RAN Transformation

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Ericsson
Agenda – RAN transformation Journey

- Purpose Build RAN
- RAN transformation
- O-RAN and Ericsson solution
- Ericsson Cloud RAN Architecture
- SMO
- Challenges
Existing RAN architecture

- HW and SW tightly coupled and proprietary
- Inner proprietary interfaces
- Outer open interfaces (devices, CN)
- E2E multi-RAT RAN integration & validation
Exponential increase in processing needs

Trends driving higher processing
- # Antenna branches growing with Massive MIMO
- More carrier bandwidth at higher frequencies
- Wider spectrum allocations in new bands
- Shorter transmission time interval (TTI)

**Carrier bandwidth**
- 20 MHz
- 100 MHz

**Antenna branches**
- 2T2R
- 4T4R
- 8T8R
- 64T64R

**Transmission time interval (TTI)**
- 1 ms
- 0.5 ms

**Layer 1 processing**
**Layer 2 processing**
**Layer 3 Packet processing function**
**Layer 3 Radio control function**

<table>
<thead>
<tr>
<th>BW</th>
<th>DL Layers</th>
<th>UL Layers</th>
<th>Total DL BW</th>
<th>Total UL BW</th>
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</thead>
<tbody>
<tr>
<td>Low-band 20 MHz 4 1 80 MHz 20 MHz</td>
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<tr>
<td>Mid-band 100 MHz 16 8 1600 MHz 800 MHz -20x proc -40x proc</td>
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Ericsson Silicon

Ericsson Many-Core Architecture (EMCA)

Hundreds of digital signaling processors (DSPs)

4G/5G HW Accelerators

Digital front-end

Tight SW/HW co-design

Software development kit (SDK) for designing massively parallel radio algorithms
Changes versus Ericsson Radio System

- COTS Server & Acceleration HW
  - Smart NICs
  - L1 Processing

- Network automation & RAN programmability
  - Programmable Networks

- Cloud Native Design
  - DevOps & CI/CD
  - Microservices
  - Containerization

- Hardware & Software Disaggregation
  - RAN applications
  - Cloud platforms
  - Virtualization

No Change
- Spectral efficiency
- Rich feature set
- Advanced radio

Change
- Ecosystem view
- Nodes vs functions
- Release management
- Design for scalability
- Operations & management automation
Virtualized BB Functions trialed since late 2015
Ericsson joined in Feb 2019 and holds 2 work-group chair positions.
Ericsson Cloud RAN

Non-real time Radio Intelligent Controller (RIC)

Service Management and Orchestration (SMO)

Mobile Device

Legacy Radio Unit

New Radio Unit

AAS

Radio Gateway

Ericsson LLS(eCPRI) Fronthaul

COTS HW

COTS HW

COTS HW

Cloud Infrastructure

New Radio Unit

Cu-Cu

Cu-Up

E1

F1

NG

S1

Legacy Radio Unit

AAS

COTS HW

O1

O2

Baseband Split (vDU, vCU)
HW/SW Disaggregation
Vendor software on COTS hardware
Additional System and Network Integration required
New interfaces including Open Management & Automation
Additional radio gateway to convert CPRI radios to eCPRI
Disaggregation of RAN: vDU, vCU-CP, vCU-UP, rApps.

- Support independent scaling of Cloud RAN Functions
- Cloud native, microservice based architecture on bare metal
- Agnostic to underlaying CaaS layer and x86 HW
- rApps to enhance RAN functionalities (LCM, Dynamic Services, traffic optimization, assurance, …)
- Multi vendor orchestration
Challenges

Fundamental Challenges

System integration
Extensive integration project to verify an open interface between vendors adds TTM & cost to the solution

Life-cycle management
Software releases between vendors need to be coordinated, tested and verified to ensure interoperability is not broken.

System performance
Minimum common denominator dictates feature support by the vendors involved, resulting in performance limitations

Assurance of KPIs & security
Challenging root cause analysis to identify vendor at fault and who is responsible for providing fixes

One Global Standard