

Fundamentals of OpenStack® Technology H6C68S

HPE course number	H6C68S
Course length	3 days
Delivery mode	ILT, vILT
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This three-day course assists administrators and users to configure, manage, and use the OpenStack® cloud services platform. An architectural overview ensures understanding of various OpenStack® projects and their functions. Hands-on labs provide configuration and operation experience with major aspects of the OpenStack® environment. Course content and labs are based on the OpenStack Newton release.

Why HPE Education Services?

- IDC MarketScape leader 4 years running for IT education and training*
- Recognized by IDC for leading with global coverage, unmatched technical expertise, and targeted education consulting services*
- Key partnerships with industry leaders OpenStack®, VMware®, Linux®, Microsoft®, ITIL®, PMI, CSA, and (ISC)²
- Complete continuum of training delivery options—self-paced eLearning, custom education consulting, traditional classroom, video on-demand instruction, live virtual instructor-led with hands-on lab, dedicated onsite training
- Simplified purchase option with HPE Training Credits

*Realize Technology Value with Training, IDC Infographic 2037, Sponsored by HPE, January 2016

Audience

System Administrators, engineers and consultants who will plan and manage OpenStack-based environments.

Certifications and Related Examinations

- EXIN Foundation Certificate in OpenStack Software

Prerequisites

HPE recommends that students have attained the following credentials or levels of experience before taking this course:

- Completion of Linux Fundamentals ([U8583S](#))
- Completion of Linux for Unix Administrators ([U2794S](#))
- Cloud Computing Overview WBT ([HK917AAE](#))

Benefits to you

- Gain the ability to configure, administer,

and use an OpenStack® environment

- Understand the architecture of the various OpenStack® projects and how they fit together in a solution

Course Objectives

Provide the information and; through labs, the experience necessary for the student to be able to:

- Describe the primary purpose of OpenStack
- Describe the major features of OpenStack
- Discuss how HPE is involved in the OpenStack project
- List the primary components of the OpenStack architecture and their function
- Describe what the core services of OpenStack are and what is meant by OpenStack's big tent
- Access the OpenStack endpoint services from the CLI, a REST client, the cURL, and the dashboard UI

- Configure and use OpenStack to deploy compute instances
- Use the primary features of the core

OpenStack Services

- Discuss other OpenStack projects that exist under OpenStack's big tent

Detailed Course Outline

Module 1: Fundamentals of OpenStack Technology – Course Overview	<ul style="list-style-type: none"> • Course objectives • Audience 	<ul style="list-style-type: none"> • Course Agenda – by day
Module 2: Introduction to OpenStack	<ul style="list-style-type: none"> • Defining Cloud Computing • Openstack Overview <ul style="list-style-type: none"> – Functionality – Benefits – Organizational structure – Release History – Documentation – HPE and the cloud – HPE history in open source – HPE cloud service portfolio – HPE Helion-related products – HPE and OpenStack • OpenStack Architecture <ul style="list-style-type: none"> – Openstack Projects – Conceptual Architecture – Inter-Service Communications 	<ul style="list-style-type: none"> – High-level architecture – OpenStack Big Tent and Core Services – OpenStack Project Adoption, Maturity, Age • OpenStack Service APIs <ul style="list-style-type: none"> – Intercommunication between OpenStack Services – OpenStack Service API Versioning – REST API Microversion Support – API Reference Materials • OpenStack Installation and Configuration <ul style="list-style-type: none"> – Configuration Options – Primary types of OpenStack installations – Development Environment - DevStack – Scripted installation process – Manually installing an OpenStack sandbox – OpenStack Installation and Configuration documentation • Lab Exercises
Module 3: OpenStack Management Tools	<ul style="list-style-type: none"> • Overview of OpenStack Management Tools <ul style="list-style-type: none"> – OpenStack RESTful API (Application Programming Interface) Access Methods – REST Client Browser-Based UI Plug-ins – Using cURL for OpenStack API Requests – OpenStack CLI client – OpenStackClient (aka OSC) – OpenStack Horizon (dashboard) 	<ul style="list-style-type: none"> – Using Python to invoke an OpenStack API • Lab Exercises <ul style="list-style-type: none"> – Exercise 1: Exploring OpenStack CLI commands – Exercise 2: Using a REST client browser plugin to generate API requests to OpenStack Services – Exercise 3: Using cURL to send request to OpenStack through an API – Exercise 4: Managing OpenStack from the Horizon GUI
Module 4: Keystone – OpenStack Identity Service	<ul style="list-style-type: none"> • OpenStack Keystone (identity) Overview <ul style="list-style-type: none"> – Keystone Functionality – Keystone API Version States – as of the Newton Release – Keystone identity and service management – Keystone use cases – Keystone Identity (Authentication/Authorization) Process – Keystone Identity-related objects – Keystone Identity-related object Relationships – Hierarchal multitenancy – Additional Keystone terminology – Keystone Support for Federated Identity – Keystone-specific Reference Resources • Identity service architecture <ul style="list-style-type: none"> – Internal components of the Identity service – Keystone backend services 	<ul style="list-style-type: none"> • Common Keystone management tasks <ul style="list-style-type: none"> – Managing projects with the CLI client – Managing users with the CLI client – Creating a role, project, user, and adding project user to role – Managing the service catalog with the CLI client – Keystone Identity in the Horizon UI – Setting user policies in OpenStack – Keystone configuration files • Keystone Troubleshooting • Lab Exercises <ul style="list-style-type: none"> – Exercise 1: Keynote Identity Functionality – Exercise 2: Horizon (Dashboard) Identity Functionality – Exercise 3: OpenStack Service Catalog and API Access • Exercise 4: Identity API v3

Module 5: Glance – OpenStack Image Repository

- Glance Overview
 - Glance Functionality
 - Example Glance Use Case
 - Glance API version States – as of the Newton Release
 - Glance architecture
 - Glance-supported backend stores
 - Glance disk and container formats
- Glance images
 - Pre-built images for OpenStack
 - Custom OpenStack images
 - Handling custom Glance images
 - Cloud-init
- Public tools for image creation
- Common Glance management tasks
 - Glance-related configuration files
 - Common Glance-related CLI commands
 - Using the CLI to load an image in Glance
 - Image caching
 - Glance operations using Horizon
- Troubleshooting Glance
- Lab Exercises
 - Exercise 1: Glance from the CLI
 - Exercise 2: Creating a Glance Image from the Horizon UI

Module 6: Neutron – OpenStack Networking Service

- Virtual Networking Concepts
 - Hosting Device Virtual Machines, and Bare Metal Machines
 - Virtual L2 (Layer 2) Switch
 - VLANs (Virtual Local Area Network)
 - Virtual Overlay Networks
 - Floating IP Address
 - Virtual Networking Terminology
- Neutron Overview
 - Nova Networking vs Neutron
 - Comparing the Nova networking function to Neutron
 - OpenStack Neutron - Enterprise-class NaaS (Networking as a Service)
 - Neutron Features and Functions
 - Neutron Concepts
 - Neutron API version States – as of the Newton Release
 - Neutron API Network Resources
 - Neutron Networking Terminology
- Neutron Architecture
 - Neutron components
- OpenStack Nodes with Neutron Components
- OpenStack Node Networks
- Network Topologies - Single Flat and Private Network
- Neutron Topology – Using routers to separate Project Networks
- Neutron Virtual Networks
- Example Neutron GRE Overlay Network
- Neutron DVR (Distributed Virtual Router)
- Neutron L3 in HA Configuration
- Common Neutron Management Tasks
 - Common CLI management tasks
 - Neutron in Horizon – Network Topology
 - Neutron in Horizon – Networks & Routers
- Troubleshooting Neutron
- Lab Exercises
 - Exercise 1: Using the CLI to view the current network parameters
 - Exercise 2: Using the Horizon UI to view the network parameters for the demo project
 - Exercise 3: Using the Horizon UI to create and configure a simple flat network

Module 7: Nova – OpenStack Compute

- Nova Overview
 - Nova Features and Functions
 - Nova Design Guidelines
 - Nova (Compute) API version States – as of the Newton Release
 - API Microversioning
 - Common Nova terminology
- Nova architecture
 - Nova System Architecture
 - Nova supported hypervisors
 - VM Instance creation process
- Compartmentalizing OpenStack Deployments
 - Segregating a cloud implementation
 - Regions, Availability Zones, and Ho
 - Cells – API Cell, Child Cells, Grandchild Cellsst Aggregates
 - Example regional architecture
- Managing Security Groups from the Horizon UI
- Assigning a Floating IP Address to an Instance
- Connecting to an instance
- Managing Instances from the Horizon UI
- Nova Scheduler
 - Nova Scheduler overview
 - nova-scheduler scheduling algorithms
 - Filter Scheduler - Filters and Weights
 - Default nova-scheduler configuration
 - nova-scheduler filters
 - nova-scheduler weights
- Nova Maintenance
 - Planned compute node maintenance
 - Inspecting and recovering data from failed instances
- Nova Troubleshooting

	<ul style="list-style-type: none"> • Common Nova Management Tasks <ul style="list-style-type: none"> – Nova configuration files – Gathering Information Required to create an Instance – Creating an Instance from the CLI – Verify Instance was created properly – Inserting instance-specific data – Creating an instance using the Horizon UI – Viewing instance details in the Horizon UI 	<ul style="list-style-type: none"> • Lab Exercises <ul style="list-style-type: none"> – Exercise 1: Verify the required nova services are enabled and happy – Exercise 2: Create an Instance from the Horizon GUI – Exercise 3: Accessing an Instance from an external network – Exercise 4: Pausing and Suspending the VM – Exercise 5: Creating a Snapshot
Module 8: Cinder – OpenStack Block Storage	<ul style="list-style-type: none"> • Cinder Overview <ul style="list-style-type: none"> – OpenStack storage overview – Comparison between the OpenStack storage technologies – OpenStack block storage (Cinder) – Block Storage Use Cases – Cinder Storage Terms – OpenStack Block Storage (aka Cinder) Drivers – Block Storage (Cinder) API version States – as of the Newton Release • Cinder architecture <ul style="list-style-type: none"> – Cinder Architectural Components – Cinder Volume Creation Workflow • Common Cinder Management Tasks <ul style="list-style-type: none"> – Viewing the status of cinder services 	<ul style="list-style-type: none"> – Creating volumes – Attach a volume to an existing instance – Cinder snapshots and backups – Creating consistent snapshots – Snapshot operations – Creating a bootable volume – Cinder types – Cinder Volumes in the Horizon UI • Troubleshooting Cinder • Lab Exercises <ul style="list-style-type: none"> – Exercise 1: Creating a Stack Volume from the CLI – Exercise 2: Creating a bootable Cinder volume – Exercise 3: Using Horizon to manage Cinder Volumes
Module 9: Swift – Object Storage Service	<ul style="list-style-type: none"> • Swift Overview <ul style="list-style-type: none"> – Object Storage – Swift Functions & Features – Swift account, container, and object features – Object Storage (Swift) API version States – as of the Newton Release • Swift Architecture <ul style="list-style-type: none"> – Swift Architectural Components – Swift Ring – Modified Consistent Hashing Ring – Swift Ring Partition – Example Swift Ring lookup – Swift Object Addressing – Swift regions and zones – Swift Storage Policies 	<ul style="list-style-type: none"> – Swift Consistency Processes – Example Object PUT Request Flow – Example Object GET Request Flow – Adding storage in a ring • Common Swift Management tasks <ul style="list-style-type: none"> – CRUD (Create, Read, Update, Delete) operations – Example API PUT of an object – Swift from the Horizon UI – Troubleshooting Swift • Lab Exercises <ul style="list-style-type: none"> – Exercise 1: Using the OpenStack Object Storage Service – Exercise 2: Exploring the Swift Configuration – Exercise 3: Examine Glance Images Stored in Swift

Course data sheet

Module 10: Heat – OpenStack Orchestration

- Heat Overview
 - Heat Functionality
 - Heat terminology
 - Heat components
 - How a Heat template works
 - HOT (Heat Orchestration Template)
 - Heat template components
 - Example Heat template format
 - Heat stack
 - Orchestration (Heat) API version States – as of the Newton Release
- Common Heat management tasks
 - Obtaining values required for the Heat template
 - Launching a stack from the command line
 - Viewing Stack Details from the CLI
- Launching a stack from the Horizon UI
- Viewing Stack Details from the Horizon UI
- Troubleshooting Heat
- Lab Exercises
 - Exercise 1: Configuring OpenStack for Heat
 - Exercise 2: Heat basic template example
 - Exercise 3: Viewing the status of Stack from Horizon
 - Exercise 4: Template Input Parameters
 - Exercise 5: Improving Templates
 - Exercise 6: Providing parameters to heat command line
 - Exercise 7: Providing template outputs
 - Exercise 8: Complex Template Deployment
 - Exercise 9: Cleanup

Module 11: Ceilometer – Openstack Telemetry Service

- Ceilometer Overview
 - Ceilometer Functionality
 - Common Ceilometer Use Cases
 - Ceilometer metering
 - Ceilometer Terminology
 - Telemetry (Ceilometer) API version States – as of the Newton Release
- Ceilometer Architecture
 - Ceilometer Architectural Components
 - Processing the Ceilometer data
- Ceilometer Data Collection
- Transforming the Ceilometer Data
- Publishing the Ceilometer Data
- Storing the Ceilometer Data
- Ceilometer alarms (Aodh)
- Common Ceilometer management tasks
- Ceilometer Troubleshooting
- Lab Exercises
 - Exercise 1: Ceilometer Overview

Module 12: Other OpenStack Projects

- CloudKitty (Charing and Billing service)
- Barbican (Key Management)
- Designate (DNS-as-a-Service)
- Freezer (Backup a s a Service)
- Fuel (Environment provisioning service)
- Ironic (Bare metal provisioning)
- Magnum (Container virtualization)
- Manila (Shared File System)
- Sahara (Data Processing)
- Trove (Database-as-a-Service)
- Zaqr (Multi-project cloud messaging)

Module 13: OpenStack Deployment Planning

- OpenStack Deployment Considerations
 - HPE Cloud Offerings
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