Installation Manual

AudioCodes One Voice™ Operations Center

AudioCodes Routing Manager (ARM)

Version 8.4

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Related Documentation

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41842	Fix. Requirements, Adding New VM, Deploying New VM, Deploying the Router OVF File
41843	Fix. Service Network Reboot. New section: Changing an Existing Configurator's IP.
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41848	DNS support
41849	New RAM | Storage requirements
41850	Licensing license policy | Online Software Upgrade | CentODS6.9 tar.gz | VM memory 8 GB
41851	RAM: 10GB p/VM > 8GB p/VM; Storage: 100 GB p/VM > 40GB p/VM
41852	License page. Upgrade. OS upgrade.
41853	Hyper-V | VMWare
41854	CPU: 2 cores per VM for Router VMs / 4 cores per VM for Configurator VM

1 Introduction

This guide shows how to install the AudioCodes Routing Manager (ARM) in an enterprise's Virtual Machine (VM) environment.

1.1 Intended Audience

The guide is intended for IT managers in enterprises that already have VMware vSphere Hypervisor (ESXi) or Microsoft Hyper-V deployed in their networks for IT purposes.

1.1.1 VMWare

For ARM deployments on VMWare, follow the instructions in this document but skip the sections relating to Hyper-V.

1.1.2 Hyper-V

For ARM deployments on Microsoft Hyper-V, follow the instructions in this manual but replace references to 'VMWare vSphere' with 'Microsoft Hyper-V'. The installation files for the ARM Configurator and Router VMs are in VHD rather than OVA format. Note that during VM deployment in Hyper-V, you need to supply the VM settings. For more information about Hyper-V, see the *Microsoft Hyper-V Server 2016 Manual*.

1.2 About the ARM

The ARM is a LINUX-based, software-only, telephony management product which expedites and streamlines IP telephony routing for enterprises that have multiple globally distributed branches. The ARM determines the quickest, least expensive, and best call quality routes in packet networks.

Routing data, previously located on the SBC, Unified Communications (UC) application (e.g., Microsoft's Skype for Business), or Media Gateway, is now located on the ARM, which functions with an ARM server. If an enterprise has an SBC in every branch, a single ARM, deployed in the enterprise's HQ, can route all calls in the globally distributed corporate network to PSTN, the local provider, enterprise headquarters, or to the IP network.

Routing rules, configured by the IT manager in the ARM's Routing Table, perform the routing.

If an enterprise has only one or two branches, its IT manager can easily independently implement maintenance changes. In globally distributed enterprises, IT managers until now had to laboriously implement changes multiple times, per branch. With the ARM, however, IT managers implement changes only once, saving enterprises significant labor and time resources and costs.

1.2.1 Architecture

The ARM currently contains two modules:

- Topology Manager (a.k.a. Configurator). This module determines
  - network topology
  - what hardware and software is installed
  - best route to take in terms of cost, call quality, voice quality, and/or user priority
- Routing Manager.
  - Operates together with the Topology Manager (Configurator)
  - Commands the nodes (gateways and SBCs) in the network what route to take, which it receives from the Topology Manager

The number of modules are managed by processes running on LINUX. The processes run independently of one another.

1.3 Requirements

1.3.1 Hyper-V

Installation of the ARM on Hyper-V requires the following:

- Microsoft Server 2016 and up
- At least two host machines for high availability (HA)
- 64-bit host machines
- Redundant host, on a redundant network connection, and power supply
- RAM: 8 GB per VM
- CPU: 2 cores (64 bit) per VM for Router VMs, and 4 cores per VM for Configurator VM
- Storage: 40 GB per VM (for HA explained in Appendix C.2)
- VM requirements for ARM Configurator and ARM Routers are the same
- A minimum of three VMs, i.e., One Configurator and at least two Routers - see Appendix C.2.

Note: ARM VHD images are provided with Linux integration services for Hyper-V version 4.2.

1.3.2 VMWare

Installation of the ARM on VMWare requires the following:

- VMware vSphere Hypervisor (ESXi) version 5.5 and up
- At least two host machines for high availability (HA)
- 64-bit host machines
- Redundant host, on a redundant network connection, and power supply
- VMware vCenter Server version 5.5
- RAM: 8 GB per VM
- CPU: 2 cores (64 bit) per VM for Router VMs, and 4 cores per VM for Configurator VM
- Storage: 40 GB per VM (for HA explained in Appendix C.2)
- VM requirements for ARM Configurator and ARM Routers are the same
- A minimum of three VMs, i.e., One Configurator and at least two Routers - see Appendix C.2.

Note: ARM OVA images are provided with VMWare Tools 5.5. However, the ARM supports later versions of VMWare Tools as well. If an ARM customer runs the VMWare environment with later version, it's recommended they upgrade the ARM images at the Guest level from vSphere Client menu: **Guest** > **Install/Upgrade VMware Tools**.

1.3.2.1 VMware Terms

This section familiarizes you with VMware's software package, 'vSphere'.
vSphere contains the following components:

- ESXi server
- vSphere client
- vCenter server

Table 1-1: vSphere Software Package

Component	Description
ESXi server	This is the virtualization server. It's the most important component. It's a type 1 hypervisor. All VMs or Guest OSs, including the ARM, are installed on it.
vCenter server	Similar to vSphere client but with more power. It's a centralized management application that lets you centrally manage VMs and ESXi hosts. To install, manage and access the virtual servers located above the ESXi server, you'll need vSphere client or vCenter.
vSphere client	Used to access vCenter server and ultimately manage ESXi server. It lets administrators connect to ESXi server and access or manage VMs. It's installed on the client machine, e.g., the IT manager's laptop, from where it's used to connect to ESXi server and perform management tasks. To install, manage and access the virtual servers located above ESXi server, you'll need vSphere client or vCenter.

Note: The physical servers are 'Host 1'. A hypervisor is installed on each. Each mediates between the hardware and the VMs the resources required: memory, CPU, storage, and to give a VM to each.

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2 Installing the ARM

This section shows how to install the ARM on VMWare or on Microsoft Hyper-V.

Installing the ARM adds another Virtual Machine (VM) to the enterprise customer's environment.

AudioCodes supplies enterprise customers with an OVA template/image. The enterprise customer deploys the OVA in their existing virtual environment.

Note:

- This section shows screenshots of the Configurator (Topology Manager) OVA deployment.
- Screenshots of the Router OVA deployment are identical, only 'router' is indicated instead of 'configurator'.
- The 'Router' VM must be deployed twice, for HA purposes (see Appendix C.2 for detailed information).

2.1 Deploying a New VM

In a VM environment, vCenter server is used to load and deploy the following new VMs:

- ARM Configurator
- ARM Router

AudioCodes supplies two OVA files for them:

- Configurator OVA file. Only one is deployed.
- Router OVA file. Many can be deployed, for example, if there are 1000 nodes and the network is congested with heavy traffic. Initially, two are deployed for HA in an Active-Active configuration (not Active-Standby).

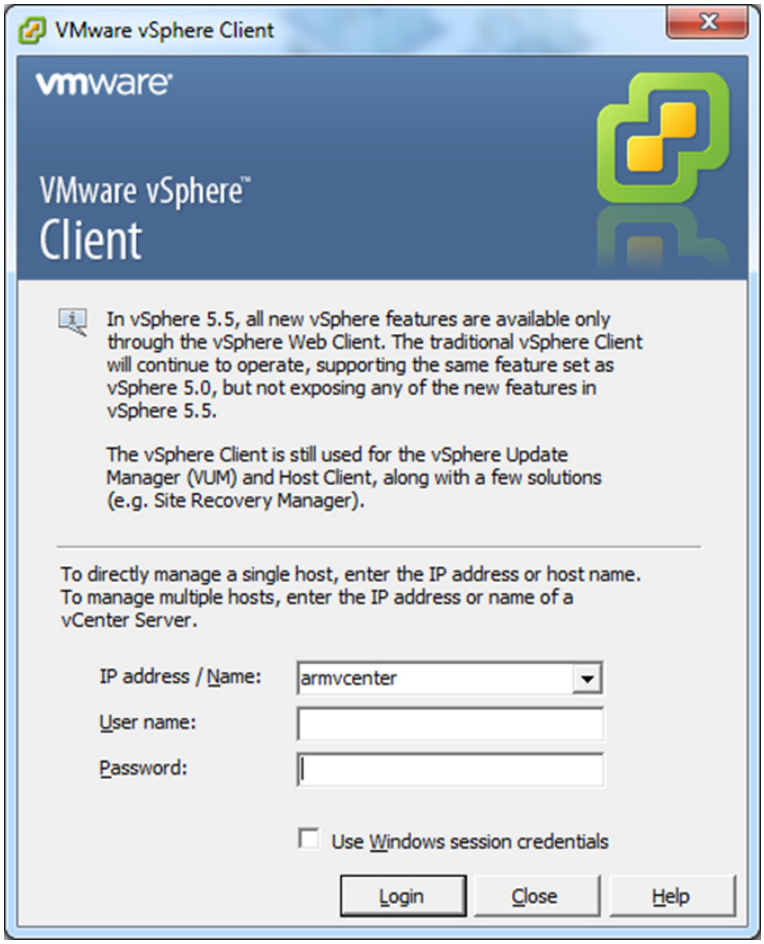
2.1.1 Deploying the ARM's OVA File on VMWare

This section shows how to deploy the ARM's OVA files. You must use the VMware vSphere Client to deploy it.

➢ To deploy the Configurator OVA File:

1. Log in to the vSphere client to connect to the vCenter server.

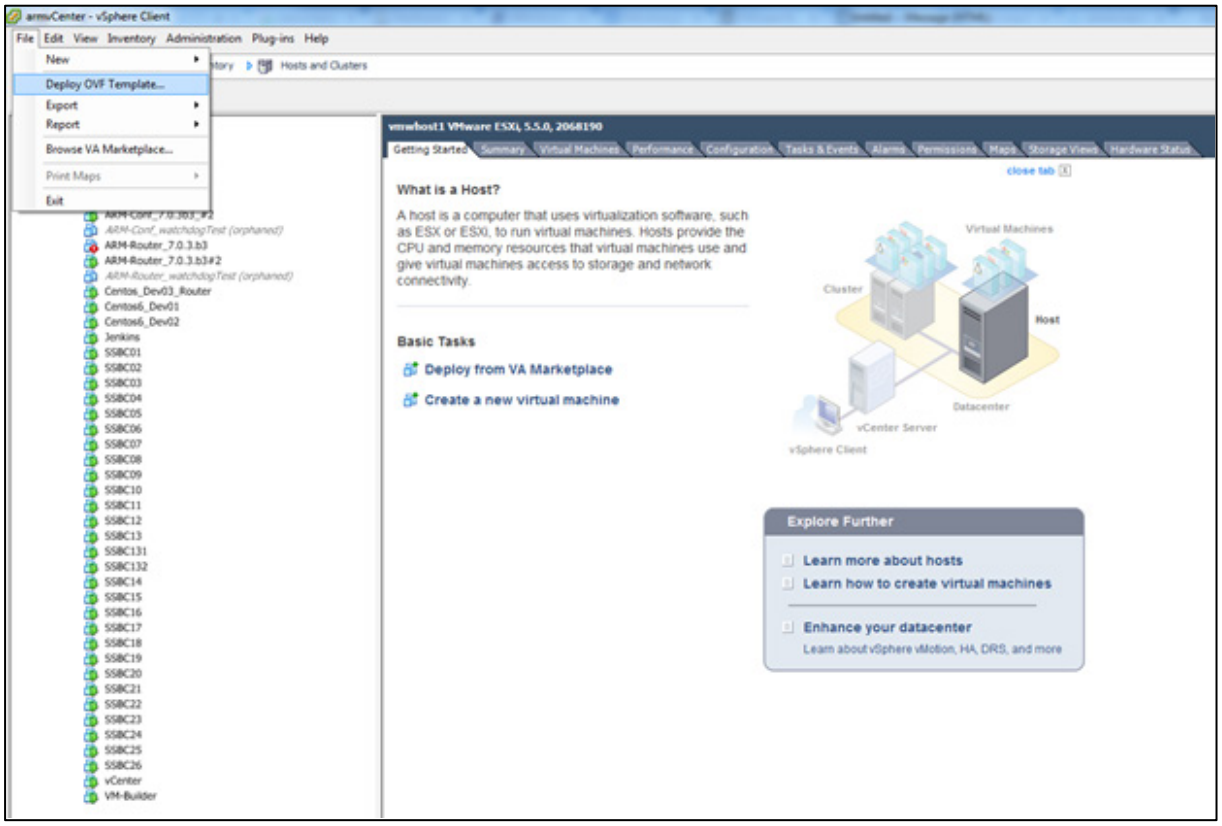
Figure 2-1: vSphere Client - Login



2. Enter the Username and Password and click the **Login** button.

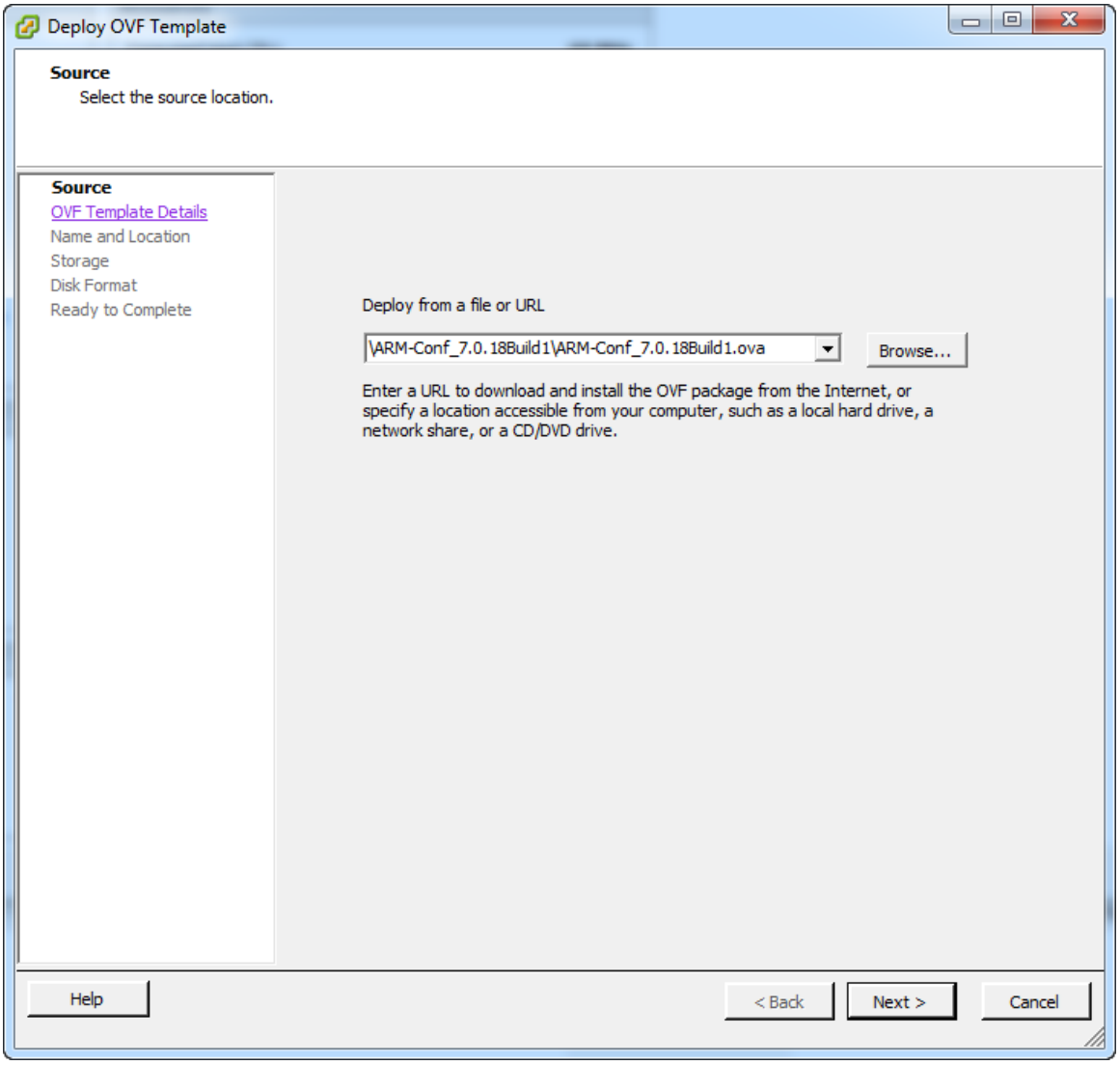
Note: Make sure the client integration plugin is installed to enable OVA functionality. If it's not, click the link in the notification that is displayed.

Figure 2-2: vSphere Client – Deploy OVF Template



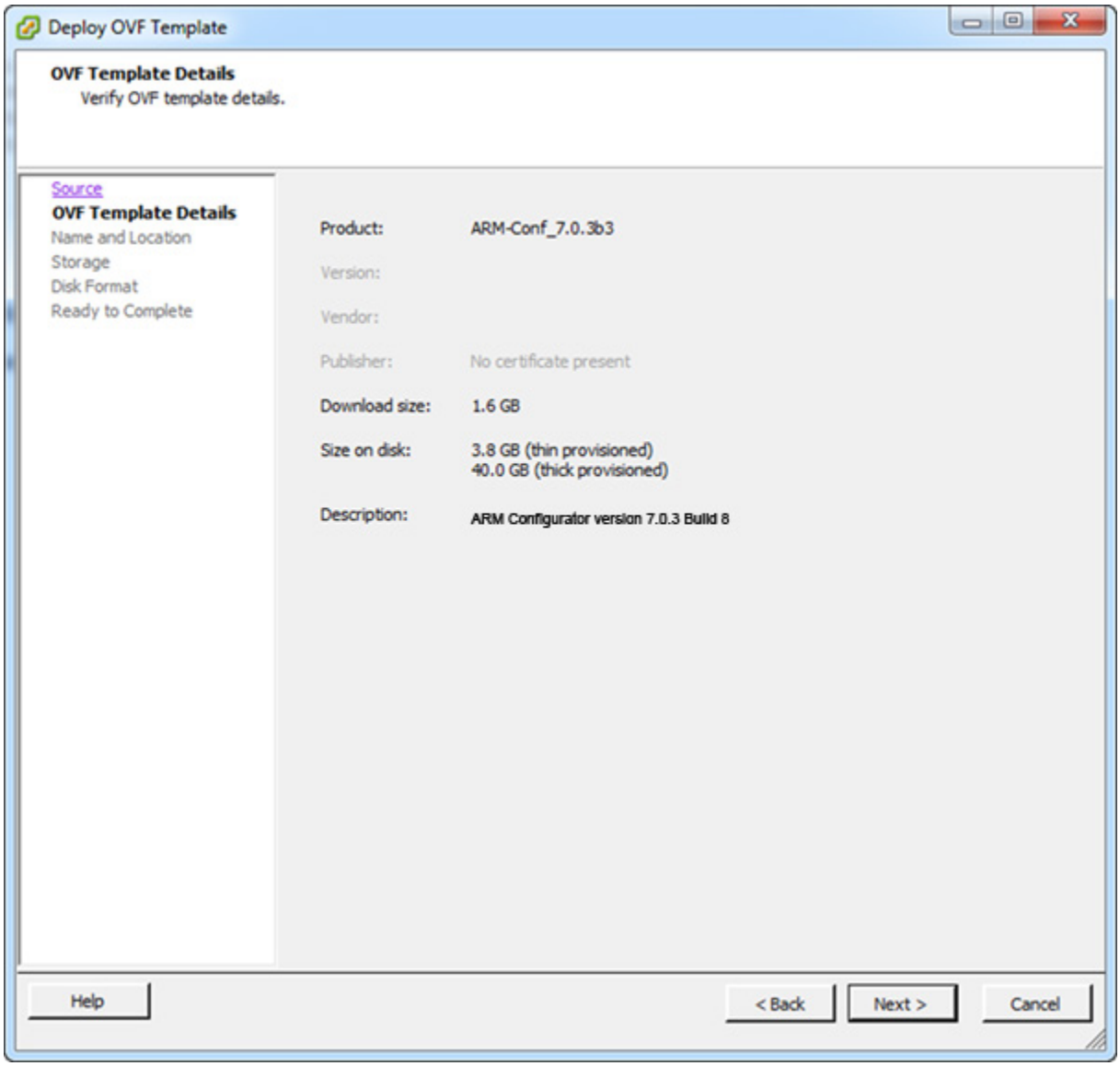
3. Choose **Host**.
4. Go to **File**.
5. Choose **Deploy OVF**; the OVF Wizard opens, as shown in Figure 2-3 below.

Figure 2-3: OVF Wizard – Browse to the ARM Configurator OVA File



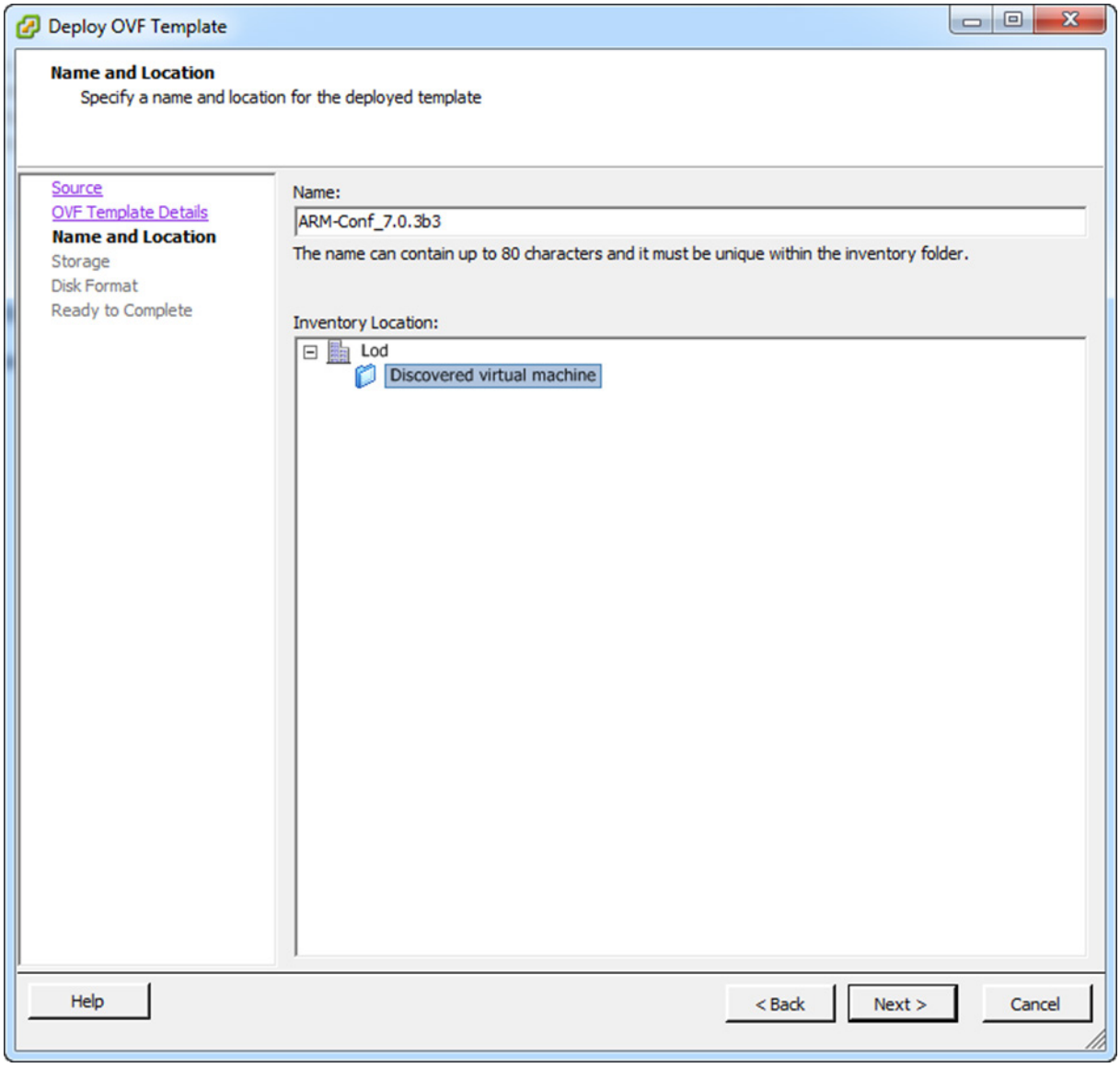
6. Use the Wizard to deploy the *specific template* of the *specific host*, in this case, the ARM Configurator: click the **Browse…** button and navigate to the ARM Configuration OVA file.
7. Click **Next**; the Description screen is displayed, as shown in Figure 2-4 below.

Figure 2-4: ARM Configurator OVF Template Details



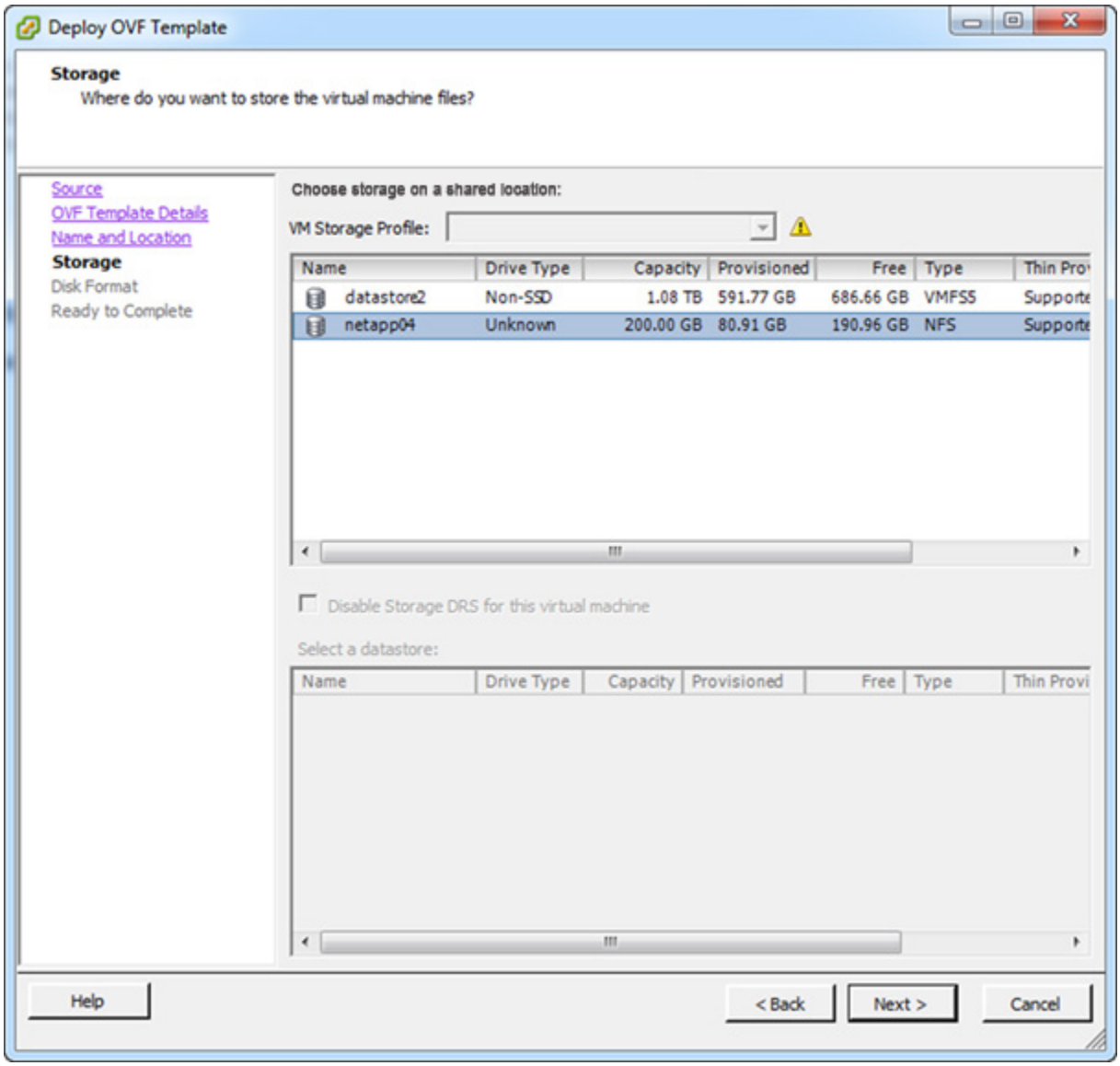
8. Click **Next**; the Name and Location of Deployed Template screen opens, as shown in Figure 2-5 below.

Figure 2-5: OVF Wizard – Name and Location of Deployed Template



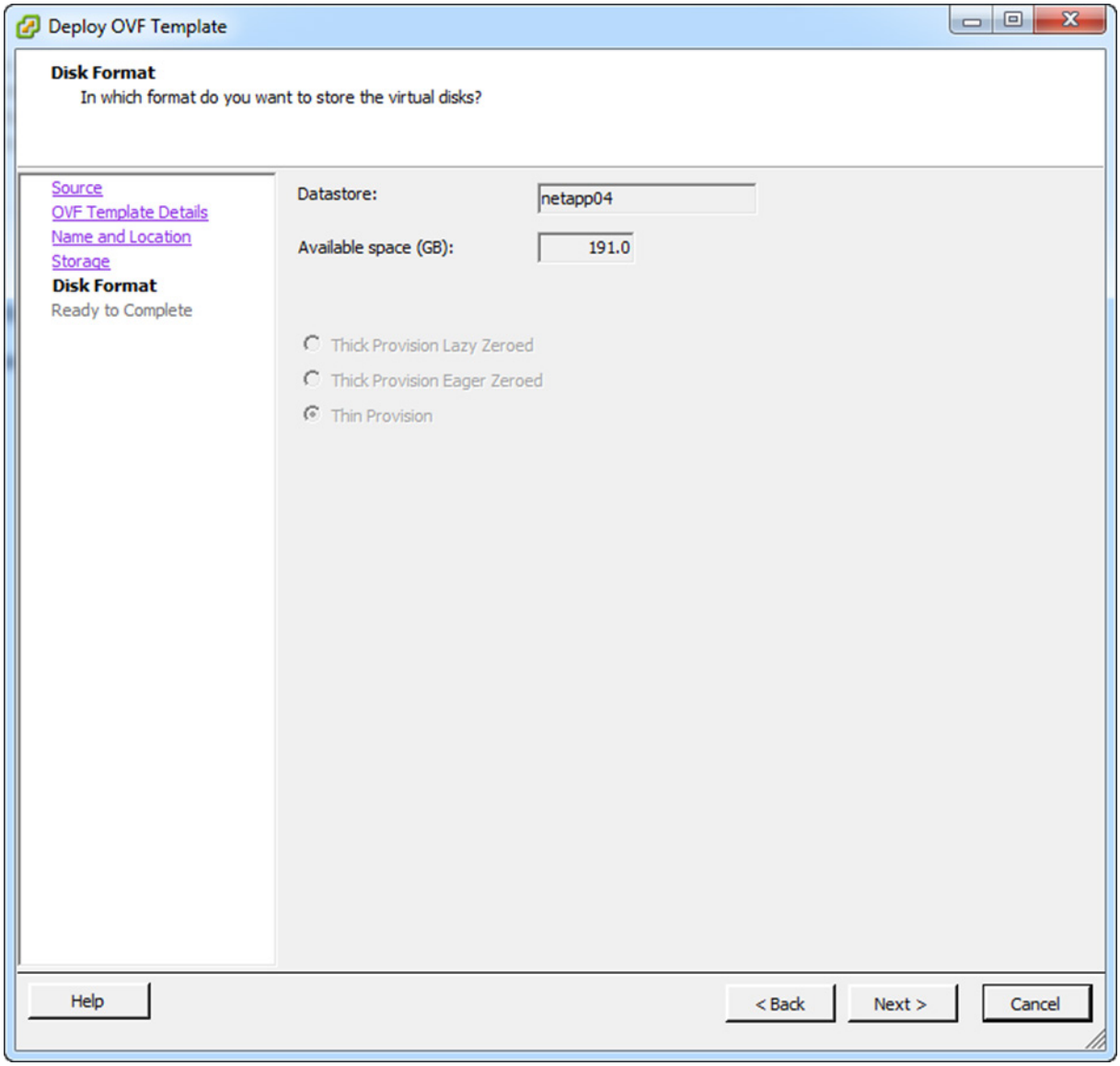
9. Click **Next**; the Storage screen opens, as shown in Figure 2-6 below. Choose a shared storage.

Figure 2-6: OVF Wizard – Storage of VM Files



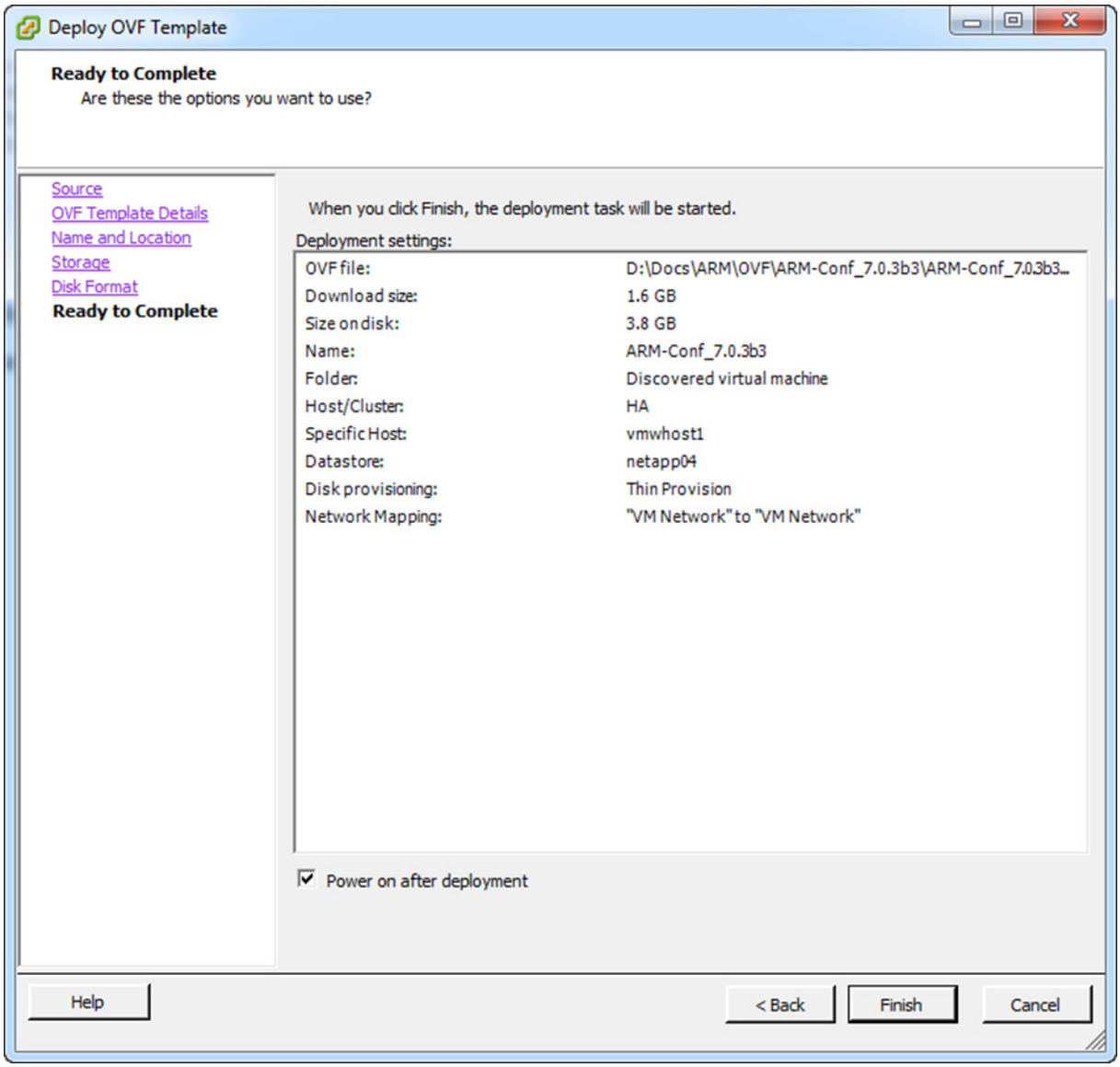
10. Click **Next**; the Disk Format screen opens, as shown in Figure 2-7 below.

Figure 2-7: OVF Wizard – Disk Format in which to Store the Virtual Disks



11. Click **Next**; the Ready to Complete screen opens, as shown in Figure 2-8 below.

Figure 2-8: OVF Wizard – Ready to Complete



12. Click **Finish**; you've successfully completed installation of the Configurator OVA File.

2.1.2 Deploying the ARM's VHD File on Microsoft Hyper-V

The ARM's VHD file must be deployed on Microsoft's Hyper-V.

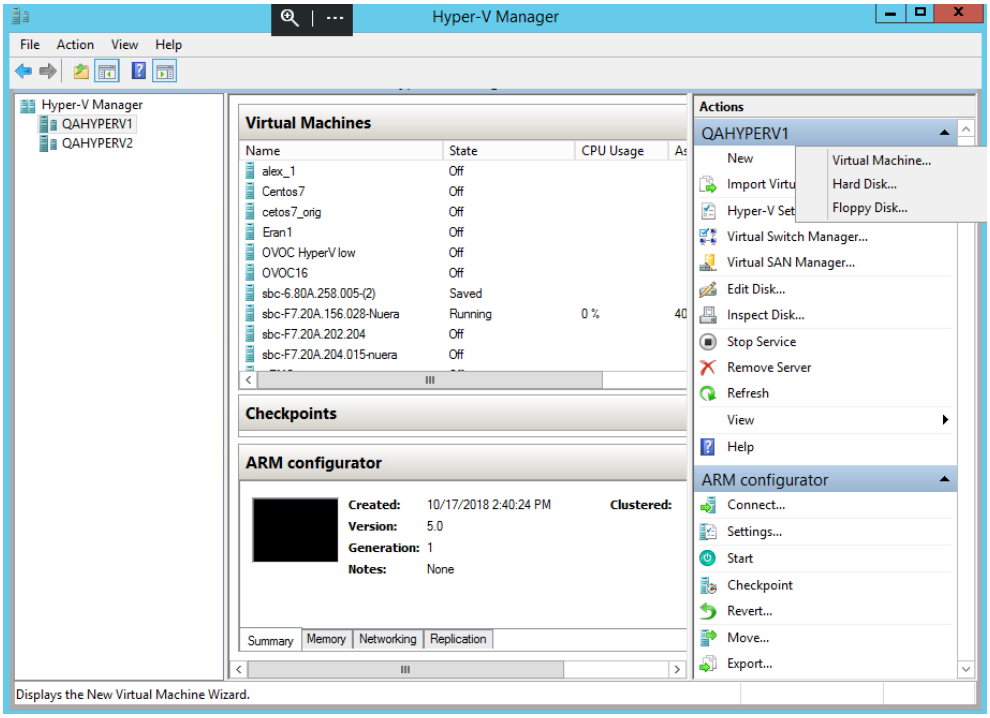
➢ Before deploying the ARM's VHD file:

1. Obtain the VHD file for the ARM Configurator and ARM Router for the version you want to install.
2. Copy the VHD files to the VHD storage location on your Hyper-V host; create a separate copy of the VHD file for each VM.

➢ To deploy the ARM's VHD file:

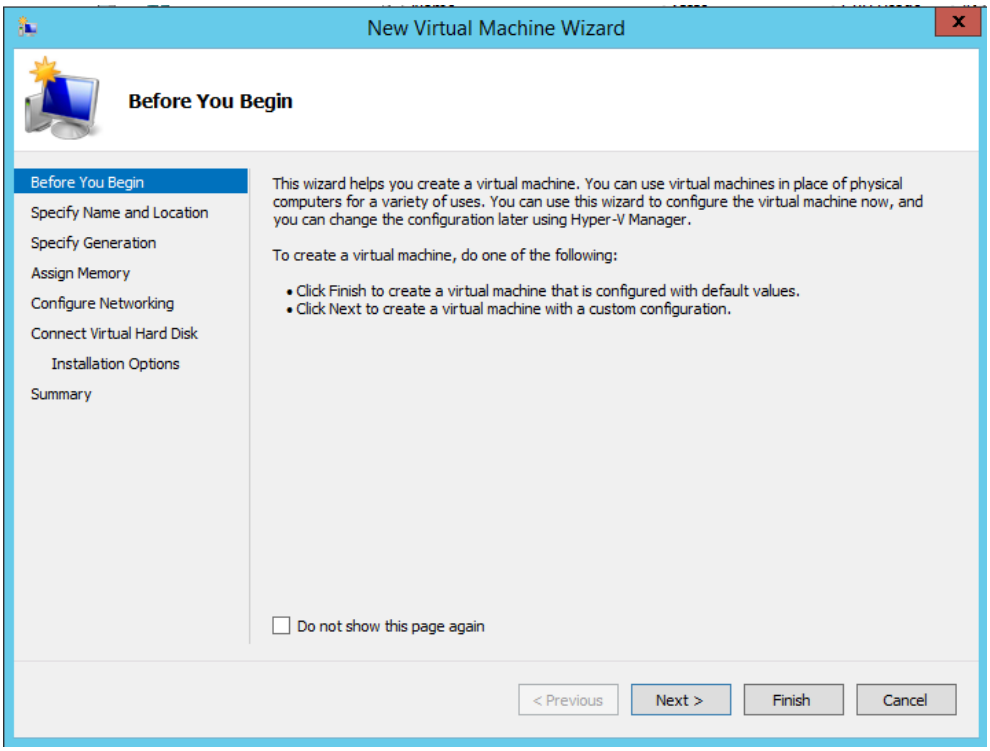
1. Start Hyper-V Manager.
2. Click **New** > **Virtual Machine**.

Figure 2-9: New > Virtual Machine



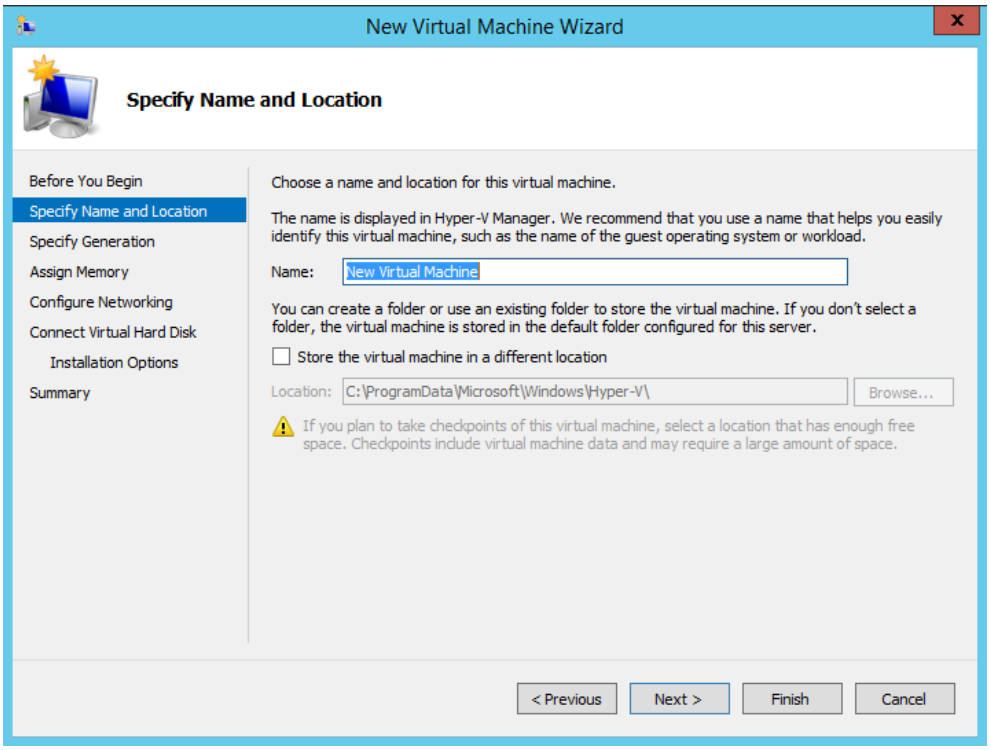
3. Click **Next**.

Figure 2-10: New Virtual Machine Wizard



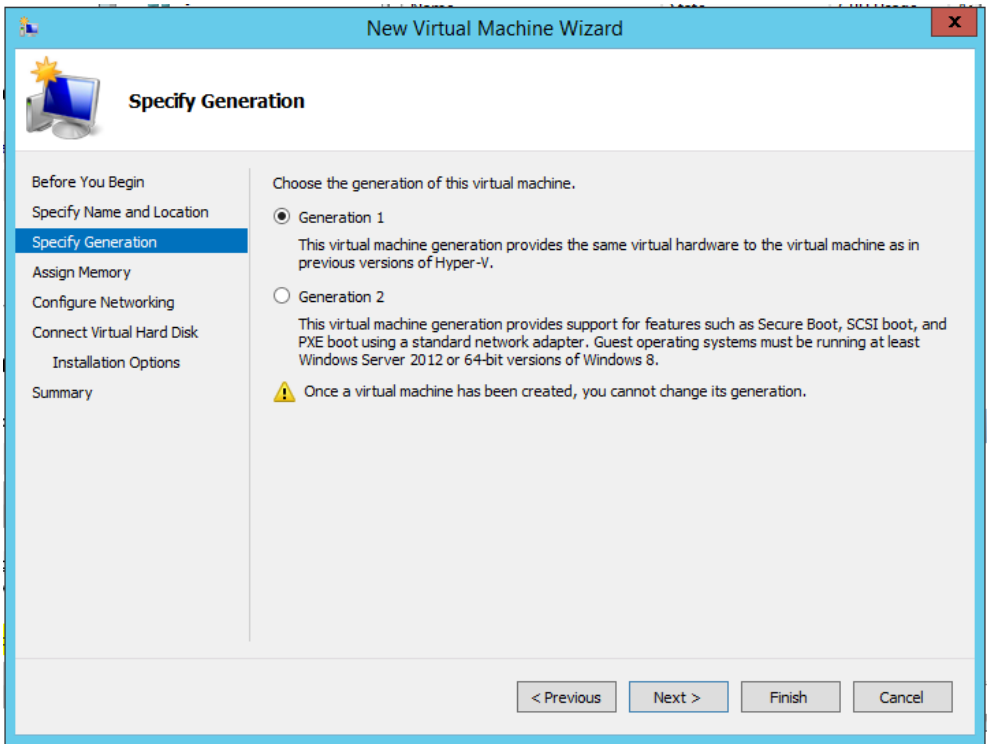
4. Give the VM a name and click **Next**.

Figure 2-11: New Virtual Machine Wizard: Specify a Name



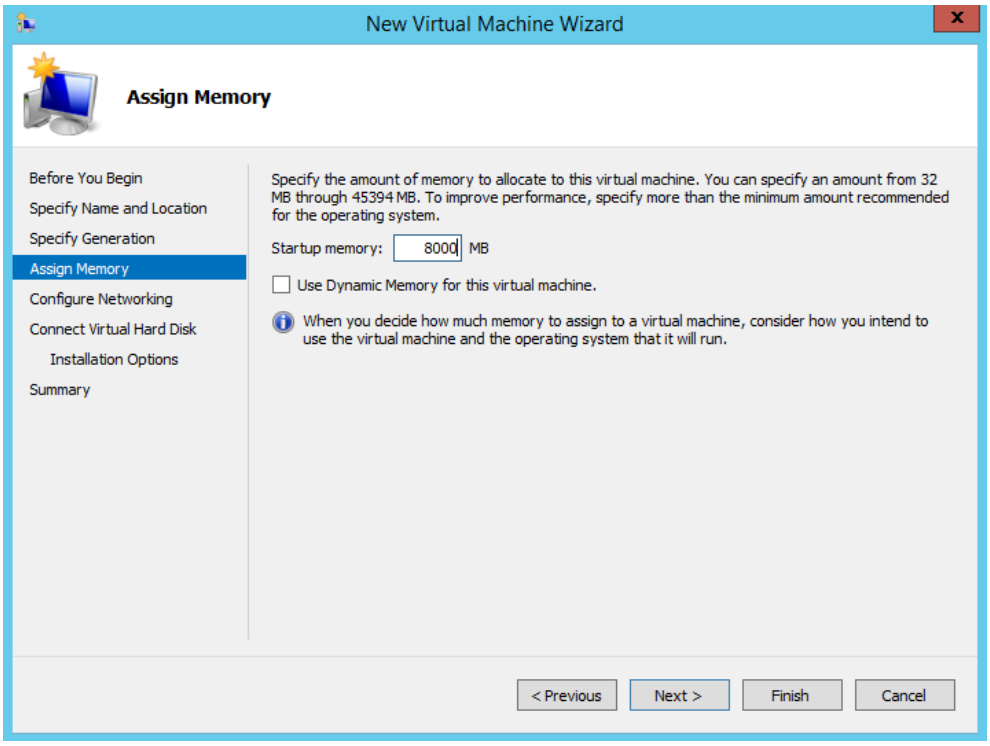
5. Select **generation 1** and click **Next**.

Figure 2-12: New Virtual Machine Wizard: Select 'Generation 1'



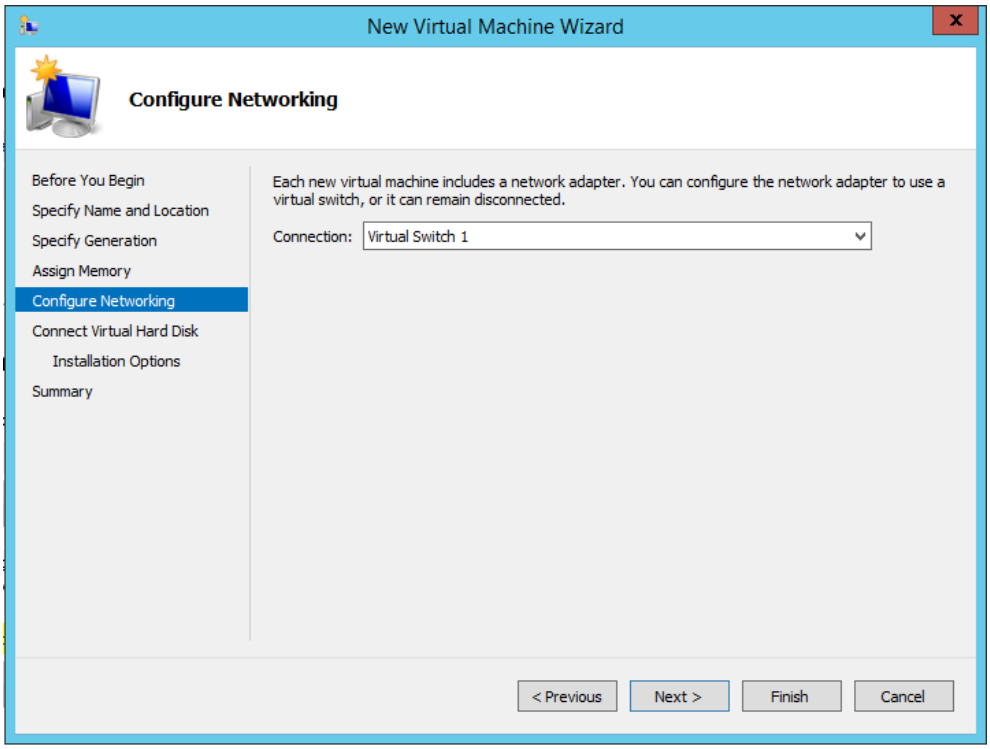
6. Allocate 8000 MB and click **Next**.

Figure 2-13: New Virtual Machine Wizard: Allocate 8000 MB



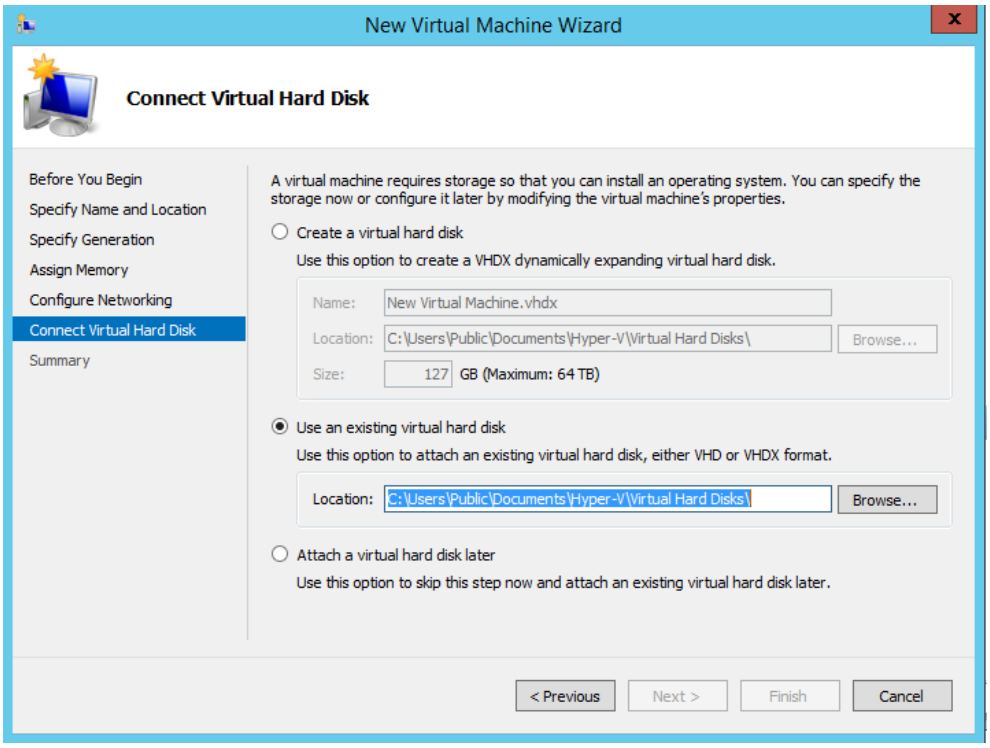
7. Select a virtual switch and click **Next**.

Figure 2-14: New Virtual Machine Wizard: Selecting a Virtual Switch



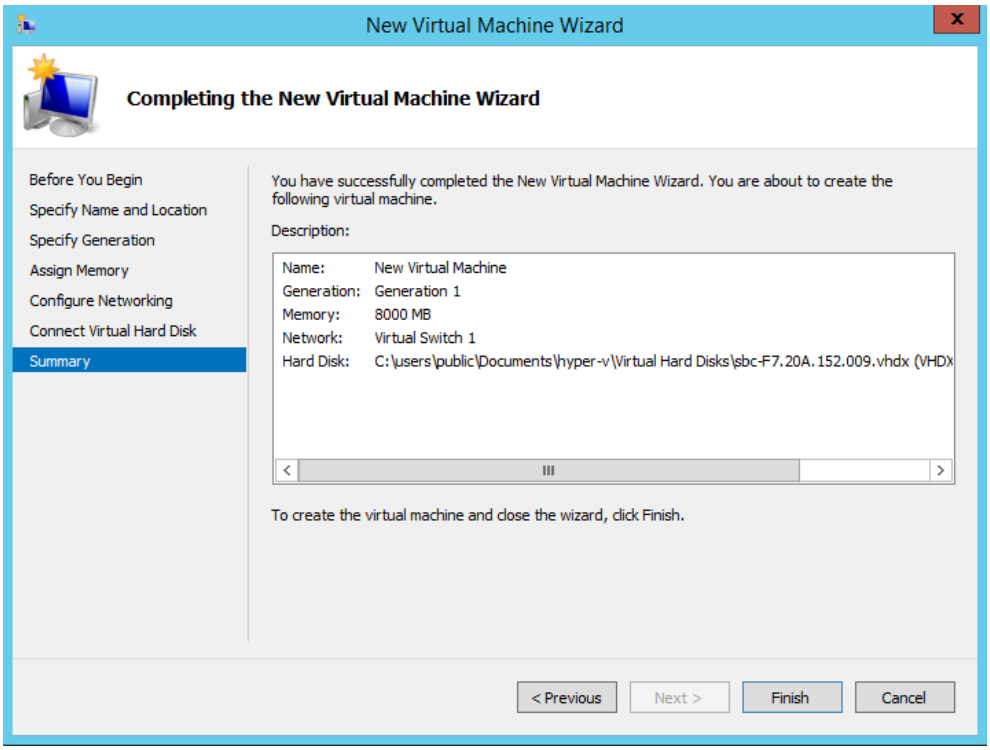
8. Select the **Use an existing virtual hard disk** option, click **Browse** and select the VHD file, and click **Next**.

Figure 2-15: New Virtual Machine Wizard: Use an existing virtual hard disk | VHD



9. Display the **Summary** describing the virtual machine and click **Finish**.

Figure 2-16: Summary

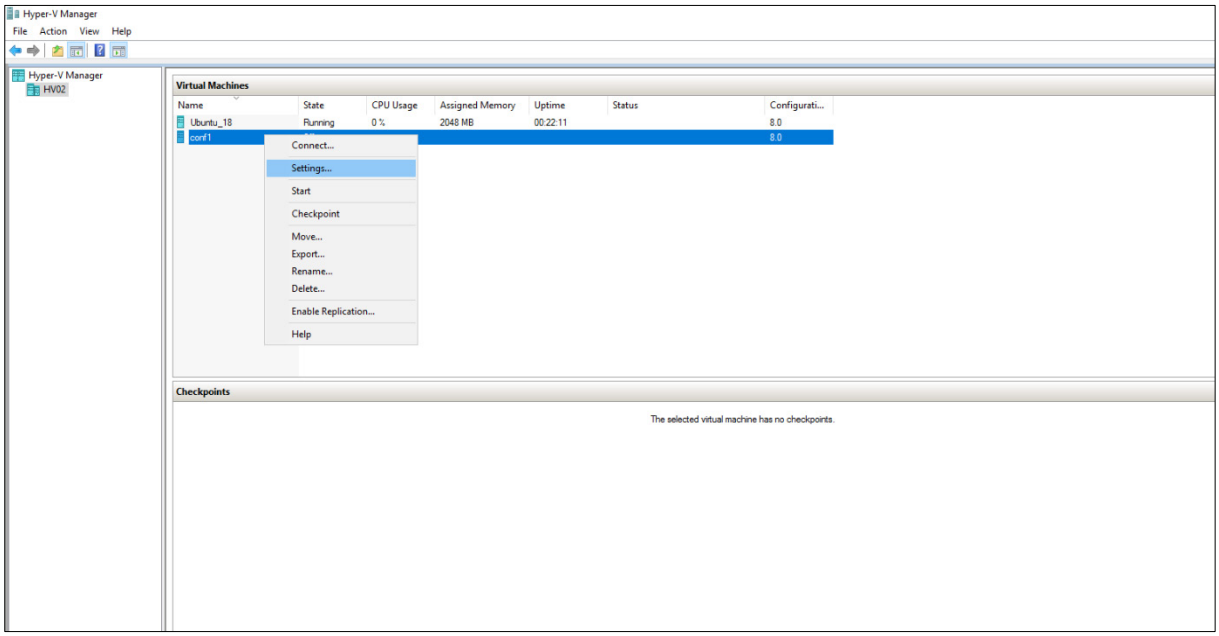


You now need to change the number of CPU cores to **2** in the ARM Router and **4** in the ARM Configurator, for each VM.

➢ **To change the number of CPU cores for each VM:**

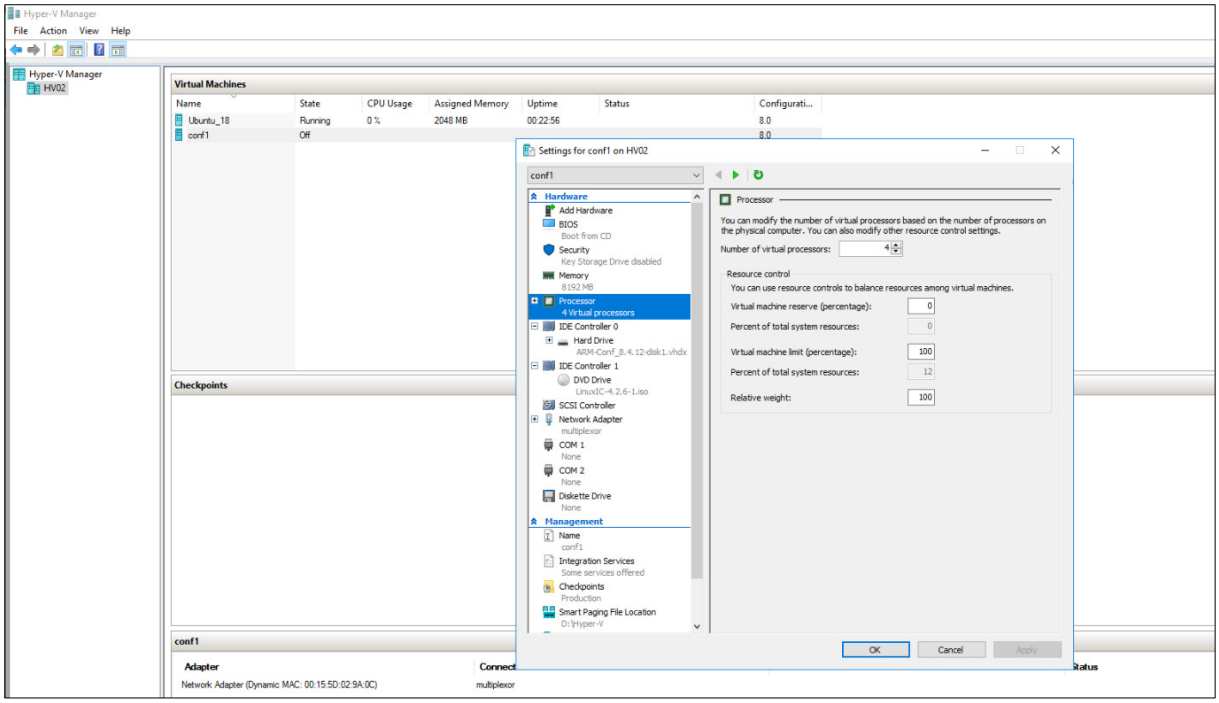
1. In Hyper-V Manager, right-click the VM and from the pop-up menu select **Settings**.

Figure 2-17: Settings



2. Click **Processor** and configure 'Number of virtual processors' to **4** for the Configurator VM, and to **2** for the Router VMs.

Figure 2-18: Processor



3. Click **OK**.

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3 Performing Initial Configuration

This section shows how to perform initial configuration, via an SSH connection to the Configurator VM and to the Router VM.

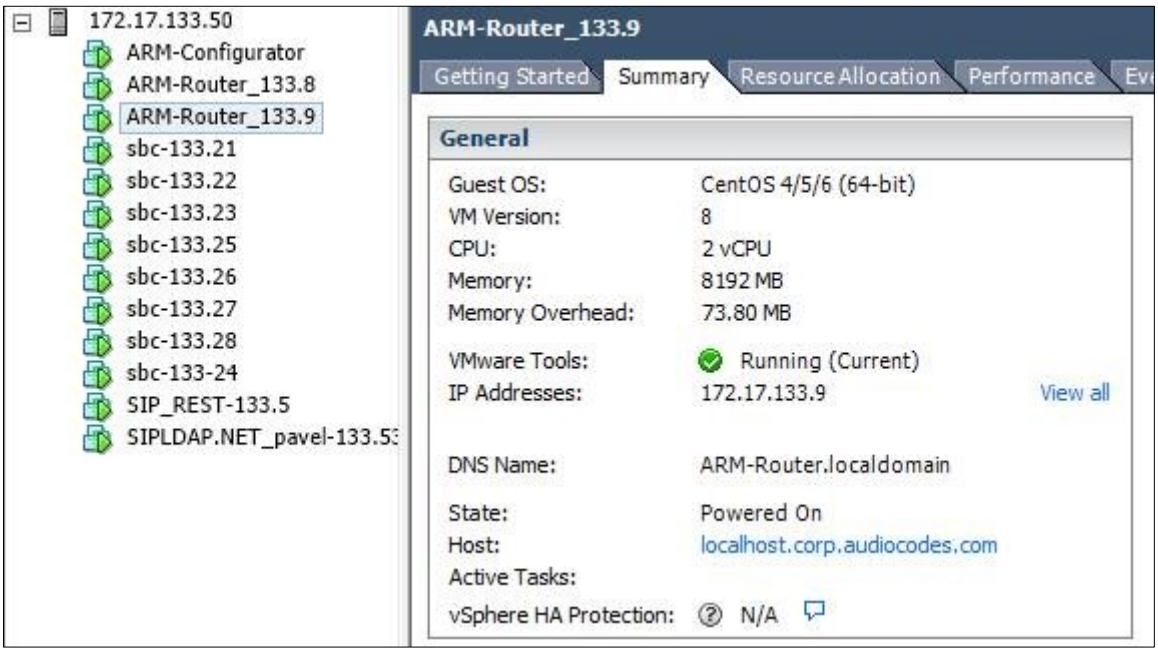
Initial configuration involves configuration of a static IP address and hostname for the VM.

3.1 Configure a Static IP Address and Hostname for the VM

The newly deployed VM (Topology Manager VM or Routing Manager VM) is by default configured with DHCP client enabled, so if your network includes a DHCP server, the VM will be configured with a dynamic IP address when powering up.

View the VM's IP address in the VSphere client's Summary screen.

Figure 3-1: VSphere Client's Summary Screen



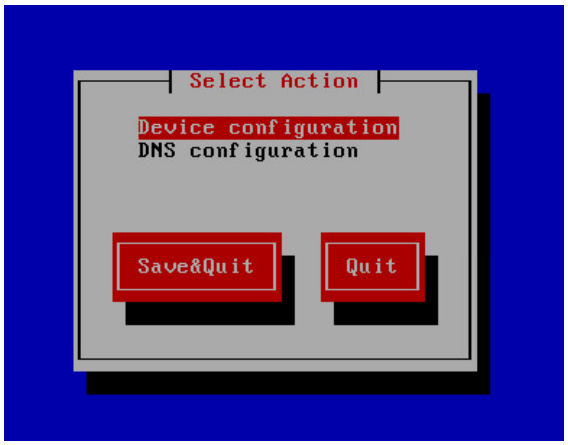
➢ **To configure a static IP address and hostname for the VM:**

1. Access the VM via either
   a. SSH, the dynamic IP address of the VM, described above.
   b. VMware virtual console
2. Log in to the VM: define **root** for username and **password** for password.
3. Run this command:

```
system-config-network-tui
```

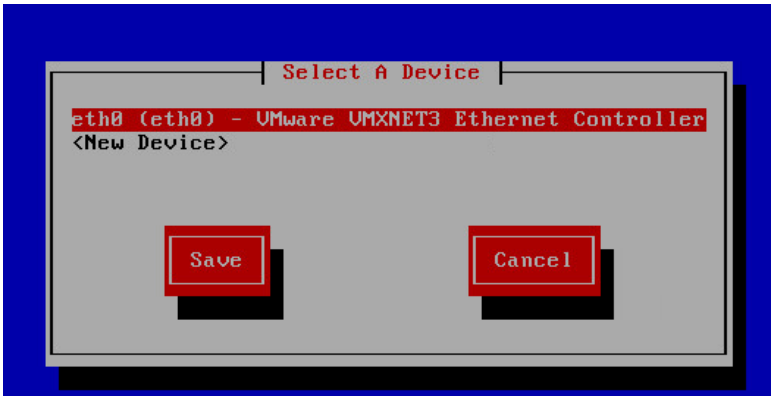
   You're prompted for a Text User Interface.
4. Select **Device Configuration**.

Figure 3-2: Device Configuration



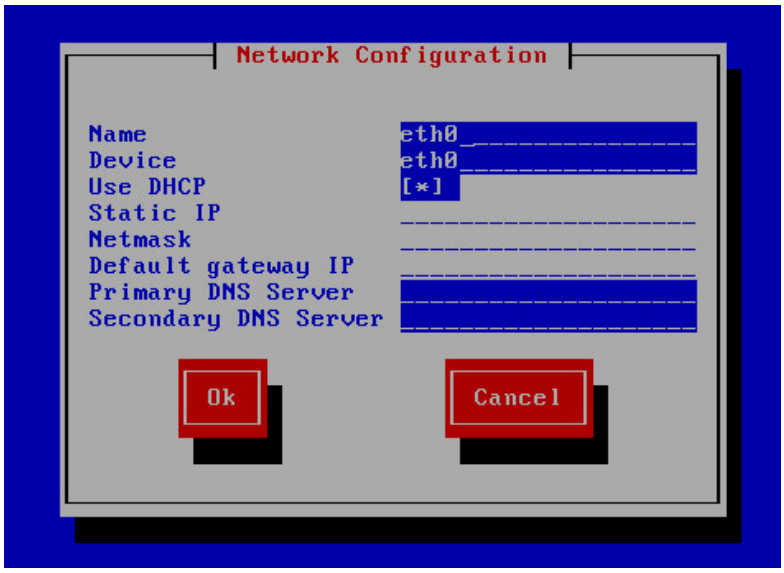
5. Select **eth0**.

Figure 3-3: eth0



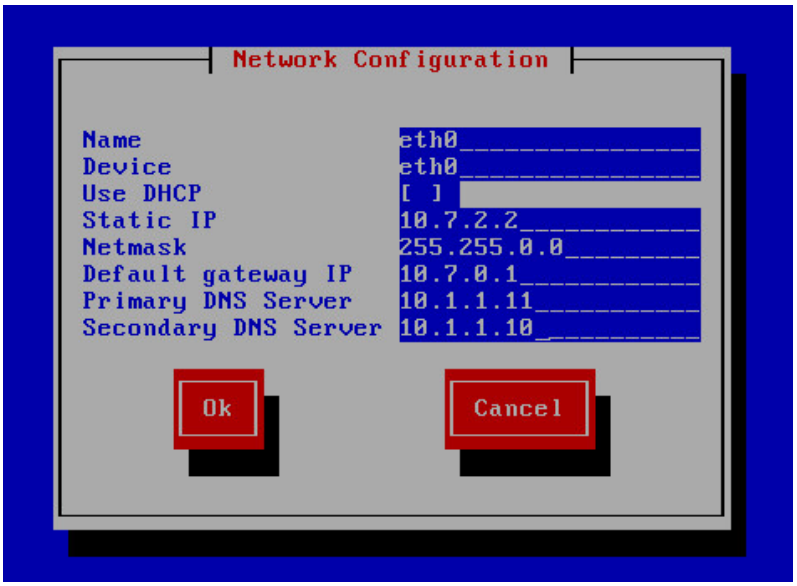
6. Change to static IP address: use the Tab key to navigate between fields and the space key to select. Enter a new static IP address, Netmask, Default Gateway, and DNS Servers.

Figure 3-4: Static IP Address



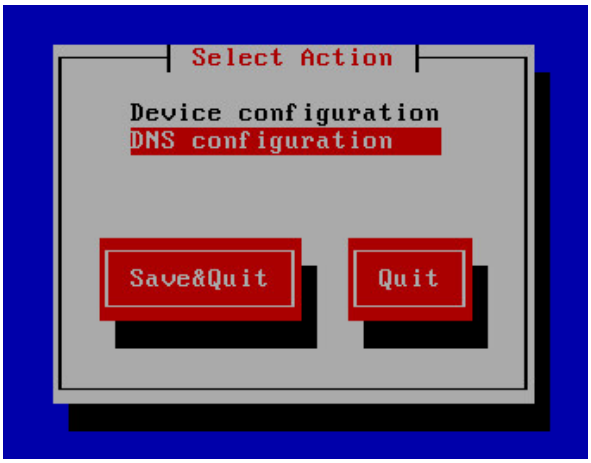
Use Figure 3-5 below as a configuration reference.

Figure 3-5: Static IP Address – Configuration Reference



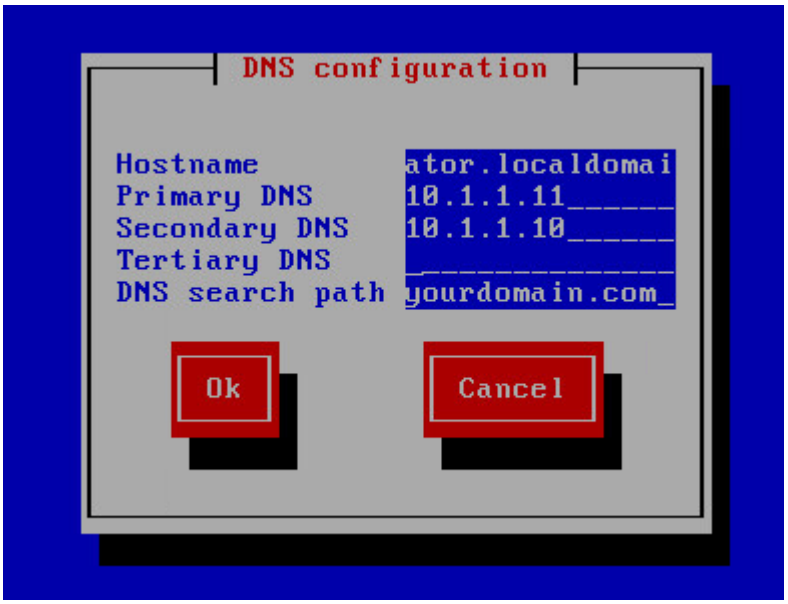
7. Select **OK** and then in the next screen, select **Save**.
8. Select **DNS Configuration**.

Figure 3-6: DNS Configuration



9. Enter a new hostname, for example, **ARM-Router1.yourdomain.com**
   Default hostnames:
   - **ARM-Configurator.localdomain** for the Topology Manager VM
   - **ARM-Router.localdomain** for the Routing Manager VM
10. Make sure all other DNS fields are configured correctly.

Figure 3-7: DNS Configuration



11. Select **OK** and then in the next screen, select **Save&Quit** to exit the Text User Interface.
12. Enter the command

```
hostname <your new hostname>
```

For example:

```
hostname ARM-Router1.yourdomain.com
```

Note: The next step disconnects your SSH connection to this VM. You'll need to reconnect later to the new static IP address.

13. For the changes to take effect, reboot the VM:

```
reboot
```

14. Wait for the machine to come up after the reboot, and then reopen the SSH session/console.
15. Verify the new hostname: enter these commands:

```
# hostname
# dnsdomainname
```

3.2 Licensing

The ARM must be licensed with a valid license for the product to become fully operational. License policy is based on a detailed breakdown for the ARM license model, including the following aspects of ARM functionality and capacity:

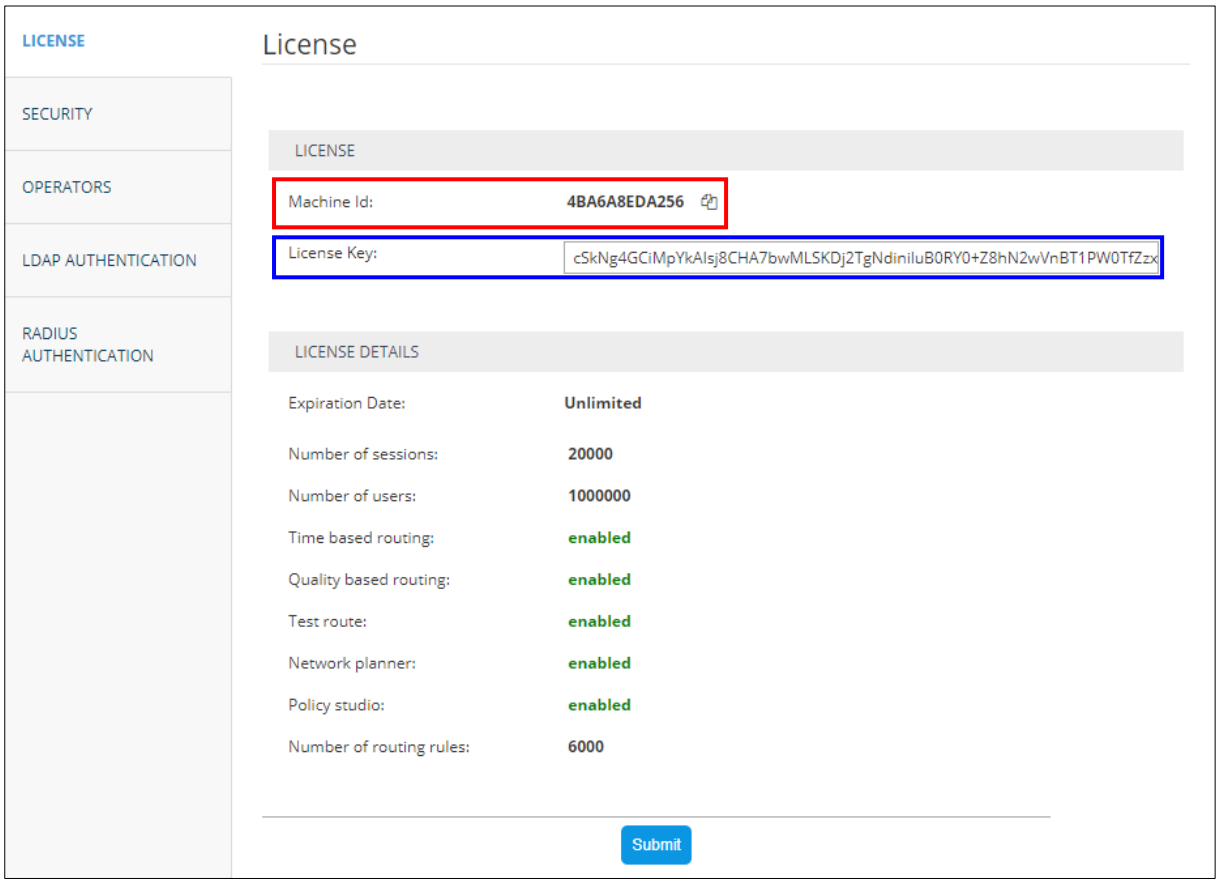
- Expiration Date
- Number of Sessions
- Number of Users
- Number of Routing Rules
- Tune Based Routing (can be either enabled or disabled)
- Quality Based Routing (can be either enabled or disabled)
- Test Route (can be either enabled or disabled)
- Network Planner (can be either enabled or disabled)
- Policy Studio (can be either enabled or disabled)

Information about the license applied to your ARM can be viewed in the ARM GUI's 'License Details' page (Settings > License) (see the *User's Manual* for more information).

➢ To activate a license:

1. Run the ARM GUI. Log in using the default username **Operator** and password **Operator** and then open the License page (**Settings** menu > **Administration** > **License** tab) shown in the figure below.

Figure 3-8: License



2. Select and copy the 'Machine ID' shown in red in the figure above.
3. Activate the product through the AudioCodes License Activation tool at

www.audiocodes.com/swactivation. You'll need your Product Key and the Server Machine ID for the activation process. An email will subsequently be sent to you with your Product License.

4. Copy and paste the Product License string that AudioCodes sends you into the 'License Key' field, indicated in blue in the figure above, and then click **Submit**; the number of sessions purchased and the license expiry date are displayed.
5. Make sure the license details (the number of sessions purchased and the license's expiry date) are those that you purchased.

3.3 Changing an Existing Configurator's IP Address

Important: When changing the IP address of an existing configurator that has existing routers configured, the existing routers will not move to the new configurator's IP address. You need to remove the existing routers and then add them again, as shown in the next section Defining Routers.

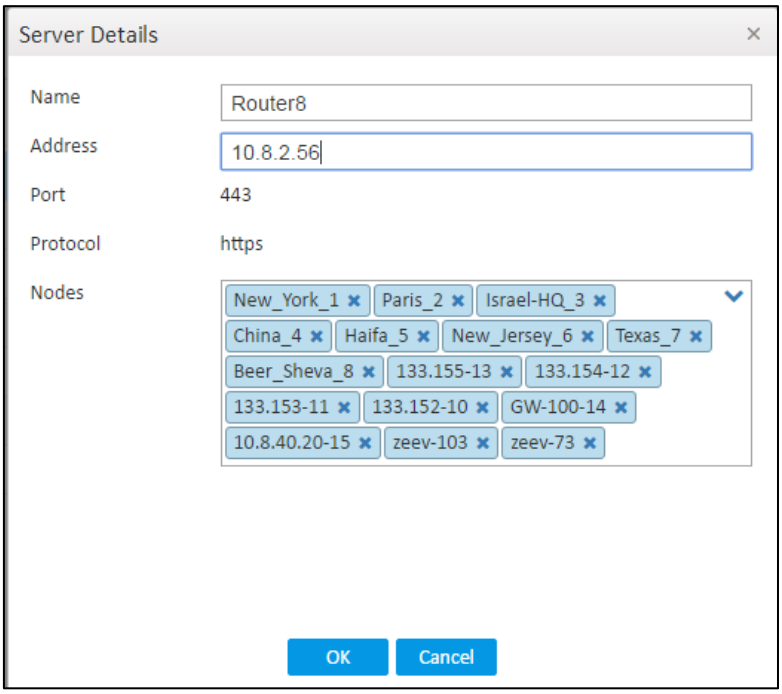
3.4 Defining Routers

You need to define routers in the ARM GUI. Before doing so, it's recommended to see the section *Getting Acquainted with the ARM GUI* in the *ARM User's Manual*.

➢ **To define routers:**

1. In the ARM GUI, open the Server Details screen (**Settings** > **Routing Servers** tab > click **Add**).

Figure 3-9: ARM GUI – Server Details



2. Configure the Router VM to connect to the device.
3. Point the ARM server to the Router VM's IP address or Host name.

A Performing an Online Software Upgrade

This appendix shows how to install a new software version on an existing ARM installation. The online upgrade replaces the software version on all ARM components. All existing configuration is preserved. Only one router is down at a time. Routers can operate temporarily without the configurator, so there is no downtime, and minimal effect on the ARM. After the initial user input collection, the upgrade continues, and completes without user interaction.

The upgrade automatically performs all of the following on the configurator:

- Unpacks the software archive file and validates readiness for upgrade
- Stops the configurator
- Converts the database to the new version schema
- Installs the new software on the configurator
- Updates the operating system of the configurator if necessary
- Validates the successful upgrade of the configurator
- Copies the relevant files to the routers
- Installs and verifies new software on the routers, one by one
- Updates the operating system of the routers if necessary

A.1 Preparing for the Upgrade

You need to prepare for the upgrade.

➢ **To prepare for the upgrade:**

1. Make sure your network is stable.
2. Make sure the ARM is available.
3. Make sure all routers are in service (green).
4. Obtain the root user password for all virtual machines.
5. Obtain the upgrade tar.gz archive file for the version you want to upgrade to.
6. Copy the tar.gz files to the configurator using SFTP (SSH File Transfer Protocol).
7. Choose a time with low call traffic.

Note: The following steps are for upgrades from ARM Version 8.2 or earlier. If you're upgrading from ARM Version 8.4 or later, you can skip it.

8. Copy the file **cent84update-repo.tar.gz** from the same location where you obtained the upgrade tar.gz file, and copy it to the '/root' directory on the ARM configurator. This file contains Linux security updates. Note that this upgrade will take longer, due to the Linux update.
9. Perform the following actions for the Configurator VM only (this step is necessary because as of Version 8.4, the ARM Configurator requires four CPU cores, while Version 8.2 only required two):
   a. In vSphere client, right-click the VM and select **Power** > **Power off**
   b. Right-click the VM and select **Edit settings** > **Hardware** > **CPUs**, and then change the number of cores per socket to 4.
   c. Right -click the VM and select **Power** > **Power on**.
   d. Wait for the VM to boot up and then check in the GUI that all routers are available.

Note: The next step is for upgrades from ARM Version 7.8 or earlier. If you're upgrading from ARM Version 8.0 or later, you can skip it.

10. This step is necessary because as of Version 8.0, the ARM requires a RAM memory allocation of 8 GB, while Version 7.8 only required 4 GB.

Perform the actions below for each ARM virtual machine (configurator and routers).

Note: There will be no loss of service so long as you perform this action separately for each VM and wait for the current VM to be up and available before moving on to the next.

a. In vSphere client, right-click the VM and select **power>power off**
b. Right-click the VM and select **edit settings>Hardware>Memory**, and then change the memory size to 8 GB.
c. Right-click the VM and select **power>power on**
d. Wait for the VM to go up and then check in the GUI that all routers are available.
e. Move on to the next VM.

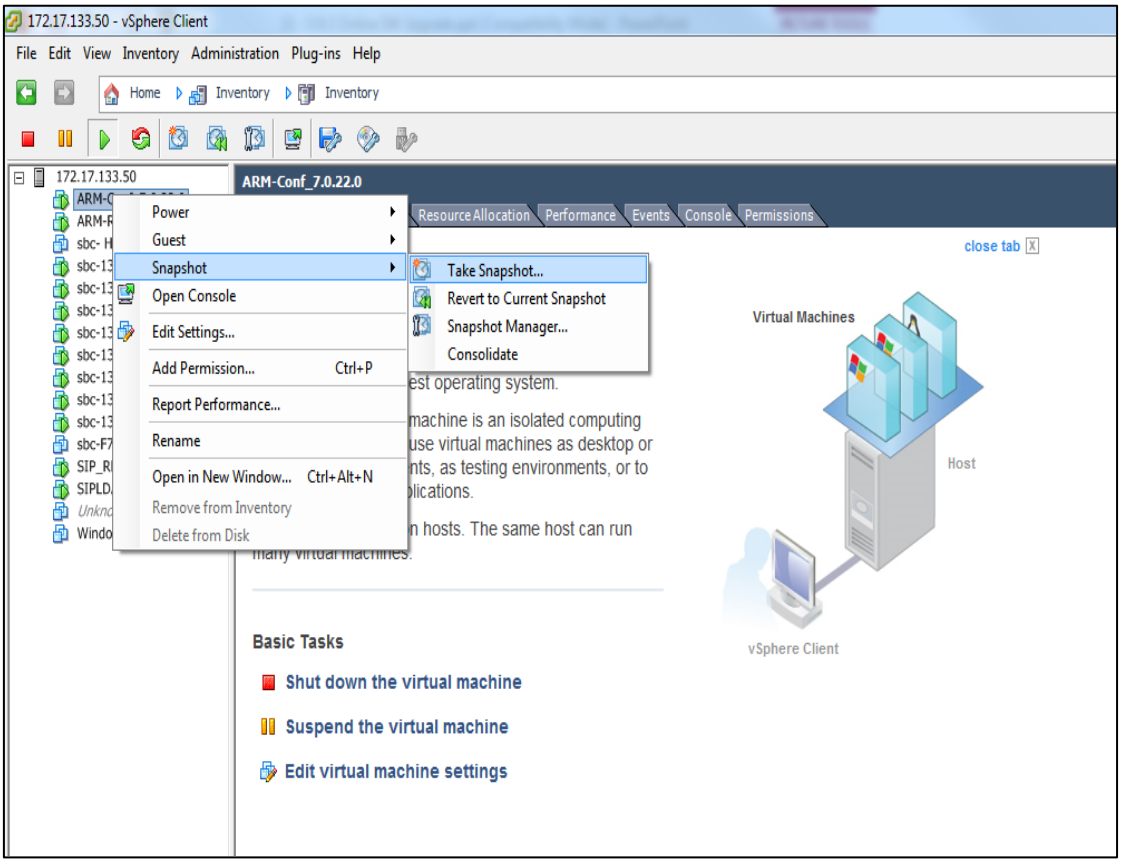
A.2 Performing the Upgrade

You're now ready to perform the upgrade.

➢ **To perform the upgrade:**

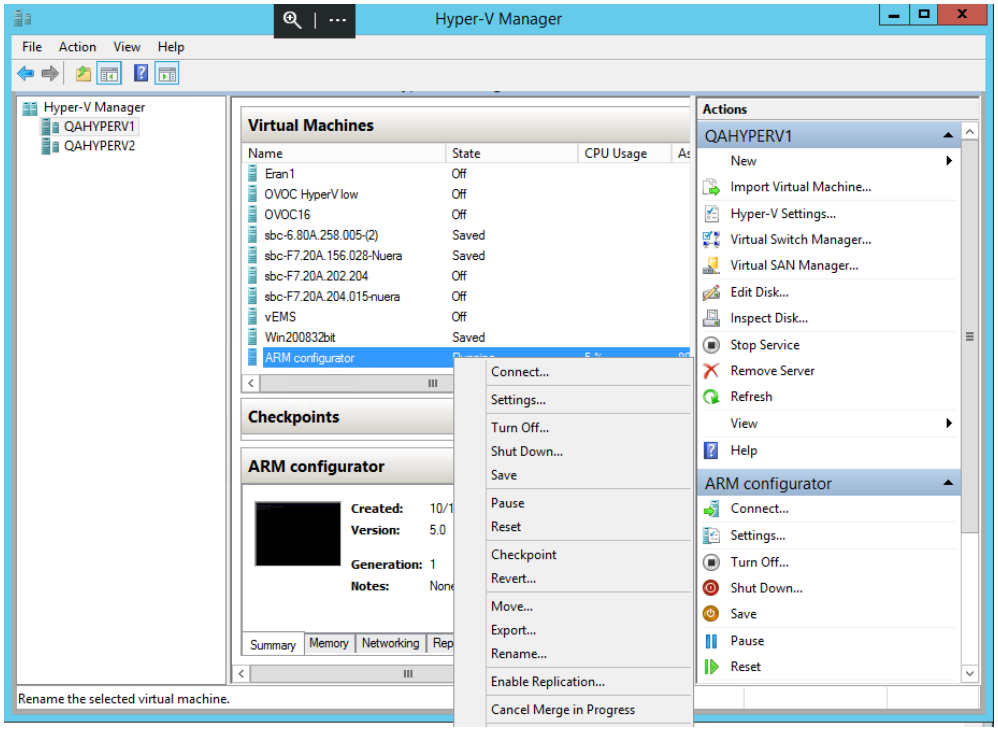
1. Perform a virtual machine snapshot of the configurator and all of the routers:
   a. If you're on VMWare: In the vSphere client, right-click the virtual machine and select **Snapshot** > **Take Snapshot**.

Figure A-1: Take Snapshot



b. If you're on Hyper-V: In Hyper-V Manager, right-click the virtual machine and select **Checkpoint**.

Figure A-2: Hyper-V Manager: Select 'Checkpoint' from VM's Right-Click Menu

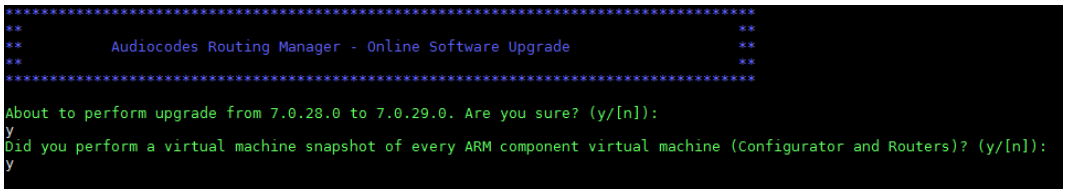


2. Log into the configurator using SSH.
3. Execute the following command:

```
upgrade_arm <path to the upgrade archive file/filename>
```

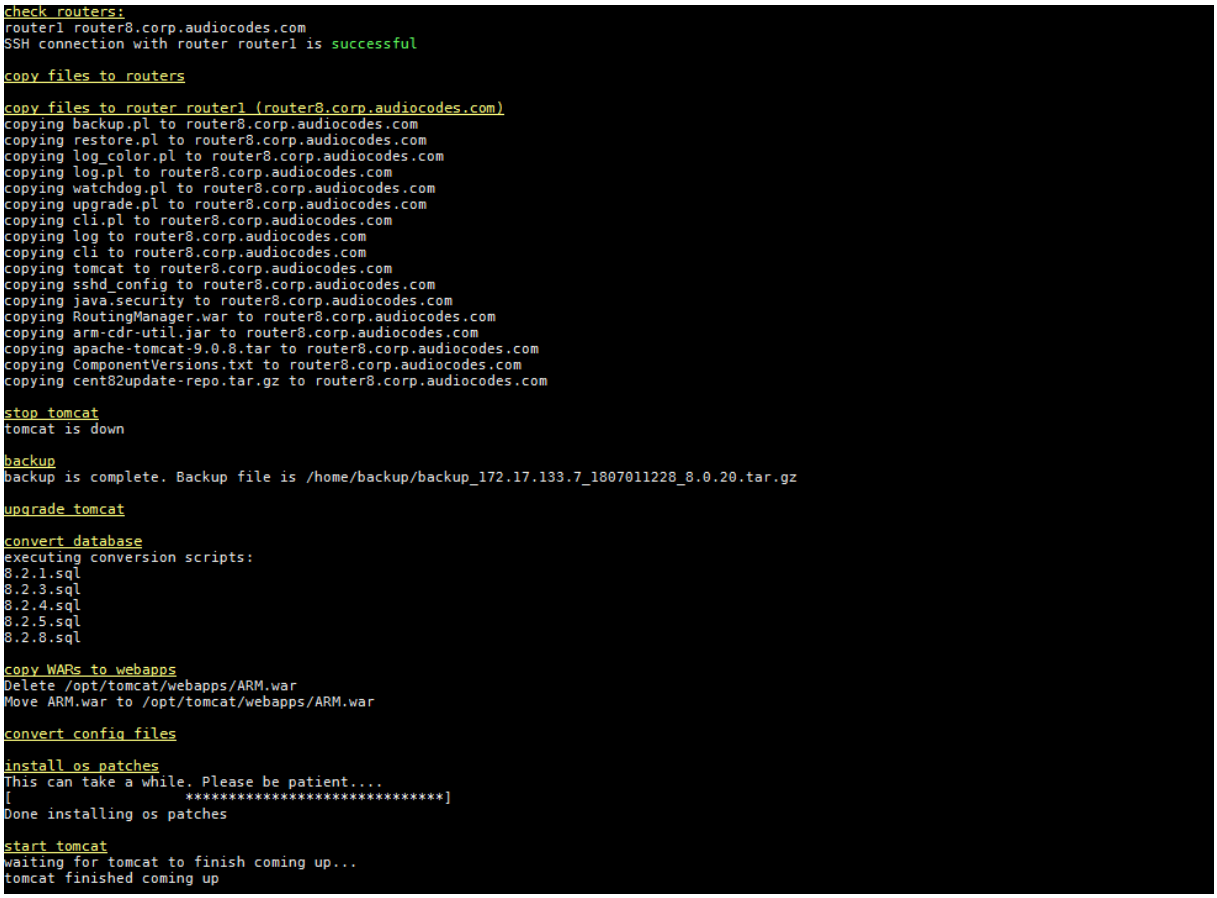
4. Answer **y** to the following questions:

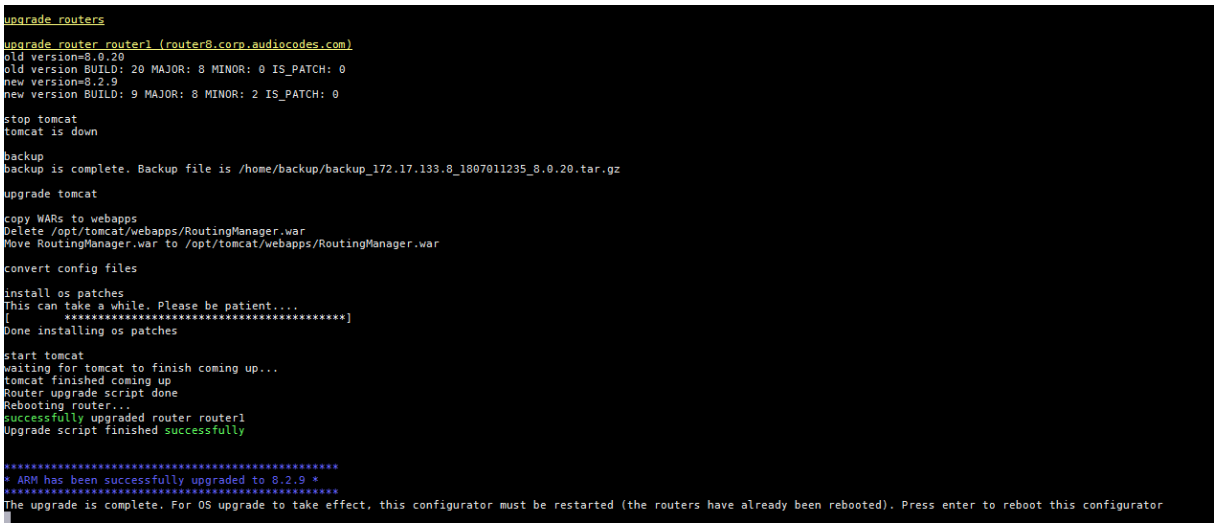
Figure A-3: Answer 'y' to the Questions



5. On the first upgrade, you will be prompted to enter each of the router's root user password (the configurator root user fingerprint is stored in the router so router password entry is not needed on future upgrades).
6. Wait for the notification **ARM has been successfully upgraded to…**

Figure A-4: ARM has been successfully upgraded to…





Note: For the OS upgrade to take effect, the Configurator must be restarted at the end of the upgrade. Press **Enter** to reboot the Configurator.

A.3 Troubleshooting

If the upgrade fails:

- Copy the file **/home/upgrade/upgrade.log** from all ARM Virtual Machines to your computer, and then revert to the pre-upgrade snapshot in VMware vSphere client.

If the upgrade is successful but the ARM is not performing flawlessly in the new version:

1. Log into the ARM Configurator virtual machine via SSH and type the command:

```
logCollect
```

2. Copy the created **tar.gz** file to your computer and then revert to the pre-upgrade snapshot in the VMware vSphere client.

B Backing up / Restoring ARM Software

The backup feature collects software, configuration and log files to enable you to restore the ARM server to its previous state.

You should back up the ARM software

- before risky changes
- after changing the ARM configuration

B.1 Backup Types

Two backup types are supported:

- Periodic Backup
  - Applies only to the Topology Manager VM
  - Stores backup files in */home/backup/periodic* and does not include the log files
  - The directory stores up to 10 files, deleting the oldest file before creating a new one.
- Manual Backup
  - Applies to the Routing Manager VM *and* to the Topology Manager VM
  - Stores backup files in */home/backup*.

B.2 Performing a Manual Backup

You can perform a manual backup.

➢ **To perform a manual backup:**

1. Log in to the VM (Topology Manager or Routing Manager) using ssh with user 'root'.
2. Execute the command:

```
backup_arm
```

   The backup utility prompts:

```
Include log files? (y/[n]):
```

3. Answer **yes** to include all log files in the backup file.

   The backup utility prompts:

```
Include all software files? ([y]/n):
```

4. Answer **no** to exclude software files from the backup file. This will make the backup smaller but will not allow rollback of changes in the tomcat directory or version changes.

   The backup feature creates a backup file and prompts:

```
  >>> collecting arm DB ...
  >>> Creating tar archive...
.....................................
  >>> Compress tar file...

Completed backup. Backup file is
/home/backup/backup_<ip address>_<date and time>_<version>.tar.gz
Checksum file is
/home/backup/backup_<ip address>_<date and time>_<version>.sfv
```

   A text file with the same name as the backup file but with suffix "sfv" (Simple File Verification) is created, containing the CRC32 checksum of the *tar.gz* file.
   The restore process checks that the checksum matches the *tar.gz* file before running.

B.3 Restoring ARM Software

You can restore ARM software.

➢ **To restore ARM software:**

1. Log in to the VM (Topology Manager or Routing Manager) using ssh with user 'root'.
2. Execute the command:

```
restore_arm_backup <backup file name>
```

The restore feature prompts you to confirm:

```
WARNING! You are now going to restore a backup of the ARM
server. ARM server will now stop, and all configuration,
database and software files will be overrun. Are you sure you
want to restore this backup? [Yes/No] (No):
```

The restore feature prompts you to confirm start:

```
Restore is done. ARM server will now start. Press Enter to
continue:
```

C High Availability (HA)

C.1 Overview

ARM HA is based on VMware HA[1] which is a viable virtualization solution for environments that can tolerate brief interruptions of service and potential loss of transactions serviced at the time of failure. VMware HA strives to minimize downtime and deliver service continuity by restarting a VM on a different host if the initial host fails, or on the same host if application failure occurs.

Both ARM VM modules, Topology Manager *and* Routing Manager, provide availability capabilities, but the HA concept differs for each module.

Topology Manager runs over only one VM. If the host fails, the Topology VM is restarted on another host by the VMware HA feature. Down time is equal to VM restart time, acceptable for the Topology Manager module because real time routing is unaffected.

The Routing Manager module runs in Active-Active mode: a few router VMs can run simultaneously, providing not only HA (no down time) if one of them goes down but also scalability by adapting to traffic capacity.

For more information on VMware HA capabilities and configuration, see vSphere 5.5 Availability.

vSphere HA provides HA for VMs by pooling the VMs and the hosts they reside on into a cluster. Hosts in the cluster are monitored and if a failure occurs, the VMs on a failed host restart on alternate hosts.

VM Monitoring restarts individual VMs if their VMware Tools heartbeats are not received within a set time.

C.2 Requirements for a vSphere HA Cluster

Consult the checklist below before setting up a vSphere HA cluster. For more information, see *Best Practices for Networking* or *Creating a vSphere HA Cluster* in vSphere 5.5 Availability.

- All hosts must be licensed for vSphere HA.
- You need at least two hosts in the cluster.
- All hosts need to be configured with static IP addresses. If you are using DHCP, make sure that the address for each host persists across reboots.
- There should be at least one management network in common among all hosts and best practice is to have at least two. VMkernel network with the **Management Traffic** checkbox enabled. See *Best Practices for Networking* in vSphere 5.5 Availability.
- To ensure that any VM can run on any host in the cluster, all hosts should have access to the same VM networks and datastores. Similarly, VMs must be located on shared, not local, storage otherwise they cannot be failed over if a host fails.

Note: vSphere HA uses datastore heartbeating to distinguish between partitioned, isolated, and failed hosts. Accordingly, if there are some datastores that are more reliable in your environment, configure vSphere HA to give preference to them.

- For VM Monitoring to function, VMware tools must be installed. The provided ARM VM includes VMware tools software.
- vSphere HA supports both IPv4 and IPv6. A cluster that mixes the use of both of these protocol versions, however, is more likely to result in a network partition.

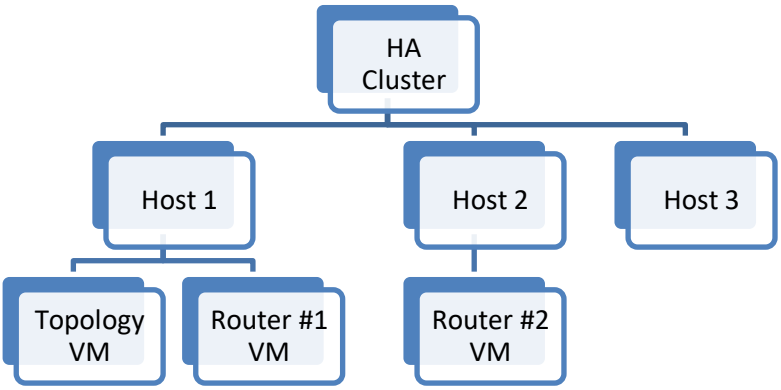
[1] This appendix is adapted from VMware documentation

C.3 Distributing ARM VMs in an HA Cluster

To achieve best HA performance for ARM VMs in the VMware HA environment, locate the Topology Manager and Routing Manager VMs among the hosts in the HA cluster like this:

- Deploy the Topology Manager VM on only one VM. It can be located on any host in the HA cluster according to VMware administrator preference, depending on environment resources.
- When the ARM setup includes only one Routing Manager VM, it necessarily means that if there's a failure of the host or Routing Manager VM, the routing service will be unavailable until the Routing Manager VM finishes restarting on the current host or on a different host. So for the routing service to stay up continuously, at least two Routing Manager VMs must be deployed, each on a different host in the HA cluster.

Figure C-1: HA Cluster Schema Example



In the above example, if Host 1 fails, VMware HA restarts the Topology VM on Host 2 or Host 3, and restarts Router #1 VM on Host 2 or Host 3.

Meanwhile, Router #2 VM preserves the routing service.

After this HA process, all three VMs may be located on Host 2 only. It's inadvisable to maintain all VMs on a single host because if a failure occurs on Host 2, *both* Router VMs will restart and the routing service will be unavailable during the restart.

A preferable option is to set Router #1 VM to restart on Host 3 if failure occurs, or, if the HA cluster contains only two hosts (Host 1 and Host 2), to restore Host 1 and move Router #1 VM back to its original location.

C.4 VM UUID

Each VM has a universal unique identifier (UUID). The UUID is generated when you initially power on the VM.

The software licenses of the ARM Topology Manager VM and Routing Manager VM are linked to the VM UUID, so each VM's UUID must be kept else a new license must be issued for the VM.

If you do not move or copy the VM to another location, the UUID remains constant. When you power on a VM that was moved or copied to a new location, you are prompted to specify whether you moved or copied the VM. If you indicate that you copied it, it receives a new UUID.

A VM can be configured to keep the same UUID (see Vmware Documentation).

C.5 ARM Datacenter Recovery Procedure

This appendix shows how to prepare for and recover from a datacenter failure.

ARM comprises a single configurator virtual machine and two or more router virtual machines. The routers operate as stateless load sharing. If the routers are distributed among multiple datacenters and one datacenter fails, ARM traffic is automatically diverted to the other routers.

The ARM configurator is a single VM. High Availability is achieved by using VMWare's HA functionality. If the active VMWare host fails, a stand-by host comes up with the same ARM configurator.

If datacenter failure occurs, it is assumed that the ARM configurator will be non-operational since both the active and standby VMWare host are non-operational. In this case, a procedure is required to recover the ARM configurator in a different datacenter.

When a configurator is down, the routers continue to operate using the last known configuration. This means that ARM call routing functionality will continue even though the configurator is down. Restoring the configurator is important for allowing configuration changes, alarms, GUI, user management, etc. Also, if a router must be restarted, it would need to reload the configuration from the configurator.

C.5.1 Preparation

C.5.1.1 Change Automatic Backup to an Hourly Backup

The ARM automatically performs a periodic backup of the configurator. The default period is 24 hours, keeping the last 10 backups. To change this to an hourly backup, login to the LINUX shell via SSH as user root, and type the following command:

```
mv /etc/cron.daily/dailybackup /etc/cron.hourly/hourlybackup
```

This will perform a backup every hour and keep the last 10 backups. The backups are stored in the folder **/home/backup/periodic**

Each backup file is accompanied by a corresponding sfv (checksum) file. It is recommended to pull the latest backup file with its corresponding sfv file once an hour from the configurator, and store it in the standby datacenter. This can be done using scp.

C.5.1.2 Prepare a Redundant Configurator

You need to prepare a redundant configurator.

➢ **To prepare a redundant configurator:**

1. In the standby datacenter, install a separate ARM configurator with the same software version as the active configurator. Besides setting the virtual machine's IP address, do not configure anything on this ARM.
2. From the GUI, obtain the machine ID and send it to AudioCodes in order to receive a license for this ARM. Load it to this configurator.
3. Switch off the virtual machine so that it will not take up any resources of the host.

Note: If you perform an upgrade of your main ARM, perform the same upgrade on the standby ARM. You can perform the upgrade before the recovery if you don't now.

C.5.1.3 Recovering from Datacenter Failure

You need to prepare a redundant configurator.

➢ **To prepare a redundant configurator:**

1. Turn on the configurator virtual machine in the standby datacenter.
2. Copy the latest ARM configurator backup file with its corresponding sfv file to the new configurator.
3. Log in to the LINUX shell via SSH, and type the command:

```
restore_arm_backup --datacenter_recovery <backup filename>
```

The script keeps the existing software license on the device.

4. Wait for the configurator to be up and running. Make sure it's up by logging in to the GUI.

Note: The routers and nodes are at this point not connected to the new IP address of the configurator. They will appear read in the network view and in the routing server table.

To fix this, type the following command in the LINUX shell:

```
configurator_publish_ip_change.pl
```

The script prompts for the HTTP credentials. Enter the same credentials you use for logging into the GUI. The output of the command will be 'All routers and nodes were successfully moved to the new configurator IP address'.

After a few minutes, the configurator will be connected and synced with all of the routers and nodes and the ARM will be fully functional.

If some of the nodes or routing servers fail to move to the new configurator IP address, they will be listed in the command output.

If a node fails to move, manually change the configurator IP in the node by logging into the node's Web interface. Go to **Services** > **HTTP Services** > **HTTP Remote Services** > **ARMTopology** > **HTTP Remote Hosts** > **ARMTopology** > **Edit**, and set the new IP Address.

If a router fails to move, check if it's running and connected. If it's not, bring it up and run the following command again:

```
configurator_publish_ip_change.pl
```

If it's up, restart it by logging into its shell via SSH, and type the command:

```
service tomcat restart
```

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