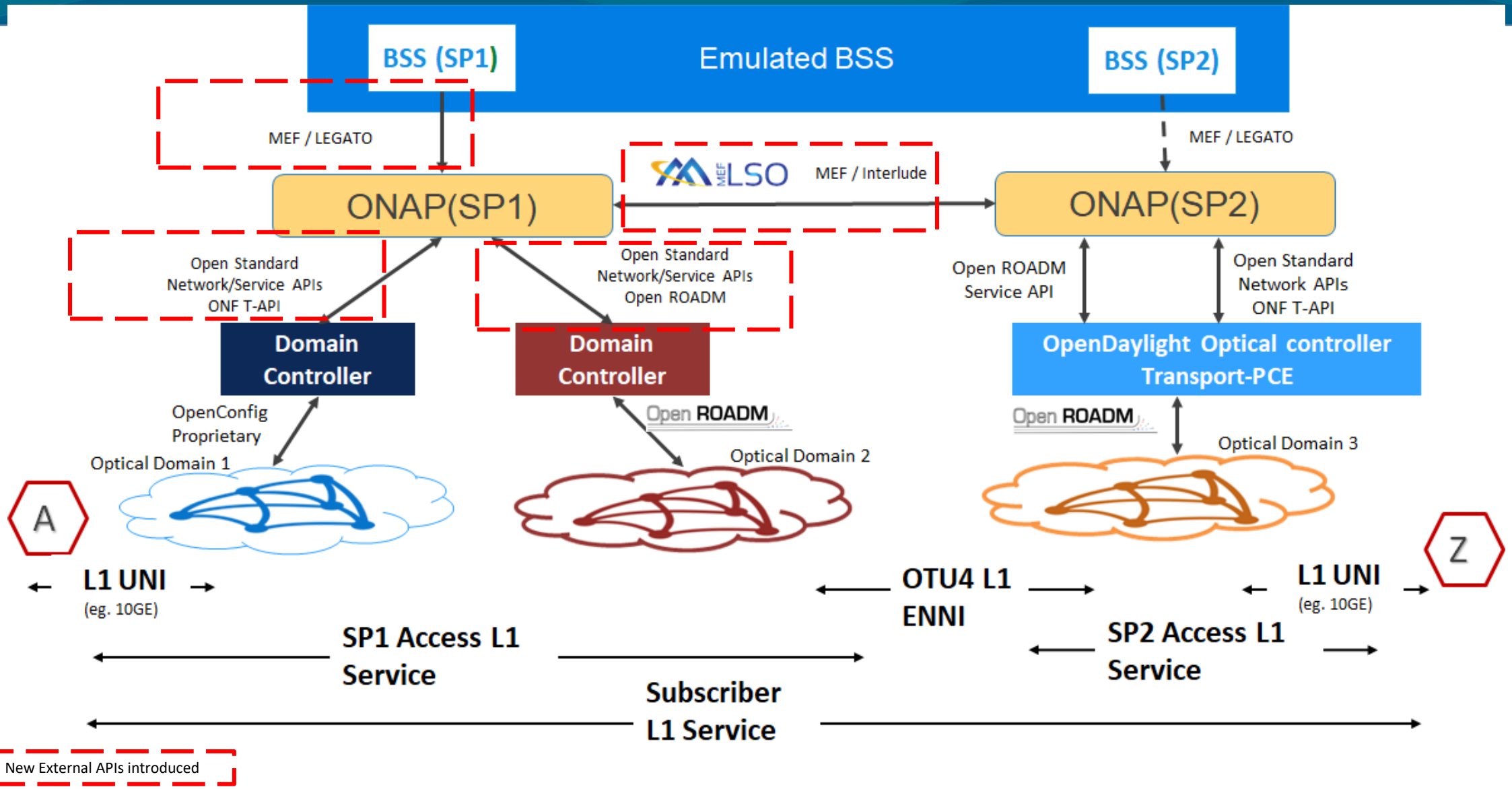
ONAP
OPEN NETWORK AUTOMATION PLATFORM

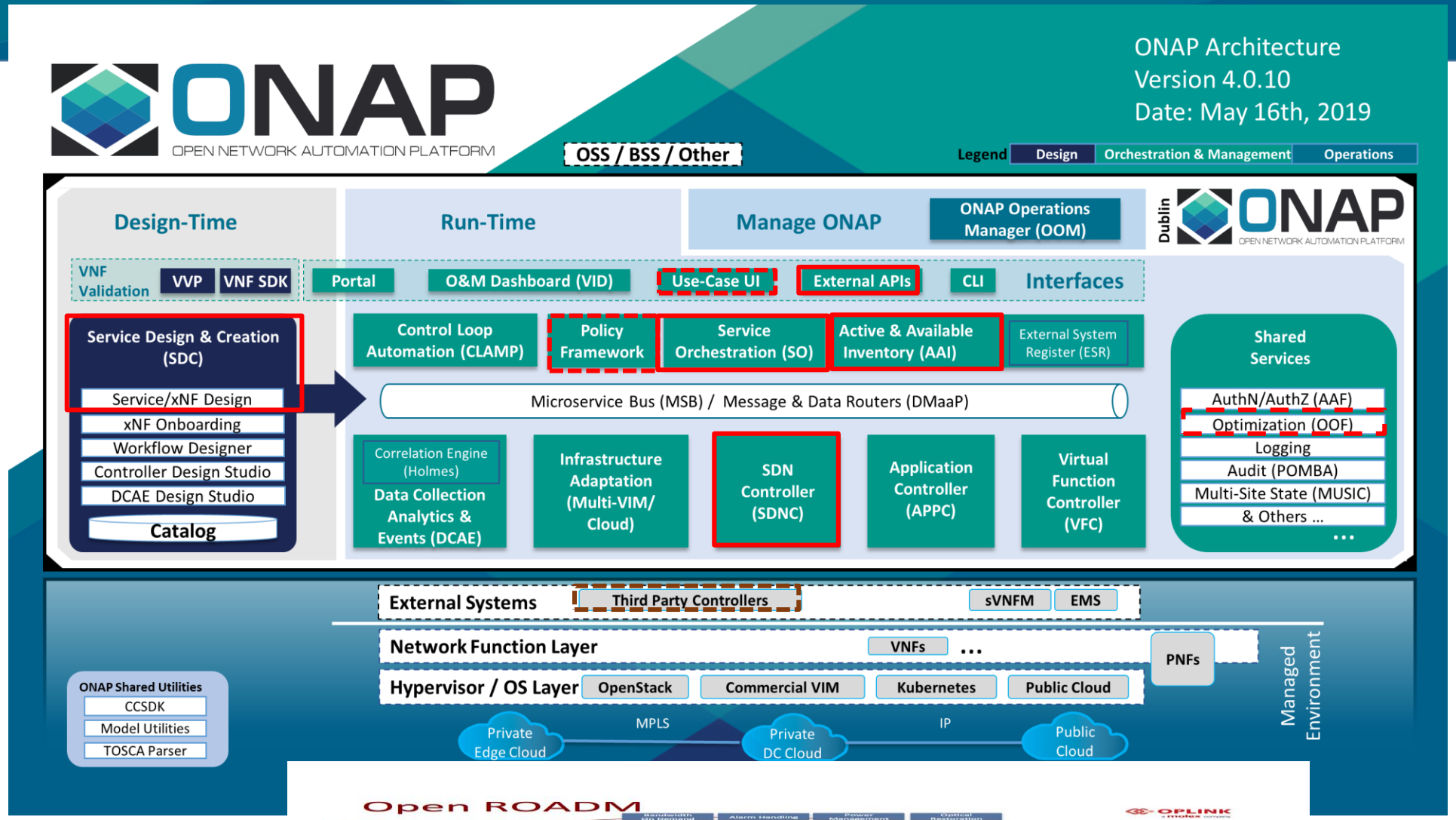
FUJITSU

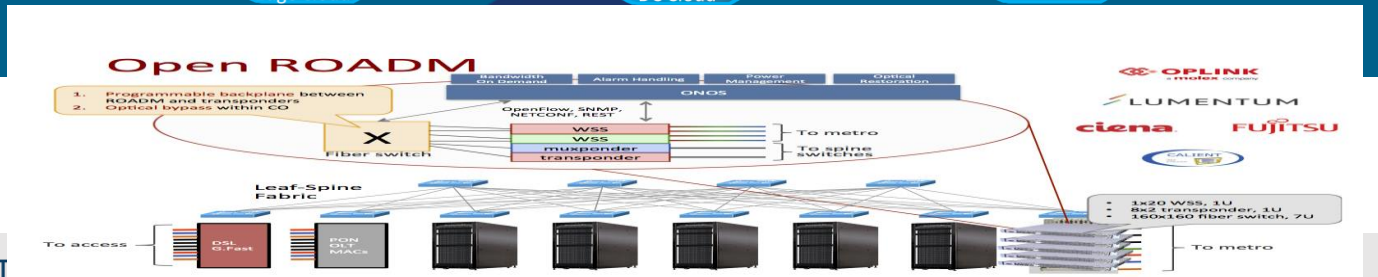
Multi Domain Optical Network Services Use Case
Impact Analysis in R6 (supported by ATT and Orange)

Use case Overview



ONAP Dublin Architecture (Impact Components in R6)





Impacted Component

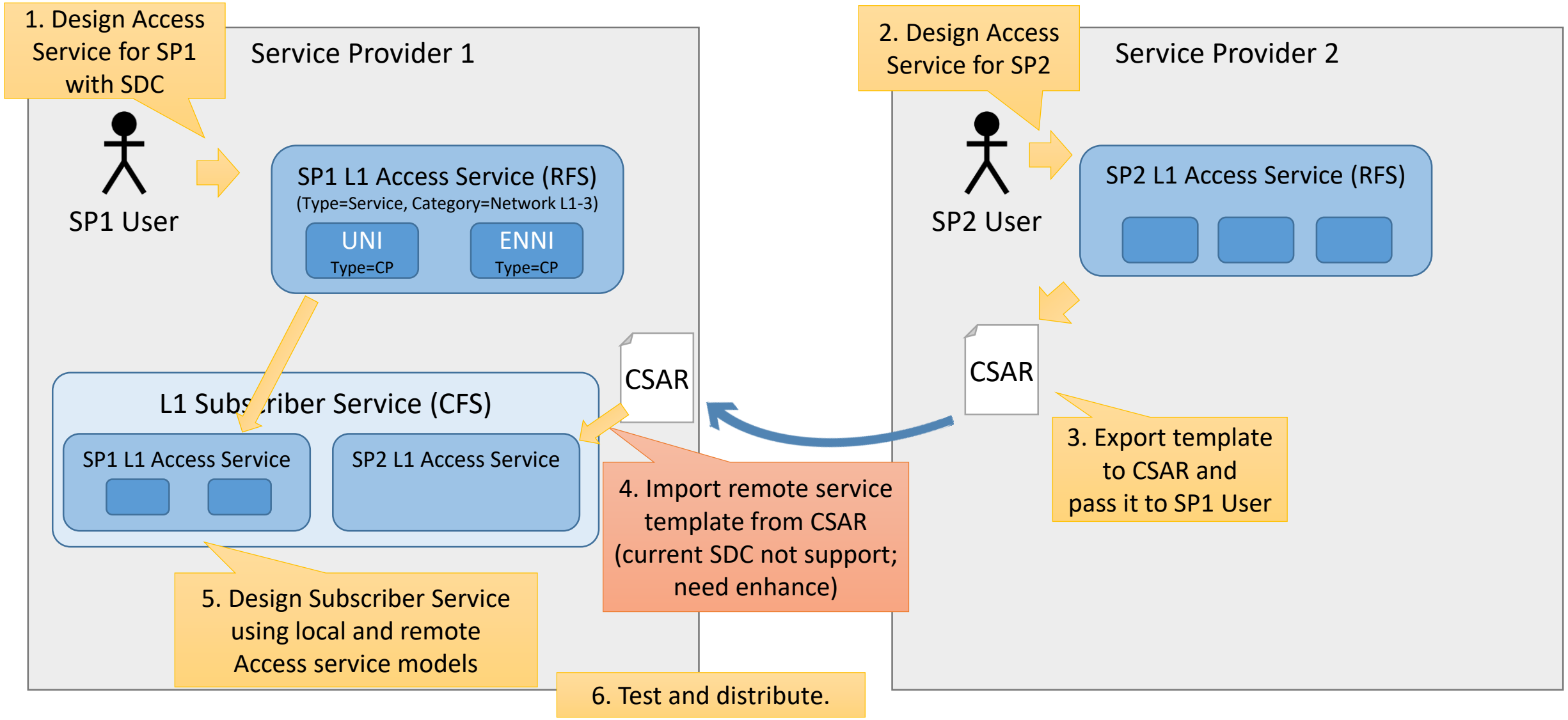
Nice to support

3rd Party Component

Requirements to SDC

- 1. Service modeling
  - No impact: can be done with existing SDC features
- 2. Importing service template from remote ONAP
  - To design L1 subscriber service, we need to import remote **access service** template
  - Need new feature to import service template from CSAR file
    - Current SDC doesn't have that
  - option 2: or import from service specification (e.g. RFSS)
    - ExtAPI exposes API to get service specification (compatible with TMF633)
    - Similar approach to TODM use case
- 3. Service composed of nested services
  - In MDONS use case, Subscriber service will be composed of Access services
  - Probably no impact: current SDC supports nested services (Service Proxy concept)

Diagram: L1 Service Design Flow <Draft>

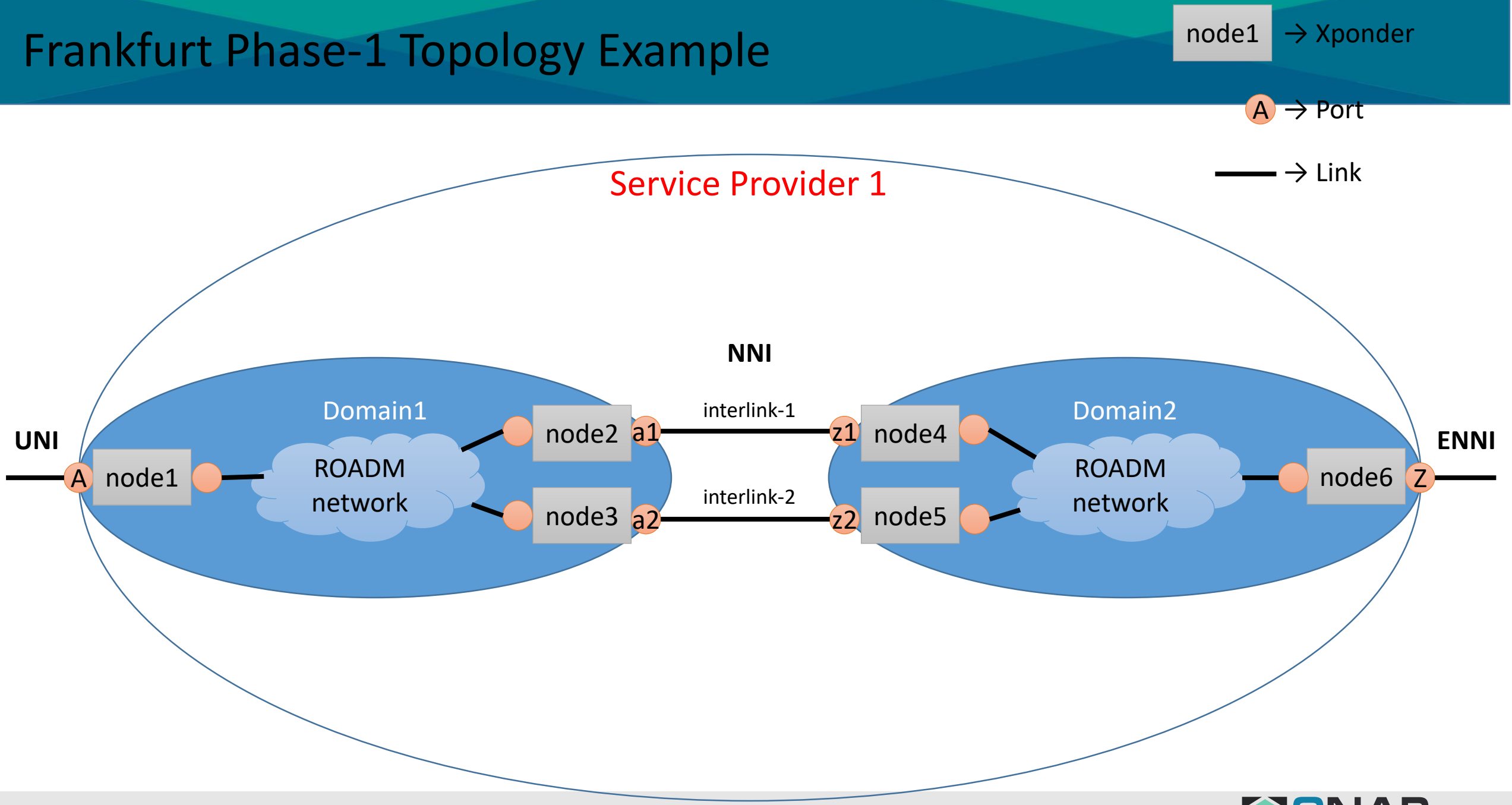


Potential Impacts to SDC

Code changes in Frankfurt:

- New feature: Importing service template from CSAR file
  - Parse CSAR file
  - Import all resources to SDC catalog
  - Validation: CSAR validity, resource conflict, etc...

Frankfurt Phase-1 Topology Example



AAI Changes: Proposal

- For "**network-resource**", add string "**network-type**" attribute. (This has already been proposed for the CCVPN use case, we can reuse it to determine if its a OpenRoadM topology or OTN topology).
- Add following attributes to **"p-interface":**

  i. **"network-interface-type" :** To indicate if that p-interface is a UNI, NNI or ENNI.

  ii. **"available-capacity" :** To indicate the current capacity of the p-interface. The existing "**speed-value"** could be used to indicate the total capacity.
- Add following attributes to **"logical-link":**

  i. **"available-capacity"** : To indicate the current capacity of the logical-link. The existing **"speed-value"** could be used to indicate the total capacity.
- Add following attributes to **"physical-link":**

  i. **"available-capacity"** : To indicate the current capacity of the physical-link. The existing "**speed-value"** could be used to indicate the total capacity.
- Add **Edge Rule** to represent "**service-instance" to "p-interface"** relationship to indicate the p-interfaces associated with that particular service. (Note: If we use the **"service-instance" to "pnf"** relationship, it becomes unclear as to which p-interface is used for that service, as a **pnf** can have many p-interfaces).
- For **"service-instance"** following attributes are added :

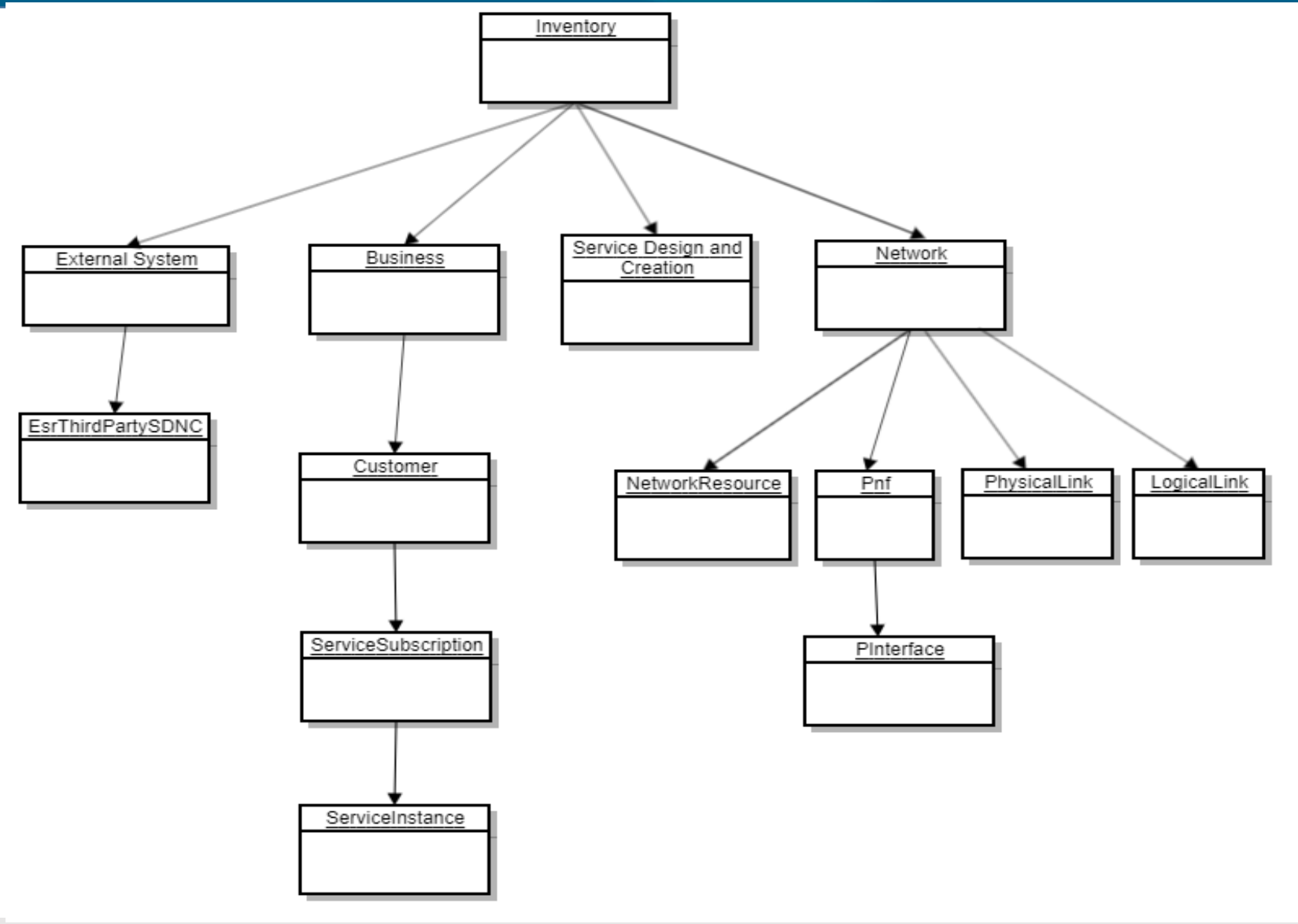
  i. **"due-date":** To indicate the due-date of the service.

  ii. **"end-date" :** To indicate the end date of the service.

  iii. **"service-rate" :** To indicate the service-rate.Eg 10GE.

  iv. **"service-layer" :** To indicate the service-layer. Eg: OTN.
- Add **Edge Rule** to represent "**esr-thirdparty-sdnc" to "network-resource"** relationship to relate a group of network resources to a particular third party controller. For eg (Openroad topology and OTN topology could be related to a SDNC controller).

A&AI Models used by MDONS Use Case



A&AI Model Attributes Used

Nodes in AAI	AAI Attributes	Data Type	Description
pnf	pnf-name(key)(M)	string	UUID
	pnf-id	string	Node ID + CLLI
	operational-status	string	Planned, deployed, maintenance
	in-maint (M)	boolean	True/False
	equip-type	string	XPONDER, ROADM
p-interface	interface-name (M)	string	UUID
	port-description	String	Port name
	network-ref	string	Network ID
	interface-type	string	XPONDER-NETWORK, XPONDER-CLIENT
	operational-status	string	Creating, Created/Active, Deleting
	in-maint (M)	boolean	True/False
	network-interface-type(newly added)	string	UNI, NNI, ENNI
	speed-units	string	
	speed-value	string	

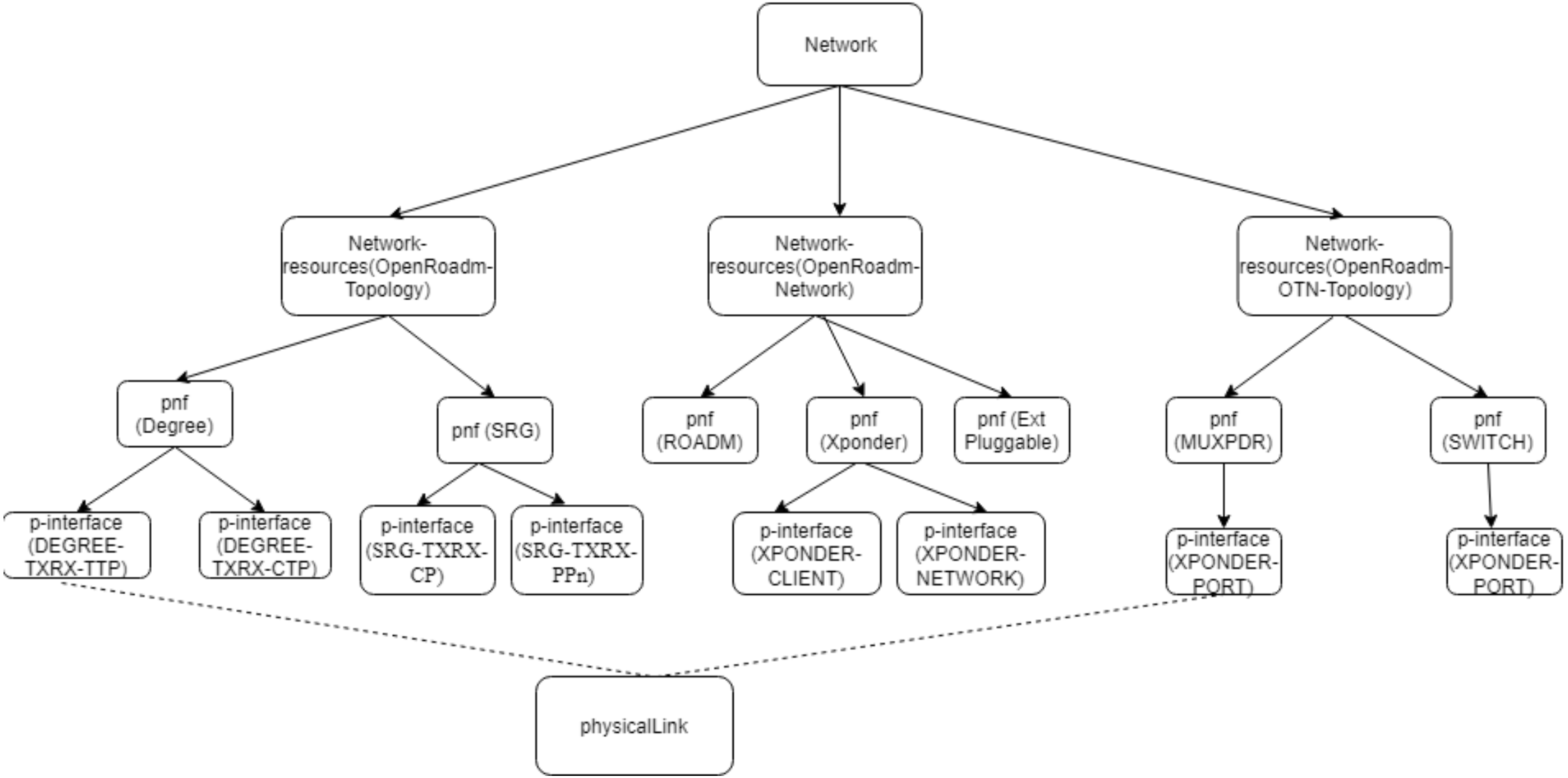
A&AI Model Attributes Used

Nodes in AAI	AAI Attributes	Data Type	Description
physical-link	link-name (M)	string	Link name
	speed-value	string	
	speed-units	string	
logical-link	link-name(M)	string	Link Name
	link-type(M)	string	OTN-Link
	in-maint(M)	boolean	True/False
	speed-value	string	
	speed-units	string	
	operational-status	string	Creating, Created/Active, Deleting

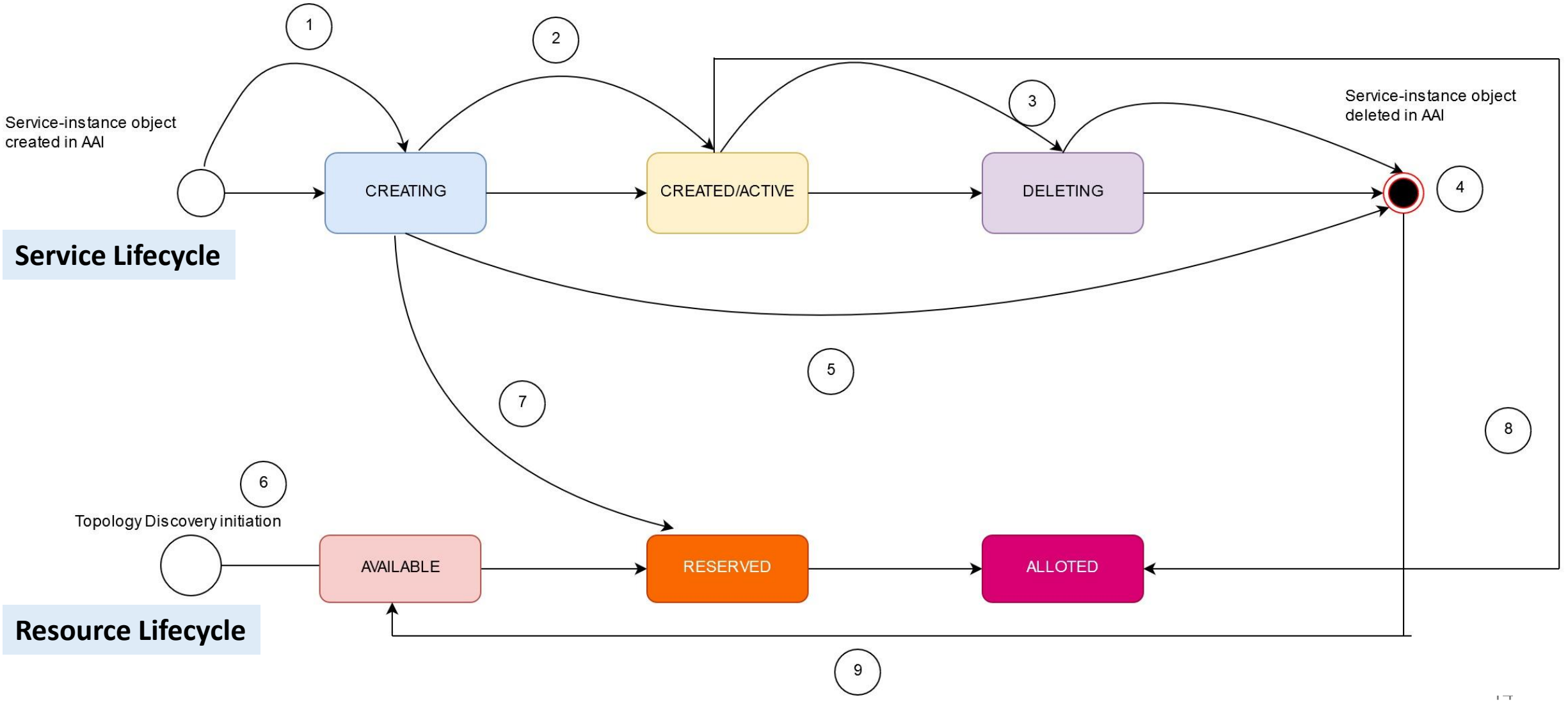
A&AI Model Attributes Used

Nodes in AAI	AAI Attributes	Data Type	Description
service-instance	service-instance-id(M)	string	UUID
	service-instance-name	string	
	service-type	string	Access, Domain
	orchestration-status	string	Creating, Created/Active, Deleting
	due-date(newly added)	string	
	end-date(newly added)	string	
	service-rate	string	10GE
	service-layer	string	OTN

Topology Model Tree View



Service and Resource Lifecycle Diagram



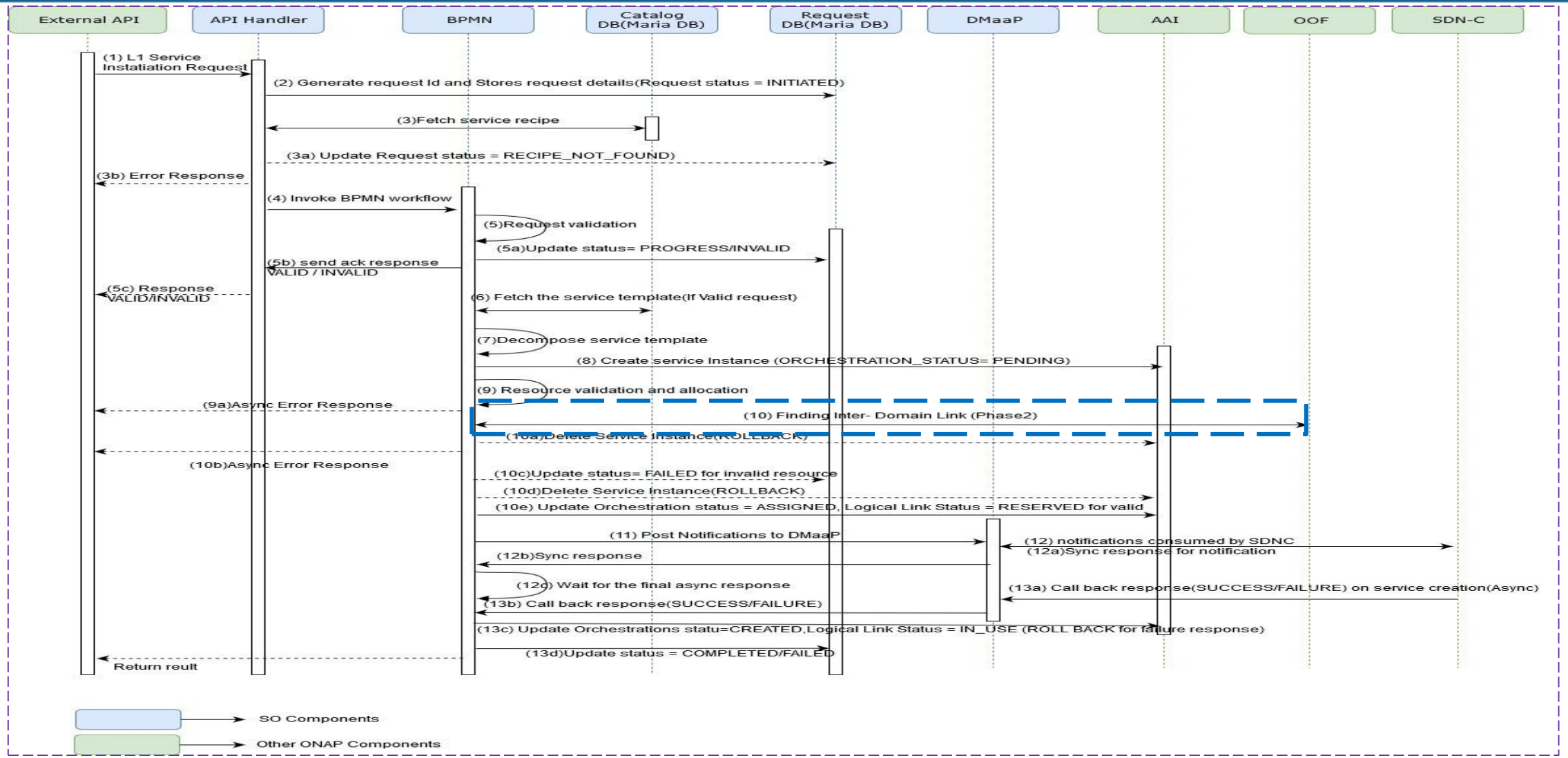
Service Status Table

S.No.	STATUS in AAI	Actions taken by SO	Actions taken by SDN-C
1.	Available	• Request received and validated • Service decomposed and SDN-C triggered	• SDN-C validates request • Sends create request to controller • Allocates resource in AAI
2.	Created/ Active	• After all the async responses for create request from the SDN controller is successful	• Receives successful async response from the SDN controller
3.	Deleting	• Delete request from UUI • Request validated and sent to SDN-C	• Service delete request from SDNC • Request validated and sent to controller
4.	None	• After all the async responses for delete request from the SDN controller is successful	• Service delete async response successful
5.	None	• Resource validation fails/SDN-C sends sync/async response with ‘failure’ or if timer expires	• Request validation fails • Async response fails for both service creation and deletion

Resource Status Table

S.No.	Status in AAI	Resource in AAI	Actions taken by SO	Actions taken by SDN-C
6.	Available	• Pnf • P-interface • Physical-link • Logical-link		During topology discovery, SDNC updates the status of all the resources as available in AAI
7.	Reserved	• P-interface • Logical-link		SDN-C reserves the status of the p-interface and physical-link that is used for a particular service during Service creation request
7.	Reserved	• Logical-link	SO reserves the inter-domain link that is the logical-link for that service.	
8.	Allotted	• P-interface • Logical-link		Once the domain service is successfully created (i.e after the async response), SDN-C marks the resources as alloted
8.	Allotted	• Logical-link	Once the access service is successfully created (i.e after the async response), SO marks resources as allotted	
9.	Available	• P-interface • Logical-link		Once the domain service is successfully deleted(i.e after the async response), SDN-C marks the resources as available
9.	Available	• Logical-link	Once the access service is successfully deleted(i.e after the async response), SO marks the resources as available	

Service Creation



New features introduced in P2

SO Requirements/Impacts in R6

S.No	Requirement		Code change needed?	Impacted model and required high-level changes (bpmn->so-bpmn-infrastructure-flows,so-bpmn-infrastructure-common)
1	**Upon distribution of MDONS service template from SDC, SO to download the template and store it.**		No	
2	**Upon reception of service creation/deletion request from UUI, SO to:**	(a) Validate the request	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow to validate if the necessary endpoints are given in request to process.
		(b) Send a synchronous response to UUI with success/failure indication along with the reason.	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow to send the success/failure indication with reason as per this use-case.
		(c) If it is allowed to process the request further, decompose the service using the design template.	Yes	• **Existing workflow to be reused:** DecomposeService • Enhance the existing workflow to adapt L1Access service template decomposition
		(d) Check feasibility (check AAI), and then determine inter-domain link by 1.hard-coded logic (Phase 1) 2.triggering OOF (Phase 2)	Yes	• **Existing workflow to be used:** DoCreateE2EServiceInstance • Enhance the existing workflow to invoke workflow -“Homing” which is an existing workflow to determine the inter-domain link with the aid of OOF
		e. Update the inter-domain link status in AAI	Yes	• **Existing workflow to be used:** DoCreateE2EServiceInstance • Enhance the existing workflow by adding a new task to update the inter-domain link status = “DOWN” in AAI

SO Requirements/Impacts in R6

S.No.	Requirement		Code change needed?	Impacted model and required high-level changes (bpmn->so-bpmn-infrastructure-flows,so-bpmn-infrastructure-common)
3	**Upon reception of response from OOF (Phase 2) (For phase 1, the following steps will simply follow step 2(d))**	Prepare and send a DMaaP message to SDN-C for each domain service to be created.	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow by creating a new task to reuse the existing DMaaP client resides in package "org.onap.so.client.dmaap"
		Store the request(s) details in local DB.	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow to store the request details in request-DB to track the request progress and handle the call back response from SDN-C
4	**Upon reception of synchronous response from SDN-C, SO to:**	(a) Send update to UUI	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Existing workflow to be enhanced to send synchronous success/failure response to UUI after getting the response from SDN-C on all domain controllers. Need to expose an API to send the response to UUI.(*Note)
		(b) Update AAI of service status (creating)	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow to update the service status in AAI based on the synchronous responses received from SDN-C on all domain controllers. If the response is success update the service status = "creating"

SO Requirements/Impacts in R6

S.No	Requirement		Code change needed?	Impacted model and required highlevel changes (bpmn->so-bpmn-infrastructure-flows, so-bpmn-infrastructure-common)
4	**Upon reception of synchronous response from SDN-C, SO to:**	(c) Update local DB of request status (if success response)	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow to update the request status in request-DB if response is success.
		(d) Start a timer (if success response)	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Existing workflow to be enhanced by adding tasks from existing workflow - "SDNCAdapterV1" to start the timer for success response (to wait for asynchronous response from SDN-C)
		(e) Rollback for failure indication (delete the AAI service instance for rollback)	Yes	• **Existing workflow to be reused:** CreateCustomE2EServiceInstance • Enhance the existing workflow by adding a task to invoke existing roll back workflow - "DoCreateServiceInstanceRollback" to delete the service instance in AAI in case of failure.
5	**Upon reception of asynchronous response over DMaaP from SDN-C, SO to:**	(a) Determine for which request the response has come.	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Existing workflow can be enhanced to check if response from all domain controllers has been received by creating a new task

SO Requirements/Impacts in R6

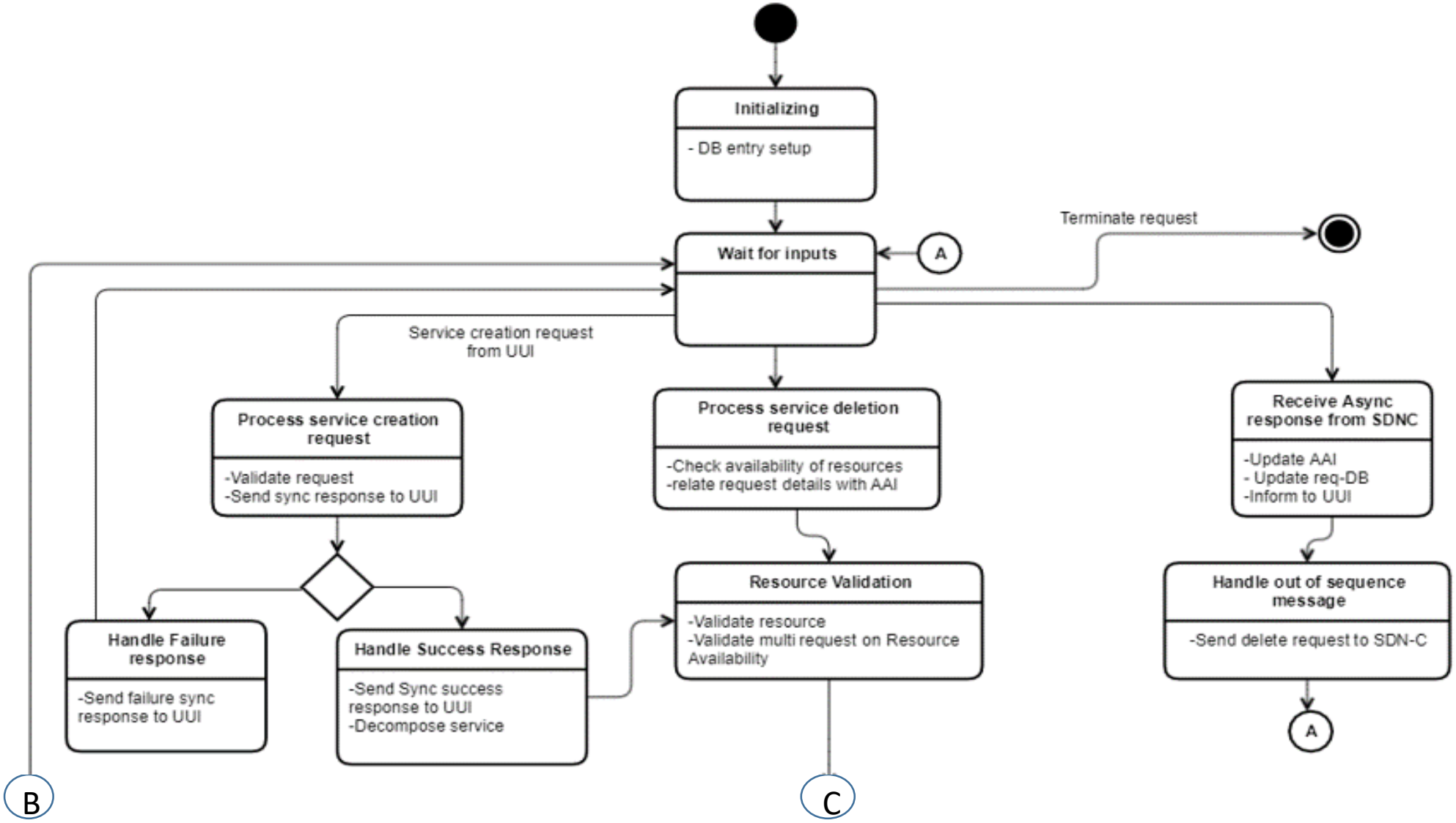
S.No	Requirement		Code change needed?	Impacted model and required highlevel changes bpmn->so-bpmn-infrastructure-flows,so-bpmn-infrastructure-common
5	**Upon reception of asynchronous response over DMaaP from SDN-C, SO to:**	(b) Update AAI inventory with service details (status: active)	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow to update the service status = "active" in AAI if the asynchronous response of all domain controllers from SDN-C is success.
		(c) Send info (async API) to UUI with success/failure indication, service details, and reason in case of failure.	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding a new task by exposing a new async API to UUI to send the success/failure response, service details and reason for failure case.(*Note)
		(d) Rollback for failure indication (delete the AAI service instance for rollback)	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow to invoke existing roll back workflow - "DoCreateServiceInstanceRollback" for failure response.
		(e) Update local DB entries	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding a task to update the service request progress based on the asynchronous success/failure response in request-DB.
		(f) Update the inter-domain link status in Aai based on the success/failure response.	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding a task to update inter-domain link status = “UP” in AAI if the response is success.

SO Requirements/Impacts in R6

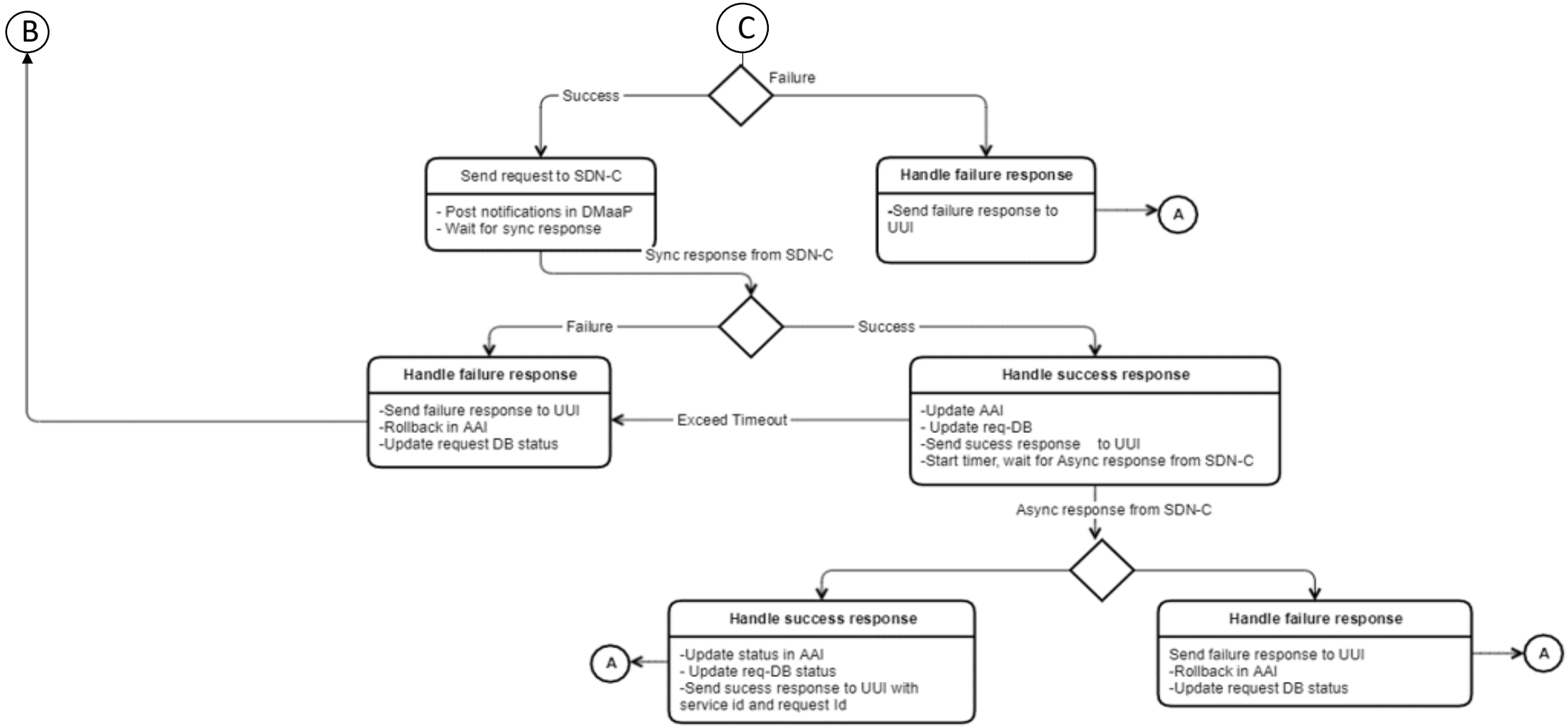
S.No	Requirement		Code change needed?	Impacted model and required highlevel changes bpmn->so-bpmn-infrastructure-flows,so-bpmn-infrastructure-common
6	**Upon expiry of timer for async response from SDN-C, SO to:**	(a) Send a failure indication to UUI with service info and reason	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding task created for the requirement (5c)(*Note)
		(b) Update local DB entries	Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding a task to update the service request failure in request-DB.
7	**SO to be able to handle multiple service creation/deletion requests in parallel (Phase 2), i.e., handle a 2nd request before the first one is fully complete**		Yes	• **Existing workflow to be reused**: CreateCustomE2EServiceInstance • The existing workflow to be enhanced to support the multiple request handling logic.

*Note: Pending confirmation from External-API if any API is exposed to consume the response from SO. Based on that existing workflow will be enhanced.

SO State Diagram



SO State Diagram



OOF Impacts in R6

- A new optimizer will be added in the optf-osdf repository under the osdf/optimizers package which will have a new solver.
- A MiniZinc template will be added wherein all the inputs and the constraints are defined.
- Once the template is run through an optimized output will be given based on the requirements and constraints.
- The output will then be formatted and sent to SO.

UUI Impacts in R6

Below are the functionalities that need to be added in UUI for MDONS use case in Frankfurt:

1. Get and show MDONS instances
2. Create MDONS instances
3. Delete MDONS instances

without changing any of the following depended APIs:

- Catolog API (SDC)
- SO API
- MSB API
- A&AI API

SDNC Requirements/Impacts in R6

1. SDN-C should be able to receive DMaaP messages from SO for service creation and deletion.
2. Upon reception of DMaaP messages from SO for service creation/deletion:
   a) SDN-C to determine which external SDN controller to be invoked using the “domain-type” info received in the request from SO.
   b) Persist the request details in local DB
   c) Check validity of request, and if valid, go to step (d), else send a synchronous response to SO with failure indication.
   d) SDN-C to prepare and send the request for service creation to the SDN controller determined in 2(a), and start a timer.
3. Upon reception of synchronous response from SDN controller, SDN-C to:
   a) Send a synchronous response (over DMaaP) indicating acceptance/rejection of the request (as received from the SDN controller)
   b) Update the resource status (under service instance [domain]) as creating.
4. Upon reception of asynchronous response from SDN controller, SDN-C to:
   a) Determine for which request the response has come (ignore if no request found)
   b) Prepare and send DMaaP message to SO with the appropriate details (success/failure, service details, reason code in case of failure)
   c) Update DB entries
5. Upon expiry of the async response timer, SDN-C to:
   a) Send a DMaaP message to SO with failure details
   b) Update DB entries (Note)
6. Topology discovery

SDNC Impacts

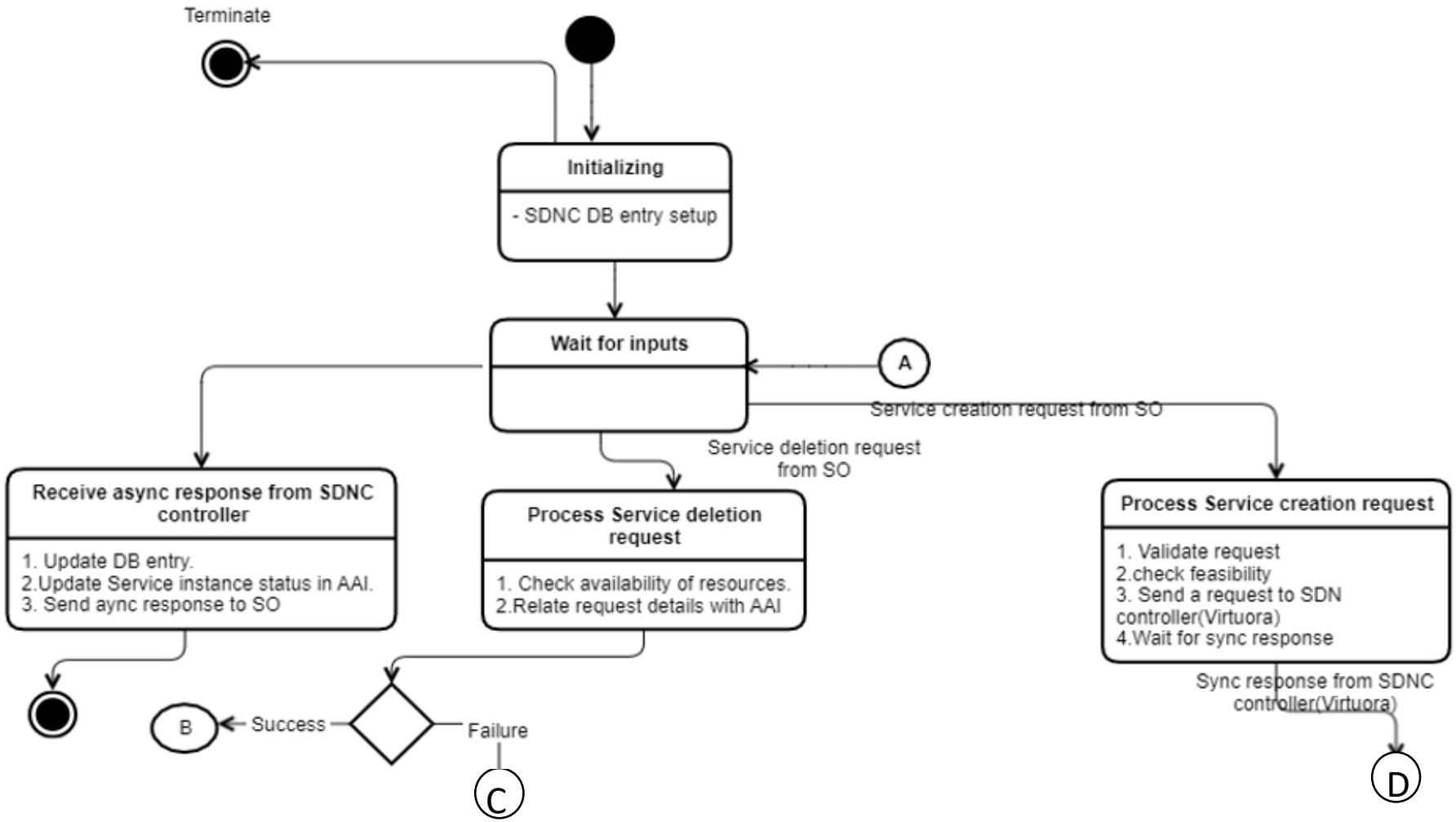
Class/sub-component	Impact Description	Requirement reference	Remarks
dmaap-listener under ccsdk-sli-northbound package	New SDNC-SO Consumer class	1, 2.a,	• A new SDNC-SO consumer class to be written to get notifications from SO and perform validation logic and invoke RPCs for Service Creation and Deletion.
SDNC DB	New table in SDNC DB	2.b. , 4.a	• A new table to be created in DB to store request details.
ccsdk/sli/adaptors - PublisherApiImpl Class	Reuse existing adaptor	2.c	• Existing class/adaptor can be used to publish notifications with success or failure response back to SO.
ccsdk-sli-northbound	New Package - RPCs and timer logic	2.d	• A new package to be created to write RPCs for OpenROADM Service Creation/Deletion and T-API Service Creation/Deletion.
generic-resource-api 'org.onap.ccsdk.sli.plugins.restapicall.RestapiCallNode'	Reuse rest-api-call-node adaptor to invoke External Controllers	2.d	• rest-api-call-node will be used in DG to invoke External controller to send Request for Service creation or Deletion.
generic-resource-api - messagerouter- publisher	Reuse existing adaptor – To be used from DG	2. c, 3.a, 5.a,4.b	• Existing class/adaptor will be used to publish callback sync/async notifications back to SO via DG.

SDNC Impacts

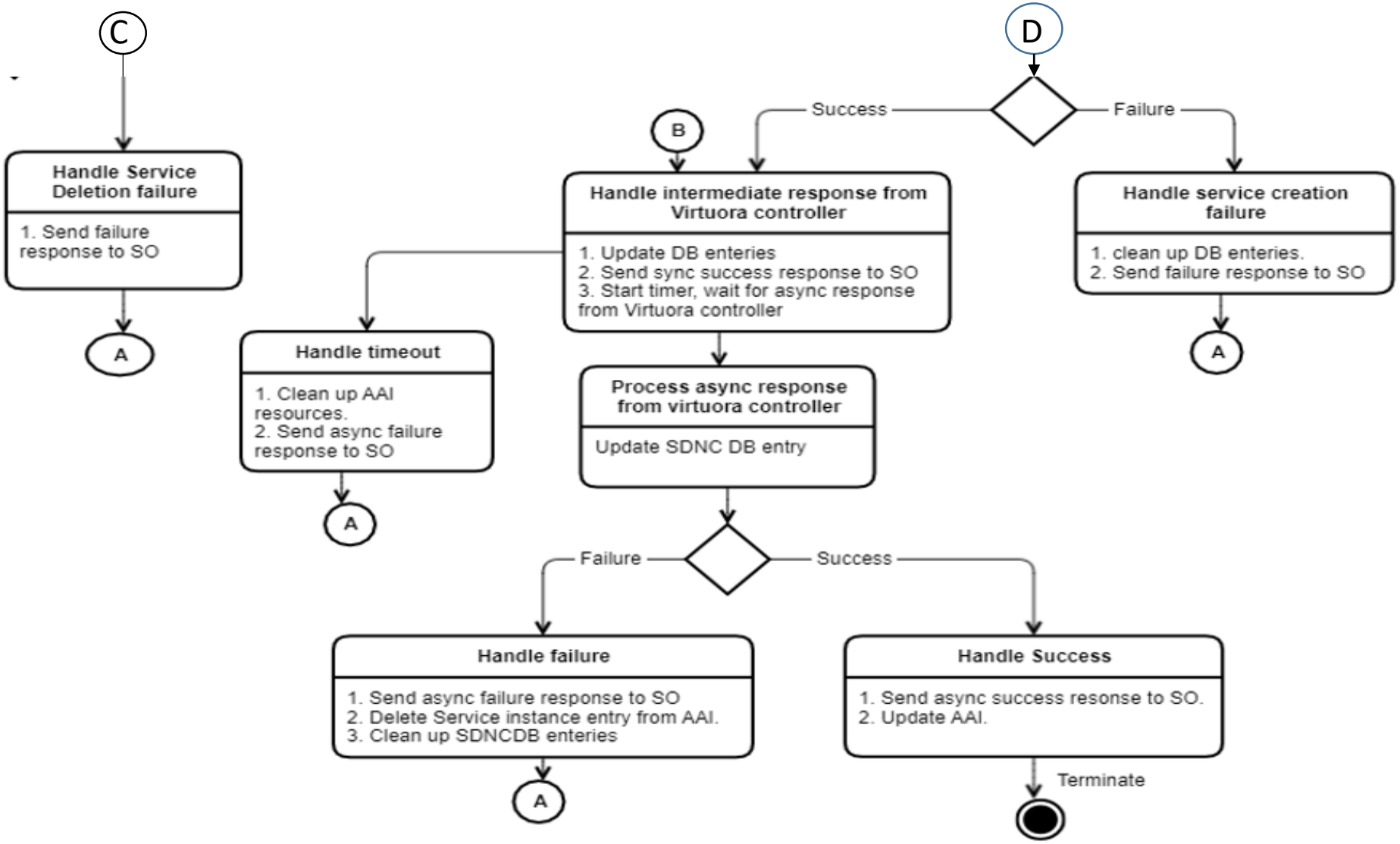
Class/sub-component	Impact Description	Requirement reference	Remarks
generic-resource-api 'org.onap.ccsdk.sli.adaptors.aai.AAIService'	Reuse existing adaptor	3.b	• An existing AAI plugin will be used to create or update resources in AAI.
generic-resource-api 'org.onap.ccsdk.sli.adaptors.resource.sql.SqlResource'	Reuse existing plugin	4.a, 4.c,5.b	• In case of async response, to co-relate response and request ids a new table needs to be created. • Update operation to be performed on DB to change request status.

Note* - New DGs to be designed for OpenROADM Service Create/Delete, T-API Service Create/Delete and Resource Topology of OpenROADM and T-API based Virtuora controllers.

SDNC – State Diagram



SDNC – State Diagram



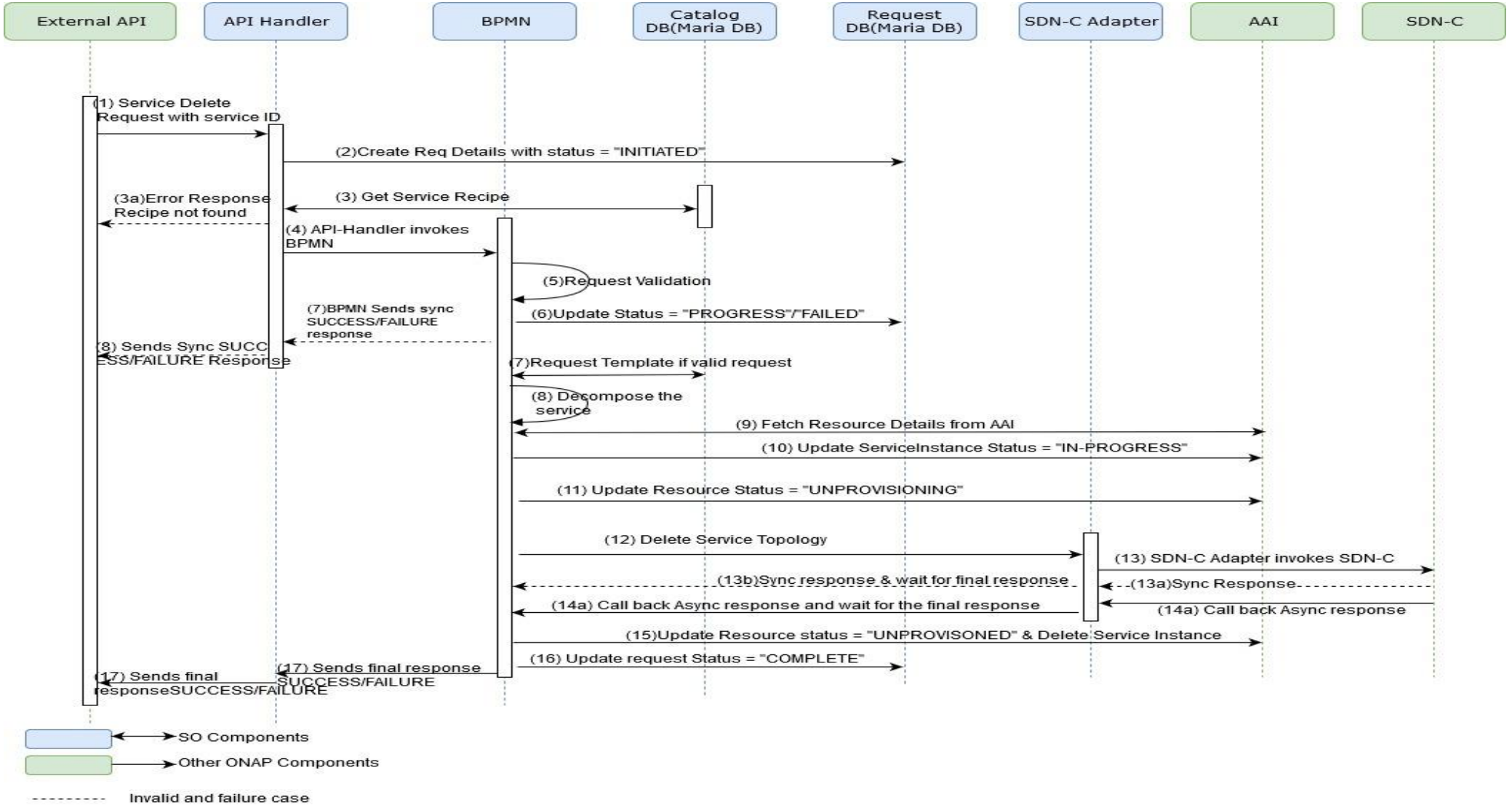
References

- https://wiki.onap.org/display/DW/Multi-domain+Optical+Network+Services

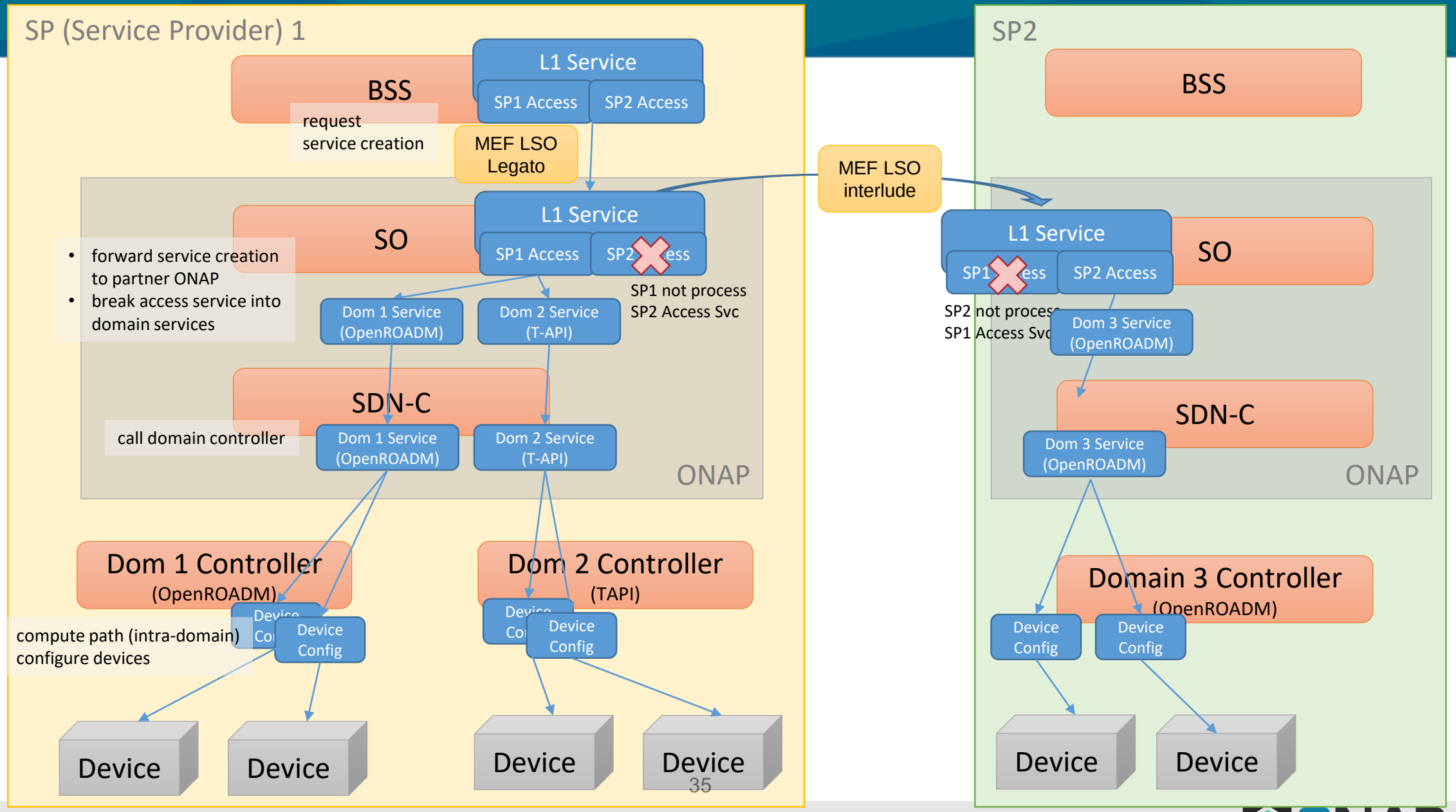
Backup

- Service Termination Flow
- Run Time Data Flow

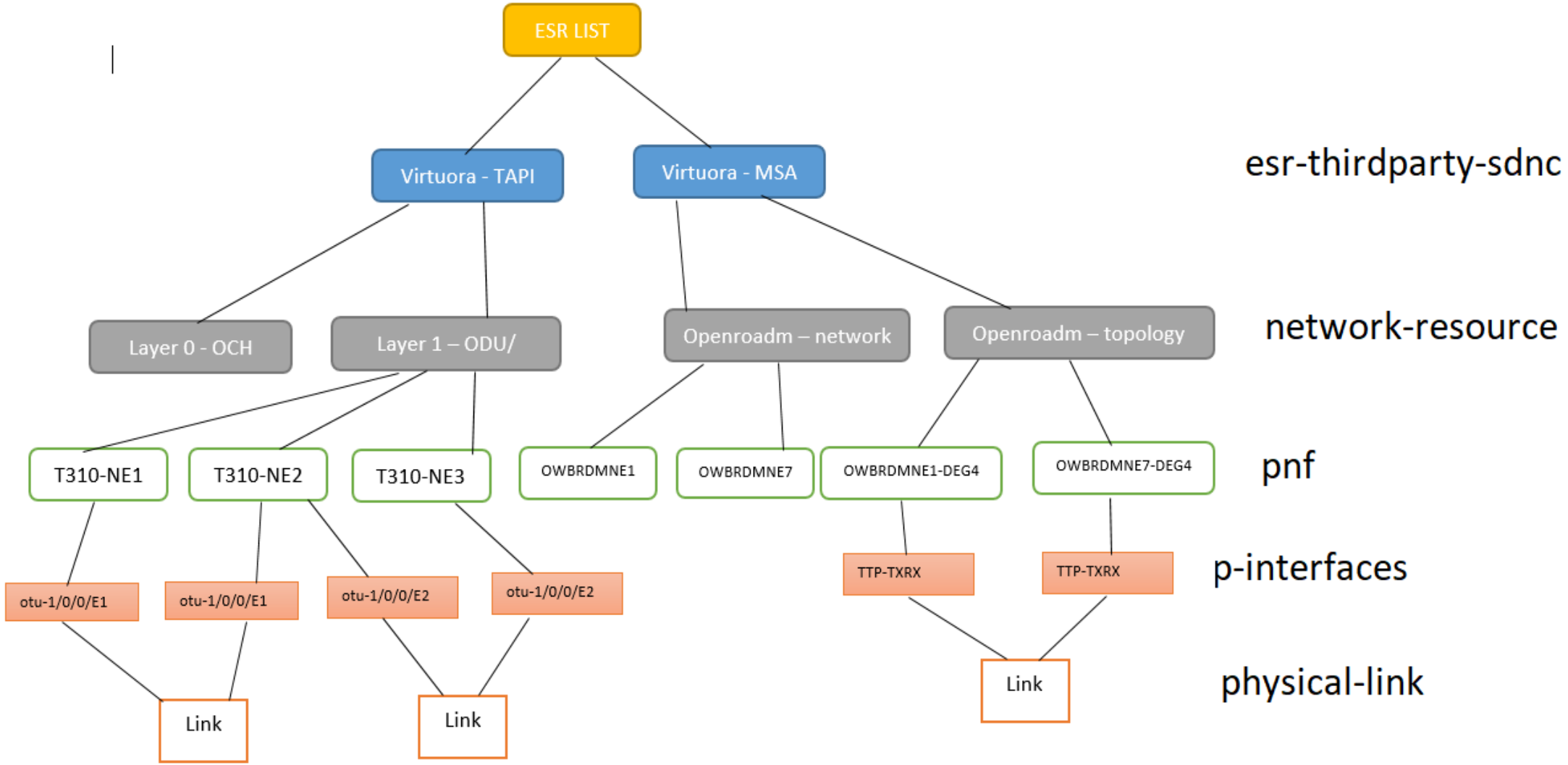
Service Termination



Run-time Data Flow



AAI Tree Structure (after Current 3rd Party Controller Onboarding)



Points to be discussed

- Align with CCVPN Extension (ELine Service Orchestration) Use Case
  - On going discussion and alignment (in service and resource modeling)
    - CCVPN Extension (L1 Connection with L2 service)
    - MDONS is orchecstrating L1 Service
- How to import the Csar across different SPs?
  - MEF Interlude API
  - Manually for now