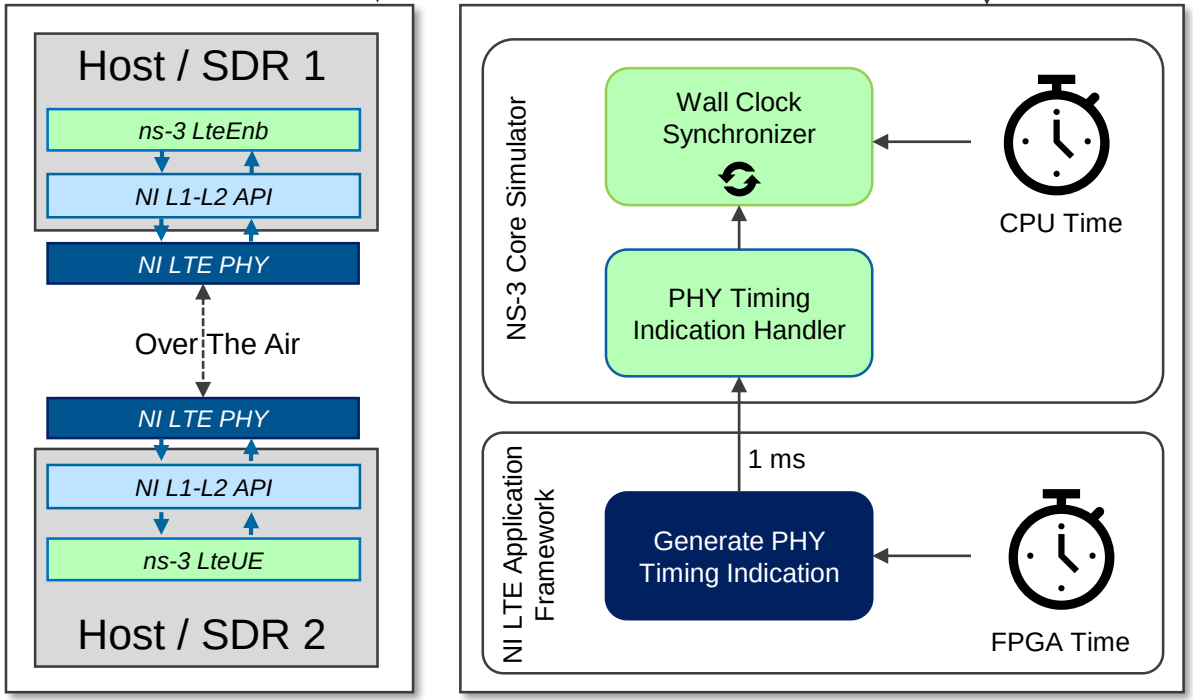




- Close to capacity limit of LTE PHY layer

Main Challenges

- Synchronization of ns-3 Simulator with the FPGA clock (LTE case)
- Separation of eNB and UE in one ns-3 instance
- Single threaded simulator
  - Tx and Rx needs to be executed asynchrony in a communications systems



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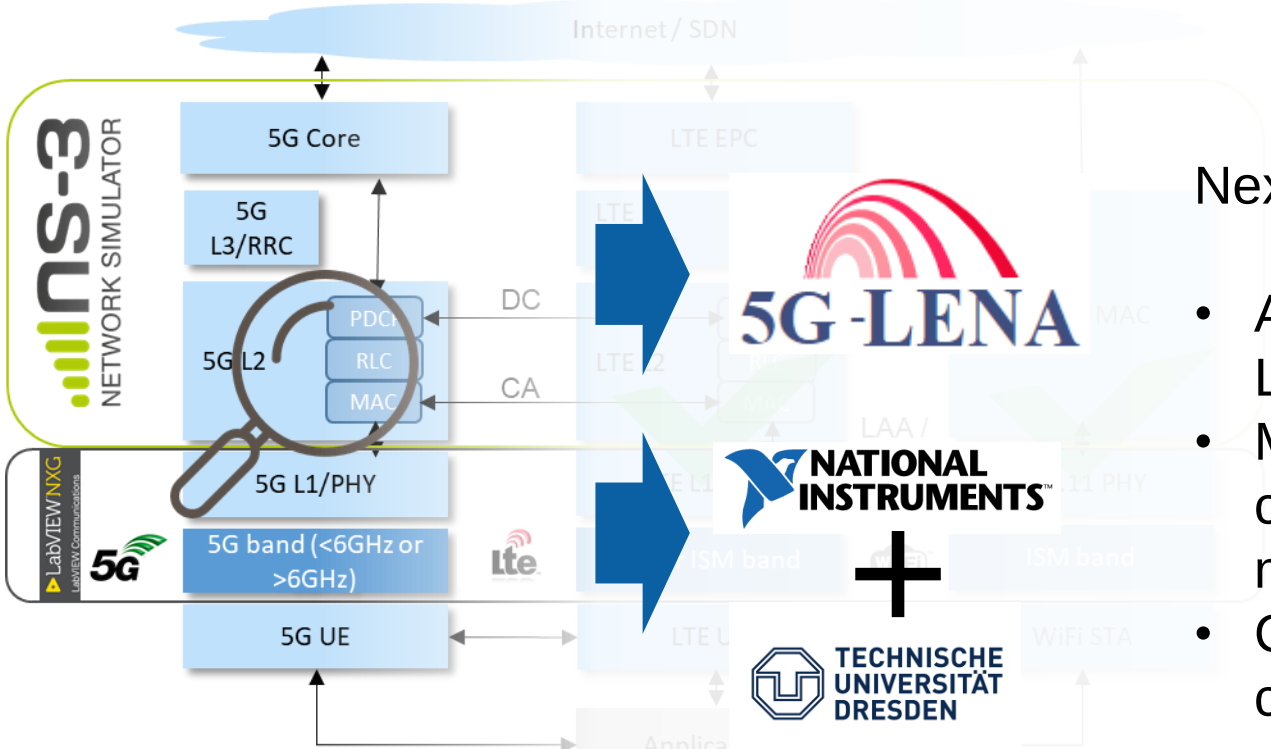
Outlook: Develop the 5G path for NI‘s Multi-RAT Platform



Next Steps

- Analyzing the 5G-LENA module
- Migrate and adapt NI changes from LTE module to 5G-LENA
- Connect to 5G SDR in collaboration with TUD

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Thank you!

NS-3 code modifications publicly available under:

https://github.com/ni/NI-ns3-ApplicationExample

3rd Open Call for Experiments – NOW OPEN!

https://www.orca-project.eu

Orca Orchestration and Reconfiguration Control Architecture