ROADM Network Model and Device Model

An Example

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1 Introduction

This document outlines the purpose and example use of the OpenROADM Network and Device models. These models are defined using YANG and are provided publicly at https://github.com/OpenROADM/OpenROADM_MSA_Public.

1.1 Device Model

The Device YANG model provides a framework for a detailed view of the devices (transponders and ROADMs) in the network. The Device model is intended to be a generic way to represent transponders and ROADMs, and each vendor will have one or more instances of this Device model that will describe how their devices are laid out and configured. Each of the transponders and ROADMs in the network will support the device YANG model over NETCONF.

Most of the data in the Device model is read-only from the perspective of the SDN controller. The intention is that the SDN controller does not need to understand the internals of the device (circuit packs, how they are connected, and so on) in order to do service provisioning. The device model internals are only needed for inventory and troubleshooting purposes, and as a result are only read by the SDN controller.

The underlying hardware and physical connections are provisioned during device/hardware turn-up to enable the SDN controller to manage abstracted services over the underlying physical devices.

Provisioning of services on the network element is done via a "connection map[1]" (connections object) of the Device model. This allows the SDN controller to provision wavelengths from the "edge" of the transponder or ROADM device without any requirement on the SDN controller to understand and provision the internals of these devices. The get-connection-port-trail RPC is provided in the Device model to allow the SDN controller to be able to retrieve the internal port trail for a service to allow service troubleshooting through the internal circuit pack layout of a device.

1.2 Network Model

The Network YANG model provides a generic and vendor independent view of the network. The Network model is not used at all by the devices (transponders, ROADMs) and is only used as a representation of the network by the SDN controller. The SDN controller is responsible for providing the Network model view and for correlating the Device model (both as discovered from the network elements themselves and/or as provided by planning tools) to the Network model.

1.3 Example Equipment for a Mock-Up ROADM Network

An example is provided below to illustrate how vendor-agnostic inventory data generated from the ROADM Network Model and specific equipment inventory data generated from a vendor's instantiation of the Device Model can be used together to represent network services and to perform some management functions.

[1] The "connection map" in the Device Model is different from the "Connectivity Map" that is built in the Network Model. The "connection map" in the Device Model describes how vendor-specific circuit packs in a given ROADM node are connected physically. The "Connectivity Map" in the Network Model describes how vendor-agnostic logical components (degrees and SRGs) in a give ROADM node are connected. The logical connections in the "Connectivity Map" can be mapped to physical links in the corresponding "connection map" in the Device Model.

Equipment configurations are vendor specific. Therefore, equipment configurations need to be detailed in the vendor instance of the Device Model. The inventory data described in the next section (Section 2) that is specific to a mock-up ROADM is derived from a Device Model that portrays the equipment configurations presented in this section.

Figure 1-1 shows a mock-up ROADM equipped with two directions/degrees and two colorless/directionless (C/D) add/drop groups (SRGs).

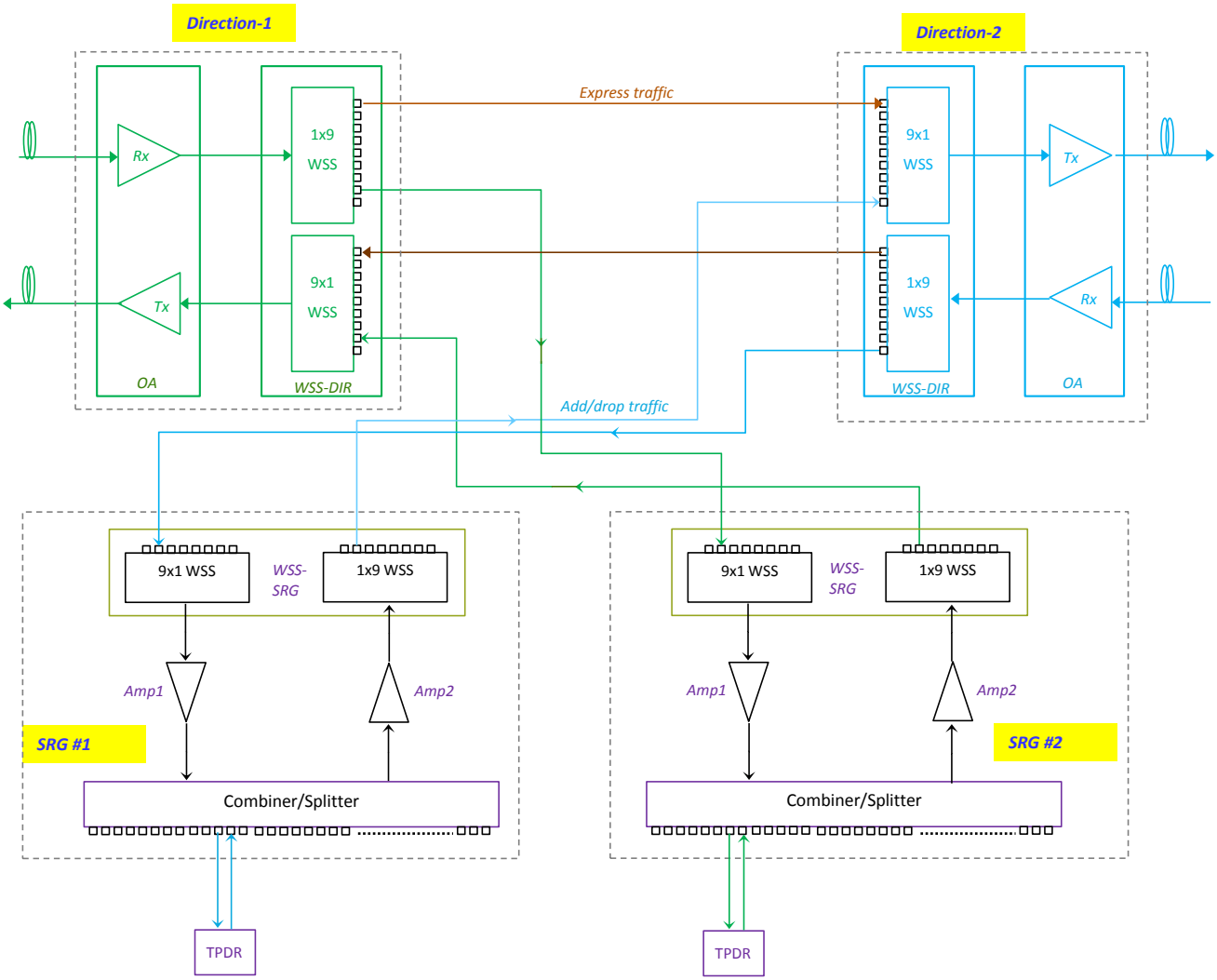

Figure 1-1. A mock-up ROADM with two directions/degrees and two add/drop groups.

Fibering of the nine pairs of IN and OUT ports between the directional WSSs (WSS-DIRs in Figure 1-1) for express traffic is engineered using the standardized port assignments described in Table 1-1:

Table 1-1. Directional WSS port assignments for express wavelengths.

Direction (Degree)	*WSS Port*		*Direction (Degree)*	*WSS Port*
1	1	*connected to*	2	1
1	2	*connected to*	3	1

Direction (Degree)	*WSS Port*		*Direction (Degree)*	*WSS Port*
1	3	*connected to*	4	1
1	4	*connected to*	5	1
2	2	*connected to*	3	2
2	3	*connected to*	4	2
2	4	*connected to*	5	2
3	3	*connected to*	4	3
3	4	*connected to*	5	3
4	4	*connected to*	5	4

The remaining five IN and OUT ports (5-9) in each directional WSS are reserved for use with add/drop banks. Fibering of the directional 1×9WSS-DIR's and the 1×9WSS-SRG's for add/drop traffic follow the standardized port assignments described in Table 1-2:

Table 1-2. Port assignments between Directional WSS and add/drop group WSS.

Direction	*WSS-DIR Port*		*SRG #*	*WSS-SRG Port*
1	9	connected to	1	1
1	8	connected to	2	1
1	7	connected to	3	1
1	6	connected to	4	1
1	5	connected to	5	1
2	9	connected to	1	2
2	8	connected to	2	2
2	7	connected to	3	2
2	6	connected to	4	2
2	5	connected to	5	2
3	9	connected to	1	3
3	8	connected to	2	3
3	7	connected to	3	3
3	6	connected to	4	3
3	5	connected to	5	3
4	9	connected to	1	4
4	8	connected to	2	4
4	7	connected to	3	4
4	6	connected to	4	4
4	5	connected to	5	4
5	9	connected to	1	5
5	8	connected to	2	5
5	7	connected to	3	5

Direction	*WSS-DIR Port*		*SRG #*	*WSS-SRG Port*
5	6	connected to	4	5
5	5	connected to	5	5

The circuit packs required for a direction/degree and the circuit packs required for a SRG (i.e., a C/D add/drop group) can be installed in a single shelf, as shown in Figure 1-2.

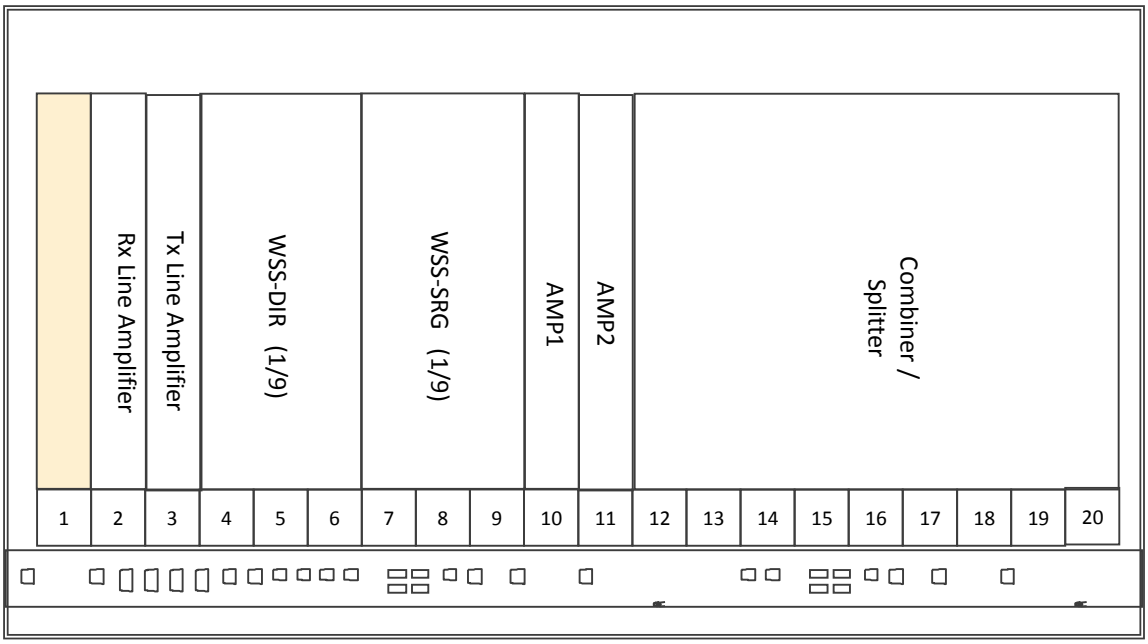

Figure 1-2. Equipment for a degree and an SRG is housed in a single shelf.

There are 96 Tx/Rx port pairs (*pp*'s) on the Combiner/splitter for connections with transponders.

The shelf where a degree and an SRG is housed will be installed as the 1st shelf in a bay. The rest of the bay can be used for transponders of different form factors. For example, Figure 1-3 shows two transponder shelves take up the upper part of the same bay.

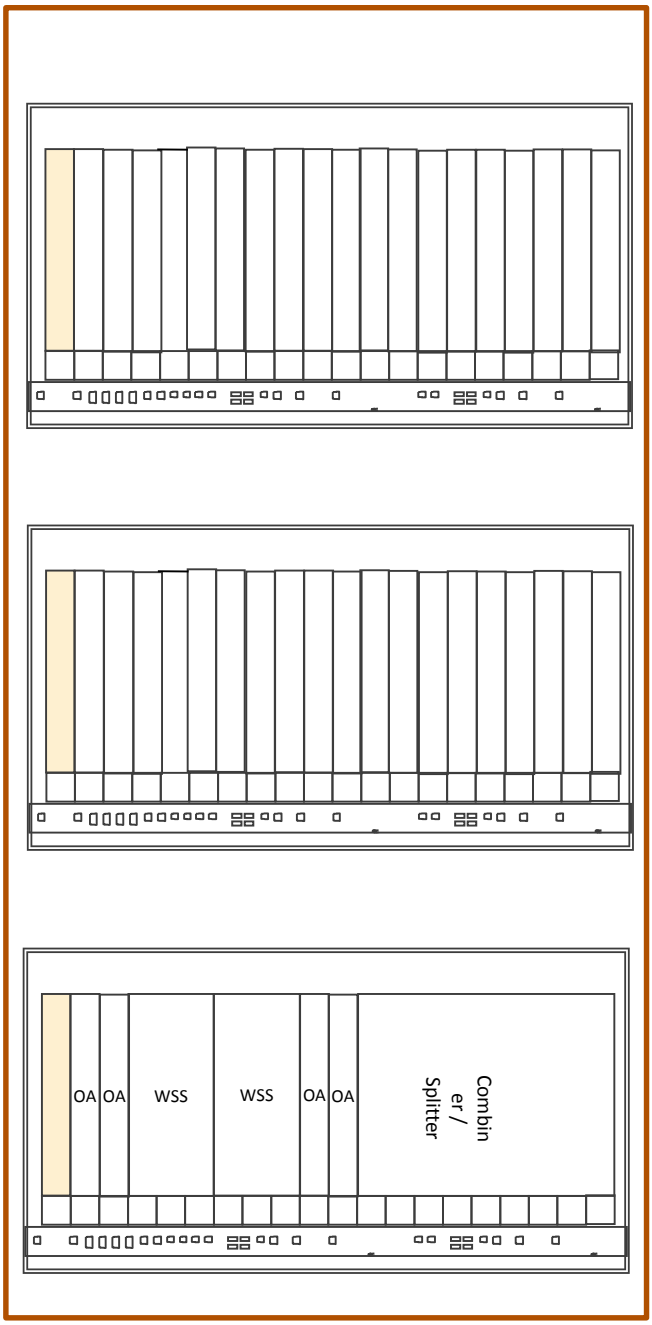

Figure 1-3. Degree and SRG equipment is in the 1st shelf of a bay.

2 ROADM Device Information Model

The ROADM device information model described in this section is derived from the equipment configurations outlined in Section 1.3. As noted in the introduction the NE implements the Device model and these details can be read by the SDN controller over a NETCONF interface to the network element. All of the data in this chapter is meant as an illustrative example (i.e. the naming conventions and so on are not prescriptive) and this would be different depending on the equipment vendor and the network being deployed.

2.1 ROADM Degree

The ROADM degree construct is specified in the Device Model in terms of the circuit packs used in a degree, the physical links between the circuit packs, and internal links inside each circuit pack. Physical ports in the circuit packs that are mapped to logical ports in the ROADM Network Model are also identified in the Device Model. All of this data is read-only from the perspective of the SDN controller.

2.1.1 Circuit Packs

Table 2-1. Device Model – Degree *d* circuit packs, *d* is degree #, i.e., 1-5.

Card	***AID (bay-shelf-slot)***	***Ports***	
Dir*d*-RxAMP	*d*-1-2	IN	*Connected to HS LGX jack #x*
		OUT	*Connected to Dird-WSS-Rx*
Dir*d*-TxAMP	*d* -1-3	IN	*Connected to Dird-WSS-Tx*
		OUT	*Connected to HS LGX jack #y*
Dir*d*-WSS	*d* -1-4	Rx	*Connected to Dird-RxAMP-OUT*
		Tx	*Connected to Dird-TxAMP-IN*
		IN1-OUT1	
		IN2-OUT2	
		IN3-OUT3	
		IN4-OUT4	
		IN5-OUT5	
		IN6-OUT6	
		IN7-OUT7	
		IN8-OUT8	
		IN9-OUT9	

2.1.2 Physical Links

The express physical links listed in Table 2-2 are derived from Table 1-1. The express link naming convention defined by the vendor is as follows:

- "ExpLink*mn*" – fiber connection between two degrees, *m*: *FROM* degree, *n*: *TO* degree

The "ExpressLink*mn*" in Table 2-2 are logical connectivity links between ROADM degrees that are included in the Connectivity Map in the ROADM Network Model. The physical links in Table 2-2 are physical connections between circuit packs that are specified in the "connection map" in vendor's Device Model.

Table 2-2. Device Model – Degree *d* physical links, *d* is degree #, i.e., 1-5.

Physical Link Name	***Logical Link Name***	***Source Port***		***Destination Port***	
		Physical	***Logical***	***Physical***	***Logical***
DirTxLink		Dir*d*-WSS-Tx		Dir*d*-TxAMP-IN	
DirRxLink		Dir*d*-RxAMP-OUT		Dir*d*-WSS-Rx	
ExpLink12	ExpressLink12	Dir1-WSS-OUT1	Dir1-CTP-Tx	Dir2-WSS-IN1	Dir2-CTP-Rx
ExpLink21	ExpressLink21	Dir2-WSS-OUT1	Dir2-CTP-Tx	Dir1-WSS-IN1	Dir1-CTP-Rx
ExpLink13	ExpressLink13	Dir1-WSS-OUT2	Dir1-CTP-Tx	Dir3-WSS-IN1	Dir3-CTP-Rx
ExpLink31	ExpressLink31	Dir3-WSS-OUT1	Dir3-CTP-Tx	Dir1-WSS-IN2	Dir1-CTP-Rx
ExpLink14	ExpressLink14	Dir1-WSS-OUT3	Dir1-CTP-Tx	Dir4-WSS-IN1	Dir4-CTP-Rx
ExpLink41	ExpressLink41	Dir4-WSS-OUT1	Dir4-CTP-Tx	Dir1-WSS-IN3	Dir1-CTP-Rx
ExpLink15	ExpressLink15	Dir1-WSS-OUT4	Dir1-CTP-Tx	Dir5-WSS-IN1	Dir5-CTP-Rx
ExpLink51	ExpressLink51	Dir5-WSS-OUT1	Dir5-CTP-Tx	Dir1-WSS-IN4	Dir1-CTP-Rx
ExpLink23	ExpressLink23	Dir2-WSS-OUT2	Dir2-CTP-Tx	Dir3-WSS-IN2	Dir3-CTP-Rx
ExpLink32	ExpressLink32	Dir3-WSS-OUT2	Dir3-CTP-Tx	Dir2-WSS-IN2	Dir2-CTP-Rx
ExpLink24	ExpressLink24	Dir2-WSS-OUT3	Dir2-CTP-Tx	Dir4-WSS-IN2	Dir4-CTP-Rx
ExpLink42	ExpressLink42	Dir4-WSS-OUT2	Dir4-CTP-Tx	Dir2-WSS-IN3	Dir2-CTP-Rx
ExpLink25	ExpressLink25	Dir2-WSS-OUT4	Dir2-CTP-Tx	Dir5-WSS-IN2	Dir5-CTP-Rx
ExpLink52	ExpressLink52	Dir5-WSS-OUT2	Dir5-CTP-Tx	Dir2-WSS-IN4	Dir2-CTP-Rx
ExpLink34	ExpressLink34	Dir3-WSS-OUT3	Dir3-CTP-Tx	Dir4-WSS-IN3	Dir4-CTP-Rx
ExpLink43	ExpressLink43	Dir4-WSS-OUT3	Dir4-CTP-Tx	Dir3-WSS-IN3	Dir3-CTP-Rx
ExpLink35	ExpressLink35	Dir3-WSS-OUT4	Dir3-CTP-Tx	Dir5-WSS-IN3	Dir5-CTP-Rx
ExpLink53	ExpressLink53	Dir5-WSS-OUT3	Dir5-CTP-Tx	Dir3-WSS-IN4	Dir3-CTP-Rx
ExpLink45	ExpressLink45	Dir4-WSS-OUT4	Dir4-CTP-Tx	Dir5-WSS-IN4	Dir5-CTP-Rx
ExpLink54	ExpressLink54	Dir5-WSS-OUT4	Dir5-CTP-Tx	Dir4-WSS-IN4	Dir4-CTP-Rx
OSPLink-Tx		Dir*d*-TxAMP-OUT	Dir*d*-TTP-Tx		
OSPLink-Rx		Dir*d*-RxAMP-IN	Dir*d*-TTP-Rx		

2.1.3 Internal Links

Table 2-3. Device Model – Internal links in Degree *d* circuit packs, *d* is degree #, i.e., 1-5.

Source Port	***Destination Port***
Dir*d*-TxAMP-IN	Dir*d*-TxAMP-OUT
Dir*d*-RxAMP-IN	Dir*d*-RxAMP-OUT
Dir*d*-WSS-IN1	Dir*d*-WSS-Tx
Dir*d*-WSS-IN2	
Dir*d*-WSS-IN3	
Dir*d*-WSS-IN4	
Dir*d*-WSS-IN5	
Dir*d*-WSS-IN6	
Dir*d*-WSS-IN7	
Dir*d*-WSS-IN8	
Dir*d*-WSS-IN9	
Dir*d*-WSS-Rx	Dir*d*-WSS-OUT1
	Dir*d*-WSS-OUT2
	Dir*d*-WSS-OUT3
	Dir*d*-WSS-OUT4
	Dir*d*-WSS-OUT5
	Dir*d*-WSS-OUT6
	Dir*d*-WSS-OUT7
	Dir*d*-WSS-OUT8
	Dir*d*-WSS-OUT9

2.2 ROADM SRG

The ROADM SRG construct is specified in the Device Model in terms of the circuit packs used in an SRG, the physical links between the circuit packs, and internal links inside each circuit pack. Physical ports in the circuit packs that are mapped to logical ports in the ROADM Network Model are also identified in the Device Model. All of this data is read-only from the perspective of the SDN controller.

2.2.1 Circuit Packs

Table 2-4. Device Model –SRG #*n* circuits, *n* is *n*th SRG, i.e., 1-5.

Card	*AID (bay-shelf-slot)*	*Port*	*Logical Port*
SRG*n*-WSS	*n*-1-7	Rx	
		Tx	
		IN1-IN9, OUT1-OUT9	*SRGn-CP-Rx, SRGn-CP-Tx*
SRG*n*-AMP1	*n*-1-10	IN	
		OUT	
SRG*n*-AMP2	*n*-1-11	IN	
		OUT	
SRG*n*-C/S	*n*-1-12	Rx	
		Tx	
		IN1-IN96, OUT1-OUT96	*pp1, pp2, …, pp96*

2.2.2 Physical Links

The add/drop physical links listed in Table 2-5 are derived from Table 1-2. The add/drop link naming convention is as follows:

- "DLink*xy*" – fiber connection from ROADM degree to SRG for drop traffic, *x*: *FROM* degree, *y*: *TO* SRG
- "ALink*yx*" – fiber connection from SRG to ROADM degree for add traffic, *y*: *FROM* SRG, *x*: *TO* degree

The "DropLink*xy*" and "AddLink*yx*" in Table 2-5 are logical connectivity links between ROADM degrees and SRGs that are included in the Connectivity Map in the ROADM Network Model. The physical links in Table 2-5 are physical connections between circuit packs that are specified in the "connection map" in vendor's Device Model.

Table 2-5. Device Model – SRG #*n* physical links.

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
SRG-Txlink-1		SRG*n*-WSS-Tx		SRG*n*-AMP1-IN	
SRG-Rxlink-1		SRG*n*-AMP2-OUT		SRG*n*-WSS-Rx	
SRG-Txlink-2		SRG*n*-AMP1-OUT		SRG*n*-C/S-Rx	
SRG-Rxlink-2		SRG*n*-C/S-Tx		SRG*n*-AMP2-IN	
DLink11	DropLink11	Dir1-WSS-OUT9	Dir1-CTP-Tx	SRG1-WSS-IN1	SRG1-CP-Rx
ALink11	AddLink11	SRG1-WSS-OUT1	SRG1-CP-Tx	Dir1-WSS-IN9	Dir1-CTP-Rx
DLink12	DropLink12	Dir1-WSS-OUT8	Dir1-CTP-Tx	SRG2-WSS-IN1	SRG2-CP-Rx
ALink21	AddLink21	SRG2-WSS-OUT1	SRG2-CP-Tx	Dir1-WSS-IN8	Dir1-CTP-Rx
DLink13	DropLink13	Dir1-WSS-OUT7	Dir1-CTP-Tx	SRG3-WSS-IN1	SRG3-CP-Rx

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
ALink31	AddLink31	SRG3-WSS-OUT1	SRG3-CP-Tx	Dir1-WSS-IN7	Dir1-CTP-Rx
DLink14	DropLink14	Dir1-WSS-OUT6	Dir1-CTP-Tx	SRG4-WSS-IN1	SRG4-CP-Rx
ALink41	AddLink41	SRG4-WSS-OUT1	SRG4-CP-Tx	Dir1-WSS-IN6	Dir1-CTP-Rx
DLink15	DropLink15	Dir1-WSS-OUT5	Dir1-CTP-Tx	SRG5-WSS-IN1	SRG5-CP-Rx
ALink51	AddLink51	SRG5-WSS-OUT1	SRG5-CP-Tx	Dir1-WSS-IN5	Dir1-CTP-Rx
DLink21	DropLink21	Dir2-WSS-OUT9	Dir2-CTP-Tx	SRG1-WSS-IN2	SRG1-CP-Rx
ALink12	AddLink12	SRG1-WSS-OUT2	SRG1-CP-Tx	Dir2-WSS-IN9	Dir2-CTP-Rx
DLink22	DropLink22	Dir2-WSS-OUT8	Dir2-CTP-Tx	SRG2-WSS-IN2	SRG2-CP-Rx
ALink22	AddLink22	SRG2-WSS-OUT2	SRG2-CP-Tx	Dir2-WSS-IN8	Dir2-CTP-Rx
DLink23	DropLink23	Dir2-WSS-OUT7	Dir2-CTP-Tx	SRG3-WSS-IN2	SRG3-CP-Rx
ALink32	AddLink32	SRG3-WSS-OUT2	SRG3-CP-Tx	Dir2-WSS-IN7	Dir2-CTP-Rx
DLink24	DropLink24	Dir2-WSS-OUT6	Dir2-CTP-Tx	SRG4-WSS-IN2	SRG4-CP-Rx
ALink42	AddLink42	SRG4-WSS-OUT2	SRG4-CP-Tx	Dir2-WSS-IN6	Dir2-CTP-Rx
DLink25	DropLink25	Dir2-WSS-OUT5	Dir2-CTP-Tx	SRG5-WSS-IN2	SRG5-CP-Rx
ALink52	AddLink52	SRG5-WSS-OUT2	SRG5-CP-Tx	Dir2-WSS-IN5	Dir2-CTP-Rx
DLink31	DropLink31	Dir3-WSS-OUT9	Dir3-CTP-Tx	SRG1-WSS-IN3	SRG1-CP-Rx
ALink13	AddLink13	SRG1-WSS-OUT3	SRG1-CP-Tx	Dir3-WSS-IN9	Dir3-CTP-Rx
DLink32	DropLink32	Dir3-WSS-OUT8	Dir3-CTP-Tx	SRG2-WSS-IN3	SRG2-CP-Rx
ALink23	AddLink23	SRG2-WSS-OUT3	SRG2-CP-Tx	Dir3-WSS-IN8	Dir3-CTP-Rx
DLink33	DropLink33	Dir3-WSS-OUT7	Dir3-CTP-Tx	SRG3-WSS-IN3	SRG3-CP-Rx
ALink33	AddLink33	SRG3-WSS-OUT3	SRG3-CP-Tx	Dir3-WSS-IN7	Dir3-CTP-Rx
DLink34	DropLink34	Dir3-WSS-OUT6	Dir3-CTP-Tx	SRG4-WSS-IN3	SRG4-CP-Rx
ALink43	AddLink43	SRG4-WSS-OUT3	SRG4-CP-Tx	Dir3-WSS-IN6	Dir3-CTP-Rx
DLink35	DropLink35	Dir3-WSS-OUT5	Dir3-CTP-Tx	SRG5-WSS-IN3	SRG5-CP-Rx
ALink53	AddLink53	SRG5-WSS-OUT3	SRG5-CP-Tx	Dir3-WSS-IN5	Dir3-CTP-Rx
DLink41	DropLink41	Dir4-WSS-OUT9	Dir4-CTP-Tx	SRG1-WSS-IN4	SRG1-CP-Rx
ALink14	AddLink14	SRG1-WSS-OUT4	SRG1-CP-Tx	Dir4-WSS-IN9	Dir4-CTP-Rx
DLink42	DropLink42	Dir4-WSS-OUT8	Dir4-CTP-Tx	SRG2-WSS-IN4	SRG2-CP-Rx
ALink24	AddLink24	SRG2-WSS-OUT4	SRG2-CP-Tx	Dir4-WSS-IN8	Dir4-CTP-Rx
DLink43	DropLink43	Dir4-WSS-OUT7	Dir4-CTP-Tx	SRG3-WSS-IN4	SRG3-CP-Rx
ALink34	AddLink34	SRG3-WSS-OUT4	SRG3-CP-Tx	Dir4-WSS-IN7	Dir4-CTP-Rx
DLink44	DropLink44	Dir4-WSS-OUT6	Dir4-CTP-Tx	SRG4-WSS-IN4	SRG4-CP-Rx
ALink44	AddLink44	SRG4-WSS-OUT4	SRG4-CP-Tx	Dir4-WSS-IN6	Dir4-CTP-Rx

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
DLink45	DropLink45	Dir4-WSS-OUT5	Dir4-CTP-Tx	SRG5-WSS-IN4	SRG5-CP-Rx
ALink54	AddLink54	SRG5-WSS-OUT4	SRG5-CP-Tx	Dir4-WSS-IN5	Dir4-CTP-Rx
DLink51	DropLink51	Dir5-WSS-OUT9	Dir5-CTP-Tx	SRG1-WSS-IN5	SRG1-CP-Rx
ALink15	AddLink15	SRG1-WSS-OUT5	SRG1-CP-Tx	Dir5-WSS-IN9	Dir5-CTP-Rx
DLink52	DropLink52	Dir5-WSS-OUT8	Dir5-CTP-Tx	SRG2-WSS-IN5	SRG2-CP-Rx
ALink25	AddLink25	SRG2-WSS-OUT5	SRG2-CP-Tx	Dir5-WSS-IN8	Dir5-CTP-Rx
DLink53	DropLink53	Dir5-WSS-OUT7	Dir5-CTP-Tx	SRG3-WSS-IN5	SRG3-CP-Rx
ALink35	AddLink35	SRG3-WSS-OUT5	SRG3-CP-Tx	Dir5-WSS-IN7	Dir5-CTP-Rx
DLink54	DropLink54	Dir5-WSS-OUT6	Dir5-CTP-Tx	SRG4-WSS-IN5	SRG4-CP-Rx
ALink45	AddLink45	SRG4-WSS-OUT5	SRG4-CP-Tx	Dir5-WSS-IN6	Dir5-CTP-Rx
DLink55	DropLink55	Dir5-WSS-OUT5	Dir5-CTP-Tx	SRG5-WSS-IN5	SRG5-CP-Rx
ALink55	AddLink55	SRG5-WSS-OUT5	SRG5-CP-Tx	Dir5-WSS-IN5	Dir5-CTP-Rx

2.2.3 Internal Links

Table 2-6. Device Model – SRG #*n* internal links.

Source Port	*Destination Port*
SRG*n*-WSS-IN1	SRG*n*-WSS-Tx
SRG*n*-WSS-IN2	
SRG*n*-WSS-IN3	
SRG*n*-WSS-IN4	
SRG*n*-WSS-IN5	
SRG*n*-WSS-IN6	
SRG*n*-WSS-IN7	
SRG*n*-WSS-IN8	
SRG*n*-WSS-IN9	
SRG*n*-WSS-Rx	SRG*n*-WSS-OUT1
	SRG*n*-WSS-OUT2
	SRG*n*-WSS-OUT3
	SRG*n*-WSS-OUT4
	SRG*n*-WSS-OUT5
	SRG*n*-WSS-OUT6
	SRG*n*-WSS-OUT7
	SRG*n*-WSS-OUT8

Source Port	*Destination Port*
	SRG*n*-WSS-OUT9
SRG*n*-AMP2-IN	SRG*n*-AMP2-OUT
SRG*n*-AMP1-IN	SRG*n*-AMP1-OUT
SRG*n*-C/S-(IN1-IN96)	SRG*n*-C/S-Tx
SRG*n*-C/S-Rx	SRG*n*-C/S-(OUT1-OUT96)

3 Sample Inventory Data

The Open ROADM SDN Controller manages the multi-vendor ROADM network using network inventory data that is derived from the vendor neutral Network Model and vendor specific Device Models. Certain controller functions can be accomplished using inventory data built upon the Network Model alone, e.g., PCE, without detailed device information, whereas other controller functions need detailed equipment information that is derived from the vendor specific Device Models, e.g., fault isolation.

The inventory data in this section includes the network level data based on the ROADM Network Model and device level data that is based on the Device Model described in Section 2. Again note that this data is an illustrative example only. Description of the sample data is focused on the equipment that supports a service in the three mock-up ROADM nodes shown in Figure 3-1. The wavelength-level service shown in Figure 3-1 that traverses the three nodes is, in the A-to-Z direction, added to Dir-4 of the ROADM in CHCGILCLW60, express through between Dir-2 and Dir-3 of the ROADM in CLEVOH02S10, and then dropped through Dir-1 of the ROADM in PITBPSRGW10.

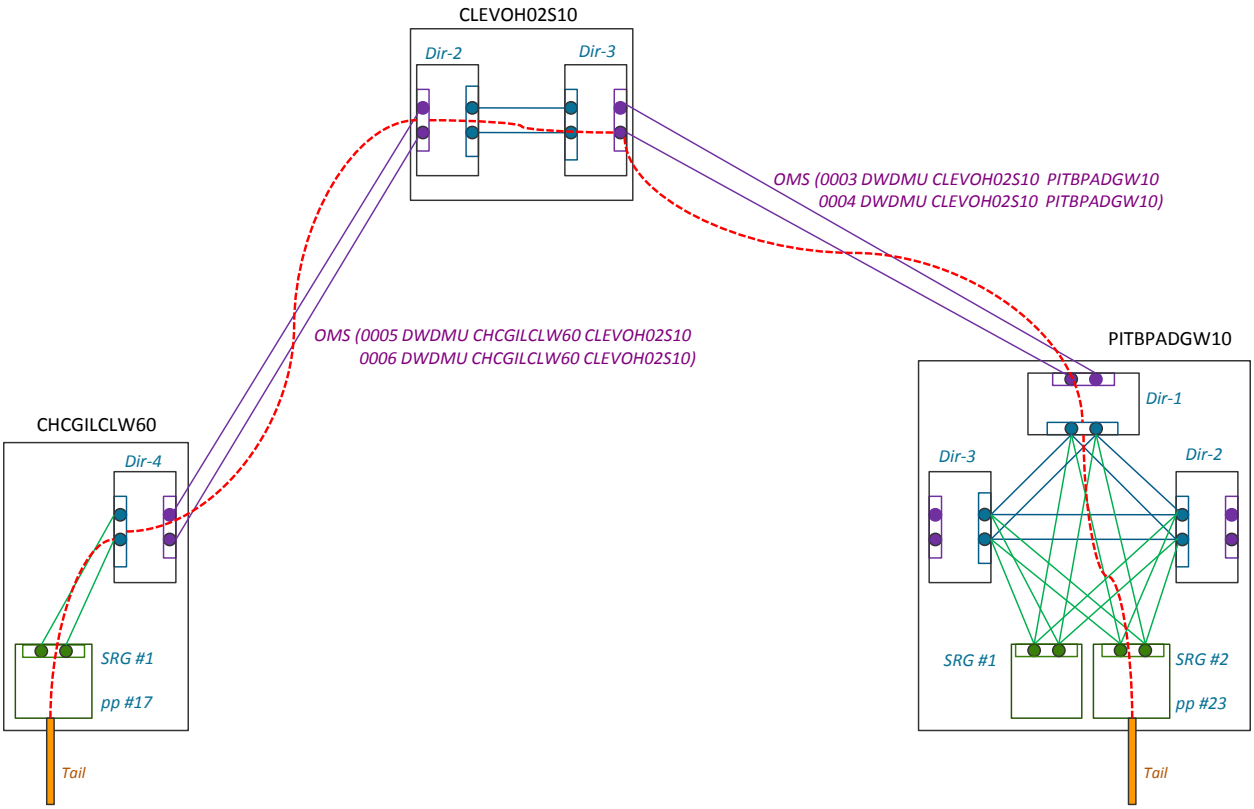

Figure 3-1. A service between Offices CHCGILCLW60 and PITBPSRGW10 through Office CLEVOH02S10.

3.1 ROADM in CHCGILCLW60

The following data is associated to the ROADM in Office CHCGILCLW60, assuming there are four degrees in the node and two add/drop groups (SRGs).

Table 3-1. Network Model – data attributes for ROADM in Office CHCGILCLW60.

Office	CHCGILCLW60
Node ID	2
Vendor	XYZ
Model number	1234
Domain-subnetwork	Core
IP address	
Relay rack	130036.01
Shelf	--
# of degrees	4
# of SRGs	2

3.1.1 Degree #4

When Degree #4 ROADM in Office CHCGILCLW60 is instantiated in the ROADM Controller, the following data is generated in the inventory database.

3.1.1.1 Network Model

The Dir-4 information described in this section is derived from the Network Model.

Table 3-2. Network Model – data attributes for Dir-4 in the CHCGILCLW60 ROADM.

Degree #		4
External	*Far-end office*	CLEVOH02S10
	Node ID	1
	Degree #	2
	OMS CLFI	0005 DWDMU CHCGILCLW60 CLEVOH02S10 0006 DWDMU CHCGILCLW60 CLEVOH02S10
	N	96
	Distance	85
	Span loss	20.4
	TTP-Tx	Dir4-TTP-TX Dir4-TTP-RX
	TTP-Rx	
Internal	*CTP-Tx*	Dir4-CTP-TX Dir4-CTP-RX
	CTP-Rx	

Table 3-3. Network Model – Connectivity Map for ExpressLinks in the CHCGILCLW60 ROADM.

ExpressLink14	Dir1-CTP-Tx	Dir4-CTP-Rx
ExpressLink41	Dir4-CTP-Tx	Dir1-CTP-Rx
ExpressLink24	Dir2-CTP-Tx	Dir4-CTP-Rx
ExpressLink42	Dir4-CTP-Tx	Dir2-CTP-Rx
ExpressLink34	Dir3-CTP-Tx	Dir4-CTP-Rx
ExpressLink43	Dir4-CTP-Tx	Dir3-CTP-Rx

3.1.1.2 Device Model

The information described in this section is associated to the three circuit packs in Dir-4. The information is derived from the Device Model.

Table 3-4. Device Model – Dir-4 cards in the CHCGILCLW60 ROADM.

Card	*AID*	*Ports*	
Dir4-RxAMP	4-1-2	IN	*Connected to HS LGX jack #x*
		OUT	*Connected to Dir4-WSS-Rx*
Dir4-TxAMP	4-1-3	IN	*Connected to Dir4-WSS-Tx*
		OUT	*Connected to HS LGX jack #y*
Dir4-WSS	4-1-4	Rx	*Connected to Dir4-RxAMP-OUT*
		Tx	*Connected to Dir4-TxAMP-IN*
		IN1-OUT1	*Dir-1 WSS IN4-OUT4*
		IN2-OUT2	*Dir-2 WSS IN4-OUT4*
		IN3-OUT3	*Dir-3 WSS IN4-OUT4*
		IN4-OUT4	*unused*
		IN5-OUT5	*unused*
		IN6-OUT6	*unused*
		IN7-OUT7	*unused*
		IN8-OUT8	*SRG-2 WSS IN4-OUT4*
		IN9-OUT9	*SRG-1 WSS IN4-OUT4*

Table 3-5. Device Model – Dir-4 physical links in the CHCGILCLW60 ROADM.

Physical Link Name	*Source Port*		*Destination Port*	
	Physical	*Logical*	*Physical*	*Logical*
DirTxLink	Dir4-WSS-Tx		Dir4-TxAMP-IN	
DirRxLink	Dir4-RxAMP-OUT		Dir4-WSS-Rx	
ExpLink14	Dir1-WSS-OUT3	Dir1-CTP-Tx	Dir4-WSS-IN1	Dir4-CTP-Rx
ExpLink41	Dir4-WSS-OUT1	Dir4-CTP-Tx	Dir1-WSS-IN3	Dir1-CTP-Rx
ExpLink24	Dir2-WSS-OUT3	Dir2-CTP-Tx	Dir4-WSS-IN2	Dir4-CTP-Rx
ExpLink42	Dir4-WSS-OUT2	Dir4-CTP-Tx	Dir2-WSS-IN3	Dir2-CTP-Rx
ExpLink34	Dir3-WSS-OUT3	Dir3-CTP-Tx	Dir4-WSS-IN3	Dir4-CTP-Rx
ExpLink43	Dir4-WSS-OUT3	Dir4-CTP-Tx	Dir3-WSS-IN3	Dir3-CTP-Rx
DLink41	Dir4-WSS-OUT9	Dir4-CTP-Tx	SRG1-WSS-IN4	SRG1-CP-Rx
ALink14	SRG1-WSS-OUT4	SRG1-CP-Tx	Dir4-WSS-IN9	Dir4-CTP-Rx
DLink42	Dir4-WSS-OUT8	Dir4-CTP-Tx	SRG2-WSS-IN4	SRG2-CP-Rx
ALink24	SRG2-WSS-OUT4	SRG2-CP-Tx	Dir4-WSS-IN8	Dir4-CTP-Rx
OSPLink-Tx	Dir4-TxAMP-OUT	Dir4-OMS-Tx		
OSPLink-Rx	Dir4-RxAMP-IN	Dir4-OMS-Rx		

* "ExpLink*mn*" – fiber connection between two degrees, *m*: *FROM* degree, *n*: *TO* degree

"DLink*xy*" – fiber connection from ROADM degree to SRG for drop traffic, *x*: *FROM* degree, *y*: *TO* SRG

"ALink*yx*" – fiber connection from SRG to ROADM degree for add traffic, *y*: *FROM* SRG, *x*: *TO* degree

Table 3-6. Device Model – internal links in Dir-4 circuit packs.

Source Port	***Destination Port***
Dir4-TxAMP-IN	Dir4-TxAMP-OUT
Dir4-RxAMP-IN	Dir4-RxAMP-OUT
Dir4-WSS-Tx	Dir4-WSS-IN1
	Dir4-WSS-IN2
	Dir4-WSS-IN3
	Dir4-WSS-IN4
	Dir4-WSS-IN5
	Dir4-WSS-IN6
	Dir4-WSS-IN7
	Dir4-WSS-IN8
	Dir4-WSS-IN9
Dir4-WSS-Rx	Dir4-WSS-OUT1
	Dir4-WSS-OUT2
	Dir4-WSS-OUT3
	Dir4-WSS-OUT4
	Dir4-WSS-OUT5
	Dir4-WSS-OUT6
	Dir4-WSS-OUT7
	Dir4-WSS-OUT8
	Dir4-WSS-OUT9

3.1.2 SRG #1

The inventory data in this section is associated to SRG #1 in the CHCGILCLW60 ROADM.

3.1.2.1 Network Model

The SRG #1 (1st add/drop group) information described in this section is derived from the Network Model.

Table 3-7. Network Model – data attributes for SRG #1 in the CHCGILCLW60 ROADM.

SRG #	1
N_{pp}	96

CP-Tx	SRG1-CP-Tx
CP-Rx	SRG1-CP-Rx

Table 3-8. Network Model – DropLinks and AddLinks associated to SRG #1 in the Connectivity Map for the CHCGILCLW60 ROADM.

DropLink11	Dir1-CTP-Tx	SRG1-CP-Rx
AddLink11	SRG1-CP-Tx	Dir1-CTP-Rx
DropLink21	Dir2-CTP-Tx	SRG1-CP-Rx
AddLink12	SRG1-CP-Tx	Dir2-CTP-Rx
DropLink31	Dir3-CTP-Tx	SRG1-CP-Rx
AddLink13	SRG1-CP-Tx	Dir3-CTP-Rx
DropLink41	Dir4-CTP-Tx	SRG1-CP-Rx
AddLink14	SRG1-CP-Tx	Dir4-CTP-Rx

3.1.2.2 Device Model

The information described in this section is associated to the circuit packs in SRG #1. The information is derived from the Device Model.

Table 3-9. Device Model –SRG #1 cards in the CHCGILCLW60 ROADM.

Card	***AID***	***Port***	***Logical Port***	
SRG1-WSS	1-1-7	Rx		*Connected to SRG1-AMP2-OUT*
		Tx		*Connected to SRG1-AMP1-IN*
		IN1 + OUT1	*SRG1-CP-Rx, SRG1-CP-Tx*	*Connected to Dir1-WSS*
		IN2 + OUT2		*Connected to Dir2-WSS*
		IN3 + OUT3		*Connected to Dir3-WSS*
		IN4 + OUT4		*Connected to Dir4-WSS*
		IN5-IN9 OUT5-OUT9		*TBD*
SRG1-AMP1	1-1-10	IN		*Connected to SRG1-WSS-Tx*
		OUT		*Connected to SRG1-Splitter-Rx*
SRG1-AMP2	1-1-11	IN		*Connected to SRG1-Splitter-Tx*
		OUT		*Connected to SRG1-WSS-Rx*
SRG1-C/S	1-1-12	Rx		*Connected to SRG1-AMP1-OUT*
		Tx		*Connected to SRG1-AMP2-IN*
		IN1-IN96 OUT1-OUT96	*pp1 – pp96*	*1-96 IN/OUT pairs are 1-to-1 mapped to the pp attribute of SRG1-CP*

Table 3-10. Device Model – SRG #1 physical links in the CHCGILCLW60 ROADM.

Physical Link Name	***Logical Link Name***	***Source Port***		***Destination Port***	
		Physical	***Logical***	***Physical***	***Logical***
DLink11	DropLink11	Dir1-WSS-OUT9	Dir1-CTP-Tx	SRG1-WSS-IN1	SRG1-CP-Rx
ALink11	AddLink11	SRG1-WSS-OUT1	SRG1-CP-Tx	Dir1-WSS-IN9	Dir1-CTP-Rx
DLink21	DropLink21	Dir2-WSS-OUT9	Dir2-CTP-Tx	SRG1-WSS-IN2	SRG1-CP-Rx
ALink12	AddLink12	SRG1-WSS-OUT2	SRG1-CP-Tx	Dir2-WSS-IN9	Dir2-CTP-Rx
DLink31	DropLink31	Dir3-WSS-OUT9	Dir3-CTP-Tx	SRG1-WSS-IN3	SRG1-CP-Rx
ALink13	AddLink13	SRG1-WSS-OUT3	SRG1-CP-Tx	Dir3-WSS-IN9	Dir3-CTP-Rx
DLink41	DropLink41	Dir4-WSS-OUT9	Dir4-CTP-Tx	SRG1-WSS-IN4	SRG1-CP-Rx
ALink14	AddLink14	SRG1-WSS-OUT4	SRG1-CP-Tx	Dir4-WSS-IN9	Dir4-CTP-Rx
SRG-Txlink-1		SRG1-WSS-Tx		SRG1-AMP1-IN	
SRG-Rxlink-1		SRG1-WSS-Rx		SRG1-AMP2-OUT	
SRG-Txlink-2		SRG1-AMP1-OUT		SRG1-C/S-Rx	
SRG-Rxlink-2		SRG1-AMP2-IN		SRG1-C/S-Tx	

***** "DLink*xy*" – fiber connection from ROADM degree to SRG for drop traffic, *x*: *FROM* degree, *y*: *TO* SRG
"ALink*yx*" – fiber connection from SRG to ROADM degree for add traffic, *y*: *FROM* SRG, *x*: *TO* degree

Table 3-11. Device Model – SRG #1 internal links in the CHCGILCLW60 ROADM.

Source Port	***Destination Port***
SRG1-WSS-Tx	SRG1-WSS-IN1
	SRG1-WSS-IN2
	SRG1-WSS-IN3
	SRG1-WSS-IN4
	SRG1-WSS-IN5
	SRG1-WSS-IN6
	SRG1-WSS-IN7
	SRG1-WSS-IN8
	SRG1-WSS-IN9
SRG1-WSS-Rx	SRG1-WSS-OUT1
	SRG1-WSS-OUT2
	SRG1-WSS-OUT3
	SRG1-WSS-OUT4
	SRG1-WSS-OUT5

Source Port	*Destination Port*
	SRG1-WSS-OUT6
	SRG1-WSS-OUT7
	SRG1-WSS-OUT8
	SRG1-WSS-OUT9
SRG1-AMP2-IN	SRG1-AMP2-OUT
SRG1-AMP1-IN	SRG1-AMP1-OUT
SRG1-C/S-Tx	SRG1-Splitter-(IN1-IN96)
SRG1-C/S-Rx	SRG1-Splitter-(OUT1-OOUT96)

3.2 ROADM in CLEVOH02S10

The following data is associated to the ROADM in Office CLEVOH02S10, assuming there are three degrees in the node and no add/drop groups (SRGs).

Table 3-12. Network Model – data attributes for the CLEVOH02S10 ROADM.

Office	CLEVOH02S10
Node ID	1
Vendor	XYZ
Model number	1234
Domain-subnetwork	Core
IP address	
Relay rack	070114.08
Shelf	--
# of direction/degrees	3
# of add/drop group	0

3.2.1 Degree #2

The data in the inventory database associated to degree #2 of the CLEVOH02S10 ROADM is described in this section.

3.2.1.1 Network Model

The Dir-2 information described in this section is derived from the Network Model.

Table 3-13. Network Model – data attributes for Dir-2 in the CLEVOH02S1 ROADM.

Degree #		2
External	*Far-end office*	CHCGILCLW60
	Node ID	2
	Degree #	4
	OMS CLFI	0005 DWDMU CHCGILCLW60 CLEVOH02S10 0006 DWDMU CHCGILCLW60 CLEVOH02S10
	N	96
	Distance	85
	Span loss	20.4
	TTP-Tx	Dir2-TTP-TX Dir2-TTP-RX
	TTP-Rx	
Internal	*CTP-Tx*	Dir2-CTP-TX Dir2-CTP-RX
	CTP-Rx	

Table 3-14. Network Model – Connectivity Map for ExpressLinks in the CLEVOH02S1 ROADM.

ExpressLink12	Dir1-CTP-Tx	Dir2-CTP-Rx
ExpressLink21	Dir2-CTP-Tx	Dir1-CTP-Rx
ExpressLink23	Dir2-CTP-Tx	Dir3-CTP-Rx
ExpressLink32	Dir3-CTP-Tx	Dir2-CTP-Rx
ExpressLink13	Dir1-CTP-Tx	Dir3-CTP-Rx
ExpressLink31	Dir3-CTP-Tx	Dir1-CTP-Rx

3.2.1.2 Device Model

The information described in this section is associated to the three circuit packs in Dir-2. The information is derived from the Device Model.

Table 3-15. Device Model – Dir-2 cards in the CLEVOH02S1 ROADM.

Card	***AID***	***Ports***	
Dir2-RxAMP	2-1-2	IN	*Connected to HS LGX jack #x*
		OUT	*Connected to Dir2-WSS-Rx*
Dir2-TxAMP	2-1-3	IN	*Connected to Dir2-WSS-Tx*
		OUT	*Connected to HS LGX jack #y*
Dir2-WSS	2-1-4	Rx	*Connected to Dir2-RxAMP-OUT*
		Tx	*Connected to Dir2-TxAMP-IN*

Card	*AID*	*Ports*	
		IN1-OUT1	*Dir-1 WSS IN1-OUT1*
		IN2-OUT2	*Dir-3 WSS IN2-OUT2*
		IN3-OUT3	*unused*
		IN4-OUT4	*unused*
		IN5-OUT5	*unused*
		IN6-OUT6	*unused*
		IN7-OUT7	*unused*
		IN8-OUT8	*unused*
		IN9-OUT9	*unused*

Table 3-16. Device Model – Dir-2 physical links in the CLEVOH02S1 ROADM.

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
DirTxLink		Dir2-WSS-Tx		Dir2-TxAMP-IN	
DirRxLink		Dir2-RxAMP-OUT		Dir2-WSS-Rx	
ExpLink12	ExpressLink12	Dir1-WSS-OUT1	Dir1-CTP-Tx	Dir2-WSS-IN1	Dir2-CTP-Rx
ExpLink21	ExpressLink21	Dir2-WSS-OUT1	Dir2-CTP-Tx	Dir1-WSS-IN1	Dir1-CTP-Rx
ExpLink23	ExpressLink23	Dir2-WSS-OUT2	Dir2-CTP-Tx	Dir3-WSS-IN2	Dir3-CTP-Rx
ExpLink32	ExpressLink32	Dir3-WSS-OUT2	Dir3-CTP-Tx	Dir2-WSS-IN2	Dir2-CTP-Rx
OSPLink-Tx		Dir2-TxAMP-OUT	Dir2-OMS-Tx		
OSPLink-Rx		Dir2-RxAMP-IN	Dir2-OMS-Rx		

* "ExpLink*mn*" – fiber connection between two degrees, *m*: *FROM* degree, *n*: *TO* degree

Table 3-17. Device Model – Dir-2 internal links in the CLEVOH02S1 ROADM.

Source Port	*Destination Port*
Dir2-TxAMP-IN	Dir2-TxAMP-OUT
Dir2-RxAMP-IN	Dir2-RxAMP-OUT
Dir2-WSS-Tx	Dir2-WSS-IN1
	Dir2-WSS-IN2
	Dir2-WSS-IN3
	Dir2-WSS-IN4
	Dir2-WSS-IN5
	Dir2-WSS-IN6

Source Port	*Destination Port*
	Dir2-WSS-IN7
	Dir2-WSS-IN8
	Dir2-WSS-IN9
Dir2-WSS-Rx	Dir2-WSS-OUT1
	Dir2-WSS-OUT2
	Dir2-WSS-OUT3
	Dir2-WSS-OUT4
	Dir2-WSS-OUT5
	Dir2-WSS-OUT6
	Dir2-WSS-OUT7
	Dir2-WSS-OUT8
	Dir2-WSS-OUT9

3.2.2 Degree #3

The data in the inventory database associated to degree #3 of the CLEVOH02S10 ROADM is described in this section.

3.2.2.1 Network Model

The Dir-3 information described in this section is derived from the Network Model.

Table 3-18. Network Model – data attributes for Dir-3 in the CLEVOH02S1 ROADM.

Degree #		3
External	*Far-end office*	PITBPSRGW10
	Node ID	1
	Degree #	1
	OMS CLFI	0003 DWDMU CLEVOH02S10 PITBPSRGW10 0004 DWDMU CLEVOH02S10 PITBPSRGW10
	N	96
	Distance	72
	Span loss	17.6
	TTP-Tx *TTP-Rx*	Dir3-TTP-TX Dir3-TTP-RX
Internal	*CTP-Tx* *CTP-Rx*	Dir3-CTP-TX Dir3-CTP-RX

3.2.2.2 Device Model

The information described in this section is associated to the three circuit packs in Dir-3. The information is derived from the Device Model.

Table 3-19. Device Model – Dir-3 cards in the CLEVOH02S1 ROADM.

Card	*AID*	*Ports*	
Dir3-RxAMP	3-1-2	IN	*Connected to HS LGX jack #x*
		OUT	*Connected to Dir3-WSS-Rx*
Dir3-TxAMP	3-1-3	IN	*Connected to Dir3-WSS-Tx*
		OUT	*Connected to HS LGX jack #y*
Dir3-WSS	3-1-4	Rx	*Connected to Dir3-RxAMP-OUT*
		Tx	*Connected to Dir3-TxAMP-IN*
		IN1-OUT1	*Dir-1 WSS IN1-OUT1*
		IN2-OUT2	*Dir-2 WSS IN2-OUT2*
		IN3-OUT3	*unused*
		IN4-OUT4	*unused*
		IN5-OUT5	*unused*
		IN6-OUT6	*unused*
		IN7-OUT7	*unused*
		IN8-OUT8	*unused*
		IN9-OUT9	*unused*

Table 3-20. Device Model – Dir-3 physical links in the CLEVOH02S1 ROADM.

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
DirTxLink		Dir3-WSS-Tx		Dir3-TxAMP-IN	
DirRxLink		Dir3-RxAMP-OUT		Dir3-WSS-Rx	
ExpLink13	ExpressLink13	Dir1-WSS-OUT2	Dir1-CTP-Tx	Dir3-WSS-IN1	Dir3-CTP-Rx
ExpLink31	ExpressLink31	Dir3-WSS-OUT1	Dir3-CTP-Tx	Dir1-WSS-IN2	Dir1-CTP-Rx
ExpLink23	ExpressLink23	Dir2-WSS-OUT2	Dir2-CTP-Tx	Dir3-WSS-IN2	Dir3-CTP-Rx
ExpLink32	ExpressLink32	Dir3-WSS-OUT2	Dir3-CTP-Tx	Dir2-WSS-IN2	Dir2-CTP-Rx
OSPLink-Tx		Dir3-TxAMP-OUT	Dir3-OMS-Tx		
OSPLink-Rx		Dir3-RxAMP-IN	Dir3-OMS-Rx		

* "ExpLink*mn*" – fiber connection between two degrees, *m*: *FROM* degree, *n*: *TO* degree

Table 3-21. Device Model – Dir-3 internal links in the CLEVOH02S1 ROADM.

Source Port	*Destination Port*
Dir3-TxAMP-IN	Dir3-TxAMP-OUT
Dir3-RxAMP-IN	Dir3-RxAMP-OUT
Dir3-WSS-Tx	Dir3-WSS-IN1
	Dir3-WSS-IN2
	Dir3-WSS-IN3
	Dir3-WSS-IN4
	Dir3-WSS-IN5
	Dir3-WSS-IN6
	Dir3-WSS-IN7
	Dir3-WSS-IN8
	Dir3-WSS-IN9
Dir3-WSS-Rx	Dir3-WSS-OUT1
	Dir3-WSS-OUT2
	Dir3-WSS-OUT3
	Dir3-WSS-OUT4
	Dir3-WSS-OUT5
	Dir3-WSS-OUT6
	Dir3-WSS-OUT7
	Dir3-WSS-OUT8
	Dir3-WSS-OUT9

3.3 ROADM in PITBPSRGW10

The following data is associated to the ROADM in Office PITBPSRGW10, assuming there are three degrees in the node and two add/drop groups (SRGs).

Table 3-22. Network Model – data attributes for ROADM in Office PITBPSRGW10.

Office	PITBPSRGW10
Node ID	1
Vendor	XYZ
Model number	1234
Domain-subnetwork	Core
IP address	
Relay rack	110213.17

Shelf	--
# of degrees	3
# of SRGs	2

3.3.1 Degree #1

The data in the inventory database associated to degree #1 of the PITBPSRGW10 ROADM is described in this section.

3.3.1.1 Network Model

The Dir-1 information described in this section is derived from the Network Model.

Table 3-23. Network Model – data attributes for Dir-1 in the PITBPSRGW10 ROADM.

Degree #		1
External	*Far-end office*	CLEVOH02S1
	Node ID	1
	Degree #	3
	OMS CLFI	0003 DWDMU CLEVOH02S10 PITBPSRGW10 0004 DWDMU CLEVOH02S10 PITBPSRGW10
	N	96
	Distance	72
	Span loss	17.6
	TTP-Tx	Dir1-TTP-TX
	TTP-Rx	Dir1-TTP-RX
Internal	*CTP-Tx*	Dir1-CTP-TX
	CTP-Rx	Dir1-CTP-RX

Table 3-24. Network Model – Connectivity Map for ExpressLinks in the PITBPSRGW10 ROADM.

ExpressLink12	Dir1-CTP-Tx	Dir2-CTP-Rx
ExpressLink21	Dir2-CTP-Tx	Dir1-CTP-Rx
ExpressLink23	Dir2-CTP-Tx	Dir3-CTP-Rx
ExpressLink32	Dir3-CTP-Tx	Dir2-CTP-Rx
ExpressLink13	Dir1-CTP-Tx	Dir3-CTP-Rx
ExpressLink31	Dir3-CTP-Tx	Dir1-CTP-Rx

3.3.1.2 Device Model

The information described in this section is associated to the three circuit packs in Dir-1. The information is derived from the Device Model.

Table 3-25. Device Model – Dir-1 cards in the PITBPSRGW10 ROADM.

Card	*AID*	*Ports*	
Dir1-RxAMP	1-1-2	IN	*Connected to HS LGX jack #x*
		OUT	*Connected to Dir1-WSS-Rx*
Dir1-TxAMP	1-1-3	IN	*Connected to Dir1-WSS-Tx*
		OUT	*Connected to HS LGX jack #y*
Dir1-WSS	1-1-4	Rx	*Connected to Dir1-RxAMP-OUT*
		Tx	*Connected to Dir1-TxAMP-IN*
		IN1-OUT1	*Dir-2 WSS IN1-OUT1*
		IN2-OUT2	*Dir-3 WSS IN1-OUT1*
		IN3-OUT3	*unused*
		IN4-OUT4	*unused*
		IN5-OUT5	*unused*
		IN6-OUT6	*unused*
		IN7-OUT7	*unused*
		IN8-OUT8	*SRG-2 WSS IN1-OUT1*
		IN9-OUT9	*SRG-1 WSS IN1-OUT1*

Table 3-26. Device Model – Dir-1 physical links in the PITBPSRGW10 ROADM.

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
DirTxLink		Dir1-WSS-Tx		Dir1-TxAMP-IN	
DirRxLink		Dir1-WSS-Rx		Dir1-RxAMP-OUT	
ExpLink12	ExpressLink12	Dir1-WSS-OUT1	Dir1-CTP-Tx	Dir2-WSS-IN1	Dir2-CTP-Rx
ExpLink21	ExpressLink21	Dir2-WSS-OUT1	Dir2-CTP-Tx	Dir1-WSS-IN1	Dir1-CTP-Rx
ExpLink13	ExpressLink13	Dir1-WSS-OUT2	Dir1-CTP-Tx	Dir3-WSS-IN2	Dir1-CTP-Rx
ExpLink31	ExpressLink31	Dir3-WSS-OUT2	Dir1-CTP-Tx	Dir1-WSS-IN2	Dir2-CTP-Rx
OSPLink-Tx		Dir1-TxAMP-OUT	Dir1-OMS-Tx		
OSPLink-Rx		Dir1-RxAMP-IN	Dir1-OMS-Rx		

* "ExpLink*mn*" – fiber connection between two degrees, *m*: *FROM* degree, *n*: *TO* degree

"DLink*xy*" – fiber connection from ROADM degree to SRG for drop traffic, *x*: *FROM* degree, *y*: *TO* SRG

"ALink*yx*" – fiber connection from SRG to ROADM degree for add traffic, *y*: *FROM* SRG, *x*: *TO* degree

Table 3-27. Device Model – Dir-1 internal links in the PITBPSRGW10 ROADM.

Source Port	***Destination Port***
Dir1-TxAMP-IN	Dir1-TxAMP-OUT
Dir1-RxAMP-IN	Dir1-RxAMP-OUT
Dir1-WSS-Tx	Dir1-WSS-IN1
	Dir1-WSS-IN2
	Dir1-WSS-IN3
	Dir1-WSS-IN4
	Dir1-WSS-IN5
	Dir1-WSS-IN6
	Dir1-WSS-IN7
	Dir1-WSS-IN8
	Dir1-WSS-IN9
Dir1-WSS-Rx	Dir1-WSS-OUT1
	Dir1-WSS-OUT2
	Dir1-WSS-OUT3
	Dir1-WSS-OUT4
	Dir1-WSS-OUT5
	Dir1-WSS-OUT6
	Dir1-WSS-OUT7
	Dir1-WSS-OUT8
	Dir1-WSS-OUT9

3.3.2 SRG #2

The inventory data in this section is associated to SRG #2 in the PITBPSRGW10 ROADM.

3.3.2.1 Network Model

The SRG #2 (2nd add/drop group) information described in this section is derived from the Network Model.

Table 3-28. Network Model – data attributes for SRG #2 in the PITBPSRGW10 ROADM.

SRG #	2
N_{pp}	96
CP-Tx	SRG2-CP-Tx
CP-Rx	SRG2-CP-Rx

Table 3-29. Network Model – DropLinks and AddLinks associated to SRG #2 in the Connectivity Map for in the PITBPSRGW10 ROADM.

DropLink12	Dir1-CTP-Tx	SRG2-CP-Rx
AddLink21	SRG2-CP-Tx	Dir1-CTP-Rx
DropLink22	Dir2-CTP-Tx	SRG2-CP-Rx
AddLink22	SRG2-CP-Tx	Dir2-CTP-Rx
DropLink32	Dir3-CTP-Tx	SRG2-CP-Rx
AddLink23	SRG2-CP-Tx	Dir3-CTP-Rx

3.3.2.2 Device Model

The information described in this section is associated to the circuit packs in SRG #2. The information is derived from the Device Model.

Table 3-30. Device Model – cards in SRG #2 in the PITBPSRGW10 ROADM.

Card	***AID***	***Port***	***Logical Port***	
SRG2-WSS	2-1-7	Rx		*Connected to SRG2-AMP2-OUT*
		Tx		*Connected to SRG2-AMP1-IN*
		IN1 + OUT1	*SRG2-CP-Rx, SRG2-CP-Tx*	*Connected to Dir1-WSS*
		IN2 + OUT2		*Connected to Dir2-WSS*
		IN3 + OUT3		*Connected to Dir3-WSS*
		IN4-IN9 OUT4-OUT9		*TBD*
SRG2-AMP1	2-1-10	IN		*Connected to SRG2-WSS-Tx*
		OUT		*Connected to SRG2-Splitter-Rx*
SRG2-AMP2	2-1-11	IN		*Connected to SRG2-Splitter-Tx*
		OUT		*Connected to SRG2-WSS-Rx*
SRG2-C/S	2-1-12	Rx		*Connected to SRG2-AMP1-OUT*
		Tx		*Connected to SRG2-AMP2-IN*
		IN1-IN96 OUT1-OUT96	*pp1 – pp96*	*1-20 IN/OUT pairs are 1-to-1 mapped to the pp attribute of SRG2-CP*

Table 3-31. Device Model – SRG #2 physical links in the PITBPSRGW10 ROADM.

Physical Link Name	*Logical Link Name*	*Source Port*		*Destination Port*	
		Physical	*Logical*	*Physical*	*Logical*
DLink12	DropLink12	Dir1-WSS-OUT8	Dir1-CTP-Tx	SRG2-WSS-IN1	SRG2-CP-Rx
ALink21	AddLink21	SRG2-WSS-OUT1	SRG2-CP-Tx	Dir1-WSS-IN8	Dir1-CTP-Rx
DLink22	DropLink22	Dir2-WSS-OUT8	Dir2-CTP-Tx	SRG2-WSS-IN2	SRG2-CP-Rx
ALink22	AddLink22	SRG2-WSS-OUT2	SRG2-CP-Tx	Dir2-WSS-IN8	Dir2-CTP-Rx
DLink32	DropLink32	Dir3-WSS-OUT8	Dir3-CTP-Tx	SRG2-WSS-IN3	SRG2-CP-Rx
ALink23	AddLink23	SRG2-WSS-OUT3	SRG2-CP-Tx	Dir3-WSS-IN8	Dir3-CTP-Rx
SRG-Txlink-1		SRG2-WSS-Tx		SRG2-AMP1-IN	
SRG-Rxlink-1		SRG2-WSS-Rx		SRG2-AMP2-OUT	
SRG-Txlink-2		SRG2-AMP1-OUT		SRG2-C/S-Rx	
SRG-Rxlink-2		SRG2-AMP2-IN		SRG2-C/S-Tx	

* "DLink*xy*" – fiber connection from ROADM degree to SRG for drop traffic, *x*: *FROM* degree, *y*: *TO* SRG
"ALink*yx*" – fiber connection from SRG to ROADM degree for add traffic, *y*: *FROM* SRG, *x*: *TO* degree

Table 3-32. Device Model – SRG #2 internal links in the PITBPSRGW10 ROADM.

Source Port	*Destination Port*
SRG2-WSS-Tx	SRG2-WSS-IN1
	SRG2-WSS-IN2
	SRG2-WSS-IN3
	SRG2-WSS-IN4
	SRG2-WSS-IN5
	SRG2-WSS-IN6
	SRG2-WSS-IN7
	SRG2-WSS-IN8
	SRG2-WSS-IN9
SRG2-WSS-Rx	SRG2-WSS-OUT1
	SRG2-WSS-OUT2
	SRG2-WSS-OUT3
	SRG2-WSS-OUT4
	SRG2-WSS-OUT5
	SRG2-WSS-OUT6
	SRG2-WSS-OUT7
	SRG2-WSS-OUT8

Source Port	*Destination Port*
	SRG2-WSS-OUT9
SRG2-AMP2-IN	SRG2-AMP2-OUT
SRG2-AMP1-IN	SRG2-AMP1-OUT
SRG2-C/S-Tx	SRG2-C/S-(IN1-IN96)
SRG2-C/S-Rx	SRG2-C/S-(OUT1-OUT96)

4 Service Representation

Assuming, in response to a service creation request the PCE in the OpenROADM SDN Controller computed the service path and made degree and SRG assignments for the service, as illustrated in Figure 4-1.

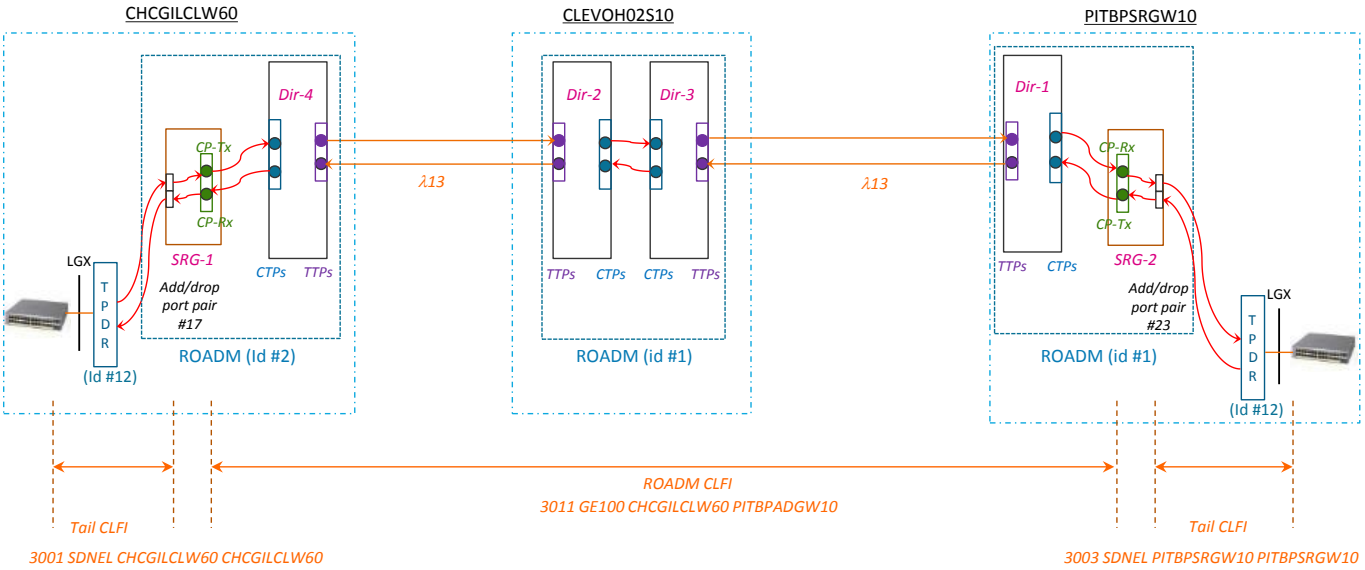

Figure 4-1. Example of a service.

In the A-to-Z direction,

- The service is added to Dir-4 of the ROADM in CHCGILCLW60 via the 17th port pair in the 1st SRG
- The service is transmitted between CHCGILCLW60 and CLEVOH02S10 using wavelength #13
- The service is express through between Dir-2 and Dir-3 of the ROADM in CLEVOH02S10
- The service is transmitted between CLEVOH02S10 and PITBPSRGW10 using wavelength #13
- The service is dropped through Dir-1 of the ROADM in PITBPSRGW10 via the 23rd port pair in the 2nd SRG

4.1 Service Representation at Network Model Level

The data related to the transponder in CHCGILCLW60 is shown in Table 4-1.

Table 4-1. Transponder in CHCGILCLW60 (information at network level).

Attribute	***Description***	
Office	CHCGILCLW60	
ID	12	
Vendor	Vendor XYZ	
Customer Code	IP	
Domain-Subnetwork	Core	
IP address		
Relay Rack	130036.04	
Shelf	1	
Output connection	*CLLI*	CHCGILCLW60
	ROADM node ID	2
	Accumulated bitrate	100G
	Port ID	1
	Vendor	Vendor XYZ
	SRG #	1
	Port Pair #	17
	Local LGX	
	Bit Rate	100G
	Signal Format	OTU4v
	Reach	SR
	Gray/color	Color
	State	In-Service
Input connection	*Accumulated bitrate*	100G
	Port ID	1
	Customer Code	IP
	Vendor	Vendor XYZ
	Local LGX	
	Bit Rate	100G
	Signal Format	Ethernet
	Reach	SR
	Gray/color	Gray
	State	In-Service
	Tail client equipment	CRS
	Tail client equipment ID	7
	Tail CLFI	3001 S100EL CHCGILCLW60 CHCGILCLW60

The information on the tail facility in CHCGILCLW60 is listed in Table 4-2.

Table 4-2. Tail facility in CHCGILCLW60 (information at network level).

Attribute		***Description***
CLFI	3001 SDNEL CHCGILCLW60 CHCGILCLW60	
Time stamps	*Start date*	
	End date	
Layout	*Client equipment*	CRS
	Transponder ID	12
	List of intermediate LGXs	
	ROADM node ID	2
	SRG #	1
	Port pair #	17

The PCE assigns a "ROADM CLFI", 3011 GE100 CHCGILCLW60 PITBPADGW10, to the requested service. In the A-to-Z direction, Table 4-3 shows the service representation using the data generated from the ROADM Network Model.

Table 4-3. ROADM CLFI: A-to-Z service layout at network level.

CHCGILCLW60 Node #2	SRG1-CP-Tx–17
	AddLink14
	Dir4-CTP-Rx–13
	Dir4-TTP-Tx–13
0005 DWDMU CHCGILCLW60 CLEVOH02S10	
CLEVOH02S10 Node #1	Dir2-TTP-Rx–13
	Dir2-CTP-Tx–13
	ExpressLink23
	Dir3-CTP-Rx–13
	Dir3-TTP-Tx–13
0003 DWDMU CLEVOH02S10 PITBPADGW10	
PITBPSRGW10 Node #1	Dir1-TTP-Rx–13
	Dir1-CTP-Tx–13
	DropLink12
	SRG2-CP-Rx–23

In the Z-to-A direction, Table 4-4 shows the service representation using the data generated from the ROADM Network Model.

Table 4-4. ROADM CLFI: Z-to-A service layout at network level.

CHCGILCLW60 Node #2	SRG1-CP-Rx–17
	DropLink41
	Dir4-CTP-Tx–13
	Dir4-TTP-Rx–13
0006 DWDMU CHCGILCLW60 CLEVOH02S10	
CLEVOH02S10 Node #1	Dir2-TTP-Tx–13
	Dir2-CTP-Rx–13
	ExpressLink32
	Dir3-CTP-Tx–13
	Dir3-TTP-Rx–13
0004 DWDMU CLEVOH02S10 PITBPADGW10	
PITBPSRGW10 Node #1	Dir1-TTP-Tx–13
	Dir1-CTP-Rx–13
	AddLink21
	SRG2-CP-Tx–23

Table 4-5. Transponder in PITBPSRGW10 (information at network level).

Attribute	***Description***	
Office	PITBPSRGW10	
ID	7	
Vendor	Vendor XYZ	
Customer Code	IP	
Domain-Subnetwork	Core	
IP address		
Relay Rack	110213.12	
Shelf	3	
Output connection	*CLLI*	PITBPSRGW10
	ROADM node ID	1
	Accumulated bitrate	100G
	Port ID	1
	Vendor	Vendor XYZ
	SRG #	2
	Port Pair #	23
	Local LGX	
	Bit Rate	100G
	Signal Format	OTU4v
	Reach	SR
	Gray/color	Color
	State	In-Service
Input connection	*Accumulated bitrate*	100G
	Port ID	1
	Customer Code	IP
	Vendor	Vendor XYZ
	Local LGX	
	Bit Rate	100G
	Signal Format	Ethernet
	Reach	SR
	Gray/color	Gray
	State	In-Service
	Tail client equipment	CRS
	Tail client equipment ID	5
	Tail CLFI	3003 SDNEL PITBPSRGW10 PITBPSRGW10

The information on the tail facility in PITBPSRGW10 is listed in Table 4-6.

Table 4-6. Tail facility in PITBPSRGW10 (information at network level).

Attribute		***Description***
CLFI	3003 SDNEL PITBPSRGW10 PITBPSRGW10	
Time stamps	*Start date*	
	End date	
Layout	*Client equipment*	CRS
	Transponder ID	7
	List of intermediate LGXs	
	ROADM node ID	1
	SRG #	2
	Port pair #	23

4.2 Service Representation at Device Model Level

The OpenROADM SDN controller provisions the service in the Device model using the "connections" object. This specifies the W and MW ports at the edge of the transponders and ROADMs that the service traverses and the wavelengths and the power targets for each of those ports. The OpenROADM SDN controller will write these values over NETCONF in to the connection object of every transponder and ROADM along the path of the service.

Table 4-7 shows the layout of the tail facilities (both directions) in CHCGILCLW60.

Table 4-7. Tail facility in CHCGILCLW60 (information at device level)

3001 SDNEL CHCGILCLW60 CHCGILCLW60			
CHCGILCLW60			
CRS	130103.09	040T	*From SDN-C*
LGX	130036.01	7-IN51	*From ROADM Controller*
LGX	130036.01	7-OUT62	
Transponder	130036.04	1-RX	*Bay-shelf from Network Model*
Transponder	130036.04	1-T	*Port names from Device Model*
C/S	130036.01	1-1-12-IN17	*From Table 3-9 (C/S and port 17 are derived from pp#17)*

3001 SDNEL CHCGILCLW60 CHCGILCLW60			
CHCGILCLW60			
CRS	130103.09	040R	*From SDN-C*
LGX	130036.01	7-OUT51	*From ROADM Controller*
LGX	130036.01	7-IN62	

Transponder	130036.04	1-TX	*Bay-shelf from Network Model* *Port names from Device Model*
Transponder	130036.04	1-R	
C/S	130036.01	1-1-12-OUT17	*From Table 3-9 (C/S and port 17 are derived from pp#17)*

Once the OpenROADM SDN Controller feeds this information in to the device, the device will set up the internal physical connections that are required. The Device model contains a "get-connection-port-trail" method that allows the OpenROADM SDN controller to retrieve the port trail for a specific service. This allows the SDN controller to be able to provide topology and perform troubleshooting.

Table 4-8. Service at the Network level is represented using Logical links and logical points (A-to-Z).

CHCGILCLW60 Node #2	SRG1-CP-Tx-17	
	Addlink14	*Corresponding vendor specific ALink can be derived from Table 3-10*
	Dir4-CTP-Rx-13	
	Dir4-TTP-Tx-13	
0005 DWDMU CHCGILCLW60 CLEVOH02S10		
CLEVOH02S10 Node #1	Dir2-TTP-Rx-13	
	Dir2-CTP-Tx-13	
	ExpressLink23	*Corresponding vendor specific ExpLink can be derived from Table 3-16*
	Dir3-CTP-Rx-13	
	Dir3-TTP-Tx-13	
0003 DWDMU CLEVOH02S10 PITBPADGW10		
PITBPSRGW10 Node #1	Dir1-TTP-Rx-13	
	Dir1-CTP-Tx-13	
	Droplink12	*Corresponding vendor specific DLink can be derived from Table 3-26*
	SRG2-CP-Rx-23	

Table 4-9 shows the equipment information in the A-to-Z ROADM CLFI.

Table 4-9. ROADM CLFI: A-to-Z service layout at the device level.

1	3011 GE100 CHCGILCLW60 PITBPADGW10CLW60	
2	CHCGILCLW60	
3	C/S 130036.01 1-1-12-IN17	*From Table 3-9, the port pair #17 in logical port SRG1-CP-Tx–17 is converted to C/S and port 17*

4	C/S	130036.01	1-1-12-Tx	*From Table 3-11 on signal flow inside Splitter*
5	AMP2	130036.01	1-1-11-IN	*From Table 3-9 on AID and from Table 3-10 on physical link*
6	AMP2	130036.01	1-1-11-OUT	*From Table 3-11 on signal flow inside AMP2*
7	WSS (SRG)	130036.01	1-1-7-Rx	*From Table 3-9 on AID and from Table 3-10 on physical link*
8	WSS (SRG)	130036.01	1-1-7-OUT4	*From Table 3-11 , 9 WSS OUT ports receive signals from the Rx. The source and destination of "Alink14" in Table 3-10 is used to determine OUT4 is where the outgoing signal flows.*
9	WSS (Dir4)	130036.01	4-1-4-IN9	*The source and destination of "Alink14" in Table 3-10 is used to determine IN9 is where the incoming signal flows. AID is from Table 3-4.*
10	WSS (Dir4)	130036.01	4-1-4-Tx	*From Table 3-6 on signal flow inside WSS*
11	TxAMP	130036.01	4-1-3-IN	*From Table 3-4 on AID and from Table 3-5 on physical link*
12	TxAMP	130036.01	4-1-3-OUT	*From Table 3-6 on signal flow inside TxAMP*

13	0005 DWDMU CHCGILCLW60 CLEVOH02S10 13	*Wavelength #13*
14	CLEVOH02S10	
15	RxAMP 070114.08 2-1-2-IN	*From Table 3-15 for AID*
16	RxAMP 070114.08 2-1-2-OUT	*From Table 3-17 on signal flow inside RxAMP*
17	WSS (Dir2) 070114.08 2-1-4-Rx	*From Table 3-15 for AID and Table 3-16 for physical link*
18	WSS (Dir2) 070114.08 2-1-4-OUT2	*From Table 3-17 , 9 WSS OUT ports receive signals from the Rx. The source and destination of "Explink23" in Table 3-16 is used to determine OUT2 is where the outgoing signal flows.*
19	WSS (Dir3) 070114.08 3-1-4-IN2	*The source and destination of "Explink23" in Table 3-16 is used to determine IN2 is where the incoming signal flows. From Table 3-19 for AID.*
20	WSS (Dir3) 070114.08 3-1-4-Tx	*From Table 3-21 on signal flow inside WSS*
21	TxAMP 070114.08 3-1-3-IN	*From Table 3-19 on AID and from Table 3-16 on physical link*
22	TxAMP 070114.08 3-1-3-OUT	*From Table 3-21 on signal flow inside TxAMP*
23	0003 DWDMU CLEVOH02S10 PITBPADGW10 13	
24	PITBPADGW10	
25	RxAMP 110213.17 1-1-2-IN	*From Table 3-25 for AID*
26	RxAMP 110213.17 1-1-2-OUT	*From Table 3-27 on signal flow inside RxAMP*
27	WSS (Dir1) 110213.17 1-1-4-Rx	*From Table 3-25 for AID and Table 3-26 for physical link*
28	WSS (Dir1) 110213.17 1-1-4-OUT8	*From Table 3-27, 9 WSS OUT ports receive signals from the Rx. The source and destination of "Dlink12" in Table 3-26 is used to determine OUT8 is where the outgoing signal flows.*
29	WSS (SRG) 110213.17 2-1-7-IN1	*The source and destination of "Dlink12" in Table 3-26 is used to determine IN1 is where the incoming signal flows. AID from Table 3-30.*
30	WSS (SRG) 110213.17 2-1-7-Tx	*From Table 3-32 on signal flow inside WSS*
31	AMP1 110213.17 2-1-10-IN	*From Table 3-30 for AID and Table 3-31 for physical link*
32	AMP1 110213.17 2-1-10-OUT	*From Table 3-32 on signal flow inside WSS*
33	C/S 110213.17 2-1-12-Rx	*From Table 3-30 for AID and Table 3-31 for physical link*
34	C/S 110213.17 2-1-12-OUT23	*From Table 3-32, OUT23 ports receive signals from Rx. OUT23 is selected because from Table 3-30 port #23 in logical port SRG2-CP-Rx–23 is converted to C/S port pair #23. .*

The facility layout for the service in the opposite Z-to-A direction can be built the same way. Table 4-10 shows the network representation of the service with some physical links included.

Table 4-10. Service at the Network level is represented using Logical links and logical points (Z-to-A).

CHCGILCLW60 Node #2	SRG1-CP-Rx-17	
	Droplink14	*Corresponding vendor's DLink can be derived from Table 3-10*
	Dir4-CTP-Tx-13	
	Dir4-TTP-Rx-13	
0006 DWDMU CHCGILCLW60 CLEVOH02S10		
CLEVOH02S10 Node #1	Dir2-TTP-Tx-13	
	Dir2-CTP-Rx-13	
	ExpressLink32	*Corresponding vendor's ExpLink can be derived from Table 3-16*
	Dir3-CTP-Tx-13	
	Dir3-TTP-Rx-13	
0004 DWDMU CLEVOH02S10 PITBPADGW10		
PITBPSRGW10 Node #1	Dir1-TTP-Tx-13	
	Dir1-CTP-Rx-13	
	Addlink12	*Corresponding vendor's ALink can be derived from Table 3-26*
	SRG2-CP-Tx-23	

If required, the equipment information in the Z-to-A ROADM CLF (similar to Table 4-9, but in the opposite direction) can then be traced from one end of the service to the other.

Table 4-11 shows the layout of the tail facilities (both directions) in PITBPSRGW10.

Table 4-11. Tail facility in PITBPSRGW10 (information at device level)

3003 SDNEL PITBPSRGW10 PITBPSRGW10	
PITBPSRGW10	
CRS 112215.19 020T	*From SDN-C*
LGX 110031.04 10-IN21	*From ROADM Controller*
LGX 110031.04 10-OUT42	
Transponder 110213.12 1-RX	*Rack-shelf from Network Model*
Transponder 110213.12 1-T	*Port names from Device Model*
C/S 110213.17 2-1-12-IN23	*From Table 3-30 (C/S port 23 is converted from pp#23)*

3003 SDNEL PITBPSRGW10 PITBPSRGW10			
PITBPSRGW10			
CRS	112215.19	020R	*From SDN-C*
LGX	110031.04	10-OUT21	*From ROADM Controller*
LGX	110031.04	10-IN42	
Transponder	110213.12	1-TX	*Rack-shelf from Network Model* *Port names from Device Model*
Transponder	110213.12	1-R	
C/S	110213.17	2-1-12-OUT23	*From Table 3-30 (C/S port 23 is converted from pp#23)*

5 Inventory Data used to Identify Services Impacted by Failures

Some failures inside the mock-up ROADM node are depicted in Figure 5-1.

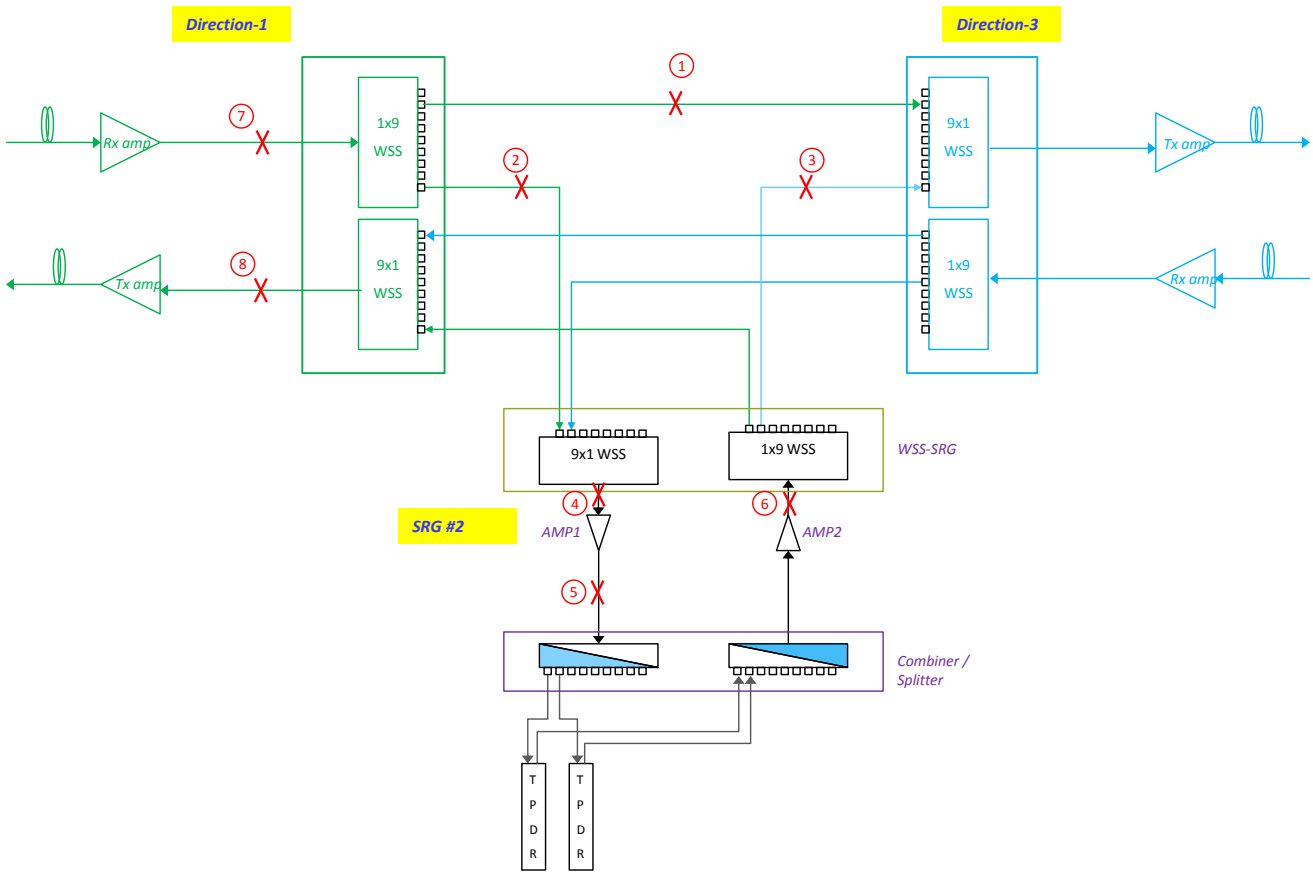

Figure 5-1. Some failure scenarios inside ROADM.

Inventory data in the ROADM Controller can be used to identify the services that are impacted by failures in Figure 5-1:

1) Incoming LOS at port Dir3-WSS-IN1
    - From Table 3-26 *ExpLink13* is determined to be the physical link
    - Query services at network level (e.g., Table 4-8) that contain *ExpLink13* to identify the impacted services

2) Incoming LOS at port SRG2-WSS-IN1
    - From Table 3-31 *DLink12* is determined to be the physical link
    - Query services at network level that contain *DLink12* to identify the impacted services

3) Incoming LOS at port Dir3-WSS-IN8
    - From Table 3-31 *ALink23* is determined to be the physical link
    - Query services at network level that contain *ALink23* to identify the impacted services

4) Incoming LOS at port SRG2-AMP1-IN
    - From Table 3-31 the input signal is determined to be from SRG2-WSS which receives input from *DLink12*, *DLink22*, and *DLink32*.
    - Query services at network level that contain *DLink12*, *DLink22*, and *DLink32* to identify the impacted services

5) Incoming LOS at port SRG2-C/S-Rx
    - Query services at device level that contain the SRG2-C/S circuit pack to identify the impacted services

6) Incoming LOS at port SRG2-WSS-Rx
    - From Table 3-31 the *ALink21*, *ALink22*, and *ALink23* are receiving signals from the Rx port
    - Query services at network level that contain *ALink21*, *ALink22*, and *ALink23* to identify the impacted services

7) Incoming LOS at Dir1-WSS-Rx
    - Query services at network level that contain *Dir1-CTP-Rx* to identify the impacted services

8) Incoming LOS at Dir1-TxAMP-IN
    - Query services at network level that contain *Dir1-CTP-Tx* to identify the impacted services

9) Incoming LOS at SRG1-C/S-IN17 (see Figure 5-2)

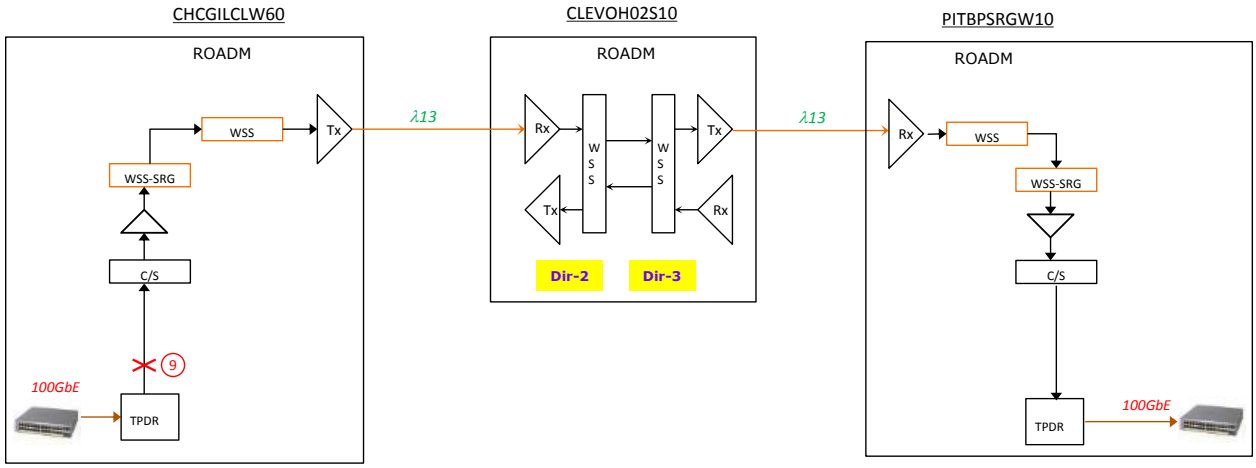

Figure 5-2. Failure in a wavelength service.

Trouble is isolated to be between the transponder and C/S in CHCGILCLW60 ROADM based on the following alarms:

CHCGILCLW60

- C/S port #17: OCh LOS-P
- Transponder (line side port): ODU4 BDI

CLEVOH02S10

- No alarms

PITBPSRGW10

- Transponder (client side port): Ethernet 100G RDI from router