

Shelf controller

User Manual

Mikrotik CCR2004-16G-2S+, ver 0.4

Release-12.1.3



The specifications and information within this manual are subject to change without further notice. All statements, information and recommendations are believed to be accurate but are presented without warranty of any kind. Users must take full responsibility for their application of any products.

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1 Introduction

1.1 General

This document describes the configuration settings that are necessary for installation of the shelf controller for DCP-R platform.

1.2 In commercial confidence

The manual is provided in commercial confidence and shall be treated as such.

1.3 Document Revision History

Revision	Date	Description of changes
8.1.1 A	2023-07-05	First revision of R8.1.1 manual Updated chapter about initial configuration Updated chapter about replacement Updated chapter about upgrade
8.1.1 B	2023-08-21	Updated chapters replacement and upgrade
8.1.3 A	2023-10-06	No update
8.1.4 A	2023-10-12	No update
8.1.5 A	2023-11-02	No Update
8.1.6 A	2023-11-30	Updated picture with ETH connection in ILA site.
8.1.7 A	2024-01-16	Added chapter about how to clear container SW. Added chapter about how to restart the container SW Added chapter about how to reset shelf controller config
9.0.1 A	2024-01-16	Added chapter about how to run recovery script Added chapter about how to configure port extender mode
9.0.1 B	2024-02-09	Added extra step to wait after container removal for SW upgrade
9.0.1 C	2024-05-15	Added chapter about script execution when the script is installed in advance.
10.0.1 A	2024-07-03	Added SW upgrade comment about waiting for DCP-R reboot to finish before upgrading the shelf controller.

10.0.2 A	2024-09-05	No update
11.0.1 A	2024-12-12	Changed name of the manual Updated SW upgrade chapter
11.1.1 A	2025-01-31	No update
11.3.1 A	2025-04-24	No update
12.0.1 A	2025-06-23	Added chapter for shelf controller migration in ROADM Added chapter for shelf controller migration in ILA Updated instructions for migration
12.0.1 B	2025-07-02	Updated text about SW upgrade
12.0.2 A	2025-08-25	Updated text about migration
12.1.1 A	2025-09-08	No update
12.1.3 A	2025-10-20	Added info about tunnel creation after migration Added replacement procedures for DCP-R and DCP-R ILA

2 Hardware

The hardware in a ROADM node consists of DCP-R unit(s) and the shelf controller. The shelf controller is managing the DCP-R units and should be connected with a connection to the customers' private secure network. If SoSmart software suite is used the shelf controller must have IP connection to the SoSmart server. If management through CLI (managedCLI mode) is used the client (PC) can reach the node either through RS232/Eth0 or SSH. DCP-R CLI through SSH uses other ports than default (22). Please see section 5.4 for details.



Figure 1. Shelf controller.



Figure 2. DCP-R unit.

The DCP-R:s in a node together with the shelf controller form a cluster and share data automatically in between each other. The DCP-R:s in a node are called degrees. The number of degrees will be determined by the number of fiber pairs through which the node should be able to communicate. Each DCP-R will get a designated degree number in the installation process. Below is an example of a 3-degree node consisting of 3 DCP-R:s and 1 shelf controller.

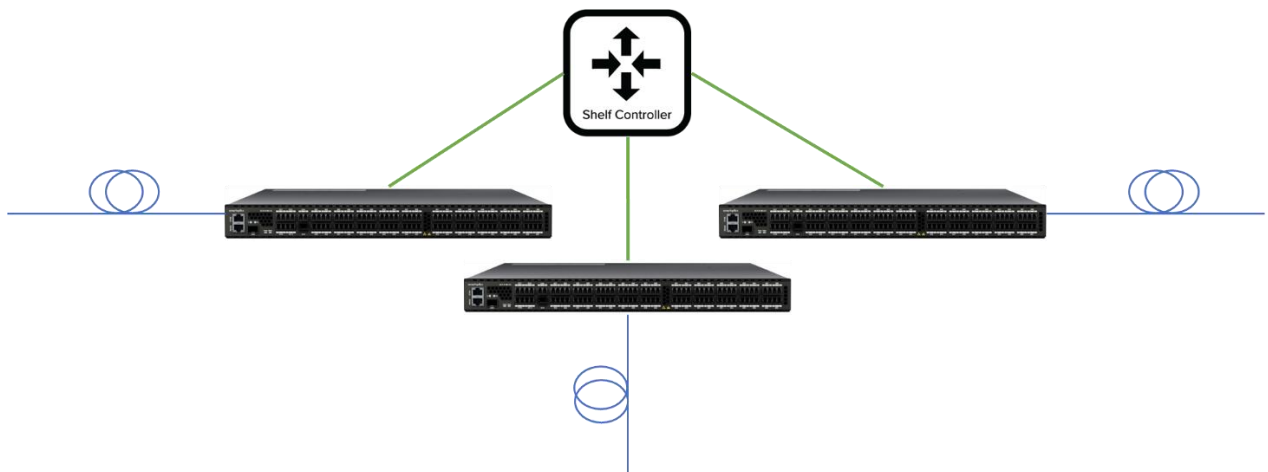


Figure 3. 3-degree node example.

2.1 Connections

2.1.1 DCP-R connections

Optical ports and RS232/Eth0 are located on the front of the unit. Ethernet connections are connected through the back of the unit. It is possible to create a tunnel through the OSC interface on the front (SFP based) to an Ethernet port on the back.

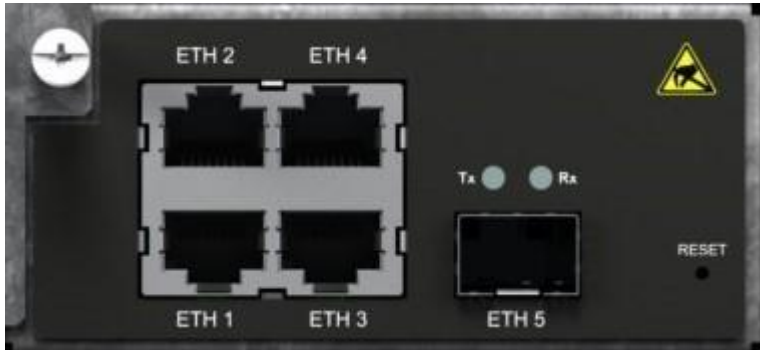


Figure 4. Ethernet connections through the back of the DCP-R.

The OSC tunnel is default configured to enabled and linked to Ethernet port 2 on the DCP-R. The tunnel port configuration to a specific Ethernet port can be changed through the DCP-R CLI. The CLI is accessed to the degree 1 in a node and from there the setting can be changed on each degree in the node. The possible choices for tunnel configuration are Ethernet ports 1, 2 and 5.

2.1.2 Shelf controller connections

The shelf controller has all the connections on the front.

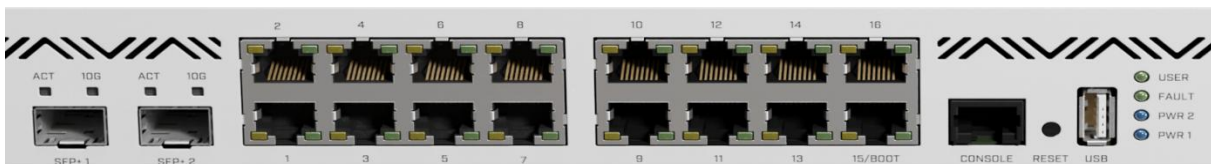


Figure 5. Close-up of the ports of the shelf controller.

The ports on the shelf controller have 16 RJ-45 Ethernet ports, 2 SFP+ Ethernet ports, 1 console and 1 USB port.

A small USB memory stick is attached to the unit and should not be removed. If it is removed later upgrade procedures will not work.

2.1.2.1 Port configuration

The ports on the shelf controller have a default configuration that is configured in production before shipment.

- Local tunnel ports are configured to ports { 1;2;3;4;5;6;7;8 }. Shelf controller tunnel ports should be connected to each of the tunnel ports configured in DCP-R (Ethernet port 2 default). It is recommended that these ports are connected in order so that degree 1 is connected to port 1 etc.
- Local lan ports are configured to ports { 9;10;11;12;13 }. Shelf controller lan ports should be connected to management port(s) on the DCP-R(s). Management ports are all Ethernet ports on DCP-R that are not possible to configure to be tunnel ports (tunnel Ethernet are ports 1, 2 and 5). Hence either port 3 or 4 can be used. It is recommended that these ports are connected in order so that degree 1 is connected to port 9, degree 2 to port 10 etc.

- Local extra ports are configured to ports { 14;15;16 }. Port 15 is to be connected to DCN (if applicable). Ports 14 and 16 can be used for other equipment such as DCP-2 chassis or other equipment configured with their own IP address.

Example configuration for degree 1.

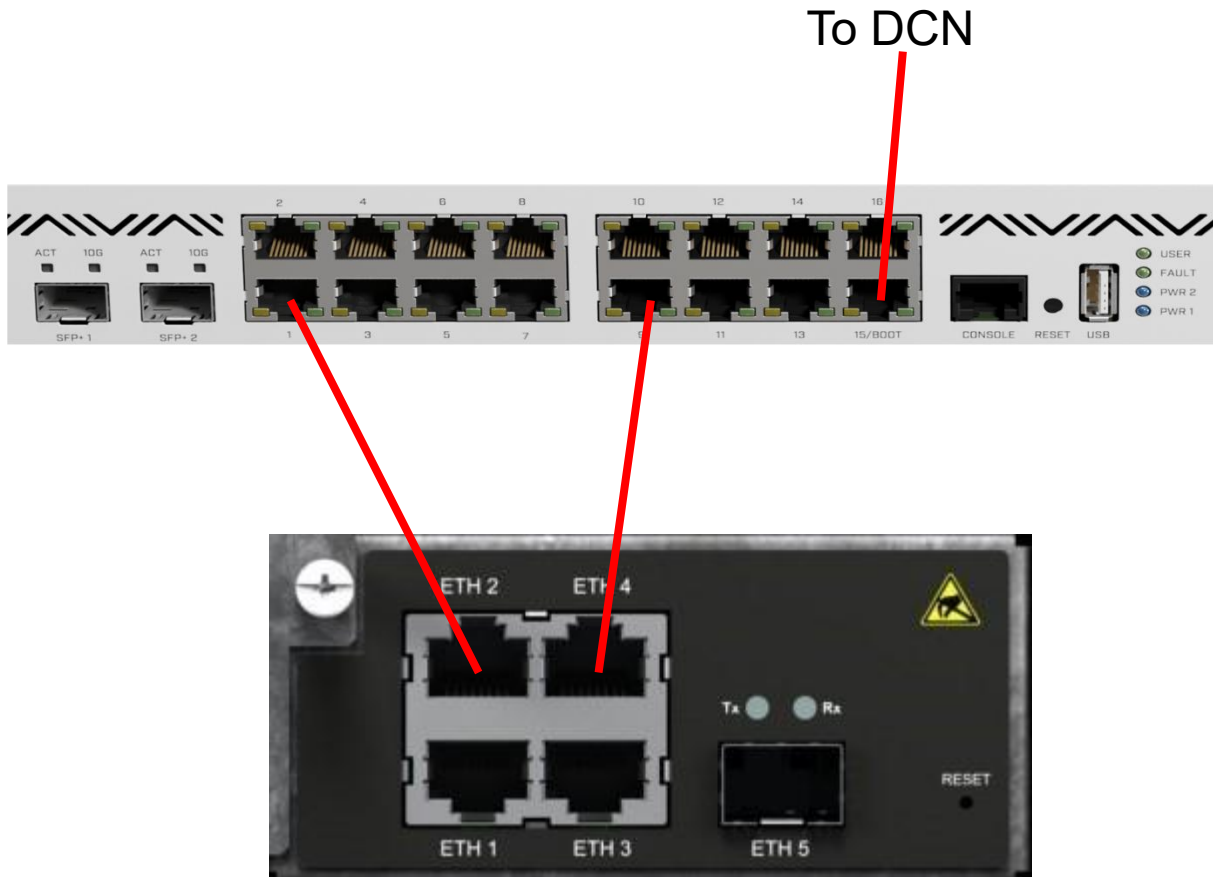


Figure 6. Example of port connections for ROADM degree 1.

3 Network architecture

The main function of the shelf controller is to facilitate bi-directional connectivity between DCP-R:s in each node, between nodes and external networks. It enables centralized management of all nodes.

The shelf controller supports all network topologies which are typically used in this type of environment - single ring and multiple joined rings, partial or full mesh, point to point etc. As the network created by shelf controllers is based on layer-3 links and uses dynamic routing protocol (OSPF) for loop avoidance and redundancy, there is no need to adjust the configuration or deployed protocols for each of the various supported topologies. Node specific OSPF settings are configured through the installation script. Currently one primary and one secondary OSPF gateway are possible to configure.

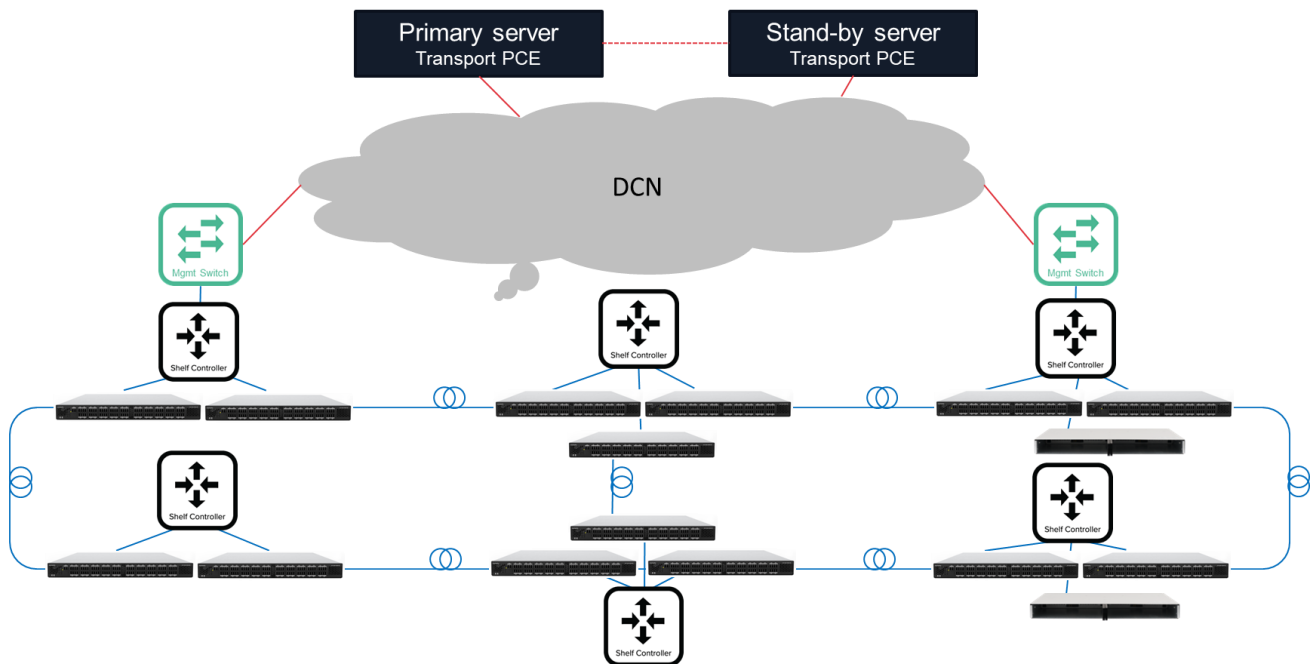


Figure 7. Example network with DCP-R:s and shelf controllers using OSPF configuration.

There is also the choice for the user not to use OSPF internally in the network. If the customer already have DCN connections to all sites and their own redundancy the shelf controller can be configured in "DCN only" configuration. See below an example of such a network.

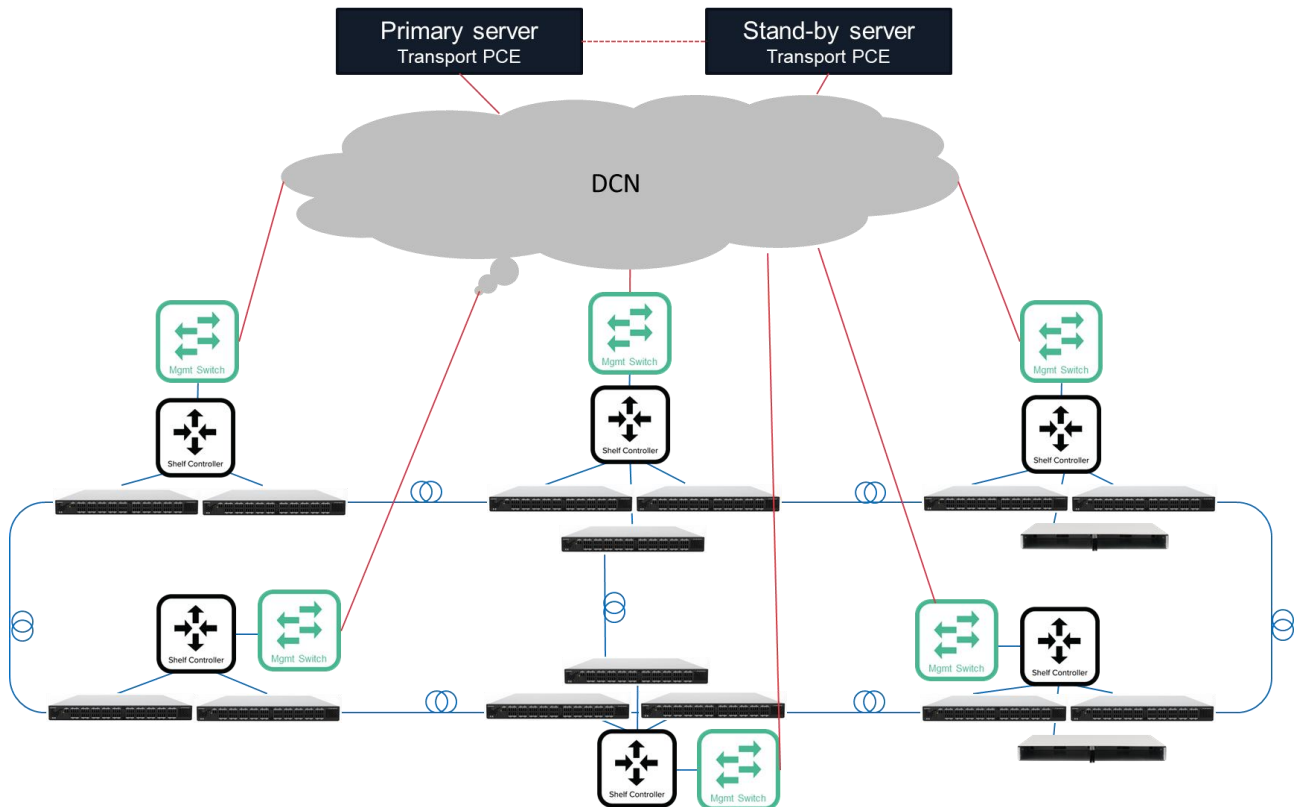


Figure 8. Example network with DCP-R:s and shelf controllers using DCN only configuration.

3.1 Degree numbering

Each DCP-R in a node will be designated a degree number in the installation process. The degree number will be an integer from 1 to 9 and equivalent to “chassis-x” number in CLI. After the chassis are added in the cluster through a process described in the DCP-R installation manual the degree numbers are fixed and cannot be changed without traffic interruption. Therefore if a certain configuration is desired such as degree 1 in one node is connected to degree 2 in another it is recommended to draw a map and a table consisting of the connected DCP-R:s together with a list of the Serial numbers. This list can look as in the example below:

Node id: ROADM-1	Ipaddress: xxx.xxx.xxx.xxx
Degree number	Serial No
1	YYYYYYY
2	ZZZZZZZZ
Node id: ROADM-2	Ipaddress: xxx.xxx.xxx.xxx
Degree number	Serial No
1	NNNNNNN
2	MMMMMM

Figure 9. Example of list containing degree numbers and serial numbers.

This list will be used in the DCP-R installation later. It is important to note that if a specific structure is wanted such as the degree 1 of one node should be connected to degree 2 in another node the list will be very helpful.

3.2 Security configuration

Out of the box the shelf controller comes with several security functions installed. These include basic firewall settings and ACL-rules. Customer specific security configuration such as white list must be configured by the customer with the installation script. The installation script will be gone through in detail in section 3.4 and 5.

3.3 Internal OSPF configuration

The nodes will communicate in an internal OSPF network using the tunnel ports on the DCP-R:s. One or more DCN connections are allowed in the network. These are connected through port 15 on the shelf controller. For the OSPF configuration, there are some rules that must be fulfilled for the network routing to work:

1. Both interfaces on each link must have IP addresses on the same subnet level.
2. There cannot be the same subnet on any of the links in the same network.
3. The external IP address on each node must be the same as RouterID and Loopback interface.

Below is an example of a 3-degree network that fulfils all these rules. It is allowed for the customer to have its own configuration if the three rules are fulfilled.

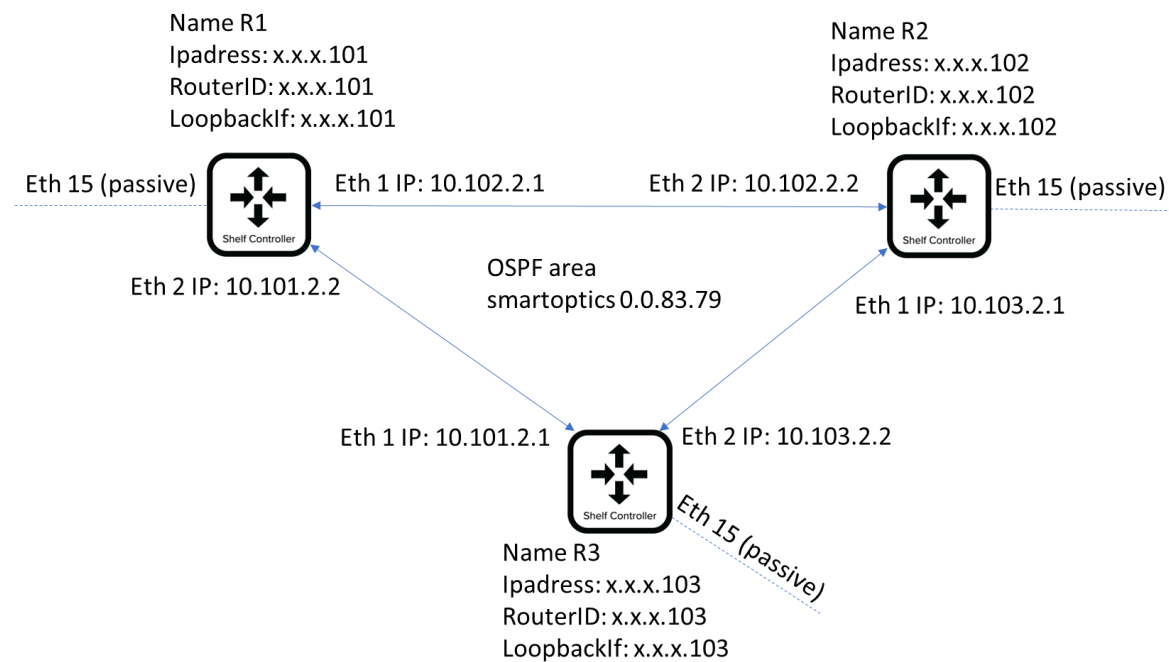


Figure 10. Example of a 3-node network internal OSPF configuration.

The logic in the setting of the IP addresses on the tunnel ports are that the second number contains the management IP address last number. In order for the 1:st and 2:nd rule to be fulfilled one of the IP addresses must have a second number that doesn't use this logic. The last number is the Ethernet interface number. The OSPF area is default smartoptics/0.0.83.79.

3.3.1 OSPF Metric/distance

OSPF metrics are important to set in the DCP-R network. The reason for this is that OSPF communication in the network must be symmetric. If OSPF metrics are only set to a default value on all OSPF interfaces then depending on the network hardware configuration and current link status the communication may go one route in one direction and another in the other direction. The proposed way in this section does not cover every case but should work in most cases. The rule of thumb is that a prioritized route is decided out of every node that has a DCN connection. All routes out of the network must be prioritized in order. If the preferred route doesn't matter for the user, this priority can be done randomly but must be done, nonetheless. See picture below for an example.

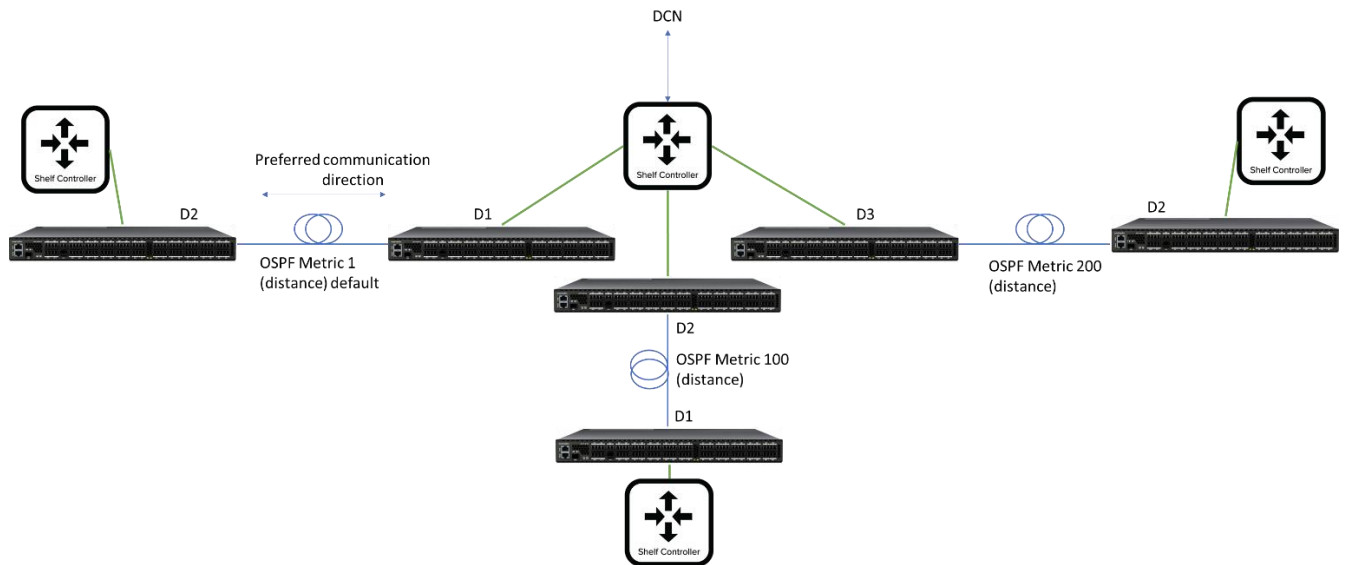


Figure 11. OSPF metrics example picture.

OSPF metric on the shelf controller are called “distance”. Each OSPF interface must have a distance. Furthermore, if a OSPF metric is set to anything other than default (which is “1”) it must also be changed to the same value on the adjacent node on the other side. This is for the OSPF metric calculation decision to be made symmetrically. In the example above the 3 degree node in the middle has DCN connection. The preferred route from the 3-degree node is to the left. Therefore this link distance can be set to 1. Since this is the default value the node to the left need not to modify its OSPF metrics (unless it has a DCN connection). The node on the bottom is chosen as second priority route. This nodes OSPF metrics must then be set to 100, both on the 3-degree and the node on the bottom (on the connected degree number, in this case D1). In similar way metrics on the right route should be set to 200, since this is the least preferred route.

Nodes that have no DCN connection do not need to be changed, they can stay at default level “1” for all degrees.

3.4 Installation script general

At customers premises or at prestage the installation script needs to be executed. This script will configure:

- Security configuration such as white list
- IP address, IPV4 for management
- OSPF parameters
- DNS parameters (if applicable)
- NTP parameters (if applicable)
- TACACS parameters (if applicable)

The installation script will be gone through in detail in section 4. The shelf controller also houses other functions that are not configured in the script. It is possible to configure and use those functions, but Smartoptics is not able to offer support if they malfunction in any way. For the script configured functions Smartoptics of course provide full support.

4 Shelf controller types

This section describes the different types of shelf controllers that are installed through the installation script.

4.1 Main shelf controller in a DCP-R only node

The main shelf controller in a DCP-R only node controls a number of DCP-R degrees. The node looks like the below example but can have different number of degrees.

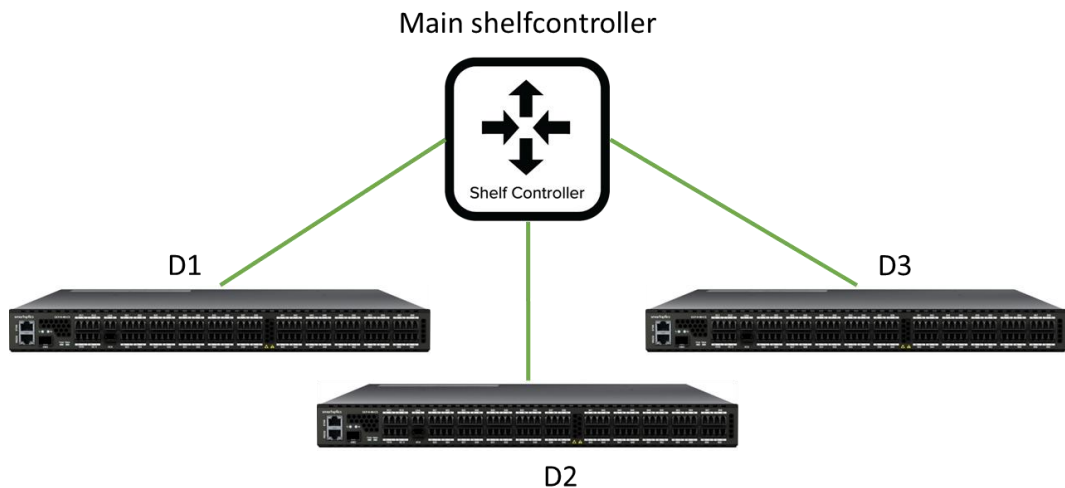


Figure 12. Main shelf controller in a DCP-R only node.

4.2 Main shelf controller in a line amplifier node

The line amplifier node also needs a shelf controller to handle management traffic. The line amplifier connections are very similar to the main shelf controller connections with the difference that only one "lan port" is used for management, although it uses two "tunnel ports".

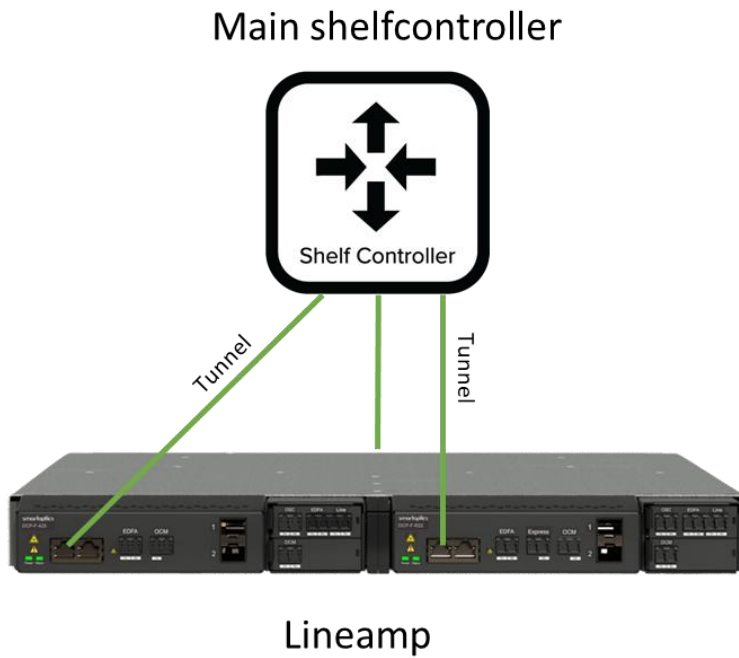


Figure 13. Main shelf controller in a line amplifier node.

The settings for the line amplifier are handled in the main shelf controller installation script. There is a parameter in the script that defines if the node is a line amplifier. If this is set to true/yes then shelf controller configuration is adjusted accordingly. Note that the two tunnel ports are treated as two regular OSPF interfaces and need to be set up in the same way as two corresponding DCP-R OSPF interfaces.

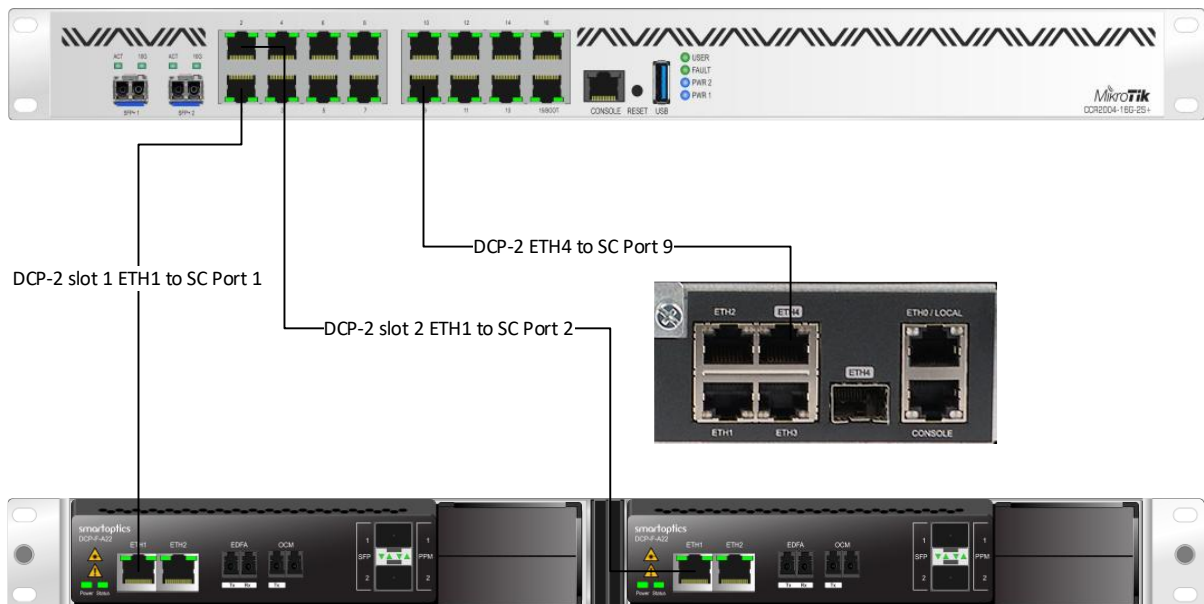


Figure 14. Management ETH connections for DCP-2 in ILA to shelf controller.

4.3 Optically extended shelf controller

In some cases the node may contain degrees that are spread out in the premises and cannot easily be reached by a regular Ethernet RJ45 cable. In this case it is possible to use the SFP+ port with suitable optics (SM/MM) and connect it as below. Similar to the line amplifier the optically extended shelf controller is defined through a parameter in the installation script.

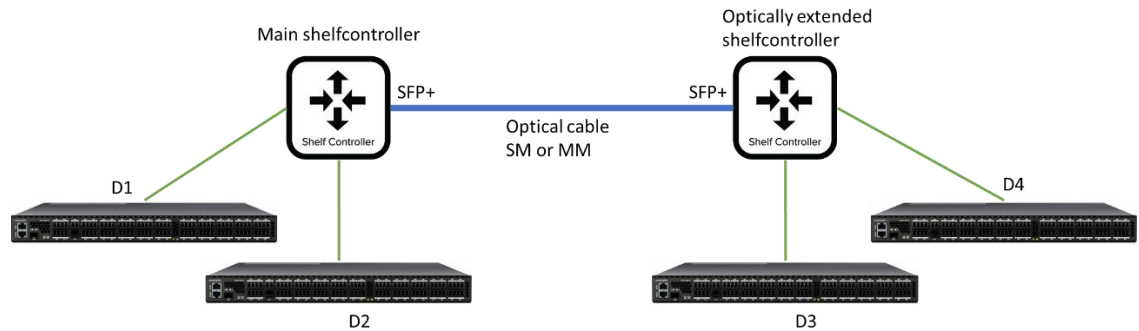


Figure 15. Main shelf controller and optically extended shelf controller in a 4-degree node.

Note that no symmetry is needed with the degrees in the node. 1 degree or more can be connected to the main shelf controller and 1 degree or more can be connected to the optically extended shelf controller.

5 Installation procedure

This chapter focuses on initial bringup of the Shelf controller.

5.1 Console settings

As the device arrives with a default IP address (192.168.88.1) configured on the dedicated management interface, a console connection needs to be established. The default settings for the console port (labelled as CONSOLE on the front panel of the device) are as follows:

- Baud rate—115200
- Parity—N
- Data bits—8
- Stop bits—1
- Flow control—hardware (RTS/CTS)

Default login to the shelf controller is user:admin and empty password (return key). The first login to the unit offers user to change password. Change password or postpone with ctrl+c.

After the console connection has been established the script can be executed.

5.2 IP connectivity settings for script installation

Using a default IP address when executing installation script is possible. However since port 15 is preset for DCN/Management it will be reconfigured during the script (to management IP). User can in this case set port 16 IP address to 192.168.98.1 and connect the RJ45 between the client PC ethernet port and port 16 on the Shelf controller. This command can be set through console or using the procedure in next section. The command for setting the IP address in the shelf controller is:

```
/ip/address/add interface=ether16 address=192.168.98.1/24
```

5.2.1 Setting local IP without console cable

The primary way to set the local IP is to use a console cable. If the console cable is not accessible or malfunctioning it is however possible to set local IP on different ports of the shelf controller through the default IP address on a new unit (i.e. a unit where the shelf controller installation script has not been executed). In this case Use port 15 and the default local IP address (192.168.88.1) on this port to connect to the unit via SSH. Then write the command (same as above):

```
/ip/address/add interface=ether16 address=192.168.98.1/24
```

After this the RJ45 cable need to be moved from port 15 to port 16 on the shelf controller. The cable should still be connected to the PC. The PC IP address then need to be changed to an address in the same subnet as port 16 (192.168.98.X).

5.3 Netconf parameters

There are 3 parameters that need to be configured for the Netconf communication to the SoSmart server. These parameters can in 7.1.1 only be configured in the DCP-R CLI. Information on how to use the DCP-R CLI can be found in the DCP-R installation manual. The parameters needed in each ROADM node are:

- Netconf Login credentials (user/pw)
- Node-id which will be the nodename that is visible in SoSmart Manager
- Geolocation data which consists of longitude and latitude of the customer premises where the node is situated.

5.4 Used services and network protocols

The table below contains information on which services and network protocols are used in the DCP-R and their intended purpose. This information is useful if the DCP-R is installed in a secure network where firewalls might need to be configured to allow for full functionality.

Service	Port	Protocol	Description
FTP	21	TCP	Used for software upgrades
SSH	22	TCP	Used for secure logins to the shelf controller CLI
SSH	122, 2201	TCP	Used for secure logins to the DCP-R CLI
TACACS+	49	TCP	Used for authentication, authorization and accounting (AAA) services
DNS	53	TCP & UDP	Used for mapping host names to IP addresses
TFTP	69	UDP	Used for software upgrades
HTTP	80	TCP	Used for software upgrades
Netconf	2022	TCP	Used for communication to the SDN controller
NTP	123	UDP	Used to synchronize the system against an NTP server
SNMP	161	UDP	Used for SNMP management and monitoring of the system

SNMP Trap	162	UDP	Used by SNMP to send traps to the SNMP receiver(s)
Syslog	514	TCP & UDP	Used for system logging
RADIUS	1812	UDP	Used for authentication, authorization and accounting (AAA) services

5.4.1 SNMP functionality

The SNMP is polled from the shelf controller in the node. In previous release it was polled from degree 1 in the node. For the user there is no difference in functionality or setup since the polled address still is the management IP and the used port remains the same.

In the DCP-R CLI the user can set up SNMP community and SNMP trap destination.

5.4.2 RADIUS functionality

RADIUS is supported both in the shelf controller and the DCP-R:s. However they need to be set up separately in these parts of the node. For using RADIUS server when logging into the shelf controller it is set up through the installation script. For the DCP-R:s RADIUS is set up through the DCP-R CLI.

5.4.3 TACACS+ functionality

TACACS+ is currently only available in the DCP-R units not the shelf controller. It is configured through the CLI.

5.5 Executing the installation script

For newer deliveries of shelf controllers the script is already loaded in the root folder. In this case it is possible to run the script directly without downloading and installing it from the

Smartoptics support portal.

Check if the script is available in the root folder by typing the command:

/file/print

The script should have a file name that starts with “shelf-controller-installation-script-xxx”

Select the appropriate chapter below for script execution.

5.5.1 Script execution through console port when there is a script in root folder

This is the procedure of operations for executing the script when it is available in the root folder:

1. Execute the script by printing: */import <file name>*
For example: */import shelf-controller-installation-script-8.0.1b.rsc*

5.5.2 Script execution through console port when there is no script in root folder

This is the preliminary procedure of operations when installing the script on the shelf controller:

2. Download the latest script from Smartoptics support portal.
3. Unzip and open file in a text editor. Use the script that has not “.escaped” in the end.
4. Log into the shelf controller through console port (section 5.1). The first login to the unit offers user to change password. Change password or postpone with ctrl+c.
5. Write */system/script*
6. Name the script by writing *add name=installationscript*
7. Write *print*
8. Write *edit 1 source*
9. Paste the content of the file from step 3 into the editor that opens*
10. Save and close using *ctrl+o*
11. Execute the script by printing *run 1*

*Some terminals might have problems with opening the script in this way. If the prompt displays “Value” after step 9 above follow the below procedure:

1. Download the latest script from Smartoptics support portal.
2. Unzip and open file in a text editor. Use the script that has “.escaped” in the end.
3. Log into the shelf controller through console port (section 5.1). The first login to the unit offers user to change password. Change password or postpone with ctrl+c.
4. Write */system/script*
5. Name the script by writing *add name=installationscript*
6. Write *print*
7. Write *edit 1 source*
8. Paste the content of the file from step **Error! Reference source not found.** into the editor that opens displaying “value”
9. Press *enter*
10. Execute the script by printing *run 1*

5.5.3 Script execution through IP when there is a script in root folder

This is the procedure of operations for executing the script when it is available in the root folder:

12. Execute the script by printing: */import <file name>*
For example: */import shelf-controller-installation-script-8.0.1b.rsc*

5.5.4 Script execution through IP when there is no script in root folder

This is the preliminary procedure of operations when installing the script on the shelf controller:

1. Download the latest script from Smartoptics support portal.
2. Unzip and open file in a text editor. Use the script that has not ".escaped" in the end.
3. Log into the shelf controller through SSH. IP address should be set as described in section 5.2.
4. Write /system/script
5. Name the script by writing add name=installationscript
6. Write print
7. Write edit 1 source
8. Paste the content of the file from step 3 into the editor that opens
9. Save and close using ctrl+o
10. Execute the script by printing run 1

5.6 Initial Configuration

When the script has been executed several questions will guide the user how the shelf controller should be configured. Please see below for the flow chart diagram.

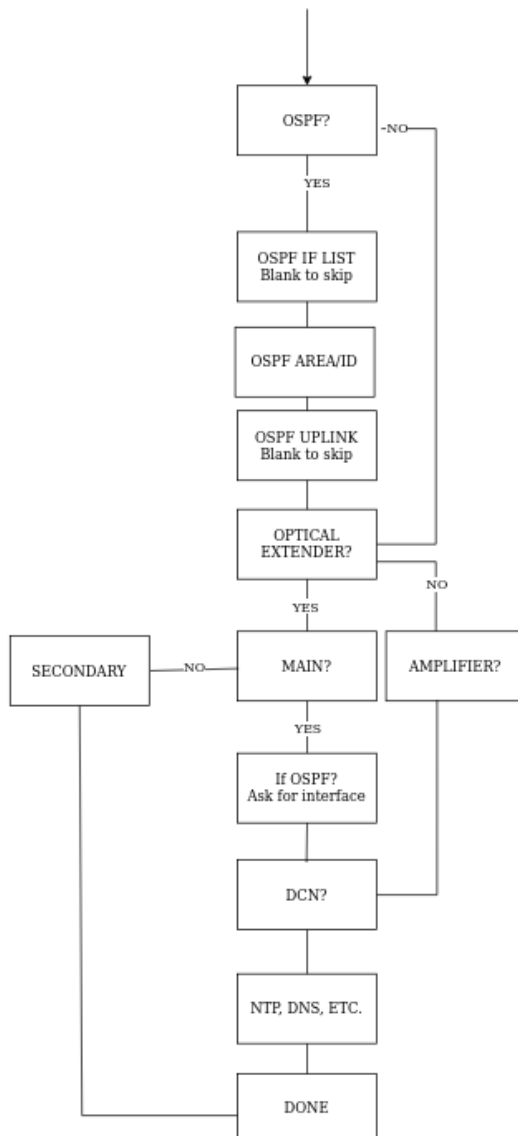


Figure 16. Flowchart of the Shelf controller configuration

The script will prompt with the following questions:

1. Configure OSPF routing?
 - a. - Yes = OSPF will be used via OSC

Notes:

 - OSPF interface IP must be set on all degrees/ethernet ports that are or should be connected to the shelf controller
 - They must be set consecutively without missing interfaces, i.e. user cannot skip ethernet port 1 and set ethernet port 2
 - If a degree is not connected yet through the line fibers set a dummy OSPF interface IP if its final value is not known

Enter interface [Port#] address. Empty to end

- '<a.b.c.d/xx>' (e.g. #1 = 10.40.193.1/30, #2 = 10.40.193.14/30)

Enter interface [Port#] metric. Empty for default

- '<distance>' (e.g. #1 = 16, #2 = 30)

Enter OSPF area. Empty for default (default 0.0.83.79)

- '<enter>'

Enter OSPF address for this node

- '<a.b.c.d/xx>' (SC Mgmt IPv4; e.g. 10.40.192.30/24)

Enter OSPF uplink address for this node, blank to skip

- '<a.b.c.d>' (e.g. 10.40.192.250)

Enter OSPF gateway for this node

- '<a.b.c.d>' (e.g. 10.40.192.249)
 - b. - No = Each SC will be connected directly to the local DCN
 - SC will be DCN only
2. Configure optically extended node?
 - No = Single SC
 - Yes = Optically extended SC or connected to an extended SC
 - Configure main unit?
 - Yes = Main Unit
 - Name one tunnel-interface connected to the extender router (ether1-8)
 - '[SC Port 1-8]'
 - No = Extended Unit
 - Enter node-id/name
 - '<NodeID>'
3. Is the unit a line amplifier site?
 - Yes = ILA
 - No = ROADM
4. Configure DCN connection?
 - No = Proceed with OSPF configuration
 - Yes = Warning: This will overwrite OSPF uplink configuration!
 - Enter DCN address for this node
 - '<a.b.c.d/xx>'
 - Enter DCN gateway for this node
 - '<a.b.c.d>'

5. Enter DNS servers (if applicable)
- '<primary server>, <secondary server>' (secondary server is optional)
6. Enter NTP servers (IPv4 or DNS)
- '<primary server>, <secondary server>' (secondary server is optional)
7. Enter time-zone
- '<TimeZone ID>' (e.g. America/New_York ref TZ ID from https://en.wikipedia.org/wiki/List_of_tz_database_time_zones)
8. Configure access whitelist?
- '<IPv4>'

After the scrip has finished it is time to connect the Ethernet cables between shelf controller and the DCP-R. Typical configuration:

DCP-R mgmt Eth4 >> SC Port: 9=D1, 10=D2, 11=D3, 12=D4, 13=D5

DCP-R tunnel Eth2 >> SC Port: 1=D1, 2=D2, 3=D3, 4=D4, 5=D5

6 Shelf controller operational procedures

6.1 Shelf controller replacement

It is important to prepare the new replacement shelf controller before it is used. Note that the shelf controller needs correct SW version for the docker container. For a used shelf controller it is required to clear the shelf controller container SW. It is also necessary to note the serial number of the new node member. Steps 1-4 can be done in advance before the physical replacement in a controlled office environment. The steps 5-8 must be done when the replacement unit is installed in the production environment.

Steps for shelf controller replacement:

1. Login to the new shelf controller through local IP (section 5.2). At this point only connect the ethernet cable between PC and shelf controller port 16.
2. Prepare the new shelf controller with correct SW version (the first three steps will clear the shelf controller container SW)
 - a. `/container/stop 0`
 - b. `/container/remove 0`
 - c. `/file/print`
Check which number the container/persistent has
`/file/remove <container/persistent number>`
 - d. Download the software from Smartoptics support portal to be used to the PC. Locate the shelf controller image. It is named "*dcp-shelf-controller-release-X.X.X.tar*".
 - e. This step will depend on the router OS and if the shelf controller has a USB memory or not.

For shelf controllers with USB, AC power and router OS 7.6 or earlier:

Transfer the new SW from PC to the USB memory on shelf controller.

Write:

For linux:

```
curl -T [source, i.e. dcp-shelf-controller-release-X.X.X.tar] ftp://[destination, i.e. 192.168.98.1/disk1]/ --user admin
```

For Windows/Mac:

Use appropriate ftp client and connect to 192.168.98.1 and transfer the file to disk1. User is admin and no password if it is a completely new unit.

*If the unit returns error code try replacing "disk1" in the above sequences with "disk2" or "disk3".

For shelf controllers with AC or DC with router OS 7.8:

/disk add type=tmpfs tmpfs-max-size=200M slot=install-tmp

- f. This step will depend on the router OS and if the shelf controller has a USB memory or not.

For shelf controllers with USB, AC power and router OS 7.6 or earlier:

Type "/container add envlist=dcg_envs file=disk1/dcg-shelf-controller-release-x.x.x.tar interface=veth1 logging=yes mounts=persistent,ssl start-on-boot=yes"

Type everything inside the quotation marks but do not include quotation marks.

*If the unit returns error code try replacing "disk1" in the above sequences with "disk2" or "disk3".

For shelf controllers with AC or DC with router OS 7.8:

/container add envlist=dcg_envs file=install-tmp/dcg-shelf-controller-release-x.x.x.tar interface=veth1 logging=yes start-on-boot=yes
mounts=persistent,ssl

Transfer the new SW from PC to the install-tmp folder on shelf controller.
Write:

For linux:

curl -T [source, i.e. dcg-shelf-controller-release-x.x.x.tar] ftp://[destination, i.e. shelf controller IP/install-tmp]/ --user admin

For Windows/Mac:

Use appropriate ftp client and connect to shelf controller IP and transfer the file to install-tmp folder. User is admin and no password if it is a completely new unit.

- g. Type /container
- h. This step will depend on the router OS and if the shelf controller has a USB memory or not.

For shelf controllers with USB, AC power and router OS 7.6 or earlier:

Type "add envlist=dcg_envs file=disk1/dcg-shelf-controller-release-x.x.x.tar interface=veth1 logging=yes mounts=persistent,ssl start-on-boot=yes"

Type everything inside the quotation marks but do not include quotation marks.

*If the unit returns error code try replacing "disk1" in the above sequences with "disk2" or "disk3".

For shelf controllers with AC or DC with router OS 7.8:

```
/container add envlist=dcg_envs file=install-tmp/ dcp-shelf-controller-
release-x.x.x.tar interface=veth1 logging=yes start-on-boot=yes
mounts=persistent,ssl
```

*If the unit returns error code try replacing “disk1” in the above sequences with “disk2” or “disk3”.

- i. Wait 1 minute when container is extracting. Then type “print”. Check that the status is “stopped”.
 - j. start 0
3. Note the serial number of the old shelf controller and the new shelf controller
 4. Run the installation script with the same parameters as was done for the original shelf controller. See sections 5.5 and 0.
 5. Note how the Ethernet cables are connected from the original shelf controller to the DCP-R chassis. It is important that the new shelf controller is connected the same way.
 6. Connect the Ethernet cables between the new shelf controller to the ROADM chassis. Wait 30 seconds for the cluster to stabilize.
 7. Log into DCP-R CLI and run the command “*config node member replace <serial old> <serial new>*”
 8. Make sure to save a new backup file after a shelf controller has been replaced. See the “DCP CLI User Manual” for information how to save backups for different systems. The need for a new backup in this case is because the serial number of the shelf controller has changed.

6.2 Replacement of DCP-R chassis in multi-degree node

It is important to prepare the new replacement chassis before it connected to the shelf controller. The chassis must be set to factory default and it should have the same SW version as the other chassis in the node. It is also necessary to note the serial number of the old and new chassis as this parameter is used in the configuration.

The configuration will automatically be downloaded to the new chassis once the replace command has been executed.

Steps for DCP-R chassis replacement:

1. Prepare the new chassis with correct SW version.
2. If the new DCP-R that should be used for replacement already has been used before it is necessary to remove old configs and do a factory default on this unit. Remove old SW configs in other releases on the new chassis. List old SW images with command “swupgrade list”.

Use command “*swupgrade remove <SW image>*” to remove a SW image.

Then do a factory default on the DCP-R chassis.

Use command “*factorydefault*”. The chassis will be rebooted after the command.

3. Note the serial number of the old DCP-R and the new DCP-R chassis
4. Note how the Ethernet cables are connected from DCP-R to shelf controller. It is important that they are connected to the same ports also after replacement.
5. Connect the Ethernet cables from the shelf controller to the new replacement chassis.
6. Run the command “*config node member replace <serial old> <serial new>*”
For replacement of degree 2 or higher it is recommended to be logged in to degree 1 when the command is executed. For replacement of degree 1 it is recommended to be logged in to degree 2 when the command is executed.
Make sure that the new node member is activated. Use command:
“show node members”
Check that the new serial number is included in the list.
7. Make sure to save a new backup file after a DCP-R chassis has been replaced.
This is because the serial number is used internally in the configuration.

6.3 Replacement of DCP-R chassis in single-degree node

It is important to prepare the new replacement DCP-R chassis before it connected to the shelf controller. The chassis must be set to factory default and it should have the same SW version as the old chassis.

Make sure that you have a saved backup file.

Steps for DCP-R chassis replacement:

1. Remove the faulty DCP-R chassis and note how the Ethernet cables are connected to the shelf controller. Insert the new DCP-R chassis (that is set to factory default and has the same SW) without connecting the Ethernet cables to the shelf controller.
2. Power up new DCP-R and connect all fibres. (not Ethernet cables)
3. Login to the new DCP-R chassis using console.
Set IP address on the DCP-R chassis.
admin@hostname>config network mgmt ipv4address 172.16.0.2 255.255.255.0 172.16.0.1
4. Connect Ethernet cables between the DCP-R chassis and the shelf controller.
5. Login to the DCP-R via console port and add shelf controller as member:
admin@hostname>config node member add <serial number> controller
6. Download the backup file.
config backup download <URL for backup file>

7. Restore backup
`config backup restore <backup file>`
 After restore, the node will restart.
8. Save a new backup file.

6.4 Replacement of ILA node with shelf controller

This is the procedure to replace an ILA node if the DCP-2 chassis has failed.

1. Remove both DCP-F modules.
2. Remove ethernet cables between SC and chassi.
3. Remove chassi.
4. Do a factory default of shelf controller according to manual for that.
5. Power up new chassi and make a factory default (with console/local port) and wait until restarted.
6. Insert DCP-F modules.
7. Change automationmode to managedILA by login using console or local port.
8. Set IP address on chassis: `config network mgmt ... 172.16.0.2 255.255.255.0 172.16.0.1`
9. Connect ethernet cables again.
10. Add the new SC using `config node member add` and enter the serial number of SC. Wait a while and check that the shelf controller is master and the slots modules are slaves. Use command “show node members” to check this.
11. Do a swupgrade list and if more than two images on chassis or slot remove old images. Maximum 2 images can be on any slot/chassi.
12. Download the backup.
13. Restore the backup and wait until rebooted.

6.5 SW upgrade of shelf controller

In a DCP-R node first upgrade the DCP-R units following instructions in the “DCP-R User manual”. Make sure that the reboot of the DCP-R units is completed before upgrading the shelf controller. Then continue to upgrade the shelf controller following the procedure below:

1. Log in to the shelf controller.

2. Type `/container/`
3. Type `print`. Check that container has status “running”.
4. Type `stop 0`
5. Wait 1 minute to make sure that the container has been stopped.
Type `print`. Check that container 0 is stopped.
6. Type `remove 0`
7. Wait 1 minute to make sure that the container has been removed.
Type `print`. Check that container 0 is removed.
There is a risk that the memory will be full if the new container is added before the first one has been removed.
8. Download the software from Smartoptics support portal to be used to the PC.
Locate the shelf controller image. It is named “*dcp-mikrotik-container-release-12.1.1.tar*”.
9. This step will depend on the router OS and if the shelf controller has a USB memory or not.

For shelf controllers with USB, AC power and router OS 7.6 or earlier:

Transfer the new SW from PC to the USB memory on shelf controller.

Write:

For linux:

```
curl -T [source, i.e. dcp-mikrotik-container-release-12.1.1.tar] ftp://[destination, i.e. shelf controller IP/disk1] --user admin
```

For Windows/Mac:

Use appropriate ftp client and connect to shelf controller IP and transfer the file to disk1. User is admin and no password if it is a completely new unit.

*If the unit returns error code try replacing “disk1” in the above sequences with “disk2” or “disk3”.

For shelf controllers with AC or DC with router OS 7.8:

```
/disk add type=tmpfs tmpfs-max-size=200M slot=install-tmp
```

Transfer the new SW from PC to the install-tmp folder on shelf controller.

Write:

For linux:

```
curl -T [source, i.e. dcp-mikrotik-container-release-12.1.1.tar] ftp://[destination, i.e. shelf controller IP/install-tmp] --user admin
```

For Windows/Mac:

Use appropriate ftp client and connect to shelf controller IP and transfer the file to install-tmp folder. User is admin and no password if it is a completely new unit.

10. Type `/container/`
11. This step will depend on the router OS and if the shelf controller has a USB memory or not.

For shelf controllers with USB, AC power and router OS 7.6 or earlier:

Type `"add envlist=dcg_envs file=disk1/dcp-mikrotik-container-release-12.1.1.tar interface=veth1 logging=yes mounts=persistent,ssl start-on-boot=yes"`
Type everything inside the quotation marks but do not include quotation marks.

*If the unit returns error code try replacing `"disk1"` in the above sequences with `"disk2"` or `"disk3"`.

For shelf controllers with AC or DC with router OS 7.8:

`/container add envlist=dcg_envs file=install-tmp/dcp-mikrotik-container-release-12.1.1.tar interface=veth1 logging=yes start-on-boot=yes mounts=persistent,ssl`

12. Wait 1 minute when container is extracting. Then type `"print"`. Check that the status is `"stopped"`.
13. Type `start 0`
14. Type `"print"`. Check that the status is `"running"`.
15. Log into the DCP-R CLI. Type `"show version"` and check chassis-0 appear with the correct SW version. It might take a minute for the shelf controller to synch up with the DCP-R chassis.
Run the command `"show node members"` to verify that the shelf controller has become master. This will take one or two minutes.

6.6 Reboot of shelf controller

To reboot the shelf controller follow the procedure below:

1. Login to the new shelf controller through console or SSH. For SSH use the management IP and port 22 as suggested in section 5.4. SSH communication in this way requires that the shelf controller installation script has been executed and unit is accessible through IP.
2. Write `/system/reboot`
Example:
`[admin@SO-ROADM-HD6085J593A] > /system/reboot`
3. After this user will get a question if they really want to reboot. Answer yes/y to this question.
Example:
Reboot, yes? [y/N]: y
4. Done. Wait for reboot to finish.

6.7 Clear the shelf controller container SW

The shelf controller container SW can be cleared from the shelf controller by stopping the container and removing the container folder. Use the procedure below:

1. `/container/stop 0`
2. `/container/remove 0`
3. `/file/print`
Check which number the container/persistent has
`/file/remove <container/persistent number>`

6.8 Restart the shelf controller container

The shelf controller container can be restarted by stopping it and starting it in two steps.

1. `/container/stop 0`
2. `/container/start 0`
3. Check that the container is running by typing `/container/print`

6.9 Reset shelf controller configuration

It is possible to remove all scripts and configurations from the shelf controller, but after this it is not possible to use the shelf controller as master anymore. The reset should only be done if the shelf controller should be used as port extender in a config with two shelf controllers in the same node.

The command for this reset is:

1. `/system/reset-configuration`

6.10 Migrate SO-SHELF-CTRL-XX to DCP-SC-28P for ROADM node

From R12.0.1 it is possible to migrate a ROADM node from shelf controller of the type SO-SHELF-CTRL-XX to DCP-SC-28P.

Prerequisites:

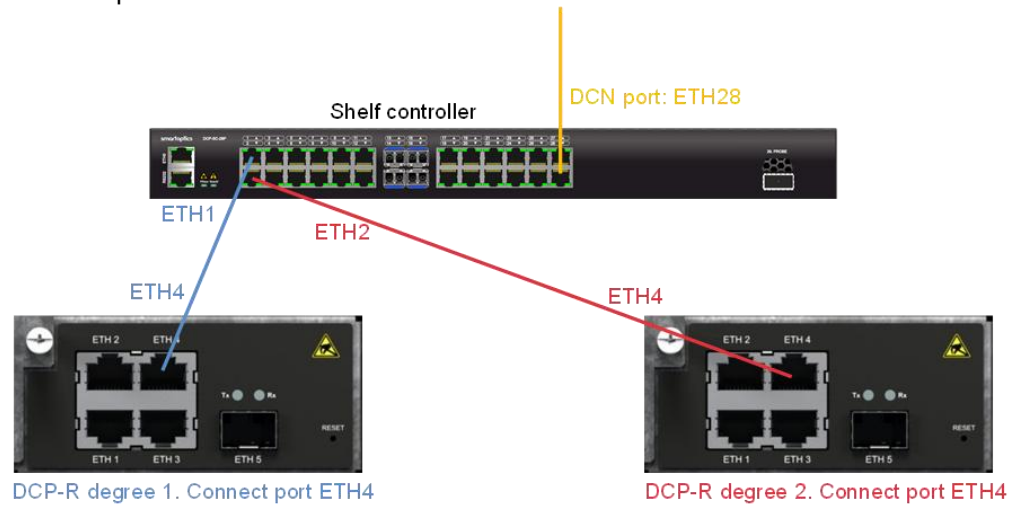
1. Make sure the ROADM node running release \geq R12.
2. Make sure the new DCP-SC-28P is running same release as the ROADM node.
Run the command `factorydefault` if the unit has any configuration.
Don't configure anything (management IP, etc), because it will be wiped after replacement.

3. Make a copy of current settings in SO-SHELF-CTRL-XX:
 - a. Mgmt ipv4 settings
 - b. NTP
 - c. DNS
 - d. OSPF
4. Make sure to have a console cable available
5. Make sure to have the Local admin user/password to login to console port of chassis-1

Procedure:

1. Power up the DCP-SC-28P.
2. Power down the SO-SHELF-CTRL-XX.
3. Handle ethernet cables:
Move all management cables for all degrees from SO-SHELF-CTRL-XX to DCP-SC-28P as follow:
 - Move cable from SO-SHELF-CTRL-XX port 9 to DCP-SC-28P port e1 for chassis-1 (degree 1)
 - Move cable from SO-SHELF-CTRL-XX port 10 to DCP-SC-28P port e2 for chassis-2 (degree 2)
 - Move cable from SO-SHELF-CTRL-XX port 11 to DCP-SC-28P port e3 for chassis-3 (degree 3)
 - Continue in same way with remaining degrees.
The cables connected from DCP-R ETH2 to SO-SHELF-CTRL-XX port 1 to 8 can be removed. They were previously used for the OSC tunnel, but this traffic will go over same cable as the chassis traffic when DCP-SC-28P is used.

- Move cable from SO-SHELF-CTRL-XX port 15 to DCP-SC-28P port e28 for DCN uplink.



4. Login to chassis-1 (either via console cable or local port), then run cli command `show node members`

- Make sure that chassis-1 has status: **Master**
- Make sure that SO-SHELF-CTRL-XX has status: **Disconnected**
- All other chassis (if any) shown up and have status: **Slave**

Note #1: It may take up to 5 minutes for chassis-1 to have status Master.

```
admin@ROADM-12-D1>show node members
```

Id	Location	Hostname	Part number	Serial number	IP address	Status
0	chassis-0	-	-	HD50880EHZT	n/a	Disconnected
1	chassis-1	-	DCP-R-9D-CS	S2240DCPR0207	fe80::96de:eff:fe05:a98%br0	Master
2	chassis-2	ROADM-12-D2	DCP-R-34D-CS	S2422DCPR0780	fe80::96de:eff:fe05:2494%br0	Slave

Note #2: If 5 minutes passed and the node member are empty, you may have to reboot the system.

```
admin@ROADM-12-D1>show node members
```

Id	Location	Hostname	Part number	Serial number	IP address	Status
--	-----	-----	-----	-----	-----	-----

```
admin@ROADM-12-D1>
```

5. Login to the DCP-SC-28P (either via console cable or local port), then run cli command `show network lldp local neighbor` and make sure that all chassis are shown up in LLDP:

```
admin@DCP-SC-28P>show network lldp local neighbor
```

Interface	Product name	Serial number	Hostname	IP address	MAC address	Port	Age
local	DCP-SC-28P	S2441SC280027	DCP-SC-28P	fe80::94de:eff:fe05:27b5	94:de:0e:05:27:b5	local	n/a
e2	DCP-R-34D-CS	S2422DCPR0780	ROADM-12-D2	fe80::96de:eff:fe05:2494	94:de:0e:05:24:94	eth3	0 day, 0:00:23
e1	DCP-R-9D-CS	S2240DCPR0207	ROADM-12-D1	fe80::96de:eff:fe05:a98	94:de:0e:05:0a:98	eth3	0 day, 00:00:24

```
admin@DCP-SC-28P>
```


6. From DCP-SC-28, run the command to replace: config node member replace [TAB] [TAB]
This command is auto completed, so that we should use tab completion for it. The first parameter for this command is the serial number of the SO-SHELF-CTRL-XX, and the second parameter is the current running DCP-SC-28's serial number, both of them are auto completed.
If there is no tab completion, it is because the system is not ready yet, just wait a few seconds until it is ready.

```
admin@DCP-SC-28P>config node member replace HD508B0EHZT S2441SC280027
Replacing.....
Node member chassis-0 serial number HD508B0EHZT replaced with S2441SC280027.
admin@DCP-SC-28P>
```

7. From DCP-SC-28, verify that the replacement was successful:
Run show node members and verify that the new DCP-SC-28P has status: Master, all other chassis have status Slave. This could take a minute. If, the ROADM chassis are not listed as slaves, wait a while and run the command again.

```
admin@DCP-SC-28P>show node members

  Id  Location  Hostname  Part number  Serial number  IP address  Status
  --  -
  0   chassis-0  hostname  DCP-SC-28P  S2441SC280027  fe80::98de:eff:fe05:27b6%br0  Master
  1   chassis-1  ROADM-12-D1  DCP-R-9D-CS  S2240DCPR0207  fe80::96de:eff:fe05:a98%br0  Slave
  2   chassis-2  ROADM-12-D2  DCP-R-34D-CS  S2422DCPR0780  fe80::96de:eff:fe05:2494%br0  Slave

admin@DCP-SC-28P>
```

8. From DCP-SC-28, run config node topology apply

```
admin@DCP-SC-28P>config node topology apply

Applying internal node topology configuration to Netconf datastore.

Generating new topology in system.
.....

Succesfully applied internal topology configuration.

admin@DCP-SC-28P>
```

The command may reach timeout if the system is not ready. Try the command again.

9. It is recommended to do a reboot after replacement

```
admin@DCP-SC-28P>reboot

Reboot in progress. It may take a few minutes for the system to be fully available again.

admin@DCP-SC-28P>
```

Run "show node members" and check that all chassis are presented

correctly.

```
admin@AMS-R1-R9D-205-controller>show node members
```

Id	Location	Hostname	Part number	Serial number	IP address	Status
0	chassis-0	AMS-R1-R9D-205-controller	DCP-SC-28P	K2450SC280214	fe80::98de:eff:fe04:45ac%br0	Master
1	chassis-1	AMS-R1-R9D-205-D1	DCP-R-9D-CS	S2233DCPR0204	fe80::96de:eff:fe05:a4e%br0	Slave
2	chassis-2	AMS-R1-R9D-205-D2	DCP-R-9D-CS	S2307DCPR0489	fe80::96de:eff:fe05:1dcd%br0	Slave

10. Configure parameters that are not migrated automatically:

- IP address
- OSPF

Note that tunnels from for the OSC channels must be created manually.
New tunnel should use eth4 and VLAN 8. Example:

config network tunnel if-1/osc if-1/eth4 vlan 8

- DNS
- NTP

11. Go to SoSmart and update topology and inventory

It is recommended to It is recommended to factory default the SO-SHELF-CTRL-XX afterwards to avoid situation that it is accidentally connect to the running system and mess up the cluster.

6.11 Migrate SO-SHELF-CTRL-XX to DCP-SC-28P for ILA node

From R12.0.1 it is possible to migrate an ILA node from shelf controller of the type SO-SHELF-CTRL-XX to DCP-SC-28P.

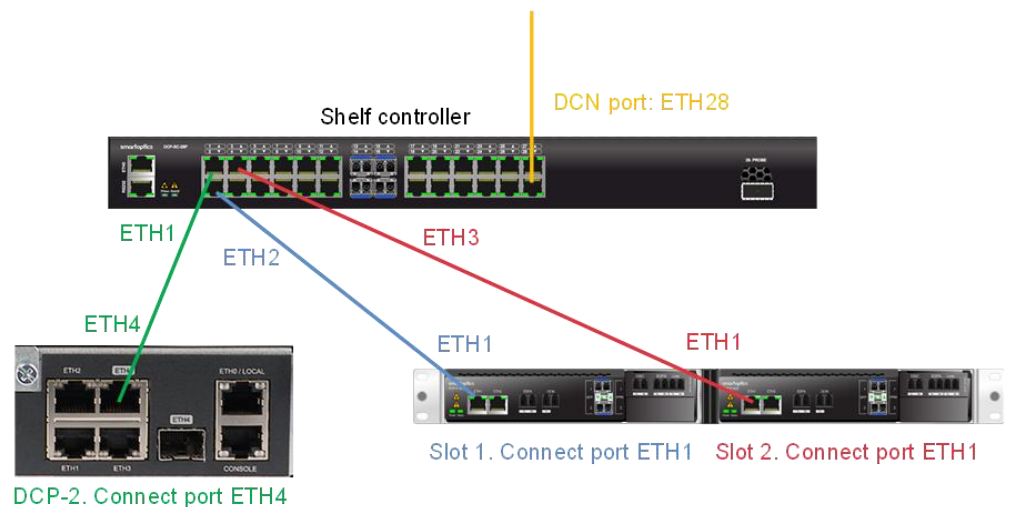
Prerequisites:

1. Make sure the ILA node running release >= R12.
2. Make sure the new DCP-SC-28P is running same release as the ROADM node.
Run the command factorydefault if the unit has any configuration.
Don't configure anything (management IP, etc), because it will be wiped after replacement.
3. Make a copy of current settings in SO-SHELF-CTRL-XX:
 - a. Mgmt ipv4 settings
 - b. NTP
 - c. DNS
 - d. OSPF
4. Make sure to have a console cable available

5. Make sure to have the Local admin user/password to login to console port of chassis-1

Procedure:

1. Power up the DCP-SC-28P.
2. Power down the SO-SHELF-CTRL-XX.
3. Move all management cables for all degrees from SO-SHELF-CTRL-XX to DCP-SC-28P as follow:
 - Move cable from SO-SHELF-CTRL-XX port 9 to DCP-SC-28P port e1 for chassis-1 (degree 1)
 - Move cable from SO-SHELF-CTRL-XX port 1 to DCP-SC-28P port e2 for slot 1
 - Move cable from SO-SHELF-CTRL-XX port 2 to DCP-SC-28P port e3 for slot 2
 - Move cable from SO-SHELF-CTRL-XX port 15 to DCP-SC-28P port e28 for DCN uplink



4. Login to chassis-1 (either via console cable or local port), then run cli command *show node members*
 - Make sure that DCP-2 has status: **Master**
 - Make sure that SO-SHELF-CTRL-XX has status: **Disconnected**
 - The slot modules shown up and have status: **Slave**
- Note #1: It may take up to 5 minutes for DCP-2 to have status Master.

```
admin@ILA-60-16>show node members
```

Id	Location	Hostname	Part number	Serial number	IP address	Status
0	chassis-1	ILA-60-16	DCP-2	K2140DCP20525	fe80::96de:eff:fe04:6fc%eth_dcp2	Master
1	slot-1/1	ILA-60-16-slot1	DCP-F-A22	S2236DCPF2036	fe80::96de:eff:fe05:a55%br0	Slave
2	slot-1/2	ILA-60-16-slot2	DCP-F-A22	S2132DCPF0206	fe80::96de:eff:fe05:1dc%br0	Slave
3	chassis-3	-	-	HBB07V895XM	fe80::e03d:a3ff:fe2b:d059%br0	Disconnected

```
admin@ILA-60-16>
```

Note #2: If 5 minutes passed and the node member are empty, you may have to reboot the system.

```
admin@ILA-60-16>show node members
```

Id	Location	Hostname	Part number	Serial number	IP address	Status
--	-----	-----	-----	-----	-----	-----

```
admin@ILA-60-16>
```

5. Login to the DCP-SC-28P (either via console cable or local port),
Configure automationMode for DCP-SC-28P:

```
admin@DCP-SC-28P>config automationMode managedILA
```

```
Changing automation mode reboots the system.
Are you sure you want to continue? (Yes/NO): yes
```

```
Automation mode set to managedILA.
```

```
Reboot in progress. It may take a few minutes for the system to be fully available again.
```

```
admin@DCP-SC-28P>
```

6. Login to the DCP-SC-28P (either via console cable or local port),
Run cli command show network lldp local neighbor and make sure that all chassis are shown up in LLDP:

```
admin@hostname>show network lldp local neighbor
```

Interface	Product name	Serial number	Hostname	IP address	MAC address	Port	Age
local	DCP-SC-28P	S2450SC280095	hostname	fe80::94de:eff:fe05:2e28	94:de:0e:05:2e:28	local	n/a
br0	DCP-2	K2140DCP20525	ILA-60-16	fe80::96de:eff:fe04:6fc	94:de:0e:04:06:fb	br0	0

```
admin@hostname>
```

7. From DCP-SC-28, run the command to replace: config node member replace [TAB]
[TAB]

This command is auto completed, so that we should use tab completion for it.

The first parameter for this command is the serial number of the SO-SHELF-CTRL-XX, and the second parameter is the current running DCP-SC-28's serial number, both of them are auto completed.

If there is no tab completion, it is because the system is not ready yet, just wait a

few seconds until it is ready.

```
admin@DCP-SC-28P>config node member replace HBB07V895XM S2450SC280095

Replacing.....
Node member chassis-0 serial number HBB07V895XM replaced with S2450SC280095.

admin@DCP-SC-28P>
```

8. From DCP-SC-28, verify that the replacement was successful:

- Run show node members and verify that the new DCP-SC-28P has status: Master, DCP-2 and slot modules have status Slave.
- DCP-SC-28 is at ID 0 and Location chassis-0.

```
admin@DCP-SC-28P>show node members

  Id  Location  Hostname      Part number  Serial number  IP address      Status
  --  -
  0    chassis-0  DCP-SC-28P-16  DCP-SC-28P   S2450SC280095  fe80::98de:eff:fe05:2e29%br0  Master
  1    chassis-1  ILA-60-16      DCP-2        K2140DCP20525  fe80::96de:eff:fe04:6fc%br0   Slave
  2    slot-1/1    ILA-60-16-slot1 DCP-F-A22     S2236DCPF2036  fe80::96de:eff:fe05:a55%br0   Slave
  3    slot-1/2    ILA-60-16-slot2 DCP-F-A22     S2132DCPF0206  fe80::96de:eff:fe05:1dc%br0   Slave

admin@DCP-SC-28P>
```

9. It is recommended to do a reboot after replacement

```
admin@DCP-SC-28P>reboot

Reboot in progress. It may take a few minutes for the system to be fully available again.

admin@DCP-SC-28P>
```

10. Configure parameters that are not migrated automatically:

- IP address
- OSPF
- DNS
- NTP

11. Go to SoSmart and update topology and inventory

It is recommended to It is recommended to factory default the SO-SHELF-CTRL-XX afterwards to avoid situation that it is accidentally connect to the running system and mess up the cluster.