Introduction to Cisco vWAAS

This chapter provides an overview of the Cisco Virtual Wide Area Applications Services (vWAAS) solution and describes the main features that enable Cisco vWAAS to overcome the most common challenges in transporting data over a wide area network.

This chapter contains the following sections:

- About Cisco vWAAS
- Cisco vWAAS and WAAS Interoperability
- Cisco vWAAS and vCM Model Profiles
- DRE Disk, Object Cache, and Akamai Connect Cache Capacity
- vWAAS Resizing for WAAS Version 6.4.1a and Later
- OVA Package Files for vWAAS and vCM Models
- Cisco Hardware Platforms Supported for vWAAS
- Hypervisors Supported for Cisco vWAAS and vCM
- Hypervisor OVA Packages for vWAAS
- Cloud Platforms Supported for vWAAS

About Cisco vWAAS

Cisco Virtual WAAS (vWAAS) is a virtual appliance—for both enterprises and service providers—that accelerates business applications delivered from private and virtual private cloud infrastructure. Cisco vWAAS enables you to rapidly create WAN optimization services with minimal network configuration or disruption. Cisco vWAAS can be deployed in the physical data center and in private clouds and in virtual private clouds offered by service providers.

Cisco vWAAS service is associated with application server virtual machines as they are instantiated or moved. This approach helps enable cloud providers to offer rapid delivery of WAN optimization services with little network configuration or disruption in cloud-based environments.

Cisco vWAAS enables migration of business applications to the cloud, reducing the negative effect on performance of cloud-based application delivery to end-users. It enables service providers to offer an excellent application experience over the WAN as a value-added service in their catalogs of cloud services.

ISR-WAAS is the specific implementation of vWAAS running in a Cisco IOS-XE Software container on a Cisco ISR 4000 Series router (ISR-4321, ISR-4331, ISR-4351, ISR-4431, ISR-4451). In this context, “container” refers to the hypervisor that runs virtualized applications on a Cisco ISR 4000 Series router.

Note ISR-4461 is supported for vWAAS for WAAS 6.4.1b and later.

Table 1-1 shows the hypervisors supported for Cisco vWAAS. For more information on each of these hypervisors, see Hypervisors Supported for Cisco vWAAS and vCM in this chapter, and in the chapters listed in Table 1-1.

Table 1-1 Hypervisors Supported for Cisco vWAAS

Hypervisor	For More Information:
Cisco ISR-WAAS	Chapter 3, "Cisco vWAAS on Cisco ISR-WAAS"
VMware vSphere ESXi	Chapter 4, "Cisco vWAAS on VMware ESXi"
Microsoft HyperV	Chapter 5, "Cisco vWAAS on Microsoft Hyper-V"
RHEL KVM	Chapter 6, "Cisco vWAAS on RHEL KVM and KVM CentOS"
KVM on CentOS	Chapter 6, "Cisco vWAAS on RHEL KVM and KVM CentOS"
Cisco Enterprise NFVIS	Chapter 8, "Cisco vWAAS with Cisco Enterprise NFVIS"

Cisco vWAAS supports WAN optimization in a cloud environment where physical WAE devices cannot usually be deployed. Virtualization also provides various benefits like elasticity, ease of maintenance, and a reduction of branch office and data center footprint.

The following hardware and cloud platforms are supported for Cisco vWAAS. For more information on each of these supported platforms, see Cisco Hardware Platforms Supported for vWAAS.

- Cisco Unified Computing System (UCS)
- Cisco UCS E-Series Servers
- Cisco UCS E-Series Network Compute Engines (NCEs)
- Cisco ISR-4000 Series
- Cisco ENCS 5400-W Series
- Microsoft Azure Cloud
- OpenStack

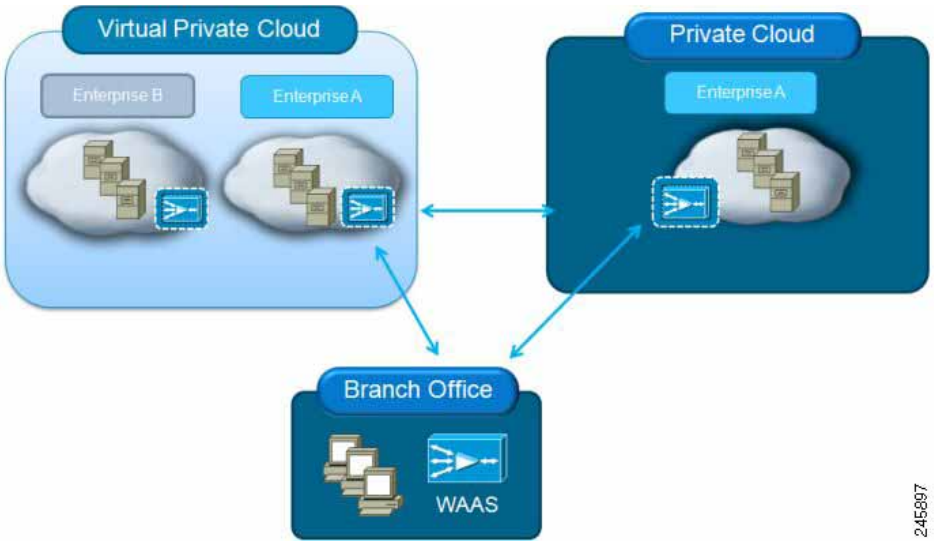
For details on the interoperability of the hypervisors and platforms supported for vWAAS, see Table 1-12.

As shown in Figure 1-1, you can enable vWAAS at the branch and/or the data center:

- *At the branch*—with Cisco ENCS 5400-W Series, Cisco Unified Computing System (UCS) E-Series servers and E-Series Network Compute Engines (NCEs), on either the Cisco 4000 Series Integrated Services Routers (ISRs) or Cisco ISR G2 branch router.
- *At the data center*—with a Cisco UCS server.

vWAAS supports on-demand provisioning and teardown, which reduces the branch office and data center footprint. Cisco vWAAS software follows the VMware ESXi standard as the preferred platform to deploy data center applications and services.

Figure 1-1 vWAAS in Virtual Private Cloud at WAN Edge, in Branch Office and Data Center



Benefits of Cisco vWAAS

The following are some of the benefits of deploying Cisco vWAAS on your system:

- On-demand orchestration of WAN optimization
- Fault tolerance with virtual machine (VM) mobility awareness
- Lower operating expenses for customers who are migrating their applications to the cloud
- Private and virtual private cloud environments:
  - Use vWAAS to create value-added WAN optimization services on a per-application basis, for optimized delivery to remote branch-office users.
  - Associate vWAAS services with application server virtual machines as they are moved in response to dynamic load demand in the cloud, to offer rapid delivery of WAN optimization services, with minimal network configuration or disruption.
- Public cloud environments:
  - Deploy vWAAS in public clouds, with the Cisco Nexus 1000V Series, to obtain benefits similar to benefits vWAAS produces in private cloud environments.

Cisco vWAAS and WAAS Interoperability

Consider the following guidelines when using Cisco vWAAS with WAAS:

- *For vWAAS with WAAS Version 6.1.x and later*—The vWAAS and vCM devices require *both* virtual (network) interfaces to be present, but both need not be active. If only one virtual interface is active, the vWAAS and vCM devices will not be operational after power up
- *Cisco WAAS Central Manager interoperability*—In a mixed version Cisco WAAS network, the Central Manager must be running the highest version of the Cisco WAAS software, and associated Cisco WAAS devices must be running Version 5.1.x or later.

- *Cisco WAAS system interoperability*—Cisco WAAS Version 5.2.1 is not supported running in a mixed version Cisco WAAS network in which any Cisco WAAS device is running a software version earlier than Version 5.1.x. Directly upgrading a device from a version earlier than Version 5.5.3 to 5.2.1 is not supported.

Cisco vWAAS and vCM Model Profiles

This section contains the following topics:

- Cisco vWAAS Models: CPUs, Memory, and Disk Storage
- Cisco vWAAS-150000 for WAAS 6.4.1a
- VMware VMFS Block Size and vWAAS Disk Size
- Cisco vCM Models: Managed Nodes, vCPUs, Memory, and Disk Storage

Cisco vWAAS Models: CPUs, Memory, and Disk Storage

Table 1-2 shows the default number of vCPUs, memory capacity, and disk storage for each vWAAS model for vWAAS for WAAS Version 6.4.1 and earlier. Table 1-8 shows the resizing capability for vWAAS for WAAS Version 6.4.1a and later.

Table 1-2 CPUs, Memory, and Disk Storage for vWAAS Models

vWAAS Model	CPUs	Memory	Disk Storage
vWAAS-150 (earliest WAAS Version 6.1.x)	1	3 GB	160 GB disk
vWAAS-200	1	3 GB	260 GB disk
vWAAS-750	2	4 GB	500 GB disk
vWAAS-1300	2	6 GB	600 GB disk
vWAAS-2500	4	8 GB	750 GB disk
vWAAS-6000	4	11 GB	900 GB disk
vWAAS-6000-R (earliest WAAS Version 6.4.x)	4	11 GB	875 GB disk
vWAAS-12000	4	12 GB	750 GB disk
vWAAS-50000	8	48 GB	1500 GB disk

For the vWAAS models noted below, follow these operating guidelines for CPU, memory, and disk storage:

- When using vWAAS-150 or vWAAS-200 with the KVM hypervisor, you must increase the default memory of 3 GB to 4 GB.
- When vWAAS-6000, 1300, 12000, or 50000 are used with Akamai Connect and when connections are more than 70% of TFO, response time will be on the higher side. Adding CPUs to these models when used with Akamai Connect may improve response time.
- Table 1-3 shows where to find more information on specific vWAAS models and their applications.

Table 1-3 For More Information on Specific vWAAS Models

vWAAS Model	For more information:
vWAAS-150	• See Cisco vWAAS-150 with Akamai Connect in Chapter 9, "Cisco vWAAS with Akamai Connect".
vWAAS-6000-R	• See Chapter 8, "Cisco vWAAS on Cisco ENCS 5400-W Series". • See *Cisco vWAAS Bundled Image Upgrade for ENCS 5400-W Series, with RMA Process for Cisco EOS/EOL WAVE Devices*.
vWAAS-12000 and vWAAS-50000	• For information on vWAAS-12000 and vWAAS-50000 used with Akamai Connect, see Akamai Connect Cache Engine on Cisco Mid- and High-End Platforms in Chapter 9, "Cisco vWAAS with Akamai Connect".
vWAAS models with Akamai Connect	• For memory and disk storage requirements for vWAAS models with Akamai Connect, see Cisco vWAAS with Akamai Connect Hardware Requirements in Chapter 9, "Cisco vWAAS with Akamai Connect."
vWAAS models on Cisco ENCS 5400 Series	• See Chapter 7, "Cisco vWAAS on Cisco ENCS 5400-W Series". • See *Cisco vWAAS Bundled Image Upgrade for ENCS 5400-W Series, with RMA Process for Cisco EOS/EOL WAVE Devices*.

Cisco vWAAS-150000 for WAAS 6.4.1a

Cisco vWAAS-150000, available for vWAAS for WAAS Version 6.4.1a, supports 150,000 connections. Table 1-4 shows specifications for Cisco vWAAS-150000.

Consider the following operating guidelines for Cisco vWAAS-150000:

- Cisco vWAAS-150000 replaces Cisco WAVE-8541, which has end-of-sale (EOS) and end-of-life (EOL) dates. For more information on WAVE-8541 EOS/EOL dates, see the *End-of-Sale and End-of-Life Announcement for the Cisco WAVE 294, 594, 694, 7541, 7571 and 8541*.
- For vWAAS with WAAS Version 6.4.1a, the supported hypervisor for vWAAS-150000 is VMware ESXi Version 5.5 or later. For more information on vWAAS on the VMware ESXi hypervisor, see Chapter 4, "Cisco vWAAS on VMware ESXi".
- Traffic interception methods used with vWAAS-150000 are AppNav, Policy-Based Routing (PBR), and Web Cache Communications Protocol (WCCP).
- Upgrading vWAAS-150000 to a version later than vWAAS for WAAS Version 6.4.1a is supported.
- Downgrading vWAAS-150000 to a version earlier than vWAAS for WAAS Version 6.4.1a is not supported.

Table 1-4 vWAAS-150000 Specifications

Specification	Description
Connections	150,000
Supported hypervisor	VMware ESXi Version 5.5 or later For more information on VMware ESXi, see Chapter 4, "Cisco vWAAS on VMware ESXi".

Specification	Description
OVA Package	Cisco-WAAS-Unified-6.41a-b-6.ova For more information on Cisco unified OVA files, see Hypervisor-wise Unified OVA Package Format for vWAAS for WAAS Version 6.4.x and Later.
Supported Hardware Platform	Cisco UCS C240 M4/M5 Rack Server **Note** The Cisco UCS C240 Rack Server offers SSD and HDD disk options. For use with vWAAS-150000, we recommend using *only* SSD disks. For more information, the Cisco UCS C220 M5 Rack Server, see the Cisco UCS C240 M4 Data Sheet and the Cisco UCS C240 M5 Data Sheet.
vCPUs	24
Memory	96 GB
Flash Disk	4 GB
Data Disk	3 TB The data disk includes: • Object cache—700 GB • DRE cache—2 TB
(Optional) Akamai Connect Disk	1.5 TB
Traffic Interception Methods Supported	vWAAS-150000 for WAAS Version 6.4.1a supports the following traffict interception methods: WCCP, AppNav, and PBR.

VMware VMFS Block Size and vWAAS Disk Size

Table 1-5 shows the VMware Virtual Machine File System (VMFS) block size and associated vWAAS maximum disk file size. For more information on VMware and vWAAS interoperability, see Table 1-12.

Table 1-5 VMware VMFS Block Size and vWAAS Maximum File Size

VMFS Block Size	vWAAS Maximum Disk File Size
1 MB	256 GB
2 MB	512 GB
4 MB	1024 GB
8 MB	2046 GB

Note For vWAAS models that have a disk size greater than 256 GB, a VMFS block size greater than 1 MB is required.

Cisco vCM Models: Managed Nodes, vCPUs, Memory, and Disk Storage

Table 1-6 shows the number of managed nodes and disk storage for each vCM model, as well as the required and recommended number of vCPUs and the required and recommended memory capacity.

Note Cisco vWAAS installation packages are configured with the minimal required amounts of CPU and memory resources to accommodate the various hypervisor setups. These minimal requirements are sufficient for initial setup and a limited number of nodes.

However, as the number of managed devices on your system increases, the Central Manager service can experience intermittent restarts or flapping—device states when under resource shortage. To remedy this, please configure the recommended values for number of CPUs and memory shown in Table 1-6.

Table 1-6 vCM Models: Managed Nodes, vCPUs, Memory, and Disk Storage

vCM Model	Managed Nodes	Required vCPUs	Recommended vCPUs	Required Memory	Recommended Memory	Disk Storage
vCM-100	100	2	2	2 GB	2 GB	250 GB
vCM-500	500	2	4	2 GB	5 GB	300 GB
vCM-1000	1000	2	6	4 GB	8 GB	400 GB
vCM-2000	2000	4	8	8 GB	16 GB	600 GB

DRE Disk, Object Cache, and Akamai Connect Cache Capacity

This section contains the following topics:

- Table 1-7 shows the DRE disk capacity, default object cache capacity, and default Akamai Connect Cache capacity by WAVE model.
- Table 1-8 shows the DRE disk capacity, default object cache capacity, and default Akamai Connect Cache capacity by vWAAS model.
- For information on default and resized DRE disk capacity, object cache capacity, and Akamai Connect Cache capacity by vWAAS model, see Table 1-9.

Table 1-7 DRE Disk, Default OC, and Default Akamai Connect Cache by WAVE Model

WAVE Model	DRE Disk Capacity	Default Object Cache Capacity	Default Akamai Connect Cache Capacity
WAVE 294-4G	40 GB	102 GB	59 GB
WAVE 294-4G-SSD	40 GB	57 GB	55 GB
WAVE 294-8G	55 GB	77 GB	65 GB
WAVE 294-8G-SSD	55 GB	46 GB	47 GB
WAVE 594-8G	80 GB	143 GB	200 GB
WAVE 594-8G-SSD	80 GB	125 GB	125 GB

vWAAS Resizing for WAAS Version 6.4.1a and Later

This section contains the following topics:

- About vWAAS Resizing
- Resizing Guidelines: Upgrading to WAAS Version 6.4.1a and Later
- Resizing Guidelines: Installing WAAS 6.4.1a
- Resizing Guidelines by Hypervisor for WAAS 6.4.1b and Later

About vWAAS Resizing

vWAAS for WAAS Version 6.4.1a and later requires additional resources, so we highly recommend that you resize CPU and memory resources, as shown in Table 1-8, and resize DRE object cache and Akamai Connect Cache, as shown in Table 1-9.

Caution Resizing CPU and memory resources is highly recommended, although optional, for vWAAS models on all hypervisors. For vWAAS for WAAS 6.4.1b and later, options are provided during vWAAS deployment for you to choose either original or resized resources.

For vWAAS for WAAS Version 6.4.1b, you cannot deploy vWAAS-12000 or vWAAS-50000 in Microsoft Hyper-V with the original resources. For a successful deployment of vWAAS 12000 or vWAAS-50000 in Microsoft Hyper-V with original resources, do a new deployment with WAAS Version 6.4.1 or earlier, and then perform the bin upgrade to WAAS Version 6.4.1b.

Note ISR-WAAS and vCM are not resized for vWAAS for WAAS Version 6.4.1a.

Resizing vWAAS on the recommended platforms enables vWAAS to scale to optimized TCP connections for the associated device, and to reduce CPU and RAM utilization.

Note For optimum performance, we recommend you use the SSD disk with the UCS models listed in Table 1-8.

Table 1-8 Resized vWAAS CPU and Memory Specifications for WAAS Version 6.4.1a and Later

vWAAS Model	Original CPU	Resized CPU	Tested CPU Clock Speed	Original Memory	Resized Memory	Minimum Recommended Platform
vWAAS-150	1 CPU	2 CPUs	1.7 GHz	3 GB	4 GB	UCS-E140N-M2
vWAAS-200	1 CPU	2 CPUs	1.8 GHz	3 GB	4 GB	UCS-E140S-M2
vWAAS-750	2 CPUs	4 CPUs	1.8 GHz	4 GB	8 GB	UCS-E140S-M2
vWAAS-1300	2 CPUs	4 CPUs	1.9 GHz	6 GB	12 GB	UCS-E160S-M3
vWAAS-2500	4 CPUs	6 CPUs	1.9 GHz	8 GB	16 GB	UCS-E160S-M3
vWAAS-6000	4 CPUs	8 CPUs	2.0 GHz	11 GB	24 GB	UCS-E180D-M3
vWAAS-6000R	4 CPUs	8 CPUs	2.0 GHz	11 GB	24 GB	UCS-E180D-M3

vWAAS Model	Original CPU	Resized CPU	Tested CPU Clock Speed	Original Memory	Resized Memory	Minimum Recommended Platform
vWAAS-12000	4 CPUs	12 CPUs	2.6 GHz	12 GB	48 GB	UCS-C220 or UCS-C240
vWAAS-50000	8 CPUs	16 CPUs	2.6 GHz	48 GB	72 GB	UCS-C220 or UCS-C240

Table 1-9 shows the default and resized DRE disk capacity, object cache capacity, and Akamai Connect cache capacity, by vWAAS model.

Table 1-9 Default and Resized DRE, OC, and Akamai Connect Cache, by vWAAS Model

vWAAS Model	DRE Disk Capacity	Default Object Cache Capacity	Default Akamai Connect Cache Capacity
vWAAS-150	52.3 GB	52 GB	30 GB
vWAAS-150 Resized	51.25 GB	52 GB	30 GB
vWAAS-200	52.23 GB	82 GB	100 GB
vWAAS-200 Resized	51.25 GB	82 GB	100 GB
vWAAS-750	96.75 GB	122 GB	250 GB
vWAAS-750 Resized	92.75 GB	122 GB	250 GB
vWAAS-1300	140 GB	122 GB	300 GB
vWAAS-1300 Resized	136.25 GB	122 GB	300 GB
vWAAS-2500	238 GB	122 GB	350 GB
vWAAS-2500 Resized	223.25 GB	122 GB	350 GB
vWAAS-6000	320 GB	122 GB	400 GB
vWAAS-6000 Resized	302.05 GB	122 GB	400 GB
vWAAS-6000R	320 GB	122 GB	350 GB
vWAAS-6000R Resized	302.05 GB	122 GB	350 GB
vWAAS-12000	450 GB	226 GB	750 GB
vWAAS-12000 Resized	407.25 GB	226 GB	750 GB
vWAAS-50000	1000 GB	227 GB	850 GB
vWAAS-50000 Resized	1000 GB	227 GB	850 GB
vWAAS-150000	1.95 T	700 GB	1500 GB

Resizing Guidelines: Upgrading to WAAS Version 6.4.1a and Later

This section contains the following procedures:

- Upgrading to WAAS Version 6.4.1a and Later with Existing CPU and Memory
- Upgrading to WAAS Version 6.4.1a and Later with Resized CPU and Memory

Upgrading to WAAS Version 6.4.1a and Later with Existing CPU and Memory

You can use the CLI or the Central Manager to upgrade to WAAS Version 6.4.1a, with existing CPU and memory:

Using the CLI to perform the upgrade with existing CPU and memory:

1. During the upgrade, if the vCPU and memory resources are undersized, you will be prompted to resize these vWAAS parameters before the upgrade.
2. You can continue the upgrade procedure and retain the existing vWAAS resources.

Note *For vWAAS for WAAS 6.4.1a only,* after the upgrade there will be undersized-resource alarms for vCPU and memory for the vWAAS device. Use the **show alarms** command to display information undersized alarms for the vWAAS model.

Using the Central Manager to perform the upgrade with existing CPU and memory:

1. During the upgrade, if the vCPU and memory resources are undersized, there will be an informational note on the upgrade page, but there will not be a prompt to resize these vWAAS parameters before the upgrade.
2. You can continue the upgrade procedure and retain the existing vWAAS resources.

Note *For vWAAS for WAAS 6.4.1a only,* after the upgrade there will be undersized-resource alarms for vCPU and memory for the vWAAS device. Use the **show alarms** command to display information undersized alarms for the vWAAS model.

Upgrading to WAAS Version 6.4.1a and Later with Resized CPU and Memory

You can use the CLI or the Central Manager to upgrade to WAAS Version 6.4.1a, with resized CPU and memory:

Using the CLI to perform the upgrade with resized CPU and memory:

1. During the upgrade, if the vCPU and memory resources are undersized, you will be prompted to resize these vWAAS parameters before the upgrade.
2. You can then cancel the upgrade procedure.
3. After shutting down the vWAAS instance, manually increase the vCPU and memory, from the hypervisor, to meet your specifications.
   - *To change settings in VMware ESXi:* Navigate to **Edit Settings...** > **Hardware** tab.
   - *To change settings in Microsoft Hyper-V*: Navigate to **Virtual Machine** > **Settings...** > **Hardware**.
   - *To change settings in RHEL KVM/CentOS:*
     a. Open **Virtual Manager**.
     b. Navigate to **Virtual Machine** > **CPUs**.
     c. Navigate to **Virtual Machine** > **Memory**.

- *To change settings in Cisco NFVIS, for the Cisco vBranch solution:*
  a. Navigate to **VM Life Cycle** > **Image Repository** > **Profiles** and add another profile with: resized CPU, memory, and same disk size.
  b. Navigate to **VM Life Cycle** > **Deploy** > **VM Details** and select the resized profile created.
  c. Click **Deploy**.

Note *If you use the Route Manager Debugging (RMD) process with vBranch:* To ensure that the RMD process will start successfully in vBranch deployment, you must manually connect both the interfaces before starting the vWAAS.

- *To change settings Microsoft Azure:*
  a. Navigate to **Deployments** > **Microsoft Template Overview** > **Custom Deployment**,
  b. Navigate to **Home** > **Virtual Machines** > **vWAAS Instance** > **Size**.

4. Restart the upgrade procedure. With the resized vCPU and memory, the host should have sufficient resources for a successful upgrade.
5. Resources will not change automatically in subsequent upgrades/downgrades of the system change, manual intervention is required to change the resource.

Using the Central Manager to perform the upgrade with resized CPU and memory:

1. During the upgrade, if the vCPU and memory resources are undersized, there will be an informational note on the upgrade page, but there will not be a prompt to resize these vWAAS parameters before the upgrade.

Note You cannot cancel the upgrade procedure, in process, from the Central Manager.

2. Resources will not change in subsequent upgrades/downgrades of the system.

Resizing Guidelines: Installing WAAS 6.4.1a

This section contains the following topics:

- New Installation with Existing CPU and Memory
- New Installation with Resized CPU and Memory

New Installation with Existing CPU and Memory

1. Install the vWAAS OVA with a WAAS version earlier than WAAS Version 6.4.1a, which, by default, will deploy with resized resource.
2. Upgrade to WAAS Version 6.4.1a and retain existing CPU and memory resources.
3. After installation is complete, there will be undersized-resource alarms for CPU and memory for the vWAAS device. You use the **show alarms** command to display information about undersized alarms for the vWAAS model.
4. After resources are upgraded, there will not be any automatic change in resources for subsequent upgrades/downgrades of the system.

New Installation with Resized CPU and Memory

1. Install vWAAS OVA with version WAAS 6.4.1a.
2. The host should have sufficient resources of resized CPU and resized memory for a successful deployment.
3. After resources are upgraded, there will not be any automatic change in resources for subsequent upgrades/downgrades of the system.

Resizing Guidelines by Hypervisor for WAAS 6.4.1b and Later

This section contains the following topics:

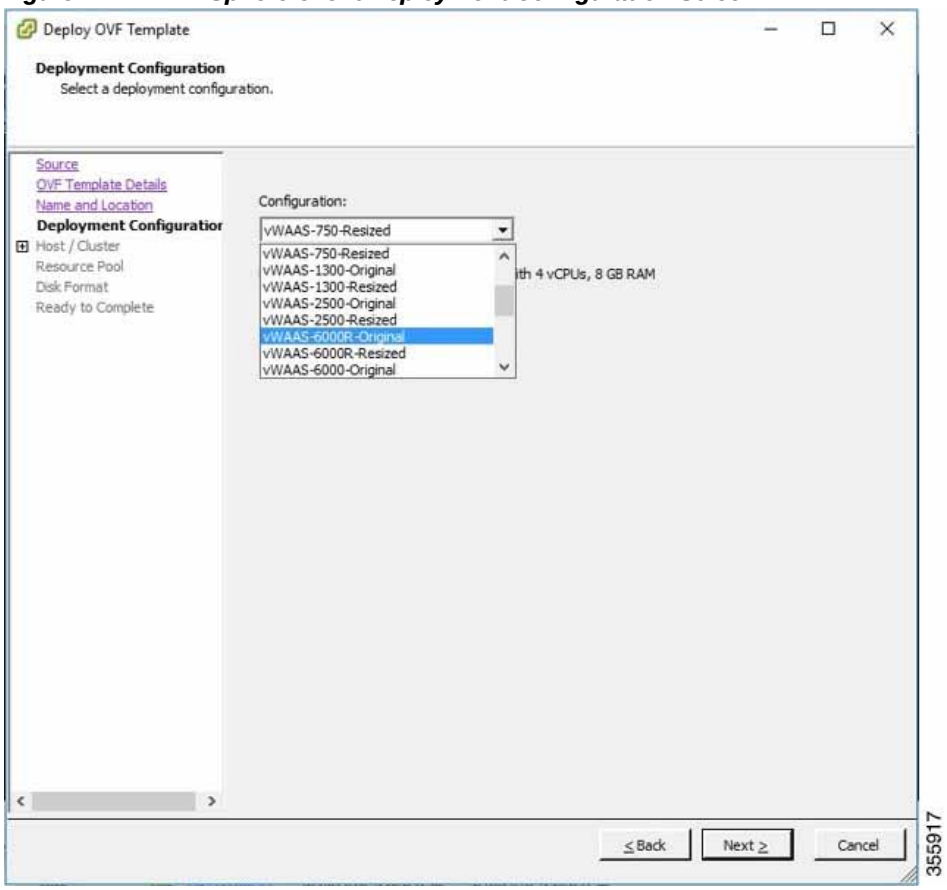
- Resizing for vWAAS on VMware ESXi
- Resizing for vWAAS on Microsoft Hyper-V
- Resizing for vWAAS on RHEL CentOS or SUSE Linux
- Resizing for vWAAS on NFVIS

Resizing for vWAAS on VMware ESXi

To resize CPU and memory for vWAAS on VMware ESXi, follow these steps:

Step 1 From the vSphere Client, choose **Deploy OVF Template** > **Deployment Configuration** (Figure 1-2).

Figure 1-2 vSphere Client Deployment Configuration Screen



Step 2 At the **Configuration** drop-down list, choose the vWAAS model for this hypervisor (Figure 1-2).

For example, if you are choosing vWAAS-6000, you can choose **vWAAS-6000-Original** or **vWAAS-6000-Resized**.

Resizing for vWAAS on Microsoft Hyper-V

To resize CPU and memory for vWAAS on Microsoft Hyper-V, follow these steps:

Step 1 Login to the WAAS Installer for Microsoft Hyper-V, which displays a list of supported WAAS models (Figure 1-3).

Figure 1-3 vWAAS and vCM Resources for vWAAS on Hyper-V

```
PS C:\Users\Administrator\Desktop\platform-hv\6.4.3-b555\Cisco-HyperV-vWAAS-unified-6.4.3-b555> .\deploy-cisco-vwaas-scv
mm.psl

----- Cisco WAAS Installer for Hyper-V -----

WAAS supports below models
5.No    Model                Original Resources      Resized Resources

                             vCPU    MEMORY          vCPU    MEMORY

1.      vWAAS-150            1       3GB             2       4GB
2.      vWAAS-200            1       3GB             2       4GB
3.      vWAAS-750            2       4GB             4       8GB
4.      vWAAS-1300           2       6GB             4       12GB
5.      vWAAS-2500           4       8GB             6       16GB
6.      vWAAS-6000R          4       11GB            8       24GB
7.      vWAAS-6000           4       11GB            8       24GB
8.      vWAAS-12000          4       12GB            12      48GB
9.      vWAAS-50000          8       48GB            16      72GB
10.     vCM-100N             2       2GB             NA      NA
11.     vCM-500N             2       2GB             NA      NA
12.     vCM-1000N            2       4GB             NA      NA
13.     vCM-2000N            4       8GB             NA      NA

Enter vWAAS/vCM model number to install[1]: 7
Do you want to install vWAAS-6000 with re-sized resources[y/n]: y

Script: C:\Users\Administrator\Desktop\platform-hv\6.4.3-b555\Cisco-HyperV-vWAAS-unified-6.4.3-b555
Loading System Center Virtual Machine Manager Powershell Module...
Powershell module loaded.
```

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Step 2 At the **Enter vWAAS/vCM model to install** prompt, enter the line number for the model you want to install. For example, from the listing shown in Figure 1-3. entering **7** would select vWAAS-6000.

Step 3 At the **Do you want to install vWAAS-6000 with resized resources [y/n]** prompt, enter Y to select resized resources.

Step 4 After you select Y, the system displays the associated script, for example:

```
Script: C:\Users\Administrator\Desktop]platform-hv\6.4.3-b55\Cisco-HyperV-vWAAS-unified-6.4.3-b55
Loading System Center Virtual Machine Manager Powershell Module...
Powershell module loaded.
```

Resizing for vWAAS on RHEL CentOS or SUSE Linux

To resize CPU and memory for vWAAS on RHEL CentOS or on SUSE Linux, follow these steps:

Step 1 At the **root@localhost** screen, enter the resizing launch script:

```
[root@localhost]# ./launch.sh nresized macvtap br-ex br-ext1
```

Step 2 The system displays original and resized resources for each vWAAS model (Figure 1-4):

Figure 1-4 vWAAS and vCM Resources on CentOS or SUSE Linux

```
[root@localhost]# ./launch.sh nresized macvtap br-ex br-ext1

                    ORIGINAL RESOURCES            RESIZED RESOURCES

SNO MODEL NAME       CPU        MEMORY          CPU        MEMORY

1.  vWAAS 150          1          4GB            2          4GB
2.  vWAAS 200          1          4GB            2          4GB
3.  vWAAS 750          2          4GB            4          8GB
4.  vWAAS 1300         2          6GB            4         12GB
5.  vWAAS 2500         4          8GB            6         16GB
6.  vWAAS 6000R        4         11GB            8         24GB
7.  vWAAS 6000         4         11GB            8         24GB
8.  vWAAS 12000        4         12GB           12         48GB
9.  vWAAS 50000        8         48GB           16         72GB
10. vCM 100N           2          2GB           NA         NA
11. vCM 500N           2          2GB           NA         NA
12. vCM 1000N          2          4GB           NA         NA
13. vCM 2000N          4          8GB           NA         NA

Select the model type :2
[root@localhost msannare]#

root@localhost msannare]# ./ezdeploy.sh

                    ORIGINAL RESOURCES            RESIZED RESOURCES

SNO MODEL NAME       CPU        MEMORY          CPU        MEMORY

1.  vWAAS 150          1          4GB            2          4GB
2.  vWAAS 200          1          4GB            2          4GB
3.  vWAAS 750          2          4GB            4          8GB
4.  vWAAS 1300         2          6GB            4         12GB
5.  vWAAS 2500         4          8GB            6         16GB
6.  vWAAS 6000R        4         11GB            8         24GB
7.  vWAAS 6000         4         11GB            8         24GB

Select the model type :
[root@localhost]#
```

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Step 3 At the **Select the model type** prompt, enter the line number of the model type for your system. For example, selecting 7 will select vWAAS-6000.

The system displays the message:

```
Do you want to install vWAAS-6000 with resized resources [y/n]
Enter Y to select resized resources.
```

Step 4 Launch the EzDeploy script:

```
[root@localhost]# ./ezdeploy.sh
```

The EzDeploy script also displays both the original and resized resources as shown in Figure 1-5.

Figure 1-5 EZDeploy Listing of Original and Resized Resources

Deployment configurations	vCPU	RAM
vWAAS-150-Original	1	3
vWAAS-150-Resized	2	4
vWAAS-200-Original	1	3
vWAAS-200-Resized	2	4
vWAAS-750-Original	2	4
vWAAS-750-Resized	4	8
vWAAS-1300-Original	2	6
vWAAS-1300-Resized	4	12
vWAAS-2500-Original	4	8
vWAAS-2500-Resized	6	16
vWAAS-6000R-Original	4	11
vWAAS-6000R-Resized	8	24
vWAAS-6000-Original	4	11
vWAAS-6000-Resized	8	24
vWAAS-12000-Original	4	12
vWAAS-12000-Resized	12	48
vWAAS-50000-Original	8	48
vWAAS-50000-Resized	16	72
vWAAS-150000-Original	24	96
vCM-100N-Original	2	2
vCM-500N-Original	2	2
vCM-1000N-Original	2	4
vCM-2000N-Original	4	8

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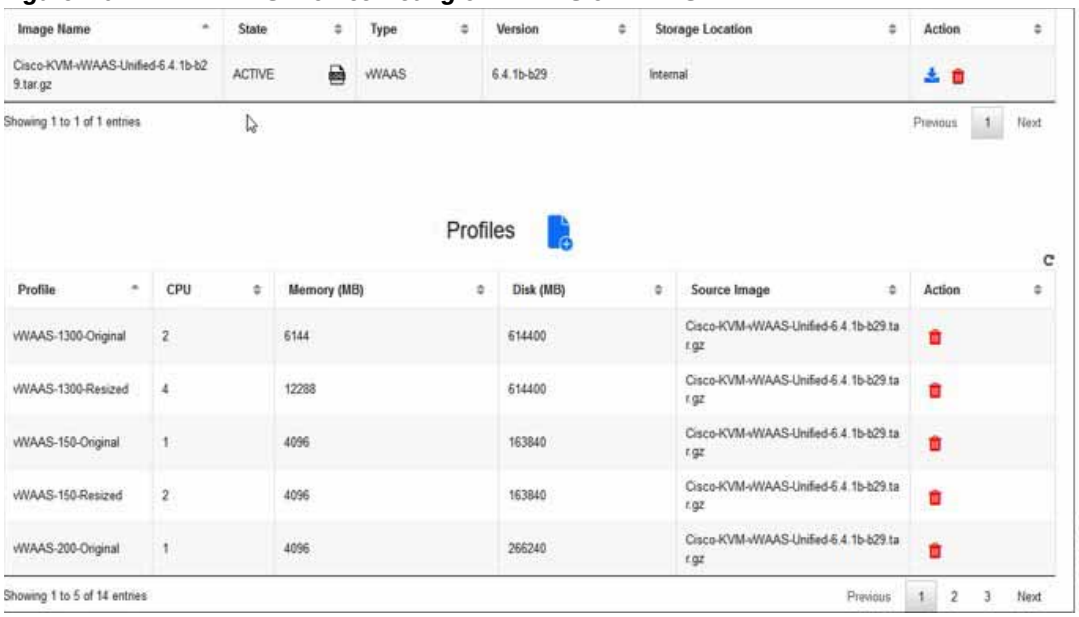
Step 5 The system deploys the selected model, with resized resources.

Resizing for vWAAS on NFVIS

For resizing for vWAAS on NFVIS, install the vWAAS OVA with version WAAS 6.4.1b. Figure 1-6 shows the NFVIS Profiles listing for original and resized vWAAS resources.

Figure 1-6 vWAAS Profiles Listing on vWAAS on NFVIS



For information on resizing vWAAS on NFVIS, see the *Cisco Enterprise Network Function Virtualization Infrastructure Configuration Guide*.

OVA Package Files for vWAAS and vCM Models

Table 1-10 shows the OVA and NPE OVA file for each vWAAS model:

Table 1-10 OVA Package Files for vWAAS Models

vWAAS Model	OVA Filename	NPE OVA Filename
vWAAS-150	vWAAS-150.ova	Cisco-WAAS-vWAAS-150-npe.ova
vWAAS-200	vWAAS-200.ova	Cisco-WAAS-vWAAS-200-npe.ova
vWAAS-750	vWAAS-750.ova	Cisco-WAAS-vWAAS-750-npe.ova
vWAAS-1300	vWAAS-1300.ova	Cisco-WAAS-vWAAS-1300-npe.ova
vWAAS-2500	vWAAS-2500.ova	Cisco-WAAS-vWAAS-2500-npe.ova
vWAAS-6000	vWAAS-6000.ova	Cisco-WAAS-vWAAS-6000-npe.ova
vWAAS-12000	vWAAS-12000.ova	Cisco-WAAS-vWAAS-12000-npe.ova
vWAAS-50000	vWAAS-50000.ova	Cisco-WAAS-vWAAS-50000-npe.ova

Table 1-11 shows the OVA and NPE OVA file for each vCM model (all models are available with WAAS version 4.3.1 and later, except as noted):

Table 1-11 OVA Package Files for vCM Models

vCM Model	OVA Filename	NPE OVA Filename
vCM-100N	vCM-100N.ova	Cisco-WAAS-vCM-100N-npe.ova
vCM-500N	vCM-500N.ova	Cisco-WAAS-vCM-500N-npe.ova
vCM-1000N	vCM-1000N.ova	Cisco-WAAS-vCM-1000N-npe.ova
vCM-2000N	vCM-2000N.ova	Cisco-WAAS-vCM-2000N-npe.ova

Cisco Hardware Platforms Supported for vWAAS

This section contains the following topics:

- Platforms Supported for vWAAS, by Hypervisor Type
- Components for Deploying vWAAS, by Hypervisor Type
- Components for Managing vWAAS, by Hypervisor Type
- Cisco UCS E-Series Servers and NCEs
- Cisco ENCS 5400 Series

Platforms Supported for vWAAS, by Hypervisor Type

For each hypervisor used with vWAAS, Table 1-12 shows the types of platforms supported for vWAAS, including minimum WAAS version, host platform, and disk type.

Note ISR-4321 with IOS-XE 16.9.x is supported for vWAAS for WAAS Version 6.4.1b and later.

Table 1-12 Platforms Supported for vWAAS, by Hypervisor Type

Hypervisor	PID and Device Type	Minimum WAAS Version	Host Platforms	Minimum Host Version	Disk Type
Cisco ISR-WAAS	• PID: OE-VWAAS-KVM • Device Type: ISR-WAAS	• 6.4.1b (ISR-4461) • 5.4.1 • 5.2.1 (ISR-4451)	• ISR-4461 (vWAAS-750, 1300, 2500) • ISR-4451 (vWAAS-750, 1300, 2500) • ISR-4431 (vWAAS-750, 1300) • ISR-4351 (vWAAS-750) • ISR-4331 (vWAAS-750) • ISR-4321 (vWAAS-200)	• IOS-XE 3.9	• ISR-SSD • NIM-SSD
Cisco NFVIS	• PID: OE-VWAAS-KVM • Device Type: OE-VWAAS-KVM	• 6.4.1 (Cisco ENCS 5400 Series and Cisco) • 6.2.x (Cisco UCS-E Series)	• Cisco ENCS (Enterprise Network Compute System) 5400 Series • Cisco UCS-E Series	• NFV FC2	• virtio
VMware vSphere ESXi	• PID: OE-VWAAS-ESX • Device Type: OE-VWAAS-ESX	• 5.0.3g	• Cisco UCS (Unified Computing System) • Cisco UCS-E Series	• ESXi 5.0	• VMDK
Microsoft Hyper-V	• PID: OE-VWAAS-HYPERV • Device Type: OE-VWAAS-HYPERV	• 6.1.x	• Cisco UCS • Cisco UCS-E Series	• Microsoft Windows 2008 R2	• VHD
RHEL KVM	• PID: OE-VWAAS-KVM • Device Type: OE-VWAAS-KVM	• 6.2.x	• Cisco UCS • Cisco UCS-E Series	• RHEL CentOS 7.1	• virtio
SUSE Linux	• PID: OE-VWAAS-GEN-LINUX • Device Type: OE-VWAAS-GEN-LINUX	• 6.4.1b	• Cisco UCS • Cisco UCS-E Series	• SUSE Linux Enterprise Server (SLES) 12	• virtio

Hypervisor	PID and Device Type	Minimum WAAS Version	Host Platforms	Minimum Host Version	Disk Type
Microsoft Azure	• PID: OE-VWAAS-AZURE • Device Type: OE-VWAAS-AZURE	• 6.2.x	• Microsoft Azure cloud	• N/A	• VHD
OpenStack	• PID: OE-VWAAS-OPENSTACK • Device Type: OE-VWAAS-OPENSTACK	• 6.4.1b	• OpenStack	• OpenStack Mitaka	• virtio

Components for Deploying vWAAS, by Hypervisor Type

For each hypervisor used with vWAAS, Table 1-13 shows the components used to deploy vWAAS, including package format, deployment tool, pre-configuration tool (if needed), and network driver.

Table 1-13 Components for Deploying vWAAS, by Hypervisor Type

Hypervisor	Package Format	Deployment Tool	Pre-Configuration	Network Driver
Cisco ISR-WAAS	• OVA	• Ezconfig	• onep	• virtio_net
Cisco NFVIS	• TAR	• NFVIS	• Bootstrap Day0 config	• virtio_net
VMware vSphere ESXi	• OVA	• ---	• ---	• vmxnet3
Microsoft HyperV	• Zip	• Powershell script	• ---	• netvsc
RHEL KVM	• TAR	• EZdeploy • launch.sh	• ---	• virtio_net
SUSE Linux	• TAR	• EZdeploy • launch.sh	• ---	• virtio_net
Microsoft Azure	• JSON template	• ---	• ---	• netvsc
OpenStack	• TAR	• OpenStack portal (Horizon U1)	• ---	• virtio_net

Note Cisco Virtual Interface Cards (VICs) are not qualified for vWAAS.

Components for Managing vWAAS, by Hypervisor Type

For each hypervisor used with vWAAS, Table 1-14 shows the components used to manage vWAAS, including vCM model, vWAAS model, number of instances supported, and traffic interception method used.

Table 1-14 Components for Managing vWAAS, by Hypervisor Type

Hypervisor	vCM Models Supported	vWAAS Models Supported	Number of Instances Supported	Traffic Interception Method
Cisco ISR-WAAS	• N/A	• vWAAS-200, 750, 1300, 2500	• 1	• AppNav-XE
Cisco NFVIS	• N/A	• vWAAS-200, 750, 1300, 2500, 6000	• 1	• WCCP • APPNav-XE • Inline (with WAAS v6.2.1 and later)
VMware vSphere ESXi	• vCM-100, 500, 1000, 2000	• vWAAS-150, 200, 750, 1300, 2500, 6000, 12000, 150000, 50000	• many	• WCCP • APPNav-XE
Microsoft HyperV	• vCM-100, 500, 1000, 2000	• vWAAS-150, 200, 750, 1300, 2500, 6000, 12000, 50000	• many	• WCCP • APPNav-XE
RHEL KVM	• vCM-100, 500, 1000, 2000	• vWAAS-150, 200, 750, 1300, 2500, 6000, 12000, 50000	• many	• WCCP • APPNav-XE • Inline (with WAAS v6.2.1 and later)
SUSE Linux	• vCM-100, 500, 1000, 2000	• vWAAS-150, 200, 750, 1300, 2500, 6000, 12000, 50000	• many	• WCCP • APPNav-XE
Microsoft Azure	• N/A	• vWAAS-200, 750, 1300, 2500, 6000, 12000	• 1	• Routed mode (with WAAS v6.2.1 and later)
OpenStack	• vCM-100, 500, 1000, 2000	• vWAAS-150, 200, 750, 1300, 2500, 6000, 12000, 50000	• many	• WCCP • APPNav-XE

Cisco UCS E-Series Servers and NCEs

This section has the following topics:

- vWAAS and Cisco UCS E-Series Interoperability
- vWAAS and Cisco UCS E-Series Memory Guidelines and Requirements

vWAAS and Cisco UCS E-Series Interoperability

Cisco UCS E-Series servers and UCS E-Series Network Compute Engines (NCEs) provide platforms for Cisco vWAAS and Cisco ISR routers. Table 1-15 shows the supported operating systems, Hypervisors, Cisco ISR routers, and minimum version of IOS-XE used.

Table 1-15 vWAAS and UCS E-Series Interoperability

Cisco UCS E-Series	Supported Operating Systems for vWAAS	Supported Hypervisors for vWAAS	Supported Cisco ISR Routers for vWAAS	Minimum IOS -XE Version
UCS E-Series Servers	• Microsoft Windows Server 2008 R2, 2012, and 2012 R2 • RHEL (Red Hat Enterprise Linux) 7.1 and later • Linux CentOS (Community Enterprise Operating System) 7.1 and later	• Microsoft Hyper-V 2008 R2, 2012, and 2012 R2 • VMware vSphere ESXi 5.5 and 6.0 • KVM for RHEL or CentOS 7.1 and later	• ISR-4331, ISR-4351, ISR-4451, ISR-4461	• 3.10
UCS E-Series NCEs	• Microsoft Windows Server (2012 R2) • RHEL 7.1 and later • Linux CentOS 7.1 and later	• Microsoft Hyper-V2012 R2 • VMware vSphere ESXi 5.5 and 6.0 • KVM for RHEL or CentOS 7.1 and later	• ISR-4321, ISR-4331, ISR-4351, ISR-4431, ISR-4451, ISR-4461	• 3.10 (UCS-EN120S) • 3.15.1 (UCS-EN140N)

vWAAS and Cisco UCS E-Series Memory Guidelines and Requirements

Table 1-16 shows memory and disk storage capacity for Cisco UCS E-Servers NCEs. When calculating memory requirements for your vWAAS system, include the following parameters:

- A minimum of 2 GB of memory is needed for VMware v5.0, v5.1, or v6.0.
- A minimum of 4 GB of memory is needed for VMware v5.5.
- You must also allocate memory overhead for vCPU memory. The amount is dependent on the number of vCPUs for your system: 1, 2, 4, or 8 vCPUs.

Note For information on vCPUs, ESXi server datastore memory, and disk space by vWAAS model and vCM model, see Table 4-3 and Table 4-4 in Chapter 4, "Cisco vWAAS on VMware ESXi".

Example1: *A deployment of vWAAS-750 on the UCS-E140S, using VMware v6.0.*

1. UCS-E140S has a default value of 8 GB memory (which can be expanded to 48 GB).
2. vWAAS-750 requires 6 GB memory + VMware v6.0 requires 2 GB memory = 6 GB memory, which is below the default memory capacity of the UCS-E140S.
3. You can deploy vWAAS-750 on the UCS-E140S without adding additional memory to the UCS-E140S DRAM.

Example1: *A deployment of vWAAS-1300 on the UCS-E140S, using VMware v6.0.*

1. UCS-E140S has a default value of 8 GB DRAM, (which can be expanded to 48 GB).
2. vWAAS-1300 requires 6 GB memory + VMware v6.0 requires 2 GB DRAM = 8 GB memory, which equals the memory capacity of UCS-E140S.
3. To deploy vWAAS-1300 on the UCS-E140S, you must add additional memory to the UCS-E140S memory.

Note For the vWAAS datastore, you can use either SAN storage or local storage on the ESXi server. NAS (Network-Attached Storage) storage should only be used in nonproduction scenarios (for test purposes, for example).

Table 1-16 Memory and Disk Storage for Cisco UCS E-Servers NCEs

Cisco UCS E-Series Server (E) or NCE (EN)	Memory	Disk Storage
UCS-E140S (single-wide blade)	Default: 8 GB Maximum: 16 GB	Up to two of the following: • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 900 GB • 10,000-RPM SAS SED: 600 GB • SAS SSD SLC: 200 GB • SAS SSD eMLC: 200 or 400 GB
UCS-EN120S (single-wide blade)	Default: 4GB Maximum: 16 GB	Up to two of the following: • 7200-RPM SATA: 500 GB • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 900 GB
UCS-E140DP (double-wide blade with PCIe cards)	Default: 8 GB Maximum: 48 GB	Up to two of the following: • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 900 GB • 10,000-RPM SAS SED: 600 GB • SAS SSD SLC: 200 GB • SAS SSD eMLC: 200 or 400 GB
UCS-E140D (double-wide blade)	Default: 8 GB Maximum: 48 GB	Up to three of the following: • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 900 GB • 10,000-RPM SAS SED: 600 GB • SAS SSD SLC: 200 GB • SAS SSD eMLC: 200 or 400 GB
UCS-EN40N (Network Interface Module)		One of the following mSATA SSD drives: • mSATA SSD drive: 50 GB • mSATA SSD drive: 100 GB • mSATA SSD drive: 200 GB

Cisco UCS E-Series Server (E) or NCE (EN)	Memory	Disk Storage
UCS-E160DP (double-wide blade with PCIe cards)	Default: 8 GB Maximum: 48 GB	Up to two of the following: • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 900 GB • 10,000-RPM SAS SED: 600 GB • SAS SSD SLC: 200 GB • SAS SSD eMLC: 200 or 400 GB
UCS-E160D (double-wide blade)	Default: 8 GB Maximum: 96 GB	Up to three of the following: • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 900 GB • 10,000-RPM SAS SED: 600 GB • SAS SSD SLC: 200 GB • SAS SSD eMLC: 200 or 400 GB
UCS-E180D (double-wide blade)	Default: 8 GB Maximum: 96GB	Up to three of the following: • 7200-RPM SATA: 1 TB • 10,000-RPM SAS: 1.8 TB • 10,000-RPM SAS: 900 GB • 10,000-RPM SAS SED: 600 GB • SAS SSD SLC: 200 GB • SAS SSD eMLC: 200 or 400 GB

Cisco ENCS 5400 Series

This section contains the following topics:

- About the Cisco ENCS 5400 Series
- ENCS 5400 Series Hardware Features and Specifications

About the Cisco ENCS 5400 Series

The Cisco Enterprise Network Compute System (ENCS) 5400 Series is designed for the Cisco Enterprise Network Functions Virtualization (NFV) solution, and is available for vWAAS for WAAS Version 6.4.1 and later.

The ENCS 5400 Series—ENCS 5406-W, 5408-W, and 5412-W—is an x86 hybrid platform for branch deployment and for hosting WAAS applications. This high-performance unit achieves this goal by providing the infrastructure to deploy virtualized network functions while at the same time acting as a server that addresses processing, workload, and storage challenges.

For more information on the Cisco ENCS 5400-W series, see the *Cisco 5400 Enterprise Network Compute System Data Sheet*.

For information on vWAAS with NFVIS on the ENCS 5400 Series, see Chapter 7, "Cisco vWAAS with Cisco Enterprise NFVIS".

ENCS 5400 Series Hardware Features and Specifications

Table 1-17 shows specifications that apply to all three ENCS 5400 series models. For views of the Cisco ENCS 5400 Series and further information, see the *Cisco 5400 Enterprise Network Compute System Data Sheet*.

Table 1-17 ENCS 5400 Series Features and Specifications

ENCS 5400 Feature/Specification	Description
vWAAS models supported	One of the following configurations: • ENCS 5406-W supports vWAAS 200, vWAAS-750 • ENCS 5408-W supports vWAAS-1300 • ENCS 5412-W supports vWAAS-2500, vWAAS-6000-R
CPU	One of the following specifications: • ENCS 5406-W: Intel Xeon Processor D-1528 (6-core, 1.9 GHz, and 9 MB cache) • ENCS 5408-W: Intel Xeon Processor D-1548 (8-core, 2.0 GHz, and 12 MB cache) • ENCS 5412-W: Intel Xeon Processor D-1557 (12-core, 1.5 GHz, and 18 MB cache)
BIOS	Version 2.4
Cisco NFVIS on KVM hypervisor	KVM hypervisor Version 3.10.0-327.el7.x86_64
CIMC	Version 3.2
Network Controller	Intel FTX710-AM2
WAN Ethernet port	Intel i350 dual port
DIMM	Two DDR4 dual in-line memory module (DIMM) slots, for ENCS models with the following capacities: • ENCS 5406-W—16 GB • ENCS 5408-W—16 GB • ENCS 5412-W—32 GB The memory module in each of the slots can be upgraded to a maximum of 32 GB, so that you can have a maximum capacity of 64 GB DIMM.
Gigabit Ethernet ports	Two Gigabit Ethernet ports—For each RJ45 port, there is a corresponding fiber optic port. At a given time, you can use either the RJ45 connection or the corresponding fiber optic port.
NIM	One Network Interface Module (NIM) expansion slot—You can install a NIM in the NIM slot, or if the slot is not needed, you can remove the NIM from the NIM module. Each ENCS 5400 model supports one NIM slot, for a Cisco 4-port 1G fail-to-wire NIM card.
Management Controller	Ethernet management port for Cisco Integrated Management Controller (CIMC), which monitors the health of the entire system.

ENCS 5400 Feature/Specification	Description
HDD Storage	Although there are two hot-swappable HDD slots, we do not recommend HDD storage for the ENCS 5400 Series.
SSD Storage	• No RAID and 1 960 GB SSD • RAID-1 and 2 SSDs (960 GB SSD)
Offload Capabilities	Optional crypto module to provide offload capabilities to optimize CPU resources like VM-toVM traffic and to maintain open software support.

Hypervisors Supported for Cisco vWAAS and vCM

Here is an overview of hypervisors are supported for Cisco vWAAS and vCM.

- **Cisco ISR-WAAS**

  ISR-WAAS is the specific implementation of vWAAS running in a Cisco IOS-XE Software container on a Cisco ISR 4000 Series router (ISR-4321, ISR-4331, ISR-4351, ISR-4431, ISR-4451, ISR-4461). In this context, “container” refers to the hypervisor that runs virtualized applications on a Cisco ISR 4000 Series router.

  Note ISR-WAAS is supported for vWAAS for WAAS 6.4.1b and later.

  For more information, see Chapter 3, “Cisco vWAAS on Cisco ISR-WAAS”.

- **VMware ESXi**

  Cisco vWAAS for VMware ESXi provides cloud-based application delivery service over the WAN in ESX/ESXi-based environments. Cisco vWAAS on VMware vSphere ESXi is delivered an OVA file. The vSphere client takes the OVA file for a specified vWAAS model, and deploys an instance of that vWAAS model.

  For more information, see Chapter 4, “Cisco vWAAS on VMware ESXi”.

- **Microsoft Hyper-V**

  Microsoft Hyper-V, available for vWAAS with WAAS Version 6.1.x and later, provides virtualization services through hypervisor-based emulations.

  Cisco vWAAS on Microsoft Hyper-V extends Cisco networking benefits to Microsoft Windows Server Hyper-V deployments.

  Microsoft HyperV, Chapter 5, “Cisco vWAAS on Microsoft Hyper-V”.

- **RHEL KVM and KVM CentOS**

  Cisco vWAAS on RHEL KVM (Red Hat Enterprise Linux Kernel-based Virtual Machine) is a virtual WAAS appliance that runs on a RHEL KVM hypervisor. Cisco vWAAS on RHEL KVM extends the capabilities of ISR-WAAS and vWAAS running on the Cisco UCS E-Series Servers.

  – Cisco vWAAS on RHEL KVM is available for vWAAS with WAAS Version 6.2.1 and later,

  – Cisco vWAAS on KVM on CentOS (Linux Community Enterprise Operating System) is available for vWAAS with WAAS version 6.2.3x and later.

Note Cisco vWAAS on RHEL KVM can also be deployed as a tar archive (tar.gz) to deploy Cisco vWAAS on Cisco Network Functions Virtualization Infrastructure Software (NFVIS). The NFVIS portal is used to select the tar.gz file to deploy vWAAS.

For more information, see Chapter 6, "Cisco vWAAS on RHEL KVM and KVM CentOS".

- **Cisco Enterprise NFVIS**

  Cisco Enterprise NFV Infrastructure Software (NFVIS) offers flexibility and choice in deployment and platform options for the Cisco Enterprise NFV solution. By virtualizing and abstracting the network services from the underlying hardware, NFVIS allows virtual network functions (VNFs) to be managed independently and to be provisioned dynamically.

  – *For vWAAS on WAAS Version 5.x to 6.2.x,* Cisco NFVIS is available for vWAAS running on Cisco UCS E-Series Servers.

  – *For vWAAS on WAAS Version 6.4.1 and later,* Cisco NFVIS is available for vWAAS running on Cisco UCS E-Series Servers and the Cisco ENCS 5400 Series.

  For more information, see Chapter 7, "Cisco vWAAS with Cisco Enterprise NFVIS".

Hypervisor OVA Packages for vWAAS

This section contains the following topics:

- Hypervisor OVA Package Format for vWAAS for WAAS Versions 5.x to 6.2.x
- Hypervisor-wise Unified OVA Package Format for vWAAS for WAAS Version 6.4.x and Later

Hypervisor OVA Package Format for vWAAS for WAAS Versions 5.x to 6.2.x

For vWAAS for WAAS Versions 5.x to 6.2.x, Cisco provides an OVA package for an NPE and non-NPE version for each vWAAS model connection profile.

For a listing of hypervisor-wise NPE and non-NPE OVA files for vWAAS or vCM, see the Cisco Wide Area Application Services (WAAS) Download Software Page and select the WAAS software version used with your vWAAS instance.

Table 1-18 shows the file formats for hypervisors supported for vWAAS and vCM, for WAAS Version 5.x to 6.2.x.

Table 1-18 File Formats for OVA Packages for vWAAS and vCM for WAAS Version 5.x to 6.2.x

vWAAS or vCM	Hypervisor Support	File Format	NPE File Format	Sample Image and NPE Image Filename Formats
vWAAS	VMware ESXi	.ova	.ova	• Cisco-vWAAS-750-6.2.3d-b-68.ova • Cisco-vWAAS-750-6.2.3d-npe-b-68.ova • For more information on this filename format, see OVA Package for vWAAS on VMware ESXi for WAAS Version 5.x to 6.2.x.
	Microsoft Hyper-V	.zip	.zip	• Hv-Cisco-vWAAS-750-6.2.3d-b-68.zip • Hv-Cisco-vWAAS-750-6.2.3d-npe-b-68.zip • For more information on this filename format, see OVA Package for vWAAS on Hyper-v for WAAS Version 5.x to 6.2.x.
	RHEL KVM	.tar.gz	.tar.gz	• Cisco-KVM-vWAAS-750-6.2.3d-b-68.tar.gz • Cisco-KVM-vWAAS-750-6.2.3d-b-68-npe.tar.gz • For more information on this filename format, see Tar Archive Package for vWAAS on KVM for WAAS Version 5.x to 6.2.x.
vCM	VMware ESXi	.ova	.ova	• Cisco-vCM-100N-6.2.3d-b-68.ova • Cisco-vCM-100N-6.2.3d-npe-b-68.ova • For more information on this filename format, see OVA Package for vWAAS on VMware ESXi for WAAS Version 5.x to 6.2.x.
	Microsoft Hyper-V	N/A	.zip	• Hv-Cisco-100N-6.2.3d-b-68.zip • Hv-Cisco-100N-6.2.3d-npe-b-68.zip • For more information on this filename format, see OVA Package for vWAAS on Hyper-v for WAAS Version 5.x to 6.2.x.
	RHEL KVM	.tar.gz	.tar.gz	• Cisco-KVM-vCM-100N-6.2.3d-b-68.tar.gz • Cisco-KVN-vCN-100N-6.2.3d-npe-b-68-npe.tar-gz • For more information on this filename format, see Tar Archive Package for vWAAS on KVM for WAAS Version 5.x to 6.2.x.

Hypervisor-wise Unified OVA Package Format for vWAAS for WAAS Version 6.4.x and Later

For vWAAS with WAAS Version 6.4.x and later, Cisco provides a single unified OVA package, one each for the NPE and non-NPE version of the WAAS image for all the vWAAS and vCM models for that Hypervisor.

Each unified OVA package file provides an option to select a vWAAS or vCM model and other required parameters to launch vWAAS or vCM with WAAS in the required configuration.

Table 1-19 shows the unified OVA filename formats supported for hypervisors, appliances, vWAAS models, and vCM models.

Note On VMware ESXi, the OVA deployment for WAAS Version 6.4.1 and later must be done only through VMware vCenter.

For a listing of hypervisor-wise NPE and non-NPE OVA files for vWAAS or vCM, see the Cisco Wide Area Application Services (WAAS) Download Software Page and select the WAAS software version for your vWAAS instance.

Table 1-19 Unified OVA Filename Format Supported for Hypervisors, Appliances, vWAAS Models , and vCM Models

Unified OVA Filename Format	Hypervisor or Appliance	Supported vWAAS Models	Supported vCM Models
Cisco-WAAS-Unified-6.4.1-b-36.ova Cisco-WAAS-Unified-6.4.1-b-36-npe.ova	VMware ESXi	vWAAS-150, vWAAS-200, WAAS-750, vWAAS-1300, vWAAS-2500, vWAAS-6000, vWAAS-6000R, WAAS-12000, vWAAS-50000, vWAAS-150000	vCM-100, vCM-500, vCM-1000, vCM-2000
Cisco-HyperV-vWAAS-unified-6.4.1-b-36.zip Cisco-HyperV-vWAAS-unified-6.4.1-b-36-npe.zip	Microsoft Hyper-V	vWAAS-150, vWAAS-200, WAAS-750, vWAAS-1300, vWAAS-2500, vWAAS-6000, vWAAS-6000R, WAAS-12000, vWAAS-50000	vCM-100, vCM-500, vCM-1000, vCM-2000
Cisco-KVM-vWAAS-Unified-6.4.1-b-36.tar.gz Cisco-KVM-vWAAS-Unified-6.4.1-b-36-npe.tar.gz	KVM CentOS	vWAAS-150, vWAAS-200, WAAS-750, vWAAS-1300, vWAAS-2500, vWAAS-6000, vWAAS-6000R, WAAS-12000, vWAAS-50000	vCM-100, vCM-500, vCM-1000, vCM-2000
Cisco-KVM-vWAAS-Unified-6.4.1-b-36.tar.gz Cisco-KVM-vWAAS-Unified-6.4.1-b-36-npe.tar.gz	Cisco NFVIS vBranch	vWAAS-150, vWAAS-200, WAAS-750, vWAAS-1300, vWAAS-2500, vWAAS-6000, vWAAS-6000R	Not supported
Cisco_NFVIS_3.7.1-FC3_WAAS-6.4.1-b36.iso.tar Cisco_NFVIS_3.7.1-FC3_WAASNPE-6.4.1-b36.iso.tar	Cisco ENCS-W	vWAAS-200, WAAS-750, vWAAS-1300, vWAAS-2500, vWAAS-6000R	Not supported
ISR-WAAS-6.4.1.36.ova ISR-WAAS-6.4.1.36-npe.ova	Cisco ISR-WAAS	vWAAS-200, WAAS-750, vWAAS-1300, vWAAS-2500	Not supported

Cloud Platforms Supported for vWAAS

Cisco vWAAS supports the following cloud computing platforms:

- Microsoft Azure—Used with vCM and vWAAS models supported on Microsoft Hyper-V. Cisco vWAAS in Azure is supported for vWAAS with WAAS Version 6.2.1x and later.
- OpenStack—Used with vCM and vWAAS models supported on KVM on CentOS, Cisco vWAAS in OpenStack is supported for vWAAS for WAAS Version 6.4.1b and later.

For more information, see Chapter 9, “Cisco vWAAS in Cloud Computing Systems”.