Integration of O-RAN into 3GPP management System

Samsung, AT&T, Verizon, KDDI

Background

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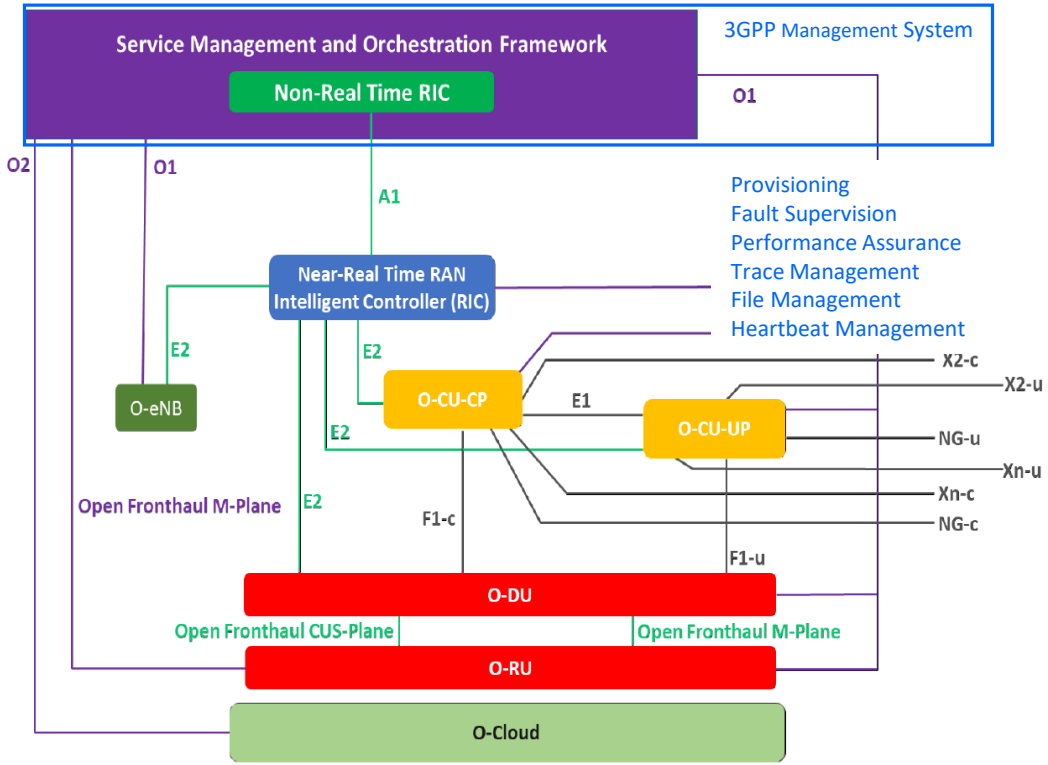
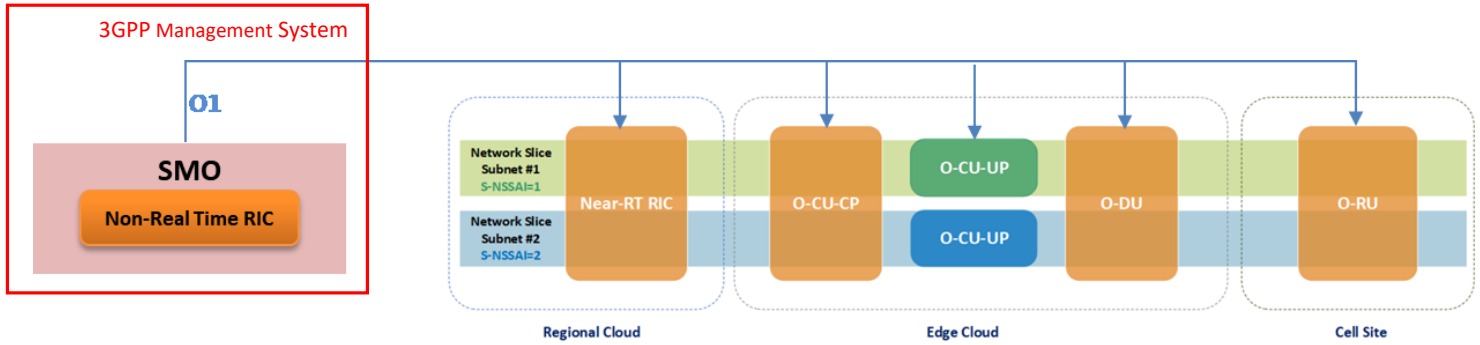
State-of-art

- Operators expect compliance with 3GPP from O-RAN implementations.
  - A 3GPP compliant SMO shall be able to manage O-RAN components in a standardized way.
- O-RAN intends to uses 3GPP Management Services for management of O-RAN components (Near-RT-RIC, O-CU-CP/UP, O-RU/DU, O-eNB). However, gaps exists in 3GPP specification to fulfil all O-RAN requirements.
- O-RAN slice management is done using the network slice subnet provisioning procedures defined in 3GPP SA5 TS 28.531



3GPP Defined Management Services to be used at O1

- Generic Provisioning (28.532)
- Performance Assurance (28.550)
- Fault Supervision (28.545, 28.532)
- Trace, File and Heartbeat Management (28.532)



Enhancements required in 3GPP specifications

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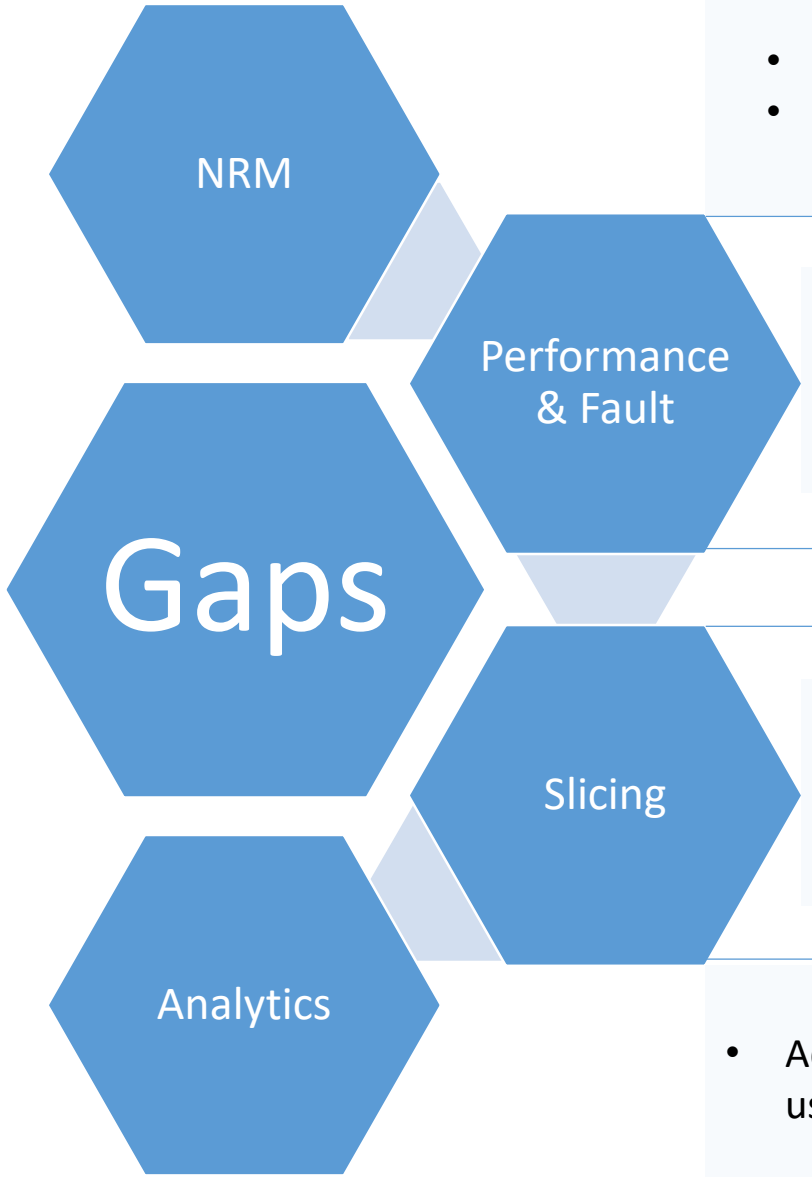

		Affected 3GPP Spec
NRM	• Missing NRM for Near-RT RIC and O-RU • RU/DU split support	3GPP TS 28.541
Performance & Fault	• New measurements: Near-RT RIC and O-DU/RU • Updated measurement: gNB-CU-CP, gNB-CU-UP and gNB-DU. • Enhanced Alarm Source info (Area, Site, DUid, CUid etc.) as part of AlarmInformation.	3GPP TS 28.552, 28.554, 28.532
Slicing	• O-NSSI Priority, Reservation and Feasibility check	3GPP TS 28.531
Analytics	• Additional MDAS Analytics report supporting O-RAN AI/ML based use cases.	3GPP TS 28.108

Rel-18 Study Objectives

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- **A new Rel-18 Study Item to be proposed in 3GPP SA5 with the following objectives**
  - Study the requirements to update NR NRM to support O-RAN modelling requirements (e.g. Near-RT RIC)
  - Study the possibility for 3GPP NR NRM to support O-RU/DU split
  - Study the O-RAN specific performance assurance enhancements.
    - Additional measurements need to be defined which are to be exposed by O-RAN components.
  - Study the O-RAN specific fault supervision enhancements.
    - An RAN alarm should include enhanced alarm source information (Area, Site, DUid, Cuid, EMS, Auxiliary port etc.) augmented by FS MnS consumer before re-expose it to the consumer.
  - Study the O-RAN specific slice management enhancements
    - O-RAN slice subnet priority, reservation and feasibility check.
  - Study the requirements to provide analytics capabilities to Non-RT RIC through MDAS.
    - This is to study the AI/ML related use cases where MDAS can complement O-RAN.
    - Role of “ML Training Host” and/or “ML Inference Host” can be played by “MDAS_producer”.

For Endorsement

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- **The WG5 is requested to have a Rel-18 work item with the Objectives provided in Slide 4.**

ANNEX

ORAN Provisioning

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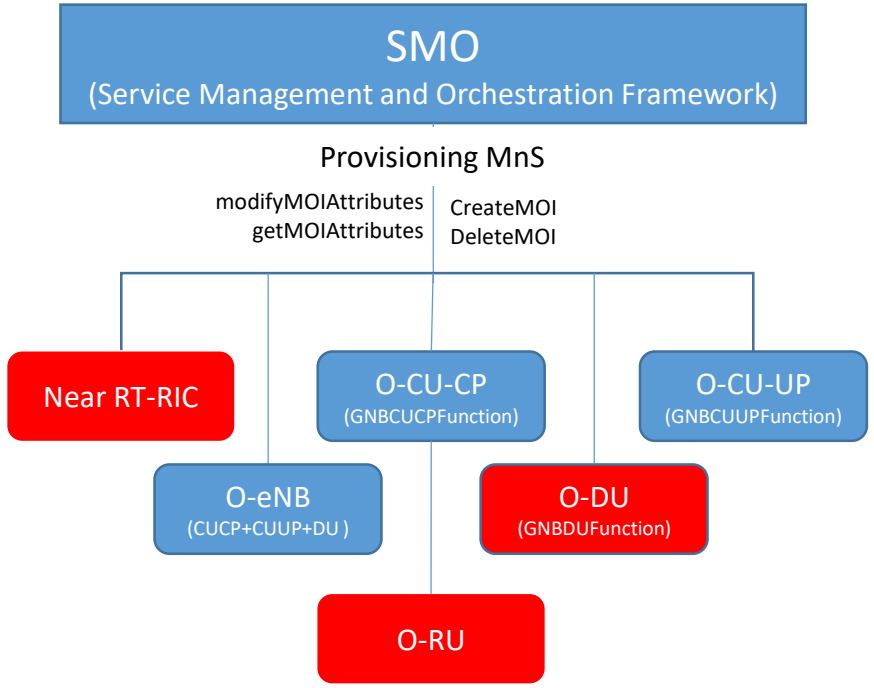
- The provisioning (LCM + Configuration) of O-RAN ME (CU-CP, CU-UP, Near RT-RIC, RU and DU) is done by 3GPP Provisioning MnS. The provisioning MnS acts on NRM (in this case NR NRM), which is a prerequisite for anything to be managed by Provisioning MnS.

- Gaps Identified in 3GPP
  - Missing NRM definitions
    - Near RT-RIC
    - O-RU
    - O-DU (implied RU-DU split)



ORAN Performance Management

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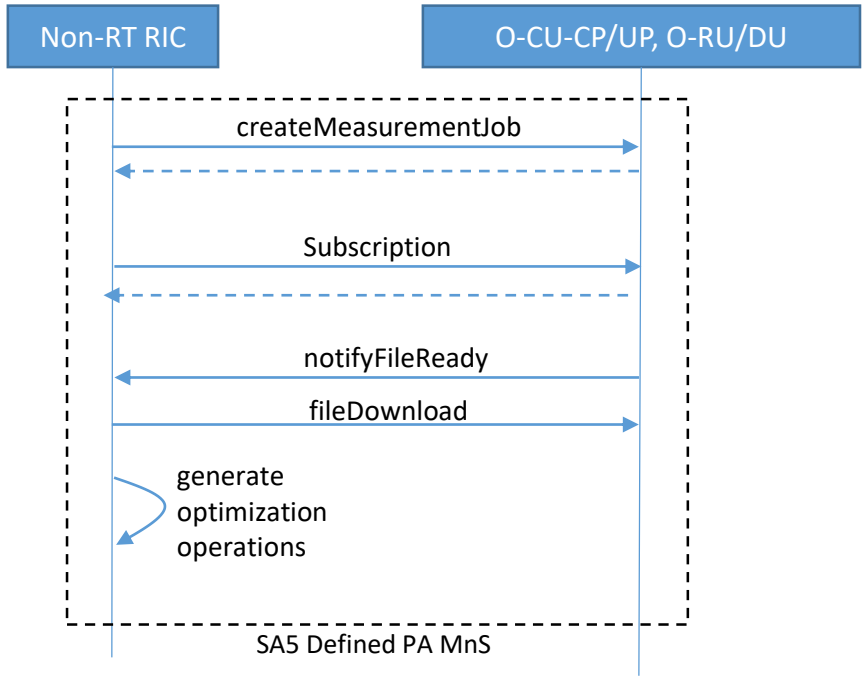
- Non-RT RIC uses the PA MnS defined in 3GPP to collect measurement data from O-RAN Managed Element (ME). Non-RT RIC acts an MnS consumer, requesting measurements, and individual ORAN ME acts as MnS Producer, producing required measurements.
- The work on defining performance measurements is on-going in ORAN WG5.
- Gaps Identified in 3GPP
  - New measurements to be defined for
    - Near-RT RIC
    - O-DU/RU
  - Update the measurements defined for gNB-CU and gNB-DU with the new KPM requirements for O-CU and O-DU respectively.



ORAN Fault Management

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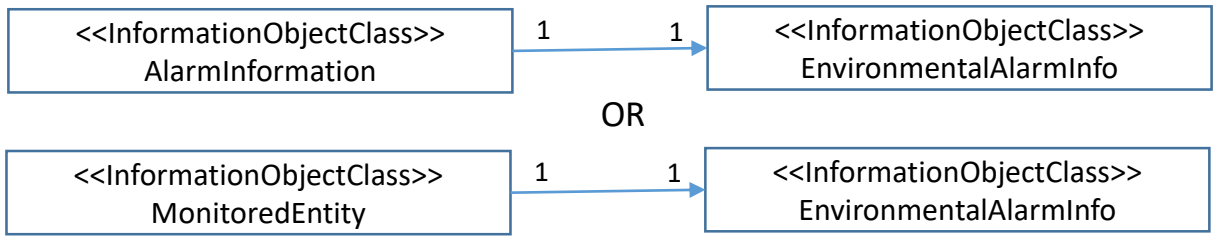
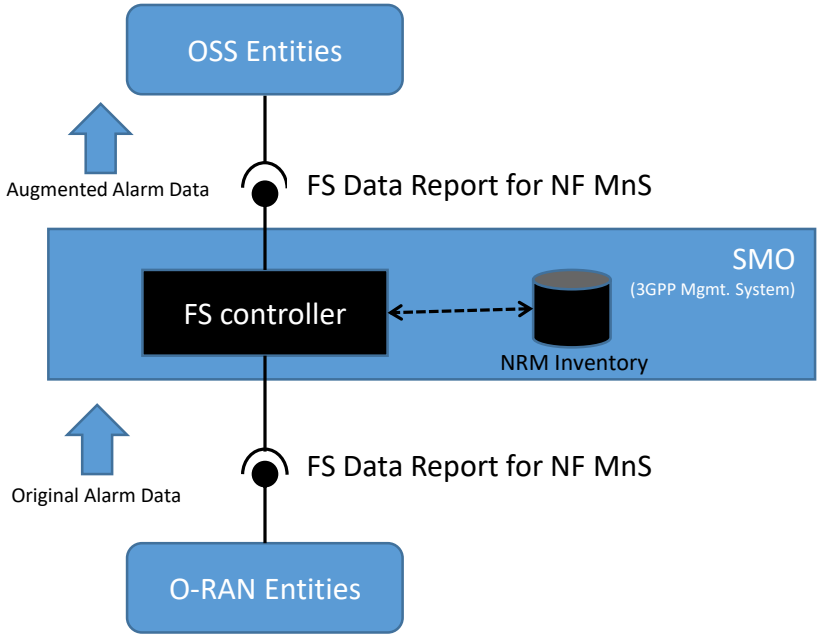
- O-RAN requires detailed alarm source information for any alarm report (AlarmInformation wrt. to 28.532) reported by O-RAN entities. The SMO must add additional information to any alarm from any O-RAN entities, since they usually are unware of their own environment information e.g such as site id, human friendly site name, area id which it belongs to, EMS host via which operators can manage it.

- Gaps Identified in 3GPP
  - AlarmInformation IOC need to be extended with additional attribute related with the environment of source O-RAN entity. The environmental attributes can be modelled as part of separate IOC in association relationship with AlarmInformation IOC or monitoredEntity IOC





ORAN Slicing

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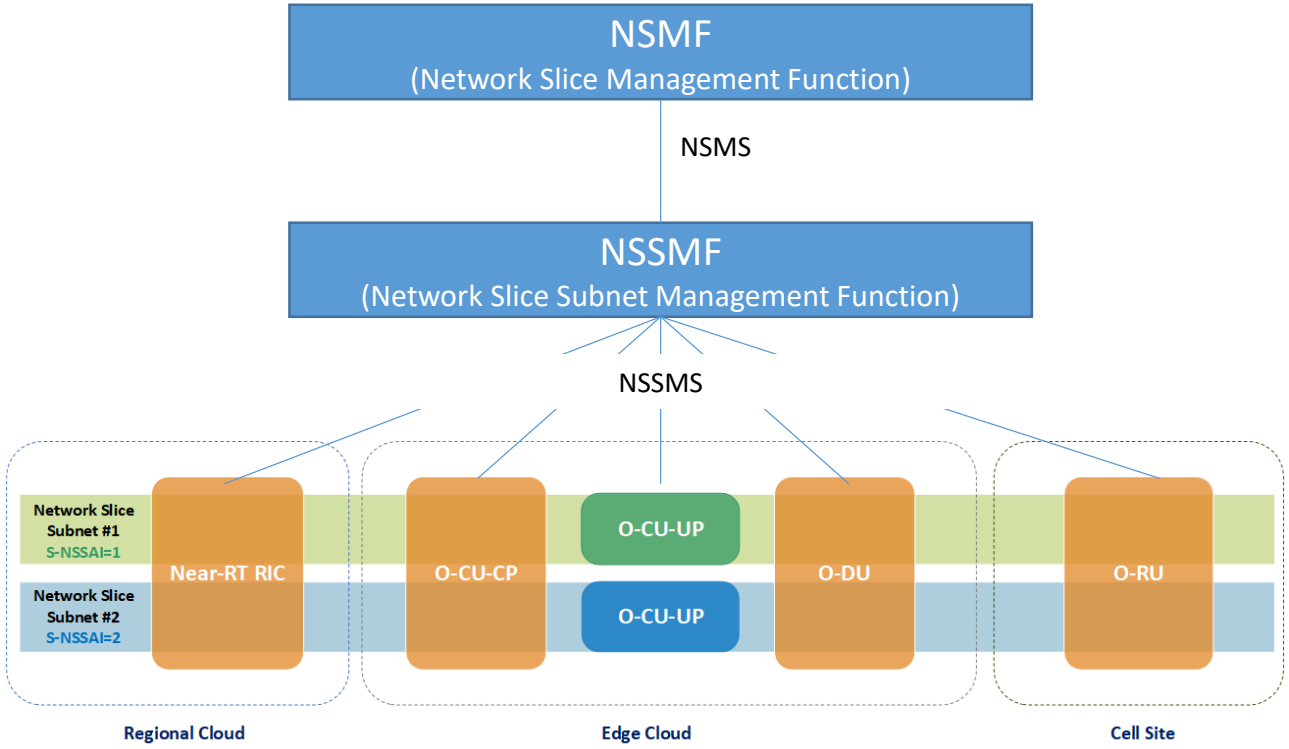
- O-RAN slicing uses the Provisioning for NSSI management service defined in 3GPP TS 28.531 to manage the O-RAN slice i.e RAN Slice Subnet. The procedure include O-RAN slice subnet creation, activation, modification, deactivation, termination etc.
- Gaps Identified in 3GPP
  - O-NSSI priority
  - O-RAN slice subnet reservation
  - O-RAN slice subnet feasibility check (the method to request the feasibility check to be stanadized)



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O-RAN Analytics

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- Study the feasibility to use MDAS for analytics in O-RAN deployments.

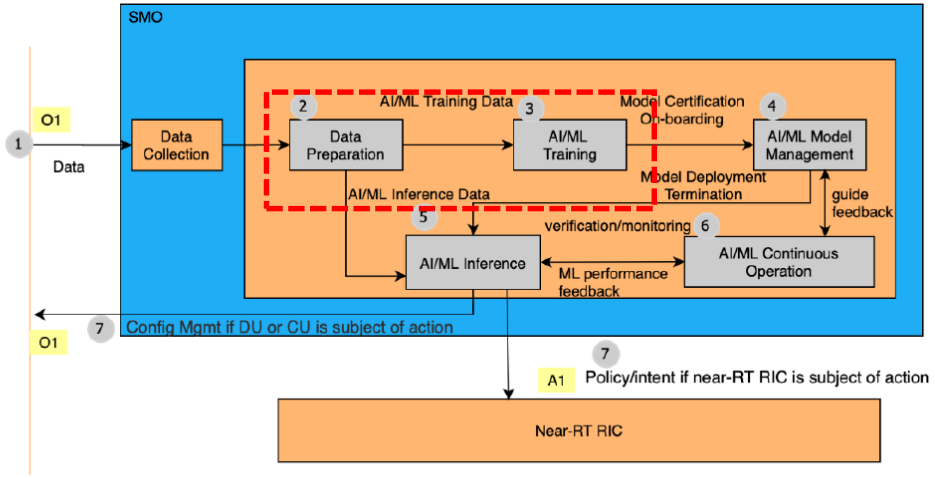

Figure 5-1 - Deployment scenario 1.1 -– AI/ML training and inference host locations

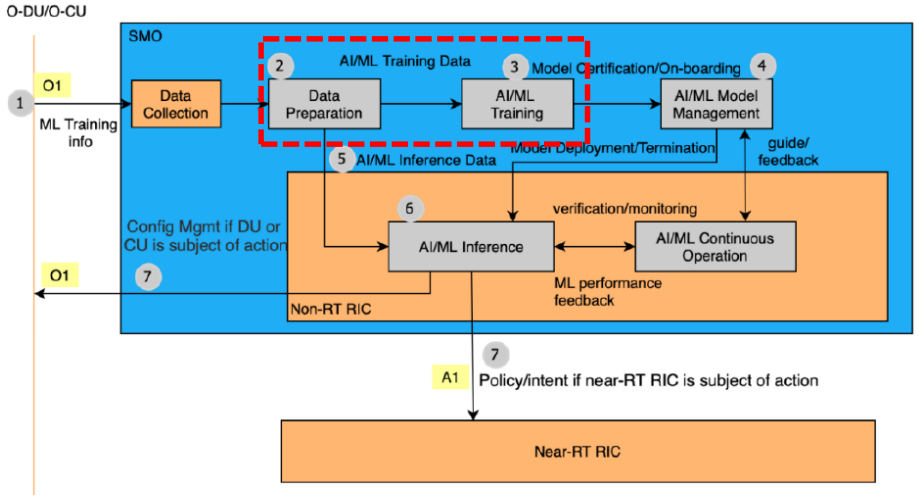

Figure 5-3 Deployment scenario 1.3 - AI/ML training and inference host locations

- MDAS can be used to provide ML Data Preparation and AI/ML Training functionality in O-RAN deployments.
- MDAS analytics report can be used to create ML Model to be deployed at ML Inference host.

Gap Identified

- MDAS analytics output need to be enhanced to support O-RAN's AI/ML related use cases.

MDAS