# From C-RAN To O-RAN

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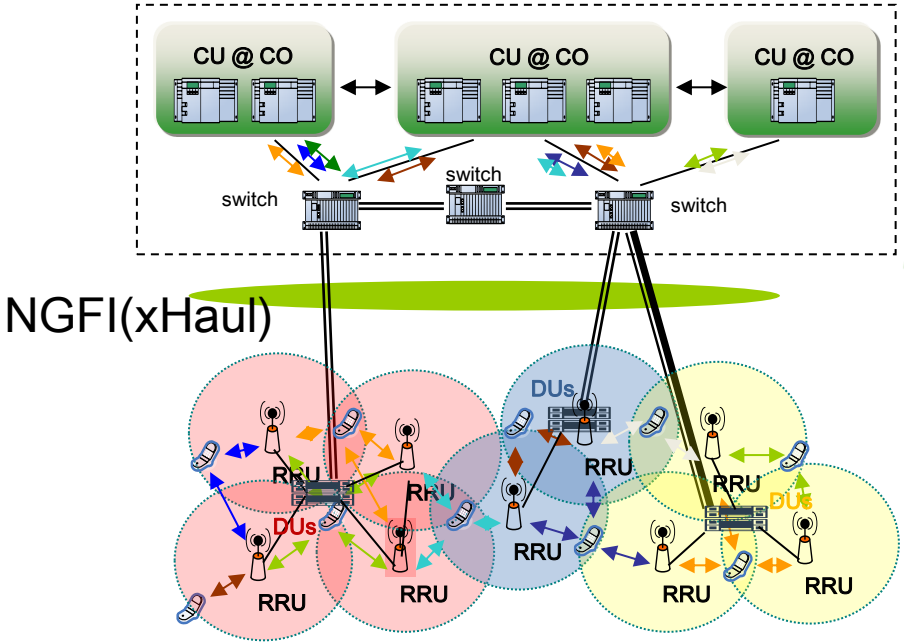
**June. 21, 2018, Beijing, China**

# C-RAN is deemed as a 5G essential enabling element (since 2011)





20%-30%% saving on radio and transport TCO

~60% energy saving

Cell edge UL CoMP gain: 50%-300%

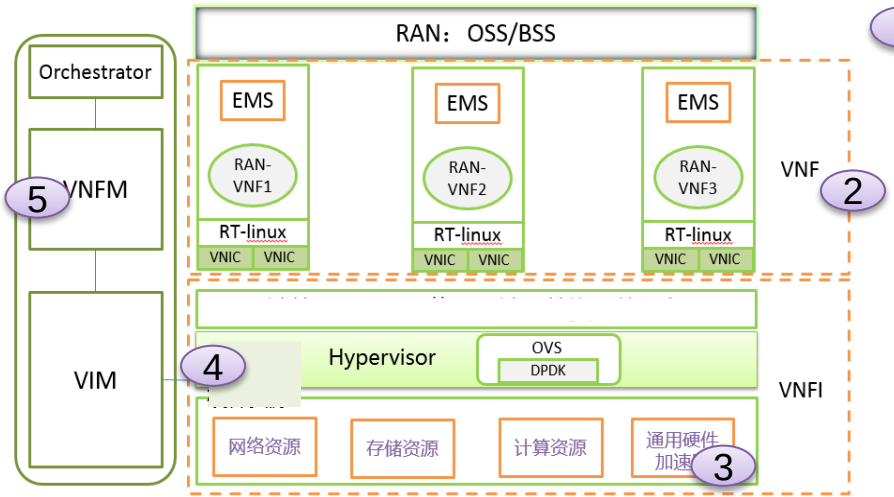
Cell edge DL CoMP gain: 30%-50%

CA gain: 83%-95%

- Various trials & deployment in 9 provinces since 2012:
- Verification of various FH solutions, CoMP & CA performance and the advantages on network deployment

# C-RAN Alliance: refocused on RAN cloudification

- 5G C-RAN WP v1 released on Nov. 18, 2016
- **Refocus C-RAN community effort,** promote the C-RAN cloudification via
  - Standardizing the interface of SW/HW, northbound -interface of MANO for CU
  - Enhancing the ETSI NFV MANO for RAN
  - Optimizing the hypervisor layer
  - PoC and field trial
- **20+ partners**




**WG 1: Use case definition (ZTE Co-lead)**

**WG 2: VNF Split and function definition(Huawei Co-lead)**

**WG 3: Common HW platform(Nokia Co-lead)**

**WG 4: Virtualization layer(Nokia Co-lead)**

**WG 5: MANO(Ericsson Co-lead)**

# Major achievements of C-RAN: towards open & smart O-RAN

- One WP, one technical report and one test spec. published: including publications from the user cases, requirements, to e.g. solution design on SW-HW-hypervisor decoupling
- Finished the lab test on CU-DU-based C-RAN, with 8 NFVI vendors involved, demonstrated the readiness for pre-commercial field trial this year

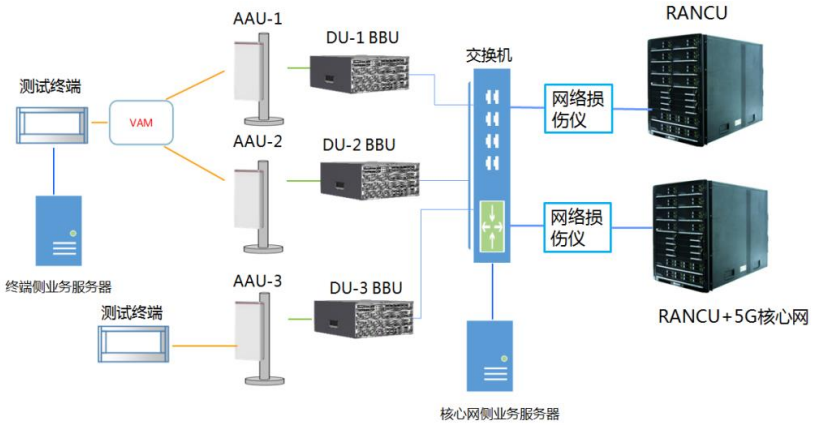

2016.11 white paper published and WGs set up

2017.9 Technical Report

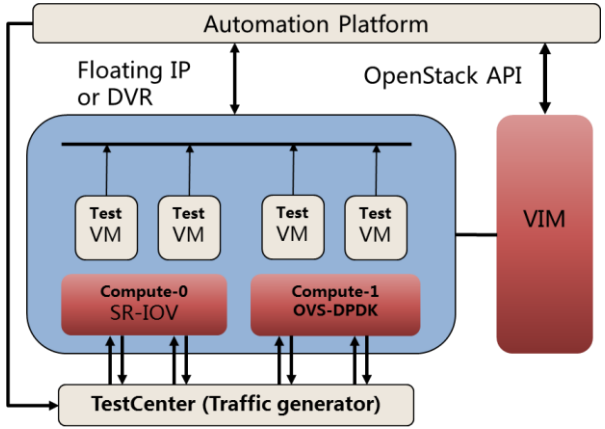

2017.12 **Test Specification and Lab Test**

2017.6 CU basic solution to de-coupling of SW/HW, Orchestration

2018.2 Not only coudification=>Open &Smart




3.5G NR Cloudification Test Framework

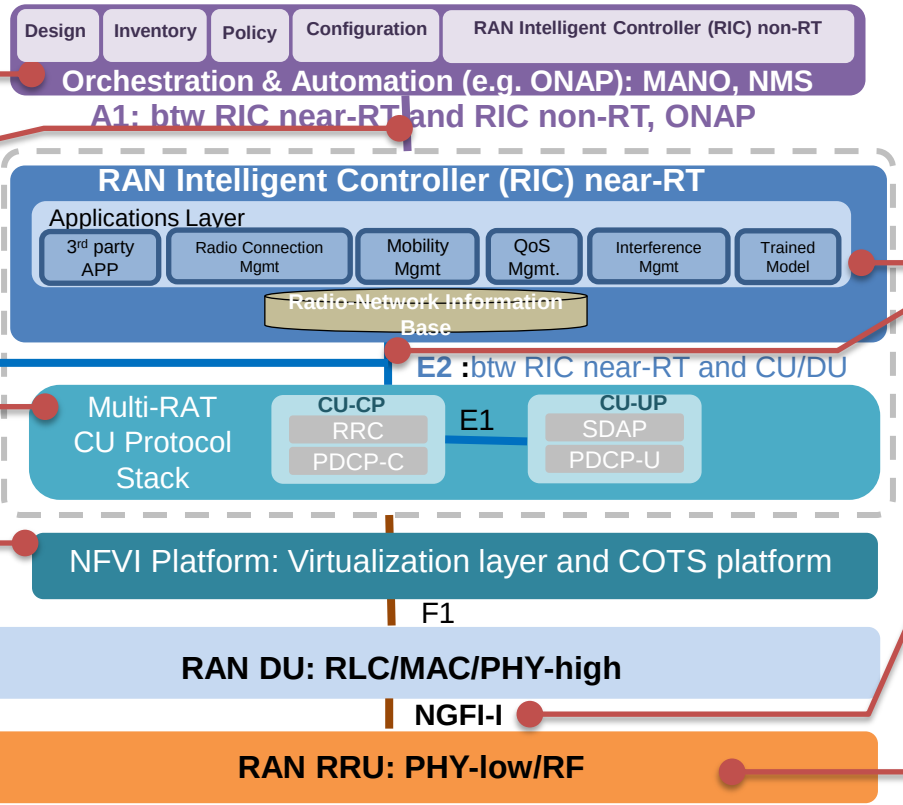



NFVI Automation Test Framework

# O-RAN Overall Architecture and Working Group (WG) Structure

**WG1: Use cases & Overall architecture**
Focus on all identifying use cases and requirements, and planning overall architecture of O-RAN and Proof-of-Concepts

**WG2: RIC(non-RT) & A1 interface**
Specify AI enabled RIC(non-RT) functionality for the operational supervision, radio optimization；
Specify the interface btw RIC(non-RT) NMS and Modular CU SW, based on AI. Focus on A1 interface to deliver non-RT data feeds for training AI models as well as to deploy new models in the near-RT RIC




**WG3: RIC(near-RT) & E2 Interface**
Specify RIC(near-RT) open architecture, functionality, Radio-Network Information Base and Network Topology, modular on boarding to new Control Applications;
Specify E2 interface between RIC(near-RT) and CU/DU stack

**WG5: Stack Reference Design and E1 & F1/V1 Interfaces**
Focus on design of Open CU, RAN virtualization and splits with related interfaces that intersect with 3GPP (E1 & F1/V1).

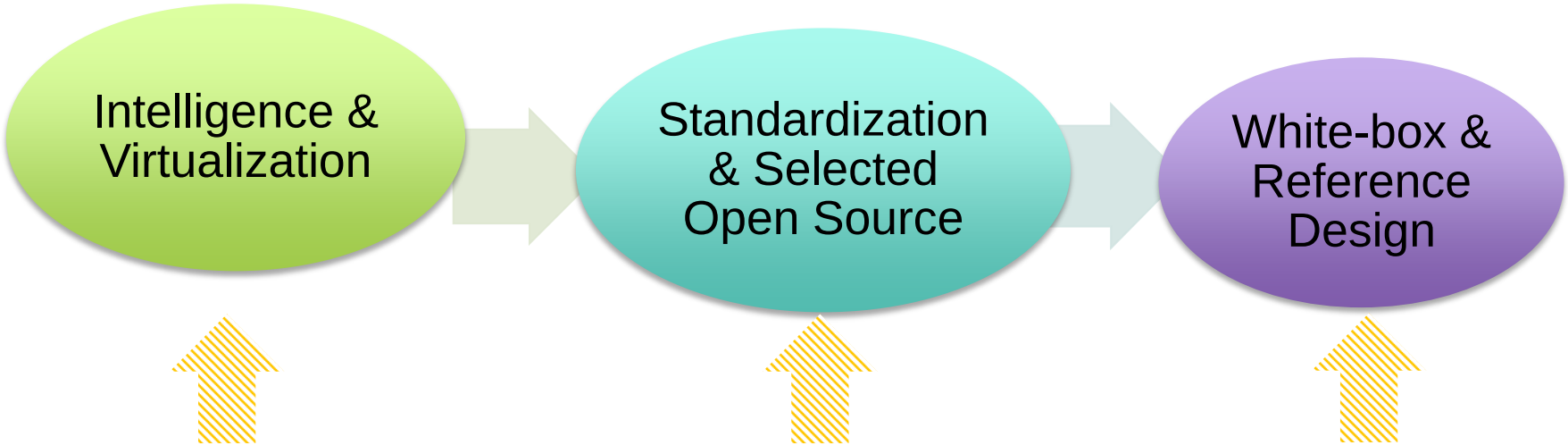
**WG4: Open FH Interface**
Specify open front-haul interface(NGFI-I) btw DU and AAU (supporting both LTE and 5G NR implementations), based on C-RAN, xRAN and DOCOMO's work (IEEE 1914, eCPRI, CPRI)

**WG6: Cloudification and MANO Enhancement**
Focus on specifying virtualization layer and HW, decoupling VNF and NFVI and MANO Enhancement (specially expansion of IFA5/IFA6/IFA7 interface)

**WG7: White-Box Hardware**
Focus on Reference Design of AAU or DU/AAU

# Step by step towards the objectives of **Smart & Open**

*Step by Step to realize O-RAN*




- Open interface to AI analytics and control
- Virtualization of CU

- Open DU to CU interface
- Open interface of MEC
- Open CU-CP interfaces

- Open DU to AAU/RRU interface
- HW Reference Design

# Welcome to the future empowered by O-RAN

O-RAN was initiated at MWC 2018. O-RAN Workshop will be held at MWC Shanghai.


## A thriving industry ecosystem

(Joined and potential partners)

CT and IT Vendors

Operators

Small and medium technology and product innovation enterprises

中国移动
China Mobile

# Thank you!

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