Learning RHEL Networking

Red Hat Enterprise Linux (RHEL) is the most popular Linux distribution currently being used and can be deployed on many platforms. Enterprises that have a large number of systems need to be interconnected, configured, and managed effectively. RHEL networking lets you accomplish these tasks easily.

This is a highly-detailed guide to help with your deployments on RHEL 7 or CentOS 7. This book, based on RHEL 7.1, will introduce you to the fundamentals of networking your systems. You will learn the use of new consistent names to identify your network cards. Soon, you will move on to configuring the basic plumbing of your network, setting up time, network address assignment, and name resolution. Last, the focus moves to configuring the new kernel-based iSCSI target services on RHEL 7 and using the service to host storage area networks.

Who this book is written for
This book is ideal for administrators who need to learn the networking abilities of Red Hat Enterprise Linux 7. You may not be a Linux administrator already, but you will need to be able to test files in Linux and navigate the filesystem.

What you will learn from this book
- Master the new time daemon, chronyd, and understand why it is used over the more traditional NTP
- Delve inside the workings of the kernel-based iSCSI target that shares disks on your network
- Share data with your Windows network and make use of their users and groups for authentication, without the need to replace your existing infrastructure
- Shield your users and data from the ever-present dangers that exist on the Internet by implementing and understanding SELinux
- Deploy Apache 2.4 and make use of its new features
- Provide saleable and fault-tolerant file systems with btrfs, more quickly than you could ever imagine
- Protect your investment using the new firewalld process, enabling you to deploy firewall changes while the firewall is in place

Gain Linux administration skills by learning new networking concepts in Red Hat Enterprise Linux 7

Andrew Mallett
In this package, you will find:

- The author biography
- A preview chapter from the book, Chapter 1 'Introducing Enterprise Linux 7'
- A synopsis of the book’s content
- More information on Learning RHEL Networking
About the Author

Andrew Mallett has been working in the IT industry since 1986. He has worked with Linux technologies since the release of the original Red Hat Linux 7 in 1999. Andrew not only possesses Linux skills and certifications, but also consults and teaches Linux and other technologies. He has written books on Linux on Citrix, which were published by Packt Publishing. Andrew has also been an active participant and works as a volunteer sysop. He is a SUSE Certified Linux Instructor, which enables him to help, support, and develop the official Novell SUSE curriculum worldwide.

Andrew currently works for his own company. He can be found on Twitter at http://theurbanpenguin.com and @theurbanpenguin. His published video courses on Linux can be found at http://www.pluralsight.com.
Welcome to *Learning RHEL Networking*. My name is *Andrew Mallett* and I will offer you expert guidance and tuition that will provide you with the skills to tame this powerful and popular Linux distribution. We will work with Red Hat Enterprise Linux 7.1. This latest release offers many improvements and is more likely to be the next version. The movement to the new system, the service management of systemd and the ecosystem that spawns from it offers so much new for administrators to absorb.

Writing about an Enterprise Linux distribution is important as we see the increase in the number of organizations deploying Linux. As a result, we require knowledgeable professionals to manage these systems. The Linux Foundation with Dice, a specialist recruitment company, surveyed many large organizations and found the following results:

- 93 percent of the organizations polled were looking to employ Linux professionals
- 91 percent of hiring managers reported that they found it difficult to find skilled Linux administrators
- As a side note to this, it was additionally noted that salaries for Linux professionals had increased by 9 percent during the last 12 months.

With such confidence in Linux coming from so many organizations, the focus of this book has to be commercially driven for me and you. We want you to be able to improve your career prospects as well as your Linux knowledge.
Preface

Enterprise Linux distributions, such as CentOS, Red Hat, Debian, and SUSE Enterprise Linux, do not deploy the latest and greatest bleeding-edge technology that you may find on home or enthusiast-oriented distributions, such as Fedora or openSUSE. Rather, they allow these to be development platforms to hone and perfect the software before migrating it to an enterprise a few months or even years later. Enterprise Linux has to be dependable, reliable, resilient, and supportable by the organization deploying it and the backend support coming from the community or paid support teams. By definition, the latest in software development does not lend itself well to this; these are the latest development, and knowledge of these developments and best practices will take time to evolve and develop.

Although the book will focus on RHEL, you may equally use Fedora 21 or CentOS; either of these releases will be able to provide you with a compatible platform, where we can work through many examples that are provided in the book.

What this book covers

Chapter 1, Introducing Enterprise Linux 7, helps you understand how enterprise-level Linux differs from other bleeding-edge distributions and the relationship between Red Hat, CentOS, and Fedora. This short chapter gives you a great understanding of RHEL and helps you learn RHEL 7 on your choice of platform.

Chapter 2, Configuring Network Settings, discusses how to configure your network settings and how Red Hat allows you to set the IP address configuration on your host.

Chapter 3, Configuring Key Network Services, helps your RHEL host with a network address. This chapter teaches you how to add some command networking services and how to configure NTP, DNS, DHCP, and SMTP, time, name resolution, IP address assignment, and e-mails.

Chapter 4, Implementing iSCSI SANs, discovers RHEL 7. It offers a new kernel-based module to implement network-based storage. This chapter teaches you how to deploy iSCSI targets and connect from an RHEL client.

Chapter 5, Implementing btrfs, takes a look at Better FS. Having volume management built-in the filesystem allows easy storage management and is a common basis for sharing your filesystem on a network.

Chapter 6, File Sharing with NFS, explains NFS, a de facto Unix file sharing service, which still maintains its importance in the Enterprise Linux market. This chapter covers how to use NFSv4 and compares it with V3 so that you can appreciate its easier firewall management feature among many other new features.
Chapter 7, Implementing Windows Shares with Samba 4, covers instances where RHEL can provide services on a network and the client-side workstation will have Windows OS installed at their end. This requires RHEL to support these Windows clients. File and print services can be supplied through the Samba 4 service on RHEL 7.

Chapter 8, Integrating RHEL 7 into Microsoft Active Directory Domains, explores the fact that many enterprise organizations have already set up Identity Services and are run with Microsoft’s Active Directory. It makes sense that these existing domain accounts should be used to access resources on the RHEL 7 server. The RHEL server can join the domain server and become a member server that allows you to share single sign-on to shared resources hosted on the Linux system.

Chapter 9, Deploying the Apache HTTPD Server, deploys a web server that can be important for your network. This may be to provision web access to an intranet or external access to the Internet. Many administrators use the Apache web server to provide access to local software repositories and install sources, so the importance of this service cannot be overlooked.

Chapter 10, Securing the System with SELinux, provides insights on the fact that with more and more systems connecting to the Internet, the vulnerability of your network facing services is increasing exponentially. SELinux has been included on RHEL since release 4, but very often, we read blogs that suggest that SELinux should be disabled. This chapter teaches you how to deploy systems with SELinux effectively.

Chapter 11, Network Security with firewalld, provides insights on how to effectively use firewalls on your RHEL 7 system with the latest command-line tool, the firewalld service, and the firewall-cmd command. Throughout the book, we have presented practical uses of the latest firewall and how to open the required ports and services. The book concludes with details of this service and how to effectively secure your server with firewalld.
Introducing Enterprise Linux 7

Welcome to the world of enterprise-level Linux version 7. This was first introduced to us on June 9, 2014. Red Hat started its journey with Red Hat Enterprise Linux (RHEL) 7 with its beta release on December 11, 2013. This was followed by the next release candidate on April 23. Finally, as expected, the gold release reached the market on June 2014. Currently, at the time of writing this book, we have Update 1 in the beta release. During the course of this book, this is what we will use for demonstration purposes.

This chapter will help you understand why enterprise-level Linux differs from other bleeding edge distributions. It will also help you understand the relationship between Red Hat, CentOS, and Fedora. We also hope that this short chapter will give you a great understanding on how to use RHEL 7 on your hardware platform of choice. The topics for this chapter are broken down as follows:

- Red Hat Enterprise Linux
- CentOS
- Fedora
- Determining your distribution and version

Red Hat Enterprise Linux

When we think of Linux, more often than not, Red Hat will be a primary consideration; almost certainly, if we are working at a corporate level, Red Hat will become part of our estate. Reliability, predictability, and stability are words synonymous with this very profitable and successful organization. To give an idea of their recent success, the company's share price on the Nasdaq (RHT) in 2010 was less than $30. However, towards the end of 2014, their value hovered around $60.
Enterprise Linux is not likely to be on the bleeding edge. As an enterprise distribution, it has to be supportable and reliable. With the release of RHEL 7, we have seen the first use of version 3 of the Linux kernel within RHEL. The Linux kernel version 3 saw the light of day on July 22, 2011. So, we can say that enterprise Linux may be some 3-4 years behind the latest and greatest version.

In many respects, the reliability aspect takes precedence over the new kernel features that version 3 will offer. These features often relate to hardware and are not important because the enterprise-level hardware has to take a similar cautious approach within mission critical environments. We find that enterprise-level hardware has to be reliable and this leads to, perhaps, a lack of new untested features. Development of new hardware and drivers that reside in the kernel can be tested on smaller businesses and home users. These beta testers can go through the torment while the developments can be improved for our mission-critical servers. A blue chip enterprise company demands a level of support that goes beyond posting a technical query within a support forum and hoping that someone will see it and respond to it. Almost certainly, any financial organization will have to be able to prove their level of support for their systems. This is most easily achieved by presenting your support agreement or contract and the associated service level agreement or SLA. To this end, Red Hat is not free, but the payment is taken for support and not for the distribution purpose. The simplest level of support starts at around $350 (US dollars) per year.

Red Hat began with Enterprise Linux in 2002 with RHEL version 2.1. Initially, the support was provided for 10 years, but has been extended to 13 years with RHEL 7. This means that the support for RHEL 7 can extend to June 30, 2027. The current RHEL 7.1 beta version uses the Linux kernel 3.10.0-210 compared to 3.10.0-123 with the 7.0 release. Here, we see tiny increments in the kernel version indicative of the care taken in rolling out any version of RHEL. At the time of writing, the very latest Linux kernel available from maintainers (https://www.kernel.org) is version 3.18.1.

Red Hat products can be downloaded from https://access.redhat.com/downloads. You will need to create an account to be able to start an evaluation and download RHEL.
CentOS

CentOS (Community Enterprise Operating System) has been commonly used and totally free of charge as a Red Hat rebuild for many years. This is where Red Hat logos and branding are removed from the system and redistributed as "CentOS". This is not quite as bad as it may first seem. Red Hat uses the open source code and redistribution is totally within the remit of the GPL (GNU Public License) agreement. What you lose out on is support. So, you may well find CentOS more used within smaller business operations and academia (where external support is not as critical). Support for CentOS is available only through public forums. Of course, this means that there is no guaranteed service level available.

CentOS began its operation in 2004 and is now entering its second decade. The free of charge product it brings on the market replicates the same reliability and predictability of its Red Hat cousin. The relationship between Red Hat and CentOS was more formalized in January 2014. The governance panel at CentOS now includes Red Hat board members among their numbers.

CentOS does not release beta versions in the same way as Red Hat. This means that the latest version available from the CentOS stable is version 7.0. This will use the same kernel and version 3.10.0-123 as the RHEL 7.0 distribution. The close resemblance between CentOS and Red Hat often means that CentOS becomes a perfect study platform for those wishing to learn Red Hat and, perhaps, gain their certifications. This is certainly a very viable option and the same applies to studying this book. Although, we will be using RHEL 7.1 beta, if you want to use CentOS, this should be very similar and mostly compatible with CentOS 7.

As CentOS does not offer subscription support, this in turn affects the product life cycle. To obtain the entire 13 years of support that RHEL 7 offers, a RHEL customer will have to purchase extended support for the final 3 years coverage. This means that CentOS has repositories that will distribute updates for 10 years, resulting in the fact that CentOS 7 can continually be updated until June 2024. Not bad at all when you see it like this and all without financial cost.

You can download the latest version of CentOS without the need to create an account directly from http://centos.org/download/.
Introducing Enterprise Linux 7

Fedora
We can say that Fedora is the home version of Red Hat. Although we have marked this as a home version, Fedora ships in a server version and it's your choice as to how and where you use Fedora. The support for newer laptops and the latest hardware is going to be far greater. This then often makes it a target for home users and enthusiasts. The current version is Fedora 21 and uses almost all the very latest kernel with version 3.17.4-301.

The other advantage of using Fedora, even if not in a production format, is that you become familiar with technologies. These technologies will become enterprise-ready at some point. In this way, you will learn as the product is developed. For example, RHEL 7 is based around Fedora 19 and 20. If you have been an enthusiastic Fedora champion, you will already be familiar with GRUB2, BTRFS, docker, and systemd (all of which debut in RHEL 7).

Support for Fedora is community-driven with software updates available for about 13 months from the initial product launch. For example, Fedora 21 will be supported for 1 month after the release of Fedora 23. The release dates are about every 6 months, which gives us an approximate support life of 13 months. This is often why Fedora (and similar distributions to Fedora) do not make it to the enterprise category because of such a short update life cycle.

For learning and home use, this is truly a great distribution. You can choose to download the workstation, server, or cloud version at https://getfedora.org/.

From a popularity perspective, Fedora is certainly there. The numbers of hits to the Fedora download page over the past twelve months rates Fedora as being the fourth most popular distribution. To support this data and to take a look at where we read this from, you may visit http://www.distrowatch.com.

Determining your distribution and version
If you are installing from scratch, then we hope that you are able to determine what you are actually installing. If you can't, then we have some issues we need to resolve before the installation. Often though, you may be faced with a machine that is preinstalled or a lab machine that you may have access to. An obvious first step to any faultfinding task will be to determine the actual OS and patch level that we will work on. We will now look at the many ways that exist to determine the flavor of Linux that you will use.
The /etc/system-release file

The /etc/system-release file is consistent across all Red Hat variants that we have discussed here. This can be simply read with the cat command, short for concatenate. As a matter of fact, on all three systems, this file is a symbolic link that provides a shortcut to the relevant file from the following list:

/etc/redhat-release
/etc/centos-release
/etc/fedora-release

However, reading the linked file does make sense as the /etc/system-release file will always be available on any of these flavors and points to the correct OS file. Running the following command on the demonstration RHEL 7.1 system reveals the following command:

$ cat /etc/system-release

Red Hat Enterprise Linux Server release 7.1 Beta (Maipo)

The /etc/issue file

A second method could be to read the login banner from a standard terminal on the physical box. These physical terminals can be tty1 through to tty6 if no graphical system is running on the device. However, if you are running a GUI on your desktop or server, then often tty2 is the first command-line terminal. You can access this terminal from the GUI with the CTRL + ALT + F2 key sequence. The /etc/issue content will be displayed before the logon prompt. The /etc/issue content needs to be read by the /sbin/agetty TTY program. We can concatenate the file, but it’s not useful because it contains special escape characters. These characters are expanded by agetty. Looking at the file as plain text, we see the following command:

$ cat /etc/issue

\$  
Kernel \r on an \m

The \$ command will display the OS, the \r command will display the kernel version, and the \m command will display the machine type. On the RHEL 7.1 system, we will use this file as displayed when logging on from a terminal as:

Red Hat Enterprise Linux Server 7.1 (Maipo)  
Kernel 3.10.0-210.el7.x86_64 on an x86_64
Using \texttt{lsb\_release}

If there is one way to display the OS details that you are using, why should there not be three ways! As is typical with Linux, we can address this issue in many ways. A third way is to use the \texttt{lsb\_release} command. This is generally not installed as part of the default installation. So, it needs to be added to your system (if this has not already been done).

Installing this software can be achieved using \texttt{yum}, but this needs to be run as the user (administrator). So, either use \texttt{su -} to switch to the root account or use \texttt{sudo} if your account is set up as an administrator, as shown in the following code:

\[
\texttt{$ sudo\ yum\ install\ redhat-lsb-core}
\]

Despite the \texttt{redhat} element in the package name, this command can also be used on CentOS (if this is the system you are using for your journey to Enterprise 7 Linux). With the package installed, we will use the \texttt{lsb\_release} command to identify the OS. On the system we use for this book, we can view the following output:

\[
\texttt{$ lsb\_release\ -a}
\]

\begin{verbatim}
LSB Version:    :core-4.1-amd64:core-4.1-noarch
Distributor ID: RedHatEnterpriseServer
Description:    Red Hat Enterprise Linux Server release 7.1 Beta (Maipo)
Release:        7.1
Codename:       Maipo
\end{verbatim}

If you are using Fedora, you can install the package using the following command:

\[
\texttt{$ sudo\ yum\ install\ redhat-lsb}
\]

The output is similar, but relates to the Fedora release, as shown in the following output from the Fedora 21 server:

\[
\texttt{$ lsb\_release\ -a}
\]

\begin{verbatim}
Distributor ID: Fedora
Description:    Fedora release 21 (Twenty One)
Release:        21
Codename:       TwentyOne
\end{verbatim}
Determining the kernel version

We have seen that the Linux kernel version may well be displayed with the `/etc/issue` file when logging on to a terminal. However, we can also easily display the version of the current kernel using the `uname -r` command. The kernel is the core of an OS and is maintained as open source software by the Linux Foundation. This command can be run as a standard user. On the RHEL 7.1 system, it displays the following information:

```
$ uname -r
3.10.0-210.el7.x86_64
```

Again, knowing the version of the Linux kernel is a great starting point in order to build a picture of the system for faultfinding and placing support calls.

Summary

By now, I am hoping that you have a better understanding of what you are going to need to follow through this book and how it will help you learn Red Hat Enterprise Linux 7 networking, be it on RHEL, CentOS, or Fedora. You will now be able to differentiate the benefits of each distribution and identify the version that you will work on.

In the next chapter, we will start looking at configuring networks on RHEL 7. Additionally, we will look at how to gain administrative rights using `su` or `sudo` and its benefits. This will be particularly useful for those new to Linux administration and those who are a little lost with running tasks as an administrator.
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You can buy Learning RHEL Networking from the Packt Publishing website.
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