Install Crosswork Cluster on VMware vCenter

This chapter contains the following topics:

Installation Overview

Crosswork Network Controller Crosswork Cluster can be installed using the following methods:

- **Cluster Installer Tool**: The cluster installer tool is a day-0 installation tool used to deploy the Crosswork cluster with user specified parameters supplied via a template file. The tool is run from a Docker container which can be hosted on any Docker capable platform including a regular PC/laptop. The Docker container contains a set of template files which can be edited to provide the deployment specific data.

- **Manual Installation (via the VMware UI)**: This option is available for deployments that cannot use the installer tool.

The installer tool method is the preferred option as it is faster and easier to use.

Note Secure ZTP and Secure Syslog require the Crosswork cluster to be deployed with FQDN.

Installation Parameters

This section explains the important parameters that must be specified while installing the Crosswork cluster. Kindly ensure that you have relevant information to provide for each of the parameters mentioned in the table and that your environment meets all the requirements specified under Installation Prerequisites for VMware vCenter.

Note Crosswork Network Controller supports only "Large" deployment profile for customer deployments.

Attention Please use the latest template file that comes with the Crosswork installer tool.

Table 1: General parameters

Parameter Name	Description
ClusterName	Name of the cluster file
ClusterIPStack	The IP stack protocol: IPv4 or IPv6
ManagementIPAddress	The Management IP address of the VM (IPv4 or IPv6).
ManagementIPNetmask	The Management IP subnet in dotted decimal format (IPv4 or IPv6).
ManagementIPGateway	The Gateway IP on the Management Network (IPv4 or IPv6). The address must be reachable, otherwise the installation will fail.
ManagementVIP	The Management Virtual IP for the cluster.
ManagementVIPName	Name of the Management Virtual IP for the cluster. This is an optional parameter used to reach Crosswork cluster Management VIP via DNS name. If this parameter is used, the corresponding DNS record must exist in the DNS server.
DataIPAddress	The Data IP address of the VM (IPv4 or IPv6).
DataIPNetmask	The Data IP subnet in dotted decimal format (IPv4 or IPv6).
DataIPGateway	The Gateway IP on the Data Network (IPv4 or IPv6). The address must be reachable, otherwise the installation will fail.
DataVIP	The Data Virtual IP for the cluster.
DataVIPName	Name of the Data Virtual IP for the cluster. This is an optional parameter used to reach Crosswork cluster Data VIP via DNS name. If this parameter is used, the corresponding DNS record must exist in the DNS server.
DNS	The IP address of the DNS server (IPv4 or IPv6). The address must be reachable, otherwise the installation will fail.
NTP	NTP server address or name. The address must be reachable, otherwise the installation will fail.
DomainName	The domain name used for the cluster.
CWusername	Username to log into Cisco Crosswork.

Parameter Name	Description
CWPassword	Password to log into Cisco Crosswork.
	Use a strong VM Password (8 characters long, including upper & lower case letters, numbers, and at least one special character). Avoid using passwords similar to dictionary words (for example, "Pa55w0rd!") or relatable words (for example, C!sco123 or Cwork321!). While they satisfy the criteria, such passwords are weak and will be rejected resulting in failure to setup the VM.
VMSize	VM size for the cluster. Value is Large.
VMName	Name of the VM
	A unique VM name is required for each node on the cluster (Hybrid or Worker).
NodeType	Indicates the type of VM. Choose either "Hybrid" or "Worker".
	Note The Crosswork cluster requires at least three VMs operating in a hybrid configuration.
IsSeed	Choose "True" if this is the first VM being built in a new cluster.
	Choose "False" for all other VMs, or when rebuilding a failed VM.
	This parameter is optional for installing using the cluster installer tool.
InitNodeCount	Total number of nodes in the cluster including Hybrid and Worker nodes. The default value is 3. Set this to match the number of VMs (nodes) you are going to deploy. For more information on VM count, see Table 1.
	This parameter is optional for installing using the cluster installer tool.
InitLeaderCount	Total number of Hybrid nodes in the cluster. The default value is 3.
	This parameter is optional for installing using the cluster installer tool.
BackupMinPercent	Minimum percentage of the data disk space to be used for the size of the backup partition. The default value is 50 (valid range is from 1 to 80).
	Please use the default value unless recommended otherwise.
	Note The final backup partition size will be calculated dynamically. This parameter defines the minimum.
ManagerDataFsSize	Refers to the data disk size for Hybrid nodes (in Giga Bytes). This is an optional parameter and the default value is 450 (valid range is from 450 to 8000), if not explicitly specified.
	Please use the default value unless recommended otherwise.
WorkerDataFsSize	Refers to the data disk size for Worker nodes (in Gigabytes). This is an optional parameter and the default value is 450 (valid range is from 450 to 8000), if not explicitly specified.
	Please use the default value unless recommended otherwise.

Parameter Name	Description
ThinProvisioned	Set to "false" for production deployments.
EnableHardReservations	Determines the enforcement of VM CPU and Memory profile reservations (see Installation Prerequisites for VMware vCenter for more information). This is an optional parameter and the default value is `true`, if not explicitly specified. If set as `true`, the VM's resources are provided exclusively. In this state, the installation will fail if there are insufficient CPU cores, memory or CPU cycles. If set as `false` (only set for lab installations), the VM's resources are provided on best efforts. In this state, insufficient CPU cores can impact performance or cause installation failure.
RamDiskSize	Size of the Ram disk. This parameter is only used for lab installations (value must be at least 2). When a non-zero value is provided for `RamDiskSize`, the `HSDatastore` value is not used.
OP_Status	This optional parameter is used (uncommented) to import inventory post manual deployment of Crosswork cluster. The parameter refers to the state for this VM. To indicate a running status, the value must be 2 (`#OP_Status = 2`). For more information, see the *Import Cluster Inventory* topic in the *Cisco Crosswork Network Controller 6.0 Administration Guide*.
SchemaVersion	The configuration Manifest schema version. This indicates the version of the installer to use with this template. Schema version should map to the version packaged with the sample template in the cluster installer tool on cisco.com. You should always build a new template from the default template provided with the release you are deploying, as template requirements may change from one release to the next.
LogFsSize	Log partition size (in Giga Bytes). Minimum value is 10 GB and Maximum value is 1000 GB. You are recommended to use the default value.
Timezone	Enter the timezone. Input is a standard IANA time zone (for example, "America/Chicago"). If left blank, the default value (UTC) is selected. This is an optional parameter. **Note** The timestamp in Kafka log messages represents the NSO server time. If you change the `Timezone` parameter in Crosswork without updating the NSO server time, there will be a mismatch between the Crosswork server time and the NSO event time.

Parameter Name	Description
EnableSkipAutoInstallFeature	Any pods marked as skip auto install will not be brought up until a dependent application/pod explicitly asks for it.
	If left blank, the default value ("False") is selected.
EnforcePodReservations	Enforces minimum resource reservations for the pod.
	If left blank, the default value ("True") is selected.
K8sServiceNetwork	The network address for the kubernetes service network. By default, the CIDR range is fixed to '/16'.
K8sPodNetwork	The network address for the kubernetes pod network. By default, the CIDR range is fixed to '/16'.

Table 2: VMware template parameters

Parameter Name	Description
vCentreAddress	The vCenter IP or host name.
vCentreUser	The username needed to log into vCenter.
vCentrePassword	The password needed to log into vCenter.
DCname	The name of the Data Center resource to use.
	Example: DCname = "WW-DCN-Solutions"
MgmtNetworkName	The name of the vCenter network to attach to the VM's Management interface.
	This network must already exist in VMware or the installation will fail.
DataNetworkName	The name of the vCenter network to attach to the VM's Data interface.
	This network must already exist in VMware or the installation will fail.
Host	The ESXi host, or ONLY the vcenter cluster/resource group name where the VM is to be deployed.
	The primary option is to use the host IP or name (all the hosts should be under the data center). If the hosts are under a cluster in the data center, only provide the cluster name (all hosts within the cluster will be picked up).
	The subsequent option is to use a resource group. In this case, a full path should be provided.
	Example: Host = "Main infrastructure/Resources/00_trial"
Datastore	The datastore name available to be used by this host or resource group.
	The primary option is to use host IP or name. The subsequent option is to use a resource group.
	Example: Datastore = "SDRS-DCNSOL-prodexsi/bru-netapp-01_FC_Prodesx_ds_15"

Parameter Name	Description
`HSDatastore`	The high speed datastore available for this host or resource group.
	When not using a highspeed data store, set to same value as Datastore.
`DCfolder`	The resource folder name on vCenter. To be used if you do not have root access as a VMware user, or when you need to create VMs in separate folders for maintenance purposes. You must provide the complete path as value for the DCfolder.
	Example: `DCfolder = "/WW-DCN-Solutions/vm/00_trial"`
	Please contact your VMware administrator for any queries regarding the complete folder path.
	Leave as empty if not used.
`Cw_VM_Image`	The name of Crosswork cluster VM image in vCenter.
	This value is set as an option when running the cluster installer tool and does not need to be set in the template file.
`HostedCwVMs`	The IDs of the VMs to be hosted by the ESXi host or resource.

After you have decided the installation parameters values for Crosswork Network Controller, choose the method you prefer and begin your deployment:

- Install Cisco Crosswork on VMware vCenter using Cluster Installer Tool , on page 6

- Manual Installation of Cisco Crosswork using vCenter vSphere UI, on page 20

Install Cisco Crosswork on VMware vCenter using Cluster Installer Tool

This section explains the procedure to install Cisco Crosswork on VMware vCenter using the cluster installer tool.

Note The time taken to create the cluster can vary based on the size of your deployment profile and the performance characteristics of your hardware.

Before you begin

Few pointers to know when using the cluster installer tool:

- Make sure that your environment meets all the vCenter requirements specified in Installation Prerequisites for VMware vCenter.

- The edited template in the `/data` directory will contain sensitive information (VM passwords and the vCenter password). The operator needs to manage access to this content. Store the template used for your install in a secure environment or edit them to remove the passwords.

- The `install.log`, `install_tf.log`, and `crosswork-cluster.tfstate` files will be created during the install and stored in the `/data` directory. If you encounter any trouble with the installation, provide these files to the Cisco Customer Experience team when opening a case.

- The install script is safe to run multiple times. Upon error, input parameters can be corrected and re-run. You must remove the `install.log`, `install_tf.log`, and `tfstate` files before each re-run. Pleaase note that running the tool multiple times may result in the deletion and re-creation of VMs.

- In case you are using the same installer tool for multiple Crosswork cluster installations, it is important to run the tool from different local directories, allowing for the deployment state files to be independent. The simplest way for doing so is to create a local directory for each deployment on the host machine and map each one to the container accordingly.

- Docker version 19 or higher is required while using the cluster installer option. For more information on Docker, see https://docs.docker.com/get-docker/

- In order to change install parameters or to correct parameters following installation errors, it is important to distinguish whether the installation has managed to deploy the VMs or not. Deployed VMs are evidenced by the output of the installer similar to:

```
vsphere_virtual_machine.crosswork-IPv4-vm["1"]: Creation complete after 2m50s
[id=4214a520-c53f-f29c-80b3-25916e6c297f]
```

- In case of deployed VMs, changes to the Crosswork VM settings or the Data Center host for a deployed VM are NOT supported. To change a setting using the installer when the deployed VMs are present, the clean operation needs to be run and the cluster redeployed. For more information, see Delete the VM using the Cluster Installer.

- A VM redeployment will delete the VM's data, hence caution is advised. We recommend you perform VM parameter changes from the Crosswork UI, or alternatively one VM at a time. Installation parameter changes that occur prior to any VM deployment, e.g. an incorrect vCenter parameter, can be performed by applying the change and simply re-running the install operation.

Known limitations:

These following scenarios are the caveats for installing the Crosswork cluster using the cluster installer tool.

- The vCenter host VMs defined must use the same network names (vSwitch) across all hosts in the data center.

- The vCenter storage folders or datastores organized under a virtual folder structure, are not supported currently. Please ensure that the datastores referenced are not grouped under a folder.

- Any VMs that are not created by the day 0 installer (for example, manually brought up VMs), cannot be changed either by the day 0 installer or via the Crosswork UI later. Similarly, VMs created via the Crosswork UI cannot be modified using the day 0 installer. When making modifications after the initial deployment of the cluster, ensure that you capture the inventory information. For more information, see the *Manage Clusters* chapter in the *Crosswork Network Controller 6.0 Administration Guide*.

- Crosswork does not support dual stack configurations, and all addresses for the environment must be either IPv4 or IPv6. However, vCenter UI provides a service where a user accessing via IPv4 can upload images to the IPv6 ESXi host. Cluster installer cannot use this service. Follow either of the following workarounds for IPv6 ESXi hosts:

  1. Upload the OVA template image manually, via the GUI and convert it to template.

  2. Run the cluster installer from an IPv6 enabled machine. To do this, configure the Docker daemon to map an IPv6 address into the docked container.

> ✎
>
> | **Note** | The installer tool will deploy the software and power on the virtual machines. If you wish to power on the virtual machines yourself, use the manual installation. |

Step 1 In your vCenter data center, go to **Host** > **Configure** > **Networking** > **Virtual Switches** and select the virtual switch. In the virtual switch, select **Edit** > **Security**, and configure the following DVS port group properties:

  • Set **Promiscuous mode** as *Reject*

  • Set **MAC address changes** as *Reject*

Confirm the settings and repeat the process for each virtual switch used in the cluster.

Step 2 In your Docker capable machine, create a directory where you will store everything you will use during this installation.

| **Note** | If you are using a Mac, please ensure that the directory name is in lower case. |

Step 3 Download the installer bundle (.tar.gz file) and the OVA file from cisco.com to the directory you created previously. For the purpose of these instructions, we will use the file names as **signed-cw-na-platform-installer-6.0.0-114-release-231211.tar.gz** and **signed-cw-na-platform-6.0.0-114-release-231211.ova** respectively.

| **Attention** | The file names mentioned in this topic are sample names and may differ from the actual file names in cisco.com. |

Step 4 Use the following command to unzip the installer bundle:

```
tar -xvf signed-cw-na-platform-installer-6.0.0-114-release-231211.tar.gz
```

The contents of the installer bundle is unzipped to a new directory (e.g. `signed-cw-na-platform-installer-6.0.0-114-release`). This new directory will contain the installer image (**cw-na-platform-installer-6.0.0-114-release-231211.tar.gz**) and files necessary to validate the image.

Step 5 Change the directory to the directory created by opening the file and then review the contents of the README file in order to understand everything that is in the package and how it will be validated in the following steps.

Step 6 Use the following command to verify the signature of the installer image:

| **Note** | Use `python --version` to find out the version of python on your machine. |

If you are using python 2.x, use the following command to validate the file:

```
python cisco_x509_verify_release.py -e <.cer file> -i <.tar.gz file> -s <.tar.gz.signature file>
-v dgst -sha512
```

If you are using python 3.x, use the following command to validate the file:

```
python cisco_x509_verify_release.py3 -e <.cer file> -i <.tar.gz file> -s <.tar.gz.signature file>
-v dgst -sha512
```

| **Note** | If you do not have python installed, go to python.org and download the version of python that is appropriate for your work station. |

Step 7 Use the following command to load the installer image file into your Docker environment.

```
docker load -i <.tar.gz file>
```

For example:

```
docker load -i cw-na-platform-installer-6.0.0-114-release-231211.tar.gz
```

Step 8 Run Docker image list or Docker images command to get the "image ID" (which is needed in the next step).

For example:

```
docker images
```

The result will be similar to the following: (section we will need is underlined for clarity)

```
My Machine% docker images
REPOSITORY                              TAG                                      IMAGE ID
      CREATED          SIZE
dockerhub.cisco.com/cw-installer  cw-na-platform-installer-6.0.0-114-release-231211  a4570324fad30
  7 days ago     276MB
```

Note Pay attention to the "CREATED" time stamp in the table presented when you run `docker images`, as you might have other images present from the installation of prior releases. If you wish to remove these, the `docker image rm {image id}` command can be used.

Step 9 Launch the Docker container using the following command:

```
docker run --rm -it -v `pwd`:/data {image id of the installer container}
```

To run the image loaded in our example, the command would be:

```
docker run --rm -it -v `pwd`:/data a4570324fad30
```

Note
- You do not have to enter that full value. In this case, "docker run --rm -it -v `pwd`:/data a45" was adequate. Docker requires enough of the image ID to uniquely identify the image you want to use for the installation.

- In the above command, we are using the backtick (`` ` ``). Do not use the single quote or apostrophe (') as the meaning to the shell is very different. By using the backtick (recommended), the template file and OVA will be stored in the directory where you are on your local disk when you run the commands, instead of inside the container.

- When deploying a IPv6 cluster, the installer needs to run on an IPv6 enabled container/VM. This requires additionally configuring the Docker daemon before running the installer, using the following method:

  - **Linux hosts (ONLY)**: Run the Docker container in host networking mode by adding the "–network host" flag to the Docker run command line.

    ```
    docker run --network host <remainder of docker run options>
    ```

- Centos/RHEL hosts, by default, enforce a strict SELinux policy which does not allow the installer container to read from or write to the mounted data volume. On such hosts, run the Docker volume command with the Z option as shown below:

  ```
  docker run --rm -it -v `pwd`:/data:Z <remainder of docker options>
  ```

Note   The Docker command provided will use the current directory to read the template and the ova files, and to write the log files used during the install. If you encounter either of the following errors you should move the files to a directory where the path is in lowercase (all lowercase, no spaces or other special characters). Then navigate to that directory and rerun the installer.

Error 1:

```
% docker run --rm -it -v `pwd`:/data a45
docker: invalid reference format: repository name must be lowercase.
See 'docker run --help'
```

Error 2:

```
docker: Error response from daemon: Mounts denied: approving /Users/Desktop: file does
not exist
ERRO[0000] error waiting for container: context canceled
```

Step 10   Navigate to the directory with the VMware template.

```
cd /opt/installer/deployments/6.0.0/vcentre
```

Step 11   Copy the template file found under
`/opt/installer/deployments/6.0.0/vcentre/deployment_template_tfvars` to the `/data`
folder using a different name.

For example: `cp deployment_template_tfvars /data/deployment.tfvars`

For the rest of this procedure, we will use `deployment.tfvars` in all the examples.

Step 12   Edit the template file located in the `/data` directory in a text editor, to match your planned deployment. Refer to the Installation Parameters, on page 1 table for details on the required and optional fields and their proper settings. The Sample manifest templates for VMware vCenter, on page 11 includes an example that you can reference for proper formatting. The example is more compact due to the removal of descriptive comments:

Step 13   From the `/opt/installer` directory, run the installer.

```
./cw-installer.sh install -p -m /data/<template file name> -o /data/<.ova file>
```

For example:

```
./cw-installer.sh install -p -m /data/deployment.tfvars -o
/data/signed-cw-na-platform-6.0.0-114-release-231211.ova
```

Step 14   Read, and then enter "yes" if you accept the End User License Agreement (EULA). Otherwise, exit the installer and contact your Cisco representative.

Step 15   Enter "yes" when prompted to confirm the operation.

Note It is not uncommon to see some warnings like the following during the install:

```
Warning: Line 119: No space left for device '8' on parent controller '3'.
Warning: Line 114: Unable to parse 'enableMPTSupport' for attribute 'key' on element 'Config'.
```

If the install process proceeds to a successful conclusion (see sample output below), these warnings can be ignored.

Sample output:

```
cw_cluster_vms = <sensitive>
INFO: Copying day 0 state inventory to CW
INFO: Waiting for deployment status server to startup on 10.90.147.66. Elapsed time 0s,
retrying in 30s
Crosswork deployment status available at
http://{VIP}:30602/d/NK1bwVxGk/crosswork-deployment-readiness?orgId=1&refresh=10s&theme=dark

Once deployment is complete login to Crosswork via: https://{VIP}:30603/#/logincontroller
INFO: Cw Installer operation complete.
```

Note If the installation fails due to a timeout, you should try rerunning the installation (step 13) without the -p option. This will deploy the VMs serially rather than in parallel.

If the installer fails for any other reason (for example, mistyped IP address), correct the error and rerun the install script.

If the installation fails (with or without the -p), open a case with Cisco and provide the .log files that were created in the /data directory (and the local directory where you launched the installer docker container), to Cisco for review. The two most common reasons for the install to fail are: (a) password that is not adequately complex, and (b) errors in the template file.

What to do next

- See Monitor Cluster Activation, on page 31 to know how you can check the status of the installation.

- See Troubleshoot the Cluster, on page 35 for common troubleshooting scenarios.

Sample manifest templates for VMware vCenter

This topic contains manifest template examples for various scenarios of Crosswork cluster deployment.

Note In case you are using resource pools, please note that individual ESXi host targetting is not allowed and vCenter is responsible for assigning the VM to a host in the resource pool. If vCenter is not configured with resource pools, then the exact ESXi host path must be passed.

Example 1

The following example deploys a Crosswork cluster containing 3 Hybrid nodes (IDs 0,1, 2) and 2 worker nodes (IDs 3, 4).

```
*******
vCenter Example
********
```

```
# In case of IPv6, specify ClusterIPstack as IPv6 and continue specifying IPv6 Configuration.


ClusterIPStack = "IPv4"
ManagementVIP = "172.25.87.94"
ManagementIPNetmask = "255.255.255.192"
ManagementIPGateway = "172.25.87.65"
DataVIP = "192.168.123.94"
DataIPNetmask = "255.255.255.0"
DataIPGateway = "0.0.0.0"
DNS = "171.70.168.183"
DomainName = "cisco.com"
CWPassword = "Password!!"
VMSize = "Large"
NTP = "ntp.cisco.com"
CloneTimeOut = 90
ManagerDataFsSize = 450
ThinProvisioned = true
BackupMinPercent = 50
EnableHardReservations = false
ManagerDataFsSize     = 450
WorkerDataFsSize      = 450

CwVMs = {
  "0" = {
    VMName = "vm0",
    ManagementIPAddress = "172.25.87.82",
    DataIPAddress = "192.168.123.82",
    NodeType = "Hybrid"
  },
  "1" = {
    VMName = "vm1",
    ManagementIPAddress = "172.25.87.83",
    DataIPAddress = "192.168.123.83",
    NodeType = "Hybrid"
  },
  "2" = {
    VMName = "vm2",
    ManagementIPAddress = "172.25.87.84",
    DataIPAddress = "192.168.123.84",
    NodeType = "Hybrid"
  },
  "3" = {

    VMName = "vmworker0",
    ManagementIPAddress = "172.25.87.85",
    DataIPAddress = "192.168.123.84",
    NodeType = "Worker"
  },
  "4" = {

    VMName = "vmworker1",
    ManagementIPAddress = "172.25.87.86",
    DataIPAddress = "192.168.123.86",
    NodeType = "Worker"
  },

}


/********* vCentre Resource Data with Cw VM assignment *********/

VCentreDC = {
```

```
VCentreAddress = "172.25.87.90",
VCentreUser = administrator@vsphere.local,
VCentrePassword = "******",
DCname = "dc-cr",
MgmtNetworkName = "VM Network",
DataNetworkName = "DPortGroup10",
VMs = [
  {
    HostedCwVMs = ["0","1","2","3", "4"],
    Host = "172.25.87.93",
    Datastore = "datastore3"
   HSDatastore = "datastore3",
  },]
}
```

Example 2

The following example deploy Crosswork cluster with Hosts specified:

```
/*********************************************
* Cw Cluster deployment input data TEMPLATE *
*              vcentre version               *
*              EDIT BEFORE USE               *
*                   v4.2.0                   *
*********************************************/
#See at the end of the file for a configured sample

/********* Crosswork Cluster Data  *********/

  # The name of the Crosswork Cluster.
  ClusterName      = "CW-Cluster-01"

  # Provide  name of Cw VM image in vcentre or leave empty
  # When empty the image name will be populated from the uploaded image
  Cw_VM_Image = "cw-na-platform-4.3.0-88-release-220809"    # Line added automatically by
installer.

  # The IP stack protocol: IPv4 or IPv6
  ClusterIPStack       = "IPv4"

  # The Management Virtual IP for the cluster
  ManagementVIP     = "10.90.147.66"

  # Optional: The Management Virtual IP host-name
  ManagementVIPName = ""

  # The Management IP subnet in dotted decimal format for ipv4 or prefix length for ipv6
  ManagementIPNetmask = "255.255.255.192"

  # The Gateway IP on the Management Network
  ManagementIPGateway = "10.90.147.65"

  # The Data Virtual IP for the cluster. Use 0.0.0.0 or ::0 to disable
  DataVIP          = "192.168.5.66"

  # Optional: The Data Virtual IP host-name
  DataVIPName = ""

  # The Data IP subnet in dotted decimal format for ipv4 or prefix length for ipv6
  # Provied any regular mask when not in use
  DataIPNetmask      = "255.255.255.0"

  # The Gateway IP on the Management Network
  DataIPGateway      = "192.168.5.1"
```

```
# The IP address of the DNS server
DNS                = "171.70.168.183"

# The domain name to use for the cluster
DomainName         = "cisco.com"

# Sets the cw-admin user ssh login password for all VMs in the cluster
# The password MUST be of min length 8 and strong
CWPassword         = "Password!!"

# Sets the VM size for the cluster.
# Options are: Small | Large.
VMSize             = "Large"

# NTP server address or name
NTP                = "ntp.esl.cisco.com"

# Configuration Manifest schema version
SchemaVersion             = "6.0.0"

# Data disk size for Manager/Hybrid nodes in GB. Min 450 Max 8000
ManagerDataFsSize = 450
# Data disk size for Worker nodes in GB. Min 450 Max 8000
WorkerDataFsSize = 450

// Thin or thick provisioning for all disks. Set to true for thin provisioning, false for
thick
 ThinProvisioned = true

# Log partition size in GB. Min 10 Max 1000
LogFsSize = 10

# Minimum percentage of the data disk space to be used for the size of the backup partition

# Note: The final backup partition size will be calculated dynamically. This parameter
defines the minimum.
# Valid range 1 - 80
BackupMinPercent = 50

# Enforces VM profile reservations as "hard"
EnableHardReservations = true

# FOR DEMO USE ONLY - NOT TO BE USED IN PRODUCTION DEPLOYMENTS
# Ram disk size in GB
RamDiskSize        = 10


/********* Crosswork VM Data Map *********/
# Configure named entries for each Cw VM.
# Number of Hybrid VMs minimum: 3; maximum: 3
# Number of Worker VMs minimum: 0; maximum: 3

CwVMs = {
    # Seed VMs' data.
    # IMPORTANT: A VM with id "0" MUST be present in the initial day0 install manifest and
 its role MUST be
    # set to either MASTER or HYBRID.
  "0" = {

    # This VM's name
    VMName             = "CW_Node_0",

    # This VMs' management IP address
```

```
        ManagementIPAddress = "10.90.147.67",

        # This VMs' data IP address. Use 0.0.0.0 or ::0 to disable
        DataIPAddress        = "192.168.5.67",

        # This Cw VM's type - use "Hybrid" for initial install
        NodeType             = "Hybrid",

        # The state for this VM; 2 = running. Only uncomment when doing a manual inventory
import
        #Op_Status = 2
      },

       # Second VMs' data
      "1" = {

        # This VM's name
        VMName               = "CW_Node_1",

        # This VMs' management IP address
        ManagementIPAddress = "10.90.147.68",

        # This VMs' data IP address
        DataIPAddress        = "192.168.5.68",

        # This Cw VM's type - use "Hybrid" for initial install
        NodeType             = "Hybrid",

        # The state for this VM; 2 = running. Only uncomment when doing a manual inventory
import
        #Op_Status = 2
      },

      "2" = {

        # This VM's name
        VMName               = "CW_Node_2",
        ManagementIPAddress = "10.90.147.69",
        DataIPAddress        = "192.168.5.69",

        # This Cw VM's type - use "Hybrid" for initial install
        NodeType             = "Hybrid",

        # The state for this VM; 2 = running. Only uncomment when doing a manual inventory
import
        #Op_Status = 2
      }
}


/********* vcentre Resource Data with Cw VM assignment *********/

VCentreDC = {

  # The vcentre IP or host name
  VCentreAddress = "10.88.192.244",

  # The username to use for logging into vcentre
  VCentreUser = "Cisco_User",

  # The vcentre password for the user
  VCentrePassword = "Password",
```

```
   # The name of the Data Centre resource to use
   DCname = "Cisco-CX-Lab",

   # The name of the vcentre network to attach to the Cw VM Management interface
   # NOTE: Escape any special characters using their URL escape codes, eg use "%2f" instead
 of "/"
  MgmtNetworkName = "VM Network",

   # The name of the vcentre network to attach to the Cw VM Data interface.
   # Leave empty if not used.
   # NOTE: Escape any special characters using their URL escape codes, eg use "%2f" instead
 of "/"
   DataNetworkName = "Crosswork-Internal",

   # The resource folder name on vcentre. Leave empty if not used.
   DCfolder = "",

   # List of the vcentre host resources along with the VMs names
   # that each that each resource will host. Add additional stanzas, separated by a ','
   # for each additional ESXi host or resource
   VMs = [{

      # The ESXi host, or ONLY the vcentre cluster/resource group name.
      Host = "10.90.147.99",

      # The datastore name available to be used by this host or resource group.
      Datastore = "Datastore-1",

      # The high speed datastore available for this host or resource group.
      # Set to same value as Datastore if unsure.
      HSDatastore = "Datastore-1"

      # The ids of the VMs to be hosted by the above ESXi host or resource. These have to
match to the Cw VM
      # ids specified in the Cw VM map. Separate multiple VMs the given
      # host with a ',', eg ["0","1"].
      HostedCwVMs = ["0","1"]

      },
      {
      Host = "10.90.147.93"
      Datastore = "Datastore-2"
      HSDatastore = "Datastore-2"
      HostedCwVMs =["2"]
      }
   ]
}
```

Example 3

The following example deploys Crosswork cluster with resource groups:

```
/********************************************
* Cw Cluster deployment input data TEMPLATE *
*              vcentre version              *
*               EDIT BEFORE USE             *
*                    v6.0.0                 *
*********************************************
#See at the end of the file for a configured sample

/********* Crosswork Cluster Data  *********/

   # The name of the Crosswork cluster.
   ClusterName      = "CW-cluster-01"
```

```
# Provide  name of Cw VM image in vcentre or leave empty
# When empty the image name will be populated from the uploaded image
Cw_VM_Image = "cw-na-platform-6.0.0-414-develop-230926"    # Line added automatically by
installer.

# The IP stack protocol: IPv4 or IPv6
ClusterIPStack        = "IPv4"

# The Management Virtual IP for the cluster
ManagementVIP     = "10.201.240.158"

# Optional: The Management Virtual IP host-name
ManagementVIPName = ""

# The Management IP subnet in dotted decimal format for ipv4 or prefix length for ipv6
ManagementIPNetmask = "255.255.255.224"

# The Gateway IP on the Management Network
ManagementIPGateway = "10.201.240.129"

# The Data Virtual IP for the cluster. Use 0.0.0.0 or ::0 to disable
DataVIP         = "192.168.77.158"

# Optional: The Data Virtual IP host-name
DataVIPName = ""

# The Data IP subnet in dotted decimal format for ipv4 or prefix length for ipv6
# Provied any regular mask when not in use
DataIPNetmask      = "255.255.255.0"

# The Gateway IP on the Management Network
DataIPGateway      = "192.168.77.1"

#  The IP address of the DNS server
DNS               = "172.18.108.43 172.18.108.34"

# The domain name to use for the cluster
DomainName         = "cisco.com"

# Kubernetes Service Network Customization - The default network '10.96.0.0'.
# NOTE: The CIDR range is fixed '/16', no need to enter.
#       Only IPv4 is supported, IPv6 customization is NOT supported.
K8sServiceNetwork = "10.96.0.0"

# Kubernetes Service Network Customization - The default network '10.244.0.0'.
# NOTE: The CIDR range is fixed '/16', no need to enter.
#       Only IPv4 is supported, IPv6 customization is NOT supported.
K8sPodNetwork = "10.244.0.0"

# Sets the cw-admin user ssh login password for all VMs in the cluster
# The password MUST be of min length 8 and strong
CWPassword        = "Password"

# Sets the VM size for the cluster.
# Options are: Small | Large.
VMSize             = "Large"

# NTP server address or name
NTP                = "ntp.esl.cisco.com"

# Configuration Manifest schema version
SchemaVersion              = "6.0.0"
```

```
       # Data disk size for Manager/Hybrid nodes in GB. Min 450 Max 8000
       ManagerDataFsSize = 450
       # Data disk size for Worker nodes in GB. Min 450 Max 8000
       WorkerDataFsSize = 450

       // Thin or thick provisioning for all disks. Set to true for thin provisioning, false for
      thick
       ThinProvisioned = true

       # Log partition size in GB. Min 10 Max 1000
       LogFsSize = 10

      # Minimum percentage of the data disk space to be used for the size of the backup partition

      # Note: The final backup partition size will be calculated dynamically. This parameter
     defines the minimum.
       # Valid range 1 - 80
       BackupMinPercent = 50

       # Enforces VM profile reservations as "hard"
       EnableHardReservations = "false"

       # FOR DEMO USE ONLY - NOT TO BE USED IN PRODUCTION DEPLOYMENTS
       # Ram disk size in GB
       RamDiskSize          = 0

       # Pods that are marked as skip auto install will not be brought up until a dependent
     application/pod explicitly asks for it
       EnableSkipAutoInstallFeature = "False"

      # DEMO/DEV USE ONLY - Enforce pod minimum resource reservations. Default and for production
     use is True
       EnforcePodReservations = "True"

      # Optional: Provide a standard IANA time zone. Default value is Etc/UTC if not specified
       Timezone = ""

/********* Crosswork VM Data Map *********/
# Configure named entries for each Cw VM.
# Number of Hybrid VMs minimum: 3; maximum: 3
# Number of Worker VMs minimum: 0; maximum: 3

CwVMs = {
  "0" = {
    VMName               = "cw-vm-0",
    ManagementIPAddress = "10.201.240.130",
    DataIPAddress       = "192.168.77.130",
    NodeType             = "Hybrid",
    #Op_Status = 2
  },
  "1" = {
    VMName               = "cw-vm-1",
    ManagementIPAddress = "10.201.240.131",
    DataIPAddress       = "192.168.77.131",
    NodeType             = "Hybrid",
    #Op_Status = 2
  },
  "2" = {
    VMName               = "cw-vm-2",
    ManagementIPAddress = "10.201.240.132",
    DataIPAddress       = "192.168.77.132",
    NodeType             = "Hybrid",
    #Op_Status = 2
  },
```

```
  "3" = {
    # This VM's name
    VMName              = "cw-worker-3",
    ManagementIPAddress = "10.201.240.133",
    DataIPAddress       = "192.168.77.133",
    NodeType            = "Worker",

    # The state for this VM; 2 = running. Only uncomment when doing a manual inventory
import
    #Op_Status = 2
  },
  "4" = {
    # This VM's name
    VMName              = "cw-worker-4",
    ManagementIPAddress = "10.201.240.134",
    DataIPAddress       = "192.168.77.134",
    NodeType            = "Worker",
    #Op_Status = 2
  }
}


/********** vcentre Resource Data with Cw VM assignment **********/

VCentreDC = {
  VCentreAddress = "10.88.192.244",
  VCentreUser = "Cisco_User",
  VCentrePassword = "Password",
  DCname = "rcdn5-spm-dc-01",
  MgmtNetworkName = "Management Network",
  DataNetworkName = "Data Network",
  DCfolder = ""
  VMs = [{
    Host = "{path to resource Group}",

    Datastore = "iSCSI-DataStore",

    HSDatastore = "iSCSI-DataStore",

    HostedCwVMs = ["0","1","2","3","4"],

    }
  ]
}
```

Set seed node explicitly

The cluster installer tool, by default, selects the first VM (VM 0) as the seed node. You can set the seed node explicitly by adding the following section to the manifest template (.tfvars file) indicating the unique key of the seed node.

Note You are recommended not to modify the default seed node value unless advised to do so by the Cisco Customer Experience team.

```
cluster_settings = {
#Default Minimum number of nodes in inventory
    min_inventory   = 3
#Default Max number of nodes in inventory
```

```
    max_inventory     = 6
#Default Min number of manager nodes
    min_mngr_nodes    = 2
#Default Max number of manager nodes
    max_mngr_nodes    = 3
#Default seed node key name
    default_seed_node = "0"
}
```

Manual Installation of Cisco Crosswork using vCenter vSphere UI

This section explains how to build the cluster using the vCenter user interface. This same procedure can be used to add or replace nodes if necessary.

The manual installation workflow is broken into two parts. In the first part, you create a template. In the second part, you deploy the template as many times as needed to build the cluster of 3 Hybrid nodes (typically) along with any Worker nodes that your environment requires.

1. Build the OVF template, on page 21

2. Deploy the template, on page 27

Note   If the cluster has already been installed (no matter the method used) the template file will already exist unless it was deleted. In this case, you can directly go to deploying the template (the second part of this procedure).

The manual installation is preferred if you face any of the following reasons:

- Owing to your data center configuration, you cannot deploy the cluster using the installer tool.

- You need to add nodes to the existing cluster.

- You need to replace a failed node.

- You want to migrate a node to a new host machine.

Important   Anytime the configuration of the cluster is changed manually to install Crosswork cluster, or to add nodes, or move nodes to new hosts using the procedures detailed in this section, you must import the cluster inventory file (.tfvars file) to the Crosswork UI. The inventory file (a sample can be downloaded from the Crosswork UI) will contain information about the VMs in your cluster along with the data center parameters. You must set the parameter `OP_Status = 2` to enable manual import of the inventory.

Cisco Crosswork cannot deploy or remove VM nodes in your cluster until you complete this operation. For more information, see the *Import Cluster Inventory* topic in the *Cisco Crosswork Network Controller 6.0 Administration Guide*.

Build the OVF template

Before you begin

- Make sure that your environment meets all the vCenter requirements specified under Crosswork Cluster VM Requirements and Installation Prerequisites for VMware vCenter.

Step 1   Download the latest available Cisco Crosswork platform image file (*.ova) to your system.

Step 2   With VMware ESXi running, log into the VMware vSphere Web Client. On the left navigation pane, choose the ESXi host or cluster where you want to deploy the VM.

Step 3   In the vSphere UI, go to **Host** > **Configure** > **Networking** > **Virtual Switches** and select the virtual switch. In the virtual switch, select **Edit** > **Security**, and configure the following DVS port group properties:

- Set **Promiscuous mode** as *Reject*

- Set **MAC address changes** as *Reject*

Confirm the settings and repeat the process for each virtual switch used in the cluster.

Step 4   Review and confirm that your network settings meet the requirements.

Ensure that the networks that you plan to use for Management network and Data network are connected to the host.

Step 5   Choose **Actions** > **Deploy OVF Template**.

Caution	The default VMware vCenter deployment timeout is 15 minutes. If vCenter times out during deployment, the resulting VM will not be bootable. To prevent this, we recommend that you document the choices (such as IP address, gateway, DNS server, etc.) so that you can enter the information quickly and avoid any issues with the VMware configuration.

Step 6   The VMware **Deploy OVF Template** window appears, with the first step, **1 - Select an OVF template**, highlighted. Click **Choose Files** to navigate to the location where you downloaded the OVA image file and select it. Once selected, the file name is displayed in the window.

Step 7   Click **Next**. The **Deploy OVF Template** window is refreshed, with **2 - Select a name and folder** now highlighted. Enter a name and select the respective data center for the Cisco Crosswork VM you are creating.

We recommend that you include the Cisco Crosswork version and build number in the name, for example: Cisco Crosswork 6.0 Build 152.

Step 8   Click **Next**. The **Deploy OVF Template** window is refreshed, with **3 - Select a compute resource** highlighted. Select the host or cluster for your Cisco Crosswork VM.

Step 9   Click **Next**. The VMware vCenter Server validates the OVA. Network speed will determine how long validation takes. After the validation is complete, the **Deploy OVF Template** window is refreshed, with **4 - Review details** highlighted.

Step 10   Review the OVF template that you are deploying. Note that this information is gathered from the OVF, and cannot be modified.

Step 11   Click **Next**. The **Deploy OVF Template** window is refreshed, with **5 - License agreements** highlighted. Review the End User License Agreement and if you agree, click the **I accept all license agreements** checkbox. Otherwise, contact your Cisco Experience team for assistance.

Step 12   Click **Next** The **Deploy OVF Template** window is refreshed, with **6 - Configuration** highlighted. Choose the desired deployment configuration.

Figure 1: Select a deployment configuration

Note If Cisco Crosswork is deployed using a single interface, then Cisco Crosswork Data Gateway must be deployed using a single interface as well (only recommended for lab deployments).

Step 13 Click **Next**. The **Deploy OVF Template** window is refreshed, with **7 - Select Storage** highlighted. Choose the relevant option from the **Select virtual disk format** drop-down list. From the table, choose the datastore you want to use, and review its properties to ensure there is enough available storage.

Figure 2: Select Storage

Note	For production deployment, choose the **Thick Provision Eager Zeroed** option because this will preallocate disk space and provide the best performance. For lab purposes, we recommend the **Thin Provision** option because it saves disk space.

Step 14 Click **Next**. The **Deploy OVF Template** window is refreshed, with **8 - Select networks** highlighted. From the **Destination Network** drop-down list, select the proper networks for the Management Network and the Data Network.

Figure 3: Select a deployment configuration

Important	Admin Network and NBI Network are not applicable for Crosswork Network Controller deployments. You can leave these fields with the default values.

Step 15 Click **Next**. The **Deploy OVF Template** window is refreshed, with **9 - Customize template** highlighted.

Note	As you are creating a template now and will not build a VM until the next section (), you can enter placeholder values for all the required fields.

a) Expand the **Management Network** settings. Provide information for the IPv4 or IPv6 deployment (as per your selection).

b) Expand the **Data Network** settings. Provide information for the IPv4 or IPv6 deployment (as per your selection).

Figure 4: Customize template settings

Note	**Data Network** settings are not displayed if you have selected the **IPv4 on a Single Interface** or **IPv6 on a Single Interface** configuration.

c) Expand the **Deployment Credentials** settings. Enter relevant values for the VM Username and Password.

Note	Use a strong VM Password (8 characters long, including upper & lower case letters, numbers, and at least one special character). Avoid using passwords similar to dictionary words (for example, "Pa55w0rd!") or relatable words (for example, C!sco123 or Cwork321!). While they satisfy the criteria, such passwords are weak and will be rejected resulting in failure to setup the VM.

d) Expand the **DNS and NTP Servers** settings. According to your deployment configuration (IPv4 or IPv6), the fields that are displayed are different. Provide information in the following three fields:

- **DNS IP Address**: The IP addresses of the DNS servers you want the Cisco Crosswork server to use. Separate multiple IP addresses with spaces.

- **DNS Search Domain**: The name of the DNS search domain.

- **NTP Servers**: The IP addresses or host names of the NTP servers you want to use. Separate multiple IPs or host names with spaces.

Note   The DNS and NTP servers must be reachable using the network interfaces you have mapped on the host. Otherwise, the configuration of the VM will fail.

e) The default **Disk Configuration** settings should work for most environments. Change the settings only if you are instructed to by the Cisco Customer Experience team.

f) Expand **Crosswork Configuration** and enter your legal disclaimer text (users will see this text if they log into the CLI).

g) Expand **Crosswork Cluster Configuration**. Provide relevant values for the following fields:

- **VM Type**:

    - Choose **Hybrid** if this is one of the 3 Hybrid nodes.

    - Choose **Worker** if this is a Worker node.

- **Cluster Seed node**:

    - Choose **True** if this is the first VM being built in a new cluster.

    - Choose **False** for all other VMs, or when rebuilding a failed VM.

- **Crosswork Management Cluster Virtual IP**: Enter the Management Virtual IP address and Management Virtual IP DNS name.

- **Crosswork Data Cluster Virtual IP**: Enter the Data Virtual IP address. and the Data Virtual IP DNS name.

- **Initial node count**: Default value is 3.

- **Initial leader node count**: Default value is 3.

• **Location of VM**: Enter the location of VM.

• **Installation type**:

• *For new cluster installation*: Do not select the checkbox.

• *Replacing a failed VM*: Select the checkbox if this VM is being installed to replace a failed VM. This parameter becomes important when you deploy the template.

Step 16   Click **Next**. The **Deploy OVF Template** window is refreshed, with **10 - Ready to Complete** highlighted.

Step 17   Review your settings and then click **Finish** if you are ready to begin deployment. Wait for the deployment to finish before continuing. To check the deployment status:

a)   Open a VMware vCenter client.

b)   In the **Recent Tasks** tab of the host VM, view the status of the **Deploy OVF template** and **Import OVF package** jobs.

Step 18   To finalize the template creation, select the host and right-click on the newly installed VM and select **Template** > **Convert to Template**. A prompt confirming the action is displayed. Click **Yes** to confirm. The template is created under the **VMs and Templates** tab in the vSphere Client UI.

This is the end of the first part of the manual installation workflow. In the second part, use the newly created template to build the cluster VMs.

Deploy the template

Step 1 To build a VM, right-click on the template and select **New VM from This Template**.

> **Note** If the template is no longer present ,go back and create the template. For more information, see Build the OVF template, on page 21.

Step 2 The VMware **Deploy From Template** window appears, with the first step, **1 - Select a name and folder**, highlighted. Enter a name and select the respective data center for the VM.

> **Note** If this is a new VM, the name must be unique and cannot be the same name as the template. If this VM is replacing an existing VM (for example, `CW-VM-0`) give the VM a unique temporary name (for example, `CW-VM-0-New`).

Step 3 Click **Next**. The **Deploy From Template** window is refreshed, with **2 - Select a compute resource** highlighted. Select the host for your Cisco Crosswork VM.

Step 4 Click **Next**. The **Deploy From Template** window is refreshed, with **3 - Select Storage** highlighted. Choose **Same format as source** option as the virtual disk format (recommended).

The recommended configuration for the nodes uses a combination of high-speed (typically SSD based) and normal (typical disks) storage. If you are following the recommended configuration follow the steps for two data stores. Otherwise, follow the steps for using a single data store.

If you are using two data stores (regular and high speed):

- Enable **Configure per disk** option.

- Select same data store (regular) as the **Storage** setting for disks 1 through 5. This data store must have 916 GB of space.

- Select the host's high speed (ssd) data store as the **Storage** setting for disk 6. The high speed data store must have at least 50 GB of space.

Deploy the template

Figure 5: Select Storage - Configure per disk

cw-template - Deploy From Template

✓ 1 Select a name and folder	**Select storage**
✓ 2 Select a compute resource	Select the storage for the configuration and disk files
3 Select storage	
4 Select clone options	
5 Customize vApp properti...	
6 Ready to complete	

Configure per disk 🟢

Virtual Machine	File	Storage	Disk format	VM Storage Poli
cw-1	Configuration File	datastore62-hdd-1 ⌄	N/A ⌄	Datastore Defa
cw-1	Hard disk 1 (50.00 GB)	datastore62-hdd-1 ⌄	Same format as source ⌄	Datastore Defa
cw-1	Hard disk 2 (156.00 GB)	datastore62-hdd-1 ⌄	Same format as source ⌄	Datastore Defa
cw-1	Hard disk 3 (10.00 GB)	datastore62-hdd-1 ⌄	Same format as source ⌄	Datastore Defa
cw-1	Hard disk 4 (450.00 GB)	datastore62-hdd-1 ⌄	Same format as source ⌄	Datastore Defa
cw-1	Hard disk 5 (250.00 GB)	datastore62-hdd-1 ⌄	Same format as source ⌄	Datastore Defa
cw-1	Hard disk 6 (50.00 GB)	datastore62-ssd-2 ⌄	Same format as source ⌄	Datastore Defa

7 items

Compatibility

✓ Compatibility checks succeeded.

CANCEL   BACK   NEXT

- Click **Next**.

If you are using a single data store: Select the data store you wish to use, and click **Next**.

Figure 6: Select Storage - single data store

Step 5 The **Deploy From Template** window is refreshed, with **4 - Select clone options** highlighted. Unless you have been given specific instructions to make modifications, select **Next**.

Step 6 Click **Next**. The **Deploy From Template** window is refreshed, with **5 - Customize vApp properties** highlighted. The vApp properties are prepopulated with the values that were entered during the template creation. Some of the values will need to be updated with the proper values for each node being deployed.

> **Tip**
> - It is recommended to change only the fields that are unique to each node. Leave all other fields at the default values.
> - If this VM is being deployed to replace a failed VM, or to migrate the VM to a new host, the IP and other settings must match the machine being replaced.

- Set the node type (Hybrid/Worker).
- **Management Network settings**: Enter correct IP values for each VM in the cluster.
- **Data Network settings**: Enter correct IP values for each VM in the cluster.
- **Deployment Credentials**: Enter same deployment credentials for each VM in the cluster.
- **DNS and NTP Servers**: Enter correct values for the DNS and NTP servers.

- **Disk Configuration**: Leave at the default settings unless directed otherwise by the Cisco Customer Experience team.

- **Crosswork Configuration**: Enter the disclaimer message.

- **Crosswork Cluster Configuration**:

    - **VM Type**: Select Hybrid or Worker

    - **Cluster Seed node**:

        - Choose **True** if this is the first VM being built in a new cluster.

        - Choose **False** for all other VMs, or when rebuilding a failed VM.

    - **Crosswork Management Cluster Virtual IP**: The Virtual IP will remain same for each cluster node.

    - **Crosswork Data Cluster Virtual IP**: The Virtual IP will remain same for each cluster node.

Step 7   Click **Next**. The **Deploy From Template** window is refreshed, with **6 - Ready to complete** highlighted. Review your settings and then click **Finish** if you are ready to begin deployment.

Step 8   Repeat from **Step 1** to **Step 7** to deploy the remaining VMs in the cluster.

> **Remember**   When deploying the cluster for the first time, make sure the IP addresses and Seed node settings are correct. When replacing or migrating a node make sure the settings match the original VM.

Step 9   Choose the relevant action:

- If you are deploying a new VM, you can now power on Crosswork VMs. The VM selected as the cluster seed node must be powered on first, followed by the remaining VMs (after a delay of few minutes). To power on, expand the host's entry, click the Cisco Crosswork VM, and then choose **Actions** > **Power** > **Power On**.
- If this VM is replacing an existing VM, perform the following:

    - Power down the existing VM

    - Change the name of the original VM (for example, change to `CW-VM-0-Old`)

    - Change the name of the replacement VM (for example change to `CW-VM-0-New`) to match the name of the original VM (for example, `CW-VM-0`).

    - Power on the new VM.

    - After confirming that cluster is healthy and running, delete the original VM (now named as `CW-VM-0-Old`)

Step 10   The time taken to create the cluster can vary based on the size of your deployment profile and the performance characteristics of your hardware. See to know how you can check the status of the installation.

> **Note**   If you are running this procedure to replace a failed VM, then you can check the status from the Cisco Crosswork GUI (go to **Administration** > **Crosswork Manager** and click on the cluster tile to check the *Crosswork Cluster* status.

Note   If you are using the process to build a new Worker node, the node will automatically register itself with the existing Kubernetes cluster. For more information on how the resources are allocated to the Worker node, see the *Rebalance Cluster Resources* topic in the *Cisco Crosswork Network Controller 6.0 Administration Guide*.

Step 11   After you login to Crosswork UI, import a cluster inventory file (.tfvars file) to the Crosswork UI. The inventory file (a sample can be downloaded from the Crosswork UI) will contain information about the VMs in your cluster along with the data center parameters. Set the parameter `OP_Status = 2` to enable manual import of the inventory. Cisco Crosswork cannot deploy or remove VM nodes in your cluster until you complete this operation.

For more information, see the *Import Cluster Inventory* topic in the *Cisco Crosswork Network Controller 6.0 Administration Guide*.

What to do next

Return to the installation workflow: Install Cisco Crosswork Network Controller on VMware vCenter

Monitor Cluster Activation

This section explains how to monitor and verify if the installation has completed successfully. As the installer builds and configures the cluster it will report progress. The installer will prompt you to accept the license agreement and then ask if you want to continue the install. After you confirm, the installation will progress and any possible errors will be logged in either `installer.log` or `installer_tf.log`. If the VMs get built and are able to boot, the errors in applying the operator specified configuration will be logged on the VM in the /var/log/firstboot.log.

Note   During installation, Cisco Crosswork will create a special administrative ID (**virtual machine (VM) administrator**, *cw-admin*, with the password that you provided in the manifest template. In case the installer is unable to apply the password, it creates the administrative ID with the default password *cw-admin*). The first time you log in using this administrative ID, you will be prompted to change the password.

The administrative username is reserved and cannot be changed. Data center administrators use this ID to log into and troubleshoot the Crosswork application VM.

The following is a list of critical steps in the process that you can watch for to be certain that things are progressing as expected:

1. The installer uploads the crosswork image file (.ova file) to the vCenter data center.

Note   On running, the installer will upload the .ova file into the vCenter if it is not already present, and convert it into a VM template. After the installation is completed successfully, you can delete the template file from the vCenter UI (located under *VMs and Templates*) if the image is no longer needed.

2. The installer creates the VMs, and displays a success message (e.g. "Creation Complete") after each VM is created.

✎

| **Note** | For VMware deployments, this activity can also be monitored from the vSphere UI. |

3. After each VM is created, it is powered on (either automatically when the installer completes, or after you power on the VMs during the manual installation). The parameters specified in the template are applied to the VM, and it is rebooted. The VMs are then registed by Kubernetes to form the cluster.

4. Once the cluster is created and becomes accessible, a success message (e.g. "Crosswork Installer operation complete") will be displayed and the installer script will exit and return you to a prompt on the screen.

You can monitor startup progress using the following methods:

- **Using browser accessible dashboard:**

  1. While the cluster is being created, monitor the setup process from a browser accessible dashboard.

  2. The URL for this grafana dashboard (in the format `http://{VIP}:30602/d/NK1bwVxGk/crosswork-deployment-readiness?orgId=1&refresh=10s&theme=dark`) is displayed once the installer completes. This URL is temporary and will be available only for a limited time (around 30 minutes).

  3. At the end of the deployment, the grafana dashboard will report a "Ready" status. If the URL is inaccessible, use the SSH console described in this section to monitor the installation process.

     Figure 7: Crosswork Deployment Readiness
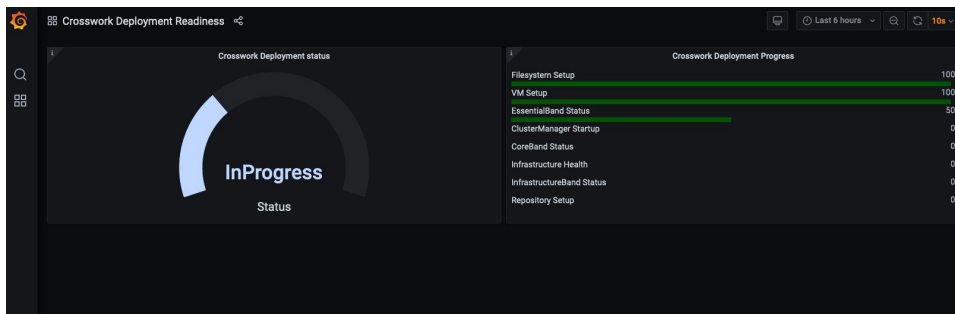
- **Using the console:**

  1. Check the progress from the console of one of the hybrid VMs or by using SSH to the Virtual IP address.

  2. In the latter case, login using the *cw-admin* user name and the password you assigned to that account in the install template.

  3. Switch to super user using `sudo su -` command.

  4. Run `kubectl get nodes` (to see if the nodes are ready) and `kubectl get pods` (to see the list of active running pods) commands.

  5. Repeat the `kubectl get pods` command until you see `robot-ui` in the list of active pods.

  6. At this point, you can try to access the Cisco Crosswork UI.

After the Cisco Crosswork UI becomes accessible, you can also monitor the status from the UI. For more information, see .

Failure Scenario

In the event of a failue scenario (listed below), contact the Cisco Customer Experience team and provide the `installer.log`, `installer_tf.log`, and `firstBoot.log` files (there will be one per VM) for review:

- Installation is incomplete

- Installation is completed, but the VMs are not functional

- Installation is completed, but you are directed to check `/var/log/firstBoot.log` or `/opt/robot/bin/firstBoot.log` file.

What to do next:

Return to the installation workflow: Install Cisco Crosswork Network Controller on VMware vCenter

Log into the Cisco Crosswork UI

Once the cluster activation and startup have been completed, you can check if all the nodes are up and running in the cluster from the Cisco Crosswork UI.

Note Supported web browsers are Google Chrome (version 100 or later) and Mozilla Firefox (version 100 or later).

Perform the following steps to log into the Cisco Crosswork UI and check the cluster health:

Note If the Cisco Crosswork UI is not accessible, during installation, please access the host's console from the VMware or AWS UI to confirm if there was any problem in setting up the VM. When logging in, if you are directed to review the `firstboot.log` file, please check the file to determine the problem. If you are able to identify the error, rectify it and restart the node(s). If you require assistance, please contact the Cisco Customer Experience team.

Step 1 Launch one of the supported browsers.

Step 2 In the browser's address bar, enter:

`https://<Crosswork Management Network Virtual IP (IPv4)>:30603/`

or

`https://[<Crosswork Management Network Virtual IP (IPv6)>]:30603/`

Note Please note that the IPv6 address in the URL must be enclosed with brackets.

Note You can also log into the Crosswork UI using the Crosswork FQDN name.

The **Log In** window opens.

Note	When you access the Cisco Crosswork for the first time, some browsers display a warning that the site is untrusted. When this happens, follow the prompts to add a security exception and download the self-signed certificate from the Cisco Crosswork server. After you add a security exception, the browser accepts the server as a trusted site in all future login attempts. If you want to use a CA signed certificate, see the *Manage Certificates* topic in the *Cisco Crosswork Network Controller 6.0 Administration Guide*.

Step 3 Log into the Cisco Crosswork as follows:

a) Enter the Cisco Crosswork administrator username **admin** and the default password **admin**.

b) Click **Log In**.

c) When prompted to change the administrator's default password, enter the new password in the fields provided and then click **OK**.

Note	Use a strong VM Password (minimum 8 characters long, including upper & lower case letters, numbers, and one special character). Avoid using passwords similar to dictionary words (for example, "Pa55w0rd!") or relatable words (for example, C!sco123 or Cwork321!).

The **Crosswork Manager** window is displayed.
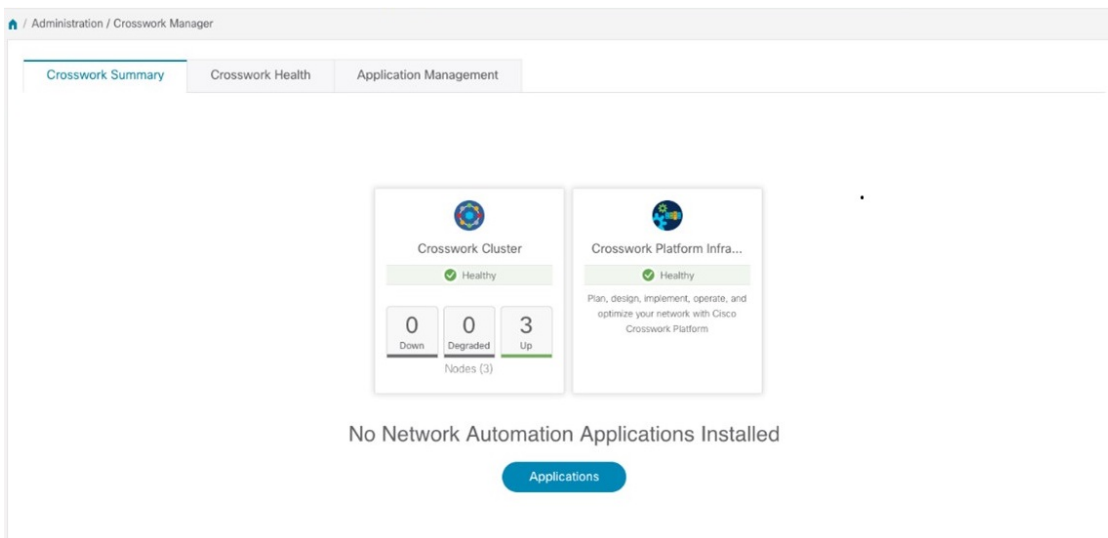
Step 4 Click on the **Crosswork Health** tab, and click the **Crosswork Platform Infrastructure** tab to view the health status of the microservices running on Cisco Crosswork.
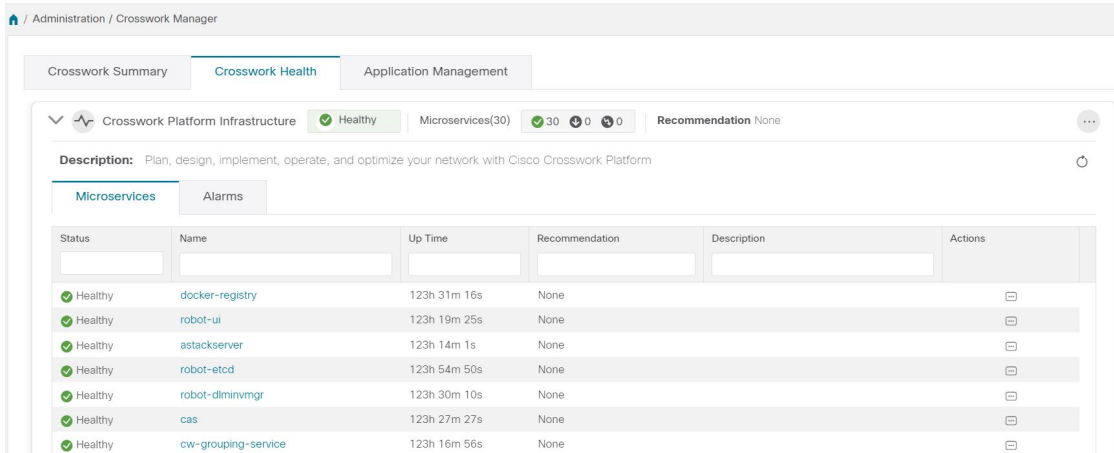
Step 5 (Optional) Change the name assigned to the admin account (by default, it is "John Smith") to something more relevant.

What to do next

Return to the installation workflow: Install Cisco Crosswork Network Controller on VMware vCenter

Troubleshoot the Cluster

By default, the installer displays progress data on the command line. The install log is fundamental in identifying the problems, and it is written into the /data directory.

Table 3: General scenarios

Scenario	Possible Resolution
Certificate Error	The ESXi hosts that will run the Crosswork application and Crosswork Data Gateway VM must have NTP configured, or the initial handshake may fail with "certificate not valid" errors.
Image upload takes a long time or upload is interrupted.	The image upload duration depends on the link and datastore performance and can be expected to take around 10 minutes or more. If an upload is interrupted, the user needs to manually remove the partially uploaded image file from vCenter via the vSphere UI.
vCenter authorization	The vCenter user needs to have authorization to perform the actions as described in Installation Prerequisites for VMware vCenter.
Floating VIP address is not reachable	The VRRP protocol requires unique router_id advertisements to be present on the network segment. By default, Crosswork uses the ID 169 on the management and ID 170 on the data network segments. A symptom of conflict, if it arises, is that the VIP address is not reachable. Remove the conflicting VRRP router machines or use a different network.

Scenario	Possible Resolution

Crosswork VM is not allowing the admin user to log in
 	
OR
 	
The following error is displayed:
 	
`Error: Invalid value for variable on cluster_vars.tf line 113:`
 	
├─────────────┤
 	
`This was checked by the validation rule at cluster_vars.tf:115,3-13.`
 	
`Error: expected length of name to be in the range (1 - 80), got`
 	
`  with data.vsphere_virtual_machine.template_from_ovf,`
 	
`  on main.tf line 32, in data "vsphere_virtual_machine" "template_from_ovf":`
`  32:    name = var.Cw_VM_Image`
 	
`Mon Aug 21 18:52:47 UTC 2023: ERROR: Installation failed.`
`Check installer and the VMs' log by accessing via console and viewing /var/log/firstBoot.log`
	This happens when the password is not complex enough. Create a strong password, update the configuration manifest and redeploy.
	
	Use a strong VM Password (8 characters long, including upper & lower case letters, numbers, and at least one special character). Avoid using passwords similar to dictionary words (for example, "Pa55w0rd!") or relatable words (for example, C!sco123 or Cwork321!). While they satisfy the criteria, such passwords are weak and will be rejected resulting in failure to setup the VM.

Deployment fails with: *Failed to validate Crosswork cluster initialization.*	The clusters' seed VM is either unreachable or one or more of the cluster VMs have failed to get properly configured. 1. Check whether the VM is reachable, and collect logs from `/var/log/firstBoot.log` and `/var/log/vm_setup.log` 2. Check the status of the other cluster nodes.

Scenario	Possible Resolution

The VMs are deployed but the Crosswork cluster is not being formed.	A successful deployment allows the operator logging in to the VIP or any cluster IP address to run the following command to get the status of the cluster:
	
	`sudo kubectl get nodes`
	
	A healthy output for a 3-node cluster is:
	
	`NAME                    STATUS   ROLES   AGE   VERSION`
	`172-25-87-2-hybrid.cisco.com   Ready    master   41d`
	`  v1.16.4`
	`172-25-87-3-hybrid.cisco.com   Ready    master   41d`
	`  v1.16.4`
	`172-25-87-4-hybrid.cisco.com   Ready    master   41d`
	`  v1.16.4`
	
	In case of a different output, collect the following logs: `/var/log/firstBoot.log` and `/var/log/vm_setup.log`
	
	In addition, for any cluster nodes not displaying the Ready state, collect:
	
	`sudo kubectl describe node <name of node>`

The following error is displayed while uploading the image: *govc: The provided network mapping between OVF networks and the system network is not supported by any host.*	The Dswitch on the vCenter is misconfigured. Please check whether it is operational and mapped to the ESXi hosts.
VMs deploy but install fails with *Error: timeout waiting for an available IP address*	Most likely cause would be an issue in the VM parameters provided or network reachability. Enter the VM host through the vCenter console. and review and collect the following logs: `/var/log/firstBoot.log` and `/var/log/vm_setup.log`
When deploying on a vCenter, the following error is displayed towards the end of the VM bringup: Error processing disk changes post-clone: *disk.0: ServerFaultCode: NoPermission: RESOURCE (vm-14501:2000), ACTION (queryAssociatedProfile): RESOURCE (vm-14501), ACTION (PolicyIDByVirtualDisk)*	Enable Profile-driven storage. Query permissions for the vCenter user at the root level (i.e. for all resources) of the vCenter.

Scenario	Possible Resolution
On running or cleaning, installer reports *Error: cannot locate virtual machine with UUID "xxxxxx": virtual machine with UUID "xxxxxxx" not found*	The installer uses the `tfstate` file stored as `/data/crosswork-cluster.tfstate` to maintain the state of the VMs it has operated upon. If a VM is removed outside of the installer, that is through the vCenter UI, this state is out of synchronization. To resolve, remove the `/data/crosswork-cluster.tfstate` file.

Table 4: Installer tool scenarios

Scenario	Possible Resolution
Missing or invalid parameters	The installer provides a clue as regards to the issue; however, in case of errors in the manifest file HCL syntax, these can be misguiding. If you see "Type errors", check the formatting of the configuration manifest. The manifest file can also be passed as a simple JSON file. Use the following converter to validate/convert: https://www.hcl2json.com/
Error conditions such as: *Error: Error locking state: Error acquiring the state lock: resource temporarily unavailable* *Error: error fetching virtual machine: vm not found* *Error: Invalid index*	These errors are common when re-running the installer after an initial run is interrupted (Control C, or TCP timeout, etc). Remediation steps are: 1. Run the clean operation (`./cw-installer.sh clean -m <your manifest here>`) OR remove the VM files manually from the vCenter. 2. Remove the state file (`rm /data/crosswork-cluster.tfstate`). 3. Retry the installation (`./cw-installer.sh clean -m <your manifest here>`).
The VMs take a long time to deploy	The time needed to clone the VMs during the installation will be determined by the workload on the disk drives used by the host machines. Running the install serially (without the [-p] flag) will lessen this load while increasing the time needed to deploy the VMs.
Installer reports plan to add more resources than the current number of VMs	Other than the Crosswork cluster VMs, the installer tracks other meta-resources. Thus, when doing an installation of, say a 3-VM cluster, the installer may report a "plan" to add more resources than the number of VMs.

Scenario	Possible Resolution
On running or cleaning, installer reports *Error: cannot locate virtual machine with UUID "xxxxxxx": virtual machine with UUID "xxxxxxx" not found*	To resolve, remove the `/data/crosswork-cluster.tfstate` file. The installer uses the `tfstate` file stored as `/data/crosswork-cluster.tfstate` to maintain the state of the VMs it has operated upon. If a VM is removed outside of the installer, that is through the vCenter UI, this state is out of synchronization.

What to do next:

Return to the installation workflow: