

Machine Learning for Networks

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Chapter 1

Wifi-networks

The power transmission of a router is defined with the following formula:

$$Pt(dBm) = 10 \log_{10}(Pt[mW]) \quad (1.1)$$

Regarding the distance at which the power is lost:

$$Pl = L1m + 10y(f, environment) \log_{10}(d) \quad (1.2)$$

Where $L1m$ is defined as the *Path-loss* at 1 meter (usually $\in [20, 25]$)

1.1 Signal to noise ratio

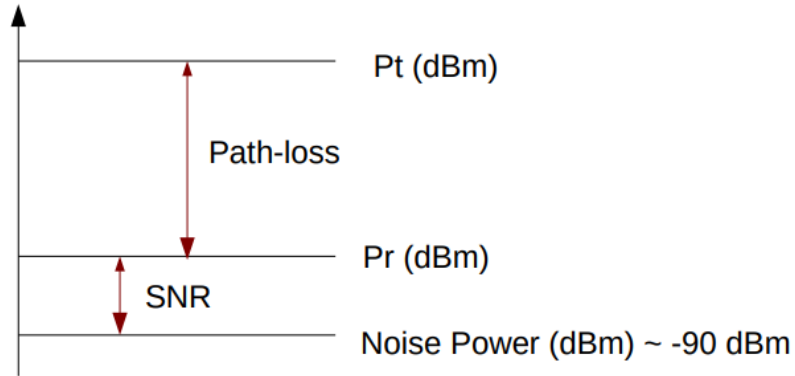


Figure 1.1: SNR

Defined as:

$$SNR[dB] = Pr[dBm] - \text{Noise Power}[dBm] \quad (1.3)$$

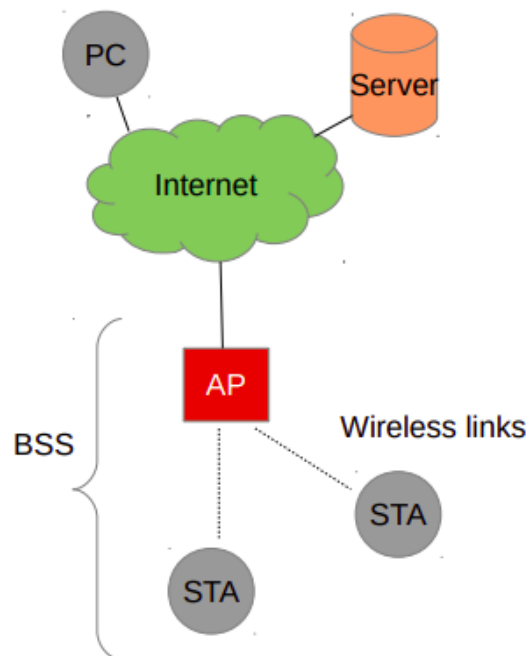
Chapter 2

How does Wifi work

Access point is a device where we can connect to the WLAN network (e.g a router).

When this device is up it starts by choosing a channel of the bandwidth to use, once this is finished it starts transmitting beacons each $T_{beacons}ms$ (usually $100ms$) Each beacon contains information about the AP, such as the BSSID (name of the network), supported transmission rates, and other characteristics...

Then we have stations (STA), devices that we use to connect to AP, e.g. computers, phones, etc



2.1 Link layer

The typical connection we'll see is formed by multiple nodes, is half-duplex (the connection allows communication in both directions but only one direction at a time). The channel access arbitration is done using the **Distributed Coordination Function (DCF)** which consists of:

- CSMA protocol
- Backoff (BEB)
- Stop & Wait ARQ protocol, for packet retransmissions

2.1.1 DCF

2.1.2 Automatic ReQuest protocol (Stop & Wait)

Where unconfirmed packages are retransmitted until they are acknowledged or discarded. There is a maximum number of retransmissions R_{\max} . Between packages we have the **Short Interframe Space (SIFS)**

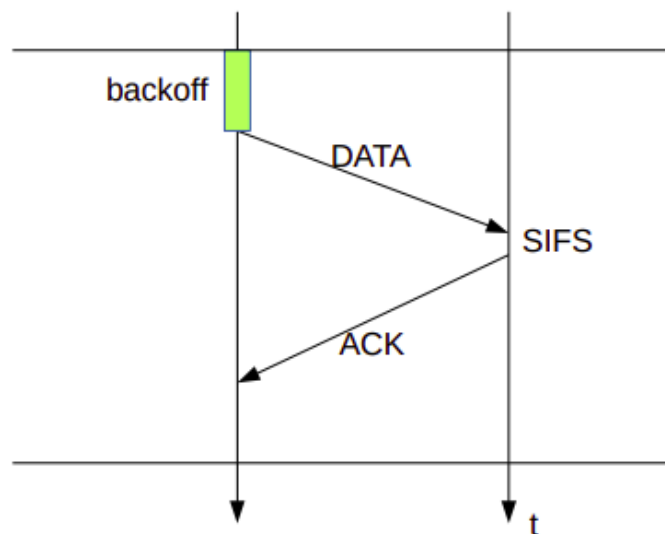


Figure 2.1: ARQ

Chapter 3

Wifi Performance

3.1 Packet Transmission time

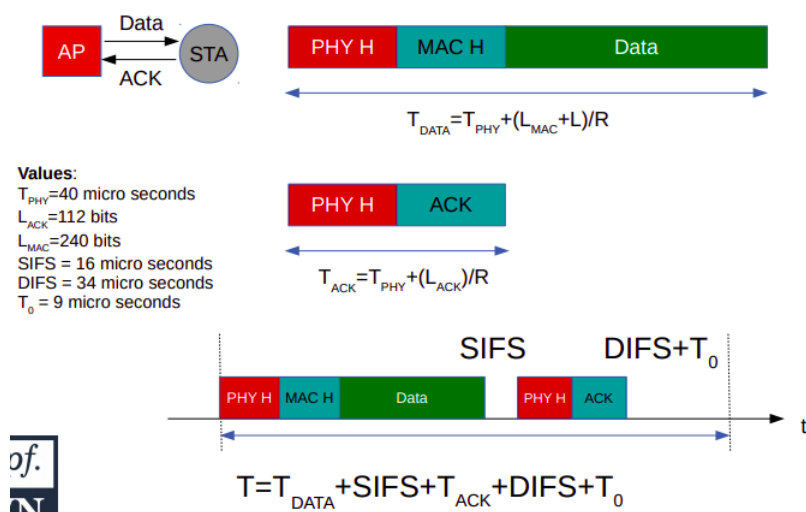


Figure 3.1: Packet transmission time