

# Enterprise Linux Network Services (GL275)

## H7092S

<b>HPE course number</b>	H7092S
<b>Course length</b>	5 Days
<b>Delivery mode</b>	ILT, VILT
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This course is an expansive course that covers a wide range of network services useful to every organization. Special attention is paid to the concepts needed to implement these services securely, and to the troubleshooting skills necessary for real-world administration of these network services. The course material is designed to provide extensive hands-on experience. Topics include security with SELinux and Netfilter, DNS concepts and implementation with Bind, LDAP concepts and implementation using OpenLDAP, web services with Apache, FTP with vsftpd, caching, filtering proxies with Squid, SMB/CIFS (Windows networking) with Samba, and e-mail concepts and implementation with Postfix--combined with either Dovecot or Cyrus.

### Prerequisites

Students should already be comfortable with basic Linux or Unix administration. Fundamentals such as the Linux filesystem, process management, and how to edit files will not be covered in class. A good understanding of network concepts, the TCP/IP protocol suite is also assumed. These skills are taught in the [U8583S](#) “Linux Fundamentals” and [H7091S](#) “Enterprise Linux Systems Administration” courses

### Supported distributions

- Red Hat Enterprise Linux 7
- SUSE Linux Enterprise 12

## Detailed course outline

<b>Module 1: Securing Services</b>	<ul style="list-style-type: none"> <li>• Xinetd</li> <li>• Xinetd Connection Limiting and Access Control</li> <li>• Xinetd: Resource limits, redirection, logging</li> <li>• TCP Wrappers</li> <li>• The /etc/hosts.allow &amp; /etc/hosts.deny Files</li> <li>• /etc/hosts.{allow,deny} Shortcuts</li> <li>• Advanced TCP Wrappers</li> <li>• SUSE Basic Firewall Configuration</li> <li>• FirewallD</li> <li>• Netfilter: Stateful Packet Filter Firewall</li> <li>• Netfilter Concepts</li> <li>• Using the iptables Command</li> <li>• Netfilter Rule Syntax</li> <li>• Targets</li> </ul>	<ul style="list-style-type: none"> <li>• Common match_specs</li> <li>• Extended Packet Matching Modules</li> <li>• Connection Tracking</li> </ul> <p><b>Lab Tasks</b></p> <ul style="list-style-type: none"> <li>• Securing xinetd Services</li> <li>• Enforcing Security Policy with xinetd</li> <li>• Securing Services with TCP Wrappers</li> <li>• Securing Services with SUSEfirewall2</li> <li>• Securing Services with Netfilter</li> <li>• FirewallD</li> <li>• Troubleshooting Practice</li> </ul>
<b>Module 2: SELinux and LSM</b>	<ul style="list-style-type: none"> <li>• AppArmor</li> <li>• SELinux Security Framework</li> <li>• Choosing an SELinux Policy</li> <li>• SELinux Commands</li> </ul>	<ul style="list-style-type: none"> <li>• SELinux Booleans</li> <li>• SELinux Policy Tools</li> </ul> <p><b>Lab Tasks</b></p> <ul style="list-style-type: none"> <li>• Exploring AppArmor Modes</li> <li>• SELinux File Contexts</li> </ul>
<b>Module 3: DNS Concepts</b>	<ul style="list-style-type: none"> <li>• Naming Services</li> <li>• DNS – A Better Way</li> <li>• The Domain Name Space</li> <li>• Delegation and Zones</li> <li>• Server Roles</li> <li>• Resolving Names</li> <li>• Resolving IP Addresses</li> </ul>	<ul style="list-style-type: none"> <li>• Basic BIND Administration</li> <li>• Configuring the Resolver</li> <li>• Testing Resolution</li> </ul> <p><b>Lab Tasks</b></p> <ul style="list-style-type: none"> <li>• Configuring a Slave Name Server</li> </ul>
<b>Module 4: Configuring BIND</b>	<ul style="list-style-type: none"> <li>• BIND Configuration Files</li> <li>• named.conf Syntax</li> <li>• named.conf Options Block</li> <li>• Creating a Site-wide Cache</li> <li>• rndc Key Configuration</li> <li>• Zones In named.conf</li> <li>• Zone Database File Syntax</li> <li>• SOA – Start of Authority</li> <li>• A, AAAA, &amp; PTR – Address &amp; Pointer Records</li> </ul>	<ul style="list-style-type: none"> <li>• NS – Name Server</li> <li>• TXT, CNAME, and MX – Text, Alias, and Mail Host</li> <li>• SRV – SRV Service Records</li> <li>• Abbreviations and Gotchas</li> <li>• \$GENERATE, \$ORIGIN, and \$INCLUDE</li> </ul> <p><b>Lab Tasks</b></p> <ul style="list-style-type: none"> <li>• Use rndc to Control named</li> <li>• Configuring BIND Zone Files</li> </ul>

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**Module 5: Creating DNS Hierarchies**

- Subdomains and Delegation
- Subdomains
- Delegating Zones
- in-addr.arpa. Delegation
- Issues with in-addr.arpa.
- RFC2317 & in-addr.arpa

**Lab Tasks**

- Create a Subdomain in an Existing Domain
- Subdomain Delegation

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**Module 6: Advanced BIND DNS Features**

- Address Match Lists & ACLs
- Split Namespace with Views
- Restricting Queries
- Restricting Zone Transfers
- Running BIND in a chroot
- Dynamic DNS Concepts
- Allowing Dynamic DNS Updates

- DDNS Administration with nsupdate
- Common Problems
- Common Problems
- Securing DNS with TSIG

**Lab Tasks**

- Configuring Dynamic DNS
- Securing BIND DNS

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**Module 7: Using Apache**

- HTTP Operation
- Apache Architecture
- Dynamic Shared Objects
- Adding Modules to Apache
- Apache Configuration Files
- httpd.conf – Server Settings
- httpd.conf – Main Configuration
- HTTP Virtual Servers
- Virtual Hosting DNS Implications

- httpd.conf – VirtualHost Configuration
- Port and IP based Virtual Hosts
- Name-based Virtual Host
- Apache Logging
- Log Analysis
- The Webalizer

**Lab Tasks**

- Apache Architecture
- Apache Content
- Configuring Virtual Hosts

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**Module 8: Apache Security**

- Virtual Hosting Security Implications
- Delegating Administration
- Directory Protection
- Directory Protection with AllowOverride
- Common Uses for .htaccess
- Symmetric Encryption Algorithms

- Asymmetric Encryption Algorithms
- Digital Certificates
- TLS Using mod\_ssl.so

**Lab Tasks**

- Using .htaccess Files
- Using TLS Certificates with Apache
- Use SNI and TLS with Virtual Hosts

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**Module 9: Apache Server-side Scripting Administration**

- Dynamic HTTP Content
- PHP: Hypertext Preprocessor
- Developer Tools for PHP
- Installing PHP
- Configuring PHP
- Securing PHP
- Security Related php.ini Configuration
- Java Servlets and JSP

- Apache's Tomcat
- Installing Java SDK
- Installing Tomcat Manually
- Using Tomcat with Apache

**Lab Tasks**

- CGI Scripts in Apache
  - Apache's Tomcat
  - Using Tomcat with Apache
  - Installing Applications with Apache and Tomcat
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**Module 10: Implementing an FTP Server**

- The FTP Protocol
- Active Mode FTP
- Passive Mode FTP
- ProFTPD
- Pure-FTPD

- vsftpd
- Configuring vsftpd
- Anonymous FTP with vsftpd

**Lab Tasks**

- Configuring vsftpd
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**Module 11: The Squid Proxy Server**

- Squid Overview
- Squid File Layout
- Squid Access Control Lists
- Applying Squid ACLs
- Tuning Squid & Configuring Cache Hierarchies
- Bandwidth Metering
- Monitoring Squid

- Proxy Client Configuration

**Lab Tasks**

- Installing and Configuring Squid
  - Squid Cache Manager CGI
  - Proxy Auto Configuration
  - Configure a Squid Proxy Cluster
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**Module 12: SQL Fundamentals and MariaDB**

- Popular SQL Databases
- SELECT Statements
- INSERT Statements
- UPDATE Statements
- DELETE Statements
- JOIN Clauses
- MariaDB
- MariaDB Installation and Security

- MariaDB User Account Management
- MariaDB Replication

**Lab Tasks**

- SQL with Sqlite3
  - Installing and Securing MariaDB
  - Creating a Database in MariaDB
  - Create a Database Backed Application
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**Module 13: LDAP Concepts and Clients**

- LDAP: History and Uses
- LDAP: Data Model Basics
- LDAP: Protocol Basics
- LDAP: Applications
- LDAP: Search Filters
- LDIF: LDAP Data Interchange Format

- OpenLDAP Client Tools
- Alternative LDAP Tools

**Lab Tasks**

- Querying LDAP
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**Module 14: OpenLDAP Servers**

- Popular LDAP Server Implementations
- OpenLDAP: Server Architecture
- OpenLDAP: Backends
- OpenLDAP: Replication
- Managing slapd
- OpenLDAP: Configuration Options
- OpenLDAP: Configuration Sections
- OpenLDAP: Global Parameters
- OpenLDAP: Database Parameters
- OpenLDAP Server Tools

- Native LDAP Authentication and Migration
- Enabling LDAP-based Login
- System Security Services Daemon (SSSD)

**Lab Tasks**

- Building an OpenLDAP Server
  - Enabling TLS for an OpenLDAP Server
  - Enabling LDAP-based Logins
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**Module 15: Samba Concepts and Configuration**

- Introducing Samba
  - NetBIOS and NetBEUI
  - Samba Daemons
  - Accessing Windows/Samba Shares from Linux
  - Samba Utilities
  - Samba Configuration Files
  - The smb.conf File
  - Mapping Permissions and ACLs
  - Mapping Linux Concepts
  - Mapping Users
  - Sharing Home Directories
  - Sharing Printers
  - Share Authentication
  - Share-Level Access
  - User-Level Access
  - Samba Account Database
  - User Share Restrictions
- Lab Tasks**
- Samba Share-Level Access
  - Samba User-Level Access
  - Samba Group Shares
  - Handling Symbolic Links with Samba
  - Samba Home Directory Shares

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**Module 16: SMTP Theory**

- SMTP
- SMTP Terminology
- SMTP Architecture
- SMTP Commands
- SMTP Extensions
- SMTP AUTH
- SMTP STARTTLS
- SMTP Session

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**Module 17: Postfix**

- Postfix Features
  - Postfix Architecture
  - Postfix Components
  - Postfix Configuration
  - master.cf
  - main.cf
  - Postfix Map Types
  - Postfix Pattern Matching
  - Advanced Postfix Options
  - Virtual Domains
  - Postfix Mail Filtering
  - Configuration Commands
  - Management Commands
  - Postfix Logging
  - Logfile Analysis
  - Postfix, Relaying and SMTP AUTH
  - SMTP AUTH Server and Relay Control
  - SMTP AUTH Clients
  - Postfix / TLS
  - TLS Server Configuration
  - Postfix Client Configuration for TLS
  - Other TLS Clients
  - Ensuring TLS Security
- Lab Tasks**
- Configuring Postfix
  - Postfix Virtual Host Configuration
  - Postfix Network Configuration
  - Postfix SMTP AUTH Configuration
  - Postfix STARTTLS Configuration
  - SUSE Postfix Configuration Cleanup
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**Module 18: Mail Services and Retrieval**

- Filtering Email
- Procmal
- SpamAssassin
- Bogofilter
- amavisd-new Mail Filtering
- Accessing Email
- The IMAP4 Protocol
- Dovecot POP3/IMAP Server
- Cyrus IMAP/POP3 Server
- Cyrus IMAP MTA Integration
- Cyrus Mailbox Administration
- Fetchmail

- Roundcube Webmail
- Mailing Lists
- GNU Mailman
- Mailman Configuration

**Lab Tasks**

- Configuring Procmal & SpamAssassin
- Configuring Cyrus IMAP
- Dovecot TLS Configuration
- Configuring Roundcube
- Base Mailman Configuration
- Basic Mailing List
- Private Mailing List

**Appendix A: NIS**

- NIS Overview
- NIS Limitations and Advantages
- NIS Client Configuration
- NIS Server Configuration
- NIS Troubleshooting Aids

**Lab Tasks**

- Using NIS for Centralized User Accounts
- Configuring NIS
- NIS Slave Server
- NIS Failover
- Troubleshooting Practice: NIS

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