Non-RealTime RIC in O-RAN Software Community
OSC Non-RealTime RIC project (NONRTRIC)
Update to O-RAN Alliance / RSAC

John Keeney Ph.D. – John.Keeney@est.tech – PTL NONRTRIC
08 June 2020
Non-RealTime RAN Intelligent Controller (NONRTRIC) project in OSC

The NONRTRIC project provides:

- Concepts
- Architecture
- Reference implementations

... for Non-RealTime RIC functionality as defined and described by the O-RAN Alliance architecture.

All implementations will be demonstrated in open community labs to prove functionalities and to give feedback to the O-RAN working groups.

Coordinates:

- Issue tracker / Backlog: JIRA: https://jira.o-ran-sc.org/projects/NONRTRIC/issues
- Code Repositories: Gerrit:
  - https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric
  - https://gerrit.o-ran-sc.org/r/admin/repos/portal/nonrtric-controlpanel
  - https://gerrit.o-ran-sc.org/r/admin/repos/sim/a1-interface
- Documentation & Discussion: Wiki: https://wiki.o-ran-sc.org/display/RICNR
- Team Status & Planning Meetings: https://wiki.o-ran-sc.org/display/RICNR/Meetings

NONRTRIC Project started July 2019

- Team: PTL: John Keeney (Ericsson Software Technology - EST)
- Full team of developers from EST, some initial input from Samsung, observers from other companies, and lots of guidance from AT&T
OSC: NONRTRIC project status – at a glance (June 2020)

- Improved NONRTRIC functionality being finalised for OSC “Bronze” Release (Early June)
  - OSC A1 Adapter (controller – mediation)
  - OSC A1 Policy Management Service (controller – A1 policies)
  - OSC Non-RT-RIC Control Panel (GUI – for A1 Policy management)
  - OSC A1 Simulator (a stateful test stub to simulate near-RT-RIC end of A1 interface)
- NONRTRIC functions support multiple A1 versions
  - O-RAN A1-AP v1.1 & OSC pre-spec A1
- ONAP continues as the chosen SMO in OSC – so ONAP/OSC alignment tasks continue
- Ongoing integration tasks with other OSC projects
  - OAM, Portal, SIM, INT (dep & test), near-rt-ric (ric-app), near-rt-ric (ric-plt)
- **Bronze: Major focus on performance, reliability, scalability, compliance, quality.**
NONRTRIC Project – OSC “Bronze”

- Policy Management GUI (OSC-NONRTRIC/Portal)
- R-APP
- Policy agent API (REST)
- R-APP
- R-APP
- Dashboard GUI (ORAN)
- DMaaP
- SDNC (SDNR?) A1 Controller (ONAP)
- NearRT RIC A1 APIs (A1-various)
- Policy Management GUI (OSC-NONRTRIC/Portal)
- A1 Policy Management Service ("Policy Agent") (OSC-NONRTRIC)
- Controller APIs (RESTCONF)
- CCSDK A1 Controller (OSC-NONRTRIC)
- SDNC (SDNR?) A1 Controller (ONAP)
- NearRT-RIC Simulator (OSC-NONRTRIC/SIM)
- OSC Near-RT RIC
- NearRT RIC A1 APIs (A1-various)
- VendorX near-RT-RIC / O-gNB
- A1 (WG2 1.1 std.)
- A1 (OSC)
Functions (Bronze)
A1 Adaptor / Controller

Mediation point for A1 interface termination in SMO/NONRTRIC

- Implemented as OSGI Feature/Bundles
  - A1 REST southbound
  - RESTCONF Northbound
    - NETCONF YANG > RESTCONF adapter
  - Mapping logic / Provider
- Can be included in an any SDNC/CCSDK persona
A1 Policy Management Service ("Policy Agent")

SMO Service above A1 Adaptor/Controller that provides:

- Unified REST & DMAAP APIs for managing A1 Policies in all near-RT-RICs
- Synchronized view of registered ‘services’ (e.g. R-APP, GUI, etc)
- Synchronized view of policy instances for each ‘service’
- Synchronized view of policy instances in all near-RT-RICs
- Synchronized view of policy types in all near-RT-RICs
- Policy Query API (e.g. per near-RT-RIC, per ‘service’, per policy type)
- Unified near-RT-RIC ID to near-RT-RIC address mapping
  - will also act as adaptor to A&AI, CMDBs etc. to “find” near-RT-RICs - soon
- Initial “O1 ManagedElement” mapping database & interface to find appropriate near-RT-RIC for RAN elements
  - will also act as adaptor to A&AI, RuntimeDB, other CMDBs etc. - soon
- Monitors all near-RT-RICs and recovers from inconsistencies
  - e.g. near-RT-RIC restarts
- Support for different Southbound connectors on a per near-RT-RIC basis
  - e.g. different A1 versions, different near-RT-RIC versions, different A1 adapters, different or proprietary A1 controllers/EMSs
Graphical user interface

• View and Manage A1 policies in the RAN (near-RT-RICs)
• Interacts with the Policy agent’s NBI (REST API)
• Graphical A1 policy creation/editing is entirely model-driven, based on policy type’s JSON schema
  • WG2 A1 v1.1: Limited Policy Type / Schema support means reduced model-driven editing
• Implementation:
  • Frontend: Angular framework
  • Backend Java Springboot application
Near-RT-RIC A1 Simulator

Stateful A1 test stub

- Used to create multiple stateful A1 providers (simulated near-RT-RICs)
- Implemented as a Python application
- Swagger-based northbound interface, so easy to change the A1 profile exposed
Current Tasks
NONRTRIC tasks for OSC “Bronze” (Jun 2020)

**Design & Development (Features & Functionality):**
- Deployment – Support for Docker & Kubernetes
- Multi-version support – including WG2 A1 v1.1 & OSC A1 v2.1
- HTTPS & IPv6 supported for all interfaces
- Performance / Scalability / Latency / Memory improvements
  - 30-120ms roundtrip time
  - 1000s of policies per near-RT-RIC
  - 1000s of (simulated) near-RT-RICs
NONRTRIC tasks for OSC “Bronze” (Jun 2020)

Design & Development (Usecases):
• R-APPs / usecases / e2e integration tasks
  • Health Check: https://wiki.o-ran-sc.org/download/attachments/3604609/RSAC_Bronze_HealthCheck_UseCase.docx?api=v2
    1. “Hello World!” R-APP
    2. OTF Test framework workflow
  • ML-based Traffic Steering: https://wiki.o-ran-sc.org/download/attachments/3604609/RSAC_Bronze_Use%20Case-Traffic%20Steering%20QoE.doc?api=v2
    • Major issues with limited functionality in ONAP to achieve SMO & R-APP requirements!
    • Very reduced scope for Bronze release
    • Significant work required to support even rudimentary O1 observability for these use cases … !
      • Ruled out of scope for Bronze
NONRTRIC tasks for OSC “Bronze” (Jun 2020)

Scoping and alignment:
• Support/Align with WG2 activities
• ONAP Alignment:
  • Work together with O-RAN initiatives in ONAP (Frankfurt & Guilin), e.g. SDNC/SDN-R sub-project, O1 mediation, Frankfurt/Guilin 5G usecases: Mobility Standard Harmonization with ONAP, ONAP/3GPP & ORAN Alignment: A1 Adapter extensions, Frankfurt/Guilin Release Requirements: REQ-38 5G / ORAN & 3GPP Standards Harmonization, ONAP A1 Adaptor REQ-352 - Extend ORAN A1 Adapter and add A1 Policy Management, etc.
  • Trying to formally align processes for ONAP Guilin / OSC Cherry upstream / downstream
  • Need to formally align ONAP platform development, OSC platform extensions, and OSC non-code deliverables for application assembly
NONRTRIC tasks for OSC “Bronze” (Jun 2020)

Infrastructure/Procedural:
• OSC Release C Requirement/Epics planning
• Improve documentation/user-guides
• Repo re-alignment
• Release preparation tasks: documentation, automated integration testing, CSIT, assembly & packaging, demo preparation, etc.
Cherry / Guilin Plans
Tentative Proposed NONRTRIC focus for OSC “Cherry” (Dec 2020)

- ONAP Architecture alignment – SMO/NONRTRIC platform functions
- A1 Adaptors – converge & improve
- Start gathering requirements for R-APP platform / API / R-APP LCM
  - Alignment with Non-RealTime-RIC Architecture study re. R-APPs
  - Identify / Investigate overlapping activities related to R-APP support in SMO
- Investigate initial approach for A1 Enrichment Information
- Extended E2E use cases beyond Bronze functionality
- Requirement gathering & initial test/integration with ML supporting functions in SMO
- Requirement gathering & initial test/integration with data collection & coordination functions in SMO
- Requirement gathering & initial test/integration with CMDB (if progressed in ONAP), Topology & Inventory functions in SMO

- Others
  - Progress with UE-id -> near-RT-RIC Topology mapping (On Hold – pending UE-id & SMO topology progress)
  - LCM for xApps (Scope discussions ongoing)
Long-term Project-Internal Requirements (Working copy)
For existing Functions

Controller & A1 Policy Management Service
shall use the O-RAN (WG2) A1 interface for policy management towards Near-RT RIC
shall use the OSC A1 interface for policy management towards Near-RT RIC
shall support a northbound REST interface for R-APPs for policy management
shall support a northbound Dmaap interface for policy management
shall be able to read the list of configured Near-RT RICs
shall maintain a mapping between Near-RT RIC and its associated RAN entities
shall maintains a consistent view of policies, policy types and policy status between the R-APPs and the Near-RT RIC
shall supervise R-APPs alive status
shall supervise Near-RT RICs alive status

GUI / NONRTRIC Control Panel
Manual policy management shall be supported via a GUI

Usecases
Policy health check use case towards Near-RT RIC shall be supported as an R-APP
Traffic steering use case towards Near-RT RIC shall be supported as an R-APP

A1 Simulator
shall provide O-RAN (WG2) A1 interface for policy management from A1 Controller
shall provide OSC A1 interface for policy management from A1 Controller
Shall maintain a stateful collection of Policy types & instances
Shall provide realistic responses to A1 operations
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<td>NONTRIC-1</td>
<td>[RICNRT-A-F10] Enable the RPGF to send policy guidance to the xApp via the A1 interface - As a</td>
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<td>Options for A1 termination in NONTRIC controller - Most likely SDNC for now Need to consider</td>
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<td>Build/Test/Integration environment for NONTRIC project - Create means for testing all levels</td>
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https://jira.o-ran-sc.org/projects/NONTRIC
Release Timelines
## O-RAN Software Community "B" Release Revised - Sprint Calendar 2020

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### Task Description
- **Sprint Planning and Design**
- **Dev Sprint 1**
- **Dev Sprint 2 - Sprint 1 Demo**
- **Dev Sprint 3 - Sprint 2 Demo**
- **Dev Sprint 4 - Sprint 3 Demo**
- **ETE - 1, 2, 3 - Sprint 4 Demo**
- **ETE - 4**
- **Release Preparation**
- **Maintenance Release**
- **Preliminary Documentation**
- **Finalize Documentation**

From [https://wiki.o-ran-sc.org/display/REL/Releases](https://wiki.o-ran-sc.org/display/REL/Releases)
## O-RAN Software Community "Cherry" Release Revised - Sprint Calendar 2020

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### Dev Sprints
- Maintenance/Defect Release: Week 21
- Defect Release: Week 22
- Dev Sprint 1: Week 23
- Dev Sprint 2 - Sprint 1 Demo: Week 24
- Dev Sprint 3 - Sprint 2 Demo: Week 25
- Dev Sprint 4 - Sprint 3 Demo: Week 26
- Sprint 4 Demo: Week 27
- Issue Management: Week 28
- No Activity: Week 29

### Test Sprints
- Maintenance Test Release: Week 30
- Test Planning & Preparation of Test Cases: Week 31
- IST Sprint-1: Week 32
- IST Sprint-2: Week 33
- IST Sprint-3: Week 34
- IST Sprint-4: Week 35
- End To End Test: Week 36
- No Activity: Week 37

### SW Req. Test Description
- SW Req. Test Description: Week 38
- SW Req. Identified & Documented: Week 39
- SW Req. Identified & Documented: Week 40
- SW Req. Identified & Documented: Week 41
- SW Req. Identified & Documented: Week 42

### O-RAN Alliance
- O-RAN Gateway Interface Freeze: Week 43
- O-RAN Gateway Interface Freeze: Week 44
- O-RAN Gateway Interface Freeze: Week 45
- O-RAN Gateway Interface Freeze: Week 46
- O-RAN Gateway Interface Freeze: Week 47
- O-RAN Gateway Interface Freeze: Week 48
- O-RAN Gateway Interface Freeze: Week 49
- O-RAN Gateway Interface Freeze: Week 50
- O-RAN Gateway Interface Freeze: Week 51
- O-RAN Gateway Interface Freeze: Week 52

From [https://wiki.o-ran-sc.org/display/REL/Releases](https://wiki.o-ran-sc.org/display/REL/Releases)
# O-RAN Software Community "D" Release Revised - Sprint Calendar 2021

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O-RAN Alliance WG2
Alignment Status
O-RAN WG2 Alignment

- WG2 - A1 spec
  - Liaising with near-RealTime RIC project to align toward Release 1.X spec
  - Providing feedback on possible improvements/simplifications to spec
  - Support for majority of v1.1. spec
    - Aiming for complete alignment
    - Call-back notifications currently not yet handled

- Non-RealTime RIC function
  - Aligned with WG2’s objectives/ambitions for Non-RealTime RIC Function
    - Architecture Study
      - Closely following ongoing study
      - Aim for full alignment once study is completed
  - Still at a very early stage ....
    - Started with A1 mediation/controller function and A1 policy management service
    - Additional functionality at discussion/architecture/design stage

- Interaction with other functions
  - Close working relationship with other OSC projects to achieve alignment/feedback/requirements
  - Close observation of activities in other WGs

- Use-cases
  - Requirements from OSC usecases are influencing/guiding development roadmap
  - Other usecases to be confirmed – will be driven by requirements, resources, supporting functions
Ericsson Software Technology

O-RAN Alliance