ONAP: A1 Policy enforcement with Non-RT RIC

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Project goals

- Enhance ONAP alignment with O-RAN standards
- Porting ORAN Non-RT RIC to ONAP (joint effort)
- Analysis, Design, Architecture of O-RAN Non-RT RIC Integration IF’s and ONAP Components
- Realization of Sample ML-based Handover use case
- Validate assumptions and define limitations
Agenda

1. What is Non-Real Time Radio Intelligent Controller (Non-RT RIC)
2. Non-RT RIC in ONAP: design and architecture
   - A1 Policy Management
   - R-APPs
3. Demo: UE handover
   - Sample R-APPs
   - O-RAN Simulator for UE Handover
4. Reflections
   - Achievements
   - Missing parts of architecture
What is Non-RT RIC

- A new component in ONAP
- A part of O-RAN Architecture
- Added to ONAP in Guilin

- For non-real-time control of RAN infrastructure
  - Optimization
  - Performance monitoring and evaluation
  - Provisioning of policies
  - Training and provisioning of AI/ML models

- Control Loops > 1s

Source: O-RAN Alliance
Community definition:

**Non-RT RIC Applications (R-APPPs)** – Modular applications that leverage the functionality exposed by the non-RT RIC Framework to provide added value services relative to RAN operation.

Current plans of O-RAN community:
Evaluate existing & planned candidates for R-APP platform, R-APP modelling, R-APP LCM & coordination in ONAP

R-APPPs to support (examples):
- Handover management for V2X
- QoE optimization by generation of AI/ML models
- Traffic Steering
- Massive MIMO optimization by requesting configuration changes
In ONAP “G” release, only A1 Policy Management function is supported

Components focus:
- A1 Policy Management Service: CCSDK micro service (community design)
- A1 Adapter: SDNC plugin (community design)
- R-APPS: DCAE micro services (proposed option)

**A1 policy**: Declarative *Set of rules* to guide the near-RT RIC function, and hence the RAN, towards better fulfilment of the RAN *operational or business goals.*
R-APPS as DCAE applications

Pros:
- R-APPS have access to ONAP services
  - DMaaP
  - AAI
  - All other services
- LCM with Cloudify framework
  - Containerized and Cloud Native
  - TOSCA-based packaging
  - Deployment and Management
  - Stable framework
- Support for ML/Analytics (Acumos)

Cons:
- Specific for ONAP, depends on DCAE

An Example of App-SDK assisted Solution Provider’s Development Workflow

Source: O-RAN Alliance
Demo scenario: UEs Handover

Goal: show how ONAP platform features can be used to implement a control loop based on Non-RT RIC

Example: Handover scenario

Cell 1

Predicted Cell 1 will go to sleep in 1 minute. High priority UE (ambulance) will be proactively switched from Cell 1 to Cell 2

Cell 2

Cell 3

Cell 2

Cell 3
Demo scenario: components

ONAP

ONAP Run-Time

AAI
VID
SDN-C
CDS

NonRT RiC

REST API

DCAE apps/R-APPS Layer

A1 Policy Actor
SleepingCellDetector ML Model

Data Collector (a placeholder for CPS, R1 API)

DMaaP

A1 Policy Management Service

A1 Adapter

REST API

Deployment

O-RAN Simulator VNF

A1 Simulator BE

OSC A1 Simulator

A1 Simulator FE

REST API (VES Events)

PM/FM/CM

HTTP/HTTPs

JDBC
Demo scenario

Scenario:

1. DCAE R-APPs deployed in ONAP (to monitor and optimize behavior of RAN)
   • Show DCAE R-APPs in dashboard
2. RAN Simulator deployed as VNF in ONAP
   • Show O-RAN Simulator in VID
3. Start RAN Simulator
4. Simulate a sleeping cell in RAN
5. Show UEs handover triggered by a sleeping cell detection
Demo
We demonstrated that:

- ONAP is a good candidate to be a default SMO for O-RAN
- R-APPs can be deployed as DCAE micro services. That is one of options
- Non-RT RIC is working in ONAP after porting from O-RAN Software Community
- A1 Policy Enforcement loops can be implemented within ONAP using Non-RT RIC, DCAE and DMaaP
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<thead>
<tr>
<th>Feature</th>
<th>ONAP</th>
<th>O-RAN</th>
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<tbody>
<tr>
<td>No final specification of R-APPs. How that specification will fit ONAP?</td>
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<td>O-RAN as an ONAP Network Service.</td>
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<td>• With CNFs and VNFs?</td>
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<tr>
<td>Missing topology service (missing CPS, R1)</td>
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<td>Missing PM data service (to collect and provide PM metrics, R1)</td>
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<tr>
<td>Hardcoded Near-RT RIC registration – missing more dynamic run-time mechanism like dedicated REST API</td>
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<tr>
<td>Missing A1 Feedback mechanism on A1 Policy execution</td>
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<tr>
<td>Missing ML-related features:</td>
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<tr>
<td>• A1 Enrichment API</td>
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<tr>
<td>• No mechanism for learning ML models</td>
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Thank You