CHAPTER 6

Cisco vWAAS on RHEL KVM and KVM CentOS

This chapter describes the hypervisors supported for Cisco vWAAS and the procedures used to install each hypervisor on Cisco vWAAS, and contains the following sections:

About vWAAS on RHEL KVM

Cisco vWAAS on RHEL KVM (Red Hat Enterprise Linux Kernel-based Virtual Machine) is a virtual WAAS appliance that runs on a KVM Hypervisor. The Cisco vWAAS on RHEL KVM solution extends the capabilities of ISR-WAAS and vWAAS running on the Cisco UCS-E Series and the ENCS-5400 Series.

- 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.

Supported Host Platforms, Software Versions, and Disk Type

Table 6-1 shows the platforms and software versions supported for vWAAS on Microsoft Hyper-V.

Table 6-1   ***Platforms and Software Versions Supported for vWAAS on VMware ESXi***

PID and Device Type	Minimum WAAS Version	Host Platforms	Minimum Host Version	Disk Type
• PID: OE-VWAAS-KVM • Device Type: OE-VWAAS-KVM	• 6.2x	• Cisco UCS • Cisco UCS-E Series	• RHEL CentOS 7.1	• virtio

vWAAS on KVM System Requirements

vWAAS on RHEL KVM has a predefined configuration with specific requirements for CPU and memory. However, there are some features that are customizable. Table 6-2 shows the supported configuration for vWAAS on RHEL KVM, and, where applicable, highlights the customizable features.

Note   Data disk size will vary according to the model shown in Table 10-4, "Hardware Requirements for vWAAS with Akamai Connect." While deploying RHEL KVM, Cisco vWAAS/vCM needs to verify that enough disk space is available in the respective partition.

Table 6-2   ***vWAAS on RHEL KVM Supported Configuration***

Feature/Component	Description
Platform	Three-disk platform of: • 10GB system • 4GB flash • Data disk (customizable, depending on number of connections)
RHEL version for vWAAS on KVM	RHEL 7.2
Memory Requirements	• vWAAS-150: 4 GB • vWAAS-200: 4 GB • vWAAS-750: 4 GB • vWAAS-1300: 6 GB • vWAAS-2500: 8 GB • vWAAS-6000: 11 GB • vWAAS-12000: 18 GB • vWAAS-50000: 48 GB
Interception Method	WCCP (Web Cache Communication Protocol) or Appnav
Device Emulation	vWAAS on RHEL KVM uses QEMU-KVM.
Management	WAAS CM and serial console
Licensing	For information on Cisco vWAAS licensing, please contact your Cisco account representative.
MAC address	Customizable

vWAAS on RHEL KVM for WAAS Version 5.x to 6.2.x

This section contains the following topics:

- Tar Archive Package for vWAAS on KVM for WAAS Version 5.x to 6.2.x
- Installing vWAAS on KVM for WAAS Version 5.x to 6.2.x

Tar Archive Package for vWAAS on KVM for WAAS Version 5.x to 6.2.x

For vWAAS on KVM, for WAAS Version 5.x through 6.2.x, Cisco provides a tar archive or NPE tar archive package for each vWAAS connection profile (examples shown in Table 6-3) and for each vCM connection profile (examples shown in Table 6-4).

Table 6-5 shows the files included for deploying Cisco vWAAS on RHEL KVM, and for deploying Cisco vWAAS on NFVIS (Network Functions Virtualization Infrastructure Software). For more information on Cisco NFVIS and Cisco NFV (Network Functions Virtualization), see the *Cisco Enterprise Network Functions Virtualization Solution Overview*. For more information on vWAAS on NFVIS, see Chapter 9, "Cisco vWAAS with Cisco Enterprise NFVIS".

> **Note**   For a listing of hypervisor OVA, zip, and tar.gz files for vWAAS, see the Cisco Wide Area Application Services (WAAS) Download Software Page and select the WAAS software version used with your vWAAS instance.

Table 6-3   OVA Package Format Examples for vWAAS on RHEL KVM for WAAS Version 5.x to 6.2.x

Package Format	File Format Example
Cisco KVM 150 package file	• Cisco-KVM-vWAAS-150-6.2.3d-b-68.tar.gz
Cisco KVM 150 package file for NPE	• Cisco-KVM-vWAAS-150-6.2.3d-b-68-npe.tar.gz
Cisco KVM 200 package file	• Cisco-KVM-vWAAS-200-6.2.3d-b-68.tar.gz
Cisco KVM 200 package file for NPE	• Cisco-KVM-vWAAS-200-6.2.3d-b-68-npe.tar.gz
Cisco KVM 750 package file	• Cisco-KVM-vWAAS-750-6.2.3d-b-68.tar.gz
Cisco KVM 750 package file for NPE	• Cisco-KVM-vWAAS-750-6.2.3d-b-68-npe.tar.gz
Cisco KVM 1300 package file	• Cisco-KVM-vWAAS-1300-6.2.3d-b-68.tar.gz
Cisco KVM 1300 package file for NPE	• Cisco-KVM-vWAAS-1300-6.2.3d-b-68-npe.tar.gz
Cisco KVM 2500 package file	• Cisco-KVM-vWAAS-2500-6.2.3d-b-68.tar.gz
Cisco KVM 2500 package file for NPE	• Cisco-KVM-vWAAS-2500-6.2.3d-b-68-npe.tar.gz
Cisco KVM 6000 package file	• Cisco-KVM-vWAAS-6000-6.2.3d-b-68.tar.gz
Cisco KVM 6000 package file for NPE	• Cisco-KVM-vWAAS-6000-6.2.3d-b-68-npe.tar.gz

Table 6-4   Cisco OVA Package Formats for vCM for WAAS Version 5.x to 6.2.x

Package Format	File Format Example
Cisco KVM 100N package file	• Cisco-KVM-vCM-100N-6.2.3d-b-68.tar.gz
Cisco KVM 100N package file for NPE	• Cisco-KVN-vCN-100N-6.2.3d-npe-b-68-npe.tar-gz

Table 6-5   Installation Files for vWAAS on KVM and vWAAS on NFVIS for WAAS 5.x to 6.2.x

Installation Files	RHEL KVM Installation	NFVIS Installation
• **Cisco signature envelope file** Verifies that this deployment is from Cisco.	X	X
• **Manifest file with checksums**	X	X
• **image_properties.xml** A VM configuration template file used on the Cisco NFVIS platform.		X
• **package.mf** template file and **bootstrap-cfg.xml** These two files work together on the Cisco NFVIS platform with the image_properties.xml file as Day-0 configuration template.		X
• **INSTRUCTIONS.TXT** Describes the procedure for deploying the virtual instance and for using the launch.sh file.	X	
• **launch.sh** file For details on how to use this script, see Using the Launch Script to Deploy vWAAS on KVM for WAAS Version 5.x to 6.2.x.	X	
• **vm.xml** Configuration file needed for vWAAS deployment using virtual bridge or Open Virtual Switch (OVS) present in host mac.	X	
• **VM disk images** A 4 GB flash disk, 10 GB system disk, and data disk (data disk size is dependent on your connection profile).	X	X
• **ezdeploy.sh** file The script used to deploy vWAAS on UCS-E. For details on how to use this script, see Using the EzDeploy Script to Deploy vWAAS on KVM on UCS-E for WAAS Version 5.x to 6.2.x and Using the EzDeploy Script to Deploy vWAAS on RHEL KVM on CentOS for WAAS Version 6.4.1 and Later.	X	

Installing vWAAS on KVM for WAAS Version 5.x to 6.2.x

This section contains the following topics:

- Using the Launch Script to Deploy vWAAS on KVM for WAAS Version 5.x to 6.2.x
- Using the EzDeploy Script to Deploy vWAAS on KVM on UCS-E for WAAS Version 5.x to 6.2.x

Using the Launch Script to Deploy vWAAS on KVM for WAAS Version 5.x to 6.2.x

To use the launch script (launch.sh) to deploy Cisco vWAAS on RHEL KVM, follow these steps:

Step 1   Launch the vWAAS VM. (You must have root permissions to launch the vWAAS VM.)

Step 2   Create a new directory to hold the extracted contents of **tar.gz**.

Step 3   Copy **tar.gz** into the specified directory.

Step 4   To extract the **tar.gz** gzip file, use the command:

tar -zxvf Cisco-KVM-vWAAS-*ModelNumber***-***Version***-***BuildNumber***.tar.gz**

Example:

```
tar -zxvf Cisco-KVM-vWAAS-200-6.2.3d.b-68.tar.gz
```

The contents of the tar.gz file are:

- INSTRUCTIONS.TXT
- Disk-0.qcow
- Disk-1.qcow
- Disk-2.qcow
- vm_tap.xml
- vm_macvtap.xml
- launch.sh
- ezdeploy.sh
- ezdeploy.qstatus.exp

Step 5   To launch vWAAS, run the **launch.sh** script:

   a. To check the prerequisite conditions, use the **./launch.sh check** command.

   b. To launch vWAAS using the OVS bridge, use the **./launch.sh** *vm-name* **bridge** *bridge1-name bridge2-name* command.

      - *bridge1-name* and *bridge2-name*—The OVS bridges already created in the host.

> **Note**   Before using the **./launch.sh** *vm-name* **bridge** *bridge1-name bridge2-name* command, verify that the OVS bridges are created and in working state.

   c. To launch vWAAS using macvtap, use the .**/launch.sh vm-name macvtap** *interface1-name interface2-name* command,

      - *vm-name*—The specified name of the vWAAS VM.

      - *interface1-name* and *interface2-name*—The specified Ethernet interfaces of the host machine.

Step 6   The vWAAS is launched

Step 7   To view the vWAAS, use the VM GUI or the **virsh list** command.

Step 8   To connect to the console, use the VM GUI or the **virsh console** *vm-name* command.

Step 9   To power down the vWAAS, use the **virsh destroy** *vm-name* command.

Step 10   To undefine the vWAAS:

   a. Use the **virsh undefine** *vm-name* command.

   b. Remove the directory with the specified *vm-name*.

> **Note** If you want to create another vWAAS of the same model, follow this procedure again for a different vWAAS. The specified directory, for example, "Basic," will then have two VMs, "Basic1" and "Basic2." Disks for these VMs will be stored in the subdirectories "Basic1" and "Basic2," respectively.

Using the EzDeploy Script to Deploy vWAAS on KVM on UCS-E for WAAS Version 5.x to 6.2.x

Use the EzDeploy script for simplified deployment of a vWAAS. Note that the EzDeploy script is not used for the vCM.

The following are prerequisites for launching the EzDeploy script:

- To launch the vWAAS VM, you must have root permission.
- The following software and utility packages must be installed before using the EzDeploy script:
  - QEMU
  - Libvirt
  - Genisoimage
  - Expect script (required only if you choose to run EzDeploy's capability for auto-monitoring WAAS CM registration status)
- Verify the following:
  - There is enough disk and RAM memory to deploy another vWAAS.
  - Compatibility of software versions.
  - Availability and readiness of network connectivity.

> **Note** Because EzDeploy leverages the launch.sh script to launch a vWAAS, the launch.sh script, as well as all the necessary files associated with it, must be present, intact, and not manually removed or manually moved elsewhere.

To use the EzDeploy script (ezdeploy.sh) to deploy Cisco vWAAS on RHEL KVM on UCS-E, follow these steps:

Step 1 Launch the vWAAS VM.

Step 2 Create a new directory to hold the extracted contents of **tar.gz**.

Step 3 Copy **tar.gz** into the specified directory.

Step 4 To extract the **tar.gz** gzip file, use the **tar -zxvf Cisco-KVM-vWAAS-200-6.2.0.b-80.tar.gz** command.

The contents of the tar.gz file are:

- INSTRUCTIONS.TXT
- Disk-0.qcow
- Disk-1.qcow
- Disk-2.qcow
- vm_tap.xml

- vm_macvtap.xml
- launch.sh
- ezdeploy.sh
- ezdeploy.qstatus.exp

Step 5   Run the **ezdeploy.sh** script:

a. During execution of hte ezdeploy.sh, you are prompted for bootstrap configuration parameters:

- vWAAS KVM name—The name is dependent on whether or not you provide the vWAAS' bootstrap configuration.

  If you do not provide the vWAAS' bootstrap configuration, the name is set as the name of the guest KVM to be created. not the vWAAS' host name.

  If you provide the vWAAS' bootstrap configuration, vWAAS' host name is set and used in both instances.

- vWAAS' local IP address and mask

- Default GW IP address: an address on the ISR-4000 series RP reachable by the vWAAS and having external network connectivity

- IP address of the WAAS CM with which the vWAAS will register

- One NTP server address, without authentication. If you want to have authentication or multiple NTP servers, use the WAAS CM to configure these after the vWAAS is powered up.

- (Optional) DNS server address

The ezdeploy.sh script performs a validation before accepting each parameter.

b. After input collection is completed, the following information is saved:

- The bootstrap configuration is saved in the file **bootstrap-cfg.xml** in the directory created for this KVM.

- The execution log and error log of the script are saved in the file **ezdeploy-log.txt** in the directory created for this KVM.

- For the vWAAS in this KVM, the error log is saved in **errorlog/ezdeploy-errorlog.txt**.

> **Note**   By default, all configuration and error logs saved in the specified KVM directory are *not* deleted, even if they have recorded errors, so allow for debugging. If you do not want to generate log files, you must confirm this choice at the end of the script execution, after input entry.

c. After completion of the EzDeploy script, the vWAAS is fully up and running. Registration with the specified WAAS CM and the NTP server are automatically started after installation of their corresponding CLIs.

d. To view the vWAAS, use the VM GUI or the **virsh list** command.

e. To connect to the console, use the VM GUI or the **virsh console** *vm-name* command.

f. To power down the vWAAS, use the **virsh destroy** *vm-name* command.

g. To undefine the vWAAS:

- Use the **virsh undefine** *vm-name* command.

- Remove the directory with the specified *vm-name*.

vWAAS on RHEL KVM for WAAS Version 6.4.1 and Later

This section contains the following topics:

- Unified OVA Package for vWAAS on KVM for WAAS Version 6.4.1 and Later
- Installing vWAAS on KVM for WAAS Version 6.4.1 and Later

Unified OVA Package for vWAAS on KVM for WAAS Version 6.4.1 and Later

For vWAAS on RHEL KVM for WAAS Version 6.4.x and later, Cisco provides a single, unified OVA or NPE OVA package for each hypervisor type, which can be used with all vWAAS models for that hypervisor.

Each unified OVA package file is a pre-configured virtual machine image that is ready to run on a particular hypervisor. The launch script for each unified OVA package provides the model and other required parameters to launch vWAAS with WAAS in the required configuration.

Here are examples of the unified OVA and NPE OVA package filenames for vWAAS on RHEL KVM:

- OVA—Cisco-KVM-vWAAS-Unified-6.4.1-b-33.tar.gz
- NPE OVA—Cisco-KVM-vWAAS-Unified-6.4.1-b-33-npe.tar.gz

The unified OVA package for vWAAS on RHEL KVM/KVM on CentOS contains the following files.

- Flash disk image
- Data system disk
- Akamai disk
- INSTRUCTIONS.TXT—Describes the procedure for deploying the virtual instance and using the launch.sh file.
- package.mf template file and bootstrap-cfg.xml—These two files work together on the Cisco NFVIS platform with the image_properties.xml file as Day-0 configuration template.
- ezdeploy.sh—The script used to deploy vWAAS on UCS-E.
- exdeploy_qstatus.exp—The dependent file for ezdeploy.sh script image_properties.xmlA VM configuration template file used on the Cisco NFVIS platform.
- launch.sh—The launch script to deploy Cisco vWAAS on Linux KVM.
- vm_macvtap.xml—Configuration file for vWAAS deployment using host machine interfaces with the help of the macvtap driver.
- vm_tap.xml—Configuration file for vWAAS deployment using virtual bridge or OVS (Open Virtual Switch) present in the host machine.

Installing vWAAS on KVM for WAAS Version 6.4.1 and Later

This section contains the following topics:

- Using the Launch Script to Deploy vWAAS on RHEL KVM on CentOS for WAAS Version 6.4.1 and Later
- Using the EzDeploy Script to Deploy vWAAS on RHEL KVM on CentOS for WAAS Version 6.4.1 and Later

> **Note**   For how to install vWAAS with NFVIS on Cisco ENCS 5400 Series, see the *Cisco vWAAS Bundled Image Upgrade for ENCS 5400 Series, with RMA Process for Cisco EOS/EOL WAVE Devices*.

Using the Launch Script to Deploy vWAAS on RHEL KVM on CentOS for WAAS Version 6.4.1 and Later

To use the launch script (launch.sh) to deploy Cisco vWAAS or vCM on RHEL KVM on CentOS, follow these steps:

Step 1   At [**root@localhost** *hostname*] enter the following:

```
[root@localhost hostname]# ./launch.sh unified mactap enp1s0f0 enp1s0f0
```

Step 2   The Model Menu is displayed:

```
--- Model Menu ---

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

Select the model type :
```

Step 3   After you select the vWAAS or vCM model type, the launch script completes the RHEL CentOS KVM deployment.

Using the EzDeploy Script to Deploy vWAAS on RHEL KVM on CentOS for WAAS Version 6.4.1 and Later

To use the ExDeploy script (exdeploy.sh) to deploy Cisco vWAAS or vCM on RHEL KVM on CentOS, for vWAAS models up to 6,000 connections, follow these steps:

Step 1   At [**root@localhost ezdeploy**] enter the following:

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

Step 2   The Model Menu is displayed:

```
--- Model Menu ---

1. vWAAS-150
2. vWAAS-200
3. vWAAS-750
4. vWAAS-1300
5. vWAAS-2500
```

```
6. vWAAS-6000R
7. vWAAS-6000

Select the model type :
```

Step 3   After you select the vWAAS model type, the EzDeploy script completes the RHEL KVM/KVM on CentOS deployment.

Using the Unified OVA Package to Deploy vWAAS on NFVIS

To use the unified OVA package to deploy Cisco vWAAS on RHEL KVM on CentOS, follow these steps:

Step 1   At the navigation pane of the Cisco Enterprise NFVIS portal, navigate to **VM Life Cycle** > **Deploy**.

The registered VM images are displayed in the VM Deployment screen.

Step 2   Select the vWAAS as the VM.

Step 3   Drag and drop the vWAAS in the network topology area.

After you select vWAAS as the VM, the vWAAS attributes and attribute choices are displayed in the VM Details pane.

Step 4   Enter the following information in the **VM Details** pane:

   a.   In the **VM Name** field, edit the vWAAS name for your system.

   b.   At the **Image** drop-down list, choose the unified OVA package for the vWAAS.

   c.   At the **Profile** drop-down list, choose the vWAAS connection profile for your system.

   d.   Other fields are automatically filled in by the system.

Step 5   Connect the vWAAS to a specified network by dragging the pointed arrow from the vWAAS to the specified network.

> **Note**   During this process, the VM Details pane displays the Virtual Network Interface Card (vNIC) details: VM name, network name, and vNIC ID. The vNIC ID number is automatically generated; you can change this number, if needed, by using the vNIC ID drop-down menu.

Step 6   Click **Deploy**.

The screen refreshes to display the deployment status.

Operating Guidelines for vWAAS on KVM/KVM on CentOS

This section contains the following topics:

   • Interoperability Guidelines for vWAAS on KVM/KVM on CentOS

   • Traffic Interception Methods for vWAAS on KVM

Interoperability Guidelines for vWAAS on KVM/KVM on CentOS

Consider the following interoperability guidelines for Cisco vWAAS on KVM:

Interoperability guidelines for WAAS versions and vWAAS on KVM:

* **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 on WAAS Version 6.2.3x and later.

Interoperability guidelines for OVS and vWAAS on KVM:

* The CDP protocol is not supported for Open Virtual Switch (OVS) on RHEL KVM on CentOS, therefore the **show cdp** command cannot be used for vWAAS on RHEL KVM on CentOS.

* For vWAAS with WAAS Version 6.2.3x and later, there is inline vWAAS support for the OVS switch, with additional settings in vWAAS. For example

  1. Install CentOS 7.2 on UCS-C240.

  2. Configure OVS switch on KVM host.

  3. Deploy KVM vWAAS OVAs with OVS switch on KVM host.

  4. Power off the vWAAS.

  5. Add two additional interfaces.

  6. Using the virt-manager, map the bridge ID in vWAAS:
     ```
     [root@localhost kvm]# virsh edit vwaas-name
     ```

     Domain vWAAS XML configuration changed.

  7. Using the virt-manager, edit the virtual type:
     ```
     virtualport type='openvswitch'/
     ```

  8. Sample output:
     ```
     <interface type='bridge'>
          <mac address='52:54:00:ea:3f:7b'/>
          <source bridge='br2'/>
          <virtualport type='openvswitch'/>
          <model type='virtio'/>
         <address type='pci' domain='0x0000' bus='0x00' slot='0x08' function='0x0'/>
        </interface>
      <interface type='bridge'>
          <mac address='52:54:00:7f:7c:99'/>
          <source bridge='br3'/>
          <virtualport type='openvswitch'/>
          <model type='virtio'/>
         <address type='pci' domain='0x0000' bus='0x00' slot='0x0a' function='0x0'/>
         </interface>
     ```

Traffic Interception Methods for vWAAS on KVM

For traffic interception for Cisco vWAAS on KVM, you can use WCCP (WCCP GRE or WCCP L2) or Appnav.

> **Note** When you use any of the traffic interception methods for vWAAS on KVM, you must disable Generic Receive Offload (GRO) on the Cisco UCS NIC. Use the command **ethtool -K** *nic_interface_name* **gro off** on KVM host to disable GRO. For example: `ethtool -K enp3s0f2 gro off`. If you do not disable GRO, traffic is not recognized, and packets are discarded.
>
> If you upgrade the UCS NIC firmware to the latest version, you do not need to disable the GRO parameter.

For more information on configuring traffic interception methods, see the *Cisco Wide Area Application Services Configuration Guide*.

Upgrade/Downgrade Guidelines for vWAAS on KVM

Consider the following guidelines when upgrading or downgrading your WAAS system with vWAAS on KVM:

- Cisco vWAAS on KVM is used with WAAS Version 6.2.1 and later. You cannot downgrade Cisco vWAAS on KVM or vCM on KVM devices to a version earlier than WAAS Version 6.2.1.

> **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.

> **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 5.2.1 from an earlier version, or downgrade from WAAS Version 5.2.1 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.