THE KERNEL

<insert funny joke>

OVERVIEW

- The kernel represents the core of the operating system. Major components include:
  - Scheduler
  - Memory manager
  - Device drivers
  - Filesystems
  - Networking

MODULAR

- The Linux kernel is modular, allowing functional blocks of software to be added and removed on the fly via the modules mechanism.

- Modules encompass functions such as:
  - Device drivers
  - Kernel features - firewalls, RAID, LVM
  - Filesystems

LSMOD

- `lsmod`: Prints all of the currently loaded modules

```
[root@dev1 ~]# lsmod
Module                  Size  Used by
ipv6                  264608  20
binfmt_misc            14096  1
dm_multipath           21136  0
parport_pc             31724  0
lp                     16576  0
parport                42252  2 parport_pc,lp
usbcore               129724  1
ext3                  125968  1
jbd                    61928  1 ext3
raid10                 23808  0
raid456               119840  0
xor                    10512  1 raid456
raid1                  24064  0
raid0                  10752  0
multipath              11776  0
linear                  9088  0
dm_mirror              23016  0
dm_snapshot            18872  0
dm_mod                 55752  3 dm_multipath,dm_mirror,dm_snapshot
processor              26412  0
fuse                   42160  1
[root@dev1 ~]#
```

RMMOD

- `rmmod`: Removes (unloads) a loaded modules
  - Can not unload a module that is a dependency of another module
  - Can not unload in-use modules

INSMOD

- `insmod`: Loads a module into the kernel.
  - Full pathname required
  - Does not handle dependencies automatically

MODPROBE

- `modprobe`: Intelligent module handler
  - Can load/unload modules
  - Automatically handles dependencies
  - Only need to specify name of module, not full path, when loading
  - `depmod`: Rebuilds module dependency lists

KERNEL BOOT PARAMETERS

- Hundreds of parameters can be passed to the kernel at boot time. Some of the most common include:
  - `root=/dev/sda3` *Set the root device*
  - `quiet` *Reduce informational messages at startup*
  - `rhgb` *Red Hat Graphical Boot*
  - `console=ttyS0` *Specify console device*
- See http://www.kernel.org/doc/Documentation/kernel-parameters.txt

KERNEL RUNTIME PARAMETERS

- Recall from performance tuning lecture that there are numerous kernel parameters which can be adjusted at runtime, including:
  - `net.ipv4.*`
  - `vm.*`
  - `kernel.*`
  - `fs.*`

SYSCTL

- sysctl: Get/set kernel parameters
  - `sysctl -w kernel.pid_max=65535`
  - `sysctl -a`
  - `sysctl -w vm.swappiness=100`

LOCALIZATION AND INTERNATIONALIZATION

- Linux has full support for timezone and locale configuration.
- Language and locale-specific details are controlled through the `LANG` and `LC_*` environment variables. See the `locale` command for details.
- The system clock tracks time by the epoch, but when displaying will be adjusted by timezone. Timezones can be set with the `TZ` environment variable, the value determined by `tzselect`. The system timezone information is provided by `/etc/localtime`.

EXERCISES

- View the loaded modules. Remove the parport module. Might be several steps involved…

- Use locate to find ‘parport.ko’ and re-load the module using insmod.

- Remove the parport module again. Add the module using modprobe. Isn’t that easier? =)

```
slideshow.end();
```