

Assignment:

Main Components of Windows and Linux



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Lab: Main Components of Windows and Linux

Part A: Windows System Information

1. Working in your lab groups, open the Windows VM on your respective computers and navigate to Start Menu > Windows Administrative Tools > System Information.
2. Explore the *System Information* window and answer the following questions. Type directly into the space provided and use the highlight function or change the font color of your answers. If the answer is different for each computer in the group, write down each group member's name and their computer's information.

a. What is your computer's OS Name? (1 mark)

Answer: Microsoft Windows Pro

b. What is the OS Version? (1 mark)

Answer: 10.0.19045

c. What is the Windows Directory? (1 mark)

Answer: C:\Windows

d. What is the Boot Device? (1 mark)

Answer: \Device\HarddiskVolume1

e. What is the Total Physical Memory? (1 mark)

Answer:

3.00GB

3. Open the Task Manager and click More details.

a. What is the program (executable) for the System Information application? (1 mark)

Answer: msinfo32

b. Using the answer from the previous question, how would you launch the System Information application? (1 mark)

Answer: You can launch the System Information application by pressing Windows + R to open the Run dialog, then type msinfo32 and press Enter.

Part B: The Windows Registry

The Windows Registry is a large file of settings and related information for installed programs and parts of Windows. Information is kept in groups (like folders) and identified by a name called the key. An individual unit of information is kept in a value that includes its name and its data. A key may also hold subkeys.

For example, whether Windows requires CTRL+ALT+DEL (CAD) to access the login screen for logging in is controlled by a value in the registry key:

HKEY_LOCALMACHINE/SOFTWARE/Microsoft/Windows NT/CurrentVersion/Winlogon

The value is named: DisableCAD. The data can be 0 (false) or 1 (true).

1. Conduct research and answer the following questions. Type directly into the space provided and use the highlight function or change the font color of your answers.

a. Briefly describe the root key HKEY_CURRENT_USER. (1 mark)

Answer: HKEY_CURRENT_USER stores configuration information for the user currently logged on. The keys under this root contain user preferences and software settings.

b. Which root key uses HKLM as its abbreviation? (1 mark)

Answer: HKEY_LOCAL_MACHINE (HKLM)

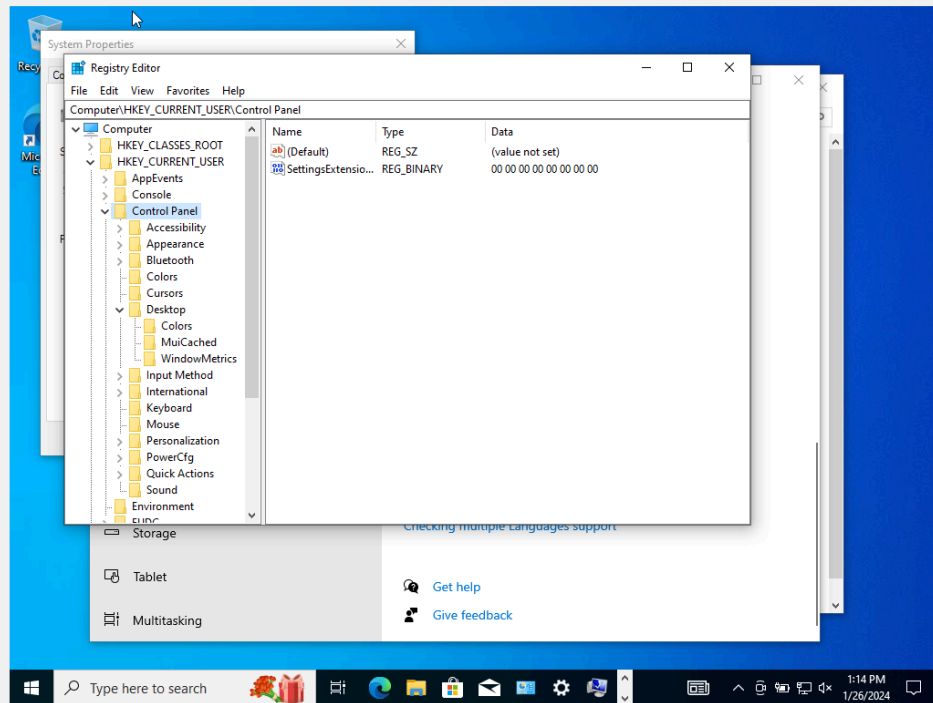
When does the system load (read) the registry keys for HKCU vs. HKLM? (3 marks)

Answer: HKCU keys are loaded when the current user logs in, containing specific settings for the user. HKLM keys are loaded when the system starts and contain system-wide settings.

Incorrectly changing registry values can lead to serious problems, including being unable to boot. However, you can make certain registry changes to achieve a well-tuned system. You can also protect a system from serious consequences by having Windows save its most recent software configuration in a restore point – a backup file for the software configuration.

2. Use Control Panel > System and Security > System > System Protection to create a restore point.
3. Because you'll often use the Windows Registry Editor (regedit) in labs, it's a good idea to add it to the taskbar (bottom of screen) for easy access.
 - a. Click Start, search for regedit and click it to start the utility.
 - b. Right-click the regedit icon in the taskbar and select Pin to taskbar.
4. Open regedit and study the values in the registry key: HKEY_CURRENT_USER\Control Panel\Desktop.

Note: Only look at the keys under Desktop, not in any of the subfolders (e.g., Colors).



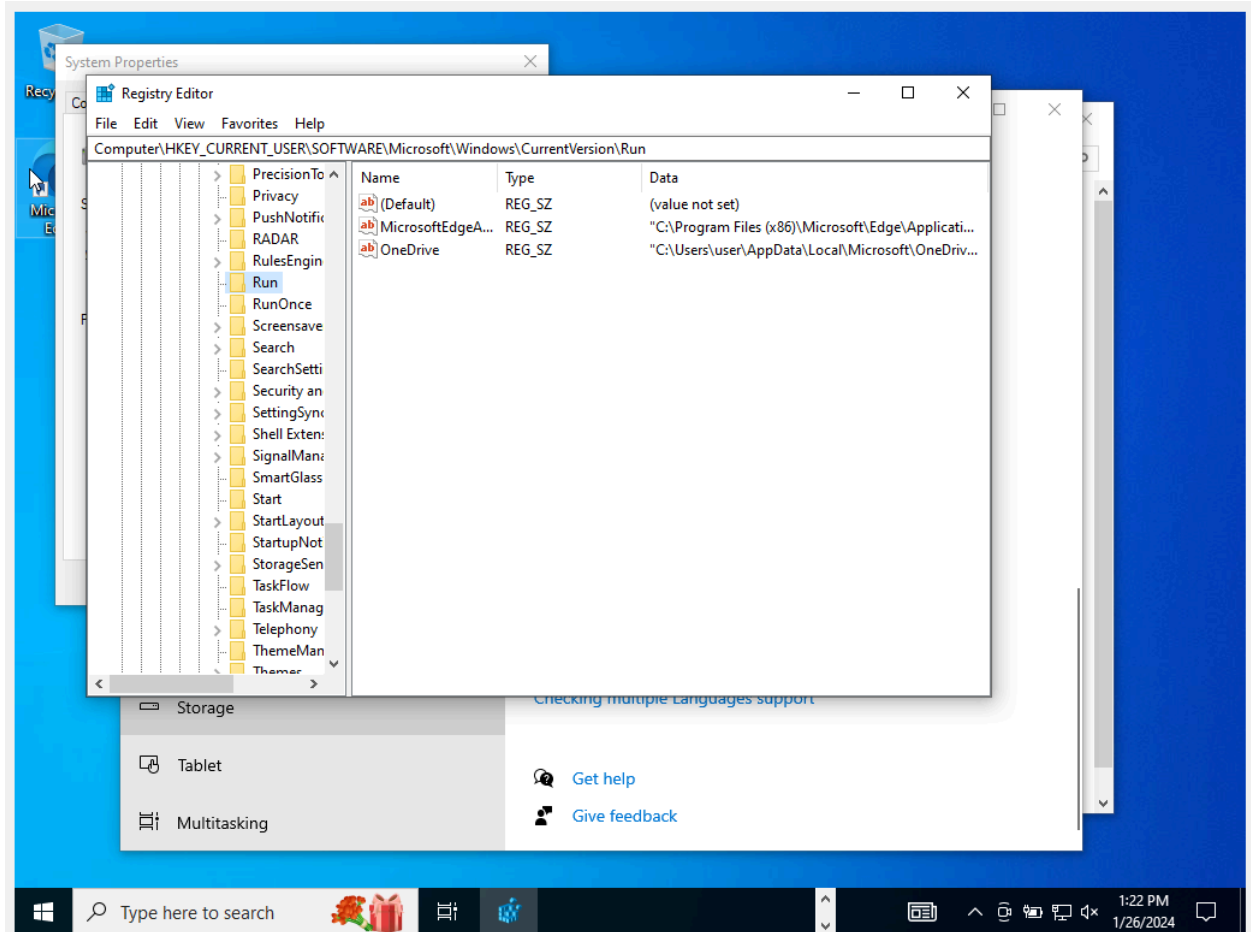
- a. Modify two values that you understand and can verify. What values did you modify (old and new values) and what changed as a result? (2 marks)

Answer: Colors ButtonLight values(212 208 200) to (111 111 111) and ButtonHiLight(255 255 255) to (000 000 000)

The button colors changed i suppose but could find it for a while.

- b. Research and briefly describe the registry key:

HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run.

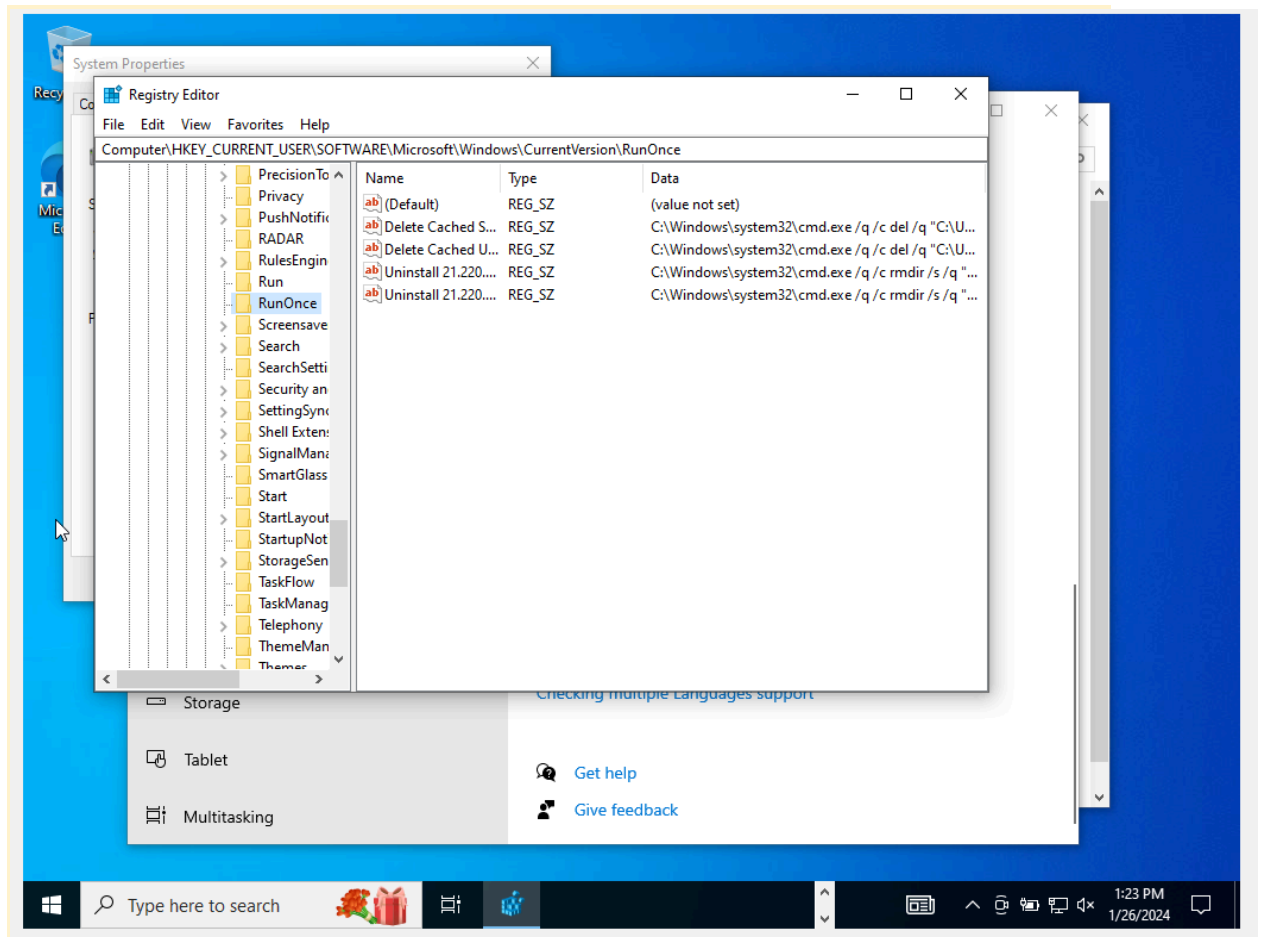


How does this key differ from the HKCU\...\RunOnce key? (2 marks)

Answer:

The HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run registry key is used to store information about programs that should automatically start every time the user logs in to Windows.

The HKEY_CURRENT_USER\...\RunOnce key, on the other hand, is used for programs that need to be run only once at the next user login and then removed from the list.



List the steps required to add a new value to automatically start the Notepad program when a user logs in using both of the keys in the previous step. What happens as a result when a user logs in? What is the difference between the two keys after a login? (3 marks)

Answer:

Run key

- Press Win + R, type regedit, and press Enter to open the Registry Editor.
- Go to HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run.
- Right-click on the Run folder, select New -> String Value.
- Name the new String Value as Notepad.
- Double-click on the newly created Notepad entry, and in the Value data field, type notepad.exe.
- Click OK to save the entry.

For the RunOnce key:

Navigate to
HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\RunOnce.

- Right-click on the RunOnce folder, select New -> String Value.
- Name the new String Value as Notepad.
- Double-click on the newly created Notepad entry, and in the Value data field, type notepad.exe.
- Click OK to save the entry.

With the Run key: Notepad will open every time the user logs in.

With the RunOnce key: Notepad will open only once upon the next login and then the entry will be deleted from the registry.

Run entry remains and will continue to initiate Notepad on every login, whereas the RunOnce entry will be removed after it has been executed once.

Part C: The Windows Command-Line Interface

The command-line interface of Windows has similarities differences with Linux. Both use environment variables and some commands are the same. Other commands are similar but with subtle syntax differences.

1. Open the command-line interface by clicking Start Menu > Windows System > Command Prompt.

Note: To save keystrokes, attach the command prompt to the taskbar, just like you did with regedit.

- a. What is the process/executable name for the command prompt utility? (1 mark)

Answer: cmd.exe

2. Research and execute the following commands, and then describe the results.

- a. Hostname (1 mark)

Answer: Displays the Hostname of the computer. DESKTOP-P6UTJGK

b. `cd \` (1 mark)

Answer: Changes directory to the root directly

`dir /ah` (1 mark)

Answer: List files with the attributes hidden

d. List the `.sys` files located in the directory from the previous step (they are important, as you'll learn later in the course). (1 mark)

Answer: To list `.sys` files, use the command `dir /a *.sys`.

3. The `SET` command displays all system variables at one time. Use `SET` to find the value of the following environment variables.

Note: Windows is case insensitive, but like all aspects of SD, there are common practices we follow for names.

a. `ALLUSERSPROFILE` (1 mark)

Answer: `C:\ProgramData`

b. `CommonProgramFiles` (1 mark)

Answer: `C:\Program Files\Common Files`

c. HOMEPATH (1 mark)

Answer:\Users\user

d. windir (1 mark)

Answer:C:\Windows

4. Use ECHO to display the value of the PATH environment variable. (Hint: a special character is required). What command did you use? (1 mark)

Answer:C:\> echo %PATH%

Part D: The Windows Boot Process

Many users judge the performance of an operating system by how quickly it starts up. The Windows boot process consists of several stages, shown below:

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The initial stage of the boot process is the same for all systems, regardless of which operating system is installed. This is commonly known as the BIOS initialization stage, which includes the power-on self-test (POST) and loading the master boot record (MBR) from the device specified in the BIOS setup.

Note: MBR is the first sector of a disk drive and the code stored on the MBR is the bootloader program.

The MBR searches its partition table and reads the partition boot record (volume boot record), the first sector of a partition/volume, and starts the second stage bootloader (OS loader). Windows 10 uses the Secure Boot on Unified Extensible Firmware Interface (UEFI) environments (if enabled) to verify the bootloader's digital signature before it loads the Windows Boot Manager to prevent rootkits from interfering with the boot process.

The boot manager is responsible for setting up the boot environment, executing any pre-boot applications, such as the memory test program (memtest.exe), and loading the kernel in any of the various modes it provides in the following diagram:

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The Windows Boot Manager (bootmgr.exe) reads information from the Boot Configuration Database (BCD).

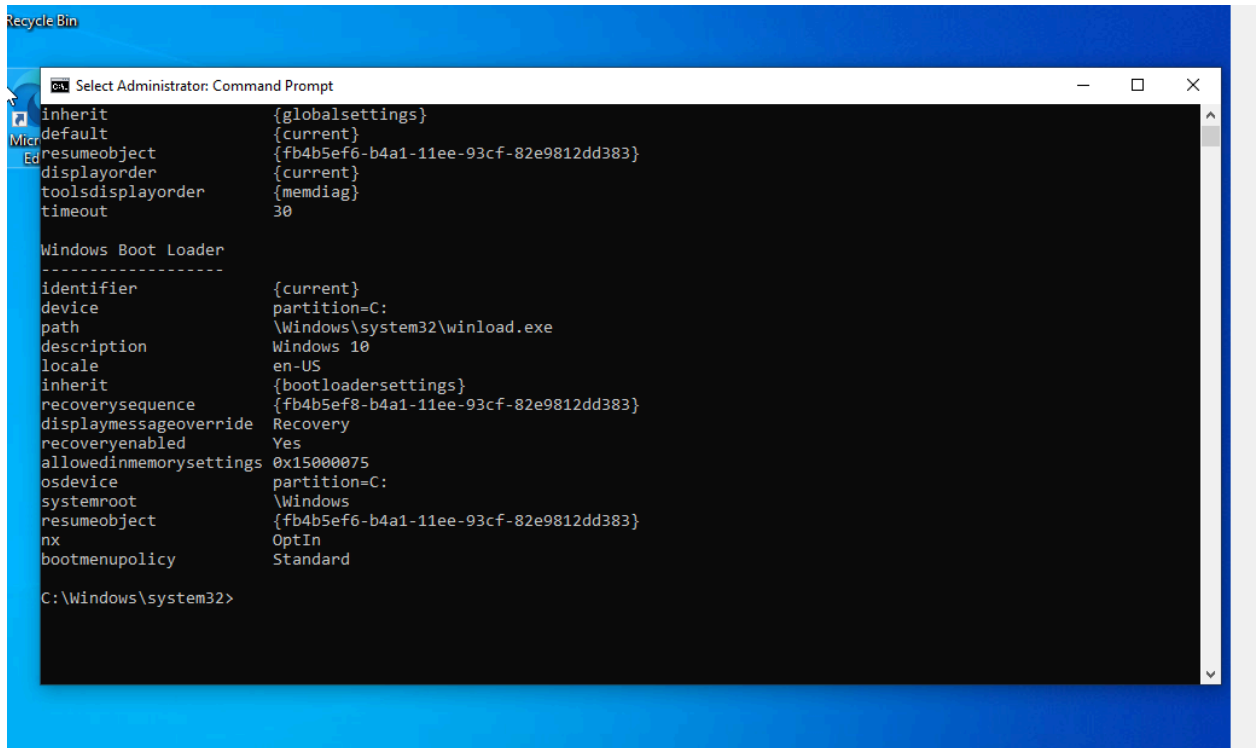
Note: The BCD replaced the boot.ini file that was used in versions prior to Windows 7.

1. Research the BCD. What is the purpose of this file? What information is stored? How is it used with the boot manager? (3 marks)

Answer: The BCD (Boot Configuration Data) stores information about the boot options and settings on Windows operating systems. It is used by the Boot Manager to determine the available operating systems to boot and any necessary options.

2. From the Windows Start menu, right-click Command Prompt and select Run as Administrator.

3. Execute the bcdedit command (no options), and then answer the following questions.



```
inherit {globalsettings}
default {current}
resumeobject {fb4b5ef6-b4a1-11ee-93cf-82e9812dd383}
displayorder {current}
toolsdisplayorder {memdiag}
timeout 30

Windows Boot Loader
-----
identifier {current}
device partition=C:
path \Windows\system32\winload.exe
description Windows 10
locale en-US
inherit {bootloadersettings}
recoveryssequence {fb4b5ef8-b4a1-11ee-93cf-82e9812dd383}
displaymessageoverride Recovery
recoveryenabled Yes
allowedinmemorysettings 0x15000075
osdevice partition=C:
systemroot \Windows
resumeobject {fb4b5ef6-b4a1-11ee-93cf-82e9812dd383}
nx OptIn
bootmenupolicy Standard

C:\Windows\system32>
```

- a. What is the device and path to the OS? (1 mark)

Answer: partition=\Device\HarddiskVolume1

- b. Which directory is the root of the OS? (1 mark)

Answer: \Windows

Note: This data is used to boot Windows. Other operating systems or system versions could be stored on disk and selected at boot time.

- c. Use bcdedit /? and explain the purpose of the command bcdedit /export. In what situation would this command be useful? (1 mark)

```
Administrator: Command Prompt
allowedinmemorysettings 0x15000075
osdevice                  partition=C:
systemroot                \Windows
resumeobject              {fb4b5ef6-b4a1-11ee-93cf-82e9812dd383}
nx                        OptIn
bootmenupolicy            Standard

C:\Windows\system32>bcdedit /?

BCDEDIT - Boot Configuration Data Store Editor

The Bcdedit.exe command-line tool modifies the boot configuration data store.
The boot configuration data store contains boot configuration parameters and
controls how the operating system is booted. These parameters were previously
in the Boot.ini file (in BIOS-based operating systems) or in the nonvolatile
RAM entries (in Extensible Firmware Interface-based operating systems). You can
use Bcdedit.exe to add, delete, edit, and append entries in the boot
configuration data store.

For detailed command and option information, type bcdedit.exe /? <command>. For
example, to display detailed information about the /createstore command, type:

    bcdedit.exe /? /createstore

For an alphabetical list of topics in this help file, run "bcdedit /? TOPICS".

Commands that operate on a store
=====
/store          Used to specify a BCD store other than the current system default.
/createstore     Creates a new and empty boot configuration data store.
```

Answer:Modifies the boot configuration data store.

The Windows Loader (winload.exe) loads basic drivers to prepare the system for the kernel to take over. The Windows 10 kernel (ntoskrnl.exe) begins by reading the disk data and loading any additional drivers that are marked as BOOT_START into memory.

Note: If the system is hibernating, winresume.exe is loaded instead of winload.exe.

During the kernel initialization stage, the system is being prepared to run native applications, which involves initializing the executive subsystem and the hardware abstraction layer (HAL).

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The kernel then passes control to the Session Manager Subsystem (smss.exe). The initial instance (session 0) initializes the registry, loads other drivers that weren't marked BOOT_START and starts the Windows subsystem processes.

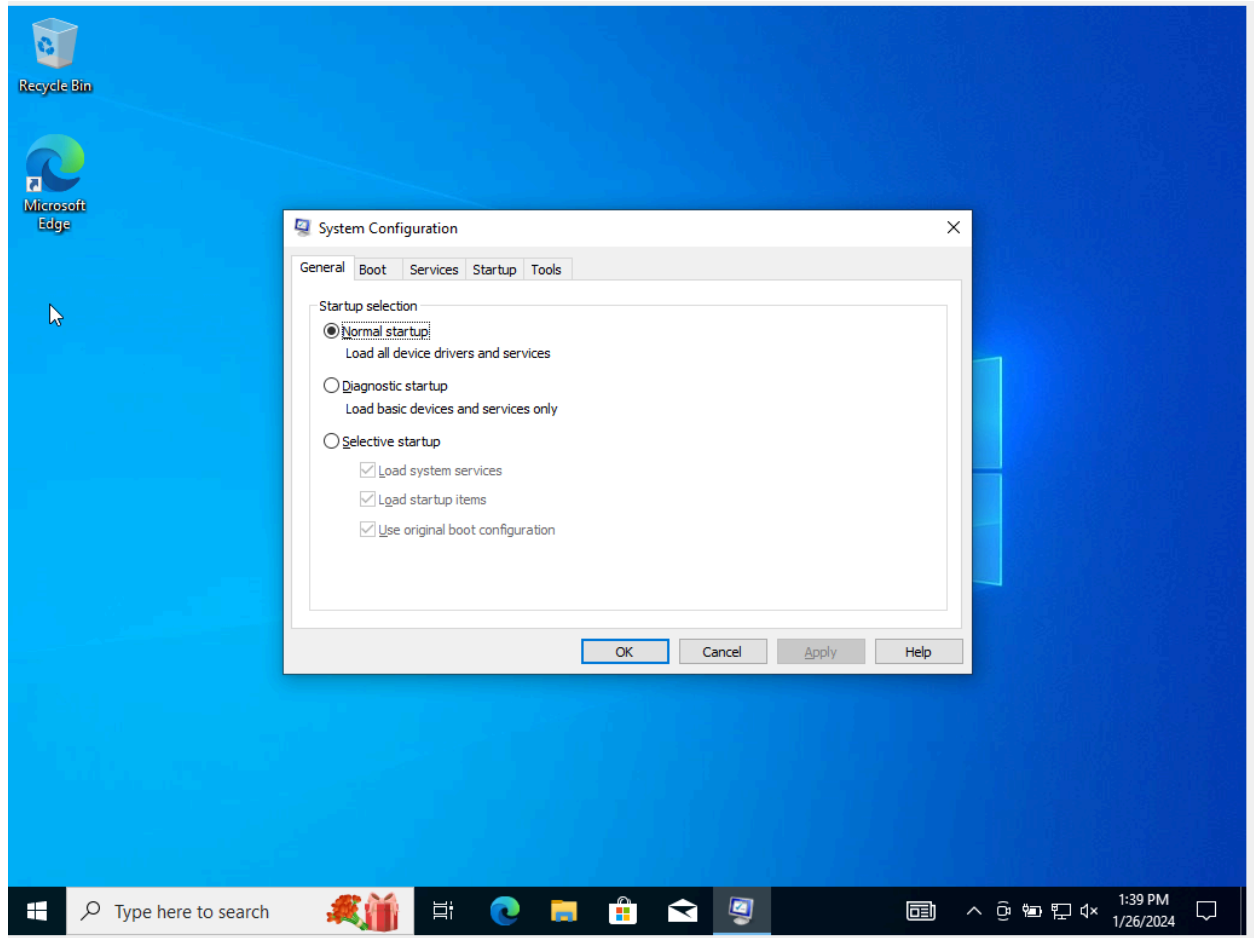
The Windows initialization process (wininit.exe) starts the Service Control Manager (SCM), the Local Security Authority (LSASS) and the Local Session Manager (LSM). It also completes the initialization of the registry and performs user-mode initialization.

All other session instances create their own Client/Server Runtime Subsystem process (csrss.exe) to handle the Graphics Device Interface (GDI) shutdown and login subsystem process (winlogon.exe), which coordinates logon and user security.

During the winlogon initialization stage, service.exe loads and initializes auto-start drivers and services. The login screen (logonui.exe) prompts the user for login credentials and if authentication is validated, control passes to the Windows Program Manager, commonly known as the Windows Explorer (explorer.exe). Windows Explorer creates the Desktop Window Manager (dwm.exe), which initializes the desktop and displays it. Now the system is ready for user input.

Windows provides a basic tool that can be used to configure boot and startup system settings.

4. From the Windows Start menu, search for MSCONFIG and run it.
5. Use the program's Help files, as well as your own research, to describe the differences between the following startup modes.



a. Normal (1 mark)

Answer: Loads all devices and services

b. Diagnostic (1 mark)

Answer: Loads basic devices and services only

c. Selective (1 mark)

Answer: The user has the choice to load any component

6. List the non-Microsoft services and items that run at startup. In what situation would it be useful to disable one or more startup items? (2 marks)

Answer: Avira anti virus scan on boot and to disable it you'd use Task Manager

Part E: Linux Basic Command-Line Operation

Many Linux commands only run through the command-line interface. To type commands and interact with the kernel, you need a Terminal (similar to a Windows Command Prompt window). The fastest way to access it is from the panel (like a Windows Quick Launch taskbar) at the top of the screen.

Note: Unlike Windows, Linux is case sensitive, so uppercase and lowercase matters!

1. Explore the GNOME menu panel (left), find the Terminal, and then open it by clicking the Terminal icon once.

The gedit command opens a new window running a simple graphical text editor, and the hostname is contained in a file named /etc/hostname. Because this file is protected from casual users, you have to run the gedit command with "superuser" privileges using the command sudo.

2. Open a terminal window and type: `sudo gedit /etc/hostname`.

Note: Because you used the sudo command, you'll be prompted for the superuser password to verify your access.

3. Change the Linux kernel hostname from Ubuntu16 to reflect the purpose of the machine. In this lab, because you're using it as a course study tool and you're responsible for your own VM, use <yourName>-<course code>.

Notes:

- <xxx> is the standard notation to insert something of your choice. Do not include the < or > characters in your hostname.
- Make sure everyone in your group performs this step on their own VM.
- Don't use any special characters other than dashes (-), which are the only acceptable symbol for hostnames.

4. To associate this hostname change to the default loopback, modify the hosts file by running `sudo gedit /etc/hosts` in the terminal window.

Tip: Use the up and down arrow keys to cycle through your command history.

The first two lines look like this:

```
127.0.0.1 localhost
127.0.1.1 Ubuntu16
```

5. Change the word `Ubuntu16` to match the hostname you used previously.
6. Restart the Linux machine to update the hostname. (Something to think about: What does this change accomplish?)

The Linux `man` command displays information from a built-in manual of information (you can also find this information online by searching for `man <commandname>`). You can advance through the information by pages by pressing the spacebar, or line by line by pressing the Enter key. Exit the man pages anytime by pressing the letter `q`.

7. Use the `man` feature to describe the purpose of the following commands.

- a. `pwd` (1 mark)

Answer: Prints the present working directory

- b. `ls` (1 mark)

Answer: Lists the files and directories in the current directory

8. Give an example of when you would use each command.

- a. `pwd` (1 mark)

Answer: When you open a terminal and want to confirm exactly which directory you're working in

b. ls (1 mark)

Answer: View the contents of a directory

9. What is the name of the present working directory? (1 mark)

Answer: /home/ubuntu

10. This is the default directory for user, which is also indicated by the special character ~. View the files in this directory. Based on the directory's contents, which Windows folder (directory) is similar? (1 mark)

Answer: The ~ symbol refers to the home directory of the current user in Linux, which is similar to C:\Users\thefa in Windows.

11. Research and list two commands that would each change the present working directory back to the user's default directory. (2 marks)

Answer: "cd" with not arguments and "cd ~"

12. The Linux pipe operator (|) is used to send the output of one command into the input of another command. Show the combination of the commands ls and more that will display files in the large directory named /usr/bin, only one screen at a time. (1 mark)

Answer: ls /usr/bin | more

The output of `man` is, by default, piped (i.e., redirected) to `less` so that only one screen of output is visible at a time. `less` works like `more`, but `less` allows searches, so you can find specific contents in a man page. For example, to find particular text (e.g., "text"), type `/text` at the blinking prompt. Use `/` to find the next occurrence.

13. Use `man proc` to see information about the `proc` pseudo-filesystem. In the man output, search for the string: `/proc/sys/kernel/version`. On what line is this string? (1 mark)

Answer: 3741

Part F: Linux Kernel System Information

The Linux kernel provides access to many of its settings and information (e.g., what action to take when CTRL-ALT-DEL is typed). The kernel makes these settings and information available through a mechanism that acts like accessing a file. This approach is called a pseudo-filesystem. With sufficient access rights, each pseudo-file can be read, written and printed just like an actual file.

1. Research and briefly describe the purpose of the `proc` pseudo-filesystem. (2 marks)

Answer: Presents information about processes and other system information in a hierarchical file-like structure. The `/proc` filesystem is a special filesystem in Unix-like operating systems.

2. Find the kernel release version of your system and record the value by using the command: `cat /proc/sys/kernel/osrelease`. (1 mark)

Answer: 6.5.0-15-generic

Tip: The TAB key auto-completes entries in the file system. If there is more than one result that matches your string, press the TAB key again to show all matches.

3. Linux uses runlevels to define the basic operating mode of the system. Research and briefly describe runlevels 0 to 6 in the standard base specification. (Hint: Trust Wikipedia!)

Answer:

- 0- Halt
- 1- Single User mode
- 2- Multi-user mode without networking
- 3- Full multi-user mode with networking
- 4- Undefined/Custom
- 5- Full multi-user mode with networking and GUI
- 6- Reboot

4. When troubleshooting the system kernel, it is often helpful to boot the system in single-user (text) mode. Reboot the VM and hold down the left SHIFT key while it is restarting (if you see the Ubuntu screen, it's too late and you need to try again).
5. Inside the GRUB menu, select Advanced options for Ubuntu, and then choose the single user option, which is usually displayed as "Ubuntu, with Linux x.x.x-xx-generic (recovery mode)". If you see more than one version of the kernel to choose from, select the latest version.
6. Choose Drop to root shell prompt and press Enter on the command line to enter singleuser text mode. What is the present working directory?

Answer: The root directory

7. Return to the default run level using the command reboot.

Part G: Linux Boot Process

A bootloader controls the process of loading a computer operating system into memory when the computer is turned on. The ability to configure a boot process is valuable, especially if the boot has been corrupted by malfunctioning software or a virus. The grub bootloader is one of the most popular bootloaders available in Linux. Ubuntu uses grub2 (the grub2 configuration file is `/etc/default/grub`).

1. Edit the grub configuration file on your computer (`sudo gedit /etc/default/grub`).
 - a. Configure the boot to automatically enter single-user mode by changing the default Linux command line from `quiet splash` to `text single`.
 - b. Update the grub2 internal configuration files using `sudo update-grub`.
2. Restart Linux, take a screenshot of the VM screen after it loads and attach it here. (1 mark)

Answer:

```
jean-pierre@MyBaby: ~  
jean-pierre@MyBaby:~$ echo $LINES  
24  
jean-pierre@MyBaby:~$ echo $SHELL  
/bin/bash  
jean-pierre@MyBaby:~$ man bash  
jean-pierre@MyBaby:~$ man proc  
jean-pierre@MyBaby:~$ cat /proc/sys/kernel/osrelease  
6.5.0-15-generic  
jean-pierre@MyBaby:~$ sudo gedit /etc/default/grub  
[sudo] password for jean-pierre:  
sudo: gedit: command not found  
jean-pierre@MyBaby:~$ sudo nano /etc/default/grub  
jean-pierre@MyBaby:~$ sudo update-grub  
Sourcing file `/etc/default/grub'  
Generating grub configuration file ...  
Found linux image: /boot/vmlinuz-6.5.0-15-generic  
Found initrd image: /boot/initrd.img-6.5.0-15-generic  
Found memtest86+x64 image: /boot/memtest86+x64.bin  
Warning: os-prober will not be executed to detect other bootable partitions.  
Systems on them will not be added to the GRUB boot configuration.  
Check GRUB_DISABLE_OS_PROBER documentation entry.  
Adding boot menu entry for UEFI Firmware Settings ...  
done  
jean-pierre@MyBaby:~$ S
```

```
GNU nano 7.2 /etc/default/grub *  
# If you change this file, run 'update-grub' afterwards to update  
# /boot/grub/grub.cfg.  
# For full documentation of the options in this file, see:  
#   info -f grub -n 'Simple configuration'  
  
GRUB_DEFAULT=0  
GRUB_TIMEOUT_STYLE=hidden  
GRUB_TIMEOUT=0  
GRUB_DISTRIBUTOR=`lsb_release -i -s 2> /dev/null || echo Debian`  
GRUB_CMDLINE_LINUX_DEFAULT="text single"  
GRUB_CMDLINE_LINUX=""  
  
# If your computer has multiple operating systems installed, then you  
# probably want to run os-prober. However, if your computer is a host  
# for guest OSes installed via LVM or raw disk devices, running  
# os-prober can cause damage to those guest OSes as it mounts  
# filesystems to look for things.  
#GRUB_DISABLE_OS_PROBER=false  
  
# Uncomment to enable BadRAM filtering, modify to suit your needs  
[ Read 40 lines ]  
^G Help      ^O Write Out ^W Where Is  ^K Cut       ^T Execute  ^C Location  
^X Exit      ^R Read File ^\ Replace  ^U Paste     ^J Justify  ^_ Go To Line
```

3. Sometimes, an error in the configuration prevents the system from completely booting, so you need to manually set the grub configuration.
 - a. Reboot the system (reboot), and then hold down the left SHIFT key to open the GNU GRUB menu.
 - b. Highlight the Linux generic configuration (not upstart or recovery mode) and press the e key to edit it.
 - c. Replace the words text single with quiet splash, and then press CTRL+X to exit the editor and start the boot.
 - d. What's the difference between quiet splash and text single modes? (2 marks)

Answer: The difference between quiet splash and text single is that quiet splash hides the boot messages behind a splash screen for a more graphical boot process, while text single displays detailed boot messages and boots the system into single-user mode.

8. When you finish the regular boot, view the grub configuration file again. Notice that it hasn't been permanently changed. Perform Steps 1 and 2 again to replace the word text single.

Note: If you don't do this step, you will regret it later!

Part H: Linux Basic Desktop Interface Operation

1. Your Ubuntu VM uses the Gnome GUI system as its desktop. Explore the Ubuntu Gnome desktop.
2. Explore LibreOffice, the free and open-source alternative to Microsoft Office. What are the three LibreOffice applications on the menu? To which Office applications are they equivalent? (3 marks)

Answer:

LibreOffice Writer - Microsoft Word

LibreOffice Calc - Microsoft Excel

LibreOffice Impress - Microsoft PowerPoint

3. Explore the System Settings menu. How would you create a new user account for this system? (2 marks)

Answer:

- Go to the "System Settings" menu
- Navigate to "Users" or "User Accounts"
- "Add User" to create a new account

Linux is an example of software built in layers. At the "lowest" layer, the kernel interacts directly with the hardware. For the user interface, this means that the kernel controls the keyboard, mouse, video card and other input/output components.

Another piece of software, X11, provides features such as basic graphics, windowing functionality and mouse click access. X11 doesn't access the input/output components directly; instead, it sends commands like "turn on that pixel on the monitor" or "check if the mouse button was pressed" to the kernel which, in turn, does the actual input and output. The graphics created by X11 are rudimentary, so Gnome provides more attractive windows and graphics. The Gnome desktop is another software layer that uses X11.

4. What other common GUI system can you easily install in the Ubuntu environment? (1 mark)

Answer: KDE Plasma

Part I: The Linux Shell

A shell is a program that runs whenever a user connects to a Linux system (e.g., when a terminal window is opened). A shell reads keyboard input, determines what the user wants to do, sends requests to the operating system to do the work, and then displays any output to the user's terminal.

1. Many system settings are stored in environment variables. Research Ubuntu Linux systemwide environment variables. Where are these stored? (1 mark)

Answer: /etc/environment

2. Use set to display all global (system-wide) and local (shell) variables. You'll see lots of output (>6000 lines). How would you direct the output to another utility so you could search the output for something specific? (1 mark)

Answer:

"grep"

Example: set | grep 'search_term'

3. What is the purpose of the PATH environment variable? (1 mark)

Answer: PATH is an environment variable specifying a set of directories where executable programs are located.

4. Use echo \$<env_var_name> to find the value of the LINES local variable and describe its purpose. (2 marks)

Answer:

The LINES variable typically stores the number of lines that can be displayed in the terminal window. For my window its 24. Its purpose is to inform applications running in the terminal of how many lines the current terminal can display, allowing text-based programs to format their output to fit within the visible area of the terminal.

5. Various shells are available to Linux users, and each shell provides a slightly different interface. Using the SHELL environment variable, what shell is currently used by the system? (1 mark)

Answer: /bin/bash

6. Use `man bash` and find the section ALIASES (not the BASH_ALIASES variable). Briefly describe what it is and how it can be useful. (2 marks)

Answer: It is useful for creating easier-to-remember commands or for commands you use frequently with many arguments or options.