Open RAN Platform
—— Super Base Station

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Internet of Everything Need 5G

1G 1980s → 2G 1990s → 3G 2000s → 4G 2010s

voice → voice, text → Web, image → stream media, HD video

1G~4G mobile communication focuses on people

5G/B5G 2020s → Future

5G/B5G~ mobile communication focuses on IoT
# Open Base Station Can Support Diverse Services

## 5G typical scenarios and Key performance indicator

<table>
<thead>
<tr>
<th>5G typical scenarios</th>
<th>Key performance indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-capacity hot-spot</td>
<td>• User experienced data rate: 1Gbps</td>
</tr>
<tr>
<td></td>
<td>• Peak data rate: Tens of Gbps</td>
</tr>
<tr>
<td></td>
<td>• Traffic volume density: Tens of Tbps/Km²</td>
</tr>
<tr>
<td>Low-power massive-connections</td>
<td>• Connection density: $10^6$/Km²</td>
</tr>
<tr>
<td></td>
<td>• Low power consumption &amp; low cost</td>
</tr>
<tr>
<td>Low-latency high-reliability</td>
<td>• Air interface latency: 1ms</td>
</tr>
<tr>
<td></td>
<td>• End-to-end latency: ms level</td>
</tr>
<tr>
<td></td>
<td>• Reliability: nearly 100%</td>
</tr>
</tbody>
</table>

## B5G and future

- More scenarios
  - Smart grid
  - Self-driving
  - VR game
  - VR live
  - Telemedicine
  - ... 

- Diversified, customized, high-metric requirements

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How to satisfy?

Super flexible open base station platform
Open Base Station Platform

There are still many challenges, and we hope to achieve the dream together with the majority of experts like you ^_^
Open Base Station Platform

1. Decouple software and hardware, replace and upgrade flexibly
2. Assign hardware resource on demand, provide multiplexing gain
3. Arrange software flexibly, provide customized software
4. Computing, communication and cache are managed integrated

Institute of computing technology
Chinese Academy of Sciences
is developing Super Base Station
Features

- Definable software
- Sharable hardware
- Manageable system
- Scalable system size
One Feasible Way

Hardware Platform

- OMC
- SNMP
- FTP
- CLI
- COTS Server
- COTS Server
- High Speed Switch
- FPGA Accelerated Board
- RRU

5G FPGA加速板升级
One Feasible Way of Hardware

**Hardware Platform**

OMC

SNMP

FTP

CLI

High Speed Switch

COTS Server

FPGA Accelerated Board

**5G COTS server**

- Intel® Xeon® Gold 6148

**4G COTS server**

- Intel® Xeon® E5-2699V4 (22 cores), 64G DDR4

- 40Gbps with FPGA server

- 22 cores support 6 LTE 20MHz dual antenna cells
One Feasible Way of Hardware Upgrade

Upgrade 5G FPGA solve the problem of limited logic resources and improve hardware processing capabilities.

4G FPGA accelerated board:
- Contains single FPGA chip, which supports 8 CPRI x 8 AxC and 40Gbps processing capacity
- Supports GPS, Beidou, IEEE1588 synchronization
- Supports interconnecting with other FPGA accelerated boards
- Supports remote management

Hardware Platform:
- OMC
- SNMP, FTP, CLI
- COTS Server
- COTS Server
- High Speed Switch
- FPGA Accelerated Board
One Feasible Way of Software

Hardware Platform

OMC

SNMP
FTP
CLI

COTS Server

High Speed Switch

FPGA Accelerated Board

COTS Server

OMC & Super Base Station Controller

CN

RAN

VM

PDCP

VM

RRC

L2

L1-High

KVM + DPDK

RT - Linux

L1-Low

FTP

One Feasible Way of Software
One Feasible Way of Software

- **OM**: Operation and management of independent network elements
- **OMC**: Basic configuration, service triggering, topology display, status monitoring and alarm, and log collection
- **Controller**: Control cell establishment, deletion and allocating resources on demand; optimizing network
Super Base Station Platform——Interface

User functions

System topology

Device management
Network slice test was done to evaluate performance of wireless resource management schemes for Slice.

<table>
<thead>
<tr>
<th>Items</th>
<th>Schemes</th>
<th>Fixed scheme</th>
<th>Enforced scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>results</td>
<td>Request1 &gt; SLA1</td>
<td>b1 = Request1</td>
<td>b1 = Request1</td>
</tr>
<tr>
<td></td>
<td>Request2 ≤ SLA2</td>
<td>b2 = SLA2</td>
<td>b2 = min(B-SLA1, Request2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>prb1/prb2 = 25/17 = 147.1%</td>
<td>prb1/prb2 = 29/17 = 170.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>prb1 = 34324.21 Mbps</td>
<td>prb1 = 23529.32 Mbps</td>
</tr>
</tbody>
</table>

Fixed and enforced schemes were realized, and the corresponding throughputs of slices were as expected.
One collaborative computing scheme was designed among local, edge and cloud. Then to evaluate the performance, the field experiment was done and parameters like delay and throughput were calculated.
Thank you 😊

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