# MICROCOMPUTERS & NETWORKING SYTEMS LEA.3V, 2020.

## Introduction To Computing & Application Software (Module-5)

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# ABSTRACT

*This project is in detail overview of each and every aspect of all modules in 3rd semester of the Micro-computers and networking systems program. Which will play vital role in future. Moreover, it can help me to prepare for some competitive exams related to computer networking systems. This project contains the all basic information about fundamental and functionality of the network in an organization it also contain the information about how to setup network and its configurations that can be very useful to learn the environment of work place.*

## Semester Project Index

# 1. Installation of Vm's

- **Hyper-V**

- Hyper-V is Microsoft's hardware virtualization product. It lets you create and run a software version of a computer, called a virtual machine. Each virtual machine acts like a complete computer, running an operating system and programs.
- In order to use Hyper-V on your system, follow below mentioned steps:
  - Go to control panel → programs → turn on windows feature on or off → check mark on Hyper-V → finish → restart the system.

- **Virtual Machine**

- A virtual machine is a computer file, typically called an image, that behaves like an actual computer. In other words, a computer is created within a computer. It runs in a window, much like any other program, giving the end user the same experience on a virtual machine as they would have on the host operating system itself. The virtual machine is sandboxed from the rest of the system, meaning that the software inside a virtual machine can't escape or tamper with the computer itself. This produces an ideal environment for testing other operating systems including beta releases, accessing virus-infected data, creating operating system backups and running software or applications on operating systems they weren't originally intended for.

- **Virtual Switch**

➢ A virtual switch (vSwitch) is a software application that allows communication between virtual machines. A vSwitch does more than just forward data packets, it intelligently directs the communication on a network by checking data packets before moving them to a destination.

➢ In order create virtual switch from virtual manager follow below mentioned steps:

➢ Go to virtual switch manager → SCSI Controller → add internal, external or private switch.

➢ Here, I have created 2 internal virtual switch namely internal-1 and internal-2.

- **Operating Systems**

➢ An operating system is the primary software that manages all the hardware and other software on a computer. The operating system, also known as an "OS," interfaces with the computer's hardware and provides services that applications can use.

## ❖ Installation of Windows Server 2016, Windows 10 and Windows 7

➢ Windows machines requirement:

| WINDOWS | STARTUP MEMORY | SIZE |
|---|---|---|
| SVR-16-1 | 4096 MB | 40 GB |
| SVR-16-2 | 4096 MB | 40 GB |
| WIN-10-1 | 2048 MB | 25 GB |
| WIN-10-2 | 2048 MB | 25 GB |
| WIN-7 | 1024 MB | 21 GB |

- **Installation of Windows Server 2016**

- In order to install all the machines on Hyper-V follow below mentioned steps:
- First of all, in order to install windows server 2016 and 2012 we have to go to Hyper-V
- Firstly, create an internal switch named (internal) on Hyper – V. After that make a folder in any drive (except c: drive) drive (such a Reena (make folder Srv-1, Srv-2, Win-10-1, Win-10-2 and Win-7 in Reena) ) on the host machine.
- Hyper V → new → virtual machine → give the name of Virtual machine and then tick mark right on store the virtual machine in a different location and then select Location (select folder Reena from F: drive).
- Again Click on Next → Select Generation 2 → add start up memory 4096 → Next → connect Internal switch → next → Add size 40 GB → Next → Tick Mark On Install an Operating System from a bootable image file → Attach ISO file for Win Server 2016/2012 → Next → Finish
- Then Press any key → enter language and click Next to continue → Click On Install Now
- Now Select Windows Server 2016 Standard (Desktop Experience) Option and then accept the license terms and click next
- Now Select Custome: install Windows only (Advanced) Option and then click Next.

- **Installation of Windows 7 or Windows 10**

- Hyper V → new → virtual machine → give name (win7/win10) → define location → brows folder (select folder from F: drive) → generation-1 (for Win-7) and generation-2 (for Win-10) → configuration details for win 7/ win 10 → brows ISO file → next → finish.

# 2. DHCP, RRAS, DNS and Subnetting

- **Server**

→ A server is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a network. There are many types of servers, including web servers, mail servers, and virtual servers.

- **Server roles and features**

→ Server roles refer to the roles that your server can play on your network roles such as a file server, a web server, or a DHCP or DNS server. Features refer to additional capabilities of the Windows operating system itself, such as the . NET Framework or Windows Backup.

- **Subnetting**

→ Subnetting is the strategy used to partition a single physical network into more than one smaller logical sub-networks (subnets). An IP address includes a network segment and a host segment. Subnets are designed by accepting bits from the IP address's host part and using these bits to assign a number of smaller sub-networks inside the original network. Subnetting allows an organization to add sub-networks without the need to acquire a new network number via the Internet service provider (ISP). Subnetting helps to reduce the network traffic and conceals network complexity. Subnetting is essential when a single network number has to be allocated over numerous segments of a local area network (LAN).

→ Subnets were initially designed for solving the shortage of IP addresses over the Internet.

- **Ping**

→ A ping is a signal sent to a host that requests a response. It serves two primary purposes: 1) to check if the host is available and 2) to measure how long the response takes.

→ A ping request can be performed using a ping command, which is a standard command in most command line interfaces. Several network utilities provide a ping feature, which allows you to ping a server by simply entering the IP address or domain name.

→ Command for the Ping is: Ping IP address of destination

- **Destination**

→ Specifies either an IP address or host name for the network or host.

- **Subnet mask**

→ Specifies a subnet mask to be associated with this route entry. If subnetmask is not specified, 255.255.255.255 is used.

- **Gateway**

→ Specifies either an IP address or host name for the gateway or router to use when forwarding.

- **Cosmetric**

→ Assigns an integer cost metric (ranging from 1 through 9,999) to be used in calculating the fastest, most reliable, and/or least expensive routes. If costmetric is not specified, 1 is used.

- **Interface**

→ Specifies the interface to be used for the route that uses the interface number. If an interface is not specified, the interface to be used for the route is determined from the gateway IP address.

- **DHCP**

→ DHCP stands for dynamic host configuration protocol and is a network protocol used on IP networks where a DHCP server automatically assigns an IP address and other information to each host on the network so they can communicate efficiently with other endpoints.

- **RRAS**

→ RRAS is a software router and an open platform for routing and networking. It offers routing services to businesses in local area network (LAN) and wide area network (WAN) environments or over the Internet by using secure VPN connections.

- **DNS (Domain Name System)**

→ DNS stands for Domain Name System. The main function of DNS is to translate domain names into IP Addresses, which computers can understand. It also provides a list of mail servers which accept Emails for each domain name.

# Practical

## ❖ Server roles: DHCP RRAS DNS

- ✓ First of all, I will need 2-Server, 2 Windows-10, and 1 Windows-7 machines to perform all the given tasks
- ✓ For that, I am having 2 Servers: 5212123-Pro-serv-1 and 5212123-Pro-serv-2.
- ✓ 2 Windows-10 machines named 5212123-Pro-W-10-1 and 5212123-Pro-W-10-2 respectively.
- ✓ 1 Windows-7 machine named 5212123-Pro-W-7
- ✓ Before starting to performing all given tasks make sure that,
- ✓ Each machines can ping each other
- ✓ Each machines firewall is entirely off.

### • Install DHCP Role

- ➢ On SVR 2016 → server manager dashboard → add roles and features → select DHCP (finishing installation) → Done.
- ➢ Tools → DHCP → right click on machine name and click authorize.

### • Install DNS

- ➢ On SVR 2016 → server manager dashboard → add roles and features → select DNS → Done.

### • Install Remote Routing and Access Service (RRAS)

- ➢ First of all, go to Server- 1 (such as Win 12 or Win 16)
- ➢ Now we need to setup all configuration to create a router
- ➢ Go to server manager → add roles and features → (check) remote access → (check) direct access and vpn routing web application proxy → (check) restart the destination server automatically if required → install

## ❖ Use Subnets 192.168.X.0/ 28 the 4th and 172.16.X.0/25 2nd

- **Adding virtual switch in servers and client machines**

- In order create virtual switch from virtual manager follow below mentioned steps:
- Go to virtual switch manager → SCSI Controller → add internal, external or private switch.
- Here, I have created 2 internal virtual switches namely internal-1 and internal-2, and 1 External Switch.
- As I have mentioned above that I have created 2 internal virtual switches from virtual switch manager, now it's time use that in order to perform our task.
- On Windows server we need to add 2 virtual switch
- For that go to → File → click on Settings → SCSI Controller → Select Switch Adapter → here add internal-1 switch and then internal-2 switch respectively.
- Similarly, do the same procedure for server-2 as well.
- On 1st windows client machine adds internal-1 switch and on 2nd client machine adds internal-2 switch.
- On client machines don't add 2 switches we need only one switch either internal-1 or internal-2.

- **Use Subnets 192.168.X.0/28 4th and 172.168.X.0/25 2nd**

- DHCP ON SEPARATE SWITCHES AND SUBNETS
- Here, 1 is my seat number

1). 192.168.1.0/28

Binary Subnet Mask: 11111111. 11111111. 11111111.11110000

Subnet Mask: 255.255.255.240

L = 256-240 = 16

Number of subnet bits: n=4

Number of subnets: $2^n = 2^4 = 16$

Number of host bits: 8-4 = 4

Number of usable hosts per subnet = $2^{8-n} - 2 = 2^{8-4} - 2 = 2^4 - 2 = 16-2 = 14$

# 0 = 1st Subnet

# 1 = 2nd Subnet

# 2 = 3rd Subnet

# 3 = 4th Subnet

SUBNET 4th = # 3 * L = 3 * 16 = 48

| SUBNET 4th | |
|---|---|
| Net ID | 192.168.1.48/28 |
| 1st | 192.168.1.49 |
| last | 192.168.1.62 |
| BCast | 192.168.1.63 |

2). 172.16.1.0/25

Binary Subnet Mask: 11111111. 11111111. 11111111.10000000

Subnet Mask: 255.255.255.128

L = 256-128 = 128

Number of subnet bits: n=1

Number of subnets: $2^n = 2^1 = 2$

Number of host bits: 8-1 = 7

Number of usable hosts per subnet = $2^{8-n} – 2 = 2^{8-1} – 2 = 2^7 – 2 = 128-2 = 126$

# 0 = 1st Subnet

# 1 = 2nd Subnet

# 2 = 3rd Subnet

# 3 = 4th Subnet

SUBNET 2nd = # 1 * L = 1 * 128 = 128

| SUBNET 2nd | |
|---|---|
| Net ID | 172.16.1.128/25 |
| 1st | 172.16.1.129 |
| last | 172.16.1.254 |
| BCast | 172.16.1.255 |

- **Server-1 IPs**

- Here I have assigned server, 2 different IPs
- **Internal-1:**
- IP Address: 192.168.1.49
- Sub Mask : 255.255.255.240
- DNS IP : 192.168.1.49
- **Internal-2:**
- IP Address: 172.16.1.129
- Sub Mask : 255.255.255.128
- DNS IP : 172.16.1.129

- **Server-2 IPs**

- Here I have assigned server, 2 different IPs
- **Internal-1:**
- IP Address: 192.168.1.50
- Sub Mask : 255.255.255.240
- DNS IP : 192.168.1.49
- D.G : 192.168.1.49 (after we enable routing on Server-1)
- **Internal-2:**
- IP Address: 172.16.1.130
- Sub Mask : 255.255.255.128
- DNS IP : 172.16.1.129
- D.G : 172.16.1.129 (after we enable routing on Server-1)

- **Client's IPs**

- Here, on both the clients I haven't assign any IP.
- Right now it is taking IPs from APIPA
- But we need to add default gateway for the routing
- **On Clients-1:**
- D.G: 192.168.1.49 (after we enable routing on Server-1)
- **On Clients-2:**
- D.G: 172.16.1.129 (after we enable routing on Server-1).

## ❖ Clients must have Dynamic IP's from DHCP they must ping

- **Create Scopes on Server-1**

- **<u>Scope-1</u>**

.

➢ Now, go to server manager → tools → DHCP → IPv4 → R.click → new scope → give name (scope-1) → give range (start IP: 192.168.1.49, end IP: 192.168.1.62) → and give CIDR range 28 (as per subnet mask: 255.255.255.240) → Yes, I want to configure these options now → yes, I want to activate this scope now → finish

- **<u>Scope-2</u>**

.

➢ Now, go to server manager → tools → DHCP → IPv4 → R.click → new scope → give name (scope-2) → give range (start IP: 172.16.1.129, end IP: 172.16.1.254) → and give CIDR range 25 (as per subnet mask: 255.255.255.128) → Yes, I want to configure these options now → yes, I want to activate this scope now → finish

- **Enable Routing on Server-1**

➢ First of all, go to Server- 1
➢ Now we need to setup all configuration to create a router
➢ Go to server manager → add roles and features → (check) remote access → (check) direct access and vpn routing web application proxy → (check) restart the destination server automatically if required → install.
➢ Now, for the configuration go to tools → routing and remote access → R. click on name of machine → click on configure and enable routing and remote access → select environment ( custom configuration ) → (check) LAN routing → Finish → Start Service.

- **Obtain IPs from station & Default Gateway for Routing**

  - On client → open network and sharing center → IPv4 → properties → (check) obtain an ip address automatically → OK
  - Advance → add → here add IP of server-1 (192.168.1.49 in 1st Client and 172.16.1.129 in 2nd Client) → OK
  - Open CMD and write command ipconfig /release and ipconfig /renew and then ipconfig /all
  - Now, here on client machines we will be able to see the result that both machines have been assigned the automatic IP addresses via DHCP server.
  - Moreover, both clients will Ping each other via Routing Service.

## 3. DFS, DNS, FQDN

- **DFS (File Distributed System)**

→ A distributed file system (DFS) is a file system with data stored on a server. The data is accessed and processed as if it was stored on the local client machine.

→ The DFS makes it convenient to share information and files among users on a network in a controlled and authorized way. The server allows the client users to share files and store data just as if they are storing the information locally. However, the servers have full control over the data, and give access control to the clients.

- **DNS (Domain Name System)**

→ DNS stands for Domain Name System. The main function of DNS is to translate domain names into IP Addresses, which computers can understand. It also provides a list of mail servers which accept Emails for each domain name.

- **FQDN (Fully Qualified Domain Name)**

→ FQDN is the feature of DNS which resolves Fully Qualified Domain Name to IP address.

- **RDP (Remote Desktop Protocol)**

→ The Remote Desktop Protocol allows remote users to see and use Windows on a device in another location. Key peripherals like your keyboard and mouse are shared with the remote machine, allowing you to use and control it as if you were sat right in front of it.

- **Hostname**

→ Also called a computer name, nodename, or sitename, a hostname is the name of a computer or device (host) on a network.

# Practical

## ❖ Server roles: DFS DNS in the same network of Windows 10

- **Install Distributed File System (DFS) on Server-2**
  - ➢ On Server-2 → server manager → add roles and features → extend (file and storage services) → file & ISCI services → DFS (namespaces) → install.

- **Install DNS on Server-2**

➢ On Server-2 → server manager dashboard → add roles and features → select DNS → Done.

## ❖ Create primary zone on Server2 and replicate it on secondary on Server1

- **Creating Primary Zone on Server-2**
  - Go to Server-2 → server manager dashboard → tools → DNS → forward lookup zones → R. click → new zone → primary zone → zone name (Such as: Reena.com) → (check) create a new file with a file name which shows "reena.com.dns" → (check) allow only secure dynamic updates only for security of DNS → finish.

- **To Create a Host**
  - Forward lookup zone → Reena.com → R.cilick → new host (A or AAA) → put name (svr1) → Ip address (192.168.1.50) → add host → close

- **To Create an Alias (Cname)**
  - Forward lookup zone → Reena.com → R.cilick → new alias (Cname) → put name (www) → fully qualified domain name ( Browse ( Machine Name → Forward lookup → Reena.com → select host ( svr1) ) ) → ok

- **Creating Secondary Zone on Server-1**
  - On Server-1, now, go to Tools on server manager → DNS → forward lookup zones → R.click → new zone → secondary zone → put zone name Reena.com → add IP of DNS server-2 or Master Server (192.168.1.50) → finish.
  - Now, go to DNS Server-2 and give permission for zone transfer
  - Reena.com → R.click → properties → zone transfers → (check) allow zone transfer → (check) to any server → Ok.

## ❖ Windows 10 can do RDP to win7 with the FQDN www.project.com.

- **RDP (Remote Desktop Connection Protocol)**

➢ On Windows-10-1 client machine
➢ Here, I am opening the host file
➢ Host file is located in: C:\windows\system32\drivers\etc on windows-10 machine.
➢ Here I am adding the IP address of other machine which is Windows-7: 172.16.1.132, and hostname is www.project.com.
➢ Now, go to Windows-7 → This PC → Properties → Change settings → Remote → Allow remote connections to this computer → here you can also add user if you want (but I am not adding any user because I want to access with administrator) →Ok.
➢ Now, in order to check the result, go to Windows-10-1 → Open Remote Desktop Connection → add Computer name: www.project.com → and login with Administrator.
➢ And then, we will be able to access Windows-7 from Windows-10 remotely.

# 4. Disk Management, User|Group creation and storage Pool

- **Disk Management**

→ Disk Management is a Microsoft Windows utility first introduced in Windows XP as a replacement for the fdisk command. It enables users to view and manage the disk drives installed in their computer and the partitions associated with those drives.

- **Storage Pool**

→ A storage pool is a collection of physical disks. A storage pool enables storage aggregation, elastic capacity expansion, and delegated administration. From a storage pool, you can create one or more virtual disks. These virtual disks are also referred to as storage spaces.

## Practical

### ❖ On Windows-7 add Local Mirror of 10 GB

- For the Mirror volume we will need minimum 2 drives.
- For that go to the settings of Windows-7 → Select SCSI Controller → Click on Hard Drive → add New → Click mark on Dynamic expanding for better utilization of physical drive → give name (such as Disk-1) → provide path (such as: F: drive → folder Reena → Extra HDD) → add 10 GB → Finish.
- The same way creates another 10GB drive.

- **Disk management**

- In order to create Mirror, go to Taskbar and Search Disk Management
- Now initialize the both 10GB disks → R. click (any drive) → select Mirror → It will show the menu to select drives for mirroring → add 2nd drive as well → finish.

## ❖ On Window-10-1 create 3-way mirror storage pool

- For the 3-Way-Mirror storage pool we will need 5 drives.
- For that go to the settings of Windows-10-1 → Select SCSI Controller → Click on Hard Drive → add New → Click mark on Dynamic expanding for better utilization of physical drive → give name (such as D-1) → provide path (such as: F: drive → folder Reena → Extra HDD) → add 10 GB → Finish.
- The same way creates another four 10GB drives.
- And then initialize the disks from the disk management.

- **Storage pool**
  - For that go to the Control Panel → View By: Large Icons → Storage Spaces → Click on create a new pool and storage space → Select drives to create a storage pool → Select all 5 disks that we have created → Enter name: Mirror, resiliency type: 3-Way-Mirror and size: 50GB for the storage space →Click on Create storage space.
  - Now it will create 50Gb 3-Way-Mirror Storage Pool
  - We can also see it in This PC and Disk Management.

- **50GB volume**

- For that go to the settings of Windows-10-1 → Select SCSI Controller → Click on Hard Drive → add New → Click mark on Dynamic expanding for better utilization of physical drive → give name (such as NewDisk-1) → provide path (such as: F: drive → folder Reena → Extra HDD) → add 50 GB → Finish.
- Now, go to Taskbar and Search Disk Management and then, initialize the 50GB disk.

## ❖ Crating Users on Windows-10 and Windows-7

- **On Windows-10**

➢ In order to create users first of all go to This PC → R. click → Manage → Expand Local Users and Groups → Here right click on anywhere on the menu and add new user → write username (such as User1) → add Password (Such as Qwerty1) → Check on Password never expires → Create → Close.

➢ The same way creates User-2.

➢ Afterwards, go to start bar and sign out from admin account and sign in again

➢ Here, it will show all the user list.

- **On Windows-7**

➢ In order to create users first of all go to taskbar and search computer management → open it → Expand Local Users and Groups → Right click on Users → New User → here write username (such as User1) → add Password (Such as Qwerty1) → Check on Password never expires → Create → Close.

➢ The same way creates User-2.

➢ Afterwards, go to start bar and sign out from admin account and sign in again

➢ Here, it will show all the user list.

# 5. Logon script and Quota

- **Logon Script**

→ Logon scripts can be used to assign tasks that will be performed when a user logs in to the domain. There are many things that the logon script can do, such as set system environment variables, carry out operating system commands and call other scripts or executable programs.

- **Quota**

→ Disk quotas are a means of controlling the storage space available to Windows users. An administrator can enforce limits on disk quotas so that no user account can exceed them. This means that, whenever a user exceeds their disk quota, he or she can no longer add new data to the disk. Furthermore, the administrator can also set warning levels, so that the users know beforehand when they are getting close to their quota limit.

# Practical

## ❖ On windows 10 when user 1 logon Should have greeting Message “HI there” and Notepad text editor open automatically.

- **Crating Users Logon Script**

- **On Windows-10**

- In order to create logon script for User1 first of all we need to login as Administrator on windows-10
- First of all, go to file explorer This PC → View (on top) → Check mark on File name extension and Hidden items.
- Now, I am creating batch file for particular user **user1.**
- Path for particular user user1: C:\users\user1\appdata\roaming\microsoft\windows\startmenu\programs \startup.
- Here, in startup create text file and write following commands:
    - @echo off
    - Echo Hi there %username% (Greeting message)
    - Start “” “Notepad.exe”” (for opening notepad )
    - Pause

- Save it, and then convert a text file into Batch file by giving extension .bat
- Afterwards, go to start bar and sign out from admin account and sign in again and login through user **user1.**
- Here, it will show pop-up login script in CMD that will show message “Hi there User1” and also it will open Notepad automatically.

## ❖ The E: of 50G should have Quotas for User2 of 5 GB

- **On Windows-10**

➢ Here, first of all, we will need 50GB E Drive, that we have already added on windows-10 machine.

- **Enforcing Disk Quota**

➢ In order to enable disk quota on 50Gb Disk go to This PC and right click on 50GB E: Drive.
➢ Now, go to properties of the drive → Select quota and enable quota management and select quota entries.
➢ Then, go to menu → quota → new quota entry → add user User2
➢ For adding User2 → go to advance → find now → add User2.
➢ After adding user there will be dialog box to fill
➢ Now, add quota limit for User2 5GB and warning level 4.99 GB.
➢ Here, we will be able to see quota entry for User2 in the menu
➢ Moreover, we have to give local share permission to everyone: full control on 50GB E: drive.
➢ Afterwards, go to start bar and sign out from admin account and sign in again and login through user **user2.**
➢ Here, it will show quota limit 5GB on 50GB E: drive for only User2.

## 6. Mapping shared folders and security permissions

- **Mapped drive**

➢ A mapped drive is a shortcut to the specific drive on a different device that enables you to access resources shared on a local network.

- **Shared Folders**

➢ Shared folders can contain applications and data. Use shared application folders to centralize administration and provide a central location for users to store and access common files. Once you have shared a folder, users must connect to the shared folder and must have the appropriate permissions to access it.

- **Security Permissions**

➢ There are basically six types of permissions in Windows: Full Control, Modify, Read & Execute, List Folder Contents, Read, and Write.

➢ Sharing has the permission for accessing the data and it also has the permission for hidden resources for the specific users. Administrator has the all right to add or remove permissions for everything on the computer. He can hide data, hide drives, apply scripts, disk quotas and many more.

## Practical

❖ **User2 on windows 7 should Map automatically at logon the E: of quotas 5GB stored on windows 10 and he should have just read permission.**

- **On Windows-10-1**

➢ First of all, Login as User2 → This PC/File Explorer → 50Gb E: Drive → Properties → Sharing → Advance sharing → Check mark on share this folder → permissions → Everyone: Full permission

➢ Now, go to Security Tab → Disable inheritance → Add User2 → give only read permission and remove users and authentic users.

- **On Windows-7**

➢ First of all, Login as Administrator

➢ Then, create batch file script for mapping 50GB E: drive on Windows-7

➢ Here, I am creating batch file for particular user **user2.**

➢ Path for particular user user2: C:\users\user2\appdata\roaming\microsoft\windows\startmenu\programs\startup.

➢ Here, in startup create text file and write following commands:

- @echo off
- net use R: \\192.168.1.52\E /PERSISTENT:YES
- Pause

➢ Here, IP Address 192.168.1.52 is an IP of a Windows-10 and E is a letter of 50Gb network drive and R is a letter of Mapped drive on Windows-7

➢ Save it, and then convert a text file into Batch file by giving extension .bat

➢ Afterwards, go to start bar and sign out from admin account and sign in again and login through user **user2.**

➢ Here, in file explorer we will be able to see Mapped drive R and when we will try to do any changes in there it won't allow because we have given User2 only read permission, So it can only read.

## 7. Backup and Restore

- **Backup & Restore**

→ By default, Backup and Restore will back up all data files in your libraries, on the desktop, and in the default Windows folders. Additionally, Backup and Restore creates a system image that you can use to restore Windows if your system is not functioning properly.

# Practical

### ❖ Add Disk On server 2 of 100G backup, Folder1 folder2 with .bmp and .txt on them that you should create on windows 10, after delete them and restore them back.

- **On Server-2**

- First of all, On Server-2 we need to add 100GB Disk
- For that go to the settings of Server-2 → Select SCSI Controller → Click on Hard Drive → add New → Click mark on Dynamic expanding for better utilization of physical drive → give name (such as Disk-100) → provide path (such as: F: drive → folder Reena → Extra HDD) → add 100 GB → Finish.
- Now, go to Taskbar and Search Disk Management and then, initialize the 100GB disk.
- Now in this 100GB Disk create new folder namely Backup in order to take backup in it.
- And then, give share permission to Everyone: Full control and in Security Tab Disable Inheritance on this 100GB Disk.

- **On Windows-10-1**

➢ First of all, Login as Administrator
➢ Then, create 2 Folders namely Folder1 and Folder2 in any drive
➢ And then, create some bmp and text files in these folders (folder1 and folder2)
➢ Afterwards, go to Control Panel → View By: Large Icons → Backup and Restore → On the right side select Set up Backup → Select a Network Location → the network location will be location of backup folder that we have created on Server-2 → \\192.168.1.50\Backup → Give Username : Administrator and Password: Qwerty1 → OK → Check mark on Let me choose → Here uncheck everything except the folders Folder1 and Folder2 (only check mark on Folder1 and Folder2 ) → Next → Here, Review your backup settings → Save settings and run backup.
➢ Now, here it will take some time to create backup
➢ After taking the backup of both folders, delete Folder1 and Folder2 on Windows-10-1
➢ Then select Restore my Files option from backup & Restore
➢ Here, Browse or search your backup for files and folders to restore
➢ Add Backup Folder from 100GB drive on network → Next
➢ Check mark on In the original location → Restore → Finish.
➢ Now go to the Drive in File explorer and here we will be able to see Folder1 and Folder2 and files inside it restored, that we have deleted.

## 8. IIS

- **IIS (Internet Information Server)**

→ Most commonly, IIS is used to host ASP.NET web applications and static websites. It can also be used as an FTP server, host WCF services, and be extended to host web applications built on other platforms such as PHP. There are built-in authentication options such as Basic, ASP.NET, and Windows auth.

- **FTP (File Transfer Protocol)**

→ FTP (File Transfer Protocol) server can be one of the easiest and most convenient solutions to transfer file through a private or public network without limitations and restrictions

- **Web Server**

→ A web server processes incoming network requests over HTTP and several other related protocols. The primary function of a web server is to store, process and deliver web pages to clients. The communication between client and server takes place using the Hypertext Transfer Protocol (HTTP).

## Practical

❖ **Create an FTP site on windows 10 and a 2-web site using binding host name that you should get access from windows 7.**

- **Install DNS on Server-2**

➢ On Server-2 → server manager dashboard → add roles and features → select DNS → Done.

- **Creating Primary Zone on Server-2**
  - ➢ Go to Server-2 → server manager dashboard → tools → DNS → forward lookup zones → R. click → new zone → primary zone → zone name (Such as: Montreal.com) → (check) create a new file with a file name which shows "Montreal.com.dns" → (check) allow only secure dynamic updates only for security of DNS → finish.
  - ➢ Similarly, create another 2 primary zones for Canada.com and India.com respectively.

- **To Create a Host**
  - ➢ Forward lookup zone → Montreal.com → R.cilick → new host (A or AAA) → put name (svr1) → Ip address of windows-10 machine (192.168.1.52) → add host → close

- **To Create an Alias (Cname)**
  - ➢ Forward lookup zone → Montreal.com → R.cilick → new alias (Cname) → put name (ftp) → fully qualified domain name ( Browse ( Machine Name → Forward lookup → Montreal.com → select host ( svr1) ) ) → ok

  - ➢ Similarly, create 2 another hostname and cname for 2 Websites www.canada.com and www.India.com.

- **To Install FTP Service On Windows-10.**
  - ➢ Go To Control Panel→ Programs & Features → Turn Windows Features On Or Off → Expand (Internet Information Services) → (Check) FTP Services→ Web Management Tool (Check IIS Management Console) → World Wide Web Services → OK.

## ❖ To Create FTP Site (Anonymous)

- **On Windows-10-1**

➢ First of all, On Windows-10-1 machine go to file explorer → C: drive → inetpub → ftproot → here create any folder (such as ftp1) and then create some files in the folder ftp1.

➢ Now, search for IIS in taskbar

➢ Open IIS → Sites → R.click → Add FTP Site → here, give FTP site name (such as ftp1) → provide physical path (C:\inetpub\ftproot\ftp1) →provide bindings: IP address: 192.168.1.52, Port: 21 and Enable virtual hostname: ftp.montreal.com → check mark on start FTP site automatically → select No SSL → Next → In Authentication check mark on Anonymous → Allow access to : All Users → give permission: read & write → Finish

➢ Now, in order to provide folder permission, right click on ftp1 site → Security → give Users full permission → apply → ok

- **On Windows-7**

➢ Now, go to Windows-7 in order access the ftp site

➢ Open CMD and write follow mentioned commands

  - FTP
  - Open to 192.168.1.52
  - ftp.montreal.com|Anonymous
  - Password: Qwerty1 (we don't need to add password for anonymous ftp site)
  - ls

➢ Here, we will be able to see the content of the ftp1 folder.

➢ Or, we can also browse it online using Internet Explorer or Mozilla Firefox

➢ For that, write hostname ftp://ftp.montreal.com in the url.

➢ Then here, one dialog box will be open for the credentials, so here write username: ftp.montreal.com|Anonymous and then password: Qwerty1.

➢ Here, we will be able to see the content of the ftp1(ftp.montreal.com).

## ❖ To Create Website

- **On Windows-10-1**

➢ First of all, On Windows-10-1 machine go to file explorer → C: drive → inetpub → wwwroot → here create 2 folders (such as www1 & www2) and then create 2 different html pages or copy from somewhere else in these both folders www1 and www2.

➢ Now, search for IIS in taskbar

➢ Open IIS → Sites → R.click → Add Website → here, give Website name (such as web1) → provide physical path (C:\inetpub\wwwroot\www1) →provide bindings: IP address: 192.168.1.52, Port: 80 and hostname: www.canada.com → OK.

➢ The same way creates second website using same IP address but with different hostname (such as www.india.com).

- **On Windows-7**

➢ Now, go to Windows-7 in order access the Website

➢ Open Internet Explorer or Mozilla Firefox

➢ Then, write hostname www.canada.com and then, www.india.com.

➢ Here, we will be able to see the content of the web1(www.canada.com) and web2(www.india.com) respectively.

# 9. DFS

- **DFS (File Distributed System)**

→ A distributed file system (DFS) is a file system with data stored on a server. The data is accessed and processed as if it was stored on the local client machine.

→ The DFS makes it convenient to share information and files among users on a network in a controlled and authorized way. The server allows the client users to share files and store data just as if they are storing the information locally. However, the servers have full control over the data, and give access control to the clients.

- **Namespace**

→ DFS Namespaces is a role service in Windows Server that enables you to group shared folders located on different servers into one or more logically structured namespaces.

## Practical

❖ **On server2 DFS Create name space Project_share, using the 50G E: folder name School. And shared folder on server1 the final name space should be mapped on User1 in both clients Windows 10 and windows 7.**

- **Install Distributed File System (DFS) on Server-2**
  - On Server-2 → server manager → add roles and features → extend (file and storage services) → file & ISCI services → DFS (namespaces) → install.

- **Creating 50GB E: Drive on Server-2**

- For that go to the settings of Server-2 → Select SCSI Controller → Click on Hard Drive → add New → Click mark on Dynamic expanding for better utilization of physical drive → give name (such as NewDisk-1) → provide path (such as: F: drive → folder Reena → Extra HDD) → add 50 GB → Finish.
- Now, go to Taskbar and Search for Disk Management and then, initialize the 50GB disk.

- **Creating Share Folder named School on Server-2**
  - On Server → File explorer→ 50GB E: drive → here create folder School and give it sharing (Everyone: full control) and security permissions.

- **Creating Share Folder on Server-1**

- On Server-1 → File explorer→ here select any drive or create new one → then create folder Share and give it sharing (Everyone: full control) and security permissions.

- **Creating DFS namespace on Server-2**
  - Now, go to tools → DFS management → namespaces → new namespace → browse (server) or only type IP address of the local server → give name (Project_share) → edit settings → (check) All users have read & write permissions → next → (check) Stand-alone namespace → next → Create → Close.

- Now, on DFS server namespace \\192.168.1.50\Project_share → create new folder (School).
- For that select New Folder on the top of the right side
- Then, here adds network path of school folder of server-2
- In Add folder target add network path (\\192.168.1.50\School) → Ok.
- Similarly, add another folder Share from Server-1
- For that select New Folder on the top of the right side
- Then, here adds network path of school folder of Server-1
- In Add folder target add network path (\\192.168.1.49\Share) → Ok.
- Now here in namespace Project_share, we will be able to see folders School and Share.

- **Mapping namespace Project_share on both clients**

- On Windows-10-1, First of all, Login as Administrator
- Then, create batch file script for mapping namespace Project_share from Server-2.
- Here, I am creating batch file for particular user **user1.**
- Path for particular user user1: C:\users\user1\appdata\roaming\microsoft\windows\startmenu\programs\startup.
- Here, in startup create text file and write following commands:
  - @echo off
  - net use P: \\192.168.1.50\Project_share /PERSISTENT:YES
  - Pause

- Here, IP Address 192.168.1.50 is an IP of Server-2 and Project_share is a namespace of DFS on Server-2, and P is a letter of Mapped drive on Windows-10-1 machine only for User-1 account.
- Save it, and then convert a text file into Batch file by giving extension .bat
- Afterwards, go to start bar and sign out from admin account and sign in again and login through user **user1.**
- Here, in file explorer we will be able to see Mapped Drive P Project_share.
- Now, do the same process for Windows-7 client machine as well.

# 10. SSH, SFTP

- **SSH (Secure Shell)**

→ The SSH command provides a secure encrypted connection between two hosts over an insecure network. This connection can also be used for terminal access, file transfers, and for tunneling other applications.

- **SFTP (SSH Secure File Transfer Protocol)**

→ SFTP (SSH File Transfer Protocol) is a secure file transfer protocol. It runs over the SSH protocol. It supports the full security and authentication functionality of SSH.

## Practical

## 1). Add Windows 10-2 on the side of windows 7 open an SSH session between windows 10-1 and windows 10-2

- ✓ Here, we will need 2 Windows-10 client machines
- ✓ Both machines should be in different networks
- ✓ Both machine's firewall would be completely off
- ✓ Both machines should ping each other

## ❖ SSH on both the client machines

- **Enable the OpenSSH Server on Windows-10-1 and Windows-10-2 machines, for that follow the below mentioned steps.**

  - In order to install OpenSSH Server first of all, we will need to add external switch on both machines.
  - Open the Settings app and go to Apps → Apps & features.
  - On the right, click Manage optional features.
  - On the next page, click the button Add a feature.
  - In the list of features, select OpenSSH Server and click on the Install button.
  - Restart both Windows 10 machines.
  - Then, search Services in the taskbar → OpenSSH Authentication Agent and OpenSSH SSH server → Start the service on both the client machines.
  - Now, we can remove the external switch.
  - Then, Do SSH on both the client machines.

- **On Windows-10-1**

➢ Open CMD with administrator → write command: ssh IP of Windows-10-2 (such as: ssh 172.16.1.133)

- **On Windows-10-2**

➢ Open CMD with administrator → write command: ssh IP of Windows-10-1 (such as: ssh 192.168.1.52)

## 2). Use SFTP to download the files of one of the websites you hosted all the files.

- **On Windows-10-1**

➢ First of all, On Windows-10-1 machine go to file explorer → C: drive → inetpub → wwwroot → here we have 2 folders www1 & www2 and also we have 2 different html pages in these folders www1 and www2.

➢ Now, we need to download one of the html pages on Windows-10-2 machine using SFTP.

- **On Windows-10-2**

➢ First of all, on desktop create folder Reena

➢ Open CMD with administrator → write command: sftp IP of Windows-10-1 (such as: sftp 192.168.1.52) → give password: Qwerty1 → follow below mentioned commands:

- pwd (in order to see present working directory)
- present working directory will be such as: c:\users\administrator
- lcd (local directory)
- lcd c:\users\administrator\desktop\reena
- cd (to change directory)
- cd c:/inetpub/wwwroot/www1
- get (to download any file) html page file
- such as: get page.html

➢ By this method we will be able to download any file from source to destination.

➢ Now, open folder Reena on desktop, here we can see our downloaded html file on Windows-10-2 machine.

# 11. Migration of profile, USMT, ADK

- **USMT (User State Migration Tool)**

→ You can use User State Migration Tool (USMT) 10.0 to streamline and simplify user state migration during large deployments of Windows operating systems. USMT captures user accounts, user files, operating system settings, and application settings, and then migrates them to a new Windows installation.

- **ADK (Assessment and Deployment Kit)**

→ The Windows Assessment Toolkit and the Windows Performance Toolkit compose the Windows Assessment and Deployment Kit (ADK). Together, they provide a complete solution for evaluating overall computer performance and automating the deployment of the Windows operating system to new PCs.

- **Windows User Profile**

→ The Windows user profile is a record of personal, user-specific data associated with a named user's identity and desktop environment. It contains many elements, such as settings, configuration items, connections and history.

# Practical

## ❖ Create User 3 on windows 7 make some changes in his profile and desktop. Perform Migration of his profile to Windows 101. Using user state migration tool (USMT) and windowINT_10 ADK (Assessment and Deployment Kit)

## ❖ To Install USMT

- **On Windows-10-1**

➢ On Windows-10-1 machine install adksetup.exe by adding external switch
➢ Then, go to, C:\Program Files (x86)\Windows Kits\10\Assessment and Deployment Kit\User State Migration Tool
➢ Now, create any new drive or use the old one if you have
➢ Here, I have created new A: drive and then, I am copy User State Migration Tool folder from C: drive and paste it into A: drive

- **On Windows-7**

➢ Now, go to Windows-7 and create new User User3
➢ In order to create new user first of all go to This PC → R.click → Manage → Expand Local Users and Groups → Here right click on anywhere on the menu and add new user → write username (such as User3) → add Password (Such as Qwerty1) → Check on Password never expires → Create → Close.
➢ On Windows-7 create a new drive or use old one
➢ Here, I have created new F: drive

- And then, copy the User State Migration Tool folder from Windows-10 machine using USB or Pendrive or by network sharing and paste it into F: drive on Windows-7.
- Now Open CMD as an Administrator
- In CMD write following commands:
    - f:
    - cd User State Migration Tool
    - cd amd4
    - scanstate.exe f:\userprofile /o /c /ue:** /ui:user3 /i:miguser.xml /i:migapp.xml /I:migdocs.xml

- Output will be: ScanState return code: 0
- Now, in F: drive there will be new folder added userprofile
- Now, give sharing permission everyone: full control to folder userprofile

- **On Windows-10-1**

- On Windows-10-1 machine
- Now, go to This PC and write the network path of windows-7 machine and copy the userprofile folder then paste it in A: drive
- Now Open CMD as an Administrator
- In CMD write following commands:
    - a:
    - cd User State Migration Tool
    - cd amd4
    - loadstate.exe a:\userprofile /c /lac /lae /ue:** /ui:user3 /i:miguser.xml /i:migapp.xml /I:migdocs.xml /all /v:13

- Output will be: LoadState return code: 0
- Now restart the windows-10-1 machine
- Then, login as user3
- Here, whole User3 profile will be migrated from windows-7 machine but user credentials won't be migrated.

# 12. DHCP RELAY AGENT AND PROXY

- **DHCP Relay Agent**

→ The DHCP relay service allows you to pass DHCP broadcast messages to network segments that a client computer is not directly attached to. DHCP relaying can be used to share a single DHCP server across logical network segments that are separated by a firewall. The DHCP relay service does not handle IP addresses. It sends unicast messages instead of broadcast messages.

→ A client in need of a DHCP-assigned IP address sends its request as a broadcast message to the network attached to the corresponding interface. The DHCP relay service on the firewall receives the request on an interface attached to the same network, e.g., eth2, 192.168.1.1/24. The DHCP relay service sends a unicast request to all configured DHCP servers in the LAN and receives a DHCP IP address offer from a DHCP server (e.g., 192.168.0.1) that has an IP address range configured for the network segment of the requesting client (e.g., 192.168.1.1/24). This offer is forwarded to the requesting client. If the client accepts the offer, the DHCP address is acknowledged by the client and immediately assigned to its attached interface.

- **Hop-Count Threshold**

→ The total number of devices that the packets should pass through as they travel from the source to the destination. In this instance the hop-count defines the number of DHCP Relay Agents the DHCP traffic is allowed to hop through.

- **Boot threshold (seconds)**

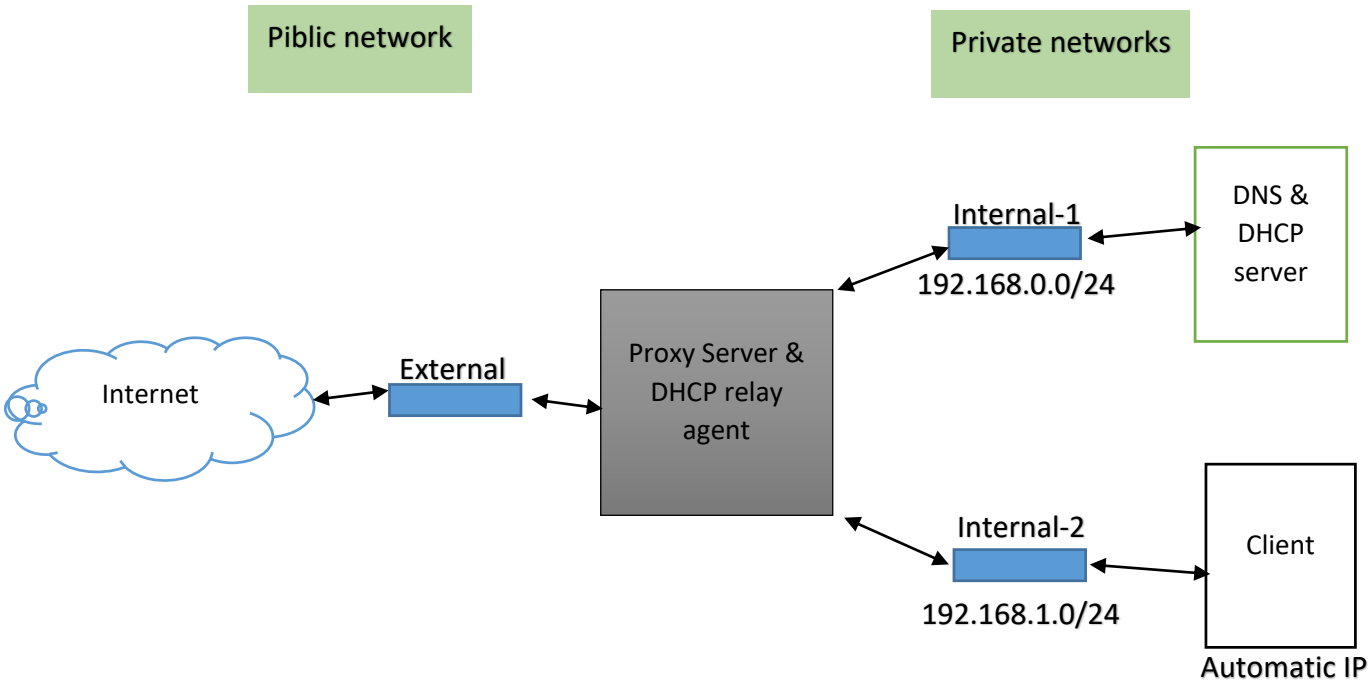
→ The number of seconds the relay agent ways before forwarding the message.

→ Your Relay Agent needs to know the DHCP server to contact when it receives a request. So the final step in this setup is to add the IP address of the Server to the Relay Agent protocol.

- **Squid Proxy Server**

→ Squid is a caching and forwarding HTTP web proxy. It has a wide variety of uses, including speeding up a web server by caching repeated requests, caching web, DNS and other computer network lookups for a group of people sharing network resources, and aiding security by filtering traffic.

- **DHCP Relay Agent Diagram**



## ❖ DHCP Relay Agent

- **On DHCP Server**

➢ First of all, On Server-1 add interface internal-1
➢ And, assign IP address: 192.168.0.1
➢ Add Default Gateway: 192.168.0.2 (IP address of DHCP relay agent)
➢ Then, On Server-1, create scope (Scope-1)
➢ Now, go to server manager → tools → DHCP → IPv4 → r. click → new scope → give name (scope-1) → give range (start IP: 192.168.1.1, end IP: 192.168.1.10) → and give CIDR range 24 (as per subnet mask: 255.255.255.0) → Yes, I want to configure these options now → yes, I want to activate this scope now → finish

- **On DHCP Relay Agent and Proxy Server**

➢ First of all, On Server-2 add 3 interfaces internal-1, Internal-2 and External switch.
➢ And, assign IP addresses
➢ Internal-1: 192.168.0.2, Internal-2: 192.168.1.50
➢ Now, on Server-2 go to → server manager → tools→ routing and remote access → IPv4 → general → r. click → new routing protocol → DHCP relay agent → ok
➢ DHCP relay agent → r. click → Properties → assign IP address of DHCP Server (such as: 192.168.0.1) → Add → OK
➢ DHCP relay agent → r. click → New interface → select (Ethernet-2) → OK → OK

- **On Windows-10**

➢ Now, On client machine → open network and sharing center → IPv4 → properties → (check) obtain an IP address automatically → OK
➢ Open CMD and write command ipconfig /release and ipconfig /renew and then ipconfig /all

## ❖ Squid Proxy Server

- **On DHCP Relay Agent and Proxy Server**

➢ Now, on Server-2 → Download Squid
➢ I have downloaded squid from: https://squid.diladele.com/
➢ On desktop, you will see icon of squid, double click on it, Then, you will see small icon of squid in taskbar at bottom right, here you can start and stop squid service, and also you can directly navigate to squid folder or configuration file.
➢ Now, go to C:\squid\etc\squid
➢ And rename files from:

- cachemgr.conf.default
- mime.conf.default
- squid.conf.default
- squid_radius_auth.conf.default

➢ To:

- cachemgr.conf
- mime.conf
- squid.conf
- squid_radius_auth.conf

➢ Simply, remove default from all files in C:\squid\etc\squid
➢ Now, go to C:\squid\etc\squid
➢ Here in squid create text file (such as: blocked-site)
➢ In blocked-site file write the site name that you want to block (such as .yahoo.com)
➢ For that, just write .yahoo.com and save it and then close it.
➢ Then after, Open squid.conf (path: c:\squid\etc\squid)
➢ Then, write following commands below the acl CONNECT method CONNECT command:

- ## custom acl
- acl blocked-site dstdomain '/etc/squid/blocked-site.txt'
- http_access deny blocked-site

- Now, Search for
  - # And finally deny all other access to this proxy
  - http_access deny all
- Change to:
  - http_access allow all
- Search following to change Caching web pages' size
  - #Default:
  - # cache_dir ufs c:/squid/var/cache 3000 16 256
- Make the Changes (make sure to delete the #)
  - #Default:
  - cache_dir ufs /var/cache/squid 10000 16 256
  - Save it and close the file
- Then, stop squid server service
- Now, Open Squid Terminal as an Administrator
- Run command: squid -z
- Proxy cache web pages will be stored in C:\squid\var\cache\squid
- Restart the squid server service
- Now, in order to Start Squid service
- Go to services and start the Squid service
- Then, check in The task manager whether the service is running or not
- Now, stop squid service and then start squid service.
- Afterwards, Configure Internet Explorer proxy settings in local host
- For that, go to start menu → search for Internet Properties → Connections → LAN settings
  - Check mark on Use a proxy server for your LAN
  - Address: localhost
  - Port: 3128
- Then, Open Mozilla Firefox → Tools → Options → Advanced → Network → Settings → Check mark on Use system proxy settings.
- Now, Restart the service
- Check whether you can Access the Internet

- **On Windows-10**

➢ Now, On client machine → Open Mozilla Firefox

➢ Go to → Options → Advanced → Network → Settings → Check mark on Manual proxy configuration:

- Proxy server IP Address is given here (192.168.1.50)
- Port is 3128

➢ Check mark on Use this proxy server for all protocols → OK.

➢ Afterwards, Configure Internet Explorer proxy settings

➢ For that, go to start menu → search for Internet Properties → Connections → LAN settings

- Check mark on Use a proxy server for your LAN
- Address: 192.168.1.50
- Port: 3128

➢ Then after, try to open Mozilla Firefox or Internet Explorer

➢ And then, firstly, open www.yahoo.com, it won't open because we have blocked it.

➢ Now, try to open www.google.com, it will open.

➢ We will be able to open any site except www.yahoo.com.

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