



Near-RT Radio Intelligent Controller: Unleash potential of customized RAN

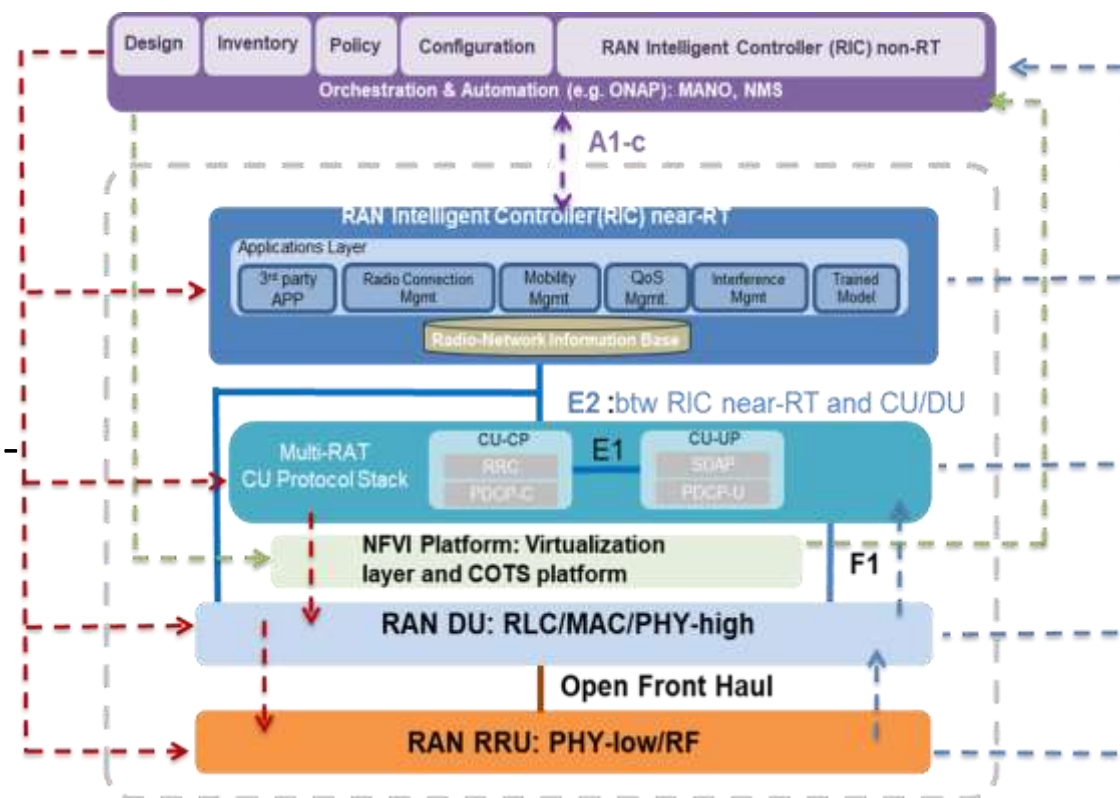
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Introduction of near-RT RIC and E2 in O-RAN WG3

- Near-RealTime RIC (nRTRIC)
 - A logical function described by the **O-RAN Alliance**
 - Target for near real-time control and optimization of E2 nodes functions and resources with control loops in the order of **10 ms-1s**
 - Achieved by fine-grained data collection and actions over the **E2 interface**
- E2 interface between the Near-RT RIC and E2 nodes(e.g. O-CU/O-DU)
 - Include four sub-interfaces: E2-cp , E2-up, E2-du, E2-en(connect to the O-eNB)
 - Support Near-RT RIC **services** (**REPORT, INSERT, CONTROL and POLICY**)
 - Support E2 Interface Management (E2 Setup, E2 Reset, Reporting of General Error Situations)
- High priority use cases supported in WG3
 - Traffic Steering
 - QoE Optimization





First release of E2 Specs

First release of near-RT Architecture Spec

1. E2 Specifications (Q42019)

- ✓ E2 General Aspects and Principles
- ✓ E2 Application Protocol
- ✓ E2 Service Model Network Interface

2. Near-RT RIC Architecture Specification (Q12020), including

- ✓ General Principles and Requirements
- ✓ Functions description
- ✓ Open APIs for xApp

Near-RT RIC reference design

Design principles

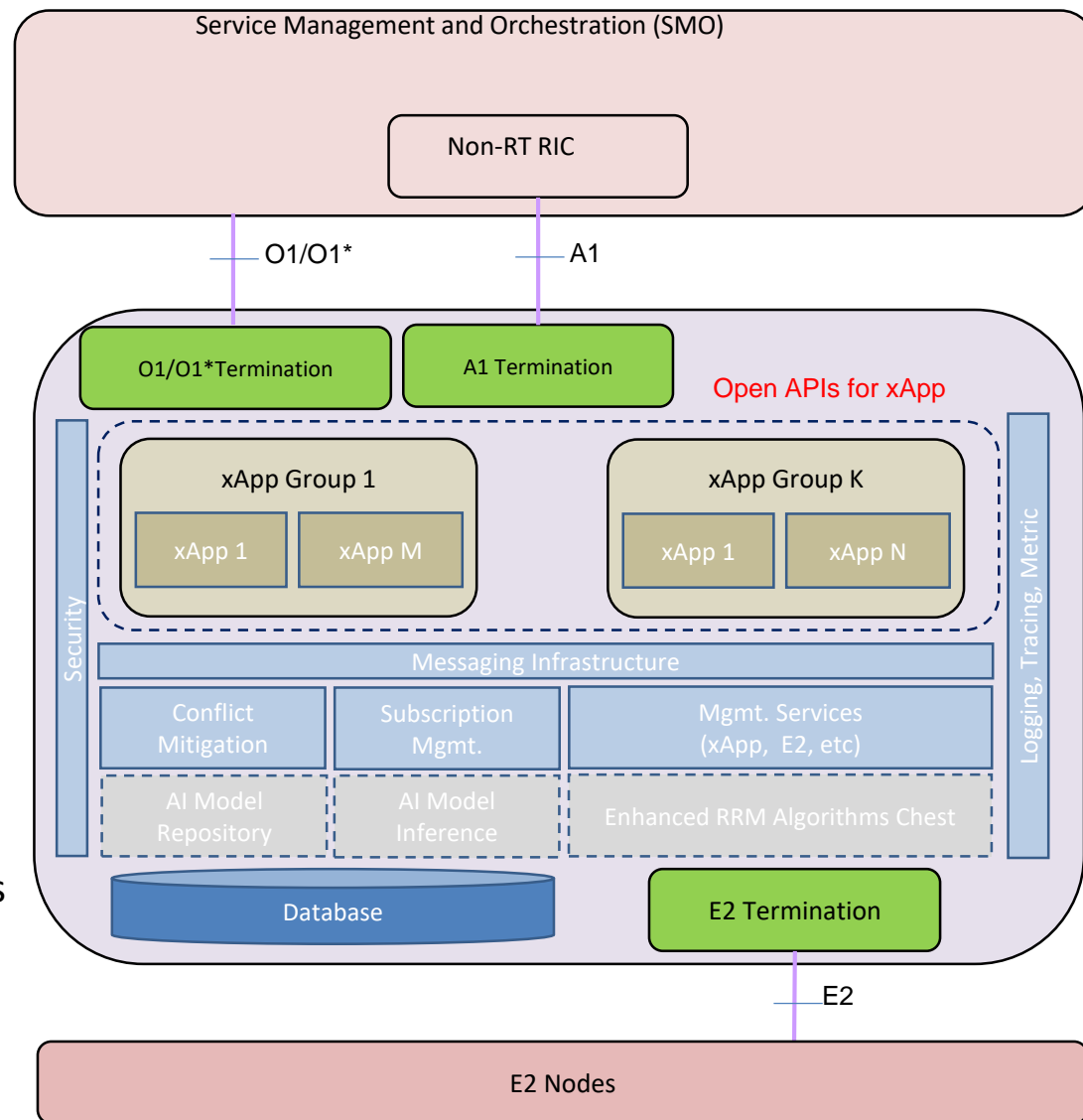
- open to embrace various xApps from the 3rd party.
- Compatible with different RRM split options

Functions description

- Database: reading and writing for RAN/UE information and more
- Conflict Mitigation: resolution of potentially overlapping or conflicting requests from xApps
- xApp Subscription Management: merging subscriptions from different xApps, and unified data distribution to xApps
- Messaging infrastructure: message interaction for nRT RIC internal functions, e.g. message bus
- Security: security scheme for xApp
- xApp:
 - ✓ Group 1: bi-direction interaction
 - ✓ Group 2: single direction interaction
- (Long term)Universal library functions:
 - ✓ AI model repository, AI model inference, Enhanced RRM algorithms chest

Current status

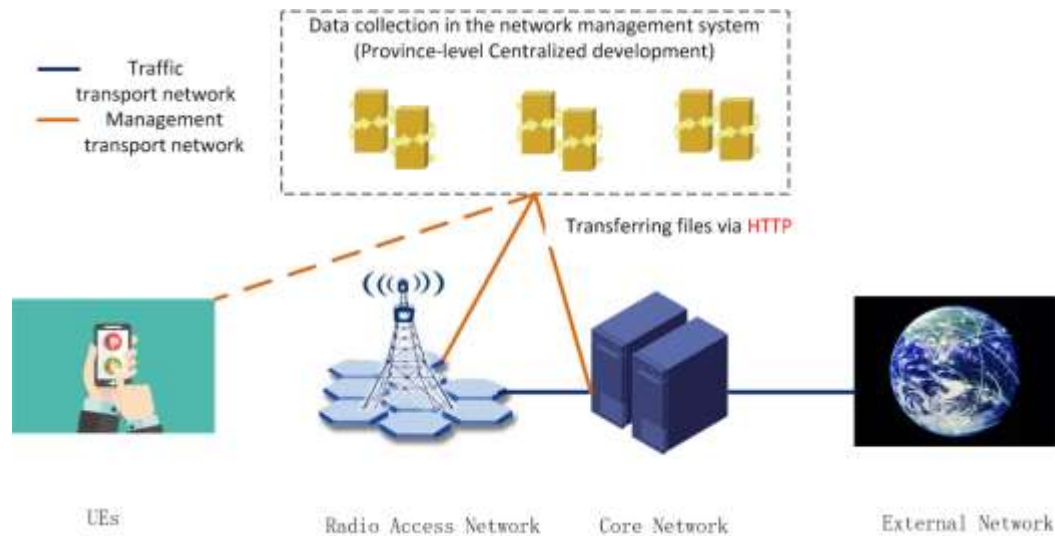
- Reference design nRT RIC is finished. The framework is accepted in WG3
- **Pre-standardization PoC will be shown in MWC2020**
- PoC based on O-RAN open source community is under development



Key challenges (1): Near-RT data collection

■ The existing data collection is mainly from network management system

- Target: Support for network performance monitoring/optimization, etc
- Data set: Unified parameters set for all the cells
- Mechanism: Periodic collection (1d/1h/15min)



■ The requirements of radio intelligence controller

- Target: Support for near-RT customized radio interface
- Data set: Independent parameters subscription set per use case
- Mechanism: Task trigger/Periodic collection (1min/100ms~1TTI)

■ The potential solution of near-RT data collection

- Support for data subscriptions by cell, UE, and parameter
- More efficient data transmitting method, e.g. TLV
- Near-RT transport protocol: e.g. TCP

	Length (bit)	Description
T	64	0Xff ffff ff ffffffff (High -----> Low) Consisting of 4 parts 1, 8bits: type, (cell:0/ue:1) 2, 16bits: LocalCellId/UeCRNTI 3, 8bits: MeasureItemId 4, 32bits: cell: (ue)S1apId
L	32	
V	32	

Example of TLV format

Data collection task:

- Parameters set
- Cells set
- UEs set
- Start time
- End time

Near-RT RIC

TLV encoded data stream via TCP

E2 Nodes (O-CU/DU)

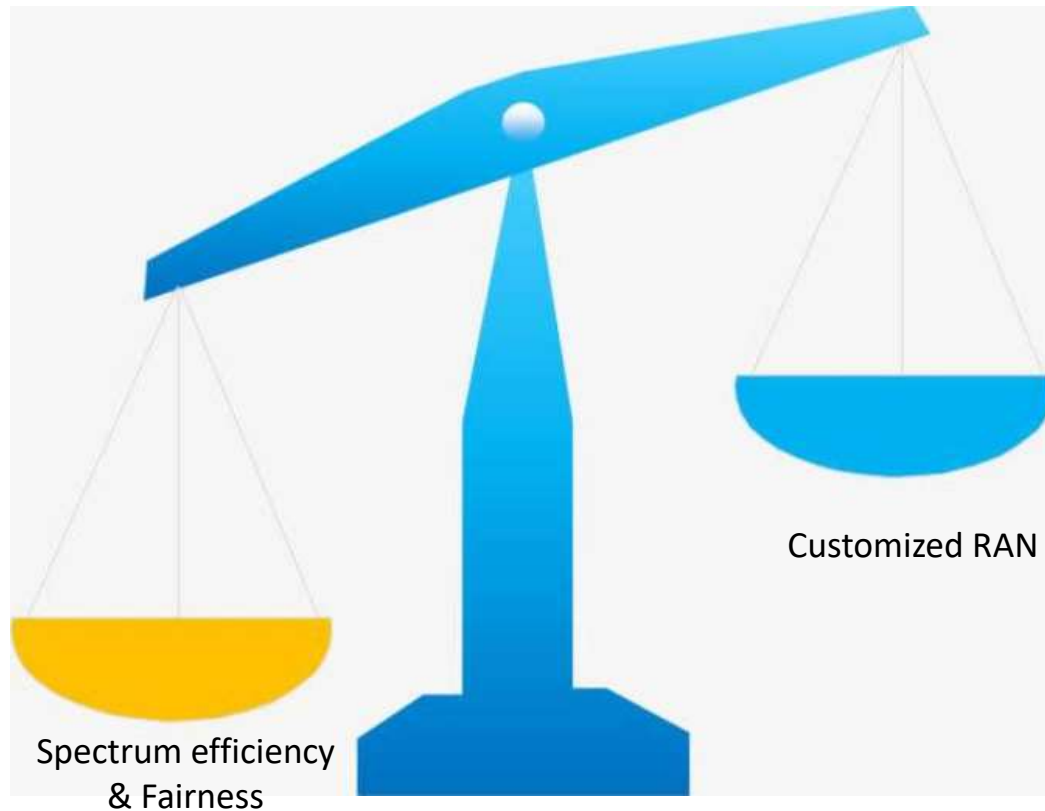
Key challenges (2): Open APIs for xApp

Near-RT RIC is a semi-open system because of supporting third-party xApp. Open APIs for xApp is the key issue for open ecosystem. **How to define an unified open APIs?**



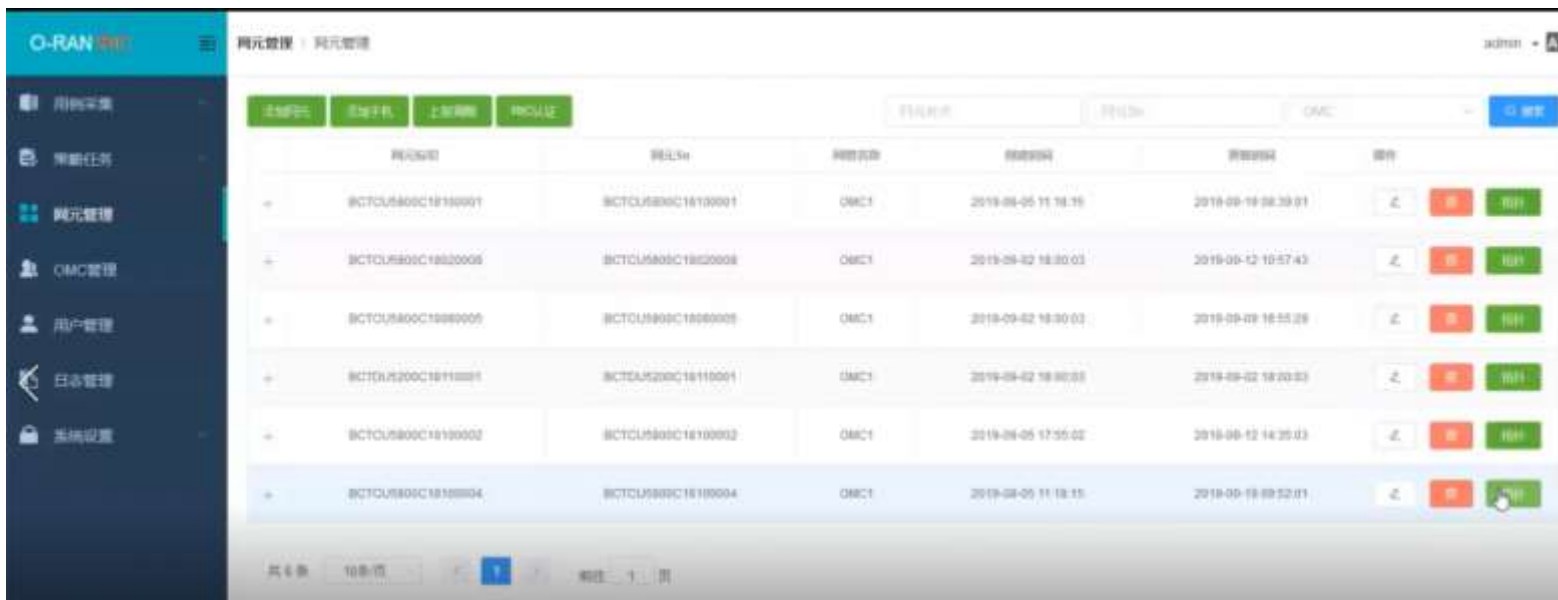
- Option 1: An abstraction APIs decoupling from the implementation solutions
- Option 2: Similar with NFV VIM north-bound interface, the open APIs quotes from an popular APIs developed in open source community
- Option 3:?

The overall radio resource is limited. **How to make a tradeoff between customization and fairness?**

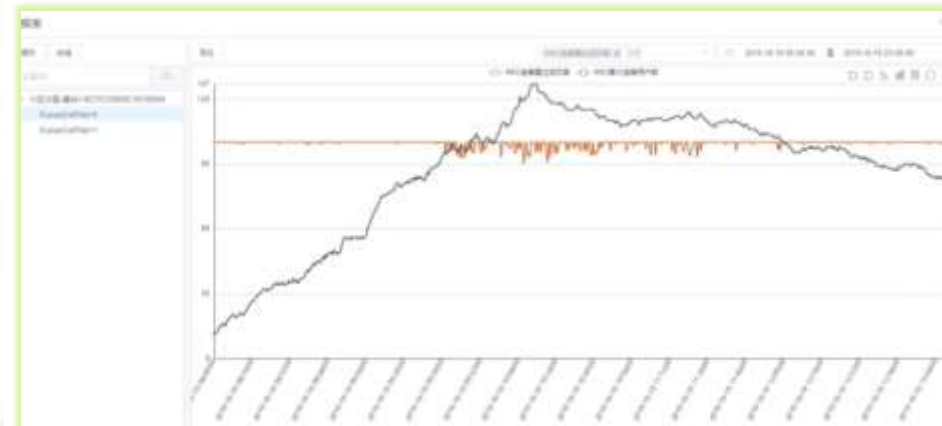


- Question 1 : quantify the value of customized RAN for a UE or UE group
- Question 2 : quantify the cost of customized RAN
- Question 3:?

O-RAN RIC GUI



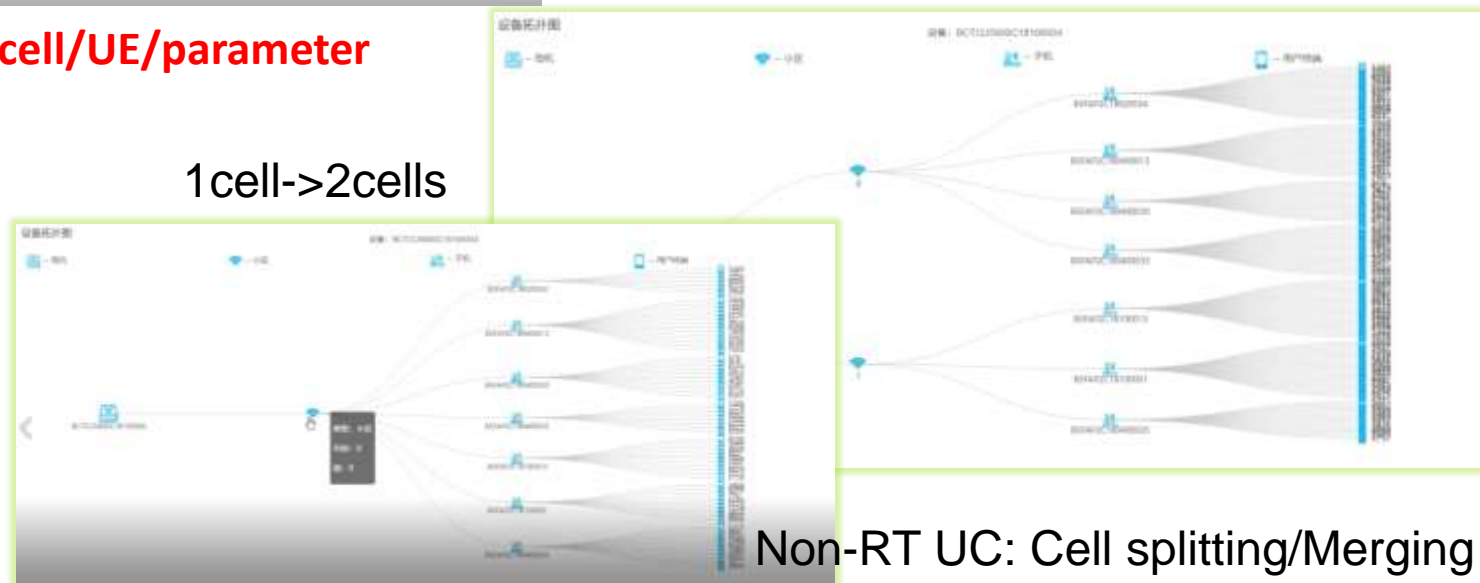
Near-RT UC: Video KQI Optimization



Data collection task management: subscriptions by cell/UE/parameter



1cell->2cells

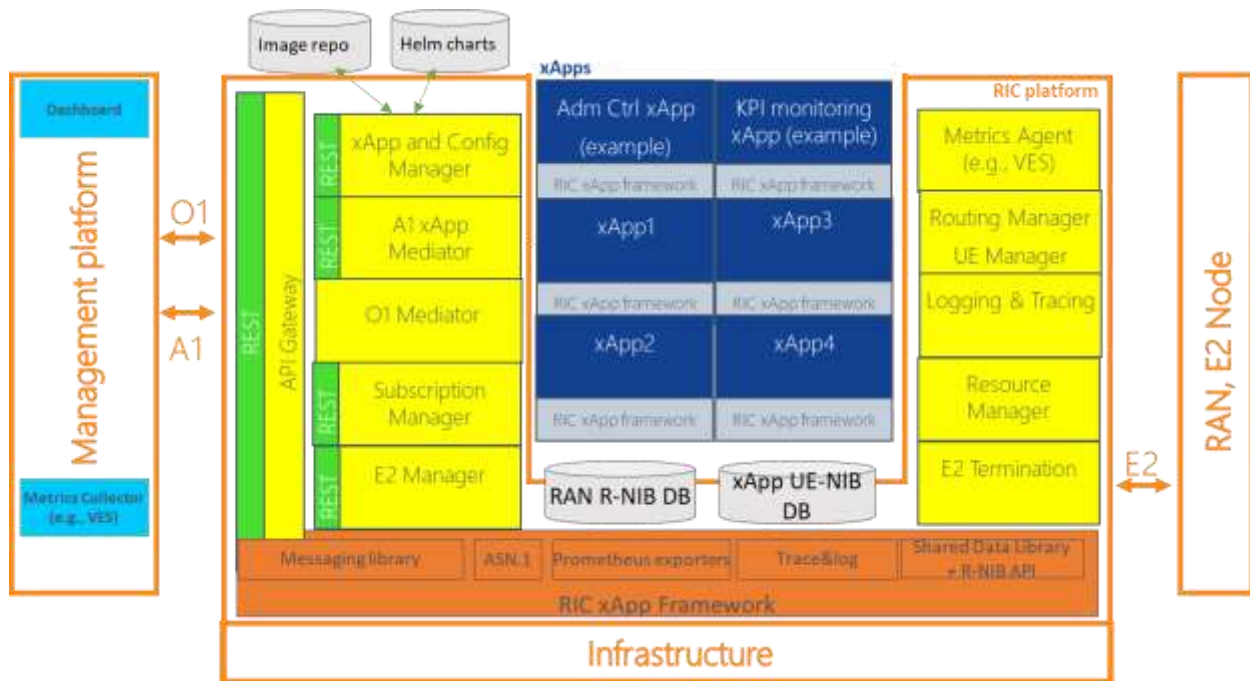


Non-RT UC: Cell splitting/Merging

The progress of open source community

Release A of near-RT RIC(Pre-standardization) was released in O-RAN community

<https://gerrit.o-ran-sc.org/r/admin/repos/q/filter:ric>



Potential collaboration with OSA

- Create a Near-RT RIC project complying with O-RAN specs
- Integration of OAI code in an O-RAN compliant near-RT RIC solution



Call for research collaboration (AI-based RRM algorithms)

- Predict key parameters (e.g. trajectory, interference) based on the near-real time data provided by nRT RIC
- Improve the RRM performance (e.g. radio admission control, mobility management), based on the prediction information provided by AI
- Introduce/optimize AI algorithms to complete one of RRM functions (e.g. dynamic resource allocation)

Thank You!

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