

# Creating HPE Software-Defined Networks

## H8D01S (00991245)

<b>HPE course number</b>	H8D01S
<b>Course length</b>	4 days
<b>Delivery modes</b>	ILT, VILT
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This course provides an overview of SDN concepts, architecture, and network design elements, as well, as how SDN-enabled applications can dynamically control network behavior and make deploying new solutions more efficient and less time-consuming.

You will learn how SDN is used in networking environments and how SDN separates the control and data plane using OpenFlow as the open standard transport mechanism. SDN “use cases” are utilized to demonstrate how SDN can be used in real-world situations to solve network challenges, and demonstrate the implications that SDN will have on the current and future network designs.

You will learn how to implement the HPE VAN SDN Controller into an existing network by installing, configuring, and licensing the HPE VAN SDN Controller. During the course, you will be installing, configuring, and testing the HPE Network Protector along with the HPE Visualizer SDN Application in the hands-on labs.

### Audience

The Creating HPE Software-Defined Networks course is suitable for all IT professionals who want to build knowledge and skills around SDN. The focus of this course is on designing and implementing Software-Defined Networks.

### Prerequisites

This SDN course is one of the elements of the ASE certification—That requires the ATP or equivalent.

### Course objectives

After completing this course, you should be able to do the following:

- Explain what Software-Defined Networking (SDN) is in broad terms
- Describe campus, datacenter, and cloud SDN solutions
- Describe HPE VAN SDN Controller requirements, architecture, and features
- Integrate Mininet with the HPE VAN SDN Controller
- Explain features and functionality of HPE SDN applications:
  - Network protector SDN application
  - Network visualizer SDN application
  - Network optimizer for Microsoft Lync®
- Explain the OpenFlow protocol
- Use cURL to interact with the Controller REST API
- Configure Controller high-availability

### Exam(s)

HPE2-Z38—Creating HPE Software-Defined Networks

### Certification(s)

HPE ASE—FlexNetwork Architect V2

## Detailed course outline

<b>Module 0: Course introduction</b>	<ul style="list-style-type: none"> <li>• Course overview</li> <li>• Course design</li> <li>• Course objectives</li> <li>• What do you want to learn in this course?</li> </ul>	<ul style="list-style-type: none"> <li>• Course agenda</li> <li>• How about the Labs?</li> <li>• HPE ExpertOne</li> <li>• Augmented reality... What's in it for you?</li> </ul>
<b>Module 1: Software-Defined Networking Introduction</b>	<ul style="list-style-type: none"> <li>• Objectives</li> <li>• Legacy networks</li> <li>• Server virtualization and innovation</li> <li>• A new (virtualized) style of network control</li> <li>• Multiple SDN views</li> <li>• OpenFlow versions</li> <li>• Traditional switching</li> <li>• Flow-based switching</li> <li>• SDN architecture</li> <li>• OpenFlow switch</li> <li>• Proactive versus reactive flows</li> <li>• HPE networking is empowering the Enterprise</li> <li>• Enterprises are moving to a New Style of IT</li> </ul>	<ul style="list-style-type: none"> <li>• Journey to Software-Defined Networking</li> <li>• HPE commitment to Open SDN</li> <li>• Making it easy for customers</li> <li>• Lab activity 1.1: Reset switches and configure initial settings</li> <li>• Lab activity 1.1: Debrief</li> <li>• Lab activity 1.2: Basic switch configuration</li> <li>• Lab activity 1.2: Debrief</li> <li>• Lab activity 1.3: UserVM configuration</li> <li>• Lab activity 1.3: Debrief</li> <li>• Summary</li> <li>• Learning check</li> <li>• Learning check answers</li> </ul>
<b>Module 2: SDN case studies</b>	<ul style="list-style-type: none"> <li>• Objectives</li> <li>• HPE SDN app store</li> <li>• HPE SDN ecosystem</li> <li>• App store circles</li> <li>• OpenDayLight (ODL)</li> <li>• HPE applications</li> <li>• HPE network protector SDN application</li> <li>• Dashboard</li> <li>• HPE network optimizer SDN application</li> <li>• HPE network optimizer SDN application</li> <li>• HPE network optimizer-Dashboard</li> <li>• Current troubleshooting tools challenges</li> <li>• HPE network visualizer benefits</li> <li>• Bluecat DNS director</li> <li>• Kemp LoadMaster</li> </ul>	<ul style="list-style-type: none"> <li>• HPE SDN case studies</li> <li>• Lab activity 2.1: RFI</li> <li>• Lab activity 2.2: Case studies</li> <li>• What is NFV?</li> <li>• SDN in the data center and cloud</li> <li>• HPE-VMware networking solution</li> <li>• VMware NSX</li> <li>• Integration and communication</li> <li>• HPE Virtual Cloud Networking (VCN)</li> <li>• HPE VCN components</li> <li>• HPE Helion OpenStack and CloudSystem</li> <li>• HPE Distributed Cloud Networking (DCN)</li> <li>• HPE Distributed Cloud Networking (DCN) (continued)</li> <li>• DCN: Solving the following table stakes</li> <li>• Summary</li> </ul>
<b>Module 3: HPE VAN SDN Controller overview</b>	<ul style="list-style-type: none"> <li>• Objectives</li> <li>• Overview of the HPE VAN SDN Controller</li> <li>• HPE VAN SDN Controller documentation</li> <li>• Lab activity 3.1: Support Matrix</li> <li>• Lab activity 3.1: Debrief</li> <li>• Lab 3.1: Review activity</li> <li>• Controller modes</li> <li>• Controller authentication</li> <li>• New install with a local Keystone server</li> <li>• 1—Installing the Keystone server</li> <li>• 1—Installing the Keystone server (continued)</li> <li>• 2—Unpacking the controller software</li> <li>• 2—Verifying hardware requirements</li> <li>• 2—Override hardware check</li> <li>• 3—Install controller and verify</li> <li>• 3—Install controller and verify (continued)</li> <li>• 4—Configure a user-local Keystone server</li> </ul>	<ul style="list-style-type: none"> <li>• 5—Verifying the NTP configuration</li> <li>• Lab activity 3.2, 3.3, and 3.4</li> <li>• Lab activity 3.2, 3.3, 3.4: Debrief</li> <li>• Labs 3.2, 3.3, and 3.4: Review activity</li> <li>• Mininet overview</li> <li>• Linear topology</li> <li>• Mininet ping</li> <li>• Linear topology result</li> <li>• Easy to read MAC addresses</li> <li>• Mininet options</li> <li>• Lab activity 3.5: Mininet lab</li> <li>• Lab activity 3.5: Debrief</li> <li>• Labs 3.5: Review activity</li> <li>• Installing a new application via the app store</li> <li>• Installing a new application (continued)</li> <li>• Installing a new application (continued)</li> <li>• Installing a new application (continued)</li> </ul>

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- Installing a new application—Local install
  - Lab activity 3.6: SDN application installation
  - Lab activity 3.6: Debrief
  - Labs 3.6: Review activity
  - Lab activity 3.7: Debrief
  - ProVision—OpenFlow configuration
  - Comware—OpenFlow configuration
  - Lab activity 3.8: Adding flows
  - Lab activity 3.8: Debrief
  - Labs 3.8: Review activity
  - Lab activity 3.8: Debrief
  - Summary
  - Learning check
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**Module 4: HPE Network Protector SDN application**

- Objectives
  - Overview
  - HPE TippingPoint reputation DV service
  - Service insertion tunnels
  - Installation
  - Lab activity 4.1: Network Protector installation
  - Lab activity 4.1: Debrief
  - Lab 4.1: Review activity
  - Lab 4.1: Review activity (continued)
  - Lab 4.1: Review activity (continued)
  - HPE VAN SDN Controller licenses
  - HPE Network Protector SDN licenses
  - HPE Network Protector URLs
  - Network Protector Setup Wizard
  - Network Protector Setup Wizard (continued)
  - Network Protector Setup Wizard (continued)
  - Lab Activity 4.2: Controller and application licensing
  - Lab Activity 4.2 Debrief
  - Activity 4.2.1: How many licenses are required?
  - Activity 4.2.2: How many licenses are required? (continued)
  - Activity 4.2.3: How many licenses are required? (continued)
  - Activity 4.2.4: Lab review
  - Switch configuration
  - Switch configuration (continued)
  - Network protector console
  - Device status panel
  - Integration
  - VLAN status
  - Lab activity 4.3: Network protector integration
  - Lab activity 4.3: Debrief
  - Lab 4.3: Lab review activity
  - Redirection server
  - Redirection server (continued)
  - Redirection server (continued)
  - Lab activity 4.4: Redirection server
  - Lab activity 4.4: Debrief
  - Lab 4.4: Review activity
  - Groups
  - Custom Blacklists
  - Lab activity 4.5: Network protector groups and custom Blacklist
  - Lab activity 4.5: Debrief
  - Lab 4.5: Review activity
  - Greylists
  - Lab activity 4.6: Basic network protector custom Greylist
  - Lab activity 4.6: Debrief
  - Lab 4.6: Review activity
  - Custom Whitelists
  - Lab Activity 4.7: Network protector custom Whitelist
  - Lab activity 4.7: Debrief
  - Lab 4.7: Review activity
  - Quality of Service
  - Quality of Service (continued)
  - Lab activity 4.8: Quality of Service
  - Lab activity 4.8: Debrief
  - ACL manager
  - ACL manager (continued)
  - Lab activity 4.9: ACL manager
  - Lab activity 4.9: Debrief
  - Lab activity 4.10: Private VLAN example
  - Lab activity 4.10: Debrief
  - Labs 4.9 and 4.10: Review activity
  - Summary
  - Learning check
  - Learning check answers
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**Module 5: HPE Network Visualizer SDN application**

- Objectives
- HPE Network Visualizer SDN app–visibility
- HPE Network Visualizer key features
- Installation
- Lab activity 5.1: Network Visualizer installation
- Lab activity 5.1: Debrief
- Lab 5.1: Review activity
- SNMP
- Switch configuration
- Switch configuration (continued)
- Capture destinations
- Custom mode capture
- Custom mode capture (continued)
- Custom mode capture (continued)
- Custom mode capture (continued)
- Session monitor
- Real-time traffic
- Network Visualizer dashboard
- Lab activity 5.2: Network Visualizer physical switch integration
- Lab activity 5.2: Debrief
- Open vSwitch
- Lab activity 5.3: Start two capture sessions simultaneously
- Lab activity 5.3: Debrief
- Active directory integration
- Users
- Capture session—User mode
- Capture session—User mode (continued)
- Anonymity mode
- Summary
- Learning check
- Learning check answers

**Module 6: OpenFlow Deep Dive**

- Objectives
- Open networking foundation
- Main components of an OpenFlow switch
- OpenFlow channel
- OpenFlow ports
- OpenFlow messages
- Symmetric OpenFlow messages
- Lab activity 6.1: OpenFlow Deep Dive part 1
- Lab activity 6.1: Debrief
- Lab 6.1: Review activity
- OpenFlow channel
- OpenFlow messages—Controller to switch
- OpenFlow messages—Controller to switch (continued)
- Messages—Asynchronous
- Multiple table pipeline processing
- Pipeline processing for flow tables
- Multiple tables
- Instructions
- Lab activity 6.2: OpenFlow Deep Dive part 2
- Lab activity 6.2: Debrief
- Lab 6.2: Review activity
- Lab 6.2: Review activity (continued)
- Auxiliary connections
- Spanning Tree and OpenFlow
- Spanning Tree and OpenFlow (continued)
- Lab activity 6.3: OpenFlow Deep Dive part 3
- Lab activity 6.3: Debrief
- ProVision configuration
- ProVision output
- Controller view: LAG links
- Optional lab activity 6.4: Link aggregation
- Lab activity 6.4: Debrief
- OpenFlow channel
- OpenFlow link discovery
- OpenFlow link discovery (continued)
- OpenFlow link discovery (continued)
- OpenFlow link discovery (continued)
- Lab activity 6.5: Link and node discovery using OpenFlow
- Lab activity 6.5: Debrief
- Group action and group table
- Creating multiple abstract distribution Trees
- Forwarding on redundant paths (load-balancing)
- Forwarding on redundant paths (active/standby)
- Abstracting a port
- Summary

## Course data sheet

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### Module 7: REST API

- Objectives
- HPE VAN SDN Controller APIs
- Why you need to use the REST API
- RESTful application program interface (API)
- SDN Controller REST API security
- RSDoc discovery
- RSDoc discovery—Datapaths
- RSDoc discovery—Authentication
- Retrieve token via RSDoc
- Retrieve token via RSDoc (continued)
- Paste token and click explore
- REST API call successful
- REST API response
- REST API authentication
- Example: Retrieving token via cURL
- Use cURL to query Controller REST API
- Activity: cURL commands
- Lab activity 7: REST API
- Lab activity 7: Debrief
- Lab 7: Review activity
- Summary
- Learning check
- Learning check answers

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### Module 8: High-availability

- Objectives
- Standalone Controller
- Lab activity 8.1: Test result of a single controller failure
- Lab activity 8.1: Debrief
- Lab 8.1: Review activity
- Controller High-availability
- Team leader
- Controller fault tolerance
- Controller fault tolerance (continued)
- Controller status
- Team creation process
- REST API authentication
- Team configuration
- View team
- Controller team information
- Lab activity 8.2: Create a team of HPE VAN SDN Controllers
- Lab activity 8.2: Debrief
- Lab 8.2: Review activity
- Regions
- REST API authentication
- Region configuration
- View regions
- Comware configuration
- ProVision configuration
- View owners
- Lab Activity 8.3: Integrate HPE switches with a team of HPE Controllers
- Lab Activity 8.3: Debrief
- Lab 8.3 Review activity
- Lab 8.3 Review activity (continued)
- Summary
- Learning check
- Learning check answers

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## Appendix A—VideosA-1

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