



Red Hat Virtualization: NetApp HCI with Cisco ACI

NetApp Solutions

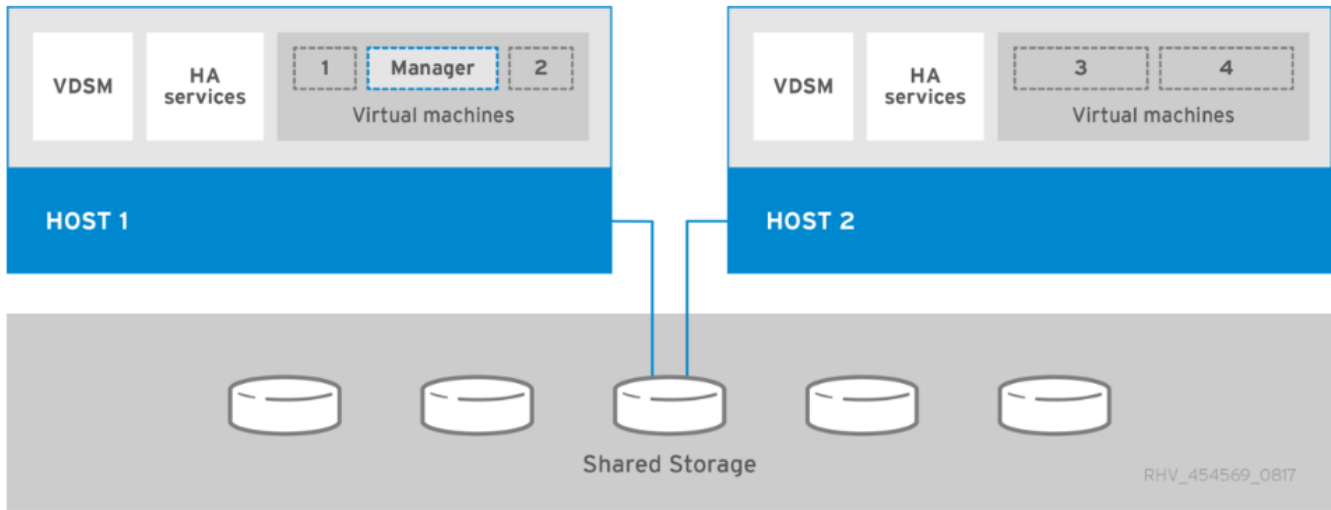
Kevin Hoke, Nikhil M Kulkarni
May 24, 2021

Table of Contents

Red Hat Virtualization: NetApp HCI with Cisco ACI	1
Workflow	1
Linux Bridge	4

Red Hat Virtualization: NetApp HCI with Cisco ACI

Red Hat Virtualization (RHV) is an enterprise virtual data center platform that runs on Red Hat Enterprise Linux using the KVM hypervisor. The key components of RHV include Red Hat Virtualization Hosts (RHV-H) and the Red Hat Virtualization Manager (RHV-M). RHV-M provides centralized, enterprise-grade management for the physical and logical resources within the virtualized RHV environment. RHV-H is a minimal, light-weight operating system based on Red Hat Enterprise Linux that is optimized for the ease of setting up physical servers as RHV hypervisors. For more information on RHV, see the documentation [here](#). The following figure provides an overview of RHV.




Starting with Cisco APIC release 3.1, Cisco ACI supports VMM integration with Red Hat Virtualization environments. The RHV VMM domain in Cisco APIC is connected to RHV-M and directly associated with a data center object. All the RHV-H clusters under this data center are considered part of the VMM domain. Cisco ACI automatically creates logical networks in RHV-M when the EPGs are attached to the RHV VMM domain in ACI. RHV hosts that are part of a Red Hat VMM domain can use Linux bridge or Open vSwitch as its virtual switch. This integration simplifies and automates networking configuration on RHV-M, saving a lot of manual work for system and network administrators.

Workflow

The following workflow is used to set up the virtual environment. Each of these steps might involve several individual tasks.

1. Install and configure Nexus 9000 switches in ACI mode and APIC software on the UCS C-series server. Refer to the Install and Upgrade [documentation](#) for detailed steps.
2. Configure and setup the ACI fabric by referring to the [documentation](#).
3. Configure tenants, application profiles, bridge domains, and EPGs required for NetApp HCI nodes. NetApp recommends using one BD to one EPG framework, except for iSCSI. See the documentation [here](#) for more details. The minimum set of EPGs required are in-band management, iSCSI, VM motion, VM-data network, and native.
4. Create the VLAN pool, physical domain, and AEP based on the requirements. Create the switch and interface profiles and policies for vPCs and individual ports. Then attach the physical domain and configure the static paths to the EPGs. see the [configuration guide](#) for more details. This table lists best practices for

PC/VPC Interface Policy Group - HCI-RHVH01



Properties

Name: HCI-RHVH01

Description: optional

Link Aggregation Type: Port Channel VPC

Link Level Policy: 10G-Auto

CDP Policy: CDP-Disabled

MCP Policy: select a value

CoPP Policy: select a value

LLDP Policy: LLDP-Enabled

STP Interface Policy: select a value

Egress Data Plane Policing Policy: select a value

Ingress Data Plane Policing Policy: select a value

Priority Flow Control Policy: select a value

Fibre Channel Interface Policy: select a value

Slow Drain Policy: select a value

Port Channel Policy: LACP-Active



Use a vPC policy group for interfaces connecting to NetApp HCI storage and compute nodes.

5. Create and assign contracts for tightly controlled access between workloads. For more information on configuring the contracts, see the guide [here](#).
6. Install and configure the NetApp HCI Element cluster. Do not use NDE for this install; rather, install a standalone Element cluster on the HCI storage nodes. Then configure the required volumes for installation of RHV. Install RHV on NetApp HCI. Refer to [RHV on NetApp HCI NVA](#) for more details.
7. RHV installation creates a default management network called ovirtmgmt. Though VMM integration of Cisco ACI with RHV is optional, leveraging VMM integration is preferred. Do not create other logical networks manually. To use Cisco ACI VMM integration, create a Red Hat VMM domain and attach the

VMM domain to all the required EPGs, using Pre- Provision Resolution Immediacy. This process automatically creates corresponding logical networks and vNIC profiles. The vNIC profiles can be directly used to attach to hosts and VMs for their communication. The networks that are managed by Cisco ACI are in the format <tenant-name>|<application-profile-name>|<epg-name> tagged with a label of format aci_<rhv-vmm-domain-name>. See [Cisco's whitepaper](#) for creating and configuring a VMM domain for RHV. Also, see this table for best practices when integrating RHV on NetApp HCI with Cisco ACI.



Except for ovirtmgmt, all other logical networks can be managed by Cisco ACI.

Network > Networks

Network:

NewImportEditRemove

1 - 8 <

Name	Comment	Data Center	Description	Role	VLAN Tag	QoS Nam	Label	Provider	MTU
HCI-Infra AFF-A200 AFF-NFS		Default		<div></div>	1569	-	aci_hci-aci-rhv		9000
HCI-Infra HCI HCI-IB-Mgmt		Default		<div></div>	1567	-	aci_hci-aci-rhv		Default (1500)
HCI-Infra HCI HCI-SCSI		Default		<div></div>	1568	-	aci_hci-aci-rhv		9000
HCI-Infra HCI HCI-VM-motion		Default		<div></div>	1634	-	aci_hci-aci-rhv		Default (1500)
HCI-Infra HCI HCI-VM-network		Default		<div></div>	1570	-	aci_hci-aci-rhv		Default (1500)
ovirtmgmt		Default	Management Network	<div></div>	3201	-	-		Default (1500)
quarantine		Default		<div></div>	666	-	aci_hci-aci-rhv		Default (1500)
uplinkNetwork		Default	uplinkNetwork	<div></div>	-	-	-		Default (1500)

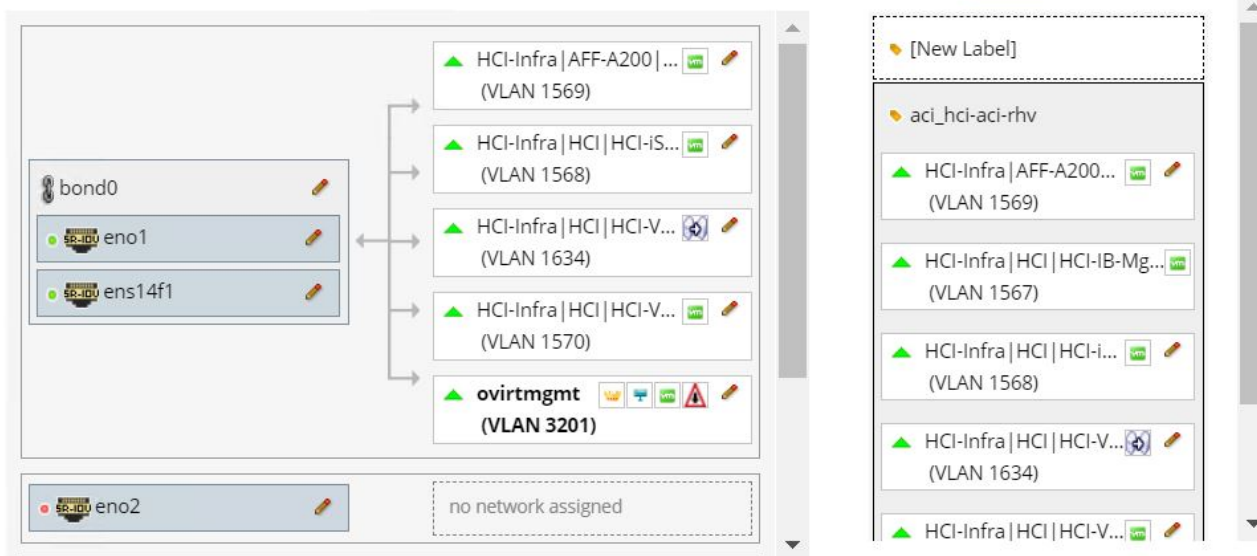
Setup Host hci-aci-rtp-rhv01.cie.netapp.com Networks

Drag to make changes

Interfaces

Assigned Logical Networks

Networks Labels



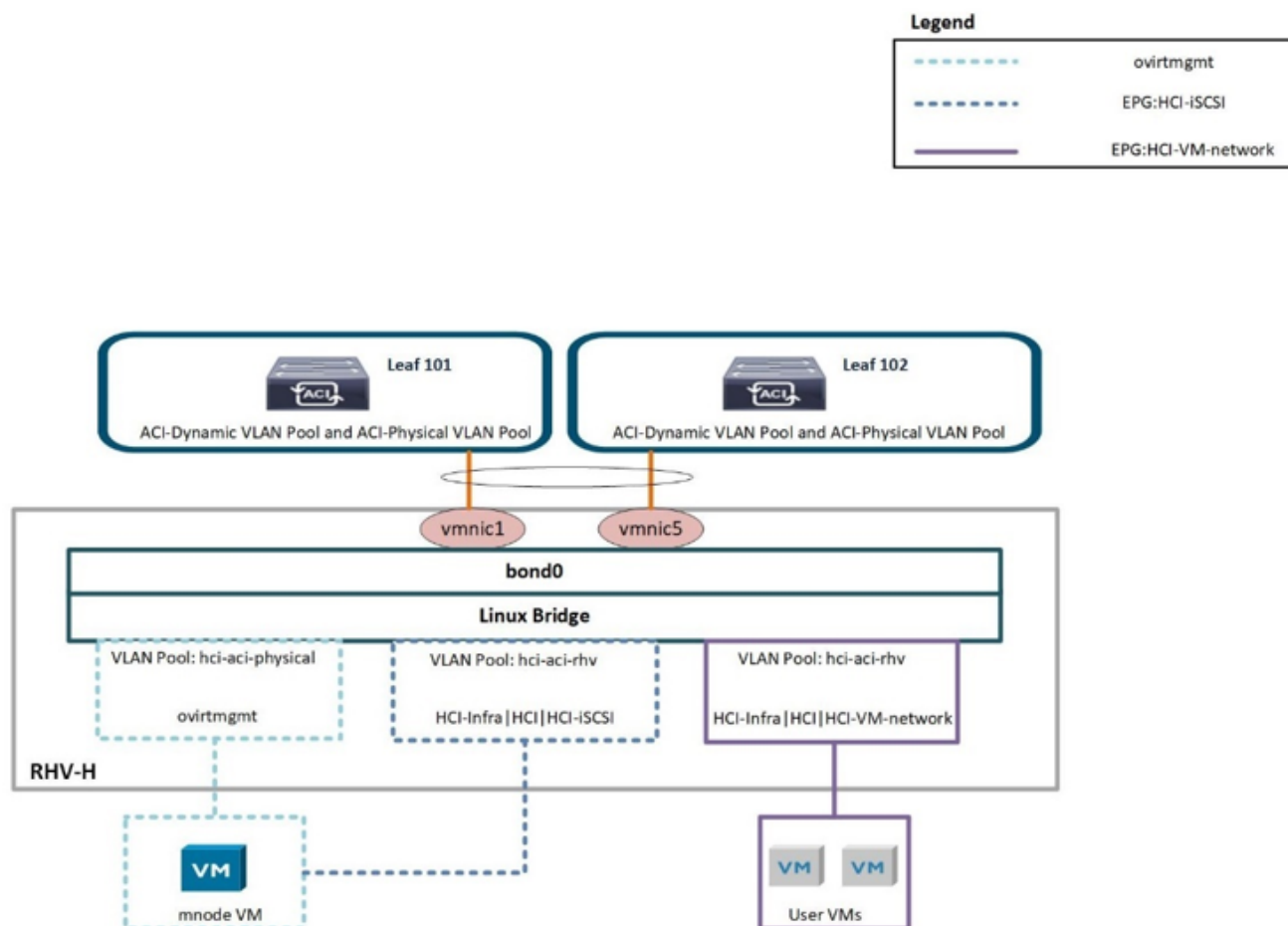
- ☒ Verify connectivity between Host and Engine
- ☒ Save network configuration

OK Cancel

The networking functionality for RHVH hosts in this solution is provided by Linux bridge.

Linux Bridge

Linux Bridge is a default virtual switch on all Linux distributions that is usually used with KVM/QEMU-based hypervisors. It is designated to forward traffic between networks based on MAC addresses and thus is regarded as a layer-2 virtual switch. For more information, see the documentation [here](#). The following figure depicts the internal networking of Linux Bridge on RHV-H (as tested).



The following table outlines the necessary parameters and best practices for configuring and integrating Cisco ACI with Linux Bridge on RHV hosts.

Resource	Configuration considerations	Best Practices
Endpoint groups	<ul style="list-style-type: none"> • Separate EPG for native VLAN • Static binding of interfaces towards HCI storage and compute nodes in native VLAN EPG to be on 802.1P mode • Static binding of vPCs required on In-band management EPG and iSCSI EPG before RHV installation 	<ul style="list-style-type: none"> • Separate VLAN pool for VMM domain with dynamic allocation turned on • Contracts between EPGs to be well defined. Allow only required ports for communication. • Use unique native VLAN for discovery during Element cluster formation • For EPGs corresponding to port-groups being attached to VMkernel ports, VMM domain to be attached with 'Pre-Provision' for Resolution Immediacy
Interface policy	<ul style="list-style-type: none"> • One vPC policy group per RHV-H host • One vPC policy group per NetApp HCI storage node • LLDP enabled, CDP disabled 	<ul style="list-style-type: none"> • Recommended to use vPC towards RHV-H hosts • Use 'LACP Active' for the port-channel policy • Use only 'Graceful Convergence' and 'Symmetric Hashing' control bits for port-channel policy Use 'Layer4 Src-port' load balancing hashing method for port-channel policy Recommended to use vPC with LACP Active port-channel policy for interfaces towards NetApp HCI storage nodes
VMM Integration	<ul style="list-style-type: none"> • Do not migrate host management logical interfaces from ovirtmgmt to any other logical network 	<ul style="list-style-type: none"> • iSCSI host logical interface to be migrated to iSCSI logical network managed by ACI VMM integration



Except for the ovirtmgmt logical network, it is possible to create all other infrastructure logical networks on Cisco APIC and map them to the VMM domain. 'ovirtmgmt' logical network uses the static path binding on the In-band management EPG attached with the physical domain.

Next: KVM on RHEL: NetApp HCI with Cisco ACI

Copyright Information

Copyright © 2021 NetApp, Inc. All rights reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means-graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system-without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP "AS IS" AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

RESTRICTED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.277-7103 (October 1988) and FAR 52-227-19 (June 1987).

Trademark Information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.