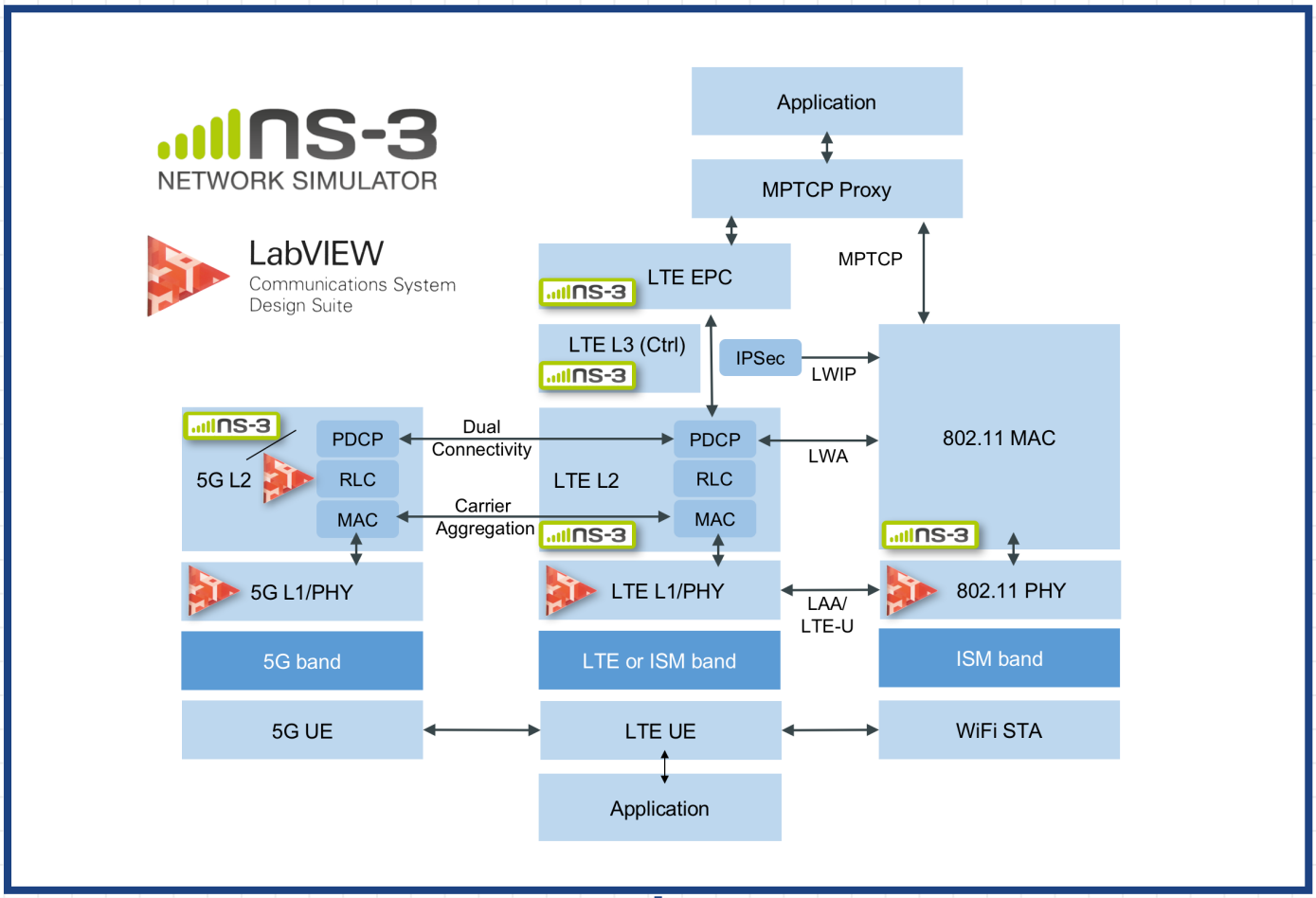
Orca

Orchestration and Reconfiguration Control Architecture

BASIC SDR CONTROL PLANE FUNCTIONALITY

Slice coordination:
Coordination strategies between multiple RATs (LTE/802.11/5G-NR)



NS-3 based Prototyping Platform for experiments on interworking of different parallel Radio Access Technologies (RATs).

- Allowing end-to-end experiments.
- Flexible configuration.
- Real-time capability using FPGA and Linux RT CPU as SDR components.
- NS-3 loopback modes allowing fast simulation and integration process.
- Platform is extendable for interworking concepts such as LWIP/LWA.

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CONTEXT

As of today, it cannot be foreseen that there will be only a single RAT in the future that can be used for all spectrum bands addressing the diverse set of anticipated service requirements. Therefore, the use of RAT interworking techniques and coordination strategies is required. One specific challenge is to enable interworking of parallel RATs to exploit the benefits of those individual options and deliver the required services to the user. Thus, in ORCA an NS-3 based prototyping platform for RAT interworking technics will be established.

UNIQUE SELLING POINT

Real experimentation results are often missing because e.g. either LTE or 802.11 prototyping systems are available only, but not both. The same holds for LTE and 5G-NR (5G New Radio). However, to proof that the anticipated performance gains translate into reality joint experimentations and measurements are necessary. Therefore, in ORCA a new prototyping setup will be created using NI's SDR platform in combination with the NS-3 network simulator. With that system various deployment and test scenarios are possible that allow for experiments that have not been possible so far.

OPPORTUNITIES

- Allowing end-to-end experiments to investigate for e.g. in aggregation and split of user data.
- Platform is extendable for interworking concepts such as MPTCP, LWIP, LWA, Dual Connectivity, Carrier Aggregation (see also extensions in 6.3 of deliverable 2.2).
- Enable interworking of different types of communication systems: scheduled vs. ad-hoc.
- Flexible programming and configuration using real-time capable SDR components such as FPGA and Linux RT CPU.
- Fast simulation and integration process using NS-3 loopback modes.

REFERENCES

The Inter-RAT prototyping platform will be available at TUD macro scale testbed [section 5.2.1 of deliverable 2.2]. Therefor the physical layer on NI's FPGA based SDR platform [1, 2, 3], the upper layers of adapted NS-3 [4, 5, 6] running on NI's Linux RT [7] will be used.

1 National Instruments, "LabVIEW Communications 802.11 Application Framework 2.0 and 2.0.1", White Paper, http://www.ni.com/white-paper/53279/en/ , December 2016.

2 National Instruments, "LabVIEW Communications LTE Application Framework 2.0 and 2.0.1", White Paper, http://www.ni.com/white-paper/53286/en/ , December 2016.

3 National Instruments, "LabVIEW System Design Software", Product Website, http://www.ni.com/labview/ , March 2017.

4 NS-3 Project, "Overview - What is NS-3", Website, https://www.nsnam.org/overview/what-is-ns-3/

5 NS-3 Project, "LTE-Module", Website, https://www.nsnam.org/docs/release/3.10/manual/html/lte.html , March 2017.

6 NS-3 Project, "Wi-Fi Module", Website, https://www.nsnam.org/docs/models/html/wifi.html , June 2017.

7 National Instruments, "NI Linux Real-Time PXI Controller for LabVIEW Communications", Product Website, http://sine.ni.com/nips/cds/view/p/lang/fr/nid/214068 , March 2017.

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