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# Novel Efficient Approach to Connect Raspberry Pi with Laptop

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**Abstract: Earlier scientist focus was in harnessing the benefits available in Raspberry pi in order to make any design that is fully controlled by the raspberry pi. There was no any focus on connection between raspberry pi and computer of developer. Our current work is an effort to fill that research gap. Raspberry Pi is the most convenient and efficient method nowadays to do any task .It is the smartest way to connect and interface. Image processing is one of main task done by this small device. As this device is very small it would be an excellent hacking tool.**

**Keyword: Laptop, Raspberry PI, Hardware Hardware Interface, Card Size Computer, Integrated Circuits**

## 1. Introduction

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouses with infra-red cameras. Connecting this device with a tv screen will not be that compatible as compared to laptop and it can be used anywhere. In below section, we will describe steps how to connect it with your laptop. First of all we need to install some operating system in our raspberry pi 2. It is recommended to use raspbian . To download this operating system go to raspberry site [4] then you have to select raspbian. In addition to this we need to download some basic softwares Win32 Disk Imager [5], SD Formatter for Windows [6] and 7 zip [7]. In [8], scientist were harnessing the benefits available in Raspberry pi in order to make a robot vehicle that is fully controlled by the raspberry pi. After downloading all these softwares we have to follow these steps:

1.Insert memory card to computer.

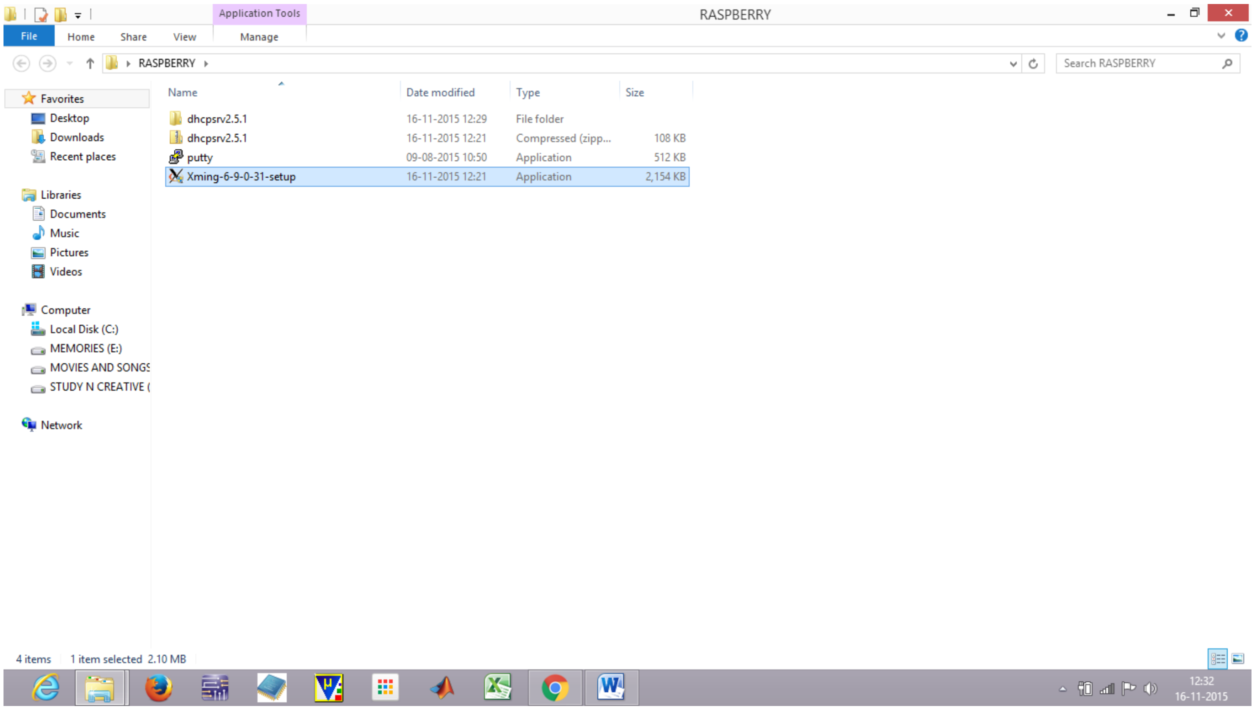
2.Now open sd formatter software , select memory card drive and then click on options> FORMAT TYPE: FULL(erase) and FORMAT SIZE ADJUSTMENT:ON> OK>FORMAT.

3.Now click on downloaded raspbian file and extract it using 7zip. After extracting we will notice a disc image file of 4.Raspbian-. Then open Win32 Disk Imager > select formed disc image > click write. Wait for processing and after its done with 100% you will see a command of write successful. Your raspberry pi has been successfully booted with raspbian.

### How to connect raspberry pi 2 with laptop ?

Now you need to download some basic softwares e.g. Putty [2], Xming [3], and DHCP server [1],

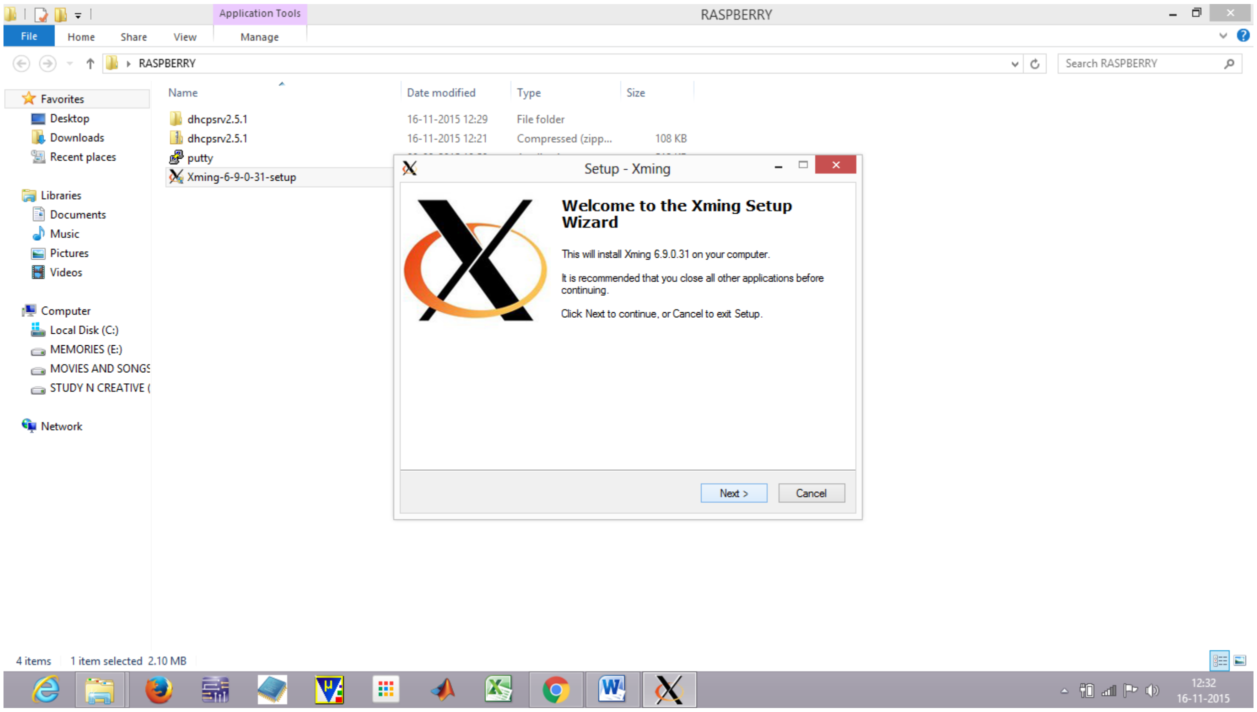
## 2. Novel Methodology Shown as Step By Step Implementation


Application Tools
RASPBERRY
File
Home
Share
View
Manage
RASPBERRY
Search RASPBERRY
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
4 items
1 item selected 2.10 MB
12:32
16-11-2015

| Name | Date modified | Type | Size |
|---|---|---|---|
| dhcpsrv2.5.1 | 16-11-2015 12:29 | File folder | |
| dhcpsrv2.5.1 | 16-11-2015 12:21 | Compressed (zipp... | 108 KB |
| putty | 09-08-2015 10:50 | Application | 512 KB |
| Xming-6-9-0-31-setup | 16-11-2015 12:21 | Application | 2,154 KB |

Figure 1: Setup Location of Software that need to be Install

Figure 1 show the location of software and Figure 2-3 deals with the steps related to setup of software. After installing all softwares, we will perform given steps:


Application Tools
RASPBERRY
File
Home
Share
View
Manage
RASPBERRY
Search RASPBERRY
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
4 items
1 item selected 2.10 MB
Setup - Xming
Next >
Cancel
12:32
16-11-2015

| Name | Date modified | Type | Size |
|---|---|---|---|
| dhcpsrv2.5.1 | 16-11-2015 12:29 | File folder | |
| dhcpsrv2.5.1 | 16-11-2015 12:21 | Compressed (zipp... | 108 KB |
| putty | | | |
| Xming-6-9-0-31-setup | | | |

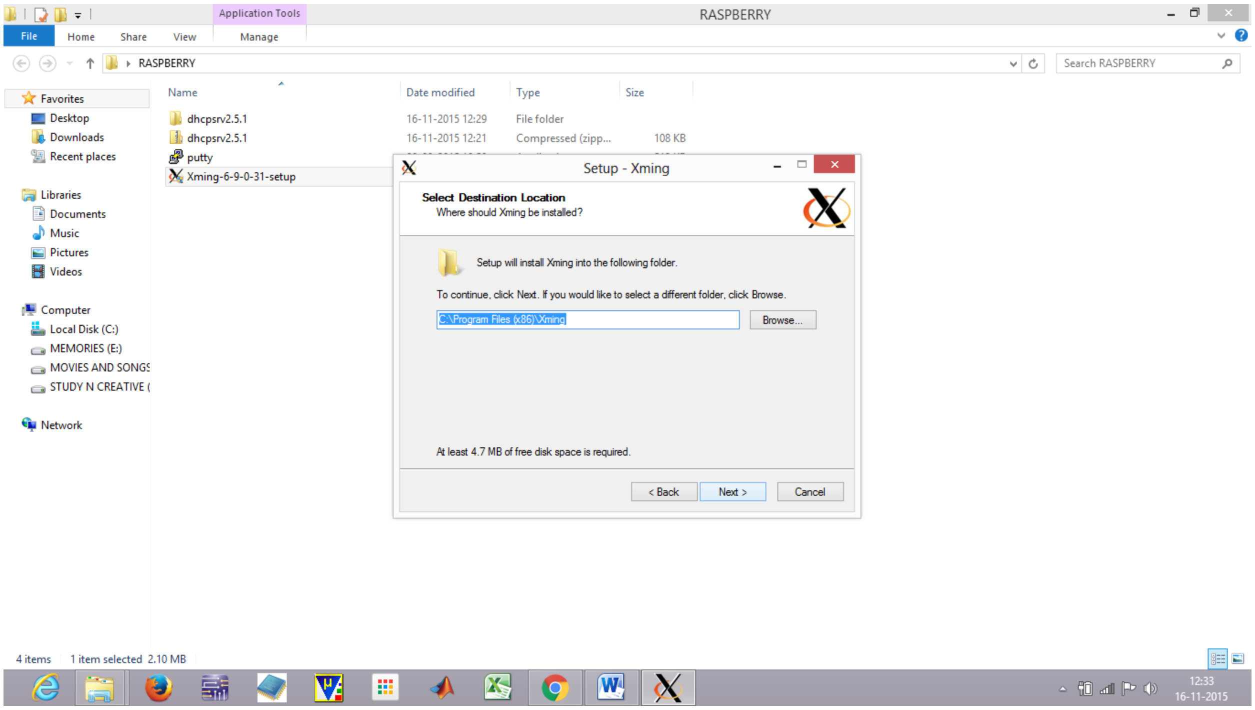
**Welcome to the Xming Setup Wizard**

This will install Xming 6.9.0.31 on your computer.

It is recommended that you close all other applications before continuing.

Click Next to continue, or Cancel to exit Setup.

Figure 2: Initial screen of Xming Setup Wizard


Application Tools
RASPBERRY
File
Home
Share
View
Manage
RASPBERRY
Search RASPBERRY
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
4 items
1 item selected 2.10 MB
Setup - Xming
Browse...
< Back
Next >
Cancel
12:33
16-11-2015

| Name | Date modified | Type | Size |
|---|---|---|---|
| dhcpsrv2.5.1 | 16-11-2015 12:29 | File folder | |
| dhcpsrv2.5.1 | 16-11-2015 12:21 | Compressed (zipp... | 108 KB |
| putty | | | |
| Xming-6-9-0-31-setup | | | |

**Select Destination Location**

Where should Xming be installed?

Setup will install Xming into the following folder.

To continue, click Next. If you would like to select a different folder, click Browse.

C:\Program Files (x86)\Xming

At least 4.7 MB of free disk space is required.

Figure 3: Destination Location of Xming.

STEP 1.Double click on Xlaunch so that it is minimized to tray.

STEP 2.Then go to Network and Settings

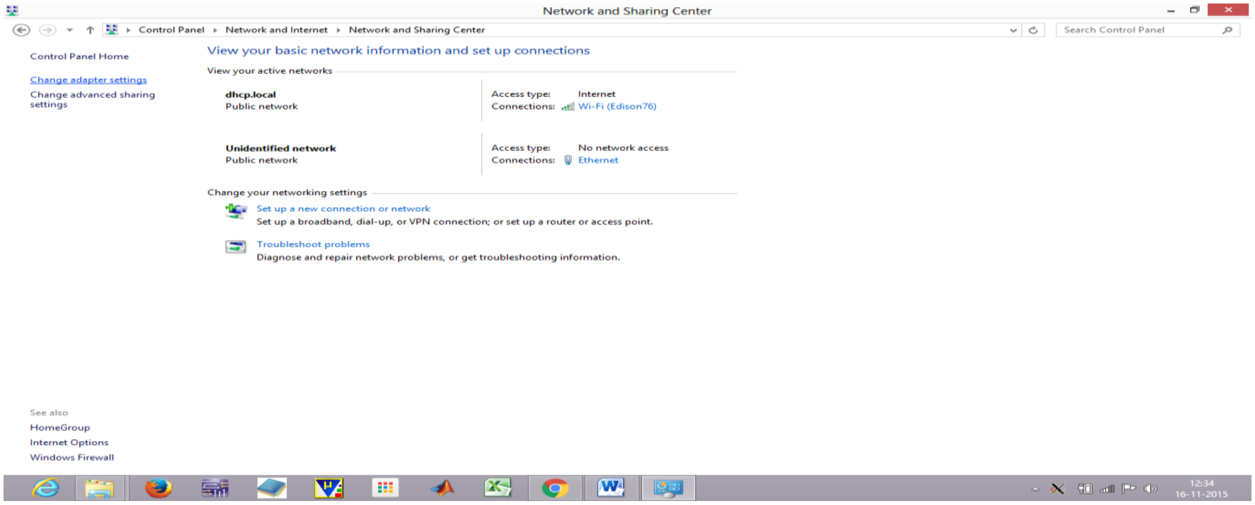

Network and Sharing Center
Control Panel ▸ Network and Internet ▸ Network and Sharing Center
Search Control Panel
Control Panel Home
Change adapter settings
Change advanced sharing settings
View your basic network information and set up connections
View your active networks
dhcp.local
Public network
Access type: Internet
Connections: Wi-Fi (Edison76)
Unidentified network
Public network
Access type: No network access
Connections: Ethernet
Change your networking settings
Set up a new connection or network
Set up a broadband, dial-up, or VPN connection; or set up a router or access point.
Troubleshoot problems
Diagnose and repair network problems, or get troubleshooting information.
See also
HomeGroup
Internet Options
Windows Firewall
12:34
16-11-2015

Figure 4: Changing ADAPTER settings

Figure 4 deals with how we can change adapter settings by right click on local area network or going to Ethernet and then to properties.

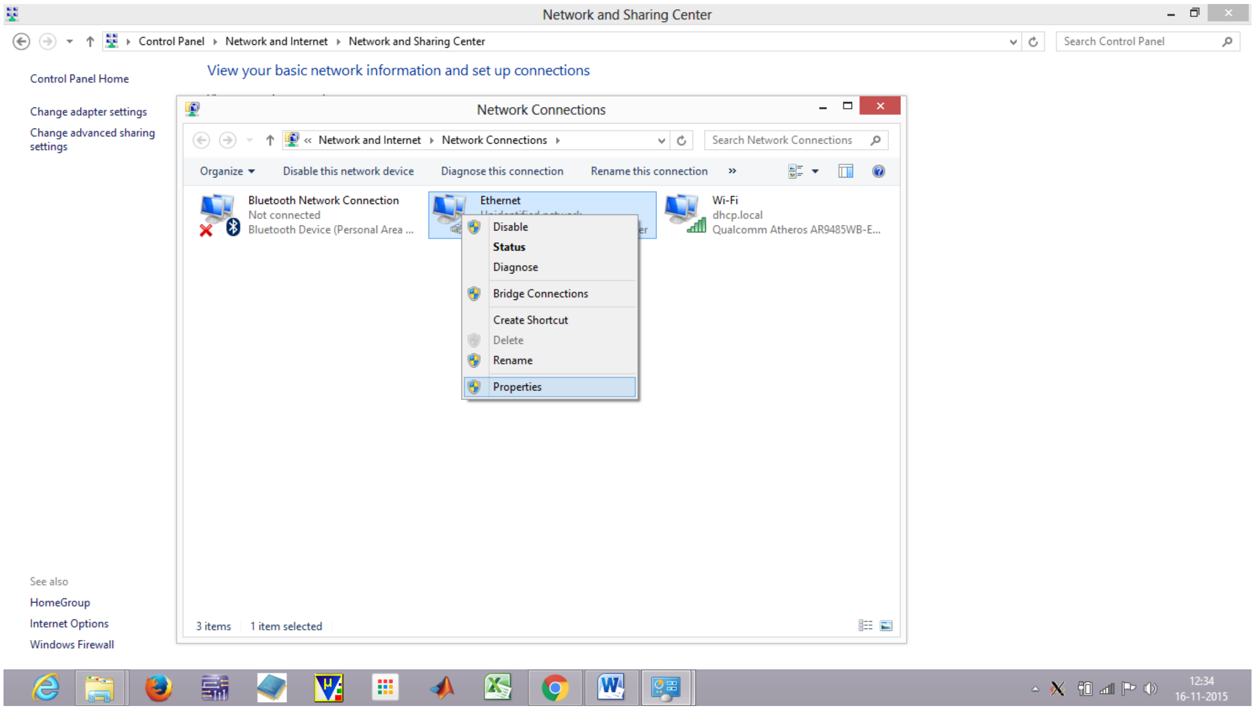
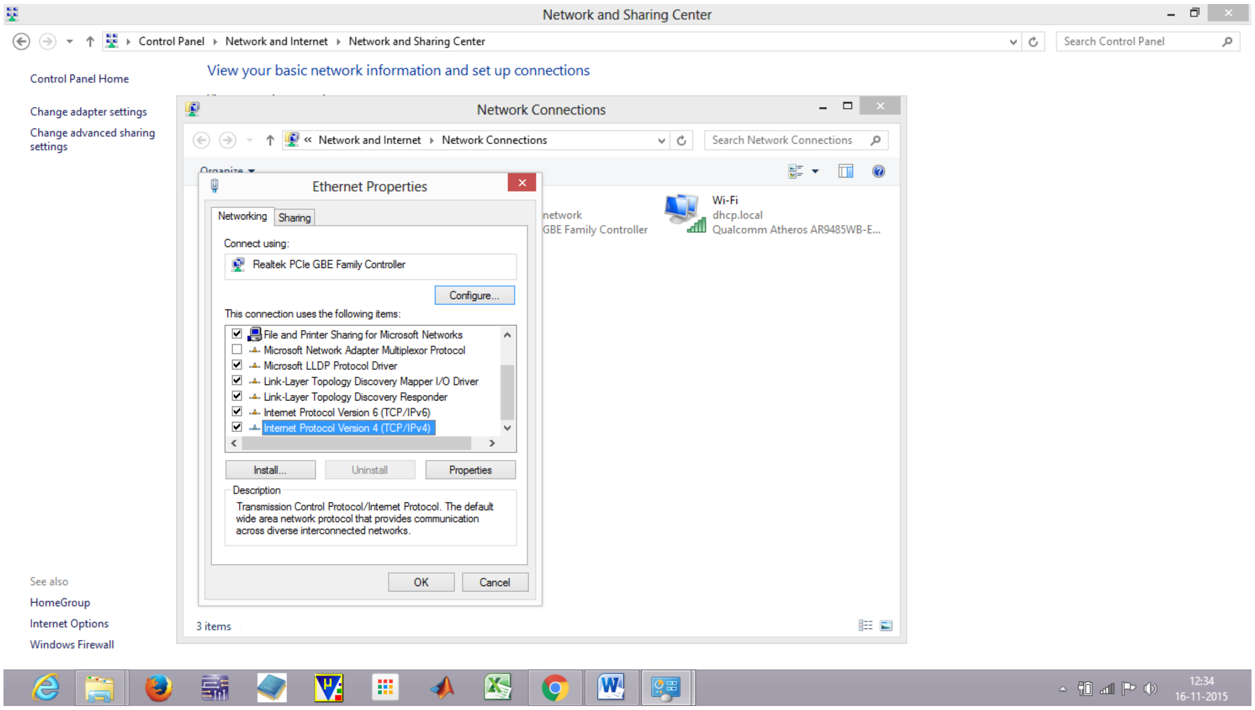

Network and Sharing Center
Control Panel ▸ Network and Internet ▸ Network and Sharing Center
Search Control Panel
Control Panel Home
Change adapter settings
Change advanced sharing settings
View your basic network information and set up connections
Network Connections
« Network and Internet ▸ Network Connections ▸
Search Network Connections
Organize
Disable this network device
Diagnose this connection
Rename this connection
»
Bluetooth Network Connection
Not connected
Bluetooth Device (Personal Area ...
Ethernet
Wi-Fi
dhcp.local
Qualcomm Atheros AR9485WB-E...
Disable
Status
Diagnose
Bridge Connections
Create Shortcut
Delete
Rename
Properties
3 items
1 item selected
See also
HomeGroup
Internet Options
Windows Firewall
12:34
16-11-2015

Figure 5: Changing ETHERNET properties.

Click on IPv4>


Network and Sharing Center
Control Panel › Network and Internet › Network and Sharing Center
Search Control Panel
Control Panel Home
Change adapter settings
Change advanced sharing settings
View your basic network information and set up connections
Network Connections
« Network and Internet › Network Connections
Search Network Connections
Organize
See also
HomeGroup
Internet Options
Windows Firewall
3 items
Wi-Fi
dhcp.local
Qualcomm Atheros AR9485WB-E...
network
GBE Family Controller
Ethernet Properties
Networking
Sharing
Configure...
Install...
Uninstall
Properties
OK
Cancel
12:34
16-11-2015

Connect using:
Realtek PCIe GBE Family Controller

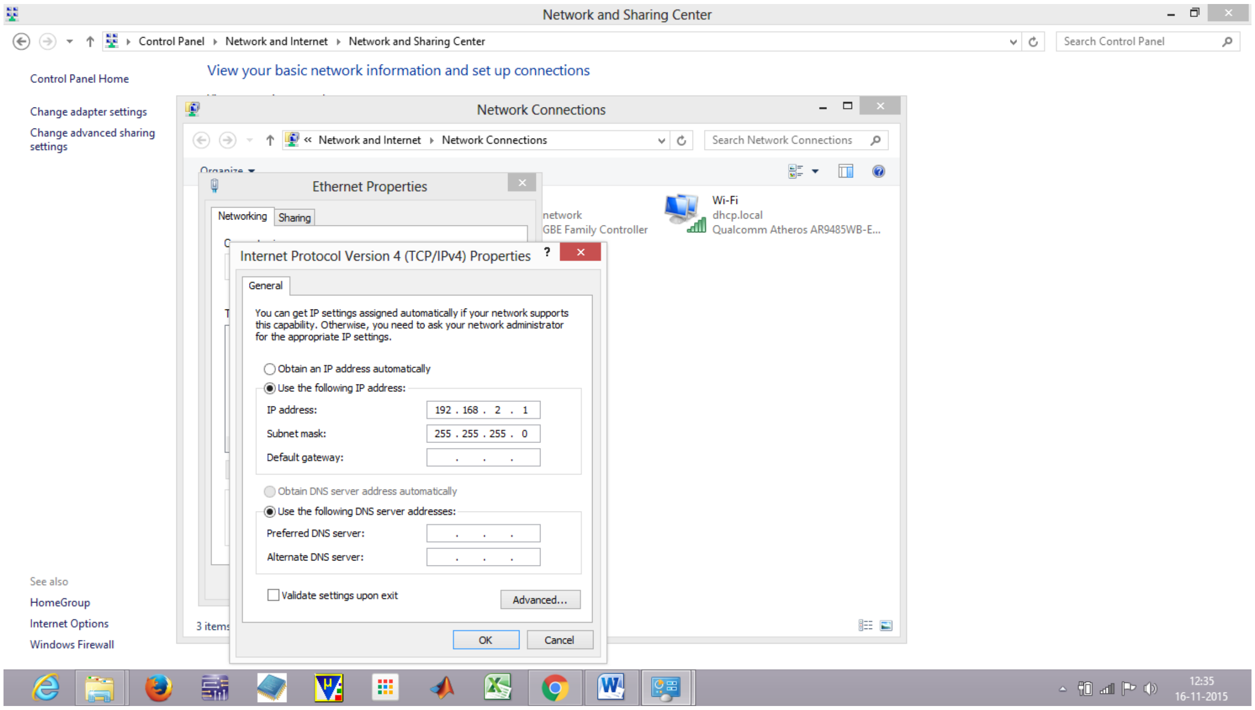
This connection uses the following items:

☑ File and Printer Sharing for Microsoft Networks
☐ Microsoft Network Adapter Multiplexor Protocol
☑ Microsoft LLDP Protocol Driver
☑ Link-Layer Topology Discovery Mapper I/O Driver
☑ Link-Layer Topology Discovery Responder
☑ Internet Protocol Version 6 (TCP/IPv6)
☑ Internet Protocol Version 4 (TCP/IPv4)

Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

Figure 6: Changing IPv4 setting

<properties>assign ip address as 192.168.2.1>then click on subnet mask you will notice subnet mask will appear automatically>then click ok.


Network and Sharing Center
Control Panel › Network and Internet › Network and Sharing Center
Search Control Panel
Control Panel Home
Change adapter settings
Change advanced sharing settings
View your basic network information and set up connections
Network Connections
« Network and Internet › Network Connections
Search Network Connections
Organize
See also
HomeGroup
Internet Options
Windows Firewall
3 items
Wi-Fi
dhcp.local
Qualcomm Atheros AR9485WB-E...
network
GBE Family Controller
Ethernet Properties
Networking
Sharing
Internet Protocol Version 4 (TCP/IPv4) Properties
General
Advanced...
OK
Cancel
12:35
16-11-2015

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:
IP address: 192 . 168 . 2 . 1
Subnet mask: 255 . 255 . 255 . 0
Default gateway: . . .

○ Obtain DNS server address automatically
● Use the following DNS server addresses:
Preferred DNS server: . . .
Alternate DNS server: . . .

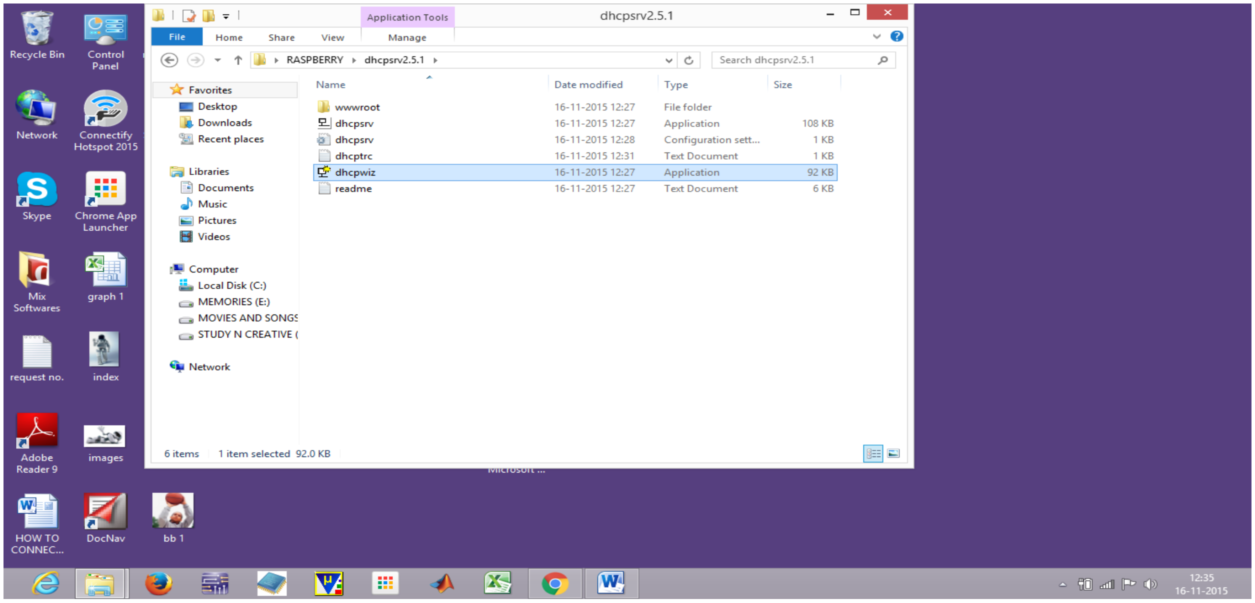
☐ Validate settings upon exit

Figure 7: Assigning IP address.

STEP 3. Now open DHCP SERVER(dhcpwiz) and follow these steps:

Open DHCP folder

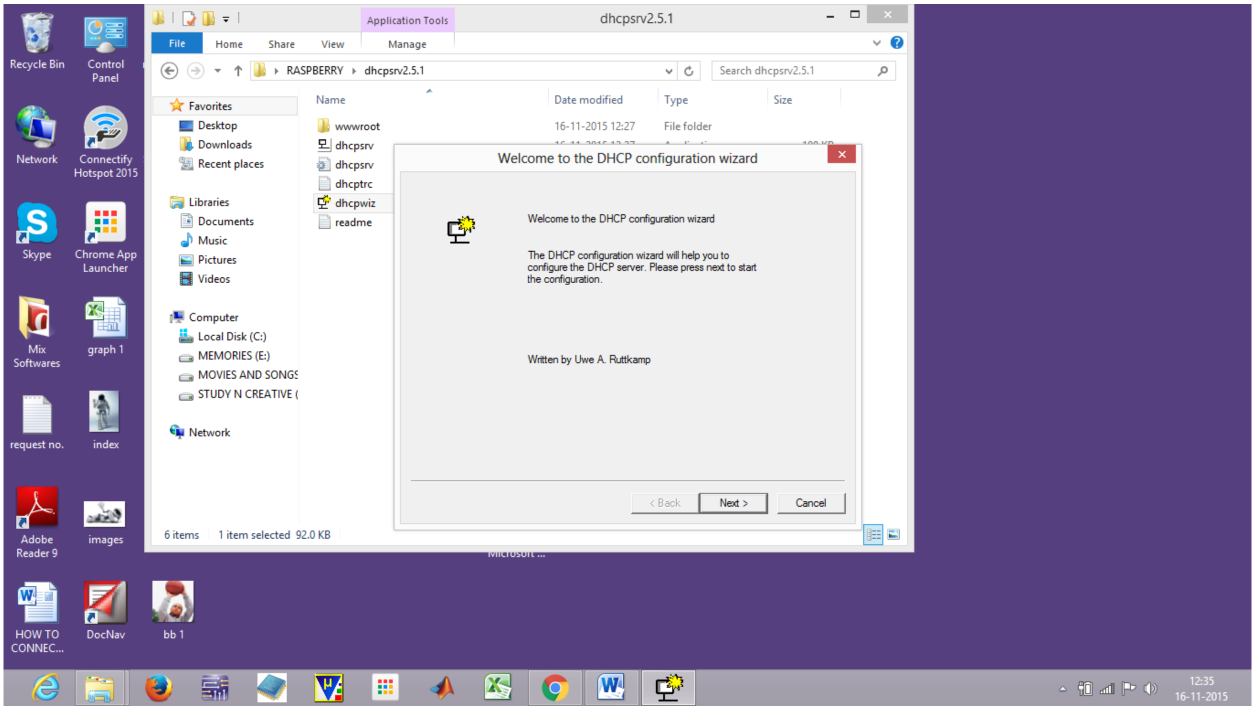
>click on dhcpwiz application


dhcpsrv2.5.1
Application Tools
File
Home
Share
View
Manage
RASPBERRY
dhcpsrv2.5.1
Search dhcpsrv2.5.1
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
6 items
1 item selected 92.0 KB
Recycle Bin
Control Panel
Network
Connectify Hotspot 2015
Skype
Chrome App Launcher
Mix Softwares
graph 1
request no.
index
Adobe Reader 9
images
HOW TO CONNEC...
DocNav
bb 1
12:35
16-11-2015

| Name | Date modified | Type | Size |
|---|---|---|---|
| wwwroot | 16-11-2015 12:27 | File folder | |
| dhcpsrv | 16-11-2015 12:27 | Application | 108 KB |
| dhcpsrv | 16-11-2015 12:28 | Configuration sett... | 1 KB |
| dhcptrc | 16-11-2015 12:31 | Text Document | 1 KB |
| dhcpwiz | 16-11-2015 12:27 | Application | 92 KB |
| readme | 16-11-2015 12:27 | Text Document | 6 KB |

Figure 8: Opening dhcpwiz folder.

This will appear after clicking on dhcpwiz:


dhcpsrv2.5.1
Application Tools
File
Home
Share
View
Manage
RASPBERRY
dhcpsrv2.5.1
Search dhcpsrv2.5.1
Name
Date modified
Type
Size
wwwroot
dhcpsrv
dhcpsrv
dhcptrc
dhcpwiz
readme
16-11-2015 12:27
File folder
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
6 items
1 item selected 92.0 KB
< Back
Next >
Cancel
12:35
16-11-2015

Welcome to the DHCP configuration wizard

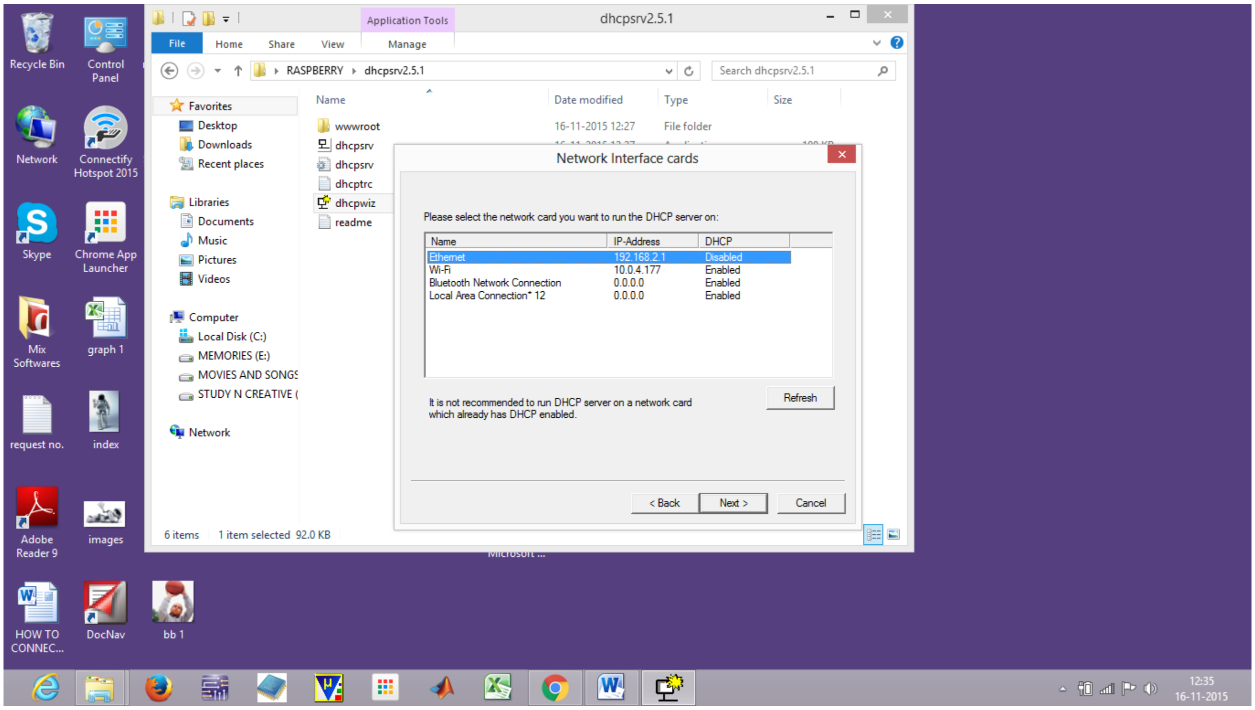
Welcome to the DHCP configuration wizard

The DHCP configuration wizard will help you to configure the DHCP server. Please press next to start the configuration.

Written by Uwe A. Ruttkamp

Figure 9: Dhcpwiz initializing screen.

> select local area network or Ethernet >


dhcpsrv2.5.1
Application Tools
File
Home
Share
View
Manage
RASPBERRY › dhcpsrv2.5.1
Search dhcpsrv2.5.1
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
Name
Date modified
Type
Size
wwwroot
dhcpsrv
dhcpsrv
dhcptrc
dhcpwiz
readme
16-11-2015 12:27
File folder
6 items
1 item selected 92.0 KB
Recycle Bin
Control Panel
Network
Connectify Hotspot 2015
Skype
Chrome App Launcher
Mix Softwares
graph 1
request no.
index
Adobe Reader 9
images
HOW TO CONNEC...
DocNav
bb 1
12:35
16-11-2015

Network Interface cards

Please select the network card you want to run the DHCP server on:

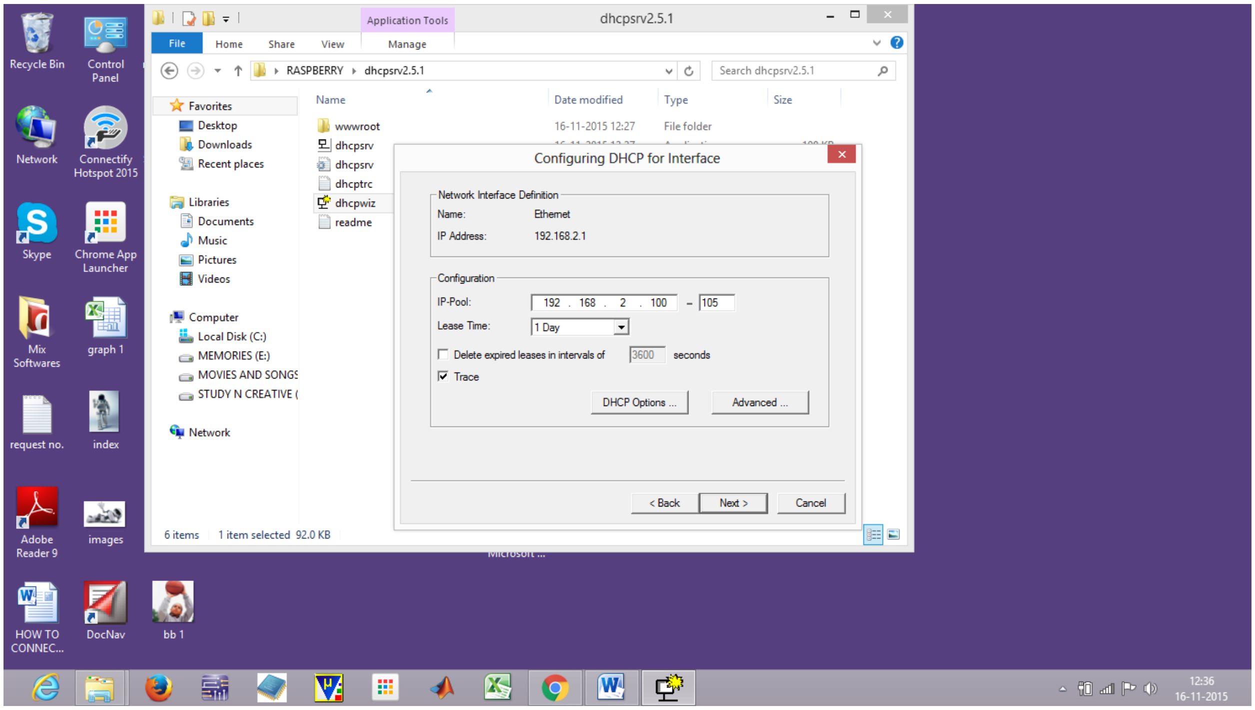
| Name | IP-Address | DHCP |
|---|---|---|
| Ethernet | 192.168.2.1 | Disabled |
| Wi-Fi | 10.0.4.177 | Enabled |
| Bluetooth Network Connection | 0.0.0.0 | Enabled |
| Local Area Connection* 12 | 0.0.0.0 | Enabled |

It is not recommended to run DHCP server on a network card which already has DHCP enabled.

Refresh
< Back
Next >
Cancel

Figure 10: Selecting ETHERNET in dhcpwiz.

Then press next > again next > Now on IP-Root assign 192.168.2.100 – 105 > then next >


dhcpsrv2.5.1
Application Tools
File
Home
Share
View
Manage
RASPBERRY › dhcpsrv2.5.1
Search dhcpsrv2.5.1
Favorites
Desktop
Downloads
Recent places
Libraries
Documents
Music
Pictures
Videos
Computer
Local Disk (C:)
MEMORIES (E:)
MOVIES AND SONGS
STUDY N CREATIVE (
Network
Name
Date modified
Type
Size
wwwroot
dhcpsrv
dhcpsrv
dhcptrc
dhcpwiz
readme
16-11-2015 12:27
File folder
6 items
1 item selected 92.0 KB
Recycle Bin
Control Panel
Network
Connectify Hotspot 2015
Skype
Chrome App Launcher
Mix Softwares
graph 1
request no.
index
Adobe Reader 9
images
HOW TO CONNEC...
DocNav
bb 1
12:36
16-11-2015

Configuring DHCP for Interface

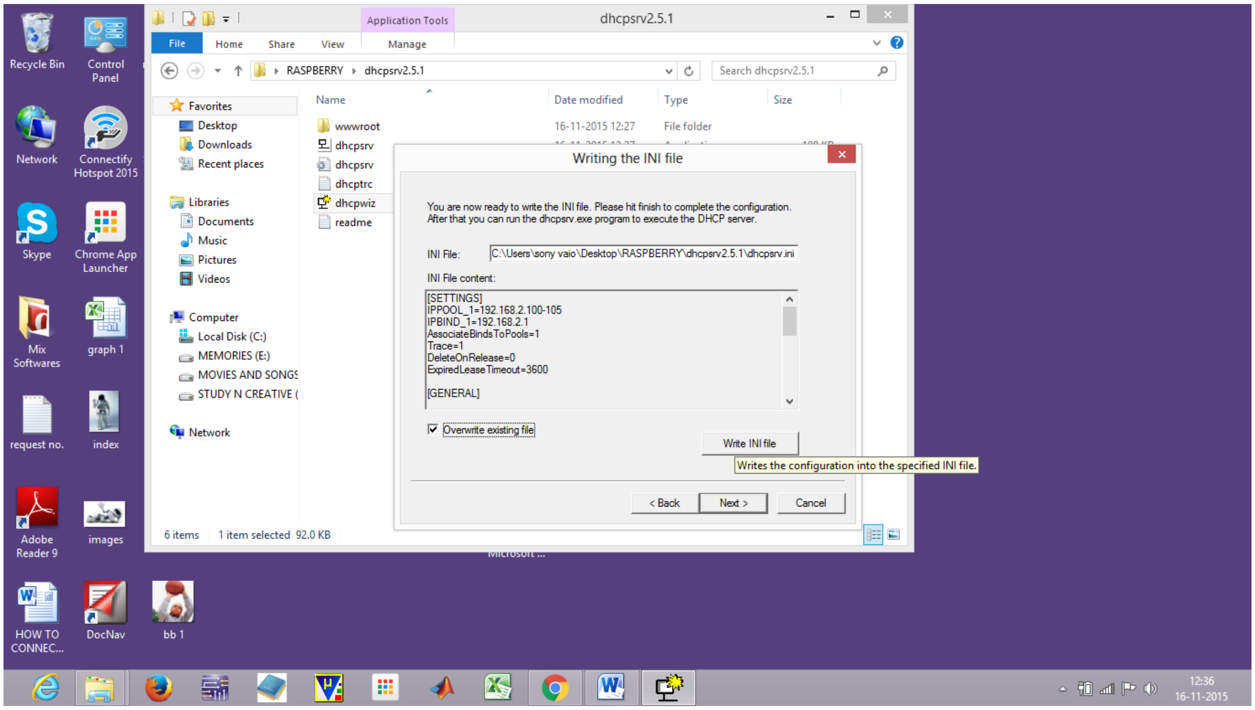
Network Interface Definition
Name: Ethernet
IP Address: 192.168.2.1

Configuration
IP-Pool: 192 . 168 . 2 . 100 – 105
Lease Time: 1 Day
☐ Delete expired leases in intervals of 3600 seconds
☑ Trace

DHCP Options ...
Advanced ...
< Back
Next >
Cancel

Figure 11: Assigning IP pool

mark overwrite existing file >



Writing the INI file

You are now ready to write the INI file. Please hit finish to complete the configuration.
After that you can run the dhcpsrv.exe program to execute the DHCP server.

INI File: C:\Users\sony vaio\Desktop\RASPBERRY\dhcpsrv2.5.1\dhcpsrv.ini

INI File content:

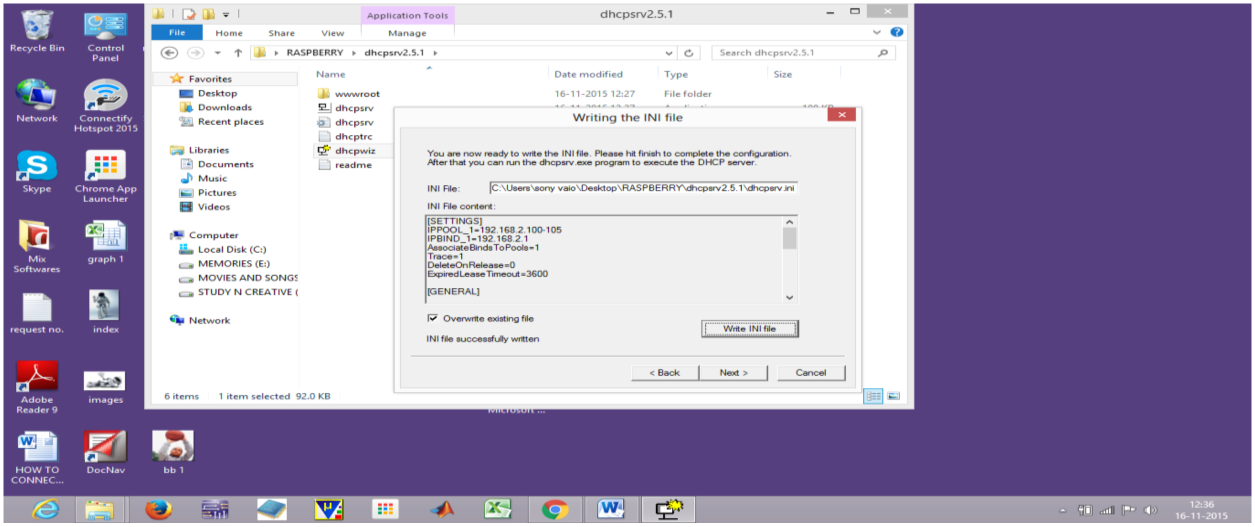
```
[SETTINGS]
IPPOOL_1=192.168.2.100-105
IPBIND_1=192.168.2.1
AssociateBindsToPools=1
Trace=1
DeleteOnRelease=0
ExpiredLeaseTimeout=3600

[GENERAL]
```

☑ Overwrite existing file

Writes the configuration into the specified INI file.

Figure 12: Writing INI file.

Then click write ini file > after you see write successful click next >



Writing the INI file

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INI File: C:\Users\sony vaio\Desktop\RASPBERRY\dhcpsrv2.5.1\dhcpsrv.ini

INI File content:

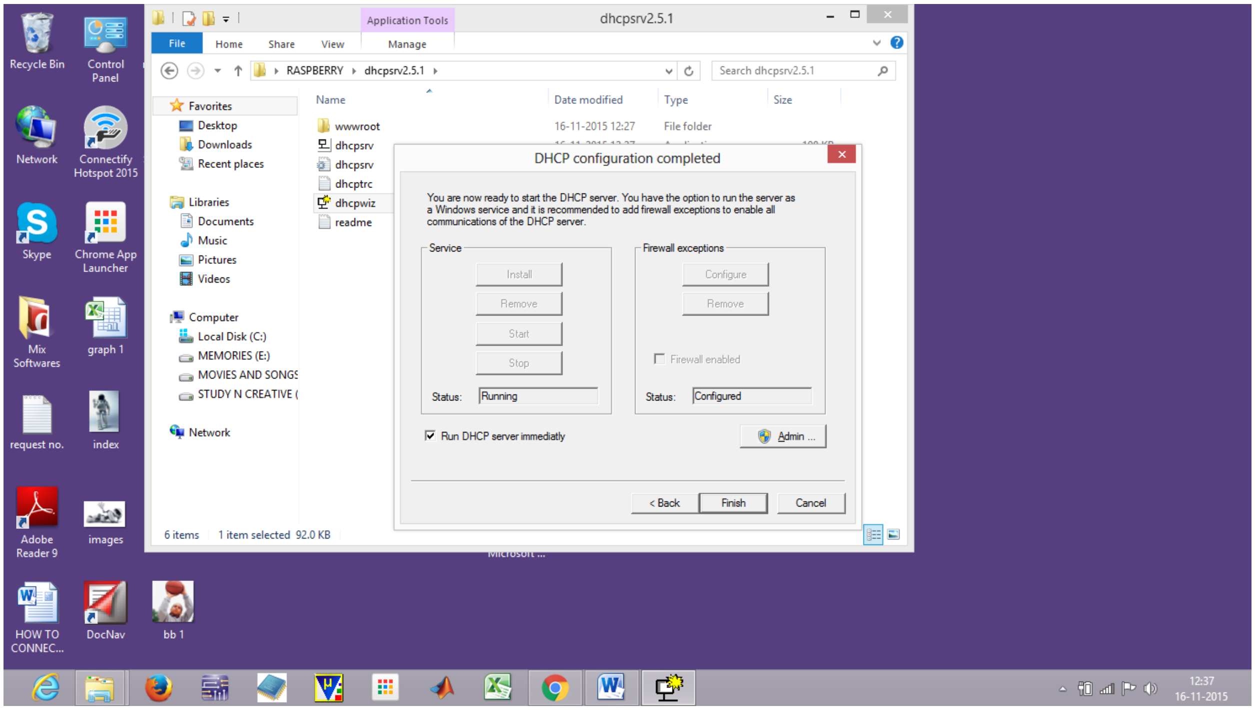
```
[SETTINGS]
IPPOOL_1=192.168.2.100-105
IPBIND_1=192.168.2.1
AssociateBindsToPools=1
Trace=1
DeleteOnRelease=0
ExpiredLeaseTimeout=3600

[GENERAL]
```

☑ Overwrite existing file

INI file successfully written

Figure 13: Overwriting INI file.

Now click on configure you will see Status as Running and Configured > mark on run DHCP server then click finish >



DHCP configuration completed

You are now ready to start the DHCP server. You have the option to run the server as a Windows service and it is recommended to add firewall exceptions to enable all communications of the DHCP server.

Service — Status: Running

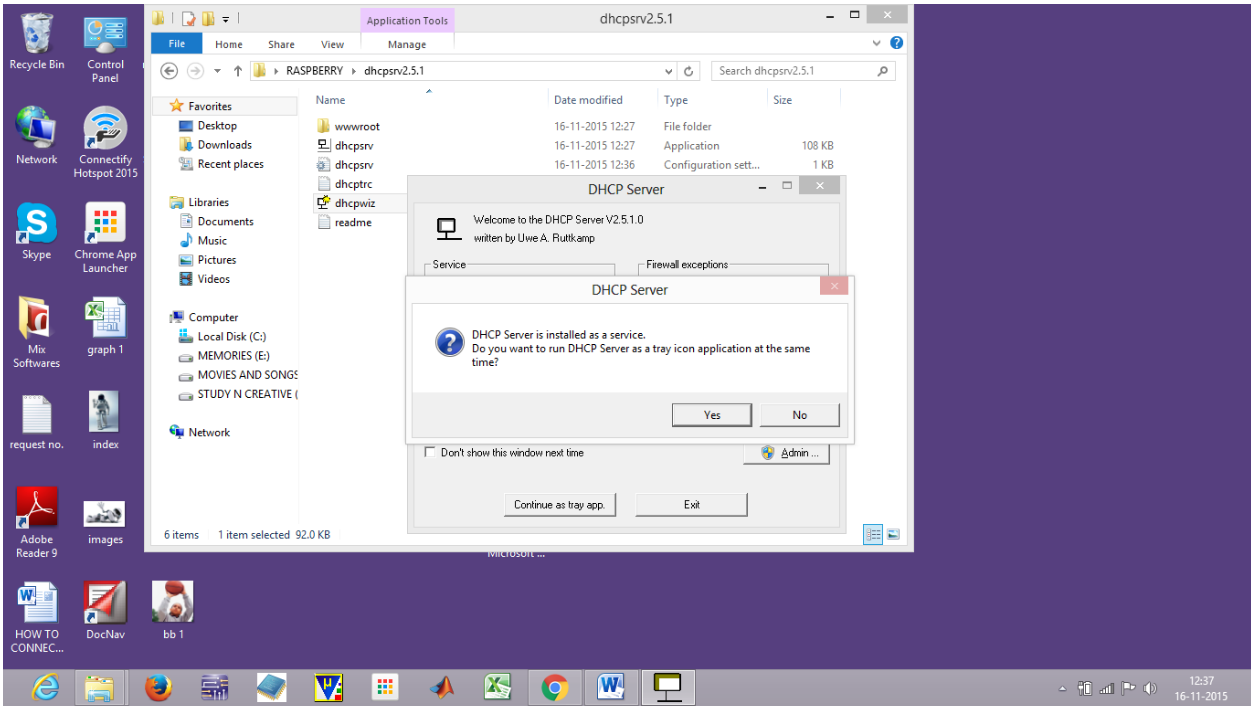
Firewall exceptions — Status: Configured

☑ Run DHCP server immediatly

dhcpsrv2.5.1
Install
Remove
Start
Stop
Configure
Remove
☐ Firewall enabled
Admin ...
< Back
Finish
Cancel

Figure 14: Running DHCP server.

Continue as tray app > yes.



DHCP Server

Welcome to the DHCP Server V2.5.1.0
written by Uwe A. Ruttkamp

DHCP Server is installed as a service.
Do you want to run DHCP Server as a tray icon application at the same time?

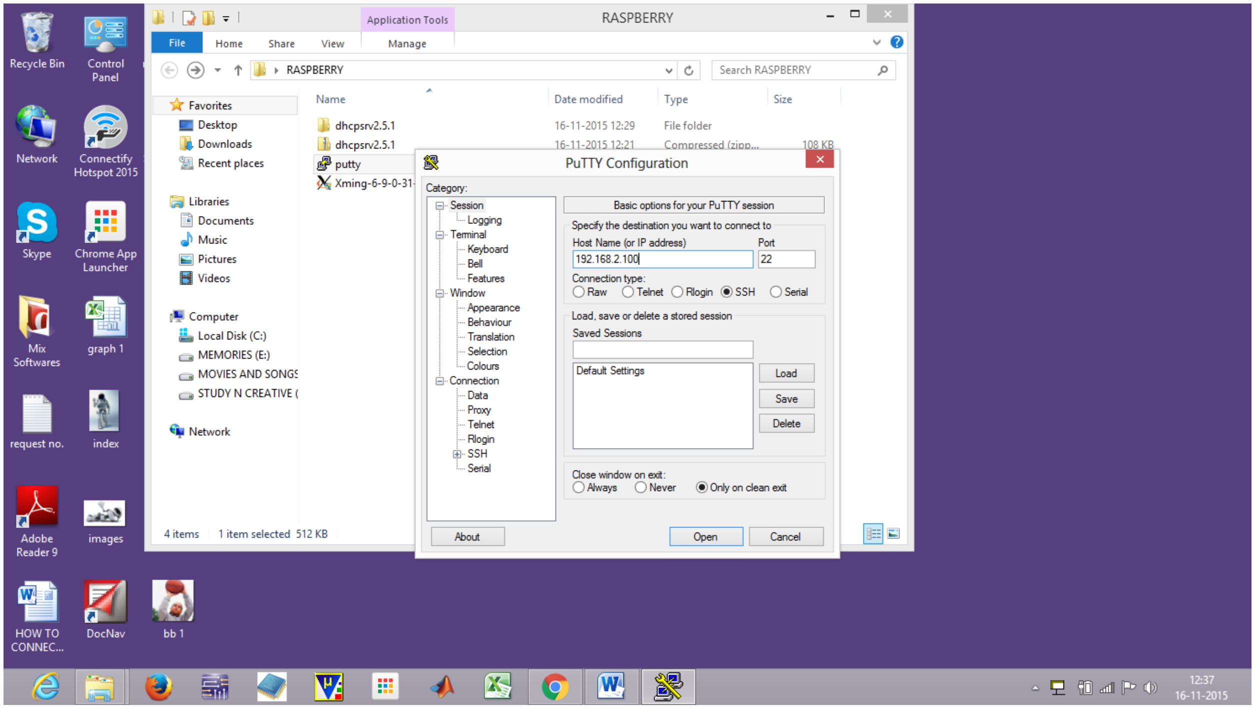
☐ Don't show this window next time

dhcpsrv2.5.1
Service
Firewall exceptions
Yes
No
Admin ...
Continue as tray app.
Exit

Figure 15: Confirming DHCP as tray icon application.

STEP 4. Now open putty and follow these steps:

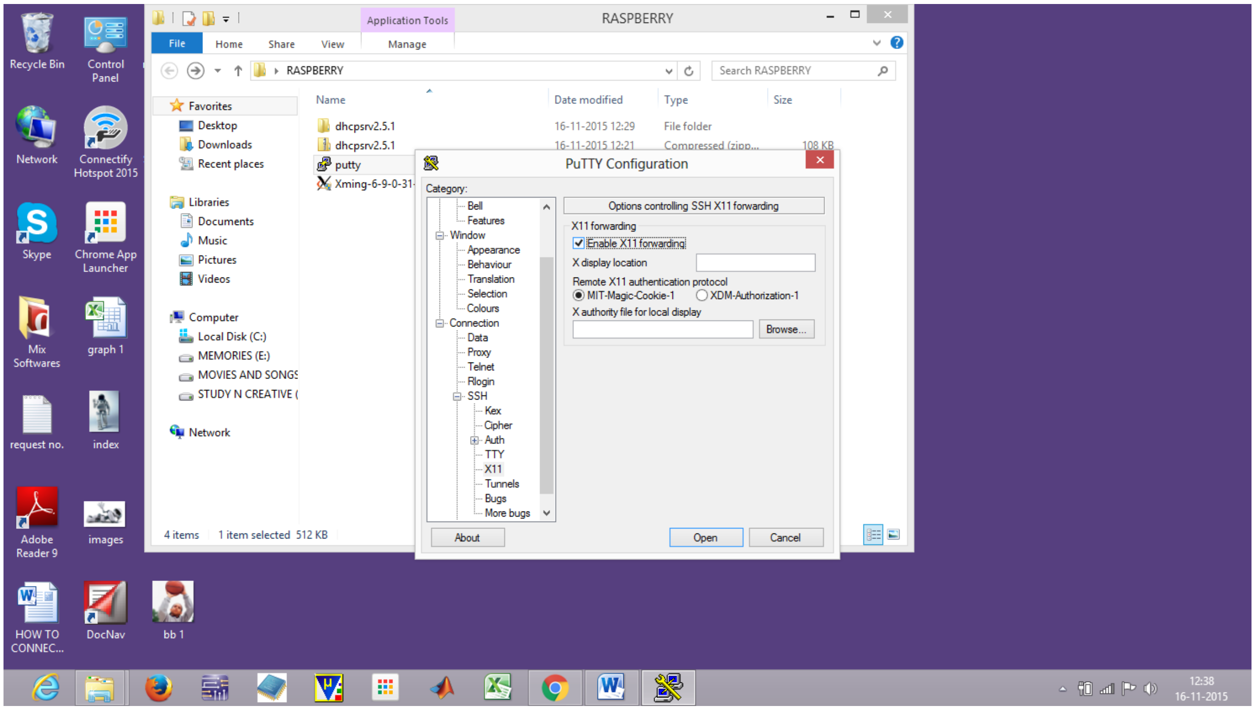
Assign Host name(or IP address) as 192.168.2.100


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Load
Save
Delete
About
Open
Cancel
RASPBERRY
dhcpsrv2.5.1
putty
Xming-6-9-0-31

Specify the destination you want to connect to
Host Name (or IP address): 192.168.2.100
Port: 22
Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial
Saved Sessions: Default Settings
Close window on exit: ○ Always ○ Never ● Only on clean exit

Figure 16: Assigning IP address in putty.

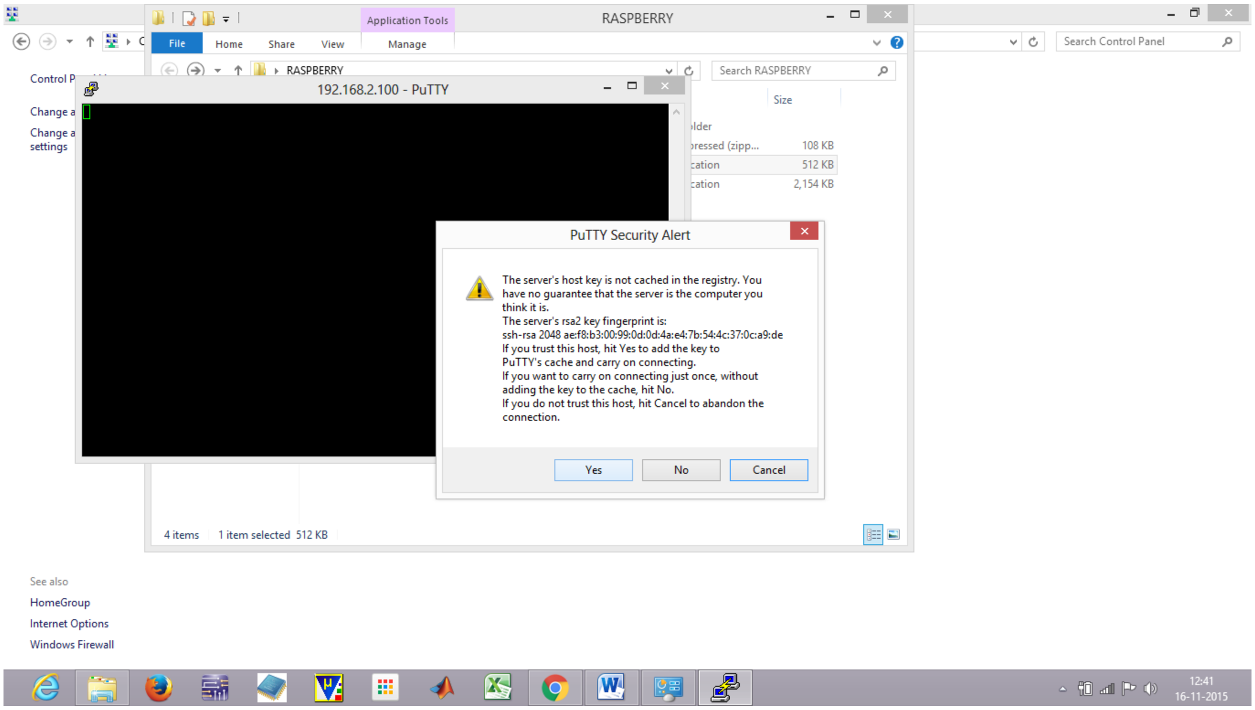
On left side category bar click on X11 > mark Enable X11 forwarding > Open.


PuTTY Configuration
Category:
SSH
Kex
Cipher
Auth
TTY
X11
Tunnels
Bugs
More bugs
Options controlling SSH X11 forwarding
Browse...
About
Open
Cancel

X11 forwarding
☑ Enable X11 forwarding
X display location:
Remote X11 authentication protocol: ● MIT-Magic-Cookie-1 ○ XDM-Authorization-1
X authority file for local display:

Figure 17: Enabling X11 forwarding.

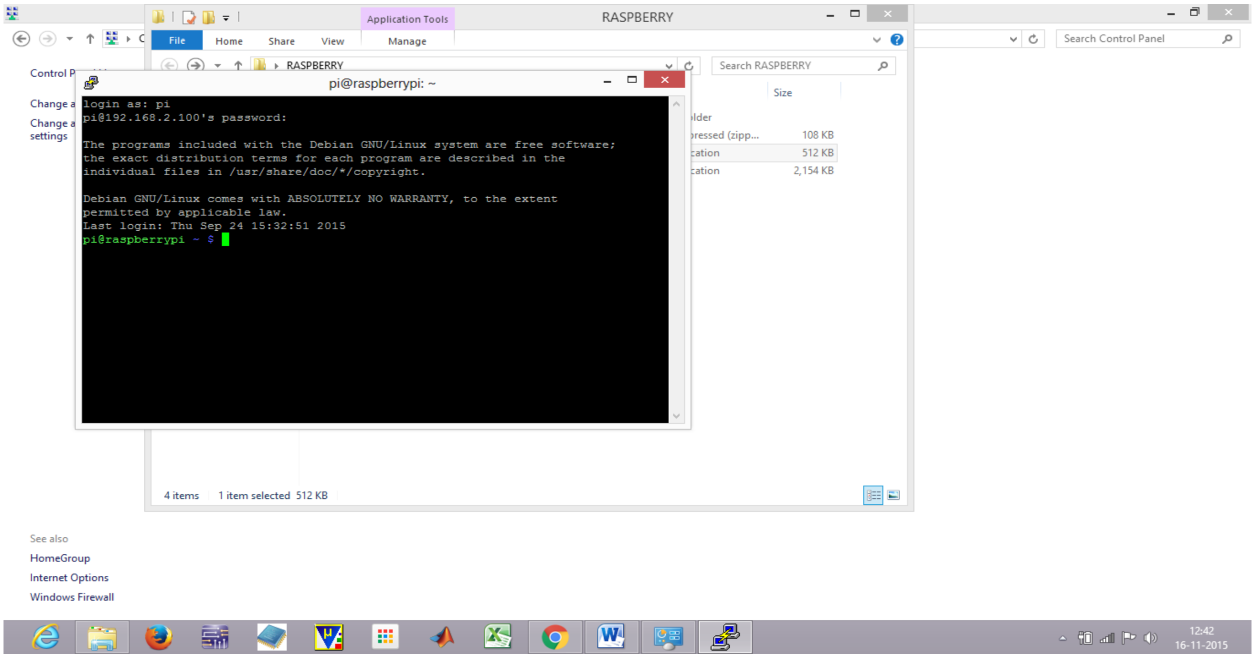
It will show a security alert for first time, click on yes.


RASPBERRY
Application Tools
File
Home
Share
View
Manage
192.168.2.100 - PuTTY
PuTTY Security Alert
Yes
No
Cancel
4 items
1 item selected 512 KB
See also
HomeGroup
Internet Options
Windows Firewall
12:41
16-11-2015

The server's host key is not cached in the registry. You
have no guarantee that the server is the computer you
think it is.
The server's rsa2 key fingerprint is:
ssh-rsa 2048 ae:f8:b3:00:99:0d:0d:4a:e4:7b:54:4c:37:0c:a9:de
If you trust this host, hit Yes to add the key to
PuTTY's cache and carry on connecting.
If you want to carry on connecting just once, without
adding the key to the cache, hit No.
If you do not trust this host, hit Cancel to abandon the
connection.

Figure 18:

Now in putty screen enter username as pi and enter , after few seconds it will ask for password : raspberry , enter password and press enter you will not see password so type it carefully , after few seconds you will be all set to play with your raspberry pi 2.


RASPBERRY
Application Tools
File
Home
Share
View
Manage
pi@raspberrypi: ~
4 items
1 item selected 512 KB
See also
HomeGroup
Internet Options
Windows Firewall
12:42
16-11-2015

```
login as: pi
pi@192.168.2.100's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Sep 24 15:32:51 2015
pi@raspberrypi ~ $
```

Figure 19: Confirming to carry on with connection.

If it does not work then try unplugging power supply and Ethernet cable and plug it again. Then follow these steps again.

## 3. Conclusion

We successfully connected raspberry pi 2 to our laptop. By using some software we made raspberry pi more compatible to use.

## 4. Future Scope

People working on raspberry pi will no longer have to carry big screens, tv sets, lcd's. They can now simply connect it to their laptop and work anywhere on it. Now as it will be easy to work on raspberry pi new era of innovations will born which will change people's life and make it easier. Now no matter how far are you working you can control appliances through this from anywhere in world.

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