H Release

Welcome to the H release page for the O-RAN Software community.

The H release is currently in incubation; initiating the definition of the requirements

- Non-Real-time RIC (NONRTRIC)
- Near-Real-time RIC X-APPs (RICAPP)
- Near-Real-time RAN Intelligent Controller Platform (E2 Interface) (RICPLT)
- Operation and Maintenance (OAM)
- O-RAN Central Unit (OCU)
- O-DU High
- O-DU Low
- Simulators (SIM)
- Service Management and Orchestration Layer (SMO)
- Infrastructure (INF)
- Integration and Test (INT)
- AIML Framework (AIMLFW)
- Features Implemented Mapping to O-RAN Spec by Project

Non-Real-time RIC (NONRTRIC)

H-Release - Highlights:

- Consolidated & Improved RAN PM data exposure in new repo for RAN PM functions
  - Adds 4 new services for RAN PM processing
  - Lots of work on deployment scripts/charts, testing, CI, and documentation
- (R1) Service Exposure & Management (SME)
  - CAPIF Aligned Service Registry & Discovery
  - Continued work of Service execution platform extensions (K8s, Istio, Keycloak, OPA, Gateway) to enable and enforce service isolation & exposure
  - Controlled access & exposure of service to/from rApps
- (R1) Data Management & Exposure (DME)
  - Small updates to Information Coordination Service – studying alignment with R1 proposals
  - File-based PM data Kafka/InfluxDB/Minio
    - Including parsing, filtering & delivery
    - ref. PM Data exposure above
- rApp Management
  - Started work on a new rApp Manager functions – more in next release
  - LCM for rApps: Building on ONAP “Automation Composition” model & platform to implement rApp use cases
    - Added a 'KServe Participant'
      - Inference Services in rApps
      - Now supports KServe-based AI/ML rApps
    - Added an ‘A1 Policy Participant’
  - Overlap with Service Exposure work to examine role of an rApp Manager to support controlled access to and exposure of Services
  - Overlap with Data Exposure work to examine role of an rApp Manager to support controlled access to and exposure of Data types
- Continued A1-Policy & A1-Enrichment-Information evolution (& R1-A1)
  - A1-Policy work in ONAP (continues in ONAP London) - candidate for R1-A1(P)
    - Numerous updates to improve security
    - Improved support fine-grained policy-based access control
    - Removed DMaaP NBI
  - A1-EI management as part of DME - candidate for how to include A1-EI in R1-DME
    - ref. DME work above
- Demonstrated ASD-based CNF LCM
  - ONAP SO CNFM in standalone mode
- Sample use cases (rApps)
  - Requirements Drivers for rApp/R1 development
- Testing, Maintenance & Housekeeping
  - 3PP update – esp. Springboot 3 & JDK 17
  - Function Test & Integration Test environment,
    - Lots of new test cases, and new ONAP L & OSC H test profiles
  - Continue integration, deployment & configuration of SMO/Non-RT-RIC related functions & usecases in OSC Integration environment.
  - Project coordination, Documentation, Delivery, Reporting, Cross-project alignment, Community demos, O-RAN Standardization support, etc.

H Release - Tasks:

Count of Epics (20 issues), User Stories, Tasks, and Issues: (455 issues)

Relevant Epics:

- **NONRTRIC-855** - Getting issue details... STATUS
- **NONRTRIC-846** - Getting issue details... STATUS
- **NONRTRIC-842** - Getting issue details... STATUS
- **NONRTRIC-829** - Getting issue details... STATUS
- **NONRTRIC-826** - Getting issue details... STATUS
- **NONRTRIC-825** - Getting issue details... STATUS
- **NONRTRIC-818** - Getting issue details... STATUS
- **NONRTRIC-799** - Getting issue details... STATUS
- **NONRTRIC-788** - Getting issue details... STATUS
- **NONRTRIC-781** - Getting issue details... STATUS
- **NONRTRIC-753** - Getting issue details... STATUS
- **NONRTRIC-725** - Getting issue details... STATUS
- **NONRTRIC-696** - Getting issue details... STATUS
- **NONRTRIC-670** - Getting issue details... STATUS
- **NONRTRIC-648** - Getting issue details... STATUS

PTL: John Keeney

Wiki: https://wiki.o-ran-sc.org/display/RICNR

Latest Architecture: Release H Architecture

Components: Release H Components

Tasks / Backlog / JIRA: https://jira.o-ran-sc.org/projects/NONRTRIC/issues

Gerrit / Source Code:

- nonrtric : https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric
- nonrtric-plt-a1policymanagementservice: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/a1policymanagementservice
- nonrtric-plt-dmaapadapter: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/dmaapadapter
- nonrtric-plt-dmaapmediatorproducer: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/dmaapmediatorproducer
- nonrtric-plt-helmmanager: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/helmmanager
- nonrtric-plt-informationcoordinatorservice: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/informationcoordinatorservice
- nonrtric-plt-ranpm: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/ranpm
- nonrtric-plt-rappcatalogue: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/rappcatalogue
- nonrtric-plt-sme: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/sme
- nonrtric-plt-ranpm: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/plt/ranpm
- nonrtric-rapp-healthcheck: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/rapp/healthcheck
- nonrtric-rapp-orufhrecovery: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/rapp/orufhrecovery
- nonrtric-rapp-ransliceassurance: https://gerrit.o-ran-sc.org/r/admin/repos/nonrtric/rapp/ransliceassurance
- portal/nonrtric-controlpanel : https://gerrit.o-ran-sc.org/r/admin/repos/portal/nonrtric-controlpanel
- sim/a1-interface : https://gerrit.o-ran-sc.org/r/admin/repos/sim/a1-interface

Sonar / Test Coverage Reports

- nonrtric-plt-dmaapadapter: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-plt-dmaapadapter
- nonrtric-plt-dmaapmediatorproducer: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-plt-dmaapmediatorproducer
- nonrtric-plt-informationcoordinatorservice: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-plt-informationcoordinatorservice
- ~~nonrtric-plt-rappcatalogue: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-plt-rappcatalogue~~
- nonrtric-plt-rappcatalogue-enhanced: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-plt-rappcatalogue-enhanced
- nonrtric-plt-auth-token-fetch: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-auth-token-fetch
- nonrtric-plt-sme: https://sonarcloud.io/project/overview?id=o-ran-sc_nonrtric-plt-sme
- ~~nonrtric-plt-capifcore: https://sonarcloud.io/project/overview?id=o-ran-sc_o-ran-sc_nonrtric-plt-sme-capifcore~~
- nonrtric use cases: https://sonarcloud.io/organizations/o-ran-sc/projects?search=nonrtric&sort=name
  - nonrtric-rapp-orufhrecovery-consumer: https://sonarcloud.io/project/overview?id=nonrtric-rapp-orufhrecovery-consumer
  - nonrtric-rapp-ransliceassurance: https://sonarcloud.io/project/overview?id=nonrtric-rapp-ransliceassurance
- portal/nonrtric-controlpanel: https://sonarcloud.io/project/overview?id=o-ran-sc_portal-nonrtric-controlpanel
  - nonrtric-gateway: https://sonarcloud.io/project/overview?id=portal-nonrtric-controlpanel-gateway
- sim/a1-interface: https://sonarcloud.io/project/overview?id=o-ran-sc_sim-a1-interface

Docs:

- nonrtric : https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric
- nonrtric-plt-a1policymanagementservice: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-a1policymanagementservice
- nonrtric-plt-dmaapadapter: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-dmaapadapter
- nonrtric-plt-dmaapmediatorproducer: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-dmaapmediatorproducer
- nonrtric-plt-helmmanager: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-helmmanager
- nonrtric-plt-informationcoordinatorservice: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-informationcoordinatorservice
- nonrtric-plt-ranpm: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-ranpm
  - nonrtric-plt-ranpm-datafilecollector: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-ranpm/en/h-release/datafilecollector
  - nonrtric-plt-pmlog: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-ranpm/en/h-release/influxlogger
  - nonrtric-plt-ranpm-pm-file-converter: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-ranpm/en/h-release/pm-file-converter
  - nonrtric-plt-pmproducer: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-ranpm/en/h-release/pmproducer
- nonrtric-plt-rappcatalogue: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-rappcatalogue
- nonrtric-plt-sme: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-plt-sme
- nonrtric-rapp-orufhrecovery: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-rapp-orufhrecovery
- nonrtric-rapp-ransliceassurance: https://docs.o-ran-sc.org/projects/o-ran-sc-nonrtric-rapp-ransliceassurance/
- portal/nonrtric-controlpanel: https://docs.o-ran-sc.org/projects/o-ran-sc-portal-nonrtric-controlpanel
- sim/a1-interface : https://docs.o-ran-sc.org/projects/o-ran-sc-sim-a1-interface

Testing:

- Function Tests

Studies

- Release H: Apache Flink
- Release H: AVRO
- Release H: Cert-Manager
- Release H: Coordinated Service Exposure
- Release H: Influxdb Security
- Release H: Kafka Connect
- Release H: Kafka Metrics
- Release H: Keycloak Quarkus distribution
- Release H: ksqldb
- Release H: Linkerd
- Release H: Loki & Promtail
- Release H: Minio Events
- Release H: Minio Metrics
- Release H: Minio Security (Keycloak)
- Release H: Protobuf
- Release H: Quarkus with Kafka
- Release H: Telegraf

Weekly Meetings:

- Meetings

Demos:

- **17 May 2023**
  H-Release: Demonstration: "LCM of ASD-based CNFs using ONAP CNFM function in Standalone mode"
  See Video (HD), Video (SD) and Slides for more information
- **17 May 2023**
  H-Release: Demonstration: "CAPIF for Service Registration & Service Discovery"
  See Video (HD), Video (SD) and Slides for more information

H release: Container images

- Release H - Docker Images

H release: Deployment Instruction

- Release H - Run in Docker
- Release H - Run in Kubernetes

Near-Real-time RIC X-APPs (RICAPP)

Primary Goals: Expand the community working on open source xApps for O-RAN SC. Update and maintain the existing xApps to latest releases.

Enhance the set of open source xApps in support of the RSAC use cases (traffic steering, network slicing) and add new xApps.

New RUST framework xApp hw-rust will be added in this release.

H release plan:

- New HW-Rust xApp to support RUST framework.
- New ad-cell xApp to detect cell level anomaly.
- RC xApp - GRPC interface support on RC xApp
- Bouncer xApp - RIC Benchmarking new features addition.
- KPIMON-GO xApp – New Version

PTL: SUNIL SINGH

Jira: Count of Epics, User Stories, Tasks, and Issues: Total (216 issues)

Completed Epics:

RICAPP-216: Bouncer xApp upgraded to E2AP 2.0, E2SM KPM 2.0, E2SM RC 1.0.3

RICAPP-215: Anomaly Detection xApp (H-Release) - listens to RMR port and expect A1 policy from non-RT RIC & Process A1 policy message.

Bug:

RICAPP-214 OSC RIC - e2mgr X1 Configuration Update problem - Moved to RICP

Epics moved to next release.

1. RICAPP-212: Hello World Rust Xapp initial release
2. ad-Cell xApp
3. RICAPP-211: RC Xapp - upgrade to E2SM-RC-2.0

H release highlights/accomplishments:

- Bouncer xApp upgraded to E2AP 2.0, E2SM KPM 2.0, E2SM RC 1.0.3
- Anomaly Detection xApp: A1 policy from non-RT RIC & Process A1 policy message.

Gerrit Reviews

https://gerrit.o-ran-sc.org/r/gitweb?p=ric-app%2Fbouncer.git;a=shortlog;h=refs%2Fheads%2Fh-release

Release 1.0.1 (Ie8fc46d2) · Gerrit Code Review (o-ran-sc.org)

H release source code, container images and deployment instructions

The list of container images for the H release:

The list of container images for the release (link).

Code Coverage Reports : Latest reports can be found at the following Link: Projects - O-RAN Software Community (sonarcloud.io).

Near-Real-time RAN Intelligent Controller Platform (E2 Interface) (RICPLT)

Original primary goals based on contributions from Nokia, Samsung, HCL, Capgemini, Parallel Wireless, Alexandre Huff (UTFPR) and Abhijit G:

- ~~We will deprecate the RMR-based E2 subscription interface and H-release xApps need to use the REST-based interface already supported by the the C++, go, and python xApp frameworks (RIC-375). The subscription manager should handle subscriptions for failing xApps (RIC-929) and provide a callback on subscription delete success/failure (RIC-928).~~ We plan to implement the RIC subscription delete required procedure (RIC-851)
- Update to newer golang version of all components (RIC-881)
- ~~We will develop a CRD, i.e., a K8S operator on top of the DMS REST API to simplify xApp deployment (RIC-715). Also the DMS Rest interface gets the missing delete API (RIC-954). RIC-717 allows to deploy multiple cooperating xApps together.~~
- On E2 side we will implement the E2 Reset procedure from RAN to RIC (RIC-949) and the RIC Subscription Delete procedure (RIC-851). ~~We also implement robustness improvements (RIC-932 for reconnect cases) and~~ troubleshooting improvements (RIC-813, RIC-814).
- There's work planned to deploy the kserve-based model provisioning from the AI/ML project into the RIC platform (RIC-955)
- ~~The xapp frameworks for Golang (RIC-930), C++ and~~ Rust (RIC-951) will get some enhancements that are already implemented in the other languages, ~~incl. support for xApp registration in the xapp framework cpp (RIC-705).~~
- E2T (RIC-813) and E2Mgr (RIC-814) support dynamic changing of log levels for better troubleshooting
- RIC-953 A1 testing improvements and bug fixes
- Added to plan during H:
  - Support for policy status notifications in A1 (RIC-973 (incl. RIC-975))
  - Faster timeout in SCTP heartbeats (E2) (RIC-976)
  - IPv6 support in RMR (RIC-985)

- Link to planned Jira work items: all teams

Achieved H release highlights = high-level release notes (2023-06-20) below (note that the release image list is here: link)

- E2 reset (from E2 node to RIC), E2 subscription delete required, A1 policy status notifications
- Preparation of feature for I release, e.g., include xApps in subscription delete required decision

For the H release of the near-RT RIC we do only limited integration testing: only the use cases: deploy RIC, deploy xApp, make E2 connection, get list of A1 policies has been tested.

Filled in end-of-release checklist: link

PTL: Thoralf Czichy

Status 2023-06-20: From the 23 epics planned (link) we implemented 11 (link). 12 items have been moved out of the H release, e.g, because of implementation delays (link). Incomplete items: 0 (link). Additionally we fixed 10 bugs and small implementation tasks (link)

H release source code, container images and deployment instructions

The list of container images for the release (link). A demo video for the H release deployment is available at the top of the demo page and shows

- how to deploy the near-RT RIC platform,
- compile connect the E2 (e2 node) simulator from the OSC simulator project and
- compile the hw-go xapp from the xapp project and use the dms_cli to deploy it and check the E2 subscriptions the xApp created.

Code coverage: Code coverage reports (current coverage and list of components that need to set up Jenkins job for auto-generation of the reports as part of CI)

Operation and Maintenance (OAM)

Primary Goals:

- Provide complete implementation for OAM functions (FCAPS).

H release Feature Scope:

- Updates according to O-RAN Operations and Maintenance Interface Specification 8.0 (O-RAN.WG10.O1-Interface.0-v08.00) October 2022
  - Please see H-Release for further details
- Hardening the solution by introducing a "SMO-gateway".
- Add a FlowManagement Component.

Please see also project wiki for further details: H-Release

PTL: Martin Skorupski

H release highlights/accomplishments (2023-06-22):

- update of OAM-Controller to ODL version Sulfur
- support of SMO team and the aligmened of requiremnets acorss several open-source projects.
- Updates according to O-RAN Operations and Maintenance Interface Specification 8.0 (O-RAN.WG10.O1-Interface.0-v08.00) October 2022
  - Please see H-Release for further details
- Hardening the solution by introducing a "SMO-gateway"
  - all components exposing http northbound are reachable by FQDN (https port 443)
  - the OAM-Controller components interfacing with the network can be reached also by FQDN (VES-http: 443, SSH-Callhome: 4334, TSL-Callhome 4335)
- Add a FlowManagement Component
  - which includes examples for ONAP-VES, StndDefined-VES with 3GPP-Body and StndDefined-VES with WG4-OFHM-body

Please see release details:

- https://jira.o-ran-sc.org/projects/OAM?selectedItem=com.atlassian.jira.jira-projects-plugin%3Arelease-page&status=unreleased

H release source code, container images and deployment instructions (and status)

Jira: Count of Epics (15 issues), User Stories, Tasks, and Issues: 166 issues

Source Code:

- OAM master
- OAM Controller features master
- ONAP VES Collector master

Integration:

- helm charts
- docker-compose

O-RAN Central Unit (OCU)

Primary Goals:

- In the absence of O-CU, Radisys commercial CU image is to be used for E2E testing

H release Feature Scope:

H Release Feature Scope:

- NA

PTL:

NA

O-DU High

Primary Goals:

1. Alignment to the ORAN WG8 AAD specification O-RAN.WG8.AAD-v07.00

2. New design with multi-scheduler algorithm support

3. Inter CU Handover

4. E2 interface enhancement

5. End-to-end integration

H release Feature Scope:

- Odu High interfaces alignment to the latest specification & New design with multi-scheduler algorithm support
  - **Status:** Completed
  - **Epic:** https://jira.o-ran-sc.org/browse/ODUHIGH-488
- Integration of ODU-High with intel L1
  - **Status:** Spread over multiple releases, to be continued in the next release
  - **Epic:** https://jira.o-ran-sc.org/browse/ODUHIGH-475
- Inter CU Handover
  - **Status:** Completed
  - **Epic:** https://jira.o-ran-sc.org/browse/ODUHIGH-463
- E2 interface enhancement
  - **Status:** Completed
  - **Epic:** https://jira.o-ran-sc.org/browse/ODUHIGH-510

PTL: Ankit Barve

Status on 26 Jun 2023

H release highlights/accomplishments (26 Jun 2023):

- Multi-Scheduling Algorithm framework design
  - To support multiple scheduler algorithms new framework has been introduced with open scheduler API function pointers, which could be initiated as per the chosen algorithm
- Alignment to the ORAN WG8 AAD specification
  - Aligning to the latest WG8 AAD specification, also provide inputs to WG8 for further releases as there are many implementation challenges with the current specification.
- Inter – CU Handover
  - Support for mobility between source and target DUs connected to separate CUs.
- E2 interface enhancement
  - Feature study and task planning completed
  - Few Global APIs added
  - Further implementation to be continued in the next release
- End-to-end integration
  - Successfully bring up Radisys containerized O-CU in NTUST lab.
  - Integration stopped due to the unavailability of TM500 in the NTUST lab, to be resumed once the TM500 is available.
  - In TDD mode, an issue has been raised on O-DU-Low related to the PRACH index issue. O-DU-Low to deliver a patch to resume the testing.

H release source code, container images, and deployment instructions (and status)

source code: https://gerrit.o-ran-sc.org/r/gitweb?p=o-du%2Fl2.git;a=shortlog;h=refs%2Fheads%2Fh-release
Release notes: https://docs.o-ran-sc.org/projects/o-ran-sc-o-du-l2/en/latest/release-notes.html#h-release
Document: https://docs.o-ran-sc.org/projects/o-ran-sc-o-du-l2/en/latest/
Code coverage: NA (Unit test framework not available)

O-DU Low

Primary Goals:

Implementation of the O-DU Low Physical Layer functions for a 5G Open Access Radio Network allowing the flexibility of a software implementation coupled with the ability of incorporating hardware accelerators on a selective basis and meets the O-RAN architecture goals of scalability, mix and match multi-vendor modules that are interoperable and that can be upgraded as the standards evolve by software updates.

The O-DU Low physical layer functions follow the 3GPP TS 38 series recommendations for 5G and the 3GPP TS 36 series recommendations for LTE with the 3GPP 7.2 functional split between O-DU Low and O-RU. In 3GPP terms the O-DU Low is referred to HIGH-PHY in the functional split for 5G.

Implementation of the Open Front Haul interface to the O-RU per O-RAN WG4 CUS specifications.

Integration of this component with multi-vendor implementations of O-DU High and O-RU modules for end to end interoperability and compatibility verification.

H release Feature Scope:

The O-DU Low H release is the same as the F Release and G Release that added support for Massive MIMO, URLLC and it is based on the commercial FlexRan 21.11 release.

The O-DU Low H, G and F Release code is an Intel contribution in collaboration with Tieto Poland for the source code releases in the O-RAN gerrit and for the binary blobs contributed via GitHub.

For the documentation preparation of the H, F and G release Intel worked with collaboration from Fransiscus Bimo and Professor Ray-Guang Cheng from National Taiwan University of Science and Technology (NTUST).

The H, G and F release are being used for end to end testing and it is based on the E maintenance release that was used for the 2021 November US O-RAN Plugfest and tested in conjuction with 2 stack partners and 2 different Test equipment vendors. The Front Haul Interface was also tested for compliance using Keysight's Front Haul Test equipment.

Container images and deployment instructions are to be provided later

PTL: Luis Farias , Alternate: @Chenxi Yue

H release highlights/accomplishments (29 Jun 2023):

H release includes a patch to our previous F & G Releases with a fix for a PRACH detection bug found by LNT.

H release source code, container images, and deployment instructions (and status)

source code: https://gerrit.o-ran-sc.org/r/gitweb?p=o-du%2Fphy.git;a=summary
Release notes: https://docs.o-ran-sc.org/projects/o-ran-sc-o-du-phy/en/latest/release-notes.html
Document: https://docs.o-ran-sc.org/en/latest/projects.html#o-ran-distributed-unit-low-layers-odulow
Code coverage: To be planned as UT framework is not available to provide code coverage.

Simulators (SIM)

Primary Goals:

- Keep alignment with latest O-RAN specifications (O1, E2)

H Feature Scope / Achievements:

- Keep alignment with latest O-RAN specifications (O1, E2)
- Initial exploration for any integration/alignment with OAI

Sprint Demos:

PTL: Alex Stancu

Jira: Count of Epics, User Stories, Tasks, and Issues: 5 issues

H release highlights/accomplishments (23 Jun 2023):

- Updated simulated O-RU YANG models according to latest release (March 2023) OpenFronthaul Management Plane specification
- Implement the Monitoring NETCONF connectivity feature for the O-RUs, according to chapter 6.7 (Monitoring NETCONF connectivity) in O-RAN.WG4.MP.0-R003-v11.00
- Created a mechanism to locally build simulated O-DU with 3GPP YANG models
- No new contributions for the E2 Simulator

H release source code, container images and deployment instructions

Source code:

- O1 Simulator
- E2 Simulator
- NS-3 E2 Plugin

Container images are described here.

Instructions: no specific instructions.

Code coverage: in progress (sonar for C/C++ code in LF repos)

Service Management and Orchestration Layer (SMO)

Primary Goals:

The primary goal of SMO in the H-release is to act as glue between the different components of O-RAN.

H release Feature Scope:

The scope for H-release includes Alignment with O-RAN O2 DMS ETSI NFV Profile.

PTL: Seshu Kumar Mudiganti

H release highlights/accomplishments (June, 2023):

- Automated API Conformance testing
- Alignment with O-RAN O2 DMS ETSI NFV Profile.
- Refresh SDNR image to the latest on SMO O1 project.

H release source code, container images and deployment instructions (and status)

H release source code for SMO can be found in the following repositories

- O1 repository
- O1/VES repository
- O2 repository
  - For the O2 Interface OpenStack Tacker project (External repository)
    - Source code: https://opendev.org/openstack/tacker
    - Code coverage: Coverage report (Latest OpenStack verification results)

The container images for SMO can be found on the Nexus server, where applicable.
The container images for OpenStack Tacker can be found in OpenStack Kolla repository.

- https://quay.io/repository/openstack.kolla/tacker-server
- https://quay.io/repository/openstack.kolla/tacker-conductor

The OpenStack Tacker container can be started with the steps in the following documentation.

- https://docs.openstack.org/tacker/latest/install/kolla.html
- https://docs.openstack.org/kolla-ansible/latest/user/quickstart.html

The installation instructions for SMO can be found in the documentation page here.

Status

The status of the SMO project is tracked using Jira items. For the latest status refer to the items below.

SMO-124 - Getting issue details... STATUS

SMO-129 - Getting issue details... STATUS

SMO-130 - Getting issue details... STATUS

SMO-131 - Getting issue details... STATUS

Infrastructure (INF)

Primary Goals:

- Implement the O-Cloud reference design, provide the real time performance to allow the O-CU, O-DU and other components running on top of it.
- Provide interaction capabilities with other components.
- Provide O2 interface and support integration with SMO.

H release Feature Scope:

- Support integration between INF as O-Cloud with SMO via O2 interface
- Support integration between INF as O-Cloud with other o-ran sc components.
- Extend multi arch support: add support for ARM64 on Debian based OS.
- Aligned INF O2 implementation to the O-RAN Spec 4.0
- Automate test cases.

PTL: Jackie Huang

H release highlights/accomplishments (06 Jun 2023):

- Supported integration between INF as O-Cloud with SMO via O2 interface.
- Extended multi arch support: add support for ARM64 on Debian based OS (POC level)
- Align INF O2 implementation to the O-RAN Spec 4.0
- Automated test cases for O2 compliance.
- Validate O-CU over INF in Taiwan Lab.
- Plugfest for SMO homing via O2 interface

Jira: Status of Epics, User Stories, Tasks, and Issues:

Update at 06 Jun 2023

- **EPICs:**

Key	Summary	T	Created	Updated	Due	Assignee	Reporter	P	Status	Resolution
INF-426	[MultiArch][ARM64]Extended multi arch support: add support for ARM64 on Debian based OS (POC level)		Jun 08, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang	=	DONE	Done
INF-404	[MultiOS][Doc] documentation updates for H release		May 15, 2023	Dec 05, 2023		Jackie Huang	Jackie Huang	=	DONE	Done
INF-396	[O2] Plugfest for SMO homing		May 09, 2023	Jun 09, 2023		Jon Zhang	Jon Zhang	=	DONE	Done
INF-391	Contribute and automate test cases for INF in H release		Dec 21, 2022	Jun 05, 2023		David Liu	Bin Yang	=	DONE	Done
INF-389	Support integration of INF as O-Cloud with other o-ran sc components for orchestration automation comforming to O-RAN compliance specs in H release		Dec 21, 2022	Jun 08, 2023		Jackie Huang	Bin Yang	=	DONE	Done

5 issues

- **Stories:**

Key	Summary	T	Created	Updated	Due	Assignee	Reporter	P	Status	Resolution
INF-427	[MultiArch][ARM64] add script to support build for ARM64 on Debian based OS (POC level)		Jun 08, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-421	[O2] Investigate add SAN certificate for IMS server.		May 24, 2023	Jun 06, 2023		David Liu	David Liu		DONE	Done
INF-417	[O2] o2ims specification 2.1.1.1.8 InfrastructureInventoryObject that needs to be implemented		May 23, 2023	Jun 14, 2023		Jon Zhang	Jon Zhang		DONE	Done
INF-414	[O2] Add Plugfest Test Cases to validate homing and placement.		May 23, 2023	Jun 06, 2023		David Liu	David Liu		DONE	Done
INF-413	Contribute o2 compliance test cases to community spec.		May 23, 2023	May 23, 2023		David Liu	David Liu		DONE	Done
INF-412	[O2] subscription and registration with SMO through oAuth2		May 18, 2023	May 23, 2023		Jon Zhang	Jon Zhang		DONE	Done
INF-399	[O2] Throw error while query DMS detail with fields		May 09, 2023	May 23, 2023		Jon Zhang	Jon Zhang		DONE	Done
INF-398	[O2] The SqlAlchemy upgrade cause error while the service starting		May 09, 2023	May 23, 2023		Jon Zhang	Jon Zhang		DONE	Done
INF-397	[O2] Add capabilities of the DMS query		May 09, 2023	May 23, 2023		Jon Zhang	Jon Zhang		DONE	Done
INF-395	[O2] Add template support for pod labels and annotations		Mar 27, 2023	Apr 03, 2023		Joshua Kraitberg	Joshua Kraitberg		DONE	Done
INF-392	Contribute o2 compliance test codes		Dec 21, 2022	May 23, 2023		David Liu	Bin Yang		DONE	Done
INF-268	[INT]Validate O-CU over INF in TW lab		Mar 24, 2022	Jun 09, 2023		Jon Zhang	Bin Yang		DONE	Done

12 issues

- **Tasks:**

Key	Summary	T	Created	Updated	Due	Assignee	Reporter	P	Status	Resolution
INF-409	[MultiOS][Doc] release-notes.rst updates for H release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-408	[MultiOS][Doc] installation.rst updates for H release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-407	[MultiOS][Doc] developer-guide.rst updates for H release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-406	[MultiOS][Doc] overview.rst updates for H release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-405	[MultiOS][Doc] index.rst updates for H release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-403	[MultiOS][CentOS] INF image for H Release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-402	[MultiOS][Yocto] INF image for H Release		May 15, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-401	[MultiOS][Debian] INF image for H Release		May 15, 2023	Jun 15, 2023		Jackie Huang	Jackie Huang		DONE	Done
INF-394	[O2] Change the oCloud name will create a new deployment manager item		Jan 17, 2023	May 30, 2023		Jon Zhang	Jon Zhang		DONE	Done

9 issues

- **Bugs:**

Key	Summary	T	Created	Updated	Due	Assignee	Reporter	P	Status	Resolution
INF-428	[MultiOS][Build][JJB] rtdv3-global-verify-master failed		Jun 09, 2023	Jun 15, 2023		Jackie Huang	Jackie Huang	=	DONE	Done
INF-422	[O2] wrong notify with subscribe the O2 Inventory with filter		May 24, 2023	May 25, 2023		Jon Zhang	Jon Zhang	=	DONE	Done
INF-419	[O2] Register O2 with SMO using the wrong type		May 24, 2023	May 25, 2023		Jon Zhang	Jon Zhang	=	DONE	Done
INF-411	[MultiOS][Yocto] qemu-native build failed		May 16, 2023	Jun 08, 2023		Jackie Huang	Jackie Huang	=	DONE	Done
INF-410	[MultiOS][Build][JJB] pti-rtp-shell-verify-master failed		May 15, 2023	Jun 09, 2023		Jackie Huang	Jackie Huang	=	DONE	Done
INF-400	[O2] DC manager query not correct in DC env.		May 11, 2023	May 23, 2023		Jon Zhang	David Liu	=	DONE	Done
INF-386	[O2] html found in error message response body but expected json		Dec 01, 2022	Dec 01, 2022		Bin Yang	David Liu	⌄⌄	DONE	Done
INF-290	[O2] the deploymentManagementServiceEndpoint in response body is incorrect		Sep 15, 2022	Jun 09, 2023		Jon Zhang	Jackie Huang	=	DONE	Done

8 issues

Test status:

Code coverage:

- INF platform
  - Code coverage report: o-ran-pti-rtp - (sonarcloud.io)
  - INF is a downstream project of StarlingX and Yocto Project, the above coverage report may not reflect the real code coverage, so we also need to refer to the status from upstream projects.
- O2
  - Total coverage: 54%
  - Detail report: cov-report_20220609.txt

Release Note:

- INF Release Notes — pti-rtp master documentation (o-ran-sc.org)
- INF O2 Release-notes — pti-o2 master documentation (o-ran-sc.org)

H release source code, images and deployment instructions

- Each repository has a branch named "h-release" that can be accessed using git:
  - For pti/rtp repo[gitweb]: git clone --branch h-release "https://gerrit.o-ran-sc.org/r/pti/rtp"
  - For pti/o2 repo[gitweb]: git clone --branch h-release "https://gerrit.o-ran-sc.org/r/pti/o2"
- Images for INF project
  - ISO image for INF:
    - Yocto Based image: inf-image-yocto-aio-x86-64.iso
    - CentOS based image: inf-image-centos-all-x86-64.iso
    - Debian Based image: inf-image-debian-all-x86-64.iso
  - Container image for o2:
    - nexus3.o-ran-sc.org:10002/o-ran-sc/pti-o2imsdms:2.0.2
    - nexus3.o-ran-sc.org:10004/o-ran-sc/pti-o2imsdms:2.0.2
- Deployment instruction:
  - INF: INF Installation Guide
  - O2: O-RAN O2 Application

Integration and Test (INT)

Primary Goals: Make each OSC projects to adopt XTesting framework and contribute test cases that can be run at release time for validation. Stretch goal would be to write additional integration test cases based on across project interactions.

H Feature Scope / Achievements:

- Convert existing RICPLT/RICAPP Robot test cases in it/test repo to be executed with XTesting, which should automate the deployment of RIC platform, onboarding an xApp, and execute test cases all together.
- Wind River may contribute XTesting test cases on the o2 repo
- Specific to the Asia Pacific Open Lab:
  - Completing E2 setup procedure between OSC Near-RT RIC and OAI gNb.
  - Incorporate E2AP v2 in OAI CU for connection between OAI CU and OSC Near-RT RIC.
  - Verify data exchange between netconf and ves between OAI CU and OSC SMO.
  - Testing C-plane in F1 interface connection between OAI CU and OSC DU.

PTL: James Li

H release highlights/accomplishments (6/29/2023):

- Full automation on RIC deployment (H release) and KPIMON-go xApp onboarding testing as the XTesting demo flow
- Execution against the selective RICPLT/RICAPP Robot test cases under it/test repo and O2 IMS compliance tests against O-cloud instance.
- Asia Pacific Open Lab: 1) Near-RT RIC + Viavi RIC Test 1.6.0 integration; 2) Slice-enabled xApp to Control ODU Scheduler (corresponding code changes may be committed to OSC later)

H release source code, container images and deployment instructions

gerrit (look for the latest changes for H release from the following repositories):

https://gerrit.o-ran-sc.org/r/it/dep

https://gerrit.o-ran-sc.org/r/it/dev

https://gerrit.o-ran-sc.org/r/it/test

AIML Framework (AIMLFW)

Primary Goals:

- Diversify training data source for Training host
- Kserve adapter for Near-RT RIC
- AIMLFW feature enhancements

H release highlights/accomplishments:

- Diversify training data source for Training host
  - Obtaining training data from DME in Non-RT RIC
  - Creating Feature groups with data source and feature information
- Kserve adapter
  - Deploy and manage AI models in Near-RT RIC/Non-RT RIC
  - Integrate Inference host with O-Cloud(RICDMS) and Management Functions of RIC.
- Training pipeline Enhancement
  - Provide sample pipelines by default
- AIMLFW feature enhancements
  - Options for edit, retrain and delete training jobs

EPICs considered for H-release:

AIMLFW-13 - Getting issue details... STATUS

AIMLFW-23 - Getting issue details... STATUS

AIMLFW-25 - Getting issue details... STATUS

AIMLFW-26 - Getting issue details... STATUS

AIMLFW-35 - Getting issue details... STATUS

AIMLFW-47 - Getting issue details... STATUS

AIMLFW-50 - Getting issue details... STATUS

PTL: Joseph Thaliath

Wiki: AI/ML Framework

Tasks / Backlog / JIRA: https://jira.o-ran-sc.org/projects/AIMLFW/issues

Gerrit / Code:

- aiml-fw/awmf/tm: Training Manager : Training job and model management
- aiml-fw/athp/tps/kubeflow-adapter: Adapter for Kubeflow
- aiml-fw/athp/sdk/model-storage: Sdk for accessing Model storage
- aiml-fw/athp/sdk/feature-store: Sdk for accessing Feature store
- aiml-fw/athp/data-extraction: Retrieving features for training from Data lake
- aiml-fw/aimlfw-dep: Deployment scripts aiml workflow
- portal/aiml-dashboard: GUI for AIML Workflow
- ric-app/qp-aimlfw: Sample ML Assist xApp for QoE prediction
- aiml-fw/aihp/ips/kserve-adapter: kserve adapter for near-RT RIC

Sonar / Test Coverage Reports:

- https://sonarcloud.io/project/overview?id=o-ran-sc_aiml-fw-athp-tps-kubeflow-adapter
- https://sonarcloud.io/project/overview?id=o-ran-sc_aiml-fw-athp-sdk-feature-store
- https://sonarcloud.io/project/overview?id=o-ran-sc_aiml-fw-athp-sdk-model-storage
- https://sonarcloud.io/project/overview?id=o-ran-sc_aiml-fw-athp-data-extraction
- https://sonarcloud.io/project/overview?id=o-ran-sc_aiml-fw-awmf-tm

Documentation:

https://docs.o-ran-sc.org/en/latest/projects.html#ai-ml-framework

Installation/Demo guides:

AIMLFW: https://docs.o-ran-sc.org/projects/o-ran-sc-aiml-fw-aimlfw-dep/en/latest/installation-guide.html

Kserve adapter: https://docs.o-ran-sc.org/projects/o-ran-sc-aiml-fw-aihp-ips-kserve-adapter/en/latest/

Demo videos:

Files for H release

Release Container images:

- Training manager component: nexus3.o-ran-sc.org:10002/o-ran-sc/aiml-fw-awmf-tm-docker:1.1.3
- Data extraction component: nexus3.o-ran-sc.org:10002/o-ran-sc/aiml-fw-athp-data-extraction-docker:1.0.1
- Kubeflow adapter component: nexus3.o-ran-sc.org:10002/o-ran-sc/aiml-fw-athp-tps-kubeflow-adapter-docker:1.1.0
- AIMLFW dashboard component: nexus3.o-ran-sc.org:10002/o-ran-sc/portal-aiml-dashboard-docker::1.1.2
- AIMLFW notebook component: nexus3.o-ran-sc.org:10002/o-ran-sc/portal-aiml-notebook-docker::1.1.2

Features Implemented Mapping to O-RAN Spec by Project

Project Name	O-RAN spec	Additional Notes
Non RT RIC	O-RAN.WG2.Non-RT-RIC-ARCH-TS-v02.01 ORAN.WG2.R1GAP-v02.00 O-RAN.WG2.A1GAP-v03.00 O-RAN.WG2.R1 Use Cases and Requirements.v02.00	
RICAPP	O-RAN.WG3.E2SM-KPM-v02.03 O-RAN.WG3.E2SM-RC-v01.03 O-RAN.WG3.E2AP-v02.03	
RICPLT	O-RAN.WG3.RICARCH-R003-v04.00 O-RAN-WG3.RICAPI-R003-v01.00 O-RAN.WG3.E2AP-v02.03 O-RAN.WG3.UCR-v02.00	
OAM	O-RAN.WG10.O1-Interface.0-v08.00	

O-DU High	O-RAN-WG3.RICAPI-R003-v01.00	
SIM		
SMO		
INF	O-RAN.WG6.O2IMS-INTERFACEv04.00	O-RAN_O2_IMS_Spec_Compliance_v3v4_v01.xlsx
AIMLFM		