

Comcores Radio over Ethernet Gateway for Future Fronthaul Networks

FG IMT-2020 Workshop and Demo Day

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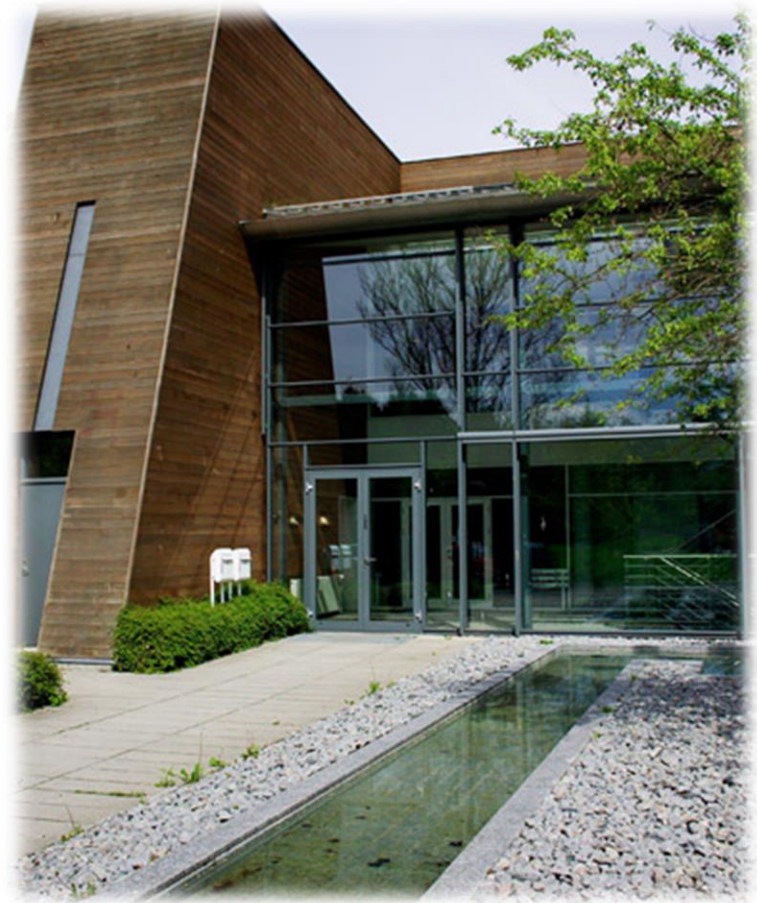
Agenda

- About Comcores
- Motivation for Ethernet Based Fronthaul
- Comcores Overview on next generation fronthaul networks
- Demo setup
- Demo results

Comcores Headquarter

About Comcores

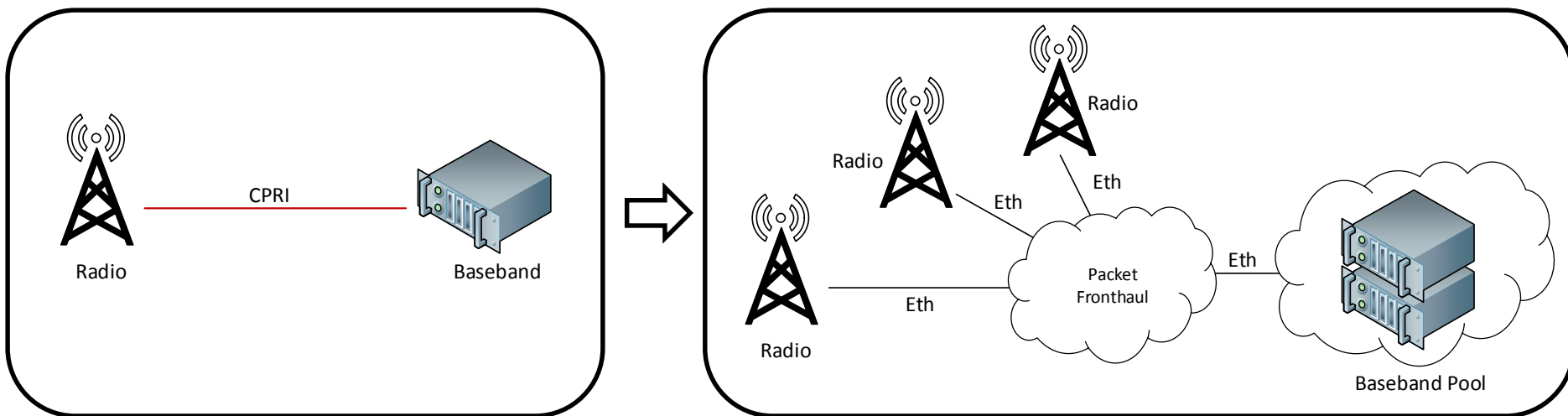
- Established in 2014
- Globally oriented high-tech company, headquartered in Scion DTU Science Park, 20 min outside Copenhagen, Denmark
- IP cores and design services for communication systems
- Specialized in digital radio systems



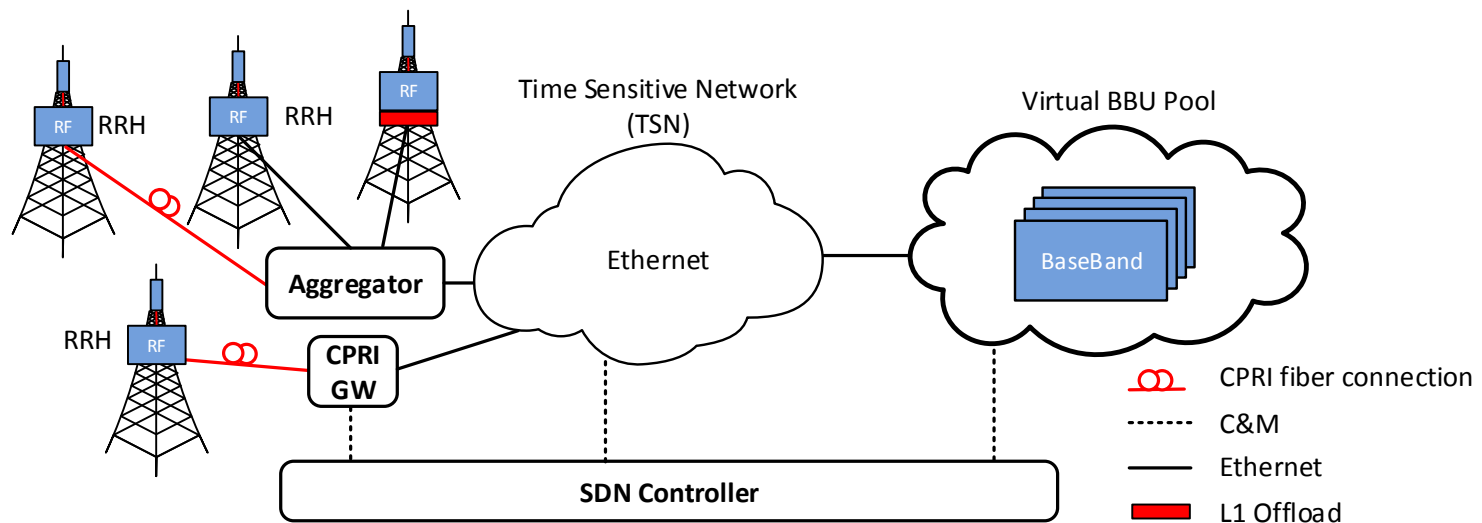
Comcores Headquarter

Motivation for Ethernet Based Fronthaul

- New fronthaul interface technologies are required to satisfy various RAN deployment and evolution requirements, and reduce fronthaul transmission costs
- Current dedicated point-to-point connection between BBUs and RRUs (such as CPRI/OBSAI) will evolve to many-to-many fronthaul mainstream switch networks (such as Ethernet) due to cost, availability and flexibility
- Fronthaul architecture is migrating from traditional RAN where single BBU connects to single/few RRUs to architectures where multiple centralized BBUs connect to multiple RRUs making a packet switched technology ideal
- Ethernet is a widely adopted & nearly ubiquitous standard technology

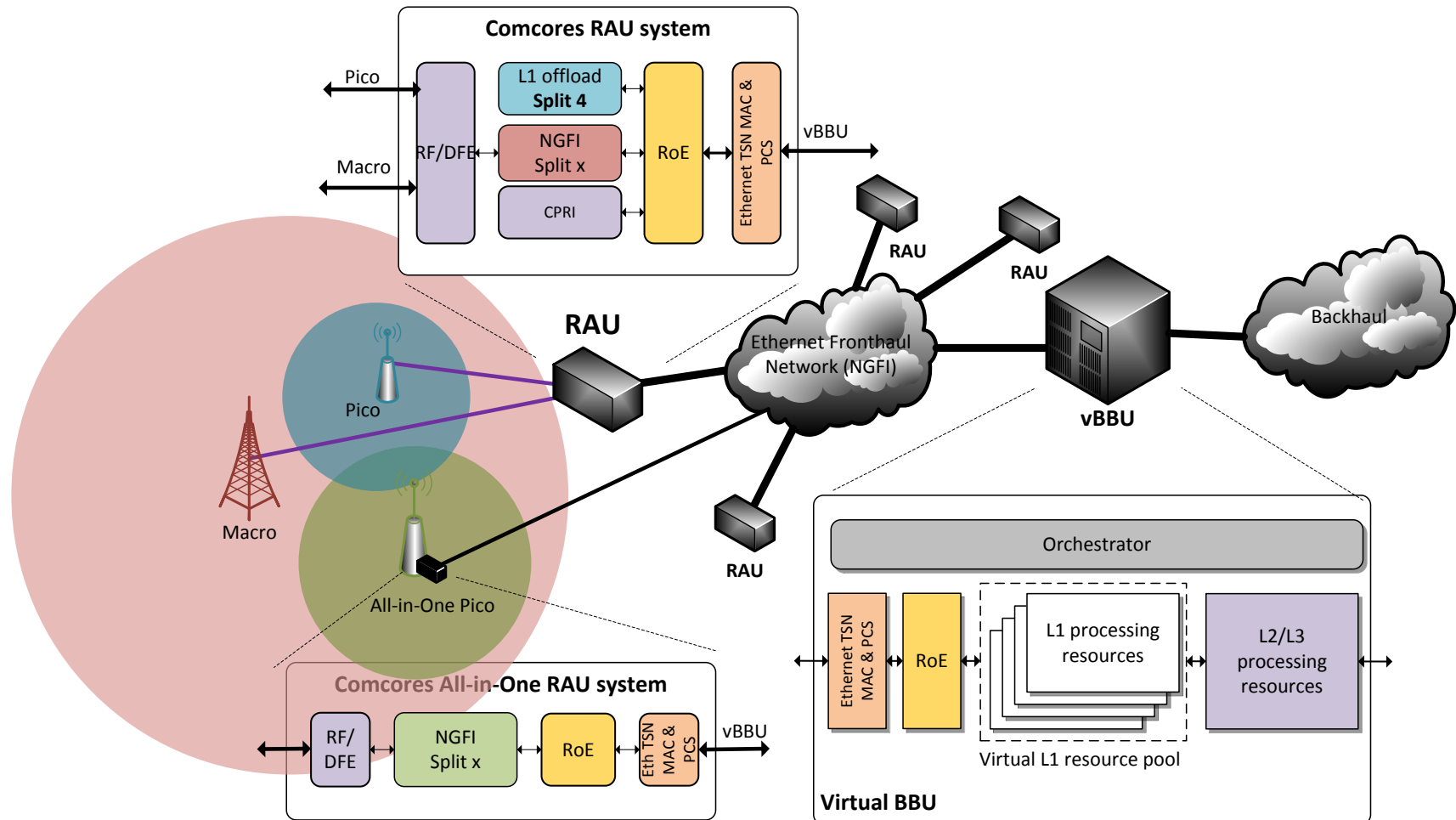


Comcores Overview on next generation fronthaul networks



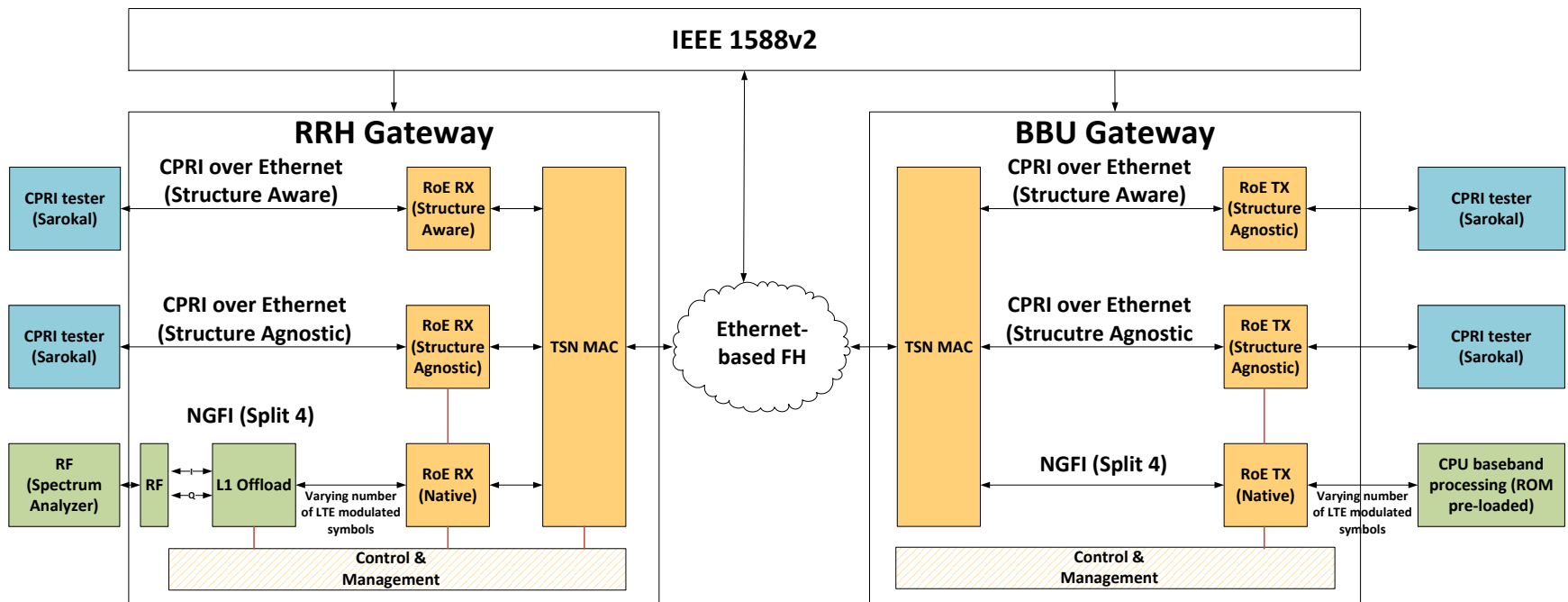
Comcores gateway

- Fits on both radio and base band side
- support of CPRI, new radio interface and high speed Ethernet

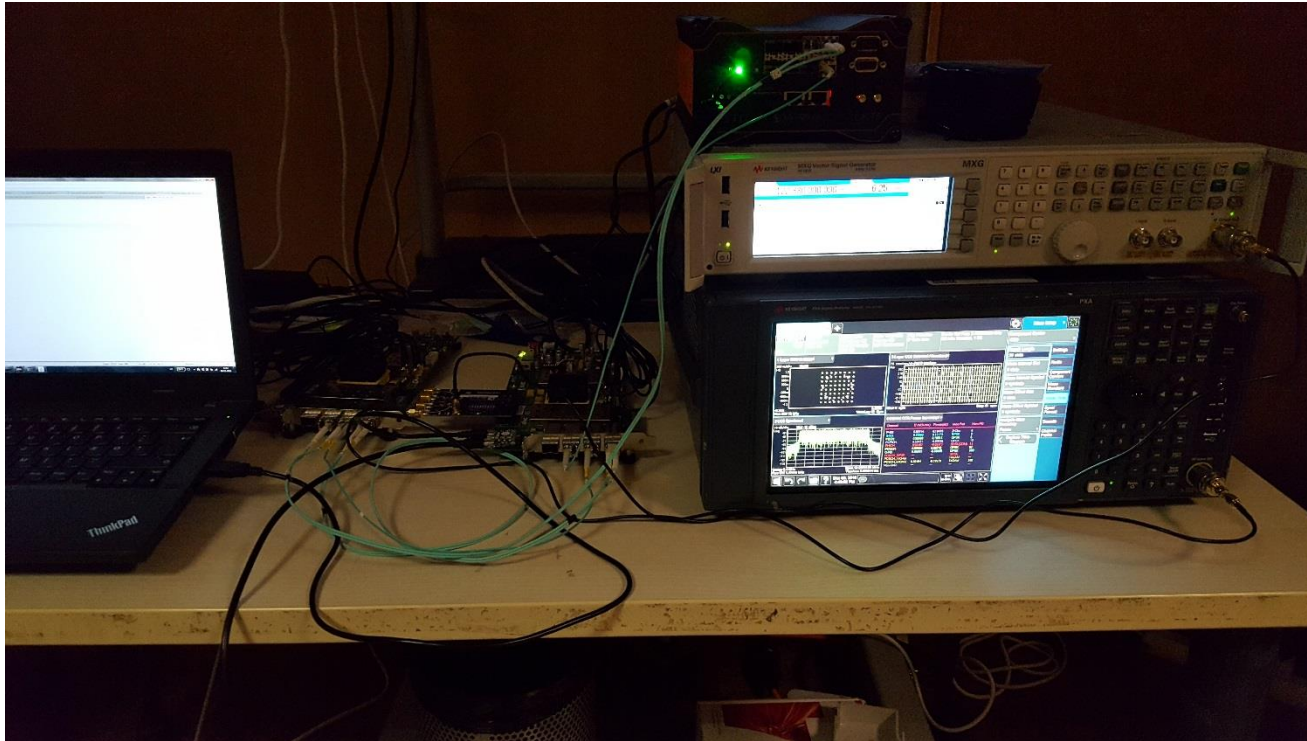


Demo setup

- IEEE P1914.3 - CPRI over Ethernet mapper/de-mapper
- IEEE P1914.1 - Next Generation Fronthaul Interface
- IEEE 802.3 - Time Sensitive Network features
- IEEE 1588v2 - time stamp



Lab setup



- Xilinx VC709 FPGA demonstration platform
- CPRI verification by Sarokal X-STEP tester
- LTE demodulation verification by Keysight PXA spectrum analyzer

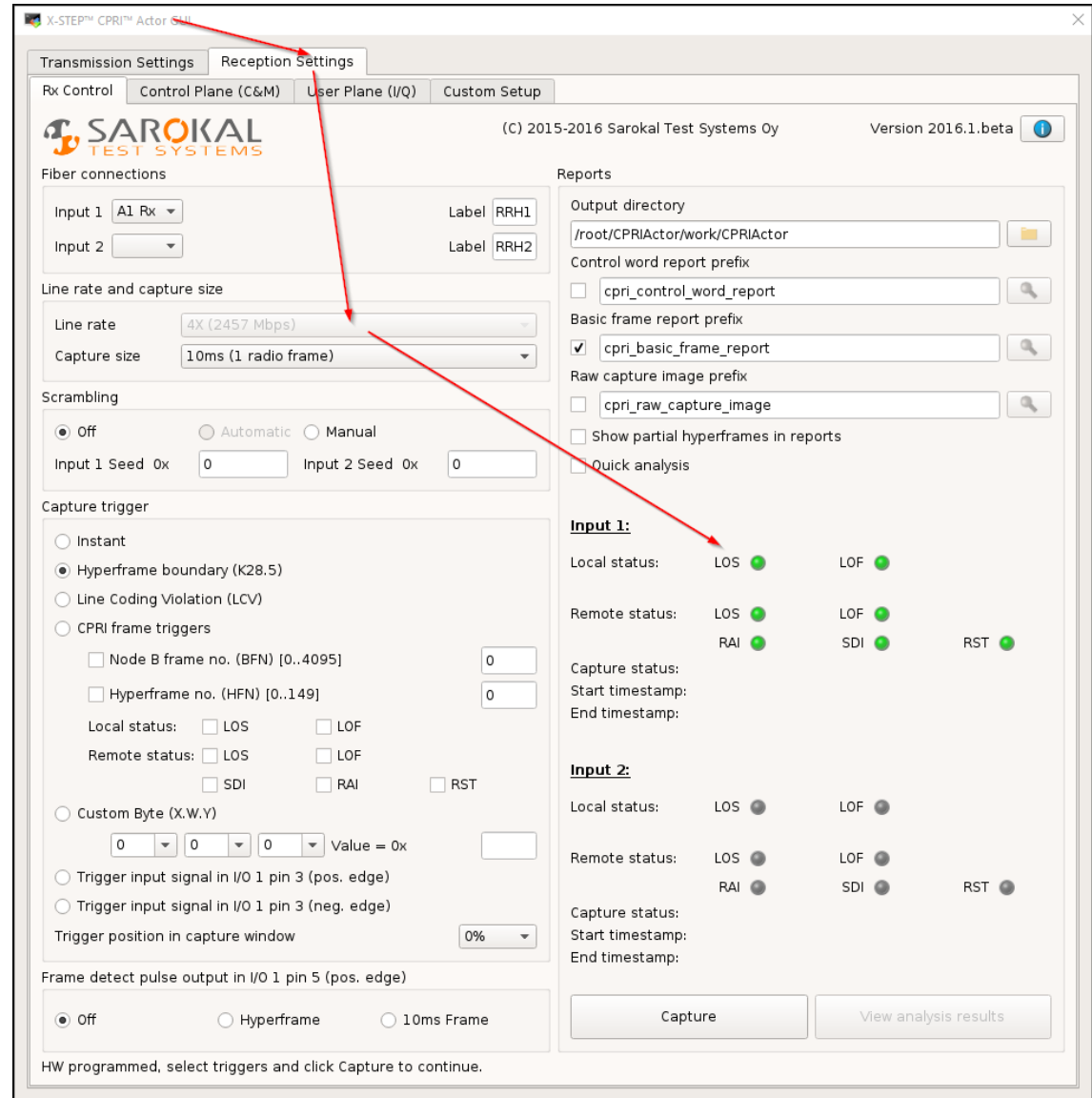


CPRI over Ethernet - motivation

- C-RAN
- Bridge to carry current CPRI flows in future Ethernet based fronthaul networks

CPRI over Ethernet - result

- Synchronous traffic over asynchronous networks
- Lossless transmission based on the clock recovery and delay control schemes



X-STEP™ CPRI™ Actor GUI

Transmission Settings Reception Settings

Rx Control Control Plane (C&M) User Plane (I/Q) Custom Setup

SAROKAL TEST SYSTEMS (C) 2015-2016 Sarokal Test Systems Oy Version 2016.1.beta

Fiber connections

Input 1 A1 Rx Label RRH1

Input 2 Label RRH2

Line rate and capture size

Line rate 4X (2457 Mbps)

Capture size 10ms (1 radio frame)

Scrambling

Off Automatic Manual

Input 1 Seed 0x 0 Input 2 Seed 0x 0

Capture trigger

Instant

Hyperframe boundary (K28.5)

Line Coding Violation (LCV)

CPRI frame triggers

Node B frame no. (BFN) [0..4095] 0

Hyperframe no. (HFN) [0..149] 0

Local status: LOS LOF

Remote status: LOS LOF

SDI RAI RST

Custom Byte (X.W.Y)

0 0 0 Value = 0x

Trigger input signal in I/O 1 pin 3 (pos. edge)

Trigger input signal in I/O 1 pin 3 (neg. edge)

Trigger position in capture window 0%

Frame detect pulse output in I/O 1 pin 5 (pos. edge)

Off Hyperframe 10ms Frame

HW programmed, select triggers and click Capture to continue.

Reports

Output directory /root/CPRIActor/work/CPRIActor

Control word report prefix

cpri_control_word_report

Basic frame report prefix

cpri_basic_frame_report

Raw capture image prefix

cpri_raw_capture_image

Show partial hyperframes in reports

Quick analysis

Input 1:

Local status: LOS LOF

Remote status: LOS LOF

RAI SDI RST

Capture status:

Start timestamp:

End timestamp:

Input 2:

Local status: LOS LOF

Remote status: LOS LOF

RAI SDI RST

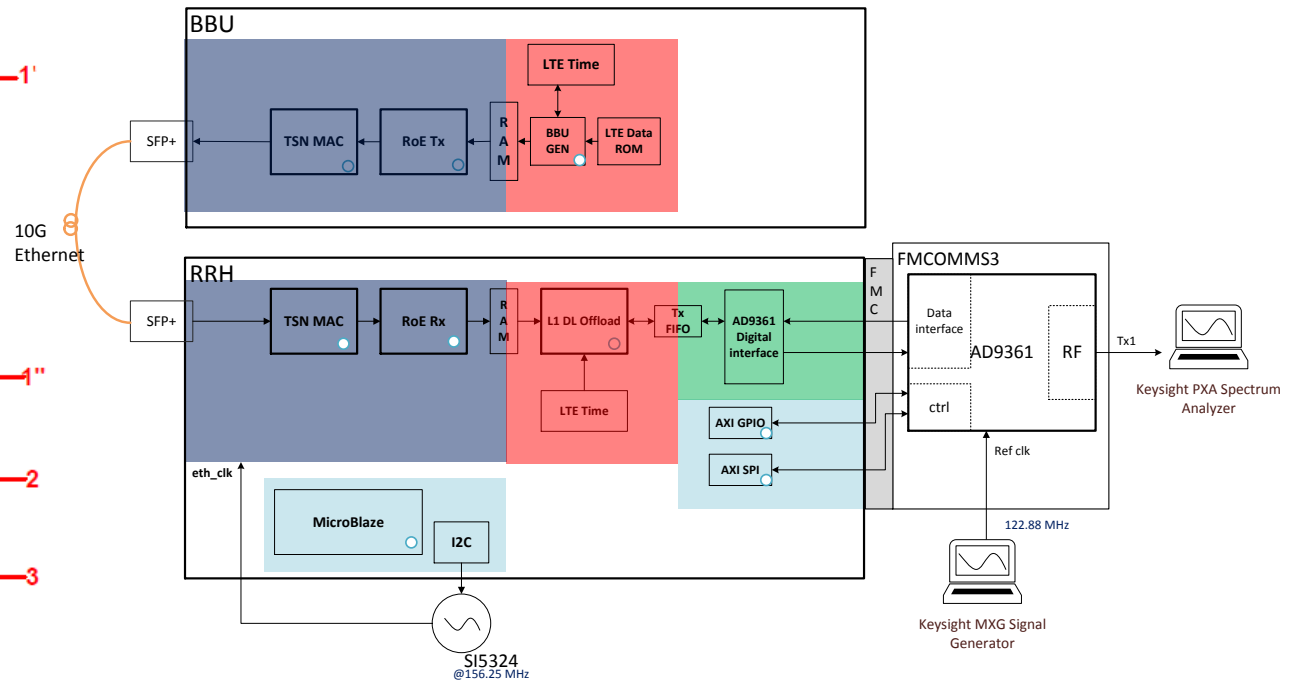
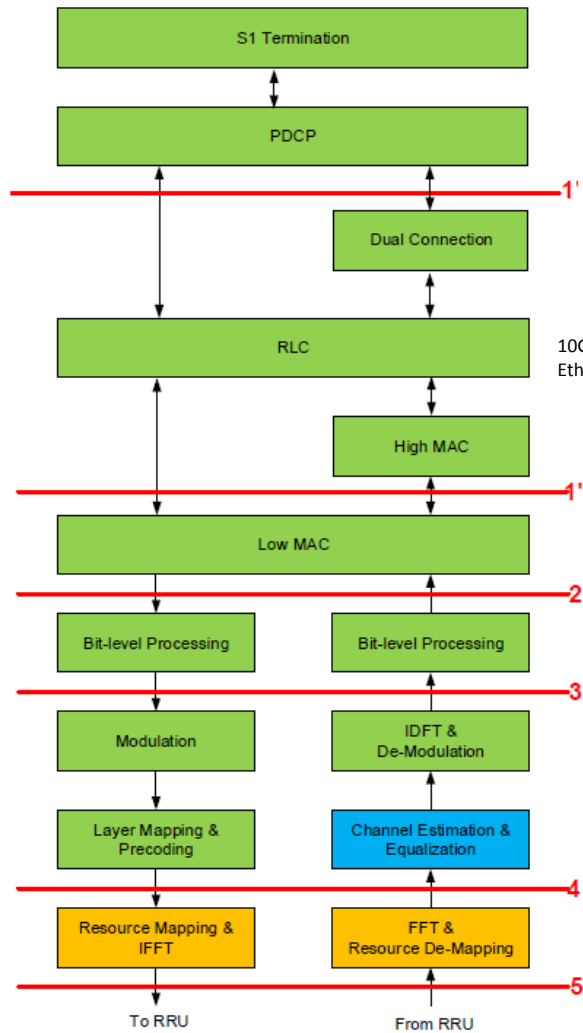
Capture status:

Start timestamp:

End timestamp:

Capture View analysis results

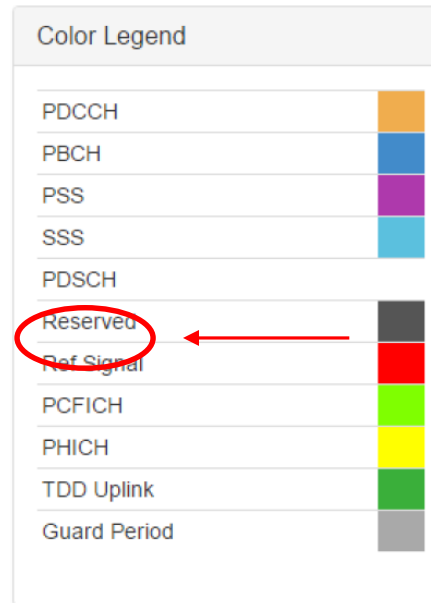
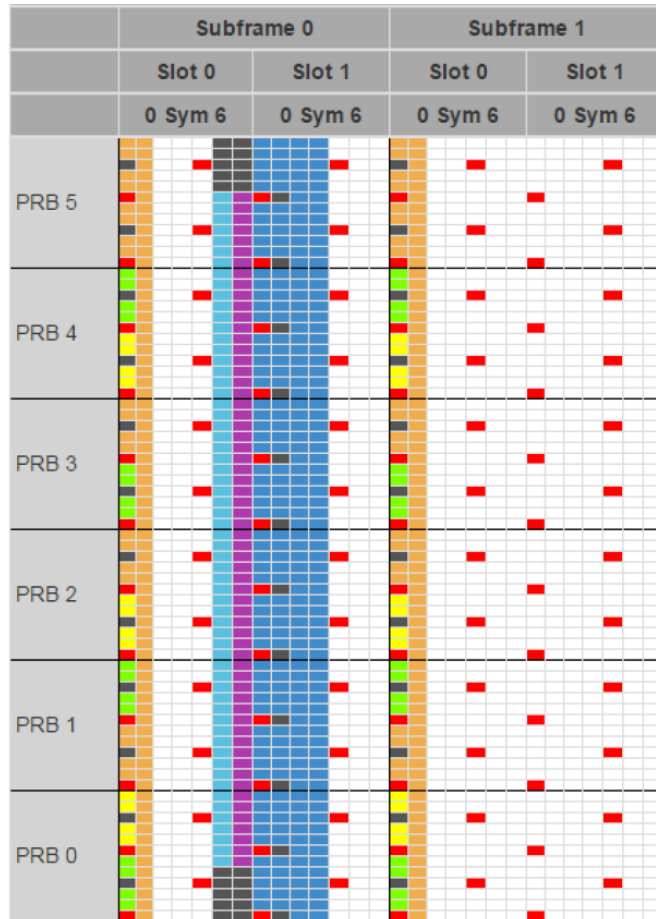
Intra-PHY Split Proof of Concept



Source: "White Paper of Next Generation Fronthaul Interface"

PDSCH cell load

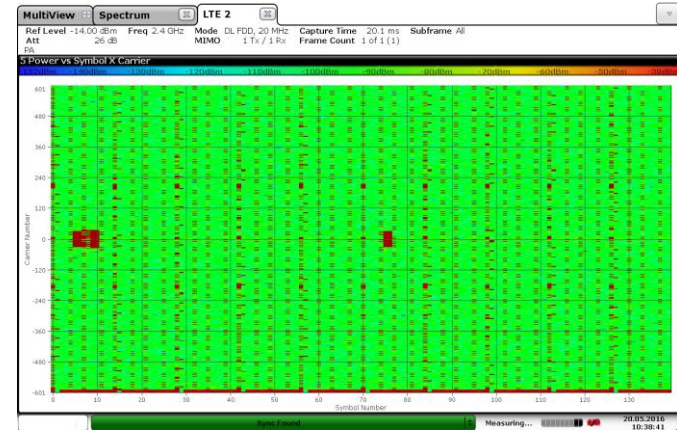
- PDSCH cell load is dependent on the real traffic for Intra-PHY splits



Downlink shared channel for user data

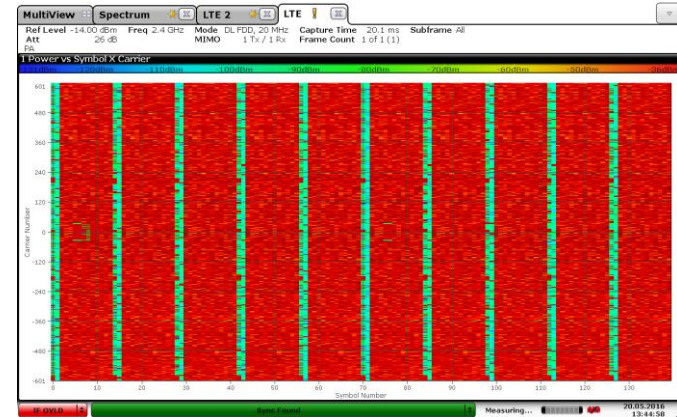
Low load in a 10 MHz cell

- Successful cell synchronization
- 1 user allocated 1 RB (bottom)
- Autodetection of cell configuration
- Autodetection of user allocation



Peak load in a 10 MHz cell

- Full allocation of user data (PDSCH)
- < 1 % EVM
- ~160 Mbps load on Ethernet link
- 1:4 reduction compared to CPRI



Acknowledgement

