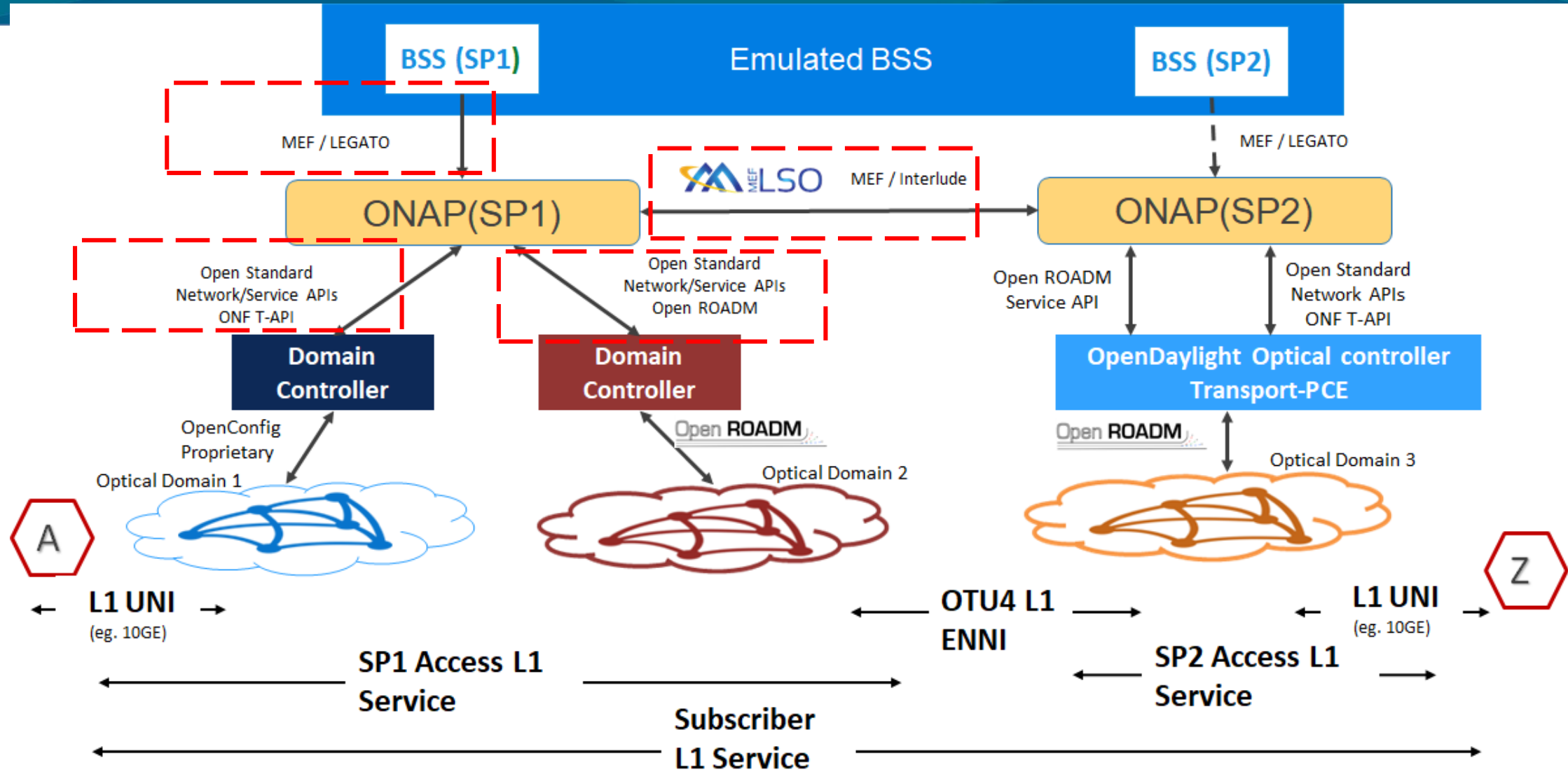


Multi Domain Optical Network Services Use Case Impact Analysis in R6 (supported by ATT and Orange)

Toshimichi Fukuta (Fujitsu), Xin Miao(Fujitsu)

Use case Overview



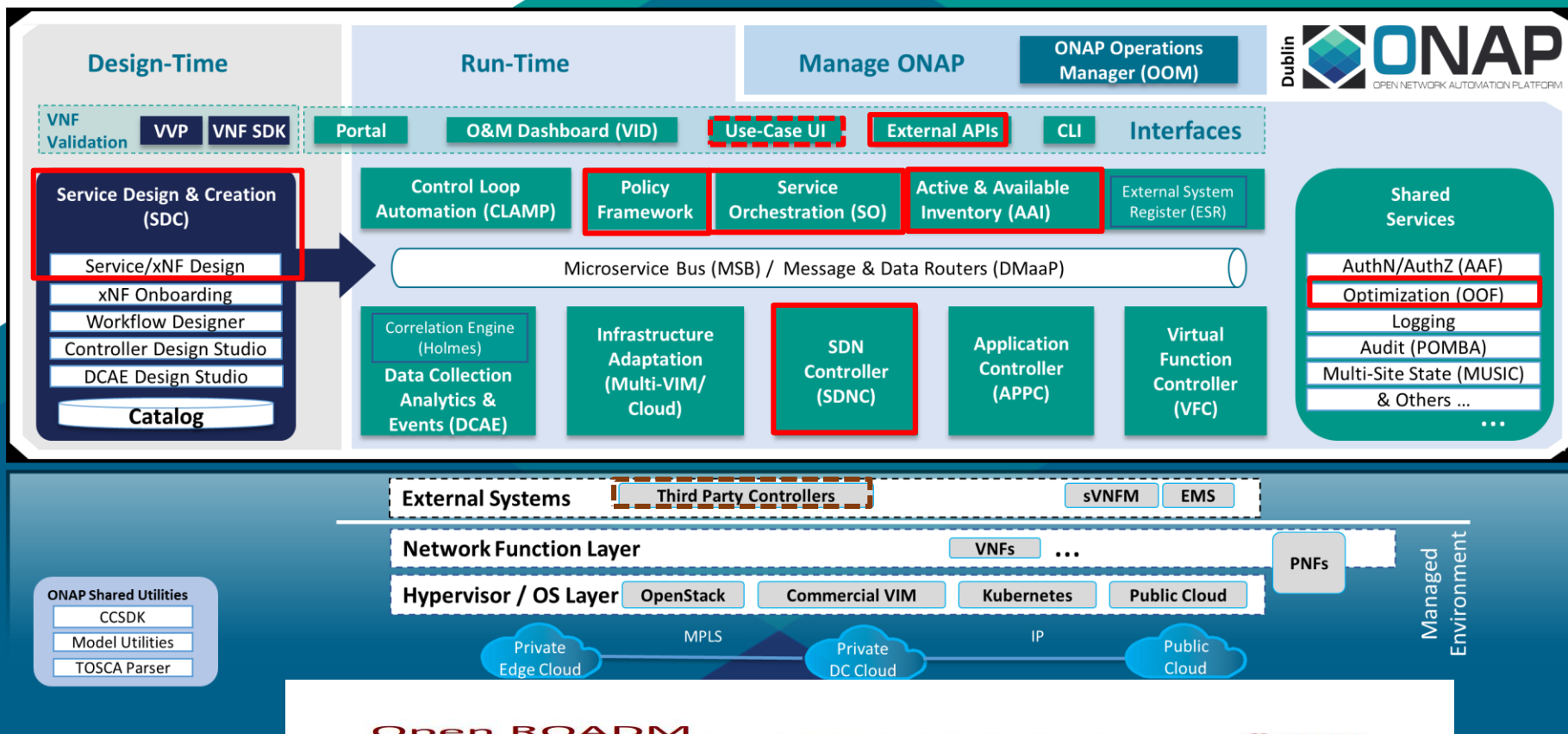
ONAP Dublin Architecture (Impact Components in R6)



ONAP Architecture
Version 4.0.10
Date: May 16th, 2019

OSS / BSS / Other

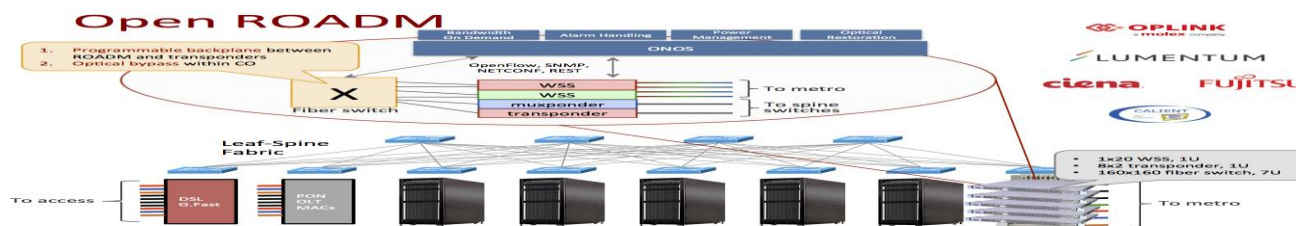
Legend Design **Orchestration & Management** Operations



Impacted Component

Nice to support

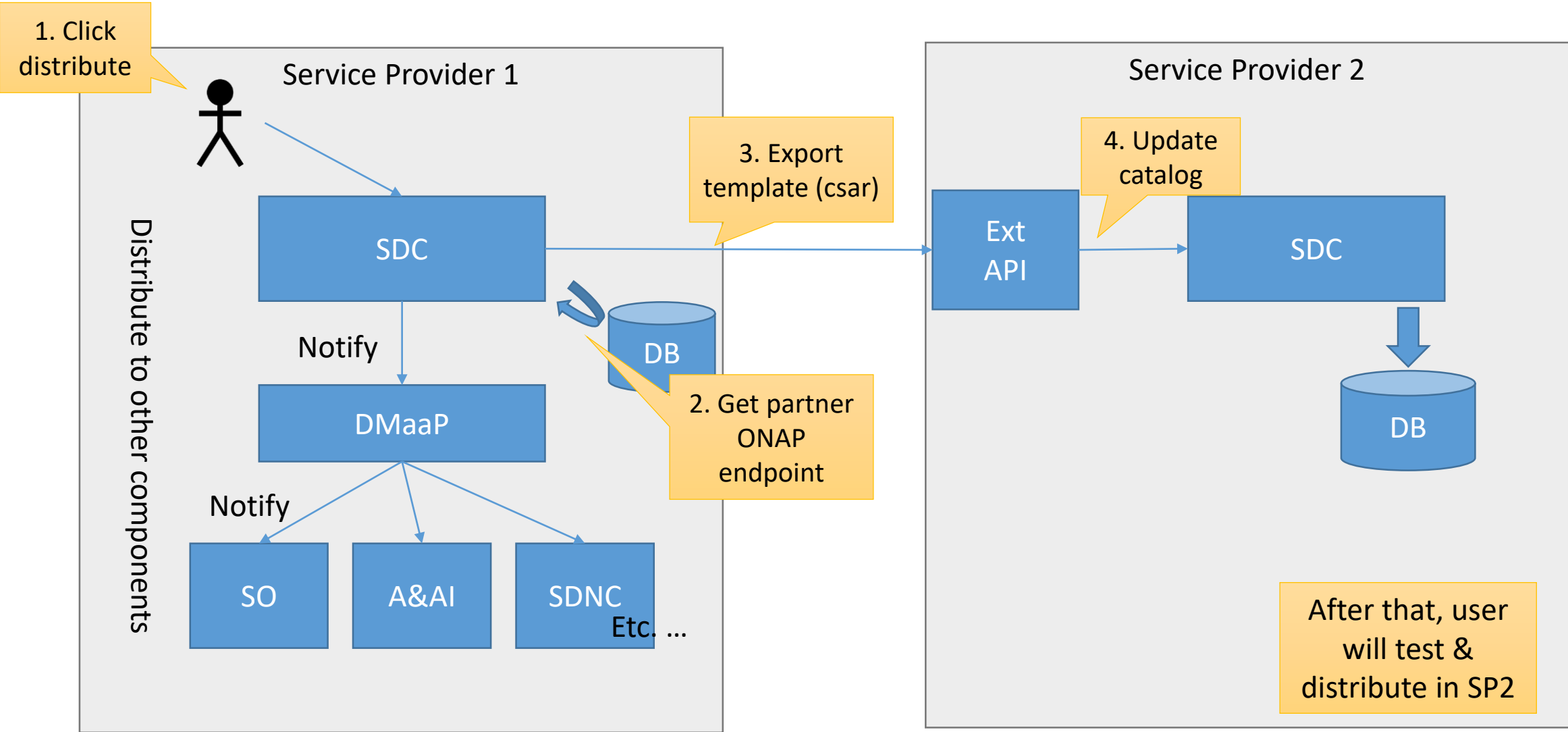
3rd Party Component



Requirements to SDC

- 1. Service modeling
 - No impact: can be done with existing sdc features
- 2. Service template export/import to remote ONAP
 - We want to use the same template in both ONAP
 - Export a template to remote ONAP's catalog
 - Some overlaps with 3rd-party operational domain manager (?)

Diagram: Exporting/Importing Service Template < Draft >



Potential Impacts to SDC

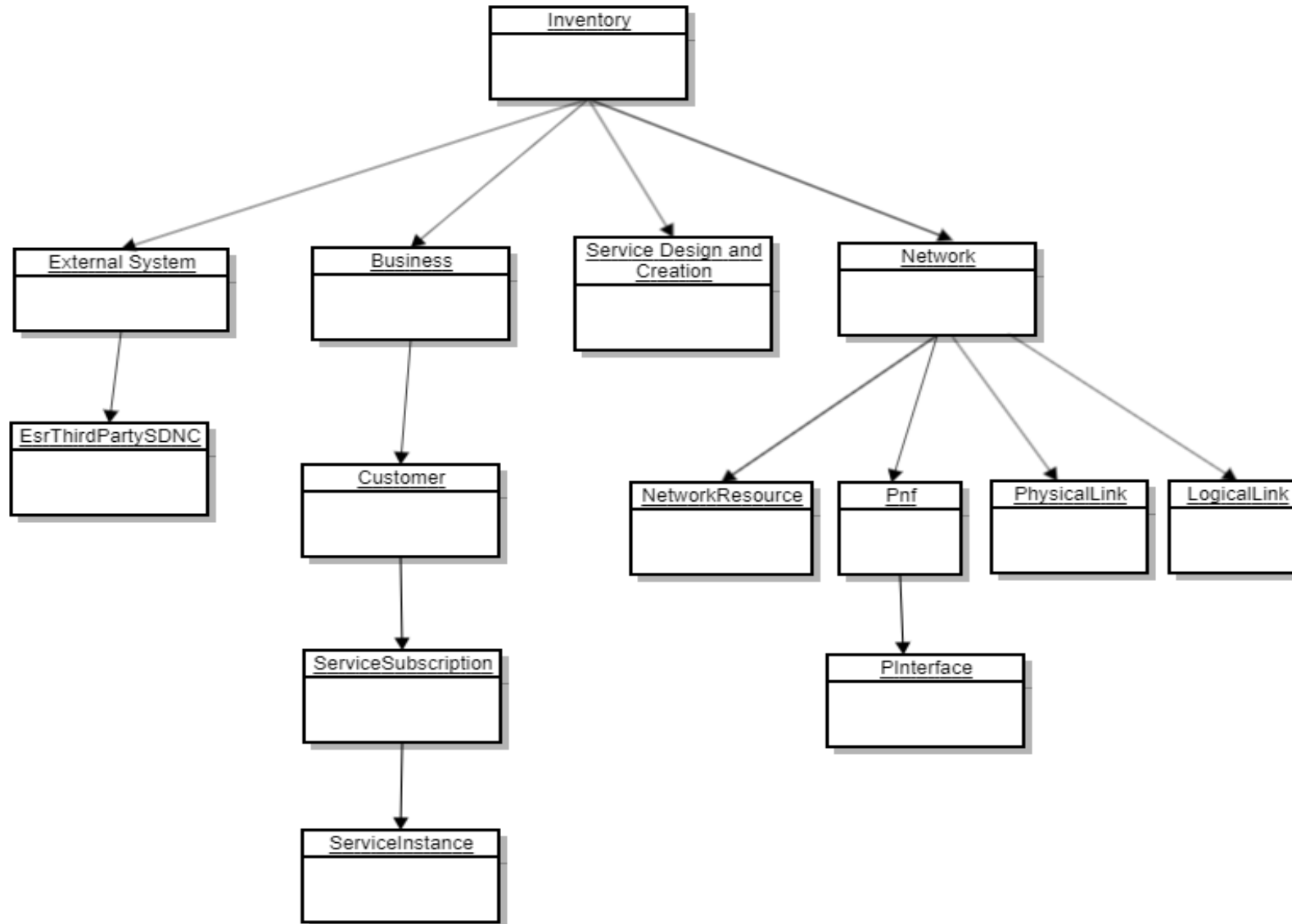
Code changes in Frankfurt:

- Export a service template to remote ONAP SDC catalog
 - Conversion logic between SDC/ExtAPI ?
- Import the template via Ext API
- Register remote ONAP info in DB
 - Might include db schema change

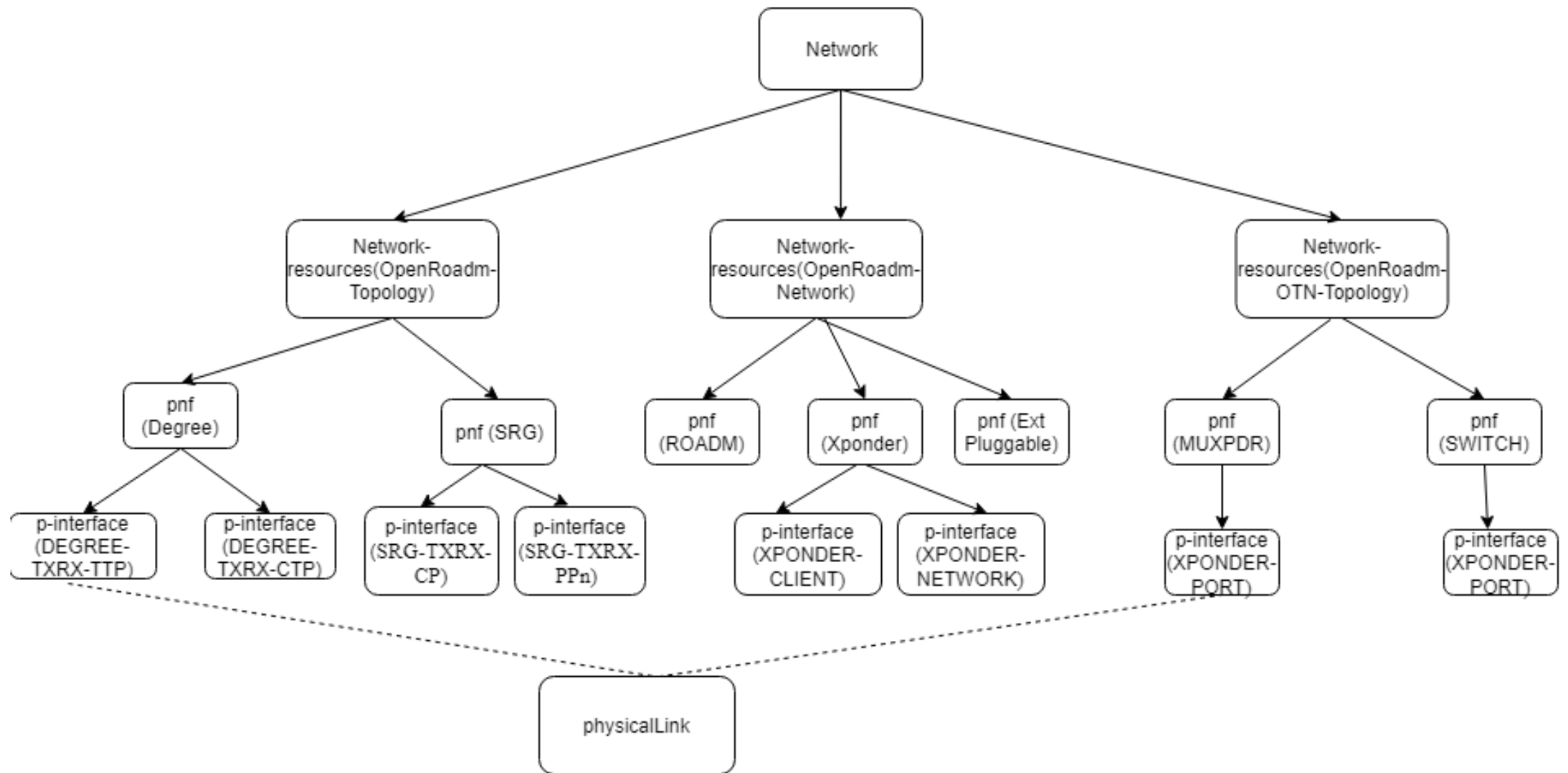
AAI Changes: Proposal

- 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.
- 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
 - iv. "**service-layer**" : To indicate the service-layer WDM or OTN

A&AI Models used by MDONS Use Case



Topology Model Tree View



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	

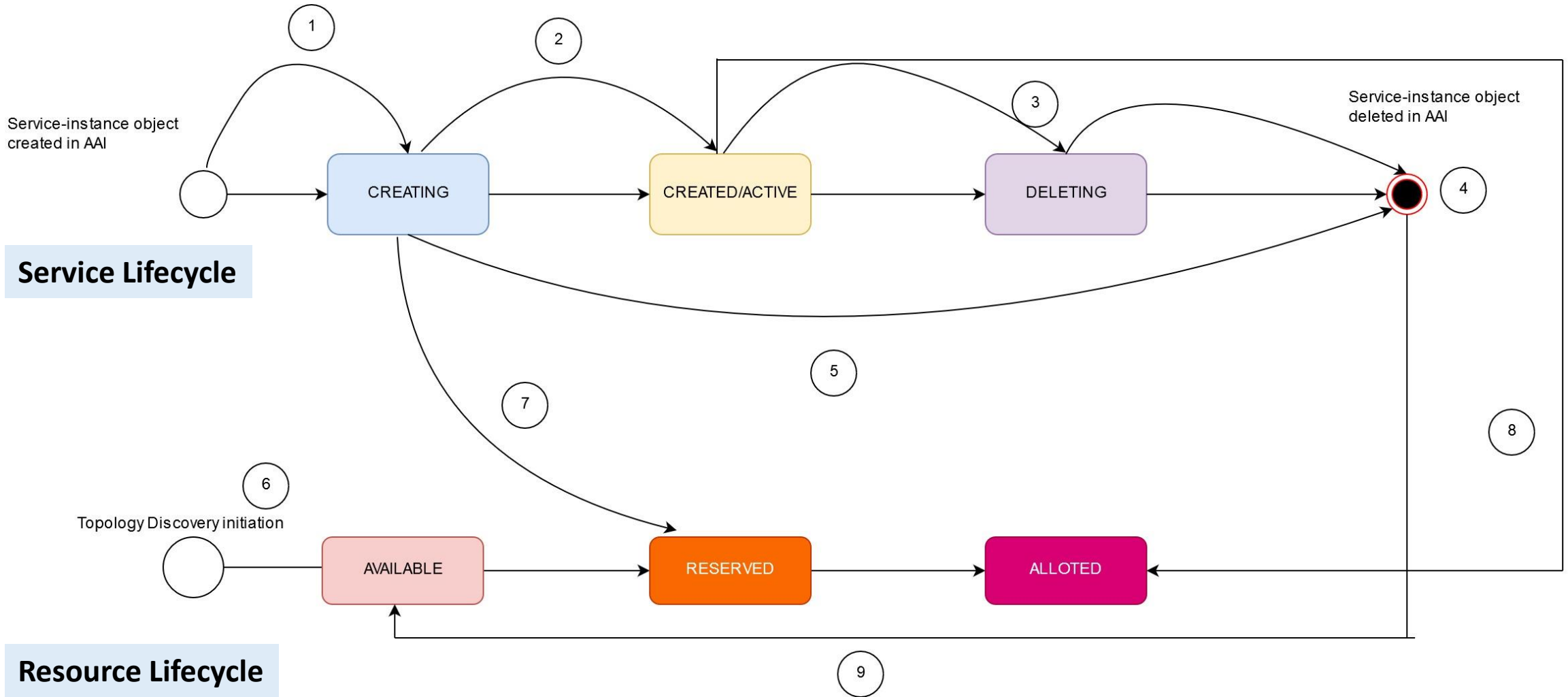
A&AI Model Attributes Used

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

Service and Resource Lifecycle Diagram



Note: Service lifecycle is generic and covers SO and SDNC's updates in AAI for Access and Domain service respectively

Service Status Table

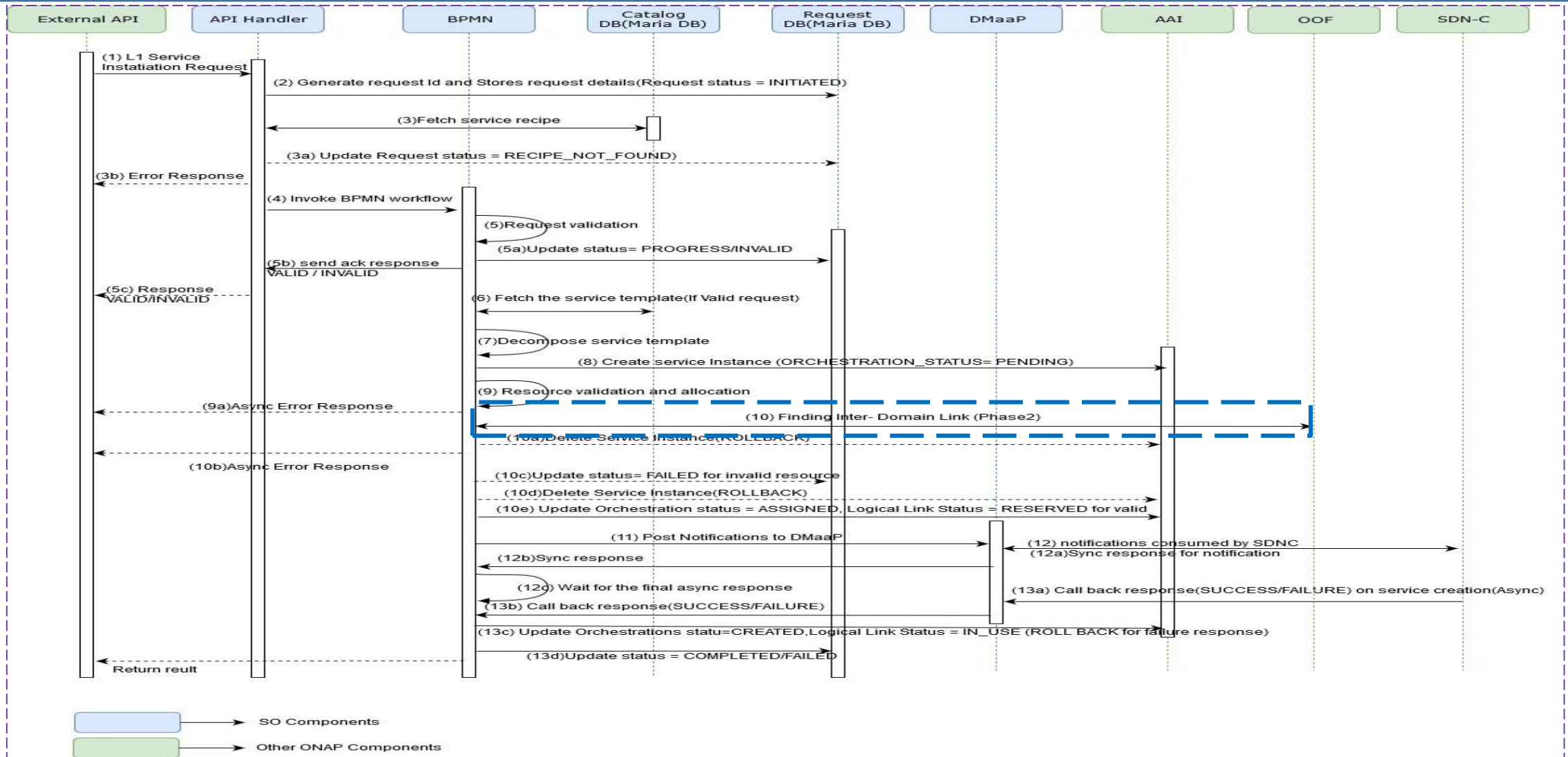
S.No.	STATUS in AAI	Actions taken by SO	Actions taken by SDN-C
1.	Creating	<ul style="list-style-type: none"> Request received and validated Service decomposed and SDN-C triggered 	<ul style="list-style-type: none"> SDN-C validates request Sends create request to controller Allocates resource in AAI
2.	Created/ Active	<ul style="list-style-type: none"> After all the async responses for create request from the SDN controller is successful 	<ul style="list-style-type: none"> Receives successful async response from the SDN controller
3.	Deleting	<ul style="list-style-type: none"> Delete request from UI Request validated and sent to SDN-C 	<ul style="list-style-type: none"> Service delete request from SDNC Request validated and sent to controller
4.	None	<ul style="list-style-type: none"> After all the async responses for delete request from the SDN controller is successful 	<ul style="list-style-type: none"> Service delete async response successful
5.	None	<ul style="list-style-type: none"> Resource validation fails/SDN-C sends sync/async response with 'failure' or if timer expires 	<ul style="list-style-type: none"> Request validation fails Async response fails for both service creation and deletion

Note:SO and SDNC's action for service status updation is shown here considering Access and Domain service respectively

Resource Status Table

S.No.	Status in AAI	Resource in AAI	Actions taken by SO	Actions taken by SDN-C
6.	Available	<ul style="list-style-type: none"> Pnf P-interface Physical-link Logical-link 		During topology discovery, SDNC updates the status of all the resources as available in AAI
7.	Reserved	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Logical-link 	SO reserves the inter-domain link that is the logical-link for that service.	
8.	Allotted	<ul style="list-style-type: none"> P-interface Logical-link 		Once the domain service is successfully created (i.e after the async response), SDN-C marks the resources as allotted
8.	Allotted	<ul style="list-style-type: none"> Logical-link 	Once the access service is successfully created (i.e after the async response), SO marks resources as allotted	
9.	Available	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 UI, SO to:	(a) Validate the request	<ul style="list-style-type: none"> 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 UI with success/failure indication along with the reason.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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)	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Existing workflow to be reused: CreateCustomE2EServiceInstance • Existing workflow to be enhanced by adding tasks from existing workflow - "SDNCAAdapterV1" 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

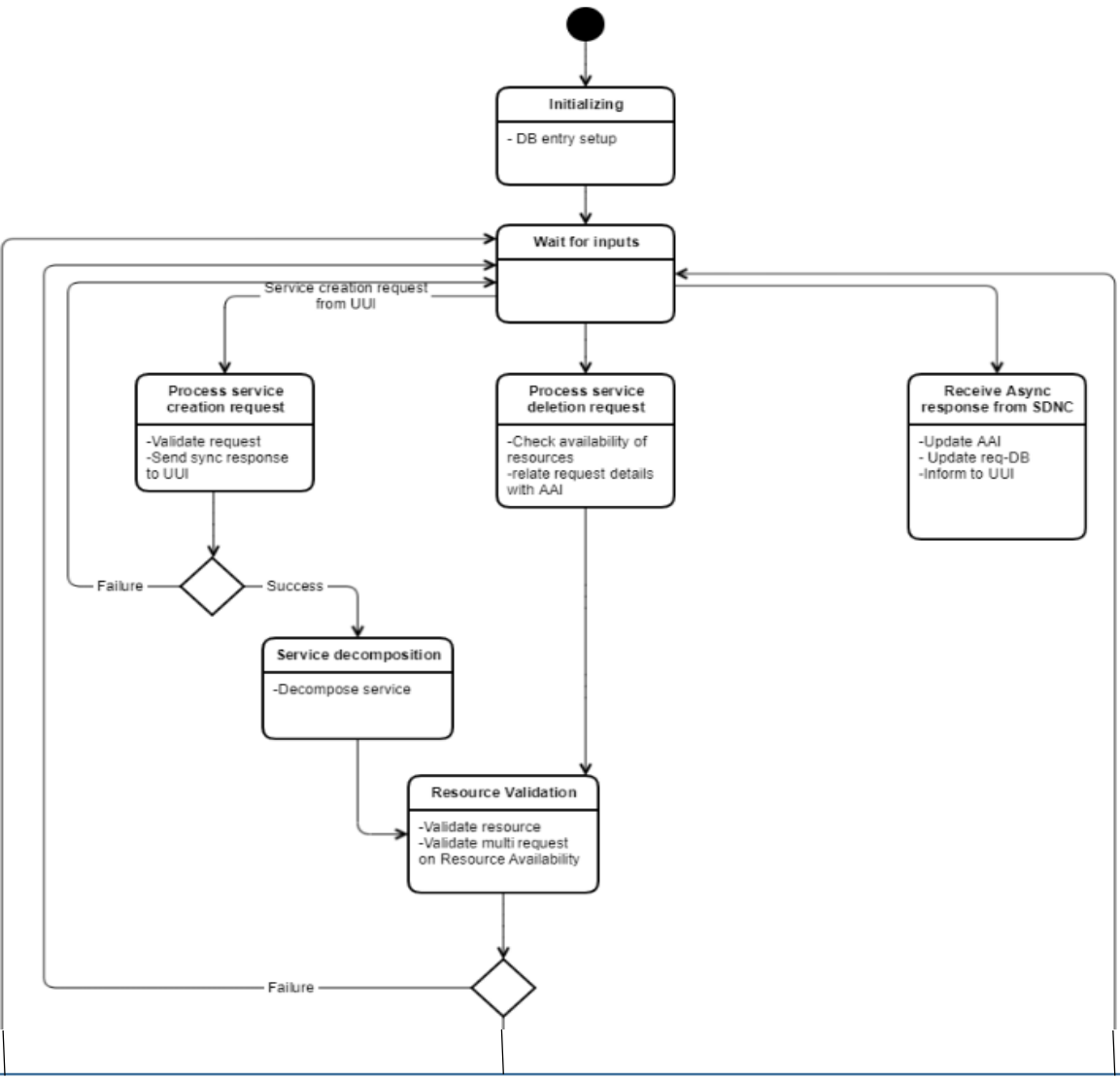
S.No	Requirement	Code change needed?	Impacted model and required highlevel changes bpmn->so-bpmn-infrastructure-flows,so-bpmn-infrastructure-common	
5	Upon reception of asynchronous response over DMaaP from SDN-C, SO to:	(b) Update AAI inventory with service details (status: active)	Yes	<ul style="list-style-type: none"> • 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 UI with success/failure indication, service details, and reason in case of failure.	Yes	<ul style="list-style-type: none"> • Existing workflow to be reused: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding a new task by exposing a new async API to UI 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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. If response is failure, then delete the service instance by invoking the existing roll-back workflow "DoCreateServiceInstanceRollback"

SO Requirements/Impacts in R6

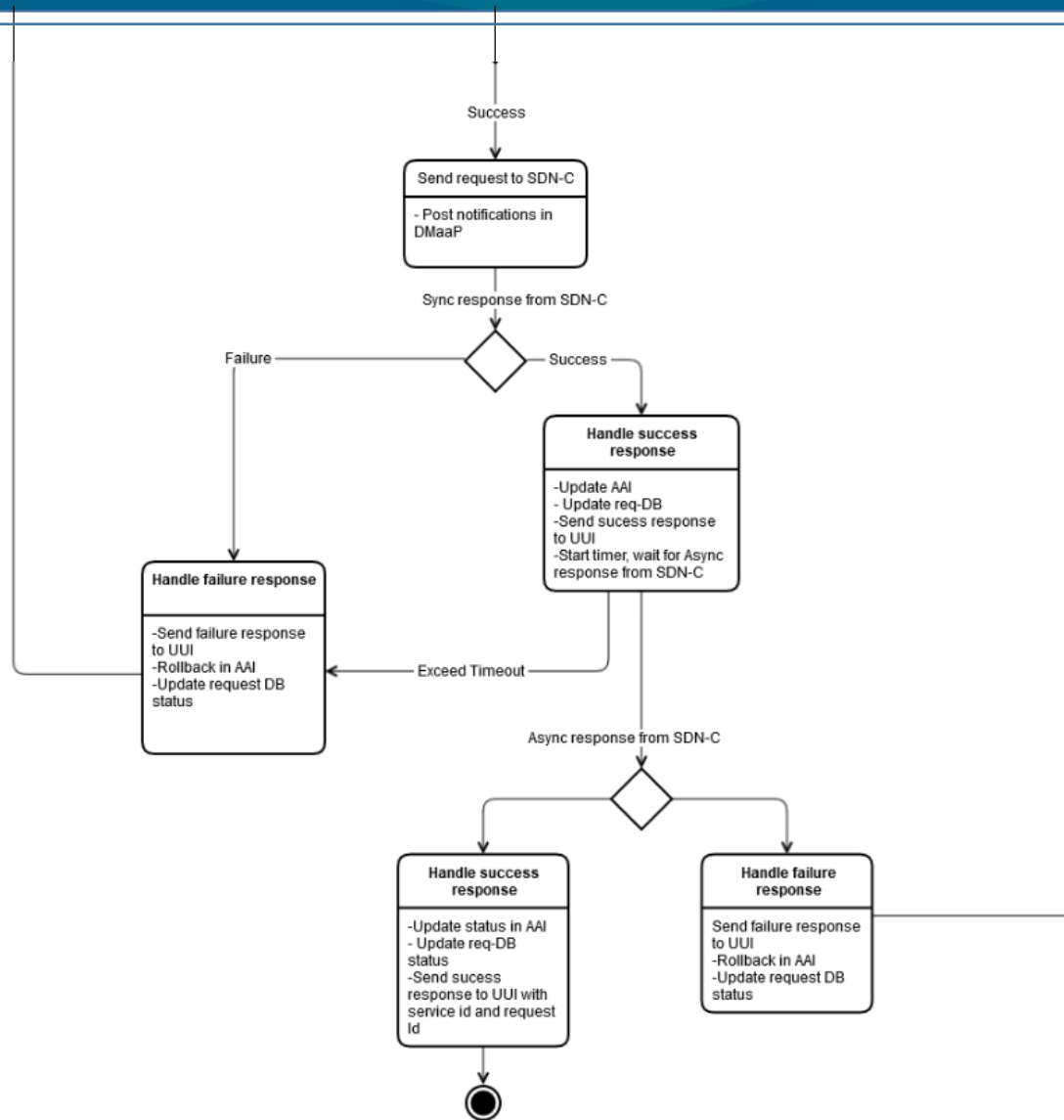
S.No	Requirement	Code change needed?	Impacted model and required highlevel changes bpmn->so-bpmn-infrastructure-flows,so-bpmn-infrastructure-common
6	Upon expiry of timer for async response from SDN-C, SO to: (a) Send a failure indication to UI with service info and reason (b) Update local DB entries	Yes	<ul style="list-style-type: none"> • Existing workflow to be reused: CreateCustomE2EServiceInstance • Enhance the existing workflow by adding task created for the requirement (5c)(*Note)
		Yes	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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



Note – Multiple request handling is not considered in this state diagram

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 request 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

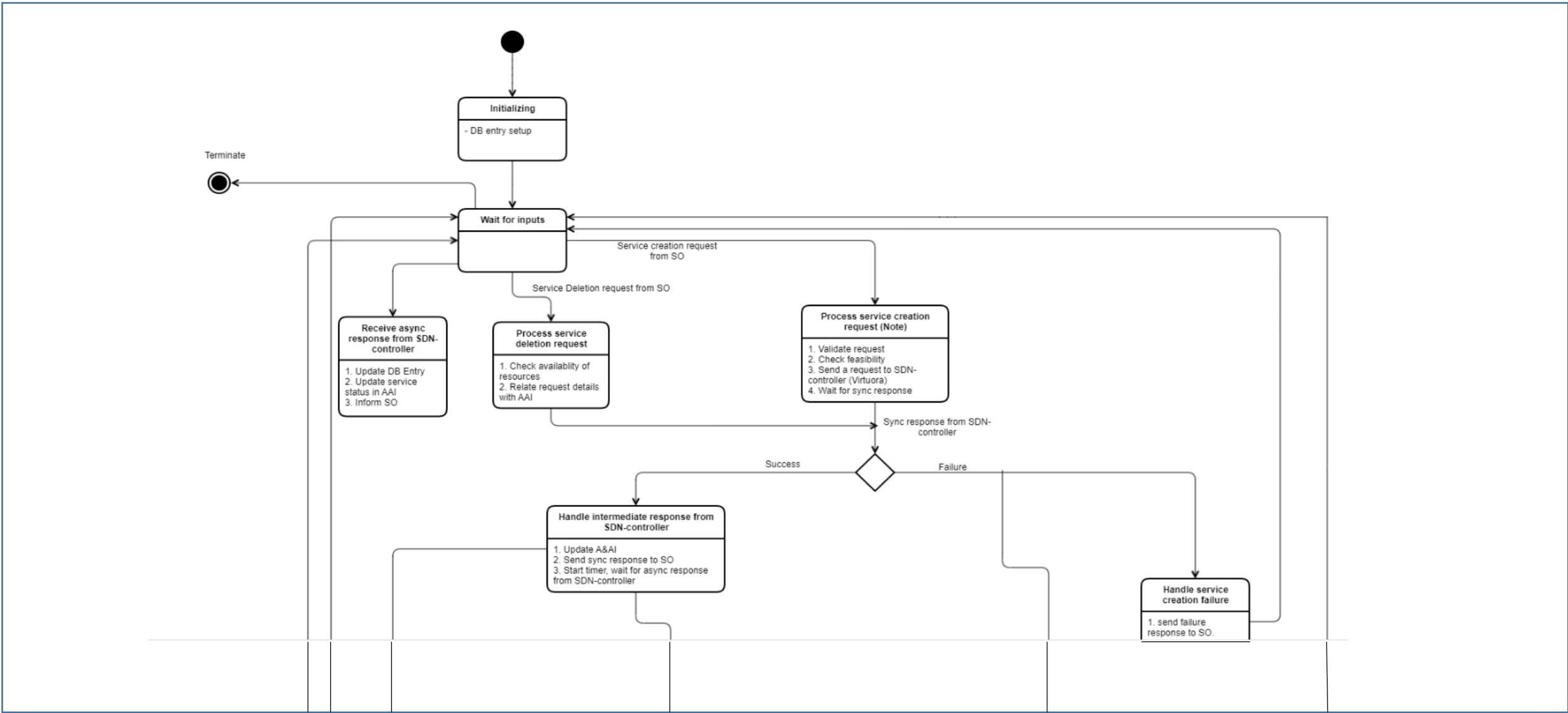
Class/sub-component	Impact Description	Requirement reference	Remarks
dmaap-listener under ccsdk-sli-northbound package	New SDNC-SO Consumer class	1, 2.a,	<ul style="list-style-type: none"> A new SDNC-SO consumer class to be written to get notifications from SO and perform validation logic and invoke RPCs for Service Creation and Deletion.
SDNC DB	New table in SDNC DB	2.b. , 4.a	<ul style="list-style-type: none"> A new table to be created in DB to store request details.
ccsdk/sli/adaptors - PublisherApilmpl Class	Reuse existing adaptor	2.c	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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.R estapiCallNode'	Reuse rest-api-call-node adaptor to invoke External Controllers	2.d	<ul style="list-style-type: none"> rest-api-call-node will be used in DG to invoke External controller to send Request for Service creation or Deletion.
generic-resource-api - messengerouter- publisher	Reuse existing adaptor – To be used from DG	2. c, 3.a, 5.a,4.b	<ul style="list-style-type: none"> Existing class/adaptor will be used to publish callback sync/async notifications back to SO via DG.

SDNC Impacts

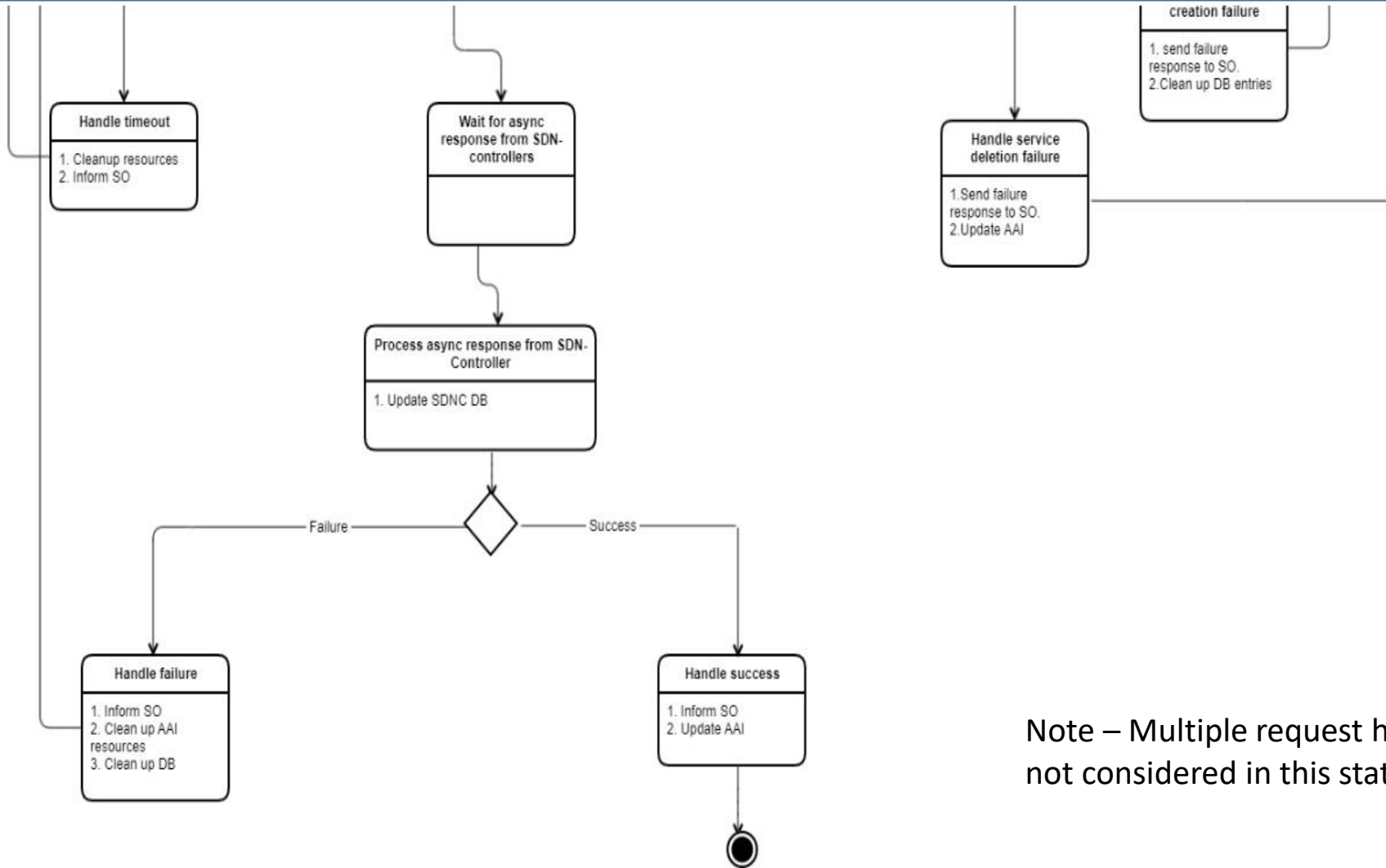
Class/sub-component	Impact Description	Requirement reference	Remarks
generic-resource-api 'org.onap.ccsdk.sli.adaptors.aai.AAISe rvice'	Reuse existing adaptor	3.b	<ul style="list-style-type: none">• An existing AAI plugin will be used to create or update resources in AAI.
generic-resource-api 'org.onap.ccsdk.sli.adaptors.resource. sql.SqlResource'	Reuse existing plugin	4.a, 4.c,5.b	<ul style="list-style-type: none">• 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



Note – Multiple request handling is not considered in this state diagram

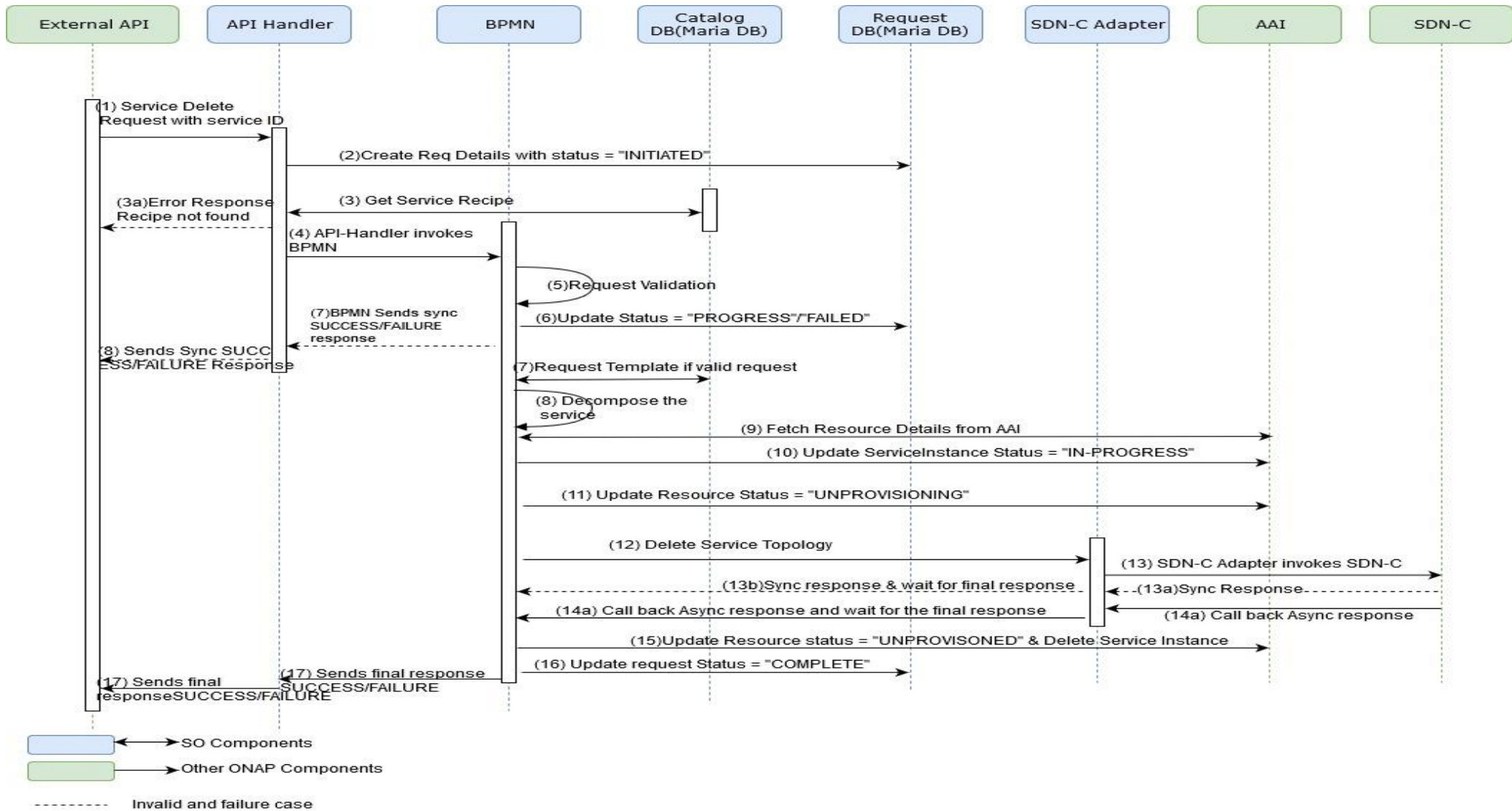
References

- <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

