

ONAP and O-RAN SC

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Summary & Objective

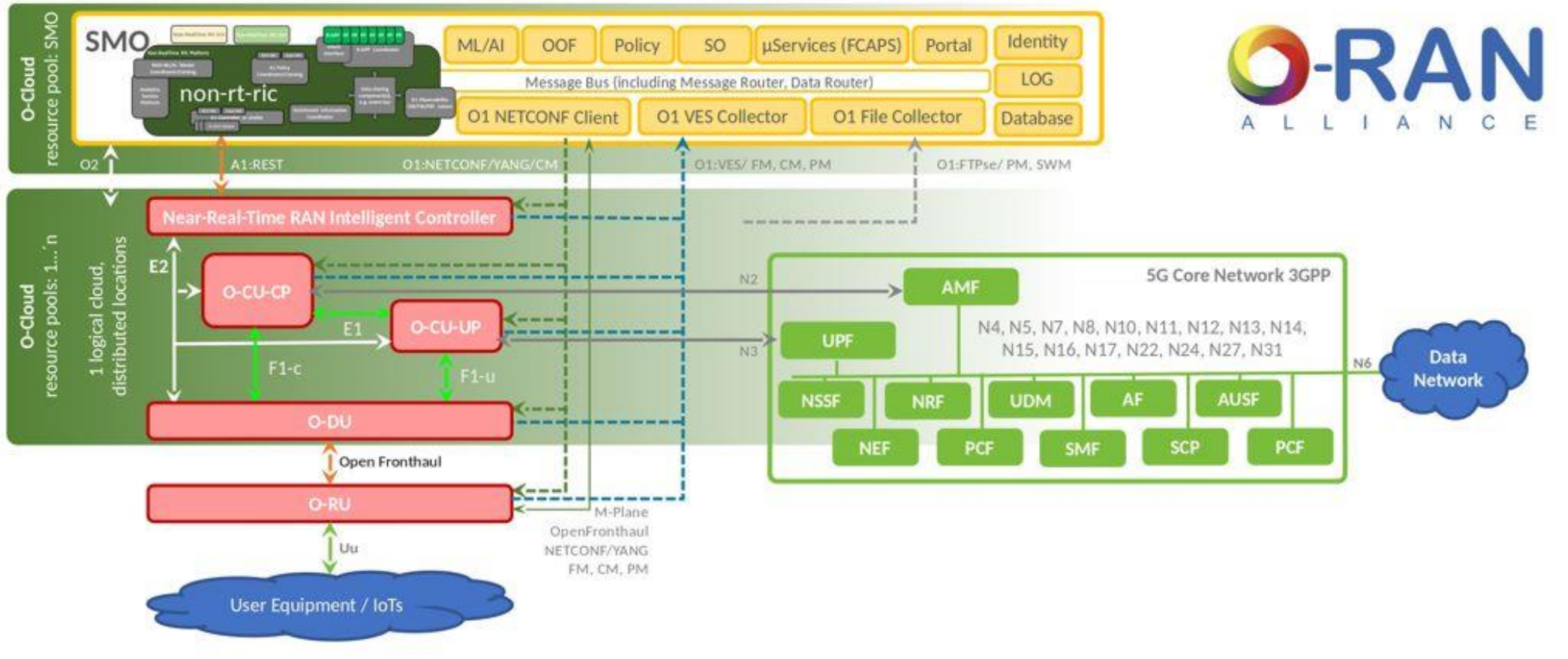
- O-RAN SC and ONAP have common areas of interest
- This is a good time to improve collaboration and synergy
- Objective of this presentation:
 - Provide a high-level overview
 - List common areas of interest
 - Highlight areas of ongoing good collaboration
 - Identify new areas with potential synergy
 - Discussion – priorities, next steps

O-RAN SC and ONAP

- O-RAN Software Community (OSC) (<https://o-ran-sc.org/>)
 - Part of Linux Foundation (LF)
 - The O-RAN Software Community (SC) is a collaboration between the O-RAN Alliance and Linux Foundation with the mission to support the creation of software for the Radio Access Network (RAN). The RAN is the next challenge for the open source community. The O-RAN SC plans to leverage other LF network projects, while addressing the challenges in performance, scale, and 3GPP alignment.
- ONAP (<https://www.onap.org/>)
 - Part of Linux Foundation (LF) and Linux Foundation Networking (LFN)
 - ONAP is a comprehensive platform for orchestration, management, and automation of network and edge computing services for network operators, cloud providers, and enterprises. Real-time, policy-driven orchestration and automation of physical and virtual network functions enables rapid automation of new services and complete lifecycle management critical for 5G and next-generation networks
- ONAP work is directly relevant to anything related to O-RAN SMO (Service Management and Orchestration)

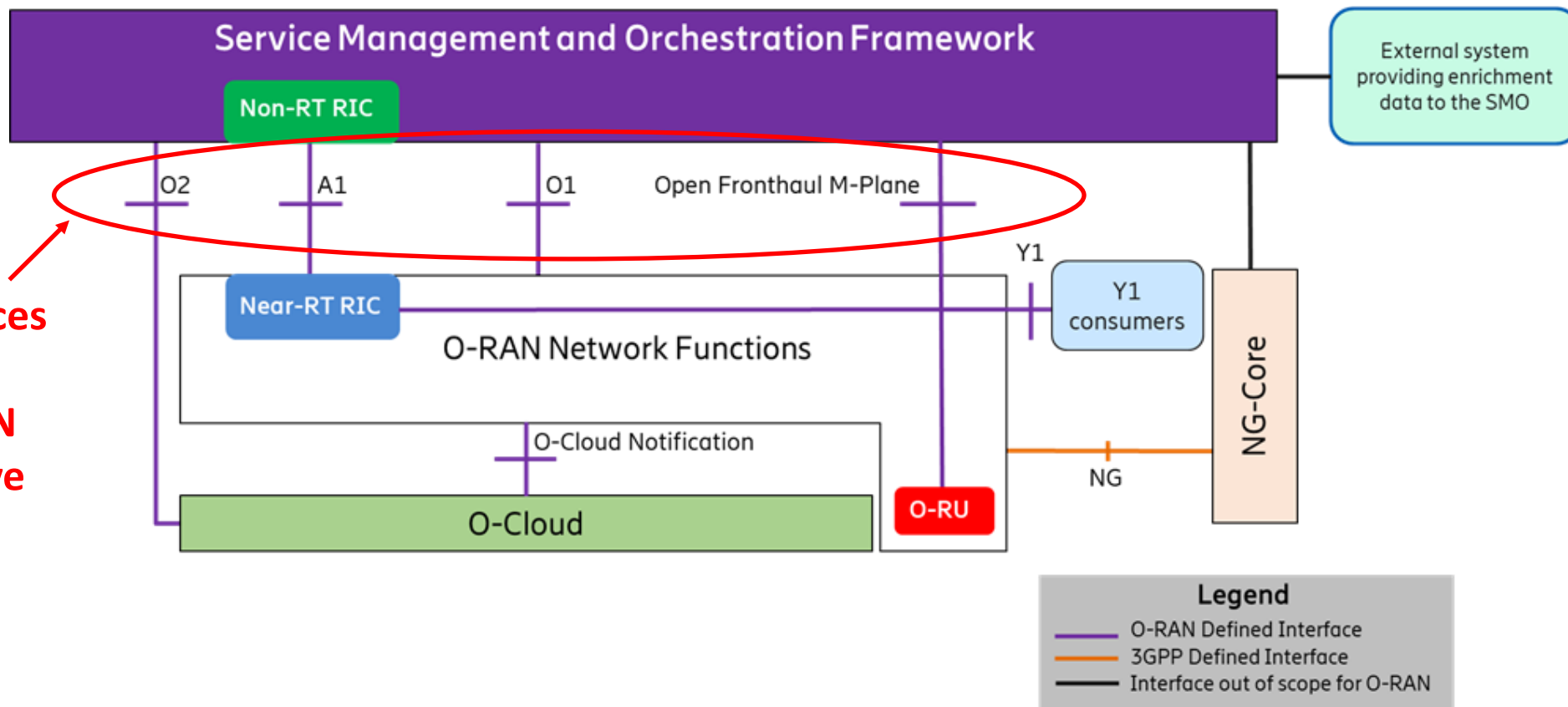
O-RAN SMO : Service Management and Orchestration

- Service Management and Orchestration functions of SMO have strong overlap with ONAP
- Operators are using ONAP components for SMO



- This figure is from early days of O-RAN (~2020/21) using ONAP concepts (e.g., DCAE, SO, Policy, OOF ..)
- Recently posted by Alex Choi in article about importance about SMO (around March 9, 2023)

(https://www.linkedin.com/posts/alex-jinsung-choi-48a8b61_oran-openran-oranalliance-activity-7039638269231263744-3Lqj?utm_source=share&utm_medium=member_desktop)

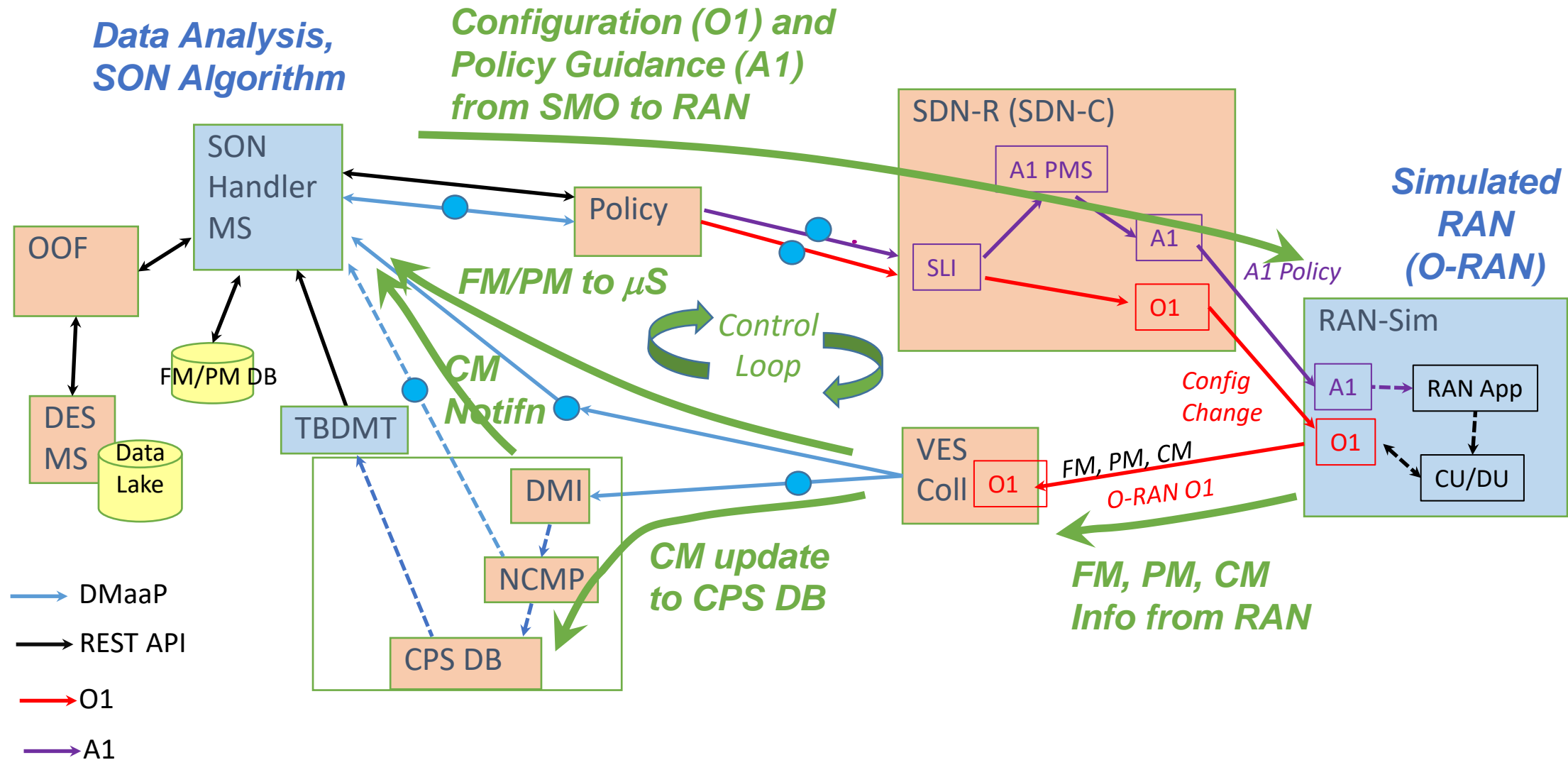


Southbound interfaces from SMO to RAN:

- Specified by O-RAN
- ONAP projects have goal to align with O-RAN specs

Figure 5.1-1: High Level Architecture of O-RAN (From O-RAN.WG1.OAD-R003-v08.00)

ONAP SON Use Case Example – Aligned to O-RAN O1 and A1



**O-RAN WG1 ATG
Decoupled SMO TR
will show separation
of SMO functionalities**

- **Ongoing work**
- **Service Based Architecture (SBA)**
- **SMO Functions (SMOF)**
- **SMO Services (SMOS)**
- **Relevant to ONAP and OSC design choices**

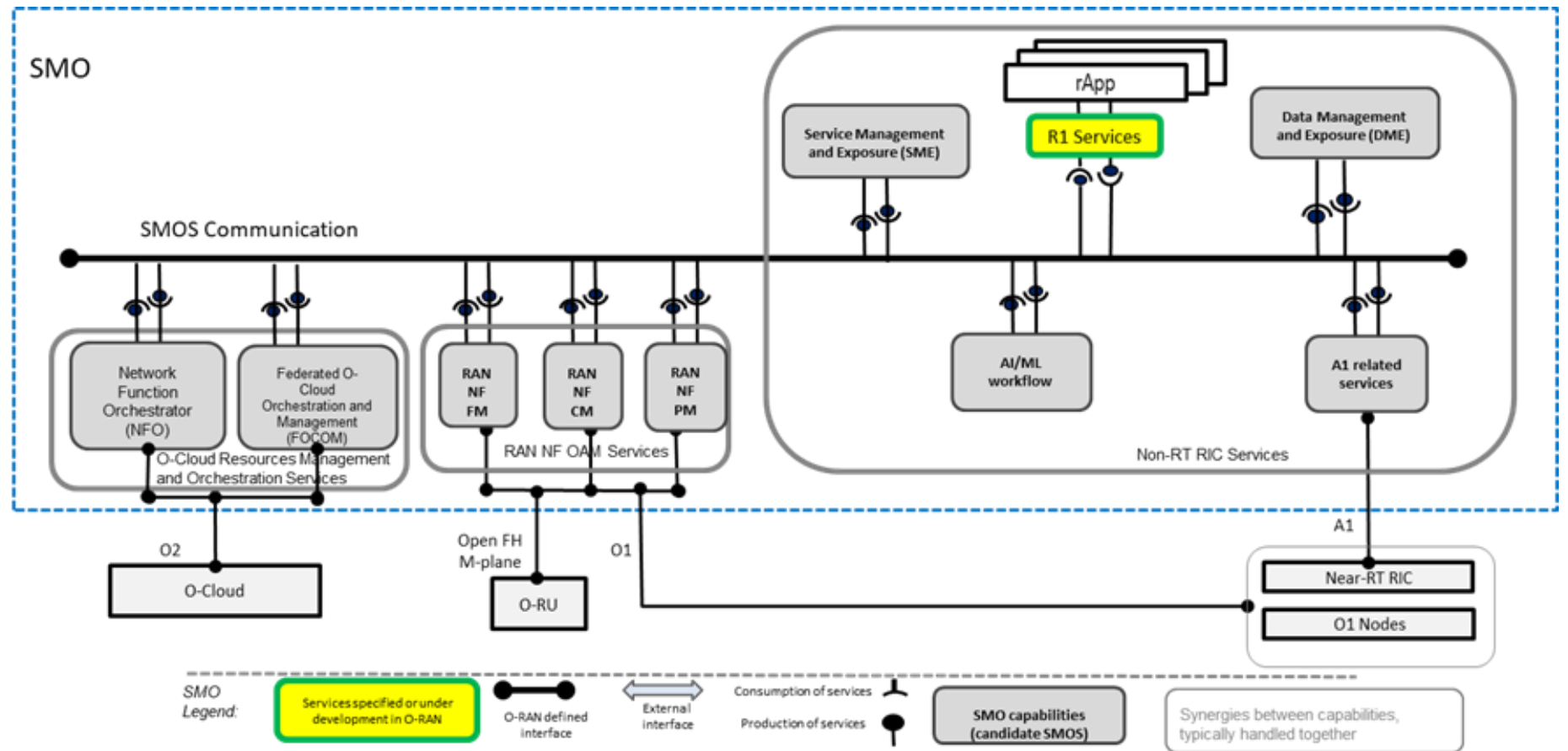


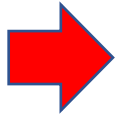
Figure 4.1-3: SBA representation of the documented SMO services in July 2022 specifications (From O-RAN WG1 Decouple SMO Architecture TR v01.00)

Editor's Note:

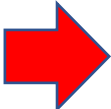
- 1) *The naming of the interfaces is to be further analyzed and refined in section 5 and 6.*
- 2) *The figure needs to be reviewed with WG2 for non-RT RIC architecture part, so it might be further updated if needed, as per latest agreed version with WG2.*
- 3) *Though the figure does not explicitly illustrate, an objective would be to represent a common set of possible abstracted SMOSs' across SMOFs. For example, it would be desirable to represent a common set of SMOSs for FM to query and acknowledge Faults, as well as an associated common information model for fault LCM, irrespective of whether that Fault originates in the O-Cloud Resources Management and Orchestration Services SMOF or the RAN NF OAM Services SMOF.*

ONAP/OSC Harmonization

- Ongoing effort among group of stakeholders seeking to find synergies
- Good collaboration - especially for o1/ofh-mp, oam, sim, non-rt-ric, a1
- Weekly calls: Wed 12 noon ET
- Approach:
 - Share information, review status, seek synergy
 - Avoid duplicate effort, re-use code, use one repo when possible
 - Stay flexible and accommodate variations of modules
- New areas are coming up: O2, R1, intra-SMO interfaces, AI/ML ...
- Harmonization effort has largely been from ONAP side to work with OSC
- **Good time to review and establish joint objectives! (ONAP TSC, OSC TOC)**
- **Operators interested in O-RAN are using ONAP components**
- **Objective today: Review and find/prioritize common areas of interest**

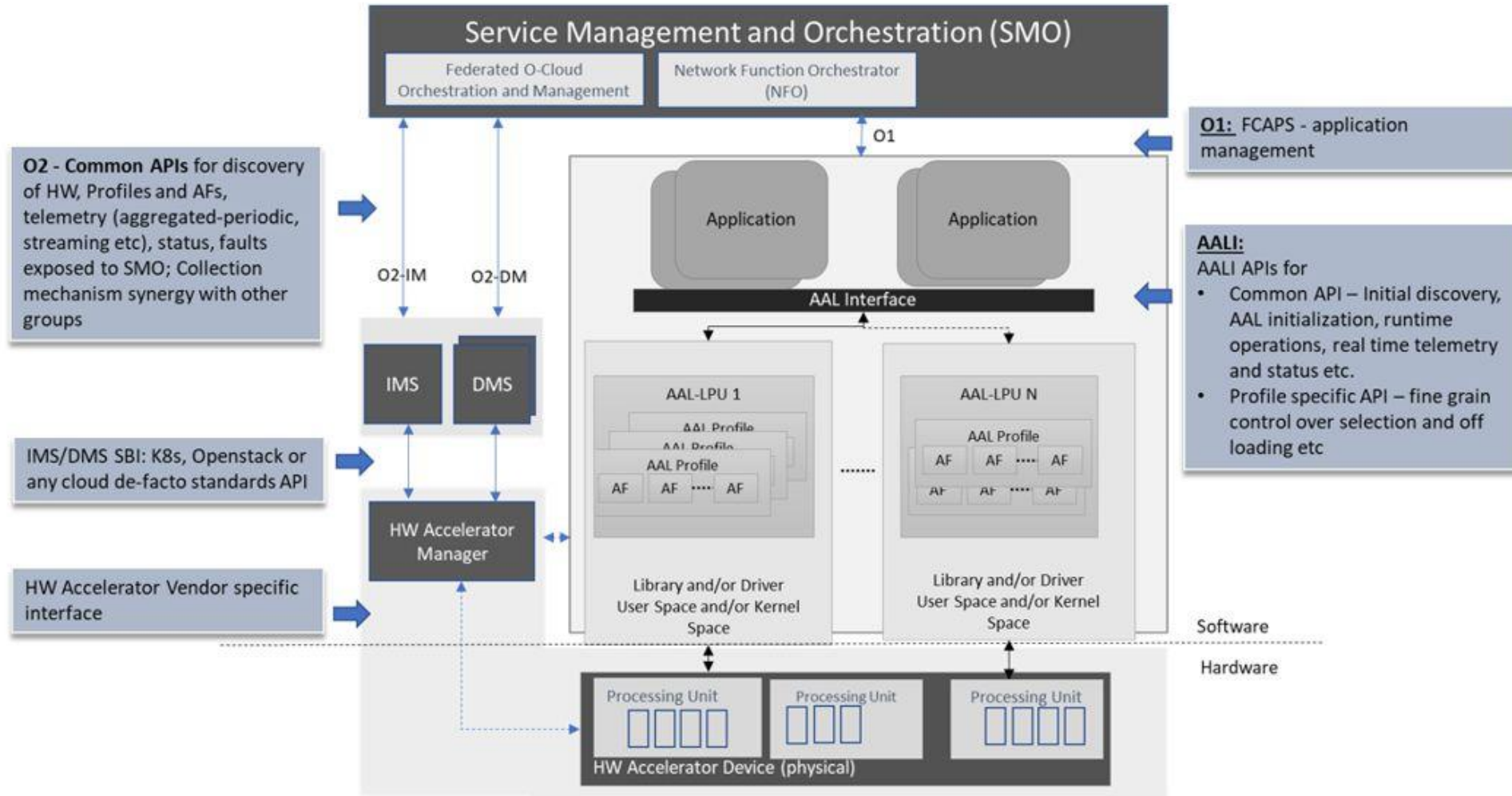


Common ONAP/OSC areas – O1 and A1

- O1 / OFH-MP interfaces (RAN NF OAM SMOF and SMOS) -> WG10, WG4
 - Good ongoing ONAP/OSC harmonization and collaboration since early days
 - CU/DU/RU yang model development and refinement
 - Strong support in OSC sim and ONAP RAN-Sim simulators
 - O1 FM/PM/CM development and refinement
 - ONAP use cases: Control loops, 5G SON, Network Slicing etc.
 - Feedback to O-RAN WGs
 - Would be helpful to make release timelines and versions better aligned.
 - A1 interface (non-rt-ric – related SMOF/SMOS) -> WG2, WG10
 - Good ongoing ONAP/OSC harmonization and collaboration since early days
 - SDN-R/CCSDK to A1-Termination
 - ONAP projects exploring rApp and control loop designs – 5G SON use case, rAppification etc.
 - ONAP RAN-Sim extended to provide ran-app abstraction and A1 Termination
-  • We can build on existing collaboration model

Common ONAP/OSC areas – O2

- O-Cloud/NF orchestration and management is relatively new area for open source
- NEW AREA • O2-ims (O-RAN FOCOM-related SMOF/SMOS) -> WG6
 - Cloud domain orchestration and management
 - ONAP multi-VIM
- NEW AREA • O2-dms (O-RAN NFO-related SMOF/SMOS) -> WG6
 - NF orchestration and management
 - O-RAN WG6 has ETSI and K8s profiles
 - ONAP NF orchestration and management more relevant for K8s (ASD) profile ?
- **Very timely area for harmonization of open-source efforts**
- Worthwhile to also consider synergy/sharing with other projects
 - Nephio (LF), O-RAN OSFG, ... ??
- Choose use cases needing co-ordination across O2-ims/O2-dms/O1
- Contribute to WG1/6/10 re. interaction between FOCOM, NFO, RAN NF OAM



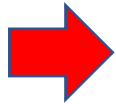
Acceleration Adaptation Layer High Level Architecture from O-RAN WG6 Specification

Common ONAP/OSC areas – Non-RT RIC

- rApp, Applications, R1 interface: → WG2 (WG10, app mgmnt, WG1)
 - ONAP use cases for applications which manage RAN – (pre-rApp, pre-R1)
 - Good amount of work in OSC
 - Already reusing ONAP functions as part of rApp management/LCM
- **NEW AREA** “rAppification” - Ongoing effort to leverage ONAP control loops, Policy, microservices, use cases, and **align with O-RAN R1 interface**
- SMO Policy Functions -> WG2 (WG10, app mgmnt, WG1)
 - ONAP has a Policy Enforcement Function to provide policy-based co-ordination across applications and interfaces
- **NEW AREA** No clear placeholder in current O-RAN SMO architecture or OSC
 - rApp might use multiple SMO services
 - rApp might contains Policies (ref work in ONAP ACM / App manager)
 - Should co-ordination across rApps and interfaces be an SMO capability?

Common ONAP/OSC areas – Intra-SMO, Northbound

- Several integral ONAP components are “intra SMO” or “northbound/external”
 - Service management, orchestration, data handling, LCM etc. – part of ONAP charter
 - End-to-end implementation can highlight design/scalability/operational issues
 - Can be relevant to SMO southbound interfaces – e.g., modelling
 - **Key takeaway: Consider reusing existing work when use cases grow to new areas**
- Service Orchestration, Service Design, Data Handling (SO, SDC, DCAE)
 - Higher level than Cloud Orchestration and NF Orchestration
 - Creation and orchestration of *SMO Services* as well as *End-to-end Services* which need to be instantiated to implement a use case
- Inventory (resources, models, connections), Configuration database
 - ONAP has A&AI for resource/NF/service inventory and CPS DB for NF configuration
 - e.g., CPS DB using O-RAN yang model for CU, DU, RU config
- Northbound interfaces (Portal etc)
 - Intent-based networking



**NEW
AREA**

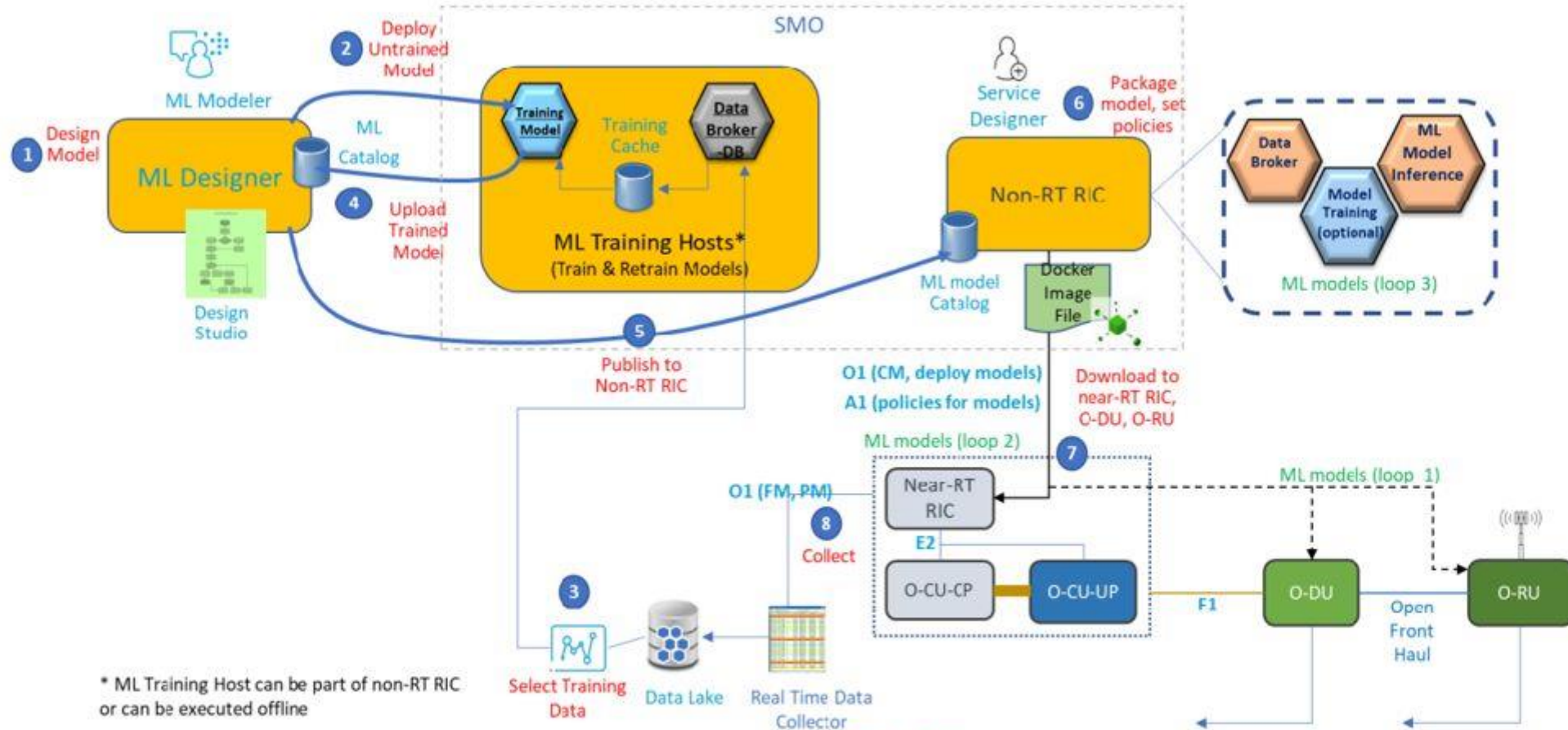
**NEW
AREA**

Common ONAP/OSC areas – Overall

- AI/ML → WG2
 - Previous AI/ML work is generic without specific role for Non-RT and Near-RT RIC.
 - Implications on implementation choices for rApp, database, data exposure etc.
- SMO Architectural choices -> WG1
 - Consider SMO Functions/SMO Services approach in implementations
 - Provide feedback to WG1 – promote efficient approaches
 - Design choices can enhance relevance of open-source efforts to industry
- End-to-end use cases -> WG1, OSC
 - Consider choosing common use cases in OSC and ONAP
 - Consider end-to-end use cases which highlight inter-operability interfaces
- Security → WG11
 - Share/use best practices - interfaces, design, system implementation, code design etc
 - Success example: Sharing of best practice for logging from ONAP to O-RAN WG11
- Simulation -> OSC
 - Ongoing effort to leverage/harmonize work in OSC sim and ONAP RAN-Sim etc.
 - OSC oriented towards CU/DU functions, ONAP oriented towards use case

NEW
AREA

NEW
AREA



* ML Training Host can be part of non-RT RIC or can be executed offline



ML model lifecycle (an implementation example)