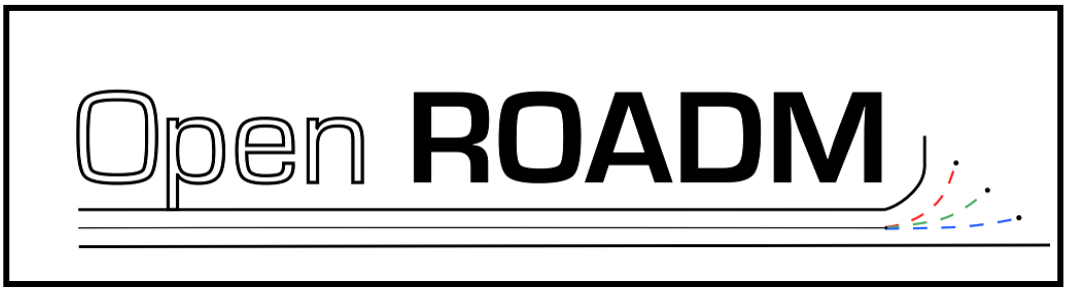

A Description of the

Open ROADM Service Model

Version 2.2

August 31, 2018

Document Revision History

Date	Revision	Description
June 5, 2018		Initial draft
August 31, 2018	0.1	Incorporate edits and comments

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1 INTRODUCTION

This white paper intends to provide a description of the Service Yang Model based on Open ROADM MSA version 2.2.

The Open ROADM Service Model consists of service related data stores, RPCs (Remote Procedure Calls), and notifications. It supports the RESTCONF interface between service providers' SDN Controller, OSS or Orchestrator and the ROADM Network Controller (RNC[1]) from vendors/third parties/service providers for making service creation/deletion, performing service changes such as restoration or reroute, and obtaining service related information and notifications. The high-level architecture is shown in Figure 1-1 below.

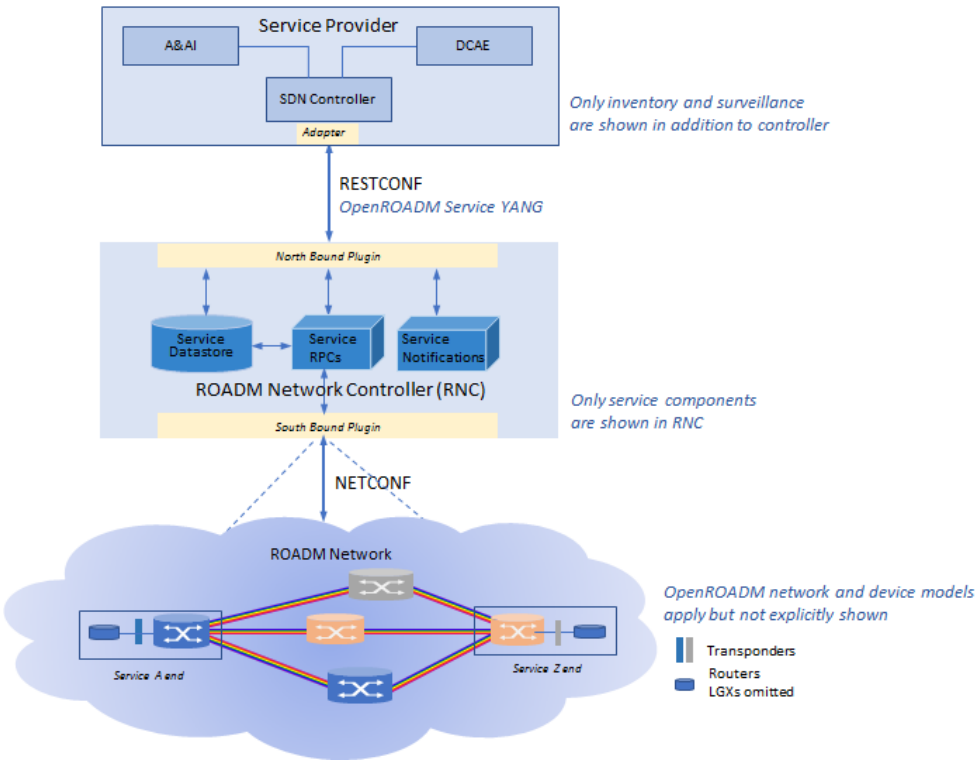

Figure 1-1 High Level Architecture of Open ROADM Service Model Application

2 SERVICE DATA STORE

Service data stores contain service list, versioned service list, and temp service list. These service lists and their parameters can be retrieved and used in various service related RPCs. Table 2-1, Table 2-2 and Table 2-3 document these 3 types of lists in the data store:

- Service list is comprised of a list of services/service names that have been requested or created in the ROADM network and their associated configuration and operational parameters
- Versioned service list adds version number(s) to the service list, while keeping the same service names as in the above-mentioned service list

[1] Also known as Open ROADM Controller.

- Temp service list represents reserved services list to be provisioned in the future. Once transitioning to a normal service, the service will be moved from the temp service list to the service list.

2.1 Service List

Services in the service list can only be created, deleted or modified using special RPCs. Service list will only contain one service with a given name. It does not contain historical (deleted or those past their end time) or temp/draft services. If two services exist with the same name (e.g., with non-overlapping start-end time), this table will contain the current one. If only planned services exist for the name, the one with the earliest start time will be present.

Table 2-1. Service List

	Parameter		***Manda-tory***	***Description***
Service List			Yes	Root of the list.
1	Services		Yes	List, parameters below will be repeated for each service.
2	Services Name		Yes	Service identifier. Unique within the context of a network, e.g., CLFI, CLCI, etc. Used as key for the services. This is reported against the service, but may not get reflected in the service in the network. (string)
3	Common ID		No	Service order #, or identifier to be used by the ROADM controller to identify routing constraints received from planning applications. (string). Also used to correlate to an existing temp service when converting the temp service into a normal service.
4	SDNC Request Header[2]	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
5		*RPC Action*	No	Only the RPC which generated the service will be present in the service list.[3] There are 14 types of RPC actions. Refer to Section 3 for complete list.
6		*Notification url*	No	URL for asynchronous response (string)

[2] Containers in the Yang model are shown as columns with grouped lines subdivided on the righthand side, for example, the SDNC Request Header container consists of {Request ID, RPC action, Notification URL, and Request system ID} from line 4 to line 7.
[3] Some RPCs do not generate service, for example, service feasibility check, temp service create, etc.

	Parameter		***Manda-tory***	***Description***
7		*Request System ID*	No	Identifier of application initiates the request. This identifier is used during call backs from the controller (string)
8	Connection Type		Yes	3 types: Service, Enum=1; Infrastructure, Enum=2; ROADM line, Enum=3
9	Lifecycle State		No	Service lifecycle state, 10 types (string) Deployed, Enum=1; Planned, Enum=2; Maintenance, Enum=3; Deploying, Enum=4; Undeploying, Enum=5; Undeployed, Enum=6; Proposed, Enum=7; Draft, Enum=8; Deploy Failed, Enum=9; Un-deploy Failed, Enum=10
10	Administrative State		No	Intended state of service (string)
11	Operational State		No	Actual state of service (string)
12	Condition		No	Service condition. Additional information about the state of the service. Only sent when applicable. 5 types: Restored temporarily, Enum=1; Re-routed temporarily, Enum=2; Activated for service, Enum=3; Activated for further check, Enum=4; Activated for troubleshooting failure, Enum=5
13	Service A-end	*Service Format*	Yes	7 types: Ethernet, Enum=1; OTU, Enum=2; OC, Enum=3; STM, Enum=4; OMS, Enum=5; ODU, Enum=6; OTM, Enum=7
14		*Service rate*	No	E.g., 10G, 100G etc. rate in integer (uint32) Service rate not applicable when service format is roadmline or ODU; valid for OTU since service-rate has already been supported for wdm layer OTU services (100 for OTU4)
15		*OTU service rate*	No	Full rate of transport of OTUn, e.g., OTU2, OTU4, only applicable for OTU services.
16		*ODU service rate*	No	Sub-rate ODU services, e.g., ODU0 in an OTU4 interface, only applicable for ODU services.

	Parameter			Manda-tory	Description
17		*Ethernet Encoding*		No	Type of Ethernet encoding when the rate = 10GE. 2 types: "10GBASE-W", Enum=1; and "10GBASE-R", Enum=2
18		*Mapping Mode*		No	Applies only to 10GE. "GFP-F" maps into an OPU2 with PT=5 (ITU-T G.7041 Section 7.1) "GFP-E" maps into an OPU2 with PT=9 (ITU-T G.7041 Section 7.9). Note GFP-E is an Open ROADM term to mean "Extended" OPU2 mapping "PCS-Transparent" maps into an OPU2E with PT=3 (ITU-T G.709 Section 17.2)
19		*CLLI*		Yes	Office location. Note the CLLI must match the site associated with the device-id of this endpoint (string)
20		*Node ID*		No	Globally unique identifier for a device length "7..63" pattern "([a-zA-Z][a-zA-Z0-9-]{5,18}[a-zA-Z0-9])"[4] A Node ID can contain letters, numbers, and hyphens. The first character must be a letter. The last character must be a letter or number. Reported against the service but may not get reflected in the service in the network.
21		*Tx direction*	*Port*		Uses service port, service LGX, and service tail. From the device model perspective the port-device-name plus the port-circuit-pack-name plus the port-name uniquely identifies the port. From the network model perspective the openroadm-topology-ref plus port-device-name plus port-name uniquely identify the termination point in the network model.
22			*Port device name*	No	Port defined for the end-to-end service (string)
23			*Port circuit pack name*	No	Port circuit pack name for the service (string)

[4] The pattern for Node ID is incorrect in the Open ROADM YANG model as it doesn't allow the length to be extended past 20 characters. This will be fixed in a future release of the YANG models.

	Parameter					***Manda-tory***	***Description***
24				*Port type*		No	Port type, e.g. “router” or “POI” etc. (string)
25				*Port name*		No	Port index identifier. Unique within the context of a circuit-pack. E.g. Tx, Rx (string)
26				*Port rack*		No	E.g. Bay FIC: Frame Identification Code (string)
27				*Port shelf*		No	E.g. shelf in the bay (string)
28				*Port slot*		No	E.g. slot in the shelf (string)
29				*Port sub-slot*		No	E.g. sub-slot in the shelf or on a card (string)
30			*LGX*	*LGX device name*		No	E.g. name/identifier of the LGX (string)
31				*LGX port name*		No	E.g. port name of the LGX (string)
32				*LGX port rack*		No	E.g. rack port of the LGX (string)
33				*LGX port shelf*		No	E.g. shelf port of the LGX (string)
34			*Tail*	*Tail ROADM*	*Node ID*	No	Tail ROADM: ROADM on which the Xponder is connected to (TID, IP Address, or FQDN). Node ID: Refer to line 20.
35				*Xponder Port*[5]	*Circuit pack name*	No	Tail Xponder circuit pack name/identifier (string)
36					*Port name*	No	Xponder circuit pack port name (string)
37				*Tail ROADM AID*		No	Provide Xponder’s port for intercity ROADM connection (bay, shelf, slot, and port)
38				*Tail ROADM Port Rack Location*		No	Xponder’s location, e.g., FIC (Frame Identification Code) of the tail ROADM
39		*Rx direction*	For Rx direction, repeat parameters from line 21 to line 38.				
40		*Optics type*				No	2 types: Gray, Enum=1; DWDM, Enum=2
41		*Router*[6]		*Node ID*		No	Refer to line 20.

[5] Xponder port in the tail that will be used as a service endpoint.
[6] Needed for communication with DWDM pluggable.

	Parameter				Manda-tory	Description
42				*IP Address*	No	Router IP address, inet:*ip-address*
43				*URL*	No	URL needed for communication with DWDM pluggable. (string)
44		*User Label*			No	Label for service endpoint, defined by the user (string)
45	Service Z-end	Repeat parameters from line 13 to line 44 for Service Z-end				
46	Hard Cons-traints[7]	*Customer Code*			No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
47		*General*[8]	*Diversity*	*Existing service*	No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
48				*Existing service applicability* — *Site*	No	Site identifies the CLLI (Boolean)
49				*Node*	No	Refer to line 20 (Boolean)
50				*SRLG*	No	Shared Risk Link Group identifiers, (Boolean)
51			*Exclude*	*Fiber bundle*	No	Fiber segment usually defined by SRLG (string), list.
52				*Site*	No	Site identifies the CLLI (Boolean), list.
53				*Node*	No	Refer to line 20, list.
54				*Supporting service name*	No	Supporting service(s) to exclude from this route (string), list. Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service.

[7] Routing constraints specified in the initial service creation call are hard (or strict) constraints. If no service path available, hard constraints can be relaxed for PCE to find a path. The relaxed constraints are specified as "Soft Constraints" which need to be re-evaluated.

[8] General constraints and Co-routing constraints are mutually exclusive.

	Parameter				***Manda-tory***	***Description***
55			*Include*	*Fiber bundle*	No	Refer to line 51 for include.
56				*Site*	No	Refer to line 52 for include.
57				*Node*	No	Refer to line 53 for include.
58				*Supporting service name*	No	Refer to line 54 for include.
59			*Latency*	*Maximum Latency*	No	Maximum *latency* allowed on service (uint32), units in “ms”.
60		*Co-routing*	*Existing service*		No	The existing service that is to be co-routed, list.
61	Soft Cons-traints	*Repeat parameters from line 46 to line 60 for soft constraints*			No	
62	Due date				No	Date and time service to be turned up. If time is not specified for a given date, default to midnight. Service will be turned up immediately if no *due date* is specified. Type: yang:*date*-and-time
63	End Date				No	Date and time service to be removed. Type: yang:*date*-and-time
64	Event Horizon Start				No	Start time to ensure that the service is routable and viable. Required resources shall be considered reserved from this time. If not provided, defaults to due date. Type: yang:*date*-and-time
65	Event Horizon End				No	End time to ensure that the service is routable and viable. Required resources shall be considered reserved until this time. If not provided, defaults to end-date. Type: yang:*date*-and-time
66	NC code				No	Network Channel code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
67	NCI code				No	Network Channel Interface code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).

	Parameter			***Manda-tory***	***Description***
68	Secondary NCI code			No	Secondary NCI code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
69	Customer			No	To be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
70	Customer contact			No	Customer contact information to be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
71	Operator contact			No	Operator contact information to be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
72	Service layer			No	Layer associated with service. 2 types: WDM, Enum=1; OTN, Enum=2
73	Latency			No	Service Latency in integer (uint32), units in “ms”
74	Fiber Span SRLGs			Yes	List of shared risk link group data on fiber spans, shared risk link group identifiers (string).
75	Equip-ment SRGs	*SRG number*		Yes	List of shared risk link group data on equipment (string).
76	Supporting Service Name			Yes	Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service.
77	Topo-logy	aToZ	*ID*	Yes	aToZ list. Unique identifier and used as key for this network-topology component within this service (string) Topology reports the individual hops along the service in the A to Z direction and Z to A directions. This includes both ports internal to a device and those at its edge that are available for externally connections. It includes both physical and logical ports. Physical ports are ordered with the logical ports that run over them as follows:

	Parameter				***Manda-tory***	***Description***
						a.\t On ingress to a node/card, physical then logical b.\t On egress to a node/card, logical then physical
78			*Hop Type*		No	2 types: Node external, Enum=1, the given resource is on the edge of the node and used in relationships to resources outside of the node. Node internal, Enum=2, the given resource is internally to the node.
79			*Device*	*Node ID*	No	Refer to line 20.
80			*Resource*		No	This resource identifier is intended to provide a generic identifier for any resource that can be used without specific knowledge of the resource. If selected, only one of the parameters in line 81 to line 99 will be chosen.
81			*Circuit Pack*	*Circuit Pack Name*	Yes, in case selected	Circuit pack, Enum=8 Circuit pack name is the circuit pack identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
82			*Port*	*Circuit Pack Name*	Yes, in case selected	Port, Enum=7 Circuit pack name, see line above.
83				*Port Name*	No	Port, Enum=7 Port name is the port identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
84			*Connection*	*Connection Name*	Yes, in case selected	Connection, Enum=5 This is used by either ROADM connection or ODU connection since they are mutually exclusive in the model. Connection name is unique within the context of a device. Same as leafref value in model, if applicable. (string)
85			*Physical Link*	*Physical Link Name*	Yes, in case selected	Physical link, Enum=10 Physical link name is the physical link identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)

	Parameter				Manda-tory	Description
86			*Internal Link*	*Internal Link Name*	Yes, in case selected	Internal link, Enum=9 Internal link name is the internal link identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
87			*Shelf*	*Shelf Name*	Yes, in case selected	Shelf, Enum=12 Shelf name is the shelf ID identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
88			*SRG*	*SRG Number*	Yes, in case selected	Shared Risk Group, Enum=4 SRG number is the shared risk group identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (uint16)
89			*Degree*	*Degree Number*	Yes, in case selected	Degree, Enum=3 Degree number is the degree identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (uint16)
90			*Service*	*Service Name*	Yes, in case selected	Service, Enum=13 Service name is the service identifier. Unique within the context of a network. Same as leafref value in model, if applicable. (string)
91			*Interface*	*Interface Name*	Yes, in case selected	Interface, Enum=11 Interface name is the interface identifier. (string)
92			*ODU sncp pg*	*ODU sncp pg name*	Yes, in case selected	ODU sncp pg, Enum=14 ODU sncp pg name is the name of the ODU sncp pg. (string)
93			*Other*	*Other resource ID*	Yes, in case selected	Other, Enum=1 Resource of type not found in list Resource ID for other (string)
94			*Device*	*Node ID*	Yes, in case selected	Device, Enum=2 ROADM, Xponder, etc., Node ID is a globally unique identifier for a device. Same as leafref value in model, if applicable.
95			*Line amplifier*	*Amp Number*	Yes, in case selected	Line amplifier, Enum=15 Amp number is the number of the line amplifier. (uint8)

	Parameter				Manda-tory	Description
96			*Xponder*	*Xpdr Number*	Yes, in case selected	Xponder, Enum=16 Xpdr number is the number of the Xponder. (uint16)
97			*Versioned Service*	*Versioned Service Name*	Yes, in case selected	Versioned service, Enum=17 Versioned service name is the versioned service identifier. Unique within the context of a network. Same as leafref value in model, if applicable. (string)
98				*Version Number*	Yes, in case selected	Versioned service, Enum=17 Version number of the service (uint64)
99			*Temp Service*	*Common ID*	Yes, in case selected	Temp service, Enum=18 Common ID is the temp service identifier. Unique within the context of a network. Same as leafref value in model, if applicable. (string)
100		*Resource Type*	*Type*		Yes	Resource type, refer to line 81 to line 99 for Enum value.
101			*Extension*		No	Populated when resource type not defined or when Enum value is set to 'other' (string)
102		zToA Repeat parameters from line 77 to line 101 for zToA.				zToA list.
103	Is Bandwidth Locked				No	Boolean (true or false), default is "false". Bandwidth lock indicates whether the service is administratively prohibited from taking on more capacity, i.e., whether it can be used as a supporting service in any new service creations. Unlike administrative status, this does not impact any previous planned or deployed services.

2.2 Versioned Service List

Versioned service list contains versioned services, regardless of their lifecycle state. Services in this list can only be created, deleted, modified, etc. using special RPCs. The list can report more than one version of a service when supported by the implementation. It may contain deleted services, multiple versions of the same service, as identified by its name.

Table 2-2 Versioned Service List

	Parameter		***Manda-tory***	***Description***
Versioned service list			Yes	Root of the list.
1	Services	*Version number*	Yes	Version number is required in this case. Service-name version-number as key. (uint64)
2	Repeat parameters from line 2 to line 103 in Table 2-1. Service List			

2.3 Temp Service List

Temp service list is a list of temporary services. Services in the temp service list can only be created, deleted or modified using special RPCs.

Table 2-3 Temp Service List

	Parameter		***Manda-tory***	***Description***
Temp service list			Yes	Root of the list.
1	Services	*Service Name*	No	List, service name in this case is optional. Refer to Table 2-1, line 2.
2		*Common ID*	Yes	Common ID is required as key for temp service, see description in Table 2-1, line 3.
3	Repeat parameters from line 4 to line 103 in Table 2-1. Service List			

3 Remote Procedure Calls (RPCs)

The ROADM Service Model specifies Remote Procedure Calls (RPCs). The service providers' SDN Controllers can make requests to the ROADM Network Controller or Open ROADM Controller using RPCs to create or delete services, perform changes in the ROADM network.

There are 14 RPCs defined in the Open ROADM Service Model version 2.2 by typedef rpc-actions:

RPC Name	Enum Value
Service create	1
Service feasibility check	2
Service delete	3
Equipment notification	4

Temp service create	5
Temp service delete	6
Service roll	7
Service reconfigure	8
Service restoration	9
Service reversion	10
Service reroute	11
Service reroute confirm	12
Network reoptimization	13
Service feasibility check bulk	14

3.1 Service Create PRC

This RPC is for the service providers' SDN Controller to request the RNC or Open ROADM Controller to create a new service either immediately or in the future. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing. Table 3-1 lists the input parameters included in the service create RPC and their descriptions. The synchronous response to the service create RPC is listed in Table 3-2.

Table 3-1 Service Create RPC and Input Parameters

	Input Parameter		***Manda-tory***	***Descriptions***
1	Services Name		Yes	Identifier for the service to be created in the ROADM network, e.g., CLFI, CLCI, etc. This is reported against the service but may not get reflected in the service in the network. (string)
2	Common ID		No	Service order #, or identifier to be used by the ROADM controller to identify routing constraints received from planning applications. (string)
3	SDNC Request Header	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
4		*RPC Action*	No	Service create, Enum=1
5		*Notification url*	No	URL for asynchronous response (string)

	Input Parameter			***Manda-tory***	***Descriptions***
6			Request System ID	No	Identifier of application initiates the request (string)
7	Connection Type			Yes	3 types: Service, Enum=1; Infrastructure, Enum=2; ROADM line, Enum=3
8	Service A-end	*Service Format*		Yes	7 types: Ethernet, Enum=1; OTU, Enum=2; OC, Enum=3; STM, Enum=4; OMS, Enum=5; ODU, Enum=6; OTM, Enum=7;
9		*Service rate*		No	E.g., 10G, 100G etc. rate in integer (uint32) Service rate not applicable when service format is roadmline or ODU; valid for OTU since service-rate has already been supported for wdm layer OTU services (100 for OTU4)
10		*OTU service rate*		No	Full rate of transport of OTUn, e.g., OTU2, OTU4
11		*ODU service rate*		No	Sub-rate ODU services, e.g., ODU0 in an OTU4 interface.
12		*Ethernet Encoding*		No	Type of Ethernet encoding when the rate = 10GE. 2 types: "10GBASE-W", Enum=1; and “10GBASE-R", Enum=2
13		*Mapping Mode*		No	Applies only to 10GE. “GFP-F” maps into an OPU2 with PT=5 (ITU-T G.7041 Section 7.1) “GFP-E” maps into an OPU2 with PT=9 (ITU-T G.7041 Section 7.9). Note GFP-E is an Open ROADM term to mean “Extended” OPU2 mapping “PCS-Transparent” maps into an OPU2E with PT=3 (ITU-T G.709 Section 17.2)
14		*CLLI*		Yes	Office location, Note the CLLI must match the site associated with the device-id of this endpoint (string)
15		*Node ID*		No	Globally unique identifier for a device length "7..63"

	Input Parameter					***Manda-tory***	***Descriptions***
							pattern "([a-zA-Z][a-zA-Z0-9-]{5,18}[a-zA-Z0-9])" A Node ID can contain letters, numbers, and hyphens. The first character must be a letter. The last character must be a letter or number.
16		*Tx direction*	*Port*				Uses service port, service LGX, and service tail. From the device model perspective the port-device-name plus the port-circuit-pack-name plus the port-name uniquely identifies the port. From the network model perspective the openroadm-topology-ref plus port-device-name plus port-name uniquely identify the termination point in the network model.
17				*Port device name*		No	Port defined for the end-to-end service (string)
18				*Port circuit pack name*		No	Port circuit pack name for the service (string)
19				*Port type*		No	Port type, e.g. “router” or “POI” etc. (string)
20				*Port name*		No	E.g. Tx, Rx (string)
21				*Port rack*		No	E.g. Bay FIC: Frame Identification Code (string)
22				*Port shelf*		No	E.g. shelf in the bay (string)
23				*Port slot*		No	E.g. slot in the shelf (string)
24				*Port sub-slot*		No	E.g. sub-slot in the shelf or on a card (string)
25			*LGX*	*LGX device name*		No	E.g. name/identifier of the LGX (string)
26				*LGX port name*		No	E.g. port name of the LGX (string)
27				*LGX port rack*		No	E.g. rack port of the LGX (string)
28				*LGX port shelf*		No	E.g. shelf port of the LGX (string)
29			*Tail*	*Tail ROADM*	*Node ID*	No	Tail ROADM: ROADM on which the Xponder is connected to (TID, IP Address, or FQDN). Node ID: Refer to line 15.
30					*Circuit pack name*	No	Tail Xponder circuit pack name/identifier (string)

	Input Parameter						Mandatory	Descriptions
31				*Xponder Port*[9]	*Port name*		No	Xponder circuit pack port name (string)
32				*Tail ROADM AID*			No	Provide Xponder's port for intercity ROADM connection (bay, shelf, slot, and port)
33				*Tail ROADM Port Rack Location*			No	Xponder's location, e.g., FIC (Frame Identification Code) of the tail ROADM
34		*Rx direction*	For Rx direction, repeat parameters from line 16 to line 33.					
35		*Optics type*					No	2 types: Gray, Enum=1; DWDM, Enum=2
36		*Router*		*Node ID*			No	Refer to line 15.
37				*IP Address*			No	Router IP address, inet:*ip-address*
38				*URL*			No	Router URL (string)
39		*User Label*					No	Label for service endpoint, defined by the user (string)
40	Service Z-end	Repeat parameters from line 8 to line 39 for Service Z-end						
41	Hard Constraints	*Customer Code*					No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
42		*General*	*Diversity*	*Existing service*			No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
43				*Existing service applicability*	*Site*		No	Site identifies the CLLI (Boolean)
44					*Node*		No	Refer to line 15 (Boolean)
45					*SRLG*		No	Shared Risk Link Group data, (Boolean)
46			*Exclude*	*Fiber bundle*			No	Fiber segment usually defined by SRLG (string), list.

[9] Xponder port in the tail that will be used as a service endpoint.

	Input Parameter				***Manda-tory***	***Descriptions***
47				*Site*	No	Site identifies the CLLI, list.
48				*Node*	No	Refer to line 15, list.
49				*Supporting service name*	No	Supporting service(s) to exclude from this route (string), list. Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service.
50			*Include*	*Fiber bundle*	No	Refer to line 46 for include.
51				*Site*	No	Refer to line 47 for include.
52				*Node*	No	Refer to line 48 for include.
53				*Supporting service name*	No	Refer to line 49 for include.
54			*Latency*	*Maximum Latency*	No	Maximum *latency* allowed (uint32), units in "ms".
55		*Co-routing*	*Existing service*		No	The existing service that is to be co-routed, list, in case co-routing is selected.
56	Soft Cons-traints	*Repeat parameters from line 41 to line 55 for soft constraints*			No	
57	Due date				No	Date and time service to be turn up. If time is not specified for a given date, default to midnight. Service turned up immediately if no *due date* is specified. Type: yang:*date*-and-time
58	End Date				No	Date and time service to be removed. Type: yang:*date*-and-time
59	Event Horizon Start				No	Start time to ensure that the service is routable and viable. Required resources shall be considered reserved from this time. If not provided, defaults to due-date. Type: yang:*date*-and-time
60	Event Horizon End				No	End time to ensure that the service is routable and viable. Required resources shall be considered reserved until this time. If not

	Input Parameter	*Manda-tory*	*Descriptions*
			provided, defaults to end-date. Type: yang:*date*-and-time
61	NC code	No	Network Channel code applied to wavelength service only. This is reported against the service, but may not get reflected in the service in the network (string).
62	NCI code	No	Network Channel Interface code applied to wavelength service only. This is reported against the service, but may not get reflected in the service in the network (string).
63	Secondary NCI code	No	Secondary NCI code applied to wavelength service only. This is reported against the service, but may not get reflected in the service in the network (string).
64	Customer	No	To be included in ticket information. This is reported against the service, but may not get reflected in the service in the network (string).
65	Customer contact	No	Customer contact information to be included in ticket information. This is reported against the service, but may not get reflected in the service in the network (string).
66	Operator contact	No	Operator contact information to be included in ticket information. This is reported against the service, but may not get reflected in the service in the network (string).
67	Service layer	No	Layer associated with service. 2 types: WDM, Enum=1; OTN, Enum=2

The Open ROADM Service Model defines the synchronous response to the service create RPC. Table 3-2 lists the output parameters in version 2.2.

Table 3-2 Synchronous Response to Service Create RPC

Output	*Field Name*	*Manda-tory*	*Note*
	Request ID	Yes	The request ID from the request message for which this is the response (string)

Configuration Response Common[10]	*Response Code*					Yes	One of the codes defined for success or error (string)
	Response Message					No	Message included for error code (string)
	Ack-final-indicator					Yes	Indicates if this is the last response that the client should expect (string).
Response Parameters[11]	*Hard Constraints*	*Customer Code*				No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
		General	*Diversity*	*Existing service*		No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
				Existing service applicability	*Site*	No	Site identifies the CLLI (Boolean)
					Node	No	Refer to Table 3-1 line 15 (Boolean)
					SRLG	No	Shared Risk Link Group data, (Boolean)
			Exclude	*Fiber bundle*		No	Fiber segment usually defined by SRLG (string), list.
				Site		No	Site identifies the CLLI, list.
				Node		No	Refer to Table 3-1 line 15, list.
				Supporting service name		No	Supporting service(s) to exclude from this route (string), list. Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service.
			Include	*Fiber bundle*		No	Refer to Table 3-1 line 46 for include.

[10] Is a container, must be part of the table.
[11] E.g., violated soft constraints, etc.

				Site	No	Refer to Table 3-1 line 47 for include.
				Node	No	Refer to Table 3-1 line 48 for include.
				Supporting service name	No	Refer to Table 3-1 line 49 for include.
			Latency	*Maximum Latency*	No	Maximum *latency* allowed (uint32), units in "ms".
		Co-routing	*Existing service*		No	The existing service that is to be co-routed, list, in case co-routing is selected.
	Soft Cons-traints	*Repeat parameters in the Hard Constraints above.*			No	

3.2 Service Feasibility Check RPC

The service feasibility check RPC is a call to check whether a service can be provisioned in the existing network, i.e., requesting the RNC or Open ROADM Controller to check connectivity, equipment availability, and reachability. It is expected that the response from the RNC will confirm existing equipment is available for a new service or propose additional equipment to be ordered for the new service. Options are made available to choose from one of the following for routing:

- Using only deployed and planned equipment
- Using existing equipment first, then proposing new equipment as needed
- Using proposed equipment

No resources will be reserved, provisioned or planned because of this RPC. Table 3-3 lists the input parameters and their descriptions in the service feasibility check RPC. Note that service name is not present in this RPC. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing.

Table 3-3 Service Feasibility Check RPC and Input Parameters

	Input Parameter		***Manda-tory***	***Descriptions***
1	Common ID		No	Service order #, or identifier to be used by ROADM controller for feasibility check. Also to be used by (string)
2	SDNC Request Header	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
3		*RPC Action*	No	Service feasibility check, Enum=2
4		*Notification url*	No	URL for asynchronous response (string)

	Input Parameter			***Manda-tory***	***Descriptions***
5			*Request System ID*	No	Identifier of application initiates the request (string)
6	Connection Type			Yes	3 types: Service, Enum=1; Infrastructure, Enum=2; ROADM line, Enum=3
7	Service A-end	*Service Format*		Yes	7 types: Ethernet, Enum=1; OTU, Enum=2; OC, Enum=3; STM, Enum=4; OMS, Enum=5; ODU, Enum=6; OTM, Enum=7;
8		*Service rate*		No	E.g., 10G, 100G etc. rate in integer (uint32) Service rate not applicable when service format is roadmline or ODU; valid for OTU since service-rate has already been supported for wdm layer OTU services (100 for OTU4)
9		*OTU service rate*		No	Full rate of transport of OTUn, e.g., OTU2, OTU4
10		*ODU service rate*		No	Sub-rate ODU services, e.g., ODU0 in an OTU4 interface.
11		*Ethernet Encoding*		No	Type of Ethernet encoding when the rate = 10GE. 2 types: "10GBASE-W", Enum=1; and “10GBASE-R", Enum=2
12		*Mapping Mode*		No	Applies only to 10GE. “GFP-F” maps into an OPU2 with PT=5 (ITU-T G.7041 Section 7.1) “GFP-E” maps into an OPU2 with PT=9 (ITU-T G.7041 Section 7.9). Note GFP-E is an Open ROADM term to mean “Extended” OPU2 mapping “PCS-Transparent” maps into an OPU2E with PT=3 (ITU-T G.709 Section 17.2)
13		*CLLI*		Yes	Office location, Note the CLLI must match the site associated with the device-id of this endpoint (string)
14		*Node ID*		No	Globally unique identifier for a device length "7..63"

	Input Parameter					***Manda-tory***	***Descriptions***
							pattern "([a-zA-Z][a-zA-Z0-9-]{5,18}[a-zA-Z0-9])" A Node ID can contain letters, numbers, and hyphens. The first character must be a letter. The last character must be a letter or number.
15		*Tx direction*	*Port*				Uses service port, service LGX, and service tail. From the device model perspective the port-device-name plus the port-circuit-pack-name plus the port-name uniquely identifies the port. From the network model perspective the openroadm-topology-ref plus port-device-name plus port-name uniquely identify the termination point in the network model.
16				*Port device name*		No	Port defined for the end-to-end service (string)
17				*Port circuit pack name*		No	Port circuit pack name for the service (string)
18				*Port type*		No	Port type, e.g. “router” or “POI” etc. (string)
19				*Port name*		No	E.g. Tx, Rx (string)
20				*Port rack*		No	E.g. Bay FIC: Frame Identification Code (string)
21				*Port shelf*		No	E.g. shelf in the bay (string)
22				*Port slot*		No	E.g. slot in the shelf (string)
23				*Port sub-slot*		No	E.g. sub-slot in the shelf or on a card (string)
24			*LGX*	*LGX device name*		No	E.g. name/identifier of the LGX (string)
25				*LGX port name*		No	E.g. port name of the LGX (string)
26				*LGX port rack*		No	E.g. rack port of the LGX (string)
27				*LGX port shelf*		No	E.g. shelf port of the LGX (string)
28			*Tail*	*Tail ROADM*	*Node ID*	No	Tail ROADM: ROADM on which the Xponder is connected to (TID, IP Address, or FQDN). Node ID: Refer to line 14.
29				*Xponder Port*	*Circuit pack name*	No	Tail Xponder circuit pack name/identifier (string)

	Input Parameter						***Manda-tory***	***Descriptions***
30						*Port name*	No	Xponder circuit pack port name (string)
31					*Tail ROADM AID*		No	Provide Xponder's port for intercity ROADM connection (bay, shelf, slot, and port)
32					*Tail ROADM Port Rack Location*		No	Xponder's location, e.g., FIC (Frame Identification Code) of the tail ROADM
33		*Rx Direction*	For Rx direction, repeat parameters from line 15 to line 32.					
34		*Optics Type*					No	2 types: Gray, Enum=1; DWDM, Enum=2
35		*Router*		*Node ID*			No	Refer to line 14.
36				*IP Address*			No	Router IP address, inet:*ip-address*
37				*URL*			No	Router URL (string)
38		*User Label*					No	Label for service endpoint, defined by the user (string)
39	Service Z-end	Repeat parameters from line 7 to line 38 for Service Z-end						
40	Hard Cons-traints	*Customer Code*					No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
41		*General*	*Diversity*	*Existing service*			No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
42				*Existing service applicability*	*Site*		No	Site identifies the CLLI (Boolean)
43					*Node*		No	Refer to line 14 (Boolean)
44					*SRLG*		No	Shared Risk Link Group data, (Boolean)
45			*Exclude*	*Fiber bundle*			No	Fiber segment usually defined by SRLG (string), list.
46				*Site*			No	Site identifies the CLLI, list.

	Input Parameter				***Manda-tory***	***Descriptions***
47				*Node*	No	Refer to line 14, list.
48				*Supporting service name*	No	Supporting service(s) to exclude from this route (string), list. Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service.
49			*Include*	*Fiber bundle*	No	Refer to line 45 for include.
50				*Site*	No	Refer to line 46 for include.
51				*Node*	No	Refer to line 14 for include.
52				*Supporting service name*	No	Refer to line 48 for include.
53			*Latency*	*Maximum Latency*	No	Maximum *latency* allowed on service (uint32), units in “ms”.
54		*Co-routing*	*Existing service*		No	The existing service that is to be co-routed, list.
55	Soft Cons-traints	*Repeat parameters from line 40 to line 54 for soft constraints*			No	
56	Propose equipment				No	Whether or not this request can propose new equipment that could be used to fulfill this request. If never, the request will just use existing deployed and planned equipment. If ifNeeded, routes using existing equipment will be preferred. If always, a route with proposed equipment shall be returned, if possible. 3 types: “Never”, Enum=1; “ifNeeded”, Enum=2, “Always”, Enum=3. Default is “ifNeeded”.
57	Due date				No	Date and time service to be turned up. If time is not specified for a given date, default to midnight. Service will be turned up immediately if no *due date* is specified. Type: yang:*date*-and-time
58	End Date				No	Date and time service to be removed. Type: yang:*date*-and-time

	Input Parameter	*Manda-tory*	*Descriptions*
59	Event Horizon Start	No	Start time to ensure that the service is routable and viable. Required resources shall be considered reserved from this time. If not provided, defaults to due-date. Type: yang:*date*-and-time
60	Event Horizon End	No	End time to ensure that the service is routable and viable. Required resources shall be considered reserved until this time. If not provided, defaults to end-date. Type: yang:*date*-and-time
61	NC code	No	Network Channel code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
62	NCI code	No	Network Channel Interface code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
63	Secondary NCI code	No	Secondary NCI code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
64	Customer	No	To be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
65	Customer contact	No	Customer contact information to be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
66	Operator contact	No	Operator contact information to be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
67	Service layer	No	Layer of the service. 2 types: WDM, Enum=1; OTN, Enum=2

The Open ROADM Service Model defines the synchronous response to the service feasibility check RPC. Table 3-4 lists the output parameters in version 2.2.

Table 3-4 Synchronous Response to Service Feasibility Check RPC

Output	***Field Name***	***Manda-tory***	***Note***
Configuration Response Common	*Request ID*	Yes	The request ID from the request message for which this is the response (string)
	Response Code	Yes	One of the codes defined for success or error (string)
	Response Message	No	Message included for error code (string)
	Ack-final-indicator	Yes	Indicates if this is the last response that the client should expect (string).
Response Parameters		Yes	E.g., violated soft constraints, etc.

	Parameter					***Manda-tory***	***Descriptions***
1	Hard Constraints	*General*		*Customer Code*		No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
2			*Diver-sity*	*Existing service*		No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
3				*Existing service applicability*	*Site*	No	Site identifies the CLLI (Boolean)
4					*Node*	No	Refer to Table 3-3 line 14 (Boolean)
5					*SRLG*	No	Shared Risk Link Group data, (Boolean)
6			*Exclude*	*Fiber bundle*		No	Fiber segment usually defined by SRLG (string), list.
7				*Site*		No	Site identifies the CLLI, list.
8				*Node*		No	Refer to Table 3-3 line 14, list.
9				*Supporting service name*		No	Refer to Table 3-3 line 48.
10			*Include*	*Fiber bundle*		No	Refer to line 6.
11				*Site*		No	Refer to line 7.
12				*Node*		No	Refer to Table 3-3 line 14, list.

13				*Supporting service name*	No	Refer to Table 3-3, line 48.
14			*Latency*	*Maximum latency*	No	Refer to Table 3-3, line 53.
15		*Co-routing*	*Existing Service*		No	The existing service that is to be co-routed.
16	Soft Constraints	*Repeat line 1 to line 15 for soft constraints.*			No	
17		*Service Format*			Yes	7 types: Ethernet, Enum=1; OTU, Enum=2; OC, Enum=3; STM, Enum=4; OMS, Enum=5; ODU, Enum=6; OTM, Enum=7;
18		*Service rate*			No	E.g., 10G, 100G etc. rate in integer (uint32)
19		*OTU service rate*			No	Full rate of transport of OTUn, e.g., OTU2, OTU4
20		*ODU service rate*			No	Sub-rate ODU services, e.g., ODU0 in an OTU4 interface.
21		*Ethernet Encoding*			No	Type of Ethernet encoding when the rate = 10GE. 2 types: "10GBASE-W", Enum=1; and "10GBASE-R", Enum=2
22		*Mapping Mode*			No	Applies only to 10GE. "GFP-F" maps into an OPU2 with PT=5 (ITU-T G.7041 Section 7.1) "GFP-E" maps into an OPU2 with PT=9 (ITU-T G.7041 Section 7.9). Note GFP-E is an Open ROADM term to mean "Extended" OPU2 mapping "PCS-Transparent" maps into an OPU2E with PT=3 (ITU-T G.709 Section 17.2)
23		*CLLI*			Yes	Office location, Note the CLLI must match the site associated with the device-id of this endpoint (string)
24	Service A-end	*Node ID*			No	Globally unique identifier for a device length "7..63"

						pattern "([a-zA-Z][a-zA-Z0-9-]{5,18}[a-zA-Z0-9])" A Node ID can contain letters, numbers, and hyphens. The first character must be a letter. The last character must be a letter or number.
25		*Tx direction*	*Port*			Uses service port, service LGX, and service tail. From the device model perspective, the port-device-name plus the port-circuit-pack-name plus the port-name uniquely identifies the port. From the network model perspective, the openroadm-topology-ref plus port-device-name plus port-name uniquely identify the termination point in the network model.
26				*Port device name*	No	Port defined for the end-to-end service (string)
27				*Port circuit pack name*	No	Port circuit pack name for the service (string)
28				*Port type*	No	Port type, e.g. “router” or “POI” etc. (string)
29				*Port name*	No	E.g. Tx, Rx (string)
30				*Port rack*	No	E.g. Bay FIC: Frame Identification Code (string)
31				*Port shelf*	No	E.g. shelf in the bay (string)
32				*Port slot*	No	E.g. slot in the shelf (string)
33				*Port sub-slot*	No	E.g. sub-slot in the shelf or on a card (string)
34			*LGX*	*LGX device name*	No	E.g. name/identifier of the LGX (string)
35				*LGX port name*	No	E.g. port name of the LGX (string)
36				*LGX port rack*	No	E.g. rack port of the LGX (string)
37				*LGX port shelf*	No	E.g. shelf port of the LGX (string)

38			*Tail*	*Tail ROADM*	*Node ID*	No	Tail ROADM: ROADM on which the Xponder is connected to (TID, IP Address, or FQDN). Node ID: Refer to line 24.
39				*Xponder Port*	*Circuit pack name*	No	Tail Xponder circuit pack name/identifier (string)
40					*Port name*	No	Xponder circuit pack port name (string)
41				*Tail ROADM AID*		No	Provide Xponder's port for intercity ROADM connection (bay, shelf, slot, and port)
42				*Tail ROADM Port Rack Location*		No	Xponder's location, e.g., FIC (Frame Identification Code) of the tail ROADM
43		*Rx direction*	*Repeat parameters in line 25 to line 42.*				
44		*Optics type*				No	2 types: Gray, Enum=1; DWDM, Enum=2
45		*Router*			*Node ID*	No	Refer to line 24.
46					*IP Address*	No	Router IP address, inet:*ip-address*
47					*URL*	No	Router URL (string)
48		*User Label*				No	Label for service endpoint, defined by the user (string)
49		*Equipment Required*[12]		*Equipment Identifier*		Yes	Equipment identifier as key (string)
50				*Equipment type*		No	The set of valid value is derived from the equipment-type grouping used in the device model (string)
51				*Equipment quantity*		No	Quantity of required equipment, integer, (uint32)
52				*Lifecycle state*		No	Refer to Table 2-1 line 9, (string)
53	Service Z-end	*For service Z-end, repeat parameters from line 17 to line 52.*				Yes	

[12] List of required equipment including equipment type, state and quantity.

54	Intermediate Sites[13]	*For each intermediate site, repeat parameters from line 17 to line 52.*	Yes	CLLI as key, list.

3.3 Service Feasibility Check Bulk RPC

This RPC checks feasibility for multiple services. It takes a list of potential services and requests the RNC or Open ROADM Controller to analyze feasibility collectively and return results on connectivity, equipment availability and reachability. It ensures that a given resource is not used more than once. No resources are reserved, provisioned or planned because of this operation. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing. Table 3-5 lists the service feasibility check bulk RPC and its associated input parameters.

Table 3-5 Service Feasibility Check Bulk PRC and Input Parameters

	Input Parameter		***Mandatory***	***Descriptions***
1	SDNC Request Header	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
2		*RPC Action*	No	Service feasibility check bulk, Enum=14
3		*Notification url*	No	URL for asynchronous response (string)
4		Request System ID	No	Identifier of application initiates the request (string)
5	Service Request List		Yes	List of the potential services for bulk feasibility check
6	Common ID		Yes	Service order #, or identifier to be used by the ROADM controller to identify routing constraints received from planning applications. (string)
7	Connection Type		No	3 types: Service, Enum=1; Infrastructure, Enum=2; ROADM line, Enum=3
8	For each service in line 5, repeat parameters in Table 3-3 from line 7 to line 67.			

The Open ROADM Service Model defines the synchronous response to the service feasibility check bulk RPC. Table 3-6 lists the output parameters in version 2.2.

[13] List of required equipment, including equipment type, state and quantity over entire route of the service.

Table 3-6 Synchronous Response to Service Feasibility Check Bulk RPC

Output	***Field Name***		***Manda-tory***	***Note***
Configuration Response Common	*Request ID*		Yes	The request ID from the request message for which this is the response (string)
	Response Code		Yes	One of the codes defined for success or error (string)
	Response Message		No	Message included for error code (string)
	Ack-final-indicator		Yes	Indicates if this is the last response that the client should expect (string).
Service Response List	Response Parameters	For each service in the feasibility check bulk, repeat parameters in Table 3-4 from line 1 to line 54.		

3.4 Service Delete RPC

This RPC is for the SDN Controller to request the RNC or Open ROADM Controller to remove an existing service either immediately or in future. If this request passed initial validation and was accepted for processing, once the processing completes, a service RPC result notification shall be sent. Once the service has been deleted, it will no longer appear in the service list.

The parameters included in the service delete RPC are described in Table 3-7 below.

Table 3-7 Service Delete RPC and Input Parameters

	Input Parameter		***Manda-tory***	***Descriptions***
1	SDNC Request Header	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
2		*RPC Action*	No	Service delete, Enum=3
3		*Notification URL*	No	URL for asynchronous response (string)
4		*Request System ID*	No	Identifier of application initiates the request (string)
5	Service Delete Request Info	*Service name*	Yes	Identifier for the service to be deleted in the ROADM network, e.g., CLFI, CLCI, etc. (string)

	Input Parameter		Manda-tory	Descriptions
6		*Due date*	No	Date and time service to be turned down. If time is not specified for a given date, default to midnight. Service will be turned down immediately if no *due date* is specified. Type: yang:*date*-and-time
7		*Tail retention*	Yes	"Yes", Enum=1, tails are left intact. "No", Enum=2, tails are deleted.

The Open ROADM Service Model version 2.2 defines the synchronous response to the service delete RPC. The synchronous response only contains the configuration response common body, see Table 3-8 below.

Table 3-8 Synchronous Response to Service Delete RPC

Output	Field Name	Manda-tory	Note
Configuration Response Common	*Request ID*	Yes	The request ID from the request message for which this is the response (string)
	Response Code	Yes	One of the codes defined for success or error (string)
	Response Message	No	Message included for error code (string)
	Ack-final-indicator	Yes	Indicates if this is the last response that the client should expect (string).

3.5 Equipment Notification RPC

This RPC is for the RNC or Open ROADM Controller to notify the SDN controller that new equipment, e.g., a new ROADM node, was self-discovered in the network. The parameters included in the equipment notification RPC are described in Table 3-9.

Table 3-9 Equipment Notification RPC and Input Parameters

	Parameter		Manda-tory	Note
1	*SDNC Request Header*	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
2		*RPC Action*	No	Equipment notification, Enum=4

	Parameter		Manda-tory	Note
3		*Notification url*	No	URL for asynchronous response (string)
4		*Request System ID*	No	Identifier of application initiates the request (string)
5	*Equipment ID*		Yes	Identifier of the equipment (e.g. ROADM node). This is also the primary key for updates. (string)
6	*Equipment Name*		No	Equipment name and description (string)
7	*Equipment Type*		Yes	ROADM, Xponder, etc. (string) The set of valid values is derived from the equipment-type grouping used in the device model.
8	*Equipment Vendor*		Yes	Name of the vendor for the equipment. (string)
9	*Equipment customer*		No	Name of customer to which this equipment belongs. (string)
10	*Equipment CLLI*		Yes	Expected 11 char CLLI but minimally 8 character CLLI of the equipment being added/updated. Note that the same equipment-clli cannot be allowed to map to more than one controller-id. (string)
11	*Equipment IP*		No	Format is IP address. (string)
12	*Controller ID*		Yes	Identifier of the RNC which controls the equipment. (string)

The Open ROADM Service Model version 2.2 defines the synchronous response to the equipment notification RPC. The synchronous response only contains the “Configuration Response Common” body, refer to Table 3-8.

3.6 Temp Service Create RPC

This RPC is for requesting the Open ROADM Controller or RNC to compute a service path and reserve the wavelengths assigned to the service. The temporary services will be converted to the normal services upon creation of a service request from the SDN controller using the matching Common ID.

A temp service can be converted to a normal service using the service-create RPC. Once converted to a normal service, that service will no longer show in the temp service list.

The parameters included in the RPC are described in Table 3-10.

Table 3-10 Temp Service Create RPC and Input Parameters

	Input Parameter		*Manda-tory*	*Descriptions*
1	Common ID		Yes	Service order #, or identifier to be used by ROADM controller and planning applications for routing constraints etc. (string)
2	SDNC Request Header	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
3		*RPC Action*	No	Temp service create, Enum=5
4		*Notification url*	No	URL for asynchronous response (string)
5		Request System ID	No	Identifier of application initiates the request (string)
6	Repeat Table 3-1 from line 7 to line 67.			

The synchronous response to the Temp Service Create RPC has the same output parameters in the Service Create RPC section. Refer to Table 3-2.

3.7 Temp Service Delete RPC

This RPC is to request the RNC or Open ROADM Controller to remove wavelengths that were reserved via a temporary service create RPC.

This command is typically used to cancel a temp service if it is not to be converted to a normal service.

The parameters included in the Temp Service Delete RPC are described in Table 3-11 below.

Table 3-11 Temp Service Delete RPC and Input Parameter

	Input Parameter	*Manda-tory*	*Descriptions*
1	Common ID	Yes	The Common ID in the Temp Service Create request before.

The synchronous response to the Temp Service Delete RPC only contains the “Configuration Response Common” body. Refer to Table 3-8.

3.8 Service Roll RPC

This RPC is to request the RNC or Open ROADM Controller to change the path of a service while keeping the same A and Z end points. The new path must comply with the routing constraints that were imposed on the service initially. This capability is mostly exercised by the SDN Controller following a network re-optimization request (Section 3.14) through which the RNC identified more optimal paths for some embedded services.

If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing

The parameters included in the Service Roll RPC are described in Table 3-12.

Table 3-12 Service Roll RPC and Input Parameters

	Input Parameter	***Manda-tory***	***Descriptions***
1	Service Name	Yes	Identifier for the service to be rolled in the ROADM network, e.g., CLFI, CLCI, etc. (string)
2	Due Date	No	Date and time service to be rolled. If time is not specified for a given date, default to midnight. Service will be rolled immediately if no *due date* is specified. Type: yang:*date*-and-time

The synchronous response to the Service Roll RPC is listed in Table 3-13.

Table 3-13 Synchronous Response to Service Roll RPC and Output Parameters

	Output Parameter	***Manda-tory***	***Descriptions***
1	Status	Yes	2 types: “Successful”, Enum=1; “Failed”, Enum=2
2	Status message	No	Details about the status (string)

3.9 Service Reconfigure RPC

This RPC provides the capability to request the RNC or Open ROADM Controller to change the service to different terminating equipment, i.e., re-home the service, to change the service path, and to route the service with different routing constraints etc. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing. Table 3-14 lists the Service Reconfigure RPC and input parameters.

Table 3-14 Service Reconfigure RPC and Input Parameters

	Input Parameter	*Manda-tory*	*Descriptions*
1	Service Name	Yes	Existing identifier for the service to be reconfigured in the ROADM network, e.g., CLFI, CLCI, etc.
2	New Service Name	No	New identifier for the service to be reconfigured in the ROADM network, e.g., CLFI, CLCI, etc.
3	Common ID	No	Service order #, or identifier to be used by ROADM controller and planning applications for routing constraints etc. (string)
4	Connection Type	No	3 types: Service, Enum=1; Infrastructure, Enum=2; ROADM line, Enum=3
5	Repeat parameters in Table 3-1 from line 8 to line 67.		Parameters blow line 4 in this table are the same as in a Service Create RPC line 8 to line 67 in Table 3-1.

The synchronous response to the Service Reconfigure RPC is the same as listed in Table 3-13.

3.10 Service Restoration RPC

This RPC is to restore the service disrupted by regen failures. The SDN Controller receives notification from the RNC or Open ROADM Controller whether the service can be restored either permanently or temporarily by a spare regen. The SDN Controller then instructs the RNC to restore the service using spare regen(s). Service restoration is to be carried out immediately. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing. Table 3-15 lists the Service Restoration RPC and input parameters.

Table 3-15 Service Restoration RPC and Input Parameters

	Input Parameter	*Manda-tory*	*Descriptions*
1	Service Name	Yes	Identifier for the service to be restored in the ROADM network, e.g., CLFI, CLCI, etc.
2	Option	Yes	2 types: “Permanent” Enum=1; “Temporary”, Enum=2. When “Permanent” is selected, a spare regen can be used to restore the service permanently without reverting back to the original regen. When “Temporary” is selected, a spare regen can be used to restore the service

	Input Parameter	*Manda-tory*	*Descriptions*
			temporarily. The service then needs to be reverted back to the original regen transponder.

The synchronous response to the Service Restoration RPC is the same as listed in Table 3-13.

3.11 Service Reversion RPC

This RPC is to revert the service that was restored or rerouted temporarily to the original equipment or path. Service reversion is expected to be performed in a maintenance window with a due date. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing. The Service Reversion RPC and input parameters are listed in Table 3-16.

Table 3-16 Service Reversion RPC and Input Parameters

	Input Parameter	*Manda-tory*	*Descriptions*
1	Service Name	Yes	Existing identifier for the service to be reverted in the ROADM network, e.g., CLFI, CLCI, etc.
2	Due Date	No	Date and time service to be reverted. If time is not specified for a given date, default to midnight. Service turned up immediately if no *due date* is specified. Type: yang:*date*-and-time

The synchronous response to the Service Reversion RPC is the same as listed in Table 3-13.

3.12 Service Reroute RPC

This RPC can be used by the SDN Controller to restore a service that is affected by ROADM line failures such as fiber cut, optical amplifier failure, etc. Service reroute is to be carried out immediately without consideration of any routing constraints.

Note:

Since service re-route is always on a temporary basis, the RNC must mark the equipment and wavelengths in the original path as “Out of Service Maintenance” so that the rerouted service can be reverted back through “Service Reversion”.

If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing. The Service Reroute RPC and input parameter are listed in Table 3-17.

Table 3-17 Service Reroute RPC and Input Parameter

	Input Parameter	*Manda-tory*	*Descriptions*
1	Service Name	Yes	Existing identifier for the service to be rerouted in the ROADM network, e.g., CLFI, CLCI, etc.

The synchronous response to the Service Reroute RPC is listed in Table 3-18.

Table 3-18 Synchronous Response to Service Reroute RPC and Output Parameters

Output Parameter					*Manda-tory*	*Descriptions*
1	Status				Yes	2 types: “Successful”, Enum=1; “Failed”, Enum=2
2	Status message				No	Details about the status (string)
3	Hard Constraints	*Customer Code*			No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
4		*General*	*Diversity*	*Existing service*	No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
5				*Existing service applicability* — *Site*	No	Site identifies the CLLI (Boolean)
6				*Existing service applicability* — *Node*	No	Refer to Table 3-1 line 15 (Boolean)
7				*Existing service applicability* — *SRLG*	No	Shared Risk Link Group data, (Boolean)
8			*Exclude*	*Fiber bundle*	No	Fiber segment usually defined by SRLG (string), list.
9				*Site*	No	Site identifies the CLLI, list.
10				*Node*	No	Refer to Table 3-1 line 15, list.
11				*Supporting service name*	No	Refer to Table 3-1 line 49.
12			*Include*	*Fiber bundle*	No	Refer to line 8.

13				*Site*		No	Refer to line 9.
14				*Node*		No	Refer to Table 3-1 line 15, list.
15				*Supporting service name*		No	Refer to Table 3-1 line 49.
16			*Latency*	*Maximum latency*		No	Refer to Table 3-1 line 54.
17		*Co-routing*	*Existing Service*			No	The existing service that is to be co-routed, list.
18	Soft Con-straints	*Repeat line 3 to line 17 for soft constraints.*				No	

3.13 Service Reroute Confirm RPC

This RPC is to confirm the service reroute. The input parameters are described in Table 3-19. If this request passed the initial validation and was accepted for processing, a service RPC result notification shall be sent once the request completes processing.

Table 3-19 Service Reroute Confirm RPC and Input Parameters

1	***Input Parameter***					***Mandatory***	***Descriptions***
2	Service Name					Yes	Identifier for the service to be rerouted in the ROADM network, e.g., CLFI, CLCI, etc. (string)
3	Hard Constraints	*Customer Code*				No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
4		*General*	*Diversity*	*Existing service*		No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
5					*Site*	No	Site identifies the CLLI (Boolean)
6					*Node*	No	Refer to Table 3-1 line 15, list.

7				*Existing service applicability*	*SRLG*	No	Shared Risk Link Group data, (Boolean)
8			*Exclude*	*Fiber bundle*		No	Fiber segment usually defined by SRLG (string), list.
9				*Site*		No	Site identifies the CLLI, list.
10				*Node*		No	Refer to Table 3-1 line 15, list.
11				*Supporting service name*		No	Refer to Table 3-1 line 49.
12			*Include*	*Fiber bundle*		No	Refer to line 8.
13				*Site*		No	Refer to line 9.
14				*Node*		No	Refer to Table 3-1 line 15, list.
15				*Supporting service name*		No	Refer to Table 3-1 line 49.
16			*Latency*	*Maximum latency*		No	Refer to Table 3-1 line 54.
17		*Co-routing*	*Existing Service*			No	The existing service that is to be co-routed, list.
18	Soft Constraints	*Repeat line 3 to line 17 for soft constraints.*				No	

The synchronous response to the Service Reroute Confirm RPC is the same as listed in Table 3-13.

3.14 Network Re-optimization RPC

As the network topology changes over time, the SDN Controller can periodically request the RNC to check whether any embedded services can be routed more efficiently without violating any routing constraints imposed on the services. The parameters included in the network re-optimization RPC are described in Table 3-20.

Table 3-20 Network Re-optimization RPC and Input Parameters

	Input Parameter	*Manda-tory*	*Descriptions*
1	Service Name	No	Identifier for the service to be checked by the RNC for re-optimization in the ROADM network, e.g., CLFI, CLCI, etc.
2	A-end	No	Services whose A-ends are terminated at the specified office location are to be checked by the RNC for re-optimization.
3	Z-end	No	Services whose Z-ends are terminated at the specified office location are to be checked by the RNC for re-optimization.
4	Pass-through	No	Services that are pass-through (either via regen or express) at the specified office location are to be checked by the RNC for re-optimization.
5	Customer Code	No	Services that belong to the specified customer are to be checked by the RNC for re-optimization.

The synchronous response to the Network Re-optimization RPC is listed in Table 3-21.

Table 3-21 Synchronous Response to Network Re-optimization RPC and Output Parameters

	Output Parameter	*Manda-tory*	*Descriptions*
1	Status	Yes	2 types: “Successful”, Enum=1; “Failed”, Enum=2
2	Status message	No	Details about the status (string)
3	Optimization Candidate	No	Specify each of the services that can be optimized (string)

4 NOTIFICATIONS

The Open ROADM Service Model version 2.2 defines the following service related notifications:

- Service RPC result
  - Notification indicates result of a service RPC
- Service traffic flow

  - Notification indicates that traffic is flowing again on the service after an administrative action has been completed
- Service notification
  - Notification indicates that a service has been added, modified, or removed. A resource creation notification shall contain the created service in its entirety. A resource modified notification shall contain just the modified field, plus the service identifier.[14] A resource deleted notification shall just contain the service identifier.

Table 4-1 describes the notification parameters.

Table 4-1 Notifications in the Open ROADM Service Model

	Notification Parameter	***Mandatory***	***Description***
Service RPC Result		Yes	
1	Notification Type	No	There are 7 types of Service notification. – Service create result, Enum=1 – Service reconfigure result, Enum=2 – Service delete result, Enum=3 – Service roll result, Enum=4 – Service revert result, Enum=5 – Service reroute result, Enum=6 – Service restoration result, Enum=7
2	Status	Yes	2 types: “Successful”, Enum=1; “Failed”, Enum=2
3	Status Message	No	Details about the status (string)
4	Services Name	Yes	Identifier for the service being reported on, e.g., CLFI etc. (string)
5	Actual Date	No	Actual date and time (if successful) yang:*date*-and-time
Service Traffic Flow			
6	Services Name	Yes	Service identifier. Unique within the context of a network, e.g., CLFI etc. (string)

[14] Recommend always sending the full results even on a resource modification. Otherwise, if a constraint was not met or deleted, it is difficult to tell if only modified fields are provided.

Notification Parameter			*Manda-tory*	*Description*
7	Actual Date		No	*Actual date* and time traffic started flowing, yang:*date*-and-time
Service Notification				
8	Notification Type		No	Refer to line 1
9	Services Name		Yes	Service identifier. Unique within the context of a network, e.g., CLFI etc. (string)
10	Common ID		No	Service order #, or identifier to be used by the ROADM controller to identify routing constraints received from planning applications. (string)
11	SDNC Request Header	*Request ID*	No	From original system requesting for the service. Uniquely generated by calling system. (string)
12		*RPC Action*	No	14 types[15]: - Service create, Enum=1 - Service feasibility check, Enum=2 - Service delete, Enum=3 - Equipment notification, Enum=4 - Temp service create, Enum=5 - Temp service delete, Enum=6 - Service roll, Enum=7 - Service reconfigure, Enum=8 - Service restoration, Enum=9 - Service reversion, Enum=10 - Service reroute, Enum=11 - Service reroute confirm, Enum=12 - Network re-optimization, Enum=13 - Service feasibility check bulk, Enum=14
13		*Notification url*	No	URL for asynchronous response (string)
14		Request System ID	No	Identifier of application initiates the request (string)
15	Connection Type		Yes	3 types: Service, Enum=1; Infrastructure, Enum=2; ROADM line, Enum=3
16	Lifecycle State		No	Service lifecycle state, 8 types (string)

[15] Not all RPCs generate service notifications.

Notification Parameter			*Manda-tory*	*Description*
				Deployed, Enum=1; Planned, Enum=2; Maintenance, Enum=3; Deploying, Enum=4; Undeploying, Enum=5; Undeployed, Enum=6; Proposed, Enum=7; Draft, Enum=8
17	Administrative State		No	Intended state of service (string)
18	Operational State		No	Actual state of service (string)
19	Condition		No	Service condition. Additional information about the state of the service. Only sent when applicable. 5 types: Restored temporarily, Enum=1; Re-routed temporarily, Enum=2; Activated for service, Enum=3; Activated for further check, Enum=4; Activated for troubleshooting failure, Enum=5
20	Service A-end	*Service Format*	Yes	7 types: Ethernet, Enum=1; OTU, Enum=2; OC, Enum=3; STM, Enum=4; OMS, Enum=5; ODU, Enum=6; OTM, Enum=7;
21		*Service rate*	No	E.g., 10G, 100G etc. rate in integer (uint32)
22		*OTU service rate*	No	Full rate of transport of OTUn, e.g., OTU2, OTU4
23		*ODU service rate*	No	Sub-rate ODU services, e.g., ODU0 in an OTU4 interface.
24		*Ethernet Encoding*	No	Type of Ethernet encoding when the rate = 10GE. 2 types: "10GBASE-W", Enum=1; and "10GBASE-R", Enum=2
25		*Mapping Mode*	No	Applies only to 10GE. "GFP-F" maps into an OPU2 with PT=5 (ITU-T G.7041 Section 7.1) "GFP-E" maps into an OPU2 with PT=9 (ITU-T G.7041 Section 7.9). Note GFP-E is an Open ROADM term to mean "Extended" OPU2 mapping "PCS-Transparent" maps into an OPU2E with PT=3 (ITU-T G.709 Section 17.2)
26		*CLLI*	Yes	Office location, Note the CLLI must match the site associated with the device-id of this endpoint (string)

Notification Parameter						***Manda-tory***	***Description***
27		*Node ID*				No	Globally unique identifier for a device length "7..63" pattern "([a-zA-Z][a-zA-Z0-9-]{5,18}[a-zA-Z0-9])" A Node ID can contain letters, numbers, and hyphens. The first character must be a letter. The last character must be a letter or number.
28		*Tx direction*	*Port*				Uses service port, service LGX, and service tail. From the device model perspective the port-device-name plus the port-circuit-pack-name plus the port-name uniquely identifies the port. From the network model perspective the openroadm-topology-ref plus port-device-name plus port-name uniquely identify the termination point in the network model.
29				*Port device name*		No	Port defined for the end-to-end service (string)
30				*Port circuit pack name*		No	Port circuit pack name for the service (string)
31				*Port type*		No	Port type, e.g. “router” or “POI” etc. (string)
32				*Port name*		No	E.g. Tx, Rx (string)
33				*Port rack*		No	E.g. Bay FIC: Frame Identification Code (string)
34				*Port shelf*		No	E.g. shelf in the bay (string)
35				*Port slot*		No	E.g. slot in the shelf (string)
36				*Port sub-slot*		No	E.g. sub-slot in the shelf or on a card (string)
37			*LGX*	*LGX device name*		No	E.g. name/identifier of the LGX (string)
38				*LGX port name*		No	E.g. port name of the LGX (string)
39				*LGX port rack*		No	E.g. rack port of the LGX (string)
40				*LGX port shelf*		No	E.g. shelf port of the LGX (string)
41			*Tail*	*Tail ROADM*	*Node ID*	No	Tail ROADM: ROADM on which the Xponder is connected to (TID, IP Address, or FQDN). Node ID: Refer to line 20.

Notification Parameter						***Manda-tory***	***Description***
42				*Xponder Port*	*Circuit pack name*	No	Tail Xponder circuit pack name/identifier (string)
43					*Port name*	No	Xponder circuit pack port name (string)
44				*Tail ROADM AID*		No	Provide Xponder's port for intercity ROADM connection (bay, shelf, slot, and port)
45				*Tail ROADM Port Rack Location*		No	Xponder's location, e.g., FIC (Frame Identification Code) of the tail ROADM
46		*Rx direction*	For Rx direction, repeat parameters from line 28 to line 45.				
47		*Optics type*				No	2 types: Gray, Enum=1; DWDM, Enum=2
48		*Router*		*Node ID*		No	Refer to line 27.
49				*IP Address*		No	Router IP address, inet:*ip-address*
50				*URL*		No	Router URL (string)
51		*User Label*				No	Label for service endpoint, defined by the user (string)
52	Service Z-end	Repeat parameters from line 20 to line 51 for Service Z-end					
53	Hard Cons-traints	*Customer Code*				No	For selecting tagged equipment on which to route a service. If more than one customer code is provided, they will be treated as an ordered list. (string)
54		*General*	*Diversity*	*Existing service*		No	Diverse from existing services identified by facility CLFI, list. (string) Constraints are either general or co-routing. Under general constraints, there are diversity, exclude, include and latency constraints.
55				*Existing service applicability*	*Site*	No	Site identifies the CLLI (Boolean)
56					*Node*	No	Refer to line 27 (Boolean)
57					*SRLG*	No	Shared Risk Link Group data, (Boolean)
58			*Exclude*	*Fiber bundle*		No	Fiber segment usually defined by SRLG (string), list.

Notification Parameter					*Manda-tory*	*Description*
59				*Site*	No	Site identifies the CLLI (Boolean), list.
60				*Node*	No	Refer to line 27, list.
61				*Supporting service name*	No	Supporting service(s) to exclude from this route (string), list. Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service.
62			*Include*	*Fiber bundle*	No	Refer to line 58 for include.
63				*Site*	No	Refer to line 59 for include.
64				*Node*	No	Refer to line 60 for include.
65				*Supporting service name*	No	Refer to line 61 for include.
66			*Latency*	*Maximum Latency*	No	Maximum *latency* allowed (uint32), units in "ms".
67		*Co-routing*	*Existing service*		No	The existing service that is to be co-routed, list.
68	Soft Cons-traints	*Repeat parameters from line 53 to line 67 for soft constraints*			No	
69	Due date				No	Date and time service to be turn up. If time is not specified for a given date, default to midnight. Service turned up immediately if no *due date* is specified. Type: yang:*date*-and-time
70	End Date				No	Date and time service to be removed. Type: yang:*date*-and-time
71	Event Horizon Start				No	Start time to ensure that the service is routable and viable. Required resources shall be considered reserved from this time. If not provided, defaults to due date. Type: yang:*date*-and-time
72	Event Horizon End				No	End time to ensure that the service is routable and viable. Required resources shall be considered reserved until this time. If not

Notification Parameter			*Manda-tory*	*Description*
				provided, defaults to end-date. Type: yang:*date*-and-time
73	NC code		No	Network Channel code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
74	NCI code		No	Network Channel Interface code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
75	Secondary NCI code		No	Secondary NCI code applied to wavelength service only. This is reported against the service but may not get reflected in the service in the network (string).
76	Customer		No	To be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
77	Customer contact		No	Customer contact information to be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
78	Operator contact		No	Operator contact information to be included in ticket information. This is reported against the service but may not get reflected in the service in the network (string).
79	Service layer		No	Layer of the service. 2 types: WDM, Enum=1; OTN, Enum=2
80	Latency		No	Service Latency in integer (uint32), units in “ms”
81	Fiber Span SRLGs		Yes	List of shared risk link group data on fiber spans, shared risk link group identifiers (string).
82	Equip-ment SRGs	*SRG number*	Yes	List of shared risk link group data on equipment (string).
83	Supporting Service Name		Yes	Supporting service is the service name that another service runs over top. For example, if connection-type is service, then this is the related connection-type = infrastructure service, list.

Notification Parameter					***Manda-tory***	***Description***
84	Topo-logy	aToZ	*ID*		Yes	aToZ list. Unique identifier and used as key for this network-topology component within this service (string) Topology reports the individual hops along the service in the A to Z direction and Z to A directions. This includes both ports internal to a device and those at its edge that are available for externally connections. It includes both physical and logical ports. Physical ports are ordered with the logical ports that run over them as follows: a.\t On ingress to a node/card, physical then logical b.\t On egress to a node/card, logical then physical
85			*Hop Type*		No	2 types: Node external, Enum=1, the given resource is on the edge of the node and used in relationships to resources outside of the node. Node internal, Enum=2, the given resource is internally to the node.
86			*Device*	*Node ID*	No	Refer to line 27.
87			*Resource*		No	This resource identifier is intended to provide a generic identifier for any resource that can be used without specific knowledge of the resource. If selected, only one of the parameters in line 88 to line 106 will be chosen.
88			*Circuit Pack*	*Circuit Pack Name*	Yes, in case selected	Circuit pack, Enum=8 Circuit pack name is the circuit pack identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
89			*Port*	*Circuit Pack Name*	Yes, in case selected	Port, Enum=7 Circuit pack name, see line above.
90				*Port Name*	No	Port, Enum=7 Port name is the port identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)

Notification Parameter					***Manda-tory***	***Description***
91			*Connection*	*Connection Name*	Yes, in case selected	Connection, Enum=5 This is used by either ROADM connection or ODU connection since they are mutually exclusive in the model. Connection name is unique within the context of a device. Same as leafref value in model, if applicable. (string)
92			*Physical Link*	*Physical Link Name*	Yes, in case selected	Physical link, Enum=10 Physical link name is the physical link identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
93			*Internal Link*	*Internal Link Name*	Yes, in case selected	Internal link, Enum=9 Internal link name is the internal link identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
94			*Shelf*	*Shelf Name*	Yes, in case selected	Shelf, Enum=12 Shelf name is the shelf ID identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (string)
95			*SRG*	*SRG Number*	Yes, in case selected	Shared Risk Group, Enum=4 SRG number is the shared risk group identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (uint16)
96			*Degree*	*Degree Number*	Yes, in case selected	Degree, Enum=3 Degree number is the degree identifier. Unique within the context of a device. Same as leafref value in model, if applicable. (uint16)
97			*Service*	*Service Name*	Yes, in case selected	Service, Enum=13 Service name is the service identifier. Unique within the context of a network. Same as leafref value in model, if applicable. (string)
98			*Interface*	*Interface Name*	Yes, in case selected	Interface, Enum=11 Interface name is the interface identifier. (string)
99			*ODU sncp pg*	*ODU sncp pg name*	Yes, in case selected	ODU sncp pg, Enum=14 ODU sncp pg name is the name of the ODU sncp pg. (string)

Notification Parameter					***Manda-tory***	***Description***
100			*Other*	*other-resource-id string*	Yes, in case selected	Other, Enum=1 Resource of type not found in list Resource ID for other (string)
101			*Device*	*Node ID*	Yes, in case selected	Device, Enum=2 ROADM, Xponder, etc., Node ID is a globally unique identifier for a device. Same as leafref value in model, if applicable.
102			*Line amplifier*	*Amp Number*	Yes, in case selected	Line amplifier, Enum=15 Amp number is the number of the line amplifier. (uint8)
103			*Xponder*	*Xpdr Number*	Yes, in case selected	Xponder, Enum=16 Xpdr number is the number of the Xponder. (uint16)
104			*Versioned Service*	*Versioned Service Name*	Yes, in case selected	Versioned service, Enum=17 Versioned service name is the versioned service identifier. Unique within the context of a network. Same as leafref value in model, if applicable. (string)
105				*Version Number*	Yes, in case selected	Versioned service, Enum=17 Version number of the service (uint64)
106			*Temp Service*	*Common ID*	Yes, in case selected	Temp service, Enum=18 Common ID is the temp service identifier. Unique within the context of a network. Same as leafref value in model, if applicable. (string)
107		*Resource Type*	*Type*		Yes	Resource type, refer to line 88 to line 106 for Enum value.
108			*Extension*		No	Populated when resource type not defined or when Enum value is set to 'other' (string)
109		zToA Repeat parameters from line 84 to line 108 for zToA.				zToA list.

	Notification Parameter	*Manda-tory*	*Description*
110	Is Bandwidth Locked	No	Boolean (true or false), default is "false". Bandwidth lock indicates whether the service is administratively prohibited from taking on more capacity, i.e., whether it can be used as a supporting service in any new service creations. Unlike administrative status, this does not impact any previous planned or deployed services.