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BP 105

Running Your IBM Lotus Domino Server on Linux

Andrew Pollack

Northern Collaborative Technologies



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Agenda

- Setting Expectations – 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
- Domino on Linux – what will trip you up?
- Doing the Installation

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 Lotus 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

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

Myth Busted!

- 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

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.
- 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 x86 (32-bit);
 - Novell SUSE Linux Enterprise Server (SLES) 10 x86_64 (64-bit);
 - Red Hat Enterprise Linux (RHEL) 5 (32-bit)
 - Note: XGL and SELinux must be disabled;
 - Red Hat Enterprise Linux (RHEL) 5 (64-bit)
 - Note: XGL and SELinux must be disabled
- Domino CAN be run on many other distributions including RHEL (Red Hat Enterprise Linux) and my new favorite “CentOS 5”
 - CentOS 4 was ok for Domino 7, but Domino 8.0 needs CentOS 5!
- 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

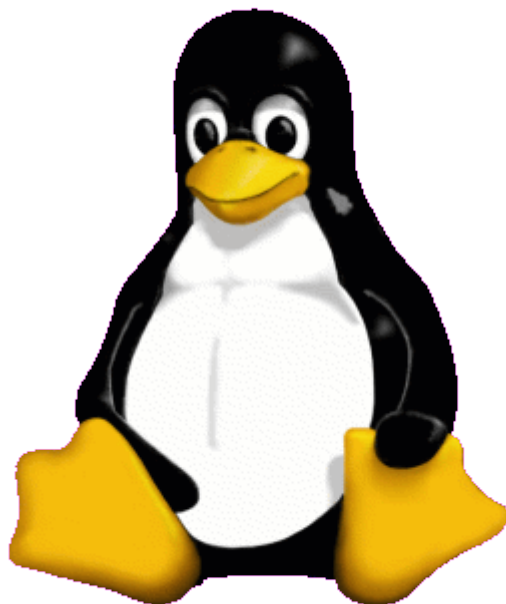
- Many people are using other distributions with Lotus Domino 6.x and Lotus Domino 7.x.
- CentOS – <http://www.centos.org> – is a community supported enterprise quality distribution very similar to RHEL but without any required subscription costs
- Do a Google Search on Domino and the distribution you 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

Installation & Configuration of Linux -- But not today

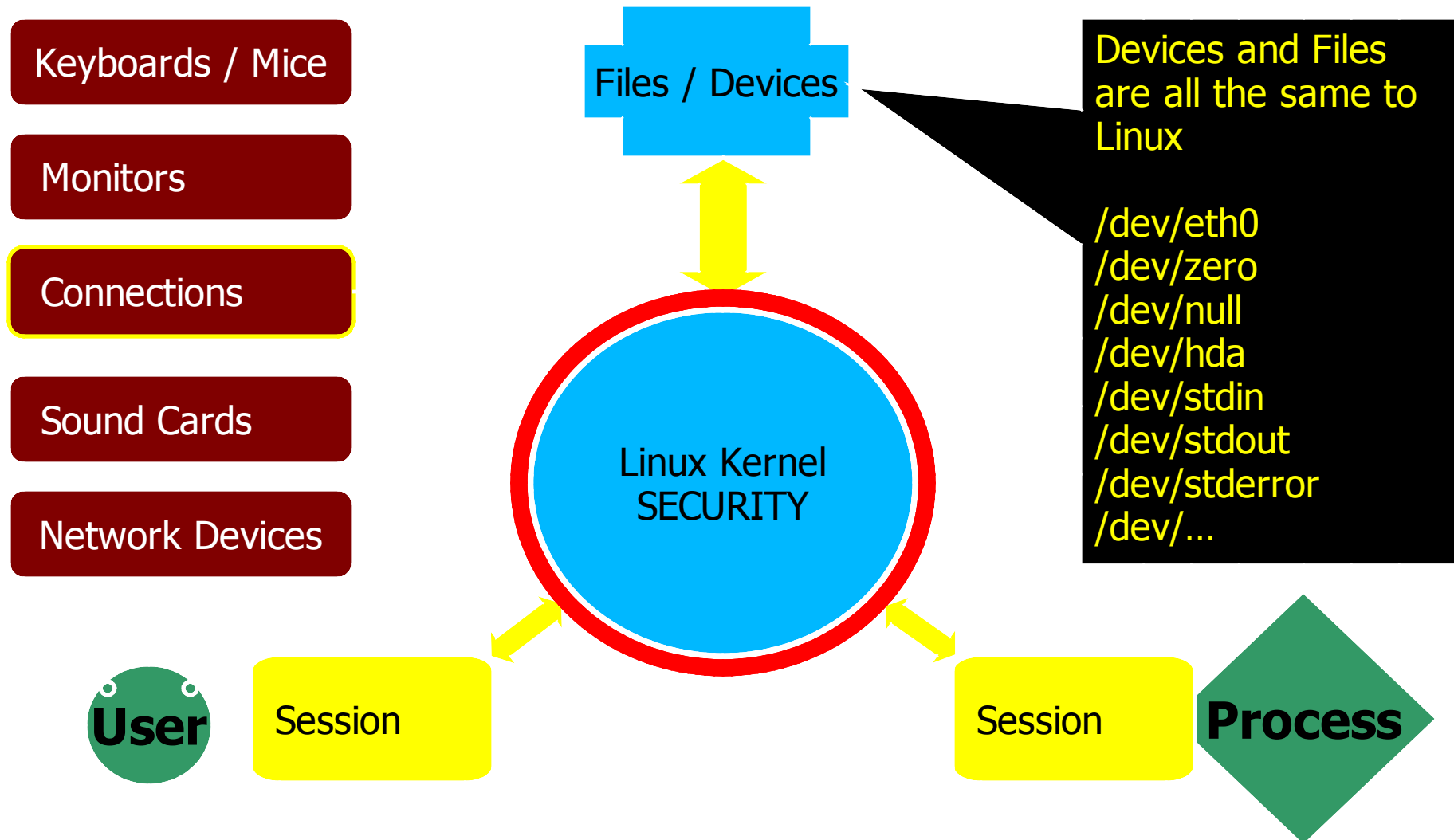
- Obviously the complete process of installing a Linux distribution is beyond out scope today
- Generally no harder than installing any other operating system
- Make sure the server is running correctly before you attempt to install Domino
- Turn off and services you do not need which may conflict with 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!



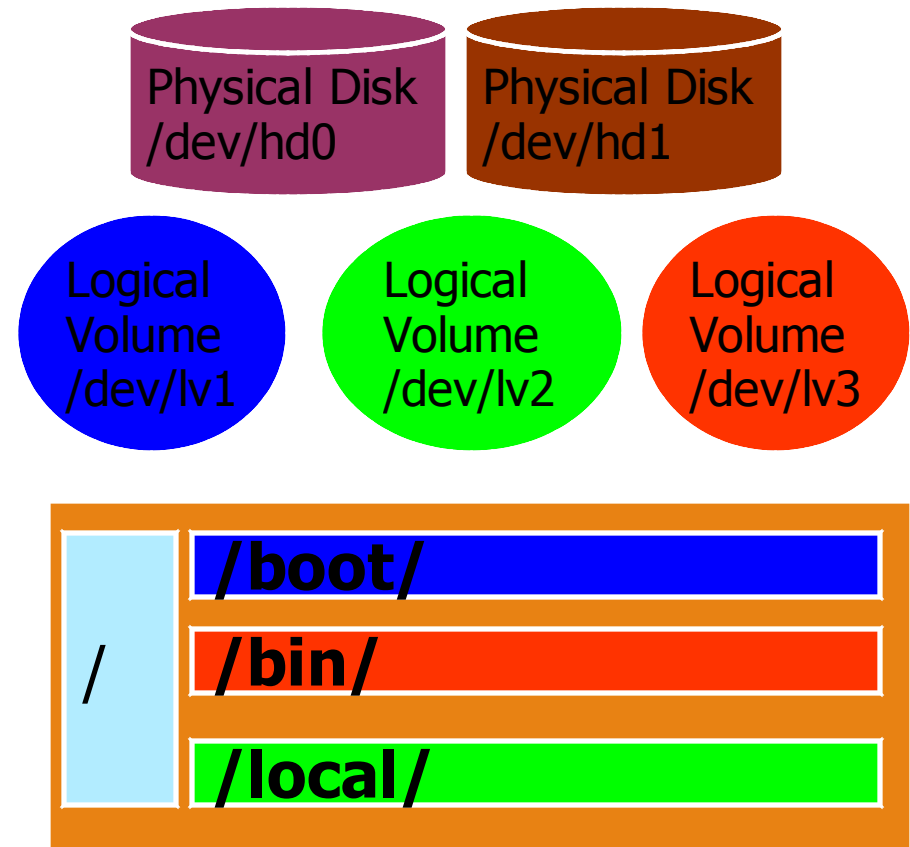
In Linux, nothing breaks the rules – You are what you are!



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.

Greatly Simplified Filesystem Example



Is the Linux File System Layout So Complex?

- The Windows 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 Linux Filesystem

- /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

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.

```
[root@sb1 linux]# ls -l -h | more
total 138M
-r-xr-xr-x 1 root daemon 3.4K Jul 17 2000 addtraps.sh
-r-xr-xr-x 1 root daemon 915K Jan 18 2006 adminp
-r-xr-xr-x 1 root daemon 13K Mar 9 2005 afsr.so
-r-xr-xr-x 1 root daemon 134K Jan 18 2006 amgr
-r-xr-xr-x 1 root daemon 39K Mar 25 2004 assr.so
```


The most common reason 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 show, or ‘-’ for not set.

```
[root@sb1 linux]# ls -l -h | more
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-r-xr-xr-x 1 root daemon 915K Jan 18 2006 adminp
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-r-xr-xr-x 1 root daemon 134K Jan 18 2006 amgr
-r-xr-xr-x 1 root daemon 39K Mar 25 2004 assr.so
```

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.

```
[root@sb1 linux]# ls -l -h | more
total 138M
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-r-xr-xr-x 1 root daemon 915K Jan 18 2006 adminp
-r-xr-xr-x 1 root daemon 113K Mar 9 2005 afsr.so
-r-xr-xr-x 1 root daemon 134K Jan 18 2006 amgr
-r-xr-xr-x 1 root daemon 39K Mar 25 2004 assr.so
```

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

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 is used.

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/rnmgr
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/clbdbdir
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!

```

root@tp1:~
top - 11:14:02 up 183 days, 9:25, 1 user, load average: 0.04, 0.24, 0.39
Tasks: 141 total, 1 running, 140 sleeping, 0 stopped, 0 zombie
Cpu(s): 4.4%us, 0.6%sy, 0.0%ni, 92.5%id, 2.5%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 2074224k total, 2017500k used, 56724k free, 56704k buffers
Swap: 5108620k total, 1063104k used, 4045516k free, 1516600k cached

  PID USER      PR  NI  VIRT  RES  SHR  S  %CPU  %MEM    TIME+  COMMAND
 7316 notes     15   0 1049m 488m 450m S   0 24.1 153:40.21 http
 2634 notes     15   0  908m 428m 423m S   0 21.1 158:06.13 replica
 2633 notes     15   0  906m 329m 325m S   0 16.3 184:56.36 update
 1273 notes     15   0  901m 320m 319m S   0 15.8  87:04.06 replica
 2319 notes     15   0  937m 293m 285m S   0 14.5 1233:18 server
 2607 notes     15   0  936m 289m 281m S   0 14.3 376:17.43 server
 2642 notes     15   0  906m 238m 235m S   0 11.8  69:33.17 ldap
 2389 notes     15   0  907m 217m 213m S   0 10.7  40:34.19 ldap
 2370 notes     15   0  905m 184m 181m S   0  9.1 232:24.48 update
 2336 notes     15   0  912m 181m 176m S   0  9.0 112:42.55 event
 2558 notes     15   0  988m 174m 165m S   0  8.6  21:29.09 runjava
 2377 notes     15   0  905m 165m 162m S   0  8.2  23:44.52 adminp
 2616 notes     15   0  905m 161m 159m S   0  8.0  41:13.14 event
 2637 notes     15   0  903m 160m 159m S   0  7.9  33:41.49 adminp
 2528 notes     15   0  905m 134m 131m S   0  6.6  36:13.76 amgr
 2525 notes     15   0  905m 133m 130m S   0  6.6  60:55.56 amgr
 2526 notes     15   0  904m 130m 127m S   0  6.5  41:50.64 amgr
 2884 notes     15   0  927m 124m 118m S   0  6.1 123:56.70 clrepl
 2809 notes     15   0  901m 123m 122m S   0  6.1  80:49.31 clrepl
 2640 notes     15   0  900m 121m 120m S   0  6.0  45:31.74 sched
 2388 notes     15   0  907m  76m  72m S   0  3.8  19:42.78 imap
 2702 notes     15   0 1010m  71m  67m S   0  3.5  30:27.14 imap
 6835 notes     15   0 1020m  65m  59m S   0  3.2   4:33.70 router
16596 notes     15   0 1022m  61m  56m S   0  3.0   3:09.57 router
 2636 notes     15   0  902m  59m  58m S   0  2.9   2:36.11 amgr
 2683 notes     15   0  900m  49m  48m S   0  2.5  36:38.39 rnmgr
 2373 notes     15   0  984m  47m  44m S   0  2.4 11:21.82 amgr
  
```


Zombies and Daemons!

- 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
 - (or has the 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
- 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.

**I am root,
owner of all the files!**

The files? Who are the files?

You are, we all are!

Well, I didn't chown to you.

You don't chown for root.

**How did you get to be
owner then?**

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)
- 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

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

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

./ -- where you are now!

- 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

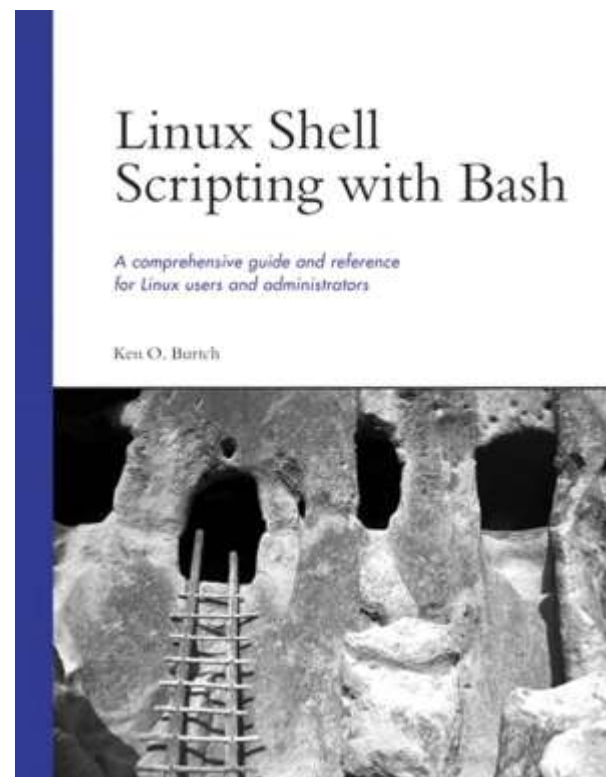
Consider Webmin to help you manage your Linux server

- 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

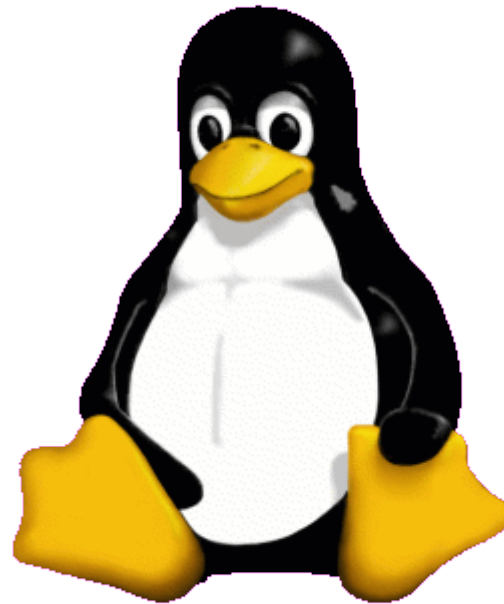
- Linux Shell Scripting with BASH
 - By Ken O. Burtch
 - Published Jan 29, 2004 by Sams.
- Not Just a “Scripting” manual
 - Well chosen content
 - Comprehensive not Overwhelming
 - Well indexed – Makes a Great Reference
 - One of the few Readable text books I’ve seen



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

Lotus knows.

Smarter software for a Smarter Planet.



- What will trip you up?

LOTUS DOMINO ON LINUX

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!

Doh!

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

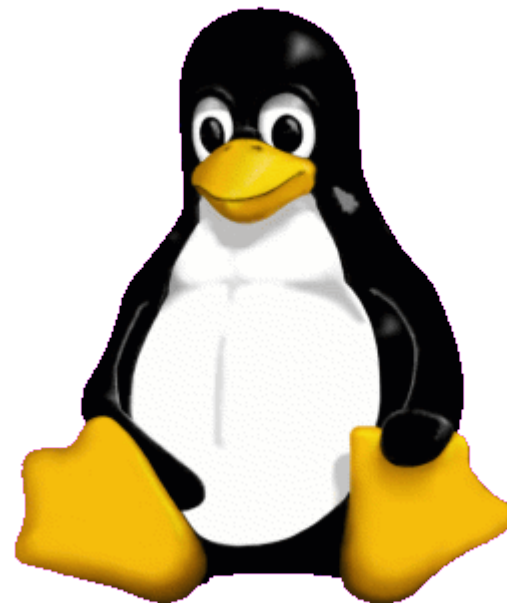
- If you mistakenly create files while logged in as 'root' or with the wrong user id....
- `chmod -R 664 /local/notesdata/*`
- `chown -R notes:notes /local/notesdata/*`
- This assumes you used 'notes' as the userid for the Domino server to run with, and that your Domino data directory is /local/notesdata.

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/>
- Linux Advanced Routing & Traffic Control
 - <http://lartc.org/>

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 hear the answers. You may also contact me directly if you like.
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