



# Multi-Layer Collection

Multi-layer (Layer 1 and Layer 3) network collection is an advanced collection configuration. This section describes how to configure collection from a multi-layer network.



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**Note** You cannot use the WAE UI to configure this collection.

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After this procedure, you should be able to collect and model the following information:

- Topologies from DWDM networks that support Generalized Multiprotocol Label Switching (GMPLS) with non-User Network Interface (UNI) circuits
- L1 circuit paths
- L1 topology with and without amplifiers
- Unprotected and restorable paths
- Actual L1 circuit path hops
- Feasibility metrics and limits
- Inactive L1 links
- L1 node and L1 link SRLGs
- Site information
- User properties
- Aging information and last seen date. To configure aging, see [Configure Aging](#).

This section contains the following topics:

- [Multi-Layer Collection Limitations, on page 2](#)
- [Multi-Layer Collection Workflow, on page 2](#)
- [Configure L3-L1 Mapping Information, on page 2](#)
- [Configure the Optical Plug-In, on page 3](#)
- [Configure Multi-Layer Collection, on page 4](#)

# Multi-Layer Collection Limitations

The following multi-layer (L1-L3) collection limitations exist:

- Collection is supported only on the following platforms:
  - Cisco Network Convergence System (NCS) 2000 platforms running version 10.61 for L1 devices.
  - Cisco Aggregation Services Routers (ASR) 9000, Cisco Carrier Routing System (CRS), and Cisco NCS 5500 platforms running IOS-XR for L3 devices.
- Multi-layer collection is limited to the collection of unprotected circuits.
- Collection of non-WSON circuits is not supported.
- L3-L1 mapping by LMP is supported only if the controller interface name is the same as the actual L3 interface name or of the form "dwdmx/x/x/x" where the "x/x/x/x" subscript matches that of the corresponding L3 interface.
- Lambda mapping is currently supported only for circuit paths but not for path hops.

# Multi-Layer Collection Workflow

This workflow describes the high-level steps to configure multi-layer collection.

Step	For more information, see...
1. Review multi-layer collection limitations.	<a href="#">Multi-Layer Collection Limitations, on page 2</a>
2. Configure and run the optical plug-in.	<a href="#">Configure the Optical Plug-In, on page 3</a>
3. Obtain and configure L1 - L3 mapping information.	<a href="#">Configure L3-L1 Mapping Information, on page 2</a>
4. Configure multi-layer collection.	<a href="#">Configure Multi-Layer Collection, on page 4</a>

# Configure L3-L1 Mapping Information



**Note** L3-L1 mapping by Link Management Protocol (LMP) is supported only if the controller interface name is same as the actual L3 interface name or in the form of "dwdmx/x/x/x" where the "x/x/x/x" subscript matches that of the corresponding L3 interface.

You can get L3-L1 information by running the configuration parsing agent. See [Configuring the Configuration Parsing Agent](#). The parse configuration agent should be specified in the optical nimo as follows:  
`networks/<multilayer_network_name>/nimo/optical-nimo/advanced/cfg-parse-agent`

If you are not running the configuration parsing agent, manually enter the mapping of L3 nodes and interfaces to L1 nodes and ports:

1. From the Expert Mode, navigate to `/wae:wae/nimos` and click the **I3-I1-mappings** tab.
2. Click the plus (+) sign, enter an arbitrary name for the L3-L1 mapping group, and click **Add**.
3. Click the **I3-I1-mapping** tab and click the plus (+) sign to enter each mapping. Repeat this step to enter all L3-L1 mappings.
4. Click the **Commit** button.

If using the WAE CLI (in config mode), enter:

```
wae@ncs(config)# wae nimos l3-l1-mappings l3-l1-mappings <mapping_name> l3-l1-mapping
<l3_node> <l3_interface> <l1_node> <l1_interface>
wae@ncs(config)# networks network <ml_network> optical-nimo optical-agents [<agent_name>]
advanced use-configured-l3-l1-mapping true l3-l1-mapping <mapping_name>
wae@ncs(config-networks-<ml_network_name>)# commit
```

Example using values:

```
# wae nimos l3-l1-mappings l3-l1-mappings bgl-phys
l3-l1-mapping Samurai-1 TenGigE0/0/1/0 SItel_IP40 OCH_PORT:Unit-2/81
!
l3-l1-mapping Samurai-1 TenGigE0/0/1/1 SItel_IP40 OCH_PORT:Unit-2/79
# commit
```

## Configure the Optical Plug-In

The optical plug-in enables collection of optical information in the network. The configuration file for the optical plug-in needs to be updated with the correct credentials and seed Layer 1 node. The optical plug-in initiates the connection to the seed node to retrieve the optical network details.



**Note** HTTPS support can be activated in the **config/profile.properties** file by setting `https` and removing `http` on the following key: `# HTTP` instead `HTTPS` `Profile spring.profiles.active=dwdm,https`. The **config/spring-jetty.xml** file contains the configuration profile for `https`. The port on which the `restconf` requests can be sent to the plugin should be configured here.

### Step 1

From the CLI, edit and save the

`<wae-installation-directory>/packages/optical-ctc-plugin/config/optical-ctc-plugin.properties` file with the following information:

- **network.id**—Optical network name. It must be entered as `<optical_network_name>:network`; for example, `cisco:network`.
- **network.nodes.vendor**—Node vendor.
- **restconf.http.port** and **restconf.https.port**—The port number where the L1 network is running. By default WAE sends requests to `http` port 9000 and `https` port 8445 to collect and deploy information to the optical network.
- **network.discovery.start.node**—The Layer 1 IP address of the discovery seed node.
- **network.discovery.start.node.login**—The ID to log in to the seed node.
- **network.discovery.start.node.password**—The password to access the seed node. For added security, the credentials can be entered as device credentials (create authgroups) in WAE and then selected during optical agent configuration.

- **network.discovery.inactivity.period**—Time (in milliseconds) in which the discovery times out if there is no access to the network.

**Note** This information is also needed later when configuring the multi-layer collection (optical-nimo).

**Step 2** Run the optical plug-in script:

```
# ./run.sh
```

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### Example

Optical plug-in configuration file example:

```
network.id=cisco:network
network.nodes.vendor=cisco

restconf.http.port=9000

network.discovery.start.node=10.89.204.17
network.discovery.start.node.login=CISCO15
network.discovery.start.node.password=pwdcisco+11
network.discovery.inactivity.period=5000
```

## Configure Multi-Layer Collection

In this task, you will do the following

- Configure an L3 and L1 network model. Do not run these collections until the aggregator configuration is complete.
- Select, configure, and run the optical agent.
- Configure the aggregator to consolidate L3 and L1 collections in a final network model.
- Run L3 and L1 collections.
- Confirm that L3 and L1 collections are consolidated in the final network model.

### Before you begin

Confirm that you have completed all the preliminary tasks in [Multi-Layer Collection Workflow, on page 2](#).

**Step 1** Configure, but do not run collection, an L3 IGP topology network model with the following interface options set to **true**:

- lag
- get-physical-ports

**Note** For more information, see [IGP Topology Collection](#).

**Step 2** Navigate to `/wae:wae/agents` and click **optical-agents**.

**Step 3** Click Add (+) and enter an agent name.

**Step 4** Select **Cisco** from the agent-type drop-down list.

**Step 5** Click **cisco-optical-agent** and click the **optical-plugin-config** tab.

**Note** The optical agent name must match the "network.id" that was configured in the optical plug-in configuration file. See [Configure the Optical Plug-In, on page 3](#).

**Step 6** Enter the following values:

This information was configured in the optical plug-in configuration file.

- **optical-plugin-ip**—Enter the IP address of where the optical plug-in is installed.
- **optical-plugin-port**—Enter the http or https port where the optical plug-in is running.
- **optical-plugin-protocol**—Select http or https.
- **seed-node**—Enter the seed node IP address.
- **seed-node-access**—Select the appropriate access group.

**Note** Click the **advanced** tab for more options such as number and interval length of retries, data recording (if net-recorder is set to record, the file will be saved in the directory where net-record-file is set), and connection timeout settings.

**Step 7** Click the **Commit** button.

**Step 8** If you plan to utilize Lambda ID mapping (where you can set whether channel ID, central frequency, or wavelength will be mapped to the lambda ID), then you must load the Lambda ID configuration file. Enter the following command:

```
# ncs_load -lmj /wae/agents/optical-agents/optical-agent <agent-name>/lambda-mappings
```

**Step 9** Navigate to the **cisco-optical-agent** tab, and click **run-optical-collection** > **Invoke run-optical-collection**.

**Step 10** Create an L1 optical collection network model:

- Navigate to **/wae:networks**.
- Click the plus (+) sign and enter the L1 network model name used in. We recommend a unique name that contains the source network and NIMO names; for example, networkABC\_L1.
- Click **Add**.
- Click the **nimo** tab.
- From the **Choice - nimo-type** drop-down list, choose **optical-nimo**.
- Click **optical-nimo** and enter the following information:
  - **source-network**—Choose the applicable network model that contains topology information collected using one of the topology NIMOs.
  - **network-access**—Choose a network access group that was previously configured.

**Step 11** Click the **optical-agents** tab and add any agents that were created.

**Step 12** Click the **advanced** tab to configure any of the following:

- **cfg-parse-agent**—Choose the configuration parse agent name if it was used for L1-L3 mapping.
- **lag**—Choose true if using the configuration parse agent.
- **lmp**—Choose true if using the configuration parse agent.
- **retain-amplifiers**—Choose true if you want to include amplifiers as part of the collection.
- **map-lambdas**—If set to true, a user table is created that displays the lambda mapping values (lambda ID, channel ID, central frequency, and wavelength). These values can then be pulled and displayed in WAE Design. Cisco recommends to set this value to true when collecting information from a network with L1 links supporting 96 channels.

- **map-lambda-id-to**—Set whether channel ID, central frequency, or wavelength will be mapped to the Lambda ID. When the plan file is imported, this is the field that WAE Design will display in the L1 Circuit Paths table.
- **use-configured-l3-l1-mapping**—Choose true if you manually configured the l3-l1 mapping (see [Configure L3-L1 Mapping Information, on page 2](#)). Choose false if you are running the configuration parsing agent.
- **l3-l1-mapping**—Choose the l3-l1 mapping group that you configured earlier. If you are running the configuration parsing agent, do not choose anything.

**Step 13** Click the **Commit** button.

**Step 14** Configure the aggregator to consolidate the L1 and L3 network models you just created. See example for aggregator rules to pick the data from proper source network. To view a CLI configuration example of the rest of this procedure, see [Aggregator and Multi-Layer Collection CLI Configuration Example](#).

- Create an empty network. This will be the final consolidated network model. From the Expert Mode, navigate to **/wae:networks**, click the plus (+) sign, and enter a final network model name. For example, networkABC\_L3L1. Also, if you are deploying, choose the aggregator NIMO and add sources.
- Navigate to **/wae:wae/components/dare:aggregators/aggregator** tab.
- Click the plus (+) sign and select the multilayer network (networkABC\_L3L1) you just created from the destination drop-down list.
- From the sources tab, click **source**, and add the L1 and L3 network models you want to combine the collections from.
- Click **Commit**.

**Step 15** Run the L3 collection.

- Navigate to **/wae:networks/network/<network-name> nimo/topo-igp-nimo**.
- From the topo-igp-nimo tab, click **run-collection**.

**Step 16** Run the L1 collection.

- Navigate to **/wae:networks/network/<network-name> nimo/optical-nimo**.
- From the optical-nimo tab, select the L1 source network and click **build-optical-topology**.

**Step 17** To verify that the merge was successful, you can open the network from WAE Design (**File > Open from > WAE Automation Server** and select the final network model).

### Example

The following is an example of the aggregator rules (from WAE CLI):

```
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/area source-ownership source [not(../ml-collected)]
source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/area source-ownership source [../ml-collected] source
l1-source operation collect_deploy
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/igp-metric source-ownership source
[not(../ml-collected)] source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/igp-metric source-ownership source [../ml-collected]
source l1-source operation collect_deploy
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/ip-addresses/ip-address/ip-address source-ownership
source [not(../ml-collected)] source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
```

```

model/nodes/node/interfaces/interface/ip-addresses/ip-address/ip-address source-ownership
source [../ml-collected] source l1-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/ip-addresses/ip-address/prefix-length source-ownership
source [not(../ml-collected)] source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/ip-addresses/ip-address/prefix-length source-ownership
source [../ml-collected] source l1-source operation collect_deploy
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/isis-level source-ownership source
[not(../ml-collected)] source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/isis-level source-ownership source [../ml-collected]
source l1-source operation collect_deploy
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/name source-ownership source [not(../ml-collected)]
source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/interfaces/interface/name source-ownership source [../ml-collected] source
l1-source operation collect_deploy
networks network final-network nimo aggregator rules rule
model/nodes/node/ports/port/interface/interface-name source-ownership source
[not(../..//l1-port/l1-port-name)] source l3-source operation collect_only
networks network final-network nimo aggregator rules rule
model/nodes/node/ports/port/interface/interface-name source-ownership source
[../..//l1-port/l1-port-name] source l1-source operation collect_deploy

```

where `final-network` is the final network, `l1-source` is the optical-nimo network and `l3-source` is the topo-igp-nimo network. Note that the above rules for interfaces are based on the custom `ml-collected` field populated only by optical nimo. These rules are applicable only when you've only two source networks for aggregator (topo-igp-nimo network and optical-nimo network). For more information on rules, contact your Cisco WAE representative.

### What to do next

You can open the plan file and view L1 and L3 topology in WAE Design.

