

MEF – SDN/NFV

Duration: 3 Days (24 HRS)

Note: This course is designed with a vendor-neutral approach, however, for better understanding, we will demonstrate key concepts using Cisco platforms and tools such as routers, switches, and the APIC controller.

Outline

Module 1: SDN Put Simply

1.1 Defining SDN By the Book

- Traditional Networking Made Easy
- The Problem with Tradition
- Key Business Drivers towards SDN for SD-WAN
- 1990s – SDN Early Beginnings
- Control and Data Plane Separation: 2001 to 2007
- OpenFlow API and NOS: 2007 to Present
- Nicira and VMware 2012

1.2 Governing Bodies

- ONF: Open Networking Foundation
- ODL: OpenDaylight
- Open vSwitch and Mininet
- OpenStack and Neutron
- MEF: Metro Ethernet Forum

Module 2: SDN Controllers

2.1 SDN Controller Core Capabilities

- Rich Southbound Support
- Extensible API Support for Northbound Traffic
- Programmability and Network Abstraction
- Centralized Monitoring and Visualization
- Reliability and Scalability with Clustering Using ZooKeeper
- Security

2.2 VMware and the Big Three Network Equipment Manufacturers

- VMware: NSX
- VMware: VXLAN Protocol
- VMware: Nicira
- Cisco ACI
- Cisco APIC
- Cisco Application Network Profile structure
- Cisco: OpFlex versus OpenFlow
- Juniper: Contrail, OpenContrail, Junos Fusion, and NorthStar
- HPE VAN SDN Controller

2.3 Other Controllers in the Market

Module 3: Controller ODL Releases

3.1 OpenDayLight Release History

- Fluorine
- Fluorine Architecture Diagram
- Beryllium

3.2 Controller Architecture

- Beryllium Architecture Diagram
- Northbound Facing

- Southbound Facing
- Controller and Clustering East-West
- Service Abstraction Layer (SAL)
- Karaf (Apache)
- Java and Maven (Apache)
- OSGi as a Java Platform

3.3 Feature Support Overview

- Authentication, Authorization and Accounting (AAA)
- Control and Provisioning of Wireless Access Points (CAPWAP)
- DLUX
- L2 Switch
- NETCONF
- BGP-PCEP with BMP
- OpFlex
- Service Function Chaining (SFC)
- Clustering and Shards

Module 4: Southbound OpenFlow

4.1 Traditional Legacy Switching

- Switching 101
- How do legacy switches communicate head-end to tail-end?

4.2 How does running OpenFlow change things?

- OpenFlow Pipeline
- Hybrid or Pure?
- Reactive and Proactive Flows
- What OpenFlow is and what it is not

- Bring your own application
- Super-sizing your controller with remote proactive flows
- The OpenFlow abstraction principle

4.3 ONF and OpenFlow

- Initial OpenFlow 1.0 Implementation
- OpenFlow 1.0 Tables and Flow entries
- Matching and Actions
- Securing the channel
- OpenFlow 1.3 Specification
- OpenFlow 1.3 new Actions and Instructions
- OpenFlow ports
- OpenFlow 1.3 Pipeline
- Group Types and Buckets
- Additional Flow Matching Features Supported

Module 5: Northbound REST APIs

5.1 Northbound RESTCONF service

- GET in action
- PUT in action

5.2 NETCONF and YANG: Yet Another Next Generation

- Yang-UI toolbox module in ODL
- Yang Visualizer

5.3 Postman

- Postman collections and folders
- Headers and variables

5.4 cURL

- cURL in action
- Objectives

Module 6: In this Module, students will discuss:

6.1 Service Chaining

- SFC-UI Web Interface
- SFC – CLI
- SFC-OVS Support
- OpenFlow Classifier
- SFC OpenFlow Renderer
- SFC-OVS Topology
- SFC Scheduling Algorithms
- Sample JSON for Scheduling
- Requirements for SFC OF Renderer in Karaf

6.2 Scaling Controllers through Clustering

- Clustering Setup Steps
- To enable the clustering service in Karaf:
- Steps to enable a Multiple Node Cluster
- Validate set up
- Define seed nodes

Module 7: MEF SD-WAN Design and Review

7.1 SD-WAN Need to Know Terminology

- NFVI
- VNF and EMS
- NFV-MANO or Management and Orchestration

- OSS/BSS and NSD

7.2 MEF defined SD-WAN Service

- SD-WAN Edge
- SD-WAN Gateway
- SD-WAN Controller
- SDN Service Orchestrator
- Subscriber Interface (Web Portal)

7.3 SD-WAN Overlays

- Hybrid SD-WAN over a single ISP
- SD-WAN service tunneled over multiple ISPs
- SD-WAN from CPE to vCPE
- SD-WAN Service with SD-WAN Edge VNF in the Cloud
- SD-WAN with MPLS VPN