Installing Management Node Remotely

This chapter contains the following topics:

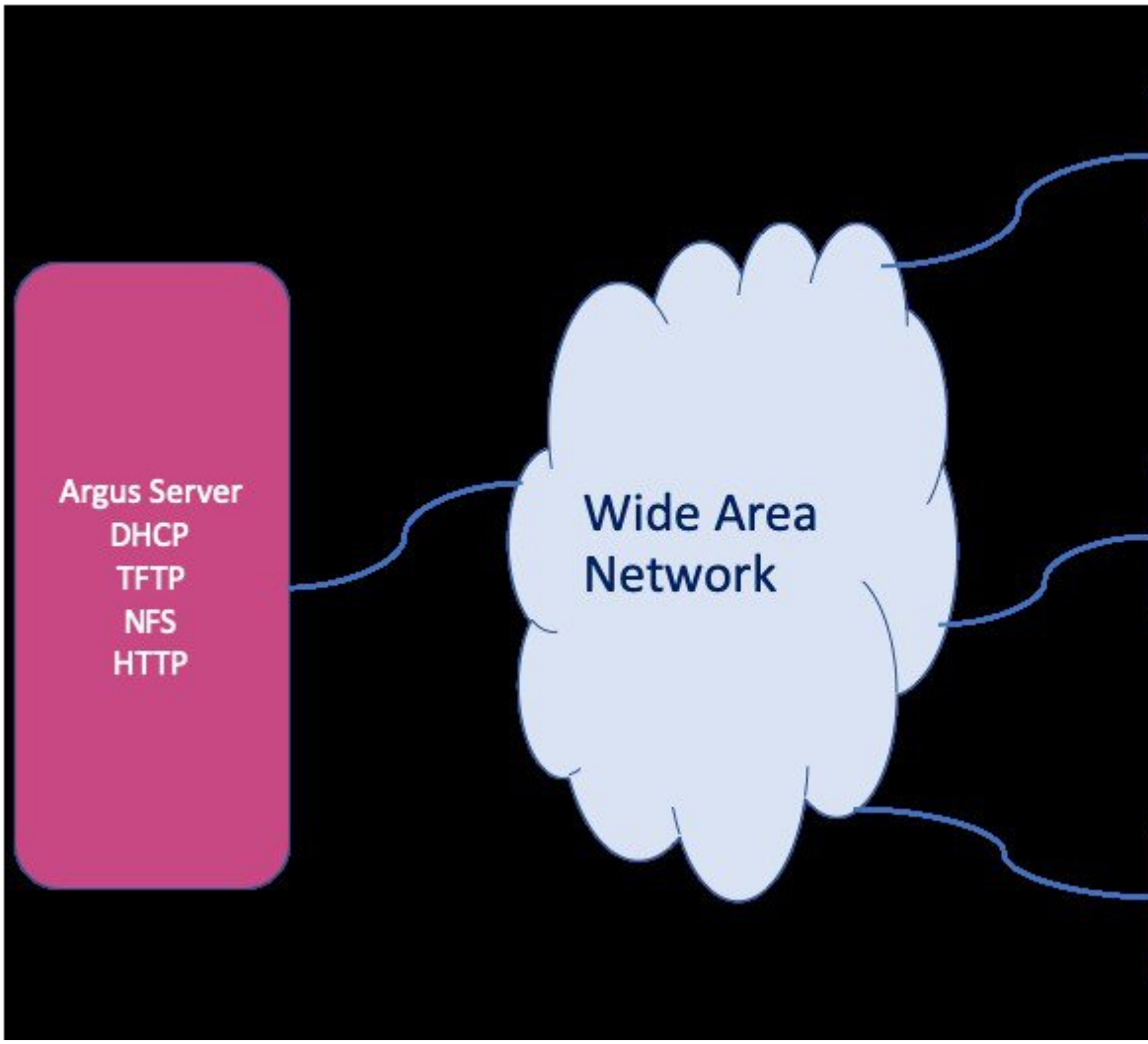
Overview to Installation of Management Node Remotely

The goal of CISCO VIM is to fully automate the installation operation of the cloud. In versions prior to CISCO VIM 3.4.0, the management node installation was always manual, as the bootstrap of the cloud happens from there. In CISCO VIM 3.4.0, an additional step of automating the management node installation is done as technical preview. The management node called as "Cisco VIM Baremetal Manager" is automatically installed over a layer 3 network to accelerate the CISCO VIM installation process.

Note In this chapter, the term Cisco VIM Baremetal Manager and Remote Install of Management Node (RIMN) are used interchangeably.

RIMN Architecture

The high-level Architecture of RIMN software is deployed on the RIMN deployment node from where one or more management nodes are installed. Cisco VIM Baremetal Manager/RIMN supports remote installation of servers across WAN (or LAN) with either IPv4 or IPv6 connectivity. Cisco VIM Baremetal Manager can be installed on the Cisco VIM Baremetal Manager Deployment node by using air-gapped installation. Once RIMN software is installed on its management node, the user will define an input file for bare-metal config (in YAML format) and use Cisco VIM Baremetal Manager CLI or Rest-API to deploy the user- specified ISO into target platform (as depicted in the Figure below):



RIMN solution is built based on the interaction of several components as depicted below:

- Rest-API & CLI: Pushes the received input data into Etcd datastore.
- Etcd datastore: Stores any stateful data related to sites, jobs, and flavor/policies used in the deployment.
- Agent: Golang based services that installs the servers based on user config, and includes a controller + multiple services (TFTP, DHCP, HTTP, NFS)

Cisco VIM Baremetal Manager software is designed to be stateful, micro-service based, and easy to use.

Hardware Requirements for RIMN

RIMN/Cisco VIM Baremetal Manager solution consists of two hardware components:

1. Cisco VIM Baremetal Manager deployment server. Cisco VIM Baremetal Manager service is deployed on the deployment server. Cisco VIM Baremetal Manager can be deployed on standard CISCO VIM Management node BOM, which is based on UCS-C or Quanta hardware.
2. Servers to be deployed. These are actual hardware to pxe-boot, install & configure, which can include a number of clusters and a number of servers in each cluster. CISCO VIM Management node BOM (UCS-C M5, M4 and/or Quanta servers) are supported target servers. Supported firmware versions are Major = 4.0 and Minor >= 1a.

From a component point of view, a typical CISCO VIM Management node BOM includes:

- 8, 16 or 24 1.2 TB Hard disks are required to install the OS
- Intel 1G NIC (br_api) for PXE and 10/25/40G VIC or Intel NIC (for br_mgmt) NICs to support configuration of multiple bridges, and other minimum requirements to satisfy the server workload.
- API availability for remote server management:
  - Quanta: Redfish
  - UCS-C: Redfish + UCS-C XML-API
- Enabled pxeboot in UEFI mode for NIC chosen (1g intel NIC: br_api) for the target servers

Network Infrastructure Requirements for RIMN

To install RIMN/Cisco VIM Baremetal Manager pxe-boots target nodes over layer 2 or layer 3 network, certain conditions need to be met for the solution feasibility:

- The Cisco VIM Baremetal Manager server need to have access for the Remote management API interface (Redfish for Quanta, Redfish + XML-API for UCS-C) of the target nodes.
- The Cisco VIM Baremetal Manager server services (agent, including agent, tftp, dhcp, http, nfs ports) need to be reachable over a layer 2 or layer 3, IPv4 and IPv6 network from the target nodes.
- For layer 3 based installation, DHCP forwarder needs to be configured in the intermediate routing infrastructure, so that the installed nodes can DHCP query the Cisco VIM Baremetal Manager server from its own network across WAN.
- For Edge deployment across WAN, DHCP Helper is configured on the network Gateway of management node API network to point out the Cisco VIM Baremetal Manager Agent IP for DHCP server.
- WAN latencies for less than 500 milli-second needs a successful install within a reasonable time period (< 30 mins). The higher the latency, the slower the installation and chances for installation failure.

Below are examples of topology deployed with Cisco VIM Baremetal Manager on bare-metal servers over Layer 2 and Layer 3 networks respectively.

1. Target Server connected to RIMN over Layer 2 and IPv4 networking

   Here, the Cisco VIM Baremetal Manager server with agent running on br_mgmt using address 172.29.86.61 is pxe-booting 2 worker nodes on VLAN 887 on ip-address 172.29.86.151 and 172.29.86.152.

2. Here, the Cisco VIM Baremetal Managerserver with agent running on br_mgmt on address is pxe-booting 2 remote worker nodes on VLAN 123 and VLAN124 across WAN. Notice DHCP forwarder is configured on VLAN 123 and 124 to forward DHCP request to the Cisco VIM Baremetal Manager server IP.

In either case 1 or 2, a port channel configured for installed server pxe-boot interface (eg. po18 on case 1) look like:

```
interface port-channel18
switchport access vlan 887
spanning-tree port type edge
no lacp suspend-individual
vpc 18
```

Also, it should be noted that the following Network Ports are open on the Cisco VIM Baremetal Manager Deployment Server:

Interface	Type	Port	Protocol	Application
restapi_interface	TCP	8141	HTTP	Cisco VIM Baremetal Manager REST-API
pxe_interface	TCP	24601	HTTP	Agent Asset Server
pxe_interface.	TCP	2049	NFS	Agent NFS Server
pxe_interface	UDP	67	DHCP4	Agent DHCPserver ipv4
pxe_interface	UDP	547	DHPCP6	Agent DHCP server ipv6
pxe_interface	UDP	69	TFTP	Agent tftp server

High Level Flow for Cisco VIM Baremetal Manager/RIMN

The high level flow for Argus has the following steps:

- Install the Cisco VIM Baremetal Manager management node server with the ISO
- Create the Cisco VIM Baremetal Manager setup data
- Bootstrap the Cisco VIM Baremetal Manager Management Server
- Import target ISO file(s) and fetch the associated flavors
- Create baremetal files with flavor and target server details
- Deploying the Target Servers

Overview to Cisco VIM Baremetal Manager REST API

The following topic explains how to use the Cisco VIM Baremetal Manager REST API to manage RIMN:

Cisco VIM Baremetal Manager provides a Representational State Transfer (REST) API that is used to deploy, expand, and manage RIMN.

Actions performed using the REST APIs are the following:

- Provides a logical grouping of management nodes in form of site, cluster and nodes for better management of nodes globally.

```
site
`-- clusters
|-- cluster_0
|   `-- servers
|       |-- node_0.0
|       | .
|       | .
|       `-- node_0.n
| .
| .
|-- cluster_n
|   `-- servers
|       |-- node_n.0
|       | .
```

```
|        | .
|        `-- node_n.n
```

- Import ISO files for booting Management node.
- Deploy an Cisco VIM Baremetal Manager site, cluster, and node.
- Add cluster to the deployed site.
- Delete cluster from the deployed site
- Add node to the deployed cluster.
- Delete node from a deployed cluster.
- Jobs to track deployment of site, cluster, and node.

The Cisco VIM Baremetal Manager API security is provided by the Secure Sockets Layer (SSL) included on the Apache web server. The Flask-Restplus-based web application runs the Rest API server. The Flask REST API server requires a username and password to authorize the REST API server requests. Apache handles the authorization process, which authorizes the request to access the Flask web application. You can access API server on the br_api interface on port 8141. Authentication is enabled by default in the web service.

You can access the API end points of a version (v1 now) using the following URL format: https://<management_node_api_ip>:8141/v1

By default, basic authentication is enabled for the API endpoints in the management node. You can find the authentication credentials in the following file in the management node:

```
/opt/cisco/argus/rest_api/client_config.json
```

The following code shows a sample client_config.json file.

```
{
"REST_API_URL": "http://172.22.191.134:5001",
"REST_API_USERNAME": "admin",
"REST_API_PASSWORD": "8675d63674ff686e8688",
"PODTYPE": "rmi"
}
```

API Resources

Cisco VIM Baremetal Manager REST API is a Flask-Restplus-based web application, which comes with Swagger integration. Swagger is built around OpenAPI Specification that helps to design, build, document, and consume REST-APIs.

The REST-API resources along with their expected payloads and responses have been documented by Swagger. Here is the view of Cisco VIM Baremetal Manager REST-API.

Installing Cisco VIM Baremetal Manager Management Node On a UCS C-series Server

The steps to install an Cisco VIM Baremetal Manager management node are similar to the steps in Installing Management Node on UCS C-series (M4/M5).

For installation of Cisco VIM Baremetal Manager management node, do the following changes:

1. In Step 11, choose the option to configure the server as a CVIM Baremetal node (Option 5).
2. Management (br_mgmt) interface has to be routable as it serves host to Cisco VIM Baremetal Manager Agent. The API (br_api) interface rout-ability depends upon user's choice. If the intention is to expose Cisco VIM Baremetal Manager REST API externally, br_api has to be routable else not.

Note The default gateway in Cisco VIM Baremetal manager management node is through br_mgmt, and not through br_api.

In the subsequent prompts, you can enter information such as the hostname, IPv4 or IPv6 addresses for br_api and br_mgmt interfaces, and gateway addresses (make sure you stick to above mentioned point: 2 while providing inputs), as per the Installing Management Node on UCS C-series (M4/M5) procedure.

The node is installed with RHEL 7.4 with the following modifications:

- Security_Enhanced Linux (SELinux) is enabled on the management node for security.
- The Cisco VIM Baremetal code consists of packages with installer code. After provisioning the server with ISO, the installer code is placed in the following path:

  ```
  /root/cvim_bm-<tag>
  ```

Installing Cisco VIM Baremetal Manager Management Node On Quanta Servers

For Quanta-based system, the CDC management node is used as the Cisco VIM Baremetal manager management node. Please leave the settings in the quanta to its default.

The bootstrap procedure on the management node sets up Cisco VIM Baremetal manager/RIMN with its components REST API, CLI, Agent, and ETCD along with the needed data containers. It prepares the Cisco VIM Baremetal manager server for the actual site deployment.

Preparing the Argus Management Node in an Air-gapped Install

If the Argus management node does not have Internet access, use the prepared USB stick and complete the following steps:

Refer to Preparing to Install Cisco NFVI on Management Nodes Without Internet Access, to prepare the USB stick with the Argus artifacts.

Note The only change is in the 'getartifacts' command is that --argus needs to be added.

Step 1 1. Insert the USB stick into the management node drive after it has been installed with buildnode.iso with the CISCO VIM Baremetal option.

Step 2 2. Run the import_artifacts.sh script to copy all artifacts onto the management node, for example:

```
# cd ~/Cisco VIM_bm-<tag_id>/tools
# ./import_artifacts.sh
```

The installation artifacts are copied to /var/cisco/artifacts/ on the management node. Once the artifacts are available in the management node, the steps to set up the Argus server is irrespective of the install mode (connected or disconnected).

Preparing the Cisco VIM Baremetal Manager Management Node from Cisco VIM Software Hub Server

When you want to install the Cisco VIM Baremetal Manager node using the artifacts obtained from the Cisco VIM Software Hub server, you need to provide an additional parameter in setup_data.yaml. Ensure that the release artifacts are pre-installed on the Cisco VIM Software Hub server and that the setup_data.yaml file is populated with the pod details. Provide the registry FQDN name to enable installation through Cisco VIM Software Hub. For example, your.domain.com.

```
REGISTRY_NAME: '<registry_name>' # Mandatory Parameter.
```

Cisco VIM Baremetal Manager node's setup_data.yaml requires the REGISTRY_USERNAME and REGISTRY_PASSWORD to connect to the docker registry and fetch docker images. To fetch the docker images from Cisco VIM Software Hub node, provide the user credentials available in the SDS_READ_ONLY_USERS section of sds_setup_data.yaml. The details of an admin user with read/write access to docker registry are provided in SDS_REGISTRY_USERNAME and SDS_REGISTRY_PASSWORD field. So, it is recommended to have a read-only user on Cisco VIM pod.

Creation OF RIMN Setup Data.yaml

```
# cd Cisco VIM_bm-<tag-id>

# cp openstack-configs/setup_data.yaml.Argus.EXAMPLE /root/openstack-configs/setup_data.yaml
```

Users are required to make changes to this example format as per their pod and use case. Argus also supports Cisco VIM Software hub (SDS) based install. The setup data of Argus has multiple sections; listed below are the snippets of the common section of the Argus setup_data.yaml

```
setup_data.yaml
#**********   ARGUS SETUP CONFIGURATIONS   ***********#
-------------------------------------------------------------------------------------------------

# User Defined Configuration File
# Information in this file is specific to the user setup


#             REGISTRY CREDENTIALS                    #
-------------------------------------------------------------------------------------------------

# Mandatory parameters
REGISTRY_USERNAME: '<username>'
REGISTRY_PASSWORD: '<password>'

# Mandatory Parameter when SDS is enabled.
# Not required when SDS is not enabled.
# Example registry FQDN name [your.domain.com]
REGISTRY_NAME: '<registry_name>'

#              INSTALLATION MODE                      #
-------------------------------------------------------------------------------------------------
```

```
# Optional parameter; default is connected
INSTALL_MODE: connected/disconnected

#               POD INFORMATION                       #
-------------------------------------------------------------------------------------------

# Mandatory parameter
PODTYPE: 'rmi'

#             NETWORKING INFORMATION                  #
-------------------------------------------------------------------------------------------

# Optional, default is v4.
DHCP_MODE: 'v4/v6'

# Optional, needed if the pod is behind a proxy
# Name of the proxy server without 'https://'
# Not required for INSTALL_MODE: disconnected
https_proxy_server: '<proxy.domain.com:8080>'
-------------------------------------------------------------------------------------------
```

Setting up RIMN/Cisco VIM Baremetal Manager Server

The first step is to set up the Cisco VIM Baremetal Manager management server infrastructure including the REST-API and CLI

```
# cd ~/Cisco VIM_bm-<tag-id>;

# ./argus/argus_runner.py --list

** ARGUS **
* CISCO'S BAREMETAL ORCHESTRATOR *
==================================
+--------------------+--------------+
| Operations         | Operation ID |
+--------------------+--------------+
| INPUT_VALIDATION   | 1            |
| BOOTSTRAP_INFRA    | 2            |
+--------------------+--------------+

# ./argus/argus_runner.py -p 1,2
```

Perform steps ['1']. Continue (Y/N) y

Step 1 Perform hardware validations to check if deployment node is Cisco compliant BOM and validations on user passed setup_data.yaml.

Step 2 Run Ansible playbooks and deploy docker containers namely argus_rest_api_<tag-id>, argus_agent_<tag_id>, argus_etcd_<tag_id>, CISCO VIM data containers and install a CLI to Argus Baremetal REST-API.

Deploying the Target Servers over Layer-2/Layer-3

Post Cisco VIM Baremetal Manager/RIMN server installation, the deployment of remote server(s) can happen

Cisco VIM Baremetal Manager CLI Helper:

```
# argus -h
       usage: argus [-h] [--json] [--debug] <subcommand> ...

       Command-line interface to the Argus Baremetal Installer
```

```
       positional arguments:
         <subcommand>
           baremetal   Perform baremetal operations
           job         Perform job operations
           flavor      Perform flavor operations
           iso         Perform ISO operations

       optional arguments:
            -h, --help    show this help message and exit
            --json        Get output in json format
            --debug       Print debugging output
```

Import ISO(s) to Argus:

The user needs to download the Cisco-provided ISO file to the Argus management node before starting the server(s) deployment. The ISO file creates a unique flavor for Cisco VIM Baremetal Manager Agent which is then used to decide the base of networking, boot, and OS for new servers.

```
# argus iso -h
usage: argus iso [-h] -a action [-f config_file] [-n name]

optional arguments:
  -h, --help      show this help message and exit
  -a action       list    - List all ISOs
                  show    - Show ISO details
                  import  - Import an ISO on the management node
                  delete  - Delete ISO
  -f config_file  Path of an ISO file
  -n name         ISO name
# argus iso -a import -f buildnode-internal-18173.iso -n rakuten-iso
       +--------+--------+
       | Action | Status |
       +--------+--------+
       | Import | PASS   |
       +--------+--------+
```

The above command can be used multiple times to import different ISO files. Verify the ISO and the corresponding flavor via:

```
# argus iso -a list
List of Isos:
+--------+--------------+
| SL.NO. |     Isos     |
+--------+--------------+
| 1      | rakuten-iso  |
+--------+--------------+
# argus iso -a show -n master_20928


ISO Details:
+-----------------------------+--------------------+
|          File Name          |       Flavor       |
+-----------------------------+--------------------+
| buildnode-internal-18173.iso | rakuten-iso-18173  |
+-----------------------------+--------------------+
```

The ISO import creates flavors that define the nature of the server. A flavor is specifically tied to the ISO file imported. You can verify the flavors that are created from the ISO import operations explained above:

```
# argus flavor -a list
List of Flavors:
+--------+--------------------+
| SL.NO. |     Flavors        |
```

```
+--------+--------------------+
| 1      | rakuten-iso-18173  |
+--------+--------------------+

[root@argus-mgmt ~]# argus flavor -a show -n rakuten-iso-18173

Flavor Details:
+------------------+------------------+----------------+--------------+-----------------+-----------+
|        Name      |      Workflow    |  OS Policies   | Disk Policies | Network Policies
 | Boot Mode |
+------------------+------------------+----------------+--------------+-----------------+-----------+
| rakuten-iso-18173 | rakuten-iso-18173 | huge-pages-1g   |   disk-sriov  |    management
   |    uefi   |
|                  |                  |                |              |       api
   |           |
+------------------+------------------+----------------+--------------+-----------------+-----------+
```

The above-mentioned created flavor(s) should be used in the site/cluster/node config during server deployment

```
* Flavor can be defined either in common or server level, as a single flavor can be used
with multiple severs
 clusters:
  ...
  servers:
     - name: server-1
       flavor: rakuten-iso-18173
  [OR]
  common_info:
    flavor: rakuten-iso-18173
```

Deploy the site:

To help deploy the target nodes, the next step is to create the site configuration data file. To deploy the site, execute the following:

```
# cp openstack-configs/argus_baremetal.EXAMPLE   /root/argus_baremetal.yaml
```

Listed below is an example of the Cisco VIM Baremetal Managersite config data to deploy the target server. Users are required to make changes to this example format as per their use case:

Cisco VIM Baremetal Manager Site config:

```
# Cisco VIM Baremetal Manager CONFIGURATIONS:
#*******************************
# User defined Baremetal configuration file, information specific to user setup

# Structure: Logical grouping of nodes to form clusters and similar grouping of
# clusters to form a site.


# REQUIREMENTS AND CRITERIAS:
#****************************

# Some validations for critical keys have been listed here:
##-------------------------------------------------------------------------
## 1. oob_password: CIMC PASSWORD                                          |
##-------------------------------------------------------------------------
## Passwords should satisfy at least 3 of the following conditions:
##     a. at least 1 letter between a to z
##     b. at least 1 letter between A to Z
##     c. at least 1 number between 0 to 9
##     d. at least 1 character from !$@%^-_+=
## AND
##     e. No space allowed
```

```
##     f. 8<= Length <=20


## 2. name: RESOURCE NAME (SITE/CLUSTER/NODE)                          |
##-----------------------------------------------------------------------
## Resource names should satisfy following criteria:
##     a. Required
##     b. Unique
##     c. ASCII chars
##     d. No space allowed
##     e. 1 <= Length <=32


## 3. info: RESOURCE INFORMATION (SITE/CLUSTER)                        |
##-----------------------------------------------------------------------
## Resource info keys should satisfy the following criteria:
##     a. Required
##     b. ASCII chars
##     c. 1 <= Length <=50


## 4. boot_network: SERVER'S BOOT NETWORK                              |
##-----------------------------------------------------------------------
## Server's boot network holds following criteria:
##     a. Optional, defaults to:
##        -> management_*_v4: if Agent running on DHCP_MODE: v4
##        -> management_*_v6: if v6 management interface defined in
##                            server's ip_address section and Agent
##                            running on DHCP_MODE: v6
##     b. Should follow <api|management>_*_<v4|v6> pattern
##
##  * - Interface Representation Number
## 5. ip_address: SERVER'S NETWORKING INTERFACES AND CONFIGS           |
##-----------------------------------------------------------------------
## Networking Interface(s) dictionary of the server to be deployed
## Dict should satisfy the following criteria:
##     a. Pattern of Keys:
##        # Should follow <api|management>_*_<v4|v6> OR
##                        <api|management>_*_gateway_<v4|v6> pattern
##        # Representation number: * of all interfaces should match
##
##     b. Mandatory Keys:
##        -> api_*_v4, api_*_gateway_v4
##        -> management_*_v4
##
##     c. Optional Keys:
##        -> management_*_gateway_v4
##        # Any 1 of the below 4 keys defined, makes others mandatory
##        -> api_*_v6, api_*_gateway_v4
##        -> management_*_v6, management_*_gateway_v6
##
##     d. Interfaces:
##        # Different interfaces should NOT share a common network
##        # Interfaces should be in valid v4 or v6 CIDR format
##        -> api_*_v4, api_*_v6
##        -> management_*_v4, management_*_v6
##
##     e. Gateways:
##        # Gateways should have a valid v4 or v6 IP
##        # IP should be in the respective interface network
##        -> api_*_gateway_v4, api_*_gateway_v6
##        -> management_*_gateway_v4, management_*_gateway_v6
##
##  -> No duplicate values allowed
```

```
##
##  * - Interface Representation Number                                |
## ---------------------------------------------------------------------

## Representation number: The one which defines an interface's uniqueness
##         ( * )          Eg. '2' in case of api_2_v4
## ---------------------------------------------------------------------


# SECTION 1. SITE INFORMATION AND COMMON CONFIGS:
#***********************************************

name: <overall_site_name>
info: <site_description>


common_info:
    # Required, common username for multiple CIMC's
    # Can be overidden at server level
    oob_username: <oob_username>

    # Required, common password for multiple CIMC's
    # Can be overidden at server level
    oob_password: <oob_password>

    # Required, time zone to be configured for node(s)
    time_zone: <UTC or US/Pacific, etc>

    # Required
    domain_name: <your.domain.com>

    # Required, max of 3
    # Can be overidden in server level
    domain_name_servers:
      - <8.8.8.8>
    # OR
    domain_name_servers: [171.70.168.183, 173.36.131.10]

    # Required
    ntp_servers:
      - <1.pool.ntp.org>
    # OR
    ntp_servers: [ ntp.cisco.com, time.apple.com ]
    # Required, common flavor for each node
    # Forms the base of OS, Boot and Networking
    # Should be created by ISO import previous to the deploy
    # Can be overidden at server level
    flavor: rakuten-iso-18173

    # Required, should start with $6
    # Run python script argus_password_hash.py in Cisco VIM_bm-<tag-id>/tools
    # to generate it from the paintext.
    # Can be overidden at server level
    # Example formatted for readability
    password_hash: $6$RoUqWDqgLdYG9Z8u$LSZ36DAlrJiXH69mUv9ySiXPNJ4aWwKWUZUu/6jg
                   7E0uPK4qoggH0bNDgi7npAG1yL/zeW20cTOTF8mLhSiqa.


    # Required, Public SSH key of Argus management Node
    # Makes SSH into the deployed nodes, passwordless
    # Use ssh-keygen command to generate this
    # Example formatted for readability
    ssh_key: "ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCz26ysi6dUrvQo+2tW9S0rPSdVt
              exqzf5ZPdHAnabV4iChI8MAeJRognVx1SjFKyg8LiNTYQCBh4h4rJq6mEiYXd0nmv
              z5d5srcH3spnaW0gZn4VDZQ8aD2UBK1rFyt6qVERaci7/IX0kvgpblqBT2KzU0nVz
```

```
                0yz7vDLV2qj8JCDL18gdlkdqPbx8nSQ3ETFh9jlt5Gj99mVaXeaNNxAy6z2FuDHJD
                fxq8ra7F+jHAq/5Lz61Nu38uDl+OrTrCqahE2ZtO+eiGU6Pwc+p5QGUq2wjw/Cayq
                Z9AkdCRA8W1m8yCxVXMn7ERRN2OaaAIOtw6JVVNGmjkqJ5nKJGOZ root@raku-aio"


# SECTION 2. CLUSTER(S) INFORMATION AND SERVER(S) NETWORKING CONFIGS:
#*******************************************************************

# Required, at least 1
clusters:
  - name: <cluter_name>
    info: <cluster_description>

    # Required, at least 1
    servers:
      - name: <target_server_name>

        # Required, CIMC IP of target server
        # IPv4 or v6
        oob_ip: 2001:420:293:2469:DAC4:97FF:FEE9:2D51

        # Optional, defaults to value in common_info
        oob_username: admin

        # Optional, defaults to value in common_info
        oob_password: *********

        # Optional, defaults to value in common_info
        # Should be created by ISO import, previous to the deploy
        flavor: rakuten-iso-26073

        # Optional, defaults to value in common_info
        # Example formatted for readability
        password_hash: $6$osTdkA95zuhv8Qp/$joETG21jcc6rix03ywila2KIJO7SU1N8tFoJ
                       N3jJYPApvej8wkCVgUL4DbdYvOYewGCZsM/8qN36/7Rs3Day1

        # Optional, defaults to value in common_info
        # Max of 3
        domain_name_servers: [171.70.168.183, 173.36.131.10]


        # ################################################################
        # Server's Interface(s) example configs
        # Refer validations mentioned in Requirements Section: 4 & 5
        # ################################################################
        boot_network: api_1_v6

        # Required
        ip_address:
          api_1_v4: 10.30.117.248/28
          api_1_gateway_v4: 10.30.117.241
          api_1_v6: 2001:420:293:256a::1248/64
          api_1_gateway_v6: 2001:420:293:256a::2
          management_1_v4: 20.20.30.248/25
          management_1_gateway_v4: 20.20.30.1
          management_1_v6:  2001:420:293:2447:2f6:63ff:fedb:9e2/64
          management_1_gateway_v6:2001:420:293:2447::2

      - name: node-2
        oob_ip: 2001:420:293:2469:DAC4:97FF:FEE8:9690
        ip_address:
          api_2_v4: 10.30.117.246/28
          api_2_gateway_v4: 10.30.117.241
          management_2_v4: 20.20.30.248/25
```

```
##########################################################################
```

Note Note: The information in the common sections is shared across all target servers in the cluster. However, one could potentially overwrite it on as per server basis. For example: flavor, oob username/password, passwpord_hash, domain_name_servers can be defined as per server level.

The password is an encrypted string from plain text password; To get you can run python script argus_password_hash.py in Cisco VIM_bm-<tag-id>/tools to generate it from the plaintext.

The ssh_key is a public SSH key for a host, and if provided, one can automatically get authenticated and SSH into the deployed nodes after installation without a password. The public/private key pair maybe generated with command below:

Baremetal CLI Helper:

```
[root@argus-mgmt ~]# argus baremetal -h
usage: argus baremetal [-h] -a action [-f config_file] [-n name] [--status]

optional arguments:
  -h, --help      show this help message and exit
  -a action       list            - List site/cluster/node
                  show            - Show details of a site/cluster/node
                  deploy          - Create and deploy a site
                  deploy-cluster  - Add and deploy a cluster
                  deploy-node     - Add and deploy a node
                  delete          - Delete a site
                  delete-cluster  - Delete a cluster
                  delete-node     - Delete a node
  -f config_file  Path of argus config-file
  -n name         Name of site/cluster/node on which operation is to be performed.
  --status        Get status of site/cluster
                  Use this argument with 'show' action.
To start server deploy, the user needs to pass the above-created site config data to the
Argus CLI with the appropriate parser and action.

# argus baremetal -a deploy -f /root/argus_baremetal.yaml
+--------+--------+---------------+-------------------------------------------------+
| Action | Status | Resource Name |                     Details                     |
+--------+--------+---------------+-------------------------------------------------+
| Deploy |  PASS  |  rakuten-rms  | job_uuid: 943c1a82-cfdb-4281-a655-d56eb9ce7318 |
|        |        |               |                 status: ToRun                   |
+--------+--------+---------------+-------------------------------------------------+
A job is created to deploy the site with UUID shown above. One can query its status as shown
 below:

# argus job -a show -u 943c1a82-cfdb-4281-a655-d56eb9ce7318

Job Details:
+---------------+-------+------+---------------+---------------+---------------+--------+------+------+-----+---+
|     Description      |  Stage   |  Status |      Created_at      |      Started_at
|      Updated_at      | Aborted_at | Command | Version | Error | Log |
+---------------+-------+------+---------------+---------------+---------------+--------+------+------+-----+---+
|     deploy site:     | workflow | Running |      2019-07-29      |      2019-07-29
|      2019-07-29      |    N.A     |  deploy |    v1    |  N.A  | N.A |
|     rakuten-rms      |          |         |   10:24:20.326375    |  17:24:20.684958544
|  17:25:54.462980001  |            |         |         |       |     |
|                      |          |         |                      |      +0000 UTC
|      +0000 UTC       |            |         |         |       |     |
+---------------+-------+------+---------------+---------------+---------------+--------+------+------+-----+---+
```

```
Task Details:
+-------------------------+---------+--------+-------------------------+-------------------------
 +----------+-------+
|             Server                |  Stage   |  Status |           Started_at
|           Updated_at           | Command | Error|
+-------------------------+--------+--------+-------------------------+-------------------------+-------+------+
|  rakuten-rms/cluster-quanta-   | workflow | Running | 2019-07-29 17:24:20.976062896  |
2019-07-29 17:25:29.424103923  |  deploy |  N.A  |
|            rms/qr1             |          |         |           +0000 UTC            |
         +0000 UTC            |         |       |
+-------------------------+--------+--------+-------------------------+-------------------------+-------+------+
|  rakuten-rms/cluster-quanta-   | workflow | Running | 2019-07-29 17:24:21.033556299  |
2019-07-29 17:25:36.094923735  |  deploy |  N.A  |
|            rms/qr2             |          |         |           +0000 UTC            |
         +0000 UTC            |         |       |
+-------------------------+--------+--------+-------------------------+-------------------------+-------+------+
|  rakuten-rms/cluster-quanta-   | workflow | Running | 2019-07-29 17:24:21.034453335  |
2019-07-29 17:25:44.136601455  |  deploy |  N.A  |
|            rms/qr3             |          |         |           +0000 UTC            |
         +0000 UTC            |         |       |
+-------------------------+--------+--------+-------------------------+-------------------------+-------+------+
```

To check the site details:

```
# argus baremetal -a show -n rakuten-rms

Site Details:
+----------+-------------------------------+----------+-----------------+-----------+-------------+
|     Name    |                 Info                 | Domain Name | Domain Name Server(s)
 | NTP Server(s) |    Metadata    |
+----------+-------------------------------+----------+-----------------+-----------+-------------+
| rakuten-rms | Quanta rakuten remote management servers |  cisco.com  |     173.36.131.10
     | ntp.cisco.com | Time_Zone: UTC |
|             |                                          |             |     171.70.168.183
    |               |                |
+----------+-------------------------------+----------+-----------------+-----------+-------------+


Cluster(s) Node(s) Details:
+-------------+---------+------+-------------------------+-------------+-------------------------+---------+
|     Cluster(s)     |     Info    | Node(s) |                IP Address               |
     Flavor       |                 OOB IP                | OOB Username |
+-------------+---------+------+-------------------------+-------------+-------------------------+---------+
|                    |             |   qr1   |         api_1_v4: 10.30.117.244         |
rakuten-iso-18173  | 2001:420:293:2469:DAC4:97FF:FEE9:2D51 |    admin     |
|                    |             |         |    api_1_v6: 2001:420:293:248b::1245    |
                   |                                       |              |
|                    |             |         | management_1_v6: 2001:420:293:148b::245 |
                   |                                       |              |
|                    |             |         |       management_1_v4: 20.20.0.245      |
                   |                                       |              |
|                    |             |         |                                         |
                   |                                       |              |
| cluster-quanta-rms | test quanta |   qr2   |      management_2_v4: 20.20.10.246      |
rakuten-iso-18173  | 2001:420:293:2469:DAC4:97FF:FEE9:336E |    admin     |
|                    |             |         | management_2_v6: 2001:420:293:148c::246 |
                   |                                       |              |
|                    |             |         |         api_2_v4: 10.30.117.245         |
                   |                                       |              |
|                    |             |         |    api_2_v6: 2001:420:293:248c::1246    |
                   |                                       |              |
|                    |             |         |                                         |
                   |                                       |              |
```

```
|                    |             |   qr3   | management_3_v6: 2001:420:293:2461::248 |
rakuten-iso-18173  | 2001:420:293:2469:DAC4:97FF:FEE8:9690 |    admin     |
|                    |             |         |      management_3_v4: 20.20.30.248      |
                  |                                     |              |
|                    |             |         |    api_3_v6: 2001:420:293:256a::1248    |
                  |                                     |              |
|                    |             |         |         api_3_v4: 10.30.117.246         |
                  |                                     |              |
+-------------+--------+------+---------------------------+-------------+-------------------------+---------+

Networking Details:
+-----------------+-----------------------+----------------------+
|    Interface    |         Subnet        |       Gateway        |
+-----------------+-----------------------+----------------------+
|     api_1_v4    |     10.30.117.0/28    |    10.30.117.241     |
|                 |                       |                      |
|     api_1_v6    | 2001:420:293:248b::/64 | 2001:420:293:248b::2 |
|                 |                       |                      |
|     api_2_v4    |     10.30.117.0/28    |    10.30.117.241     |
|                 |                       |                      |
|     api_2_v6    | 2001:420:293:248c::/64 | 2001:420:293:248c::2 |
|                 |                       |                      |
|     api_3_v4    |     10.30.117.0/28    |    10.30.117.241     |
|                 |                       |                      |
|     api_3_v6    | 2001:420:293:256a::/64 | 2001:420:293:256a::2 |
|                 |                       |                      |
| management_1_v4 |      20.20.0.0/25     |         N.A          |
|                 |                       |                      |
| management_1_v6 | 2001:420:293:148b::/64 |         N.A          |
|                 |                       |                      |
| management_2_v4 |     20.20.10.0/25     |         N.A          |
|                 |                       |                      |
| management_2_v6 | 2001:420:293:148c::/64 |         N.A          |
|                 |                       |                      |
| management_3_v4 |     20.20.30.0/25     |         N.A          |
|                 |                       |                      |
| management_3_v6 | 2001:420:293:2461::/64 |         N.A          |
+-----------------+-----------------------+----------------------+

Site Status Details:
+--------------------+---------+--------------------+--------------------+--------------------+
|     Cluster(s)     | Node(s) |    Node Status     |   Cluster Status   |    Site Status
    |
+--------------------+---------+--------------------+--------------------+--------------------+
|                    |   qr1   |     Deploying      |                    |
    |
| cluster-quanta-rms |   qr2   |     Deploying      |      Deploying.    |      Deploying
    |
|                    |   qr3   |     Deploying      |                    |
    |
+--------------------+---------+--------------------+--------------------+--------------------

The above command can also be used to get details for a specific cluster:
# argus baremetal -a show -n rakuten-rms/cluster-quanta-rms

Cluster Node(s) Details:
+---------+-------+---------------------------+-------------+---------------------------+---------+
|     Info     | Node(s) |                IP Address                |       Flavor       |
              OOB IP                | OOB Username |
+---------+-------+---------------------------+-------------+---------------------------+---------+
|             |   qr1   |         api_1_v4: 10.30.117.244         | rakuten-iso-18173  |
2001:420:293:2469:DAC4:97FF:FEE9:2D51 |    admin     |
|             |         |    api_1_v6: 2001:420:293:248b::1245    |                    |
                          |              |
|             |         | management_1_v6: 2001:420:293:148b::245 |                    |
```

```
                                        |                |
|              |          |       management_1_v4: 20.20.0.245      |                     |
                                        |                |
|              |          |                                          |                     |
                                        |                |
| test quanta |   qr2    |      management_2_v4: 20.20.10.246      | rakuten-iso-18173  |
2001:420:293:2469:DAC4:97FF:FEE9:336E |    admin     |
|              |          | management_2_v6: 2001:420:293:148c::246 |                     |
                                        |                |
|              |          |         api_2_v4: 10.30.117.245         |                     |
                                        |                |
|              |          |    api_2_v6: 2001:420:293:248c::1246    |                     |
                                        |                |
|              |          |                                          |                     |
                                        |                |
|              |   qr3    | management_3_v6: 2001:420:293:2461::248 | rakuten-iso-18173  |
2001:420:293:2469:DAC4:97FF:FEE8:9690 |    admin     |
|              |          |      management_3_v4: 20.20.30.248      |                     |
                                        |                |
|              |          |    api_3_v6: 2001:420:293:256a::1248    |                     |
                                        |                |
|              |          |         api_3_v4: 10.30.117.246         |                     |
                                        |                |
+————————+————+————————————————————————+——————————————+————————————————————————+————————————+


Cluster Status Details:
+————————+————————————————————+————————————————————+
| Node(s) |    Node Status     |   Cluster Status   |
+————————+————————————————————+————————————————————+
|   qr1   |     Deploying      |                    |
|   qr2   |     Deploying      |      Deploying     |
|   qr3   |     Deploying.     |                    |
+————————+————————————————————+————————————————————+


And also for a particular server:
# argus baremetal -a show -n rakuten-rms/cluster-quanta-rms/qr1

Node Details:
+————————————————————————————+——————————————+————————————————————————+————————————+——————————————+
|                IP Address                |       Flavor       |                OOB IP
             | OOB Username |       Status       |
+————————————————————————————+——————————————+————————————————————————+————————————+——————————————+
|         api_1_v4: 10.30.117.244         | rakuten-iso-18173    |
2001:420:293:2469:DAC4:97FF:FEE9:2D51 |    admin     |    Deploying       |
|    api_1_v6: 2001:420:293:248b::1245    |                    |
             |              |                    |
| management_1_v6: 2001:420:293:148b::245 |                    |
             |              |                    |
|       management_1_v4: 20.20.0.245      |                    |
             |              |                    |
+————————————————————————————+——————————————+————————————————————————+————————————+——————————————+


The show command can also be used to get only status of the site with –status

# argus baremetal -a show -n rakuten-rms –status

Site Status Details:
+————————————————————+————————+————————————————————+————————————————————+————————————————————+
|     Cluster(s)     | Node(s) |    Node Status     |   Cluster Status   |    Site Status
    |
+————————————————————+————————+————————————————————+————————————————————+————————————————————+
|                    |   qr1   |    Deploying       |                    |
```

```
    |
| cluster-quanta-rms |   qr2   |    Deploying       |   Deploying        |    Deploying
    |
|                    |   qr3   |    Deploying       |                    |
    |
+--------------------+---------+--------------------+--------------------+--------------------+
And also to get the status of a particular cluster
# argus baremetal -a show -n rakuten-rms/cluster-quanta-rms -status

Cluster Status Details:
+---------+--------------------+--------------------+
| Node(s) |    Node Status     |   Cluster Status   |
+---------+--------------------+--------------------+
|   qr1   |    Deploying       |                    |
|   qr2   |    Deploying       |      Deploying     |
|   qr3   |    Deploying       |                    |
+---------+--------------------+--------------------+
Users can also abort the above job if required:
# argus job -a abort -u 943c1a82-cfdb-4281-a655-d56eb9ce7318
+--------+--------+-------------------------------------------+
| Action | Status |                  Details                  |
+--------+--------+-------------------------------------------+
| Abort  |  PASS  | Abort job request accepted. Please Wait!! |
+--------+--------+-------------------------------------------+
```

All the above Argus CLI commands can be used with:

- --json: Prints the REST-API response in json format instead of tables
- --debug: Prints the CLI call as a CURL command, its relative logs along with the REST-API response
- Use –json and –debug together to achieve a collective behavior.

Delete the site:

The above-created site can be deleted as per user's choice, which is nothing but a power-off of all the servers and removal of their respective data from ETCD datastore.

```
[root@argus-mgmt ~]# argus baremetal -a delete -n rakuten-rms
+--------+--------+--------------------------------------------------+
| Action | Status |                    Details                       |
+--------+--------+--------------------------------------------------+
| Delete |  PASS  | job_uuid: ef648d52-20eb-49d7-b16d-b84cb52eae66 |
|        |        |                 status: ToRun                    |
+--------+--------+--------------------------------------------------+
```

Deploy Cluster:

A new cluster can be added to a deployed site using the modified bare-metal file which was used with the site deploy. The user must add the new cluster info in the bare-metal file and pass that to the Argus CLI.

```
 # vim /root/argus_baremetal.yaml
  Add the new cluster info under 'clusters' key and save.
# argus baremetal -a deploy -n cluster-rakuten-bms -f /root/argus_baremetal.yaml
+--------+--------+--------------------------------+--------------------------------------------+
| Action | Status |          Resource Name         |                    Details
            |
+--------+--------+--------------------------------+--------------------------------------------+
| Deploy |  PASS  |  rakuten-rms/cluster-quanta-bms  | job_uuid:
943c1a82-cfdb-4281-a655-d56eb9ce7318 |
|        |        |                                |                 status: ToRun
```

```
             |
+--------+--------+--------------------------------+-----------------------------------------------+
```

Delete Cluster:

Similar to site delete, a user can delete a cluster which will again power-off all the servers present in that cluster and delete the server's entry from the ETCD datastore.

```
[root@argus-mgmt ~]# argus baremetal -a delete -n rakuten-rms/cluster-quanta-bms
+--------+--------+-----------------------------------------------+
| Action | Status |                   Details                     |
+--------+--------+-----------------------------------------------+
| Delete |  PASS  | job_uuid: ef648d52-20eb-49d7-b16d-b84cb52eae66 |
|        |        |                status: ToRun                  |
+--------+--------+-----------------------------------------------+
```

Deploy Node:

A new node can be added to a deployed cluster using the modified bare-metal file. User needs to add the new node info in the desired cluster in the bare-metal file and pass that to the Cisco VIM Baremetal Manager CLI.

```
# vim /root/argus_baremetal.yaml
  Add the new node info under 'clusters-> <cluster_name> -> servers' key and save.
# argus baremetal -a deploy -n cluster-rakuten-bms/qr3 -f /root/argus_baremetal.yaml
+--------+--------+---------------------------------+---------------------------------------------+
| Action | Status |            Resource Name        |                    Details
              |
+--------+--------+---------------------------------+---------------------------------------------+
| Deploy |  PASS  | rakuten-rms/cluster-quanta-bms/qr3 | job_uuid:
943c1a82-cfdb-4281-a655-d56eb9ce7318 |
|        |        |                                 |                 status: ToRun
              |
+--------+--------+---------------------------------+---------------------------------------------+
```

Delete Node:

As the name sounds, delete node power-off that node and delete the server's entry from the ETCD datastore.

```
[root@argus-mgmt ~]# argus baremetal -a delete -n rakuten-rms/cluster-quanta-bms/qr3
+--------+--------+-----------------------------------------------+
| Action | Status |                   Details                     |
+--------+--------+-----------------------------------------------+
| Delete |  PASS  | job_uuid: ef648d52-20eb-49d7-b16d-b84cb52eae66 |
|        |        |                status: ToRun                  |
+--------+--------+-----------------------------------------------+
```