Appendix B
Basic Linux and vi Commands

vi Commands

The Visual Interpreter/Editor (*vi*) is the most widely used text editor available for the UNIX environment. While almost everybody curses its unwieldy command syntax, it is still the only editor almost certain to be included with every version of the UNIX and Linux operating system. The following are a partial list of available *vi* commands.

vi has two modes. Command line (where anything typed is taken as an editing command) and input mode (where everything typed will be treated as part of the file being edited. To enter the input mode, type a, A, i, I, o, O, c, C, s, S, r, or R. To return to the command-line mode, use the <ESC> key. To access the *vi* editor from SQLPlus, enter the following command:

```
SQL>define _editor=vi
```

To edit a file from SQLPlus prompt, edit <*filename*> (press enter), from the Linux command prompt, vi <*filename*> (press enter)

To MOVE the cursor:

h - move left j - move down k - move up l - move right

w - one word forward b - one word backward e - end of current word

W, B, or E - same as lower case but ignores punctuation

0 (zero) - Move to beginning of current line $ - end of current line

G - go to last line of file H - go to top line on the screen

L - go to last line on screen M - go to middle line on the screen

/<string> - Search forward to the next occurrence of <string>

?<string> - Search backward to the next occurrence of <string>

n - Repeat previous search N - Repeat previous search in opposite direction

<ctrl> f - Scroll forward one page <ctrl> b - Scroll backward one page

To UNDO previous changes:

u - Will undo the most recent change. U - Will undo the most recently deleted text.

:e! - re-edit current file without saving any changes made since last change

To ENTER NEW text:

a - Append text after the current cursor position.

A - Append text to the end of a line (jumps to end of line and begin appending).

c - Change object C - Change from current cursor position to end of the line

i - Insert text before the current cursor position. I - Insert text at the beginning of a line.

o - Insert a blank line BELOW the current cursor position.

O - Insert a blank line ABOVE the current cursor position.

r - Replace character at current cursor position R - Replace all characters until <ESC> is pressed

s - substitute text for character under cursor

:s/A/B/opt substitutes string B for string A. %s/A/B/opt is global replace

options include: g (change all occurences on current line) c (confirm prior to each change)

p (print changed lines) S - Substitute entire line to the end

. <period> - repeat last change *n*. <integer><period> repeat last change *n* times

To leave the input mode, press <ESC>

To DELETE existing text:

x - Will delete the character directly under the current cursor location.

dd - Will delete the entire line where the cursor is located.

d*n*d (where *n* is some integer) will delete *n* lines from current cursor position

dw - delete current word D - delete to end of current line

J - Delete return at end of current line. Join this line and the next

<int> J - Join the next <int> lines

COPY, CUT, and PASTE: *vi* uses a single buffer where the last changed or deleted text is stored. This text may be manipulated with the following commands:

Y - Yank a copy of the current line y <integer> - Yank a copy of next <int> lines

yw - Yank a copy of the current word yb - Yank a copy of the previous word

p - Put buffer contents after cursor P - Put buffer contents before cursor

Also, see the s and S commands under the input section

To SAVE edited changes to an operating system file:

zz - Will terminate edit mode. :w filename - Will save changes to the filename specified.

:wq - Write all changes and quit the edit mode

To QUIT without saving changes:

ZZ - Will terminate edit mode. :q! - Will terminate the file without saving changes.

Basic Linux Commands

This appendix is meant to serve only as a quick reference while you are in class. For more details on these commands, consult the man pages, your Linux documentation, or other Linux command reference books.

Files and Directories	Linux Commands	Description/Comments

Command manual	`man <command>`
	
	`man -k <string>`
	
	`man man`
		Find the manual entry for this <command>.
		Show all the manual entries that contain this <string>.
		Displays the manual page for `man`.

Command information	`info <command>`	Show the information system entry for this command. Using `info info` shows a tutorial of the `info` documentation system.
Print to standard out	`cat <file>`	Concatenate and print – print the named file to the terminal screen.
List users	`cat /etc/password`	
Change working directory	`cd <directory>`	Change working directory to specified directory cd with no parameters changes to $HOME.
Copy a file	`cp <source_file> <destination_file>`	Copy a source file to a destination file.
View a file	`less <file>`	View a file a page at a time. This is a GNU version of `more`, or `pg`.
View a file	`more <file>`	View a file a page at a time. BSD version.
List directory	`ls <directory>`	Options –l long listing, -R recursive, -a show hidden files, -t sort by time, -r reverse sort, default directory is current working directory.
Create a directory	`mkdir <directory>`	Make a directory defaults into the current working directory, full path may be specified.
Move or rename a file	`mv <old_file> <new_file>`	Move changes the name of a file or moves it to a different directory.

Process List	`ps` `ps -ef`	Shows the processes report Shows all processes on the system with a full listing. Many option exist see the man page for details.
Print working directory	`pwd`	Print to stdout the current working directory.
Remove or erase a file	`rm <file>`	Removing a file on Linux is permanent. Options –r recursive, and –f force (including subdirectories) are *very dangerous*. Often the `rm` command is aliased with `rm –i` The option –i asks 'Are you sure?'
Create an empty file	`touch <file>`	Create a file.
Name of the machine	`hostname`	Returns the name of the machine.
The IP address of the machine	`host <machine_name>`	Queries the Domain Name Server, and returns the IP address of the machine name.
Remote shell	`rsh <host> <command>`	Execute a <command> on <host>. Rsh is not secure, use ssh instead.
Remote shell	`ssh <host>`	Secure shell, has features to replace rsh, rcp, ftp, and telnet.
Remote shell	`telnet <host>`	Start a terminal session on <host>. Telnet is not secure use ssh instead.
Search a file for a pattern	`grep <option> <pattern> <file>`	Search a <file> or stream for a regular expression defined by <pattern> and show the line that contains that pattern. A common option is –i for case insensitive. `grep` can accept input from a file or `stdin` through a pipe as in: `netstat –a| grep ESTABLISHED`
Source a script	`. <script_file>`	In the `bash` shell this command '.' forces the script to run in the shell. Normal behavior is for the script to run in a child shell.

An interpreter	`awk`	A macro language for reformatting or interpreting input. For each line of input, a variety of actions can be taken. May be referred to as nawk – for "new awk."
Sort a file	`sort`	Sort a file takes input from stdin or a filename argument, many options to sort by a particular column, field, etc. See man page.
Command-line editor	`sed`	Sed is a command-line editor, with many possible commands and options that are very good for editing from a shell script.
Visual editor	`vi <file>`	Terminal based editor available on every Unix system, Linux provides vim, an improved vi, that is a superset of vi.
Gnu editor	`emacs <file>`	This is a GPL editor with extensive customizable features available on most UNIX and Linux distributions.
WSIWIG editor	`gedit <file>`	A full-screen editor, requiring X. Available under Gnome.
WSIWIG	`kate <file>`	A full-screen editor, requires X. Available under KDE
Terminal output	`stdout`	Standard out (stdout), is not a command but a concept, most Linux commands write to stdout by default unless redirected.
Terminal input (keyboard)	`stdin`	Standard in (stdin), is not a command but a concept, most Linux commands read from stdin by default unless redirected.
Alias	`alias <command> <alias>`	Make a substitution when a user types <command> substitute and execute <alias>, common alias is alias 'rm' 'rm –i'. These aliases are set in the .bashrc file.
Show shell variables	`set`	Prints all of the variables that are currently defined in the shell.

Show environment variables	`printenv or env`	Prints all the environment variables – an environment variable has been 'exported' so that it will be inherited by child processes.
File Creation mask	`umask –S u=rwx,g=rx,o=rx`	Set the default permissions for all files created by this shell or its children. The –S option uses the symbolic notation, the numeric notation is obsolete.
Clock	`xclock`	An X client that shows a clock on the screen. Often used to test the X windows system.
X access control	`xhost` `xhost +<Xclient>`	Show the current access control in place. Add a Xclient that is allowed to access the local DISPLAY, if no <Xclient> is given all are allowed.

System Administration	Linux Commands	Description / Comments
Substitute user	`su - username`	Change the user that is currently performing the work. This can be used by any user to change who is the effective id of the session user. normal users must provide a password, root does not. The '-' parameter is optional. It runs the new users login scripts.
Limited root privileges	`sudo`	The root user may configure which users can execute certain commands as root, and whether a password is required or not. Useful for allowing specific users to perform certain root commands e.g. mount and unmount removable volumes such as CDROMs.
Root file system	`/`	The root directory for the system directory tree.
Home Directory	`/home`	Typically the directory in which all user home directories placed. For example: `/home/oracle`.
Tmp directory	`/tmp`	A temporary storage area. Do notput anything here you want to keep. SA often have a cron job to remove everything periodically.
Boot directory	`/boot`	A small partition to hold the kernel image(s) and boot loader instructions.
Log directory	`/var/log`	The location of most system log files.
Sample configuration files	`/etc/inittab`	Configuration files are located per the application. Any configuration file that you change after installation should be included in the backup.
Password files	`/etc/passwd` `/etc/shadow`	The `/etc/passwd` file holds user information and must be readable by others; even with encrypted passwords this can be a security hole. The `/etc/shadow`

		file holds the encrypted passwords and is only readable by root.
Groups file	`/etc/group`	The `/etc/groups` file defines the groups on a server and the users that are members of the group; primary group for a user is defined in the `/etc/passwd` file.
X configuration file	`/etc/X11/XF86Config`	The file that sets the X server settings for your video card, monitor, mouse, and keyboard. Usually set up with a OS vendor supplied tool.

Schedule a command to run at a regularly scheduled time	`crontab -e`	Use this command to edit the `crontab` file, to create the specification for the `cron` daemon to use.
Schedule a script to run at a particular frequency	`/etc/anacrontab`	Edit the file to specify a script to run at a particular frequency (see `man anacrontab` for details).
Schedule a command to run at a single specified time	`at <options> TIME`	Runs a job specified by <options> at a specified TIME parameter.
Schedule a command	`batch <options> <TIME>`	Run a command when the load average drops below .8, optionally after a set TIME.
Mount a file system	`mount <opt> <dev> <mount_point>`	Mount a file system on device <dev> at <mount_point> with the options specified by <dev>.
Unmount a file system	`umount <dev>` `umount <mount_point>`	Unmount the file system or device.
Maximum # of user ID	`65535`	

Recover root password	`{lilo}`
	`control-x`
	`linux S`
	`passwd root`
		This is a procedure to recover the root password if is lost. This requires physical access to the machine and system console. You start by rebooting the machine, then during the LILO boot press and hold [Ctrl] + [x] to get a

	{grub} c kernel vmlinuz-2.4.9-13 **single** ro root=/dev/hda8 initrd /initrd-2.4.9-13.img boot passwd root	prompt and command LILO to boot linux to runlevel S. The second procedure uses the grub boot loader.
Create new user	useradd	The –D option alone shows the defaults. –D with other options changes the defaults options; without –D override, the default (e.g., –g) sets a primary group.

Delete user	`userdel`	Remove a user and optionally all files belonging to the user.
Modify user account	`usermod`	Change `/etc/password` information.
Create new group	`groupadd`	–g sets the group id; default is first free value above 500.
Delete group	`groupdel`	Remove a group from the system. May not remove a group that is a primary group for a user. Files owned by deleted group must be manually changed with chown.
Change run levels	`init <runlevel>`	The `init` command causes the rcN.d scripts to be evaluated, for the change in run level. `init 6` forces a reboot.
Synchronize the disks	`sync`	Forces the buffer cache and page cache to write all dirty buffers to disk. Used just before a reboot to prevent disk corruption.
Shutdown the Linux system	`shutdown <mode> <delay>`	Do a graceful shutdown of the system, shut down processes, run all shutdown scripts, and sync disks. The modes are –r, reboot and –h, halt. The delay is a required parameter is a number in seconds or 'now'. Option shutdown warning message may be sent as well.
Error logs	`dmesg`	View boot messages. This log is circular, and limited system errors could overwrite boot information after a time.
Network IP configuration	`/etc/sysconfig/network-scripts/`	This directory holds scripts executed as part of the boot up sequence by `rc.sysinit`.
Hosts IP addresses	`/etc/hosts`	A list of hosts that your machine knows about. Must at minimum include the name of the local machine and loopback IP.
Name service switch	`/etc/nsswitch.conf`	

Network parameters	`sysctl -a | grep net`	View all net parameters that are set for the kernel.
Routing daemon	`routed`	
NIC Configurations	`ifconfig -a`	Show all the network devices currently configured.
Secondary IP Address	`modprobe ip_alias` `ifconfig eth0:1 IP`	
Login prompt	`/etc/issue`	Banner message user sees when issued the login prompt.
YP/NIS service binder	`/sbin/ypbind`	Finds and attaches to a NIS server for name resolution and other services.
Module information	`modinfo <options> <module>`	Display information about kernel modules: –l shows license, –p parameters, –d description.
List modules	`lsmod`	Show currently loaded modules.
Load module	`insmod`	Load a loadable module.
Unload module	`rmmod`	Unload a loadable module.
Install Software	`rpm -ivh package`	Install –i, verbose –v, with progress hash marks –h.
Uninstall software	`rpm -e package`	Erase package –e; will not uninstall if dependencies exist.
List installed software	`rpm -qa`	Query –q, All –a, lists all installed packages.
Verify installed software	`rpm -V package`	Compares installed files with the rpm database information.
List all files	`rpm -ql package`	List all the files that are part of a package.
Package owner	`rpm -qf file`	List the package when given the full file name.
Machine model	`uname -m`	Shows CPU level (e.g., i686).
OS Level	`uname -r`	Shows kernel version.
Run Level	`runlevel`	Shows previous and current runlevel.
Kernel Parameters	`sysctl -a`	Show settings of all settable kernel parameters.
Max # File Descriptors	`sysctl fs.file-max`	Shows the value of maximum number of file descriptor per process.

Kernel parameter settings	`/etc/sysctl.conf`	Compiled in kernel parameters; may be reset at bootup by setting them in this file.
Change Kernel Parameter	`echo <value> > </proc/<file>`	Write the new value of a kernel parameter into the `/proc` file system.
	`echo 2147483648 >/proc/sys/kernel/shmmax`	Set the value of the maximum size of a shared memory segment.
Shared Memory	`sysctl kernel.shmmax`	Show the `shmmax` parameter.
Change Kernel Parameter	`sysctl -w <parameter>=<value>`	Change a kernel parameter; the –p option reads the setting from a file and sets them. The default file is `/etc/sysctl.conf`
Set Process limits	`ulimit <option> <value>`	Set limits on a shell and processes started by the shell. Users can make limits more restrictive; generally only root can make limit less restrictive; some options require root privilege. Options: –u sets number of processes, –n number of file handles; many others (see `man bash`).
Show process limits	`ulimit`	Without options ulimit show the current limit settings.
Interprocess Communication (Shared Memory and Semaphores)	`ipcs <option>`	Options: –m the current usage of shared memory; –s usage of semaphores; –a shows all.
Remove a shared memory segment	`ipcrm shm <shmid>`	Releases the shared memory segment identified by `<shmid>`. *This is very dangerous*. You can corrupt a database that is using the segment that is released.

System Performance	Linux Commands	Description / Comments
Performance monitor	`top`	View real-time OS and process statistics.
System activity reporter	`sar –<options> <interval> <count>`	Options: –q shows CPU queue, –u CPU utilization, –d device activity, –n DEV network device activity, many more (see `man` page). Interval is in seconds.
Virtual Memory statistics	`vmstat <interval> < count>`	Interval is in seconds.
Virtual Memory statistics	`cat /proc/meminfo`	Shows instantaneous virtual memory usage.
Kernel Cache statistics	`cat /proc/slabinfo`	Kernel slab allocator statistics: frequently allocated cache objects such as inode, dentries, and asynchronous IO buffers.
I/O statistics	`iostat <option> <interval> <count>`	Options: –d device activity, –c CPU activity, –x extended disk activity statistics. The interval is in seconds.
Multiprocessor Statistics	`mpstat –P <cpu> <count> <interval>`	Return CPU statistics for particular processor or *all* CPUs in an smp system.
Physical RAM	`64 GB(Theoretical)`	Maximum physical RAM requires enterprise kernel (Red Hat Enterprise Linux AS 21 only supports up to 16 GB).
Swap device	`swapon -s`	Shows devices currently in use for swap. The swap device is arbitrary designated at install. It may be changed or added to. Multiple swap devices may be created; swap size should be at least as large as physical memory.

Display swap size	`free`	Show the current memory and swap usage.
Activate Swap	`swapon -a`	Turn on swap.
Free disk blocks	`df -k`	Measured in KB; use –m for MB units.
Device listing	`cat /proc/devices`	List devices known to the system by major and minor number.

Disk information	`cat /proc/scsi/scsi0/sda/model`
	
	`cat /proc/ide/ide0/hda/model`
		View SCSI disk information.
		
		View IDE disk information.

Print network statistics	`netstat <options>`	Print a wide variety of network statistics (see `man netstat`).
Graphical system statistics viewer	`xosview`	An X-based display of recent OS statistics.

Misc System Information	Linux Commands	Description / Comments
NFS exported	`/etc/exports`	Database file are not supported on simple NFS.
NFS Client mounted directories	`/var/lib/nfs/xtab`	
Max File System	`2 TB with 4KB block size (on 32 kernel)`	With ext3 and ext2, others vary.

Max File Size
 	
File size can not exceed file system
	`2 GB {512B block size}`
	
	`2 TB {4KB block size}`
		The oracle database can create files up to 64 GB with a 16 KB database block size.
		
		The 32-bit kernel limits file and block devices to 2 TB.

File System Block size	`dumpe2fs <device>`	Dump the file system properties to `stdout`.
Filesystem table	`/etc/fstab`	Mounts these file systems at boot up.

Journal Filesystem types	`ext3`
	
	`reiserfs`	

Disk Label	`fdisk -l`	`fdisk` is not available on all distributions.
Extend File system	`resize2fs` `resize_reiserfs`	Extending a file system is applicable to only some file system types.
Backup	`tar cvf /dev/rst0 /`	Create a backup of the root / file system.
Restore	`tar xvf /dev/rst0`	Restore the root / file system.
Prepare boot volumes	`/sbin/lilo`	Must be run after changing `/etc/lilo.conf` to push changes to boot loader.
Startup script	`/etc/rc.d/rc`	
Kernel	`/boot/vmlinuz`	
Kernel Bits	`getconf WORD_BIT`	POSIX call to get kernel information. There are many other variables besides `WORD_BIT`.

Boot single user	{lilo} control-x linux S {grub} c kernel vmlinuz-2.4.9-13 **single** ro root=/dev/hda8 initrd /initrd-2.4.9-13.img boot	Use LILO facility. Use GRUB Boot Loader.
Time zone Management	/etc/sysconfig/clock	
SW Directory	/var/lib/rpm	Directory where rpm database are kept.
Devices	/dev	This directory holds all the device files.
CPU	cat /proc/cpuinfo	Shows CPU static information.
Whole Disk	/dev/sda	Device name.
CDROM	/dev/cdrom	Usually mounted at /mnt/cdrom.
CDROM file type	iso9660	
Floppy drive	/dev/fd0	Usually mounted at /mnt/floppy.
System information	/proc	The /proc filesystem is a memory-based file system that allows access to process and kernel settings and statistics.
Compile and link a executable	make –f <file> <command>	Use a make file <file> to determine which parts of a large program need to be recompiled, and issue the commands required to compile, link, and prepare the executable for use.

LVM	Linux (UnitedLinux)	Description / Comments
LVM	`Logical Volume Manager`	This package is not provided by Red Hat Enterprise Linux AS 2.1 and may not be added without tainting the kernel. Kernel support is provided in United Linux.
LVM Concepts	`logical extents`	A Logical volume is made up of logical extents.
	`logical volume`	A set of logical extents taken from a volume group and presented to the OS as a disk volume. These extents may be striped across multiple disks.
	`volume group`	A set of physical disk partitions created by `fdisk` or the like, initialized with `pvcreate`, then grouped into a physical volume with `vgcreate`.
Display volume group	`vgdisplay -v`	
Modify physical volume	`pvchange`	
Prepare physical disk	`pvcreate`	
List physical volume	`pvdisplay`	
Remove disk from volume group	`vgreduce`	
Move logical volumes to another physical volumes	`pvmove`	
Create volume group	`vgcreate`	
Remove volume group	`vgremove`	
Volume group availability	`vgchange`	
Restore volume group	`vgcfgrestore`	

Exports volume group	`vgexport`	
Imports volume group	`vgimport`	
Volume group listing	`vgscan`	
Change logical volume characteristics	`lvchange`	
List logical volume	`lvdisplay`	
Make logical volume	`lvcreate`	
Extend logical volume	`lvextend`	
Reduce logical volume	`lvreduce`	
Remove logical volume	`lvremove`	
Create striped volumes	`lvcreate -i 3 -I 64`	