Wireless Network 3

Wi-Fi Network Standards

The networking standard used by wireless architecture is IEEE 802.11. However, this standard is in continual development and new amendments come out regularly. Amendments to the standard are assigned letters, and while many amendments have been released, the most commonly known are:

IEEE Standard	Year Adopted	Frequency	Max. Data Rate	Max. Range
802.11a	1999	5 GHz	54 Mbps	400 ft.
802.11b	1999	2.4 GHz	11 Mbps	450 ft.
802.11g	2003	2.4 GHz	54 Mbps	450 ft.
802.11n	2009	2.4/5 GHz	600 Mbps	825 ft.
802.11ac	2014	5 GHz	1 Gbps	1,000 ft.
802.11ac Wave 2	2015	5 GHz	3.47 Gbps	10 m.
802.11ad	2016	60 GHz	7 Gbps	30 ft.
802.11af	2014	2.4/5 GHz	26.7 Mbps – 568.9 Mbps (depending on channel)	1,000 m.
802.11ah	2016	2.4/5 GHz	347 Mbps	1,000 m.
802.11ax	2019 (expected)	2.4/5 GHz	10 Gbps	1,000 ft.
802.11ay	late 2019 (expected)	60 GHz	100 Gbps	300-500 m.
802.11az	2021 (expected)	60 GHz	Device tracking refresh rate 0.1-0.5 Hz	Accuracy <1m to <0.1m

Wifi Connection Modes

Infrastructure Mode

Infrastructure mode is the most common style of Wi-Fi, and it is the one people think of when they connect at home or the office. With infrastructure mode, you need an access point that serves as the primary connection device for clients. All other clients in the network (computer, printer, mobile phone, tablet, or other device) connect to an access point to gain access to a wider network.

Ad Hoc Mode

Ad hoc mode is also referred to as peer-to-peer mode because it does not involve an access point, but is instead made up of multiple client devices. The devices, acting as “peers” within the network, connect to each other directly.

Wi-Fi Direct

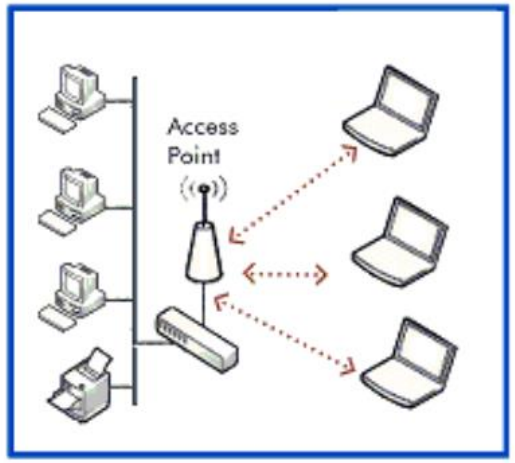
Wi-Fi Direct is a form of Ad Hoc, but with some additional features and capabilities. Wireless connectivity is provided to compatible devices that need to connect without the use of an access point. Televisions are frequently Wi-Fi Direct compatible, allowing users to send music or images straight from a mobile device to their TV.

Wi-Fi Hotspot

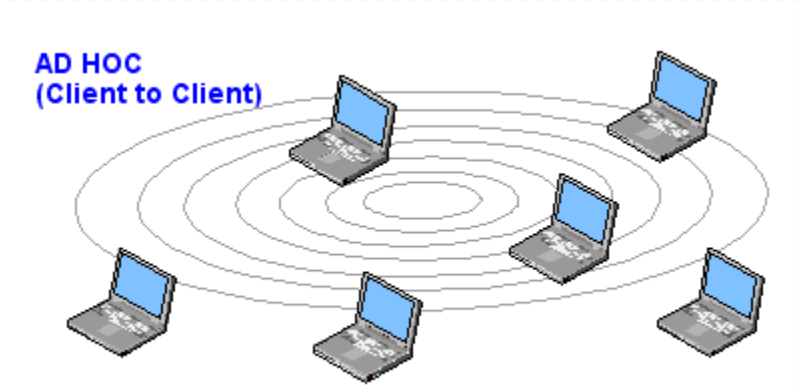
The term “Wi-Fi hotspot” usually refers to wireless networks placed in public areas, like coffee shops, to allow people to connect to the internet without having to have special credentials. While some are free, others require a fee, particularly those administered by companies that specialize in the provision of hotspots in places like airports or bus terminals.

Wifi Connection Modes

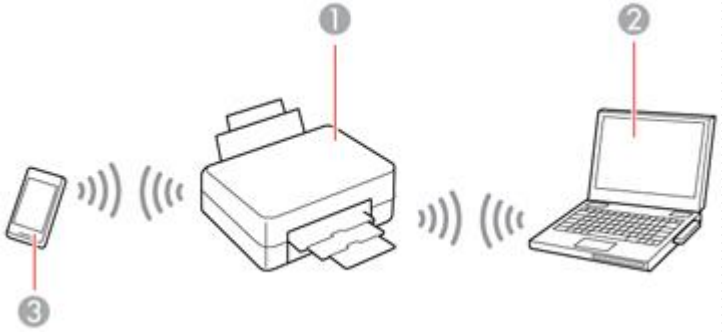
Infrastructure Mode



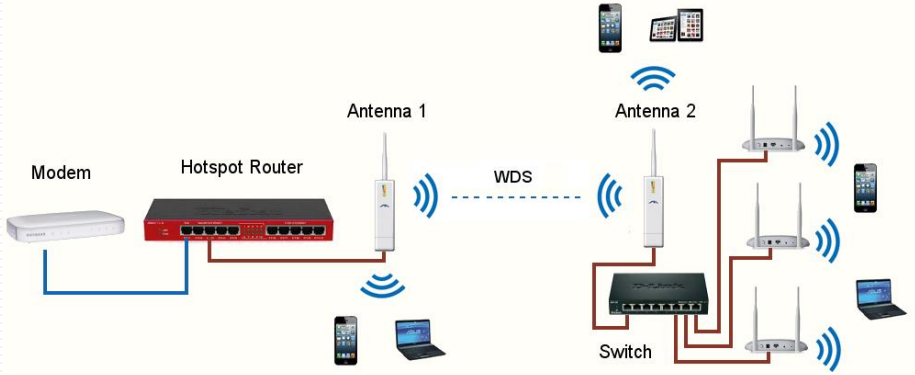
Ad Hoc Mode



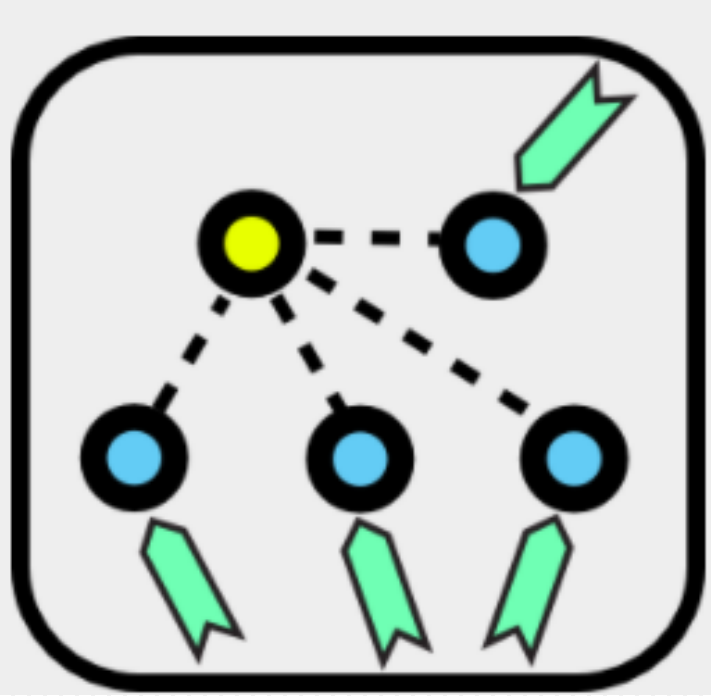
Wi-Fi Direct



Wi-Fi Hotspot



Wireless Device Roles (Clients)



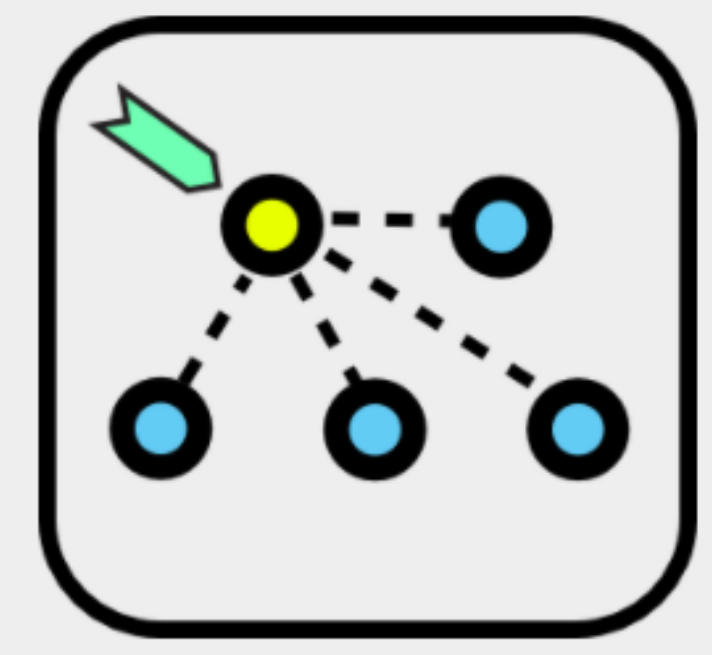
Wireless Clients (Station)

Devices such as computers, tablets, and phones are common Clients on a network. When you are accessing a wireless hotspot, or the router in your home or office, your device is the client. This client mode is also known as “station mode” as well.

Some routers can operate as Clients as well, which allows them to act like the wireless card in a computer, and connect to other Access Points. This can bridge two Ethernet networks, or connect to more distant APs.

A Wireless Client is similar to a person in the audience of a play or movie. They are one of several or many people accessing information through the same conduit - someone speaking.

Wireless Device Roles (Access Points)



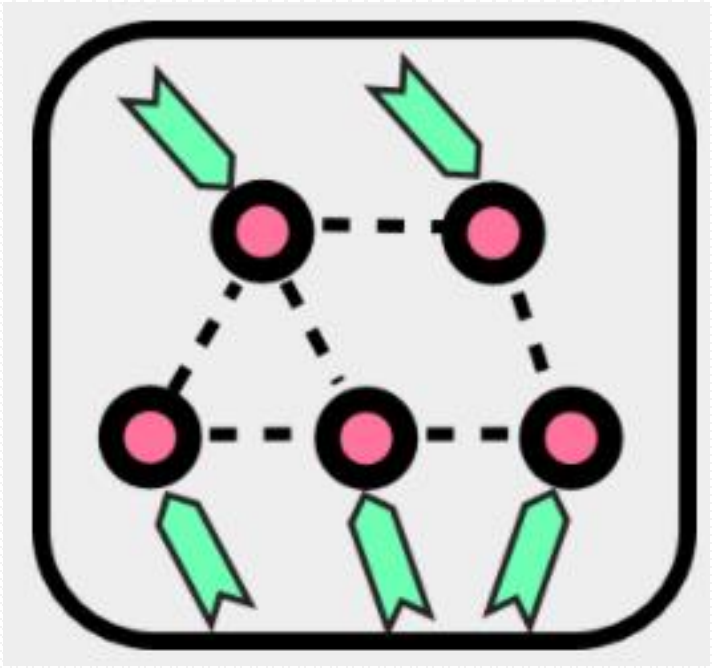
Access Points (Master)

Most wireless networks are made using Access Points - devices that host and control the wireless connection for laptops, tablets, or smart phones. If you use Wi-Fi in your home or office, it is most likely through an Access Point. When a router is set up as an AP, it is said to be in “Master” or “Infrastructure” mode.

An AP is sometimes a stand-alone device that bridges between a wireless and wired (Ethernet) network, or is part of a router. APs can cover a range of areas with a wireless signal, depending on the power of the device and the type of antenna. There are also some APs that are weatherproof, designed to be mounted outdoors.

An Access Point is similar to a person on stage, addressing an audience or crowd - they are providing the information for everyone else. Those audience members can ask questions of the person on the stage, and receive a response.

Wireless Device Roles (Ad-Hoc Node)



Ad-Hoc Node (Mesh)

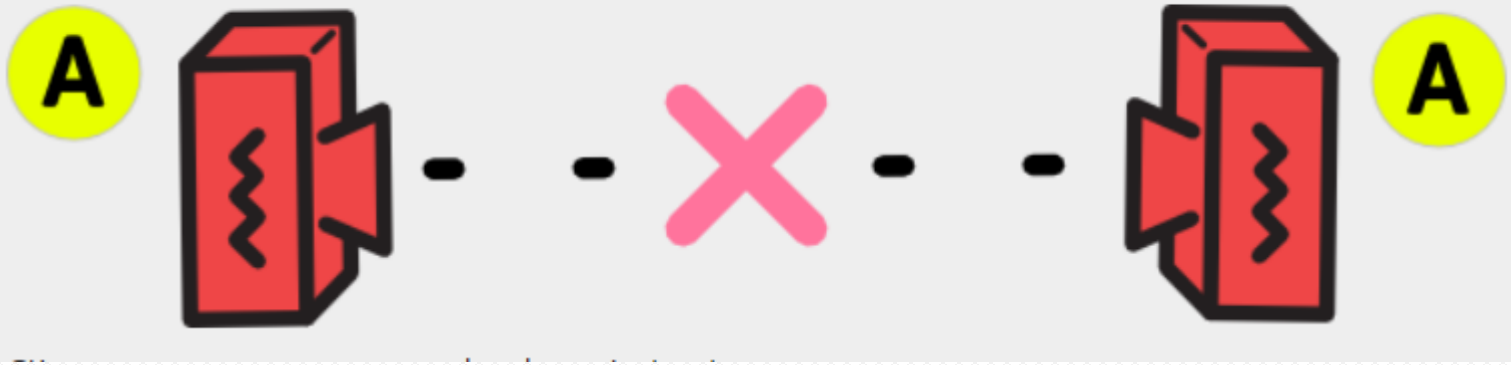
Some wireless devices (laptops, smart phones, or wireless routers) support a mode called Ad-Hoc. This allows those devices to connect together directly, without an Access Point in-between controlling the connection. This forms a different type of network - in Ad-Hoc mode, all devices are responsible for sending and receiving messages to the other devices - without anything else in between. In an Ad-Hoc network, every device must be in this role, and using the same configuration to participate. Not all devices use this mode, and some have it as a "hidden" feature.

Ad-Hoc devices are used to create a Mesh network, so when they are in this mode, they are called "Mesh Nodes".

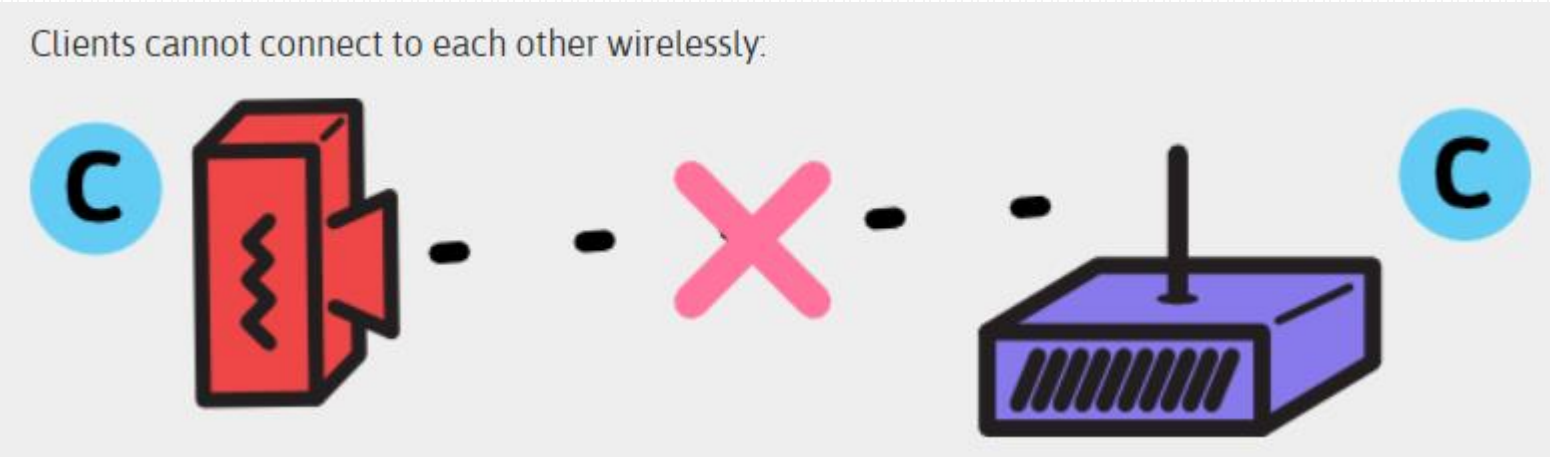
An Ad-Hoc or Mesh node is similar to an individual in a group or roundtable discussion. They can take equal part in the conversation, raising their hand when they want to speak so the others will listen. If someone at the end of the table cannot hear, one of the individuals in-between can repeat the original message for the listener.

Wireless Device Roles

Access Points cannot connect to each other wirelessly:



Clients cannot connect to each other wirelessly:



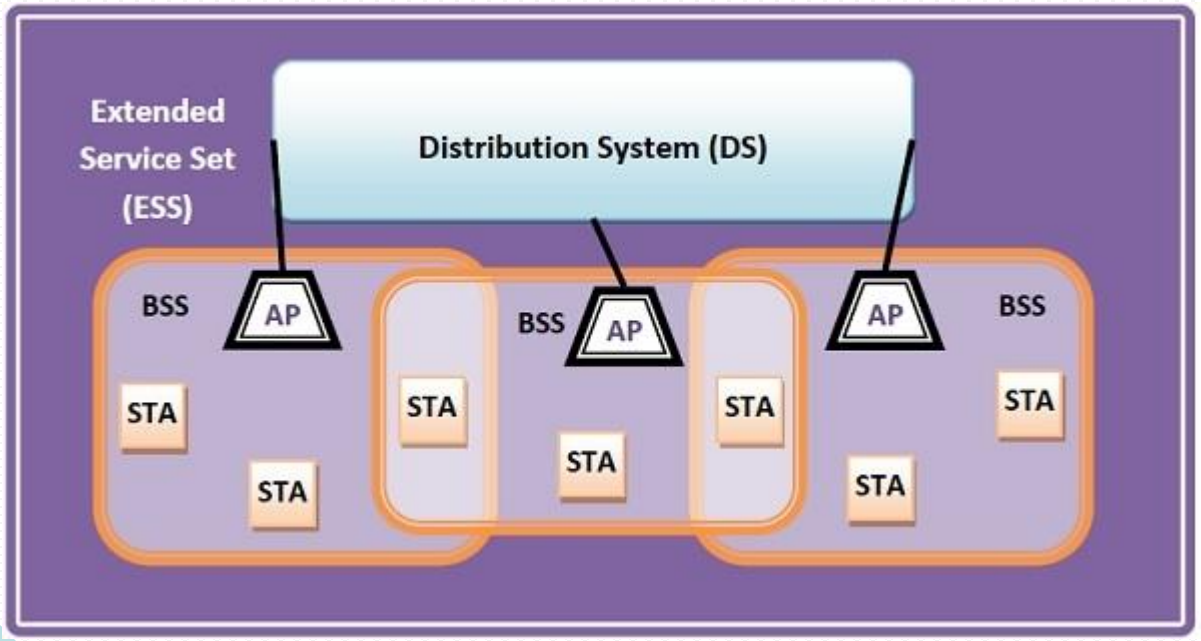
Wireless Device Roles

Clients cannot connect to Ad-Hoc (Mesh) devices wirelessly:

Access Points cannot connect to Ad-Hoc (Mesh) devices wirelessly:

WLAN

Wireless LANs use high-frequency radio waves instead of cables for communications. They provide clutter free homes, offices and other networked places. They have an Access Point or a wireless router or a base station for transferring packets to and from the wireless computers and the internet. Most WLANs are based on the standard IEEE 802.11 or WiFi.



Components of WLAN :

Stations (STA) − Stations comprises of all devices and equipment that are connected to the wireless LAN. Each station has a wireless network interface controller. A station can be of two types −

- Wireless Access Point (WAP or AP)
- Client

Basic Service Set (BSS) − A basic service set is a group of stations communicating at the physical layer level. BSS can be of two categories −

- Infrastructure BSS
- Independent BSS

Extended Service Set (ESS) − It is a set of all connected BSS.

Distribution System (DS) − It connects access points in ESS.

Static/DHCP

Static

Static IP will provide certainty to the device, meaning that as long as the configuration is installed and not changed it will be the same. In contrast to DHCP which has a certain time which makes the device will get a different identity the second time it connects if it doesn't use binding or IP reservation.

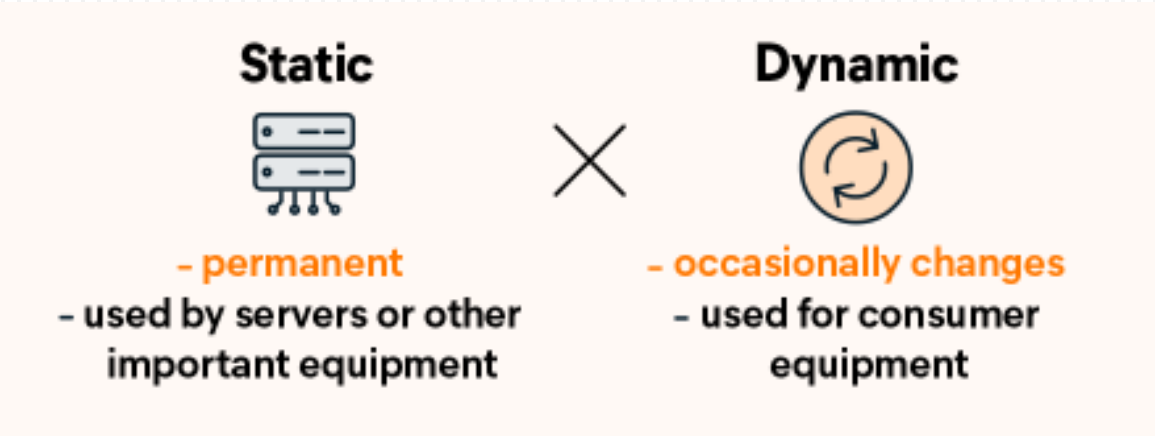
Manual configuration will complete the connection process, especially if the devices to be configured are not many 1 or 2 for example.

DHCP

People usually recognize this distribution technique as an efficient way to configure multiple devices in a single network in an instant it makes the difference between DHCP and Static IP. The system will provide a Package offer to the client automatically when the device is connected to the network for the first time.

Case Study: This process is very suitable for setting up 100 computers in one lab.

Static or DHCP ?



The difference between DHCP and static that has been mentioned will give a different picture after knowing it.

The use of Static IP addresses is highly recommended for devices that already exist, primary, and or complementary to the network.

For example on one network there are 2 servers, 5 Wifi Packages, Wifi Routers and 15 Computers + Printers, these devices are suitable for manual configuration.

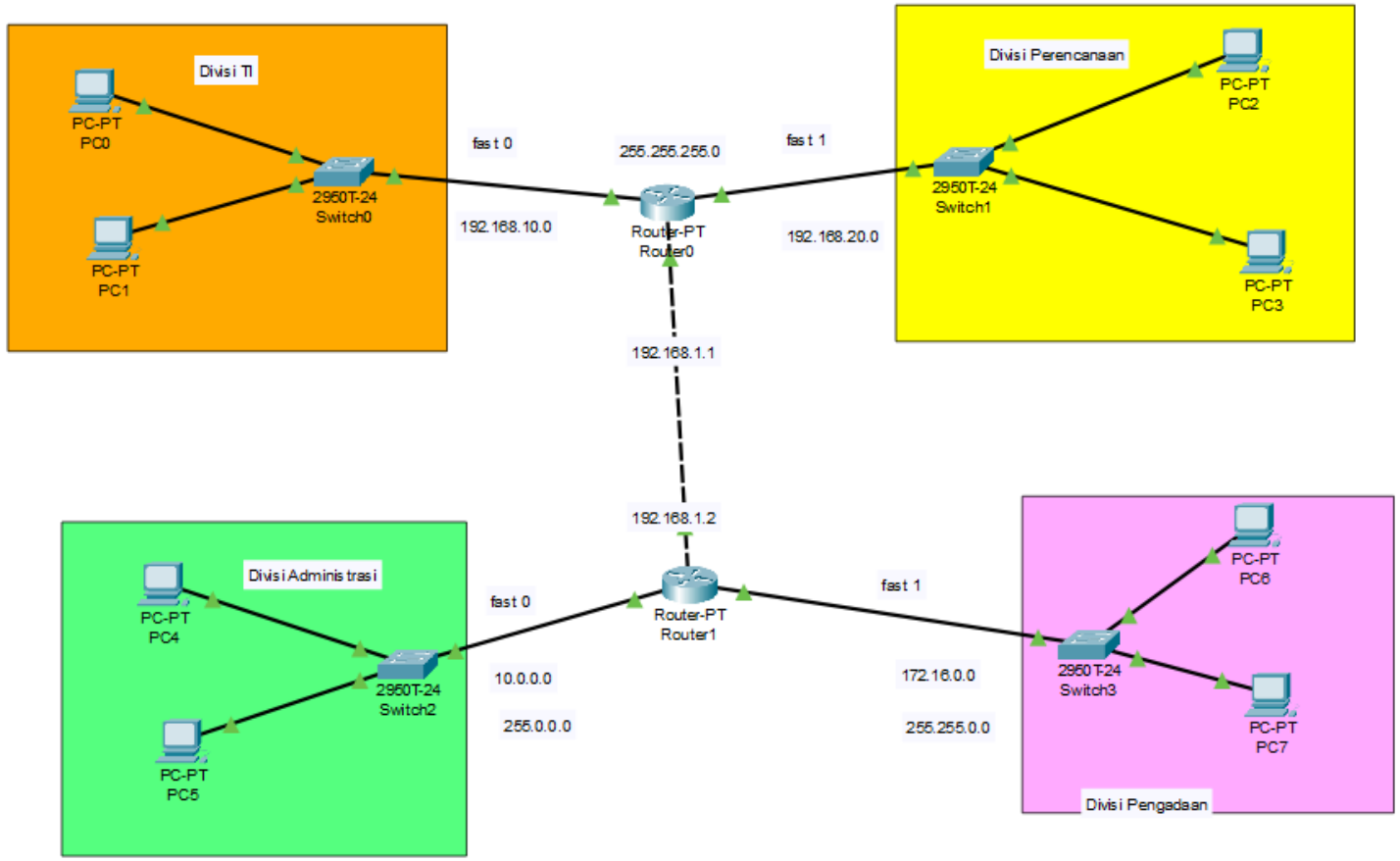
The configuration manual will provide fixed IP access, so remote processes and device sharing properly don't interfere with central access changes.

Meanwhile, the automatic distribution package system can be used for users as end users or users, where it is not certain to always be connected to the same/guest network. it is also to give priority to the availability of the initial identity to the device that is connected first.

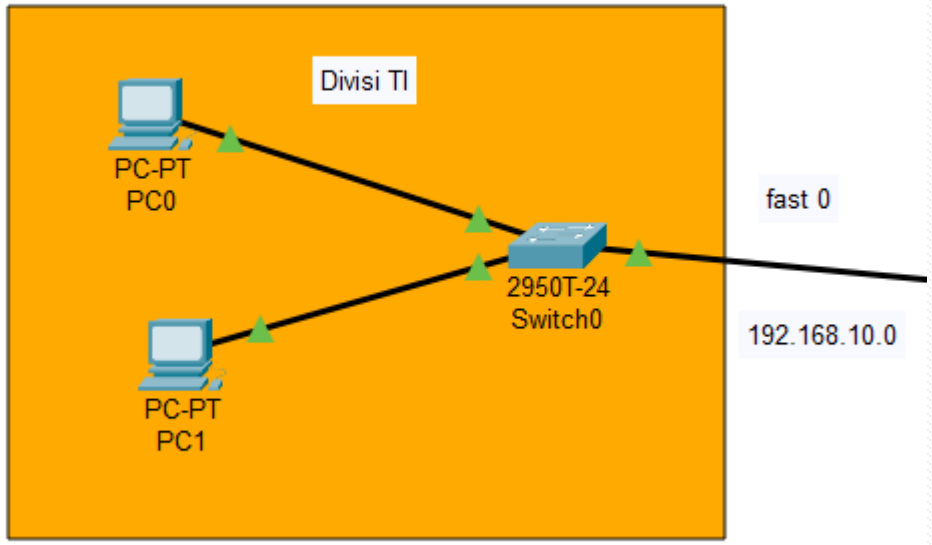
Latihan

Buatlah sebuah aristektur jaringan Wide Area Network, yang terdiri dari beberapa LAN.

Alat-alat yang digunakan :
8 device
4 switch
2 router
Copper Straight Line



Setting PC 0 dan PC 1



PC0

IP Configuration

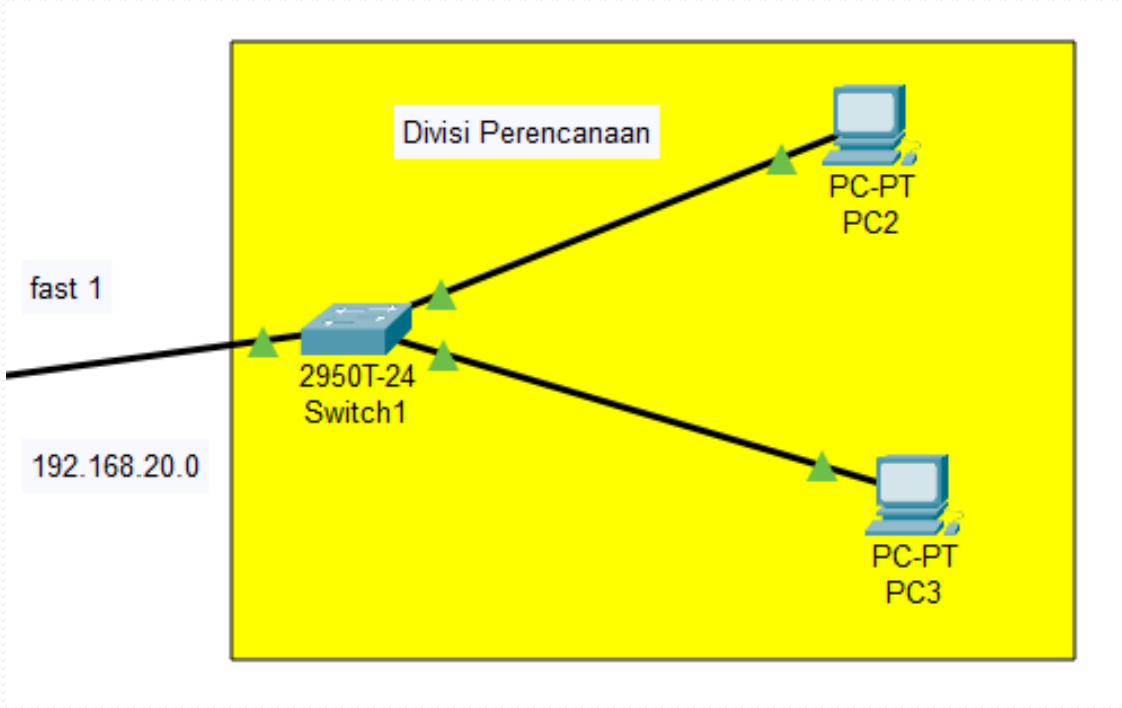
DHCP	Static
IPv4 Address	192.168.10.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.10.1
DNS Server	0.0.0.0

PC1

IP Configuration

DHCP	Static
IPv4 Address	192.168.10.3
Subnet Mask	255.255.255.0
Default Gateway	192.168.10.1
DNS Server	0.0.0.0

Setting PC 2 dan PC 3



PC2

IP Configuration

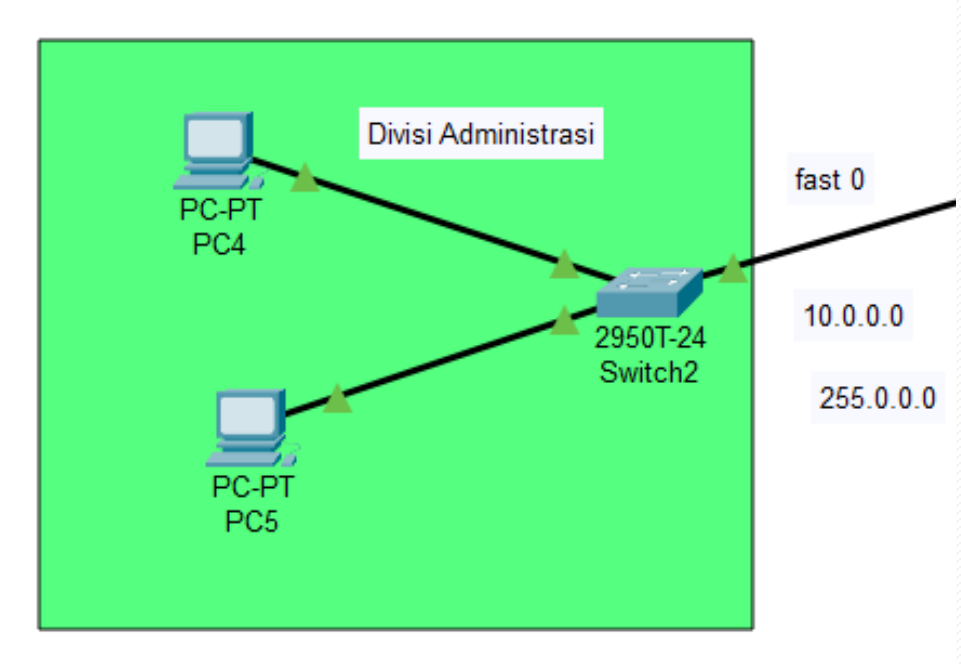
DHCP	Static
IPv4 Address	192.168.20.2
Subnet Mask	255.255.255.0
Default Gateway	192.168.20.1
DNS Server	0.0.0.0

PC3

IP Configuration

DHCP	Static
IPv4 Address	192.168.20.3
Subnet Mask	255.255.255.0
Default Gateway	192.168.20.1
DNS Server	0.0.0.0

Setting PC 4 dan PC 5



PC4

IP Configuration

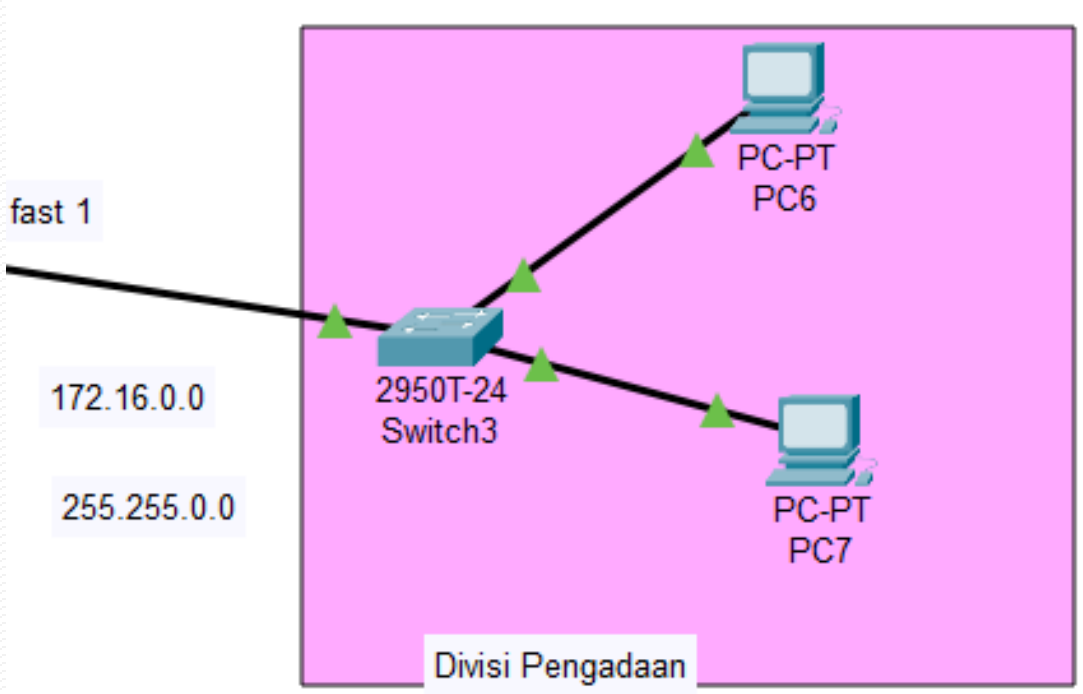
DHCP	Static
IPv4 Address	10.0.0.2
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.1
DNS Server	0.0.0.0

PC5

IP Configuration

DHCP	Static
IPv4 Address	10.0.0.3
Subnet Mask	255.0.0.0
Default Gateway	10.0.0.1
DNS Server	0.0.0.0

Setting PC 6 dan PC 7



PC6

IP Configuration

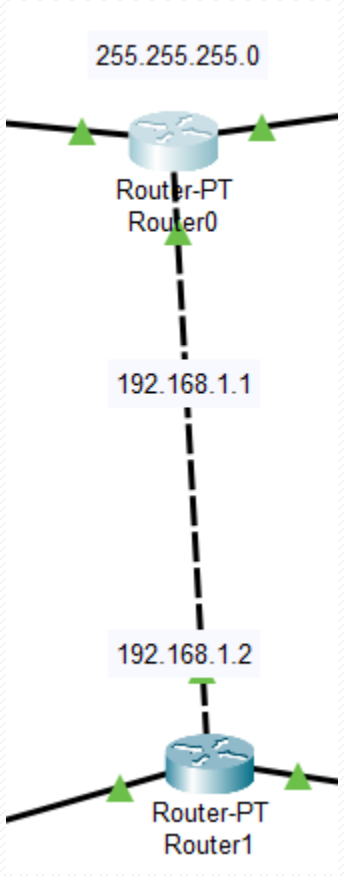
DHCP	Static
IPv4 Address	172.16.0.2
Subnet Mask	255.255.0.0
Default Gateway	172.16.0.1
DNS Server	0.0.0.0

PC7

IP Configuration

DHCP	Static
IPv4 Address	172.16.0.3
Subnet Mask	255.255.0.0
Default Gateway	172.16.0.1
DNS Server	0.0.0.0

Setting Router 0



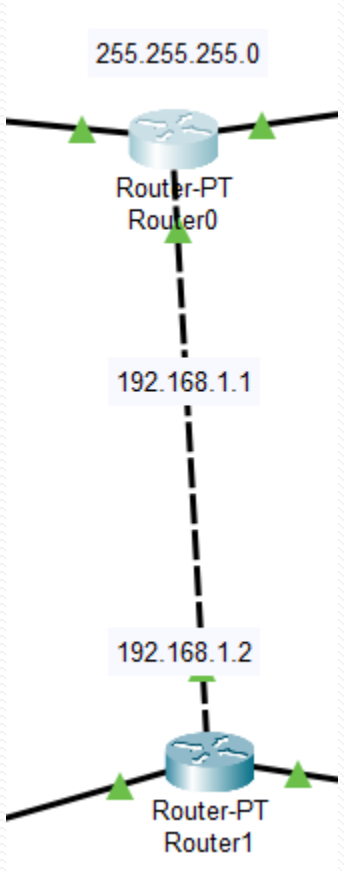
FastEthernet0/0

Port Status	On
Bandwidth	100 Mbps / 10 Mbps / Auto
Duplex	Half Duplex / Full Duplex / Auto
MAC Address	00D0.BA94.4B10
IP Configuration	
IPv4 Address	192.168.10.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

FastEthernet1/0

Port Status	On
Bandwidth	100 Mbps / 10 Mbps / Auto
Duplex	Half Duplex / Full Duplex / Auto
MAC Address	0090.2B07.BD72
IP Configuration	
IPv4 Address	192.168.20.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

Setting Router 1



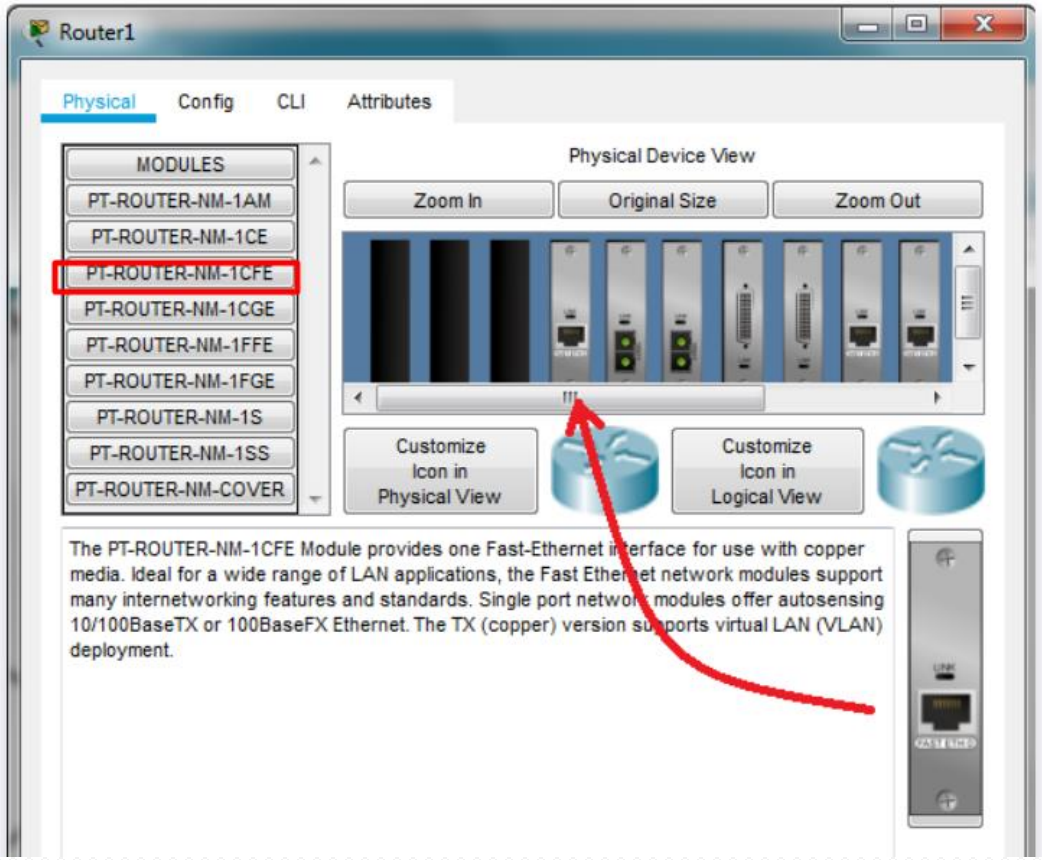
FastEthernet0/0

Port Status	On
Bandwidth	100 Mbps / 10 Mbps / Auto
Duplex	Half Duplex / Full Duplex / Auto
MAC Address	0050.0F73.350E
IP Configuration	
IPv4 Address	10.0.0.1
Subnet Mask	255.0.0.0
Tx Ring Limit	10

FastEthernet1/0

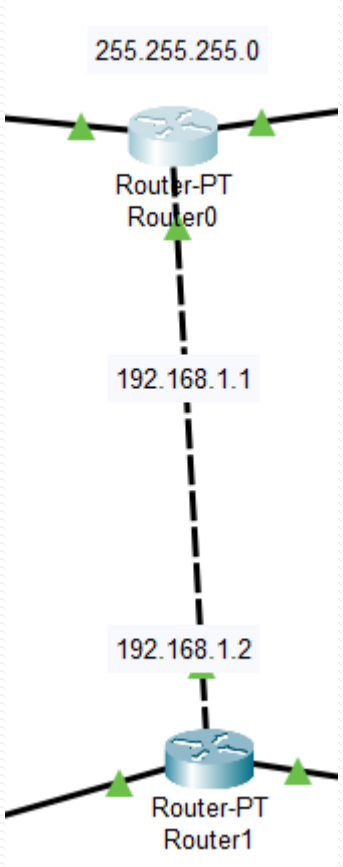
Port Status	On
Bandwidth	100 Mbps / 10 Mbps / Auto
Duplex	Half Duplex / Full Duplex / Auto
MAC Address	00D0.D375.798C
IP Configuration	
IPv4 Address	172.16.0.1
Subnet Mask	255.255.0.0
Tx Ring Limit	10

Setting Router 0 dan 1 (Menghubungkan 2 Router)



Tambahkan Module Fast Ethernet pada kedua router untuk menyambungkan router 0 dan router 1 .

Setting Router 0 dan 1 (Menghubungkan 2 Router)



Router 0

FastEthernet6/0

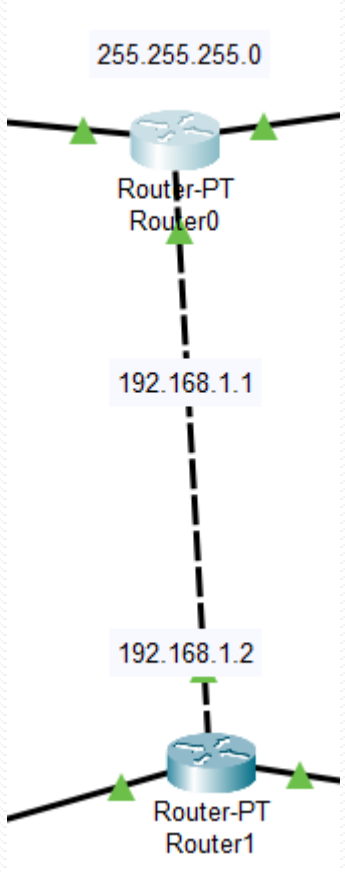
Port Status	On
Bandwidth	100 Mbps / 10 Mbps / Auto
Duplex	Half Duplex / Full Duplex / Auto
MAC Address	00D0.BCCB.4355
IP Configuration	
IPv4 Address	192.168.1.1
Subnet Mask	255.255.255.0
Tx Ring Limit	10

Router 1

FastEthernet6/0

Port Status	On
Bandwidth	100 Mbps / 10 Mbps / Auto
Duplex	Half Duplex / Full Duplex / Auto
MAC Address	0030.F2DE.424B
IP Configuration	
IPv4 Address	192.168.1.2
Subnet Mask	255.255.255.0
Tx Ring Limit	10

Static Routing



Router 0 :
Buka Router 1 -> CLI
#interface FastEthernet6/0

#ip route 10.0.0.0 255.0.0.0 192.168.1.2

#ip route 172.16.0.1 255.255.0.0 192.168.1.2

Router 1 :
Buka Router 0 -> CLI
#interface FastEthernet6/0

#ip route 192.168.20.0 255.255.255.0 192.168.1.1

#ip route 192.168.10.0 255.255.255.0 192.168.1.1

Keterangan :
Merah : IP Tujuan
Kuning : Subnet Mask Tujuan
Hijau : Jalur lewat IP

Tugas 2

Menggunakan Aristektur WAN yang sudah anda buat. Tambahkan masing-masing, minimal 2 device pada setiap divisi. Hubungkan device yang sudah ditambahkan sehingga dapat terkoneksi secara wireless.

Cek Koneksi masing-masing device yang ditambahkan apakah sudah berhasil terkoneksi atau belum.

Tugas yang dikumpulkan :

1. File Tugas Cisco Packet Tracer
2. Screenshot Arsitektur/Simulasi yang dibuat
3. Screenshot bukti arsitektur berjalan dengan baik. Contoh : ping PC di divisi berbeda

THANK YOU