Welcome to the Amber release page (press release) for the O-RAN Software community

This page contains all the information specific to the Amber release and frozen code (code freeze = Nov-30-2019) and documentation. The main trunk will continue on to support future releases.

This release is the first release and is in partnership with the O-RAN Alliance. The specification and software are being worked at the same time and the software is considered pre-specification software.

The projects have limited capabilities which will increase over future releases.

See Requirements and Software Architecture under Committees and Projects for more details on current activites.

Initial release capabilities include contributions under the following projects:

- Non-real-time RIC (A1 Interface) (NONRTRIC)
- Near real-time RIC Platform (E2 Interface) (RICP)
- Near Real-time RIC X-Apps (RICAPP)
- OAM (O-1 Interface)
- O-RAN Central Unit (OCU)
- O-DU High
- O-DU Low
- Dashboard (OAM)
- Simulators (SIM)
- Infrastructure (INF)
- Integration and Test (INT)
- Documentation (DOC)

O-RAN ALLIANCE, WORKING WITH THE LINUX FOUNDATION, ANNOUNCED THE O-RAN SOFTWARE COMMUNITY’S FIRST SOFTWARE CODE RELEASE, “AMBER”

Get Amber

- Source code: O-RAN-SC-Amber-R1.1.tar.gz
- Per-repository details: Releasing Amber Tasks

Documentation

- Developer Documentation
- Wiki

Table of Projects

Amber Release Timeline

Amber Timeline

Learn Amber

- Documentation home: http://docs.o-ran-sc.org
- Video tutorials and demos:
  - O-DU HIGH Demo
  - INT demo for Near Realtime RAN Intelligent Controller platform
  - INT demos Open Testing Framework
  - Building work flow
  - Debugging work flow
  - Running virtual test head
  - INT demo for using nanobot for automated testing
  - INT demo for using RAN load generator
  - MC xApp demo video (simulator mode)

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### Near Real-Time RIC xApps (RICAPP)

**Primary Goals:** Support near-real-time radio resource management via development and deployment of a series of xApps that interact with one another and the external components via A1, O1, and E2 interfaces (OCU/O-DU)

**Scope:** Planned xApps: (1) Admission Control; (2) Measurement Campaign; (3) UE Manager; (4) ML xApp; (5) KPI Monitor

Active participation from AT&T, Nokia, Samsung

**PTL:** Matti Hiltunen (AT&T)

**PTL:** Thoralf Czichy (Nokia)

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### Near Real-Time RIC Platform (RICP)

**Primary Goals:** Support near-real-time radio resource management, managing O-CU’s and O-DU’s via E2 messages, receiving A1 intent and policy guidance messages from the non-RT RIC, O1 configuration requests, and emitting O1 measurement data to ONAP.

**Scope:** Platform Components: (1) xApp and Config Manager; (2) A1 xApp mediator; (3) Subscription Manager; (5) E2 Manager; (6) E2 Termination; (7) Redis RAN R-NIB; (8) Redis xApp DB2; (9) Resource Manager; (10) Logging and OpenTracing support; (11) Prometheus support; (12) VES Agent / VESPA; and (13) API Gateway

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### Non Real Time RIC (NONRTRIC)

**Primary Goals:** Support non-real-time radio resource management, higher layer procedure optimization, policy optimization in RAN, and providing guidance, parameters, policies and AI/ML models to support the operation of near-RealTime RIC functions in the RAN to achieve higher-level non-real-time objectives.

**Scope:** (1) A1 controller (mediator, Endpoint); (2) Coordinate/Host A1 Policy Management Services; (3) Coordinate AI/ML models in RAN (E2 nodes and non-RT RIC) and non-RT RIC; (4) Data Enrichment coordinator; and (5) xApp Host and SMO Application Coordinator.

**PTL:** John Keeney (Ericsson)
### Amber

14 Epics defined; 5 Completed; 8 in-progress; 0 Blocked; 1 Deferred to Rel B
5 xApps being worked for Amber:
- Admission Control (AC)
- Measurement Campaign
- ML-based AC
- KPI monitor
- xApp interaction methods Using RIC Message Router (RMR)
- Using Shared Data Layer (SDL)

### Project Relations

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### O-RAN Distributed Unit Home (O-DU High)

**Primary Goals:**
The O-DU (High) project provides reference implementation according to the O-RAN WG8 documents. It provides the implementation of F1AP, RLC, MAC, Scheduler modules and API between them.

**Scope:** Develop software deliverable for the A-release as per SW requirements specifications, leveraging seed code of 5G NR RLC and MAC protocol functions and developing F1AP module, CU stub and L1 Stub.

**PTL:** Sachin Srivastava (Radisys)

### O-DU (ODU-LOW)

**Primary Goals:**
The O-RAN-SC-ODU LOW project provides reference implementation of ODU-LOW according to the O-RAN AAL specification (WG8) documents. The reference design will follow the open interface toward ODU HIGH, RRU and Accelerator, provide physical layer signal processing functionality according to 3GPP.

**Scope:**
- According to the ORAN-WG8.AAD specification, PHY layer functionality is realized as High-PHY in O-DU and Low-PHY in O-RU. Some of the PHY functionalities may be realized using hardware acceleration. O-DU Low project will focus on the High-PHY and fronthaul library modules that reside in O-DU. NR FAPI being standardized by Small Cells Forum (SCF) will be used for defining L1 and L2 interactions.

**PTL:** Zhimin Yuan (Intel)

### Operations, Administration, and Maintenance (OAM)

**Primary Goals:**
The O-RAN-SC-OAM project provides reference implementation according to the O-RAN OAM (WG1) documents. In addition we provide a common MnS-Consumer for development and module test purposes. The assumption is that the projects for the Managed Functions can concentrate on the more important control and user-plane functionality.

**Scope:**
- According to the O-RAN-SC-OAM-Architecture document all ManagedElements containing one or more Managed Functions (near-real-time-RIC, O-CU-CP, O-CU-UP, O-DU and O-RRU) implement and provide a logical O1-interface to all contained Managed Functions. The O-RAN-OAM-interface specification defines a NetConf-Server for Configuration Management (CM), a HTTP-client for Fault Management (FM), Performance Management (PM) and other events.

**PTL:**
<table>
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<th>Project</th>
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| Amber   | 6 Epics identified  
5 in-progress  
0 Blocked  
1 Deferred to Rel B  
O-DU-OAM-Agent – Work In Progress  
Initial bring up of the system and layer configuration.  
MAC-PHY (FAPI) Interface Discussions with the O-DU Low team is in progress.  
Test code development is WIP for initial PHY configuration message.  
F1AP: Following messages between CU and DU are being developed.  
F1 SETUP REQUEST  
F1 SETUP RESPONSE  
GNB-DU CONFIGURATION UPDATE  
GNB-DU CONFIGURATION UPDATE ACKNOWLEDGE |
| Documentation and Project Coordination | Wiki  
Jira  
Gerrit  
Meetings (common meeting with O-CU, O-DU High, O-DU Low and Sim)  
ASN 1 tool |
| Project Relations | Near-RT RIC Platform  
Non-RT RIC  
OAM  
O-CU-CP  
O-CU-UP  
O-DU Low |
| O-RAN Simulators (SIM) | Primary Goals: Provide the infrastructure to vO-CU and vO-DU, include the VM and Container solutions. Enable the AAL (accelerator abstract layer) for the RAN application VNF/CNF.  
Active participation from Windriver and Lenovo. |
| Infrastructure (INF) | Primary Goals: To create documentation for the O-RAN Software Community (OSC) component. platform. O-RAN repositories create a variety of content depending on the nature of the project. Status |
| PTL | Martin Skorupski (highstreet technologies) |
| Amber | 7 Epics(1 Done, 6 To Do), 11 stories (6 Done, 5 In Progress), 4 tasks (In Progress) |
| Documentation and Project Coordination | wiki  
jira  
gerrit  
meetings |
| Project Relations | Non-RT RIC  
SIM  
Near-RT RIC Platform |
| Documentation (DOC) | PTL | weichen ni |
| Amber | Documentation homepage: http://docs.o-ran-sc.org |
| Documentation and Project Coordination | Wiki  
Jira  
Gerrit  
Meetings (TBD) |
| Project Relations | ALL projects |
**Primary Goals:** The O-RAN Simulators projects are meant to provide simulators needed to stimulate or respond to messages generated by O-RAN elements being developed. They are more robust than a simple test stub in which they can provide a controlled injection of messages or responses to messages over O-RAN and 3GPP interfaces. Simulators eventually will also support a Virtual Test Head (VTH) API which allow them to be integrated into test suites, managed by the OTF capabilities in the Test and Integration projects, which can be applied to non open source systems in order to verify the elements compliance to standard interfaces.

**Scope:** The project aims to provide simulation solutions to all the projects that have such a need. The project can be split according to the type of interfaces it simulates:

- A1
- E1
- E2
- F1
- FH
- O1

The project structure is flexible and it can be changed according to the needs of the other projects.

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<tr>
<th>PTL</th>
<th>Alex Stancu (highstreet technologies)</th>
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<tr>
<td>Amber</td>
<td>4 Epics defined (1 [Done], 3 not entered in JIRA, 1 [Backlog])</td>
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**Integration and Testing (INT)**
## Project Scope:

### Integration:
- Integrating software deliverables by O-RAN software projects (INF, O-DU, O-CU, RICPLT, RICAPP, NONRTRIC, OAM, and SIM) into full O-RAN system with coherent deployment tooling and platform technologies;
- Completing system level release objectives (e.g. demos, end-to-end stories) identified by O-RAN Alliance TIGF and O-RAN SC RSAC.

### Testing:
- Developing software testing tools, strategies, and flows for controlling quality and integrity of the O-RAN SC software deliverables;
- Conducting integrated and system level testing for gating functionalities and quality of O-RAN SC software releases

### CICD:
- Leveraging Linux Foundation tool chain, incorporating automated work flows and processes into O-RAN SC software development, integration, deployment, releasing, and quality control.

## PTL
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## Amber
| 19 epics, 14 completed |
| Additional details |

## Documentation and Project Coordination
| Home: Wiki |
| JIRA: Jira |
| Gerrit: https://gerrit.o-ran-sc.org, /it/ repos |
| Weekly Meetings: Meetings |

## Project Relations
| All Projects |