Linux System Administration on Red Hat

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1 Course overview

This class is for people who are familiar with Linux or Unix systems as a user (i.e., they know file manipulation, an editor, and common Unix/Linux tools). The class covers information they will need to be a successful system administrator of a Red Hat Linux system. This class stresses troubleshooting problems an administrator is likely to encounter.

2 Course objectives

Students attending this class will learn:

- how to install the operating system
- the parts of a user account and the files where these data are stored
- how to verify, install, update, and remove software packages
- the structure of data on disks, including partitions and filesystems and how to work with them
- system administration tools such as *rsync* and *lsof*
- shell programming
- how to execute jobs at regular intervals
- logging, how to control it, how log files are rotated
- the information in the **/proc** filesystem and how to work with it
- how the system boots and how to customize it
- how to configure the network to use static or dynamic IP addresses
- configuring and working with network services such as name lookups, NIS (optional), NFS, the automounter, and *ssh*.
- the Linux tools commonly used for backups
- tools for network monitoring and testing
- network performance tuning
- performance monitoring

3   Student background

If you are attending this class, then we assume that

- You are comfortable with basic Linux commands such as *cp*, *mv*, *rm*, *mkdir*, *rmdir*, *chmod*, *cat*, *more* or *less*, *passwd*, *date*, and *ls*.
- You know what absolute and relative paths are and the difference between them.
- You know what . and .. mean and when you would use them.
- You know what the permissions on directories mean (they are different from files).
- You are comfortable working at the command line.
- You can read manual pages and other system documentation.
- You know an editor.
- Knowing a programming language will make shell programming much easier.

4   Logistics

The class lasts four days. Fedora core 4 or Centos 4 The class uses the following software:

- A CD DVD or USB memory to mount; the installation CDs/DVD work fine for this
- All backup software we use is on the OS distribution CDs
- Gnome for a desktop environment (on distribution CDs)
- Kernel source (from Internet or source CDs or DVDs; **not** on the normal distribution media)
- OS distribution CD 1 or Knoppix CD
- OS installation media
- The test partition created at install time
- *gkrellm* (on class web site)
- *iptraf* (if covered in this class)
- *nmap* (on distribution media)
- *ttcp* (on class web site)
- *xosview* (on class web site)
- a DHCP and DNS server for the class
- a package to install and upgrade (the instructor needs to be prepared for this)
- an NIS server on the instructor machine with an account the students will log into (if this class covers NIS)
- bonnie or bonnie++ (on class web site)
- class network configuration information
- either Internet access or a local CentOS repository (the instructor needs to be prepared for this)
- static IP addresses (these do not need to be routable)
- un-allocated space left at install time.

No class network information specified.

The class needs a web server for the class web site. The instructor's laptop may be this web server; otherwise the machine provided in the classroom for the instructor is a good choice. This machine obviously will need web server software installed.

5   Class outline

1. Introduction (Lecture: 15; Lab: 0)

    (a) Class Introductions
    (b) Class Logistics
        i. Class schedule
        ii. Breaks
        iii. Question policy
        iv. Break room and restroom locations
        v. Assumptions about your background
    (c) Typographic conventions

2. Red Hat OS Installation (Lecture: 25; Lab: 75)

    (a) Hardware requirements
    (b) Installer options
    (c) Disk partitioning
    (d) Network configuration
    (e) GNU/Linux as a guest OS
    (f) Kickstart
        i. Summary of CentOS 5 Installation
    (g) Lab

3. Finding the answer (Lecture: 15; Lab: 40)

    (a) General hints
    (b) The help system
    (c) The manual pages
    (d) GNU info
        i. Some *info* commands
    (e) Summary
    (f) Lab

4. Basic bash programming, part I (Lecture: 30; Lab: 40)

    (a) Variables
        i. Environment Variables
        ii. Pre-defined Variables
    (b) Comments and spaces
    (c) Shell Scripts

(d) Quoting

(e) Lab

5. Basic bash programming, part II (Lecture: 30; Lab: 50)

    (a) Exit status and **$?**

    (b) Expressions

        i. Expressions (using *test*)

        ii. String expressions (*bash* and *ksh*)

        iii. File expressions

        iv. Arithmetic expressions (*bash* and *ksh*)

    (c) if

        i. Examples

    (d) case

    (e) Lab

6. Basic bash programming, part III (Lecture: 20; Lab: 45)

    (a) for

    (b) while

    (c) Functions

        i. Function arguments

        ii. Example

        iii. Output from running the example

        iv. Local variables

    (d) Debugging Shell Scripts

    (e) Lab

7. User Information (Lecture: 40; Lab: 50)

    (a) User and group information files

        i. **/etc/passwd**

        ii. **/etc/shadow**

        iii. **/etc/group**

    (b) Adding and deleting users

        i. GUI

        ii. *vipw*

    (c) Password aging

        i. *chage* command-line arguments

    (d) **login.defs**

    (e) PAM

        i. Example

    (f) **nsswitch.conf**

    (g) *su* and the root account

      iii. *chkconfig*

      iv. *service*

  (f) Boot floppies/CDs

      i. Booting rescue mode

  (g) Shutting down the system

  (h) Troubleshooting

  (i) Summary

  (j) Lab

13. Network Configuration (Lecture: 30; Lab: 45)

  (a) Network configuration

      i. DHCP client configuration

      ii. Static network configuration

  (b) DNS lookups

      i. **/etc/resolv.conf**

      ii. *host*

  (c) Virtual network interfaces

  (d) *mii-tool* and *ethtool*

      i. Examples

  (e) *system-config-network*

  (f) Troubleshooting

  (g) Summary

  (h) Lab

14. Network services (Lecture: 30; Lab: 45)

  (a) *xinetd*

  (b) *ssh*

      i. Public key authentication

      ii. Tunneling

  (c) NFS

      i. Client

      ii. Server

  (d) Automounter

  (e) Troubleshooting

  (f) Summary

  (g) Lab

15. Network monitoring, testing, and tuning (Lecture: 45; Lab: 80)

  (a) Network monitoring and testing tools

      i. *tcpdump*

      ii. *wireshark*

   v. Examples
  (e) *rsync*
   i. Example
  (f) Summary
  (g) Lab

Appendices

 A. Basics (Lecture: 20; Lab: 20)
  (a) Logging in and out
  (b) Typing and correcting mistakes
   i. In dialog boxes
   ii. In a terminal window
  (c) Changing your password
  (d) An overview of the Gnome Desktop
   i. The decoration around windows
   ii. The panel
   iii. The Terminal Emulator
  (e) An introduction to the Gnome file manager
  (f) Command-line structure
  (g) Some simple commands
  (h) Displaying the contents of a file in a terminal
  (i) Lab

 B. File manipulation (Lecture: 30; Lab: 50)
  (a) An Overview of the UNIX filesystem
   i. Pathnames
   ii. Directories
   iii. Filenames
  (b) Listing files
  (c) Renaming and Copying Files
  (d) Removing Files
  (e) The *file* command
  (f) Creating and removing directories
  (g) Links
  (h) Lab

 C. File and directory permissions (Lecture: 15; Lab: 15)
  (a) Introduction
  (b) Looking at File Permissions
  (c) Changing Permissions
  (d) Lab

D. The vi editor (Lecture: 20; Lab: 30)

  (a) Introduction
  (b) Getting in and out
  (c) *vi* modes
  (d) Moving around
  (e) Adding text
  (f) Deleting text
  (g) More
  (h) Lab

E. The shell (Lecture: 55; Lab: 55)

  (a) Introduction
  (b) Metacharacters
       i. Examples
  (c) Redirecting I/O
       i. Examples
  (d) Pipes
  (e) History and command line editing (*ksh* and *bash*)
  (f) Shell startup and customization (*bash*)
  (g) Aliases
  (h) Additional *bash* features
  (i) Lab

F. Some useful tools, part I (Lecture: 35; Lab: 60)

  (a) *grep*
  (b) Regular expressions
       i. Example
       ii. Example
       iii. Summary of regular expression characters
  (c) *head* and *tail*
  (d) *less*
  (e) Summary
  (f) Lab

G. Some useful tools, part II (Lecture: 30; Lab: 30)

  (a) *cut*
  (b) *diff*
  (c) *sort*
       i. Example
  (d) *uniq*
  (e) *cat*
  (f) *wc*

    (g) *tee*

    (h) *sleep*

    (i) Lab

H. Processes (Lecture: 30; Lab: 25)

    (a) Process information

    (b) Job control

    (c) *nice*

    (d) Looking at processes

        i. *ps*

    (e) *top*

    (f) Killing processes

    (g) Lab