ONAP Use Case – Third Party Operational Domain Manager

Telstra

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Executive Summary - In case of tier 1 / brownfield operators, it’s more likely that ONAP might need to interface with existing orchestration platforms for specific domains. This use case will provide ONAP capability to be operational domain manager for third party services. Service providers will be able to use ONAP to provide end to end automation for composite or white labelled services which could be provided and managed by third parties. This use case will enable federated catalog and orchestration management.

Business Impact - The use case will provide capability in ONAP for seamlessly on-boarding services from partner (or specific ) domain catalog. Lack of this capability today leads to manual creation of partner services in ONAP which is time consuming and error prone. With introduction of this capability, ONAP will be able to consume domain specific service definitions via Open APIs and publish the same to run time components. Next phase of this use case will extend the operational domain manager capabilities to support complete service operations value chain for “Third Party” or Domain specific services via federation.

Business Markets
- Potential candidates for Third Party Domains which can be supported by ONAP in this context:
  - Fixed Broadband Service from Last Mile Connectivity Provider
  - Managed Network Service from other service providers (Telco Peers)
  - Hybrid cloud ecosystem of private and public clouds from multiple cloud service providers
  - Special case could be composite services which include service components managed by a existing domain manager
- This use case is also relevant to service provider environment where all services are managed by single ONAP environment (e.g. If there is need to move catalog from dev / test to production)
- This will be very relevant for automation of digital services delivered via diverse 5G Ecosystem (B2B2X Models) for vertical industry solutions

Funding/Financial Impacts -
- This use case, once developed, can be used by any service provider deploying and using ONAP.
- ONAP as “Third Party” Domain manager will play a significant role in on-boarding partner domains in a uniform manner.
- Service definition from “Third Party” will be made available to service provider in few hours, consumable via an abstraction layer (optional) (NaaS in Telstra context).
- Once catalog is on-boarded ONAP can publish the service definition to other design time and run time components such that ONAP can support complete life cycle management of the service via federation
- All this will essentially bring down time to market for partner services. Telstra is committed to drive the implementation of these capabilities in ONAP across next few releases.

Organization Mgmt, Sales Strategies - There is no additional organizational management or sales strategies for this use case outside of a service provider’s "normal" ONAP deployment and its attendant organizational resources from a service provider.
Use Case Overview

- A standards-based approach that allows a service provider to have a network automation platform for composite or white labelled services managed by specific/Third Party domain managers
- ONAP provides Operations Domain Management (ODM) and other complementary capabilities to ensure full automation of the E2E lifecycle management of the service via federation
- Services are exposed and consumed via Network as a Service (NaaS) which is an abstraction layer above the operational domains and exposes the services to BSS
- Consistent way of consuming 3rd party services for service providers like Telstra
- ONAP will facilitate service operations value chain for third party domain via federation
- Substitutes multiple handovers between parties/teams and applications to enable zero touch automation

This use case implementation will be phased out across release F and beyond

Initial Impact Analysis

- Service Provisioning
  - SDC – Import 3rd party service definition, Publish catalog to run time ONAP components
  - Any potential SO enhancements for orchestration
  - A&AI – add references on 3rd party domain inventory
  - Enhancements to Ext APIs (POST Operation for Catalog API)
  - Service life cycle management action associated with O2A and T2R must be supported via federation
    - CM: change management (capacity increase to meet scaling demands);
    - IM: Support incident management (problem identification and fix); and
    - VM: Any support (workflow/notification if any) for services associated with VNFS managed by “Third Party”
  - Remediation actions are triggered automatically using ONAP as ODM
  - Necessary references to service provided by “Third Party” domains will be made available to support C2M/P2O processes

Beneficiary: 3rd party providers and Service Providers like Telstra
Sample Internet Service - Service Specifications

Mapping of Service Specifications of the sample Internet Service with the respective domain managers

**TMF SID Framework Terminology**
- **CFS** – Customer Facing Service like Internet Access
- **CFSS** – Customer Facing Service Specification
- **RFS** – Resource Facing Service like Copper / Fiber Access
- **RFSS** – Resource Facing Service Specification

**CFS/Public Service**
Managed by ONAP ODM

**RFS/Private Service**
Managed Service from third party suppliers;
Could be of different access types also like fibre / copper etc

**RFS/Private Service**
Managed by Telstra’s Domain
Guiding Principles Followed for this Use Case

- **Minimize impact to existing ONAP Information Model.** (No impact to existing SDC model is foreseen based on the analysis done so far)
- **All communication from external application with ONAP must be via ExtAPI.** This is available today for Northbound Integration for Catalog/Order/Inventory. We would propose to extend this guidance for southbound integration as well.
- **Southbound Payload Translation**: Any order payload translation towards 3rd Party Domain Manager to stay outside ExtAPI.
- **Exposure of third party domain**: ONAP will communicate with third party domain and this will not be directly exposed to BSS.
- **Controlled access to ONAP SDC Catalog** – Only consumers defined in ONAP will have access to post service specification
- **Separation of Concerns**: Third Party payload for service definition will not have resource level deployment artifacts since resource management is responsibility of third party
Assumptions and Scope of this solution

- Business Process on sharing of the information between the 3rd Party Domains and the ODM will be defined in advance.
- Network details for the service order, like IP Addresses for the VNFs will be managed by the 3rd Party Domain.
- The 3rd Party order will be enriched by the 3rd Party domain with the details needed for complete provisioning.
- Connection details - encryption keys, protocols will be agreed upon in advance between the ODM and the 3rd Party.
- Details like cloud region to be used will be made available in advance.
- Policy will be created with the details of the target site and cloud regions to enable homing.
- Definition of Service/Resource is out of scope for the use case and will be taken up separately.
- It is assumed that the service provider will allow controlled access to the API to post service definition. Some SPs may receive the definition from the 3rd Party (over email) and then BSS will invoke the API to add the service definition in ONAP.
Design Time and Run Time View

**BSS** *(Product Specification, CFSS References)*

**NaaS (Optional)**

- **Receive RFSS for each Service**
- **Create CFSS for composite service including Partner Domain Service (composed of multiple RFSS potentially across domains)*

**ONAP - Third Party Operational Domain Manager** *(CFS Life Cycle Management)*

**ExtAPI**
- **POST RFS Definition (TMF Open API - 633)**

**SDC (CFSS, RFSS Reference)**
- **Post RFS Order (TMF Open API - 641)**

**SO (Orchestrate CFS Order, Federate RFS Order)**
- **POST Inventory (TMF Open API - 638)**

**AAI (CFS Instance, RFS Instance Reference and Topology)**

**Further SO and AAI impact analysis is in progress via PoC**

- **SO should directly post this line item (via ExtAPI) to third party without going via VIM / MultiCloud**
- **Gets CFS Instance update from SO and RFS Instance Update from 3rd Party**

**3rd Party Domain** *(RFS, Resource Life Cycle management)*
- **Onboard PNF/VNF, Compose RFS, Instantiate and Configure Resource/RFS**

**Publish RFSS to ONAP for each Service** *(This is actually CFSS from 3rd Party Perspective but RFSS from ONAP perspective)*

**Payload transformation from TMF Open API to 3rd Party Domain is outside NBI**
Flow Diagram for 3rd Party Catalog Sync – Design Time

1 - Invoke Open API 633 Service Catalog (INTERLUDE)

2 - Update SDC Catalog

5a - Pull catalog details

5b - Pull details

5c - Get Service Catalog Details

3 - Notify Update Success (INTERLUDE)

4 - Test, Verify and Distribute the Service.

5 – Catalog Notification to AAI and SO

(Parsing logic updates to handle a CSAR without resource)

External Partner Domain request to which is managed by ONAP

Upstream BSS layer (optionally NaaS layer can exist between BSS and ONAP)

ONAP components involved in the catalog sync and orchestration

Request → Response → {Existing} {New} {Enhanced}
The flow steps (1 – 5c)

**Catalog Sync Summary**
1 – External Third party domain exports its service catalog details to Telstra. Telstra orchestrator ONAP exposes TMF Open API 633 Service Catalog API via ONAP Ext API component. Third Party Domain leverages the API 633 to POST the Service Catalog payload.

```plaintext
POST nbi/api/v2/serviceSpecification
```
Request body – TMF 633 Service Catalog compatible payload
Payload contents:
- RFSS for Partner Domain Service
2 – ONAP Ext API updates SDC catalog by invoking internal SDC API

```plaintext
POST sdc/v1/catalog/services
```
4 – Service Definition Updates / Creation of Composite Service happen in SDC UI (any manual updates to the received service definition)
Test, Verify and Distribute the Service definition. SDC updates other ONAP components (which have registered with SDC DMaaP) with catalog details
5a – SO pulls SDC catalog details
5b – AAI pulls inventory details
3 – Ext API notifies Third party after successful update within ONAP
Ext API notifies northbound systems (BSS/NaaS) after successful import of the service catalog into ONAP.
5c - BSS retrieves catalog information from ONAP
Flow Diagram for 3rd Party Order Activation – Run Time – option 1

1. **Invoke 3rd Party Ordering API (INTERLUDE) – Order translation outside NBI**
2. **Submit Order**
3. **Send 3rd party RFS items to Ext API**
4. **Submit Order – Open API 641 LEGATO**
5. **Decompose Service & Update CFS Service Instance**
6. **Send internal order items to internal network domain**
7. **Update RFS instance details received from 3rd Party**
8. **Update SO with status about RFS order item completion**

**Run Time**

- **BSS**
- **ONAP Ext API**
- **ONAP SO**
- **ONAP AAI**
- **3rd Party Domain – (1..n)**
- **Internal Network Domain (0..n)**

**Upstream BSS layer**
- Optionally NaaS layer can exist between BSS and ONAP

**ONAP components involved in the catalog sync and orchestration**

**External Partner Domain, ONAP manages request to it**

**Service Provider Internal Domain**

**Detailed flow for internal requests in not shown. These will be submitted from SO to the network domain.**

Request → **Response** → {Existing} {New} {Enhanced}
The flow steps (6 – 12)

Order Activation Summary
6 – BSS submits order using TMF 641 Service Ordering API, that is exposed by ONAP Ext API
7 – ONAP Ext API submits the request to ONAP SO
8 – ONAP SO decomposes the service, updates AAI with Service instance details
9 – SO submits the request by invoking Ext API (This is similar to what is being proposed for CCVPN use case as well. This maintains that only Ext API interacts with outside world and other ONAP components do not) [Note - There can be multiple 3rd Party domains, After SO decomposes the CFS into multiple RFSs, Ext API will send the request to the corresponding 3rd party domain]
10 – ONAP Ext API invokes Ordering API, order translation to 3rd Party format happens outside Ext API, translated order gets submitted to 3rd Party domain
11 – Ext API updates AAI with the RFS instance details received from 3rd party response. AAI topology gets synced with the Service instance details to the level of the RFS instance.
12 - Ext API updates SO with the order item status for the RFS order item. Once SO has received responses for all the RFS order items in the order, it sends a response to Ext API which then responds to BSS with order update.
Flow Diagram for 3rd Party Order Activation – Run Time – option 2

1. **6 - Submit Order**
   - Open API 641
   - LEGATO

2. **7 - Submit Order**
   - ONAP Ext API
   - ONAP SO
   - ONAP AAI

3. **8 - Decompose Service & Update CFS Service Instance**
   - Loop – For each RFS order item
   - 9a – Send request to internal network domain(s)
   - 9b – Send 3rd party RFS items to Partner Domain(s)

4. **10 - Update RFS instance details received from 3rd Party / Internal Domain**

5. **11 - Update Ext API with status about order completion**

**Upstream BSS layer** (optionally NaaS layer can exist between BSS and ONAP)

**ONAP components involved in the catalog sync and orchestration**

**External Partner Domain, ONAP manages request to it**

**Service Provider Internal Domain**

**Detailed flow for internal requests in not shown. These will be submitted from SO to the network domain**
## Comparison of Approaches to interface with Partner Domain

<table>
<thead>
<tr>
<th>Interface Option 1: via Ext API</th>
<th>Interface Option 2: via SO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Interface to external system will be limited to Ext API</td>
<td>• Less interactions between ONAP components</td>
</tr>
<tr>
<td>• Reuse of capability developed for CCVPN use case</td>
<td>• No need to introduce southbound interface in NBI</td>
</tr>
<tr>
<td>• Requires multiple interactions between ONAP components</td>
<td>• SO will have to be exposed to external world outside ONAP</td>
</tr>
<tr>
<td>• Logic in Ext API to intimate SO about order item completion, decompose logic in SO</td>
<td>• Orchestration logic to be written in SO</td>
</tr>
</tbody>
</table>

**Legend:** Pros, Cons, Neutral
Responsibilities of ONAP components

- **SDC**
  - Automate the capability to onboard service definition
  - Introduction of new service category
- **Ext API**
  - Enhancements to Open API for Service Catalog
- **SO**
  - Flow for Identification of Partner Service Order Item and decomposing the service order
  - Recipe for the flow to External Partner Domain
- **AAI**
  - Reuse the Supplier Partner model
### Impact Analysis So Far for 3rd Party Catalog Sync

<table>
<thead>
<tr>
<th>SDC</th>
<th>Ext API / NBI</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Expose POST functionality of SDC Onboarding API as an external API within ONAP</td>
<td>• Introduce POST for TMF API 633 – Service Catalog API</td>
</tr>
<tr>
<td>• Reuse sdc-dao to update the Cassandra database and store the new service in SDC catalog</td>
<td>• Realization of POST operation in Ext API will depend on decisions taken during SDC implementation.</td>
</tr>
<tr>
<td>• Reuse SDC distribution functionality to distribute the new service to registered ONAP components (no change)</td>
<td>• Ext API changes to be planned for future release</td>
</tr>
<tr>
<td>• Existing UUID creation logic will be used</td>
<td></td>
</tr>
<tr>
<td>• Last mile access service from 3rd party will be used for detailed analysis and reference implementation</td>
<td></td>
</tr>
<tr>
<td>• TOSCA based onboarding in work is progress in SDC, it supports heat based onboarding only. The TOSCA based work is ongoing separately in Modeling project. This dependency on Modeling project need to be looked into.</td>
<td></td>
</tr>
</tbody>
</table>
Possible Approaches for 3rd Party Catalog Sync

payload Option 1: JSON

• Leveraging existing approach for Ext API / NBI
• Ext API will expose POST for TMF633 Service Catalog
• 3rd Party will send the payload in TMF633 format
• ExtAPI / NBI will send the JSON in SDC compatible format for its Consumption in v1/catalog/services

payload Option 2: CSAR

• Potential reuse from TOSCA onboarding Project in SDC
• This might alter existing Ext API / NBI approach
• There would be additional implementation at Third Party end to generate higher level TOSCA

Entity Option 1: Resource

• Onboard the resource in ONAP SDC as a VSP, will require updates to VSP onboarding API

Entity Option 2: Service

(Proposed)

• Onboard the service in ONAP SDC as a Service, will require updates to Service onboarding API

Legend: Pros, Cons, Neutral
Flow Diagram for 3rd PARTY SDC Catalog Sync

1 - Invoke Open API 633 Service Catalog

2 - Update SDC Catalog

2a. Update Cassandra DB

Invoke sdc-dao package to Parse the payload and insert data in Cassandra schema

3 - Notify Update Success

4 – Service Composition/Workflow

5a – Pull catalog details

5a – Notify AAI/SO/…

5b – Get Service Catalog Details LEGATO

{GET nbi/api/v2/serviceSpecification}

{POST sdc/v1/catalog/services}

JSON contents:

```
{    "name": "AccessService",    "description": "Partner Access Service",    "serviceSpecCharacteristic": [        {            "name": "bandwidth",            "valueType": "string"        }    ]}
```
Steps 1 to 3 on previous slide - which are part of new functionality - are explained here.

Steps 4 onward depict existing functionality reused

1 – Invoke TMF 633 Service Catalog API
3rd Party Domain’s Payload to be submitted as a JSON –
Expected format - Service Specification payload specified by TMF 633

2- Ext API to invoke SDC onboarding API to updated ONAP SDC catalog
Invoke ServiceServlet - createService() – JSON payload
Currently on-boarding API is invoked when Create Service button is clicked in SDC UI
Ext API needs to be added as a consumer of the API
Existing logic to be reused:
   UUID creation in validateServiceBeforeCreate
   Logic to add default TOSCA components
2a – Persist the service in SDC database

3-Ext API will Notify 3rd Party after SDC catalog update
   Register for Distribution: Ext API will register itself with SDC.
   Ext API will receive distribution notification from SDC after service catalog creation in SDC
   Ext API notifies 3rd Party Domain
Model - Service Model including Partner Service

Leveraged from Service Resolver Model -
https://wiki.onap.org/display/DW/Service+Resolver
Payload structure of input to ONAP from Third Party

```json
{
  "id": "2944ce7c-a7ce-4816-b08c-d51b8bbb2830",
  "name": "partner Access",
  "description": "Partner Access",
  "version": "v1.0.0",
  "lifecycleStatus": "Active",
  "serviceSpecCharacteristic": [
    {
      "name": "serviceDetails",
      "description": "Service details",
      "valueType": "object",
      "@type": "ServiceSpecCharacteristic",
      "minCardinality": 1,
      "maxCardinality": 1,
      "access": ["Create", "Read", "Update"],
      "serviceSpecCharacteristicValue": [...],
      "configurable": false,
      "isUnique": false,
      "extensible": false
    },
    {
      "name": "order"...
    },
    {
      "name": "access"...
    },
    {
      "@type": "NetworkServiceSpecification",
      "isBundle": false,
      "lastUpdate": "2019-05-17T06:37:31.911Z"
    }
  ]
}```
Payload structure of input to SDC Service creation API-with sample

```json
{
  "contactId": "cs0008",
  "categories": [
    {}
  ],
  "name": "ExtService",
  "tags": ["ExtService"],
  "componentType": "SERVICE",
  "projectCode": "010203",
  "properties": [
  ],
  "inputs": [
  ],
  "ecompGeneratedNaming": true,
  "serviceApiArtifacts": {},
  "instantiationType": "A-la-carte",
  "environmentContext": "General_Revenue-Bearing"
}
```

Placeholder for attributes needed for instantiation
Below is the expanded view of the TOSCA CSAR generated by ONAP SDC.

Definitions – contains the interface yaml file which contains the metadata definition of the properties defined in the payload (detailed in previous slide)

No Artifacts folder as there are no deployment artifacts for the partner service

TOSCA-Meta-File-Version: 1.0
CSAR-Version: 1.1
Created-By: Carlos Santana
Entry-Definitions: Definitions/service-ServicePoc2-template.yml
Name: csar.meta
Content-Type: text/plain

SDC-TOSCA-Meta-File-Version: 1.0
SDC-TOSCA-Definitions-Version: 9.0

Service spec characteristics get added here
ONAP Ext API

2 - POST apikeys/create

Created

UEB

3 - Send the POST request with authentication keys

POST sdc/v1/catalog/services

202 Created

ONAP SDC

1 - Allow POST operation on /catalog/services for External API

1 - SDC to expose on-boarding API to Ext API
2 - Ext API to send apikeys for the on-boarding request
3 - Ext API invoke SDC onboarding API

Currently on-boarding API is invoked when Create Service button is clicked in SDC UI
Today, SDC on-boarding API is part of SDC Internal API and is not consumed by any ONAP component.
(Only GET /catalog/services is exposed)
Changes -
SDC on-boarding API needs to be exposed (within ONAP) similar to SDC Distribution APIs
Ext API needs to be added as a consumer of the API for POST operation.
Flow Diagram for Ext API to register for SDC Service Creation Notification

1 – Ext API to get server list
2 - Ext API creates API keys to authenticate
3 - Ext API registers with SDC

Ext API needs to Notify 3rd Party after successful Service catalog update on ONAP/SDC
So Ext API needs to register for notification:
Ext API will receive distribution notification from SDC after service catalog creation in SDC
Ext API notifies 3rd Party Domain

As part of the current phase of the use case, we will Concentrate on SDC changes and stub out Ext API function
Activities in Scope for SDC

- Impact Analysis
- Created epic [https://jira.onap.org/browse/SDC-2378](https://jira.onap.org/browse/SDC-2378)
  - Stories added so far under the epic
  - [https://jira.onap.org/browse/SDC-2382](https://jira.onap.org/browse/SDC-2382)
  - [https://jira.onap.org/browse/SDC-2383](https://jira.onap.org/browse/SDC-2383)
  - [https://jira.onap.org/browse/SDC-2385](https://jira.onap.org/browse/SDC-2385)
- Sprint Planning
- Design
- Implementation
- Architecture Documentation
- Integration ??
- Testing Based on ROBOT Framework
- Defect Management
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>We need to introduce new service category for 3rd Party Services</td>
</tr>
<tr>
<td>2</td>
<td>The dashboard has to be customized for the new service category, as certain functionalities need to be shown to the designer for the new kind of service</td>
</tr>
<tr>
<td>3</td>
<td>‘Composition’ tab need not be shown to the catalog user, as the 3rd Party service will not have VNF components to be added to it</td>
</tr>
<tr>
<td>4</td>
<td>3rd party service will only be created using an API. So manual creation of the service will be disabled</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Projects</th>
<th>Files</th>
</tr>
</thead>
<tbody>
<tr>
<td>catalog-be</td>
<td>sdc\catalog-be\src\main\resources\import\tosca\categories\categoryTypes.yml</td>
</tr>
</tbody>
</table>
| catalog-ui | • menu.js  
• workspace-view-model.ts |
SDC-2383 - Expose the API for service creation as an External API

<table>
<thead>
<tr>
<th>Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDC exposes GET on Service catalog to Ext API</td>
</tr>
<tr>
<td>Same auth can be used by Ext API to consume POST as well</td>
</tr>
<tr>
<td>SDC needs to introduce the method for service creation</td>
</tr>
<tr>
<td>The exposed method will reuse the logic available</td>
</tr>
<tr>
<td>Project – catalog-be</td>
</tr>
<tr>
<td>Files – CrudExternalServlet</td>
</tr>
<tr>
<td>Add method createServiceExternal – it will invoke existing ServiceBusinessLogic.createService</td>
</tr>
</tbody>
</table>
Changes

We need to define service characteristics for 3rd party services and many of the characteristics are of object type with child nodes for child attributes.

e.g.

bandwidth attribute can have child nodes upstream_speed, downstream_speed, unit and those child nodes can be of type enum will multiple values. see attached file

In SDC payload, we define the service specification in a single hierarchy. We would need a logic to map the child nodes to the parent node
A POC has been done on local SDC dev instance to on-board the service using a sample payload for a 3rd party access service. Attached video takes us through the service creation journey, from creation to distribution-approved, in SDC with the help of the API and SDC UI.

It is also uploaded on the use case page at https://wiki.onap.org/display/DW/Third-party+Operational+Domain+Manager
Service Distribution – Design Time – SO Impact

1. SDC distributes the service
2. SO/AAI are registered to listen to DMaaP
3. SO pulls the detail, parses the CSAR and saves the service
4. AAI pulls the details and AAI ML is updated

The 3rd Party Service CSAR doesn’t have a resource. SO looks for a resource in the TOSCA template, filters it as VF/PF or Other (Allotted resource for CCVPN). This filter needs to be bypassed for a 3rd Party Service.
Service Instantiation – Run Time – SO Impact

1 – Ext API submit the Service Order
2 - SO identifies the workflow and parses the 3rd party Order details
3 – SO updates AAI with Service instance details
4 – Sends the 3rd party (RFS) order to Ext API which sends it out
5 – SO updates AAI with the RFS instance details received
6 – SO sends the final response to Ext API

Potential to ReUse SO CCVPN infra -
Reuse - Create3rdONAPEServiceInstance.
Reuse - ExternalAPIUtil.PostServiceOrderRequestsTemplate
The groovy script will need to be enhanced to cater to 3rd Party Service

saveSPPartnerInAAI can be reused
[Analysis ongoing for SPPartner model in AAI]
Thank you