Running Your IBM Lotus Domino Server on Linux

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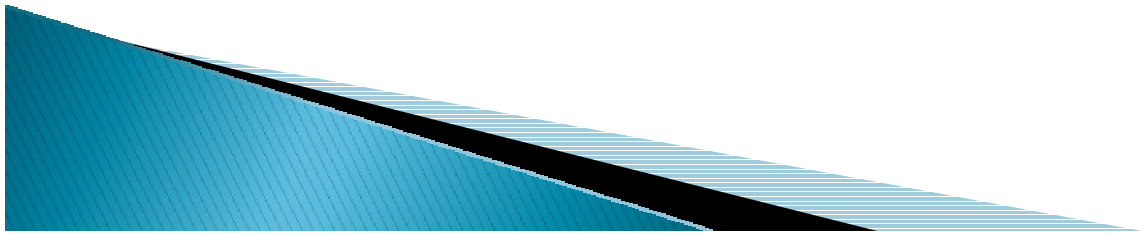
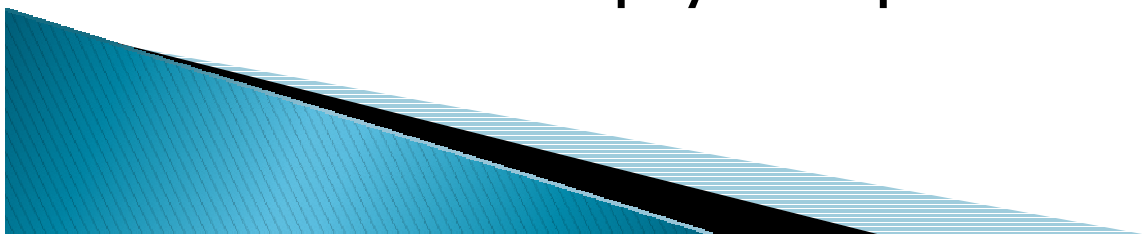
Northern Collaborative Technologies



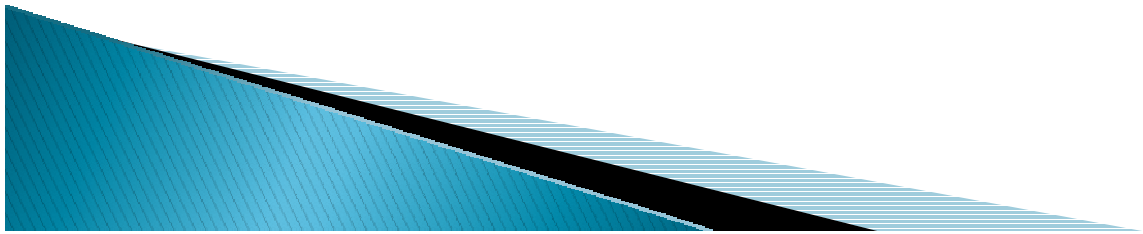
Agenda

- What will we cover, and how deeply?
- Why Linux?
- What is the difference between Linux, Linux Distributions, and software running on Linux?
- Key Concepts for using Linux or Unix
  - Files, Devices, Permissions and Processes
  - Our personal daemons!
  - Killing Zombies!
- The Scary Command Line
- What will trip you up?



Setting Expectations

- Your time is valuable.
  - If these points do not match your needs for this session, please feel free to move to another session. If you plan to do so, please do it early on so as not to disturb the others.
- Covered Topics
  - Enough about Linux to move your IBM Lotus Domino server to it
- Technical Level
  - Medium –This is a session about what you need to know to get started. There are other excellent sessions this week on advanced aspects of these topics
  - We will go into some detail about linux file systems, processes, and permissions because these are essential to your success.
- Detail is on the Slides – So you can use it as reference

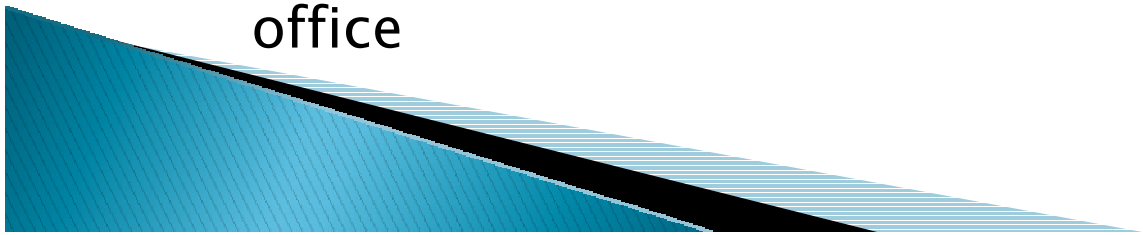


Who am I to tell you these things?

- Andrew Pollack, President of Northern Collaborative Technologies
- Author of NCT Search, NCT Compliance Search, and NCT Simple Sign On, and now Second Signal
- IBM Lotus Beacon Award Winner once, Finalist three times
- Administrator & Developer since version 2.0
- Firefighter – A Lieutenant on an Engine company
  - In firefighting, just like Server Administration it's all in the planning
- My own mail & web servers are Linux based

Why pick Linux as the OS for Domino?

- Reduced Cost of Acquisition
  - Minimal operating system license costs
    - Sometimes having one or two also lowers your other server product license fees, just show the Linux server to your sales rep.
- Performance
  - Web based applications can often be served faster on Linux than other popular platforms
- Security
  - A Linux based server can be kept “hardened” for external exposure
- Flexibility
  - A single box can provide multiple services for a small office



Picking Linux vs. Windows

- Lower price
- Very fast transactions
- Extremely flexible
- Handles multiple needs in across the environment
- Easily managed remotely
- Great for smaller, remote offices

- Appears easier to use
  - Less intimidating
- Better driver support for high end networking, RAID, and SAN systems
- Wider support for third party add-ons

Linux

Windows

Administration Staff Training Requirements

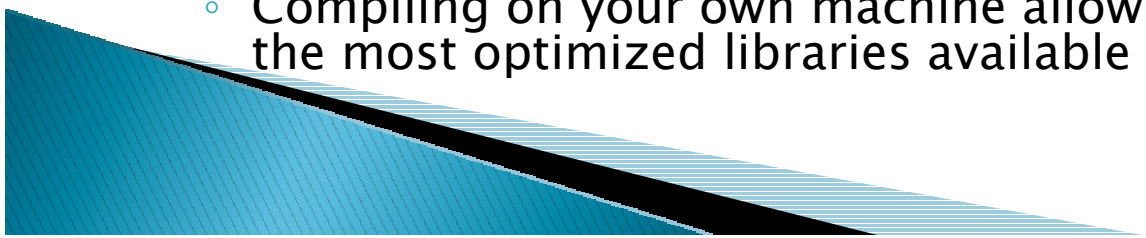
- It is NOT true that maintaining a Linux based server is harder than maintaining a Microsoft Windows based one
  - However, your staff must understand how to do it before you start using it in production

- It is NOT true that Linux based servers do not require updates and patches
  - Most Linux distributions now include easy to use and automate tools to keep these patches and updates current

Myth Busted!

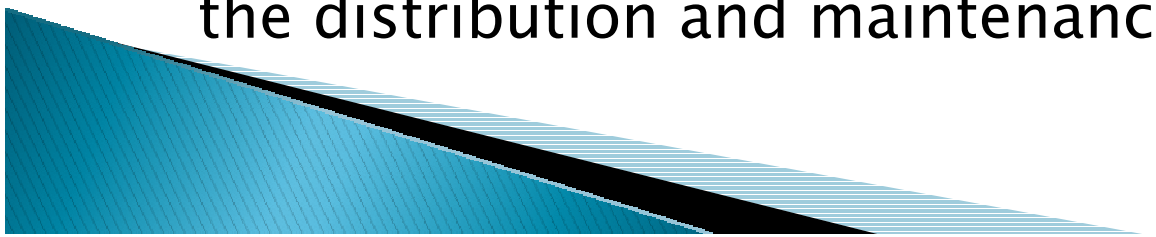
What is Linux?

- Linux itself is the core “Kernel” – a few megabytes in size when compiled. Compare it to “Kernel32.exe” in the Microsoft Windows world.
- It is “Open Source” – yes, you probably have all the source code for it on your distribution of Linux.
- Many open source software products come as source code, and compiling them is part of the installation. In general, this amounts to little more than unpacking the file, typing “make clean; make; make install”
  - You do not need to do this for Lotus Domino or other commercial software.
  - Compiling on your own machine allows the tools to make use of the most optimized libraries available for your particular machine.



What is a “Distribution” of Linux?

- A Linux Distribution consists of the Linux kernel itself, an installation kit, and a large number of “Packages” which comprise the commands and programs needed to do anything useful.
- There are several different “Package Managers” out there, which vary by distribution
  - rpm, yum, etc…
- Each distribution evolved to fill a different set of needs. Some are commercial distributions, others are entirely non-commercial.
- No one can sell you Linux. They can charge you for the distribution and maintenance of that distribution.

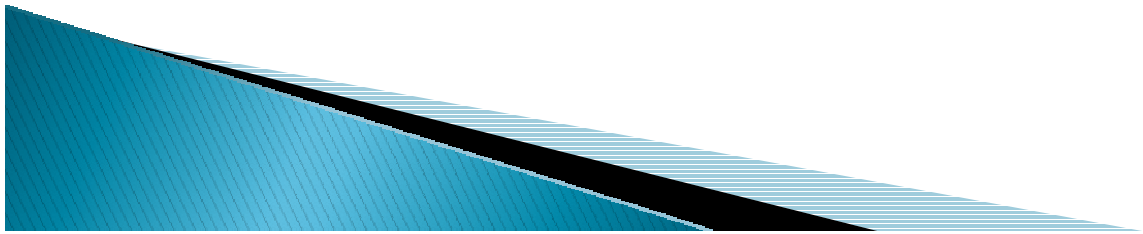


Picking the Linux Distribution

- IBM Currently supports Lotus Domino on
  - Novell SUSE Linux Enterprise Server (SLES) 10, 11
  - Red Hat Enterprise Linux (RHEL) 5
    - Note: XGL and SELinux must be disabled;
- Make sure to check README.NSF in your Notes HELP Directory
  - Look for a document titled “Linux system requirements”

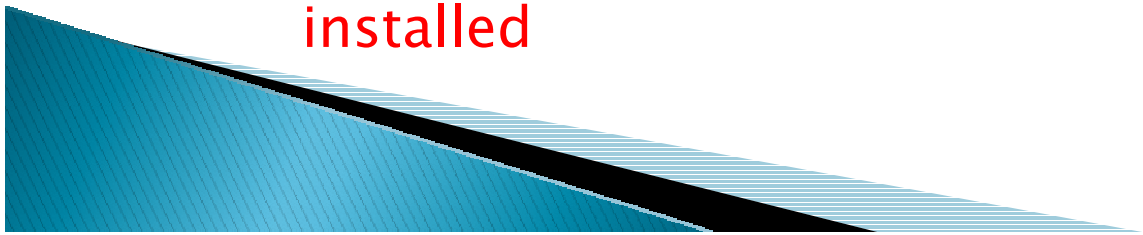
Domino CAN be run on many other distributions

- My current favorite is “CentOS 5”
  - http://www.centos.org
  - “Scientific Linux” is quickly gaining ground
- Different distributions may require minor changes in configuration or additional libraries to make Domino run.
- Make sure to check README.NSF in your Notes HELP Directory
  - Look for a document titled “Linux system requirements”



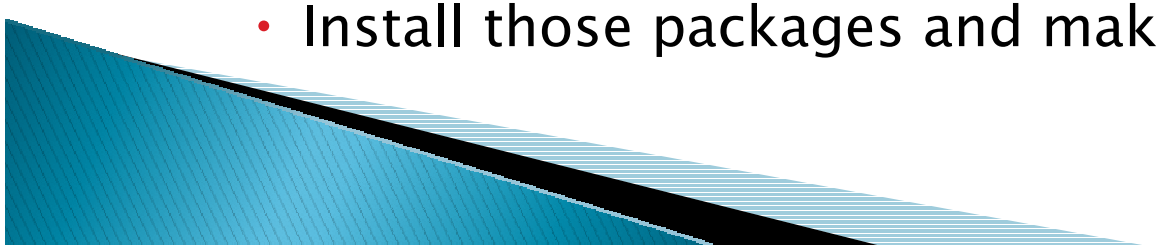
Running on Unsupported Distributions

- Many people are using other distributions with Lotus Domino 6.x, 7.x, and 8.x
- Do a Google Search on Domino and the distribution you want to try and you may find what you're looking for
- Make sure to view the README.NSF file
  - Look for the document "Linux system requirements"
  - Make sure you've got all the necessary packages installed



Required Packages – YMMV

- I used the "ldd" tool to generate a dependency list against an installed server
  - ld-linux.so.2
  - libdl.so.2
  - libm.so.6
  - libpthread.so.0
  - librt.so.1
  - libstdc++.so.5
  - libc.so.6
  - libgcc_s.so.1
  - libnsl.so.1
  - libresolv.so.2
  - libstdc++.so.6
- All were satisfied with the packages
  - glibc, libgcc, and libstdc++
  - Install those packages and make sure they're updated



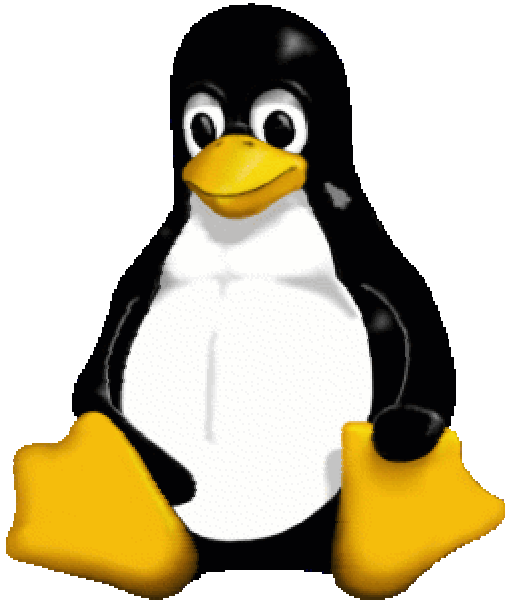
Installation & Configuration of Linux -- But not today

- Obviously the complete process of installing a Linux distribution is beyond our scope today
  - Generally no harder than installing any other operating system
  - Make sure the server is running correctly before you attempt to install Domino
  - Turn off and services you do not need which may conflict with Domino's web or mail services
  - Apache, Tomcat, Sendmail, Qmail, etc.
  - Configure the firewall to allow data to and from Domino – include ports 25, 80, 1352, 443 and possibly 8085, 8080, or 8000.

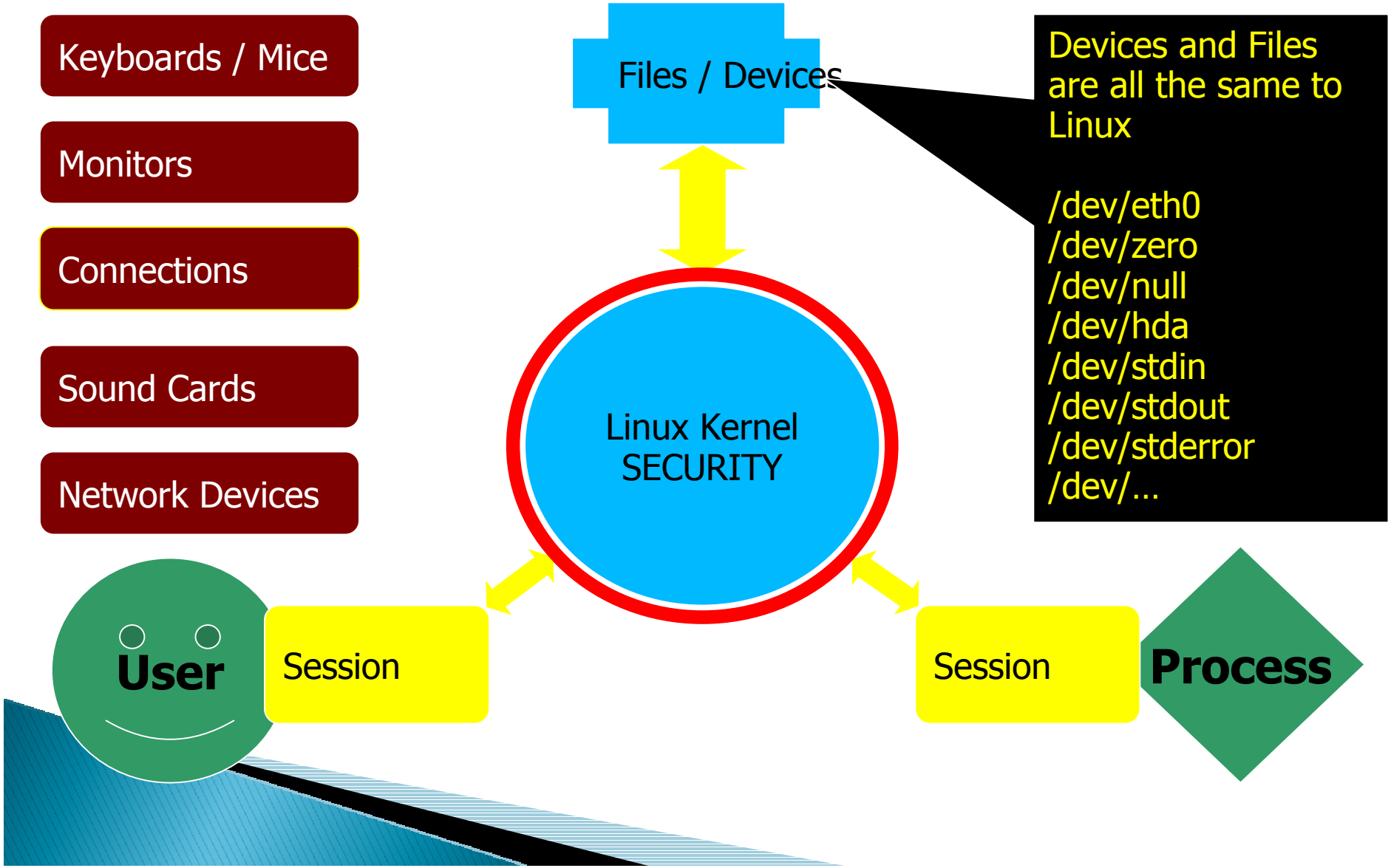
Key Linux Concepts

- Be warned, there are daemons and zombies here….

  …and sometimes you have to kill them!

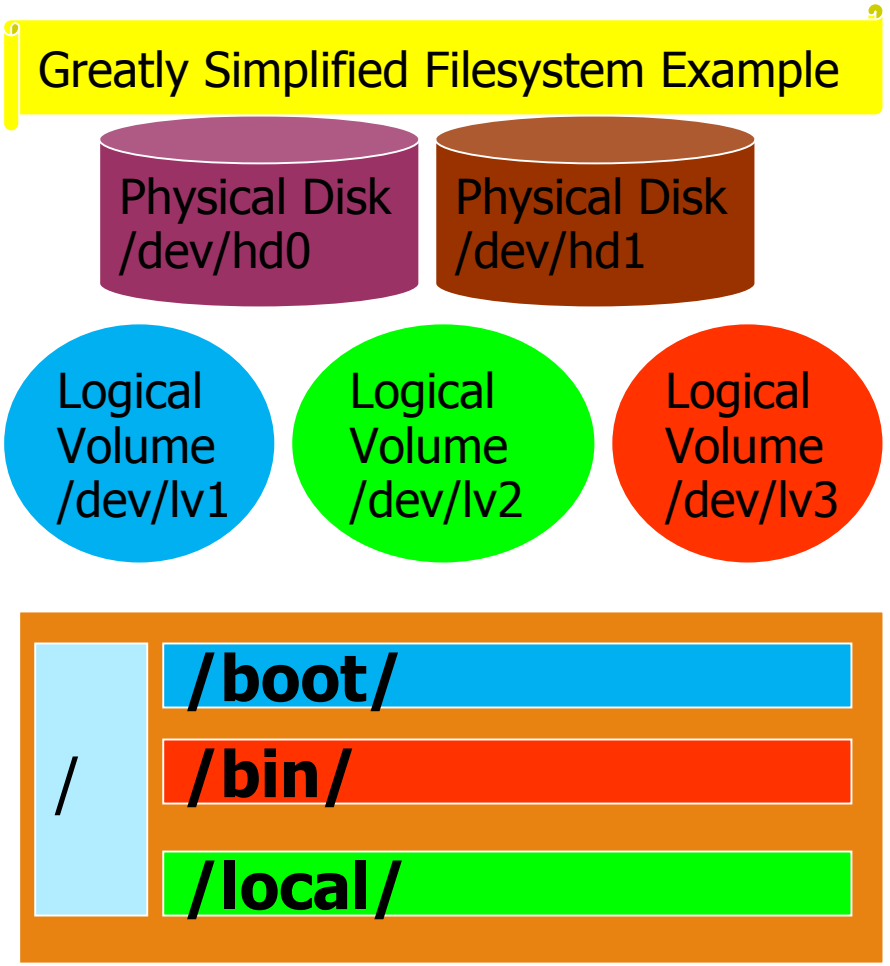


In Linux, nothing breaks the rules – You are what you are!



Files …and Devices

- File Systems Live on Logical Volumes
  - Or single drive partitions
- File Systems are “Mounted” to locations on the ‘root’ file system
- Mountings can change!
  - You could add a new drive, create a file system on it, then mount it to directory entry called “/usr/home/extraspace/” and all that new space would be available.

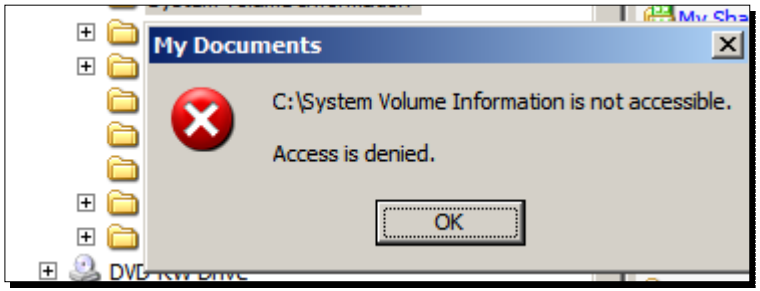


Is the Linux File System Layout So Complex?

- /etc – Contains system configurations
- /var/log – Log Files from all over
- /var/spool – To-Do lists for the OS
- /var/lib – A place for application data
  - Why doesn't the Domino Data go here?
- /home – User data home folders
- /usr/bin – Program Files
- /usr/lib – Libraries (Like DLL's)
- It's actually pretty organized

The Linux Filesystem

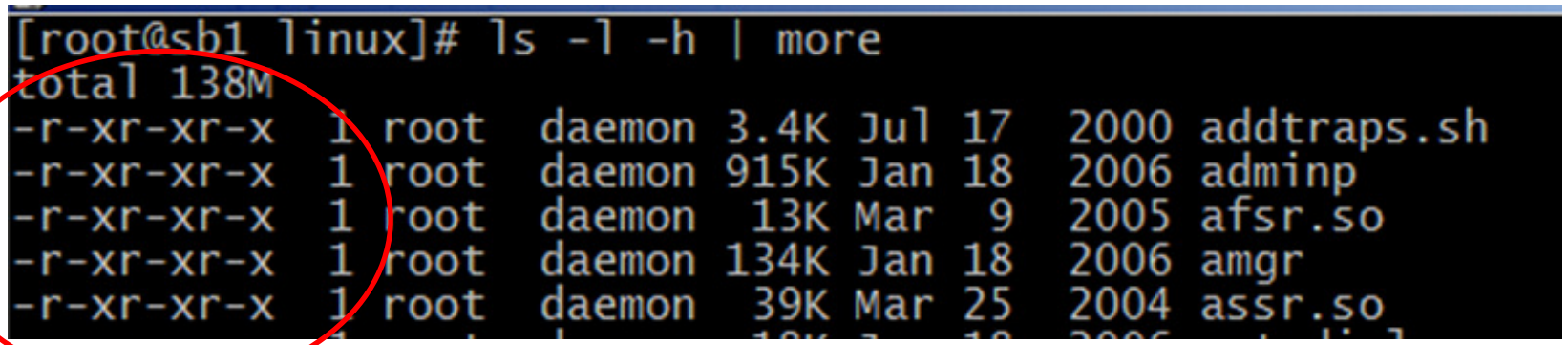
- HUNDREDS of directories in C:\WINDOWS
- LOTS of HIDDEN Directory Trees
  - Hidden even from you, the administrator
    - "System Volume Information"
    - "Local Settings" – For Each User
- Do you really know the Windows file system as well as you think?



The Windows Filesystem

File …and device … Permissions

- 3 Kinds of Access
  - Read Access, Write Access, Execute Access
- 3 Kinds of relationship between a process and a file
  - Owner, Group, Everyone Else
- The ls (lowercase L) application is like the “dir” command
  - In fact, in many distributions, dir is aliased to call ls with a set of options that make it provide similar output.
  - Calling ls with the –l (lower case L) will show you the permissions on files.

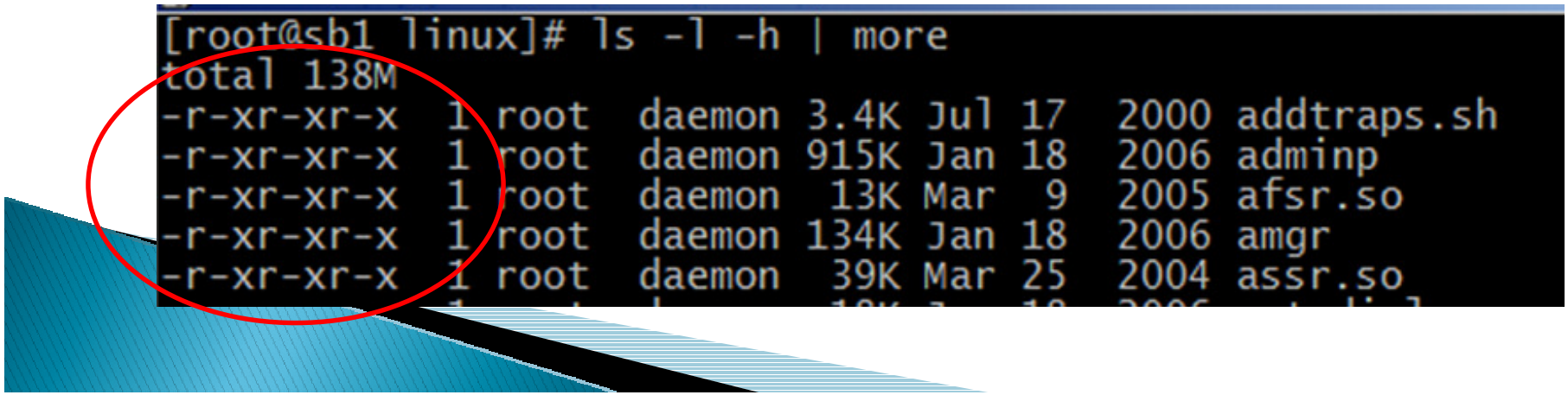


Why you'll need this

- New linux admins make the mistake of logging in and working as "root". New files they create are then created with root listed as the owner.
- Lotus Domino admin types make these mistakes:
  - ftp a file to their Lotus Domino server's html directory and find the server can't read the file.
  - mess with, copy, or otherwise fiddle with the .nsf files belonging to their server
- Using these two commands will usually fix the mistake:
  - (Assuming you used the default user, group, and directories during your install)
  - chown -R notes:notes /local/notesdata/*
  - chmod -R 664 /local/notesdata/*

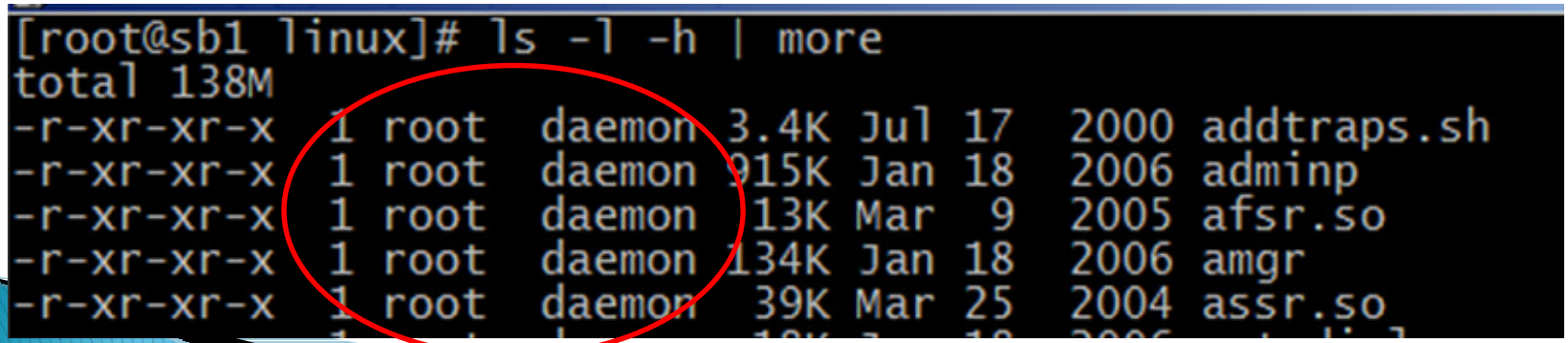
What those permission flags mean

- There are 10 positions in the permissions flags for each file (device)
- The first is a flag. It can indicate several things, usually it will be either a “d” for directory, “l” for link, or a “-” for ‘not set’.
- The next 9 are actually three sets of three. The first three represent the permissions for the owner, the next three are the group, and the last three are everyone else.
- Within a set of three flags, there is an ‘r’ for read, a ‘w’ for write, and an ‘x’ for execute.
- Each flag is either set (true) and is thus shown, or ‘-’ for not set.



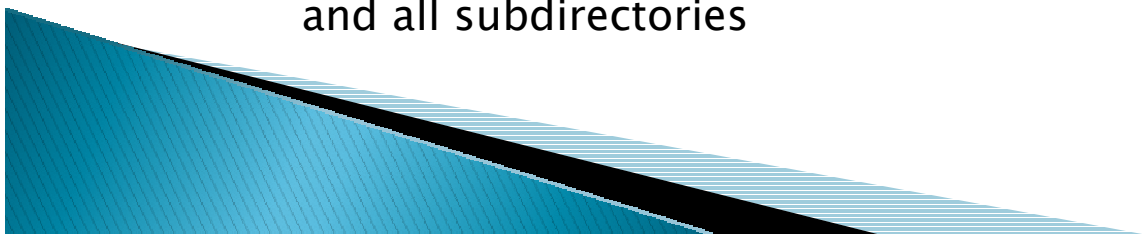
Working with Permissions

- The two names are who the permissions represent.
- The first is the “owner” of the file. In this case, the special username “root” (which will be discussed later).
- The second is the primary group, which in this case is ‘daemon’.
  - The daemon group is commonly used in most distributions of Linux
- Groups are managed through /etc/groups and can be multi-level
- A process (UID) can be in more than one group, and a group can contain other groups.



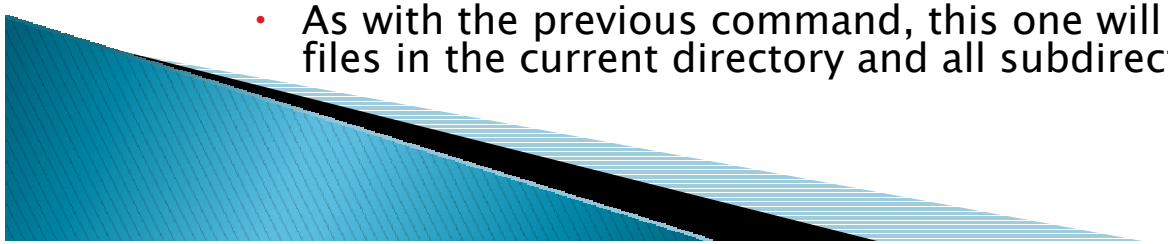
Changing Ownership of Files

- The application ‘chown’ is used to change the owner of a file or group.
- The syntax is ‘chown newuser:newgroup filename’
- Some Examples:
  - chown notes:notesgroup myfile.html
    - Set the owner to ‘notes’ and the group to ‘notesgroup’ on the file myfile.html
  - chown notes:notes *
    - Set the owner and permission for all the files in the current directory
  - chown –R notes:notes *
    - set the owner and permission file all the files in the current directory and all subdirectories



Changing the Permissions on Files

- Recall that the permissions are in three sets of three flags, for “read”, “write”, and “execute”
- There is a number associated with each of those three flags.
  - 4 = Read 2 = Write 1 = Execute
- Add them together and you can set a permission
  - You set all three at once, usually.
- The ‘chmod’ command does this.
  - chmod 754 myfile
    - sets the permissions on ‘myfile’ so that the owner can read, write, and execute. Members of the group can read and execute, and anyone else can just read the file.
  - chmod -R 754 *
    - As with the previous command, this one will set the permissions on all the files in the current directory and all subdirectories

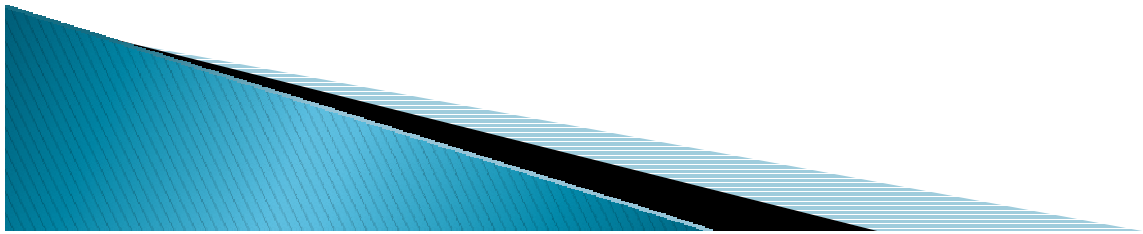


Fixing File Ownership and Permissions in the Domino Data

- Remember “664” – The Neighbor of the Beast
  - Owner & Group can read and change files
  - Everyone else can read only on those files
  - There should not be executable files there

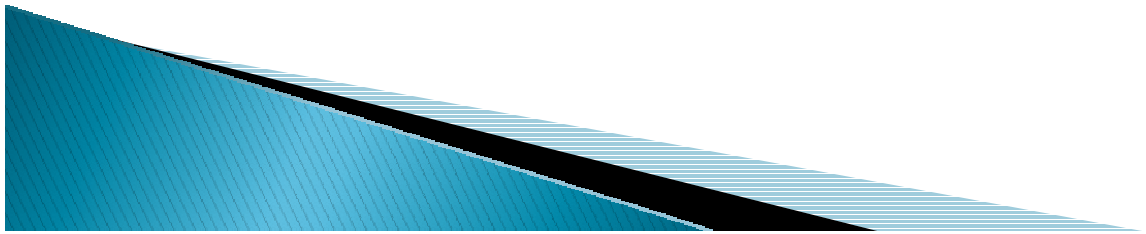
- Use these two commands to reset permissions and ownership
  - chown –R notes:notes /local/notesdata/
  - chmod –R 664 /local/notesdata/

- * Assumes default installation locations and server task user id



File & Directory Links – Files that aren't!

- Some operating systems give you "shortcuts" but they're only partly functional
- In Linux, one kind of file is a 'link'. Remember on the permissions set that first flag which can be empty, "d" or "l"? This is the "l" part.
- A link is a file system entry that refers to another file system entry somewhere else.
- Unlike a shortcut, a link is treated for all intents and purposes by processes as if it were the actual file or directory itself!
- To create a link use the 'ln' (lowercase L) application. The syntax is:
  - ln [-s] target [localname]
  - The -s is used if the thing you're linking to is a directory, not a file.
  - If the localname is not entered, a local file entry with the same name as your target will be created, otherwise the localname you specify isused.



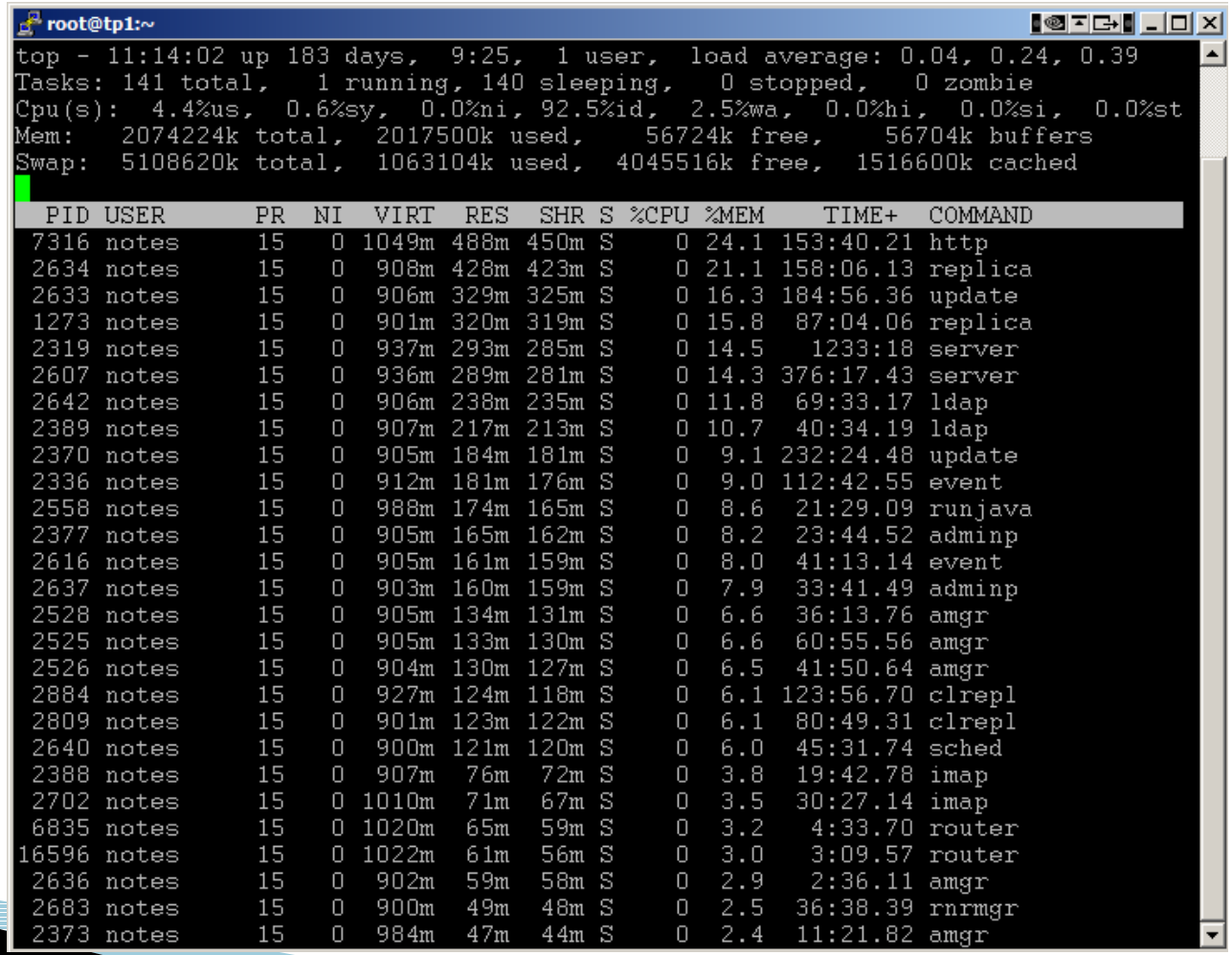
Sessions & Processes

- The ‘ps’ application shows Processes
- Processes run with a UID (user id) which provides the authority under which they operate.
- Processes also have a process id, and a ‘parent’ process id, as well as the terminal which receives their standard input and standard output (that process’s /dev/stdin, /dev/stdout, and /dev/stderr)

```
[root@sb1 dev]# ps -af
UID        PID  PPID  C STIME TTY          TIME CMD
root      3170  3166  0 Jan10 pts/2    00:00:00 su notes -c /opt/ibm/lotus/notes/latest/linu
notes     3175  3170  0 Jan10 pts/2    00:00:00 bash -c /opt/ibm/lotus/notes/latest/linux/st
notes     3246  3175  0 Jan10 pts/2    00:21:27 /opt/ibm/lotus/notes/latest/linux/server
notes     3877  3246  0 Jan10 pts/2    00:01:16 /opt/ibm/lotus/notes/latest/linux/logasio NO
notes     4295  3246  0 Jan10 pts/2    00:02:49 /opt/ibm/lotus/notes/latest/linux/event
notes     4725  3246  0 Jan10 pts/2    00:20:39 /opt/ibm/lotus/notes/latest/linux/update
notes     4726  3246  0 Jan10 pts/2    00:05:55 /opt/ibm/lotus/notes/latest/linux/replica
notes     4727  3246  0 Jan10 pts/2    00:01:27 /opt/ibm/lotus/notes/latest/linux/router
notes     4728  3246  0 Jan10 pts/2    00:00:08 /opt/ibm/lotus/notes/latest/linux/amgr
notes     4733  3246  0 Jan10 pts/2    00:02:39 /opt/ibm/lotus/notes/latest/linux/adminp
notes     4734  3246  0 Jan10 pts/2    00:02:56 /opt/ibm/lotus/notes/latest/linux/sched
notes     4761  3246  1 Jan10 pts/2    03:49:13 /opt/ibm/lotus/notes/latest/linux/http
notes     4762  3246  0 Jan10 pts/2    00:32:58 /opt/ibm/lotus/notes/latest/linux/pop3
notes     4763  3246  0 Jan10 pts/2    00:01:48 /opt/ibm/lotus/notes/latest/linux/rnrmgr
notes     4773  3246  0 Jan10 pts/2    00:02:34 /opt/ibm/lotus/notes/latest/linux/smtp
notes     4836  4728  0 Jan10 pts/2    00:02:36 /opt/ibm/lotus/notes/latest/linux/amgr -e 1
notes     4837  4728  0 Jan10 pts/2    00:00:22 /opt/ibm/lotus/notes/latest/linux/amgr -e 2
notes     4838  4728  0 Jan10 pts/2    00:00:21 /opt/ibm/lotus/notes/latest/linux/amgr -e 3
notes     4940  3246  0 Jan10 pts/2    00:00:03 /opt/ibm/lotus/notes/latest/linux/cldbdir
notes     4983  3246  0 Jan10 pts/2    00:07:43 /opt/ibm/lotus/notes/latest/linux/clrepl
root     16389 16383  0 00:47 pts/1    00:00:40 /usr/sbin/asterisk -c
root     21892 21373  0 13:52 pts/3    00:00:00 ps -af
```

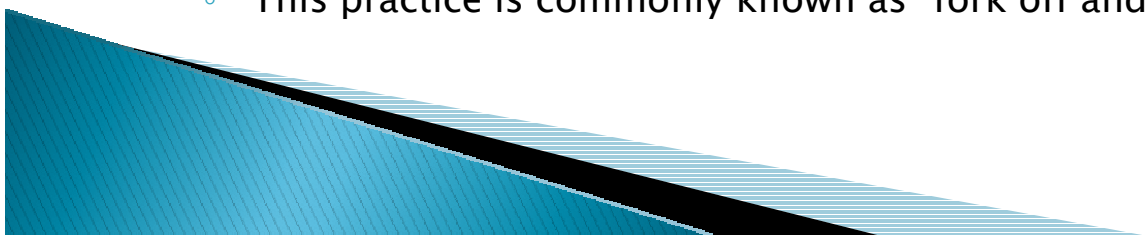
Using the 'top' package to monitor cpu & memory

- This command installs as part of the 'procps' package!



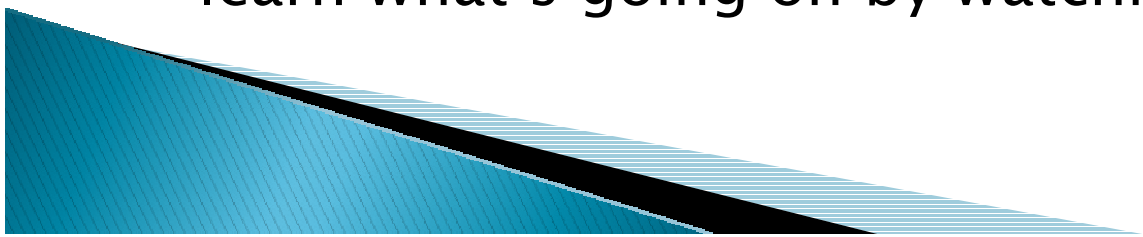
Zombies and Daemons, oh my!

- From Wikipedia, the free encyclopedia
- Zombie
  - A zombie process or defunct process is a process that has completed execution but still has an entry in the process table, allowing the process that started it to read its exit status.
  - The term zombie process derives from the common definition of zombie—an undead person. In the term's colorful metaphor, the child process has died but has not yet been reaped.
- Daemon
  - A daemon is a computer program that runs in the background, rather than under the direct control of a user; they are usually initiated as processes.
  - Daemons typically do not have any existing parent process, but reside directly under init in the process hierarchy (PPID=1).
  - Daemons usually become daemons by forking a child process and then having the parent process immediately exit, thus causing init to adopt the child.
  - This practice is commonly known as "fork off and die.“



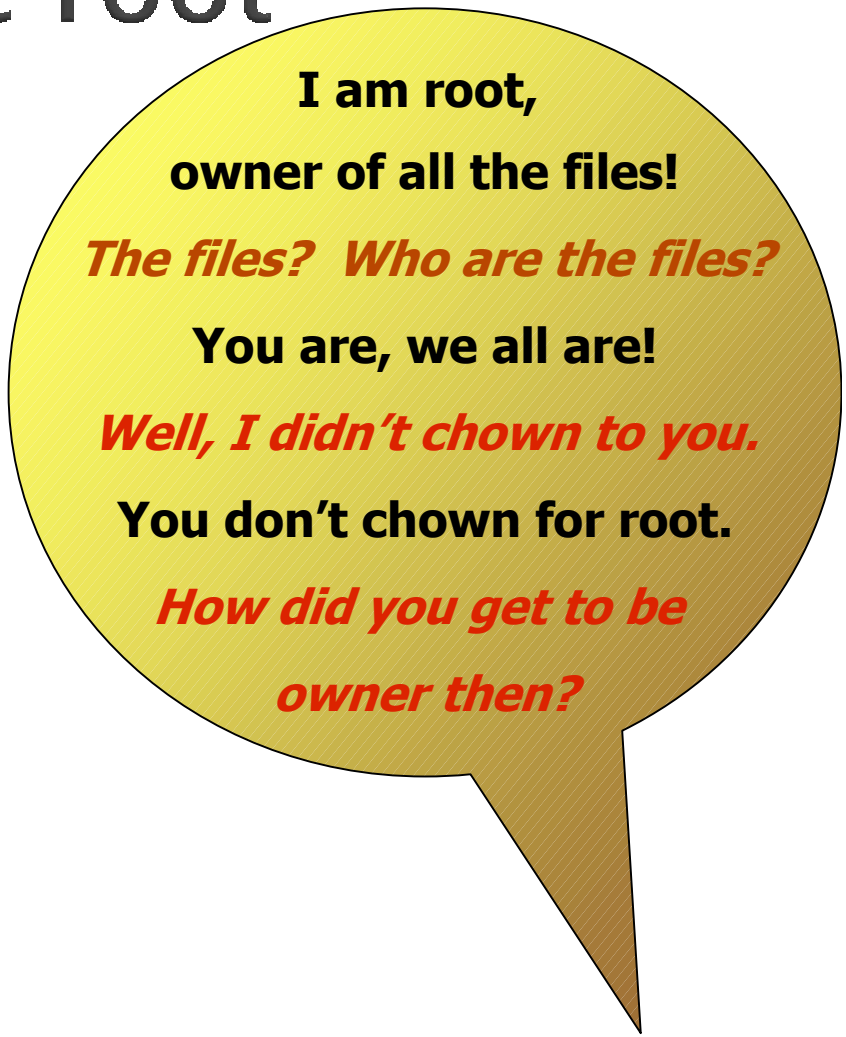
Killing Zombies and Daemons!

- The “kill” application sends a “signal” to a “process”
- Signals are sent by name or signal number
- There are many names and numbers (eg. 9 = sigkill)
  - Kill -9 can kill a zombie or daemon
- kill -l (lower case L) will list the other options – perhaps you have tame daemon or a zombie that has a good reason to be wandering around
- Not all Zombies and Daemons should be killed! Many Daemons do good things for us, and some processes learn what’s going on by watching their zombies!



It's good to be the root

- root is a special user who has no uid (uid 0)
- If you log in as root, nothing can stop you from killing or removing any file or process.
- You can break everything, all at once, in the background
  - rm –r –f &
- You should only log in as root if you absolutely must.
- If you think you need to, you probably don't
- We all do it anyway.
- Use "sudo" to prefix your commands to have them run as root, instead of logging in that way.



The Scary Linux Command Line

- If you have a command prompt, you are in a 'shell'.
  - Common shells are "sh" and "bash", but there are others.

- Commands & Applications you'll need to know:
  - chown – change the ownership of files
  - chmod – change the permission modes on files
  - cd -- change directory (remember, use / not \ )
  - ls – list directory (like dir)
  - pwd – 'print working directory' (do not use cd)
  - rm – remove (like del)
  - cp – copy
  - mkdir – make a directory
  - cat – display the contents of a file (like type)
  - su – change to another userid (often used to become root)

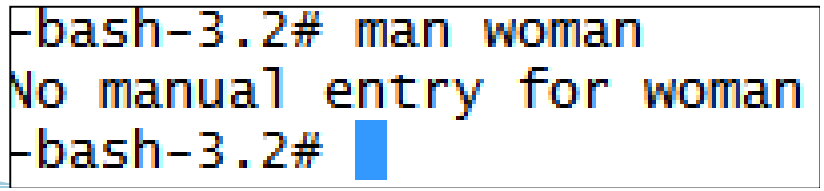
Find a text editor you can learn to use. If you're an old programmer you still remember wordstar commands (like ctrl-k d)

If that's you, find and install 'joe' (Joe's Own Editor).

Use 'putty.exe' – freely available for download – to get shell access to your Linux server from your Microsoft Windows based machine

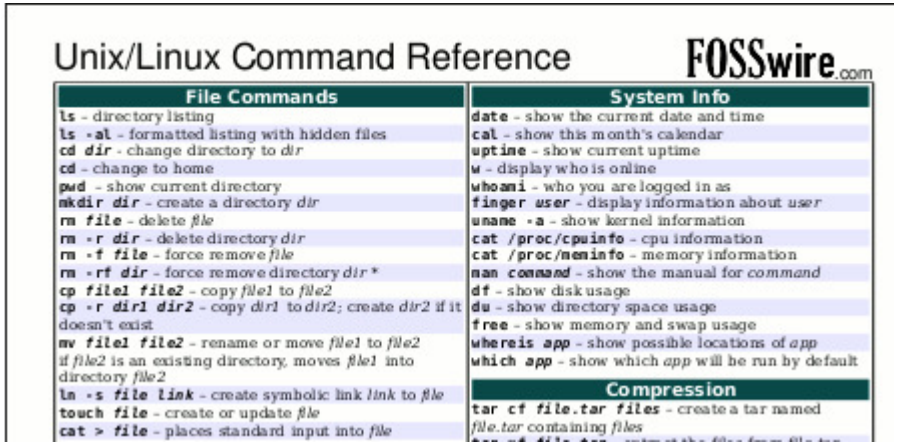
- type 'man command' to learn about these.
  - (e.g. man cp).

- In addition, these will help you a great deal if you learn about them:
  - find, grep, screen, tail, & less



Linux Command Line Cheat Sheets

- http://fosswire.com/2007/08/02/unixlinux-command-cheat-sheet/
- http://www.scottklarr.com/topic/115/linux-unix-cheat-sheets---the-ultimate-collection/

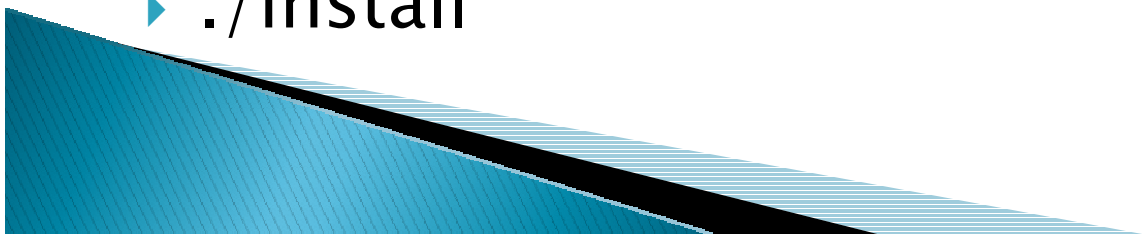


Unix/Linux Command Reference FOSSwire.com

File Commands	System Info
`ls` - directory listing	`date` - show the current date and time
`ls -al` - formatted listing with hidden files	`cal` - show this month's calendar
`cd dir` - change directory to *dir*	`uptime` - show current uptime
`cd` - change to home	`w` - display who is online
`pwd` - show current directory	`whoami` - who you are logged in as
`mkdir dir` - create a directory *dir*	`finger user` - display information about *user*
`rm file` - delete *file*	`uname -a` - show kernel information
`rm -r dir` - delete directory *dir*	`cat /proc/cpuinfo` - cpu information
`rm -f file` - force remove *file*	`cat /proc/meminfo` - memory information
`rm -rf dir` - force remove directory *dir* *	`man command` - show the manual for *command*
`cp file1 file2` - copy *file1* to *file2*	`df` - show disk usage
`cp -r dir1 dir2` - copy *dir1* to *dir2*; create *dir2* if it doesn't exist	`du` - show directory space usage
	`free` - show memory and swap usage
`mv file1 file2` - rename or move *file1* to *file2* if *file2* is an existing directory, moves *file1* into directory *file2*	`whereis app` - show possible locations of *app*
	`which app` - show which *app* will be run by default
`ln -s file link` - create symbolic link *link* to *file*	**Compression**
`touch file` - create or update *file*	`tar cf file.tar files` - create a tar named *file.tar* containing *files*
`cat > file` - places standard input into *file*	

./ (dot slash) – You Are Here

- Executable files in the current directory, are usually not on your current ‘path’
- To execute a local file, you need to execute it with it’s path name specified
- ./ is where you are now
- ./install



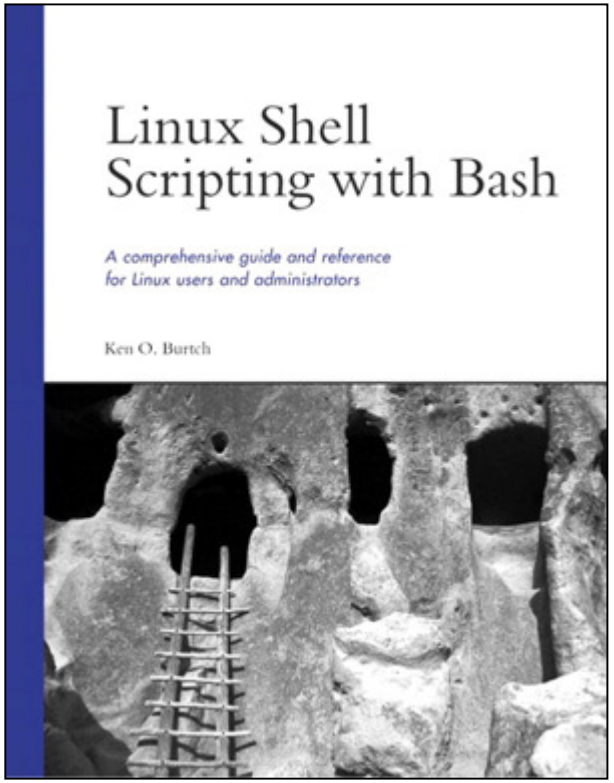
Consider Webmin to help you manage your Linux server

- Free, as in Beer at http://www.webmin.com/
- Secure, Stable, & Easy
- Manage most aspects of your Linux server through a web browser

BUY THIS BOOK IMMEDIATELY

http://www.amazon.com/Linux-Shell-Scripting-Developers-Library/dp/0672326426

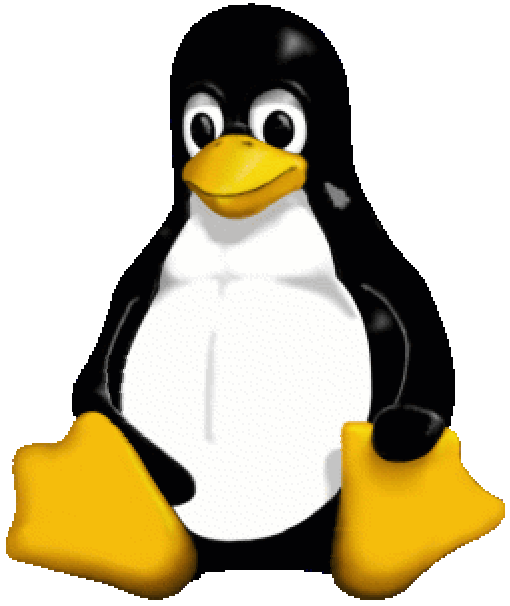
- Linux Shell Scripting with BASH
  - By Ken O. Burtch
  - Published Jan 29, 2004 by Sams.



- Not Just a "Scripting" manual
  - Well chosen content
    - Comprehensive not Overwhelming
  - Well indexed – Makes a Great Reference
  - One of the few Readable text books I've seen

Lotus Domino on Linux

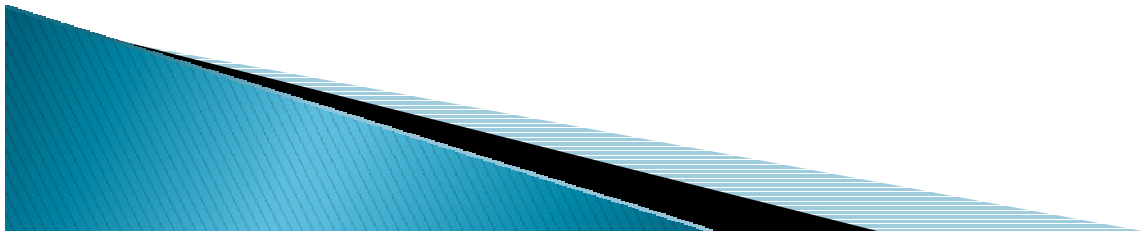
Common Newbie Mistakes



Common Linux rookie mistakes

- Nearly all file systems used by Linux are case sensitive. The file ‘server.id’ is not the same as the file ‘Server.id’

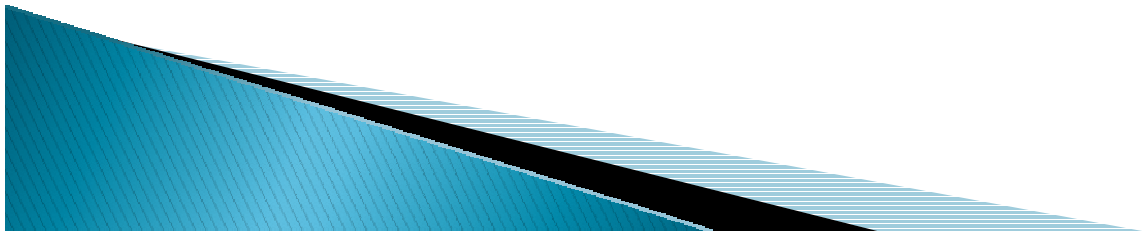
- Be extremely careful when logged in as ‘root’ – you will have access to more than you should, and files you create may be read only or unavailable to the Domino server by default.



The file system is case sensitive, the Domino internal cache is not

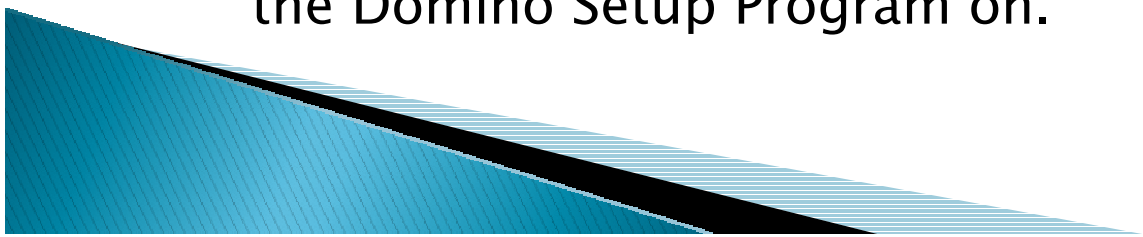
- A database which is on disk as “Keywords.nsf” will be invisible if accessed through the browser or in an @DBLookup, LotusScript, or other programmed action as “keywords.nsf” or “KEYWORDS.NSF”.

- HOWEVER……
  - Once the database has been properly accessed as “Keywords.nsf” it will work properly even if accessed incorrectly as “KEYWORDS.NSF” or some other variation as long as it remains in the cache. OUCH!



During Installation, Allow the server to access your GUI host environment

- Critical step only if you plan to use the GUI console to configure your new Domino server and only on some operating system distributions
- Can be avoided if you log into your GUI as the ‘notes’ user.
  - /usr/X11R6/bin/xhost <hostname>
  - See IBM tech note 1107421
- If you do not do this, you will see the error message
  - “Please edit your shell’s DISPLAY environment variable to reflect an unlocked terminal that you would like to launch the Domino Setup Program on.”



File Access Descriptors

- If you mistakenly create files while logged in as ‘root’ or with the wrong user id….

- chmod –R 664 /local/notesdata/*
- chown –R notes:notes /local/notesdata/*

- This assumes you used ‘notes’ as the userid for the Domino server to run with, and that your Domino data directory is /local/notesdata.

Other Useful Things

- Daniel Nashed's Resources
  - http://www.nashcom.de
  - Linux/Unix Startup Script:
    - http://www.nashcom.de/nshweb/pages/startscript.htm
  - Domino on Linux on XBOX
    - http://xbox.nashcom.de/nshweb/pages/xbox.htm
- Unison – File System Level Replication
  - http://www.cis.upenn.edu/~bcpierce/unison/

Questions & Answers!

- For those playing the home game, direct questions & comments to andrewp@thenorth.com
- We're all Lotus professionals here, please ask your questions so others can here the answers. You may also contact me directly if you like.
- Please fill out your evaluations
- The latest copy of this presentation will also be available at my website:

http://www.thenorth.com