



Red Hat System Administration II

Course Outlines

- Tuning and Maintaining the kernel
- Filesystem Management



KERNEL SERVICES AND CONFIGURATION



Kernel Modules

- Many of the kernel's components are not part of the standard kernel image, but are dynamically loadable modules.
- These modules increase the kernel's functionality without increasing the size of the kernel image loaded at boot time.
- A smaller kernel image results in a faster boot process as well as less memory use.



The /lib/modules directory

- Kernel modules reside in the /lib/modules/<kernel-version> directory.
- Kernel version can be obtained by uname -r command.



Listing and unloading modules

The kernel normally loads modules automatically when they are required without any human intervention.

- While rarely needed, there are commands that will
- List the kernel modules that are loaded into memory -> lsmod, modprobe
- Load kernel modules into memory -> modprobe
- Remove kernel modules from memory -> rmmod, modprobe
- See what each module will do -> modinfo



Examples

- Unload the vfat module using rmod command

```
# lsmod | grep fat
```

```
vfat 14529 0
```

```
fat 44257 1 vfat
```

```
# rmmod vfat
```

```
# lsmod | grep fat
```

```
fat 44257 0
```

- Loading vfat module using modprobe command

```
# lsmod | grep fat
```

```
#
```

```
# modprobe vfat
```

```
vfat 14529 0
```

```
fat 44257 1 vfat
```

- Unload the vfat module using modprobe command

```
# modprobe --remove vfat
```

```
# lsmod | grep fat
```

```
#
```



Loading modules

- These module dependencies are defined in the `/lib/modules/<kernelversion>/modules.dep` file, which is generated by the `depmod` command.
- You seldom need to run the `depmod` command manually because the default `/etc/rc.d/rc.sysinit` script is configured to run the `depmod` command when the system is booted.



Configure kernel modules

- When you load a module with the modprobe command, the /etc/modprobe.conf configuration file is consulted for appropriate default values.

more /etc/modprobe.conf

alias eth0 el00 # tells the modprobe command to load the el00 module if the eth0 device is activated.

alias snd-card-0 snd-intel8x0 # tells the modprobe command to load the snd-intel8x0 module if the snd-card-0 device is activated.

options snd-card-0 index=0 # tells the modprobe command to provides the index=0 option to the kernel when the snd-card-0 module is loaded.



Update a kernel RPM

- To install an updated kernel, use `rpm -i` to install an additional kernel. Then, test the new kernel
- Only after you are convinced that the new kernel is working properly will you want to delete the older kernel
- To delete an older kernel

```
# rpm -e kernel-<version>
```



The /proc filesystem

- It contains a virtual filesystem that has information about the running kernel, such as system hardware, network settings and activity, and memory usage.
- Features of the /proc filesystem
 - It is not a disk-based filesystem; all of the data is stored in memory.
 - It is mounted during system boot-up through an entry in the /etc/fstab file.



The /proc filesystem (cont.)

- Listing the files and directories under /proc will reveal that virtually all of them have a size of zero, but you can cd into the directories and can view files by cat



Some of the key files

- /proc/cpuinfo
 - Information about the system's CPU
- /proc/meminfo
 - Information on available memory, free memory, swap, cached memory, and buffers
- /proc/uptime
 - System uptime and idle time
- /proc/version
 - Information on Linux kernel version, host, date, etc



Some of the key Directories

- /proc/scsi
 - Information about SCSI devices
- /proc/ide
 - Information about IDE devices
- /proc/net
 - Information about network activity and configuration
- /proc/sys
 - Kernel configuration parameters
- /proc/\$PID
 - Information about process PID



Examples

```
# echo 1 > /proc/sys/net/ipv4/ip_forward # Turn  
on IP forwarding
```

```
# echo 16384 > /proc/sys/fs/file_max /proc/sys  
modification are temporary and not saved at  
system shutdown
```

- Kernel configuration file is /etc/sysctl.conf
 - To change any parameter in /etc/sysctl.conf
 - For example: net.ipv4.ip_forward = 1
- ```
sysctl -p then check /proc/sys
cat /proc/sys/net/ipv4/ip_forward
```



# Filesystem Management





# Adding a new disk

- If you added a new disk the system should detect its presence after reboot.
- You would be able to see this discovery in the `/var/log/dmesg` log file.
- The tool that partitions disks is called `fdisk`.
- You use the device name of the disk as the argument.



Only the root account can adjust disk partition settings.

# Starting the fdisk Utility

```
fdisk /dev/hda
```

- To show the menu of command options, type m.
- Delete a partition -> d
- Lists known partition types -> l
- Adds a new partition -> n
- Prints the partition table -> p
- Quits without saving changes -> q
- Writes table to disk and exit -> w



# Did Kernel Feel The Changes ?

If you cat /proc/partitions

- The new partition is not available
- So for the kernel to feel the changes use partprobe command.



# Formatting a partition

- The format utility is generally known as mkfs

```
mkfs -t ext2 /dev/hda5
```

```
mkfs -t ext3 /dev/hda5
```



# Create a mount point

- Create a mount point for this partition  
`# mkdir /rdbm`
- Mount a partition to a directory  
`# mount -t ext2 /dev/hda5 /rdbm`
- Disconnect a filesystem from mount point  
with `umount`

`# umount /dev/hda5`

`# umount /rdbm`



# Adding Additional Partitions to /etc/fstab

- At boot-up time, the rc.sysinit command reads the fstab file to determine which filesystems should be mounted.

```
more /etc/fstab
```

```
DEV LOCAL-ACCESS FILE-TYPE OPTIONS DUMP FSCK-ORDER
```

```
/dev/hda2 / ext3 defaults 1 1
```

```
/dev/hda1 /boot ext3 defaults 1 2
```

```
/dev/hda3 swap swap defaults 0 0
```



# Filesystem Labels

```
e2label /dev/hda8 mydisk
```

```
mount LABEL=mydisk /data1
```

```
mount -L mydisk # in case it is present in
/etc/fstab
```

```
e2label /dev/hda8
mydisk
```

Using labels in /etc/fstab

```
LABEL=mydisk /data1 ext3 defaults 1 1
```



## ADDING ADDITIONAL SWAP TYPE DISK SPACE





# Introduction

- Swap space allows processes to use more memory than actually exists on the system
- If the amount of memory requested by the process running on the system exceeds the amount of available RAM, the Linux kernel can swap some of the pages of memory being used by sleeping or idle processes to disk to make room for the additional memory needed by running processes or new processes.



# Swap summary usage with the swap command

- You can display your current swap usage using the `-s` option to the `swapon` command

```
swapon -s
```

| Filename  | Type      | size    | Used | Priority |
|-----------|-----------|---------|------|----------|
| /dev/hda2 | partition | 2040244 | 0    | -1       |



# Adding a new swap type partition

- Add a new swap partition
  - Using the fdisk utility to create a partition
  - Set the system ID to the value hex 82
  - Use the t command within fdisk to change a partition's system ID to Linux swap
  - Save the changes
  - Use partprobe to force the system to recognize the changes.



Format swap partition

```
mkswap /dev/hda6
```

# Implement and Display swap Partition Usage Information

- Use the swapon utility
  - To begin using the device as swap space.
- Use the -s option
  - To display the swap usage summary information
- Add the new swap partition to the /etc/fstab file



# Example

# fdisk /dev/hda

Command (m to help): n

First cylinder (3001-4864, default 3001):

Using default value 3001

Last cylinder or +size or +sizeM or +sizeK(3001-4864,  
default 4864): +199

Command (m to help): t

Partition number (1-6): 6

Hex code (type L to list codes): 82

Changed system type of partition 6 to 82 (Linux swap)



# Example cont'd

# fdisk /dev/hda

Command (m to help): n

First cylinder (3001-4864, default 3001):

Using default value 3001

Last cylinder or +size or +sizeM or +sizeK(3001-4864,  
default 4864): +199

Command (m to help): t

Partition number (1-6): 6

Hex code (type L to list codes): 82

Changed system type of partition 6 to 82 (Linux swap)



# Example cont'd

Command (m to help): w

The partition table has been altered!

Calling ioctl() to re-read partition table.

WARNING: Re-reading the partition table failed with error  
16: Device or resource busy.

The kernel still uses the old table.

The new table will be used at the next reboot.

Syncing disks

# partprobe



# Example cont'd

```
mkswap /dev/hda6
```

Setting up swapspace version 1, size = 1645019 KB

```
swapon /dev/hda6
```

```
swapon -s
```

| Filename  | Type      | Size    | Used | Priority |
|-----------|-----------|---------|------|----------|
| /dev/hda2 | partition | 2040244 | 0    | -1       |
| /dev/hda6 | partition | 1606460 | 0    | -2       |

```
grep swap /etc/fstab
```

```
/dev/hda2 swap swap defaults 0 0
```

```
vi /etc/fstab
```

```
/dev/hda6 swap swap defaults 0 0
```





# Adding Temporary File Space as swap

- Create a local file of the required size using the dd command.
- Format this file just as if it were a partition device file.



# Example

```
dd if=/dev/zero of=/myswap bs=1024 count=1024
```

```
1024+0 records in
```

```
1024+0 records out
```

```
ls -l /myswap
```

```
-rw-r--r-- 1 root root 1048576 Jul 6 06:37 /myswap
```

```
chmod 600 /myswap
```

```
mkswap /myswap
```

```
Setting up swapspace version 1, size = 1044 kB
```

```
swapon /myswap
```

```
swapon -s
```

| Filename  | Type      | Size   | Used | Priority |
|-----------|-----------|--------|------|----------|
| /dev/hda2 | partition | 327672 | 2868 | -1       |
| /myswap   | file      | 1016   | 0    | -2       |

```
vi /etc/fstab
```

```
/myswap swap swap defaults 0 0
```



Thanks 😊

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