



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](#)
- [vWAAS Model Profiles](#)
- [vWAAS Central Manager \(vCM\) Model Profiles](#)
- [Cisco WAAS and vWAAS Interoperability](#)
- [DRE Disk, Object Cache, and Akamai Connect Cache Capacity](#)
- [Hypervisors Supported for Cisco vWAAS](#)
- [Cisco vWAAS and WAAS Interoperability](#)

About Cisco vWAAS

This section has the following topics:

- [Benefits of Cisco vWAAS](#)
- [Cisco vWAAS at the Branch and the 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 is supported on a wide range of hypervisors, including Microsoft Hyper-V, RHEL KVM, KVM on CentOS, and Microsoft Azure. Each hypervisor is described in [Hypervisors Supported for Cisco vWAAS](#).
- Cisco vWAAS runs on a wide range of platforms, described in [Platforms Supported for Cisco vWAAS](#).

Cisco vWAAS at the Branch and the Data Center

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.

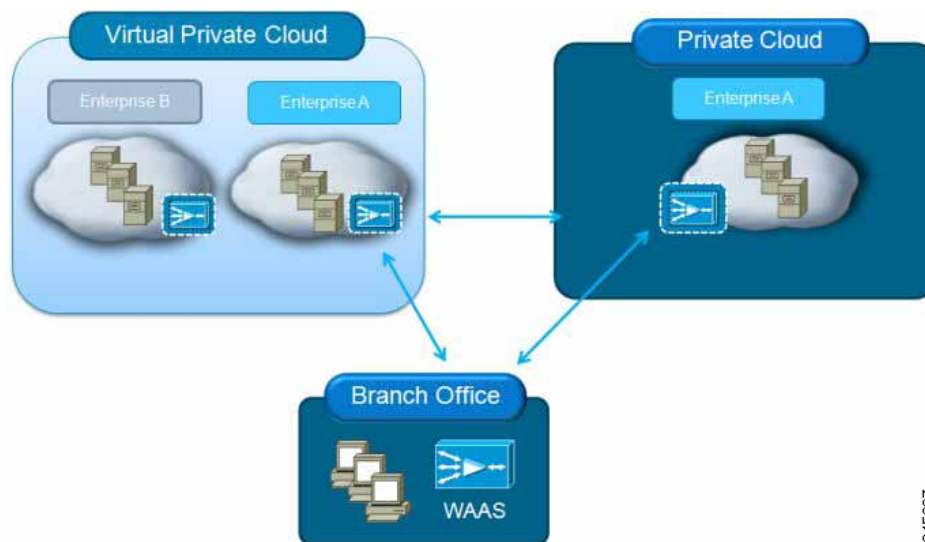
Cisco vWAAS supports WAN optimization in a cloud environment where physical WAE devices cannot usually be deployed. Virtualization also provides various benefits like elasticity, ease of maintenance, and a reduction of branch office and data center footprint.

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

- *At the branch*—with 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



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The following hypervisors are supported for Cisco vWAAS:

- Cisco ISR-WAAS
- Cisco NFV Infrastructure Software (NFVIS)
- VMware vSphere ESXi
- Microsoft HyperV
- Red Hat Enterprise Linux Kernel-based Virtual Machine (RHEL KVM)
- KVM on CentOS
- Microsoft Azure

The following platforms are supported for Cisco vWAAS:

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

For details on the interoperability of the hypervisors and platforms supported for vWAAS, see [Table 1-12](#).

vWAAS Model Profiles

This section contains the following topics:

- [ISR Models: CPUs, Memory, Disk Storage and Supported ISR Platforms](#)
- [vWAAS Models: CPUs, Memory and Disk Storage](#)
- [VMware VMFS Block Size and vWAAS Disk Size](#)
- [vWAAS Models: OVA and NPE OVA Files](#)

ISR Models: CPUs, Memory, Disk Storage and Supported ISR Platforms

[Table 1-1](#) shows the default number of CPUs, memory capacity, disk storage and supported ISR platforms for each ISR model.

Table 1-1 *ISR Models: CPUs, Memory, Disk Storage and Supported ISR Platforms*

ISR Model	CPUs	Memory	Disk Storage	Supported ISR Platform
ISR-WAAS-200 (for WAAS 5.x and 6.2.1)	1	3 GB	151 GB	ISR-4321
ISR-WAAS-200 (for WAAS 6.2.3x and 6.3.1)	1	4 GB	151 GB	ISR-4321
ISR-WAAS-750	2	4 GB	151 GB	ISR-4351, ISR-4331, ISR-4431, ISR-4451
ISR-WAAS-1300	4	6 GB	151 GB	ISR-4431, ISR-4451
ISR-WAAS-2500	6	8 GB	338 GB	ISR-4451

**Note**

For vWAAS with WAAS Version 6.2.3x or WAAS Version 6.3.1, ISR-4321 with profile ISR-WAAS-200, ISR-WAAS RAM is increased from 3 GB to 4 GB. For this increase in ISR-WAAS RAM to be implemented, you must complete a new OVA deployment of WAAS version 6.2.3x or 6.3.1; the increase in ISR-WAAS RAM is not automatically implemented with an upgrade to WAAS 6.2.3x or 6.3.1.

vWAAS Models: CPUs, Memory and Disk Storage

Table 1-2 shows the default number of CPUs, memory capacity and disk storage for each vWAAS model.

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

vWAAS Model	CPUs	Memory	Disk Storage
vWAAS-150 (for WAAS Version 6.x)	1	3 GB	160 GB
vWAAS-200 (for WAAS Version 5.x through 6.2.1)	1	3 GB	260 GB
vWAAS-200 (for WAAS Version 6.2.3x and 6.3.1)	1	4 GB	260 GB
vWAAS-750	2	4 GB	500 GB
vWAAS-1300	2	6 GB	600 GB
vWAAS-2500	4	8 GB	750 GB
vWAAS-6000	4	11 GB	900 GB
vWAAS-12000	4	12 GB	750 GB
vWAAS-50000	8	48 GB	1500 GB

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.

**Note**

For vWAAS with WAAS Version 6.2.3x or WAAS Version 6.3.1, ISR-4321 with profile ISR-WAAS-200, ISR-WAAS RAM is increased from 3 GB to 4 GB. For this increase in ISR-WAAS RAM to be implemented, you must complete a new OVA deployment of WAAS version 6.2.3x or 6.3.1; the increase in ISR-WAAS RAM is not automatically implemented with an upgrade to WAAS 6.2.3x or 6.3.1.

- 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.

VMware VMFS Block Size and vWAAS Disk Size

Table 1-3 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 1-3 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.

vWAAS Models: OVA and NPE OVA Files

Table 1-4 shows the OVA and NPE OVA file for each vWAAS model (all models are available with WAAS version 4.3.1 and later, except as noted):

Table 1-4 OVA and NPE OVA Files, by vWAAS Model

vWAAS Model	OVA Filename	NPE OVA Filename
vWAAS-150 (for WAAS Version 6.x)	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-500000-npe.ova

vWAAS Central Manager (vCM) Model Profiles

This section contains the following topics:

- [vCM Models: CPUs, Memory, Disk Storage and Managed Nodes](#)
- [vCM Models: OVA and NPE OVA Files](#)

vCM Models: CPUs, Memory, Disk Storage and Managed Nodes

Table 1-5 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 1-5](#).

Table 1-5 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

**Note**

If your WAAS Central Manager restarts intermittently with the following vCM models - vCM-500, vCM-1000, or vCM-2000 - it may be due to insufficient system resources. To remedy this, for these vCM models we recommend that you upgrade your system with the CPU and memory resources show in [Table 1-6](#).

Table 1-6 Recommended CPU and Memory Upgrade for vCM-500, vCM-1000, and vCM-2000

vCM Model	Default Number of vCPUs	Recommended Number of vCPUs	Default Memory	Recommended Memory	Disk Storage (unchanged)	Managed Nodes (unchanged)
vCM-500	2	4	2 GB	5 GB	300 GB	500
vCM-1000	2	6	4 GB	8 GB	400 GB	1000
vCM-2000	4	8	8 GB	16 GB	600 GB	2000

vCM Models: OVA and NPE OVA Files

[Table 1-7](#) 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 1-7 OVA and NPE OVA Files, by vCM Model

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 WAAS and vWAAS Interoperability

Table 1-8 shows the default number of CPUs, memory capacity, disk storage and supported ISR platforms for ISR models.

Table 1-8 *ISR Models: CPUs, Memory, Disk Storage and Supported ISR Platforms*

ISR Model	CPUs	Memory	Disk Storage	Supported ISR Platform
ISR-WAAS-200 (for WAAS 5.x and 6.2.1)	1	3 GB	151 GB	ISR-4321
ISR-WAAS-200 (for WAAS 6.2.3x and 6.3.1)	1	4 GB	151 GB	ISR-4321
ISR-WAAS-750	2	4 GB	151 GB	ISR-4351, ISR-4331, ISR-4431, ISR-4451
ISR-WAAS-1300	4	6 GB	151 GB	ISR-4431, ISR-4451
ISR-WAAS-2500	6	8 GB	338 GB	ISR-4451



Note

For vWAAS with WAAS Version 6.2.3x or WAAS Version 6.3.1, ISR-4321 with profile ISR-WAAS-200, ISR-WAAS RAM is increased from 3 GB to 4 GB. For this increase in ISR-WAAS RAM to be implemented, you must complete a new OVA deployment of WAAS version 6.2.3x or 6.3.1; the increase in ISR-WAAS RAM is not automatically implemented with an upgrade to WAAS 6.2.3x or 6.3.1.

Consider the following guidelines when using Cisco vWAAS with WAAS:



Note

For vWAAS with WAAS Version 6.2.3x or WAAS Version 6.3.1, ISR-4321 with profile ISR-WAAS-200, ISR-WAAS RAM is increased from 3 GB to 4 GB. For this increase in ISR-WAAS RAM to be implemented, you must complete a new OVA deployment of WAAS version 6.2.3x or 6.3.1; the increase in ISR-WAAS RAM is not automatically implemented with an upgrade to WAAS 6.2.3x or 6.3.1.



Note

When selecting the format in the vSphere Client for the virtual machine's disks for vWAAS with VMware vSphere ESXi, you must choose the **Thick Provision Eager Zeroed** disk format for vWAAS deployment; this is the format recommended with vWAAS deployment for a clean installation.

- For vWAAS in Azure, the supported traffic interception method is PBR (Police-Based Routing); vWAAS in Azure does not support WCCP or AppNav interception methods.



Caution

Multiple deployments of vWAAS on the same Hyper-V host *in parallel* may cause unexpected results, due to availability of free space when creating VHDs. We recommend that you do *not* deploy multiple vWAAS on Hyper-V in parallel, unless you have verified that you have enough free disk space required for the respective vWAAS models.

- 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. For more information, see the [Cisco Virtual Wide Area Application Services Installation and Configuration Guide](#).

- To ensure reliable throughput with the following configuration—**vWAAS on Windows Server 2012 R2 Hyper-V in Cisco UCS-E Series 160S-M3**—we recommend that you do the following:
 - Upgrade to the latest UCS-E firmware (Version 3.1.2), available on the [Cisco Download Software Page for UCS E-Series Software, UCS E160S M3 Software](#).
 - Verify that you have installed the critical Windows Server updates, available on the [Microsoft Windows RT 8.1, Windows 8.1, and Windows Server 2012 R2 Update Rollup](#) page. You can also obtain the standalone update package through the Microsoft Download Center by searching for **KB2887595**.

**Note**

When upgrading vWAAS, do not upgrade more than five vWAAS nodes at the same time on a single UCS box. Upgrading more than five vWAAS nodes at the same time may cause the vWAAS devices to go offline and diskless mode.

- If the virtual host was created using an OVA file of vWAAS for WAAS Version 5.0 or earlier, and you have upgraded vWAAS within WAAS, you must verify that the SCSI Controller Type is set to **VMware Paravirtual**. Otherwise, vWAAS will boot with no disk available and will fail to load the specified configuration.

If needed, change the SCSI controller type to **VMware Paravirtual** by following these steps:

- a. Power down the vWAAS.
- b. From the VMware vCenter, navigate to **vSphere Client > Edit Settings > Hardware**.
- c. Choose **SCSI controller 0**.
- d. From the Change Type drop-down list, verify that the SCSI Controller Type is set to **VMware Paravirtual**. If this is not the case, choose **VMware Paravirtual**.
- e. Click **OK**.
- f. Power up the vWAAS, with WAAS Version 6.1.x or later.

For more information on setting the SCSI Controller Type and on the vWAAS VM installation procedure, see the [Cisco Virtual Wide Area Application Services Installation and Configuration Guide](#).

**Note**

For a vCM-100 model used with the RHEL KVM or KVM on CentOS hypervisor, with the default memory size of 2 GB:

When you upgrade to WAAS Version 6.2.3 from an earlier version, or downgrade from WAAS Version 6.2.3 to an earlier version, and use either the **restore factory-default** command or the **restore factory-default preserve basic-config** command, the vCM-100 may not come up due to GUID Partition Table (GPT) boot order errors.

CAUTION: *The **restore factory-default** command erases user-specified configuration information stored in the flash image, including the starting configuration of the device, and also removes data from the disk, user-defined partitions, and the entire Central Manager database.*

To resolve this situation, follow these steps:

1. Power down the vWAAS using the **virsh destroy vmname** command or the virt manager.
2. Power up the vWAAS using the **virsh start vmname** command or the virt manager.

This upgrade/downgrade scenario does not occur for vCM-100 models whose memory size is upgraded to 4 GB.

DRE Disk, Object Cache, and Akamai Connect Cache Capacity

This section contains the following topics:

- [Table 1-9](#) shows the DRE disk capacity, default object cache capacity, and default Akamai Connect Cache capacity by WAVE model.
- [Table 1-10](#) shows the DRE disk capacity, default object cache capacity, and default Akamai Connect Cache capacity by vWAAS model.

Table 1-9 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

[Table 1-10](#) shows the default DRE disk capacity, object cache capacity, and Akamai Connect cache capacity, by vWAAS model.

Table 1-10 Default DRE, OC, and Akamai Connect Cache, by vWAAS Mode

vWAAS Model	DRE Disk Capacity	Default Object Cache Capacity	Default Akamai Connect Cache Capacity
vWAAS-150	52.3 GB	52 GB	30 GB
vWAAS-200	52.23 GB	82 GB	100 GB
vWAAS-750	96.75 GB	122 GB	250 GB
vWAAS-1300	140 GB	122 GB	300 GB
vWAAS-2500	238 GB	122 GB	350 GB
vWAAS-6000	320 GB	122 GB	400 GB
vWAAS-6000R	320 GB	122 GB	350 GB
vWAAS-12000	450 GB	226 GB	750 GB
vWAAS-50000	1000 GB	227 GB	850 GB

Hypervisors Supported for Cisco vWAAS

This section has the following topics, which show the hypervisors supported for Cisco vWAAS and Virtual Central Manager (vCM).

- [Cisco ISR-WAAS](#)
- [VMware vSphere ESXi](#)
- [RHEL KVM and KVM on CentOS](#)
- [Microsoft Hyper-V](#)
- [Microsoft Azure](#)

Table 1-11 shows the file formats for hypervisors supported for vWAAS and vCM, for WAAS Version 6.x and later.

Table 1-11 File Formats for Hypervisors Supported for vWAAS and vCM

vWAAS or vCM	Hypervisor	File Format	NPE File Format	Example of Image and NPE Image Filename Formats
vWAAS	VMware ESXi	.ova	.ova	<ul style="list-style-type: none"> • Cisco-vWAAS-2500-6.2.1-b-11.ova • Cisco-vWAAS-2500-6.2.1-npe-b-11.ova
	Microsoft Hyper-V	.zip	.zip	<ul style="list-style-type: none"> • Hv-Cisco-vWAAS-750-6.2.1-b-11.zip • Hv-Cisco-vWAAS-750-6.2.1-b-11-npe.zip
	RHEL KVM	.tar.gz	.tar.gz	<ul style="list-style-type: none"> • Cisco-KVM-vWAAS-2500-6.2.1-b-11.tar.gz • Cisco-KVM-vWAAS-2500-6.2.1-b-11-npe-npe.tar.gz
	Microsoft Azure	N/A	N/A	• N/A
vCM	VMware ESXi	.ova	.ova	<ul style="list-style-type: none"> • Cisco-VCM-500N-6.2.1-b-11.ova • Cisco-VCM-500N-6.2.1-npe-b-11.ova
	Microsoft Hyper-V	N/A	.zip	<ul style="list-style-type: none"> • Hv-Cisco-vCM-100N-6.1.1-b-26.zip • Hv-Cisco-vCM-500N-6.1.1-b-26.zip
	RHEL KVM	.tar.gz	.tar.gz	<ul style="list-style-type: none"> • Cisco-KVM-vCM-500N-6.2.1-b-11.tar.gz • Cisco-KVM-vCM-500N-6.2.1-b-11-npe-npe.tar.gz
	Microsoft Azure	N/A	N/A	• N/A

Cisco ISR-WAAS

Cisco ISR-WAAS is the implementation of vWAAS running in a Cisco IOS-XE software container on a Cisco ISR4400 Series router. “Container” in this context refers to a KVM hypervisor that runs virtualized applications on the Cisco ISR-4400 Series router.

VMware vSphere 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 as 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 3, “[Cisco vWAAS and VMware vSphere ESXi](#)”.

RHEL KVM and KVM on 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 6.2.1x and later,
- Cisco vWAAS on KVM on CentOS (Linux Community Enterprise Operating System) is available for vWAAS with WAAS version 6.2.3.



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 4, “[Cisco vWAAS on KVM](#)”.

Microsoft Hyper-V

Cisco vWAAS for 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.

For more information, see Chapter 5, “[Cisco vWAAS on Microsoft Hyper-V](#)”.

Microsoft Azure

Microsoft Azure is a Microsoft cloud computing platform that can be used to build and host applications online, using the Microsoft Hyper-V hypervisor. Cisco vWAAS in Azure is available for vWAAS with WAAS Version 6.2.1x and later. Cisco vWAAS in Azure is also part of WAAS support for Office 365, and end-to-end solution with enterprise branch offices.

For more information, see Chapter 6, “[Cisco vWAAS in Microsoft Azure](#)”.

Platforms Supported for Cisco vWAAS

Cisco vWAAS is supported on the following platforms:

- Cisco Unified Computing System (UCS)

- Cisco UCS E-Series Servers
- Cisco UCS E-Series Network Compute Engines (NCEs)
- Cisco ISR-4000 Series
- Microsoft Azure Cloud

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](#)
- [vWAAS on Cisco UCS E-Series Servers and NCEs](#)
- [VMware ESXi for Cisco vWAAS and Cisco WAAS](#)

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

For vWAAS for WAAS Version 6.2.x with Cisco Enterprise NFVIS, the vWAAS must run as an unmanaged VM.

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	<ul style="list-style-type: none"> • PID: OE-VWAAS-KVM • Device Type: ISR-WAAS 	<ul style="list-style-type: none"> • 5.4.1 • 5.2.1 (ISR-4451) 	<ul style="list-style-type: none"> • ISR-4451 (vWAAS-750, 1300, 2500) • ISR-4431 (vWAAS-750, 1300) • ISR-4351 (vWAAS-750) • ISR-4331 (vWAAS-750) • ISR-4321 (vWAAS-750) 	<ul style="list-style-type: none"> • IOS-XE 3.9 	<ul style="list-style-type: none"> • ISR-SSD • NIM-SSD
Cisco NFVIS	<ul style="list-style-type: none"> • PID: OE-VWAAS-KVM • Device Type: OE-VWAAS-KVM 	<ul style="list-style-type: none"> • 6.2x 	<ul style="list-style-type: none"> • Cisco ENCS (Enterprise Network Compute System) • Cisco UCS-E Series 	<ul style="list-style-type: none"> • NFV FC2 	<ul style="list-style-type: none"> • virtio
VMware vSphere ESXi	<ul style="list-style-type: none"> • PID: OE-VWAAS-ESX • Device Type: OE-VWAAS-ESX 	<ul style="list-style-type: none"> • 5.0.3g 	<ul style="list-style-type: none"> • Cisco UCS (Unified Computing System) • Cisco UCS-E Series 	<ul style="list-style-type: none"> • ESXi 5.0 	<ul style="list-style-type: none"> • VMDK
Microsoft HyperV	<ul style="list-style-type: none"> • PID: OE-VWAAS-HYPERV • Device Type: OE-VWAAS-HYPERV 	<ul style="list-style-type: none"> • 6.1x 	<ul style="list-style-type: none"> • Cisco UCS • Cisco UCS-E Series 	<ul style="list-style-type: none"> • Microsoft Windows 2008 R2 	<ul style="list-style-type: none"> • VHD

Hypervisor	PID and Device Type	Minimum WAAS Version	Host Platforms	Minimum Host Version	Disk Type
RHEL KVM	<ul style="list-style-type: none"> • PID: OE-VWAAS-KVM • Device Type: OE-VWAAS-KVM 	<ul style="list-style-type: none"> • 6.2x 	<ul style="list-style-type: none"> • Cisco UCS • Cisco UCS-E Series 	<ul style="list-style-type: none"> • RHEL • CentOS 7.1 	<ul style="list-style-type: none"> • virtio
Microsoft Azure	<ul style="list-style-type: none"> • PID: OE-VWAAS-AZURE • Device Type: OE-VWAAS-AZURE 	<ul style="list-style-type: none"> • 6.2x 	<ul style="list-style-type: none"> • Microsoft Azure cloud 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • VHD

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	<ul style="list-style-type: none"> • OVA 	<ul style="list-style-type: none"> • Ezconfig 	<ul style="list-style-type: none"> • onep 	<ul style="list-style-type: none"> • virtio_net
Cisco NFVIS	<ul style="list-style-type: none"> • TAR 	<ul style="list-style-type: none"> • NFVIS 	<ul style="list-style-type: none"> • Bootstrap • Day0 config 	<ul style="list-style-type: none"> • virtio_net
VMware vSphere ESXi	<ul style="list-style-type: none"> • OVA 	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • vmxnet3
Microsoft HyperV	<ul style="list-style-type: none"> • Zip 	<ul style="list-style-type: none"> • Powershell script 	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • netvsc
RHEL KVM	<ul style="list-style-type: none"> • TAR 	<ul style="list-style-type: none"> • EZdeploy • launch.sh 	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • virtio_net
Microsoft Azure	<ul style="list-style-type: none"> • JSON template 	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • --- 	<ul style="list-style-type: none"> • netvsc

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, 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)
Microsoft Azure	• N/A	• vWAAS-200, 750, 1300, 2500, 6000, 12000	• 1	• Routed mode (with WAAS v6.2.1 and later)

vWAAS on 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 NCEs (Network Compute Engines) 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	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> ISR-4331, ISR-4351, ISR-4451 	<ul style="list-style-type: none"> 3.10
UCS E-Series NCEs	<ul style="list-style-type: none"> Microsoft Windows Server (2012 R2) RHEL 7.1 and later Linux CentOS 7.1 and later 	<ul style="list-style-type: none"> Microsoft Hyper-V 2012 R2 VMware vSphere ESXi 5.5 and 6.0 KVM for RHEL or CentOS 7.1 and later 	<ul style="list-style-type: none"> ISR-4321, ISR-4331, ISR-4351, ISR-4431, ISR-4451 	<ul style="list-style-type: none"> 3.10 (UCS-EN120S) 3.15.1 (UCS-EN140N)

vWAAS and Cisco UCS E-Series Memory Guidelines and Requirements

When calculating memory requirements for your vWAAS system, include the following parameters:

- vWAAS on VMware
 - 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.
 - Table 1-16 shows memory and disk storage for Cisco UCS E-Servers/NCEs
- 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.
 - Table 1-18 shows vCPUs, ESXi server datastore memory, and disk space by vWAAS model.
 - Table 1-19 shows vCPUs, ESXi server datastore memory, and disk space by vCM model.

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

- UCS-E140S has a default value of 8 GB memory (which can be expanded to 48 GB).
- 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.
- 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.

- UCS-E140S has a default value of 8 GB DRAM, (which can be expanded to 48 GB).
- vWAAS-1300 requires 6 GB memory + VMware v6.0 requires 2 GB DRAM = 8 GB memory, which equals the memory capacity of UCS-E140S.
- 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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

VMware ESXi for Cisco vWAAS and Cisco WAAS

This section contains the following topics:

- [VMware ESXi Versions Supported for Cisco WAAS](#)
- [ESXi Server Datastore Memory and Disk Space for vWAAS and vCM Models](#)

VMware ESXi Versions Supported for Cisco WAAS

Table 1-17 VMware ESXi Versions Supported for Cisco WAAS

ESX version	WAAS v5.1	WAAS v5.2	WAAS v5.3	WAAS v5.4	WAAS v5.5	WAAS v6.x
ESXi 6.0 vWAAS fresh installation	x	x	x	x	x	Supported OVA
ESXi 6.0 vWAAS upgrade	x	x	x	x	x	Upgrade with .bin file

ESXi version	WAAS v5.1	WAAS v5.2	WAAS v5.3	WAAS v5.4	WAAS v5.5	WAAS v6.x
ESXi 5.5 vWAAS fresh installation	x	x	Supported OVA	Supported OVA	Supported OVA	Supported OVA
ESXi 5.5 vWAAS upgrade	x	x	Upgrade with .bin file	Upgrade with .bin file	Upgrade with .bin file	Upgrade with .bin file
ESXi 5.0/5.1 vWAAS fresh installation	Supported OVA	Supported OVA	Supported OVA	Supported OVA	Supported OVA	Supported OVA
ESXi 4.1/5.0 vWAAS upgrade	Upgrade with .bin file	Upgrade with .bin file	Upgrade with .bin file	Upgrade with .bin file	Upgrade with .bin file	x
ESXi 4.1 vWAAS fresh installation	Supported OVA	Install vWAAS 5.1 OVA, then upgrade using .bin file, or Migrate from ESXi 4.1 to 5.0/5.1	x	x	x	x

- VMware vCenter server and vSphere client version 4.x management software.

ESXi Server Datastore Memory and Disk Space for vWAAS and vCM Models

This section has the following topics:

- [Table 1-18](#) shows ESXi server datastore memory and disk space per vWAAS model, for WAAS v4.3.1 through v5.3.5, and for WAAS v5.4.x through v6.x.
- [Table 1-19](#) shows ESXi server datastore memory and disk space per vCM model, for WAAS v4.3.1 through v5.3.5, and for WAAS v5.4.x through v6.x.

Table 1-18 vCPUs, ESXi Server Datastore Memory, and Disk Space by vWAAS Model

vWAAS Model	For WAAS v4.3.1 through v5.3.5			For WAAS v5.4.x through v6.x		
	vCPUs	Datastore Memory	Disk	vCPUs	Datastore Memory	Disk
vWAAS-150 (for WAAS Version 6.x)	---	---	---	1	3 GB	160 GB
vWAAS-200	1	2 GB	160 GB	1	3 GB	260 GB
vWAAS-750	2	4 GB	250 GB	2	4 GB	500 GB
vWAAS-1300	2	6 GB	300 GB	2	6 GB	600 GB
vWAAS-2500	4	8 GB	400 GB	4	8 GB	750 GB
vWAAS-6000	4	8 GB	500 GB	4	11 GB	900 GB
vWAAS-12000	4	12 GB	750 GB	4	12 GB	750 GB
vWAAS-50000	8	48 GB	1500 GB	8	48 GB	1500 GB

Table 1-19 vCPUs, ESXi Server Datastore Memory, and Disk Space by vCM Model

vCM Model	For WAAS v4.3.1 through v5.3.5			For WAAS v5.4.x through v6.x		
	vCPUs	Datastore Memory	Disk	vCPUs	Datastore Memory	Disk
vCM-100N	2	2 GB	250 GB	2	2 GB	250 GB
vCM-500N	---	---	---	2	2 GB	300 GB
vCM-1000N	---	---	---	2	4 GB	400 GB
vCM-2000N	4	8 GB	600 GB	4	8 GB	600 GB

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 6.2.3 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 6.2.3 is not supported.

