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CS-E4160 - Laboratory Works in Networking and Security

Linux Command Line Basics

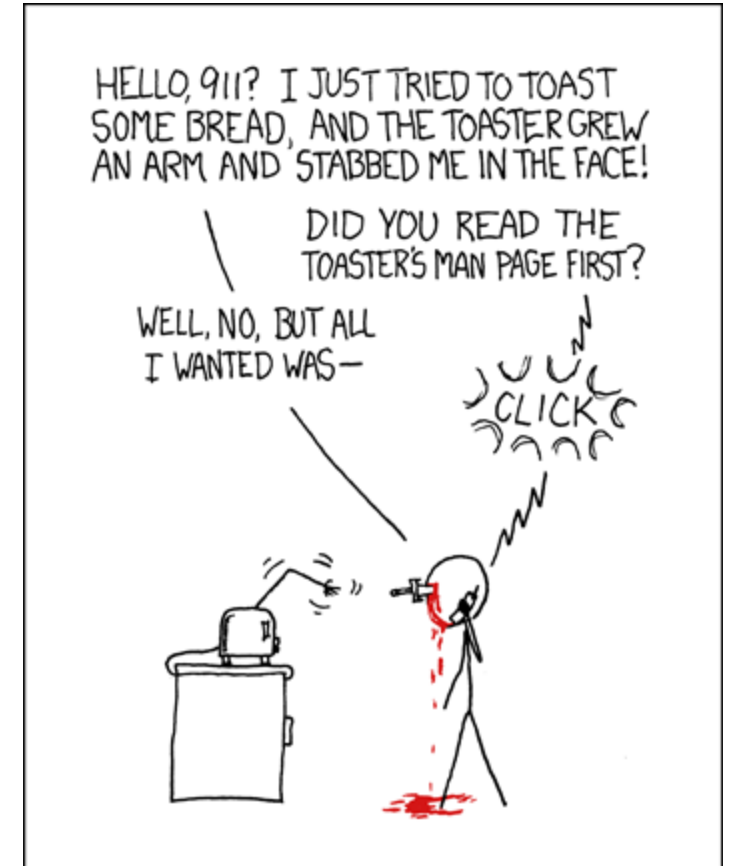


Getting Help

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- *man* – Manual pages
 - `man <command>`
- Searching online
 - “What I want to achieve”
Ubuntu/Debian/Linux/Arch
- The Arch Linux Wiki is a good resource

The TAB key is your friend!





Traversing Directories

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- **cd – Change Directory**
 - Change to a directory
 - Give the directory as an argument
 - With no arguments, changes to your home directory
- **pwd – Print Working Directory**
 - Displays your current working directory



Files and Directories on Linux

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- **By default, all file names are case sensitive!**
 - Foo.txt is different than foo.txt (unless working with Windows Partitions)
- **Dot “.”**
 - Means current directory
 - Example: find .
- **Double dot “..”**
 - The previous directory
 - Example: cd ..
- **Asterisk “*”**
 - Matches zero or more characters (use “?” for a single character)
 - Example (list all files ending in “txt”): ls *.txt



More on Files and Directories

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cp – copy files

- cp source dest

mv – move files

- mv source dest

rm – remove file/dir

- rm file
- rm -rf directory
- **Use with care!**

ls – list files

mkdir – make directory

- mkdir mydir

head – front of a file

tail – tail of a file

- tail /var/log/syslog
- default is 10 lines
- follow: -f



Access Privileges

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Check file permissions

- `ls -ld filename`
- `ls -la`

Change file permissions

- `chmod ugo+rwx`
- User, Group, Others
- Add +, remove -
- Read, Write, eXecute
- S = Set user id or Set group id (extra rights)
- Checkout the `chmod [numeric_mode]` file syntax

What are my groups?

- `groups`

Change ownership

- `chown` – change user
- `chgrp` – change group

Switch to root shell

- `su`
- `sudo -s`
- See also `/etc/sudoers.d/`



Important directories

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- **Your personal home directory is tilde: “~”**
 - Usually maps to /home/myaccountname
- **Superuser home directory is /root**
- **Temporary storage in /tmp**
 - Wiped out on reboot!
- **Configuration files usually located in /etc**
 - Sometimes in /var (as with BIND DNS server)
- **Log files in /var/log**
 - Important in diagnosing problems with services



Usage of Files

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- **What type of file is it?**
 - file filename – displays file type
- **System executables**
 - System applications: just type the command, e.g. “ls”
 - Non-system applications: “./my_binary”
- **Text files**
 - cat file – displays the contents
 - less file – displays scrollable contents (q=quit)
 - Text editors: nano, emacs, vi(m)



Searching for Files

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- **Locate**
 - Searches file names using a precreated index
 - Fast, but may not be up-to-date
 - Example: `locate foo.txt`
- **Find**
 - Searches file names without a precreated index
 - Slow but always up-to-date
 - Example: `find /etc -name "*cfg"`
- **Grep**
 - Search file contents (always up-to-date)
 - Example: `grep -r ssh /etc`



Searching for Executables

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- **Where is tool xyz located?**
 - which xyz – displays the path of xyz
- **What was the tool related to “keyword”?**
 - man –k keyword
 - Note: manual pages describe command line use
 - Start with the examples in the manual pages
- **What was the command I used yesterday?**
 - history – displays all typed commands



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Installing software in Debian based Linux distributions

- **apt-get or apt**
 - Use one of them but don't mix them!
 - Here, the syntax is the same for both
 - **Searching**
 - apt-get search softwarename
 - apt-cache search softwarename
 - apt search softwarename
 - **Installation**
 - apt-get/apt install softwarename
 - **Uninstalling**
 - apt-get/apt remove softwarename
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Volumes and Disks

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- **mount** – attaches a volume to a directory
- **umount** – detaches a volume
- **df** – how full is the disk?
 - Human readable: `df -h`



Reading and Writing I/O

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- **Read from an unnamed input stream <**
 - `grep "abc" <file`
- **Redirect normal output of a tool to a file >**
 - `find . >file`
 - `cat > foo.txt`
 - `Ctrl+d` ends stdin!
- **Redirect error output of a tool to a file 2>**
 - `find /etc 2> file`
- **Just redirect everything to a file**
 - `find /etc >file 2>&1`
- **Appending is >>**
 - `echo "foo" >>file`
 - Note: `>` overwrites the file
- **Piping |**
 - `find /etc | less`
- **Stop/resume output**
 - `Ctrl+s / Ctrl+q`



Process Management

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- **Process running?**
 - `ps axu | grep ssh`
 - Or just “top”
 - **Kill process**
 - `kill process id`
 - `kill 'pidof processname'`
 - `killall processname`
 - **Start in background &**
 - `processname &`
 - **Bring a background application to the foreground**
 - `fg`
 - **Put the application to the background**
 - `bg`
 - **Suspend: Ctrl+z**
 - **Terminate Ctrl+c**
-



Service Management

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- **Is “ssh” service running?**
 - `systemctl status ssh`
- **Stop “ssh” service**
 - `systemctl stop ssh`
- **Start “ssh” service**
 - `systemctl start ssh`
- **Stop + start “ssh” service**
 - `systemctl restart ssh`
- **Reload configuration**
 - `systemctl reload ssh`
- **Start at boot**
 - `systemctl enable ssh`
- **Old style invocation**
 - `service ssh status`
- **In Debian, services are in**
 - `/etc/systemd/system`



SSH Access

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- Login `ssh user@hostname.domain`
- Exiting: `exit` (if unresponsive, press `alt-gr+~+.`)
- Clear terminal: `reset/clear`
- Upload: `scp local_file user@remotemachine:dir/`
- Download `scp user@remotemachine:remote_file .`
 - Recursive copy: `-r`
- **Annoyed by password prompts?**
 - `man ssh-keygen`, `man authorized_keys`
 - Make sure `~/.ssh` permissions are correct!
 - Spend 5 minutes now to set up, save countless minutes later!
- **SSH tunneling / proxying (`ssh -L`)**



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Miscellaneous

- **System Information**

- `uname -a`

print all system information

- `lsb_release -a` (linux release)

- **Cron & Crontab**

schedule periodic execution
of a binary

- **Docker Containers**

- Execute processes in an
isolated environment

- **Apparmor and SELinux –**

security enhancements

-> mandatory access control (mac)

- **Screen**

- Exiting ssh kills running
processes

- Screen avoids this (e.g. for
IRC sessions)

- `screen program zcname` *opens up the
program inside a screen*
- `Ctrl+a+d` *to detach*
- `screen -r` *to reattach*
- `screen -list` *lists all opened screen
sockets*

- **TMUX**

- Alternative for screen



Networking Commands

1 of 2

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- **Recommended**
 - ip addr, ip neigh
 - ip route
 - ip xfrm
 - iw
 - **Old skool**
 - ifconfig, arp
 - route
 - setkey (ipsec)
 - iwconfig
 - **DNS look-up**
 - host
 - dig
 - nslookup
 - hosts file
 - **Firewall**
 - nftables
 - iptables/ip6tables
 - **ping, ping6, traceroute, mtr**
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Networking commands

2 of 2

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- **Netmask generation or conversion**
 - netmask
- **Traffic capture**
 - tcpdump
 - wireshark
- **Fine tune n/w stack**
 - /proc/sys/net
 - /proc/net
- **What service is up?**
 - netstat (local)
 - nmap (remote)
- **Web testing**
 - lynx
 - wget (note -r)
 - curl
- **Performance**
 - iperf, netperf
 - t-stat, httpperf, jperf



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Questions?

Was something missing?
