Baicells Open Hardware Reference Design for 5G sub6GHz Digital Indoor Solution

Wang Li, Dec. 4th 2019
5G Economics – Do 5G Right to Drop Cost Per GB!

Cost per GB (Rev per GB)
- 2016: $11.5
- 2018: $5.8

Content per GB:
- 2016: Content ~$0.5
- 2018: Core ~$1.0
- 2018: RAN ~$4.0

However, 5G doesn’t guarantee the cost saving by default

- Architecture change
- Small Cell massive adoption
- Edge Computing everywhere

5G Cost per GB:
- CMO: $5.5
- FMO: < $2.0

Content Acquisition SDN/NFV
5G Economics Requires “Small Cell + MEC”

Traditional Macro architecture could cover 80% of the outdoor space while leave indoor and some outdoor black-hole uncovered.

5G era, due to its spectrum characteristics, through MEC, Small Cells will carry 80% of total traffic, cover 80% indoor and 20% outdoor space.

- Coverage
- Capacity
- Latency
- Backhaul BW
- Operation
Trend of RAN is to be fully OPEN

**TIP**
Facebook, SK telecom, DT, Intel, Nokia, etc.

**xRAN**
AT&T, DT, Telstra, Verizon, SK Telecom, Intel, TI, Aricent, Radisys, Mavenir, Cisco, Altiostar, ASOCS and Stanford University.

**ORAN**
CMCC, AT&T, DT, NTT DoCoMo, Orange, etc.

**Open vRAN**
CISCO, Reliance Jio, Alcatel-Arr起了, Intel, Mavenir, Pharzr, Red Hat, and Tech Mahindra, etc.

White box HW
5G Is All About Openness and Computing

- Computing at any location
- Openness at any interface
- Cloudification for any operation
Baicells’ M-RAN: Modulization Makes RAN Flexible and Open

Baicells M-RAN leverages flexible Fronthaul/Midhaul interfaces, pushing for open interfaces and white-box hardware reference design along with operators, reduces TCO.
Baicells M-RAN indoor solution for sub6GHz

- Baicells M-RAN solutions are based on GPP and FPGA HW platforms, and support RAN virtualization to provide carrier grade solution with most flexibility.

- Specifically for indoor, support SW architecture of CU/DU/RRU, while co-platform for CU, DU, and MEC including local CN functionality.
  - Carrier grade GPP server with FPGA acceleration for CU/DU and MEC
  - Carrier grade timing support, such as GNSS, OCXO, 1588V2 GM, and SyncE
  - Computing power scalable via cloudification upon specific scenario
  - PicoExtending unit supports multiple modes including CPRI and eCPRI
  - pRRU could be used as O-RU
4G+5G dual mode O-RU reference design

◆ Indoor picoRRU FR1
  ● Based on FPGA SoC and transceiver
  ● RF
    □ 6 TRx, max 250mw/Tx
    □ NR 2.6GHz 100MHz 4T4R+ LTE 2.3GHz 50MHz
  ● Fronthual
    □ 10G SFP+ and 10GE RJ45
    □ CPRI or eCPRI with LL1 (O-RAN 7-2 catA)
  ● Remote power supply
Open fronthaul gateway reference design

◆ (e)CPRI FHGW
- UL 2x25G, DL 8x25G
- All ports support (e)CPRI configurable
  - Mode-1: CPRI switch
  - Mode-2: eCPRI to CPRI switch
  - Mode-3: eCPRI switch
Open ACC and Sync reference design

◆ FPGA Acc & Sync card
  ● PCIe 3.0 x16 FH 3/4L, dual FPGA chipsets
  ● Sync(GNSS+OCXO+1588V2+SyncE)
    □ GNSS SMA
  ● L1 offloading(FEC + LL1)
  ● FH(CPRI, eCPRI based on O-RAN WG4)
    □ 6x25G SFP+
From reference design to commercial product

◆ Reference design is also evolving as chipset does
  ● Cost-Power-Functionality-Flexibility

◆ Chipset requirement
  ● Highly integrated
  ● Tailored for specific scenario
  ● Customized for specific usage
THANK YOU