



Reference design of CU Test Case based on OAI 4G eNB

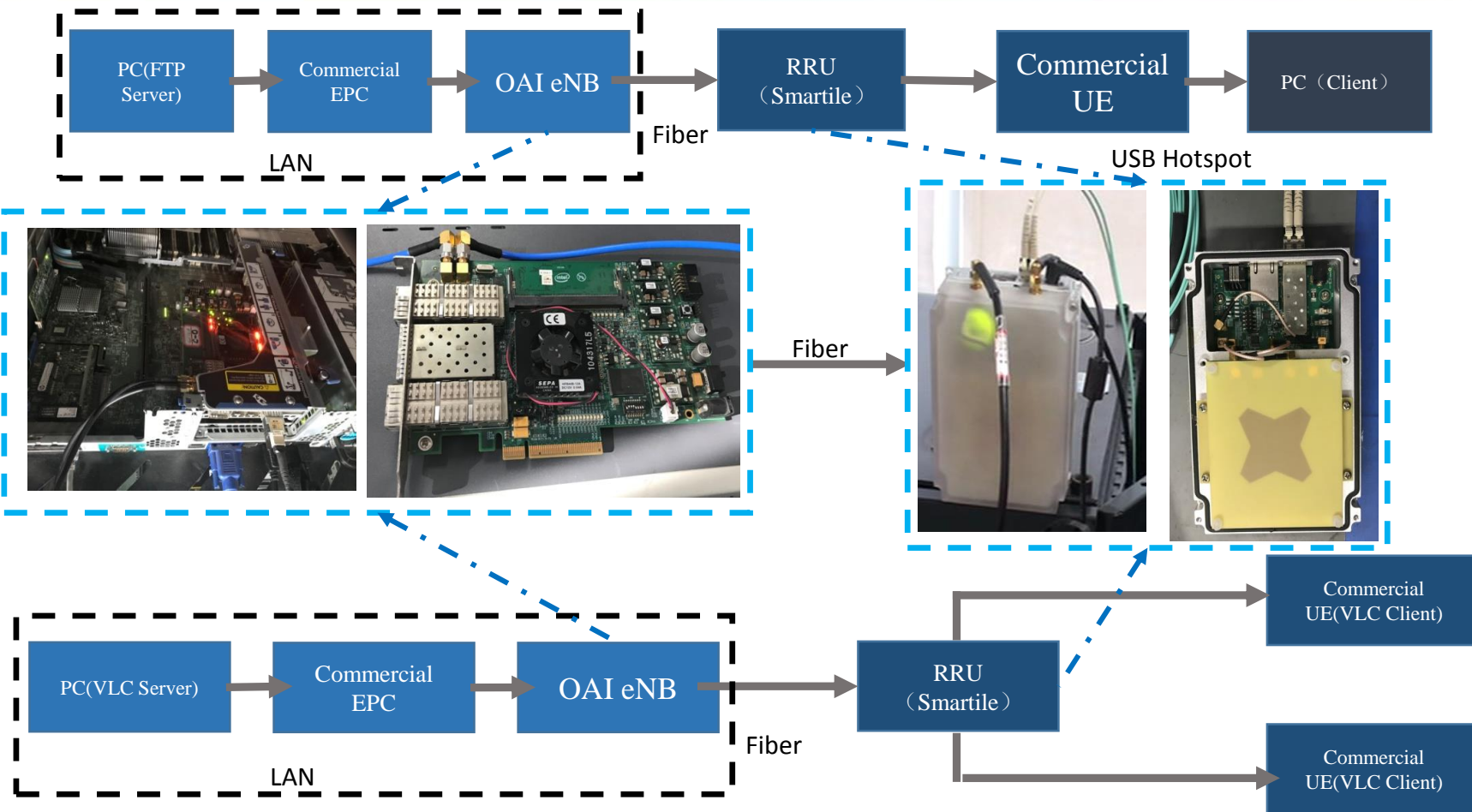
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Introduction of C-RAN PoC



LTE TDD
Config 1 and 3

Performance

- iPerf TCP testing mode: 18Mbps downloading bitrates
- FTP downloading bitrates: 2.0MBytes/s

VLC video streaming demo

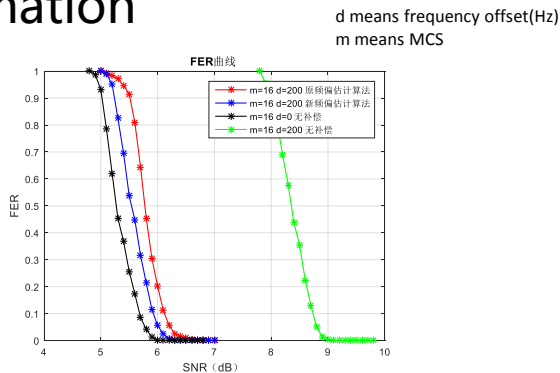
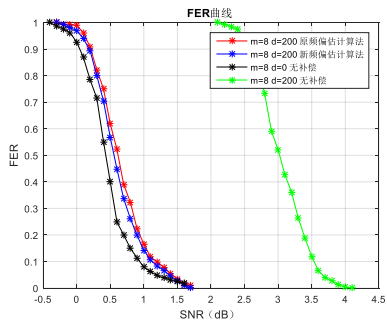
- 2 UE 720p video streaming
- Multipath radio scenario



DU Meter 秒表 - #2	
已经过去时间	接收 发送
总计传输数据	2分 54.3 秒
最大传输速率	367.1 MB 7.7 MB
平均传输速率	22.7 Mbps 475.6 kbps
当前传输速率	17.7 Mbps 371.4 kbps
Minimum Wi-Fi signal quality	已停止 已停止
Average Wi-Fi signal quality	0% 0%

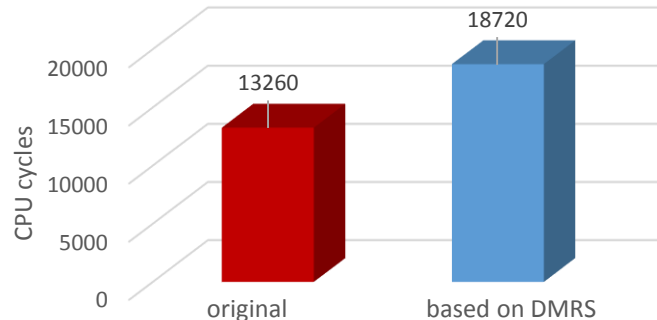


Frequency Offset Estimation

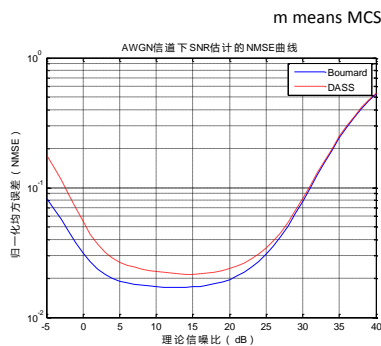
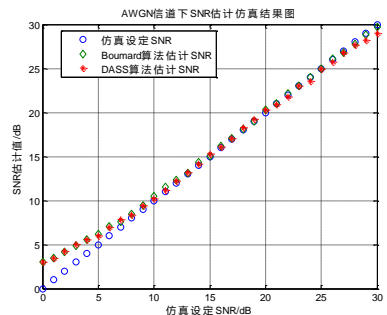


d means frequency offset(Hz)
m means MCS

Time consuming

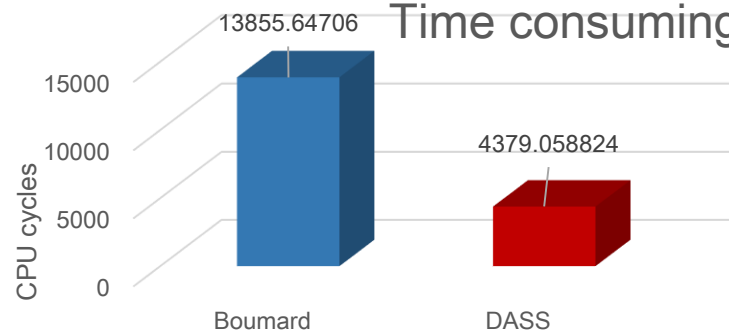


Noise Estimation



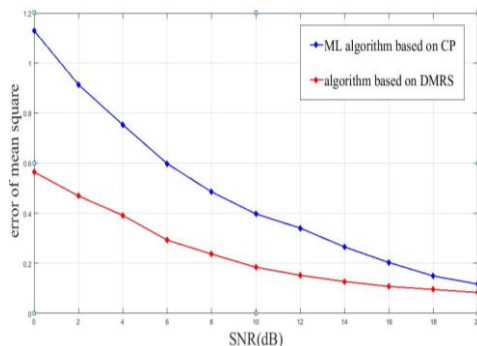
m means MCS

Time consuming

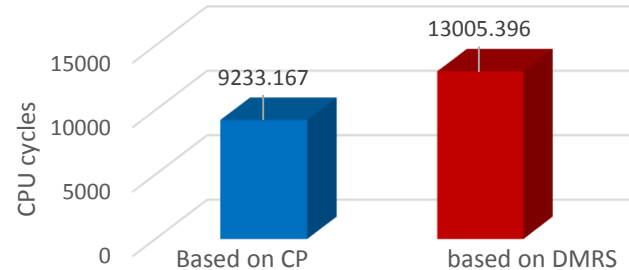


Timing Offset Estimation

RB=100, delay=20 samples

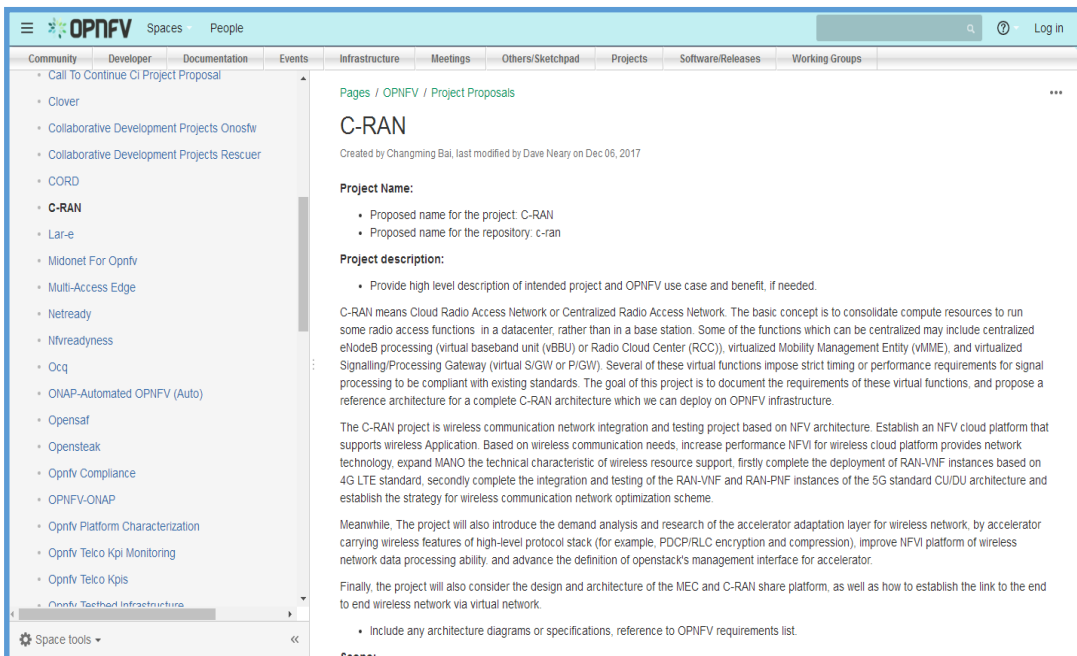
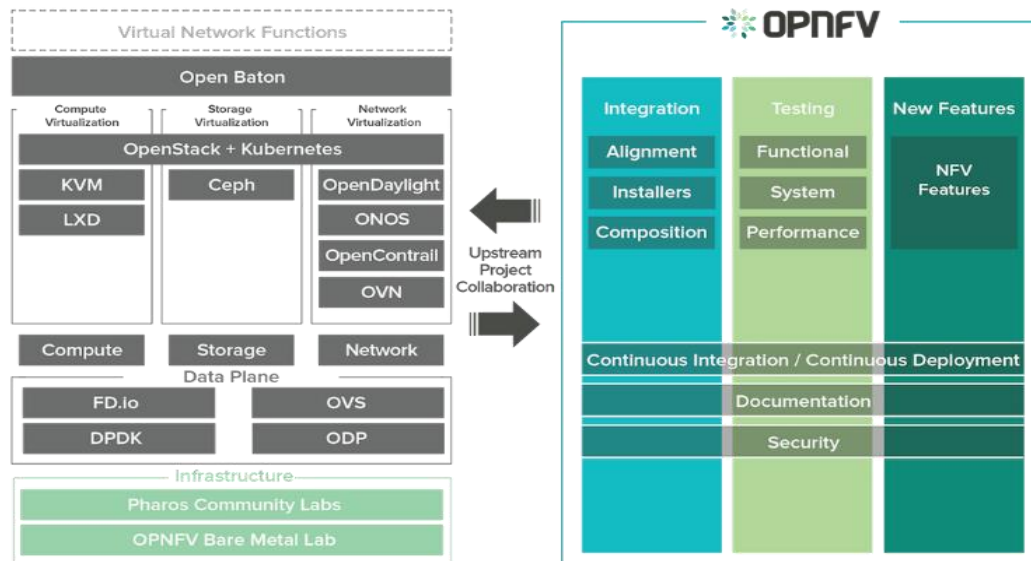


Time consuming



What is OPNFV

- ❑ An open source community.
- ❑ Focus on NFV platform and integration testing.
- ❑ Adapt the code from other communities to make them work together.
- ❑ Support various requirements of applications.



The screenshot shows the OPNFV project proposal page for C-RAN. The page includes a navigation menu, a search bar, and a list of project proposals. The C-RAN proposal is selected, showing the following details:

- Project Name:**
 - Proposed name for the project: C-RAN
 - Proposed name for the repository: c-ran
- Project description:**
 - Provide high level description of intended project and OPNFV use case and benefit, if needed.

The description text reads: "C-RAN means Cloud Radio Access Network or Centralized Radio Access Network. The basic concept is to consolidate compute resources to run some radio access functions in a datacenter, rather than in a base station. Some of the functions which can be centralized may include centralized eNodeB processing (virtual baseband unit (vBBU) or Radio Cloud Center (RCC)), virtualized Mobility Management Entity (vMME), and virtualized Signaling/Processing Gateway (virtual S/GW or PiGW). Several of these virtual functions impose strict timing or performance requirements for signal processing to be compliant with existing standards. The goal of this project is to document the requirements of these virtual functions, and propose a reference architecture for a complete C-RAN architecture which we can deploy on OPNFV infrastructure."

The C-RAN project is wireless communication network integration and testing project based on NFV architecture. Establish an NFV cloud platform that supports wireless Application. Based on wireless communication needs, increase performance NFVI for wireless cloud platform provides network technology, expand MANO the technical characteristic of wireless resource support, firstly complete the deployment of RAN-VNF instances based on 4G LTE standard, secondly complete the integration and testing of the RAN-VNF and RAN-PNF instances of the 5G standard CU/DU architecture and establish the strategy for wireless communication network optimization scheme.

Meanwhile, The project will also introduce the demand analysis and research of the accelerator adaptation layer for wireless network, by accelerator carrying wireless features of high-level protocol stack (for example, PDCC/RLC encryption and compression), improve NFVI platform of wireless network data processing ability, and advance the definition of openstack's management interface for accelerator.

Finally, the project will also consider the design and architecture of the MEC and C-RAN share platform, as well as how to establish the link to the end to end wireless network via virtual network.

- Include any architecture diagrams or specifications, reference to OPNFV requirements list.

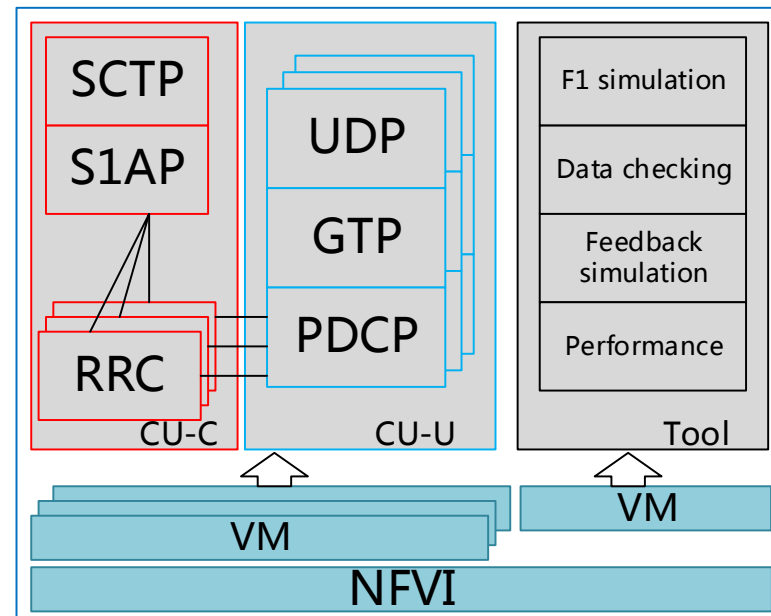
C-RAN project in OPNFV

- ❑ C-RAN project proposal has been established this year.
- ❑ Integration of RAN functions and NFVI.
- ❑ Goal is to document the requirements and propose a reference architecture of the RAN functions(such as CU) so that we can deploy them on NFVI.
- ❑ Help to make CU open source.

CU test case based on 4G eNB

Instruction of CU test case

- ❑ The picture is the final structure of CU based on LTE.
- ❑ A tool is introduced to test CU.
- ❑ CU and the tool will be deployed on VMs with CentOS.
- ❑ This test case is used to test whether the NFVI can meet the requirement about throughput and delay of CU.
- ❑ The split code is an independent file, so it will be easy to be merged into develop branch.



Progress of CU test case

- ❑ The CU/DU is split based on LTE with TDD1 20M bandwidth.
- ❑ The interface between CU and DU is designed based on the master branch of OAI in 2014.
- ❑ The protocol is used to encapsulate data as the protocol-split branch does.
- ❑ CU and DU have been split completely and they can run on two servers. CU is server and DU is client and they exchange messages through socket without TNL.

Ongoing work

- ❑ CU will be split into CU-C and CU-U. DU will be replaced by the tool.
- ❑ Migrate the test case from Ubuntu to CentOS.

Summary and rough plan

- CU test case based on 4G eNB
 - DU waits for subframe indication from hardware.
 - CU and DU run asynchronously.
 - Two commercial UEs can make random access and achieve ping package through EPC at the same time.
- Rough plan
 - The interface between CU and DU is private. F1 interface will be used when NR CU completed.
 - The work about CU/DU splitting will be continue and we hope the NR CU will be tested in C-RAN project.



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Thank you!

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