Switch security features

Lecture 5

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Have a Question?

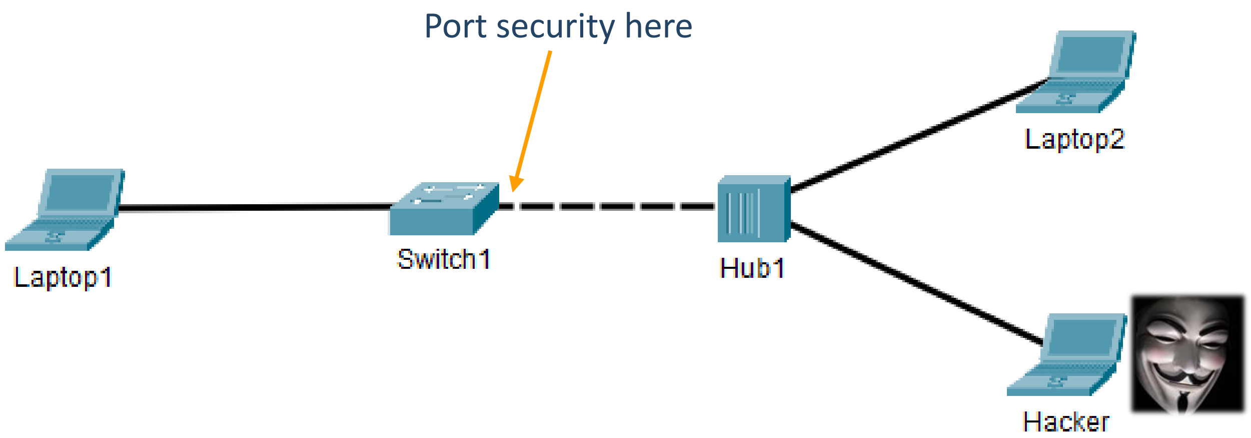
sli.do

#CNA

Port security

What is port security?

- Without port security, any device can connect to any port in the network
- With port security, the switch looks at the source MAC address of the received frames



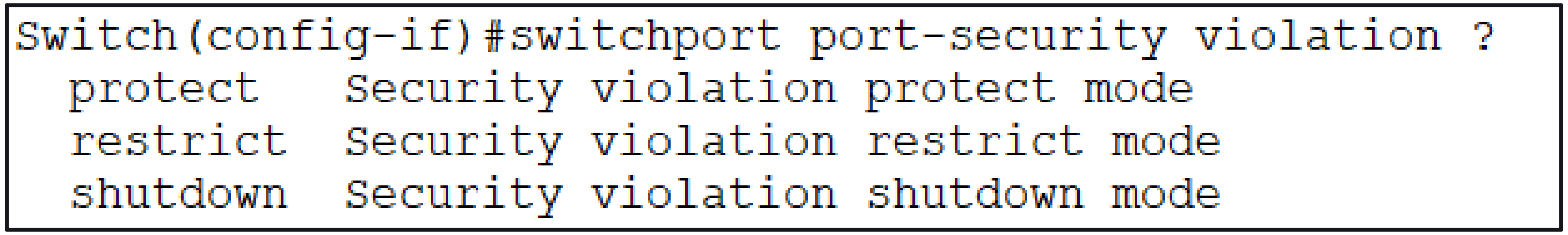
Note: This is not a user authentication (802.1X, discussed later in the course)

Configuration options

- Static
  - Manually configure the allowed MAC addresses on a port
  - Better control, but requires manual configuration
- Dynamic learning
  - Specify a number of allowed MAC address on a port (let’s say “n”)
  - Only the first “n” dynamically learned MAC addresses are allowed
  - When the switch is rebooted, the learning process starts over! (not in the config)
- Combination of static and dynamic learning
  - Specify a number of allowed MAC address on a port, let’s say 5
  - Manually configure only some of them, let’s say 2
  - The other 3 MAC addresses will be dynamically learned

Violation actions

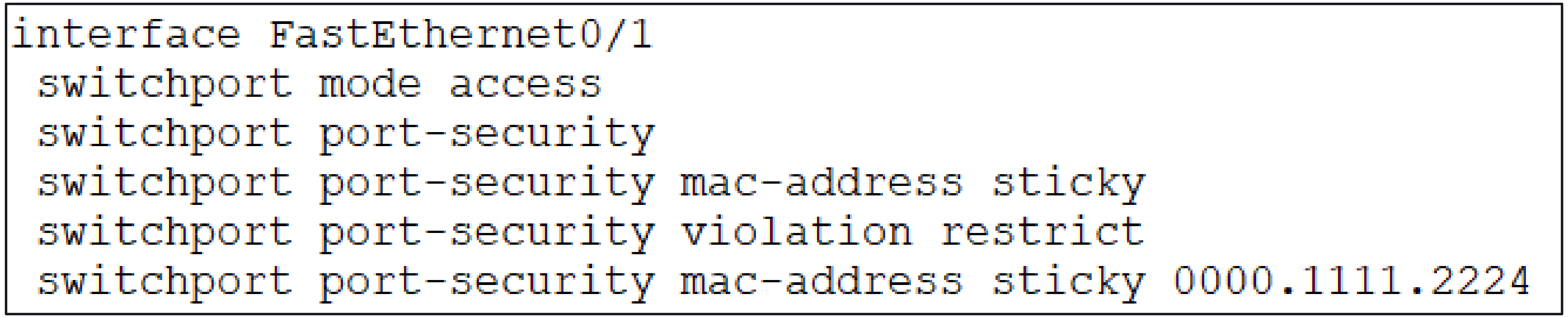
- What happens when a device with not allowed MAC address tries to access the switch port?
  - **Protect** - drops packets with unknown source MAC when the allowed maximum is reached
  - **Restrict** - same as Protect + logging (counters will increment)
  - **Shutdown** (default) - puts the port into Error disable mode and sends SNMP trap notification



```
Switch(config-if)#switchport port-security violation ?
  protect    Security violation protect mode
  restrict   Security violation restrict mode
  shutdown   Security violation shutdown mode
```

MAC address sticky

- The “static” option drawback - requires to manually enter MAC addresses
- The “dynamic learning” option drawback - the learned allowed MAC addresses are lost after device reboot
- The “sticky” option learns the allowed MAC addresses dynamically and then adds them to the running configuration



```
interface FastEthernet0/1
 switchport mode access
 switchport port-security
 switchport port-security mac-address sticky
 switchport port-security violation restrict
 switchport port-security mac-address sticky 0000.1111.2224
```

Error disable and auto recovery

- Normally, the “shutdown” violation action requires manual intervention to re-enable it (shutdown + no shutdown)
- A switch port can be configured to auto recover after a period of time
- Example:
  - **errdisable recovery cause psecure-violation**
  - **errdisable recovery interval 30**
- Note that this functionality is not (currently) available in Cisco Packet Tracer

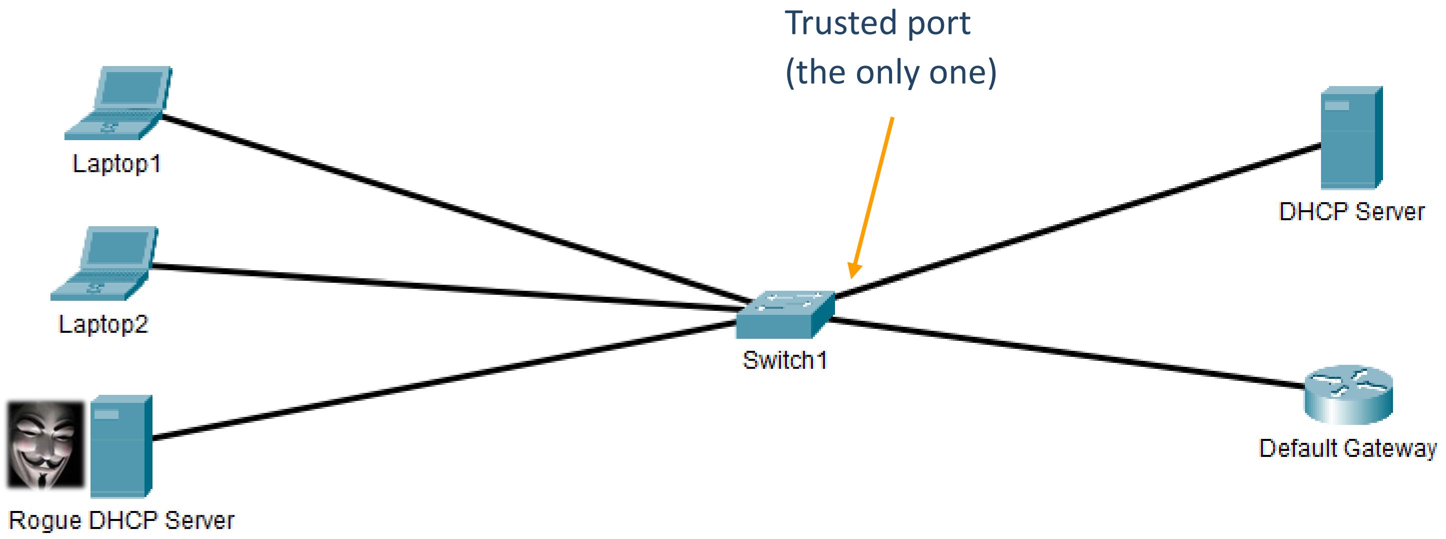
Port security configuration

- Minimum required configuration:
  - (config-if)# **switchport mode access** (not allowed on dynamic ports)
  - (config-if)# **switchport port-security** (enables port security with default settings)
- Optional configurations:
  - (config-if)# **switchport port-security violation** [**protect/restrict/shutdown**]
  - (config-if)# **switchport port-security maximum** [**1-132**]
  - (config-if)# **switchport port-security mac-address** ***MAC***
  - (config-if)# **switchport port-security mac-address sticky**
  - (config-if)# **switchport port-security aging time [1-1440]**

DHCP snooping

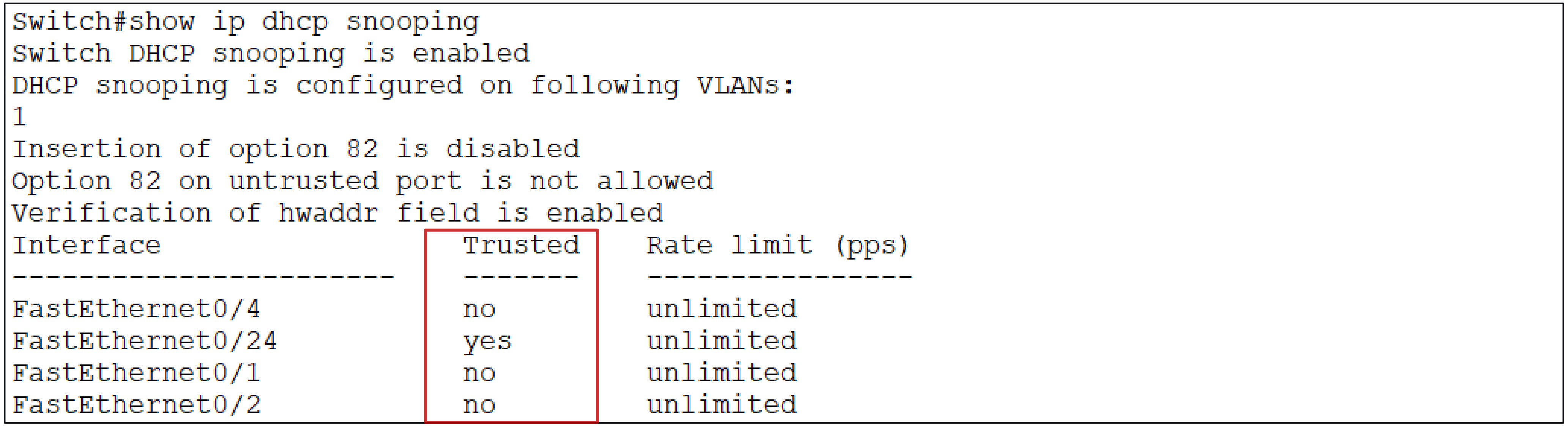
What is DHCP snooping?

- Without DHCP snooping, anyone can act as a DHCP server in the segment (VLAN), intentionally or not
- This can lead to security problems (point users to a wrong DNS or gateway, for example) or simply Denial Of Service
- DHCP snooping does not allow server messages on “untrusted” ports



Trusted and untrusted ports

- When DHCP snooping is enabled, all ports by default are “untrusted”
- DHCP “offer” and “acknowledge” messages are not allowed on untrusted ports
- The port going to the **real** DHCP server should be configured as trusted



```
Switch#show ip dhcp snooping
Switch DHCP snooping is enabled
DHCP snooping is configured on following VLANs:
1
Insertion of option 82 is disabled
Option 82 on untrusted port is not allowed
Verification of hwaddr field is enabled
Interface                  Trusted    Rate limit (pps)
-----------------------    -------    ----------------
FastEthernet0/4            no         unlimited
FastEthernet0/24           yes        unlimited
FastEthernet0/1            no         unlimited
FastEthernet0/2            no         unlimited
```

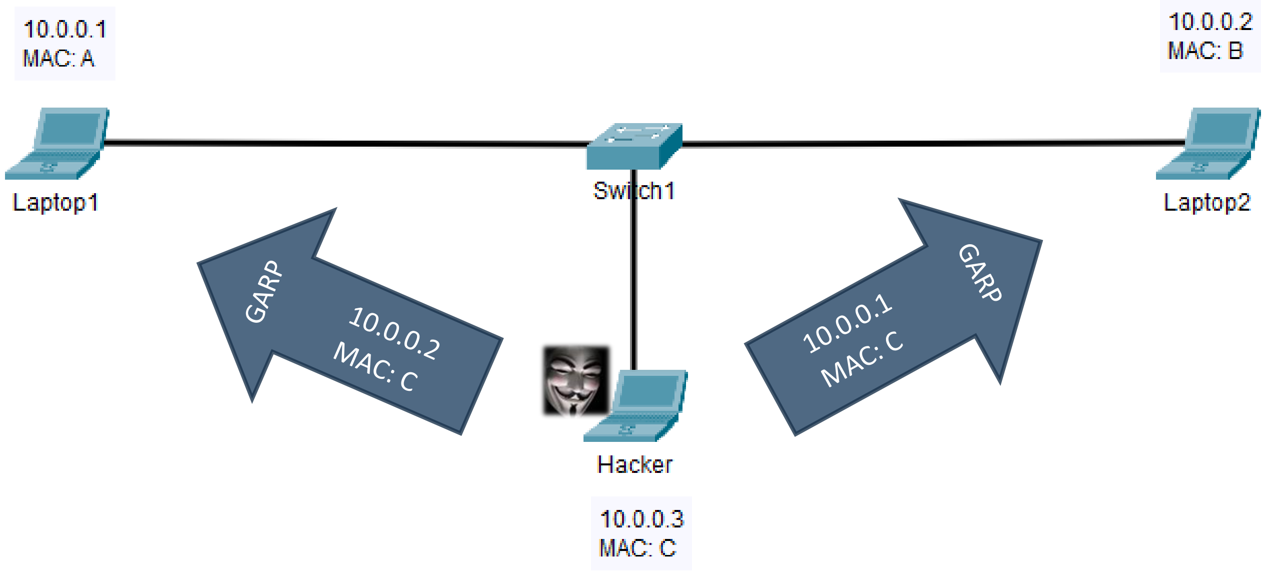
DHCP snooping configuration

- (config)# **ip dhcp snooping** - globally enables the feature
- (config)# **ip dhcp snooping vlan *n*** - enables the feature for VLAN *n*
- (config-if)# **ip dhcp snooping trust** - makes a port trusted (allows DHCP “offer” and “acknowledge” messages)
- (config-if)# **no ip dhcp snooping information option** - disables insertion of option 82

Dynamic ARP inspection

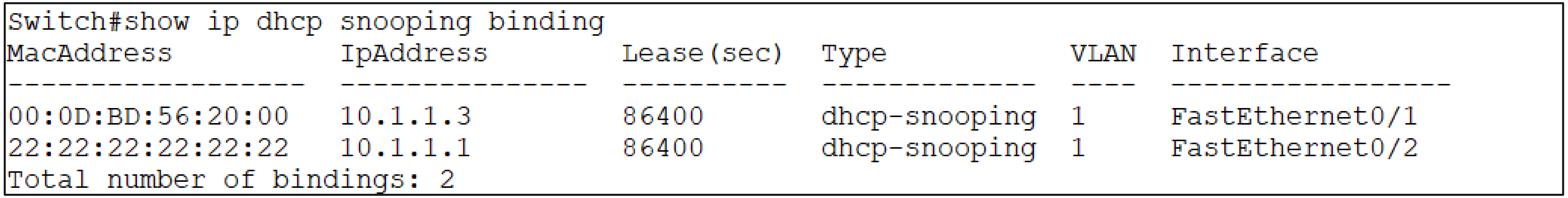
What is dynamic ARP inspection?

- Without dynamic ARP inspection (DAI), a malicious user can insert himself between the communicating devices and perform “man in the middle” attacks
- An attacker can poison the ARP cache tables of the hosts with gratuitous ARP
- The result: traffic between the laptops goes through the “Hacker” device



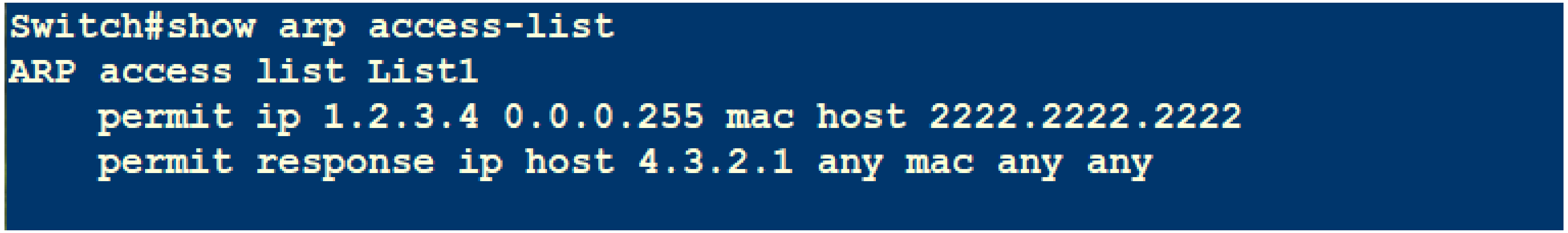
What is dynamic ARP inspection (2)?

- With dynamic ARP inspection (DAI), the switch will check the MAC-to-IP entries in the ARP messages and verify if they are correct
- How does the switch verifies these entries:
  - Via DHCP snooping (1)
  - Via manually created access list (2)



```
Switch#show ip dhcp snooping binding
MacAddress          IpAddress        Lease(sec)  Type           VLAN  Interface
------------------  ---------------  ----------  -------------  ----  -----------------
00:0D:BD:56:20:00   10.1.1.3         86400       dhcp-snooping  1     FastEthernet0/1
22:22:22:22:22:22   10.1.1.1         86400       dhcp-snooping  1     FastEthernet0/2
Total number of bindings: 2
```

(1)

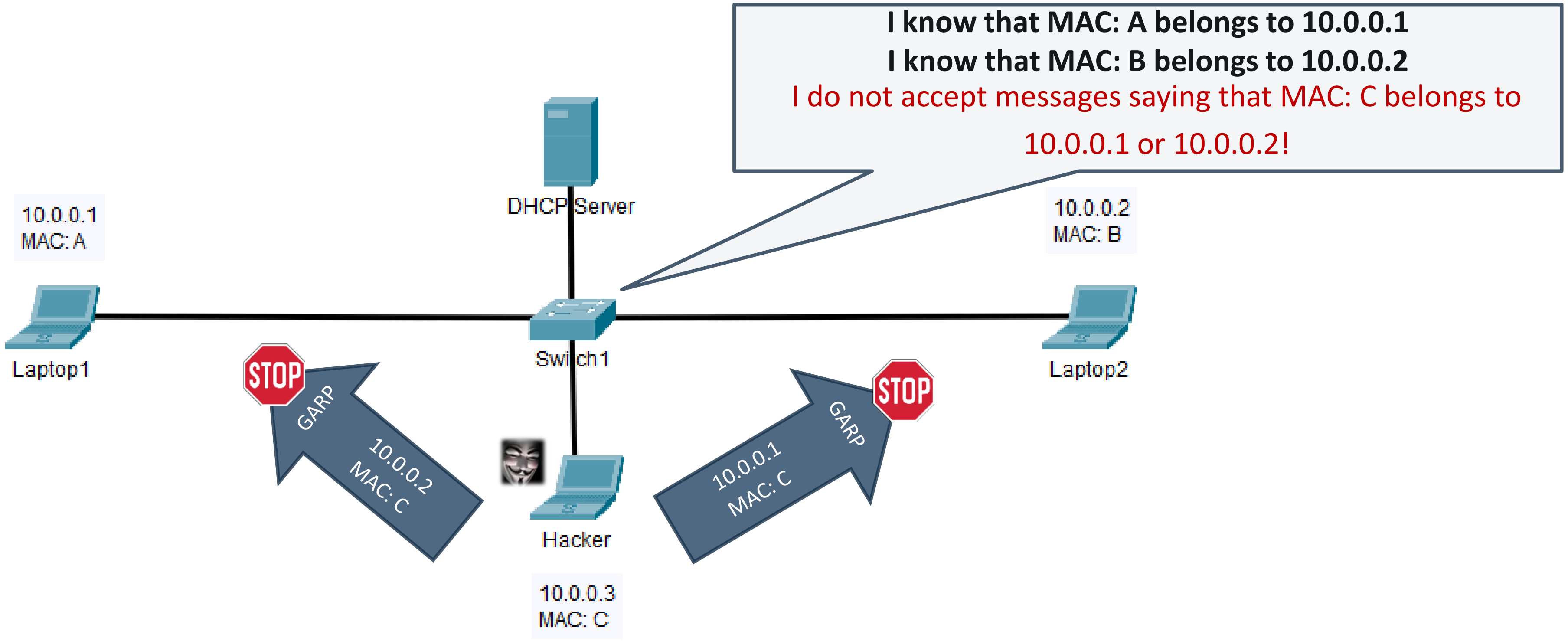


```
Switch#show arp access-list
ARP access list List1
    permit ip 1.2.3.4 0.0.0.255 mac host 2222.2222.2222
    permit response ip host 4.3.2.1 any mac any any
```

(2)

Dynamic ARP inspection

- Because the switch knows which are the correct mappings between MAC and IP addresses, it will discard any other information regarding this topic



I know that MAC: A belongs to 10.0.0.1

I know that MAC: B belongs to 10.0.0.2

I do not accept messages saying that MAC: C belongs to 10.0.0.1 or 10.0.0.2!

Dynamic ARP inspection configuration

- (config)# **ip arp inspection vlan *n***
- (config)# **ip arp inspection validate** [**dst-mac/ip/src-mac**]

- (config-if)# ip arp inspection trust - defines an interface as trusted, no inspection
- (config-if)# ip arp inspection limit rate [0-2048] - packets per second

- (config)# **arp access-list *name***

Demonstration

Summary

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3. Dynamic ARP inspection
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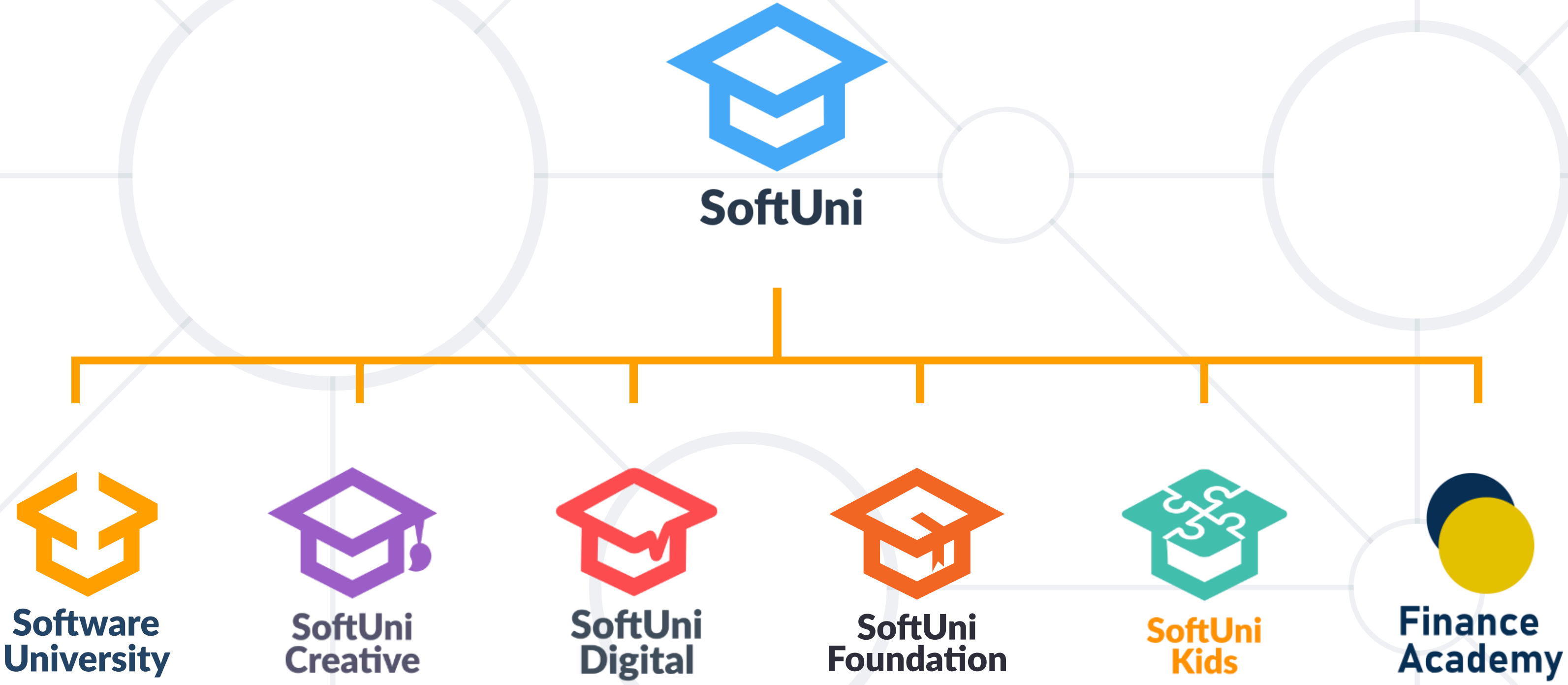
Questions?



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