



# **KVM on RHEL: NetApp HCI with Cisco ACI**

## **NetApp Solutions**

Kevin Hoke, Dorian Henderson, Nikhil M Kulkarni  
April 06, 2021

This PDF was generated from [https://docs.netapp.com/us-en/netapp-solutions/infra/hcicaci\\_kvm\\_on\\_rhel.html](https://docs.netapp.com/us-en/netapp-solutions/infra/hcicaci_kvm_on_rhel.html) on August 18, 2021. Always check docs.netapp.com for the latest.

# Table of Contents

KVM on RHEL: NetApp HCI with Cisco ACI. ....	1
Workflow. ....	1
Open vSwitch. ....	1

# KVM on RHEL: NetApp HCI with Cisco ACI

KVM (for Kernel-based Virtual Machine) is an open-source full virtualization solution for Linux on x86 hardware such as Intel VT or AMD-V. In other words, KVM lets you turn a Linux machine into a hypervisor that allows the host to run multiple, isolated VMs.

KVM converts any Linux machine into a type-1 (bare-metal) hypervisor. KVM can be implemented on any Linux distribution, but implementing KVM on a supported Linux distribution—like Red Hat Enterprise Linux—expands KVM’s capabilities. You can swap resources among guests, share common libraries, and optimize system performance.

## Workflow

The following high-level workflow was 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 install and configure APIC software on a UCS C-series server. See the Install and Upgrade [documentation](#) for detailed steps.
2. Configure and set up the ACI fabric by referring to the [documentation](#).
3. Configure the tenants, application profiles, bridge domains, and EPGs required for NetApp HCI nodes. NetApp recommends using a 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. Also see this table [<link>](#) for best practices for integrating ACI with Open vSwitch on the RHEL–KVM hypervisor.



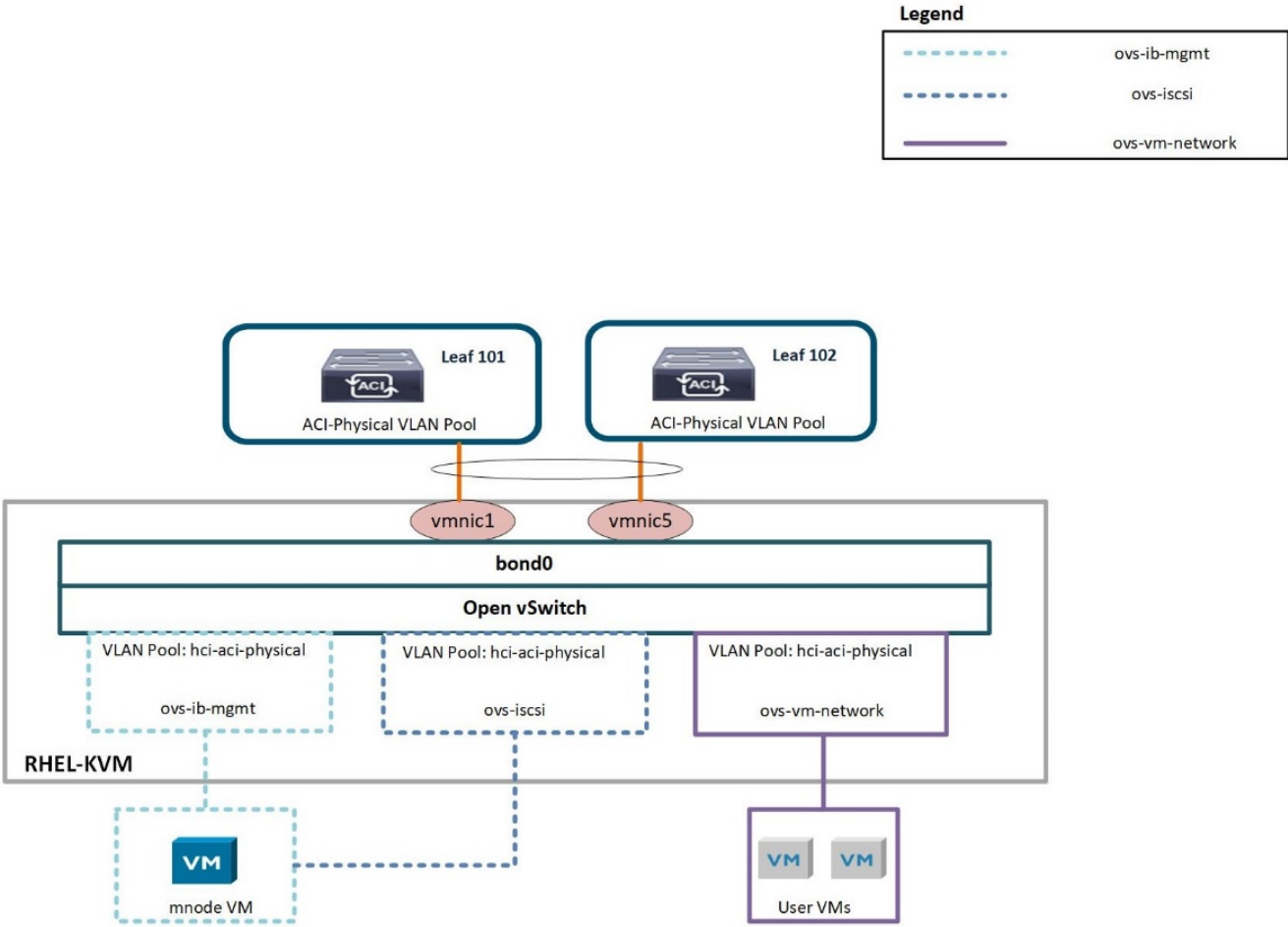
Use a vPC policy group for interfaces connecting to NetApp HCI storage and compute nodes.

5. Create and assign contracts for tightly-controlled access between workloads. For more details on configuring the contracts, see the guide [here](#).
6. Install and configure a NetApp HCI Element cluster. Do not use NDE for this installation; rather, install a standalone Element cluster on HCI storage nodes. Then configure the required volumes for the installation of RHEL. Install RHEL, KVM, and Open vSwitch on the NetApp HCI compute nodes. Configure storage pools on the hypervisor using Element volumes for a shared storage service for hosts and VMs. For more details on installation and configuration of KVM on RHEL, see the [Red Hat documentation](#). See the [OVS documentation](#) for details on configuring Open vSwitch.
7. RHEL KVM hypervisor’s Open vSwitch cannot be VMM integrated with Cisco ACI. Physical domain and static paths must be configured on all required EPGs to allow the required VLANs on the interfaces connecting the ACI leaf switches and RHEL hosts. Also configure the corresponding OVS bridges on RHEL hosts and configure VMs to use those bridges. The networking functionality for the RHEL KVM hosts in this solution is achieved using Open vSwitch virtual switch.

## Open vSwitch

Open vSwitch is an open-source, enterprise-grade virtual switch platform. It uses virtual network bridges and flow rules to forward packets between hosts. Programming flow rules work differently in OVS than in the

standard Linux Bridge. The OVS plugin does not use VLANs to tag traffic. Instead, it programs flow rules on the virtual switches that dictate how traffic should be manipulated before forwarded to the exit interface. Flow rules determine how inbound and outbound traffic should be treated. The following figure depicts the internal networking of Open vSwitch on an RHEL-based KVM host.



The following table outlines the necessary parameters and best practices for configuring Cisco ACI and Open vSwitch on RHEL based KVM hosts.

Resource	Configuration Considerations	Best Practices
Endpoint groups	<ul style="list-style-type: none"><li>• Separate EPG for native VLAN</li><li>• Static binding of interfaces towards HCI storage and compute nodes in native VLAN EPG to be on 802.1P mode</li><li>• Static binding of vPCs required on in-band management EPG and iSCSI EPG before KVM installation</li></ul>	<ul style="list-style-type: none"><li>• Separate VLAN pool for physical domain with static allocation turned on</li><li>• Contracts between EPGs to be well defined. Allow only required ports for communication.</li><li>• Use unique native VLAN for discovery during Element cluster formation</li></ul>

Resource	Configuration Considerations	Best Practices
Interface Policy	<ul style="list-style-type: none"> <li>• One vPC policy group per RHEL host</li> <li>• One vPC policy group per NetApp HCI storage node</li> <li>• LLDP enabled, CDP disabled</li> </ul>	<ul style="list-style-type: none"> <li>• NetApp recommends using vPC towards RHV-H hosts</li> <li>• Use LACP Active for the port-channel policy</li> <li>• Use only Graceful Convergence and Symmetric Hashing control bits for port-channel policy</li> <li>• Use Layer4 Src-Port load-balancing hashing method for port-channel policy</li> <li>• NetApp recommends using vPC with LACP Active port-channel policy for interfaces towards NetApp HCI storage nodes</li> </ul>

Next: [ONTAP on AFF: NetApp HCI and 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.