

Multi-RAT Experimentation below 6 GHz

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Abstract. Novel 5G use cases like massive machine-type communication (mMTC) and ultra-reliable and low-latency communication (URLLC) demand for new prototyping platforms to evaluate new concepts for future wireless communication systems. One goal of the H2020 research project “ORCA” is to develop a platform for multi radio access technology (multi-RAT) experimentation below 6 GHz [1].

1 Introduction

The coordination and coexistence of heterogeneous wireless technology has grown to an important research area. The European research project ”ORCA” offers facilities to complement theoretical research and simulations with practical evaluation. In this poster and demo, we introduce a platform for sub 6 GHz multi-RAT prototyping, discuss different options for radio access technology (RAT) interworking and present a unified L1-L2 application programming interface (API).

2 A Multi-RAT Platform based on ns-3

To accommodate for the different processing requirements of PHY and higher layers, the system partitioning involves L2 and upper layers to run on an Intel CPU while computational demanding hardware implementations of PHY layers run on the FPGA-based SDR platform USRP-RIO [2].

The following software components have been used to implement the RAT building blocks Long Term Evolution (LTE), 802.11 and 5G:

- For the LTE link, we employ the open source network simulator 3 (ns-3) [3], with a real-time implementation of the LTE layer 1 (L1) on FPGA [4].
- For the 802.11 link, similarly, we have combined the ns-3 WiFi module with an FPGA real-time implementation of 802.11.
- For the 5G link, an FPGA implementation of a flexible PHY is being used.

The complete sub-6 GHz multi-RAT platform is depicted in Fig. 1. First focus of the project is on implementing the different RATs. Subsequent additions of the inter-working technologies such as LWIP, LWA and DC for LTE and 802.11 will complete the platform. The connection of ns-3 to NI’s SDR platform enables a variety of experimentation scenarios – setups that have not been possible so far. The resulting testbed will accelerate research towards 5G RAT and network

