NETWORK FUNDAMENTALS

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MAC ADDRESSES

- IP addresses are the Layer 3 (Network layer) addressing scheme used to identify a host in a network, while MAC addresses uniquely identify a network card (Layer 2).
- A MAC (Media Access Control) address is also known as the physical address.
- MAC addresses are 48 bit (6 bytes) long and are expressed in hexadecimal form (HEX).
- 00:11:AA:22:EE:FF

- To discover the MAC address of the network cards installed on your computer, you can use:
- • ipconfig /all on Windows
- • ifconfig on *nix operating systems, like MacOS
- • ip addr on Linux

BROADCAST MAC ADDRESS.

- There is also a special MAC address FF:FF:FF:FF:FF:FF …which is the broadcast MAC address.
- A frame (the name of the packets at Layer 2) with this address is delivered to all the hosts in the local network (within the same broadcast domain).

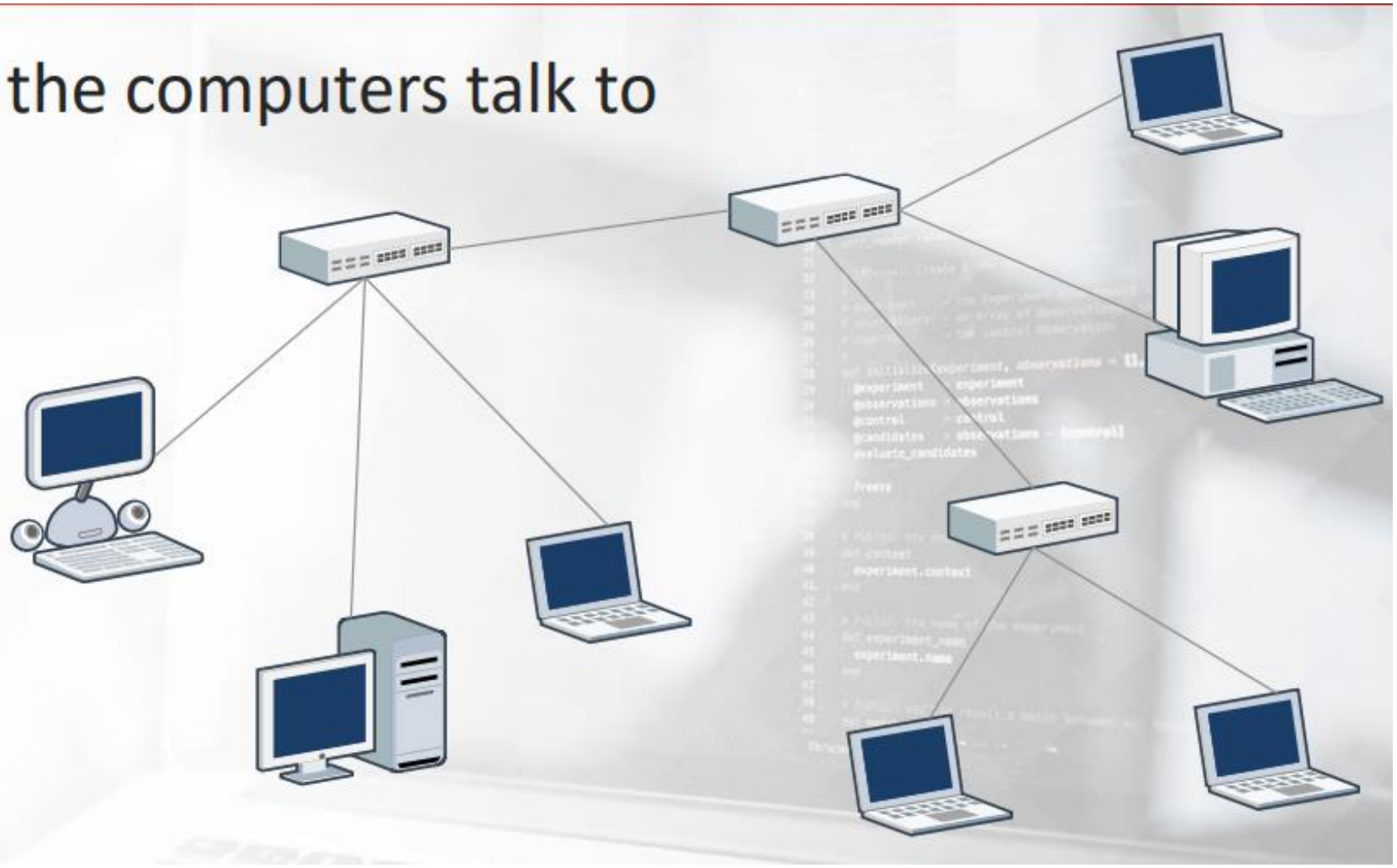
While routers work with IP addresses, switches work with MAC addresses. Switches also have multiple interfaces, so they need to keep a **forwarding table** that binds one or more MAC addresses to an interface.

MAC	Interface	TTL
00:11:22:33:44:55	1	30
AA:BB:CC:DD:EE:01	2	5
AA:CC:FF:0A:0C:12	2	5
11:22:33:1D:CC:0A	3	7

SWITCHES

- The smallest switches you can encounter are home switches, usually integrated into a DSL home router. They usually have 4 ports.
- Corporate switches may have up to 64 ports, and system administrators can connect multiple switches together to accommodate more hosts.
- The main difference between one switch and another is the packet forwarding speed. The speed of a switch varies from 10Mbps (megabits per second) to 10Gbps (gigabits per second). Nowadays, 1Gbps is the most common forwarding speed in commercial switches.

Switches let all the computers talk to each other.



SWITCHING

- -SWITCH PORTS
- -SWITCH RULES
- -SWITCH MODES
- -BASIC CONFIG

SWITCH PORTS

- -BASED ON FUNCTIONALITY
- ACCESS PORT
- -used for connecting a switch with another device(comp,router)
- TRUNK PORT
- -used to connect two switches

SWITCH RULES

- When you are trying to connect a switch to a router, you will connect in 0/1 to router's 0/0 port.
- When you are trying to connect a switch with another switch, you will connect in 0/24 to another switch's 0/1

SWITCH MODES

- Similar to router modes
- We have 24 port switch
- We have to assign the ports manually.

#INTERFACE FASTETHERNET 0/2
#SWITCHPORT MODE ACCESS
#EXIT

If you have many ports that has to be assigned as access mode, then you can use the RANGE command

#INTERFACE RANGE FA0/1-20
#SWITCHPORT MODE ACCESS
#EXIT

FORWARDING TABLES

- A forwarding table binds MAC addresses to interfaces.
- In the following slides you will see:
- The structure of the table
- The way a switch constructs the MAC address – interface binding
- How forwarding works

A typical forwarding table contains:

- The MAC address
- The interfaces the switch can use to deliver packets to a specific MAC address
- A time to live (TTL)

MAC	Interface	TTL
00:11:22:33:44:55	1	30
AA:BB:CC:DD:EE:01	2	5
AA:CC:FF:0A:0C:12	2	5
11:22:33:1D:CC:0A	3	7

The forwarding table, or Content Addressable Memory table (CAM table), is stored in the device's RAM and is constantly refreshed with new information.

MAC	Interface	TTL
00:11:22:33:44:55	1	30
AA:BB:CC:DD:EE:01	2	5
AA:CC:FF:0A:0C:12	2	5
11:22:33:1D:CC:0A	3	7

The TTL determines how long an entry will stay in the table.

This is important because the **CAM table has a finite size**.

So, as soon as an entry expires it is removed from the table.

MAC	Interface	TTL
00:11:22:33:44:55	1	30
AA:BB:CC:DD:EE:01	2	5
AA:CC:FF:0A:0C:12	2	5
11:22:33:1D:CC:0A	3	7

CAM TABLE POPULATION

- Switches learn new MAC addresses dynamically; they inspect the header of every packet they receive, thus identifying new hosts.
- While routers use complex routing protocols to update their routing rules, switches just use the source MAC address of the packets they process to decide which interface to use when forwarding a packet.

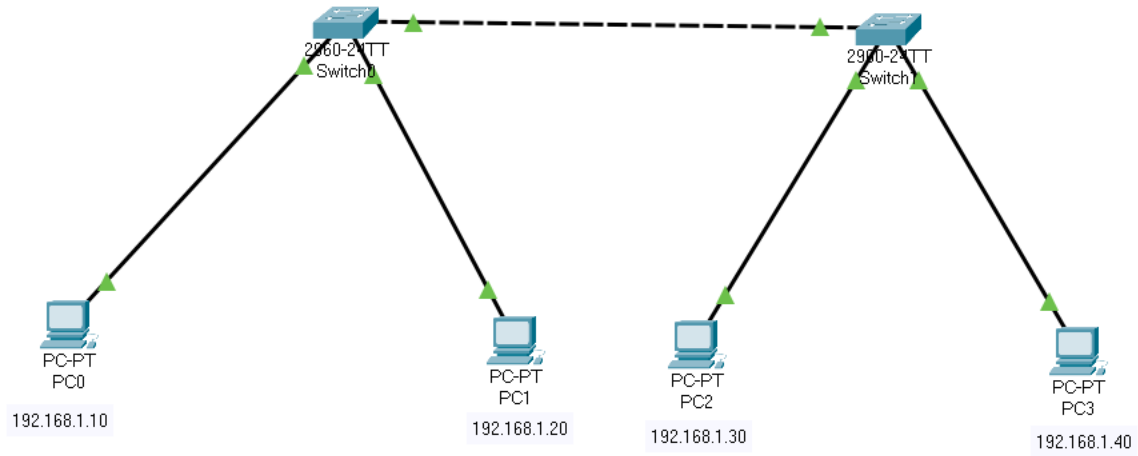
CAM TABLE POPULATION

- The source MAC address is compared to the CAM table:
- If the MAC address is not in the table, the switch will add a new MAC-Interface binding to the table
- If the MAC-Interface binding is already in the table, its TTL gets updated
- If the MAC is in the table but bound to another interface the switch updates the table

Cisco Packet Tracer

File Edit Options View Tools Extensions Window Help

Logical Physical x: 775, y: 685 [Root] 05:49:00



Time: 00:11:15 Realtime Simulation

Copper Cross-Over

Scenario 0 New Delete Toggle PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	Successful	PC3	PC1	ICMP		0.000	N	0	(edit)	(delete)
	Successful	PC2	PC0	ICMP		0.000	N	1	(edit)	(delete)
	Successful	PC3	PC0	ICMP		0.000	N	2	(edit)	(delete)

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