Introduction to Networking

1 IT 101

1.1 Lectio3

We spoke about PXE there is also Wake On LAN which listen to port 5 and wake the computer automatic when receives packet

1.1.1 Topology

there is multiply types:

1. **BUS**

2. **Star**

Pros :

- it is survivable even if one computer in the chain fell down. unlike BUS which operate by chaining the devices.
- Single Point of Failure - the more mediate points the more chance of failure

Cons :

- there is a failure in the main switch the network fall
- the length of cable is limited [max length 70m after redundancy 100 m the official] so deployment can be more limited

3. **Dual BUS**

in the first it was hub in the middle of a Star which by a switch connect the computers later on we moved to switch the difference between each switch is the "backbone" the amount of data you can transfer between each entity in the network. to choose between different quality of switches is by the expected load you perceive to be active in the network

In WAN we operate be BUS topology.

Client - what consumes and requests the data **Server** - what distribute the data

P2P - network with no distinguishing main computer

1.1.2 Network Types

In windows there is two types of networks:

1.1.2.1 Type of servers

- **Domain** - organized network with policy that set from another computer. it is deployed by having a server entity[either cluster or singular]
- **Workgroup** - there is no policy given by one main computer which have higher cost in maintenance it is an equal system

- **Terminal/Clinet** - Operate by a PC and thin client
- **Server/Client** - each computer independent but the server is a master relation of resources, You can put an independent server for storage
- **Domain** - An hierarchical client server network the of one domain[symbolized by triangle] or more create forest and can contain subdomain subordinate to it
- **LAN** - Ethernet

1.1.2.2 Encryption protocols

- **WEP** - Clear text
- **WPA** - encrypted key and the key pass with the packets
- **WPA2** - The encryption key is a bit more complicated
- **Radius** - Encrypted 2pass authorization

1.1.2.3 Traffic Protocols A system that regulate the streams of data access.

- **802.2/802.3** - 10/100/1,000/1,0000/1,000,000, Can be chained and regulate traffic to balance the load

1.1.2.4 Wifi Protocols

pg 51

- **Frequency** - The access points of the stream

- **Band** - The strength of the stream

- **Mimo** - The number of channels it is capable to reproduce

- **Repeaters** - A device that increase the spread of the stream but as the frequency is low

- **Gateway** - navigate streams to different switches

- **Bridge** - move a physical access further down

- **MAC address** - A physical identity that is unchangeable

- **Logical Addres** - usually an IP address given by DHCP

1.1.2.5 Traffic Types

- **Unicast** - 1:1
- **Multicast** - 1:Many
- **Broadcast** - More general We would want to avoid broadcast as it block other streams.

1.1.2.6 Network Protocols

- **IP Adddress** - An open protocol that took over the market where in the past in the past ### IPv4

1.1.2.7 IP address gain process:

1.** Broadcast - DHCP Discover** - Broadcastt type of communication - **DHCP Request** - After gainign DHCP list requesting IP   2.** Unicast - DHCP Offer** - Gaining access

We moved toward from hub to switch as switch isolate the broadcast request - **VLAN** - create a logical sapration in the network

Translation to binary of Octat is done by division

1.1.2.8 Translation of the IP

The Mac address give the base and by & operation hence

** Object**	IP Address	Binary Translation
Mac address	255.255.255.000	[11111111].[11111111].[11111111].[00000000]
Operator	192.168.004.052	[11000000].[10101000].[00000100].[00110100]
Equal	192.168.004.000	[11000000].[10101000].[00000100].[00000000]

1.1.2.9 Range Boundery

Internal Ranges of IPv4

** Class**	** Start Range**	** End Range**	Subnet Mask	** Total**
A	001.XXX.XXX.XXX	126.XXX.XXX.XXX	255.000.000.000	125
B	128.XXX.XXX.XXX	191.XXX.XXX.XXX	255.255.000.000	65
C	192.XXX.XXX.XXX	223.XXX.XXX.XXX	255.255.255.000	31
D	224.XXX.XXX.XXX	239.XXX.XXX.XXX		15
E	240.XXX.XXX.XXX	255.XXX.XXX.XXX		15

Blocked Ranges

IP Address	Reason
000.000.000.000	Default route
XXX.XXX.XXX.255	Limited to Broadcast
127.XXX.XXX.XXX	Limited to Loopback
169.254.XXX.XXX	"Automatic Private IP Address" meaning the device is not connected
192.000.002.000	Test-net
255.255.255.255	Secure Network

in it all the 255 remain the same[full value] and the 0 is an open space

1.1.2.9.1 Training

IP	C/Sub	NID	HID
198.000.003.065	C/255.255.255.000	198.000.003	065
001.002.003.004	A/255.000.000.000	001.002.003	004
223.000.000.001	C/255.255.255.000	223.000.000	001
166.000.089.254	B/255.255.000.000	166.000.089	254
001.000.000.001	A/255.000.000.000	001.000.000	001
192.058.240.255	C/255.255.255.000	192.058.240	255
000.065.079.031	NOT AN IP		
158.255.048.017	B/255.255.000.000	155.255.048	017
014.085.000.001	A/255.000.000.000	014.085.000	001
196.140.006.000	C/255.255.255.000	196.140.006	000
055.089.255.000	A/255.000.000.000	055.089.255	000
134.078.255.055	B/255.255.000.000	134.078.255	055
010.000.255.255	A/255.000.000.000	010.000.255	255
233.018.003.255	D/MULTI-CAST		
192.168.259.035	NOT AN IP		
001.255.255.254	A/255.000.000.000	001.255.255	254
102.228.214.163	A/255.000.000.000	102.228.214	163
207.037.137.093	C/255.255.255.000	207.037.137	093
126.089.181.026	A/255.000.000.000	126.089.189	026
079.124.218.119	A/255.000.000.000	079.124.218	119
027.106.038.231	A/255.000.000.000	027.106.038	231
013.155.197.038	A/255.000.000.000	013.155.197	038
103.087.157.247	A/255.000.000.000	103.087.157	247

1.2 Lectio 4

In order to avoid natural collusion between IP addresses we saperate the network to different collusion zones to sapreate switch. a usual use case is to limit the subnet mask according to the case usage is limited to multiply computers by limiting the subnet we

In the case of:

ID	IP	Bit
1	172.025.000.000	16
2	172.025.032.000	24

Is not of the same network however

ID	IP	Bit
1	172.025.000.000	0
2	172.025.032.000	0

are of the same network

thus it si not known if two computers

1.2.1 Exercise

Req:

Requirment	Value
Required IP	70,000
Required Networks	100
Original IP	128.30.40.50
Base Subnet	255.255.0.0
Base IP	128.30.0.0
New Subnet	255.255.140.0

	IP	255	255	140	0
Bin	11111111	11111111	11110000	000000000	

IP Start	IP End	Computer Range
128.15.0.0	128.30.0.0	

1.3 Lectio 5

The DHCP process is:

1. DHCP Discovery
2. DHCP Lease Offer
3. DHCP Request
4. DHCP Lease Ack

The Computer name operate by: [UNIX-NAME]@[Domain name] so for example: COMPUTER1@ domain-initial.domain-address.domain-initial

1.3.1 DNS

The process by which the computer recognize the IP address[or MAC address] accroding to the name given to it. the process is operating under Windows 98 and above part of the connection after attaining IP address includes request to the DNS

1.3.2 File sharing

In order to have file sharing you need couple of processes

1. Network Discovery offered after windows 7 by the *Link-Layer Topology Discovery* or *LLDP* in the interface settings of the network adapter

1.3.3 Introduction to Hyper-V

1.3.3.1 Training:

1. Open **Hyper-V**
2. **New VM**
3. **Gen 1**
4. **4096gb ram**
5. **OS later**

6. Open the VM
7. Open the iso from *C:\ISO\Win10Ent* 8, Install windows
8. After Installation to create another machine

to classify Class C Network

1.4 Lectio 6

Weve talked about the dhcp process DNS translate name to IP. Computer FQDN(Fully qualified name) is in unix and can include 256 chars. it is hierarchical in nature.(since Win 2000). In the network there can be only one unique name.

Translation processes:

- **Broadcast** - One computer broadcast the name of the other computer and request his IP
    - this is limited to a single segment and NetBEUI
- **Static** translation by name - based on the host file in the pc.
    - Not a single segment network, and require manual update
    - two types:
        1. Lmhosts - Legacy support for NetBIOS
        2. hosts - Newer DNS
- **Dynamic allocation** - automatic allocation
- **Windows Discovery** - in the past it was called neighbor networking.
    - in the past it was less configurable
- **Network sharing**

Authenticated User - everyone who has a passed 2 pass authentication with the server Everyone - Every user that came in touch with the computer

To publish the computer:

1. To transfer to Dynamic IP Address

1.5 Lectio 7

Last lesson we spoke about shares, now we need to organize it as a network path, this done because in the past software couldn't translate network path so they had to be mapped as a drive.

you can do it in cmd using "net use x: \\Servername\SharePath\"

1.5.1 Automation

We want to automate the mapping of the network drive.

this is today called the world of devops.

@echo off

net use /del /y

net use j: 127.0.0.1 myshare

1.5.2 Firewall

When connecting to network it asks what type of network in order to fit the security settings to the usage. in the Domain we tend to cancel it as their are other more effective solutions

but we will want to remote desktop connect, in **System Properties** > **Remote** > **Enable**

1.5.3 Server vs Client

Measure	Server	Client
Application Layer	applications sucha s ERP is a database system that manage the entire organization and other server solutiions	End Client applications
OS	Linux, UNIX, Windows	Linux, MAC, Windows
Initial OS	BIOS	BIOS
Hardware Layer	Designated Hardware	Generic hardware

Servers are measured by the amount of U(the cabinet size measure) of them which the higher it is the more cost it have in maintenance

Measure	**PC**	**Server**
Place	Under the desk	In a desgnated hall
Noise	Quite	Noisy
Size	As a drawer	
Architecture	Muliply cores 4 dimm slots SATA up to 10 hdd	Many fans cores and memory slots
Redundency	One PSU	2 PSU or more
	Custom Raid controller	2 Network cards and more
	No ECC	RAid support
		With ECC
Expension support	Up to 5 PCIE slots	With PCIX support
	Limited by form factor	RSA
	Rarely support PCI-X	
Other		Hotswap

1.5.4 Test

The test will have:

1. **Topology**

2. **IP Address Ranges**

3. **Alternate configuration of IP**

4. **Distinguishing between the role of DNS to DHCP**

2 Windows 10

2.1 Lectio 8

2.1.1 Features:

1. **Semiannual release**

2. **Editions:**

- **Home** - can't connect to domain

- **IOT** - To general hardware

- **Professional**

- **Enterprise**

3. **Security**

Microsoft add basic security suite to users this is included in the Microsoft Security Center and recently added sandboxing for launching applications.

4. **added new way to start up**

5. **Embedded Software**

6. **Cortana**

7. **Embedded connection to their cloud services**

8. **Update analytics**

9. **Windows Hello for Bussiness** - Biometric recognition

10. **Edge browser**

11. **Types of editions** -

- **LTSB** - *Long term service branch* - a semiannual major release cycle of updates with intermediate lesser updates

- –

12. **HyperVisor** - virtualization technology

2.1.2 Minimum Requirements

2.1.2.1 32bit

1. **CPU** - 1GHz or more

2. **Mem** - 1GB or more

3. **HDD Space** - 16GB or more

2.1.2.2 64bit

1. **CPU** - 1GHz

2. **Mem** - 1GB

3. **HDD Space** -20GB or more

2.1.3 How to install

1. **Clean installation from iso file** - From any removable media storage

2. **Microsoft Deployemnt Tool(MDT)** - Send a computer over network in the UEFI

3. **System Center Configuration Manager ($SCCM$)** -

4. **Provision** - Over 50 PC in Networks or more

2.1.4 Exercise

Install VM using custom partioning

2.2 Lectio 9

2.2.1 Virtualizaton automation

WAFG - Windows Answer File Generator - create an System image with predefiend settings ot install

In order to create an image we need to preapre the system: first use Sysprep it need it to:

1. Remove sytem specific data from CLI

2. Configure windwos to start audit mode

3. Configure windows operation system to start zero day

4. reset activation

DISM

1. view content of a wim file

2. capture and apply images

3. Mount images for offline images

2.2.1.1 USMT

Homework - create an automated installation of windows 10 and windows 7 using the Microsft deploment kit

2.2.2 Powershell

A CLI scripting envrioenment that allow to automate and control windows

an example script to hard reset all Virtual machines

```
VMS = Get-VM
Stop-VM $VMS -and Start-VM $VMS
```

2.2.3 GPO

Local Computer Policy - Group policy decided by the specifcation required

Site - Area in the architecture applying settingss dynamically more localized under the domain in order to reduce traffic.

Domain - A logical unit which contain the sites

OU - Organization units system wide units which users are set to