

Enterprise Linux High Availability Clustering

Course Summary

Description

Enterprise Linux High Availability Clustering is an in-depth course that focuses on two key areas, Linux high availability (HA) clustering and HA storage administration. Storage is integral to many HA clusters so as to make use of clustered storage technologies to enable active/active configurations.

Over the course of many in-depth lab exercises, each student will assemble a realistic three-node Linux cluster utilizing best practices. Each node has three network interfaces and each student's cluster has its own dedicated cluster VLAN.

The class contains a storage array for shared LUNs among the nodes. This enables students to perform very real world tasks in a real world setting, including multipathing, redundant ring communication, last man standing cluster, and shared storage scenarios. Course topics include: Cluster Architecture & Design, Pacemaker, Corosync, Fencing, Resource Management, Advanced Resource Management, Multipathing, Cluster LVM, Global File System v2.

Topics

- Introduction to Clustering and Storage Management
- Corosync and Quorum Management
- STONITH and Fencing
- Pacemaker Cluster Resource Manager
- Advanced Resource Configuration
- Storage Technologies
- iSCSI
- Kernel Device Management
- Device Mapper and Multipathing
- Advanced LVM and Cluster LVM
- Global File System (GFS) 2

Audience

This course is designed for those wanting to learn Linux high availability (HA) clustering and HA storage administration.

Prerequisites

This course requires an advanced knowledge of Linux system administration. These skills are taught in PT9992 "Enterprise Linux Systems Administration" and PT6795 "Linux Fundamentals".

Duration

Four days

Enterprise Linux High Availability Clustering

Course Outline

I. Introduction to Clustering and Storage Management

- A. Clustering Introduction
- B. Cluster Building Blocks
- C. Shared Storage
- D. Hardware and Software Requirements
- E. Network Considerations
- F. Split Brain Prevention with Fencing
- G. HA Components
- H. Clustered Resources
- I. Configuration Tools
- J. Red Hat Cluster Stack Roadmap
- K. Running Commands on Multiple Systems

Lab Tasks

- Running Commands on Multiple Hosts
- Prepare System for Clustering
- Static Network Configuration

II. Corosync and Quorum Management

- A. Vocabulary
- B. Network Topology
- C. Ethernet Bonding
- D. Communication Methods
- E. IPv6 Considerations
- F. Cluster Node Preparation
- G. Enable and Configure pcsd
- H. PCS & PCSD
- I. Cluster Quorum
- J. Advanced Quorum Techniques
- K. Corosync
- L. Corosync - Redundant Ring Protocol (RRP)
- M. Corosync Security
- N. Joining and Leaving the Cluster
- O. Quorum Administration
- P. Upgrading

Lab Tasks

- Install Cluster Components
- Setup a Two Node Cluster
- Setup a Three Node Cluster with PCS
- Totem RRP
- PCS GUI

III. STONITH and Fencing

- A. Fencing Introduction
- B. Node Level Fencing
- C. Node Fencing: External

- D. Node Fencing: Internal
- E. Node Fencing: Pseudo
- F. Resource Level Fencing
- G. Fencing Architecture
- H. STONITH Subsystem
- I. Fencing Agents
- J. Fencing Agents listing
- K. STONITH Resources
- L. Working With stonith_admin
- M. Manual Fencing
- N. Best Practices

Lab Tasks

- Suicide Fencing with Storage Based Death
- Fencing with fence_scsi

IV. Pacemaker Cluster Resource Manager

- A. Cluster Architecture Revisited
- B. Pacemaker Architecture
- C. Pacemaker Cluster Information Base (CIB)
- D. Resource Management Overview
- E. Component Relationships
- F. Resource Agents
- G. Types of Resources
- H. Resource Naming Conventions
- I. Resource Specific Parameters/Options
- J. Resource Meta Parameters/Options
- K. Resource Agent Operations
- L. Discover Resource Agents
- M. Available Resource Agents
- N. Resource Spotlight: IPAddr2
- O. Add a Primitive Resource
- P. Resource Group Management
- Q. Resource Group Example
- R. Resource Actions: Monitoring
- S. Resource Administration
- T. PCS vs. CRM_*

Lab Tasks

- Simple Management with PCS-GUI
- Using Resource Groups

V. Advanced Resource Configuration

- A. Resource Placement Basics
- B. Resource Ordering
- C. Location Constraints
- D. Relocating Resources
- E. Relocation on Failure

Enterprise Linux High Availability Clustering

Course Outline (cont'd)

- F. Resource Standard: Clones & Multi-State
- G. Resource Operations
- H. Troubleshooting
- I. Cluster Maintenance

Lab Tasks

- Setup a Web Farm
- Using Constraints
- Cluster Monitoring

VI. Storage Technologies

- A. Remote Storage Overview
- B. Remote Filesystem Protocols
- C. Remote Block Device Protocols
- D. Distributed Lock Manager
- E. dlm_control & dlm_tool
- F. Block Devices and the Device Mapper
- G. Managing Loopback Devices

Lab Tasks

- Manipulating Block Devices

VII. iSCSI

- A. iSCSI Architecture
- B. iSCSI Target Implementations
- C. iSCSI Target Node Preparation & targetcli
- D. iSCSI Target Administration
- E. iSCSI Target Defining Storage Objects
- F. iSCSI Target LUN Administration
- G. iSCSI Target Network Portal Configuration
- H. iSCSI Target Security
- I. iSCSI Target Examples
- J. Open-iSCSI Initiator Implementation
- K. iSCSI Initiator Discovery
- L. iSCSI Initiator Node Administration
- M. Mounting iSCSI Targets at Boot
- N. iSCSI Multipathing Considerations

Lab Tasks

- iSCSI Initiator Configuration

VIII. Kernel Device Management

- A. Managing Linux Device Files
- B. Kernel Hardware Info `/sys/`
- C. `/sys/` Structure
- D. `udev`
- E. I/O Elevators

Lab Tasks

- Creating Custom UDEV Rules

IX. Device Mapper and Multipathing

- A. SAN Multipathing
- B. Multipath Configuration
- C. Multipathing Best Practices

Lab Tasks

- Multipath Configuration

X. Advanced LVM and Cluster LVM

- A. Logical Volume Management
- B. Implementing LVM
- C. Creating Logical Volumes
- D. Activating LVM VGs
- E. Exporting and Importing a VG
- F. Examining LVM Components
- G. Changing LVM Components
- H. Advanced LVM Overview
- I. Advanced LVM: Components & Object Tags
- J. Advanced LVM: Automated Storage Tiering
- K. Advanced LVM: Thin Provisioning
- L. Advanced LVM: Striping & Mirroring
- M. Advanced LVM: RAID Volumes
- N. cLVM

Lab Tasks

- Creating and Managing LVM Volumes
- cLVM

XI. Global File System (GFS) 2

- A. GFS2 Overview
- B. GFS2 Capabilities
- C. GFS2 Theory of Operation
- D. GFS2 Configuration Prerequisites
- E. Setting Up Cluster LVM
- F. GFS2 Filesystem Creation & Mounting
- G. GFS2 Filesystem Management
- H. GFS2 Fencing Requirement

Lab Tasks

- GFS2