# Authentication with 802.1X. Wireless Networking Concepts
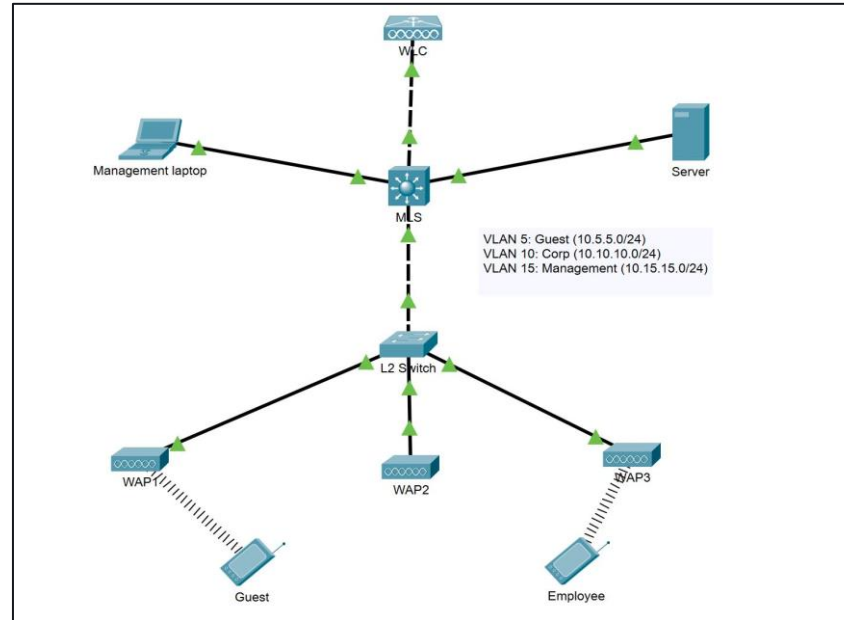## Lecture 6



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**sli.do**

**#CNA**

Authentication with 802.1X

# Who Can Connect to the Network?

- By default, anyone with physical access can connect to our wired network

- Two common protection mechanisms:

  - Port security - simple authentication based on MAC addresses

    - Only frames from specific MAC addresses are allowed

    - Limited number of MAC addresses are permitted

  - User authentication with AAA and 802.1X

# AAA

- AAA: Authentication, Authorization and Accounting

  - **Authentication** – "Who are you? Prove it!"

  - **Authorization** – "This is where you have access and where you do not"

  - **Accounting** – "I am recording all (un)successful login attempts"

- Often a single server plays the three roles but can be multiple servers as well

# 802.1X

- IEEE 802.1X is an IEEE Standard for Port-based Network Access Control (PNAC)

- Part of the IEEE 802.1 group of networking protocols

- Provides authentication mechanism to devices asking to attach to a LAN or a WLAN

- Uses Extensible Authentication Protocol (EAP) over LAN – known as EAPOL

# The Participants in 802.1X

1. Supplicant - the end device requesting access

2. Authenticator - usually a switch or AP which is to provide access

3. Authentication Server - the device which makes the decision (grant/deny access), usually RADIUS server
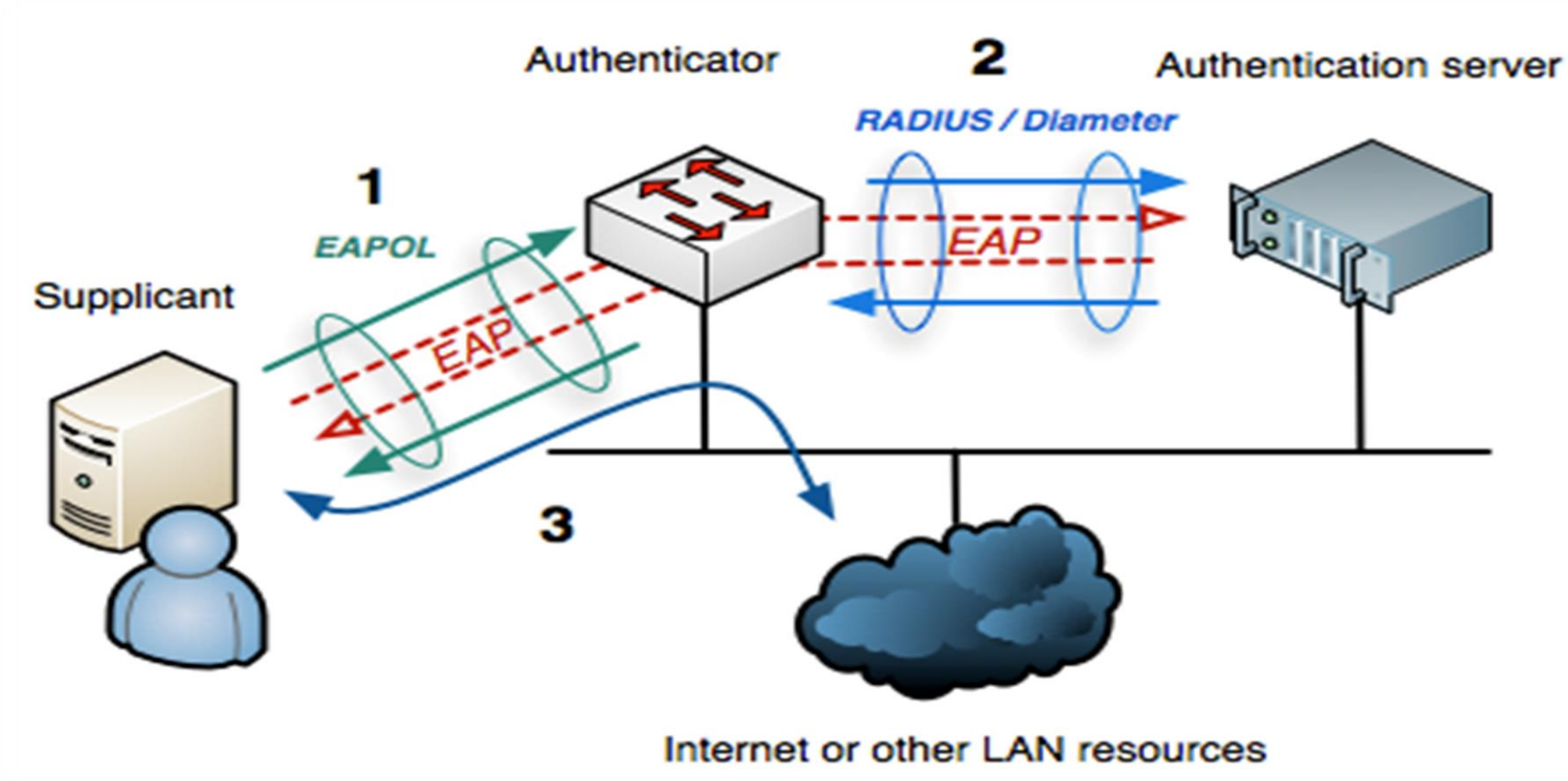
# 802.1X

# Why 802.1X?

- The switches and access points do not need to know how to authenticate the client

- They (authenticators) simply pass the authentication information between the client and the authentication server

- That is why it is easier for 802.1X to support many authentication methods

# 802.1X and EAP

- 802.1x uses EAP to facilitate the communications between the participants

- Common EAP authentication types:

  - **EAP-MD5** - minimal security, one-way authentication

  - **EAP-TLS** - mutual authentication, secure but no very easy to adopt

  - **EAP-TTLS** - mutual authentication (optional client certificate)

  - **EAP-PEAP** - most popular method, has an "outer" and "inner" methods, developed by Cisco, Microsoft and RSA Security
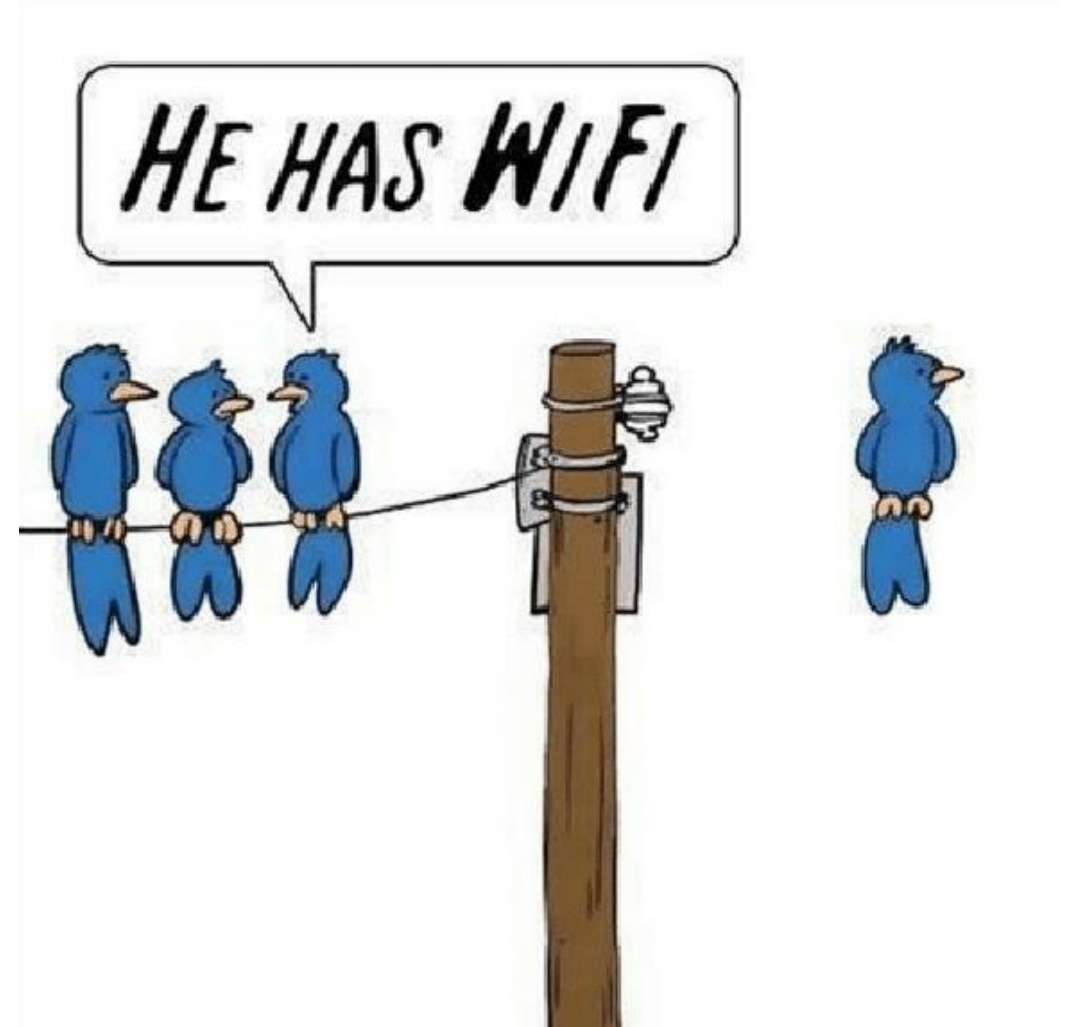
# Network Access Protection
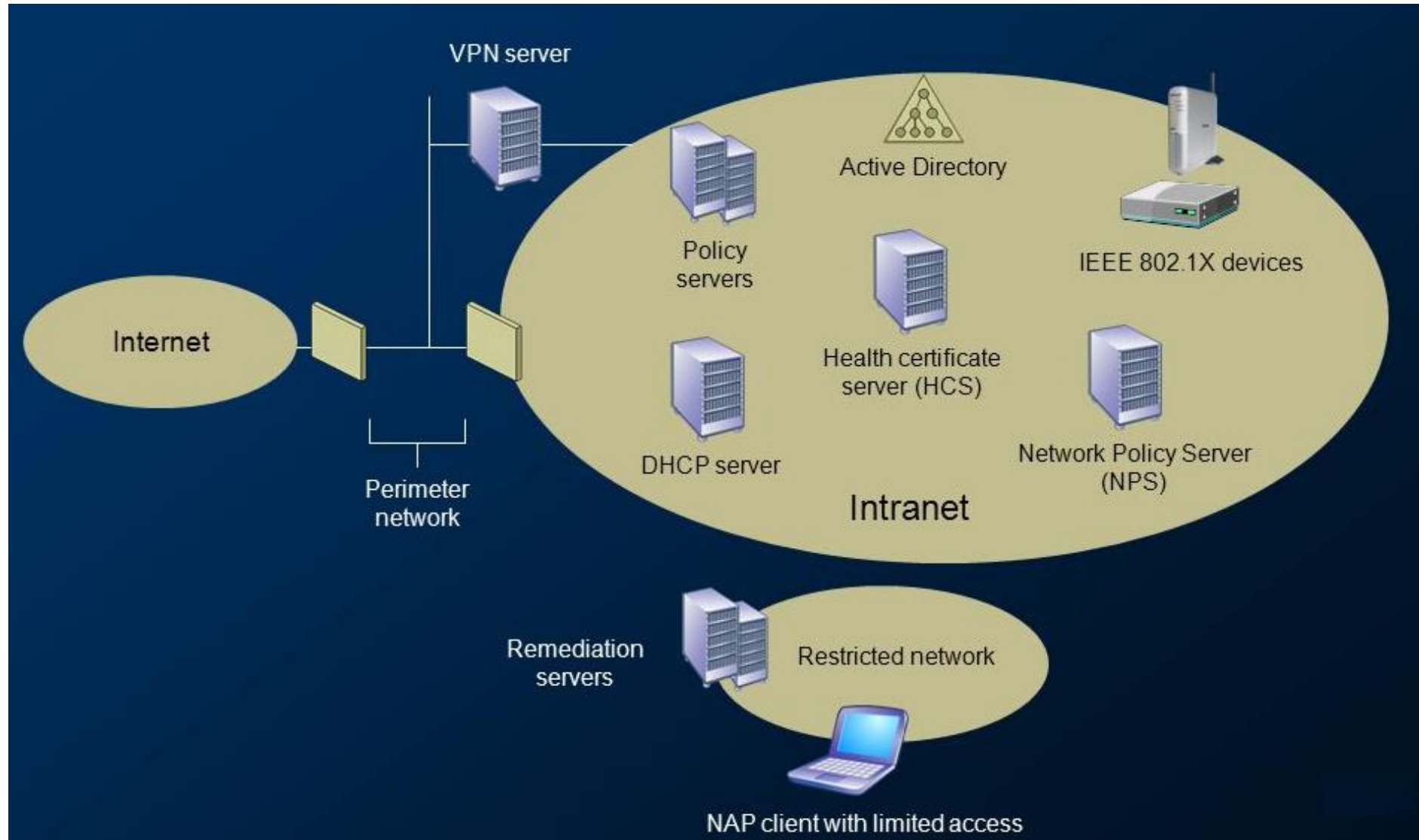
# Wireless Networking Concepts

# Cable vs Wireless?

■ Speed

■ Signal quality

■ Mobility

■ Device adaptability

■ Security

■ Interference

# Some 802.11 standards

| IEEE Standard | 802.11b | 802.11a | 802.11g | 802.11n | 802.11ac | 802.11ax |
|---|---|---|---|---|---|---|
| **Friendly name** | WiFi 1 | WiFi 2 | WiFi 3 | WiFi 4 | WiFi 5 | WiFi 6 |
| **Year adopted** | 1999 | 1999 | 2003 | 2009 | 2014 | 2019 |
| **Frequency** | 2.4 Ghz | 5 Ghz | 2.4 Ghz | 2.4/5 Ghz | 5 Ghz | 2.4/5 Ghz |
| **Max data rate** | 11 Mbps | 54 Mbps | 54 Mbps | 450 Mbps | 1.7 Gbps | 2.4 Gbps |
| **Typical range indoors*** | 35 m | 35 m | 38 m | 70 m | 35 m | - |
| **Typical range outdoors*** | 140 m | 120 m | 140 m | 250 m | 250 m | 250 m |

# SSID

- SSID: Service Set Identifier
- This is the name of the wireless network (not the Access Point name)
- It is up to 32 characters in length
- A single AP can broadcast multiple SSIDs
- Should you hide your SSID?

# Wireless Security

- Hiding the SSID ("not the best" security)

- MAC ID filtering

- Static client IP addressing

- 802.11 security (next slide)

# 802.11 Security

- **WEP** - very weak, deprecated

- **WPA** - better than WEP, still risky

- **WPA2** - the de facto standard

  - WPA2 (TKIP) - risky

  - WPA2 (AES)

  - WPA2-PSK vs WPA2-Enterprise (which uses EAP)

- **WPA3** - improved general Wi-Fi encryption

  - WPA3 - personal
    (uses Simultaneous Authentication of Equals (SAE) vs PSK)

  - WPA3 - enterprise
    (targets large-scale Wi-Fi with optional 192-bit security)
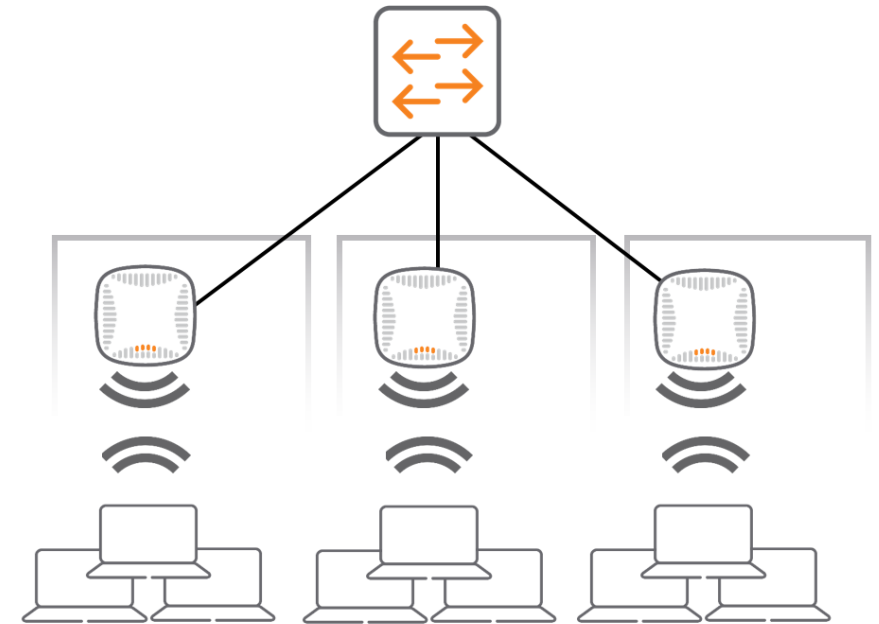
Better security

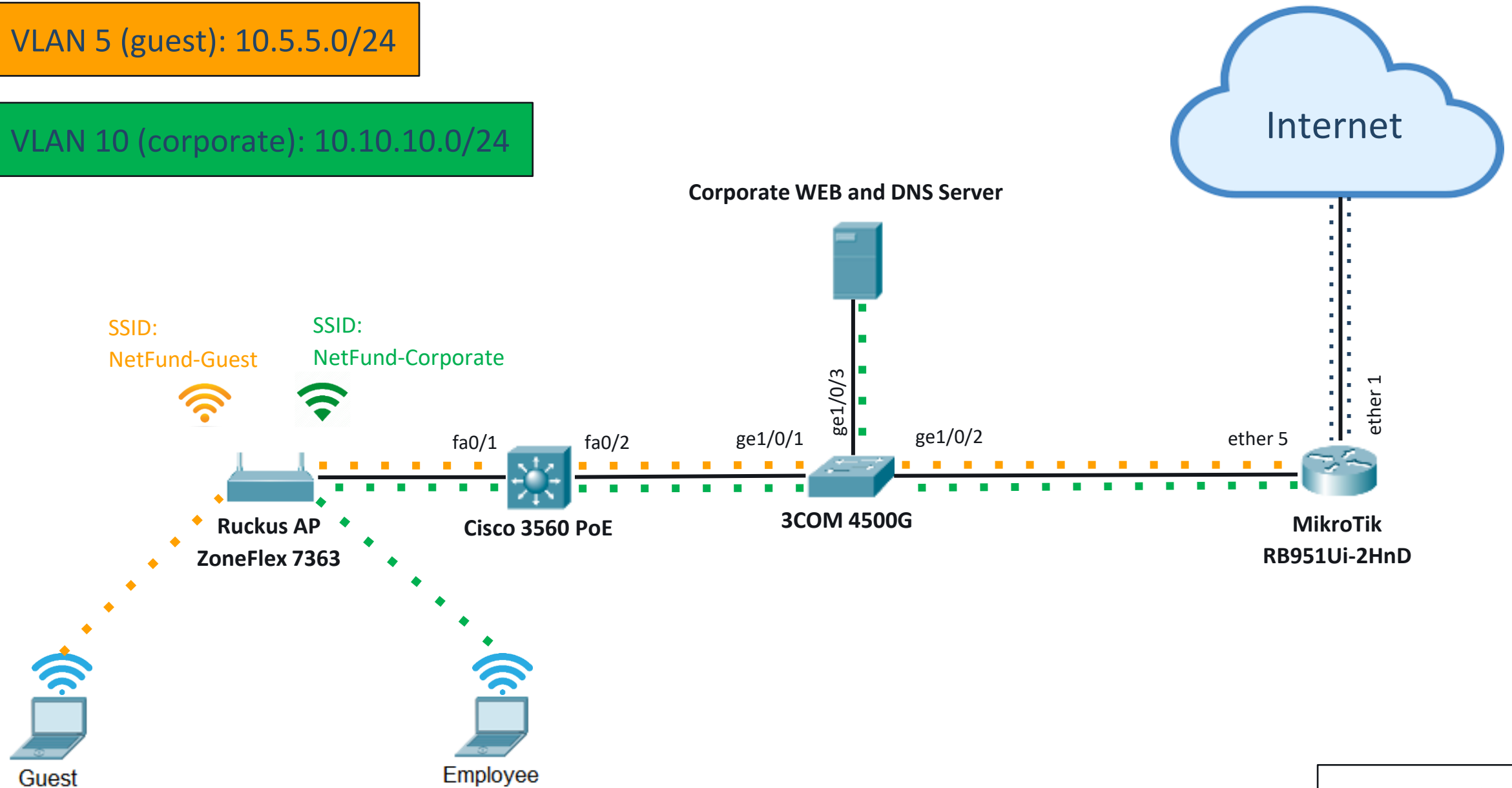# Wireless Devices Management

## APs in standalone mode

## APs controlled by a controller

# Demonstration

# Summary

1. **Authentication with 802.1X**

2. **Wireless networking concepts**

3. **Demonstration**

# Questions?
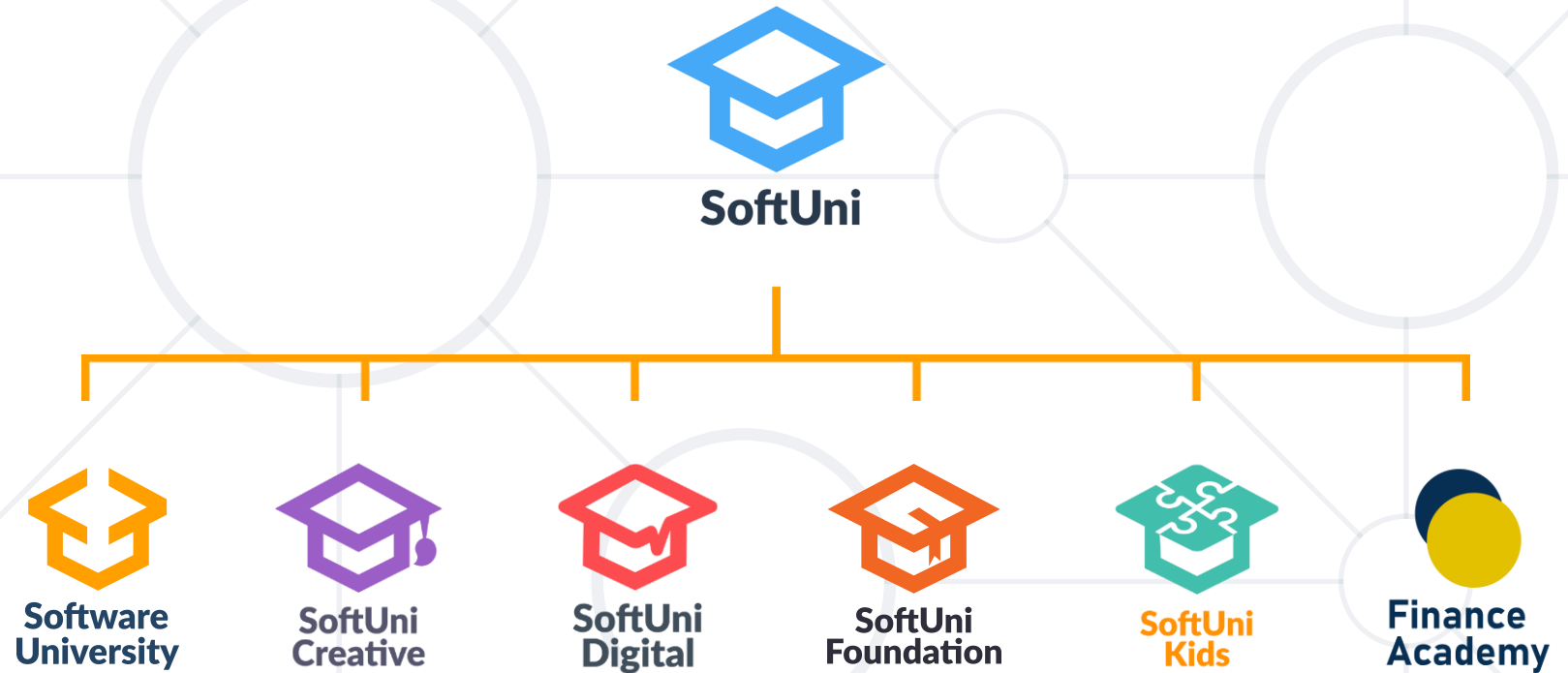
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