

Introduction to O-RAN

Working Group 6

Cloudification & Orchestration Workgroup



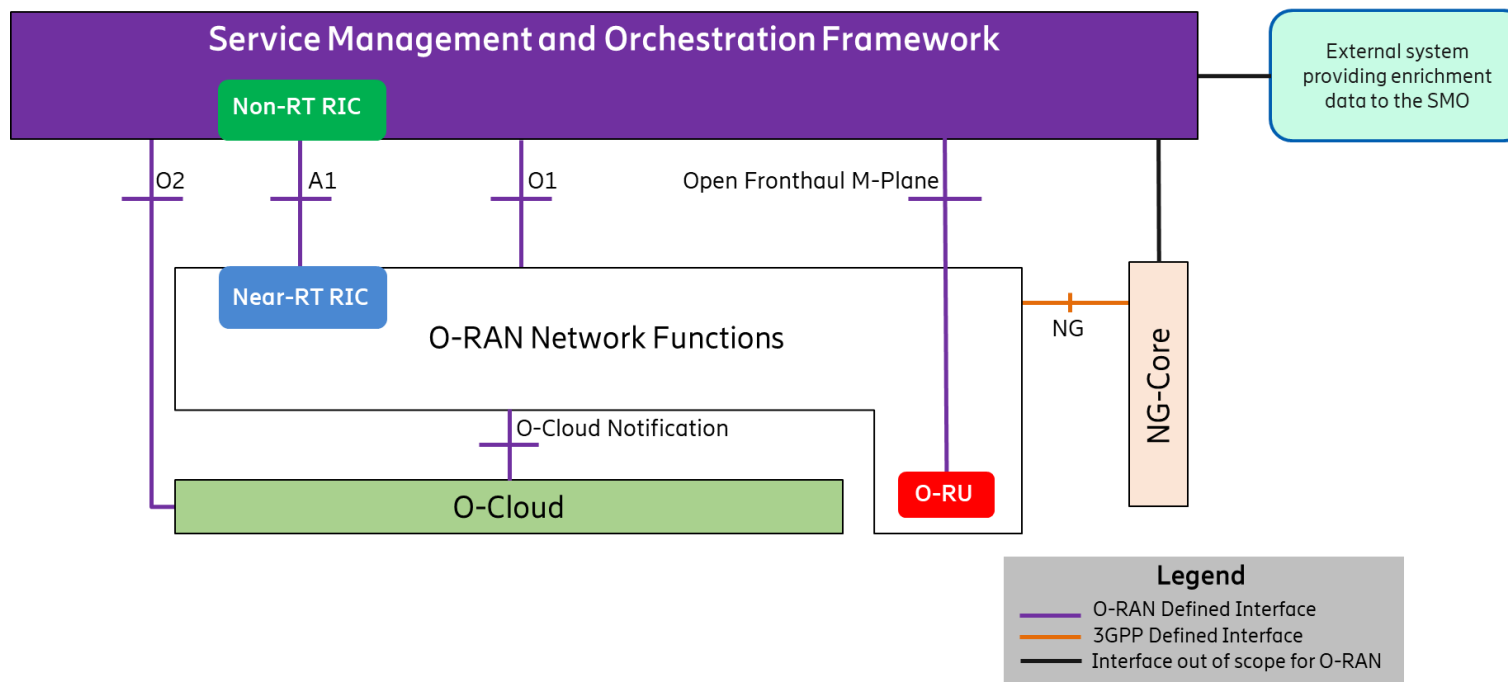
Udi Schwager, Wind River Systems, Rapporteur WG6 O-Cloud Notification API Specification

- O-RAN Alliance was founded in February 2018 by AT&T, China Mobile, Deutsche Telekom, NTT DOCOMO and Orange.
- O-RAN Alliance's mission is to re-shape the RAN industry towards more intelligent, open, virtualized and fully interoperable mobile networks.
- To achieve this, O-RAN Alliance is active in 3 main streams:
 - The specification effort => extending RAN standards towards openness and intelligence
 - O-RAN Software Community => development of open software for the RAN (in cooperation with the Linux Foundation)
 - Testing and integration effort => supporting O-RAN member companies in testing and integration of their O-RAN implementations

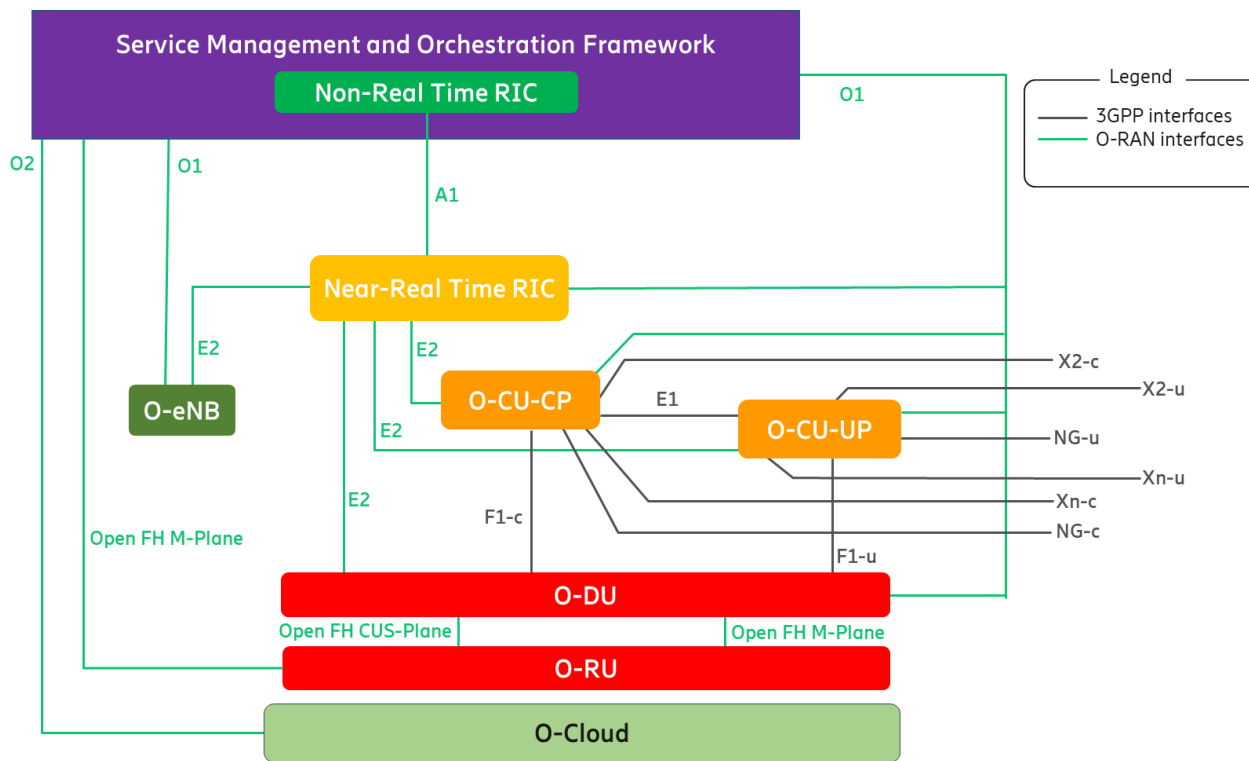
■ O-RAN Alliance Workgroups

- TSC - Technical Steering Committee
 - MVP-C - Minimum Viable Plan Committee
 - ACOP - Ad-hoc Committee for O-RAN Procedures
 - ACOIE - Ad-hoc Committee for O-RAN Industry Engagement
 - nGRG - next Generation Research Group
- Working Groups (with related Task Groups, if any)
 - WG1 - Use Cases and Overall Architecture Workgroup
 - WG2 - Non-Real-time RIC and A1 Interface Workgroup
 - WG3 - Near-Real-time RIC and E2 Interface Workgroup
 - WG4 - Open Fronthaul Interfaces Workgroup
 - WG5 - Open F1/W1/E1/X2/Xn Interface Workgroup
 - WG6 - Cloudification and Orchestration Workgroup
 - WG7 - White-box Hardware Workgroup
 - WG8 - Stack Reference Design Workgroup
 - WG9 - Open X-haul Transport Workgroup
 - WG10 - OAM for O-RAN
 - WG11 - Security Work Group
- Focus Groups
 - OSFG - Open Source Focus Group
 - SDFG - Standard Development Focus Group
 - TIFG - Test & Integration Focus Group
- O-RAN Software Community
- PlugFests

- O-RAN Overall Architecture



■ O-RAN Logical Architecture



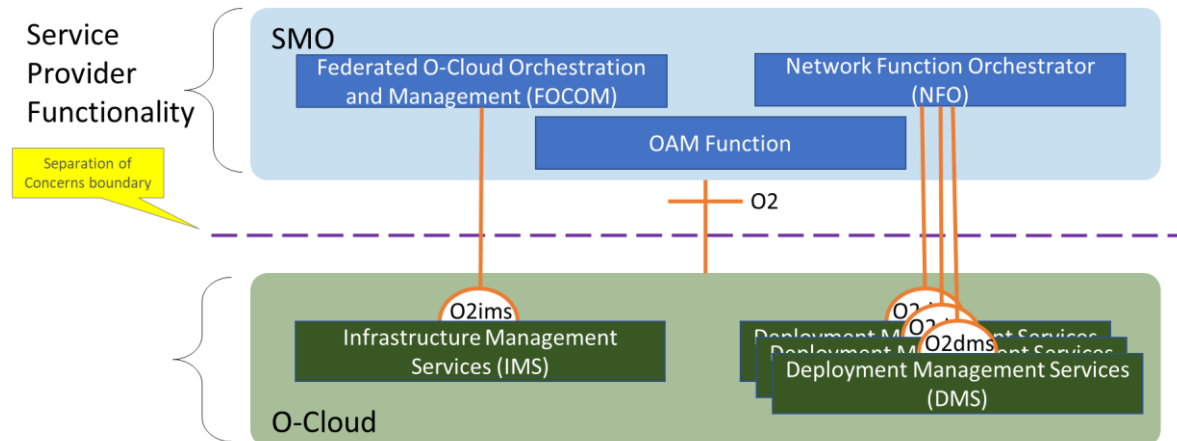
- **WG6 Scope and Goals:**
 - WG6 addresses Cloudification and Orchestration in O-RAN which allows the flexibility of deploying multiple software implementations from different software vendors on a common platform
 - Identify use cases that will demonstrate the benefits of h/w and s/w decoupling of all O-RAN elements (including RIC, O-CU, O-DU, O-RU)
 - Develop requirements and reference designs for the cloud platform including the NFVI (infrastructure), VIM (container/VM orchestration), and Accelerator Abstraction layers
 - WG6's orchestration charter is to support O-RAN's disaggregation mission by developing lifecycle flows and commonality of O2 APIs between the SMO and the O-Cloud

- WG6 Sub Teams:

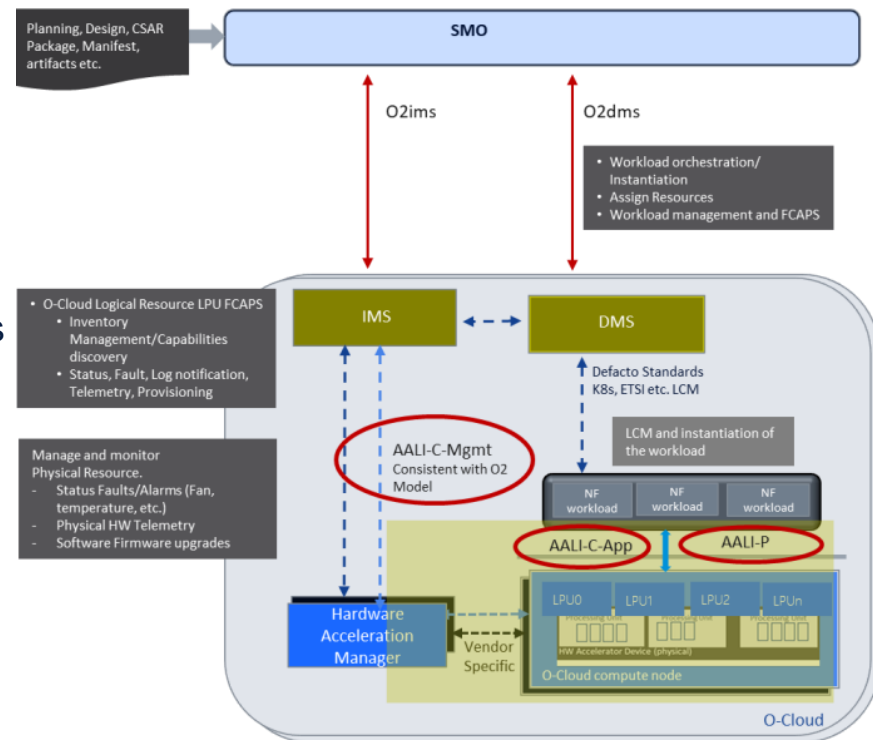
WG6 Sub-Team	Description & Sub-team link
O2 IMS Provisioning Sub-team	Develops O2 IMS Provisioning work items: O2 IMS Provisioning Team
O2 IMS Fault Sub-team	Develops O2 IMS Fault work items: O2 IMS Fault Team
O2 IMS Performance Sub-team	Develops O2 IMS Performance work items: O2 IMS Performance Team
O2 DMS K8s Profile Sub-team	Develops O2 DMS LCM Profile for K8s: O2 DMS K8s Profile Team
O2 DMS NFV Profile Sub-team	Develops O2 DMS LCM Profile for NFV: O2 DMS ETSI NFV Profile Team
Networking and Network Slicing Sub-team	Networking & Network Slicing for WG6
Energy Savings Sub-team	Cloud-based Energy Savings related to WG1 UCTG Energy Savings
Cloud Testing Sub-team	Testing and Integration for Cloud infrastructure
Resource Optimization Sub-team	Resource Optimization use case and development
Acceleration Abstraction Layer (AAL) Sub-team	Develops Cloud Management & Operations specifications for acceleration functions.
Common Application LCM Sub-team	Deployment-related requirements for common application package

■ O2 Interface:

- The O2 interface is an open logical interface within O-RAN architecture providing secured communication between the Service Management and Orchestration (SMO) and O-Cloud
- It enables the management of O-Cloud infrastructures (by IMS) and the deployment and other lifecycle management (LCM) of O-RAN NFs (by DMS)
- This interface enables a multi-vendor environment and is independent of specific implementations of the SMO and O-Cloud

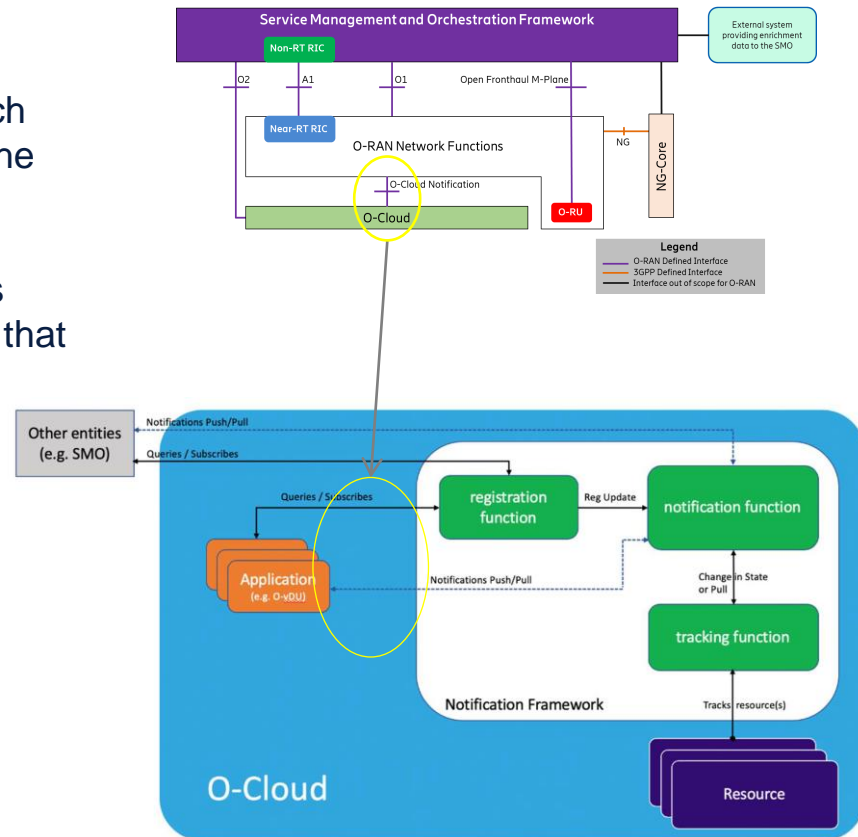


- AAL Acceleration Abstraction Layer Interface:**
 - AALI-C-Mgmt** - Common administrative operations/actions/events from the Accelerator Manager toward the O-Cloud Infrastructure Management Service
 - AALI-C-App** - Common operations/actions/events toward RAN AAL Application
 - AALI-P** - A set of AAL profile specific APIs which is specific to each defined AAL profile



■ O-Cloud Notification API:

- This API allows Event Consumers (EC) such as a workload to subscribe to events/status from the O-Cloud
- The cloud infrastructure provides Event Producers (EP) to enable workloads to receive events/status that might be known only to the infrastructure
- Currently used for events related to time synchronization state (e.g PTP)



Note: The diagram shows the interaction and functionally from a logical perspective only but not where these functions reside or how they are implemented

- CADS (Cloud Architecture and Deployment Scenarios for O-RAN Virtualized RAN)
 - High-level description of O-Cloud objectives
 - These objectives are defined in a great details in other specification documents
- Cloud REF (Cloud Platform Reference Designs)
 - This document provides a references to implementation
 - This document is expected to be re-arranged by WG6
- O2 GA&P (O2 General Aspects and Principles Specification)
 - Defines the O2 interface terminology, capabilities and general requirements (e.g. fault management concept)
- ORCH Use Cases (Orchestration Use Cases and Requirements for O-RAN Virtualized RAN)
 - Provides use cases related to Network Function, O-Cloud, SMO and Near-RT RIC
 - Every use case includes traceability to its requirements

- O2 IMS (Infrastructure Management Services) INTERFACE
 - This document defines O-RAN O-Cloud IMS interface functions and protocols for the O-RAN O2 interface
- Alternative DMS (Deployment Management Services) profiles
 - O2 DMS INTERFACE ETSI-NFV PROFILE
 - A set of concepts and orchestration aspects related to O-RAN NF Deployments
 - Specifies protocols and data models for the O2dms interface by profiling ETSI NFV specifications
 - O2 DMS INTERFACE K8S PROFILE
 - This document deals with containerized workload lifecycle management services offered over the O2dms interface by profiling Kubernetes APIs
- O-Cloud Notification API
 - REST API that allows Event Consumers (EC) such as a vO-DU to subscribe to events/status from the O-Cloud

- **AAL GAnP**
 - Defines the supported architecture
 - Defines the capabilities and requirements of the acceleration abstraction layer interface
 - Defines the capabilities and requirements of the HW Accelerator Manager
- **AAL Common-API**
 - The AAL interface defines the AALI-C and AALI-P
 - AALI-C: A profile independent set of functions between application(s) and underlying AAL implementation(s) including management and orchestration within an O-Cloud platform
 - AALI-P: A set of profile specific interfaces dependent upon the profile selected e.g., FEC
- **AAL HI-PHY**
 - Focuses on the Acceleration Abstraction Layer for the AAL_DOWNLINK_High-PHY and AAL_UPLINK_High-PHY Profiles
- **AAL FEC**
 - This document details the AAL specification consisting of the description of the interface, information models and requirements to implement an AALi, for the AAL_PUSCH_FEC and AAL_PDSCH_FEC Profiles



Thank you!