



Configuring Multi-Layer Network Collection

Multi-layer (L1 and L3) network collection is an advanced collection configuration. This section describes how to configure inventory, topology, and traffic collection from a multi-layer network. After installing the multi-layer package, you are able to collect and model the following information:

- Topology from DWDM networks that support Generalized Multiprotocol Label Switching (GMPLS) with non-User Network Interface (UNI) circuits
- Dynamic L1 circuit paths
- Unprotected and restorable paths
- Actual L1 circuit path hops
- Feasibility metrics and limit
- Inactive L1 links

After collection, the network model (plan file) is placed in the Design Archive. You can open the plan file and view L1 and L3 topology in WAE Design. For more information, see “Layer 1 Simulation” in the [Cisco WAE Design User Guide](#).

Prerequisites

- Obtain the YANG runtime software from your Cisco WAE representative before proceeding with multi-layer configuration. The YANG runtime software is required to collect data from the optical network.
- Confirm that all system requirements for multi-layer collection have been met with a Cisco WAE representative.
- Confirm that the `redhat-lsb-core` and `perl-Params-Check` packages are installed. If you do not have the packages, install them. For example, on CentOS:

```
$ sudo yum install -y redhat-lsb-core
$ sudo yum install -y perl-Params-Check
```

- Confirm you have the seed node credentials for discovery.
- Create an authentication file by running the `mate_auth_init` CLI tool. After the authentication file (`auth.enc`) is created, add the following lines to the file (using tabs, not spaces):

```
<AuthServerGroup>
    AuthServerGroupName      Username      Password
    ncs      admin      admin
```

For more information on using the `mate_auth_init` tool, see [Network Authentication](#).

Multi-Layer Configuration Workflow

The following steps describe the high-level workflow of multi-layer collection configuration.

-
- Step 1** [Download and Install the Multi-Layer \(ML\) Package](#)
 - Step 2** [Start Multi-Layer Services](#)
 - Step 3** [Configure Layer 1 Collection](#)
 - Step 4** [Configure L3 Collection and Merge L1 Information in Snapshot](#)
 - Step 5** (Optional) [Collect from Multiple Networks](#)

This step can be repeated depending on the number of L1 networks that need collection.

Download and Install the Multi-Layer (ML) Package

Confirm you have met all the requirements documented in the [Prerequisites](#) section.

The package installs necessary components used for multi-layer collection. See [Table 6-1](#) for a list of services and associated command options that are installed. See [Table 6-2](#) to see where all the components are installed.

-
- Step 1** Log into the Planning Server with the username and password used during the WAE Planning Software installation. The default user is **wae** and the password is **ciscowae**.
 - Step 2** Go to the software download center where you obtained the WAE Planning Software. From there, download the WAE Optical Plug-in package `<wae-ml-collector-xxxxxx-x86_64.bin>`.
 - Step 3** Run the following commands:

```
$ source /etc/profile.d/mate.sh
$ sh <ML_package> -nso-install <nso_install_dir> -nso-run <nso-run directory> -wae-home
<wae-design installed directory>
```

For example:

```
$ source /etc/profile.d/mate.sh
$ sh wae-ml-collector-6.4.0-Linux-x86_64.bin -nso-run /opt/ncs-run -nso-install
/opt/ncs-wae-home /opt/cariden/software
```

Table 6-1 Multi-Layer Package Contents

Service	Description
wae-ml	<p>The <code>wae-ml</code> service performs the following actions:</p> <ul style="list-style-type: none"> <code>start</code>—Starts multi-layer services. <code>stop</code>—Stops multi-layer services. <code>status</code>—Lists status of all multi-layer services. <code>restart</code>—Restarts multi-layer services. <code>reload</code>—Reloads multi-layer packages. <code>cli</code>—Starts the service console.
wae-optical wae-optical-n	<p>The <code>wae-optical</code> service performs the following actions:</p> <ul style="list-style-type: none"> <code>start</code>—Starts the plug-in instance. <code>stop</code>—Stops the plug-in instance. <code>status</code>—Checks the status of the plug-in instance. <code>restart</code>—Restarts the optical plug-in instance. <code>create</code>—Creates another optical plug-in instance under <code>\$WAE_HOME</code>. You need to create additional optical plug-in instances when collecting multi-layer information from multiple networks. The new instance will have its own service name as follows: <code>wae-optical-1</code>, <code>wae-optical-2</code>, and so on. See Collect from Multiple Networks for more information. <code>list</code>—Lists all optical plug-in instances. <code>delete</code>—Deletes the indicated optical plug-in instance. <p>Note The first optical plug-in instance cannot be deleted.</p>

Table 6-2 Directory Structure

Component	Location
Optical plug-in	WAE_HOME
Documentation	WAE_HOME/docs/wae-ml/
Controller and service scripts	WAE_ROOT/bin

Start Multi-Layer Services

Step 1 Edit and save the `$WAE_HOME/optical-plugin/config/ctc-connectors-domain.properties` file with the following information:

- `network.id`—Optical network name. For example, `cisco:network`
- `network.nodes.vendor`—Node vendor.
- `network.discovery.start.node`—The IP address of the discovery seed node.
- `network.discovery.start.node`—The ID to log into the seed node.
- `network.discovery.start.node.password`—The password to access the seed node.

- `network.discovery.inactivity.period`—Time in milliseconds which the discovery will time out if there is no access to the network.

Step 2 Start the ML services:

```
$ wae-ml start
```

Step 3 Confirm that the services are running:

```
$ wae-ml status
```

Configure Layer 1 Collection

You can start and configure L1 collection using the CLI console.

Step 1 Start the console:

```
$wae-ml cli
```

Step 2 Enter into configuration mode:

```
admin@ncs# config
```

Step 3 Configure the `auth.enc` and `cariden-home` paths using the Network Service Module setting options:

```
admin@ncs(config)# services NsmSettings server cariden-home <${CARIDEN_HOME}>
admin@ncs(config)# services NsmSettings server cariden-auth-file <auth-file-path>
```

For example:

```
admin@ncs(config)# services NsmSettings server cariden-home /home/wae
```

```
admin@ncs(config)# services NsmSettings server cariden-auth-file
/home/wae/.cariden/etc/auth.enc
```

Step 4 Configure the L1Server IP address and optical plug-in port for the network:

```
admin@ncs(config)# services NsmSettings network <network_name> L1Server IPAddress
<system_ip_address> port <optical_plugin_port>
```

For example:

```
admin@ncs(config)# services NsmSettings network NetworkA L1Server IPAddress 172.20.162.101
port 9000
```



Note The default port is 9000 for the first optical plug-in instance. Default for the next additional optical plug-in instances are 9001, 9002, 9003, and so on. To configure the optical plug-in to connect to a different port, edit the line `restconf.http.port=<port_number>` in the `$WAE_HOME/optical-plugin[-<instance_number>]/config/ctc-connectors-restconf.properties` file.

Step 5 Schedule L1 collection:

```
admin@ncs(config)# services NsmSettings network <network_name> schedules schedule
run-l1-collection minutes <interval_for_L1_Collection_in_minutes>
```

For example:

```
admin@ncs(config)# services NsmSettings network NetworkA schedules schedule
run-l1-collection minutes 15
```

Step 6 Commit the collection and exit the console:

```
admin@ncs(config)# commit
admin@ncs(config)# exit
admin@ncs # exit
```

Configure L3 Collection and Merge L1 Information in Snapshot

Step 1 Edit the \$CARIDEN_HOME/etc/snapshot.txt file:

- Enter the appropriate snapshot information, including the following parameters:
 - network
 - unique
 - seed_router
 - igp
 - home_dir
 - cariden_home
- Uncomment the tools for L3 collection. To uncomment a task, remove the # sign. For examples on what type of information to collect, see [Appendix A, “Snapshot Examples”](#).



Note To collect L1-L3 port mapping in non-UNI networks, contact your Cisco representative.

- Uncomment ACCESS_NETCONF. The `access_netconf` tool merges the L1 data with the L3 data.

Step 2 Run the snapshot collection:

```
# cd $CARIDEN_HOME/bin
# ./snapshot -config-file ../etc/snapshot.txt
```

Step 3 Open the plan files using WAE Design. Alternatively, you can collect multi-layer information from additional networks. For more information, see [Collect from Multiple Networks](#).

Collect from Multiple Networks

The following procedure describes how to include additional L1 networks to the multi-layer collection. This procedure assumes that you have already performed a previous collection (as described earlier in this section) and the additional L1 networks are connected to a single L3 network.

Step 1 Create a new instance of an optical-plugin:

```
# wae-optical create
```

Step 2 Configure L1 collection.

Follow the same steps described in [Configure Layer 1 Collection](#), but the network name, L1Server IP address, and port in the new network should refer to the network name IP Address and port of the new optical plug-in instance.

Step 3 Start the new instance of an optical plug-in:

```
# wae-optical-n start
```

For example:

```
# wae-optical-1 start
```

Step 4 Run the `access_netconf` tool with the new network name and old output plan as the input.

For example:

```
# ./access_netconf -network NetworkB -authGroup ncs -action merge_l1_data
-input-plan-file post-NetworkA.txt -output-plan-file post-NetworksAB.txt
```

You can repeat this procedure to merge collections from additional networks.

Exclude Optical Amplifiers from Collection

By default, L1 collection includes amplifier link and node information. You may want to remove optical amplifier information to declutter the topology shown when opening a plan file in WAE Design.

[Figure 6-1](#) and [Figure 6-2](#) show the differences in topology when amplifiers are included and when they are not.

To exclude optical amplifiers from collection, do the following:

Step 1 Start the ML CLI:

```
$wae-ml cli
```

Step 2 Enter into configuration mode:

```
admin@ncs# config
```

Step 3 From the Network Service Module setting options, set the `retain-amplifiers` option to false:

```
admin@ncs(config)# services NsmSettings network <network_name> options retain-amplifiers
false
```

For example:

```
admin@ncs(config)# services NsmSettings network cisco:network options retain-amplifiers
false
```

Step 4 Commit the collection and exit the console:

```
admin@ncs(config)# commit
admin@ncs(config)# exit
```

The next time L1 collection is scheduled, optical amplifier information is not included in the plan file.

Figure 6-1 Topology With Amplifiers

The screenshot shows the WAE Design interface with a network topology. The topology consists of several nodes connected in a line. The nodes are labeled as follows: 49/69/0/7WC1, 49/6068/0/UZ03, 49/7946/0/UZ01, 49/711/10/7WC1, 49/7171/0/UZ07, and 49/731/0/7WC1. The nodes 49/6068/0/UZ03, 49/711/10/7WC1, and 49/731/0/7WC1 are marked with a blue 'X' icon, indicating they are amplifiers. The nodes 49/69/0/7WC1, 49/7946/0/UZ01, and 49/7171/0/UZ07 are marked with a blue square icon, indicating they are ROADMs. The interface also shows a menu bar, a toolbar, and a table of nodes.

Name	Type	Description	Site
1 49/6068/0/UZ03	Amplifier		
2 49/69/0/7WC1	ROADM		
3 49/711/10/7WC1	ROADM		
4 49/7171/0/UZ07	Amplifier		
5 49/731/0/7WC1	ROADM		
6 49/7946/0/UZ01	Amplifier		

Figure 6-2 Topology Without Amplifiers

Name	Type	Description	Site
1 49/69/0/7WC1	ROADM		
2 49/711/10/7WC1	ROADM		
3 49/731/0/7WC1	ROADM		

Set Feasibility Properties for L1 Circuits

The quality of an L1 circuit deteriorates as it passes through L1 links. Using feasibility properties, WAE Design enables you to simulate the weakening of L1 circuits to determine if they have degraded to the point of being unroutable. To set the feasibility limit margin, do the following:

-
- Step 1** Start the console:
- ```
$wae-ml cli
```
- Step 2** Enter into configuration mode:
- ```
admin@ncs# config
```
- Step 3** From the Network Service Module setting options, set the decimal value for the `feasibility-limit-margin`. The default value is 2.5.
- ```
admin@ncs(config)# services NsmSettings network <network_name> options
feasibility-limit-margin <margin_decimal_value>
```



For example:

```
admin@ncs(config)# set services NsmSettings network cisco:network options
feasibility-limit-margin 2.4
```

**Step 4** Commit the collection:

```
admin@ncs(config)# commit
admin@ncs(config)# exit
```

The next time L1 collection is scheduled, the set margin is implemented in the plan file.

---

## Collect Inactive or Failed L1 Circuit Objects

To collect failed L1 nodes or L1 links, do the following:

---

**Step 1** Start the console:

```
$wae-ml cli
```

**Step 2** Enter into configuration mode:

```
admin@ncs# config
```

**Step 3** From the Network Service Module setting options, set the `compute-inactive-links` option to true:

```
admin@ncs(config)# services NsmSettings network <network_name> options
compute-inactive-links true
```

For example:

```
admin@ncs(config)# services NsmSettings network cisco:network options
impute-inactive-links true
```

**Step 4** Commit the collection:

```
admin@ncs(config)# commit
admin@ncs(config)# exit
```

The next time L1 collection is scheduled, failed L1 links and L1 nodes are included in the plan file.

---

■ Collect Inactive or Failed L1 Circuit Objects