Wi-Fi Technology Fundamentals

WI-FI TECHNOLOGY
FUNDAMENTALS COURSE

Module-1
Introduction and History of WiFi
Session-1d

Basic Functional Building Blocks of a Wi-Fi Router

Last Session Recap……

Module-1

Introduction and History of WiFi

Session-1c

WLAN Standards/Amendments and Alphabet Soup

Standards and Amendments
- IEEE

Certifications and Plug fests
- Wi-Fi Alliance
- WBA
- BBF

Opensource Technology
- OpenWRT
- OpenWiFi
- Open Mesh
- Open Roaming
- RDKB

Public Sector
- City Mesh
- PM-WANI

Events/Summits/Podcasts
- Wi-Fi NOW
- Wi-Fi KS
- Mobility Field Day
- WLAN Pros
- CTS Podcast

Skill Certification
- CWNP
- Cisco CCNA

How to Stay Connected?

Access Course Webpage

Click here: Wi-Fi Technology Fundamentals Course (candelatech.com)

- ✓ Access course notes, slides, video recordings

Register to Get Updates

Click Here: Registration (zoho.in)

- ✓ Provide basic contact into to get calendar invites, reminders and updates about the material and sessions.

Join Whatsapp Group

Click here: WhatsApp Group Invite

- ✓ Provide basic contact into to get whatsapp messages about calendar invites, reminders and updates about the material and sessions.

Today's Session…

Module-1

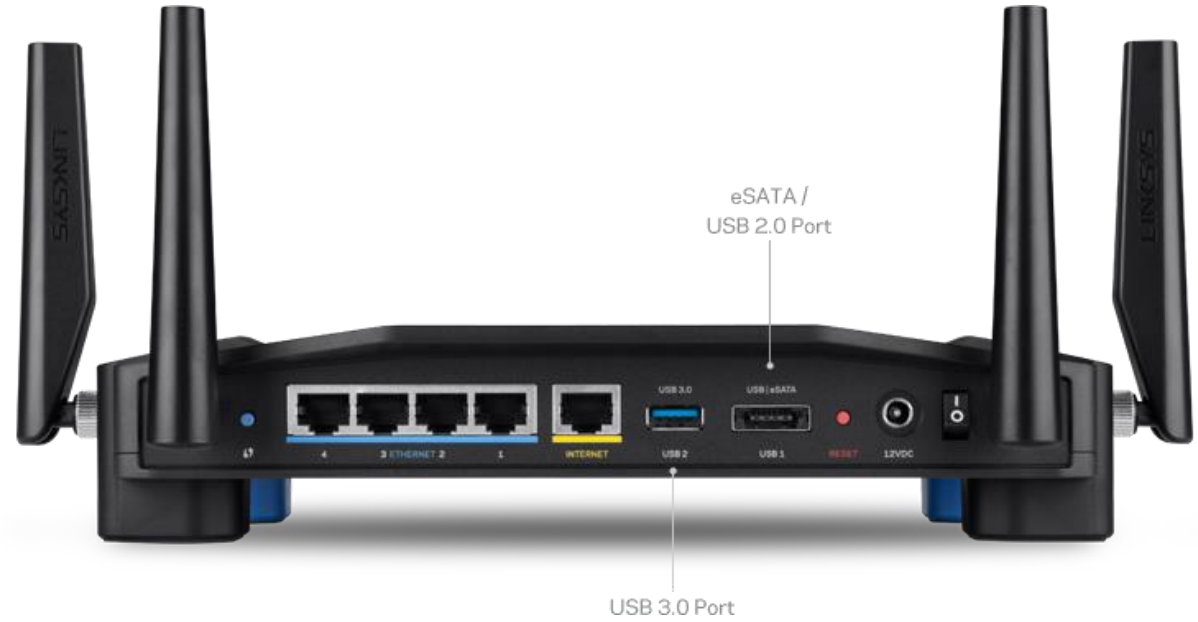
Introduction and History of WiFi

Session-1d

Basic Functional Building Blocks of a WiFi Router

Wi-Fi Connection

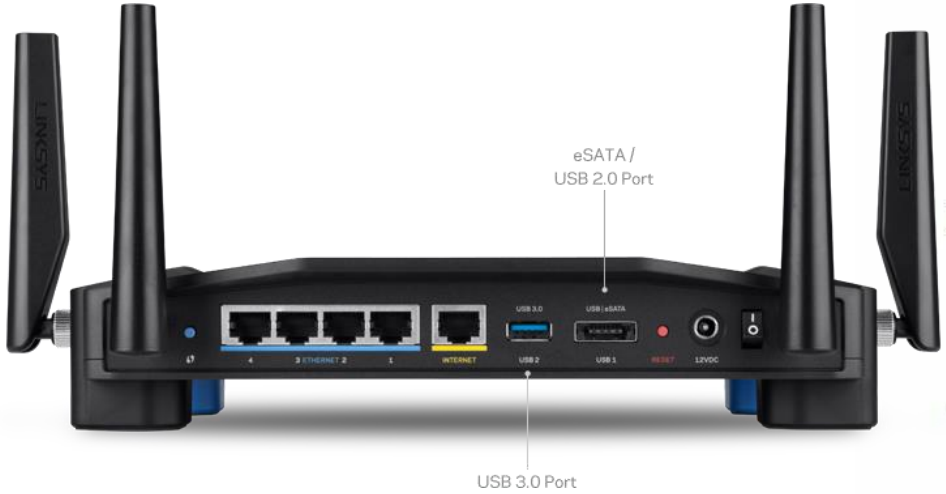
Types of WiFi Routers/APs

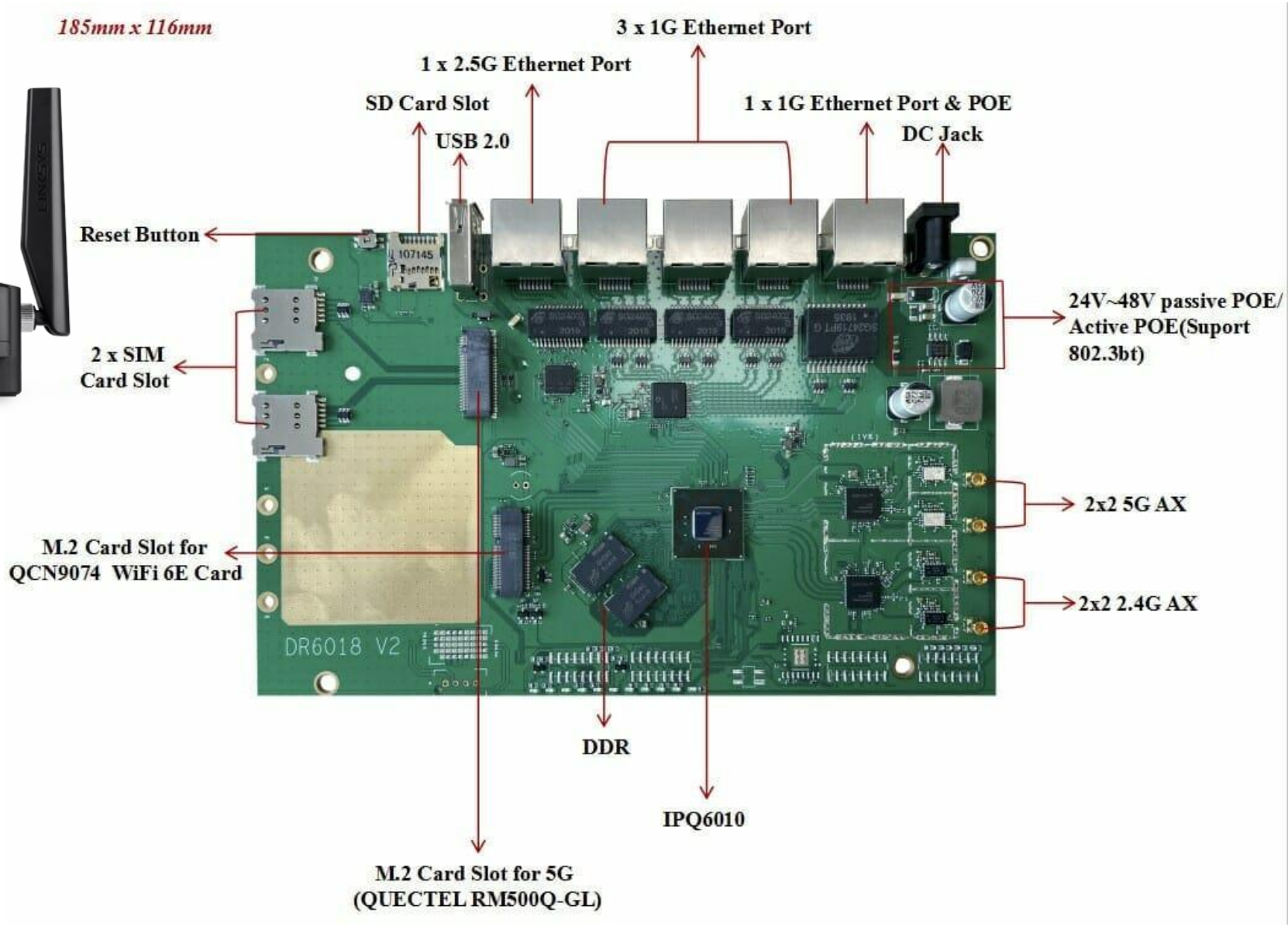


Residential
Wi-Fi Router

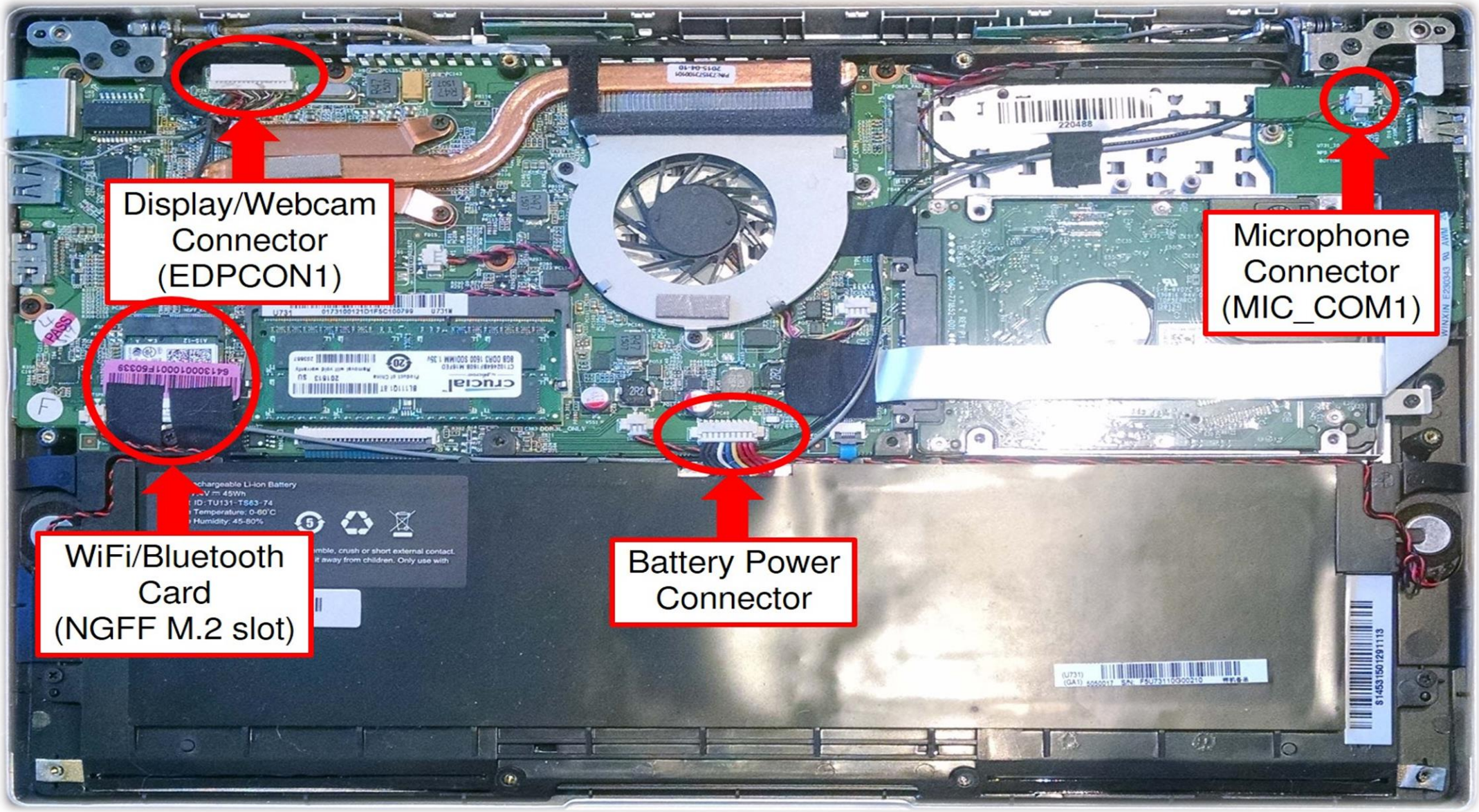
Enterprise
Wi-Fi Access Point

What is Inside the Wi-Fi Router?





WiFi Client


Display/Webcam Connector (EDPCON1)
Microphone Connector (MIC_COM1)
WiFi/Bluetooth Card (NGFF M.2 slot)
Battery Power Connector

Inside the Wi-Fi Access Point

https://fccid.io/MSQ-RTAX5600/Internal-Photos/Internal-Photos-5516748

FCC ID.io Blog Search

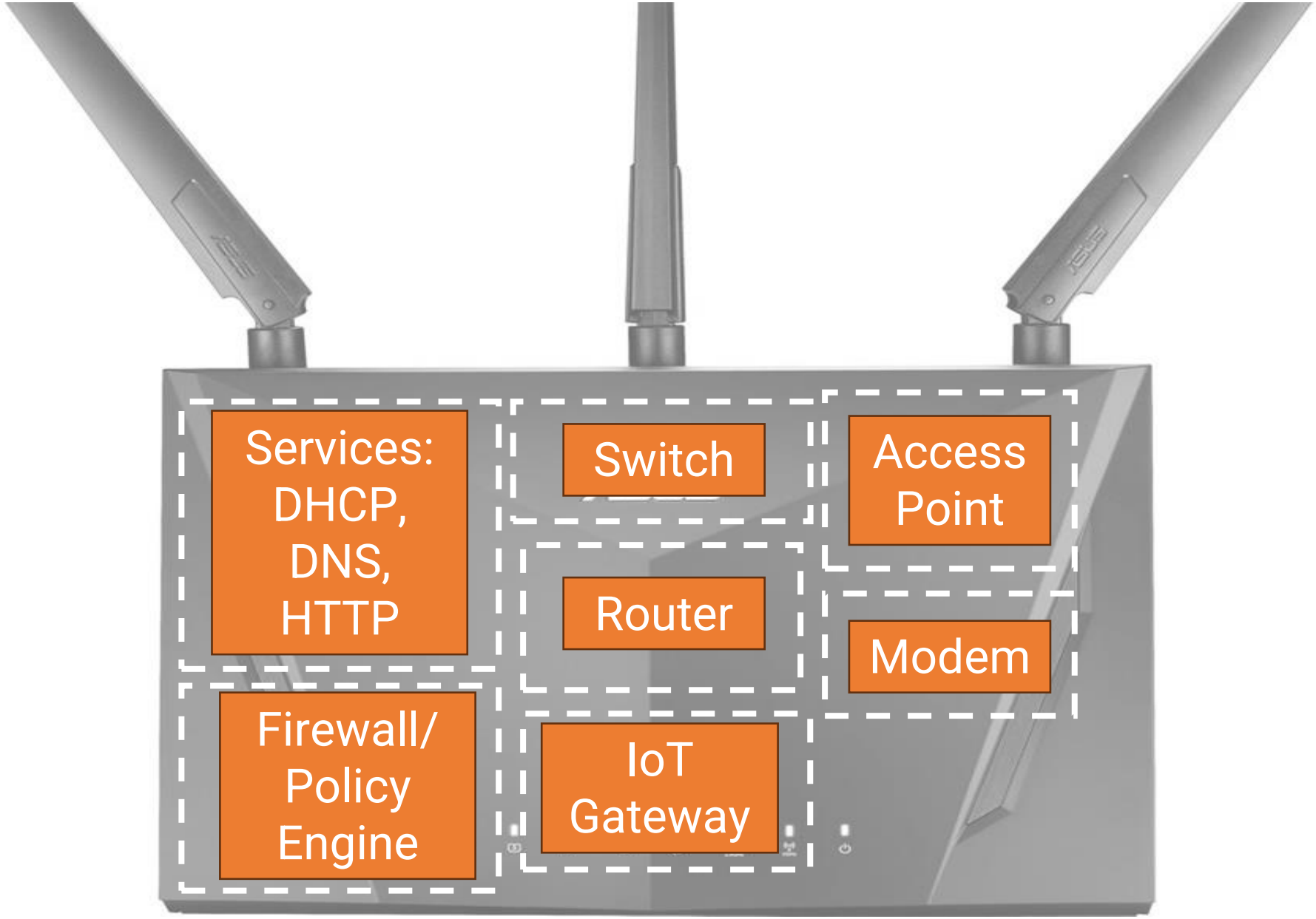
External Photos External Photos

Alternate Views: PDF [Zoom] Download [PDF]

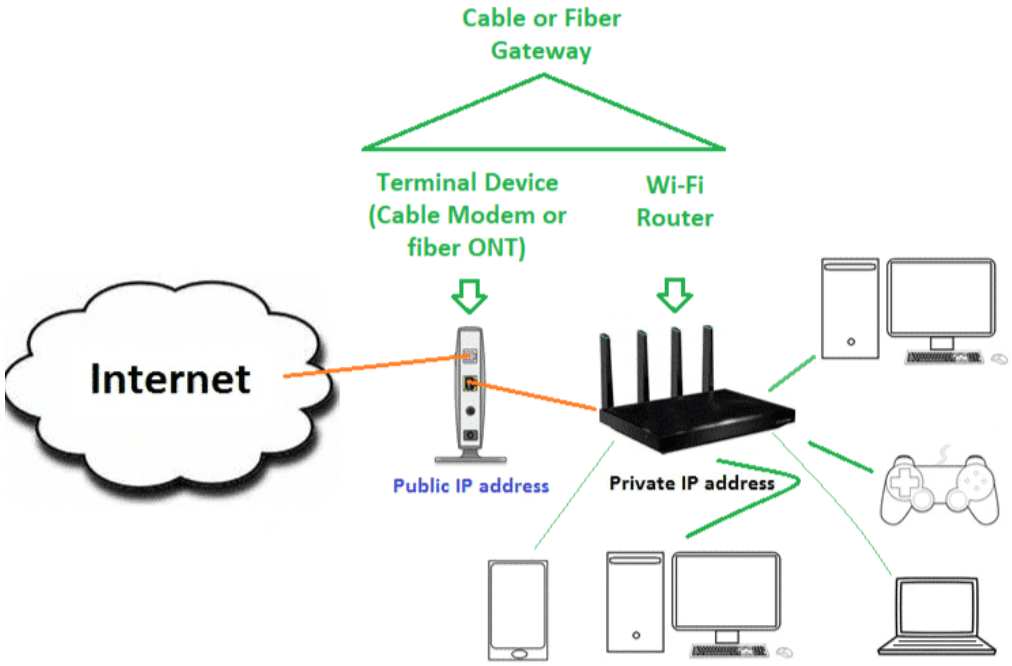
3 of 43 Automatic Zoom

https://fccid.io/

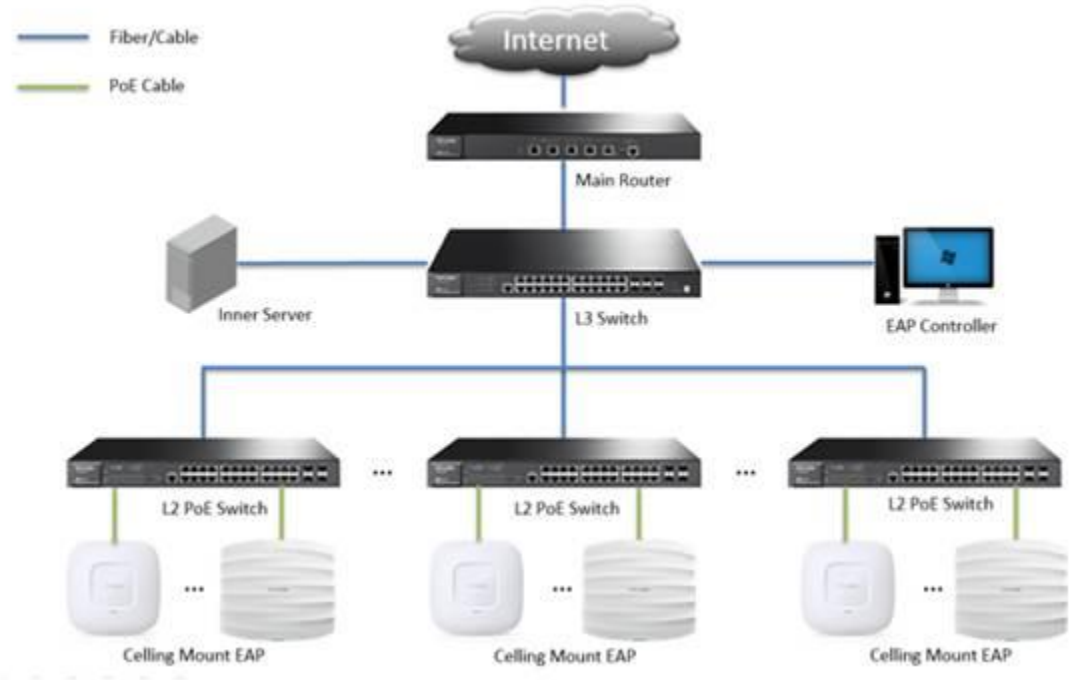
A Modern Day Wi-Fi Router



Types of WiFi Network Installations



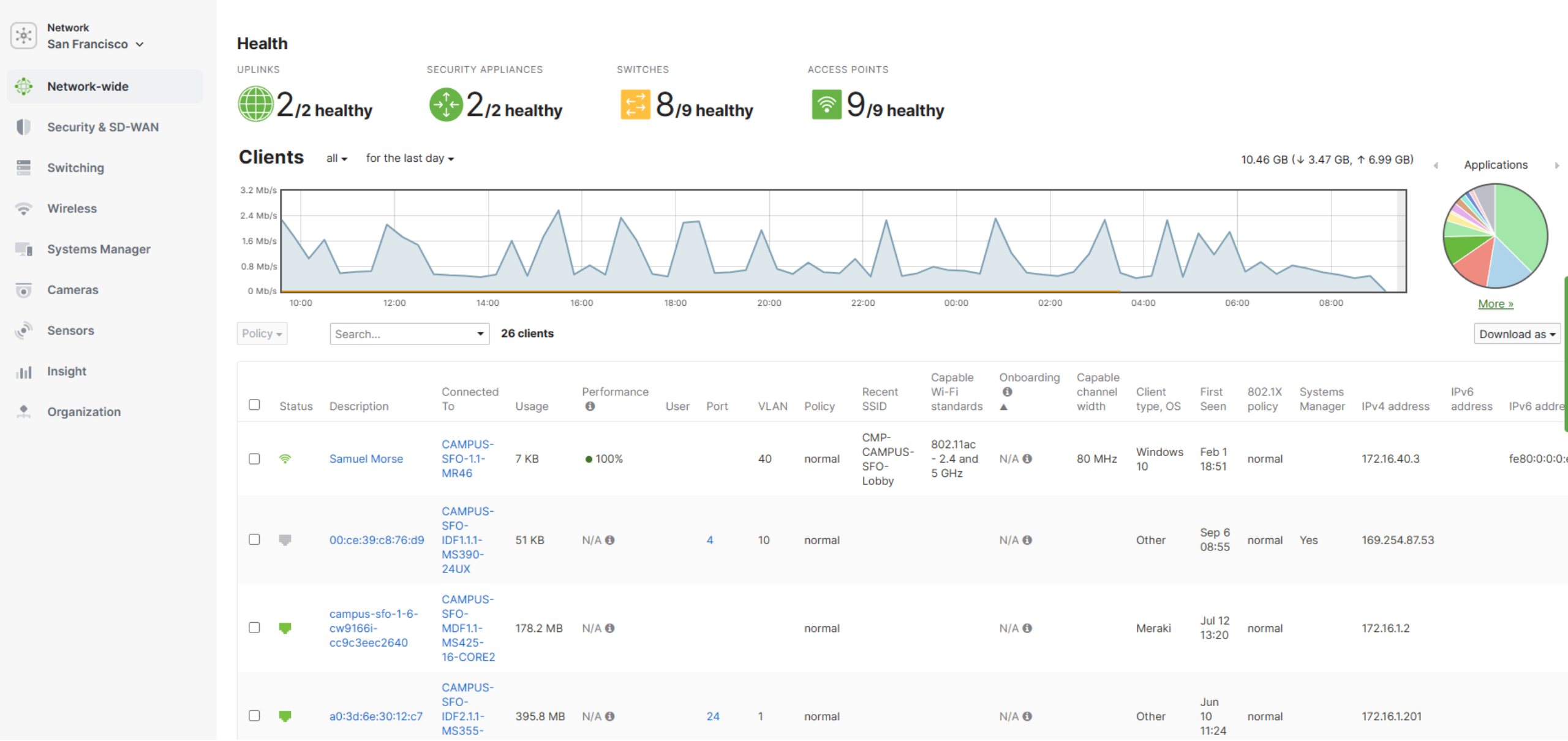
Residential WiFi Network



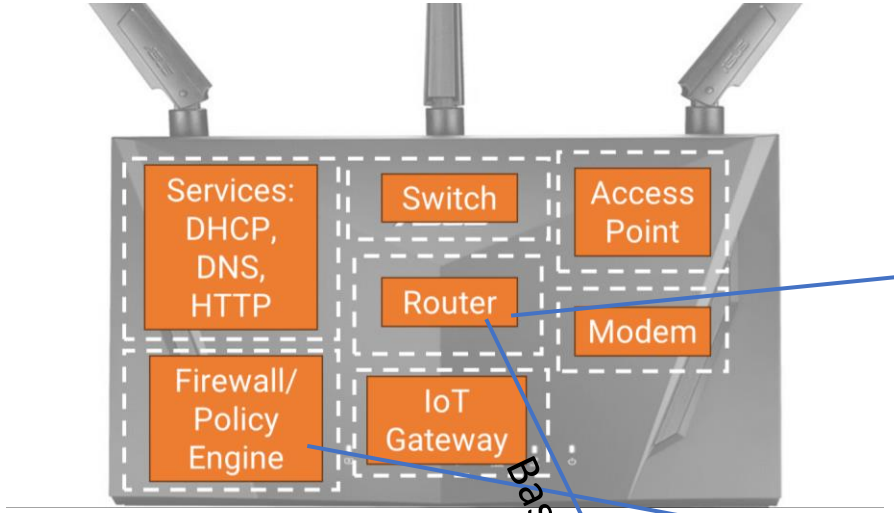
Enterprise WiFi Network

The Configuration Interface of a Residential Router

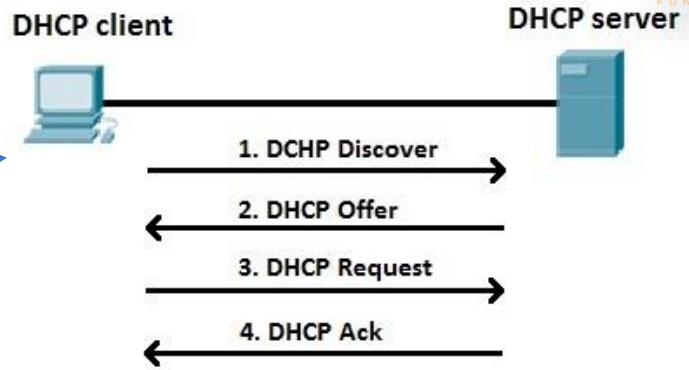
Enterprise AP Configuration



Difference Between Wi-Fi Router and Access Point

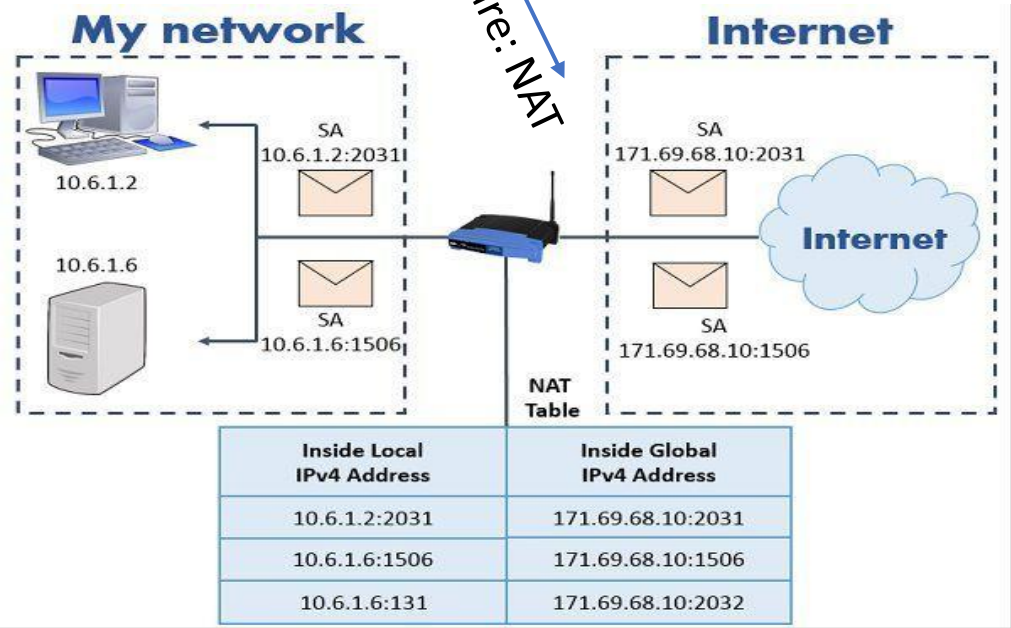


Basic Feature: DHCP

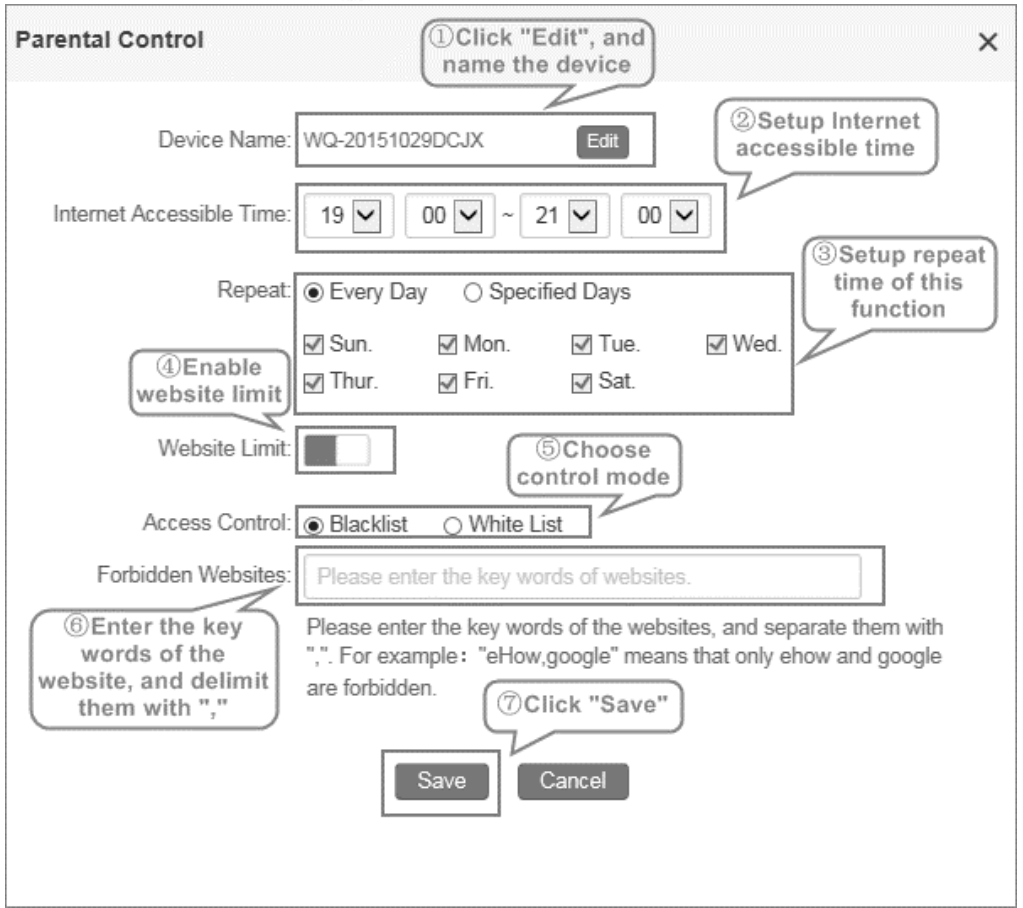


Basic Feature: NAT

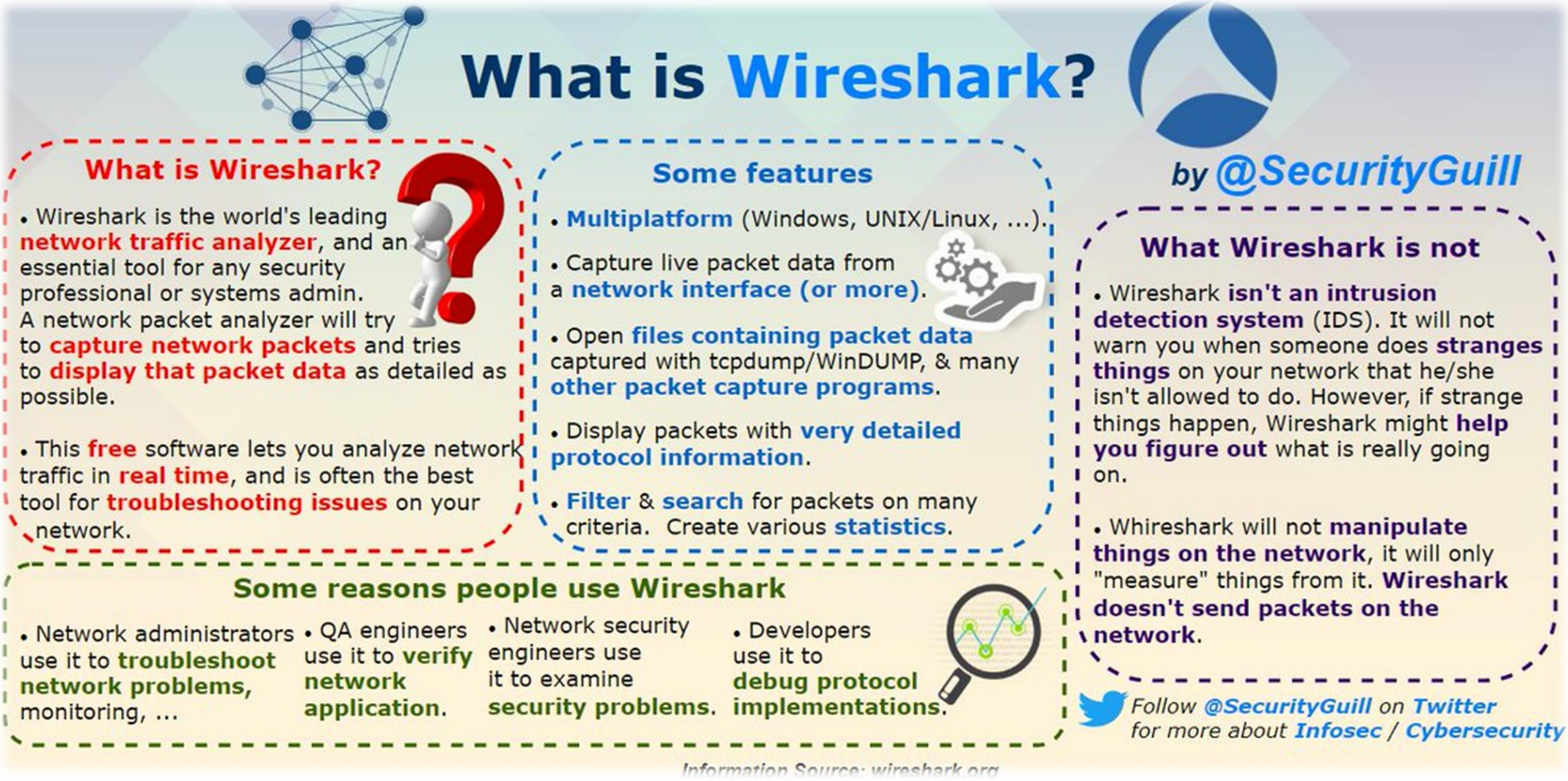
Advanced Features



Inside Local IPv4 Address	Inside Global IPv4 Address
10.6.1.2:2031	171.69.68.10:2031
10.6.1.6:1506	171.69.68.10:1506
10.6.1.6:131	171.69.68.10:2032



What is Wireshark?



DHCP Packet Capture

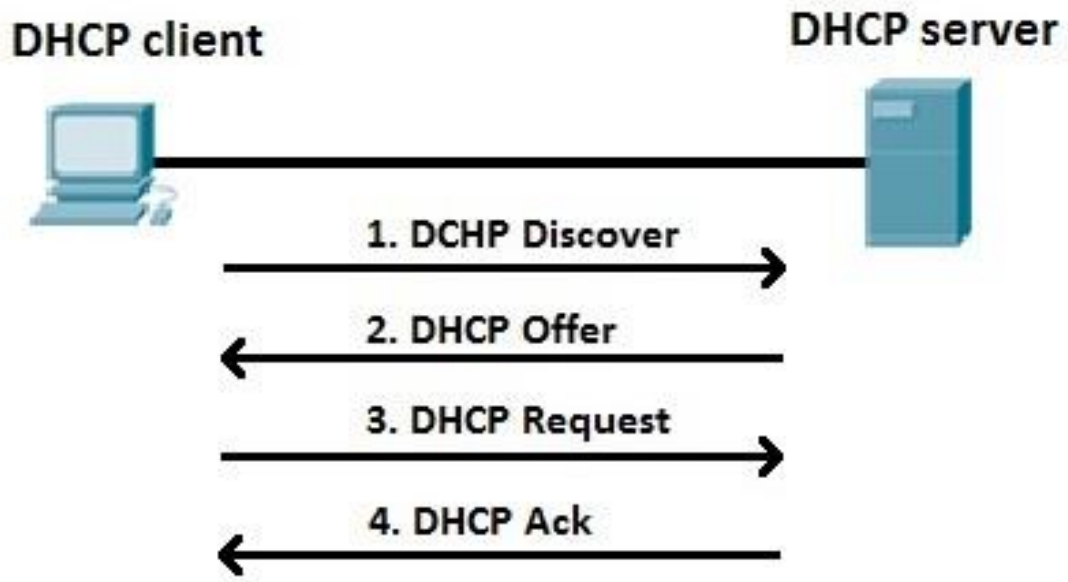
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

dhcp`

No.	Time	Source	Destination	Protocol	Length	Info
19	0.266326	0.0.0.0	255.255.255.255	DHCP	342	DHCP Discover - Transactio
28	0.282418	192.168.90.217	192.168.90.227	DHCP	352	DHCP Offer - Transactio
29	0.294187	0.0.0.0	255.255.255.255	DHCP	370	DHCP Request - Transactio
30	0.313803	192.168.90.217	192.168.90.227	DHCP	352	DHCP ACK - Transactio

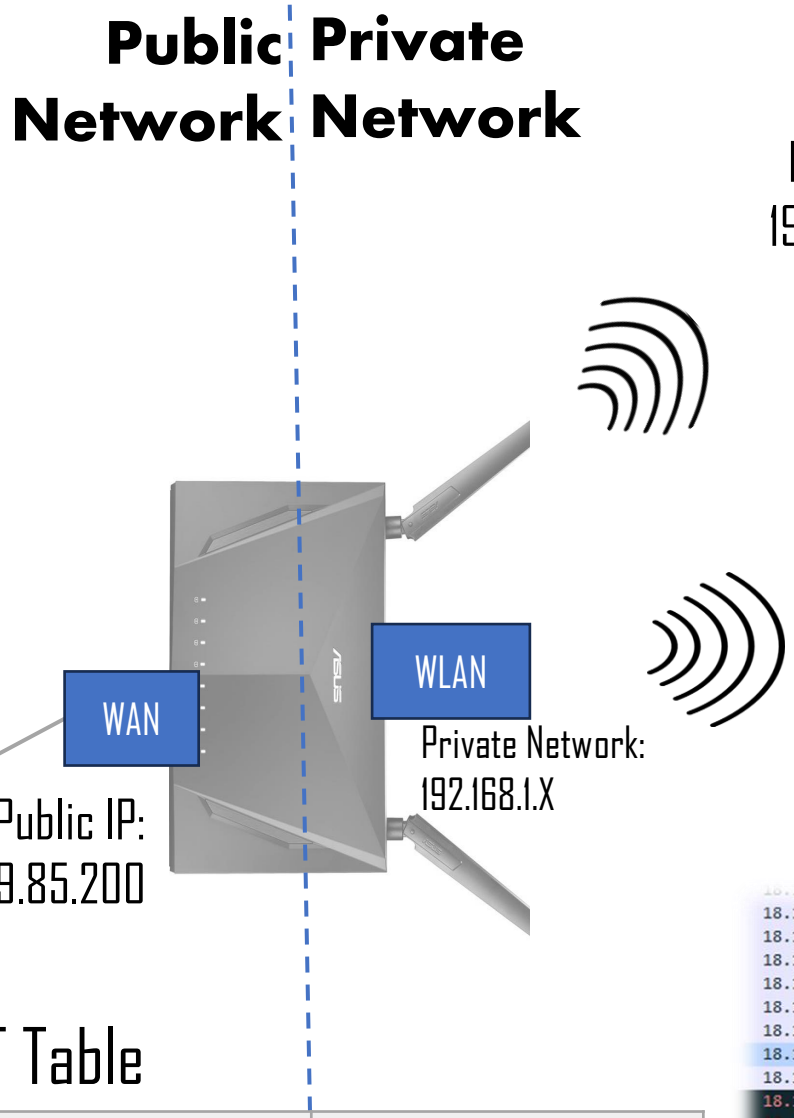
```
> Frame 29: 370 bytes on wire (2960 bits), 370 bytes captured
> Ethernet II, Src: d4:1b:81:3e:80:b5 (d4:1b:81:3e:80:b5), Ds
> Internet Protocol Version 4, Src: 0.0.0.0, Dst: 255.255.255
> User Datagram Protocol, Src Port: 68, Dst Port: 67
v Dynamic Host Configuration Protocol (Request)
    Message type: Boot Request (1)
    Hardware type: Ethernet (0x01)
    Hardware address length: 6
    Hops: 0
    Transaction ID: 0x169f40cc
    Seconds elapsed: 0
  > Bootp flags: 0x0000 (Unicast)
    Client IP address: 0.0.0.0
    Your (client) IP address: 0.0.0.0
    Next server IP address: 0.0.0.0
    Relay agent IP address: 0.0.0.0
    Client MAC address: d4:1b:81:3e:80:b5 (d4:1b:81:3e:80:b5
    Client hardware address padding: 00000000000000000000
    Server host name not given
    Boot file name not given
    Magic cookie: DHCP
  > Option: (53) DHCP Message Type (Request)
  > Option: (61) Client identifier
  v Option: (50) Requested IP Address (192.168.90.227)
      Length: 4
      Requested IP Address: 192.168.90.227
  > Option: (54) DHCP Server Identifier (192.168.90.217)
  > Option: (12) Host Name
  > Option: (81) Client Fully Qualified Domain Name
  > Option: (60) Vendor class identifier
```

```
0000  ff ff ff ff ff ff d4 1b  81 3e 80 b5 08 00 45 00   ·····
0010  01 64 ae 87 00 00 80 11  8b 02 00 00 00 00 ff ff   ·d····
0020  ff ff 00 44 00 43 01 50  e1 19 01 01 06 00 16 9f   ···D
```



NAT/PAT Packet Capture

172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	1514 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	1514 32628 → 5201 [ACK] Seq=579
172.16.222.41	18.189.85.200	TCP	1514 32628 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2362 [TCP Window Full] 32628 →
172.16.222.41	18.189.85.200	TCP	194 [TCP Window Full] 32628 →
172.16.222.41	18.189.85.200	TCP	66 [TCP Keep-Alive] 32628 → 5
172.16.222.41	18.189.85.200	TCP	66 [TCP Keep-Alive] 32628 → 5
172.16.222.41	18.189.85.200	TCP	74 22898 → 5201 [SYN] Seq=0
172.16.222.41	18.189.85.200	TCP	66 22898 → 5201 [ACK] Seq=1 A
172.16.222.41	18.189.85.200	TCP	126 22898 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 22898 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	1514 22898 → 5201 [ACK] Seq=295
172.16.222.41	18.189.85.200	TCP	1514 22898 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	2962 22898 → 5201 [PSH, ACK] Se
172.16.222.41	18.189.85.200	TCP	1514 22898 → 5201 [ACK] Seq=874
172.16.222.41	18.189.85.200	TCP	1514 22898 → 5201 [PSH, ACK] Se

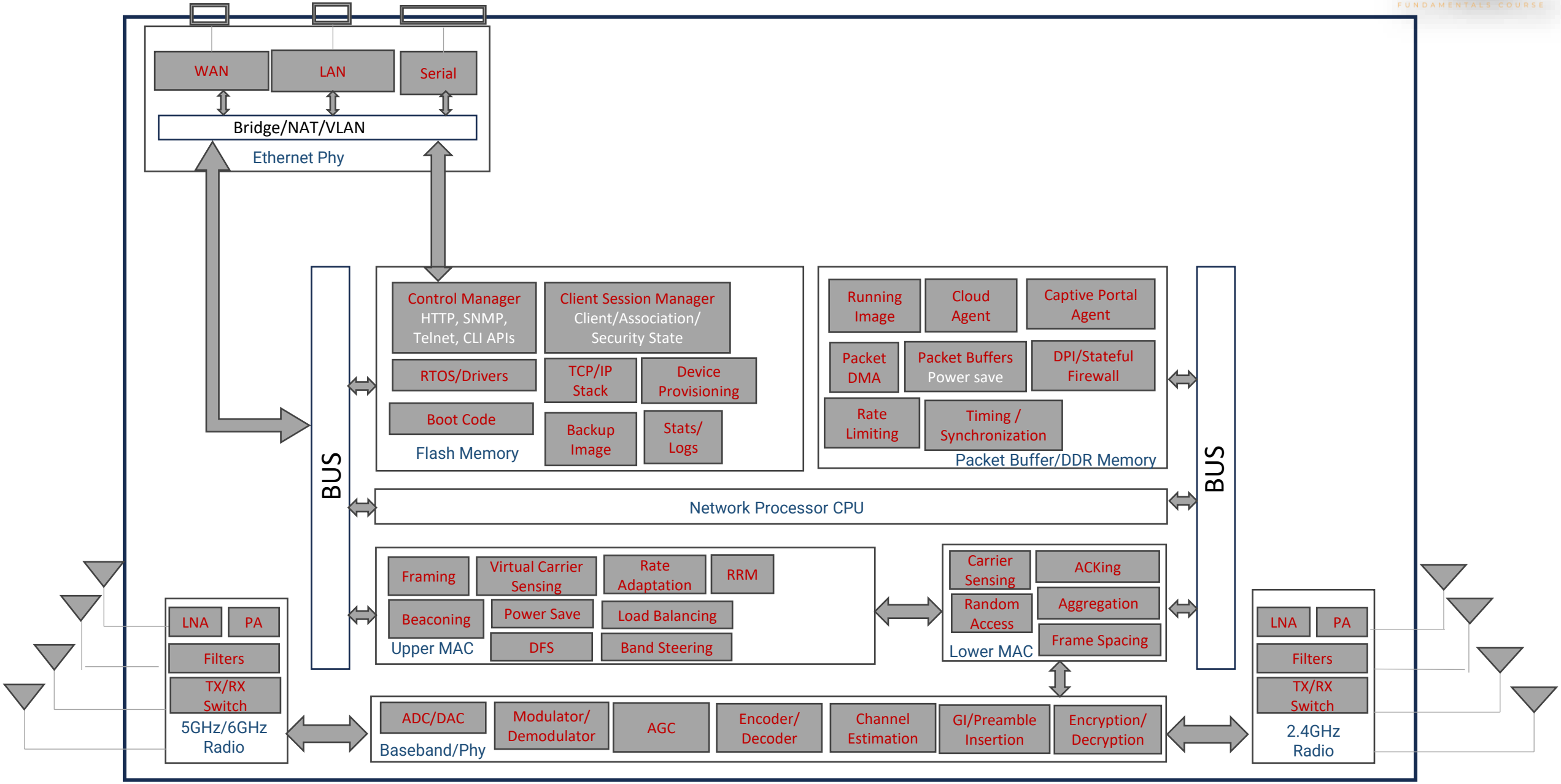


NAT Table

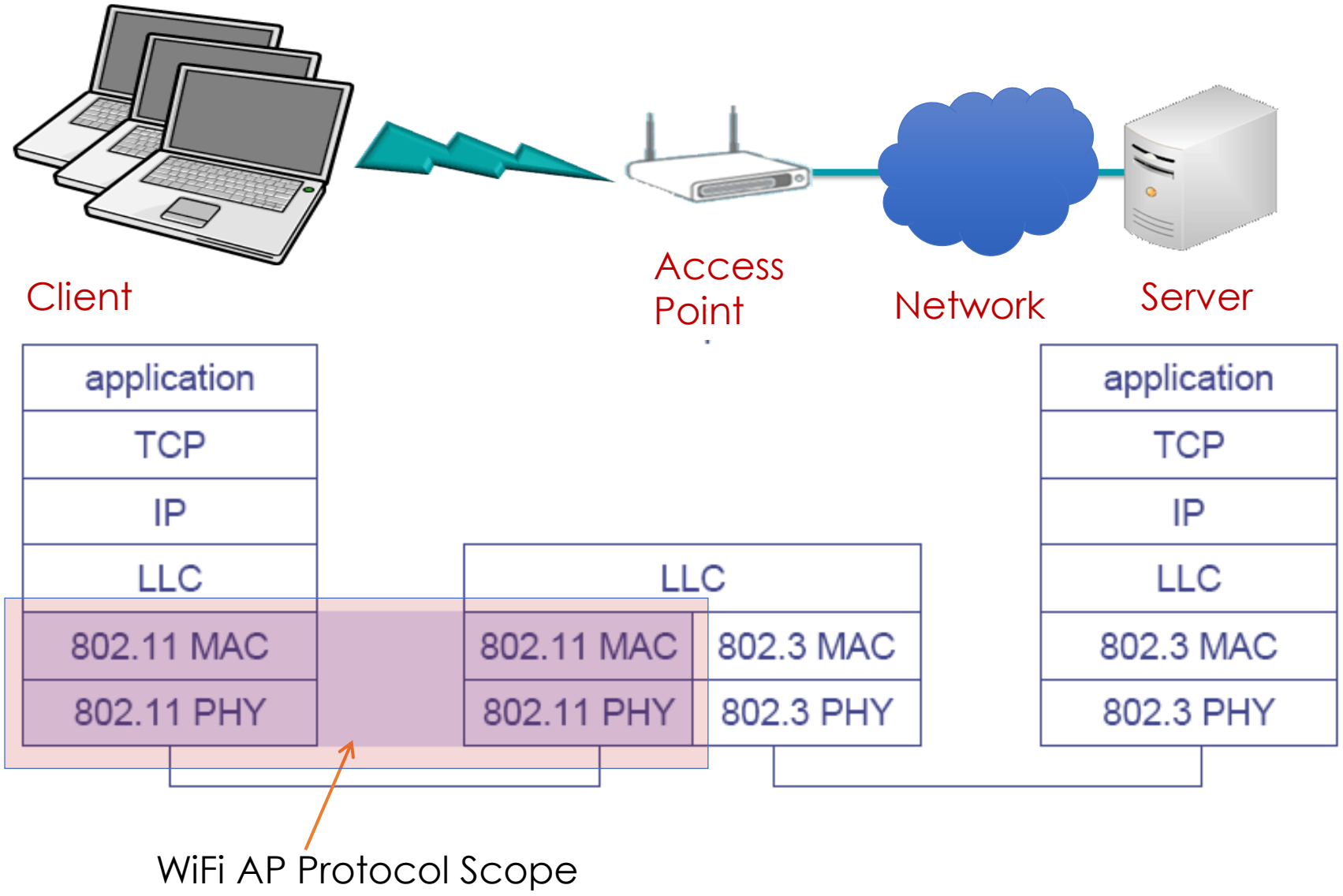
Public Address	Private Address
18.189.85.200:32628	192.168.1.53
18.189.85.200:22898	192.168.1.82

18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	252 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 5201 → 32628 [ACK
18.189.85.200	192.168.1.53	TCP	162 [TCP ZeroWindow]
18.189.85.200	192.168.1.53	TCP	162 [TCP ZeroWindow]
18.189.85.200	192.168.1.82	TCP	170 5201 → 22898 [SYN
18.189.85.200	192.168.1.82	TCP	162 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	162 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	162 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	404 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	328 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	328 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	162 5201 → 22898 [ACK
18.189.85.200	192.168.1.82	TCP	162 5201 → 22898 [ACK

Anatomy/Functional Block Diagram of Enterprise WiFi Access Point



WiFi Infrastructure Network



Module 2
WLAN PHY

Module 3
WLAN MAC

Module 4
Security

Module 5
Advanced Topics

Module 6
Troubleshooting

Some References

What is Wireshark and how it works
https://www.youtube.com/watch?app=desktop&v=Lb-PJl9u3z8

Instant Demo of Enterprise Wi-Fi network Management
https://meraki.cisco.com/form/instant-demo/

FCC ID Website
https://fccid.io/

Wireshark Website
https://www.wireshark.org/

NAT and PAT explained
https://www.youtube.com/watch?v=wg8Hosr20yw

How DHCP Works
https://www.youtube.com/watch?v=IUOVSIKj6GU

Wireshark Masterclass
https://www.youtube.com/watch?v=OU-A2EmVrKQ&list=PLW8bTPfXNGdC5Co0VnBK1yVzAwSSphzpJ

QUIZ! TIME

?

Quiz 1c Results

Number of participants - 231

Vysyaraju Manideepika