



**EXIN
OpenStack Software**

FOUNDATION

Certified by


Newton

Preparation Guide

Edition 201706

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1. Overview

EXIN Foundation Certificate in OpenStack Software (FOSS.EN), Newton

Scope

EXIN Foundation Certificate in OpenStack Software (version Newton) is a certification that validates a professional's knowledge on OpenStack, OpenStack Compute, OpenStack and Storage, OpenStack Identity Management, OpenStack Networking and OpenStack Support Services.

Summary

OpenStack is a free and open-source cloud computing software platform. The technology consists of a series of interrelated projects that controls pools of processing, storage and networking resources throughout a data center.

EXIN Foundation Certificate in OpenStack Software requires knowledge about the fundamental concepts of OpenStack and an understanding of the architecture, design and deployment of OpenStack. The candidate needs to have knowledge of Compute, Storage, Identity management, Networking and Support Services.

Context

The EXIN Foundation Certificate in OpenStack Software certification is part of the EXIN OpenStack Software qualification program.

Target Group

EXIN Foundation Certificate in OpenStack Software is intended for everyone who wants to learn more about OpenStack software. This module is suitable for beginners in OpenStack technology as well as the ones who design or build OpenStack infrastructure.

The following roles could be interested in this module: Architects, Solution Designers, Technical Consultants, Technical pre-sales and Solution Consultants.

Note: This exam is Newton-based.

Requirements for Certification

- Successful completion of the EXIN Foundation Certificate in OpenStack Software exam.

A training is strongly recommended. Basic understanding of Linux and Cloud Computing is recommended, as well as some practical experience with OpenStack.

Examination Details

Examination type:	Multiple-choice Questions
Number of questions:	40
Pass mark:	65%
Open book/notes:	No
Electronic equipment/aides permitted:	No
Exam duration:	60 minutes

The Rules and Regulations for EXIN's examinations apply to this exam.

Bloom level

The EXIN EXIN Foundation Certificate in OpenStack Software certification tests candidates at Bloom Level 1 and 2 according to Bloom's Revised Taxonomy:

- Bloom Level 1: Remembering – relies on recall of information. Candidates will need to absorb, remember, recognize and recall.
- Bloom Level 2: Understanding – a step beyond remembering. Understanding shows that candidates comprehend what is presented and can evaluate how the learning material may be applied in their own environment. This type of questions aims to demonstrate that the candidate is able to organize, compare, interpret and choose the correct description of facts and ideas.

Training

Contact Hours

The recommended number of contact hours for this training course is 21. This includes group assignments, exam preparation and short breaks. This number of hours does not include lunch breaks, homework and the exam.

Indication Study Effort

50 hours, depending on existing knowledge.

Training Organization

You can find a list of our accredited training organizations at www.exin.com.

2. Exam Requirements

The exam requirements are specified in the exam specifications. The following table lists the topics of the module (exam requirements) and the subtopics (exam specifications).

Exam Requirements	Exam Specifications	Weight
1. What is OpenStack		10%
	1.1 Characteristics of Cloud Computing	3%
	1.2 Characteristics of OpenStack	3%
	1.3 OpenStack high level architecture	4%
2. OpenStack Compute		15%
	2.1 The role of the Nova service	3%
	2.2 Nova Operation	7%
	2.3 Compartmentalizing OpenStack deployments in Nova	3%
	2.4 Bare metal provisioning with Ironic	2%
3. OpenStack and Storage		30%
	3.1 Image management using Glance	6%
	3.2 Block Storage managed using Cinder	9%
	3.3 Object storage provided using Swift	9%
	3.4 Database access provided by Trove	3%
	3.5 Shared file system provided by Manila	3%
4. OpenStack Identity Management		10%
	4.1 Keystone User Authentication	4%
	4.2 User Authorization	2%
	4.3 Service Registration	2%
	4.4 Key management with Barbican	2%
5. OpenStack Networking		20%
	5.1 Neutron Networking features	10%
	5.2 Layer 3 services	5%
	5.3 Network Security	5%
	(5.4 Managing Networking Services with Astaro)	0%
6. OpenStack Support Services		15%
	6.1 OpenStack Metering using Ceilometer	4%
	(6.2 OpenStack Dashboard provided by Horizon)	0%
	6.3 OpenStack Orchestration using Heat	4%
	6.4 Messaging service provided by Zaqar	1%
	6.5 DNS management with Designate	1%
	6.6 Data Processing with Sahara	1%
	6.7 Chargeback and Billing with CloudKitty	1%
	6.8 Backup as a Service with Freezer	1%
	6.9 OpenStack Environment Provisioning with Fuel	1%
	6.10 Container Virtualization with Magnum	1%
Total		100%

Exam Specifications

1 What is OpenStack

- 1.1 The candidate understands the concept of Cloud computing
The candidate can...
 - 1.1.1 explain what Cloud computing is.
 - 1.1.2 compare the four main Deployment Models for Cloud computing (Private, Public, Community and Hybrid cloud).
 - 1.1.3 describe the three main Service Models for Cloud computing (SaaS, PaaS and IaaS).
- 1.2 The candidate understands various important characteristics of OpenStack
The candidate can...
 - 1.2.1 describe the licensing model of OpenStack.
 - 1.2.2 summarize the role of the OpenStack foundation.
 - 1.2.3 identify the Cloud services model provided by OpenStack.
- 1.3 The candidate understands the high level architecture of OpenStack
The candidate can...
 - 1.3.1 identify the various parts of OpenStack.
 - 1.3.2 summarize the responsibilities of each service.
 - 1.3.3 identify inter-service operations.
 - 1.3.4 describe the networks used in an OpenStack implementation.

2 OpenStack Compute

- 2.1 The candidate understands the role of the Nova service
The candidate can...
 - 2.1.1 describe the component parts of Nova.
 - 2.1.2 describe provisioning instances using Nova.
 - 2.1.3 explain the purpose of the Nova scheduler.
- 2.2 The candidate understands the operation of Nova
The candidate can...
 - 2.2.1 describe the use of virtual and bare metal instances.
 - 2.2.2 explain the effect of processes such as reboot, rebuild, resize etc..
 - 2.2.3 describe the use of Flavors.
 - 2.2.4 explain the effects of using images or volumes.
- 2.3 The candidate understands the compartmentalizing deployment options available in Nova
The candidate can...
 - 2.3.1 explain the four (4) types of Nova compartmentalizing deployment options.
 - 2.3.2 describe the limitations of segregating a cloud implementation.
- 2.4 The candidate understands the operation of Ironic
The candidate can...
 - 2.4.1 describe the component parts of Ironic.
 - 2.4.2 explain the role of hardware drivers in Ironic.

3 OpenStack and Storage

- 3.1 The candidate knows how to work with images and Glance
The candidate can...
 - 3.1.1 describe the operation and functionality of Glance, the image service.
 - 3.1.2 describe the process of creating an image.
 - 3.1.3 explain security that can be applied in Glance.
 - 3.1.4 explain the concept of containers.
 - 3.1.5 describe Glance's use of back ends including Cinder and Swift.

- 3.2 The candidate understands how to work with volumes and Cinder
The candidate can...
 - 3.2.1 identify the key responsibilities of the Cinder service.
 - 3.2.2 describe the benefits of block storage.
 - 3.2.3 describe the architecture and extensibility of Cinder.
 - 3.2.4 identify the key use of volume types and extra-specs.
 - 3.2.5 describe the operation and use of snapshots and backups.
- 3.3 The candidate understands how to work with Object Storage and Swift
The candidate can...
 - 3.3.1 explain the use cases for Object Storage.
 - 3.3.2 identify the key components of the Swift service.
 - 3.3.3 explain the distribution mechanisms used for accounts, containers and objects.
 - 3.3.4 identify the main management tools to use in Swift.
 - 3.3.5 describe the use of regions and zones in Swift.
- 3.4 The candidate understands how to work with databases and Trove
The candidate can...
 - 3.4.1 explain the use cases for Database as a Service.
 - 3.4.2 identify the key components of the Trove service.
- 3.5 The candidate understands how to work with shared file systems and Manila
The candidate can...
 - 3.5.1 explain the use cases for shared file systems.
 - 3.5.2 identify the key components of the Manila service.

4 OpenStack Identity Management

- 4.1 The candidate understands user authentication by Keystone
The candidate can...
 - 4.1.1 describe how Keystone handles authentication.
 - 4.1.2 describe user/project relationships in Keystone.
- 4.2 The candidate understands user authorization in OpenStack
The candidate can...
 - 4.2.1 describe the process of authorization.
 - 4.2.2 identify the components in authorization.
 - 4.2.3 identify the files used by authorization.
- 4.3 The candidate understands service oriented operations
The candidate can...
 - 4.3.1 describe the reason and operation of service registration.
 - 4.3.2 identify the requirement for and the creation of API endpoints.
- 4.4 The candidate understands key management provided by Barbican
The candidate can...
 - 4.4.1 describe the reason and operation of key management using Barbican.
 - 4.4.2 identify the different kinds of secrets Barbican can handle.

5 OpenStack Networking

- 5.1 The candidate understands features of Neutron
The candidate can...
 - 5.1.1 describe the networking features and services provided by Neutron.
 - 5.1.2 identify the use cases for implementing Neutron.
 - 5.1.3 describe the extensibility of a network based on Neutron.
- 5.2 The candidate understands the Layer 3 services provided by Neutron
The candidate can...
 - 5.2.1 describe the use of Floating IP addresses and Network Address Translation (NAT).
 - 5.2.2 describe the DHCP function used by Neutron.
 - 5.2.3 describe the operation of routing within Neutron.

- 5.3 The candidate understands the implementation of network security by Neutron
The candidate can...
 - 5.3.1 describe the use of security groups.
 - 5.3.2 describe the implementation of a security policy using security rules.
 - 5.3.3 describe the application of security groups to instances.
- 5.4 The candidate understands features of Astar
Exam requirement 5.4 is not being examined in the Newton release.

6 OpenStack Support Services

- 6.1 The candidate understands the implementation of metering using
The candidate can...
 - 6.1.1 identify the use cases of OpenStack Metering using Ceilometer.
 - 6.1.2 describe the various types of data supplied by Ceilometer.
 - 6.1.3 identify the workflow for gathering data, including user generated.
- 6.2 The candidate understands the Dashboard provided by Horizon
Exam requirement 6.2 is not being examined in the Newton release.
- 6.3 The candidate understands Orchestration using Heat
The candidate can...
 - 6.3.1 describe the orchestration functionality provided by Heat.
 - 6.3.2 identify the responsibilities of the Heat template.
 - 6.3.3 describe the operations that can be carried out on a Heat stack.
- 6.4 The candidate understands messaging provided by Zaqr
The candidate can...
 - 6.4.1 describe the messaging functionality provided by Zaqr.
 - 6.4.2 identify the component parts of Zaqr.
- 6.5 The candidate understands DNS management using Designate
The candidate can...
 - 6.5.1 describe the DNS management functionality provided by Designate.
 - 6.5.2 identify the component parts of Designate.
- 6.6 The candidate understands Data Processing using Sahara
The candidate can...
 - 6.6.1 describe the Data Processing functionality provided by Sahara.
 - 6.6.2 identify the component parts of Sahara.
- 6.7 The candidate understands Chargeback and Billing using CloudKitty
The candidate can...
 - 6.7.1 describe the Chargeback and Billing functionality provided by CloudKitty.
 - 6.7.2 identify the component parts of CloudKitty.
- 6.8 The candidate understands Backup as a Service using Freezer.
The candidate can...
 - 6.8.1 describe the Backup as a service functionality provided by Freezer.
 - 6.8.2 identify the component parts of Freezer.
- 6.9 The candidate understands OpenStack Environment Provisioning using Fuel
The candidate can...
 - 6.9.1 describe the OpenStack Environment Provisioning functionality provided by Fuel.
 - 6.9.2 identify the component parts of Fuel.
- 6.10 The candidate understands Container Virtualization using Magnum
The candidate can...
 - 6.10.1 describe the Container Virtualization functionality provided by Magnum.
 - 6.10.2 identify the component parts of Magnum.

3. List of Basic Concepts

This chapter contains the terms and abbreviations with which candidates should be familiar.

Please note that knowledge of these terms alone does not suffice for the exam; the candidate must understand the concepts and be able to provide examples.

API	Network access
Application	Network Address Translation (NAT)
Architecture	Network node
Astara	Network-as-a-Service (NaaS)
Asymmetric key	Networking Infrastructure
Authentication	Neutron
Authorization	Node
Backup	Nova
Backup-as-a-Service (BaaS)	Nova architecture
Barbican	Nova service
Bare Metal	Nova-API
Bare Metal host (compute host)	Nova-compute
Bare Metal instance	Nova-consoleauth
Bare Metal node	Nova-network
Billing	Nova-novncproxy
Block storage	Object storage
Boot	On-demand self-service
Chargeback	Open source
Ceilometer	OpenStackClient (OSC)
Cells	Nova-compute
Cinder	Open vSwitch
CLI client	Operating system
Cloud (private)	orchestration
Cloud (public)	OS ISO
CloudKitty	Outbound
Compute	Platform
Container	Platform-as-a-Service (PaaS)
Container Virtualization	Publishing workflow
cURL	PXE
Dashboard	qr-* network
Data network	qr-* port
Database as a Service (DBaaS)	RAM disk
Deploy image	Rating
Designate	Reboot
DHCP	Rebuild
Directory	Region
DNS	Release
DNS-as-a-Service (DNSaaS)	Resize
dnsmasq program	Resource pooling
Elasticity	REST API
Endpoint	Ring
Environment Provisioning	Role
External network	Root partition
Firewall as a Service (FWaaS)	Routing
Flat network	Sahara
Flat Network Manager	Secure Shell (SSH)
Flavor	Security group

Freezer
Fuel
Generic Routing Encapsulation (GRE)
Glance
Glance architecture
GRE agent
Heat
Heat templates
Horizon
Hybrid
Hypervisor
Identity Management
Identity service
Image
Inbound
Infrastructure
Infrastructure-as-a-Service (IaaS)
Instance
Integration bridge
IP address (fixed)
IP address (floating)
IP Address Management (IPAM)
IP tables
IPMI
Ironic
Kernel
Keystone
Layer
Management network
Manila
Metered service or measured service
Metering
Multi-tier
NBP
Network (external)
Network (internal)
Security level
Security policy
Security rule
Sensitive service
Server (instance)
Server (physical)
Service
Service catalog
Service component
Service endpoint
Snapshot
Software-as-a-Service (SaaS)
SSH rule
SSH server
SSH service
Stack
Storage
Swift
Symmetric key
Template
Tenant
TFTP
Transmission Control Protocol (TCP)
Trove
Tunnel
User
User-defined data
Virtual Local Area Network (VLAN)
Virtual Machine (VM)
Virtual Network Computing (VNC)
VLAN Network Manager
VLAN networking
Volume
Zaqar
Zone

4. Literature

Exam Literature

Due to the open-source character of OpenStack, the software is continually improved and functionality is added. There are no exam literature references due to the continual change. Up-to-date content documentation can be found on www.openstack.org.

Candidates who take part in the HP OpenStack training can make use of:

- A. **OpenStack Foundations Student Guide**
Hewlett-Packard Development Company, L.P.
April 2016, version H6C68S D.00

Additional Literature

- B. <http://www.OpenStack.org/>
- C. Vishal Shukla
Fundamentals of OpenStack
CreateSpace Independent Publishing Platform
February 2014
- D. Michael Kunas
OpenStack – A Management and Exam Guide
IT Governance Publishing 2017

Comment

Additional literature is for reference and depth of knowledge only.

Literature Matrix

Exam Requirements	Reference
1. What is OpenStack	A: Module 2 - Introduction to OpenStack 2-1
2. OpenStack Compute	A: Module 7 - OpenStack Compute Service (Nova) 7-1 A: Module 12 – Other OpenStack Projects (Ironic) 12-1
3. OpenStack and Storage	A: Module 5 - OpenStack Image Service (Glance) 5-1 A: Module 8 - OpenStack Block Storage Service (Cinder) 8-1 A: Module 9 - OpenStack Object Storage Service (Swift) A: Module 12 – Other OpenStack Projects (Trove) 12-1 A: Module 12 – Other OpenStack Projects (Manila) 12-1
4. OpenStack Identity Management	A: Module 4 - Keystone OpenStack Identity Service 4-1 A: Module 12 – Other OpenStack Projects (Barbican) 12-1
5. OpenStack Networking	A: Module 6 - Neutron (OpenStack Networking Service) 6-1
6. OpenStack Support Service	A: Module 3 - OpenStack Management Tools 3-1 A: Module 11 - OpenStack Metering (Ceilometer) 11-1 A: Module 10 - OpenStack Orchestration Service (Heat) 10-1 A: Module 12 – Other OpenStack Projects (Zaqar) 12-1 A: Module 12 – Other OpenStack Projects (Designate) 12-1 A: Module 12 – Other OpenStack Projects (Sahara) 12-1 A: Module 10 - Other OpenStack Projects (CloudKitty) 12-1 A: Module 12 – Other OpenStack Projects (Freezer) 12-1 A: Module 12 – Other OpenStack Projects (Fuel) 12-1 A: Module 12 – Other OpenStack Projects (Magnum) 12-1

Contact EXIN

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