



CISCO TM

CCNA 200-301

Lesson 7

LAN Switching Concept

- How Switches learn MAC addresses
- Switches' forwarding mechanism
- Related Commands
- Console configuration
- Telnet Configuration
- External server security

How Switches learn MAC addresses ?

According to the MAC address table switches make decision how to forward frames.

Switches learn mac addresses by analyzing source mac address of incoming ethernet frames.

If mac address is not in mac address table, the switches create an entry in the table. The entry consists of mac address and the interface where the mac-address is learnt.

Mac-address entry:

```
Switch#show mac-address-table
      Mac Address Table
```

Vlan	Mac Address	Type	Ports
1	000c.85a3.6c17	DYNAMIC	Fa0/1
1	00d0.ffcb.a4d7	DYNAMIC	Fa0/2



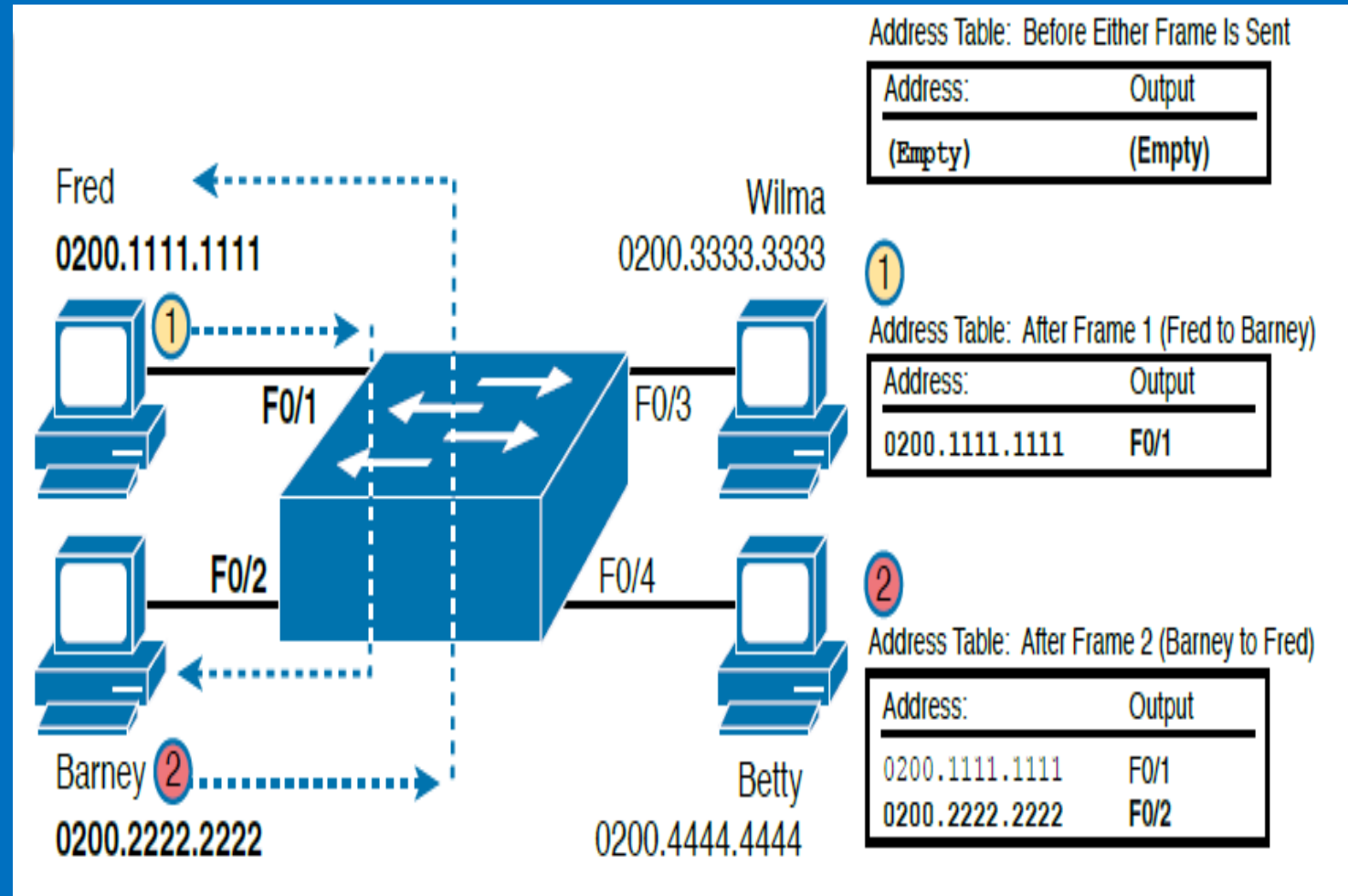
Mac address learning cont.

In the first table there is no mac address.

Step 1. Host Fred sends frame host Barney. When the frame reaches to F0/1 interface the switch add mac address to the mac address table.

Step 2. Host Barney sends frame to host Fred. When the frame arrives at F0/2 the switch adds mac address entry to its mac address table.

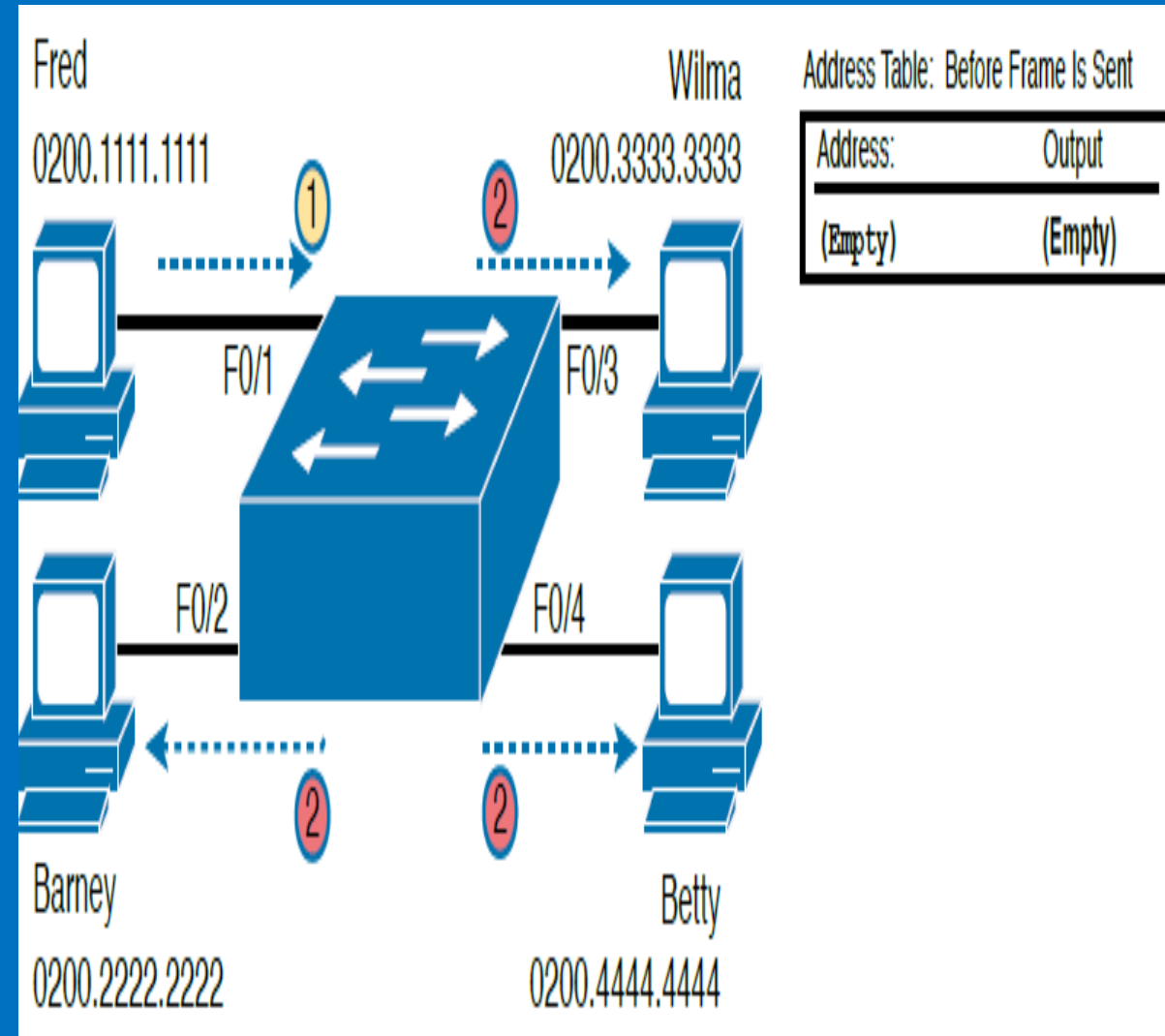
As a result, the switch learns mac-address of Host Fred and Host Barney.



Switches' forwarding mechanism

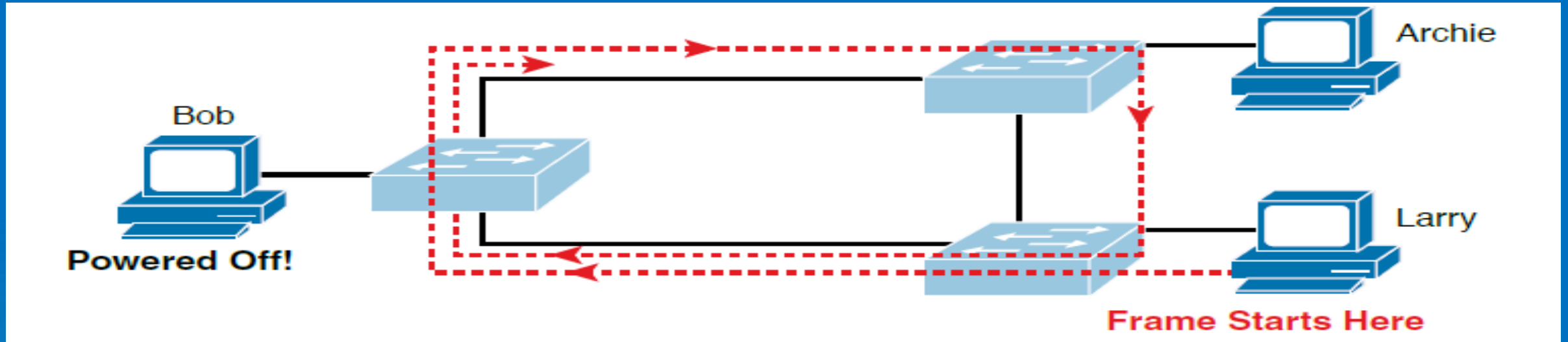
According to the mac address table, switches forward frames to exact destination. If the frame's destination mac address is not known for switch, in that case, switch will forward the frame to all its interfaces with the destined broadcast **FFFF.FFFF.FFFF.FFFF** address. This is called **flooding** and the frame is called **unknown unicast frame**.

In the image we see that the mac address of switch is empty. In this case the switch is flooding incoming frame from Host Fred to all its interfaces except from receiving interface.



Spanning-tree protocol overview

Another good feature is loop-prevention mechanism in Layer 2.



In the image we have 3 switches. The frame starts from Host Larry. If there is no block in between any of two switches the frame will circulate between switches indefinitely.

Switches use Spanning-Tree Protocol to get rid of loop in topology. Briefly Spanning-Tree Protocol avoids looping in layer two network.

We'll learn STP in another lesson...

Related commands

Switch#show mac address-table dynamic – shows mac entries in mac address table

Switch#show interface interfaces status - shows switches interfaces status

Switch#show mac address-table address aaaa.aaaaa.aaaa.aaaa – shows noted mac address from mac-address table.

Switch#show mac address-table dynamic interface F0/1 – shows mac-address learnt from interface F0/1

Switch#show mac address-table dynamic interface vlan 1 - shows mac-address learnt from interface VLAN 1

Switch#clear mac address-table dynamic vlan 1 – clears mac-address related to VLAN 1.

Switch# clear mac address-table dynamic interface F0/1 – clears mac-address learnt from F0/1

Switch#clear mac address-table address aaaa.aaaaa.aaaa.aaaa – clears noted mac address from mac-address table

Switch Management Configuration

In previous lesson we noted that, it is possible to connect to cisco switches using one of three methods:

- ❖ Console connection
- ❖ Telnet connection
- ❖ SSH connection

By default, cisco switches has no password requirement to connect switches using console cable. Anyone with console cable can connect to switches. That is why we use password to protect our switches.

Console port configuration

Switch>enable

Switch#configure terminal

Switch(config)#line console 0

Switch(config-line)#password cisco

Switch(config-line)#login

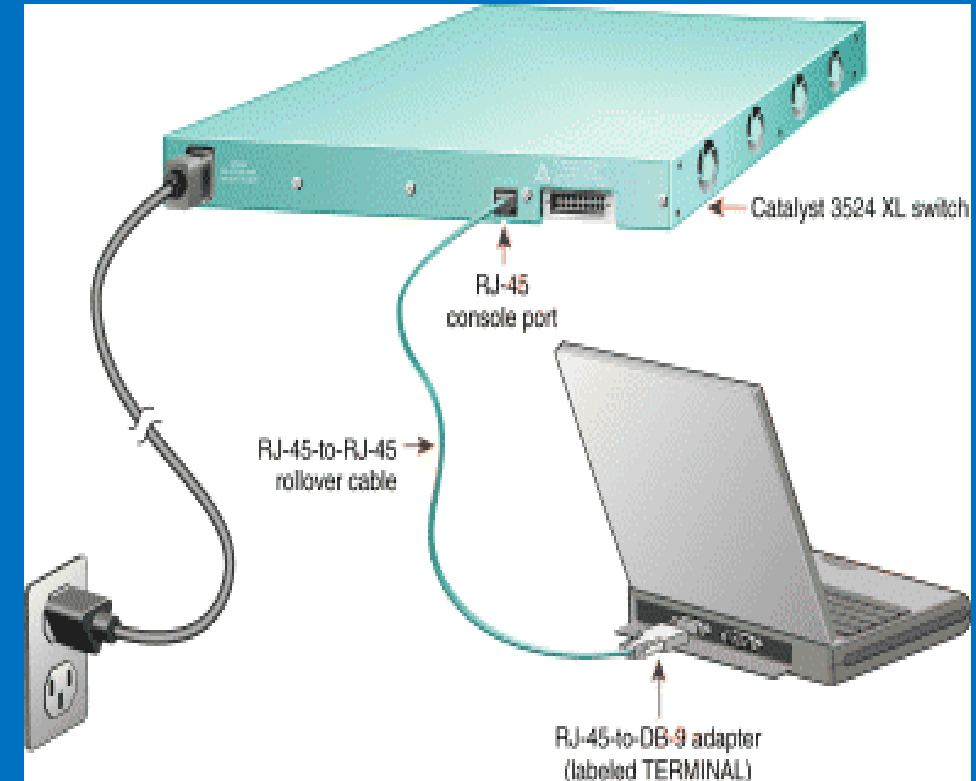
Switch(config-line)#exit

Switch(config)#

In this case we configure password for user mode.

We also configure password for enable mode using the next command.

Switch(config)#enable password cisco



Telnet configuration

Telnet and SSH connection is possible over network. From the point of switches' telnet connection we need to assign IP address to switch for remote connection. Generally, Switches are Layer 2 devices that is why we can not assign IP address to its interfaces. Instead, we can assign IP address to VLANs that is Layer 2 technology.

We'll learn VLANs in another lesson.

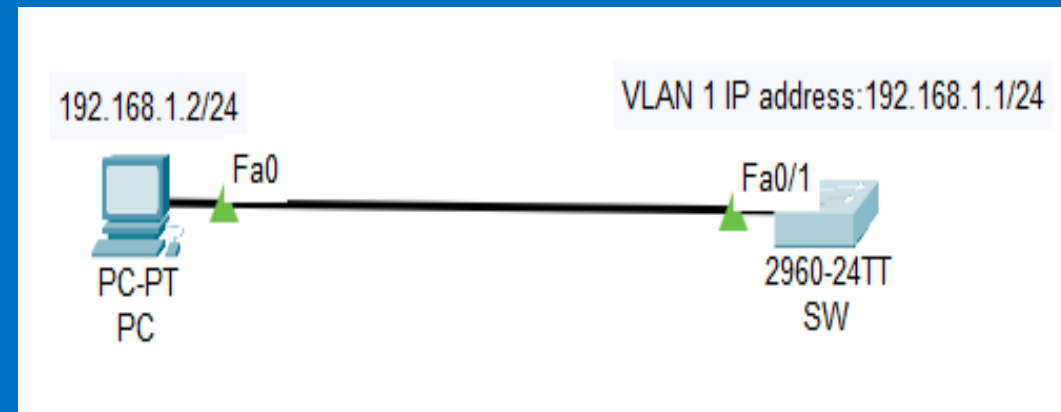
By default, switch interfaces operates at VLAN 1.

To assign IP address to VLAN 1, we can use the next commands:

```
Switch(config)#interface vlan 1
```

```
Switch(config-if)#ip address 192.168.1.1 255.255.255.0
```

```
Switch(config-if)#no shutdown
```



Telnet configuration cont.

After assigning IP address to switch VLAN interface we can configure telnet for remote connection. We use next commands for telnet configuration:

Switch(config)# - global configuration mode

Switch(config)#**line vty 0 15** – vty (virtual teletype) configuration mode

Switch(config-line)#**password cisco** – password to authenticate users

Switch(config-line)#**login** – enable password

Switch(config-line)#**transport input telnet** – give permission only coming telnet connection

Switch(config-line)#**transport output telnet** – give permission only going telnet connection

Switch(config-line)#**end** – return to enable mode

Switch#

We also configure password for enable mode using the next command.

Switch(config)#**enable password cisco**

Packet tracer practice....

Per engineer per access...

In previous slides, we configure console and telnet for connecting cisco switches. In this case all users use the same password to connect. There is another method to define username and password separately for each user. We use next commands:

```
Switch(config)#username cisco password cisco
```

```
Switch(config)#line console 0
```

```
Switch(config-line)#login local
```

```
Switch(config-line)#exit
```

```
Switch(config)#line vty 0 15
```

```
Switch(config-line)#login local
```

```
Switch(config-line)#exit
```

```
Switch(config)#
```

We can create username and password for each engineer.

More commands

Switch(config)#line console 0 | vty 0 15

Switch(config-line)#login local

Switch(config-line)#logging synchronous – synchronize syslog messages

Switch(config-line)#exec-timeout 10 – inactivity timer (default is 5 minutes)

Switch(config-line)#history size 20 - sets the default number of commands saved in the history buffer

When we mistype command, the IOS think for a while, and search for DNS server to resolve command. In urgent case, an engineers have no time to wait.

For example, mistakenly we type **configute** instead of **configure**. In this case IOS will give us next sentence.

Switch#configute

Translating "configute"...domain server (255.255.255.255)

To avoid this case, **ctrl+shift+6** keyboard combination is used.

no ip domain-lookup global configuration command is used as a another method to get rid of getting IOS message.

Switch(config)#no ip domain-lookup

User mode security with External Server

In our previous samples, Switches' local database is used for authentication. Username and password credentials are checked according to local database.

In external security, we have server and username/password pairs are checked according server's configuration.

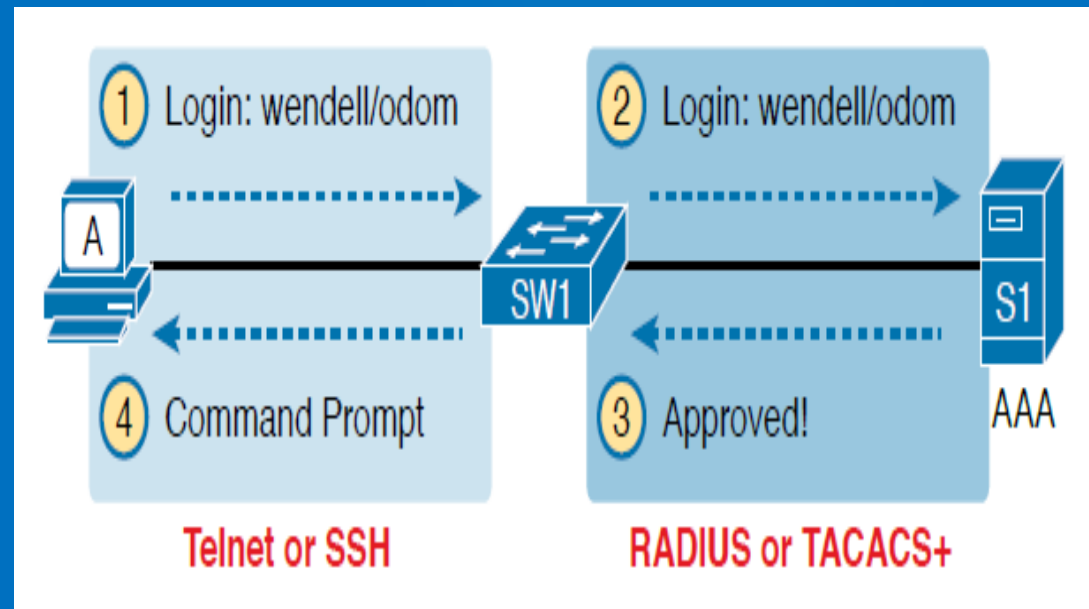
St_1. User A wants to connect SW1 and send wendell/odom pairs to SW1.

St_2. SW1 forward the connection request to S1 (AAA).

St_3. AAA servers either approves or not.

St_4. User A get access to command prompt.

AAA server uses RADIUS or TACACS+ protocol.



That is all for Lesson 7



The key is :



Learn



Repeat



Practice



You will be able to reach your goals.



GOOD LUCK !!!!!...