ONAP/3GPP & ORAN Alignment use case

ONAP Guilin 5G use case
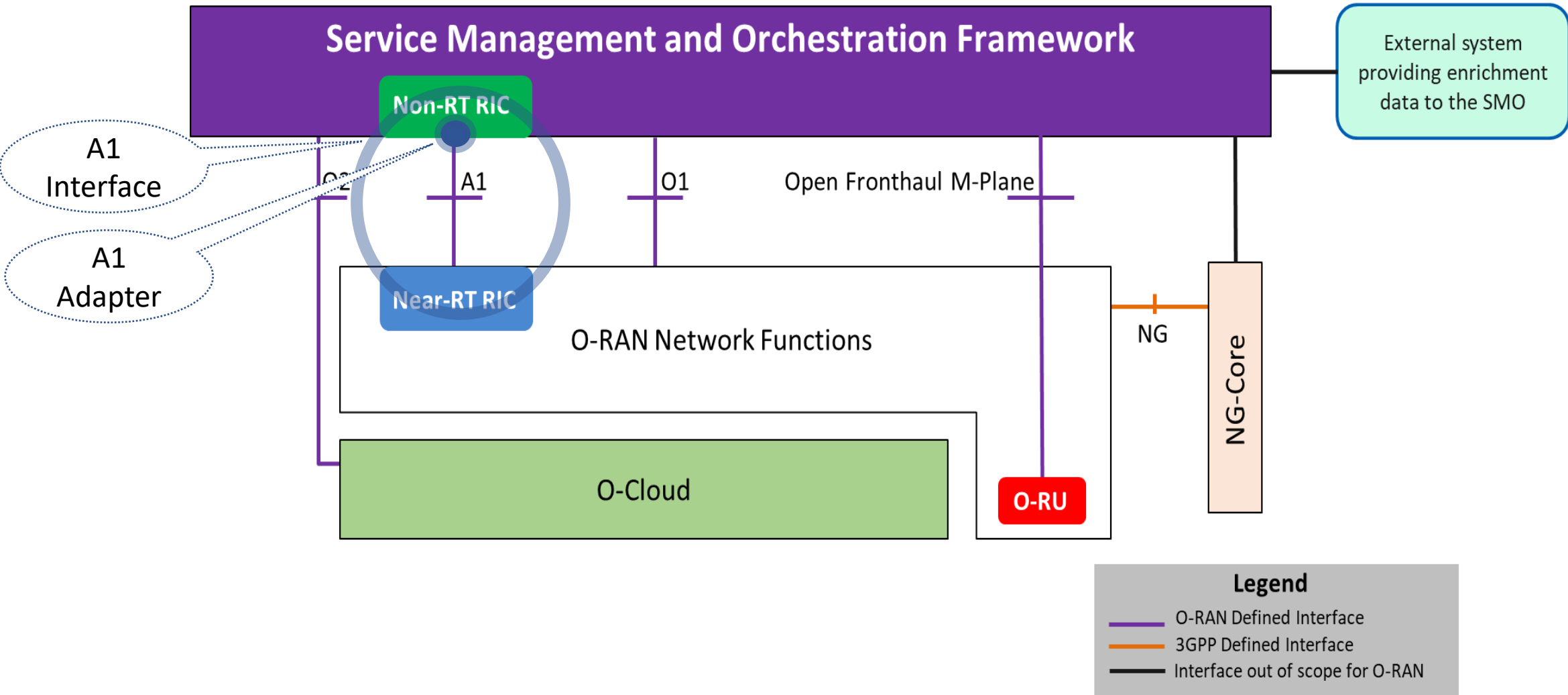
A1 Adapter Extensions

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O-RAN A1 Interface

- The O-RAN architecture introduces a new management interface - "A1 interface" - between the network management system and the radio access network (RAN)
  - A1-AP (Application Protocol) specified by O-RAN Alliance WG2
- A1 interface enables vendor-agnostic policy-based guidance ("A1 Policies") to be sent to underlying RAN elements from the management system.
  - *"A1-EI" will also support transmission of enrichment information from the management platform to the RAN elements (Still being defined – currently out of scope)*
  - *"A1-ML/AI" may also assist with ML Model management in the RAN (Still being defined – currently out of scope)*
- The A1 interface connects Non-RealTime-RIC logical function in OAM/SMO layer with the Near-RealTime-RIC logical function in the RAN.

A1 in O-RAN Architecture for Disaggregated RAN

High Level Architecture of O-RAN
From ORAN-WG1 Architecture Description - v01.00.00 - https://www.o-ran.org/specifications

A1 Adapter in Frankfurt

- Implemented as an SDNC/CCSDK extension to terminate & expose A1 interface

- https://wiki.onap.org/display/DW/A1+Adapter+in+ONAP

- Developed for Release Requirement (REQ-38): **5G / ORAN & 3GPP Standards Harmonization**

- Can be used by other ONAP functions to perform A1 Policy Operations over A1 Interface

- Provides DMaaP northbound interface, and REST (A1) southbound interface

Enhancements for Guilin Release

- Add additional support for standardized A1 protocol (O-RAN A1-AP v1.1)
  - Current (Frankfurt) supports only O-RAN-SC's (draft) non-spec version of A1 Application Protocol
  - Will add support for upcoming A1 standard spec evolution
  - Will add support for multiple versions for different A1 connections

- Managing A1 Policies
  - Operations:
    - Query A1 Policy Types in near-RT-RICs
    - Create/Query/Update/Delete A1 Policy Instances in near-RT-RICs
    - Query Status for A1 Policy Instances
  - Maintain transient cache of RAN's A1 Policy information
    - Support RAN-wide view of A1 Policy information
    - Streamline A1 traffic
    - Enable (optional) re-synchronization after inconsistencies / near-RT-RIC restarts

- Add support for multiple near-RT-RICs (with multi-version support)
- Unified REST & DMaaP NBI
- Add support for TLS/HTTPS REST for southbound A1 interfaces (and NBIs)
  - Leverage existing ONAP cert management approaches
- Converge ONAP & O-RAN-SC A1 Adapter/Controller functions in ONAP SDNC/CCSDK
  - Proposed functionality is currently available as 2 functions in O-RAN-SC
    - Basic A1 Adapter is an ODL extension & Policy Management is a separate microservice

Policy Types / Policy Instances / Policy Status Operations (REST)

/policies*?ric=yy&service=zz&type=xx* (GET)

- *PolicyInfo[]*

/policy*?id=ww* (GET, PUT, DELETE)

- *Policy*

/policy_types*?ric=zz* (GET)

/policy_schema*?id=xx* (GET)

- *Schema*

/policy_schemas*?ric=yy* (GET)

- *Schema[]*

/policy_status*?id=ww* (GET)

- *Status*

A1 Policies - Northbound Interface (REST & DMaaP) Proposed

DMaaP
Inbound request (Topic can be configured)

```
{
  "type": "string",
  "correlationId": "string",
  "target": "string",
  "timestamp": "timestamp",
  "apiVersion": "string",
  "originatorId": "string",
  "requestId": "string",
  "operation": "string",
  "url": "string",
  "body": "string"
}
```

Example

To get all policy types for a specific Near-RT RIC:

```
{
  "type":"request",
  "correlationId":"xyz123",
  "target":"policy-agent",
  "timestamp":"<timestamp>",
  "apiVersion":"1.0",
  "originatorId":"12345",
  "requestId":"6789",
  "operation":"GET",
  "url":"/policy_schemas?ric=ric_1"
}
```

DMaaP
Outbound Response (Topic can be configured)

```
{
  "requestId": "string",
  "correlationId": "string",
  "originatorId": "string",
  "type": "string",
  "message": "string",
  "type":  "string",
  "timestamp": "string",
  "status": "string"
}
```

Example

The response containing all policy types for a specific Near-RT :

```
{
  "requestId":"6789",
  "correlationId":"xyz123",
  "originatorId":"12345",
  "type":"response",
  "message":" <response – in this case an array
              of Policy type schemas> ",
  "timestamp":"<timestamp>",
  "status":"200 OK"
}
```

Propose to deprecate / phase out existing A1 Adapter DMaaP Interface

A1 Policies – Southbound (A1-P Application Protocol)

O-RAN Alliance (spec) v1.1.3 (Proposed)

/A1-P/v1/policies (GET)

/A1-P/v1/policies/{policyId} (GET, PUT, DELETE)

/A1-P/v1/policies/{policyId}/status (GET)

O-RAN-SC A1 (non-spec) v2.1.0 (Existing)

/a1-p/healthcheck (GET)

/a1-p/policytypes (GET)

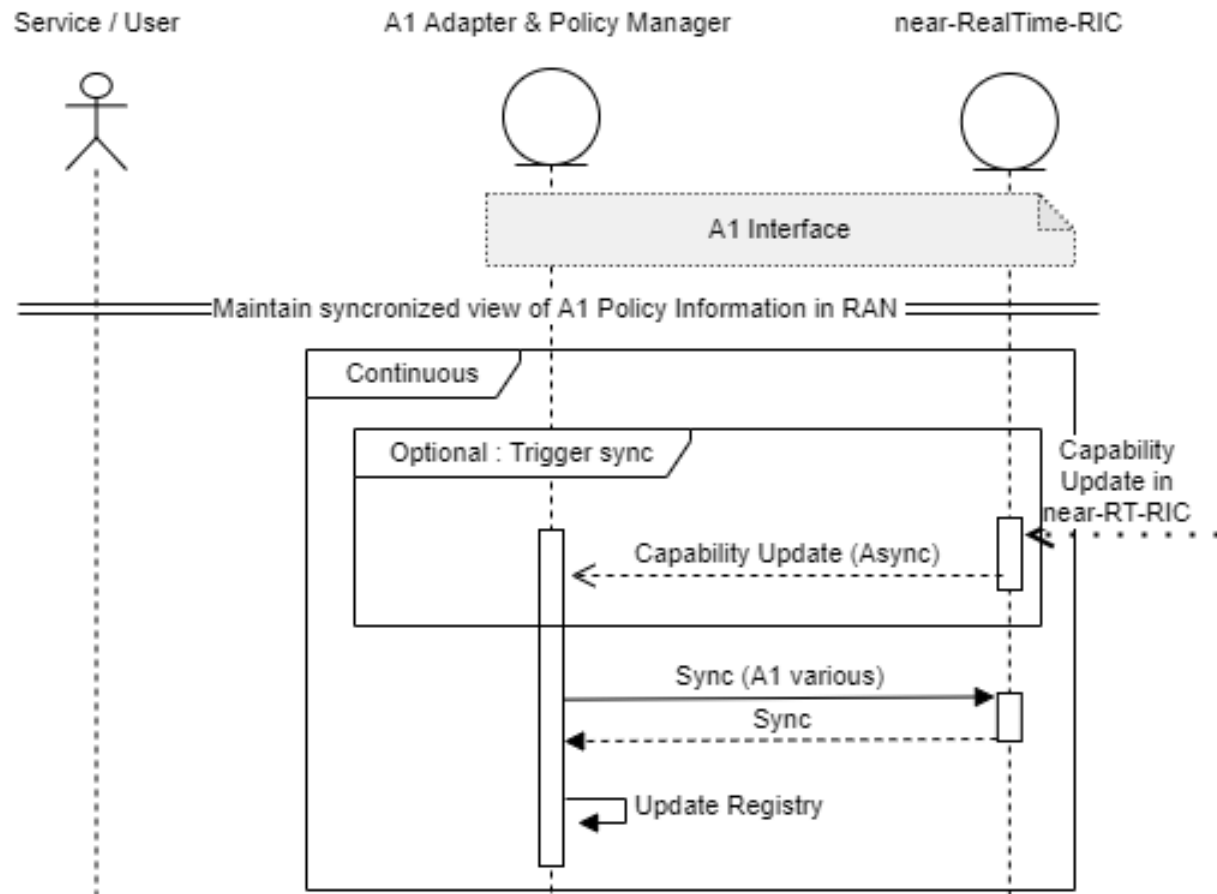/a1-p/policytypes/{policy_type_id} (GET, DELETE, PUT)

/a1-p/policytypes/{policy_type_id}/policies (GET)

/a1-p/policytypes/{policy_type_id}/policies/{policy_instance_id} (GET, DELETE, PUT)

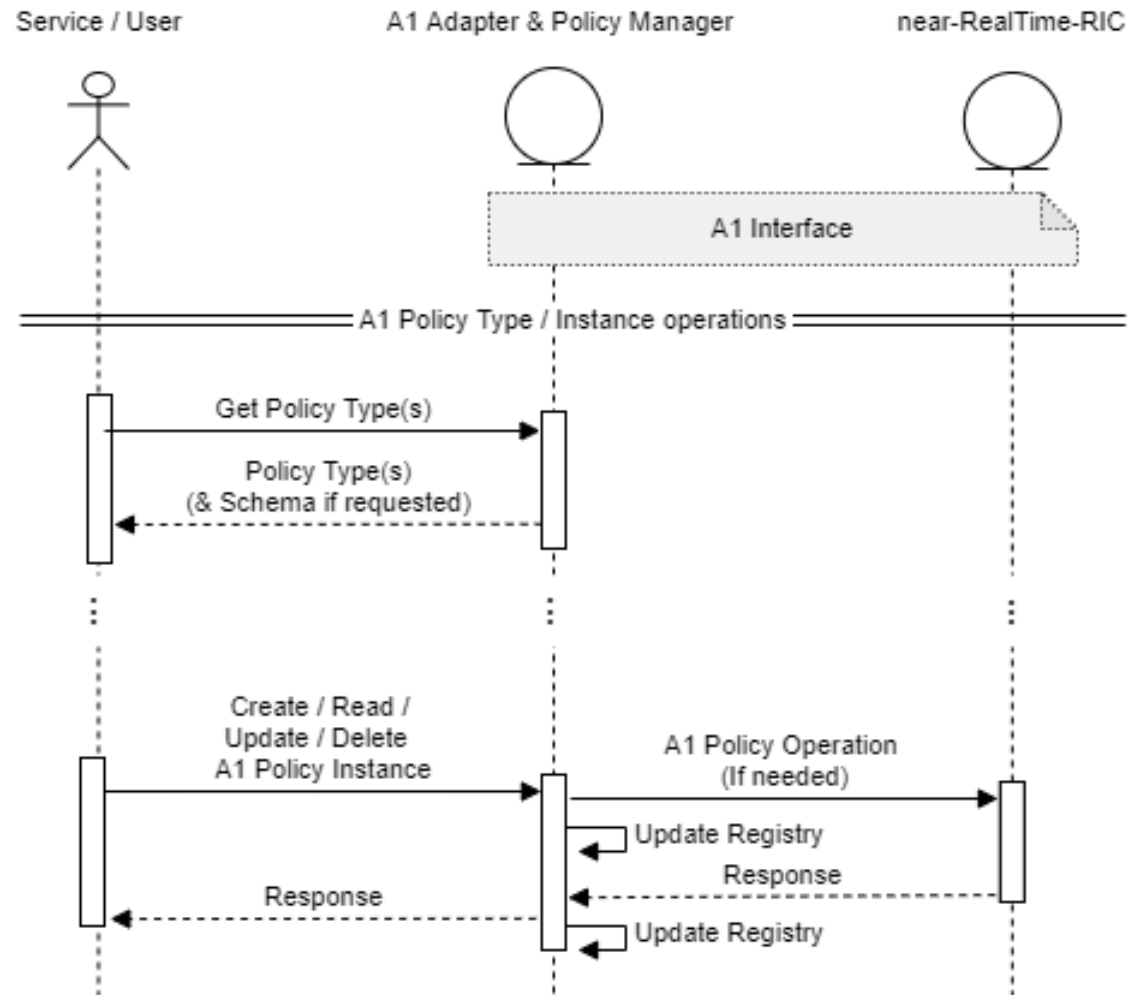/a1-p/policytypes/{policy_type_id}/policies/{policy_instance_id}/status (GET)

Flow chart / use cases (1/3)

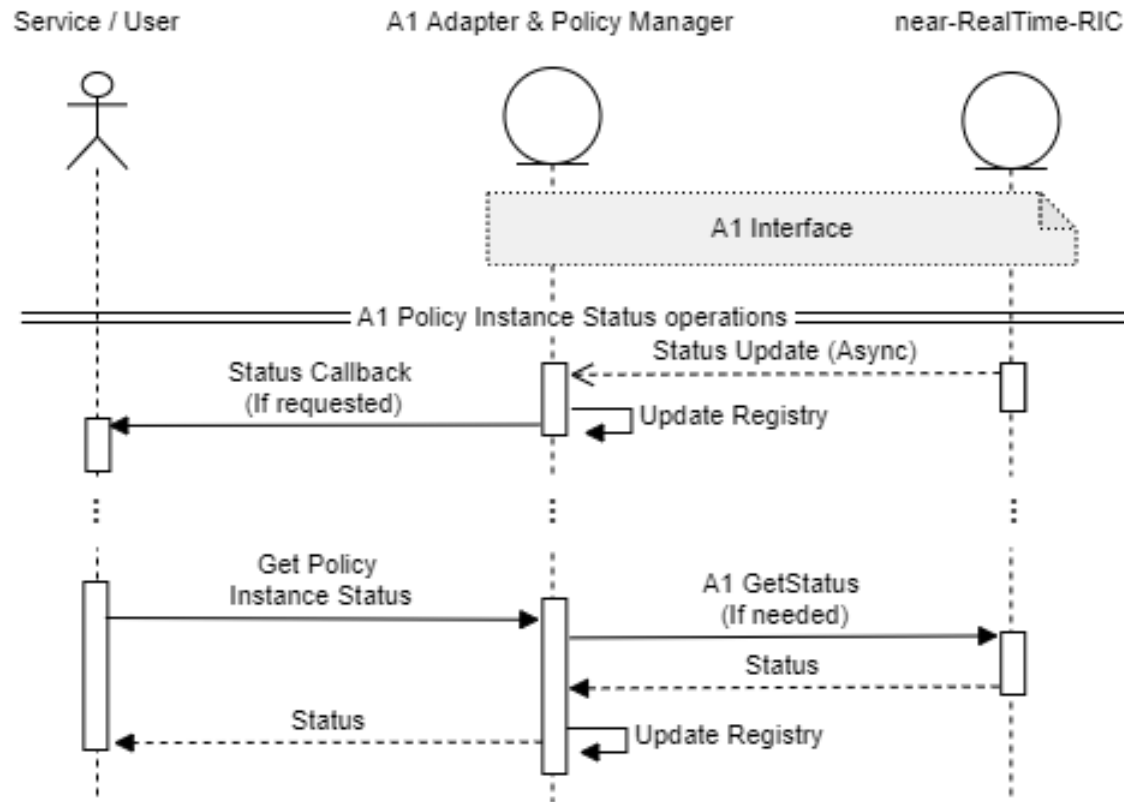- Synchronize A1 Policy Information in RAN

- A1 Policy Type / Instance Operations

- A1 Policy Instance Status Operations

Other Impacts 1/2

Affected ONAP Functions:

- SDNC / CCSDK only

Integration of bordering ONAP components:

- Guilin: None required – Studies only
    - Stretch Goal: "Hello world" demonstrations with other ONAP components
- Honolulu: A&AI, RuntimeDB, DCAE, CLAMP, Policy. (TBC)
    - Will form part of cross-project 5G integration use cases envisioned for Honolulu (TBC)

Interfaces:

- Northbound Interface – See earlier slide
    - Add/Change SDNC NBI for A1 Policy Management (REST & DMaaP)
        - REST (New)
        - DMaaP (New – Deprecate Existing – goes beyond existing A1 interface message mediation)
- Southbound Interfaces – See earlier slide
    - OSC A1 v2.1 (Existing)
    - O-RAN A1 v1.1 (New)

Usage outside ONAP:

- Used in O-RAN-SC NONRTRIC Project (Downstream)
- Southbound Interface: O-RAN A1 Interface + Information Model is specified and maintained by O-RAN Alliance

Other Impacts 2/2

Modelling Impacts:

- None

Test:

- Current (Frankfurt) tests against OSC near-RT-RIC
- Add support to also test with OSC A1-Simulator (multiple A1 versions)
- Add full suite of unit & function tests for all aspects

Other Impacts:

- Update Documentation with A1 interface aspects
- Update Integration & Existing Test requirements

Business Driver

EXECUTIVE SUMMARY - This requirement enhances the A1 adapter/interface capabilities provided in Rel 6 as part of 5G/ORAN & 3GPP Standards Harmonization requirement (REQ-38).   O-RAN has defined A1 interface specification in the context of the management of 5G RAN elements to provide intent based policies for optimization of the RAN network performance. Planned enhancements for Rel 7 include additional support for managing A1 Policies, multiple A1 targets in the RAN, multi-version support for different A1 targets, and secure TLS communication.

BUSINESS IMPACT - Continuing the convergency between ONAP and ORAN initiated in Rel 6, A1 interface can be used by all service providers and avoid duplicate development effort.

BUSINESS MARKETS - Enhanced A1 capabilities, once developed, will be useable by any service provider deploying and using ONAP.

FUNDING/FINANCIAL IMPACTS - A1 interface provides a flexible way for the operator to manage wide area RAN network optimization, reducing capex investment needs.

ORGANIZATION MGMT, SALES STRATEGIES - There is no additional organizational management or sales strategies for this use case outside of a service providers "normal" ONAP deployment and its attendant organizational resources from a service provider.