Batch files for the Windows Operating System:

Lecture 9

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1. Learning Outcomes

By the end of this lecture you will:

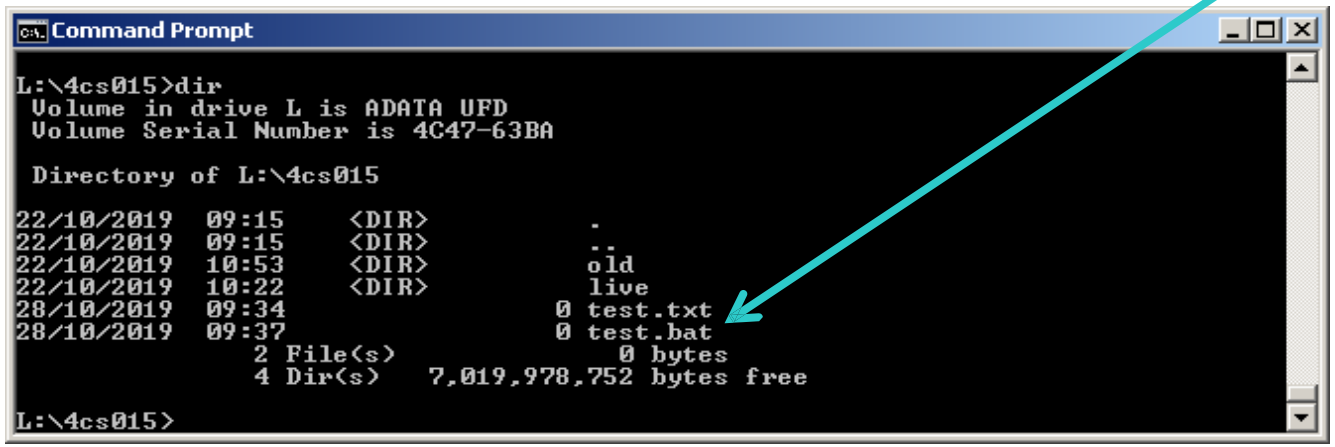
- How to create a batch file (Windows OS) and execute it
- Learnt about some basic commands to get you started (programming)
  - **Setup** commands
  - **Control** commands
- Some advance batch file examples

2. Creating a Batch File (revisited)

- A **batch file** is a script file in that can be run under Microsoft Windows.
- It consists of a series of commands executed by the command-line interpreter
- It is stored in a plain text file with a **.bat** extension
  - Creating a batch file = **c:\notepad.exe** **test.bat**

Application used to construct program

Name of executable program



3.Batch File Commands (setup)

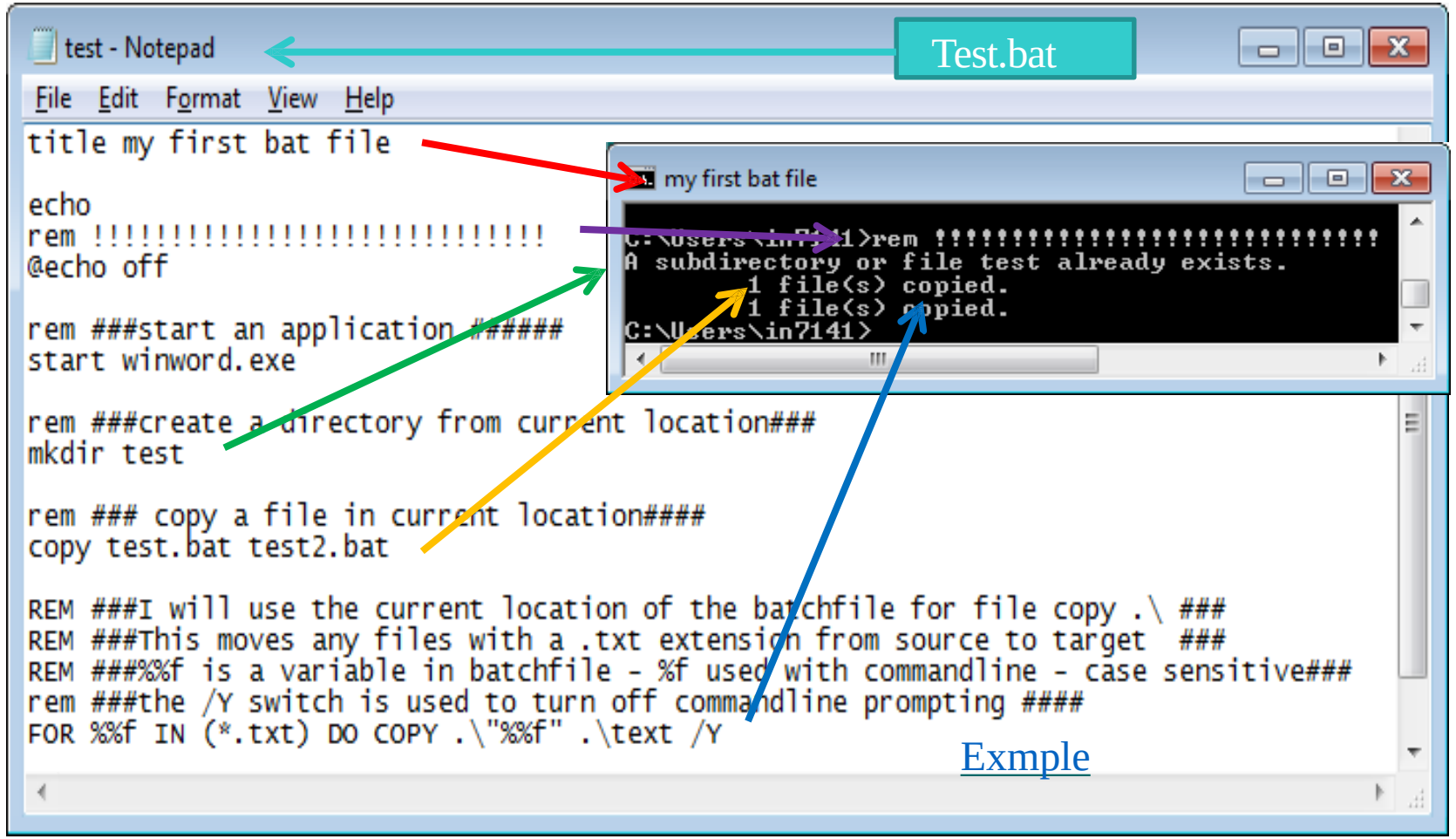
- Program setup Example
  - **TITLE-** Edit the title of the window
  - **REM -** Inserts a comment line in the program
  - **ECHO -** Displays the text on the monitor
  - **@ECHO OFF -** Hides the text that is normally displayed
    - @' symbol will prevent the 'echo off' command from being seen on the screen
  - Run

4. Batch File Commands (control)

Program control

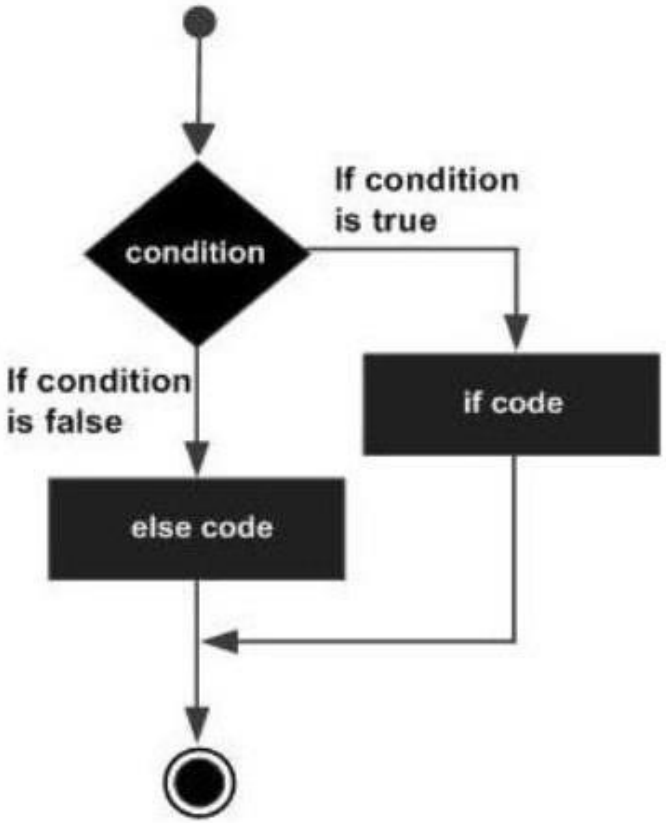
- **MKDIR** – Creates a directory
- **COPY -** Copy a file or files (XCOPY – extended version)
- **FOR/DO -** This command lets you specify actions with loops
- **START -** Run a file with its default application
- **IF/THEN/ELSE** – This command sequence allows for selective branching
- recallMe Example Run

5. Overview Example: Simple batch file execution



6. Batch file: If-Then-Else

- The following is the general form of this statement -
- IF (condition)
- THEN (do something)
- ELSE (do something else)



6.1 Example: If-Then-Else

2 - Notepad

File Edit Format View Help

```
title if-then-else

echo off

rem #####the /A' is used for assigning numeric values###
rem #####other are classed as empty strings ####
SET /A a=3
SET /A b=2
SET name1=Aston
SET name2=Martin

Rem ### Using if else statements ###
IF %a%==%b% (echo Numbers equal) ELSE (echo Numbers different)

IF %name1%==%name2% (echo Name is Same)^
ELSE (echo Name is different)
```

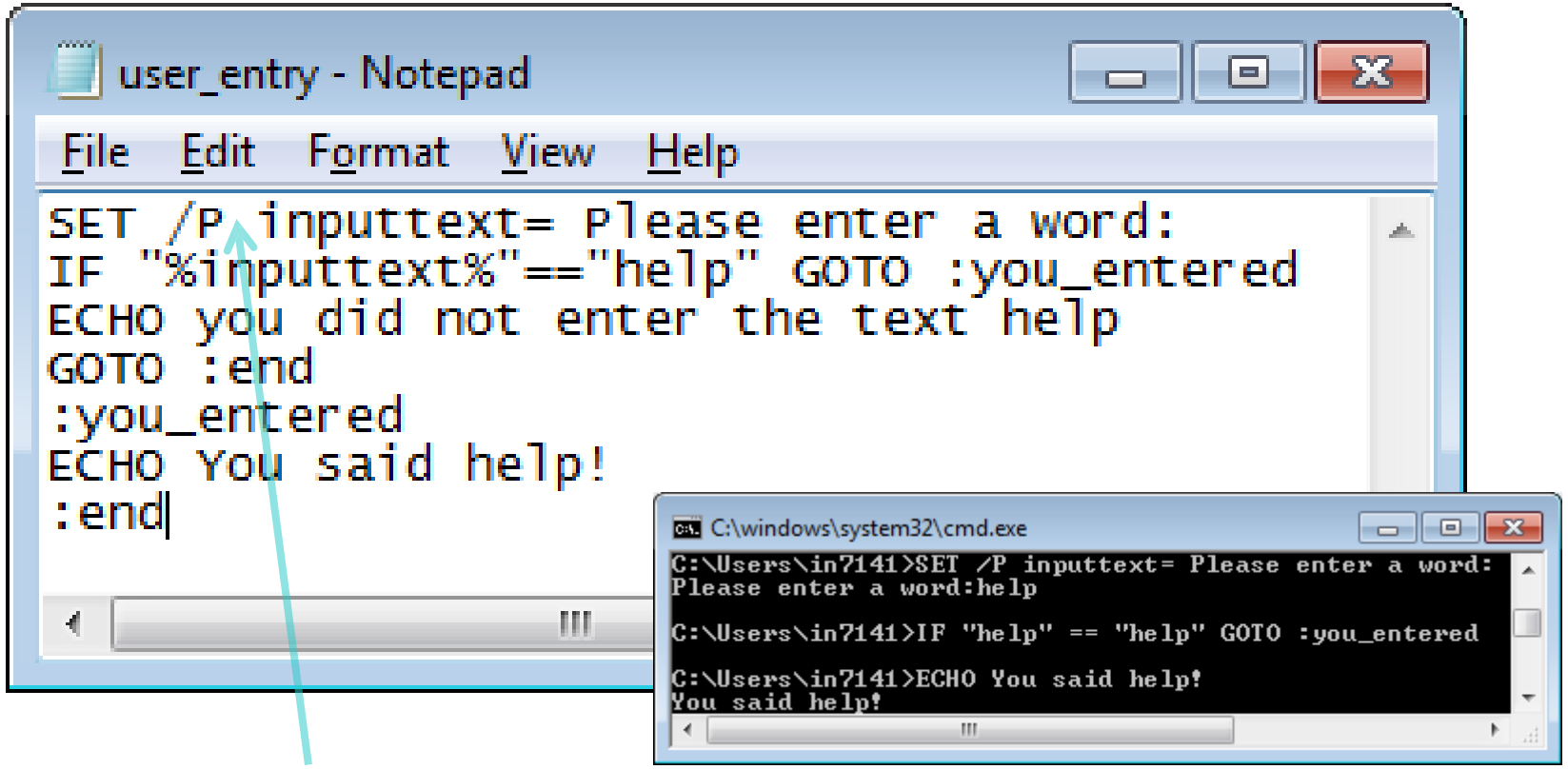
if-then-else

```
C:\Users\in7141>echo off
Numbers different
Name is different

C:\Users\in7141>_
```

- NB//
  - /A is used to denote numbers (official rule)
  - ^ (carrot) is used for continuing a command-line on the next line example Run

7. User Entry



- NB// The '**/P**' switch tells the command interpreter to prompt the user for an input which is saved into the variable which is stored as an environment variable which can be used later in the code. Example Run

8. Function Call(s)

function_call - Notepad

File Edit Format View Help

```
@ECHO OFF
rem ##### remember we use the @ so that the echo off is not displayed ###
rem ##### this is the start of the main code loop ######


rem #### or :: lets call a function #######
CALL :f


rem ##### this exit is to end the main code not the function######
EXIT /B


rem ###### this is the function called ######
:f
ECHO called
EXIT /B
```

C:\windows\system32\cmd.exe

```
C:\Users\in7141>function_call
called

C:\Users\in7141>
```

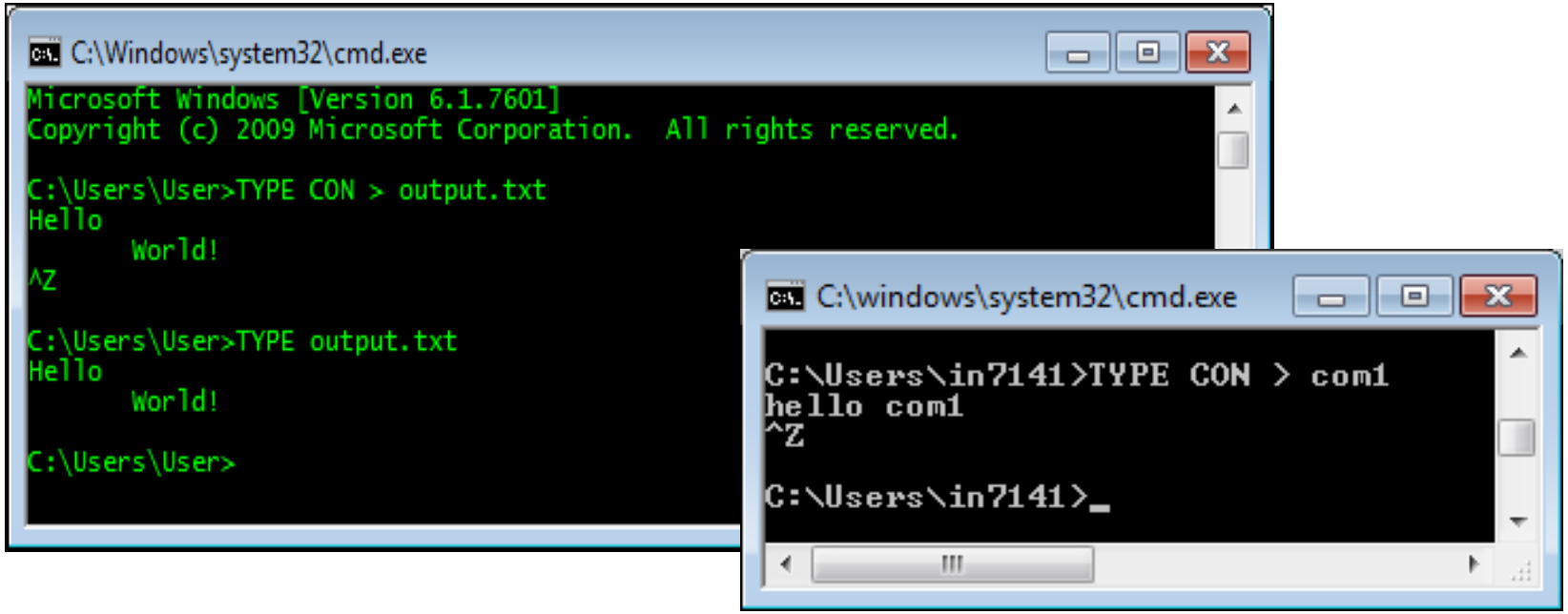
We use the **CALL** keyword to invoke the function and pass any arguments to the function Example Run

The **EXIT /B** will stop execution of a batch file or subroutine and

return control to the command processor.

9. Re-directing Input / Output

- You can direct commandline input by simply redirecting the command prompt's own **stdin**, called **CON**
- This can be directed to -
  - A file (in example 'output.txt')
  - Communication port (com1, com2, LPT1, etc.)
  - Using CTRL+Z, which sends the end-of-file (EOF) character to stop.

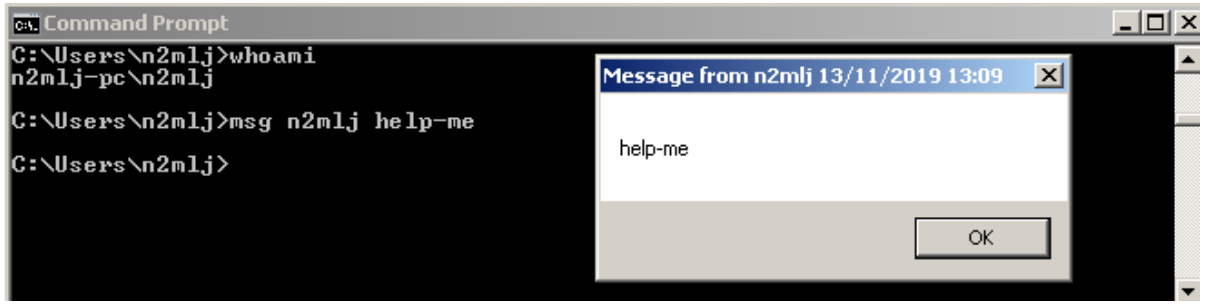


10. Taster: More Advanced Control

- Swap (exchange) Mouse Button control *(only 2 lines of code!)*
- **@echo off**
  Rundll32 User32, SwapMouseButton
- To reverse the action on a University Computer simply reboot the machine
- For a Home machine –
  - Search "mouse" in the start menu & open it
  - The mouse dialog box will appear
  - In the buttons tab - Untick the option "switch primary and secondary buttons"

11. Network BAT file

- **<u>BAT (for example test.bat)</u>**
- Using msg to send **network** messages to individual PC's
- @echo off
- msg n2mlj help-me
- n2mlj – computer name discovered by using **whoami** at command prompt
- *help-me – text message sent*



12. Testing for IP addresses

- **Pinger – Testing IP network address example**

```
@echo off  title Pinger
set /p target=Enter IP address or URL:
ping %target%
pause
```

- **This outputs:**

```
Pinging google.com [2404:6800:4002:80c::200e] with 32 bytes of data:
Reply from 2404:6800:4002:80c::200e: time=25ms
Reply from 2404:6800:4002:80c::200e: time=24ms
Reply from 2404:6800:4002:80c::200e: time=25ms
Reply from 2404:6800:4002:80c::200e: time=25ms

Ping statistics for 2404:6800:4002:80c::200e:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 24ms, Maximum = 25ms, Average = 24ms
```

- *Pressing CTRL+C forcefully stops any running command*

13. Turn-off Computer

- **Shutdown timer – This script closes down the windows operating system**

- The batch file schedules a shutdown user input where –
  - /p = user input,
  - /a = numerical value
  - CMDline shutdown is also used for log-off, reboot, etc.
  - Switches –s = shutdown, -t = time

```
@echo off
title Shutdown System
set /p min =Enter minutes to wait until shutdown: set /a
sec=%min%*60
shutdown -s -t %sec%
```

14. Kill a task

- To kill an individual task (application or process)
- The task list can be view on your own computer by using CTRL+ALT+DEL
- The processes keep the system alive
- Many applications use the processes as services for them to execute

Code: *This will force termination of the chrome browser*

- **@echo off**
  taskkill /im chrome.exe /f
- **pause**

- Key taskkill - use to terminate a process
  /f - forceably termination of the process
  im - this is the the image name associated with software (use task manager)
  firefox.exe - the image name that you wanted to terminate.

15. System Crash

- The **fork bomb** is the equivalent of a DDoS (distributed denial-of-service) attack on your operating system.
- It aims to deprive the system of memory (RAM), leaving nothing for other applications or the operating system's vital operations required to keep the systems running, hence crashing it.
- The fork bomb is not permanently harmful for a computer, just annoying.

The code:

```
:s
start %0
goto s
```

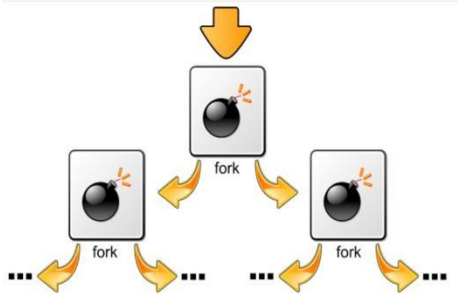
(1) Create a label ':**s**'

(2) Start means RUN – **%0** actually refers to the name of the batch file itself. So we are running the same file again.

(3) **goto s** – then forms the infinite loop

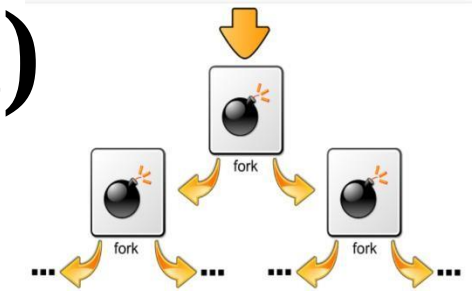
16. System Crash (detail)

- Thus; every time the loop is completed another instance of the same program is started (both are then running and duplicate themselves, and so on……)



- This doubling effect is a form of **exponential growth**.
- After one iteration of the loop, two programs (2^1) are created. After another cycle, each of those two create another two for a total of four (2^2). After 10 iterations we have 1024 (2^{10}) instances of our little batch file. After 100 iterations we have 2^{100} = **1.267 nonillion** ('nonillion' = $10^{30\,(US)}$ or $10^{54\,(UK)}$).
- Many systems will not complete **50 iterations** before the system crashes.
- For such a simple script, each individual iteration would take **a few milliseconds**, thus it has a very quick effect on the computer.

17. System Crash (protection)



- As with most unwanted or malicious script there is a way to protect you system.
- Any **antivirus** worth it's salt would be able to scan this suspicious executable file and warn the user before execution.
- As a fork bomb's mode of operation is entirely dependent on being able to **create new processes**
- One way of preventing a fork bomb s to limit the maximum number of processes that a system user can own **(not straight forward in Windows – 'MSconfig')**
- On Linux, this can be achieved by using the *ulimit* utility; for example, the command **ulimit -u 30** would limit the affected user to a maximum of thirty owned processes.

For interest, the fork bomb in Linux - https://en.wikipedia.org/wiki/Fork_bomb

Bash

:(){ :|:& };:

18. Rundll32.exe (run a DLL)

- The **rundll32.exe** process is responsible for running **DLLs** (dynamic link libraries) and placing them into memory.
- It can be used for **malicious purposes** by an attacker allowing access to your computer from remote locations, stealing passwords, Internet banking and personal data.

Code for opening a file with Windows' "Open as" dialog box

RUNDLL32 SHELL32.DLL,OpenAs_RunDLL *filename*

Code for swapping your mouse button to left handed use (already shown – part 1)

RUNDLL32 USER32.DLL,SwapMouseButton

Code to open the device manager in windows

RUNDLL32 devmgr.dll DeviceManager_Execute

NB// Code to list all DLL's running use '**listdlls**' program - https://docs.microsoft.com/en-us/sysinternals/downloads/listdlls

19. Registry Entries (changes)

- You can directly make changes to software execution by changing associated software entries in the windows system register
- You use a program called '**reg edit**' to achieve this
- (** WARNING this can make you O.S. completely un-useable)

- **Disable Mouse (using the windows register)**

```
@echo off
Set key="HKEY_LOCAL_MACHINE\system\CurrentControlSet\Service\Mouclass"
reg delete %key%
reg add %key% /v Start /t
REG_DWORD /d 4
```

NB// To Rollback the changes:- Just Change the last line of above code with REG_DWORD /d 3

20. Auto-Launch at Windows Startup

- There are two ways on how will you make your batch file runs at start up.
  - (1) Creating a **registry key**
  - (2) Copying the file to the **Startup** folder (*you could then hide the file so it is not visible*)
  - C:\Users\uttambabu\AppData\Roaming\Microsoft\Windows\Start

Method (1) - Note the location of file.bat (the file we wish to execute at Startup) code:

```
@echo off

copy file.bat "C:\windows\system32"Menu\Programs\Startup

attrib +h "C:\windows\system32\file.bat"
reg add hklm\software\microsoft\windows\currentversion\run /v filedotbat /t reg_sz /d
C:\windows\system32\file.bat /f
```

Change its attributes so it will be hidden (attrib/? = help)

Make a registry key for auto-startup

/v - use to specify a file name
/t - type of registry key
/d - the destination of the file to execute
/f - force to create a registry key
NB// filedotbat – name of the register entry
(see Registry Editor Picture)

21. Auto-Launch (method 2)

- This method for Windows is much easier.
- It works on the premiss that Windows always look's toward the startup folder when the system is re-starting

<u>The code:</u>

NB// caret symbol ^ for continuing a single line

```
@echo off

copy file.bat "C:\Documents and ^
Settings\%userprofile%\Start Menu\Programs\startup"

attrib +h copy file.bat "C:\Documents and ^
Settings\%userprofile%\Start ^
Menu\Programs\startup\file.bat"
```

22. Summary

- Add multiple command-line functions and actions into a sequence of events (creating a batch-file)
- You can use many simple commands -
  - dir, rmdir, mkdir, etc.
  - User entry - set /p
  - Loops for conditional actions - If/then/else
- We can also –
  - Execute **applications** with **switches** and **filenames**, from specific locations.
  - Call **DLL**'s (dynamic Link Library's) that can effect system behaviour

23. Workshop

- Finish command line material for Windows and Linux and start batch-file programming
- Submission date for portfolio is last week of module – please seen canvas for details.