

Non-RealTime RIC in O-RAN Software Community

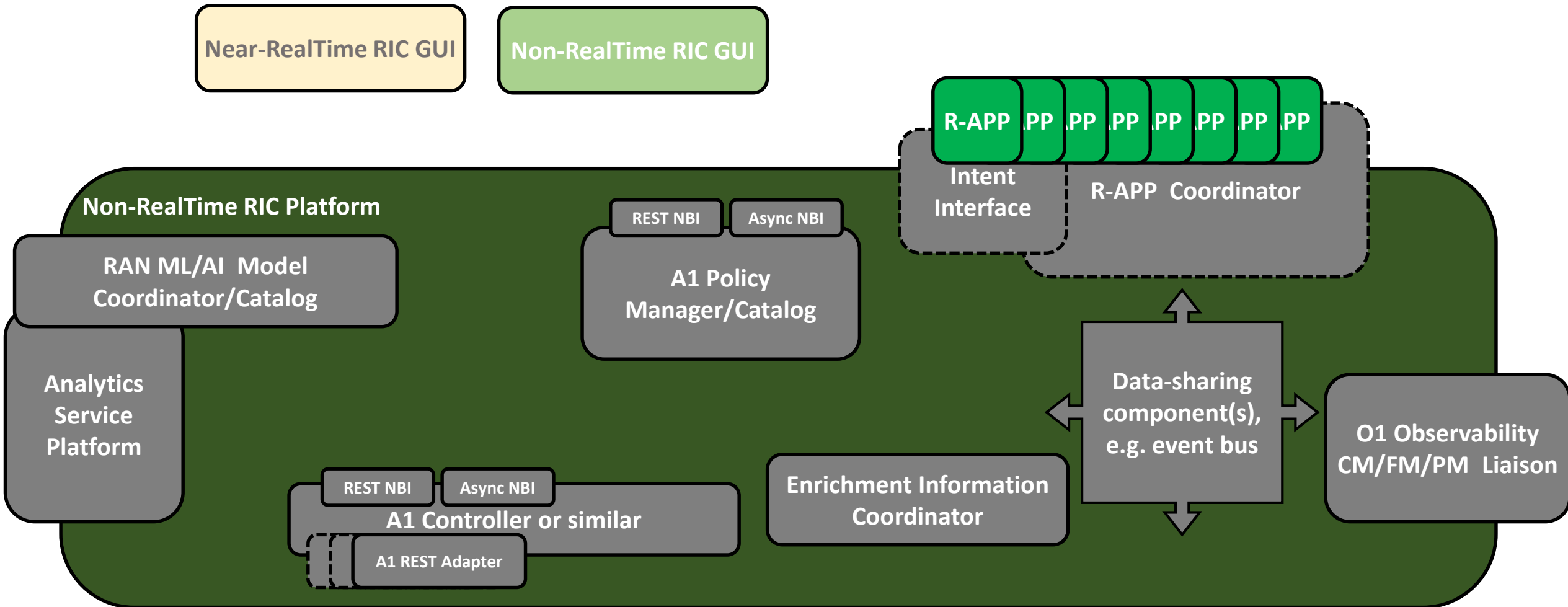
OSC Non-RealTime RIC project (NONRTRIC)

Demo functionality from “Amber +” release (Feb 2020)

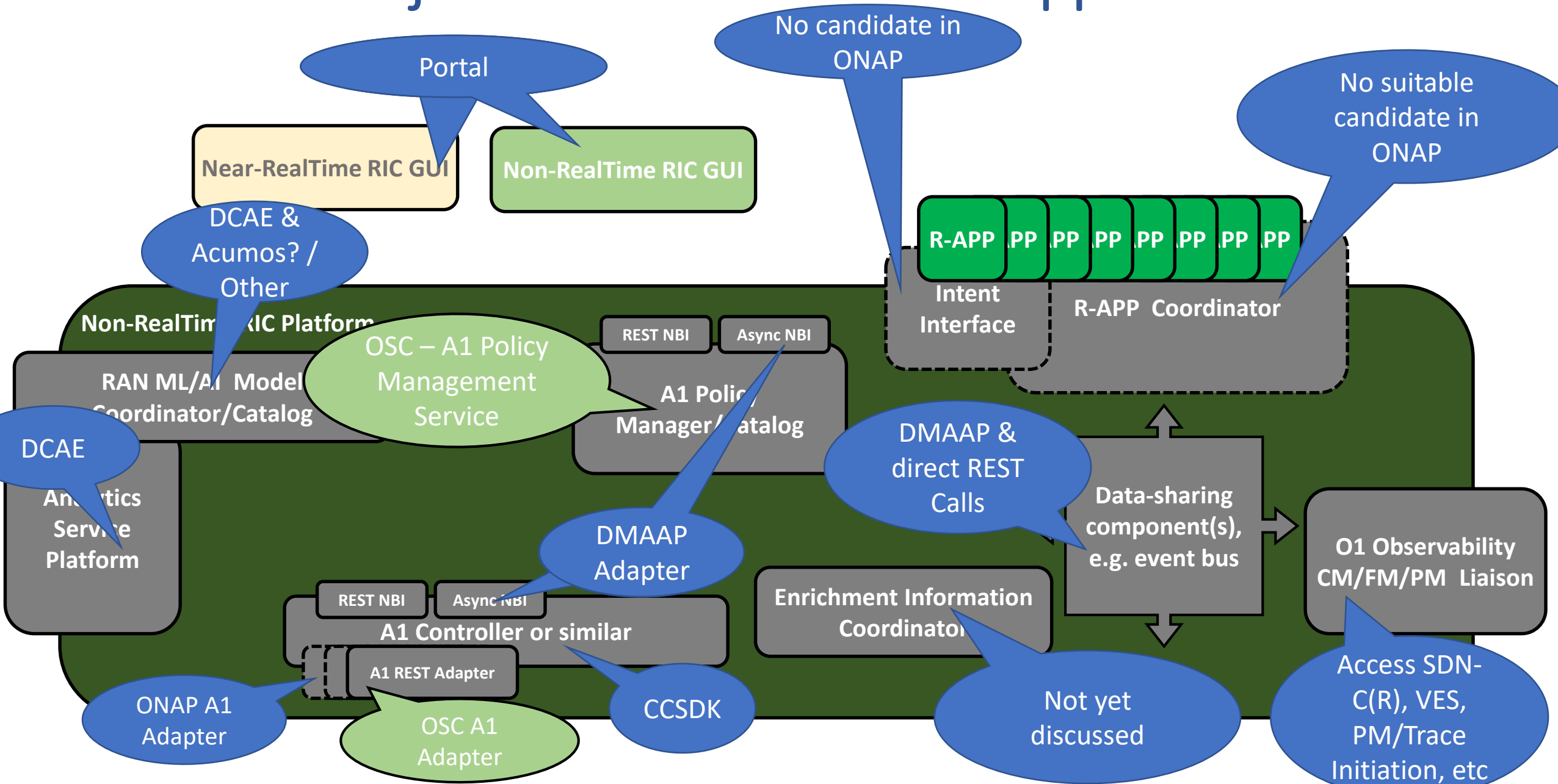
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05 March 2020

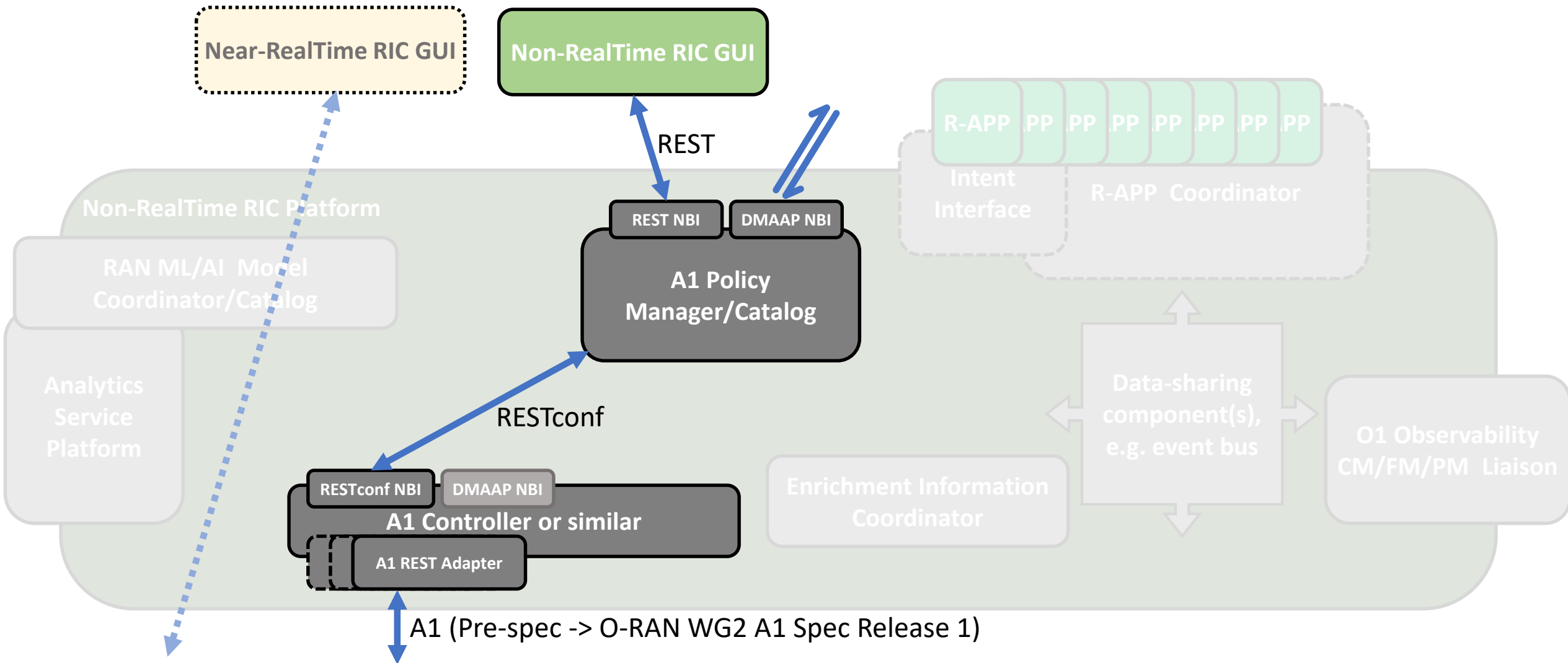
NONRTRIC Project – Functions



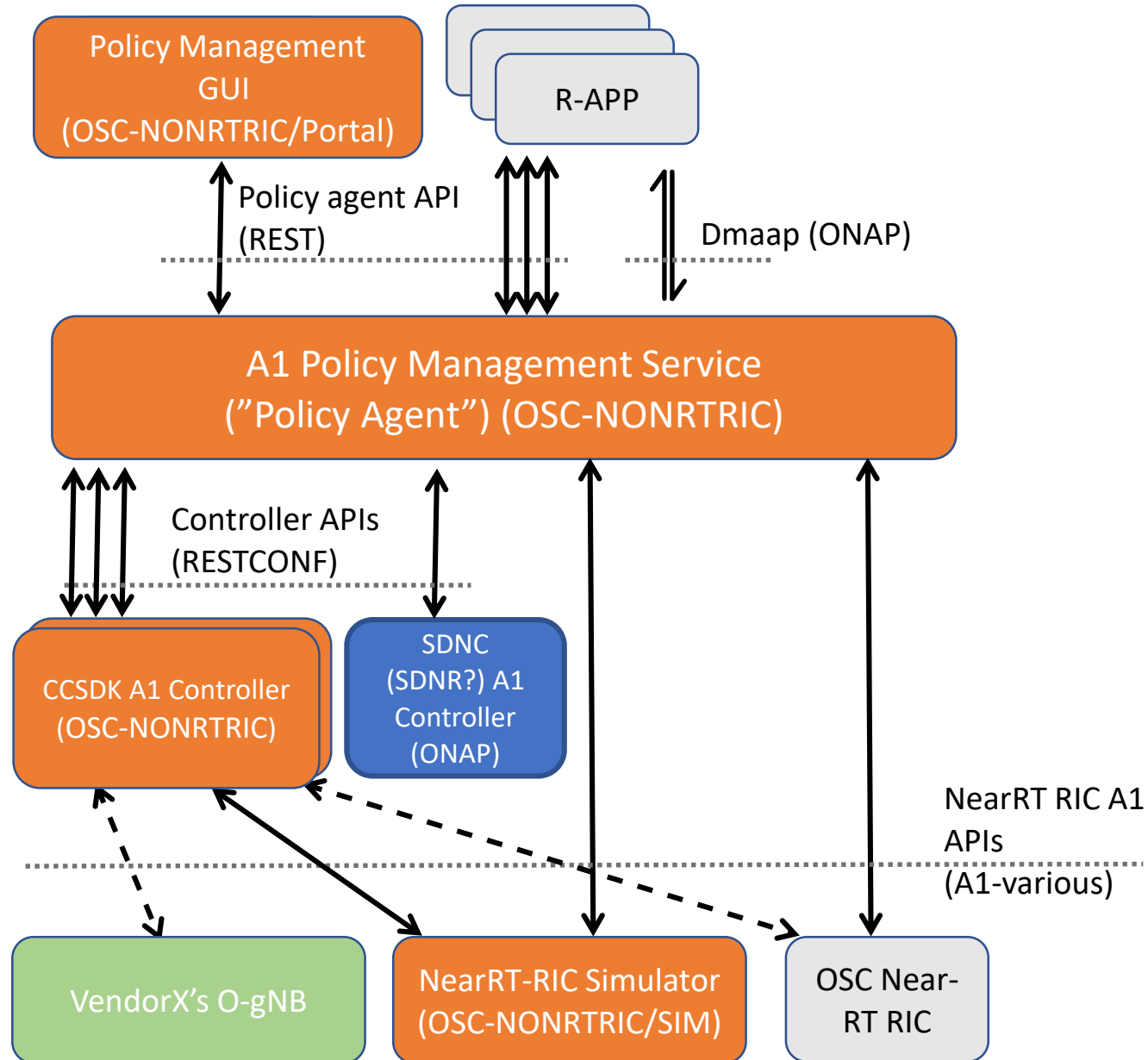
NONRTRIC Project – Partial Platform Support from ONAP



NONRTRIC Project – OSC “Amber+”/ ONAP Frankfurt



NONRTRIC Project – OSC “Amber+”



Functions

A1 Policy Management Service (“Policy Agent” v1)

SMO Service above A1 Adaptor/Controller that provides:

- Unified REST & DMAAP APIs for managing A1 Policies in all near-RT-RICs
- Synchronized view of registered ‘services’ (e.g. R-APP, GUI, etc)
- Synchronized view of policy instances for each ‘service’
- Synchronized view of policy instances in all near-RT-RICs
- Synchronized view of policy types in all near-RT-RICs
- Policy Query API (e.g. per near-RT-RIC, per ‘service’, per policy type)
- Unified near-RT-RIC ID to near-RT-RIC address mapping
 - will also act as adaptor to A&AI, CMDBs etc. to “find” near-RT-RICs - *soon*
- Initial “O1 *ManagedElement*” mapping database & interface to find appropriate near-RT-RIC for RAN elements
 - will also act as adaptor to A&AI, RuntimeDB, other CMDBs etc. - *soon*
- Monitors all near-RT-RICs and recovers from inconsistencies
 - e.g. near-RT-RIC restarts
- Support for different Southbound connectors on a per near-RT-RIC basis
 - e.g. different A1 versions, different near-RT-RIC versions, different A1 adapters, different or proprietary A1 controllers/EMSs

Policy Management GUI / NONRTRIC Control Panel

Graphical user interface

- View and Manage A1 policies in the RAN (near-RT-RICs)
- Interacts with the Policy agent's NBI (REST API)
- Graphical A1 policy creation/editing is model-driven, based on policy type's JSON schema
- Implementation:
 - Frontend: Angular framework
 - Backend Java Springboot application
- *(To be moved to portal/nonrtric-controlpanel repo)*

A1 Adaptor / Controller

Mediation point for A1 interface termination in SMO/NONRTRIC

- Implemented as OSGI Feature/Bundles
 - A1 Rest southbound
 - NETCONF YANG Northbound
 - RESTCONF > NETCONF adapter
 - Mapping logic / Provider
- Can be included in an any SDNC/CCSDK persona

Near-RT-RIC A1 Simulator

Stateful A1 test stub

- Used to create multiple stateful A1 providers (simulated near-RT-RICs)
- Implemented as a Python application
- Swagger-based northbound interface, so easy to change the A1 profile exposed

- *(To be moved to sim/a1-interface repo)*

Interfaces

A1 Policy Management Service (“Policy Agent” v1)

Northbound interface - REST

A1 Policy Handling:

- Query policies (GET) - using query parameters
- Get a policy (GET)
- Create/update a policy (PUT)
- Delete a policy (DEL)
- Get policy schema (GET)
- Get policy schemas for a Near RT RIC (GET)
- Policy status (GET)

To create a policy instance (PUT)

URL:

`http://policy_agent_uri/policy?type=STD_QoSNUdging_0.2.0&instance=d41553bb-b92d-4a00-8ee6-daa258ba51ce&ric=ric_ric-simulator_1&service=dashboard`

Request Param:

```
{
  "scope": {
    "qosId": "1",
    "uId": "1"
  },
  "statement": {
    "priorityLevel": 1
  }
}
```

A1 Policy Management Service (“Policy Agent” v1)

Northbound interface - REST

Service Register:

- Register a service (PUT)
- Service info (GET)
- De-register a service (DEL)
- Service keep alive (POST)

Near RT RIC repository:

- Near RT RICs information (GET)
 - list of Near-RT-RIC IDs
- ME mapping to Near-RT RIC (GET)
 - Near RT-RIC-ID for a *ManagedElement*

A1 Policy Management Service (“Policy Agent” v1)

Northbound interface - REST

Agent/Service (internal) operations:

- .../health (GET)
- .../health/** (GET)
- .../info (GET)
- .../logfile (GET)
- .../loggers (GET)
- .../loggers/{name} (GET, POST)
- .../metrics (GET)
- .../metrics/{requiredMetricName} (GET)
- .../status (GET)

A1 Policy Management Service ("Policy Agent" v1)

DMaaP Interface

All previous Policy Management operations:

- Request (*req. topic*)
- Response (*resp. topic*)

CURL:
curl -X POST -v -H "Content-Type: application/json" -d @./A1-get-policy-types.json http://dmaap_url/events/A1-POLICY-AGENT-READ

Request body (e.g. /A1-get-policy-types.json):

```
[ {  
  "apiVersion": "1.0",  
  "operation": "PUT",  
  "correlationId": "c09ac7d1",  
  "originatorId": "849e6c6b420",  
  "payload": <request json payload>,  
  "requestId": "23343221",  
  "target": "policy-agent",  
  "timestamp": "2020-03-02T11:44:51.36Z",  
  "type": "request",  
  "url": <url for the operation>  
}
```

Response body:

```
[ {  
  "requestId": "23343221",  
  "correlationId": "c09ac7d1",  
  "originatorId": "849e6c6b420",  
  "type": "response",  
  "message": <response payload>,  
  "timestamp": "2020-03-02T11:44:52.37Z",  
  "status": "200 OK"  
}
```

A1 Adaptor

Northbound interface - RESTCONF

A1 Policy Handling (derived from NETCONF YANG):

- All operations are POST (NETCONF Actions)

e.g. NETCONF Yang

```
rpc putPolicy {  
  input {  
    leaf near-rt-ric-url {  
      type string;  
    }  
    leaf policy-id {  
      type string;  
    }  
    leaf policy-type-id {  
      type string;  
    }  
    leaf policy {  
      type string;  
    }  
  }  
  output {  
    leaf returned-policy {  
      type string;  
    }  
  }  
}
```

e.g. RestConf – get policy types

http://a1-controller-container:8181/restconf/operations/A1-ADAPTER-API:putPolicy

```
{  
  "A1-ADAPTER-API:input": {  
    "A1-ADAPTER-API:near-rt-ric-url": "nrrtric_url /",  
    "A1-ADAPTER-API:policy-id": "d41553bb-b92d-4a00-8ee6-daa258ba51ce",  
    "A1-ADAPTER-API:policy-type-id": "STD_QoS Nudging_0.2.0",  
    "A1-ADAPTER-API:policy": "{\"scope\":{\"qosId\":\"1\",\"uId\":\"1\"},\"statement\":{\"priorityLevel\":1}}"  
  }  
}
```


A1 Adaptor

Southbound interface(s) – A1 REST (multiple pre-spec versions)
SIM Northbound interface(s) & near-RT- RIC Northbound interface(s)
& *WG2 A1 (1.1) spec (soon)*

A1 Policy Handling (derived from near-RT-RIC NBI, or O-gNB NBI):

- e.g. Query policies (GET) - using query parameters
- e.g. Get a policy (GET)
- e.g. Create/update/delete a policy (PUT, DEL)
- e.g. *Get policy type schema (GET)*
- e.g. *Policy status (GET)*

To retrieve policy type / schema (GET) (eg. OSC NONRTRIC Simulator)

URL: http://nrrtric_url/a1-p/v1/policytypes/STD_QoSNUdging_0.2.0

Response payload:

```
{ "$schema": "http://json-schema.org/draft-07/schema#", "title": "STD_QoSNUdging_0.1.0",  
  "description": "QoS policy type with ueld and qosld scope, version 0.1.0", "type": "object", "properties": {  
    "scope": { "type": "object", "properties": { "ueld": { "type": "string"}, "qosld": { "type": "string"} }, "required": [ "ueld", "qosld" ] },  
    "statement": { "type": "object", "properties": { "priorityLevel": { "type": "number"} }, "required": [ "priorityLevel" ]  
  }  
}
```

To create a policy instance (PUT) (eg. OSC near-RT-RIC)

URL: http://nrrtric_url/a1-p/policytypes/STD_QoSNUdging_0.2.0/policies/d41553bb-b92d-4a00-8ee6-daa258ba51ce

Request Param:

```
{  
  "scope": { "qosld": "1", "ueld": "1"},  
  "statement": { "priorityLevel": 1 }  
}
```

Status & Plans

NONRTRIC artefacts in OSC Release A (“Amber”)

(Dec 2019)

Achieved ‘stretch’ goals to have some initial non-RealTime RIC functionality for Release “Amber”:

- **Initial A1 Adapter/Controller**
 - OSGI bundle to integrate with ONAP CCSDK/SDNC
 - Implements a subset of the A1 Policy LCM functions based on a “pre-spec” version of A1 protocol
 - Prototype RESTCONF-based NBI for A1 mediation interface to allow messages to be sent up/down A1 interface
- **Dashboard extension to manage Policy Types and Policy Instances**
 - Based on existing OSC near-RT-RIC “RIC Dashboard”
- **Near-RTRIC A1 simulator/test-stub**
 - Implements server-end of A1 (Policy) interface – beyond existing OSC near-RTRIC implementation
- **All necessary CI/CD integration for LF OSC**

NONRTRIC artefacts in OSC “Amber+” Maintenance Release (Feb 2020)

A1 Policy Management Service (“Policy Agent” v1):

SMO Service above A1 Adaptor/Controller

- Unified REST & DMAAP APIs for managing A1 Policies in all near-RT-RICs
- Synchronized view of policy instances for each R-APP
- Synchronized view of policy instances in near-RT-RICs
- Synchronized view of policy types in near-RT-RICs
- Policy Query API (e.g. per near-RT-RIC, per R-APP, per policy type)
- Placeholder “O1 *ManagedElement*” mapping database interface to find appropriate near-RT-RIC to address A1 operations

Plus all existing “Amber” functionality +

- Routine improvements and bug-fixes
- Small evolution of A1 interface

Ongoing NONRTRIC tasks for Release B (“Bronze”)

(Jun 2020)

Design & Development (1/2):

- Continue A1 Adapter/Controller implementation – 2 versions available – ONAP & OSC
 - Ongoing discussion about ONAP/OSC alignment of A1 adapter
- Improve A1 Policy Management Service (“Policy Agent”) – north of A1 adapter.
- Select & implement WG2 A1 interface features.
 - Ongoing discussions/planning about A1 interface extensions for “Policy Type” & “Policy Status”
- Work together with near-RT-RIC dashboard project for a seamless GUI experience
- Extend near-RT-RIC A1 Simulator / Test-stub

>>> contd.

Ongoing NONRTRIC tasks for Release B (“Bronze”)

(Jun 2020)

Design & Development (2/2):

- R-APPs / usecases / e2e integration tasks (detailed design ongoing)
 - Health Check: https://wiki.o-ran-sc.org/download/attachments/3604609/RSAC_Bronze_HealthCheck_UseCase.docx?api=v2
 1. “Hello World!” R-APP
 2. OTF Test framework workflow
 - ML-based Traffic Steering: https://wiki.o-ran-sc.org/download/attachments/3604609/RSAC_Bronze_Use%20Case-Traffic%20Steering%20QoE.doc?api=v2
 - Major issues with limited functionality in ONAP to achieve SMO & R-APP requirements!
 - Very reduced scope for Bronze release
 - Significant work required to support even rudimentary O1 observability for these use cases ... !
 - More study & roadmap (re-)prioritisation is needed
- R-APP platform design/architecture

Ongoing NONRTRIC tasks for Release B (“Bronze”)

(Jun 2020)

Scoping and alignment:

- Continue SMO functional scope discussions with OSC OAM project
 - Align with ongoing architecture discussions in WG1 and WG2&WG6
- Continue discussing scope and responsibility of R-APP platform
- ONAP Alignment:
 - Need to formally align with O-RAN initiatives in ONAP (Frankfurt & Guilin), e.g. [SDNC/SDN-R sub-project](#), O1 mediation, Frankfurt 5G usecase: [Mobility Standard Harmonization with ONAP](#), Frankfurt Release Requirement [REQ-38 5G / ORAN & 3GPP Standards Harmonization](#), [ONAP A1 Adaptor](#)
 - Need to formally align processes for ONAP Frankfurt upstreaming
 - Need to formally align ONAP platform development, OSC platform extensions, and OSC non-code deliverables for application assembly
- Support A1 evolution

Ongoing NONRTRIC tasks for Release B (“Bronze”)

(Jun 2020)

Infrastructure/Procedural:

- OSC Release B Requirements/Epics
- Improve documentation/user-guides
- Repo re-alignment
- Release preparation tasks: documentation, automated integration testing, CSIT, assembly & packaging, demo preparation, etc.

O-RAN WG2 Alignment

- WG2 - A1 spec
 - Liaising with near-RealTime RIC project to align toward Release 1.X spec
 - Providing feedback on improving implementability of spec
 - Providing feedback on possible improvements/simplifications to spec
 - Aiming for complete alignment – but some pragmatic compromises might be required ...
- Non-RealTime RIC function
 - Aligned with WG2's objectives/ambitions for Non-RealTime RIC Function
 - Still at a very early stage
 - Started with A1 mediation/controller function and A1 policy management service
 - Additional functionality at discussion/architecture/design stage
- Interaction with other functions
 - Close working relationship with other OSC projects to ensure alignment/feedback/requirements
 - Close observation of activities in other WGs
- Use-cases
 - Requirements from OSC usecases are influencing/guiding development roadmap
 - Other usecases to be confirmed – will be driven by requirements, resources, supporting functions



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