

# Fundamentals of OpenStack® Technology H6C68S

<b>HPE course number</b>	H6C68S
<b>Course length</b>	3 days
<b>Delivery mode</b>	ILT, VILT
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This course teaches 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 operations experience with major aspects of the OpenStack environment. Course content and labs are based on the OpenStack Stein release.

## Why HPE Education Services?

- IDC MarketScape leader 5 years running for IT education and training\*
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## Audience

System administrators, engineers and consultants who plan and manage OpenStack-based environments

## Prerequisites

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

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

## Course objectives

After completing this course, students should be able to:

- Describe the purpose and features of OpenStack
- Describe its high level architecture and list its major components
- Describe methods of access to OpenStack services
- Manage identities in an OpenStack cloud
- Launch and manage instances
- Create and manage images, volumes, networks and object store objects
- Create, launch and monitor simple autoscaling stacks

## Certifications and related examinations

EXIN Foundation Certificate in OpenStack Software (additional study and preparation may be required to pass the exam)

## Detailed course outline

<b>Module 1: OpenStack Technology Overview</b>	<ul style="list-style-type: none"> <li>• What is a cloud; What is OpenStack</li> <li>• OpenStack architecture</li> </ul>	<ul style="list-style-type: none"> <li>• OpenStack installation</li> <li>• Your lab system</li> </ul>
<b>Module 2: Accessing OpenStack</b>	<ul style="list-style-type: none"> <li>• OpenStack API, endpoints and WSGI</li> <li>• Authentication and tokens</li> </ul>	<ul style="list-style-type: none"> <li>• The OpenStack command line and dashboard</li> </ul>
<b>Module 3: Keystone (Identity)</b>	<ul style="list-style-type: none"> <li>• Keystone concepts</li> <li>• Keystone API versions</li> </ul>	<ul style="list-style-type: none"> <li>• Keystone command line</li> <li>• Authentication, authorization and policies</li> </ul>
<b>Module 4: Nova (Servers)</b>	<ul style="list-style-type: none"> <li>• Nova concepts <ul style="list-style-type: none"> <li>– How a user sees Nova instances</li> </ul> </li> <li>– Instances, keypairs, console, IP addresses, security groups, instance-specific data</li> <li>• Launch instances and make them available on the network</li> <li>• Customize instance with user data</li> <li>• Nova implementation <ul style="list-style-type: none"> <li>– Nova microversions</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Nova architecture</li> <li>– What happens when an instance is launched</li> <li>– Nova scheduler and placement service</li> <li>• Managing compute nodes <ul style="list-style-type: none"> <li>– Overview</li> <li>– Cells</li> <li>– Aggregates and availability zones</li> </ul> </li> <li>• Nova troubleshooting</li> </ul>
<b>Module 5: Glance (Images)</b>	<ul style="list-style-type: none"> <li>• Glance concepts <ul style="list-style-type: none"> <li>– Where to get images</li> <li>– Disk and container formats</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Uploading images</li> <li>– Glance backends</li> </ul>
<b>Module 6: Neutron (Networks)</b>	<ul style="list-style-type: none"> <li>• Neutron resource abstractions <ul style="list-style-type: none"> <li>– Networks, subnets, ports, routers</li> <li>– Provider networks, external networks, tenant networks</li> <li>– Floating IPs and address translation</li> </ul> </li> <li>• Network implementation</li> </ul>	<ul style="list-style-type: none"> <li>– Network separation and access</li> <li>– Routing</li> <li>– Plugins and agents</li> <li>– The ML2 plugin</li> <li>• Command examples</li> </ul>
<b>Module 7: Cinder (Block Storage – LUNs)</b>	<ul style="list-style-type: none"> <li>• Basic concepts and commands <ul style="list-style-type: none"> <li>– OpenStack storage overview</li> <li>– What cloud operators and users want from storage</li> <li>– Storage drivers</li> <li>– Creating, deleting, attaching, detaching, listing volumes</li> <li>– Using volumes as boot disks</li> <li>– Multi-attach</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Cinder implementation</li> <li>• Advanced concepts <ul style="list-style-type: none"> <li>– Backends, volume types and extra specs</li> <li>– Snapshots</li> <li>– Backups</li> </ul> </li> <li>• HPE storage and Cinder</li> </ul>
<b>Module 8: Swift (Object Storage)</b>	<ul style="list-style-type: none"> <li>• Swift concepts <ul style="list-style-type: none"> <li>– Why object storage</li> <li>– Accounts, containers, objects</li> <li>– Replication</li> </ul> </li> <li>• Using Swift <ul style="list-style-type: none"> <li>– Uploading and downloading objects</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Other commands</li> <li>– Access control</li> <li>– TempURL</li> <li>– Large objects</li> <li>• Swift architecture</li> </ul>
<b>Module 9: Ceilometer (Metering) and Heat (Orchestration)</b>	<ul style="list-style-type: none"> <li>• Ceilometer and the Telemetry family <ul style="list-style-type: none"> <li>– Telemetry architecture and dataflow</li> <li>– Ceilometer sampling and publishing to Gnocchi</li> <li>– Alarms</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Heat: orchestrating a cloud application <ul style="list-style-type: none"> <li>– Templates and stacks</li> <li>– Heat architecture</li> <li>– Example template</li> <li>– Heat and autoscaling</li> <li>– Launching and viewing a stack</li> </ul> </li> </ul>

## Detailed lab outline

<b>Lab 1: OpenStack Overview</b>	<ul style="list-style-type: none"> <li>• Lab 1a: Access and setting up your lab environment</li> </ul>	<ul style="list-style-type: none"> <li>• Lab 1b: Obtaining OpenStack documentation</li> </ul>
<b>Lab 2: Accessing OpenStack</b>	<ul style="list-style-type: none"> <li>• Lab 2a: The dashboard</li> <li>• Lab 2b: Discovery</li> <li>• Lab 2c: The command line</li> </ul>	<ul style="list-style-type: none"> <li>– Task 1: Command-line completion</li> <li>– Task 2: A few CLI commands</li> <li>• Lab 2d: The OpenStack shell</li> </ul>
<b>Lab 3: Keystone</b>	<ul style="list-style-type: none"> <li>• Lab 3a: Keystone configuration</li> <li>• Lab 3b: Keystone access using the command line               <ul style="list-style-type: none"> <li>– Task 1: Explore Keystone endpoints and API versions</li> <li>– Task 2: List identity resources and explore their details</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Task 3: Create domains and projects</li> <li>– Task 4: Explore roles and associated privilege</li> <li>– Task 5: Explore the system scope</li> <li>• Lab 3c: Using Horizon for identity administration</li> </ul>
<b>Lab 4: Nova</b>	<ul style="list-style-type: none"> <li>• Lab 4a: Discover the Nova implementation               <ul style="list-style-type: none"> <li>– Task 1: Configuration files</li> <li>– Task 2: Nova processes and services</li> </ul> </li> <li>• Lab 4b: Create an Instance using the GUI               <ul style="list-style-type: none"> <li>– Task 1: Enter essential instance details</li> <li>– Task 2: Check networks and add a keypair</li> <li>– Task 3 (optional): Modify the instance launch dialog</li> </ul> </li> <li>• Lab 4c: Create an instance from the command line               <ul style="list-style-type: none"> <li>– Task 1: Verify Nova services</li> <li>– Task 2: Gather necessary information</li> <li>– Task 3: Create a key pair</li> <li>– Task 4: Launch the instance</li> </ul> </li> <li>• Lab 4d: Access instances through their consoles               <ul style="list-style-type: none"> <li>– Task 1: View instance console content</li> <li>–Task 2: Use two methods to open interactive instance consoles</li> <li>–Task 3: Confirm that the two instances have network connectivity to each other</li> </ul> </li> <li>• Lab 4e: Enable instance access from the network</li> </ul>	<ul style="list-style-type: none"> <li>– Task 1: Add floating IP addresses to the instances</li> <li>– Task 2: Explore the default security group</li> <li>–Task 3: From the GUI, create a security group that permits ICMP traffic</li> <li>–Task 4: From the command line, add an SSH rule to the security group               <ul style="list-style-type: none"> <li>– Task 5: Test ssh access</li> </ul> </li> <li>• Lab 4f: Instance metadata               <ul style="list-style-type: none"> <li>– Task 1: Simple metadata</li> <li>– Task 2: Use cloud-init to personalize an instance</li> </ul> </li> <li>• Lab 4g: Other instance actions               <ul style="list-style-type: none"> <li>– Task 1: Create a snapshot</li> <li>– Task 2 (optional): Pause an instance</li> <li>– Task 3 (optional): Suspend an instance</li> </ul> </li> <li>• Lab 4h (optional): Create an instance that can't be scheduled               <ul style="list-style-type: none"> <li>– Task 1: Look into a failed instance launch</li> <li>– Task 2: Explore the Placement service</li> </ul> </li> </ul>
<b>Lab 5: Glance</b>	<ul style="list-style-type: none"> <li>• Lab 5a: Discover your Glance implementation</li> <li>• Lab 5b: Use Glance</li> </ul>	<ul style="list-style-type: none"> <li>– Task 1: Create a Glance image in Horizon</li> <li>– Task 2: The Glance command line - classic image upload and other tasks</li> </ul>
<b>Lab 6: Neutron</b>	<ul style="list-style-type: none"> <li>• Lab 6a: Discover Neutron configuration settings               <ul style="list-style-type: none"> <li>– Task 1: Explore configuration files</li> <li>– Task 2: Explore the running system</li> </ul> </li> <li>• Lab 6b: Verify the network configuration               <ul style="list-style-type: none"> <li>– Task 1: Explore networking using the GUI</li> <li>– Task 2: Explore networking from the command line</li> </ul> </li> <li>• Lab 6c: Create a network and connect VMs               <ul style="list-style-type: none"> <li>–Task 1: Use the CLI to create a new network and router</li> <li>–Task 2: Find out why the router was not connected to private</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>– Task 3: Solve this problem with the CLI</li> <li>– Task 4: Launch the second-tier instance</li> <li>– Task 5: Launch the first-tier instance</li> <li>–Task 6: Create a route between the instances</li> <li>• Lab 6d (optional): Role-base access control               <ul style="list-style-type: none"> <li>– Task 1: Share a network</li> <li>– Task 2: Share a security group</li> </ul> </li> </ul>

**Lab 7: Volume Management (Cinder)**

- Lab 7a: Cinder configuration discovery
- Lab 7b: Create and attach volumes
  - Task 1: Create a volume
  - Task 2: Explore how the volume is implemented
  - Task 3: Attach the volume
  - Task 4: Explore how volume attachment is implemented
  - Task 5: Access the volume from the instances
  - Task 6: Move the volume to a third instance
- Lab 7c: Launching an instance from a volume
  - Task 1: Launch the instance
  - Task 2 (optional): Compare with an instance with ephemeral storage
- Lab 7d: Snapshots and backups
  - Task 1: Recover file from snapshot
  - Task 2: Backups
- Lab 7e (optional): Add a Cinder backend
  - Task 1: Explore the current configuration
  - Task 2: Add a volume backend
  - Task 3: Create a volume type for the new backend and make it the default
  - Task 4: Use the new volume type

**Lab 8: OpenStack Object Storage (Swift)**

- Lab 8a: Using the OpenStack Object Storage service GUI
  - Task 1: Where does Glance keep its images?
  - Task 2: Manage objects using the GUI
- Lab 8b: Command line
- Lab 8c (optional): TempURL
- Lab 8d (optional): Large objects

**Lab 9: OpenStack Metering (Ceilometer) and Orchestration (Heat)**

- Lab 9a: Ceilometer alarms
  - Task 1: Ceilometer and Gnocchi configuration
  - Task 2: Generate and measure load
  - Task 3: Set up and process alarms
  - Task 4: Measuring groups of servers
  - Task 5: Alarms on a group of instances
- Lab 9b: Orchestrating stacks
  - Task 1: Create a simple stack
  - Task 2: Create a stack with an autoscaling group
  - Task 3: Create an autoscaling stack
  - Task 4: Add parameters and output to the template
  - Task 5: Explore the orchestration section of Horizon

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