

LabVIEW based Software-Defined PHY/MAC Architecture for prototyping dense LTE Networks

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Agenda

CROWD Overview

Testbed Platform Goals

Prototyping Platform Architecture

Example eICIC Application: ABSF

Conclusion/Future Work

CROWD Overview

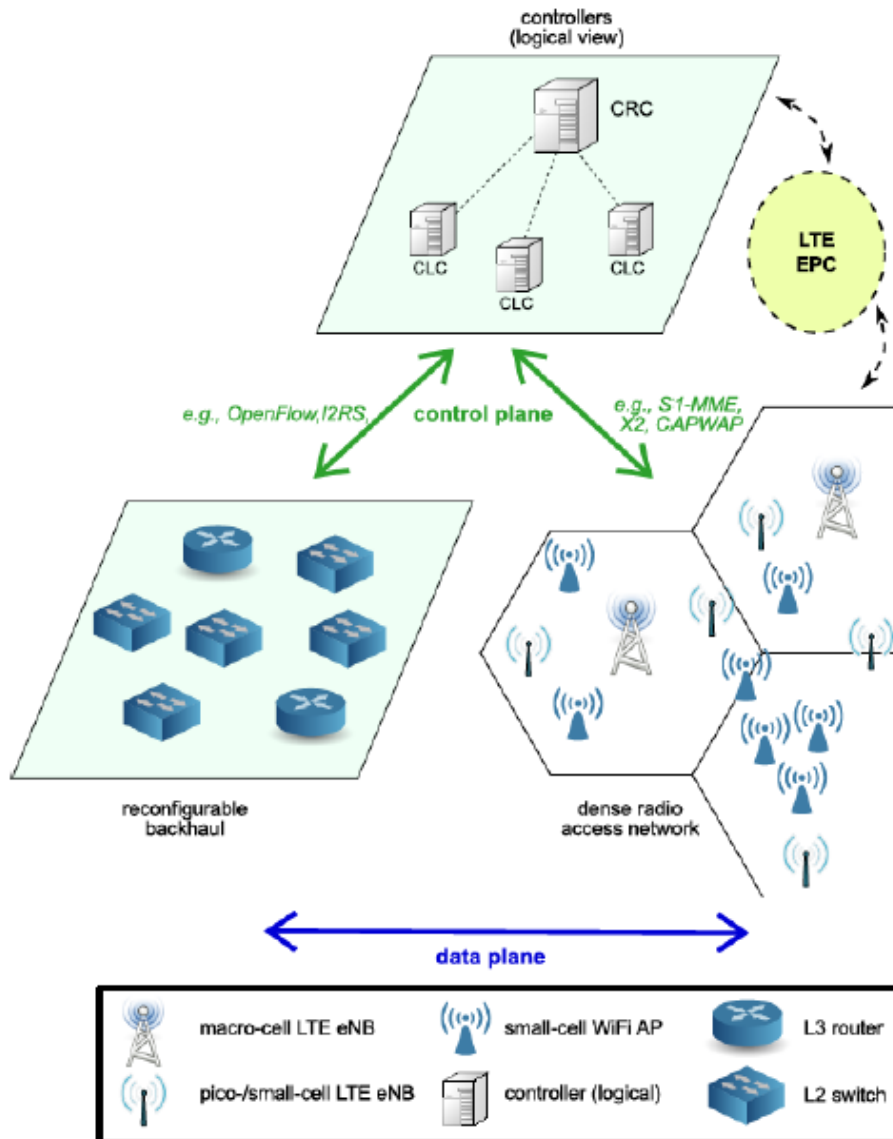
- What is **CROWD**?
 - Connectivity management for eneRgy Optimised Wireless Dense Networks (**Duration: 01/2013 – 06/2015**)
- **EU FP7/2007-2013** Research project (Grant# 318115) with focus on:
 - ✓ Connectivity Management of Dense Access Points
 - ✓ Energy Efficiency
 - ✓ MAC Optimizations for LTE, WLAN
- **Partners: Intecs**, National Instruments (NI), Alcatel Lucent, Avea, University Carlos III Madrid(UC3M), IMDEA, University of Paderborn



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Carlos III de Madrid



CROWD Architecture



Controllers are decision points using SDN Approach

CLC:

- ✓ CROWD Local Controller for managing LTE/WiFi locally

CRC:

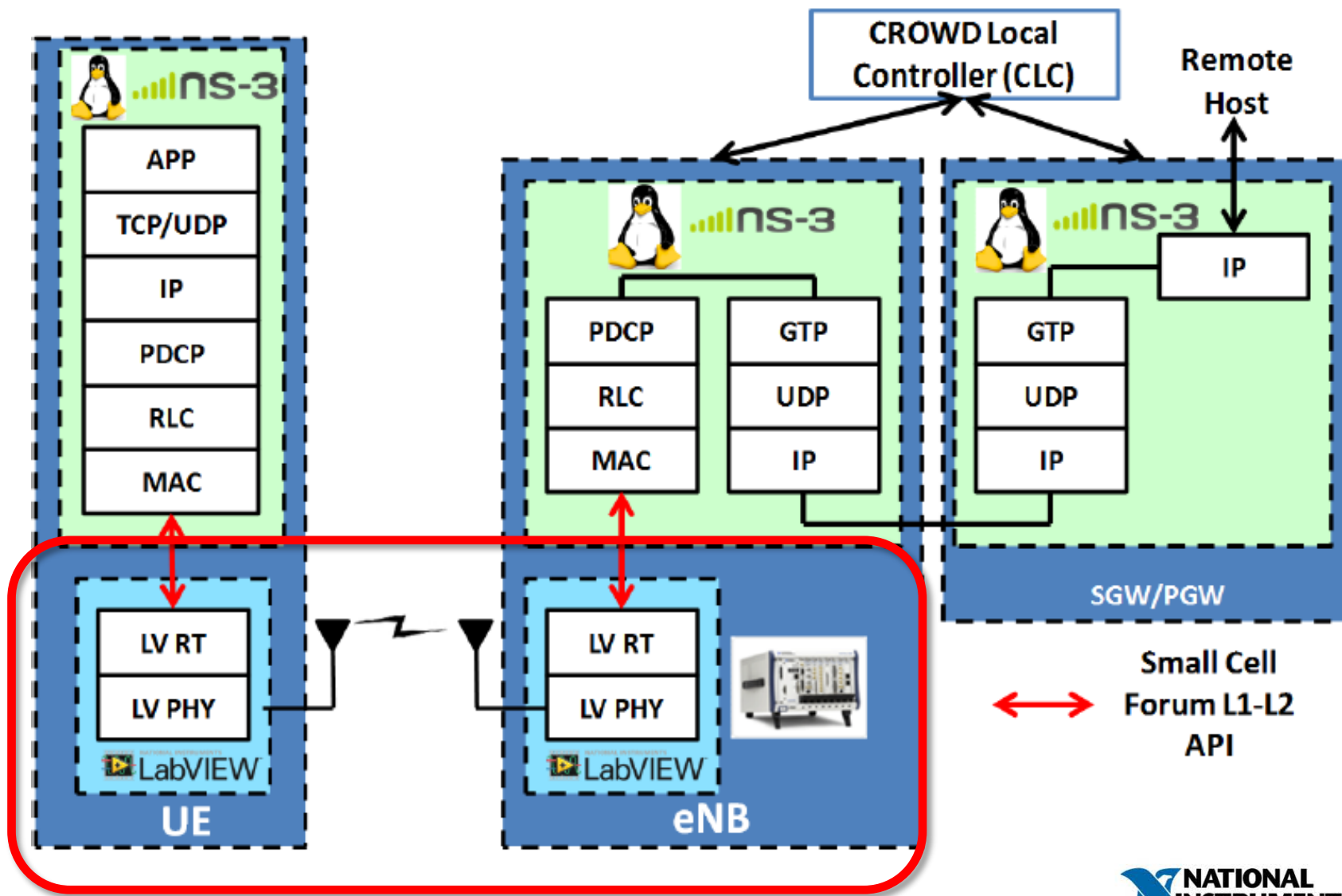
- ✓ CROWD Regional Controller to manage several CLCs

Testbed Platform Goals

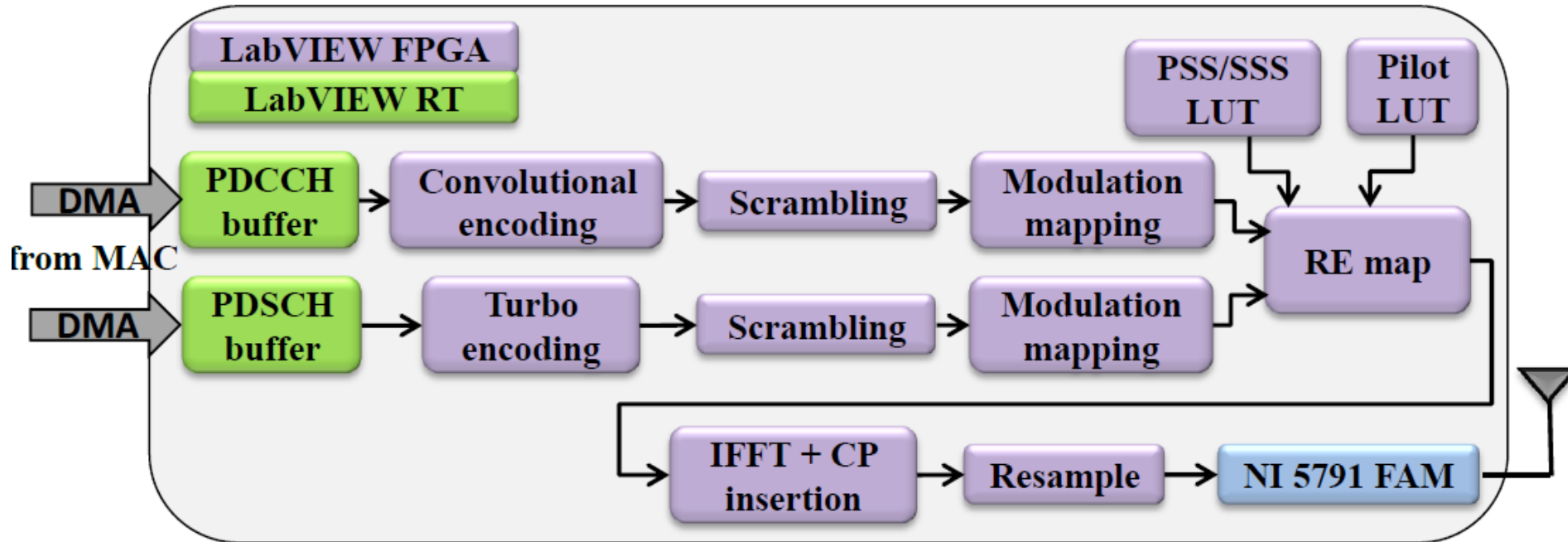
- To prototype cross layer PHY/MAC algorithms
- To create **dense LTE/WiFi network based on Software Defined Networking (SDN)** for measuring performance of algorithms in real network environments
 - ✓ Enhanced Interference Coordination Technologies
 - ✓ Dynamic radio and backhaul configuration
 - ✓ Connectivity Management
- A unified platform for prototyping SDN based cross-layer PHY/MAC algorithms for **Dense Wireless networks**

Prototyping Platform Architecture

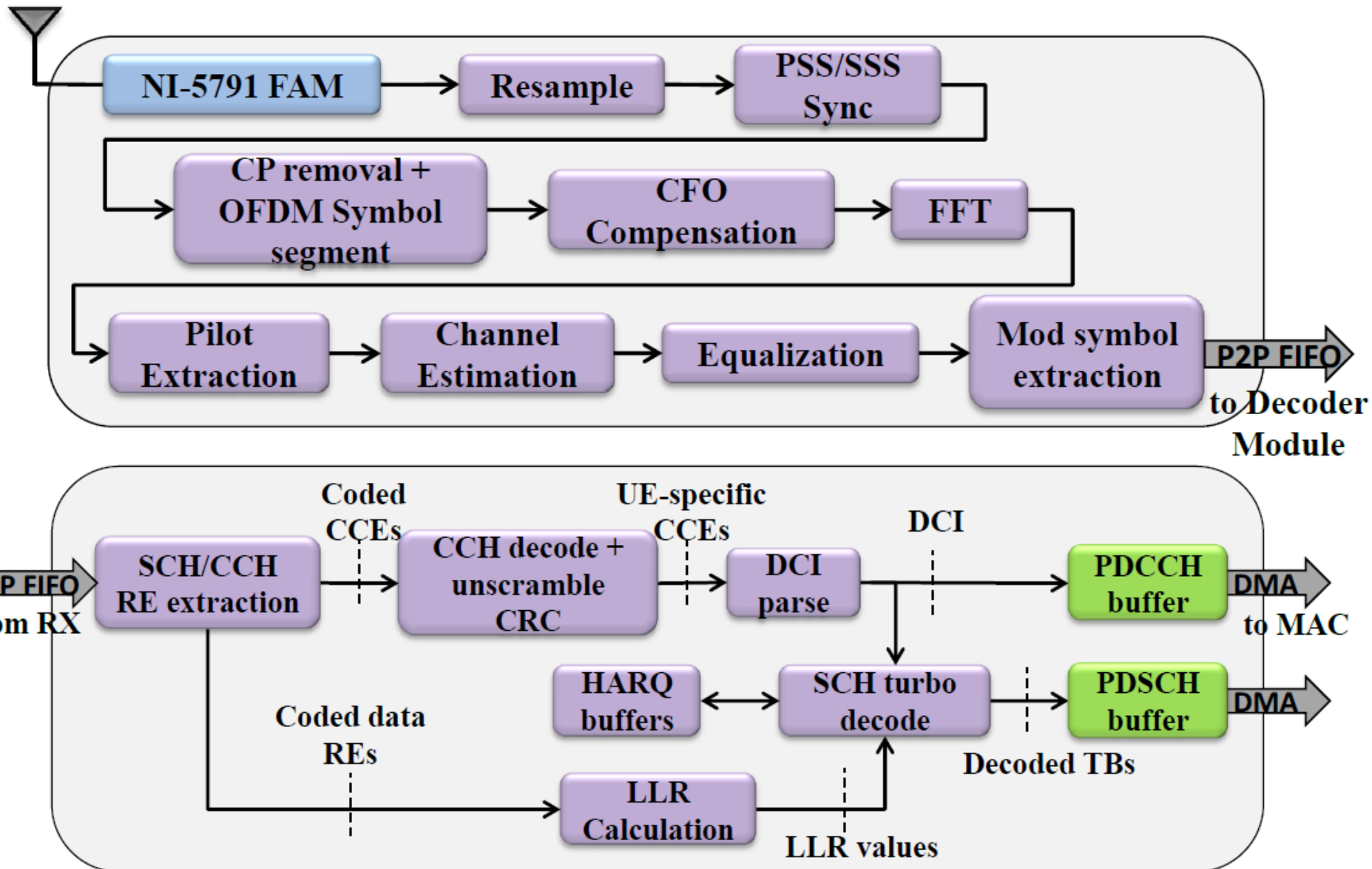
Focus of Presentation



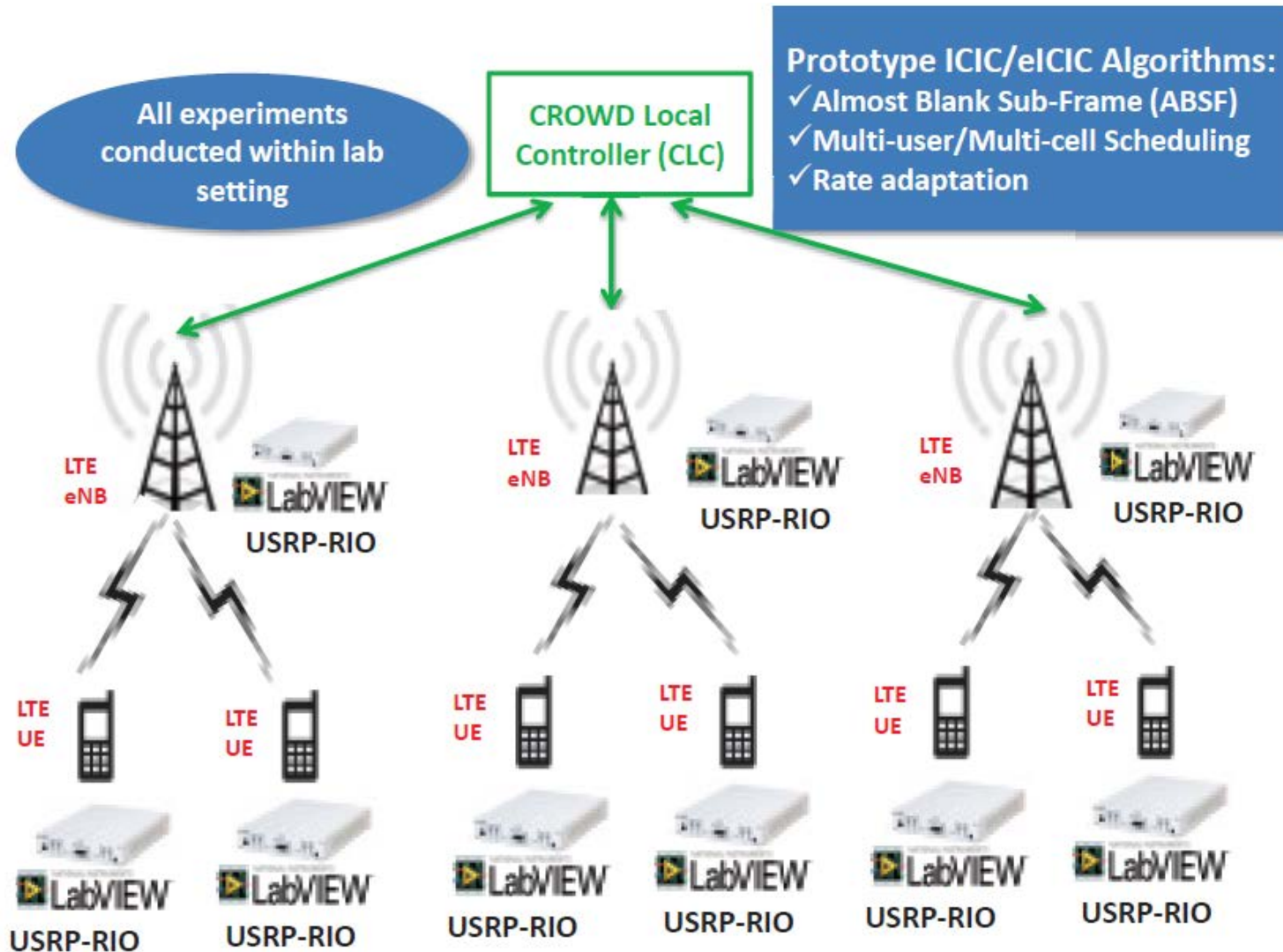
LTE DL Transmitter in LabVIEW FPGA



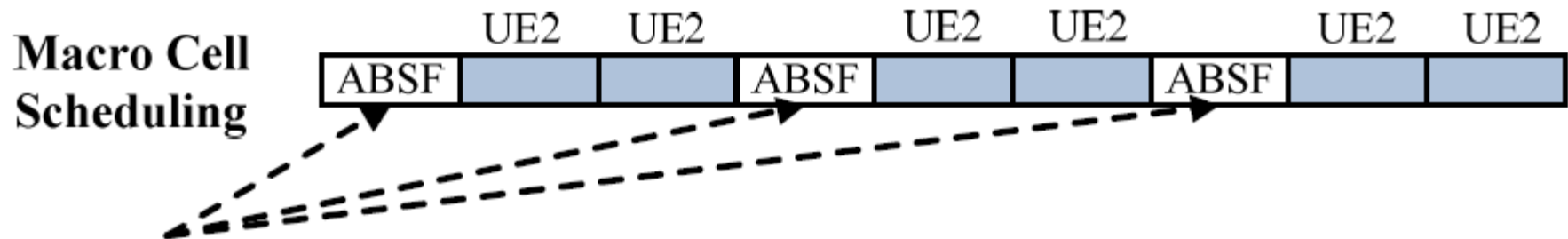
LTE DL Receiver in LabVIEW FPGA



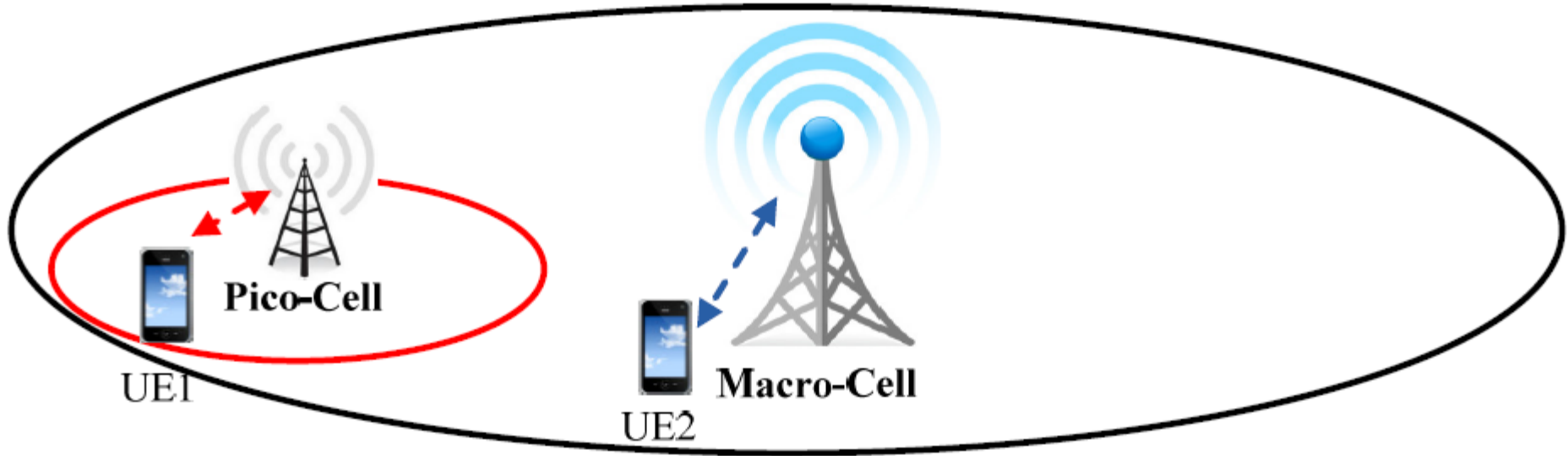
Use Case: eICIC



Experiment: Almost Blank Subframe (ABS) Overview

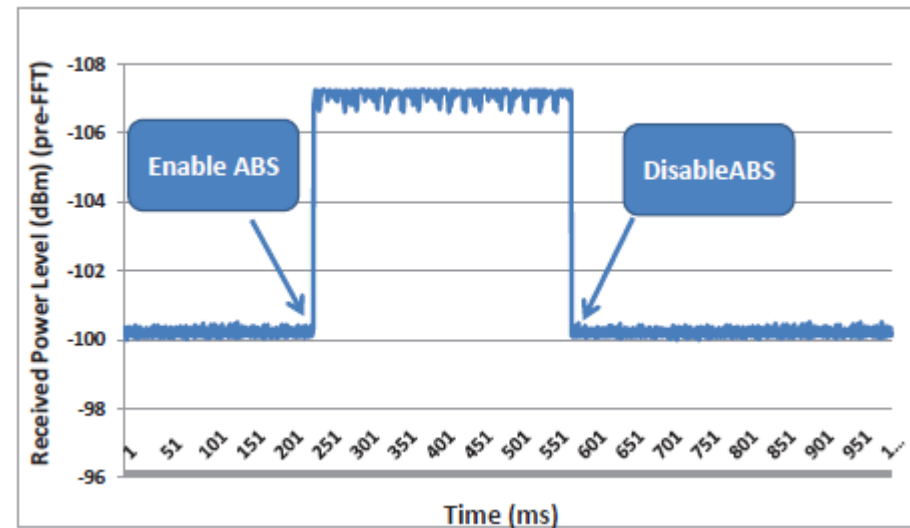
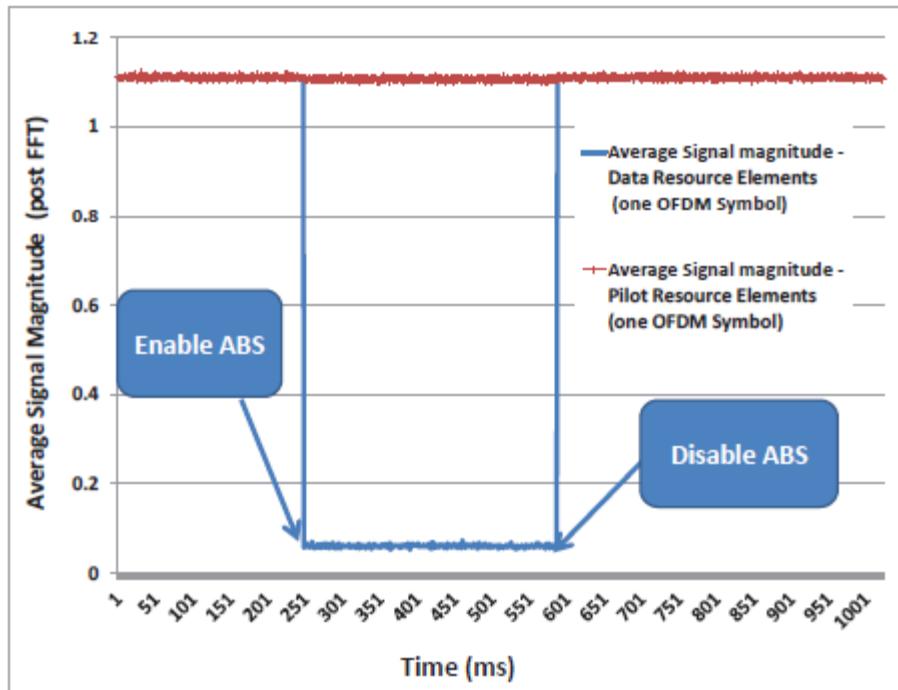


UE1 can be scheduled by Pico-Cell in blanked subframes

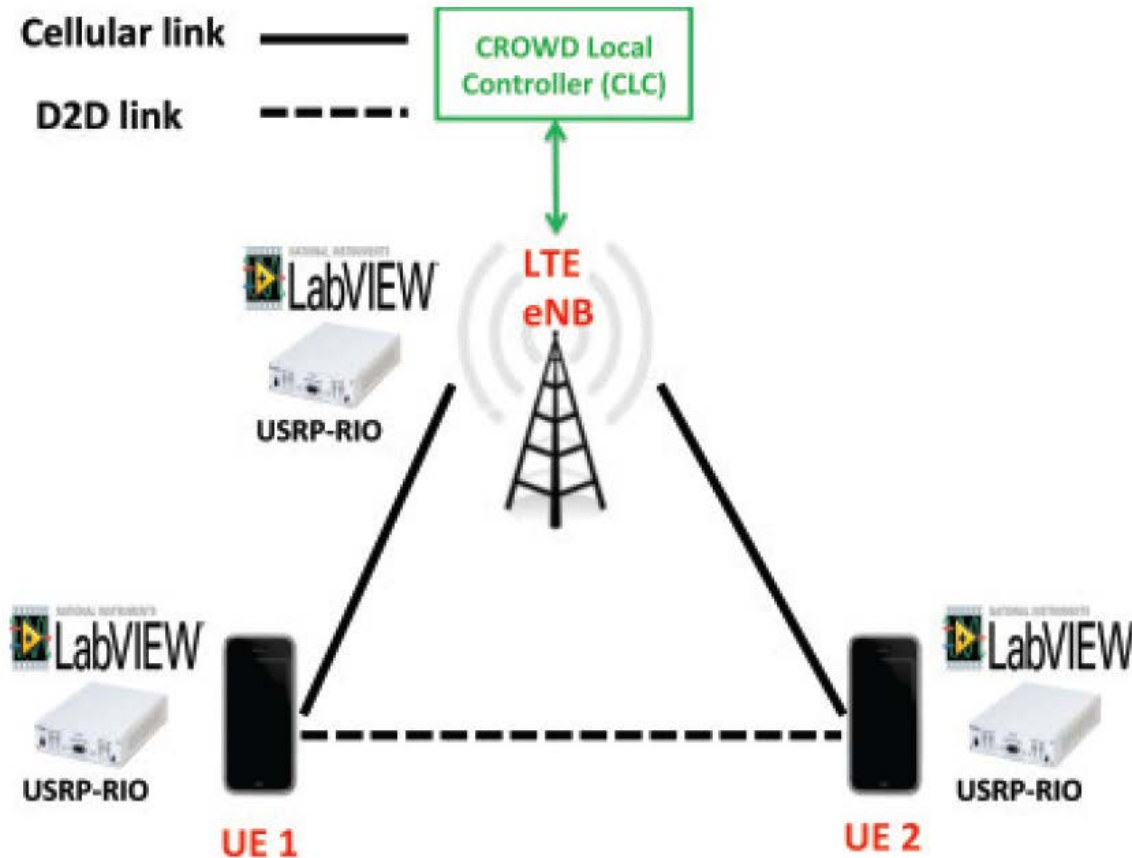


Results - ABS

- Pre/Post-FFT before/after applying ABS
- 7 dB reduction in Pre-FFT received power due to ABS



Use case: LTE Direct prototyping



Conclusion/Future Work

- This is an open platform for building 5G MAC/PHY algorithms for eICIC
- Integrate real-time PHY layer (PDCCH + PDSCH) with NS-3 LTE LENA Stack
- Extend LabVIEW PHY/NS-3 LENA for multi-user
- Integrate CROWD Local Controller (CLC) + WiFi Testbed
- Integrate ABSF Algorithms



Thank You