Field Installation Guide

Orchestrator 1.0

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Notice

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Conventions

Convention	Description
variable_value	The action depends on a value that is unique to your environment.
`ncli> command`	The commands are executed in the Nutanix nCLI.
`user@host$ command`	The commands are executed as a non-privileged user (such as nutanix) in the system shell.
`root@host# command`	The commands are executed as the root user in the hypervisor host (vSphere or KVM) shell.
`> command`	The commands are executed in the Hyper-V host shell.
`output`	The information is displayed as output from a command or in a log file.

Default Cluster Credentials

Interface	Target	Username	Password
Nutanix web console	Nutanix Controller VM	admin	admin
vSphere client	ESXi host	root	nutanix/4u
SSH client or console	ESXi host	root	nutanix/4u
SSH client or console	KVM host	root	nutanix/4u

Interface	Target	Username	Password
SSH client	Nutanix Controller VM	nutanix	nutanix/4u
IPMI web interface or `ipmitool`	Nutanix node	ADMIN	ADMIN
IPMI web interface or `ipmitool`	Nutanix node (NX-3000)	admin	admin

Version

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Contents

Overview

Nutanix installs the Nutanix Operating System (NOS) Controller VM and the KVM hypervisor at the factory before shipping each node to a customer. To use a different hypervisor (ESXi), nodes must be re-imaged in the field. This guide provides step-by-step instructions on how to re-image nodes (install a hypervisor and then the NOS Controller VM) after they have been physically installed at a site.

> **Note:** Only Nutanix sales engineers, support engineers, and partners are authorized to perform a field installation.

A field installation includes the following steps:

- *Imaging a Cluster (standard method)* on page 12:

  1. Set up the installation environment as follows:

     a. Connect the Ethernet ports on the nodes to a switch.
     b. Download Orchestrator (multi-node installation tool) and Phoenix (Nutanix Installer ISO) image files to a workstation. Also, acquire an ESXi installer from the customer and download it to the workstation.
     c. Install Oracle VM VirtualBox on the workstation.

  2. Open the Orchestrator GUI on the workstation and configure the following:

     a. Enter hypervisor and IPMI address and credential information.
     b. Select the Phoenix and hypervisor ISO image files to use.
     c. Start the imaging process and monitor progress.

- *Imaging a Cluster (manual method)* on page 19:

  1. Set up the installation environment (same as above).
  2. Invoke the Orchestrator `discovery.py` utility from the command line to do the following:

     a. Run the node discovery command and then review and update (if needed) the output file.
     b. Run the IPMI address configuration command.

  3. Create a configuration file that provides IPMI and hypervisor information for each node. The `discovery.py` utility produces an initial version of this file.
  4. Invoke Orchestrator from the command line using the desired Phoenix and hypervisor ISO image files.

- *Imaging a Node* on page 25:

  1. Download the Phoenix and hypervisor ISO image files to a workstation.
  2. Sign into the IPMI web console for that node, attach the hypervisor ISO image file, provide required node information, and then restart the node.
  3. Repeat step 2 for the Phoenix ISO image file.

Field installation can be used to cleanly install new nodes (blocks) in a cluster or to install a different hypervisor on a single node. It should not be used to upgrade the hypervisor or switch hypervisors of nodes in an existing cluster. The following table lists the hypervisors that can be installed through this method.

Supported Hypervisors

Product (Series)	ESXi 5.0U2	ESXi 5.1U1	ESX 5.5
NX-1000	●	●	●
NX-2000			
NX-3000			
NX-3050	●	●	●
NX-6000	●	●	●
NX-7000		●	●

Preparing Installation Environment

Imaging a cluster in the field requires first installing certain tools and setting the environment to run those tools.

Installation is performed from a workstation (laptop or desktop machine) with access to the IPMI interfaces of the nodes in the cluster. Configuring the environment for installation requires setting up network connections, installing Oracle VM VirtualBox on the workstation, downloading ISO images, and using VirtualBox to configure various parameters. To prepare the environment for installation, do the following:

1. Connect the first 1GbE network interface of each node (middle RJ-45 interface) to a 1GbE Ethernet switch. The nodes must be connected through shared IPMI ports.

   Another option is to connect a 10 GbE port and the IPMI 10/100 port or the first 1GbE port. This provides more bandwidth for installation but requires additional cabling.
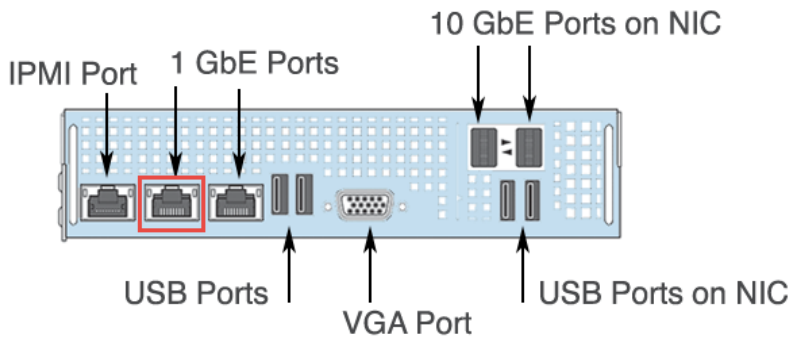

   Figure: Port Locations (NX-3050)

2. Connect the installation workstation (laptop or desktop machine used for this installation) to the same 1GbE switch as the nodes.

   The installation workstation requires at least 3 GB of memory (Orchestrator VM size plus 1 GB), 25 GB of disk space (preferably SSD), and a physical (wired) network adapter.

3. Go to the Orchestrator portal (see *Orchestrator Portal* on page 31) and copy the `orchestrator_bundle_version#.tar.gz` file (using the `scp` or `wget` copy utility) to a temporary directory on the installation workstation. The *version#* in the file name is the version number, for example `orchestrator_bundle_1.0.tar.gz` for version 1.0.

   Orchestrator is the name of the multi-node installation tool. Each Orchestrator bundle file includes the following:

   - Nutanix Orchestrator installation folder (VM descriptions in .vbox and .vmx format and two vmdk files, a small one and a large "flat" one). The Nutanix Orchestrator VM is used to perform cluster imaging.
   - Oracle VM VirtualBox installer (.exe and .dmg VirtualBox installers for Windows and Mac OS, respectively). Oracle VM VirtualBox is a free open source tool used to create a virtualized environment on the workstation.

4. Go to the copy location on the workstation and extract the contents of the tar file:

   ```
   tar [-C output_directory] -xzvf orchestrator_bundle_version#.tar.gz
   ```

   If you have a Windows machine that does not support the `tar` command, use the `7-Zip` utility. Open `orchestrator_bundle_version#.tar.gz` from the `7-Zip` GUI and extract the contents (to any convenient location).

5. Using the Oracle VM VirtualBox installer provided in the bundle, install Oracle VM VirtualBox using the default options.

   See the *Oracle VM VirtualBox User Manual* for installation and start up instructions (https://www.virtualbox.org/wiki/Documentation).

6. Create a new folder called `VirtualBox VMs` in your home directory.

   On a Windows system this is typically `C:\Users\`*user_name*`\VirtualBox VMs`.

7. From the location of the extracted Orchestrator bundle, copy the `Orchestrator_VM` folder to the `VirtualBox VMs` folder that you created in step 6.
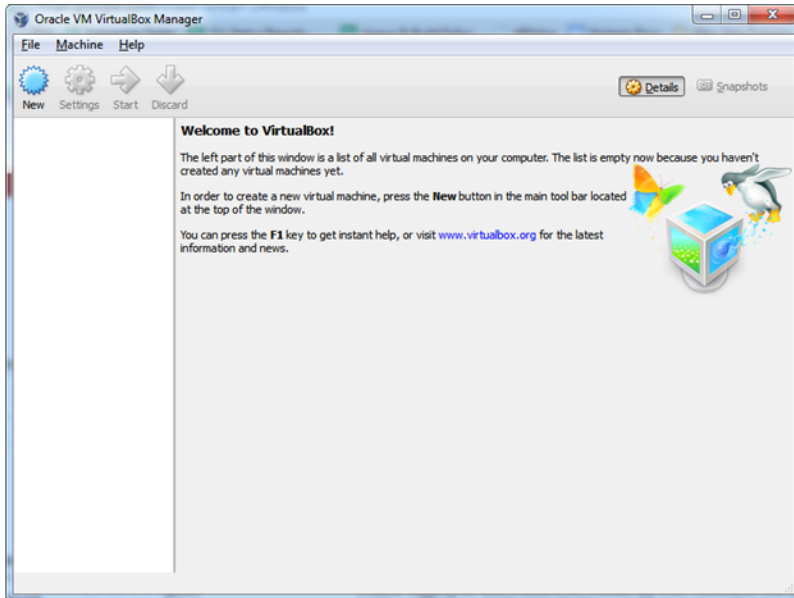
8. Start Oracle VM VirtualBox.

Figure: VirtualBox Welcome Screen

9. Click the **Machine** option of the main menu and then select **Add** from the pull-down list.

10. Navigate to the `Orchestrator_VM` folder, select the `Orchestrator_vm_`*version#* file, and then click **Open**. The *version#* in the file name is the version number, for example `Orchestrator_vm_1.0` for version 1.0.

11. Select **Nutanix_Installer** (which is the Orchestrator VM) in the left panel of the VirtualBox screen.

12. Click **Settings** (left panel) and do the following:

    a. Click **Network** in the left panel of the Settings screen.

    b. Click the **Adapter 1** tab (right panel).

    c. Verify the following items:
       - **Enable Network Adapter** box is checked (enabled).
       - **Attached to** field is set to **Bridged Adapter**.
       - Name is set to your workstation's physical (wired) network adapter, not a wireless adapter.

    d. When the values are correct, click the **OK** button (bottom of screen) to save any changes and exit the settings screen.
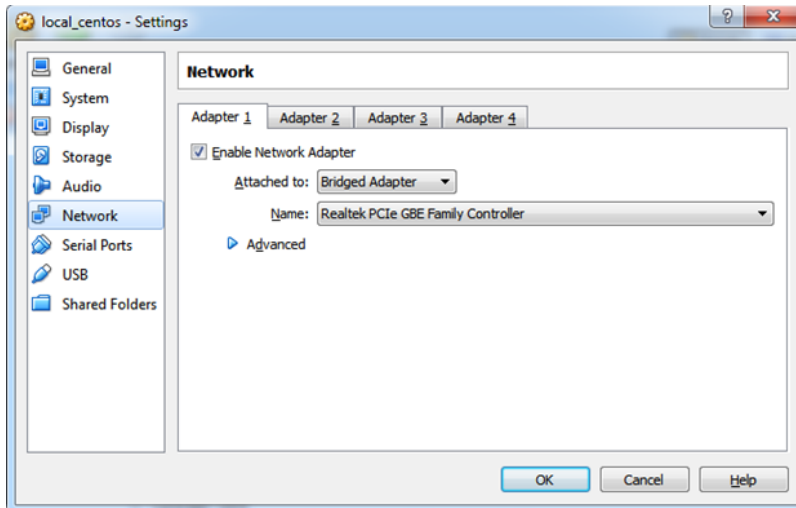
Figure: VirtualBox Network Settings Screen

13. In the left column of the main screen, select **Nutanix_Installer** and click **Start**.
The Orchestrator VM console launches and the VM operating system boots.

14. At the login screen, login as the Nutanix user with the password `nutanix/4u`.
The Orchestrator VM desktop appears (after it loads).

15. Open a terminal session and run the `ifconfig` command to determine if the Orchestrator VM was able to get an IP address from the DHCP server.

If the Orchestrator VM has a valid IP address, skip to the next step. Otherwise, configure a static IP as follows:

> **Note:** Normally, the Orchestrator VM needs to be on a public network in order to copy selected ISO files to the Orchestrator VM in the next two steps. This might require setting a static IP address now and setting it again when the workstation is on a different (typically private) network for the installation (see *Imaging a Cluster (standard method)* on page 12).

a. Double click the **set_orchestrator_ip_address** icon on the Orchestrator VM desktop.
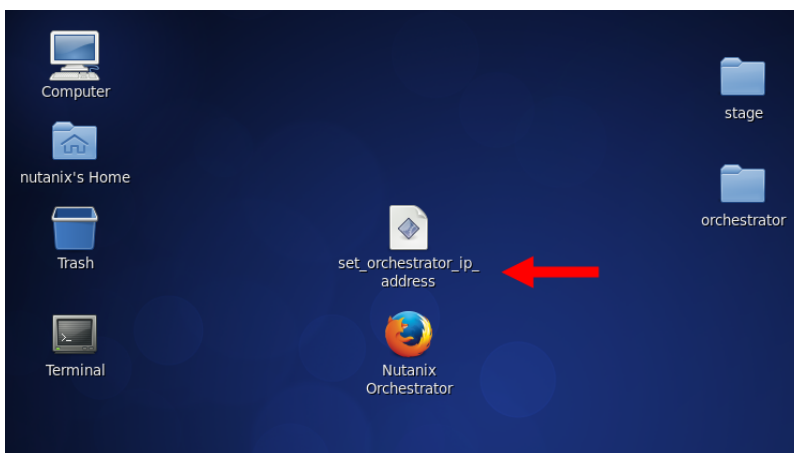
Figure: Nutanix_Installer VM: Desktop

b. In the pop-up window, click the **Run in Terminal** button.
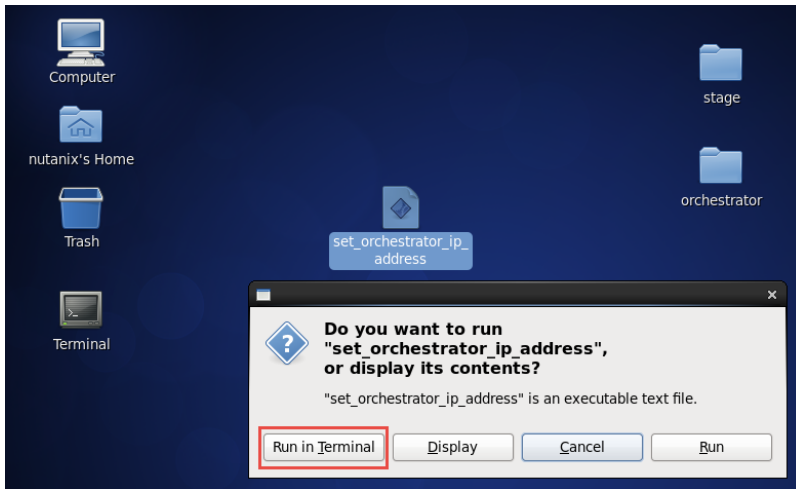
Figure: Orchestrator VM: Terminal Window

c. In the Select Action box in the terminal window, select **Device Configuration**.

Figure: Orchestrator VM: Action Box

d. In the Select a Device box, select **eth0**.

Figure: Orchestrator VM: Device Configuration Box

e. In the Network Configuration box, remove the asterisk in the **Use DHCP** field (which is set by default), enter appropriate addresses in the **Static IP**, **Netmask**, and **Default gateway IP** fields, and then click the **OK** button.

Figure: Orchestrator VM: Network Configuration Box

   f. Click the **Save** button in the Select a Device box and the **Save & Quit** button in the Select Action box.
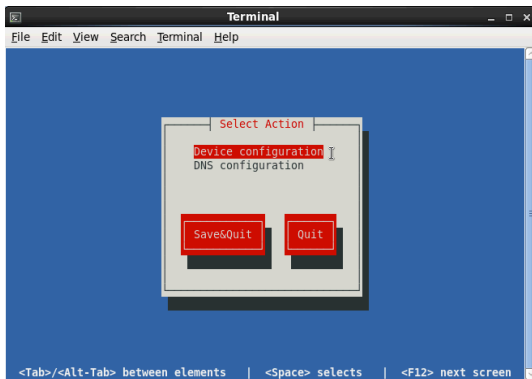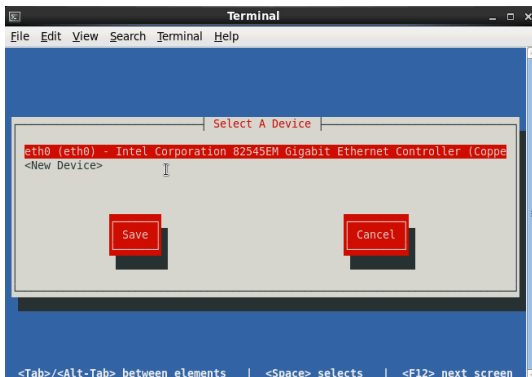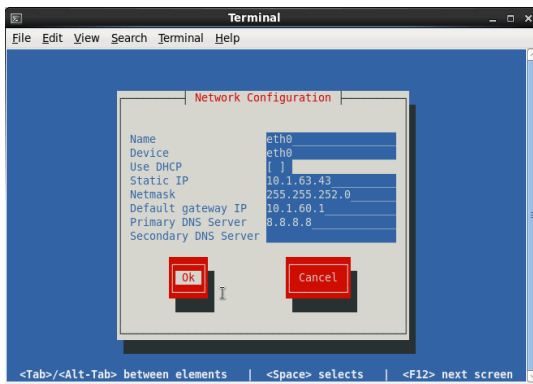This save the configuration and closes the terminal window.

16. Copy the desired Phoenix ISO image file from the Orchestrator portal (see *Orchestrator Portal* on page 31) to the `/home/nutanix/orchestrator/isos/phoenix` folder.

Phoenix is the name of another installation tool used in this process. There is a Phoenix ISO image file for each supported NOS release. See the *Phoenix Releases* section in *Orchestrator Portal* on page 31 for a list of the available Phoenix ISO images.

> ☢ **Caution:** Phoenix release 1.0.1 is the earliest supported release; do not use a Phoenix ISO image from an earlier release.

17. Download the desired hypervisor ISO image to the `/home/nutanix/orchestrator/isos/hypervisor` folder.

Customers must provide the ESXi ISO image from their purchased copy; it is not provided by Nutanix. Check with your VMware representative or download it from the VMware support site (http://www.vmware.com/support.html). The following table lists the supported hypervisor images.

Hypervisor ISO Images

File Name	MD5 Sum	Hypervisor Version
VMware-VMvisor-Installer-5.0.0.update02-914586.x86_64.iso	fa6a00a3f0dd0cd1a677f69a236611e2	ESXi 5.0U2
VMware-VMvisor-Installer-5.1.0.update01-1065491.x86_64.iso	2cd15e433aaacc7638c706e013dd673a	ESXi 5.1U1
VMware-VMvisor-Installer-5.5.0-1331820.x86_64.iso	9aaa9e0daa424a7021c7dc13db7b9409	ESXi 5.5

Imaging a Cluster (standard method)

This procedure describes how to install the NOS Controller VM and a selected hypervisor on all the new nodes in a cluster from an ISO image on a workstation.
Before you begin.

- Physically install the Nutanix cluster at your site. See the *Physical Installation Guide* for your model type for installation instructions.
- Set up the installation environment (see *Preparing Installation Environment* on page 7).
- Have ready the appropriate IP address and netmask information needed for installation. You can use the following table to record the information prior to installation.

> **Note:** The Orchestrator IP address set previously assumed a public network in order to download the approrpriate files. If you are imaging the cluster on a different (typically private) network in which the current address is no longer correct, repeat step15 in *Preparing Installation Environment* on page 7 to configure a new static IP address for the Orchestrator VM.

Installation Parameter Values

Parameter	Value
Global Parameters	
IPMI netmask	
IPMI gateway (IP address)	
IPMI username (default is ADMIN)	
IPMI password (default is ADMIN)	
Hypervisor netmask	
Hypervisor gateway	
Hypervisor name server (DNS server IP address)	
Node-Specific Parameters	
Starting IP address for IPMI port range	
Starting IP address for hypervisor port range	

To install the Controller VM and hypervisor on the cluster nodes, do the following:

1. Click the **Nutanix Orchestrator** icon on the Orchestrator VM desktop to start the Nutanix Installer GUI.

> **Note:** See *Preparing Installation Environment* on page 7 if Oracle VM VirtualBox is not started or the Nutanix Orchestrator VM is not running currently. You can also start the Nutanix Installer GUI by opening a web browser and entering `http://localhost:8000/gui/index.html`.
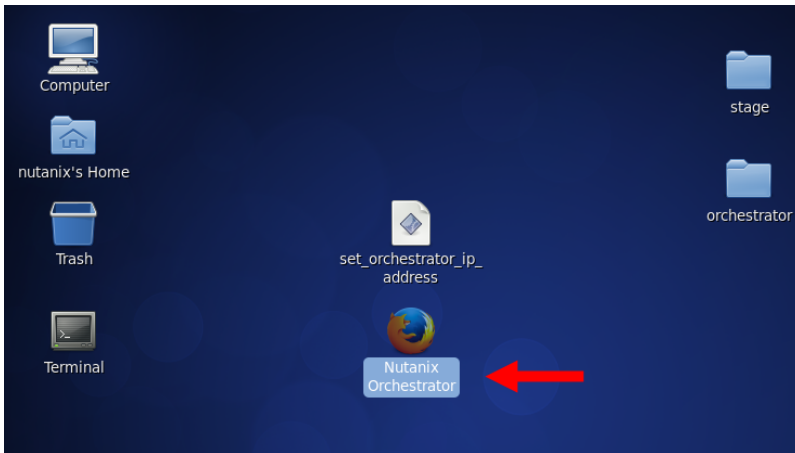
Figure: Orchestrator VM Desktop

The Nutanix Installer screen appears. The screen contains three sections, global hypervisor and IPMI details at the top, node information in the middle, and ISO image links at the bottom. Upon opening the Nutanix Installer screen, Orchestrator beings searching the network for unconfigured Nutanix nodes and displays information in the middle section about the discovered nodes. The discovery process can take several minutes (or longer) if the cluster is large. Wait for the discovery process to complete before proceeding.

Figure: Nutanix Installer: Full Screen

2. In the top section of the screen, enter appropriate values in the indicated fields:

> **Note:** The parameters in this section are global and will apply to all the discovered nodes.

a. **IPMI Netmask**: Enter the IPMI netmask value.

b. I**IPMI Gateway**: Enter an IP address for the gateway.

c. **IPMI Username**: Enter the IPMI user name. The default user name is ADMIN.

d. I**IPMI Password**: Enter the IPMI password. The default password is ADMIN.

e. **Hypervisor Netmask**: Enter the hypervisor netmask value.

f. **Hypervisor Gateway**: Enter an IP address for the gateway.

g. **Hypervisor Name Server**: Enter the IP address of the DNS name server.

3. In the middle section of the screen, do the following:

   The middle section includes columns for the block, node, IPMI IP address, and hypervisor IP address. A section is displayed for each discovered block with lines for each node in that block. The size of the middle section varies and can be quite large when many blocks are discovered.

   a. In the top line of the **IPMI IP** column, enter a starting IP address.

      The entered address is assigned to the IPMI port of the first node, and consecutive IP addresses (starting from the entered address) are assigned automatically to the remaining nodes. Discovered nodes are sorted first by block ID and then by position, so IP assignments are sequential. If you do not want all addresses to be consecutive, you can change the IP address for specific nodes by updating the address in the appropriate fields for those nodes.

      Note: Automatic assignment is not used for addresses ending in 0, 1, 254, or 255, because such addresses are commonly reserved by network administrators.

   b. Repeat the previous step for the IP addresses in the **Hypervisor IP** column.

4. In the bottom section of the screen, do the following:

   a. In the **Phoenix ISO Image** field, select the Phoenix ISO image you downloaded previously from the pull-down list (see *Preparing Installation Environment* on page 7).

      Note: If you do not see the desired Phoenix ISO image (or hypervisor ISO image in the next step) in the list, click the **Refresh** button to display the current list of available images.

   b. In the **Hypervisor ISO Image** field, select the hypervisor ISO image you downloaded previously from the pull-down list (see *Preparing Installation Environment* on page 7).

5. When all the fields are correct, click the Run Installation button.

   The imaging process begins. Nodes are imaged in parallel, and the imaging process takes about 45 minutes.

   Note: Simultaneous processing is limited to a maximum of eight nodes. If the cluster contains more than eight nodes, the total processing time is about 45 minutes for each group of eight nodes.

   Processing occurs in two stages. First, the IPMI port addresses are configured. If IPMI port addressing is successful, the nodes are imaged. No progress information appears in the GUI during the IPMI port configuration processing (which can take several minutes or longer depending on the size of the cluster). You can watch server progress by viewing the service.log file in a terminal:

   ```
   cd /home/nutanix/orchestrator/log && tail -f service.log
   ```

When processing moves to node imaging, the GUI displays dynamic status messages and a progress bar for each node. A blue bar indicates good progress; a red bar indicates a problem. Processing messages for starting, installing, rebooting, and succeeded (installed) appear during each stage. Click on the progress bar for a node to display the log file for that node (on the right).
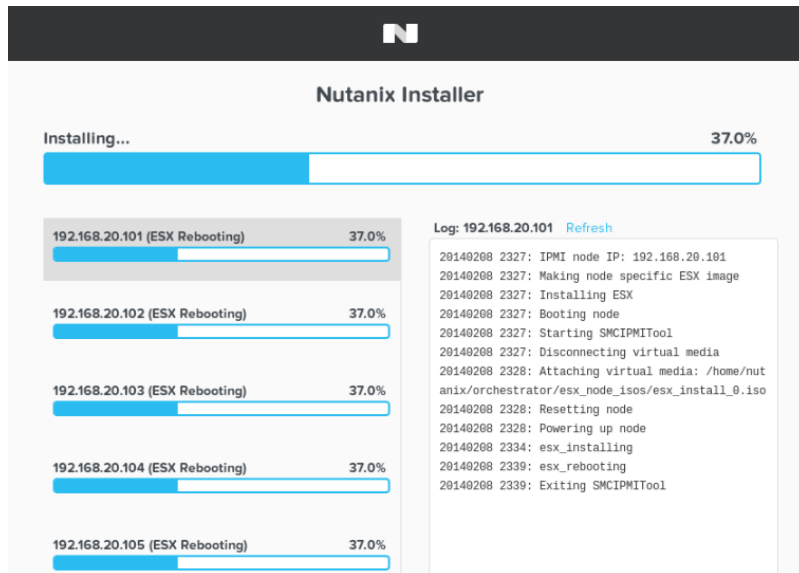

Figure: Nutanix Installer: Progress Bars

When processing is complete, a green check mark appears next to the node name if IPMI configuration and imaging was successful or a red x appears if it was not. At this point, do one of the following:

- *Status: There is a green check mark next to every node.* This means IPMI configuration and imaging (both hypervisor and NOS Controller VM) across all the nodes in the cluster was successful. At this point you can configure the cluster normally as you would after receiving pre-installed nodes from the factory. See the *Nutanix Setup Guide* for instructions on configuring a Nutanix cluster.
- *Status: At least one node has a red check mark next to the IPMI address field.* This means the installation failed at the IPMI configuration step. To correct this problem, see *Fixing IPMI Configuration Problems* on page 15.
- *Status: At least one node has a red check mark next to the hypervisor address field.* This means IPMI configuration was successful across the cluster but imaging failed. The default per-node installation timeout is 30 minutes, so you can expect all the nodes (in each run of up to eight nodes) to finish successfully or encounter a problem in that amount of time. To correct this problem, see *Fixing Imaging Problems* on page 16.

Fixing IPMI Configuration Problems

When the IPMI port configuration fails for one or more nodes in the cluster, the installation process stops before imaging any of the nodes. (Orchestrator will not go to the imaging step after an IPMI port configuration failure, but it will try to configure the IPMI port address on all nodes before stopping.) The installation screen reappears with a red check next to the IPMI port address field for any node that was not configured successfully. To correct this problem, do the following:

1. Review the displayed addresses for the failed nodes, determine if that address is valid, and change the IP address in that field if necessary.

   Hovering the cursor over the address displays a pop-up message (see figure) with troubleshooting information. This can help you diagnose and correct the problem. In addition see the `service.log` file (in `/home/nutanix/orchestrator/log`) for more detailed information.

2. When you have corrected all the problems and are ready to try again, click the **Configure IPMI** button at the bottom of the screen.

3. Repeat the preceding steps as necessary to fix all the IPMI configuration errors.

4. When all nodes have green check marks in the IPMI address column, click the Image Nodes button at the bottom of the screen to begin the imaging step.

   If you cannot fix the IPMI configuration problem for one or more of the nodes, you can bypass those nodes and continue to the imaging step for the other nodes by clicking the Proceed button. In this case you must configure the IPMI port address manually for each bypassed node (see *Setting IPMI Static IP Address* on page 34).
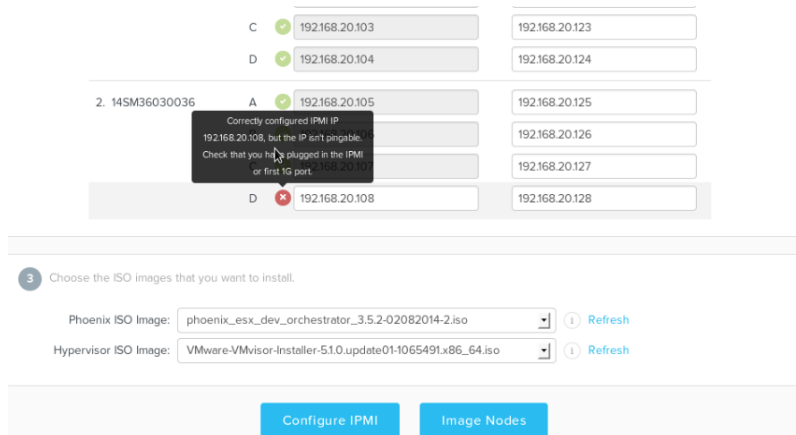

Figure: Nutanix Installer: IPMI Configuration Error

Fixing Imaging Problems

When imaging fails for one or more nodes in the cluster, the installation screen reappears with a red check next to the hypervisor address field for any node that was not imaged successfully. To correct this problem, do the following:

1. Review the displayed addresses for the failed nodes, determine if that address is valid, and change the IP address in that field if necessary.

   Hovering the cursor over the address displays a pop-up message with troubleshooting information. This can help you diagnosis and correct the problem.

2. When you have corrected the problems and are ready to try again, click the **Proceed** button at the bottom of the screen.

   The GUI displays dynamic status messages and a progress bar for each node during imaging (see *Imaging a Cluster (standard method)* on page 12.

3. Repeat the preceding steps as necessary to fix all the imaging errors.

   If you cannot fix the imaging problem for one or more of the nodes, you can image those nodes one at a time (see *Imaging a Node* on page 25).

   In the following example, a node failed to image successfully because it exceeded the installation timeout period. (This was because the IPMI port cable was disconnected during installation.) The progress bar turned red and a message about the problem was written to the log.
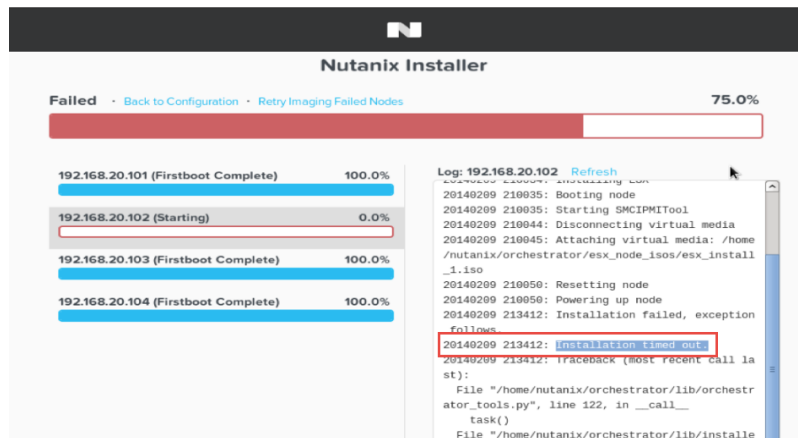
Figure: Nutanix Installer: Imaging Problem (progress screen)

Clicking the **Back to Configuration** link at the top redisplays the original Nutanix Installer screen updated to show 192.168.20.102 failed to image successfully. After fixing the problem, click the **Image Nodes** button to image that node again. (You can also retry imaging by clicking the **Retry Imaging Failed Nodes** link at the top of the status bar page.)
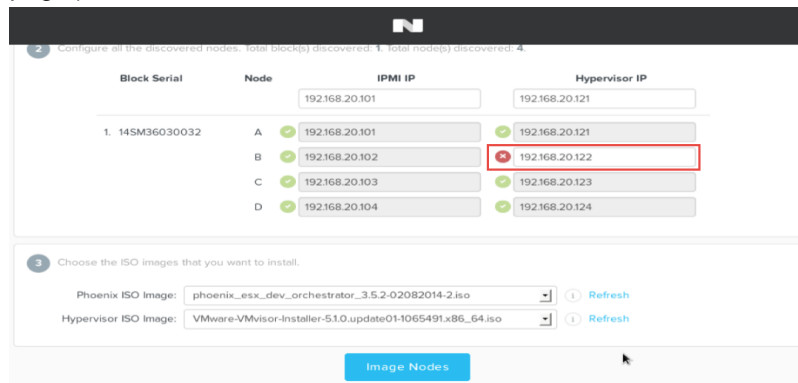
Figure: Nutanix Installer: Imaging Problem (configuration screen)

The imaging process starts again for the failed node(s).
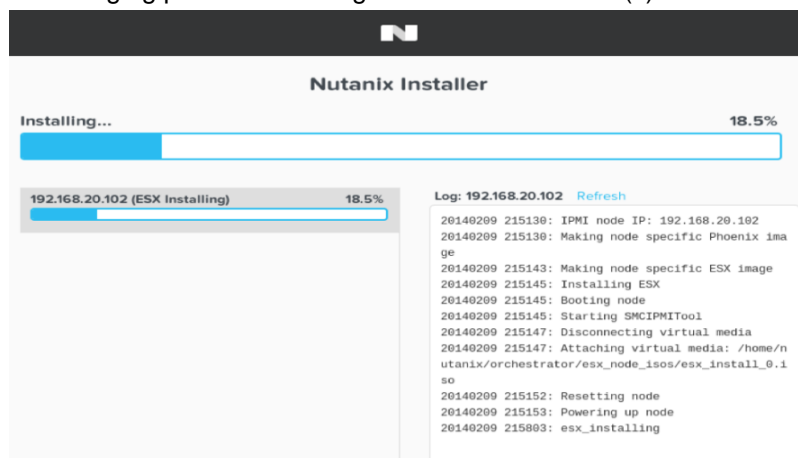
Figure: Nutanix Installer: Imaging Problem (retry screen)

Cleaning Up After Installation

This procedure describes how to return the Orchestrator VM to a fresh state after an installation.

Some information persists after imaging a cluster through Orchestrator. If you want to use the same Orchestrator VM to image another cluster, the persistent information must be removed before attempting another installation. To remove the persistent information after an installation, do the following:

1. Open a terminal window and go to the Orchestrator home directory:

   ```
   cd /home/nutanix/orchestrator
   ```

2. Remove the persistent information by entering the following command:

   ```
   rm persisted_config.json
   ```

3. Restart the Orchestrator service by entering the following command:

   ```
   sudo /etc/init.d/orchestrator_service restart
   ```

Imaging a Cluster (manual method)

This procedure describes how to manually install the NOS Controller VM and selected hypervisor on all the new nodes in a cluster from an ISO image on a workstation.
Before you begin.

- Physically install the Nutanix cluster at your site. See the *Physical Installation Guide* for your model type for installation instructions.
- Set up the installation environment (see *Preparing Installation Environment* on page 7).

> **Note:** The standard method (see *Imaging a Cluster (standard method)* on page 12) is recommended in most cases. The manual procedure is available when the standard method is not an option.

Manually installing the Controller VM and hypervisor on the cluster nodes involves the following tasks:

1. Prepare the cluster nodes for installation.

    This requires identifying all the nodes in the cluster and then configuring a static IP address for the IPMI interface on each node (see *Preparing Nutanix Nodes* on page 19).

2. Complete the installation.

    This requires creating a configuration file and then running the Orchestrator installation tool (see *Completing Installation* on page 22).

Preparing Nutanix Nodes

Manually imaging a cluster in the field requires first configuring the IPMI ports of all the new nodes in the cluster to a static IP address.

The Orchestrator installation tool includes a `discovery.py` utility that can find the nodes on a LAN or VLAN and configure their IPMI addresses. To configure the IPMI port addresses in a cluster using this utility, do the following:

1. Power on all the nodes in the cluster.

    Wait at least 10 minutes after powering up a node for the hypervisor and Controller VM to finish booting.

2. In the Nutanix Orchestrator VM, right click on the desktop and select **Open in Terminal** from the pull-down menu.

    > **Note:** See *Preparing Installation Environment* on page 7 if Oracle VM VirtualBox is not started or the Nutanix Orchestrator VM is not running currently.

3. In the terminal window, go to the Orchestrator directory.

    ```
    $ cd /home/nutanix/orchestrator
    ```

    This directory contains Orchestrator-related files.

4. Enter the following command to discover any new nodes in a cluster:

    ```
    $ ./discovery.py discover
    ```

    This command finds nodes on the same LAN (or VLAN) segment that are not yet part of a cluster and writes their names and IPv6 addresses to the file `discovered_nodes.txt` (located in `~/orchestrator`).

The discovery process typically takes a few minutes depending on the size of the network. For example, it took about 10 minutes to discover 60 nodes on a crowded VLAN.

```
                    nutanix@nutanix-installer:~/orchestrator
File  Edit  View  Search  Terminal  Help
[nutanix@nutanix-installer orchestrator]$ ./discovery.py discover
INFO: Discovering nodes. Expect this to take some time.
Discovered block 14SM36030032 node B at fe80::20c:29ff:fee1:15c2%eth0
Discovered block 14SM36030032 node A at fe80::20c:29ff:fede:22fc%eth0
Discovered block 14SM36030032 node C at fe80::20c:29ff:fee3:6ddd%eth0
Discovered block 14SM36030036 node B at fe80::20c:29ff:fef4:6c51%eth0
Discovered block 14SM36030036 node D at fe80::20c:29ff:fe9c:e3e%eth0
Discovered block 14SM36030032 node D at fe80::20c:29ff:fe18:a71d%eth0
Discovered block 14SM36030036 node C at fe80::20c:29ff:febf:afb8%eth0
Discovered block 14SM36030036 node A at fe80::20c:29ff:fe36:beee%eth0
INFO: Wrote nodes to discovered_nodes.txt
[nutanix@nutanix-installer orchestrator]$ cat discovered_nodes.txt
14SM36030032 NX-3060 A fe80::20c:29ff:fede:22fc eth0
14SM36030032 NX-3060 B fe80::20c:29ff:fee1:15c2 eth0
14SM36030032 NX-3060 C fe80::20c:29ff:fee3:6ddd eth0
14SM36030032 NX-3060 D fe80::20c:29ff:fe18:a71d eth0
14SM36030036 NX-3060 A fe80::20c:29ff:fe36:beee eth0
14SM36030036 NX-3060 B fe80::20c:29ff:fef4:6c51 eth0
14SM36030036 NX-3060 C fe80::20c:29ff:febf:afb8 eth0
14SM36030036 NX-3060 D fe80::20c:29ff:fe9c:e3e eth0
[nutanix@nutanix-installer orchestrator]$
```

The output file includes a line for each node containing node information (block ID, model type, node position, IPv6 address, and IPv6 interface). The lines are sorted first by block ID and then by node position. The content of this file is used as input in the next step.

- You can add or edit entries in this file if necessary. However, make sure the changes conform to the block ID and node position sort ordering. Otherwise, the IPMI IP address assignments will not be consecutive. In addition, do not leave blank lines in the file.
- If you suspect nodes are being missed, you can extend the number of retries by adding an "-n number_of_retries" option to the command. This parameter sets the number of consecutive retries discovery.py must run without finding a new node. The retries number is set to 10 by default.
- You can extend the browsing timeout (to account for a congested network) by adding a "-t time_in_seconds" option to the command. This sets the maximum wait time for a browsing call to return before advancing to the next retry. The default value is 40 seconds.
- You can change the name of the output file by adding an "-f file_name" option to the command.

> **Note:** The discovery.py command syntax is:
>
> ```
> discovery.py [options] [discover | configure]
> ```

5. Enter the following command to configure the IPMI port addresses on the discovered nodes:

```
$ ./discovery.py --ipmi_ip_start ip_start_number --ipmi_netmask netmask_value configure
```

This command configures the IPMI interface IP addresses for all the nodes discovered in the previous step. It starts at the *ip_start_number* address and increments by one for each node. The *netmask_value* sets the netmask for all the IPMI interfaces. IP addresses are assigned based on the node order listed in discovered_nodes.txt. This means the IP addresses will be assigned in order of block ID and node position. You can specify additional options as needed. The following table describes the options available for this command.

> **Note:** This command assumes the input file is named discovered_nodes.txt. If the -f option was used in the previous step to change the output file name, you must specify that file by adding an "-f file_name" option to this command.

```
┌──────────────────────────────────────────────────────────────────────┐
│ ⊠            nutanix@nutanix-installer:~/orchestrator      _ □ ×       │
├──────────────────────────────────────────────────────────────────────┤
│ File  Edit  View  Search  Terminal  Help                              │
│ [nutanix@nutanix-installer orchestrator]$ ./discovery.py --ipmi_ip_start=192.168^│
│ .20.30 --ipmi_netmask=255.255.255.0 --ipmi_gateway=192.168.20.1 --hypervisor_ip_│
│ start=192.168.20.40 --hypervisor_netmask=255.255.255.0 --hypervisor_gateway=192.│
│ 168.20.1 configure                                                    │
│  2014-02-10 17:39:43 WARNING cluster:1399 Executing operation ipconfig on localh│
│ ost                                                                   │
│ 2014-02-10 17:39:43 INFO cluster:1401 Executing action ipconfig on SVMs localhos│
│ t                                                                     │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fede:22fc%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:febf:afb8%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fef4:6c51%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fe18:a71d%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fee3:6ddd%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fe36:beee%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fee1:15c2%eth0                                                      │
│ 2014-02-10 17:39:43 INFO cluster:494 IP configuration succeeded on fe80::20c:29f│
│ f:fe9c:e3e%eth0                                                       │
│ 2014-02-10 17:39:43 INFO cluster:1463 Success!                        │
│                                                                       │
│ INFO: Configured IPs.                                                 │
│ INFO: Wrote config template to generated_orchestrator_cfg.txt         │
│ [nutanix@nutanix-installer orchestrator]$ ▮                           │
│                                                                       │
└──────────────────────────────────────────────────────────────────────┘
```
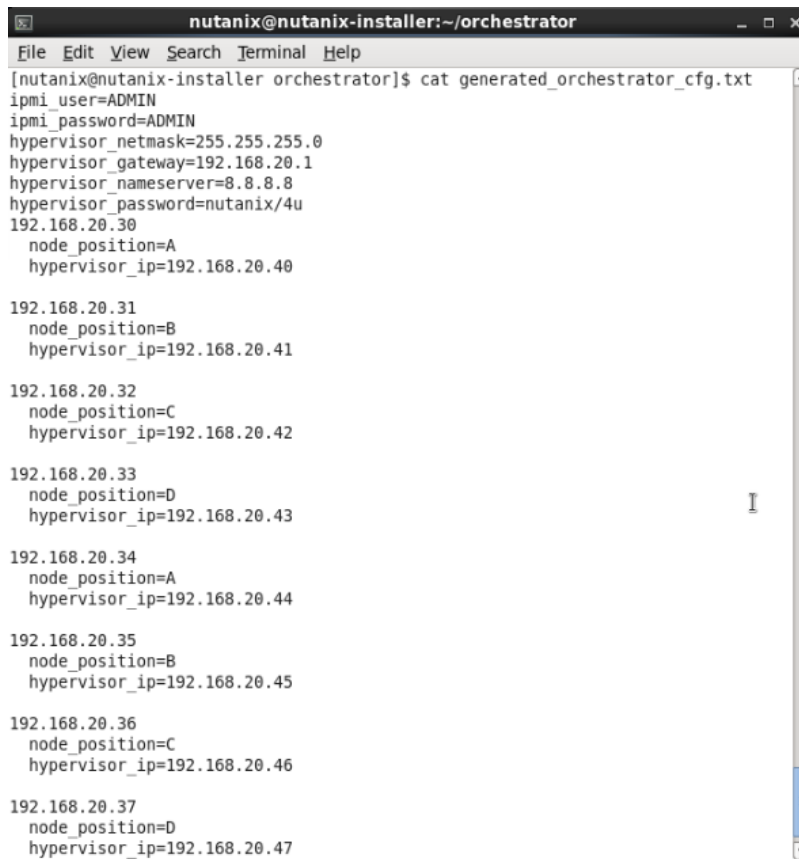
Discovery.py Command Options

Option Name	Description
--ipmi_ip_start	Sets the starting IP address that will be assigned to the IPMI interfaces. Addresses increment by one for each additional node. This option is required.
--ipmi_netmask	Sets the IPMI netmask value. This is a global setting across all nodes. This option is required.
--ipmi_gateway	Specifies the IP address of the router for the IPMI range.
--ipmi_user	Specifies the user name for the IPMI console. The default user name is ADMIN.
--ipmi_password	Specifies the password for the IPMI console. The default password is ADMIN.
--hypervisor_ip_start	Sets the starting IP address for the hypervisor address range.
--hypervisor_netmask	Sets the hypervisor netmask value. This is a global setting across all nodes.
--hypervisor_gateway	Specifies the IP address of the router for the hypervisor range.
--hypervisor_nameserver	Specifies the IP address of the name server in the hypervisor range. The default value is 8.8.8.8.
--hypervisor_password	Specifies the password for the hypervisor console. The default (and required) name is nutanix/4u.

6. Verify that the IP addresses were assigned correctly by pointing a web browser at the expected IPMI IP address.

It may take up to a minute after the completion of assignment for the IPMI interfaces to be available.

7. Review the generated_orchestrator_cfg.txt file for accuracy and completeness.

A summary of the configuration information is written to the `generated_orchestrator_cfg.txt` file that can be used as the basis for an `orchestror.config` file (see *Completing Installation* on page 22). You can manually update this file as needed.

```
                    nutanix@nutanix-installer:~/orchestrator              _  □  ×
File  Edit  View  Search  Terminal  Help
[nutanix@nutanix-installer orchestrator]$ cat generated_orchestrator_cfg.txt
ipmi_user=ADMIN
ipmi_password=ADMIN
hypervisor_netmask=255.255.255.0
hypervisor_gateway=192.168.20.1
hypervisor_nameserver=8.8.8.8
hypervisor_password=nutanix/4u
192.168.20.30
  node_position=A
  hypervisor_ip=192.168.20.40

192.168.20.31
  node_position=B
  hypervisor_ip=192.168.20.41

192.168.20.32
  node_position=C
  hypervisor_ip=192.168.20.42

192.168.20.33
  node_position=D
  hypervisor_ip=192.168.20.43

192.168.20.34
  node_position=A
  hypervisor_ip=192.168.20.44

192.168.20.35
  node_position=B
  hypervisor_ip=192.168.20.45

192.168.20.36
  node_position=C
  hypervisor_ip=192.168.20.46

192.168.20.37
  node_position=D
  hypervisor_ip=192.168.20.47
```

> **Note:** If the IPMI port address on any of the nodes was not configured successfully using this utility, you can configure that address manually by going into the BIOS on the node (see *Setting IPMI Static IP Address* on page 34).

Completing Installation

Completing a manual installation involves creating a configuration file and then running the Orchestrator installation tool using that configuration with the appropriate NOS and hypervisor image files.

To complete imaging a cluster manually, do the following:

1. In a terminal window on the Orchestrator VM, go to the Orchestrator directory (`/home/nutanix/orchestrator`) and copy `generated_orchestrator_cfg.txt` (see *Preparing Nutanix Nodes* on page 19) as `orchestrator.config`.

Orchestrator targets the nodes specified in `orchestrator.config`. If there is an existing `orchestrator.config`, save it before overwriting with the `generated_orchestrator_cfg.txt` contents.

2. Open `orchestrator.config` for editing (using an editor of choice), review the entries, and update them if necessary.

Syntax is one parameter per line in the form *parameter_name=value* (no spaces). The top section is for global variables:

- **ipmi_user**: This is the IPMI user name.
- **ipmi_password**: This is the IPMI user password.
- **hypervisor_netmask**: This is the hypervisor netmask value.
- **hypervisor_gateway**: This is the gateway IP address for the hypervisor.
- **hypervisor_nameserver**: This is the name server IP address for the hypervisor.
- **hypervisor_password**: This is the hypervisor password, which must be `nutanix/4u`.

The following section is for node-specific parameters. The following lines should be present for each node to be imaged:

- The IPMI IP address is on the first line.
- The **hypervisor_ip** parameter is indented on the next line.
- The `generated_orchestrator_cfg.txt` contents may include an optional indented line for the **node position** parameter.

When all the values are correct, save the file.

> **Note:** See *Orchestrator Configuration File* on page 33 for a sample `orchestrator.config` file.

3. Verify the desired Phoenix and hypervisor ISO image files are in the `/home/nutanix/orchestrator` directory (see *Preparing Installation Environment* on page 7).

4. Enter the following command to stop the Orchestrator service:

```
$ sudo service orchestrator_service stop
```

5. Enter the following command to start the installation:

```
$ ./orchestrator orchestrator.config --esx=esx_iso_filename --
phoenix=phoenix_iso_filename
```

Replace *esx_iso_filename* with the full absolute path name of the target ESXi ISO image file and *phoenix_iso_filename* with the full absolute path name of the target Phoenix ISO image file.

6. Monitor the progress of the NOS and ESXi installation from the Orchestrator output and/or a VGA monitor connected to the physical nodes.

The entire installation process takes approximately 45 minutes. (Installation runs in parallel across all nodes. However, when there are more than eight nodes in the cluster, installation is 45 minutes per block of eight nodes.) The following is sample output during the installation process. A status message is printed every 20 seconds indicating the number of nodes in each state. (The sum of numbers on a line should be the total number of nodes.)

```
[nutanix@localhost orchestrator] $ ./orchestrator thor.config --
esx=VMware-VMvisor-Installer-5.1.0.update01-1065491.x86_64.iso --
phoenix=phoenix_esx_dev_orchestrator_3.5.2-01312014.iso
Detecting node classes.
Processing ESX iso
Processing phoenix iso
Installation in progress. Will report aggregate node status
every 20 seconds.
Node status: starting: 4
Node status: starting: 4
...
Node status: esx_installing: 1, starting: 3
...
Node status: esx_rebooting: 1, esx_installing: 3
...
Node status: esx_installed: 3, svm_download: 1
...
Node status: phoenix_complete: 1, imaging: 3
...
Node status: phoenix_complete: 3, firstboot_complete: 1
```

```
Installation was successful on all nodes.
Run time: 38.2 minutes.
[nutanix@localhost orchestrator] $
```

7. When the installation completes and Orchestrator exits, wait for one final reboot of ESXi before using the nodes.

   This final reboot should occur within a few minutes after Orchestrator exits.

8. After a successful installation, configure the cluster as described in the *Nutanix Setup Guide*.

9. If an error occurs during installation, do the following:

   a. Check the `/home/nutanix/orchestrator/log` directory for HTTP and node level error logs and make adjustments as indicated in the logs.

   b. If you are unable to correct the problem(s), re-run Orchestrator for just the failed nodes by editing the Orchestrator configuration file and removing the node information for the nodes that were successfully installed. (You can comment out a line by starting it with a # sign.)

Imaging a Node

This procedure describes how to install the NOS Controller VM and selected hypervisor on a new or replacement node from an ISO image on a workstation (laptop or desktop machine).
Before you begin.

- If you are adding a new node, physically install that node at your site. See the *Physical Installation Guide* for your model type for installation instructions.

Imaging a new or replacement node can be done either through the IPMI interface (network connection required) or through a direct attached USB (no network connection required). In either case the installation is divided into two steps:

1. Install the desired hypervisor version (see *Installing a Hypervisor* on page 25).

2. Install the NOS Controller VM and provision the hypervisor (see *Installing the Controller VM* on page 28).

Installing a Hypervisor

This procedure describes how to install a hypervisor on a single node in a cluster in the field.

To install a hypervisor on a new or replacement node in the field, do the following:

1. Connect the IPMI port on that node to the network.
   A 1 or 10 GbE port connection is not required for imaging the node.

2. Assign an IP address (static or DHCP) to the IPMI interface on the node.
   To assign a static address, see *Setting IPMI Static IP Address* on page 34.

3. Download the appropriate hypervisor ISO image to a temporary folder on the workstation.
   Customers must provide the ESXi ISO image from their purchased copy; it is not provided by Nutanix. Check with your VMware representative or download it from the VMware support site (http://www.vmware.com/support.html). The following table lists the supported hypervisor images.

Hypervisor ISO Images

File Name	MD5 Sum	Hypervisor Version
VMware-VMvisor-Installer-5.0.0.update02-914586.x86_64.iso	fa6a00a3f0dd0cd1a677f69a236611e2	ESXi 5.0U2
VMware-VMvisor-Installer-5.1.0.update01-1065491.x86_64.iso	2cd15e433aaacc7638c706e013dd673a	ESXi 5.1U1
VMware-VMvisor-Installer-5.5.0-1331820.x86_64.iso	9aaa9e0daa424a7021c7dc13db7b9409	ESX 5.5

4. Open a Web browser to the IPMI IP address of the node to be imaged.

5. Enter the IPMI login credentials in the login screen.

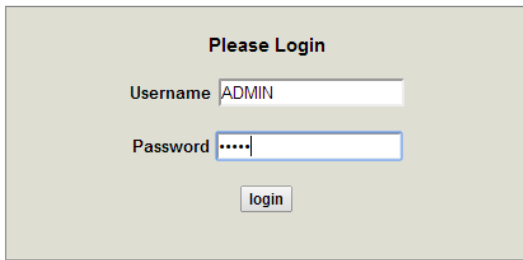The default value for both user name and password is ADMIN (upper case).

Figure: IPMI Console Login Screen
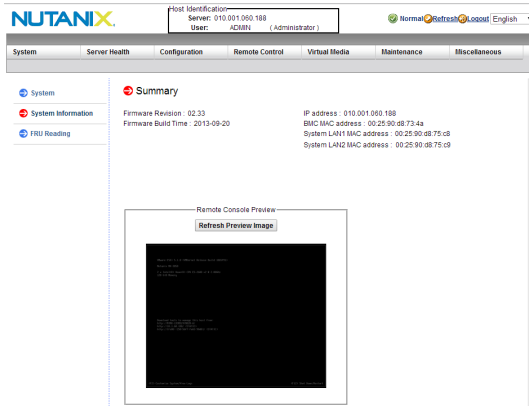
The IPMI console main screen appears.

Figure: IPMI Console Screen

6. Select **Console Redirection** from the **Remote Console** drop-down list of the main menu, and then click the **Launch Console** button.
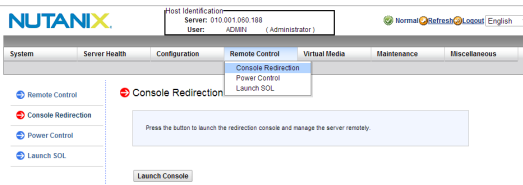

Figure: IPMI Console Menu

7. Select **Virtual Storage** from the **Virtual Media** drop-down list of the remote console main menu.
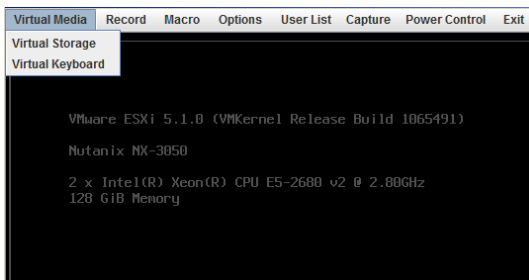

Figure: IPMI Remote Console Menu (Virtual Media)

8. Click the **CDROM&ISO** tab in the Virtual Storage display and then select **ISO File** from the **Logical Drive Type** field drop-down list.
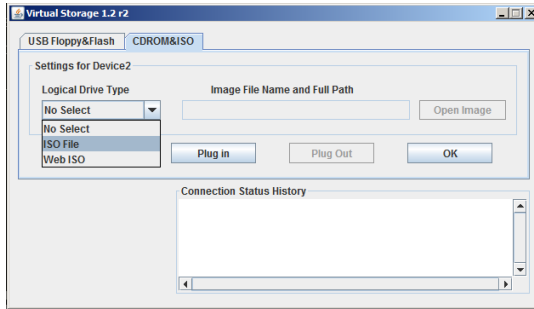
Figure: IPMI Virtual Storage Screen

9. In the browse window, go to where the hypervisor ISO image was downloaded, select that file, and then click the **Open** button.

10. In the remote console main menu, select **Set Power Reset** in the **Power Control** drop-down list.

   This causes the system to reboot using the selected hypervisor image.

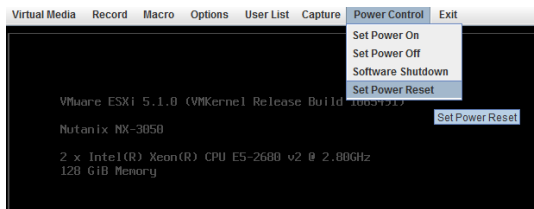*Figure: IPMI Remote Console Menu (Power Control)*

11. Click **Continue** (Enter) at the installation screen and then accept the end user license agreement on the next screen.
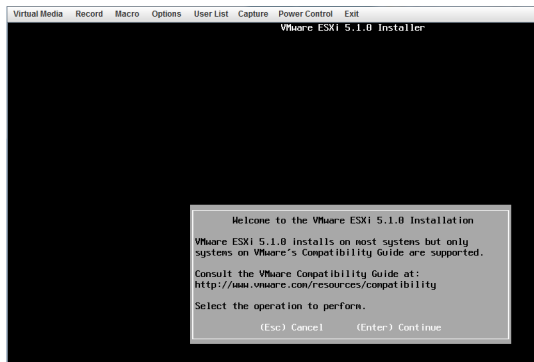

Figure: ESXi Installation Screen

12. In the Select a Disk page, select the SATADOM as the storage device, click **Continue**, and then click **OK** in the confirmation window.
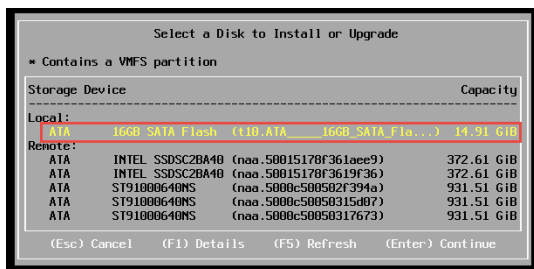

Figure: ESXi Device Selection Screen

13. In the keyboard layout screen, select a layout (such as **US Default**) and then click **Continue**.

14. In the root password screen, enter "`nutanix/4u`" as the root password.

> 📄 **Note:** The root password must be nutanix/4u or the installation will fail.

15. Review the information on the Install Confirm screen and then click **Install**.
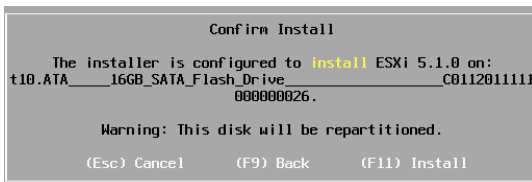
```
                    Confirm Install

     The installer is configured to install ESXi 5.1.0 on:
t10.ATA_____16GB_SATA_Flash_Drive_____C0112011111
                       000000026.

         Warning: This disk will be repartitioned.

     (Esc) Cancel      (F9) Back      (F11) Install
```

Figure: ESXi Installation Confirmation Screen

The installation begins and a dynamic progress bar appears.

16. When the Installation Complete screen appears, go back to the Virtual Storage screen (see step 9), click the **Plug Out** button, and then return to the Installation Complete screen and click **Reboot**.

After the system reboots, you can install the NOS Controller VM and provision the hypervisor (see *Installing the Controller VM* on page 28).

Installing the Controller VM

This procedure describes how to install the NOS Controller VM and provision the previously installed hypervisor on a single node in a cluster in the field.
Before you begin.

- Install a hypervisor on the node (see *Installing a Hypervisor* on page 25).

To install the Controller VM (and provision the hypervisor) on a new or replacement node, do the following:

1. Copy the appropriate Phoenix ISO image file from the Orchestrator portal (see *Orchestrator Portal* on page 31) to a temporary folder on the workstation. (You can download it to the same folder as the hypervisor ISO image .)

Phoenix is the name of the installation tool used in this process. There is a Phoenix ISO image file for each supported NOS release. See the *Phoenix Releases* section in *Orchestrator Portal* on page 31 for a list of the available Phoenix ISO images.

> ☢ **Caution:** Phoenix release 1.0.1 is the earliest supported release; do not use a Phoenix ISO image from an earlier release.

2. In the IPMI web console, attach the Phoenix ISO to the node as follows:

a. Go to **Remote Control** and click **Launch Console** (if it is not already launched).
Accept any security warnings to start the console.

b. In the console, click **Media** > **Virtual Media Wizard**.

c. Click **Browse** next to **ISO Image** and select the ISO file.

d. Click **Connect CD/DVD**.
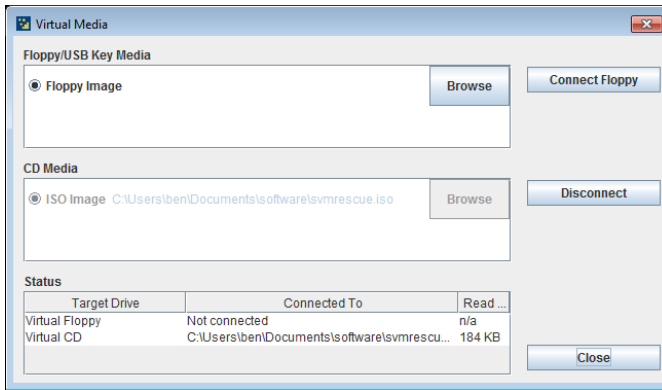
    e. Go to **Remote Control** > **Power Control**.

    f. Select **Reset Server** and click **Perform Action**.
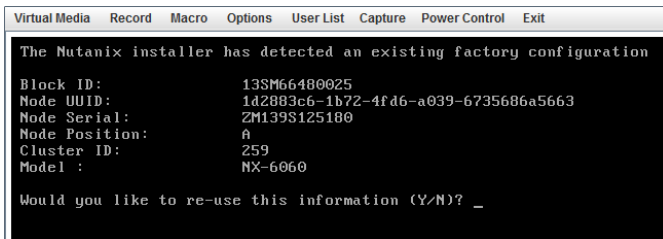The host restarts from the ISO.

3. At the prompt enter **Y** to accept the factory configuration or **N** if the node position value is not correct.

4. Do the following in the Nutanix Installer configuration screen:

    a. Review the values in the **Block ID**, **Node Serial**, and **Node Cluster ID** fields (and **Node Model** if you entered **N** in the previous step) and update them if they are not correct.

    The **Hypervisor Type**, **Hypervisor Version**, **Node Model**, and **Nutanix Software** fields cannot be edited.

    b. Do one of the following:

- If you are imaging a U-node, select both **Clean Install Hypervisor** and **Clean Install SVM**
- If you are imaging an X-node, select **Clean Install Hypervisor** only.

    A U-node is a fully configured node which can be added to a cluster. Both the Controller VM and the hypervisor must be installed in a new U-node. An X-node does not includes a NIC card or disks; it is the appropriate model when replacing an existing node. The disks and NIC are transferred from the old node, and only the hypervisor needs to be installed on the X-node.

> **Caution:** Do not select **Clean Install SVM** if you are replacing a node (X-node) because this option cleans the disks as part of the process, which means existing data will be lost.

    c. When all the fields are correct, click the **Start** button.

```
 Virtual Media   Record   Macro   Options   User List   Capture   Power Control   Exit

                        << Nutanix Installer >>

        Hypervisor Type        : ESX
        Hypervisor Version     : 5.X.X
        Node Model             : NX-6060
        Node Position          : A
        Nutanix Software       : 3.5.2
        Block ID               : 13SM66480025
        Node Serial            : ZM139S125180
        Node Cluster ID        : 259

        [x] Clean Install Hypervisor     [ ] Clean Install SVM
        Please hit the spacebar to toggle these checkboxes

        Cancel     Start

 Version: master_78aa3d16
```
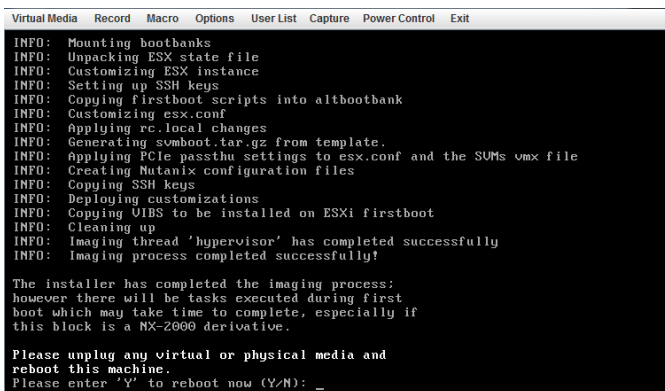
Installation begins and takes about 20 minutes.

5. In the **Virtual Media** window, click **Disconnect** next to **CD Media**.

6. At the restart prompt in the console, type Y to restart the node.


```
 Virtual Media   Record   Macro   Options   User List   Capture   Power Control   Exit
 INFO:   Mounting bootbanks
 INFO:   Unpacking ESX state file
 INFO:   Customizing ESX instance
 INFO:   Setting up SSH keys
 INFO:   Copying firstboot scripts into altbootbank
 INFO:   Customizing esx.conf
 INFO:   Applying rc.local changes
 INFO:   Generating svmboot.tar.gz from template.
 INFO:   Applying PCIe passthru settings to esx.conf and the SVMs vmx file
 INFO:   Creating Nutanix configuration files
 INFO:   Copying SSH keys
 INFO:   Deploying customizations
 INFO:   Copying VIBS to be installed on ESXi firstboot
 INFO:   Cleaning up
 INFO:   Imaging thread 'hypervisor' has completed successfully
 INFO:   Imaging process completed successfully!

 The installer has completed the imaging process;
 however there will be tasks executed during first
 boot which may take time to complete, especially if
 this block is a NX-2000 derivative.

 Please unplug any virtual or physical media and
 reboot this machine.
 Please enter 'Y' to reboot now (Y/N): _
```

The node restarts with the new image. After the node starts, additional configuration tasks run and then the host restarts again. During this time, the host name is `installing-please-be-patient`. Wait approximately 20 minutes until this stage completes before accessing the node.

⚠ **Warning:** Do not restart the host until the configuration is complete.

Orchestrator Portal

The Orchestrator portal site provides access to many of the files required to do a field installation.

Portal Access

Nutanix maintains a site where you can download Nutanix product releases. To access the Orchestrator portal on this site, do the following:

1. open a web browser and enter:

   ```
   http://releases.nutanix.com
   ```

2. This displays a login page. Enter your Nutanix account or partner portal credentials to access the site.
3. The Current NOS Releases page appears. In the pull-down list next to your name (upper right), select **Orchestrator** to download Orchestrator-related files or **Phoenix** to download Phoenix-related files.
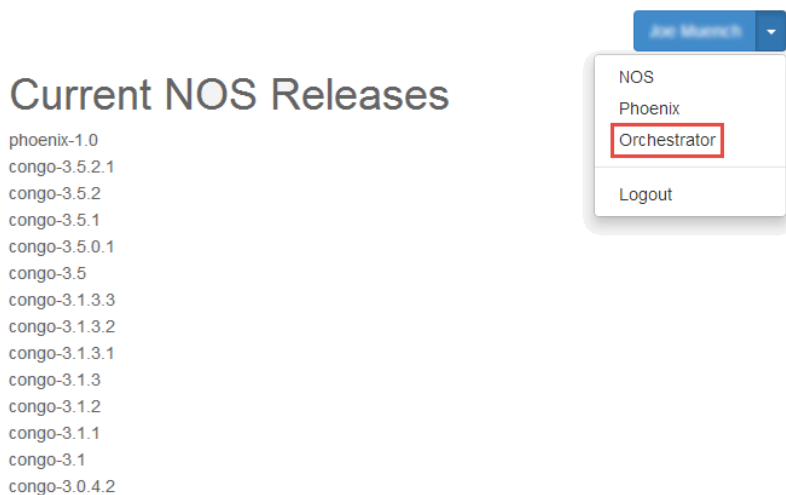

Figure: NOS Releases Screen

4. The Orchestrator (or Phoenix) releases screen appears. Click on the target release link.
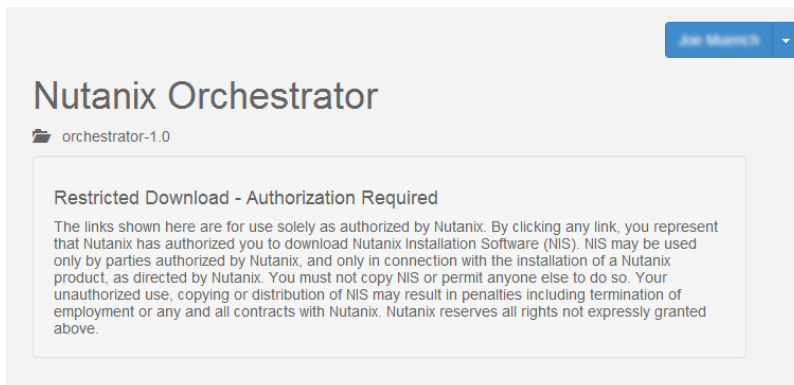

Figure: Orchestrator Releases Screen

5. The Orchestrator (or Phoenix) files screen for that release appears. (For Phoenix you must first select a hypervisor before the files screen appears.) Access or download the desired files from this screen.
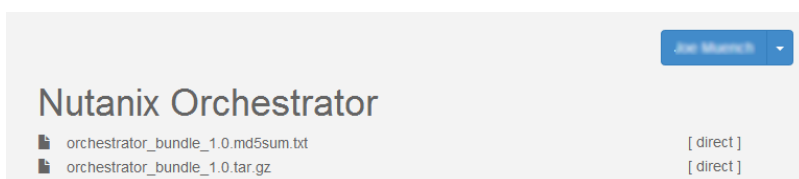
Figure: Orchestrator Files Screen

Orchestrator Releases

The following table describes the files for each Orchestrator release.

Orchestrator Files

File Name	Description
Orchestrator Release 1.0	
orchestrator_bundle_1.0.tar.gz	This is the compressed tar file of the Orchestrator components. It contains the Oracle VirtualBox installer and the components needed for the Orchestrator VM (vmdk and vbox and vmx VM description files)
orchestrator_bundle_1.0.md5sum.txt	This is the associated MD5 file to validate against after downloading the Orchestrator bundle.

Phoenix Releases

> ☢ **Caution:** Phoenix release 1.0.1 is the earliest supported release; do not use a Phoenix ISO image from an earlier release.

The following table describes the files for each supported Phoenix release.

Phoenix Files

File Name	Description
Phoenix Release 1.0.1	
phoenix-1.0.1_ESX_NOS-3.1.3.3-*xxxxxx*.iso	This is the Phoenix ISO image for NOS release 3.1.3.3 when the hypervisor is ESXi. (The *xxxxxx* part of the name is replaced by a build number.)
phoenix-1.0.1_ESX_NOS-3.1.3.3-xxxxxx.md5sum.txt	This is the associated MD5 file to validate against after downloading the Phoenix ISO image for NOS release 3.1.3.3.
phoenix-1.0.1_ESX_NOS-3.5.2.1-*xxxxxx*.iso	This is the Phoenix ISO image for NOS release 3.5.2.1 when the hypervisor is ESXi.
phoenix-1.0.1_ESX_NOS-3.5.2.1-xxxxxx.md5sum.txt	This is the associated MD5 file to validate against after downloading Phoenix ISO image for NOS release 3.5.2.1.
phoenix-1.0-facory_KVM_NOS-3.5.2-*xxxxxx*.iso	This is the Phoenix ISO for NOS release 3.5.2 when the hypervisor is KVM.

Orchestrator Configuration File

Cluster information used for imaging the nodes is stored in a configuration file called `orchestrator.config`.

Contents of the `orchestrator.config` file are either generated automatically (see *Imaging a Cluster (standard method)* on page 12) or entered manually by the user (see *Imaging a Cluster (manual method)* on page 19). The following is a sample `orchestrator.config` file for four nodes.

```
ipmi_user = ADMIN
ipmi_password = ADMIN

hypervisor_netmask = 255.255.252.0
hypervisor_gateway = 10.1.60.1
hypervisor_nameserver = 8.8.8.8
hypervisor_password = nutanix/4u

10.1.60.41
  hypervisor_ip = 10.1.60.33

10.1.60.42
  hypervisor_ip = 10.1.60.34

10.1.60.43
  hypervisor_ip = 10.1.60.35

10.1.60.44
  hypervisor_ip = 10.1.60.36
```

Setting IPMI Static IP Address

You can assign a static IP address for an IPMI port by resetting the BIOS configuration.

To configure a static IP address for the IPMI port on a node, do the following:

1. Connect a VGA monitor and USB keyboard to the node.

2. Power on the node.

3. Press the **Delete** key during boot up when prompted to enter the BIOS setup mode.
   The BIOS Setup Utility screen appears.

4. Click the **IPMI** tab to display the IPMI screen.
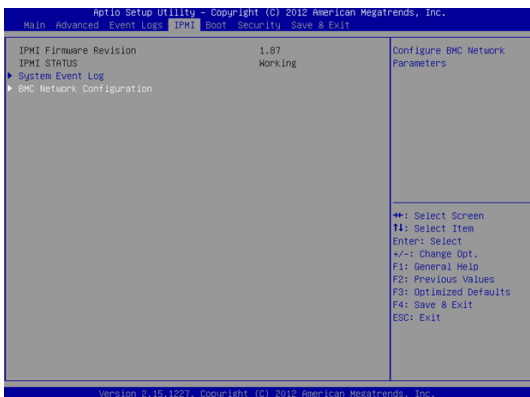
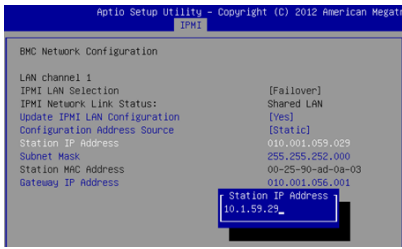5. Select **BMC Network Configuration** and press the **Enter** key.

6. Select **Update IPMI LAN Configuration**, press **Enter**, and then select **Yes** in the pop-up window.
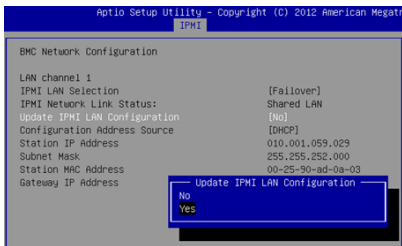
7. Select **Configuration Address Source**, press **Enter**, and then select **Static** in the pop-up window.
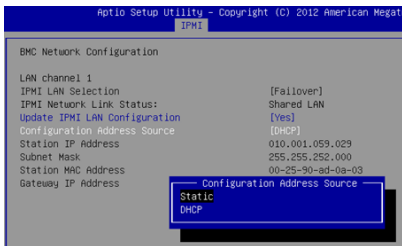
8. Select **Station IP Address**, press **Enter**, and then enter the IP address for the IPMI port on that node in the pop-up window.

```
         Aptio Setup Utility - Copyright (C) 2012 American Megatr
                         IPMI

  BMC Network Configuration

  LAN channel 1
  IPMI LAN Selection                   [Failover]
  IPMI Network Link Status:            Shared LAN
  Update IPMI LAN Configuration        [Yes]
  Configuration Address Source         [Static]
  Station IP Address                   010.001.059.029
  Subnet Mask                          255.255.252.000
  Station MAC Address                  00-25-90-ad-0a-03
  Gateway IP Address                   010.001.056.001
                             ┌ Station IP Address ┐
                             │10.1.59.29_          │
                             └                    ┘
```

9. Select **Subnet Mask**, press **Enter**, and then enter the corresponding submask value in the pop-up window.

10. Select **Gateway IP Address**, press **Enter**, and then enter the IP address for the node's network gateway in the pop-up window.

11. When all the field entries are correct, press the **F4** key to save the settings and exit the BIOS setup mode.