



AIR FORCE ASSOCIATION'S

CYBERPATRIOT

NATIONAL YOUTH CYBER EDUCATION PROGRAM

UNIT EIGHT

Ubuntu Security



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SECTION ONE

Basic GUI Security

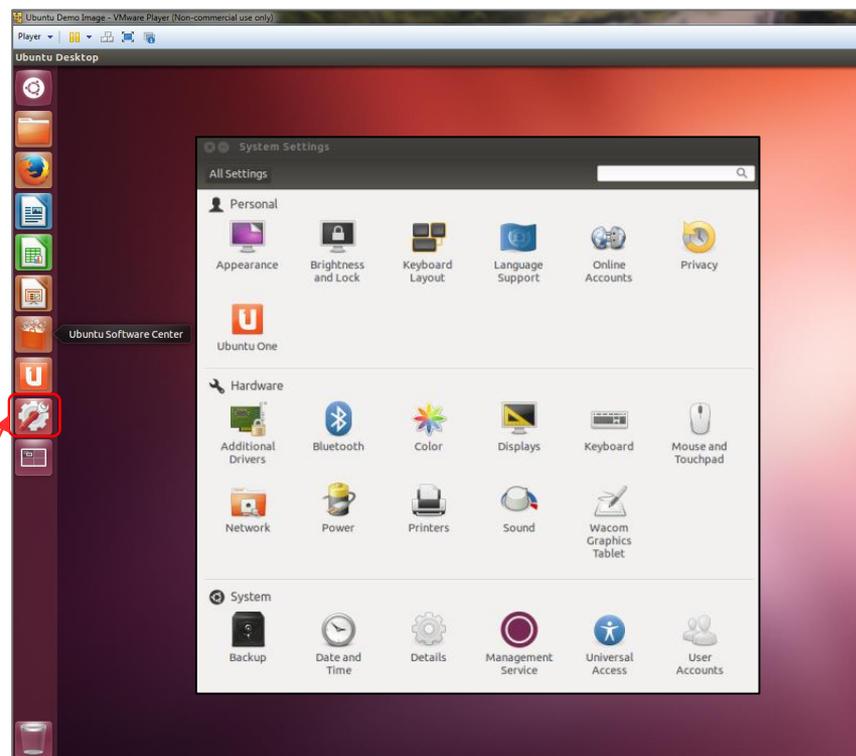


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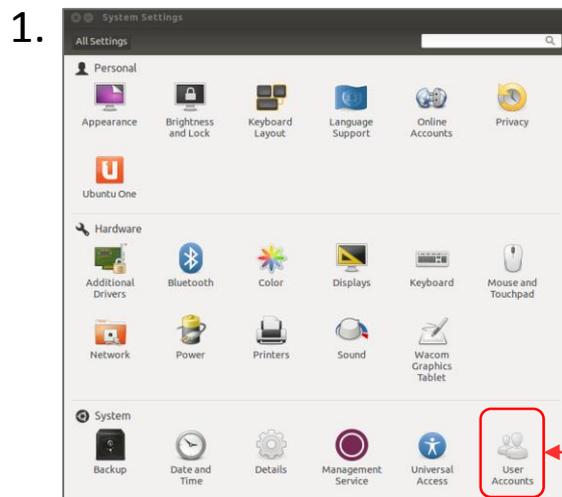
Basic Linux Security

- This unit will show you how to make many of the same security settings you made in Unit 5
 - Linux has many of the same vulnerabilities, so the fixes are similar
- Linux does not have a Control Panel like in Windows
- The System Settings menu offers limited security tools
- Click the System Settings button in the menu bar

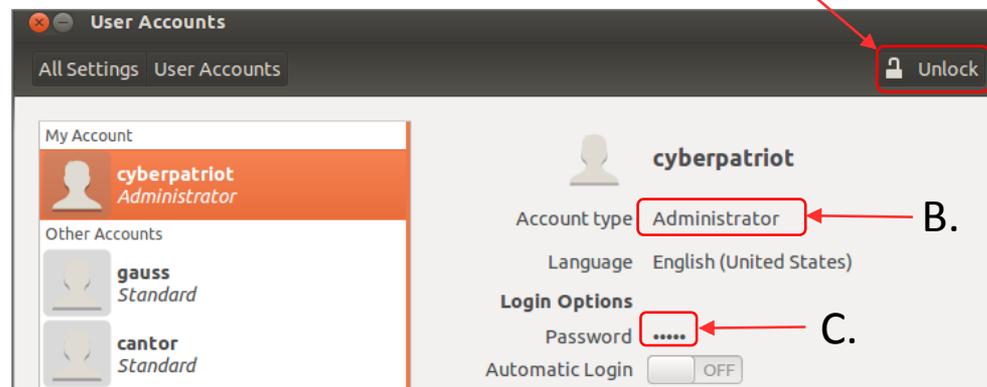




User Accounts



2.



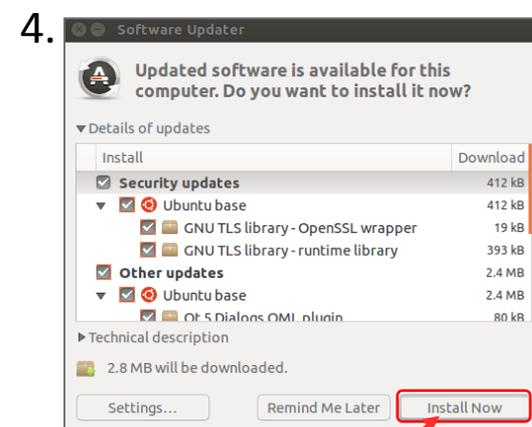
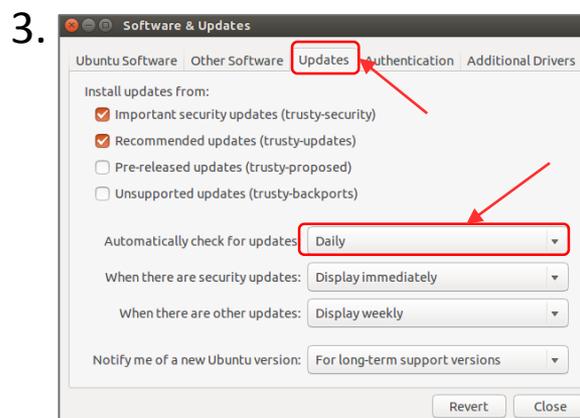
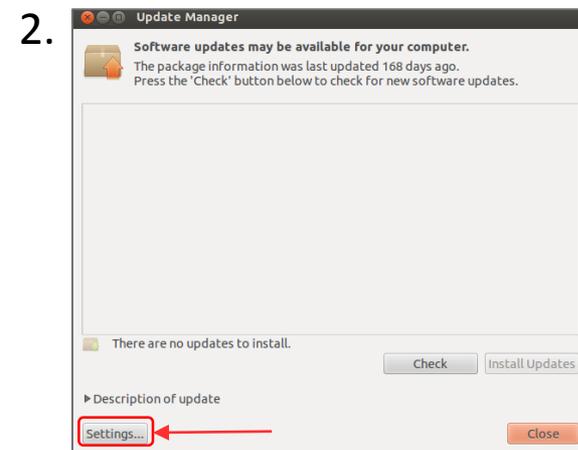
- Click User Accounts in the System Settings window
- As in Windows, it is important to restrict root (Admin) privileges and password protect all accounts
 - To make account management changes, you must enact root permissions by clicking Unlock and authenticate yourself by entering your password
 - Switch users from Administrator to Standard User by clicking next to Account Type
 - Change passwords by clicking the asterisks next to the Password option



Installing and Automating Updates

- The open-source community regularly develops improvements and patches for Ubuntu
- You should install these updates regularly

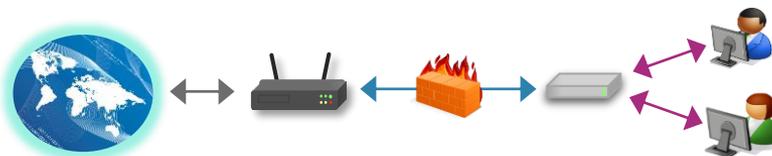
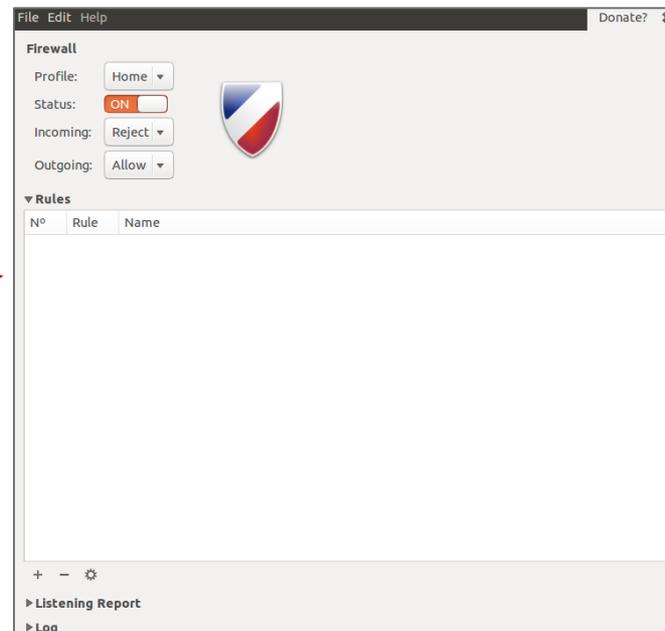
1. Click the Ubuntu button in the menu bar and search for Update Manager
2. Click Settings on the Update Manager Screen
3. To set automatic updates, go to the Updates Tab and make sure “Automatically check for updates” is set to “Daily”
4. After applying the changes, install any available updates from the main Update Manager window





Enabling the Firewall

- Enable the Ubuntu Built-in Firewall (UFW) to prevent unauthorized access to the computer
 - The UFW is deactivated by default
- By default, UFW is only accessible by command line
- You can download **Gufw**, a graphical firewall interface, from the Software Center and use it to make changes to the UFW in the GUI
 - You might need to install Ubuntu updates before installing Gufw

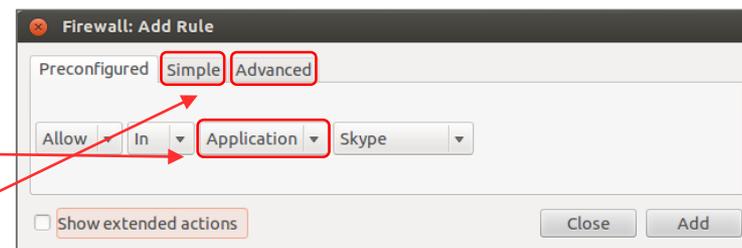
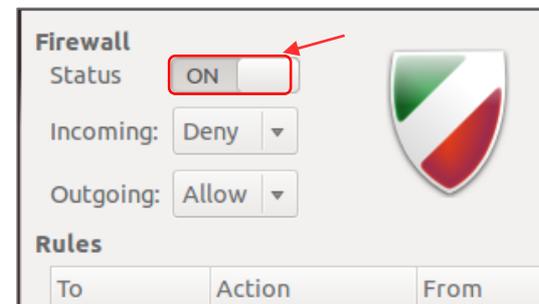


Source: <https://help.ubuntu.com/community/UFW>



Using Gufw

- After downloading Gufw from the Software Center, click the Ubuntu button in your menu bar → Search → Firewall Configuration
- Click the Unlock button on the Gufw window → Enact root permissions by authenticating → Turn Firewall Status On
- The default (and recommended rules) governing traffic are to Deny all incoming traffic and Allow all outgoing traffic
- The Reject option is the same as Deny, but also sends a notification to the sender that connection has been blocked
- The Preconfigured rule panel allows incoming and/or outgoing traffic to be controlled for certain applications or services
 - Similar to the Windows Firewall Exceptions list
 - Open entire ports by clicking the Simple or Advanced tabs



Source: <https://help.ubuntu.com/community/Gufw>



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SECTION TWO

Basic Command Line Security



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The gedit Command

- Gedit is one of many text editor commands in Ubuntu
 - Syntax: `gedit [filepath]`
 - Unlike with other text editors, using gedit will cause a second window to pop-up where you can easily change the text of a file
 - This command will allow you to edit security policy files
- You need to enact root permissions before using gedit to edit files that cannot be accessed by standard users (e.g. system and security files)
- When using gedit for the first time, go to **Edit → Preferences → Uncheck “Create a backup copy of files”** to avoid saving issues
- Try using gedit by **opening Terminal and entering `gedit hello2.txt`**
 - You will not be prompted to authenticate because this is a public file

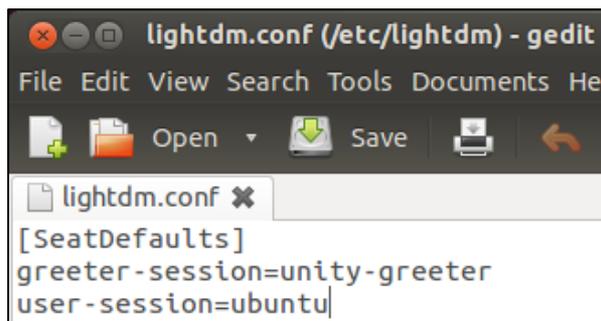


Using gedit to Turn off the Guest Account

- Like in Windows, the Ubuntu guest account is turned on by default
 - You should disable it so people can't access the computer anonymously
- The guest account is controlled by LightDM, the display manager controlling the Ubuntu login screen
- To turn off the guest account, edit the LightDM file:
 - After root authenticating, type `gedit /etc/lightdm/lightdm.conf`

```
root@ubuntu:/home/cyberpatriot# gedit /etc/lightdm/lightdm.conf
```

- Add the line `allow-guest=false` to the end of the Light DM file that pops up and click `Save`
- Restart your system and click your username button in the top-right corner of your desktop. The guest account should be disabled.



Sources: <https://help.ubuntu.com/8.04/serverguide/C/user-management.html>,
<http://askubuntu.com/questions/451526/removing-guest-session-at-login-in-ubuntu-14-04>



PAM Files

- Pluggable Authentication Modules (PAM) are used for logon and applications
- They simplify user authentication
 - They *do not* govern authorization (i.e. grant privileges to users)
- 4 types of PAM files:
 - Account – control account conditions (e.g. not expired, etc.)
 - Authentication – verify user identities
 - Password – control some password policies
 - Session – define actions performed at the beginning and end of user sessions.



Source: http://i.walmartimages.com/i/p/00/06/41/44/03/0006414403031_500X500.jpg

Source: <http://www.linux-mag.com/id/7887/>



Editing the PAM Password File

- Type `gedit /etc/pam.d/common-password`
- Lines in the file starting with “#” are comments to help the user understand the file. They do not enforce any policies.
- After making changes, save the file and close it.

1. To enforce password history of 5 :

Add “`remember=5`” to the end of the line that has “`pam_unix.so`” in it.

2. To enforce Password length of 8:

Add “`minlen=8`” to the end of the line that has “`pam_unix.so`” in it

```
common-password (/etc/pam.d) - gedit
File Edit View Search Tools Documents Help
common-password
#
# /etc/pam.d/common-password - password-related modules common to all services
#
# This file is included from other service-specific PAM config files,
# and should contain a list of modules that define the services to be
# used to change user passwords. The default is pam_unix.
#
# Explanation of pam_unix options:
#
# The "sha512" option enables salted SHA512 passwords. Without this option,
# the default is Unix crypt. Prior releases used the option "md5".
#
# The "obscure" option replaces the old 'OBSCURE_CHECKS_ENAB' option in
# login.defs.
#
# See the pam_unix manpage for other options.
#
# As of pam 1.0.1-6, this file is managed by pam-auth-update by default.
# To take advantage of this, it is recommended that you configure any
# local modules either before or after the default block, and use
# pam-auth-update to manage selection of other modules. See
# pam-auth-update(8) for details.
# here are the per-package modules (the "Primary" block)
password requisite pam_cracklib.so retry=3 minlen=8 difok=3
password [success=1 default=ignore] pam_unix.so obscure use authtok
try_first_pass sha512
# here's the fallback if no module succeeds
password requisite pam_deny.so
# prime the stack with a positive return value if there isn't one already;
# this avoids us returning an error just because nothing sets a success code
# since the modules above will each just jump around
password required pam_permit.so
# and here are more per-package modules (the "Additional" block)
password optional pam_gnome_keyring.so
# end of pam-auth-update config
```

3. To enforce password complexity with one of each type of character:*

Add “`ucredit=-1 lcredit=-1 dcredit=-1 ocredit=-1`” to the end of the line with “`pam_cracklib.so`” in it.**

*ucredit = upper case, lcredit=lower case, dcredit = number and ocredit = symbol

**cracklib may need to be installed before enforcing password complexity

Source: http://www.deer-run.com/~hal/sysadmin/pam_cracklib.html



Using gedit to Edit Password History

- Type `gedit /etc/login.defs`
- This is a much longer file. To easily find the section to edit, type `Ctrl+F` and then “`PASS_MAX_AGE`”
- Modify the following variables to the same recommended settings used in Windows:
 - Maximum Password Duration:
 - `PASS_MAX_DAYS 90`
 - Minimum Password Duration:
 - `PASS_MIN_DAYS 10`
 - Days Before Expiration to Warn Users to Change Their Password:
 - `PASS_WARN_AGE 7`
- Save the file and close it

```
login.defs (/etc) - gedit
login.defs x
#
# Password aging controls:
#
#     PASS_MAX_DAYS   Maximum number of days a password may be used.
#     PASS_MIN_DAYS   Minimum number of days allowed between
password changes.
#     PASS_WARN_AGE   Number of days warning given before a password
expires.
#
PASS_MAX_DAYS   99999
PASS_MIN_DAYS   0
PASS_WARN_AGE   7
#
# Min/max values for automatic uid selection in useradd
#
UID_MIN         1000
UID_MAX         60000
# System accounts
#SYS_UID_MIN    100
#SYS_UID_MAX    999
Plain Text ▾ Tab Width: 8 ▾ Ln 145, Col 56 INS
```

Sources: <http://xmodulo.com/2013/12/set-password-policy-linux.html>,



Using gedit to Set Account Policy

- Type `gedit /etc/pam.d/common-auth`
- This file allows you to set an account lockout policy
- Add this line to the end of the file:

```
auth required pam_tally2.so deny=5 onerr=fail unlock_time=1800
```

- Save the file and close it

Sets the number of allowed failed login attempts (in this case 5)

Sets the account lockout duration in seconds (in this case, 30 minutes)

Source: http://linux.die.net/man/8/pam_tally



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SECTION THREE

Advanced Ubuntu security



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The ls Command

- The `ls` command (lower case “l”) lists the contents and properties of a file or directory
- Syntax: `ls [option] [filepath]`
 - `-l` is a common option (lower case “l”), which provides the user with more details about the file or directory
- Example: `ls -l hello2.txt` will yield a description similar to the one below (exact details may differ)

```
cyberpatriot@ubuntu:~$ ls -l hello2.txt  
-rw-rw-r-- 1 cyberpatriot cybercamp 57 May 29 09:34 hello.txt
```

Owner (user who created the file)

Size (kb)

File

Links (refers to how many files, folder, and shortcuts link to this file)

Group (user's group when file was created)

Date Modified



Viewing File Permissions with the `ls` Command

- File permissions are the first items noted when using the `ls` command with the `-l` option
- File permissions are split into the 10 fields outlined below
- If any fields are blank, the users in that section cannot do that action with the file

1. Type: if this says “d,” the item in question is a directory. A blank means it is a file.

2-4. Owner File Permissions: what the user can do with the file or directory

(Blank 2) Read - r

(Blank 3) Write/modify - w

(Blank 4) Execute - x

5-7. Group File Permissions

(Blank 2) Read - r

(Blank 3) Write/modify - w

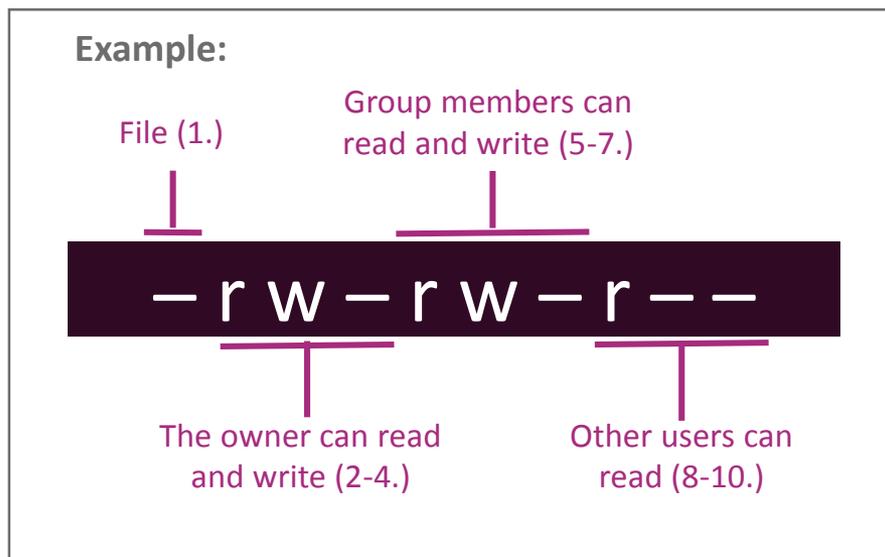
(Blank 4) Execute - x

8-10. Other File Permissions

(Blank 2) Read - r

(Blank 3) Write/modify - w

(Blank 4) Execute - x





The chmod Command

- Chmod allows you to change file permissions

Change permissions for the user, group, or others

Add or subtract permissions

Specify whether read, write, or execute privileges are being changed

- Syntax: `chmod [u,g or o][+ or -][r,w, or x] [filepath]`

- Do not put spaces between the three fields after “chmod”

- Example:

1. Type `chmod o-r hello2.txt`

2. Type `ls -l hello2.txt`

3. If your permissions originally matched those on the last slide, you should see hello2.txt’s new file permissions as shown below

```
cyberpatriot@ubuntu:~$ ls -l hello2.txt
-rw-rw---- 1 cyberpatriot cybercamp 57 May 29 09:34 hello.txt
```

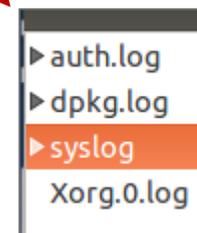
Sources: <http://condor.depaul.edu/dpwebpg/support/chmod.html>,
<https://help.ubuntu.com/community/FilePermissions>



System Logs

- Similar to Windows Event Viewer
- From the Search field in the Ubuntu menu on the left of the desktop, type **System Log** to view available logs
- Four types of logs
 - **auth.log**: Tracks authentication events that prompt for user passwords (e.g., uses of PAM files and sudo)
 - **dpkg.log**: Tracks software events (e.g., installations and updates)
 - **syslog**: Tracks operating system events (e.g. error messages)
 - **Xorg.0.log**: Tracks desktop events (e.g., service changes and graphic card errors).
- Can add different types of logs

```
System Log
syslog updated today 12:50:12 PM
May 28 07:34:54 ubuntu rsyslogd: [origin software="rsyslogd" swVersion="7.4.4" x-pid="694" x-info="http://www.rsyslog.com"] sta
May 28 07:34:54 ubuntu rsyslogd: rsyslogd's userid changed to 101
May 28 07:34:54 ubuntu rsyslogd-2039: Could no open output pipe '/dev/xconsole': No such file or directory [try http://www.rsys
May 28 07:34:54 ubuntu kernel: [ 0.000000] Initializing cgroup subsys cpuset
May 28 07:34:54 ubuntu kernel: [ 0.000000] Initializing cgroup subsys cpu
May 28 07:34:54 ubuntu kernel: [ 0.000000] Initializing cgroup subsys cpacct
May 28 07:34:54 ubuntu kernel: [ 0.000000] Linux version 3.13.0-24-generic (build@panlong) (gcc version 4.8.2 (Ubuntu 4.8.2-
May 28 07:34:54 ubuntu kernel: [ 0.000000] Command line: BOOT_IMAGE=/boot/vmlinuz-3.13.0-24-generic root=UUID=43901b45-dcf2-4
May 28 07:34:54 ubuntu kernel: [ 0.000000] KERNEL supported cpus:
May 28 07:34:54 ubuntu kernel: [ 0.000000] Intel GenuineIntel
May 28 07:34:54 ubuntu kernel: [ 0.000000] AMD AuthenticAMD
May 28 07:34:54 ubuntu kernel: [ 0.000000] Centaur CentaurHauls
May 28 07:34:54 ubuntu kernel: [ 0.000000] Disabled fast string operations
May 28 07:34:54 ubuntu kernel: [ 0.000000] e820: BIOS-provided physical RAM map:
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x0000000000000000-0x0000000000009ebfff] usable
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x0000000000009ec000-0x0000000000009fffff] reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000a0000-0x000000000000a000ffff] reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0003fedffff] usable
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0003fefffff] usable
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0003fefffff] ACPI data
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0003fefffff] ACPI NVS
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0003fefffff] usable
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0007fffff] reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0007fffff] reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0007fffff] reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] BIOS-e820: [mem 0x000000000000b0000-0x000000000000b0007fffff] reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] NX (Execute Disable) protection: active
May 28 07:34:54 ubuntu kernel: [ 0.000000] SMBIOS 2.4 present.
May 28 07:34:54 ubuntu kernel: [ 0.000000] DMI: VMware, Inc. VMware Virtual Platform/4408X Desktop Reference Platform, BIOS 0
May 28 07:34:54 ubuntu kernel: [ 0.000000] Hypervisor detected: VMware
May 28 07:34:54 ubuntu kernel: [ 0.000000] e820: update [mem 0x000000000-0x000000fff] usable ==> reserved
May 28 07:34:54 ubuntu kernel: [ 0.000000] e820: remove [mem 0x000000000-0x000000fff] usable
May 28 07:34:54 ubuntu kernel: [ 0.000000] No AGP bridge found
May 28 07:34:54 ubuntu kernel: [ 0.000000] e820: last_pfn = 0x40000 max_arch_pfn = 0x400000000
May 28 07:34:54 ubuntu kernel: [ 0.000000] MTRR default type: uncachable
May 28 07:34:54 ubuntu kernel: [ 0.000000] MTRR fixed ranges enabled:
May 28 07:34:54 ubuntu kernel: [ 0.000000] 00000-9FFF write-back
May 28 07:34:54 ubuntu kernel: [ 0.000000] 00000-BFFF uncachable
May 28 07:34:54 ubuntu kernel: [ 0.000000] 00000-CFFF write-protect
May 28 07:34:54 ubuntu kernel: [ 0.000000] D0000-EFFF uncachable
May 28 07:34:54 ubuntu kernel: [ 0.000000] F0000-FFFF write-protect
May 28 07:34:54 ubuntu kernel: [ 0.000000] MTRR variable ranges enabled:
May 28 07:34:54 ubuntu kernel: [ 0.000000] 0 base 000000000000 nask FFC00000000 write-back
```



Sources: <http://debian-handbook.info/browse/stable/sect.manipulating-packages-with-dpkg.html>, <http://ubuntuforums.org/showthread.php?t=900245>



Setting Audit Policies

- Unlike Windows, auditing is not set up by default in Ubuntu
- Three step process to setting up audits:
 1. Install the auditing program by typing `apt-get install auditd`
 2. Enable audits by typing `auditctl -e 1`
 3. View and modify policies by typing `gedit /etc/audit/auditd.conf`

3.

```
auditd.conf (/etc/audit) - gedit
File Edit View Search Tools Documents Help
auditd.conf
#
# This file controls the configuration of the audit daemon
#
log_file = /var/log/audit/audit.log
log_format = RAW
log_group = root
priority_boost = 4
flush = INCREMENTAL
freq = 20
num_logs = 4
disp_qos = lossy
dispatcher = /sbin/audispd
name_format = NONE
##name = mydomain
max_log_file = 5
max_log_file_action = ROTATE
space_left = 75
space_left_action = SYSLOG
action_mail_acct = root
admin_space_left = 50
admin_space_left_action = SUSPEND
disk_full_action = SUSPEND
disk_error_action = SUSPEND
##tcp_listen_port =
tcp_listen_queue = 5
tcp_max_per_addr = 1
##tcp_client_ports = 1024-65535
tcp_client_max_idle = 0
enable_krb5 = no
krb5_principal = auditd
##krb5_key_file = /etc/audit/audit.key
```

```
2. root@ubuntu:/home/cyberpatriot# auditctl -e 1
AUDIT_STATUS: enabled=1 flag=1 pid=4229 rate_limit=0 backlog_limit=320 lost=50 b
acklog=0
```



Groups

- Work very similarly to Windows
 - Root permissions are required

1. To list all groups:

```
cat /etc/group
```

2. To add a group:

```
addgroup [groupname]
```

3. To add a user to a group:

```
adduser [username] [groupname]
```

```
root@ubuntu: /home/cyberpatriot
root@ubuntu:/home/cyberpatriot# cat /etc/group
root:x:0:
daemon:x:1:
bin:x:2:
sys:x:3:
adm:x:4:syslog,cyberpatriot
tty:x:5:
disk:x:6:
lp:x:7:
mail:x:8:
news:x:9:
uucp:x:10:
man:x:12:
proxy:x:13:
kmem:x:15:
dialout:x:20:
fax:x:21:
voice:x:22:
cdrom:x:24:cyberpatriot
floppy:x:25:
tape:x:26:
sudo:x:27:cyberpatriot
audio:x:29:pulse
dip:x:30:cyberpatriot
www-data:x:33:
backup:x:34:
test:x:1002:cyberpatriot,guest
cybercamp:x:1003:cyberpatriot
root@ubuntu:/home/cyberpatriot#
```

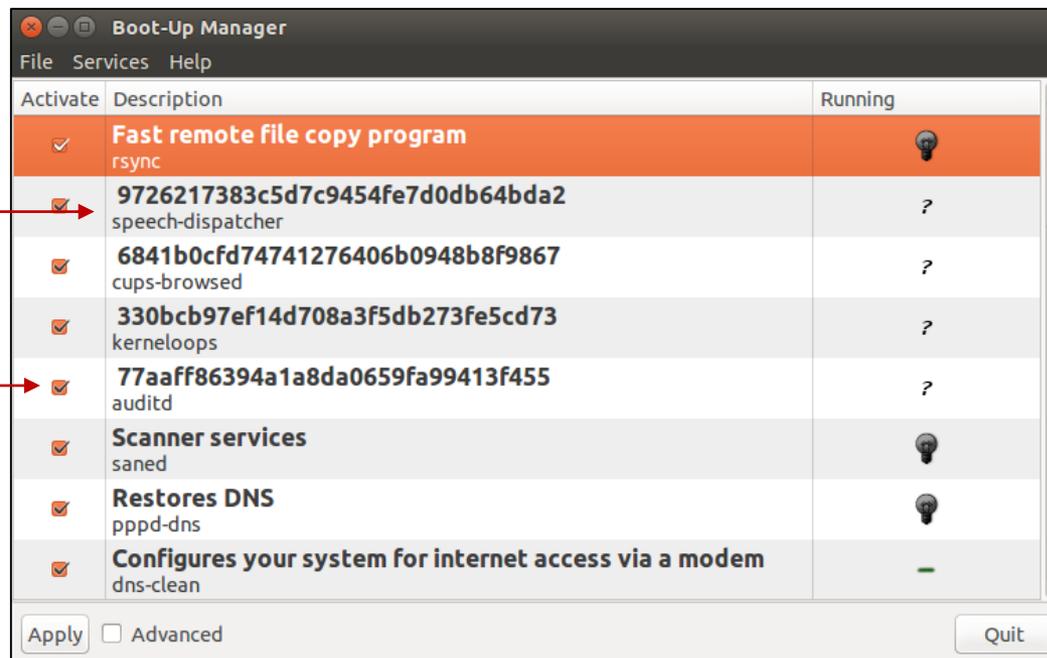


Services

- Can be viewed and managed in the GUI
- To install, type `apt-get install bum` in Terminal
- After installing, type `bum` to run

To start a service, right-click it and select "Start"

To enable a service, check the box next to it



When a service is started, the light bulb will light up. When stopped, the light bulb will be dark.