

# **MASTER OF SCIENCE (INFORMATION TECHNOLOGY)**

**PART – II, SEMESTER – III**  
**2023– 2024**

## **PRACTICAL JOURNAL**

**PAPER II: Security Breaches and Countermeasures**

**PAPER III: Machine Learning**

**PAPER IV: Robotic Process Automation**

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# Security Breaches And Countermeasures

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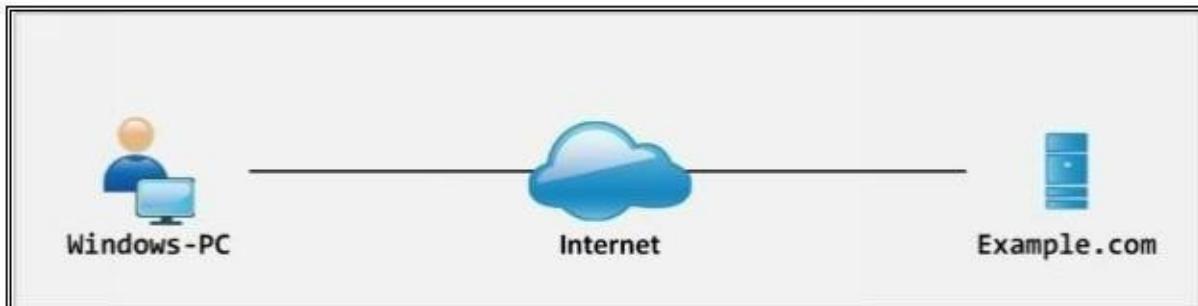
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## Practical No 1: Windows Command Line Utilities Ping.

Consider a network where you have access to a Windows PC connected to the Internet. Using Windows-based tools, let's gather some information about the target. You can assume any target domain or IP address, in our case, we are using **example.com** as a target.

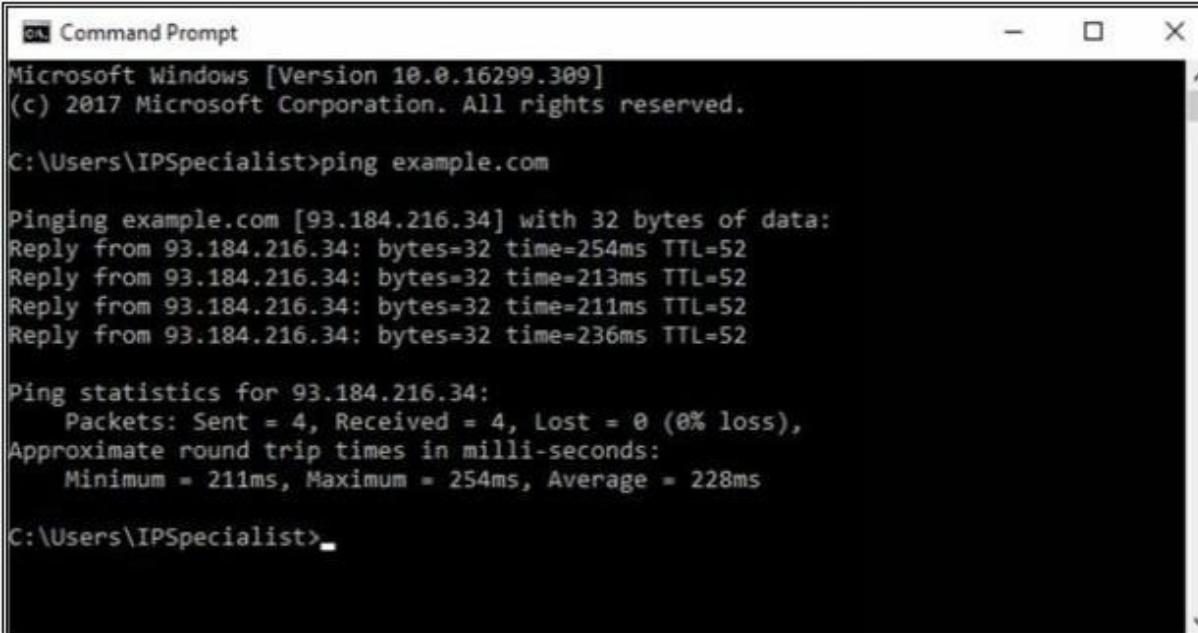
### Topology Diagram:



1- Open Windows Command Line (cmd) from Windows PC



2 -Enter the command “ Ping example.com ” to ping.



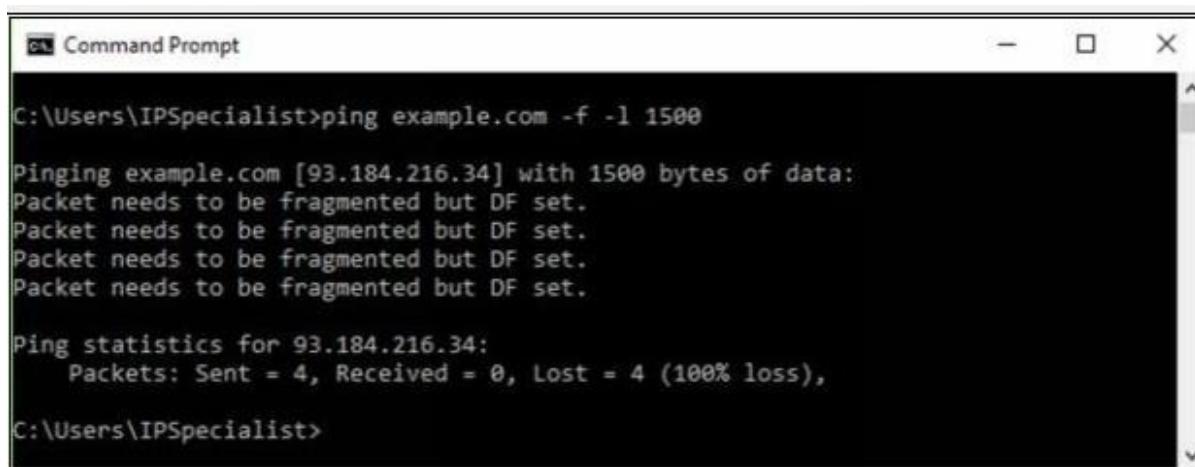
From the output, you can observe and extract the following information:

- Example.com is live

- IP address of example.com.

- Round Trip Time
- TTL value
- Packet loss statistics

3- Now, Enter the command “ Ping example.com -f -l 1500 ” to check the value of fragmentation.

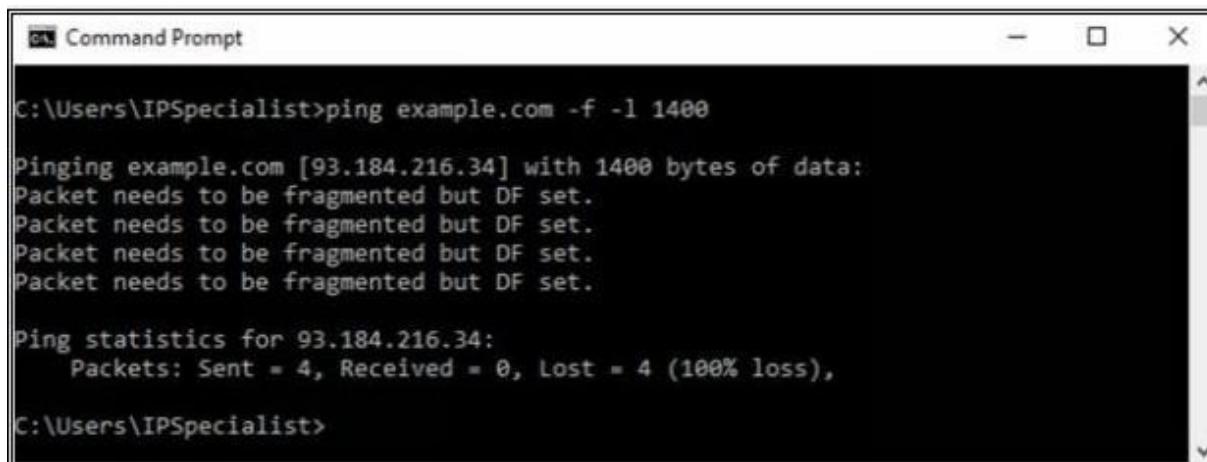


```
C:\Users\IPSpecialist>ping example.com -f -l 1500

Pinging example.com [93.184.216.34] with 1500 bytes of data:
Packet needs to be fragmented but DF set.

Ping statistics for 93.184.216.34:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\Users\IPSpecialist>
```

The output shows “ **Packet needs to be fragmented but DF set** ” which means 1500 bits will require being fragmented. Let’s try again with smaller value:

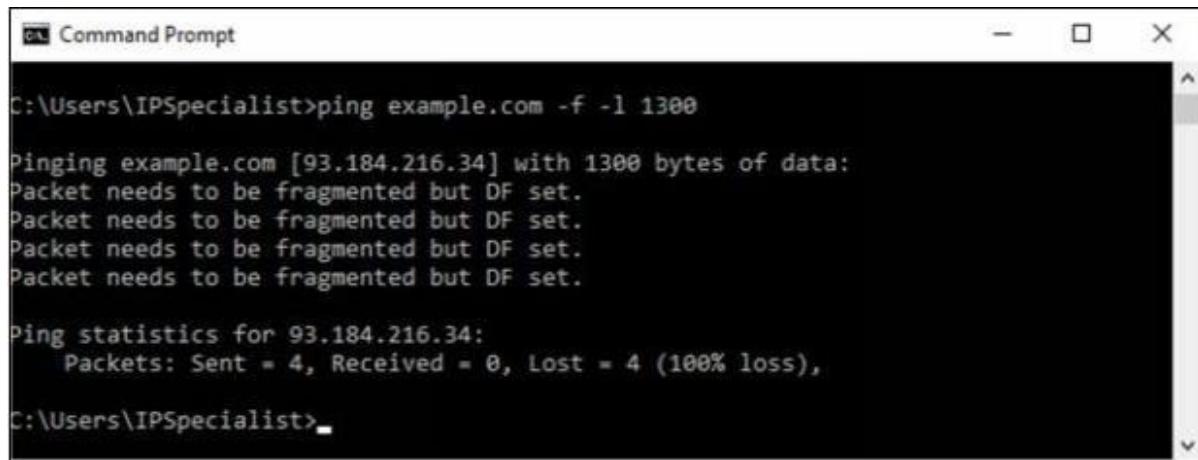


```
C:\Users\IPSpecialist>ping example.com -f -l 1400

Pinging example.com [93.184.216.34] with 1400 bytes of data:
Packet needs to be fragmented but DF set.

Ping statistics for 93.184.216.34:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\Users\IPSpecialist>
```

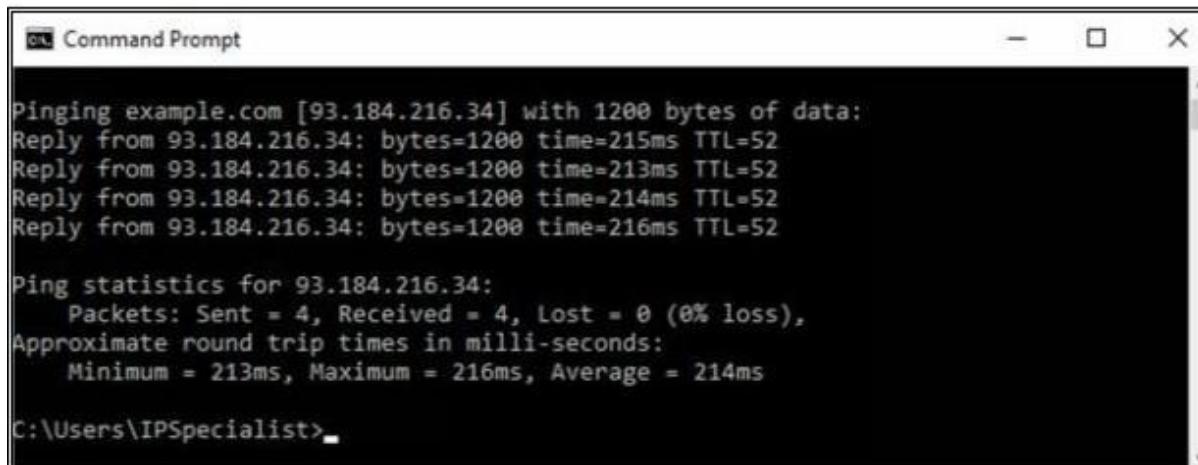
Output again shows “ **Packet needs to be fragmented but DF set** ” which means 1400 bits will require being fragmented. Let’s try again with smaller value:



```
C:\Users\IPSpecialist>ping example.com -f -l 1300
Pinging example.com [93.184.216.34] with 1300 bytes of data:
Packet needs to be fragmented but DF set.

Ping statistics for 93.184.216.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\Users\IPSpecialist>
```

Output again shows “ **Packet needs to be fragmented but DF set** ” which means 1300 bits will require being fragmented. Let’s try again with smaller value:



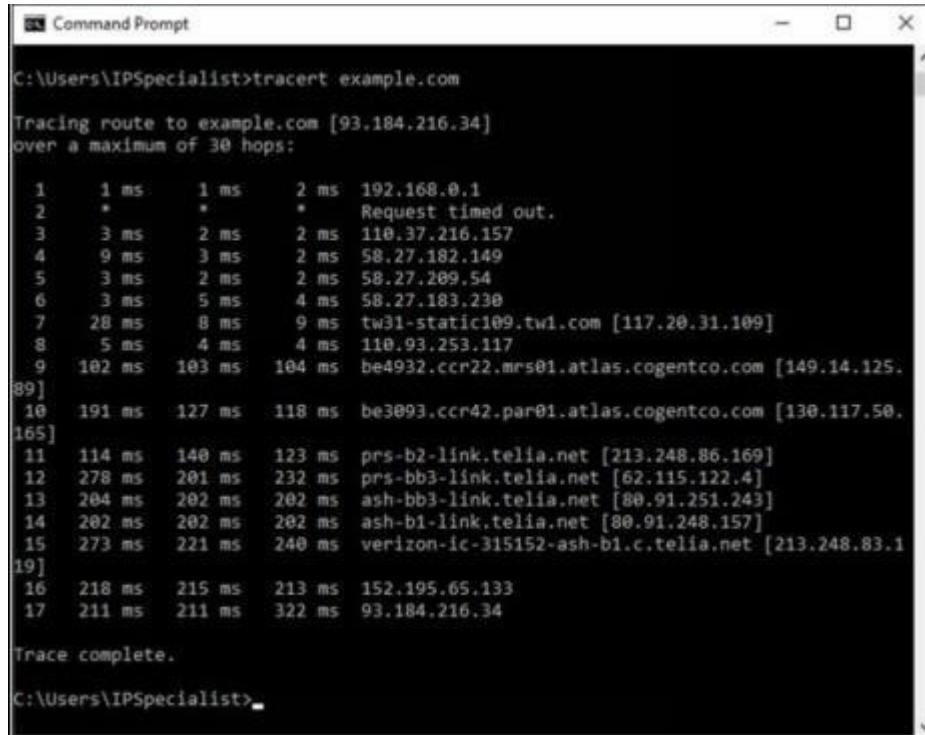
```
C:\Users\IPSpecialist>
Pinging example.com [93.184.216.34] with 1200 bytes of data:
Reply from 93.184.216.34: bytes=1200 time=215ms TTL=52
Reply from 93.184.216.34: bytes=1200 time=213ms TTL=52
Reply from 93.184.216.34: bytes=1200 time=214ms TTL=52
Reply from 93.184.216.34: bytes=1200 time=216ms TTL=52

Ping statistics for 93.184.216.34:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 213ms, Maximum = 216ms, Average = 214ms
C:\Users\IPSpecialist>
```

The output shows the reply now, which means 1200 bits will not require being fragmented. You can try again to get the more appropriate fragment value.

## Practical No 2: Windows Command Line Utilities Tracert Using Ping.

Enter the command “ Tracert example.com ” to trace the target.



```
Command Prompt
C:\Users\IPSpecialist>tracert example.com

Tracing route to example.com [93.184.216.34]
over a maximum of 30 hops:
1  1 ms    1 ms    2 ms  192.168.0.1
2  *        *        * Request timed out.
3  3 ms    2 ms    2 ms  110.37.216.157
4  9 ms    3 ms    2 ms  58.27.182.149
5  3 ms    2 ms    2 ms  58.27.209.54
6  3 ms    5 ms    4 ms  58.27.183.230
7  28 ms   8 ms    9 ms  tw31-static109.tw1.com [117.20.31.109]
8  5 ms    4 ms    4 ms  110.93.253.117
9  102 ms   103 ms  104 ms  be4932.ccr22.mrs01.atlas.cogentco.com [149.14.125.
89]
10  191 ms   127 ms  118 ms  be3093.ccr42.par01.atlas.cogentco.com [130.117.50.
165]
11  114 ms   140 ms  123 ms  prs-b2-link.telia.net [213.248.86.169]
12  278 ms   201 ms  232 ms  prs-bb3-link.telia.net [62.115.122.4]
13  204 ms   202 ms  202 ms  ash-bb3-link.telia.net [80.91.251.243]
14  202 ms   202 ms  202 ms  ash-b1-link.telia.net [80.91.248.157]
15  273 ms   221 ms  240 ms  verizon-ic-315152-ash-b1.c.telia.net [213.248.83.1
19]
16  218 ms   215 ms  213 ms  152.195.65.133
17  211 ms   211 ms  322 ms  93.184.216.34

Trace complete.

C:\Users\IPSpecialist>
```

From the output, you can get the information about hops between the source (your PC) and the destination (example.com), response times and other information.

## Practical No 3: Website Copier Tool (Httrack)

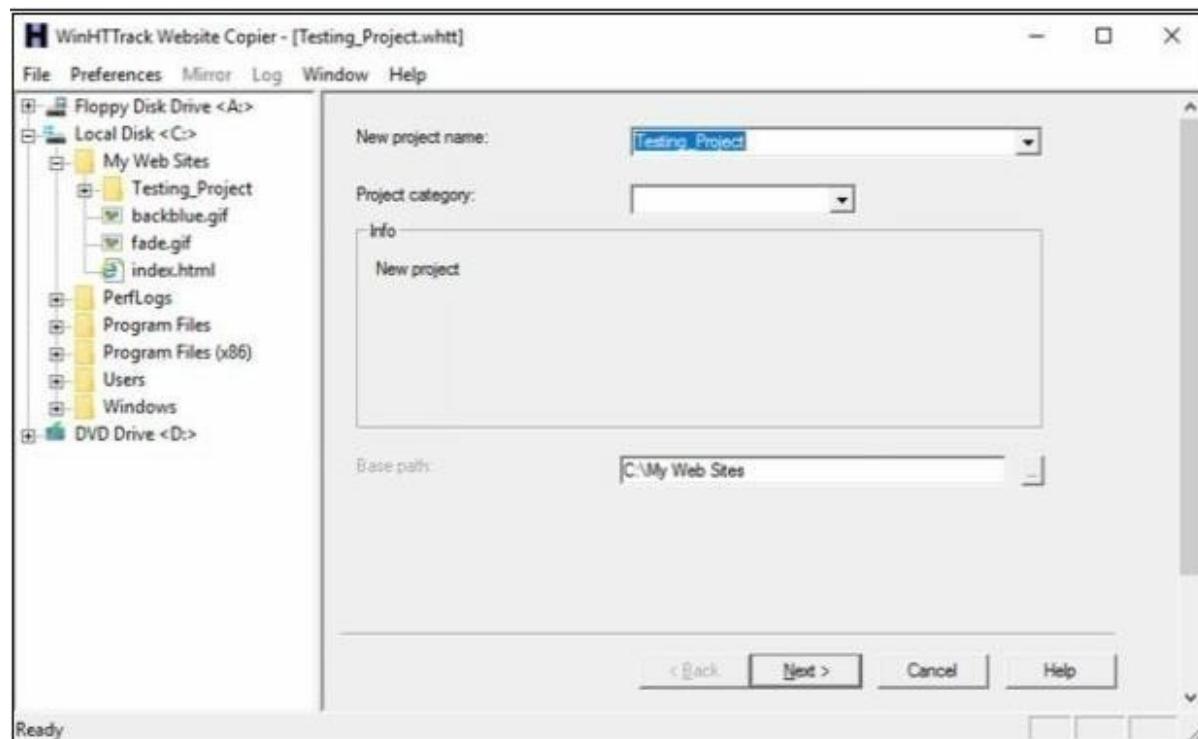
- 1- Download and Install the WinHTTrack Website Copier Tool from the website <http://www.httrack.com>. You can check the compatibility of HTTrack Website copier tool on different platforms such as Windows, Linux, and Android from the website.



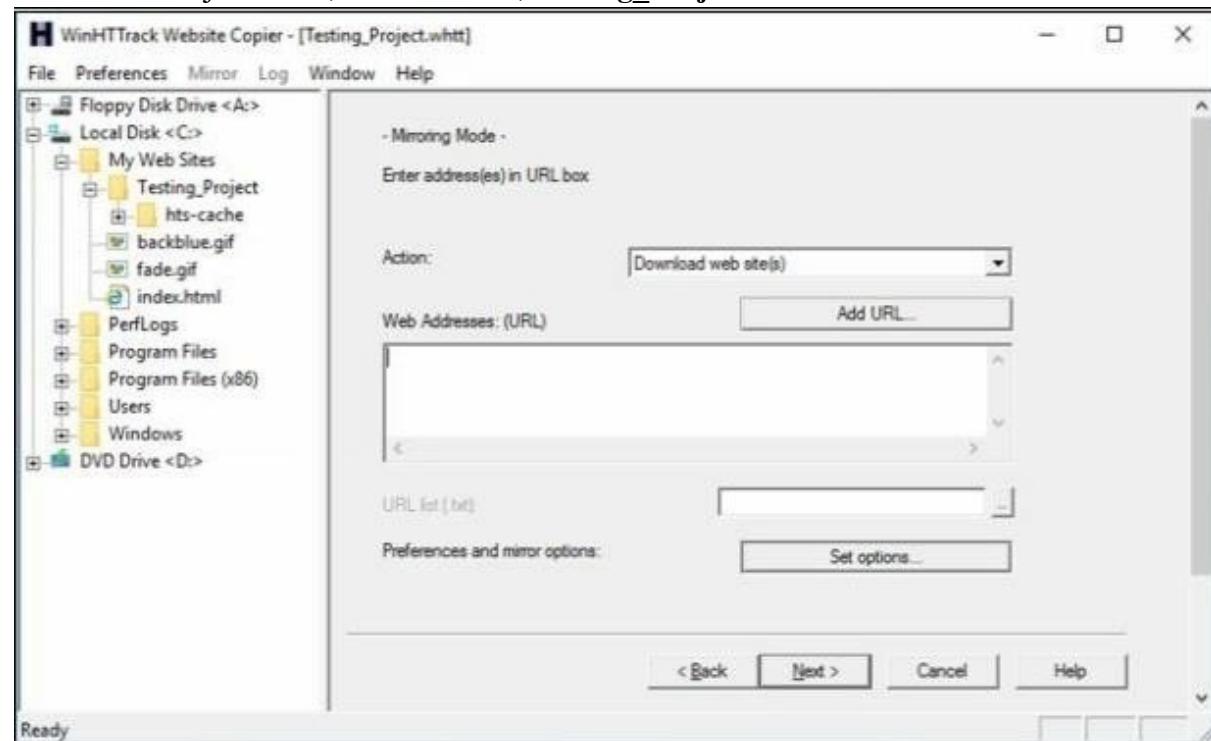
## 2- HTTrack Website Copier tool installation



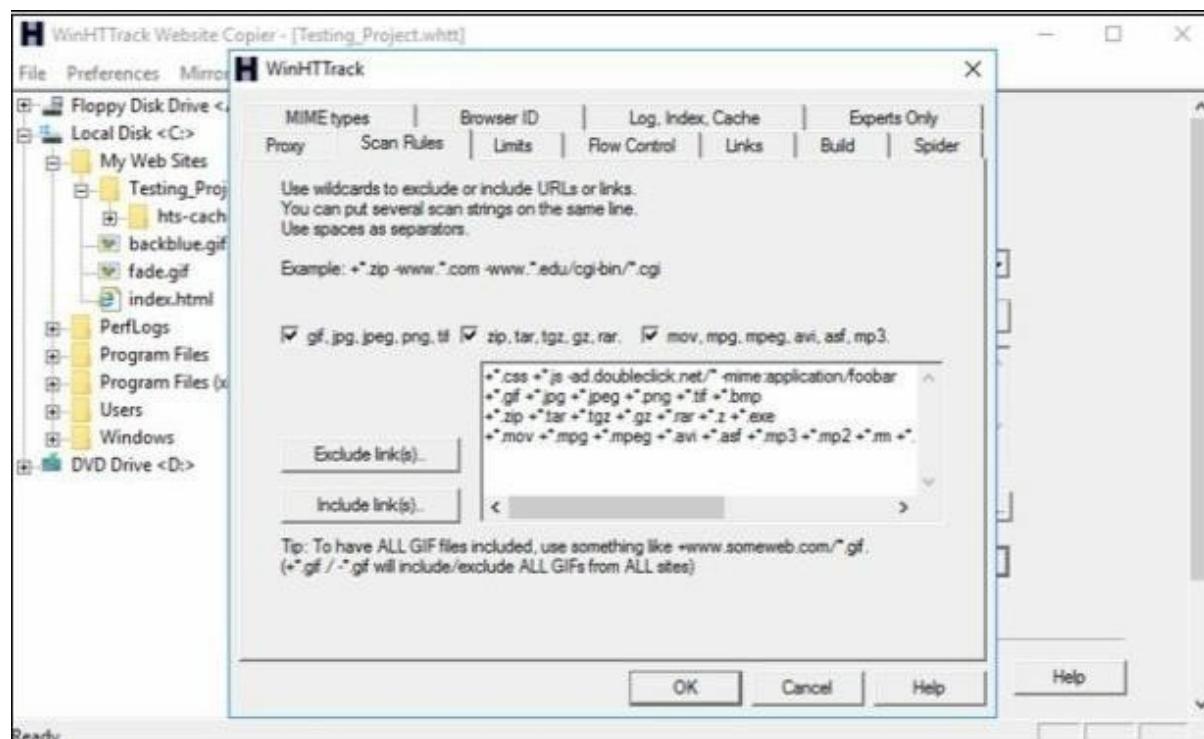
## 3- Click Next



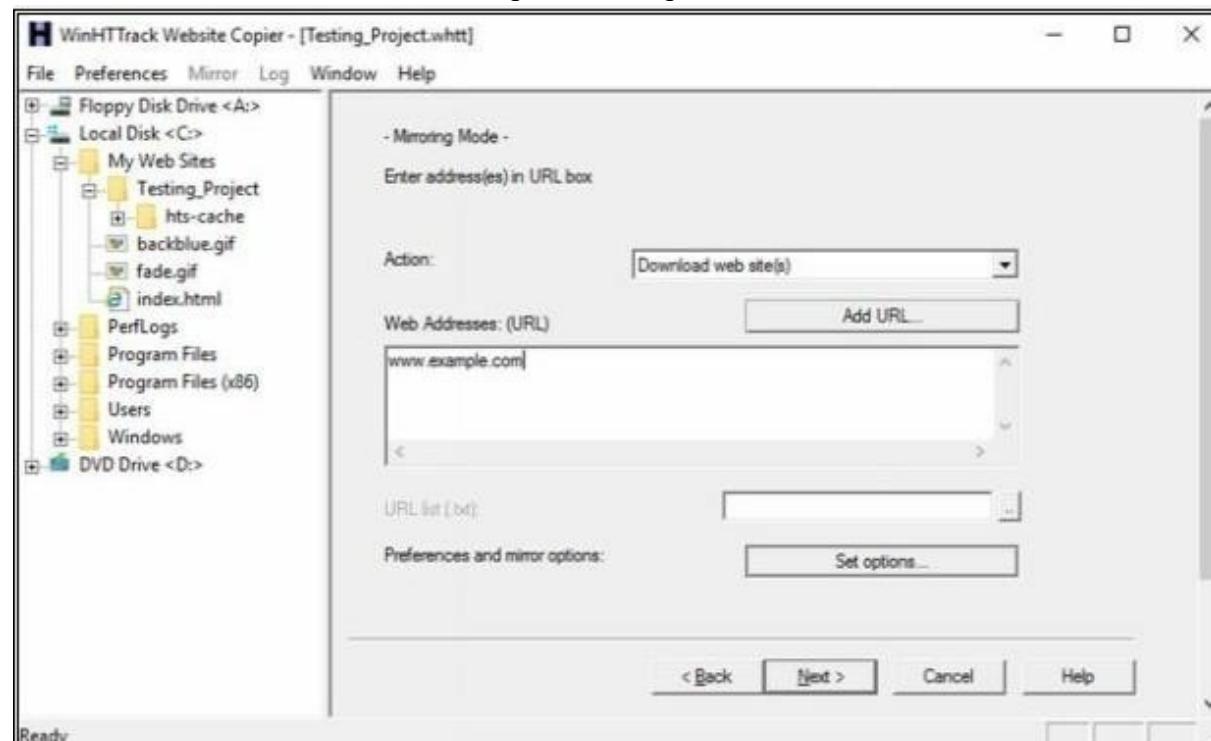
4- Enter a Project name, as in our case, **Testing\_Project**.



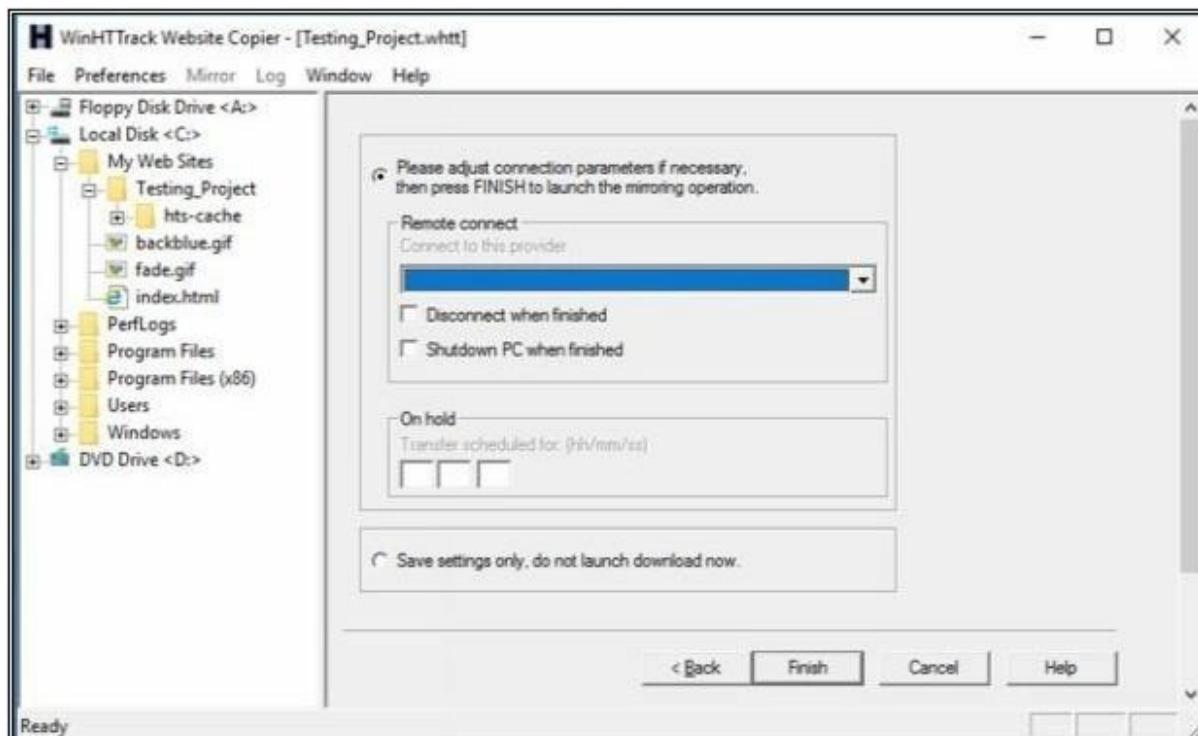
5- Click on **Set Options** button.



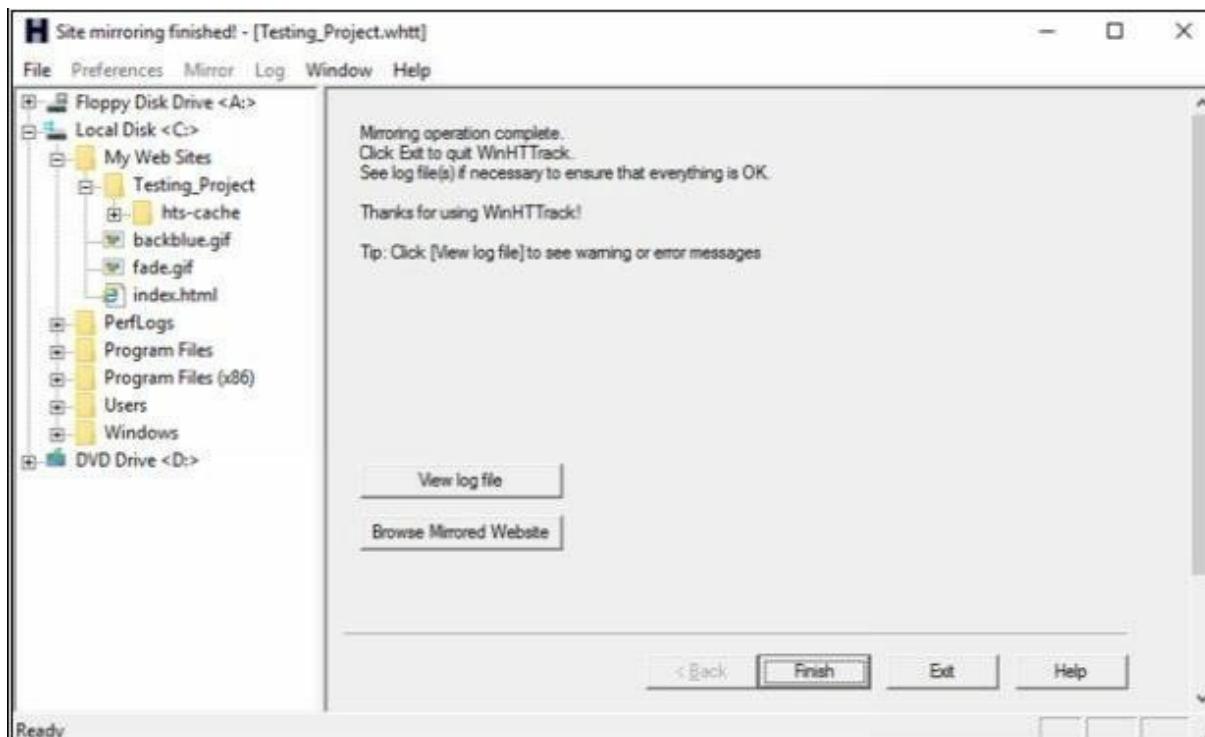
6- Go to Scan Rules Tab and Select options as required.



7- Enter the Web Address in the field and Click Next.



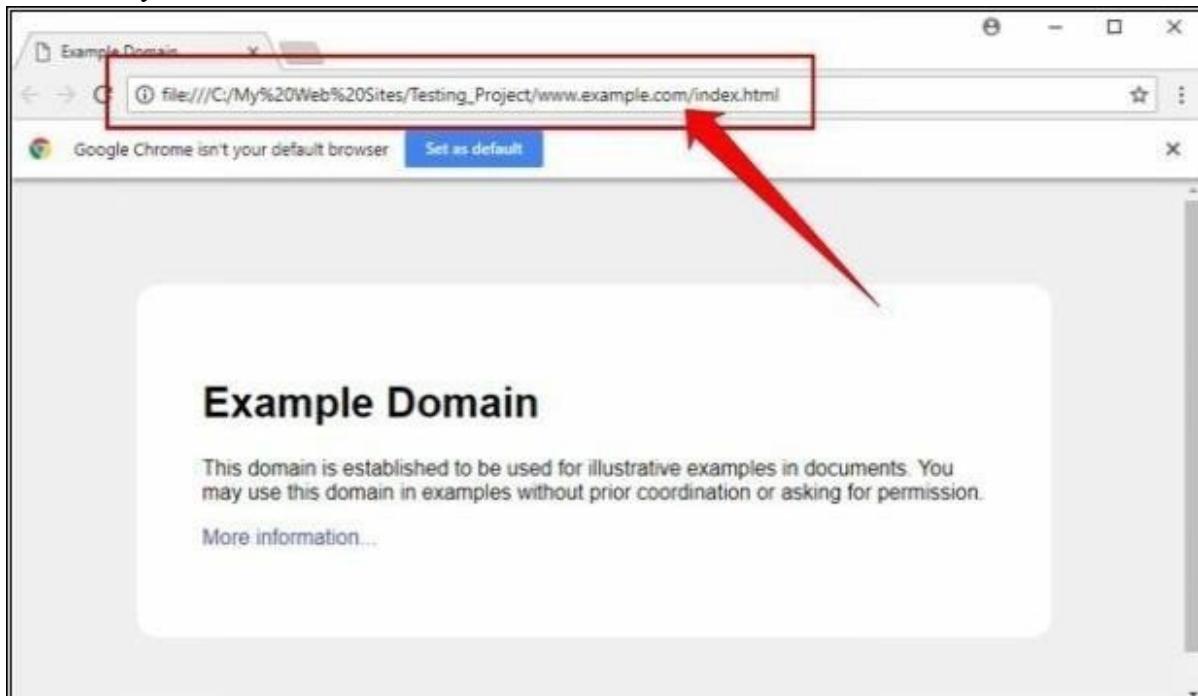
8- Click Next.



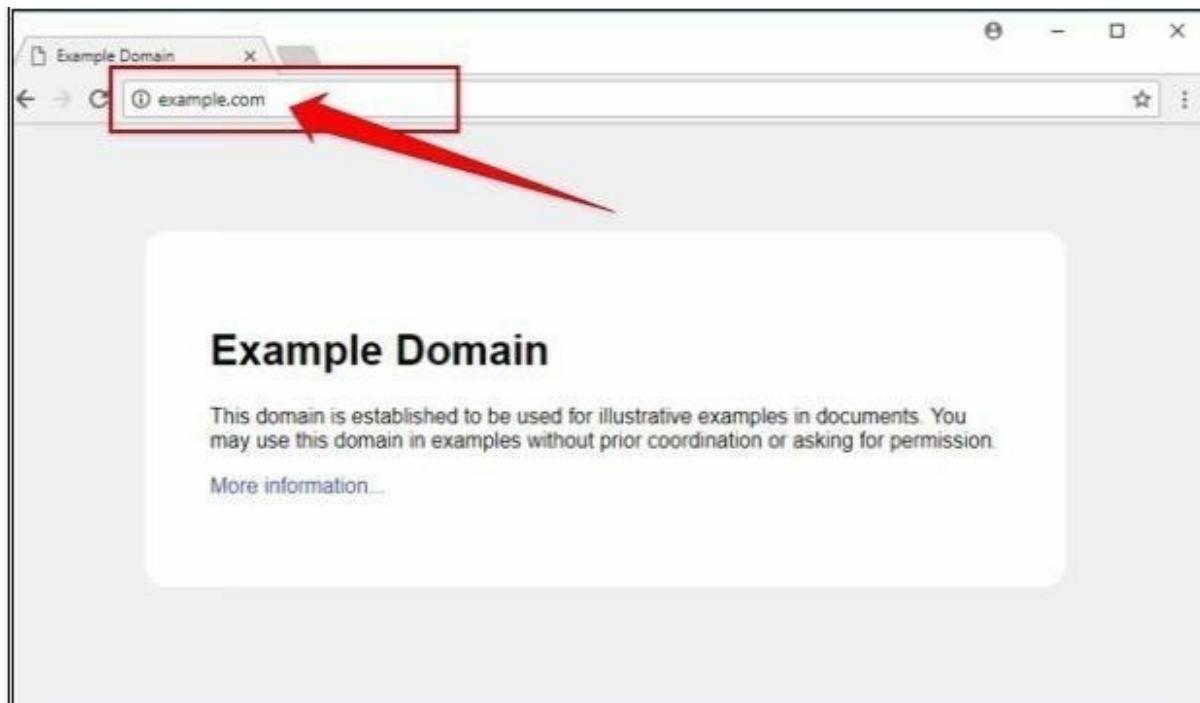
9- Click Browse Mirrored Website.



10- Select your favorite web browser.



Observed the above output. Example.com website is copied into a local directory and browsed from there. Now you can explore the website in an offline environment for the structure of the website and other parameters.

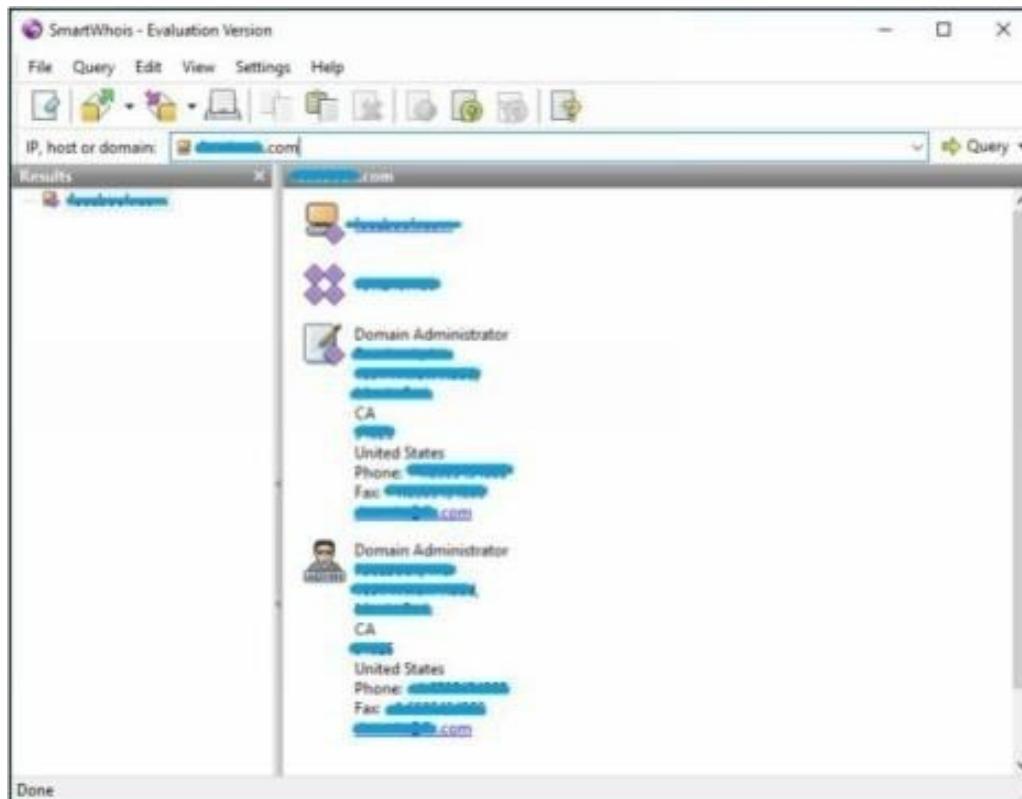


To make sure, compare the website to the original example.com website. Open a new tab and go to URL example.com.

## Practical No

### 4: Smart Whois

You can download software “*SmartWhois*” from [www.tamos.com](http://www.tamos.com) for Whois lookup as shown in the figure below: -



### 5: Emailtracker Pro

eMailTrackerPro is a Windows based email tracker that can be used to monitor employees, senders and recipients. This powerful tool can be used in conjunction with other programs such as Windows Nuke (also known as Spamwasher) to quickly identify where a computer has been and how it has been used.

Click on Trace Headers/Trace email address and enter the Message Header and click Okay. The Status of the Trace will be shown inside Trace Reports

## Practical No

The trace is complete, the information found is displayed on the right.

**Email Summary**

From: no-reply@accounts.google.com  
To: brasadivshwakarma@yahoo.com  
Date: Fri, 21 Nov 2014 09:55:46 +0000 (UTC)  
Subject: Google Account: sign-in attempt blocked  
Location: Mountain View, California, USA

**Misdirected:** No  
**Abuse Address:** arin-contact@google.com  
**Abuse Reporting:** To automatically generate an email abuse report [click here](#)  
**From IP:** 209.85.218.69

**System Information:**

- There is no SMTP server running on this system (the port is closed).
- There is no HTTP server running on this system (the port is closed).
- There is no HTTPS server running on this system (the port is closed).
- There is no FTP server running on this system (the port is closed).

**Network Whois**

**Domain Whois**

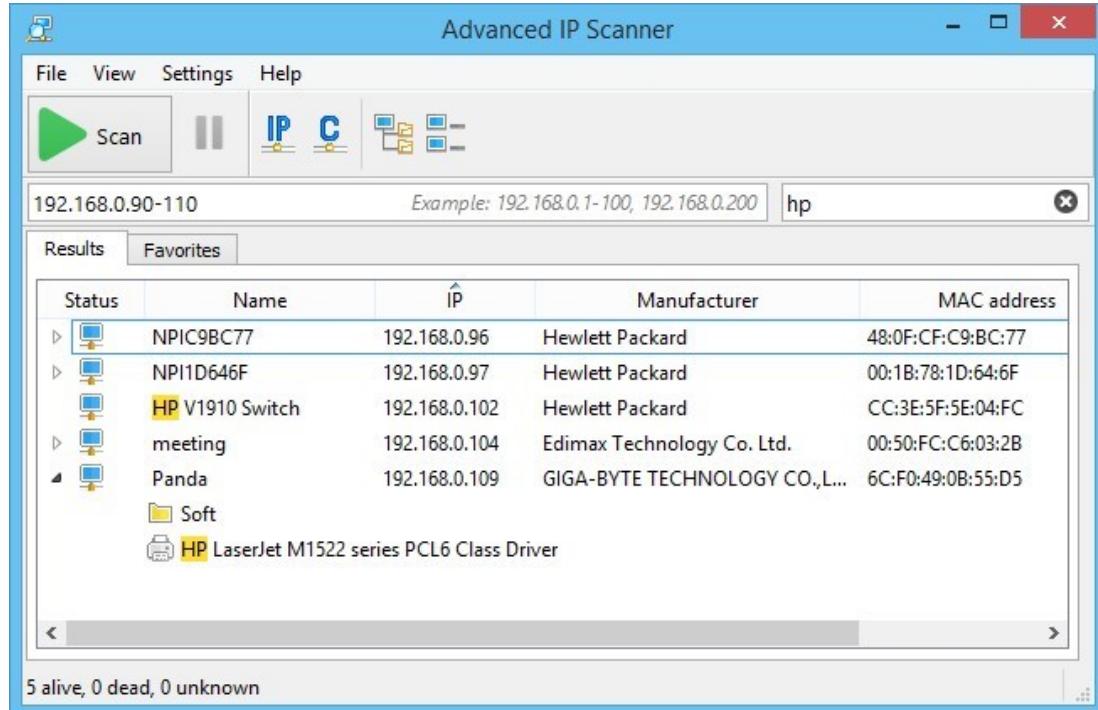
**Email Header**

#	Hop IP	Hop Name	Location
1	192.168.1.1		
2	117.248.244.1	(India)	
3	218.248.164.70	(India)	
4	218.248.235.162	(India)	
5	218.248.178.42	(India)	
7	72.14.211.114	[America]	
8	72.14.232.110	Mountain View, California, USA	
9	209.85.243.245	Mountain View, California, USA	
10	209.85.242.89	Mountain View, California, USA	

## 6: Scan The Network Using The Advanced IP Scanner.

Advanced IP Scanner is a fast and powerful network scanner with a user-friendly interface. In seconds, Advanced IP Scanner can locate all computers on your wired or wireless local network and scan their ports. The program provides easy access to various network resources such as HTTP, HTTPS, FTP, and shared folders.

## Practical No



### 7: Angry IP Scanner

Angry IP Scanner (or simply ipscan) is an open-source and cross-platform network scanner designed to be fast and simple to use. It scans IP addresses and ports as well as has [many other features](#).

It is widely used by network administrators and just curious users around the world, including large and small enterprises, banks, and government agencies.

It runs on Linux, Windows, and Mac OS X, possibly supporting other platforms as well.

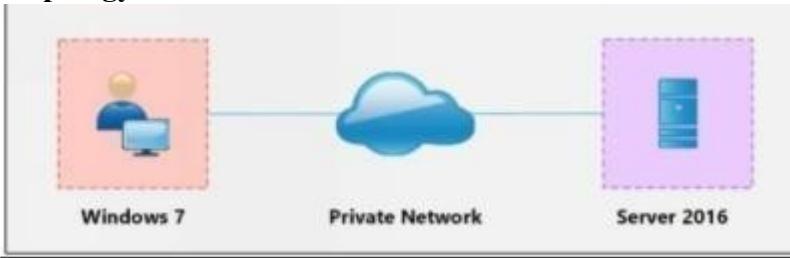
## Practical No

IP Range - Angry IP Scanner				
<a href="#">Scan</a> <a href="#">Go to</a> <a href="#">Commands</a> <a href="#">Favorites</a> <a href="#">Tools</a> <a href="#">Help</a>				
IP	Ping	Hostname	Ports [3+]	Web detect
195.80.116.226	[n/a]	[n/s]	[n/s]	[n/s]
195.80.116.227	9 ms	[n/a]	80,443	Resin/4.0.37
195.80.116.228	10 ms	[n/a]	80,443	[n/a]
195.80.116.229	9 ms	[n/a]	80,443	Apache
195.80.116.230	13 ms	mx3.rmk.ee	[n/a]	[n/a]
195.80.116.231	10 ms	mx4.rmk.ee	[n/a]	[n/a]
195.80.116.232	[n/a]	[n/s]	[n/s]	[n/s]
195.80.116.233	[n/a]	[n/s]	[n/s]	[n/s]
195.80.116.234	[n/a]	[n/s]	[n/s]	[n/s]
195.80.116.235	9 ms	[n/a]	80,443	[n/a]
195.80.116.236	[n/a]	[n/s]	[n/s]	[n/s]
195.80.116.237	[n/a]	[n/s]	[n/s]	[n/s]

## 8: Currports

**Case Study:** Using the Previous lab, we are going to re-execute HTTP Remote Access Trojan (RAT) on Windows 12 machine (10.10.50.211) and observed the TCP/IP connections to detect and kill the connection.

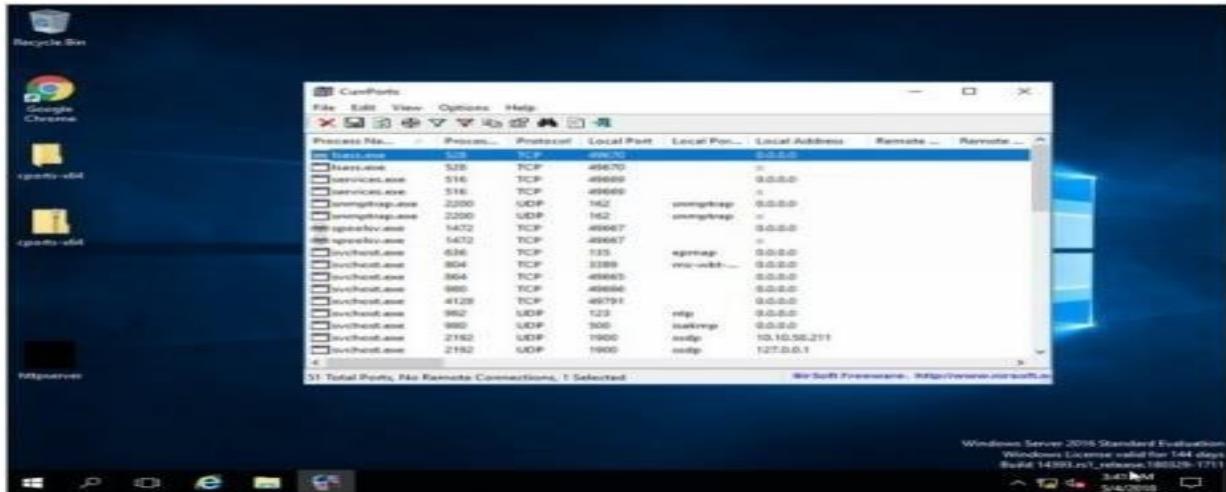
### Topology:



### Configuration:

- Run the application **Currports** on Windows Server 2016 and observe the processes.

## Practical No



2. Run the HTTP Trojan created in the previous lab

The screenshot shows the NirSoft NetworkMiner interface with a list of network connections. A yellow arrow points to the 'Remote IP' column, specifically highlighting the entry for port 1900 which has a remote IP of 10.10.50.211.

Process Name	Process ID	Protocol	Local Port	Local Port	Local Address	Remote IP	Remote Port
httpserver.exe	2644	TCP	80	http	0.0.0.0		
lsass.exe	528	TCP	49670		0.0.0.0		
lsass.exe	528	TCP	49670		0.0.0.0		
services.exe	516	TCP	49669		0.0.0.0		
services.exe	516	TCP	49669		0.0.0.0		
snmptrap.exe	2200	UDP	162	snmptrap	0.0.0.0		
snmptrap.exe	2200	UDP	162	snmptrap	0.0.0.0		
spoolsv.exe	1472	TCP	49667		0.0.0.0		
spoolsv.exe	1472	TCP	49667		0.0.0.0		
svchost.exe	636	TCP	135	epmap	0.0.0.0		
svchost.exe	804	TCP	3389	ms-wbt-	0.0.0.0		
svchost.exe	864	TCP	49665		0.0.0.0		
svchost.exe	980	TCP	49666		0.0.0.0		
svchost.exe	4128	TCP	49791		0.0.0.0		
svchost.exe	992	UDP	123	ntp	0.0.0.0		
svchost.exe	980	UDP	500	isakmp	0.0.0.0		
svchost.exe	2192	UDP	1900	ssdp	10.10.50.211		

The new process is added to the list. You can observe the process name, Protocol, Local and remote port and IP address information.

3. For more detail, right click on httpserver.exe and go to properties

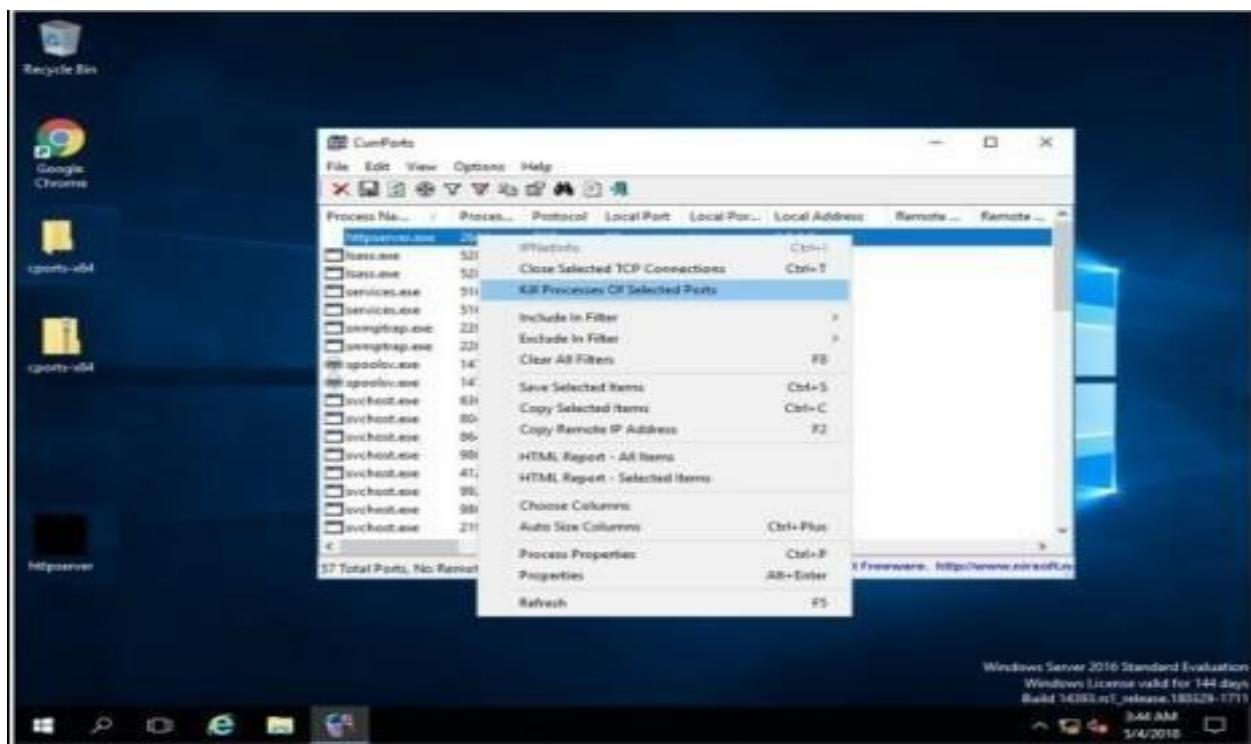


Properties are showing more details about tcp connection. 4. Go to Windows 7 machine and initiate the connection as mentioned in the previous lab using a web browser.

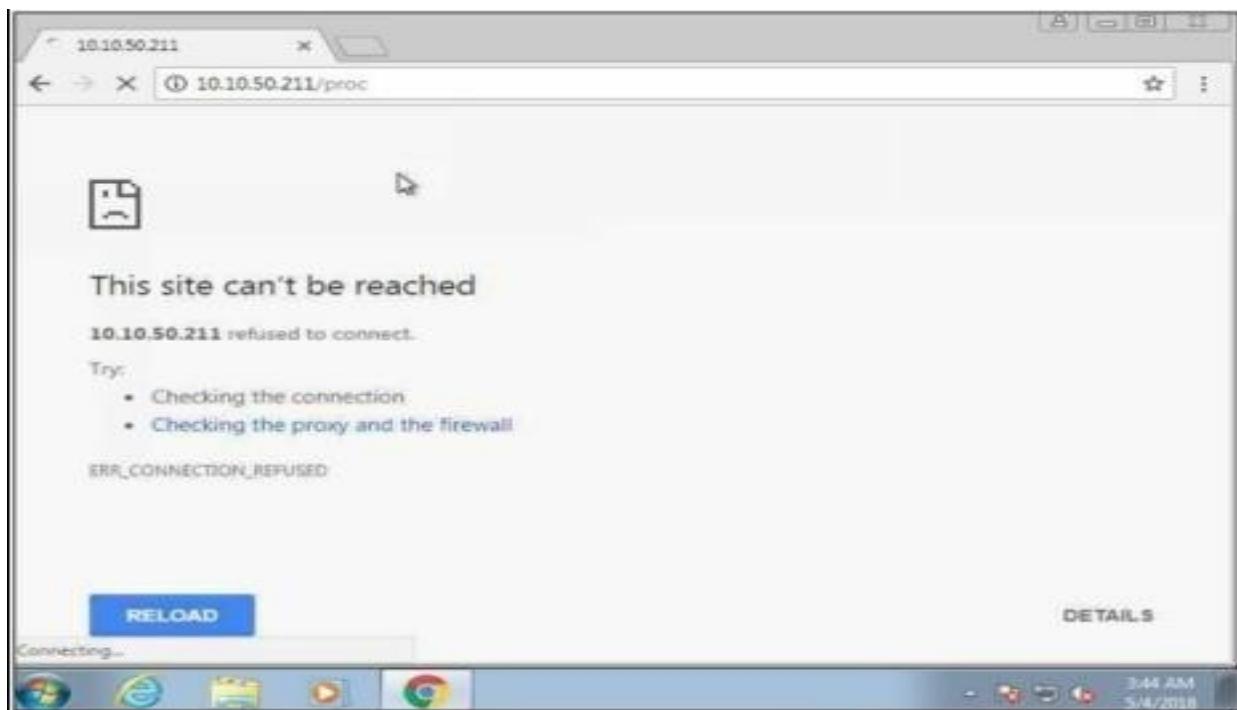


Connection successfully established.

5. Back to Windows Server 2016, Kill the connection



6. To verify, retry to establish the connection from windows 7.

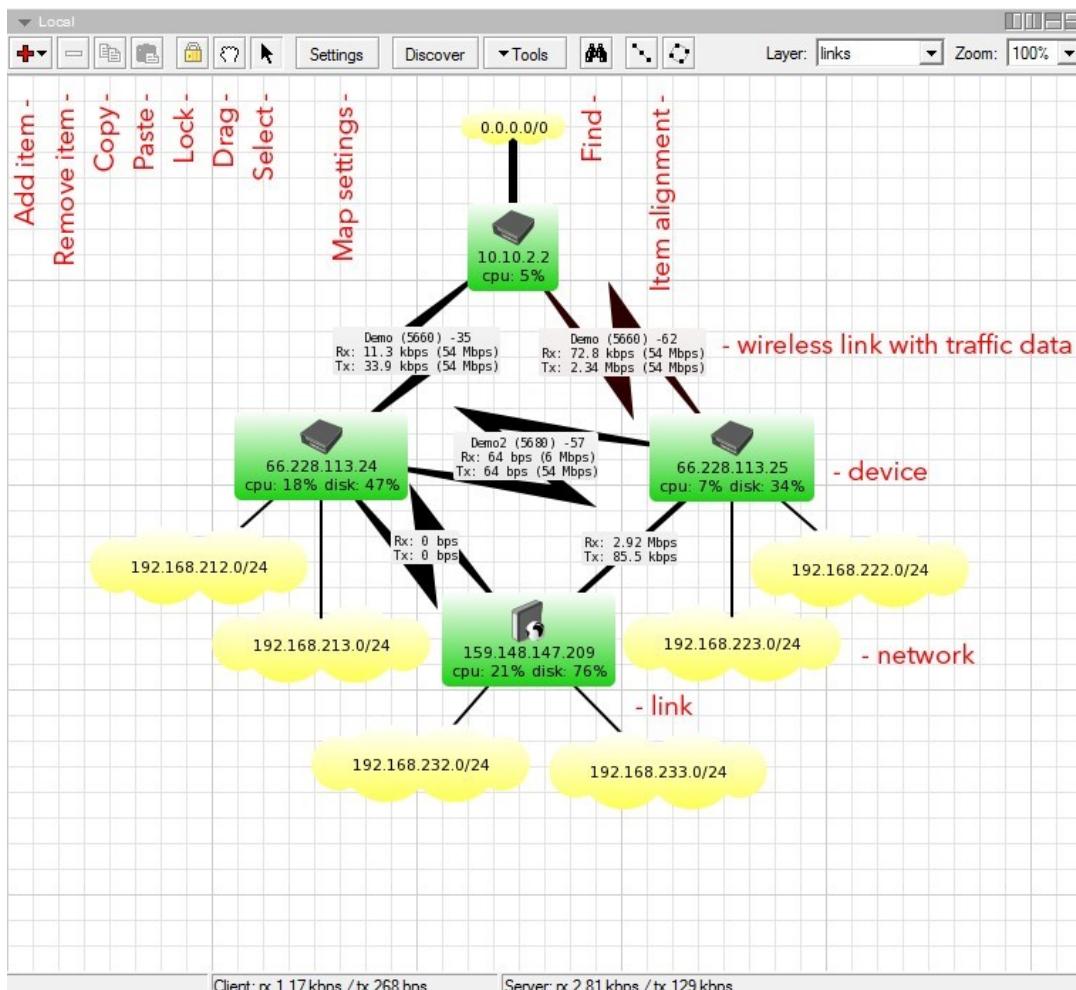


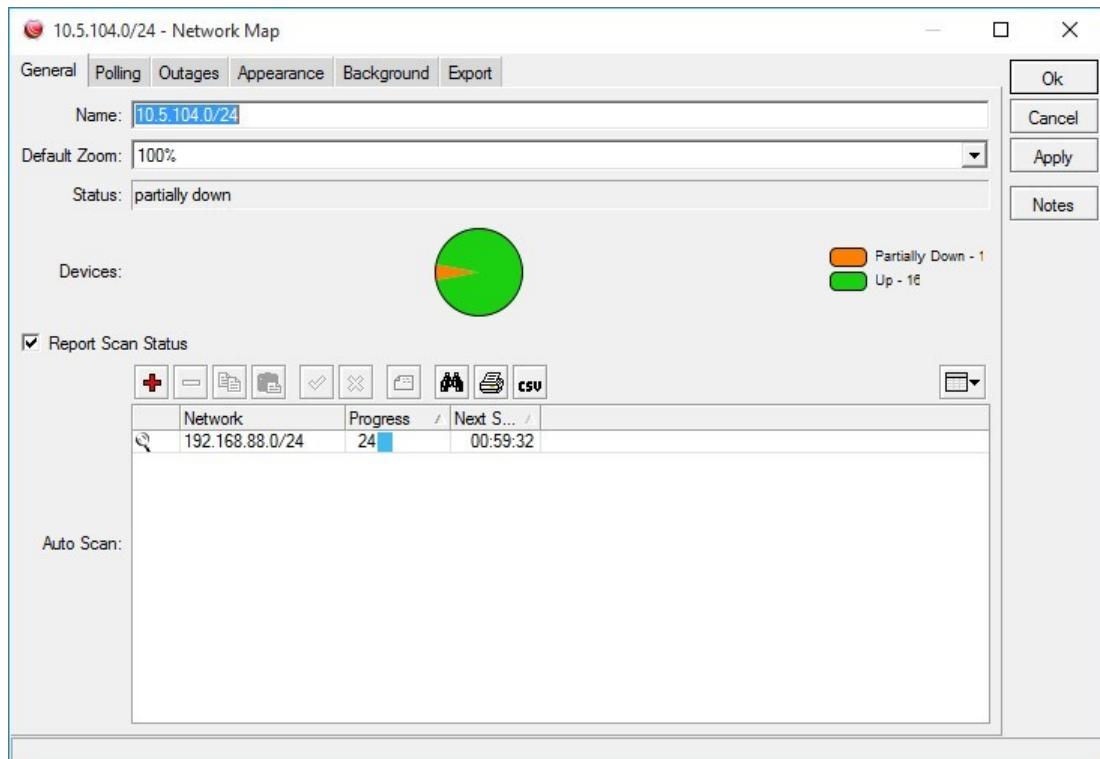
## Practical No 9: The Dude

The Dude network monitor is a new application by MikroTik which can dramatically improve the way you manage your network environment. It will automatically scan all devices within specified subnets, draw and layout a map of your networks, monitor services of your devices and alert you in case some service has problems.

### Main Features:

- Auto network discovery and layout
- Discovers any type or brand of device
- Device, Link monitoring, and notifications
- Includes SVG icons for devices, and supports custom icons and backgrounds
- Easy installation and usage
- Allows you to draw your own maps and add custom devices
- Supports SNMP, ICMP, DNS and TCP monitoring for devices that support it
- Individual Link usage monitoring and graphs
- Direct access to remote control tools for device management • Supports remote Dude server and local client





10.5.104.0/24 - Network Map

General Polling Outages Appearance Background Export

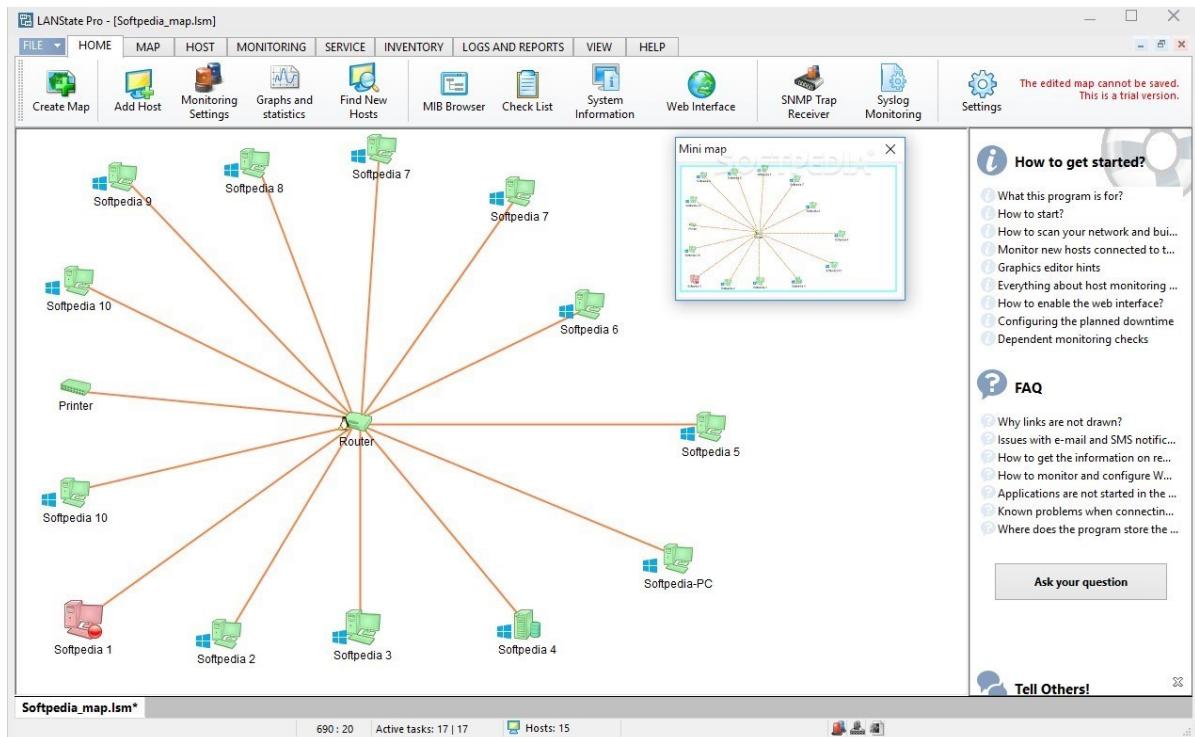
Remove Resolved

Status	Time	Duration	Device	Service
active	Dec/16 12:49:17	2d 04:39:25	gateway.lan	dns
active	Dec/16 12:49:17	2d 04:39:25	gateway.lan	radius
active	Dec/16 12:49:16	2d 04:39:26	gateway.lan	router
active	Dec/16 12:49:16	2d 04:39:26	gateway.lan	mikrotik
active	Dec/16 12:49:16	2d 04:39:26	gateway.lan	switch
active	Dec/16 12:49:07	2d 04:39:35	gateway.lan	disk
active	Dec/16 12:49:07	2d 04:39:35	gateway.lan	cpu
resolved	Dec/16 15:06:42	00:00:16	crs212.lan	ssh
resolved	Dec/16 15:06:42	00:00:16	crs212.lan	http
resolved	Dec/16 15:06:42	00:00:17	crs212.lan	ftp
resolved	Dec/16 15:06:41	00:00:17	crs212.lan	ping
resolved	Dec/16 15:03:57	00:00:32	crs212.lan	ftp
resolved	Dec/16 15:03:57	00:00:32	crs212.lan	http
resolved	Dec/16 15:03:57	00:00:31	crs212.lan	ssh
resolved	Dec/16 15:03:56	00:00:32	crs212.lan	ping
resolved	Dec/02 11:22:46	00:03:00	crs226.lan	http
resolved	Dec/02 11:22:46	00:03:00	crs226.lan	ssh
resolved	Dec/02 11:22:46	00:03:27	crs226.lan	ping
resolved	Dec/02 11:22:46	00:03:00	crs226.lan	ftp
resolved	Dec/02 11:22:34	00:03:27	nine.lan	http
resolved	Dec/02 11:22:34	00:03:27	nine.lan	ping
resolved	Dec/02 11:22:34	00:03:20	ppc.lan	dns
resolved	Dec/02 11:22:34	00:03:27	nine.lan	telnet
resolved	Dec/02 11:22:34	00:03:27	nine.lan	ssh
resolved	Dec/02 11:22:34	00:03:27	nine.lan	ftp

## Practical No

### 10: Perform Network Discovery Using The LANState Pro

LANState is a simple network topology mapping, host monitoring, and management program. Monitor the service availability. Manage servers, computers, switches, and other devices easier using the graphic map. Access devices' properties, RDP, web UI faster.



### Practical No 11: Perform Enumeration Using The Nmap.

NMAP, as we know, is a powerful networking tool which supports many features and commands. Operating System detection capability allows to send TCP and UDP packet and observe the response from the targeted host. A detailed assessment of this response bring some clues regarding nature of an operating system disclosing the type an OS. To perform OS detection with nmap perform the following: nmap -O<ip address>

Target: 192.168.0.109      Profile:      Scan      Cancel

Command: nmap -O -v 192.168.0.109

Hosts Services Nmap Output Ports / Hosts Topology Host Details Scans

OS Host 192.168.0.109

nmap -O -v 192.168.0.109

Nmap scan report for 192.168.0.109

Host is up (0.002s latency).

Not shown: 984 closed ports

PORT	STATE	SERVICE
80/tcp	open	http
135/tcp	open	msrpc
139/tcp	open	netbios-ssn
443/tcp	open	https
445/tcp	open	microsoft-ds
554/tcp	open	rtsp

MAC Address: [REDACTED]

Device type: general purpose

Running: Microsoft Windows 7|2008

OS CPE: cpe:/o:microsoft:windows\_7::= cpe:/o:microsoft:windows\_7::sp1 cpe:/o:microsoft:windows\_server\_2008::sp1 cpe:/o:microsoft:windows\_8

OS details: Microsoft Windows 7 SP0 - SP1, Windows Server 2008 SP1, or Windows 8

Uptime guess: 58.139 days (since Tue Dec 05 20:51:59 2017)

Network Distance: 1 hop

ICP Sequence Prediction: Difficulty=259 (Good luck!)

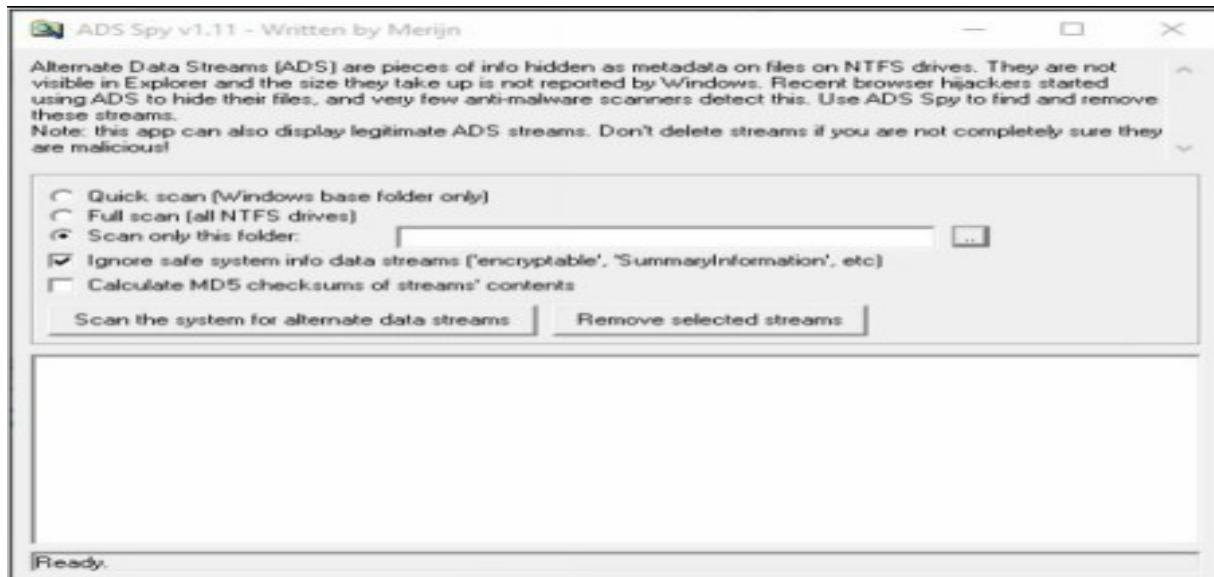
IP ID Sequence Generation: Incremental

## 12: Perform The System Hacking Using The ADS Spy.

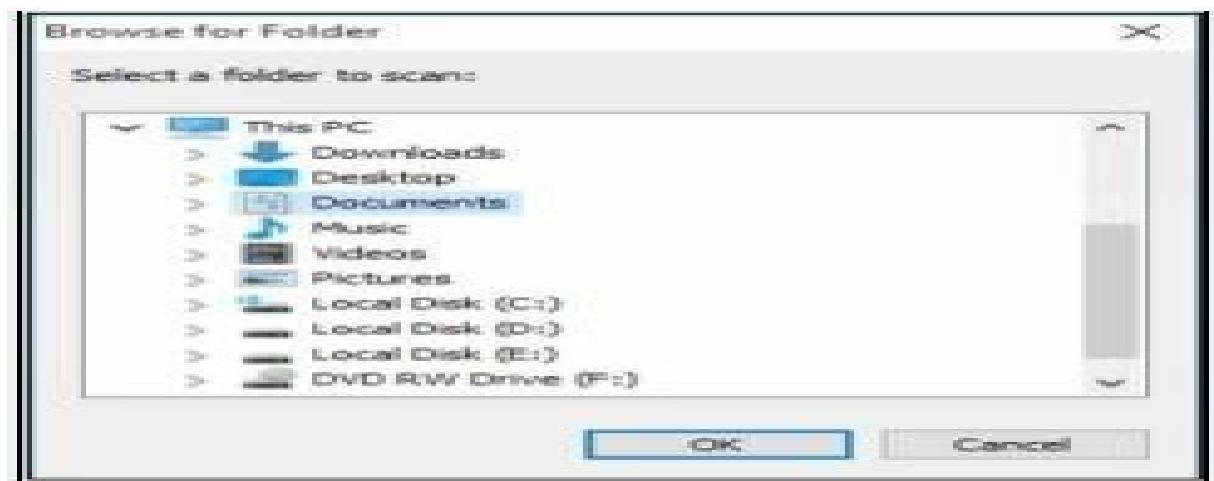
AdSpy offers the most search options of any Ad Intelligence Tool, so you can find the data you want, how you want. Search in the usual way: ad text, URL, page name. Search true data from user reactions in advert comments. Be as rigorous as you need to: search or filter by affiliate network, affiliate ID, Offer ID, landing page technologies - whatever helps you find the information you can work with. Open ADS Spy application and select the option if you want to:

- Quick Scan
- Full Scan
- Scan Specific Folder

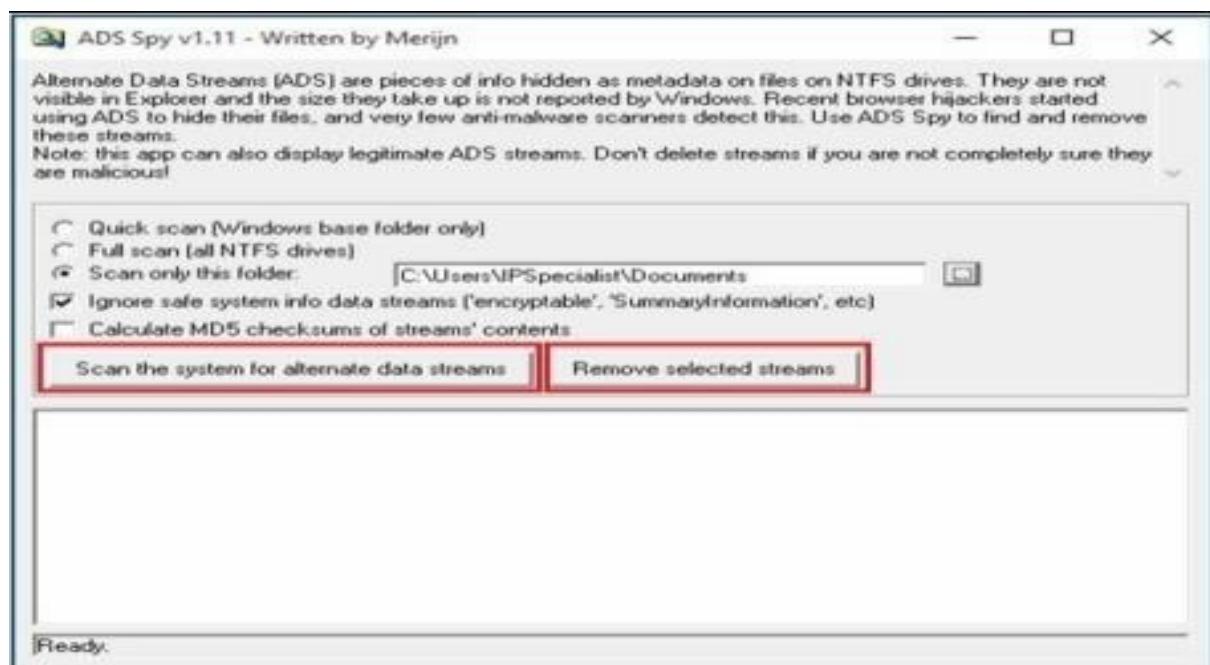
## Practical No



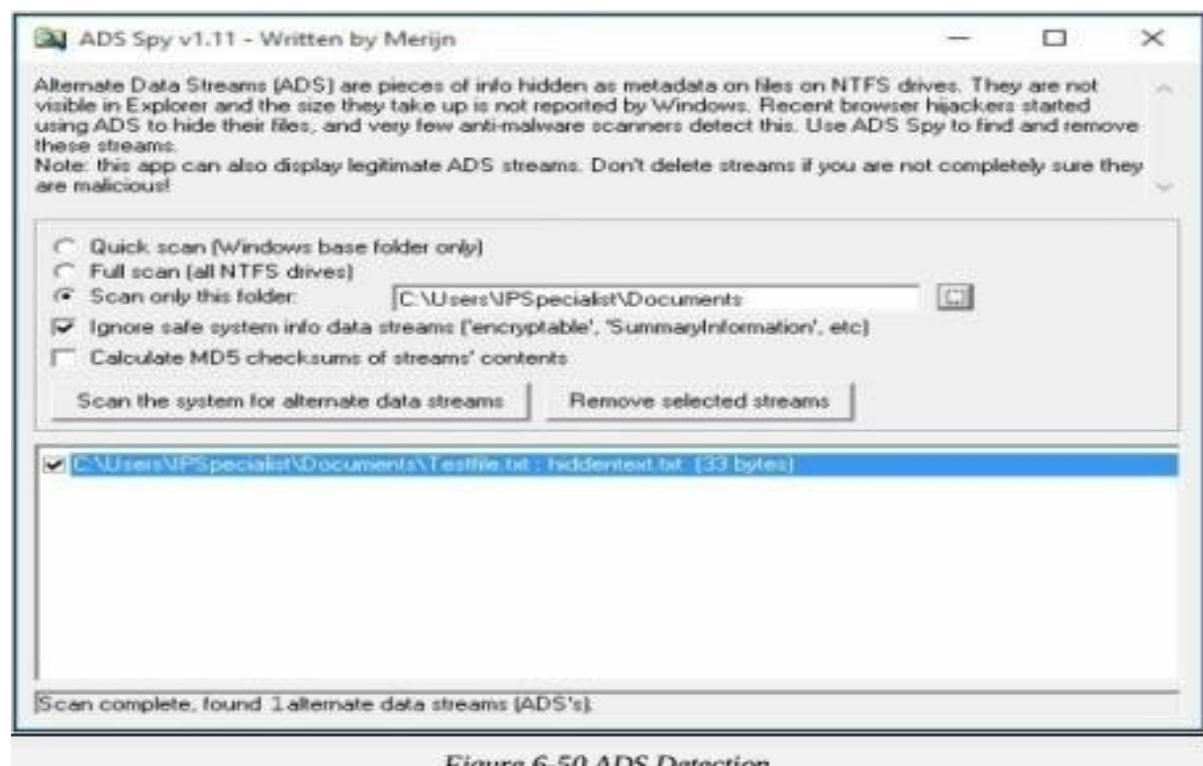
As we store the file in the Document folder, Selecting Document folder to scan particular folder only.



Select an Option, if you want to scan for ADS, click "**Scan the system for ADS**"/ or click **removes** button to remove the file



As shown in the figure below, ADS Spy has detected the **Testfile.txt:hidden.txt** file from the directory.

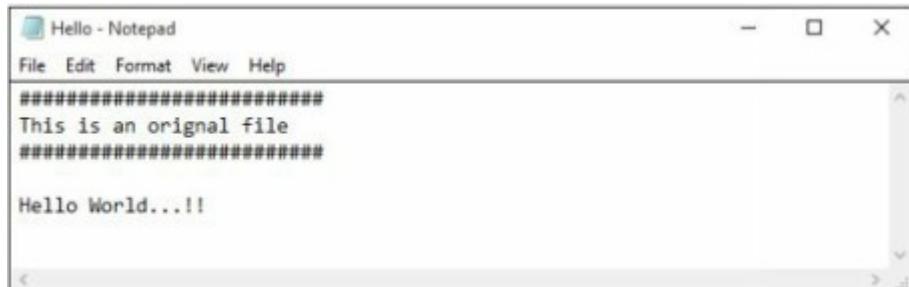


*Figure 6-50 ADS Detection*

### 13: Perform The System Hacking Using The Snow.

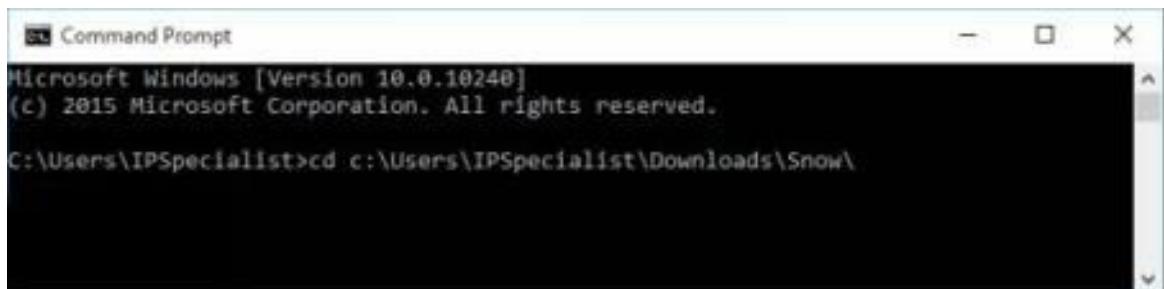
Create a text file with some data in the same directory where Snow Tool is installed.

## Practical No



Go to Command Prompt

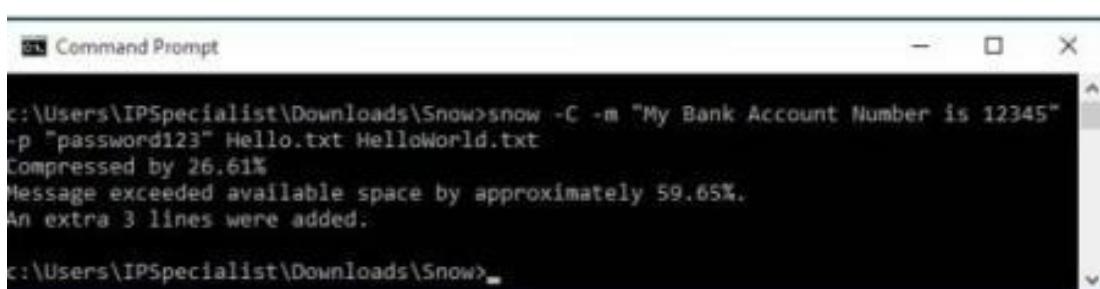
Change the directory to run Snow tool



Type the command

**Snow -C -m "text to be hide" -p "password" <Sourcefile> <Destinationfile>**

The source file is a Hello.txt file as shown above. Destination file will be the exact copy of source file containing hidden information.



Go to the directory; you will find a new file **HelloWorld.txt**. Open the File



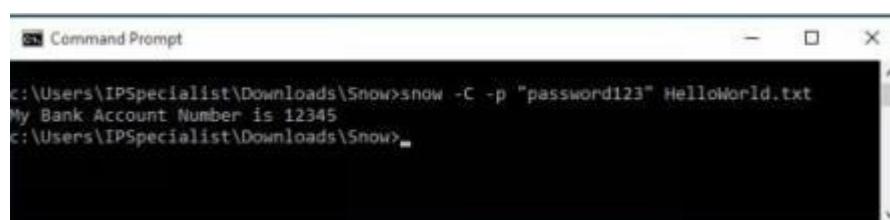
New File has the same text as an original file without any hidden information. This file can be sent to the target.

#### *Recovering*

#### *Hidden*

#### *Information*

On destination, Receiver can reveal information by using the command **Snow -C -p "password123" HelloWorld.txt**



As shown in the above figure, File decrypted, showing hidden information encrypted in the previous section.

## **14: Use SMAC For MAC Spoofing.**

SMAC is a MAC address changer that has a simple-to-use graphical interface that enables the less experienced user all the way up to the guru to change a piece of hardware's MAC address. The less experienced user will appreciate the random generator whereas the guru will appreciate the ability to hand enter a new MAC address.

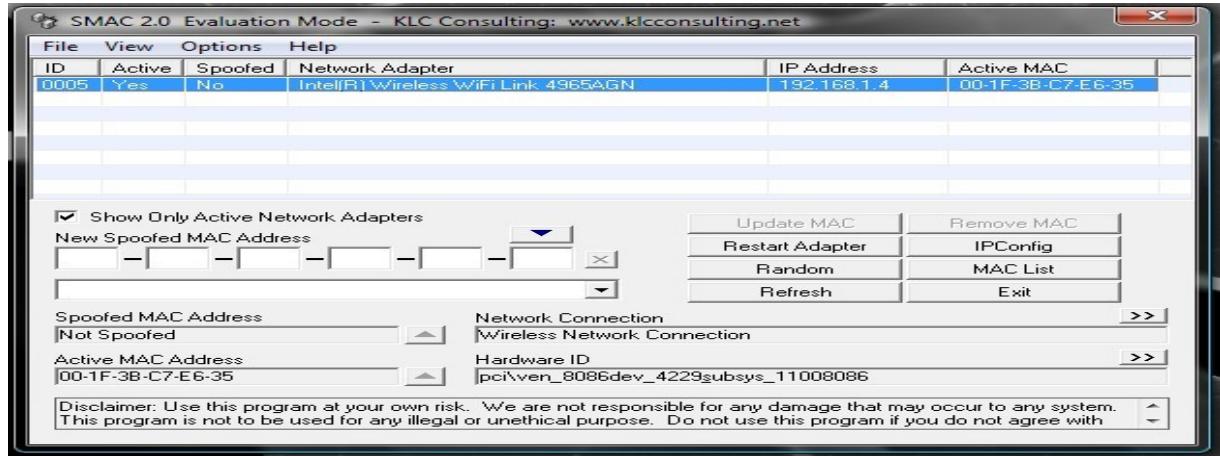
Once it is installed, you will find the application launcher in a Start Menu subdirectory called KLC. Click on that folder and you will see SMAC 2.0. Click on that launcher and the SMAC main window (**Figure A**) will open.

Using SMAC can be very simple, depending on how you want to use it. The simplest way to use SMAC is to assign a random MAC address to a piece of hardware. Before we actually assign a new address, let's take a look at the other hardware on the machine. In the main window there is a check box that tells SMAC to show only active hardware. This checkbox is checked by default. Uncheck that box and your listing will grow, depending on the hardware

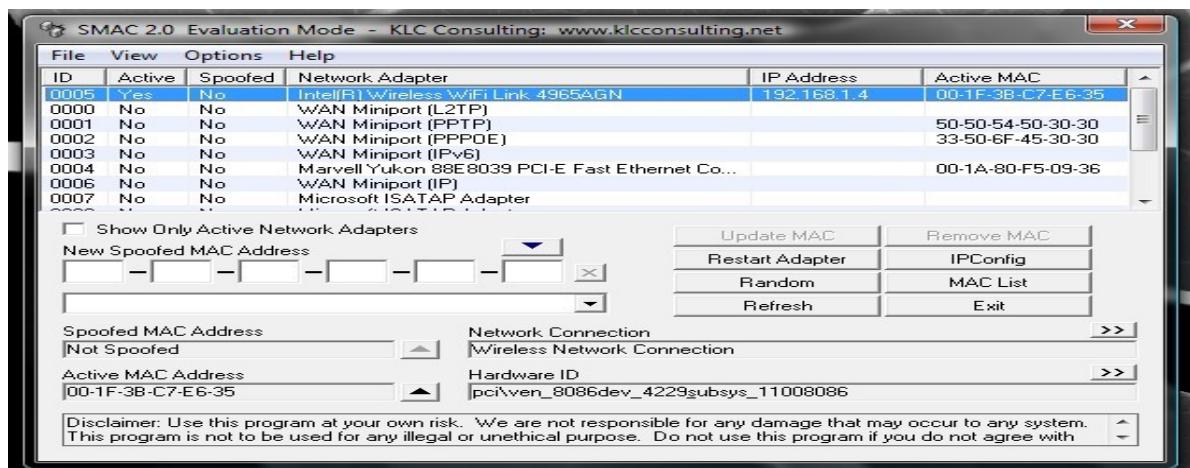
## Practical No

on your machine. Take a look at **Figure B** to see how much the listing grows on my laptop that includes wireless, wired, and dial-up connections.

*Figure A*



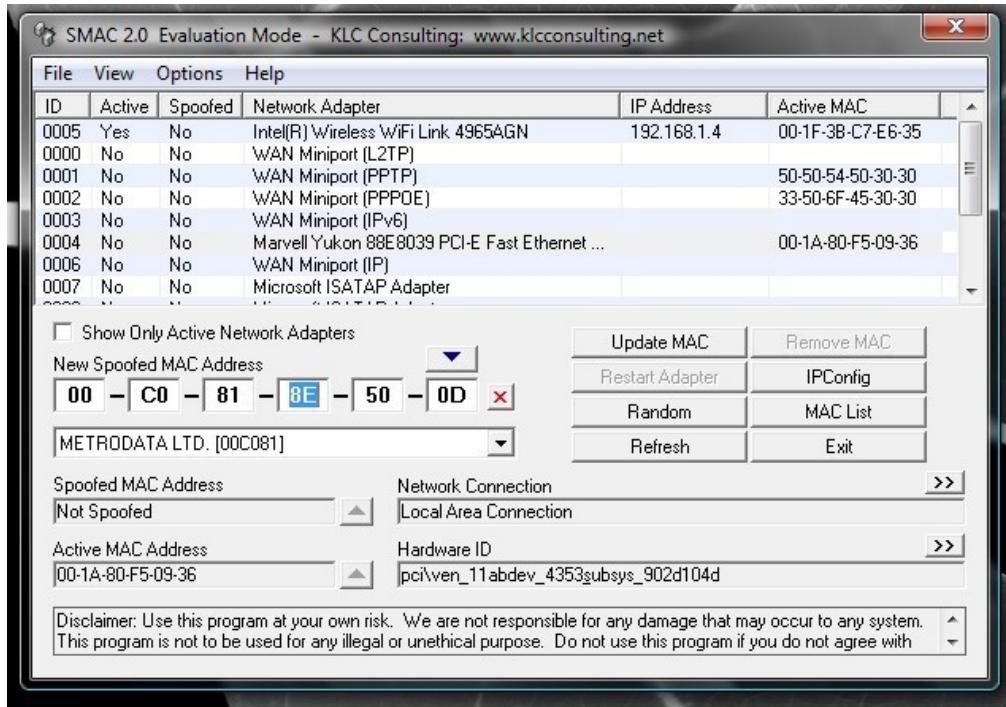
*Figure B*



When you click on a different listing, the information about that hardware will be displayed below.

Let's change the MAC address of the Wired Marvell Yukon PCI-E Faster Ethernet Controller. To do this, select that entry from the list and click the Random button. As you can see in **Figure C**, the new, random MAC address is displayed in the New Spoofed MAC Address section.

*Figure C*



The address listed will correspond to a manufacturer list that you can choose from.

If you know you want to spoof your MAC address to that of a specific manufacturer you can select a different manufacturer from the drop-down list. When you make this selection, the address listed will change. You can keep hitting Random until you get an address you like (or you can just take the first random address you get).

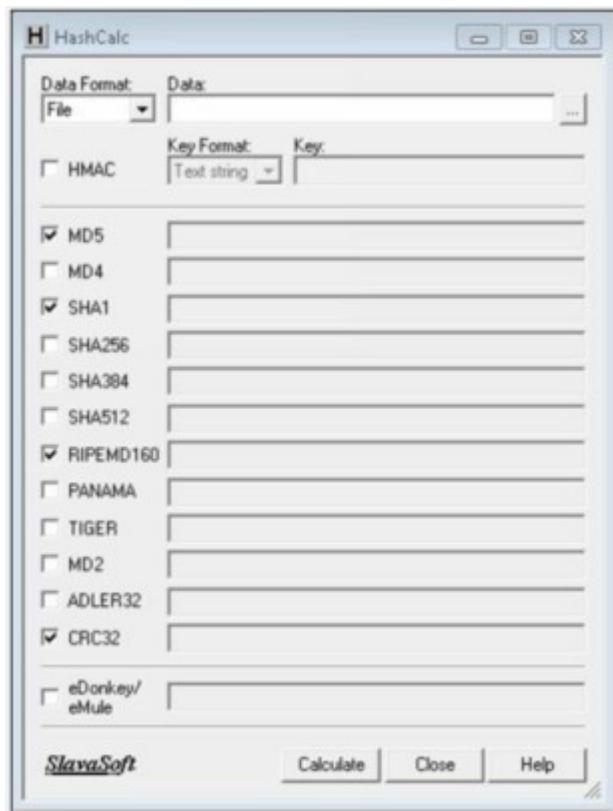
Once you have your address, select the Options menu and make sure Automatically Restart Adapter is checked. Once that is checked, hit the Update MAC Address button and the new MAC address will be applied.

## 15: Use The Following Tools For Cryptography Hashcale.

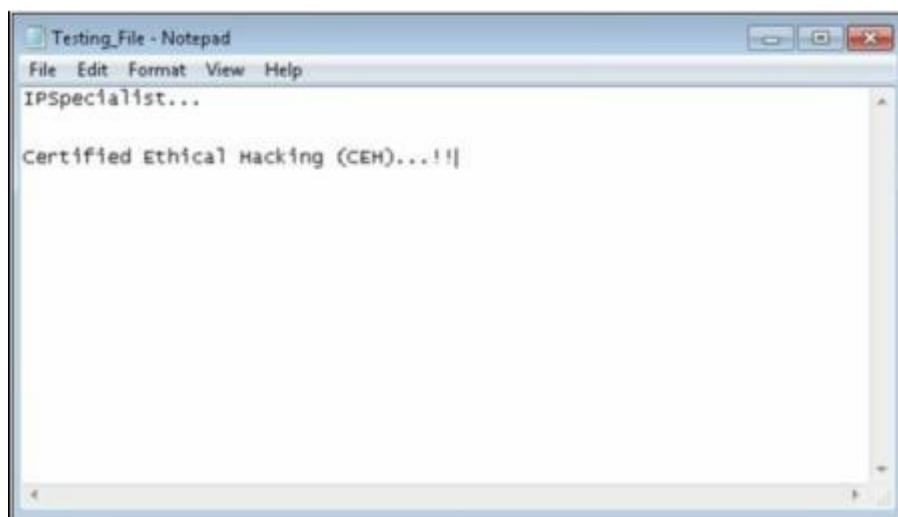
### Calculating MD5 value using HashCalc

1. Open HashCalc tool.

## Practical No



2. Create a new file with some content in it as shown below.

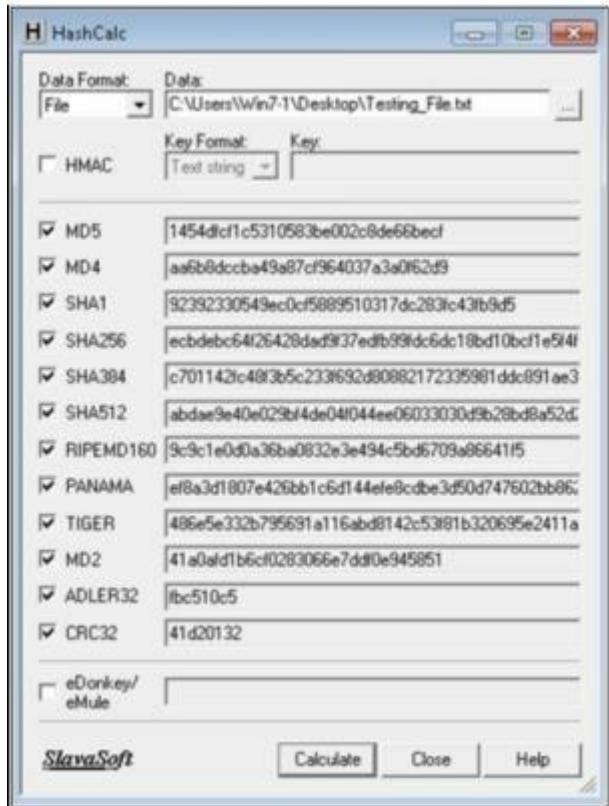


3. Select Data Format as "File" and upload your file



4. Select Hashing Algorithm and Click Calculate

## Practical No

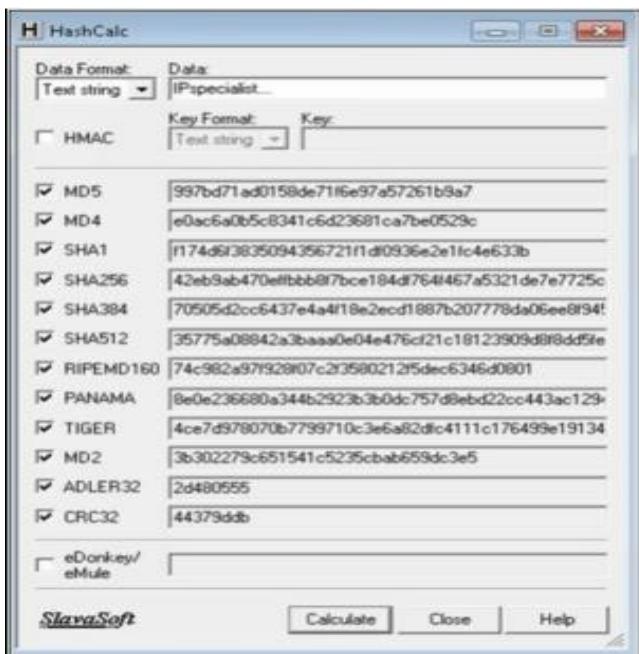


5. Now Select the Data Format to “Text String” and Type “IPSpecialist...” into Data filed and calculated MD5.



MD5 Calculated for the text string “IPSpecialist...” is  
“**a535590bec93526944bd4b94822a7625**”

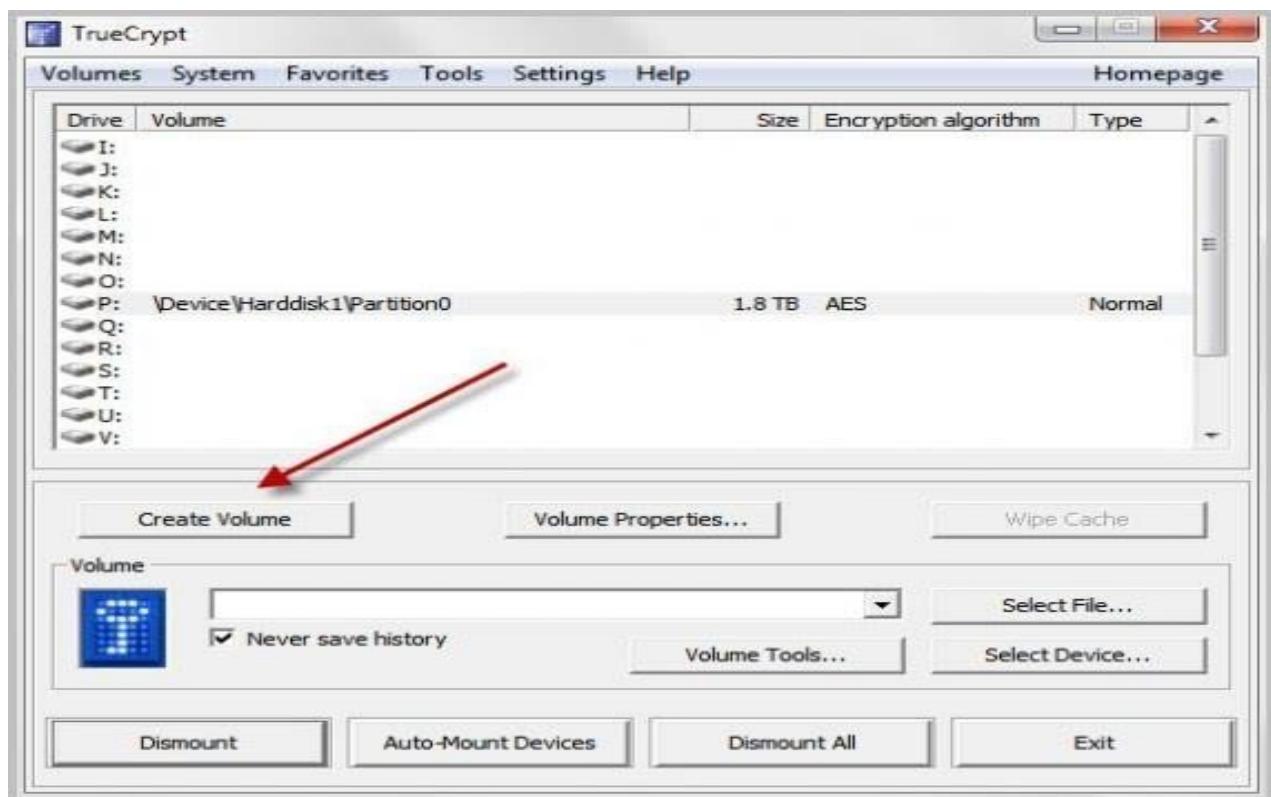
6. Now, let's see how MD5 value is changed from minor change.



Just lowering the case of single alphabet changes entire hashing value. MD5 Calculated for the text string “**IPspecialist...**” is “**997bd71ad0158de71f6e97a57261b9a7**”

## Practical No 16: Use The Following Tools For Cryptography Truecrypt.

TrueCrypt is a leading disk encryption software program that lets you secure disk partitions on your Windows computer. There are times when your hard drive is accessible by other people, such as in an office setting, while travelling, or at home. The data you have on the PC may be vulnerable to attack and compromise your privacy. However, in these moments of risk, TrueCrypt may just be the tool to protect your data.



Click Next two times on the following screens to create an encrypted file container with a standard TrueCrypt volume (those are the default options). Click Select File and browse to a location where you want to create the new container. **Make sure it is not in the Dropbox folder if Dropbox is running.** You can name the container anyway you want, e.g. holiday2010.avi.

Click Next on the encryption options page unless you want to change the encryption algorithm or hash algorithm. Select the volume size on the next screen. I suggest you keep it at a few hundred Megabytes tops.

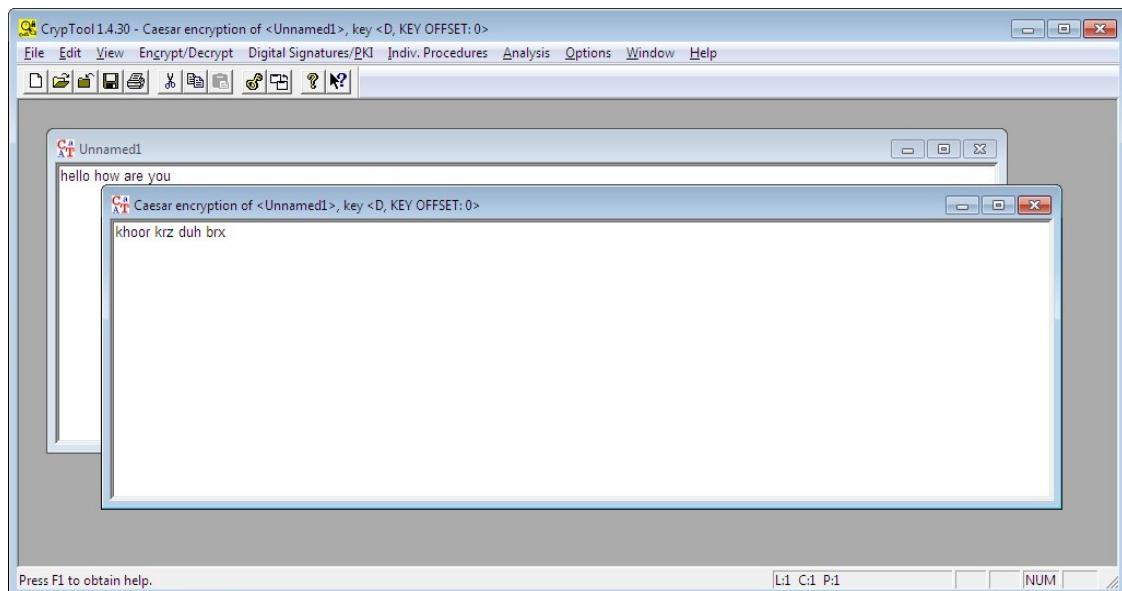
You need to enter a secure password on the next screen. It is suggested to use as many characters as possible (24+) with upper and lower letters, numbers and special characters. The maximum length of a True Crypt password is 64 characters.

Now it is time to select the volume format on the next screen. If you only use Windows computers you may want to select NTFS as the file system. If you use others you may be better off with FAT. Juggle the mouse around a bit and click on format once you are done with that.

Congratulations, the new True Crypt volume has been created.

### Practical No 17: Use The Following Tools For Cryptography Cryptool.

Cryptool is a free e-learning tool to illustrate the concepts of cryptography. Try Various Encryption/Decryption algorithms.





# Machine Learning

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**Practical No. 01**

**Aim: Design a simple machine learning model to train the training instances and test the same.**

**Code:**

```
# python library to generate random numbers from
random import randint

# the limit within which random numbers are generated
TRAIN_SET_LIMIT = 1000

# to create exactly 100 data items
TRAIN_SET_COUNT = 100

# list that contains input and corresponding output
TRAIN_INPUT = list()
TRAIN_OUTPUT = list()

# loop to create 100 data items with three columns each for
i in range(TRAIN_SET_COUNT):
    a = randint(0, TRAIN_SET_LIMIT)
    b = randint(0,
    TRAIN_SET_LIMIT) c = randint(0,
    TRAIN_SET_LIMIT)

    # creating the output for each data item op
    op = a + (2 * b) + (3 * c)
    TRAIN_INPUT.append([a, b, c])

    # adding each output to output list
    TRAIN_OUTPUT.append(op)
```

```
# Sk-Learn contains the linear regression model from
sklearn.linear_model import LinearRegression #

Initialize the linear regression model predictor =
LinearRegression(n_jobs =-1)

# Fill the Model with the Data
predictor.fit(X = TRAIN_INPUT, y = TRAIN_OUTPUT)

# Random Test data
X_TEST = [[ 10, 20, 30 ]]

# Predict the result of X_TEST which holds testing data outcome
= predictor.predict(X = X_TEST)

# Predict the coefficients coefficients
= predictor.coef_

# Print the result obtained for the test data
print('Outcome : {} \nCoefficients : {}'.format(outcome, coefficients))
```

**Output:**

```
Outcome : [140.]
Coefficients : [1. 2. 3.]
```

**Practical No. 02****Aim: Perform Data Loading, Feature selection (Principal Component analysis).**

Principal component analysis, or PCA, is a dimensionality reduction method that is often used to reduce the dimensionality of large data sets, by transforming a large set of variables into a smaller one that still contains most of the information in the large set. Reducing the number of variables of a data set naturally comes at the expense of accuracy, but the trick in dimensionality reduction is to trade a little accuracy for simplicity. Because smaller data sets

are easier to explore and visualize and make analyzing data points much easier and faster for machine learning algorithms without extraneous variables to process.

**Code :**

```
import numpy from pandas import read_csv from
sklearn.decomposition import PCA from
sklearn.feature_selection import RFE from
sklearn.linear_model import LogisticRegression

# load data url = "pima-indians-diabetes.csv" names = ['preg',
'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class']

dataframe = read_csv(url, names=names) array
= dataframe.values

X = array[:,0:8]

Y = array[:,8]

# feature extraction pca =
PCA(n_components=3)

fit = pca.fit(X)

# summarize components print("Explained Variance: %s" %
fit.explained_variance_ratio_) print(fit.components_)
```

**Output :**

```
Explained Variance: [ 0.88854663  0.06159078  0.02579012]
[ -2.02176587e-03   9.78115765e-02   1.60930503e-02   6.07566861e-02
  9.93110844e-01   1.40108085e-02   5.37167919e-04  -3.56474430e-03]
[ -2.26488861e-02  -9.72210040e-01  -1.41909330e-01   5.78614699e-02
  9.46266913e-02  -4.69729766e-02  -8.16804621e-04  -1.40168181e-01]
[ -2.24649003e-02  -1.43428710e-01  -9.22467192e-01  -3.07013055e-01
  2.09773019e-02  -1.32444542e-01  -6.39983017e-04  -1.25454310e-01]]
```

**Practical No. 03****Aim: Perform Data Loading, Feature selection Feature Scoring and Ranking.**

An extra tree classifier is a supervised machine learning method that uses decision trees to aggregate the results of multiple de-correlated decision trees. It's also known as an Extremely Randomized Trees Classifier. Extra tree classifiers use averaging to improve predictive accuracy and control over-fitting. They're less sensitive to noise and irrelevant features, and can effectively handle datasets with a large number of features and noisy data.

**Code:**

```
from     pandas      import     read_csv     from
sklearn.ensemble import ExtraTreesClassifier
# load data url = "pima-indians-diabetes.csv" names = ['preg',
'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class']
dataframe = read_csv(url, names=names) array
= dataframe.values
X = array[:,0:8]
Y = array[:,8] # feature extraction model =
ExtraTreesClassifier(n_estimators=10) model.fit(X, Y) print(names)
print(model.feature_importances_) Output :
```

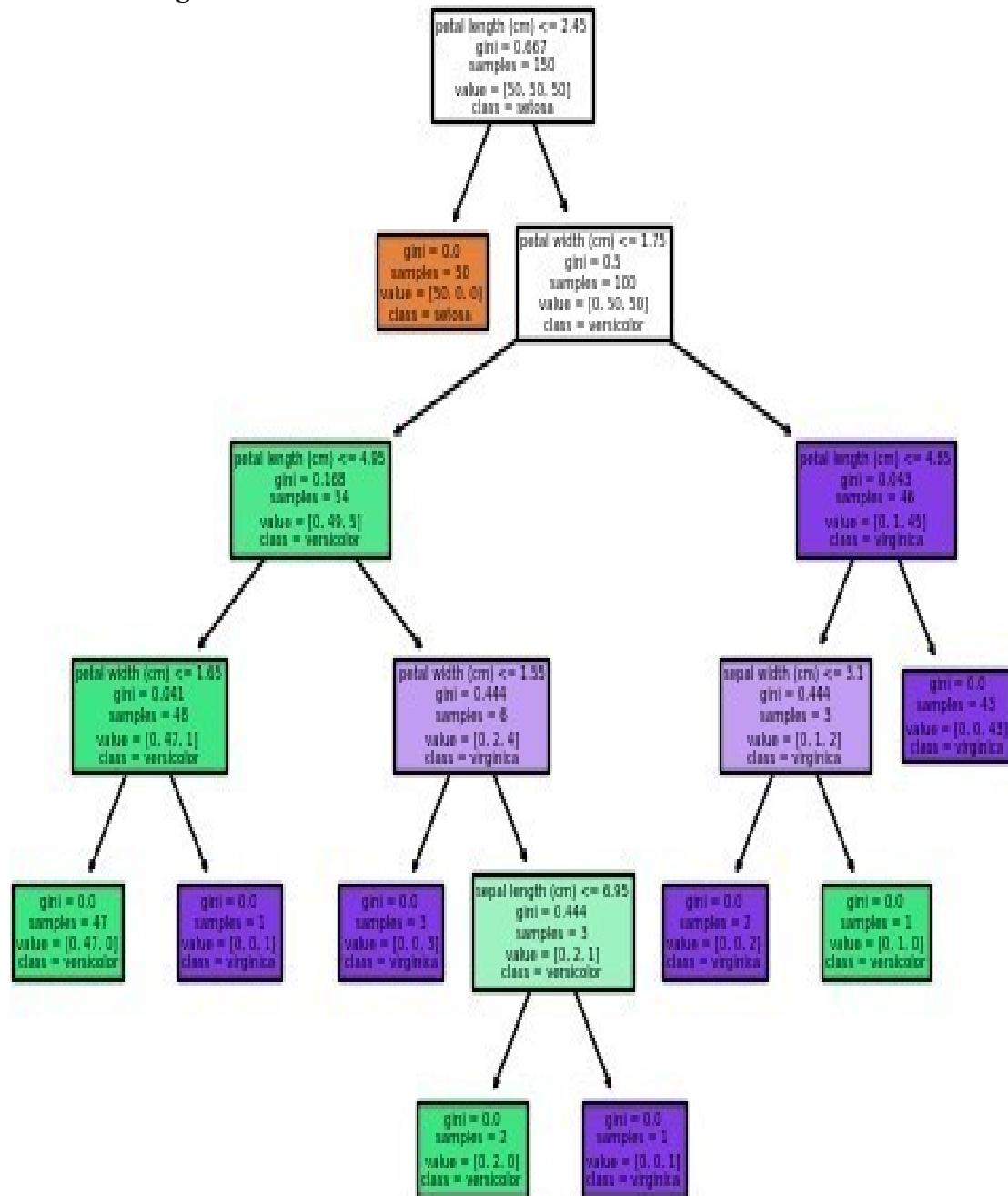
```
[ 'preg', 'plas', 'pres', 'skin', 'test', 'mass', 'pedi', 'age', 'class']
[0.10480812 0.24534539 0.09943327 0.07471693 0.06870453 0.14726085
 0.12199345 0.13773745]
```

**Aim: Write a program to implement Decision Tree.**

A decision tree is a non-parametric supervised learning algorithm, which is utilized for both classification and regression tasks. It has a hierarchical, tree structure, which consists of a root node, branches, internal nodes and leaf nodes. It builds a flowchart-like tree structure where each internal node denotes a test on an attribute, each branch represents an outcome of the test, and each leaf node (terminal node) holds a class label. It is constructed by recursively splitting the training data into subsets based on the values of the attributes until a stopping criterion is met, such as the maximum depth of the tree or the minimum number of samples required to split a node.

During training, the Decision Tree algorithm selects the best attribute to split the data based on a metric such as entropy or Gini impurity, which measures the level of impurity or randomness in the subsets. The goal is to find the attribute that maximizes the information gain or the reduction in impurity after the split. **Code :**

```
from matplotlib import pyplot as plt from
sklearn import datasets from sklearn.tree import
DecisionTreeClassifier from sklearn import tree
# Prepare the data data iris =
datasets.load_iris() X = iris.data y = iris.target
# Fit the classifier with default hyper-parameters
clf = DecisionTreeClassifier(random_state=1234)
model = clf.fit(X, y) fig = plt.figure()
_= tree.plot_tree(clf,
                  feature_names=iris.feature_names,
                  class_names=iris.target_names, filled=True)
plt.show() Output
:
```



### Practical No. 05

**Aim: For a given set of training data examples stored in a .CSV file implement Least Square Regression algorithm.**

Least squares regression is a method of linear regression that establishes the relationship between dependent and independent variables along a linear line. It's also known as a line of best fit or a trend line. The least squares regression line represents the relationship between variables in a scatterplot. It fits the line to the data points in a way that minimizes the sum of the squared vertical distances between the line and the points. The least squares regression line is a mathematical model used to predict the value of y for a given x. It helps predict results based on an existing set of data as well as clear anomalies in the data. Anomalies are values that are too good, or bad, to be true or that represent rare cases. The term least squares is used because it is the smallest sum of squares of errors, which is also called the variance.

## Code :

```
# regression line
```

```
""""
```

To find regression line, we need to find a and b.

Calculate a, which is given by  $a = (\sum y_i)/n - b * (\sum x_i)/n$   
 Calculate b,  
 which is given by  $b = (n * \sum(x_i * y_i) - \sum(x_i) * \sum(y_i)) / (n * \sum(x_i)^2 - (\sum x_i)^2)$

Put value of a and b in the equation of regression line.

```
""""
```

```
# Function to calculate b def
```

```
calculateB(x, y, n):
```

```
# sum of array x
```

```
sx = sum(x)
```

```
# sum of array y
```

```
sy = sum(y)
```

```
# for sum of product of x and y
```

```
sxsy = 0
```

```
# sum of square of x
```

```
sx2 = 0
```

```
for i in range(n): sxsy += x[i] * y[i] sx2
```

```
+ x[i] * x[i] b = (n * sxsy - sx * sy) / (n *
```

```
sx2 - sx * sx) return b
```

```
# Function to find the #
```

```
least regression line
```

```
def leastRegLine(X,Y,n):
```

```

# Finding b = b =
calculateB(X, Y, n)
meanX = int(sum(X)/n)
meanY = int(sum(Y)/n)

# Calculating a
a = meanY - b * meanX

# Printing regression line
print("Regression line:")
print("Y = %.3f%a, " + "%.3f%b, *X", sep="")

```

# Driver code

```

# Statistical data import
pandas as pd

# Step 1 :Import libraries and dataset
datas = pd.read_csv('data.csv')
print(datas)

X = datas.TEMPERATURE
Y = datas.PRESSURE

n = len(X)
leastRegLine(X,
Y, n)

Output:

```

	SNO	TEMPERATURE	PRESSURE
0	1	0	0.0002
1	2	20	0.0012
2	3	40	0.0060
3	4	60	0.0300
4	5	80	0.0900
5	6	100	0.2700

Regression line:  
Y = -0.117 + 0.002\*X

**Practical No. 06**

**Aim: For a given set of training data examples stored in a .CSV file implement Linear Regression algorithm.**

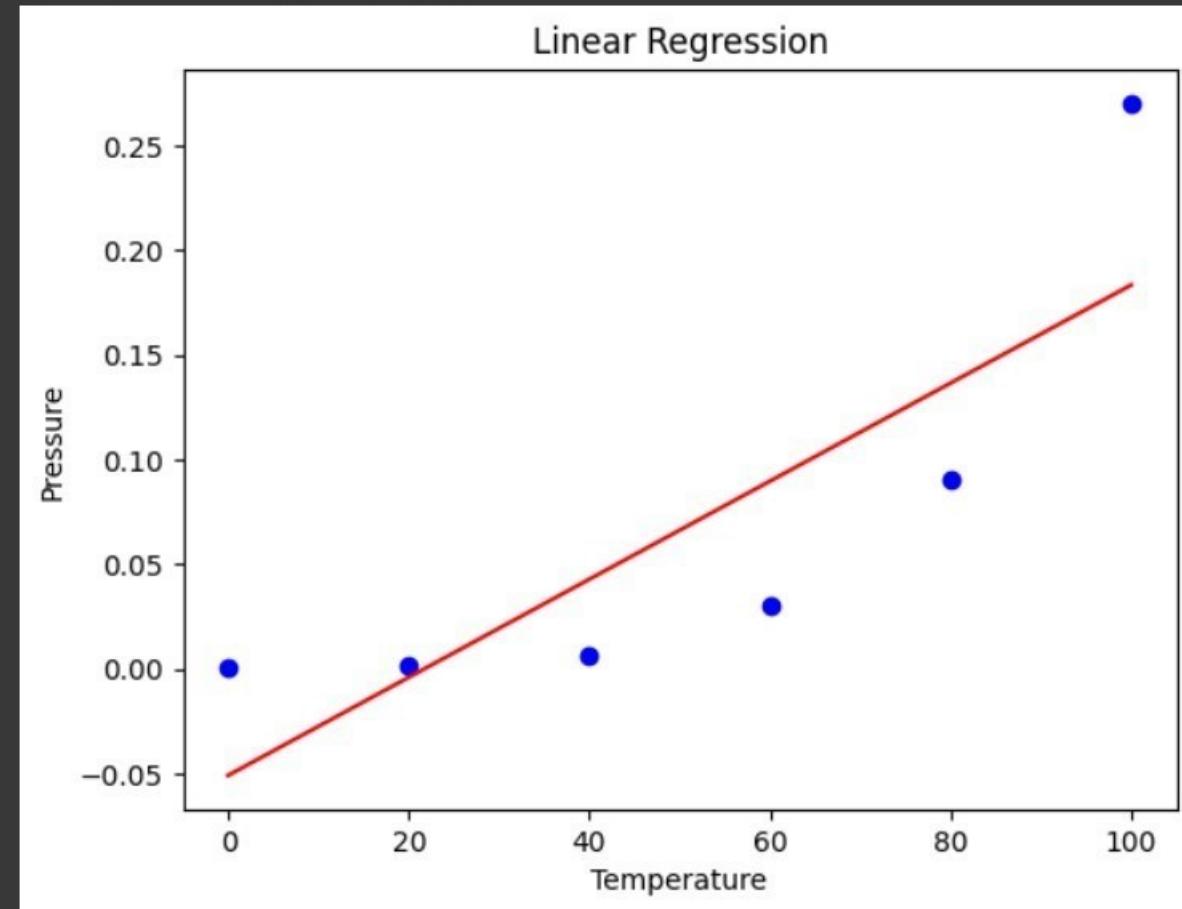
Linear regression is a statistical method that uses a linear equation to model the relationship between two variables. It's used in data science and machine learning to predict the outcome of future events. Linear regression assumes a linear relationship between the independent variable and the dependent variable. It aims to find the best-fitting line that describes the relationship.

**Code :**

```
import numpy as np import  
matplotlib.pyplot as plt import  
pandas as pd  
  
# Step 1 :Import libraries and dataset  
datas = pd.read_csv('data.csv') print(datas  
)  
  
#Step 2: Dividing the dataset into 2 components  
X = datas.iloc[:, 1:2].values y = datas.iloc[:,  
2].values  
  
#Step 3: Fitting Linear Regression to the dataset  
from sklearn.linear_model import LinearRegression  
lin = LinearRegression() lin.fit(X, y) plt.scatter(X,  
y, color = 'blue') plt.plot(X, lin.predict(X), color =  
'red') plt.title('Linear Regression')  
plt.xlabel('Temperature') plt.ylabel('Pressure')  
plt.show()
```

**Output :**

SNO	TEMPERATURE	PRESSURE
0	1	0 0.0002
1	2	20 0.0012
2	3	40 0.0060
3	4	60 0.0300
4	5	80 0.0900
5	6	100 0.2700



### Practical No. 07

**Aim:** Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.

K-nearest neighbors (KNN) is a supervised learning algorithm used for classification and regression. It's a simple and effective machine learning technique. KNN is based on the idea that similar data points tend to have similar labels or values. It uses proximity to make classifications or predictions about the grouping of an individual data point. You can calculate the distance between a new entry and other existing values using the Euclidean distance formula. You can also calculate the distance using the Manhattan and Minkowski distance formulas.

**Code :**

```
import pandas as pd import matplotlib.pyplot as plt
from sklearn.datasets import load_iris from
```

```
sklearn.model_selection import train_test_split from
```

```
sklearn.neighbors import KNeighborsClassifier
```

```
iris = load_iris() df =
```

```
pd.DataFrame(iris.data,columns=iris.feature_names) print(df)
```

```
df['target'] = iris.target df['flower_name'] = df.target.apply(lambda
```

```
x: iris.target_names[x]) print(df)
```

```
df0 = df[:50]      # setosa df1 =
```

```
df[50:100]        # versicolor
```

```
df2 = df[100:]    # virginica
```

```
X = df.drop(['target','flower_name'], axis='columns') y
```

```
= df.target
```

```
X_train, X_test, y_train, y_test = train_test_split(X,y, test_size=0.2)
```

```
knn = KNeighborsClassifier(n_neighbors=10)
```

```
knn.fit(X_test, y_test) print(knn.score(X_test,
```

```
y_test))
```

**Output :**

```

      sepal length (cm)  sepal width (cm)  petal length (cm)  petal width (cm)
0              5.1          3.5            1.4            0.2
1              4.9          3.0            1.4            0.2
2              4.7          3.2            1.3            0.2
3              4.6          3.1            1.5            0.2
4              5.0          3.6            1.4            0.2
..             ...
145             6.7          3.0            5.2            2.3
146             6.3          2.5            5.0            1.9
147             6.5          3.0            5.2            2.0
148             6.2          3.4            5.4            2.3
149             5.9          3.0            5.1            1.8

[150 rows x 4 columns]
      sepal length (cm)  sepal width (cm)  petal length (cm)  petal width (cm)  \
0              5.1          3.5            1.4            0.2
1              4.9          3.0            1.4            0.2
2              4.7          3.2            1.3            0.2
3              4.6          3.1            1.5            0.2
4              5.0          3.6            1.4            0.2
..             ...
145             6.7          3.0            5.2            2.3
146             6.3          2.5            5.0            1.9
147             6.5          3.0            5.2            2.0
148             6.2          3.4            5.4            2.3
149             5.9          3.0            5.1            1.8

target flower_name
0          0    setosa
1          0    setosa
2          0    setosa
3          0    setosa
4          0    setosa
..         ...
145         2  virginica
146         2  virginica
147         2  virginica
148         2  virginica
149         2  virginica

[150 rows x 6 columns]
0.9

```

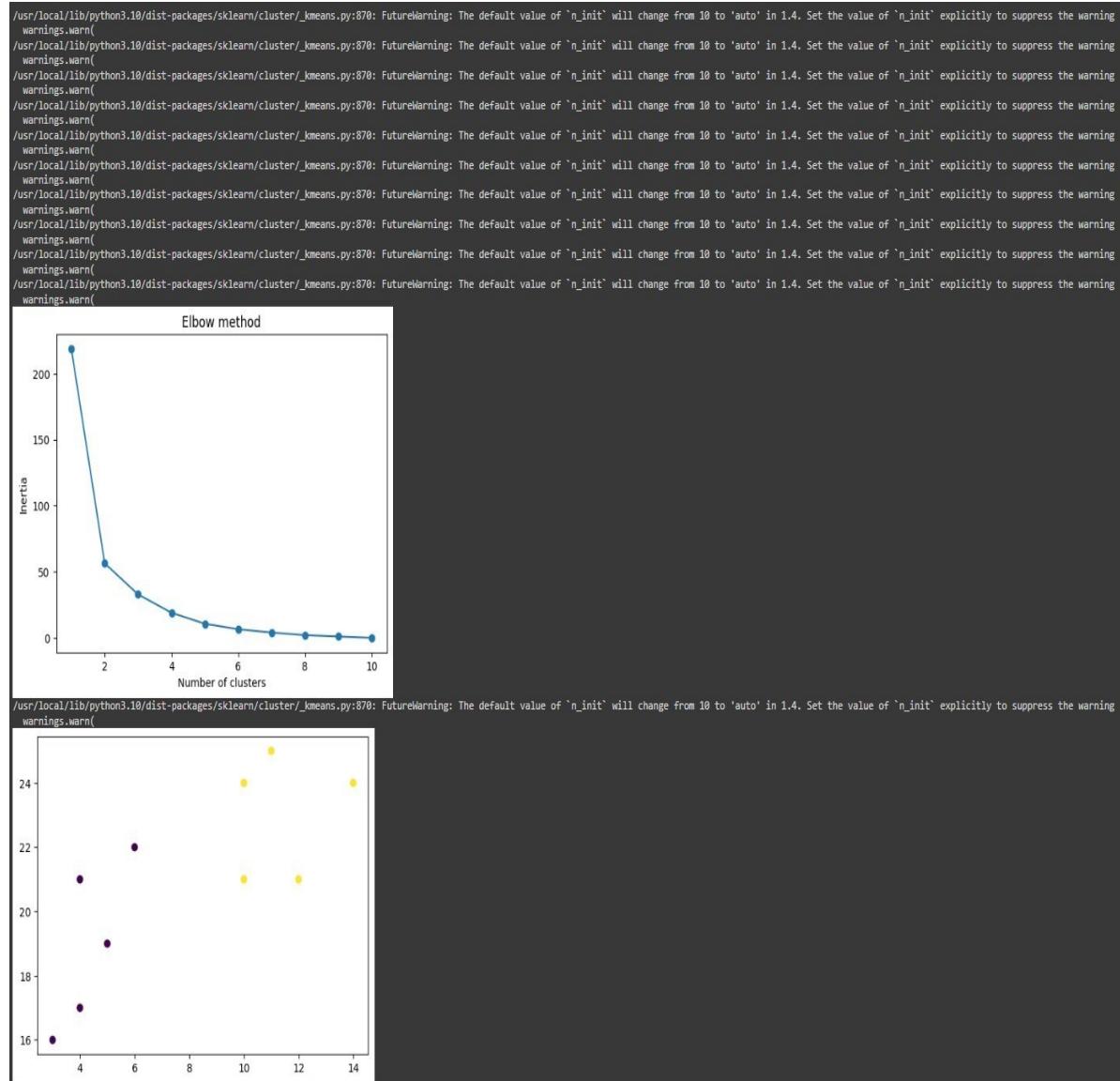
## Practical No. 08

**Aim: Implement the classification model using clustering for the following techniques with K means clustering**

K-means clustering is an unsupervised machine learning algorithm that groups unlabeled data into different clusters. The algorithm partitions n observations into k clusters, where each observation belongs to the cluster with the nearest mean.

```
Code : import matplotlib.pyplot as
plt from sklearn.cluster import
KMeans
x = [4, 5, 10, 4, 3, 11, 14 , 6, 10, 12] y =
[21, 19, 24, 17, 16, 25, 24, 22, 21, 21]
##### from sklearn.cluster import
KMeans
data = list(zip(x, y)) inertias
= []
for i in range(1,11):
    kmeans = KMeans(n_clusters=i)
    kmeans.fit(data)
    inertias.append(kmeans.inertia_)
plt.plot(range(1,11), inertias, marker='o')
plt.title('Elbow method')
plt.xlabel('Number of clusters')
plt.ylabel('Inertia') plt.show() #####
data = list(zip(x, y))
kmeans = KMeans(n_clusters=2)
kmeans.fit(data) plt.scatter(x, y,
c=kmeans.labels_) plt.show()
```

**Output :**



## Practical No. 09

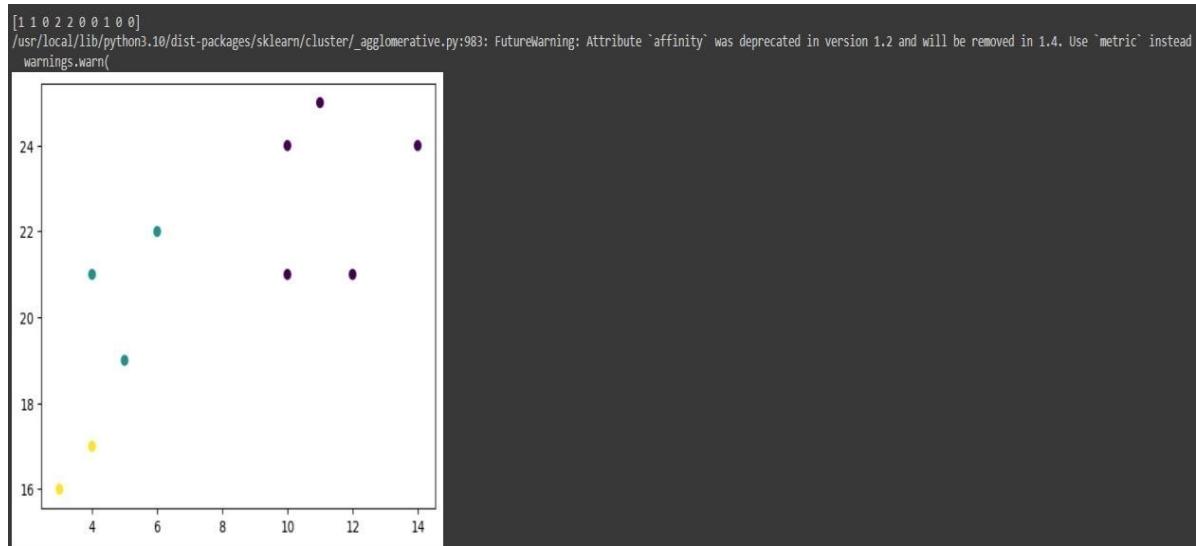
**Aim: Implement the classification model using clustering for the following techniques with hierarchical clustering with Prediction**

Hierarchical clustering is a popular method for grouping objects. It creates groups so that objects within a group are similar to each other and different from objects in other groups. Clusters are visually represented in a hierarchical tree called a dendrogram.

**Code :**

```
import numpy as np
import matplotlib.pyplot as plt from sklearn.cluster
import AgglomerativeClustering from
scipy.cluster.hierarchy import dendrogram, linkage
```

```
x = [4, 5, 10, 4, 3, 11, 14 , 6, 10, 12] y =  
[21, 19, 24, 17, 16, 25, 24, 22, 21, 21]  
data = list(zip(x, y))  
hierarchical_cluster = AgglomerativeClustering(n_clusters=3,  
affinity='euclidean', linkage='ward') labels =  
hierarchical_cluster.fit_predict(data) print(labels)  
plt.scatter(x, y, c=labels) plt.show()
```

**Output :**

# Robotic Process Automation

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11

Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is displayed.

21

## Practical No. 1

### Aim : Automate UiPath Number Calculation (Subtraction, Multiplication, Division of numbers).

#### Steps:

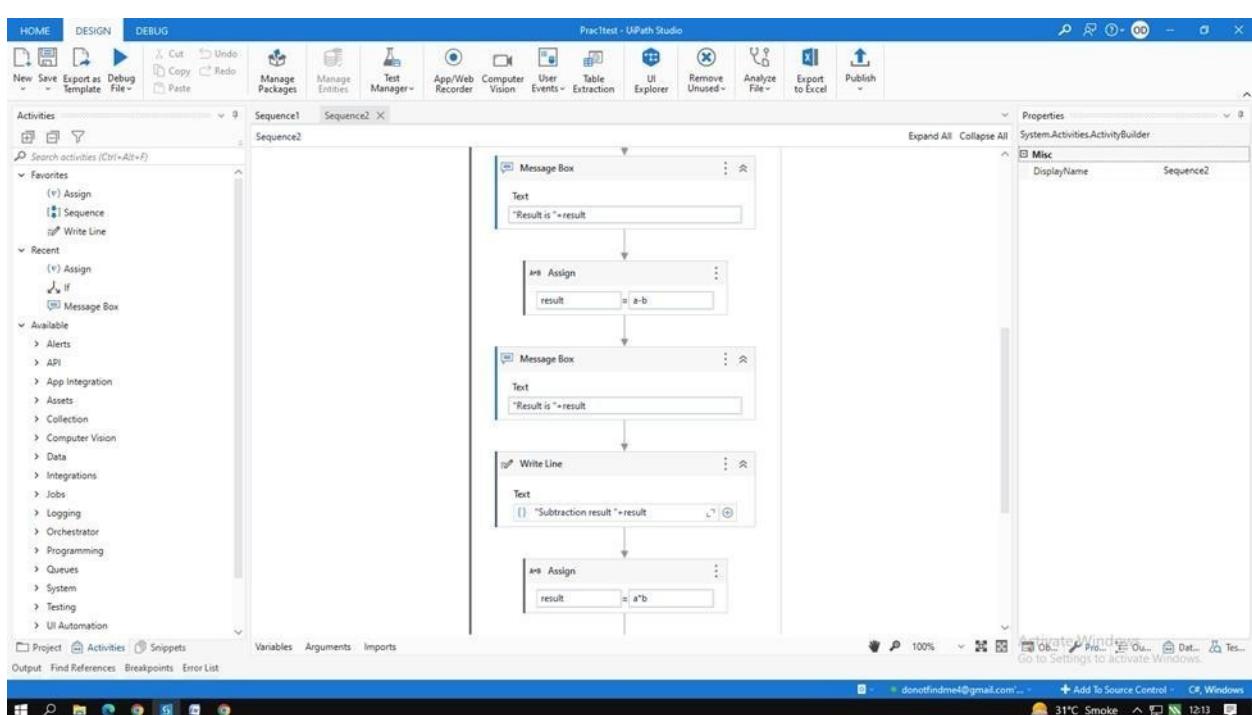
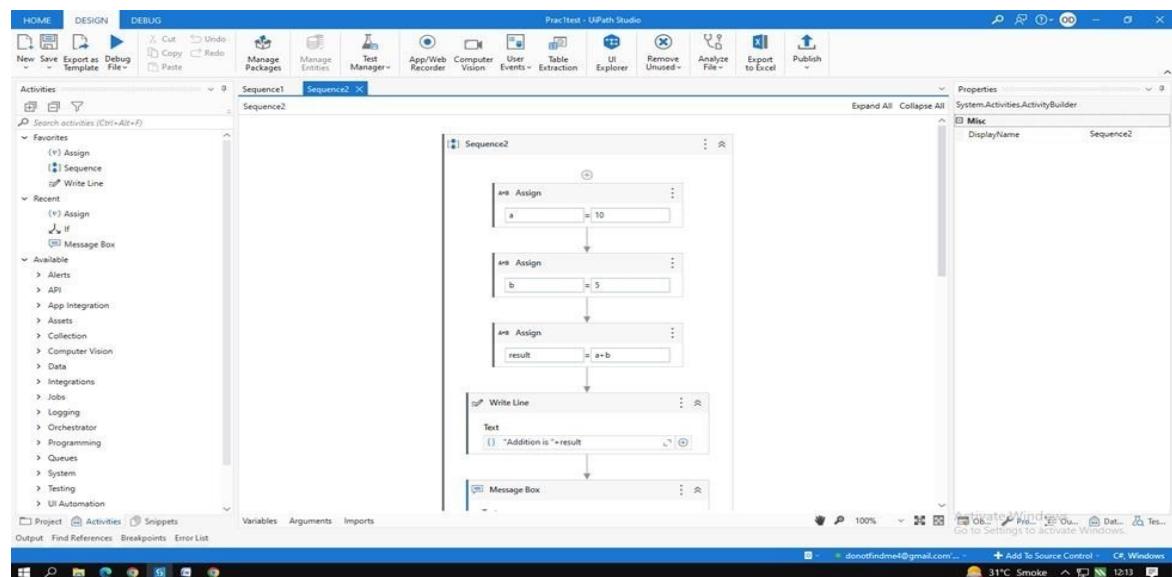
1. Create a new sequence.
2. In the sequence, drag and drop an assign box to assign a variable. Assign a variable “a” with value 10.
3. On the variables tab, create the variable and assign the variable type as Int32.
4. Repeat steps 2 and 3 to create another variable “b” of integer type and give it the value 15.
5. Add a third assign box and create a variable “result” that will store the value of the operation between a and b. ( $a+b$ ). This variable will also be integer.
6. Once done, drag and drop a write line box and add: “Addition is” + result since the output will be in string format.
7. Repeat steps from 5 and 6 thrice and change the operation as  $result=a-b$ ,  $result=a*b$ ,  $result=a/b$ .
8. Run the automation.

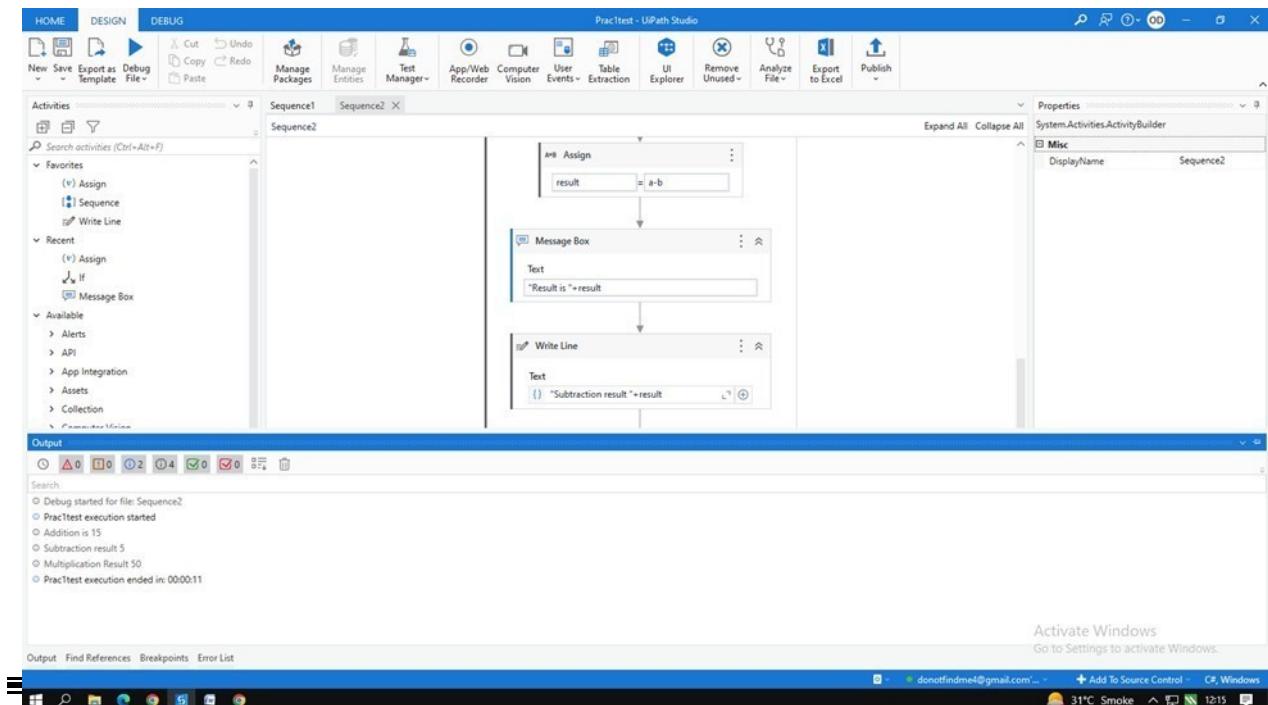
#### Output:

This will give the output of addition, subtraction, multiplication, division between variables a and b

# Robotic Process Automation

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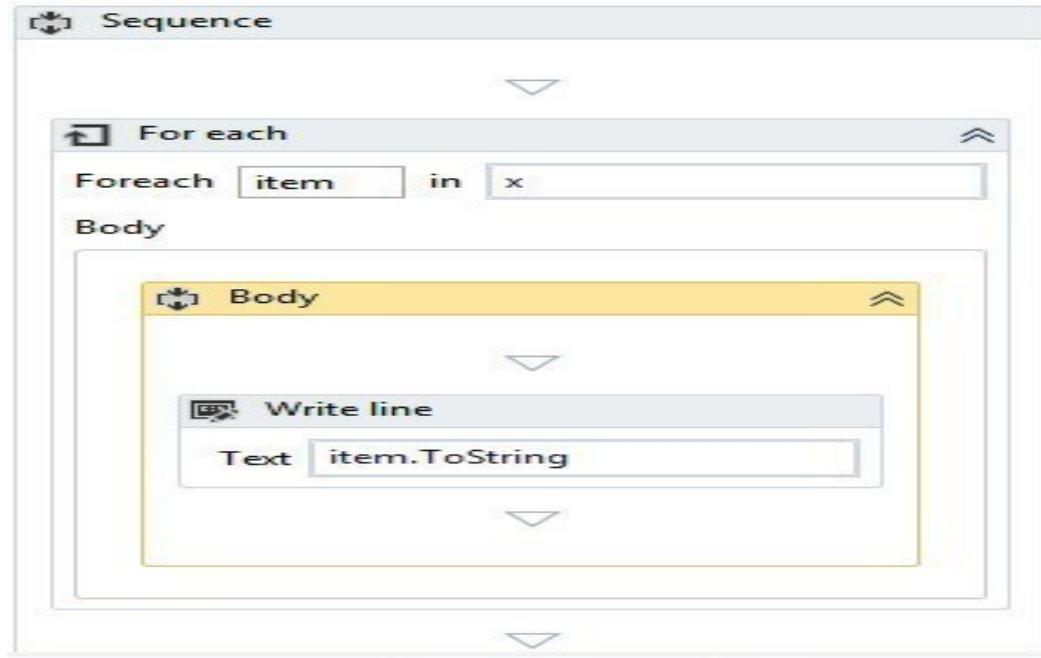
## Practical No. 2

**Aim :** Create an automation UiPath project to calculate sum of an array.

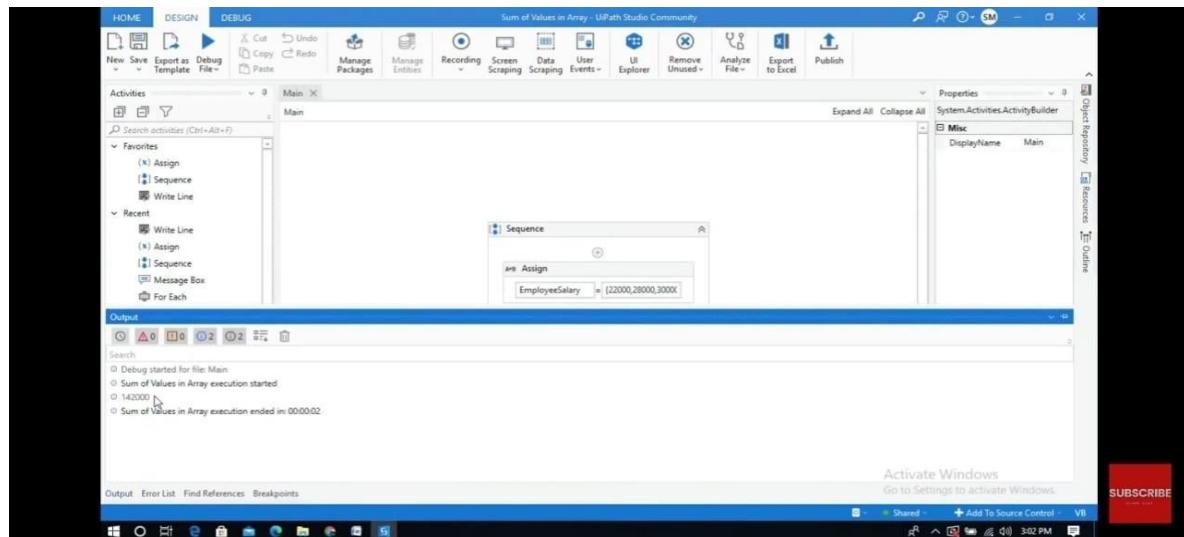
**Steps:**

1. Start with a Blank project in UiPath.
2. Add a Sequence activity to the Designer panel.
3. Next, add a For each activity within the Sequence and create an integer type array variable, x.
4. In the default value of the variable, put in {2,4,6,8,10,12,14,16,18,20}.
5. Create a variable sum and write it's default as 0.
6. In the body drag and drop assign activity and assign `sum = sum + item` in it
7. Outside the foreach loop drag and drop writeline activity and write sum in it.

**Output:**



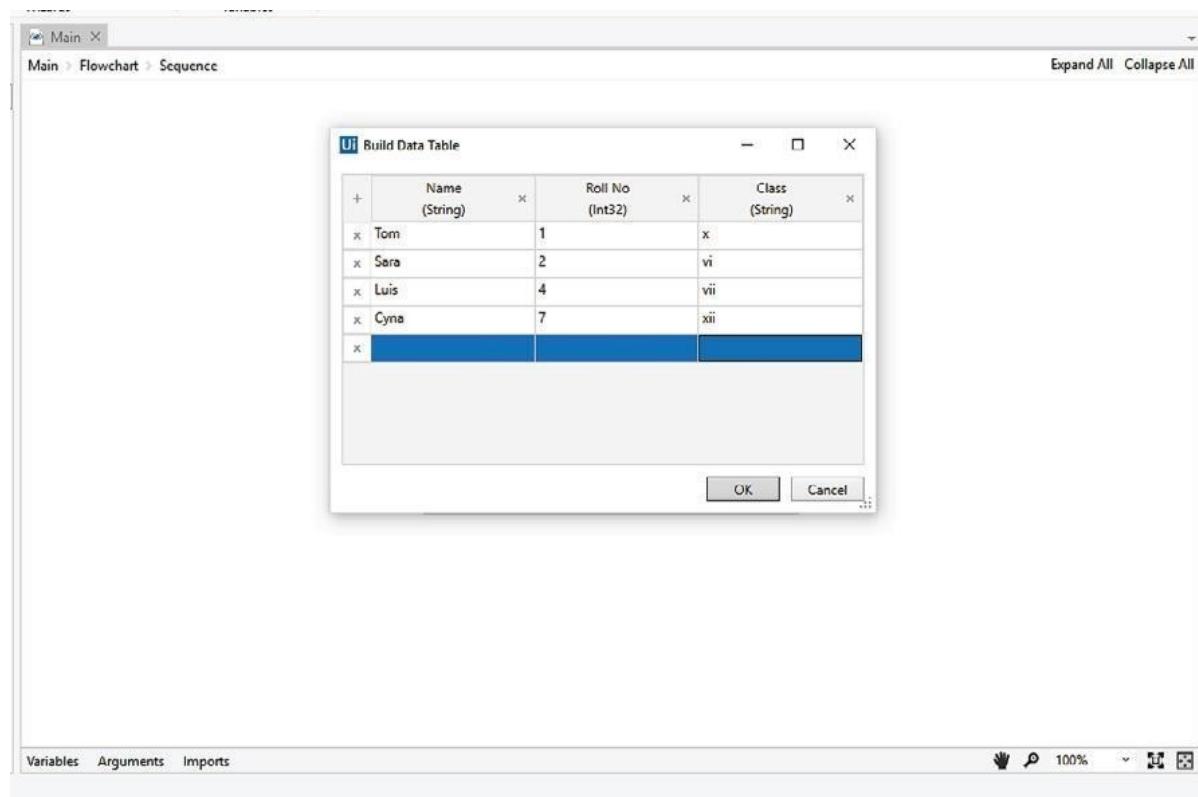
In the body we also have to add an assign activity and in it **assign sum = sum + item** before write line

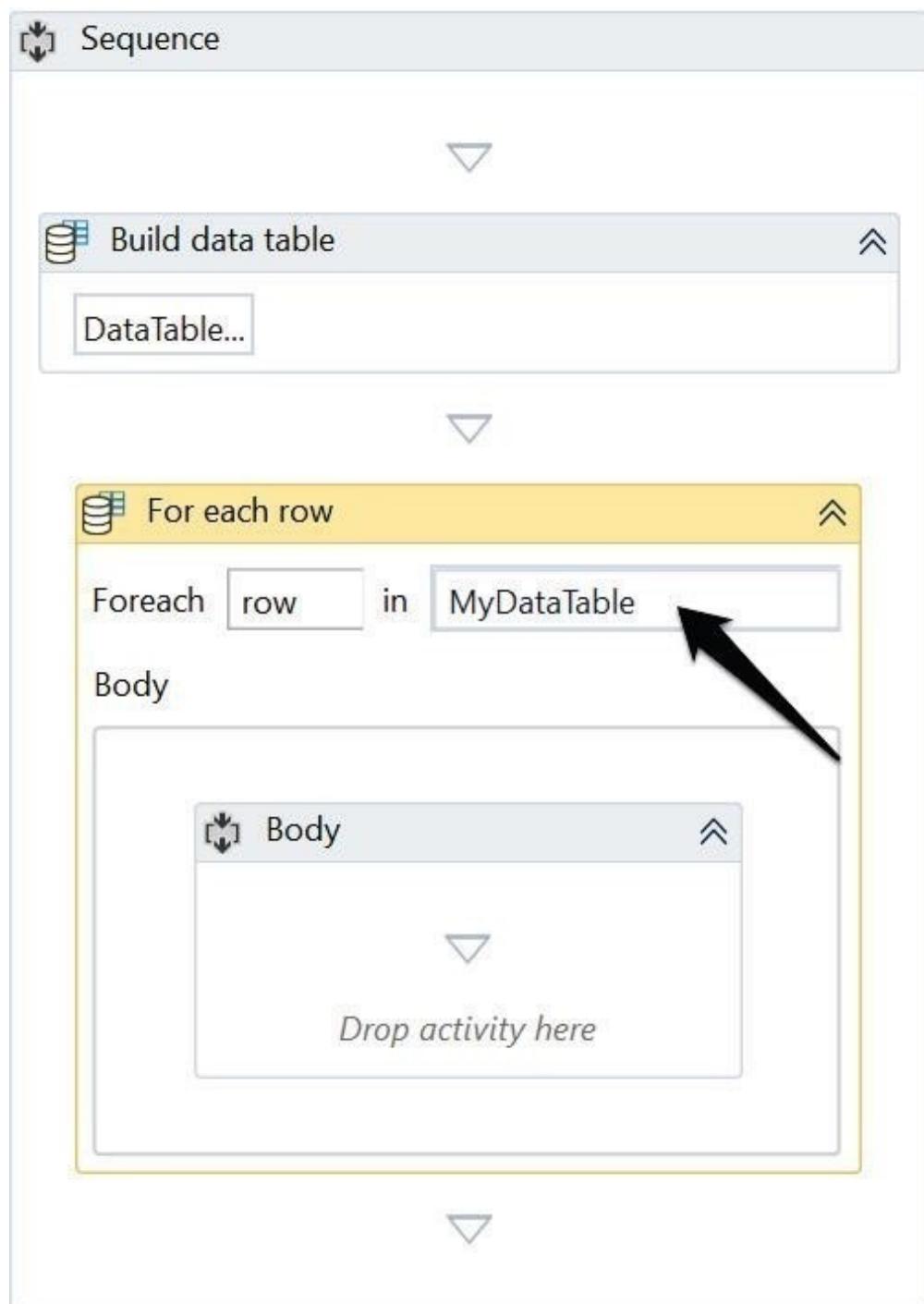


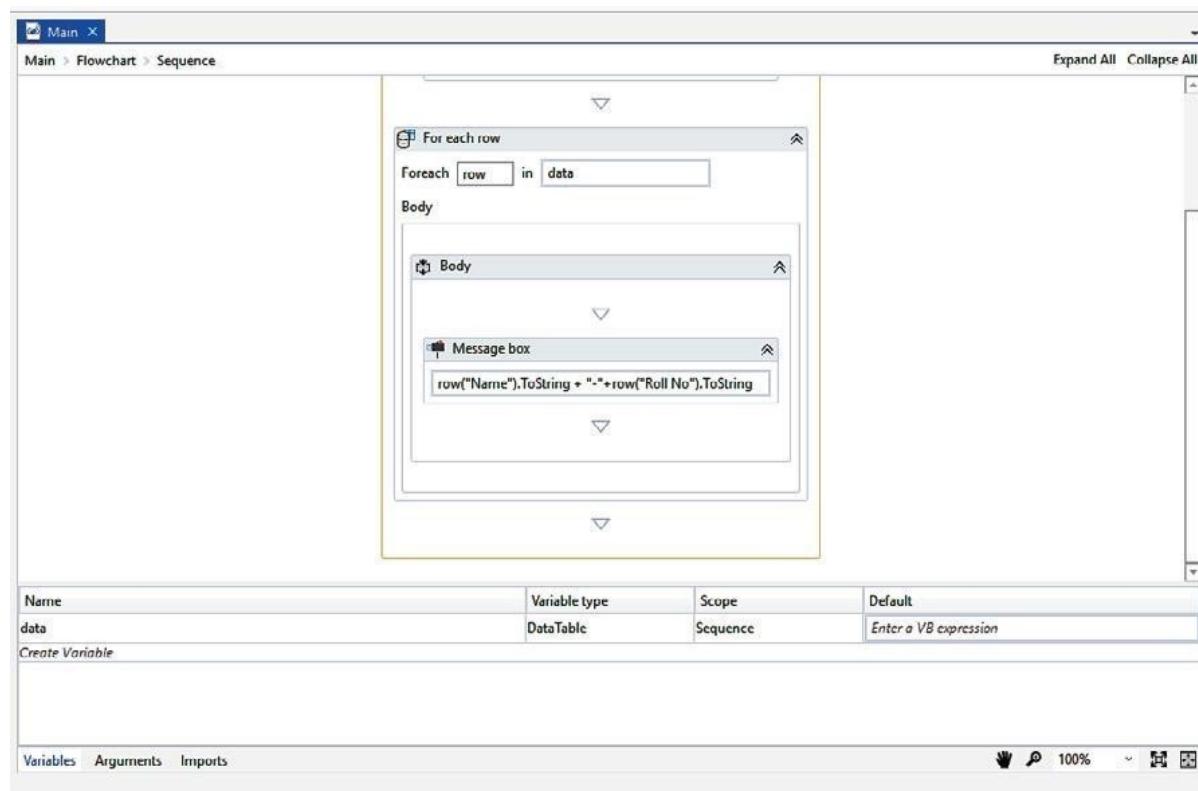
**Practical No. 3****Aim : Create an automation UiPath project to create and display a data table.****Steps:**

1. Drag and drop a Flowchart activity on the Designer panel. Also, drag and drop a Sequence activity and set it as the Start node.
2. Double click on the Sequence and drag and drop the Build Data Table activity inside the Sequence activity.
3. Click on the **Data Table** button. A pop-up window will appear on the screen. Remove both the columns (auto generated by the **Build Data Table** activity) by clicking on the Remove Column icon.
4. Now, we will add three columns by simply clicking on the + symbol. Specify the column names and select the appropriate data types from the drop-down list. Click on the OK button. We will add column Name of String Data Type, Roll\_no of Int32 type and finally Class of string type. Now enter some random values just to insert the data into the rows. Click on the OK button and our data table is ready. We have to iterate over the data table's rows to make sure everything works correctly.
5. In order to store the Data Table created by Build Data Table activity, we have to create a data table variable mydatatable of DataTable type and in order to store the result of the data table that we have dynamically built. Also, specify assign the Output property of the Build Data Table activity with this variable. Specify the data table variable's name there.
6. After our data table is ready, we will iterate the data table's rows to make sure everything works correctly. Drag and drop the For each row activity from the Activities panel inside the Sequence activity. Specify the data table variable's name in the expression text box of the For each row activity
7. Drag and drop a Message box activity inside the For each row activity. In the Message box activity, Inside the message box we have to write following string: row ("Name").ToString  
+" - " + row("Roll\_No").ToString + " - " + row("Class").ToString. row the variable which holding data for the data row in each iteration

**Output:**

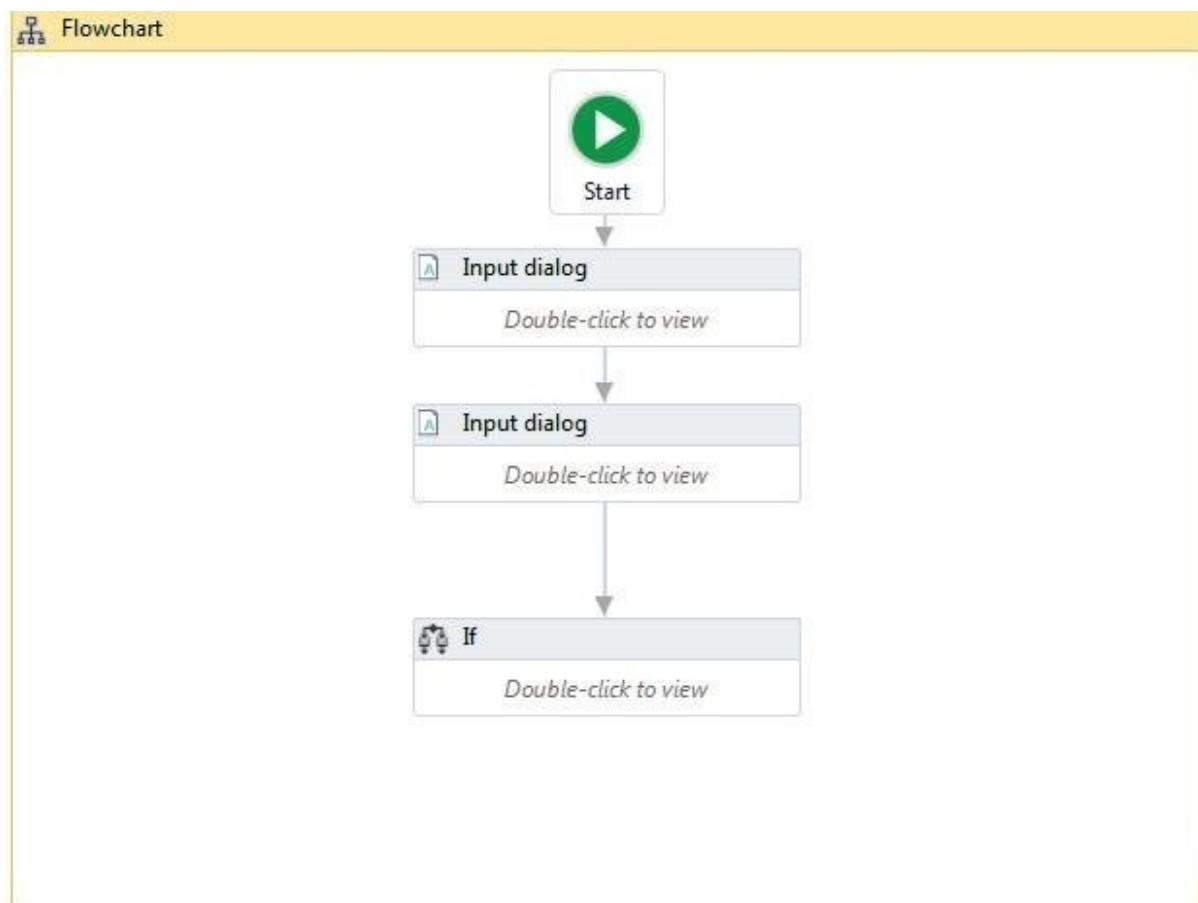






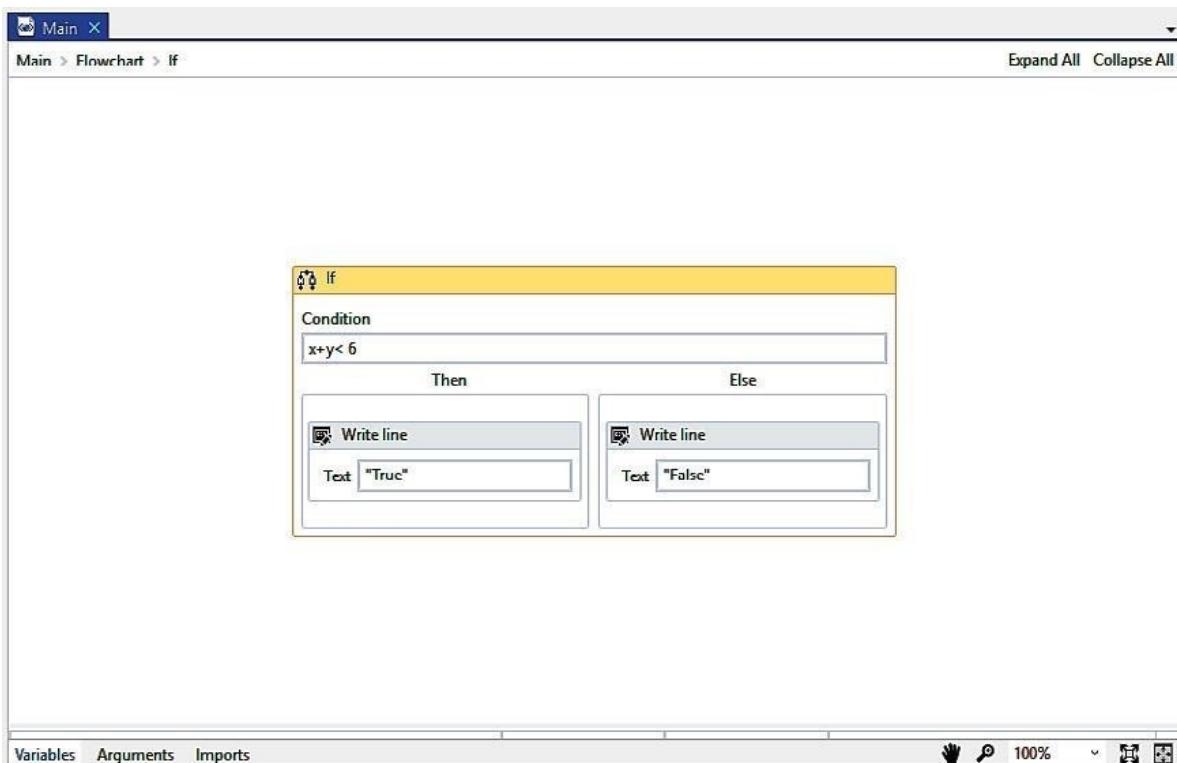
**Practical No.****4****Aim : Create an automation UiPath Project using if-else statements.****Steps:**

1. Add a Flowchart from the Activities panel.
2. Add two Input dialog activities. Create two integer variables, x and y.
3. In the Properties panel, change the label name and title name of both the Input dialog activities.
4. Now, specify these name of these two variables in the Result property of both the Input dialog activities.
5. Now add the If activity to the Designer panel
6. In the condition part,  $x+y < 6$ , check whether it is true or false. Add two Write line activities and type "True" in one and "False" in the other
7. Click the Run button to check the output. If the condition holds true then it will show the true value; otherwise, it will show the false value, as shown in the second



screenshot (in our case, we put in the values of x and y as 9 and 4, respectively, thus getting a sum of 13, which is not less than 6; hence, the output shows it as false value)

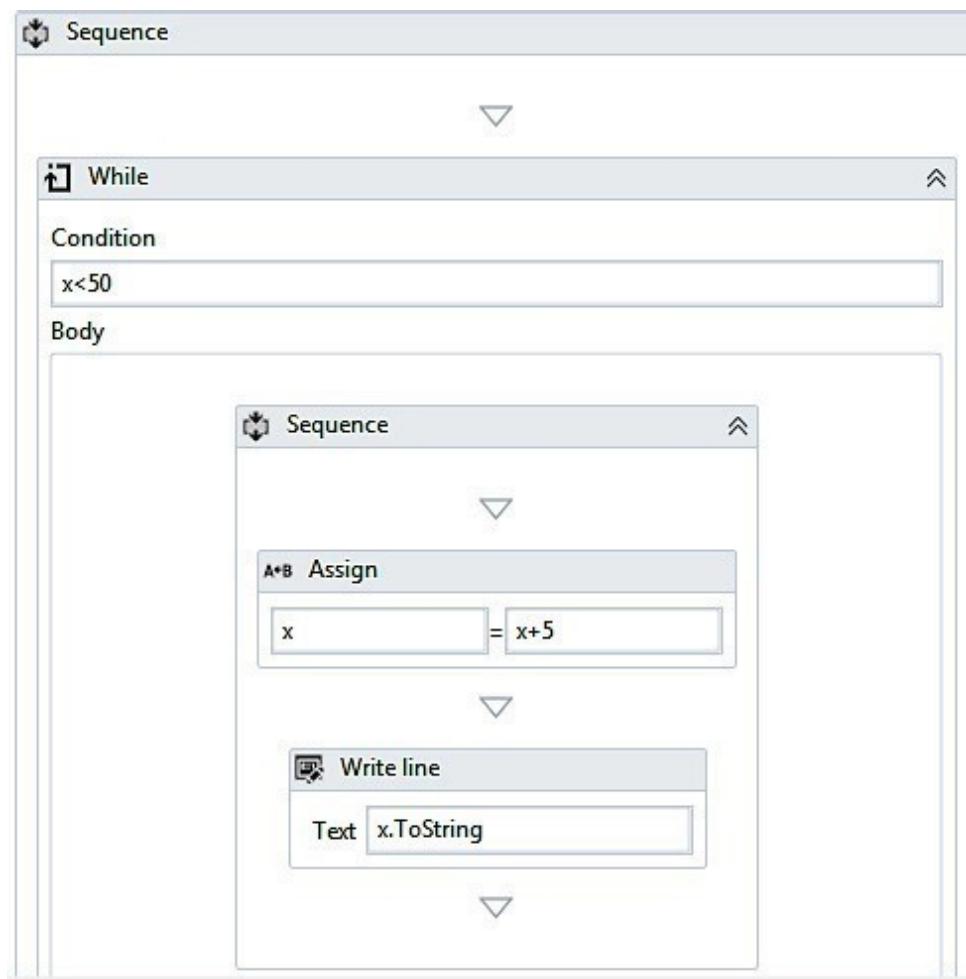
**Output:**

**Practical No.**

**Aim : Create an automation UiPath Project using while statements.****Steps:**

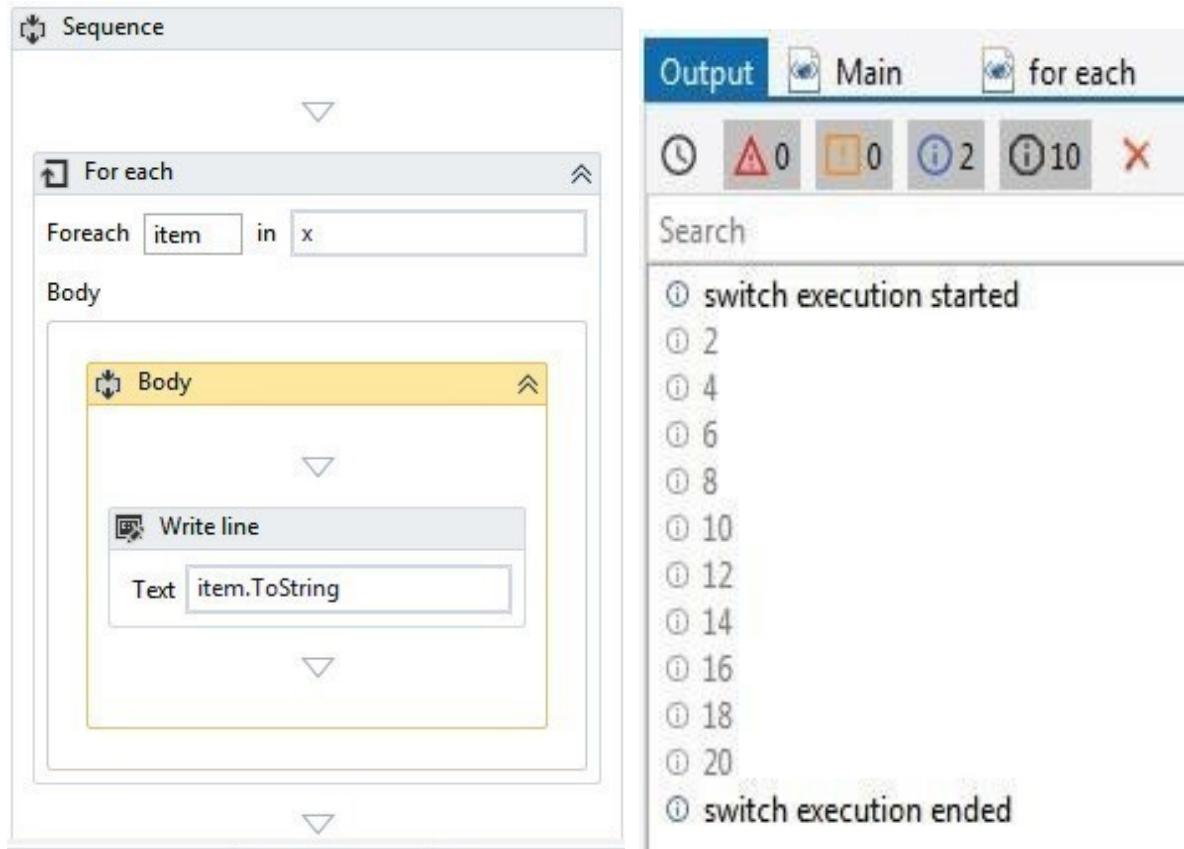
1. On a Blank project, add a Sequence activity.
2. Now, create an integer type variable x. Set its default value to 5.
3. Next, add a While activity to the Sequence.
4. In the condition field, set  $x < 50$ .
5. Add an Assign activity to the body section of the While loop.
6. Now, go to the Properties panel of the Assign activity and type in the text field integer variable for value field integer  $x + 5$ .
7. Drag and drop a Write line activity and specify the variable name x and apply ToString method on this variable

**Output:**

**Practical No.**

**Practical No.****6****Aim : Create an automation UiPath Project using foreach statements.****Steps:**

1. Start with a Blank project in UiPath.
2. Add a Sequence activity to the Designer panel.
3. Next, add a For each activity within the Sequence and create an integer type array variable, x.
4. In the default value of the variable, put in {2,4,6,8,10,12,14,16,18,20}.
5. Add a Write line activity to the Designer Panel (this activity is used to display the results).
6. In the Text field of the Write line activity, type item.ToString to display the output

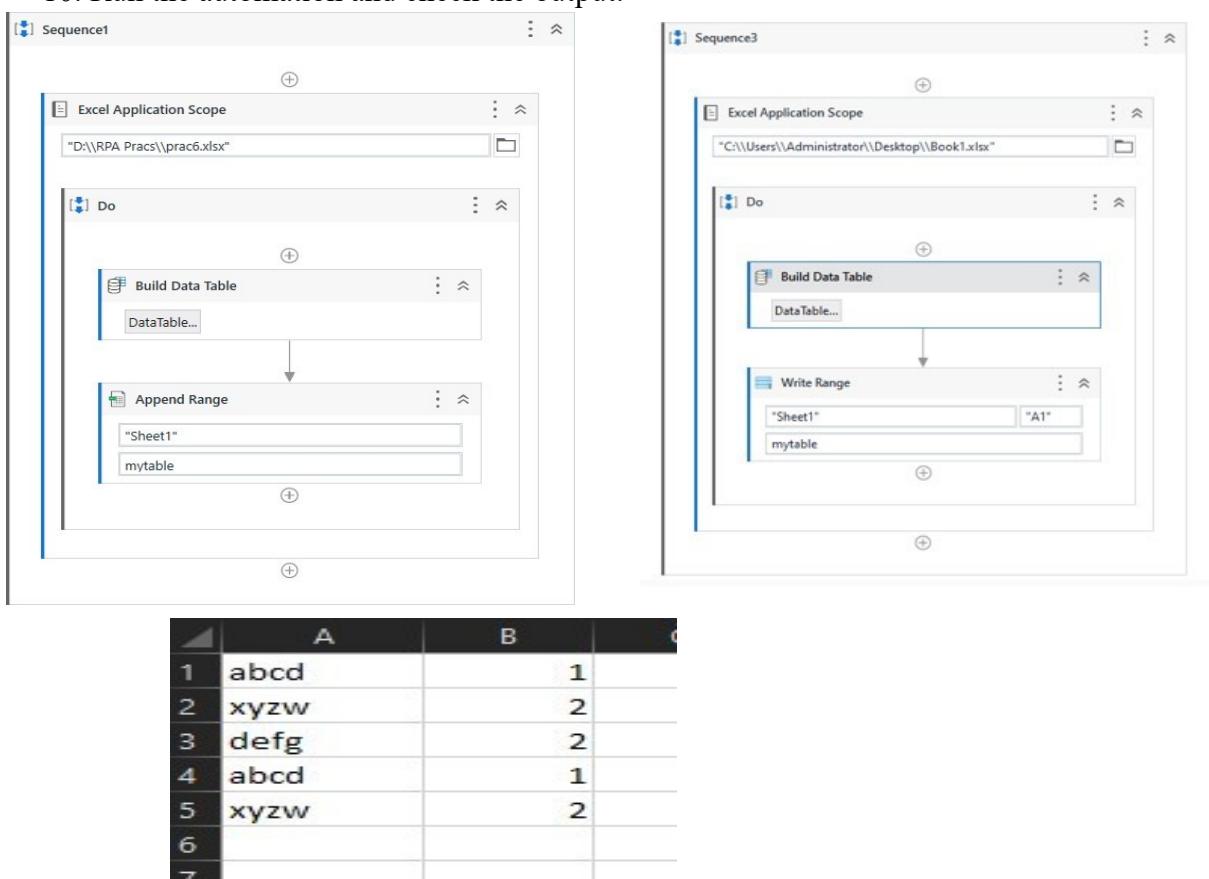
**Output:**

**Practical No.**

7

**Aim : Automate the process to extract data from an excel file into a data table and vice versa****Steps:**

1. Create a new sequence.
2. Create a excel file and keep the file empty
3. Drag and drop Excel application scope from the activities panel
4. In the application scope, browse the excel file in the system and add the path of the file.
5. Drag and drop Build data table activity and add a datatable and click on create option
6. On the right side of the page, right click on the output option and create a variable "mytable"
7. In the DO panel of the excel application scope, Drag and drop append range / write range activity.
8. It will automatically take the sheet as "Sheet1" and cell as "A1" as the initial point if you use write range.
9. It will also give a text box to enter the data you wish to write in the excel file. Add the variable name as mytable.
10. Run the automation and check the output.



**Practical No.**

**Output:** This automation will write the data of the data table in the excel file and append the data the number of times you run the automation.

**8**

**Aim : Create an application automating the read, write and append operation on excel file.**

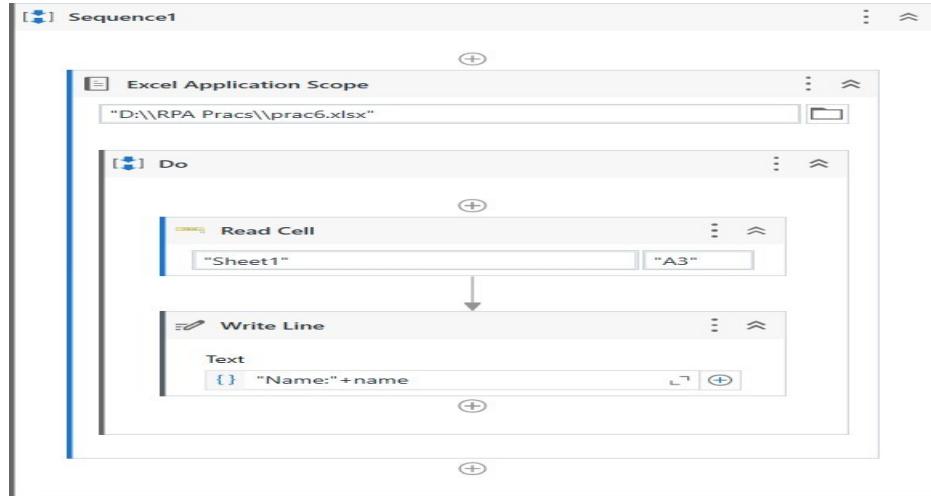
**Steps:**

1. Create a new sequence.
2. Create a excel file and add 2 columns of data

	A	B
1	fname	roll
2	abcd	1234
3	xyzw	5678
4	abcd	1234
5		

3. Drag and drop Excel application scope from the activities panel

4. In the application scope, browse the excel file in the system and add the path of the file.
5. In the DO panel of the excel application scope, Drag and drop read cell activity.
6. It will automatically take the sheet as “Sheet1” and cell as “A1” as the initial point .
7. Right click on the “Sheet1” and select create variable and add a variable as name and add any cell number you want to print.
8. Drag and drop a Writeline activity and add : “Name:”+name
9. Run the automation and check the output.

**Practical No.**

**Output:** The system will print the data available in cell A3

```
⌚ Debug started for file: Sequence1
⌚ record2 execution started
⌚ Name:xyzw
⌚ record2 execution ended in: 00:00:00
```

9

**Aim : Automate the process of taking screenshots in UiPath.**

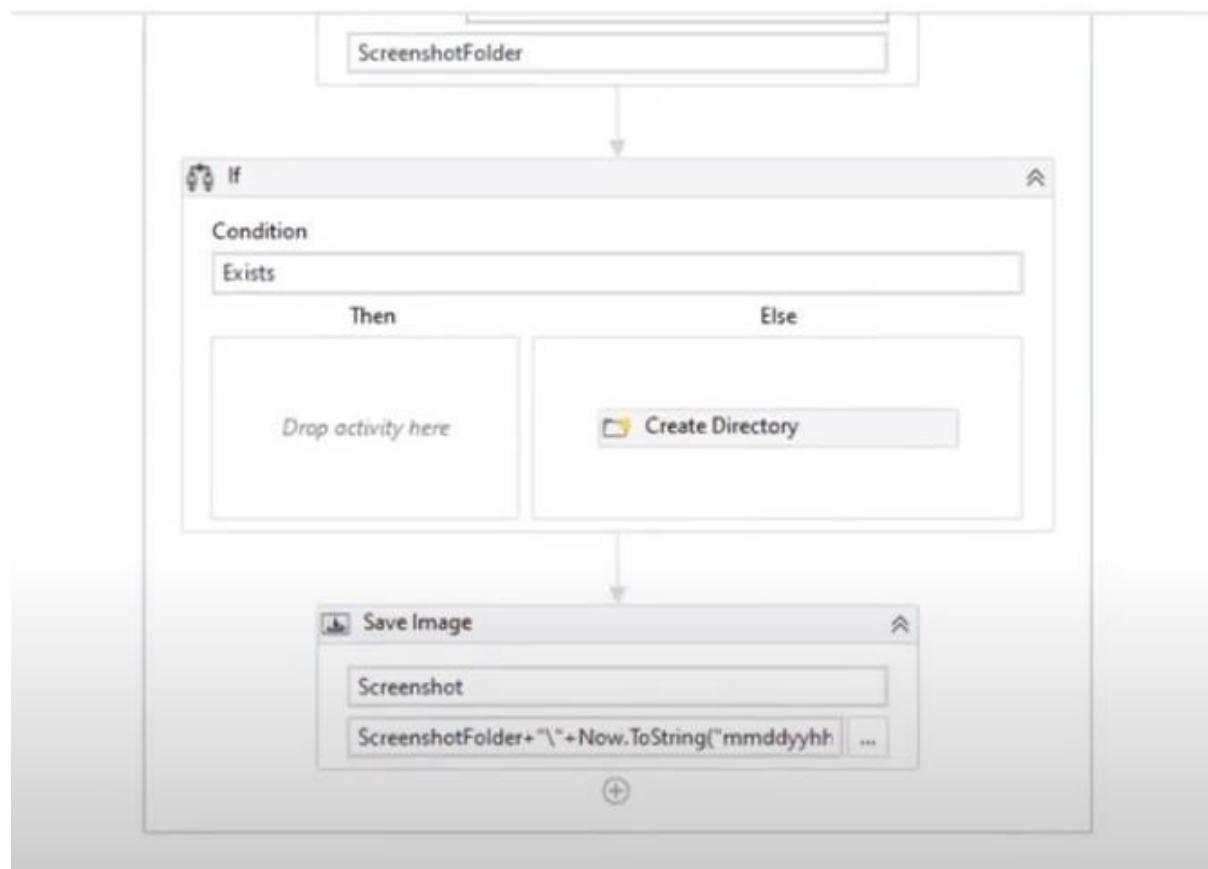
**Steps:**

1. Create a new sequence.
2. Determine the specific point or event in your workflow where you want to capture a screenshot. This could be after a particular action, when an error occurs, or any other relevant moment.
3. Add the "Take Screenshot" Activity

**Practical No.**

4. Set the Selector Property: Define the screen region or UI element you want to capture. You can interactively select it using the "Indicate on Screen" feature or manually enter the selector using the Selector Editor
5. Set the OutputImage Property: Create a variable of type System.Drawing.Bitmap to store the captured screenshot. This variable will hold the screenshot image.
6. If you want to save the screenshot as an image file, use the "Save Image" activity. Configure it to save the screenshot to a specific file path.
7. Save and Run the Project

**Output:**



**Aim : Demonstrate the following events in UiPath:**

**i. Element triggering event**

**ii. Image triggering event**

1. Open Studio and create a new **Process** named by default **Main**.
2. Drag a **Sequence** container in the **Workflow Designer**.
3. Create the following variable:

Variable Name	Variable Type
ContinueMonitor	Boolean

4. Drag a **Log Message** activity inside the **Sequence** container.
  - o In the **Properties** panel, select the **Level** option from the **Message** drop-down list.
  - o Add the expression "Start monitoring..." in the **Message** field.
5. Add an **Assign** activity under the **Log Message** activity.
  - o In the **Properties** panel, add the variable ContinueMonitor in the **To** field.
  - o Add the condition **True** in the **Value** field.
6. Place a **Monitor Events** activity below the **Assign** activity.
  - o In the **Properties** panel, add the value ContinueMonitor in the **RepeatForever** field.
7. Drag a **Hotkey Trigger** activity inside the **Monitor Events** activity. This activity opens the **Calculator** app from **Windows**.
  - o Select the checkboxes for the **Alt** and **Shift** options.
  - o In the **Key** field, type the letter **c**.
  - o In the **Properties** panel, select the option **EVENT\_BLOCK** from the **EventMode** drop-down list.
8. Drag another **Hotkey Trigger** activity and place it next to the previous **Hotkey Trigger** activity. This activity opens a new browser tab and searches on Google the text previously selected by the user.
  - o Select the checkboxes for the **Alt** and **Shift** options.
  - o In the **Key** field, type the letter **g**.
  - o In the **Properties** panel, select the option **EVENT\_BLOCK** from the **EventMode** drop-down list.
9. Drag another **Hotkey Trigger** activity and place it next to the previous **Hotkey Trigger** activity. This activity stops monitoring the events.
  - o Select the check boxes for the **Alt** and **Shift** options.
  - o In the **Key** field, type the letter **s**.
  - o In the **Properties** panel, select the option **EVENT\_BLOCK** from the **EventMode** drop-down list.
10. Add a new **Sequence** container and place it below the **Hotkey Trigger** activity.
  - In the **Properties** panel, add the name **Event Handler** in the **DisplayName** field.
  - Create the following variable:

### Practical No.

Variable Name	Variable Type
TriggerHotkey	UiPath.Core.EventInfo
ContinueMonitor	Boolean

11. Drag a **Log Message** activity inside the **Event Handler**.
- In the **Properties** panel, select the **Info** option from the **Level** drop-down list.
  - Add the expression "Event triggered" in the **Message** field.
12. Drag a **Get Event Info** activity below the **Log Message** activity.
- In the **Properties** panel, add the variable TriggerHotkey in the **Result** field.
  - Select the **UiPath.Core.EventInfo** option from the **TypeArgument** drop-down list.
13. Place a **Switch** activity below the **Get Event Info** activity. All **Hotkey Triggers** are described inside this activity and treated as cases.
- In the **Properties** panel, add the value TriggerHotkey.KeyEventInfo.KeyName.ToLower in the **Expression** field.
  - Select the **String** option from the **TypeArgument** drop-down list.
14. Click the **Add new case** button from the **Switch** activity.
- Add the value c in the **Case value** field.
15. Place an **Open Application** activity and place it inside the **Case c** container. This represents the first **Hotkey Trigger** case that opens the **Calculator** app.
- In the **Properties** panel, add the expression "calc.exe" in the **Arguments** field.
  - Add the expression "<wnd app='applicationframehost.exe' title='Calculator' />" in the **Selector** field.
16. Click the **Add new case** button from the **Switch** activity.
- Add the value g in the **Case value** field.
17. Drag a **Sequence** container and place it inside the **Case g** container. This represents the second **Hotkey Trigger** case that initiates a Google search for the previously selected text.
- In the **Properties** panel, add the name Google selected text in the **DisplayName** field.
  - Create the following variable:

Variable Name	Variable Type

TextToSearch

**GenericValue**

18. Drag a **Delay** activity and place it inside the **Google selected text** sequence.

- In the **Properties** panel, add the value 00:00:00.5000000 in the **Duration** field.

19. Add a **Copy Selected Text** activity below the **Delay** activity.

- In the **Properties** panel, add the value True in the **ContinueOnError** field.
- Add the variable **TextToSearch** in the **Result** field.
- Add the value 2000 in the **Timeout (milliseconds)** field.

20. Drag an **If** activity under the **Copy Selected Text** activity.

- In the **Properties** panel, add the expression **TextToSearch IsNot Nothing** in the **Condition** field.

21. Place an **Open Browser** activity inside the **Then** box.

- In the **Properties** panel, select the **IE** option from the **BrowserType** drop-down list.
- Add the expression "www.google.com" in the **Url** field.
- Select the checkbox for the **NewSession** option. This starts a new session in the selected browser.

22. Place a **Type Into** activity inside the **Do** sequence.

- In the **Properties** panel, select the **Target** option from the **Target** drop-down list.
- Add the expression "<webctrl tag='INPUT' aaname='Search' />" in the **Selector** field.
- Select the **INTERACTIVE** option from the **WaitForReady** drop-down list.
- Add the variable **TextToSearch** in the **Text** field.
- Select the checkbox for the **Activate** option. This option brings the UI element to the foreground and activates it before the text is written.
- Select the checkbox for the **SimulateType** option. This option simulates the type using the technology of the target application.

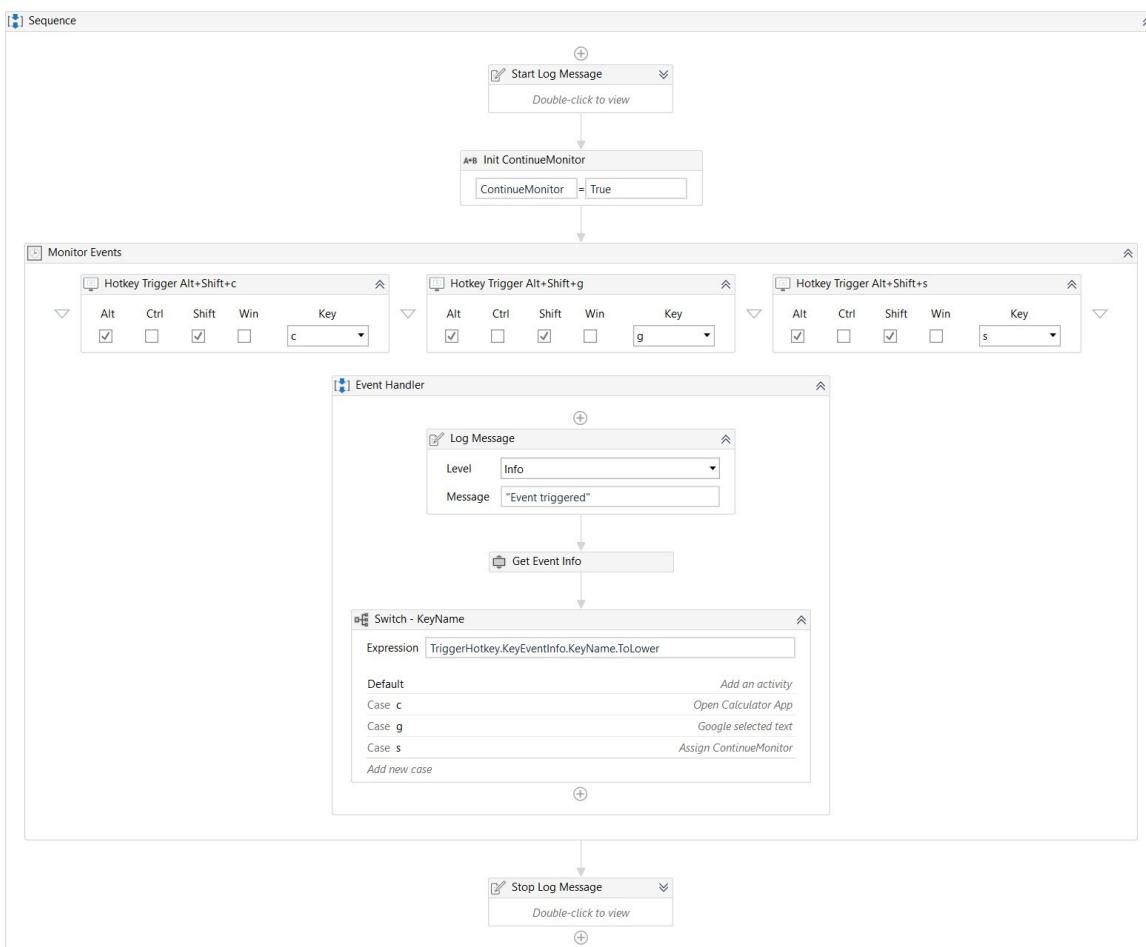
23. Drag a **Send Hotkey** application below the **Type Into** activity.

- In the **Properties** panel, add the expression "enter" in the **Key** field.
- Select the **Target** option from the **Target** drop-down list.
- Add the expression "<webctrl tag='INPUT' aaname='Search' />" in the **Selector** field.
- Select the **INTERACTIVE** option from the **WaitForReady** drop-down list.
- Select the checkbox for the **Activate** option. This option brings the UI element to the foreground and activates it before the text is written.
- Select the **None** option from the **KeyModifiers** drop-down list.
- Select the checkbox for the **SpecialKey** option. This option indicates if the use of a special key in the keyboard shortcut.

24. Drag a **Message Box** activity in the **Else** container.

- In the **Properties** panel, select the **Ok** button from the **Buttons** drop-down list.
- Add the expression "Text could not be copied. Please try again." in the **Text** field.
- Select the checkbox for the **TopMost** option. This option always brings the message box to the foreground.

25. Click the **Add new case** button from the **Switch** activity.
- Add the value s in the **Case value** field.
26. Drag an **Assign** activity inside the **Case s** container. This represents the third **Hotkey Trigger** case that stops monitoring the events.
- Add the variable ContinueMonitor in the **To** field.
  - Add the condition False in the **Value** field.
27. Place a **Log Message** activity below the **Monitor Events** activity.
- In the **Properties** panel, select the **Info** option from the **Level** drop-down field.
  - Add the expression "Stop monitoring.." in the **Message** field.



### Practical No. 11

**Aim :** Consider an array of names. We have to find out how many of them start with the letter "a". Create an automation where the number of names starting with "a" is counted and the result is displayed.

**Steps:**

1. Create a new sequence.
2. Drag and drop multiple assign activity
3. Create a string array and add the names you wish to add  
Names=New String[5]{“Aman”, “Ajay”, “Omkar”, “Ashish”, “Tejas”}
4. Once the array is created, go to the variable tab and change the data type of the array to Array of [T] and select the datatype as string.
5. Once array is created, create a new variable i=0 for iteration and count=0 and select the datatype as Int32 for both the variables.
6. Once done, Drag and drop a while activity from activities panel.
7. Add condition as  $i < 5$
8. In the body panel of the while activity, drag and drop an if activity
9. Add the following condition in the if activity:  
Names[i].StartsWith(“A”)
10. Drag and drop an assign activity in the “then” panel of the if activity and add  
Count=count+1(This will increase the counter by 1 if the condition is true)
11. After the else panel in the if activity, drag and drop an assign activity and add  $i=i+1$
12. Outside the while loop in the main sequence, drag and drop writeline activity and add:  
Count.ToString().
13. Run the automation and check the output.

## Output:

