



# Future Cert



# LPIC-3: Linux Enterprise Professional Certification

## LPIC-3 304: Virtualization & High Availability

LPIC-3 is a professional certification program program that covers enterprise Linux specialties. LPIC-3 304 covers administering Linux enterprise-wide with an emphasis on Virtualization & High Availability.

To become LPIC-3 certified, a candidate with an active LPIC-1 and LPIC-2 certification must pass at least one of the following specialty exams. Upon successful completion of the requirements, they will be entitled to the specialty designation: LPIC-3 Specialty Name. For example, LPIC-3 Virtualization & High Availability.

### Specialties:

- 300: Mixed Environment
- 303: Security
- 304: Virtualization and High Availability

### TOPIC 330: VIRTUALIZATION

#### 330.1 Virtualization Concepts and Theory (8)

Candidates should know and understand the general concepts, theory and terminology of Virtualization. This includes Xen, KVM and libvirt terminology.

##### Key knowledge areas:

- Terminology
- Pros and Cons of Virtualization
- Variations of Virtual Machine Monitors
- Migration of Physical to Virtual Machines
- Migration of Virtual Machines between Host systems
- Cloud Computing

#### 330.2 Xen (9)

Candidates should be able to install, configure, maintain, migrate and troubleshoot Xen installations. The focus is on Xen version 4.x.

##### Key knowledge areas:

- Xen architecture, networking and storage
- Xen configuration
- Xen utilities
- Troubleshooting Xen installations
- Basic knowledge of XAPI
- Awareness of XenStore
- Awareness of Xen Boot Parameters
- Awareness of the xm utility

#### 330.3 KVM (9)

Candidates should be able to install, configure, maintain, migrate and troubleshoot KVM installations.

##### Key knowledge areas:

- KVM architecture, networking and storage
- KVM configuration
- KVM utilities
- Troubleshooting KVM installations

#### 330.4 Other Virtualization Solutions (3)

Candidates should have some basic knowledge and experience with alternatives to Xen and KVM.

##### Key knowledge areas:

- Basic knowledge of OpenVZ and LXC
- Awareness of other virtualization technologies
- Basic knowledge of virtualization provisioning tools

#### 330.5 Libvirt and Related Tools (5)

Candidates should have basic knowledge and experience with the libvirt library and commonly available tools.

##### Key knowledge areas:

- libvirt architecture, networking and storage
- Basic technical knowledge of libvirt and virsh
- Awareness of oVirt

#### 330.6 Cloud Management Tools (2)

Candidates should have basic feature knowledge of commonly available cloud management tools.

##### Key knowledge areas:

- Basic feature knowledge of OpenStack and CloudStack
- Awareness of Eucalyptus and OpenNebula

### TOPIC 334: HIGH AVAILABILITY CLUSTER MANAGEMENT

#### 334.1 High Availability Concepts and Theory (5)

Candidates should understand the properties and design approaches of high availability clusters.

##### Key knowledge areas:

- Understand the most important cluster architectures
- Understand recovery and cluster reorganization mechanisms
- Design an appropriate cluster architecture for a given purpose
- Application aspects of high availability
- Operational considerations of high availability

#### 334.2 Load Balanced Clusters (6)

Candidates should know how to install, configure, maintain and troubleshoot LVS. This includes the configuration and use of keepalived and ldirectord. Candidates should further be able to install, configure, maintain and troubleshoot HAProxy.

##### Key knowledge areas:

- Understanding of LVS/IPVS
- Basic knowledge of VRRP
- Configuration of keepalived
- Configuration of ldirectord
- Backend server network configuration
- Understanding of HAProxy
- Configuration of HAProxy



**Exam Objectives Version:** Version 2.0 (last update: December 4th, 2014)

**Exam Covered:** LPIC-3 304 (304-200); Exam 1 of 1 to obtain LPIC-3 Linux Enterprise Professional: certification

**Objectives Reflected in Published Exam:** February 17th, 2015

**Required Prerequisite:** Successfully pass LPIC-1 101 and 102 and LPIC-2 201 and 202 exams

**About objective weights:** Each objective is assigned a weighting value (x). The weights range roughly from 1 to 10 and indicate the relative importance of each objective. Objectives with higher weights will be covered in the exam with more questions.

### 334.3 Failover Clusters (6)

Candidates should have experience in the installation, configuration, maintenance and troubleshooting of a Pacemaker cluster. This includes the use of Corosync. The focus is on Pacemaker 1.1 for Corosync 2.x.

#### Key knowledge areas:

- Pacemaker architecture and components (CIB, CRMD, PEngine, LRMd, DC, STONITHd)
- Pacemaker cluster configuration
- Resource classes (OCF, LSB, Systemd, Upstart, Service, STONITH, Nagios)
- Resource rules and constraints (location, order, colocation)
- Advanced resource features (templates, groups, clone resources, multi-state resources)
- Pacemaker management using pcs
- Pacemaker management using crmsh
- Configuration and Management of corosync in conjunction with Pacemaker
- Awareness of other cluster engines (OpenAIS, Heartbeat, CMAN)

### 334.4 High Availability in Enterprise Linux Distributions (1)

Candidates should be aware of how enterprise Linux distributions integrate High Availability technologies.

#### Key knowledge areas:

- Basic knowledge of Red Hat Enterprise Linux High Availability Add-On
- Basic knowledge of SUSE Linux Enterprise High Availability Extension

### TOPIC 335: HIGH AVAILABILITY CLUSTER STORAGE

#### 335.1 DRBD/cLVM (3)

Candidates are expected to have the experience and knowledge to install, configure, maintain and troubleshoot DRBD devices. This includes integration with Pacemaker. DRBD configuration of version 8.4.x is covered. Candidates are further expected to be able to manage LVM configuration within a shared storage cluster.

#### Key knowledge areas:

- Understanding of DRBD resources, states and replication modes
- Configuration of DRBD resources, networking, disks and devices
- Configuration of DRBD automatic recovery and error handling
- Management of DRBD using drbdadm
- Basic knowledge of drbdsetup and drbdmeta
- Integration of DRBD with Pacemaker
- cLVM
- Integration of cLVM with Pacemaker

### 335.2 Clustered File Systems (3)

Candidates should know how to install, maintain and troubleshoot installations using GFS2 and OCFS2. This includes integration with Pacemaker as well as awareness of other clustered filesystems available in a Linux environment.

#### Key knowledge areas:

- Understand the principles of cluster file systems
- Create, maintain and troubleshoot GFS2 file systems in a cluster
- Create, maintain and troubleshoot OCFS2 file systems in a cluster
- Integration of GFS2 and OCFS2 with Pacemaker
- Awareness of the O2CB cluster stack
- Awareness of other commonly used clustered file systems