

device or technology based on the Institute  
of Electrical and Electronics Engineers (IEEE)  
wireless communication standard 802.11  
"The Standard for Wireless Fidelity"

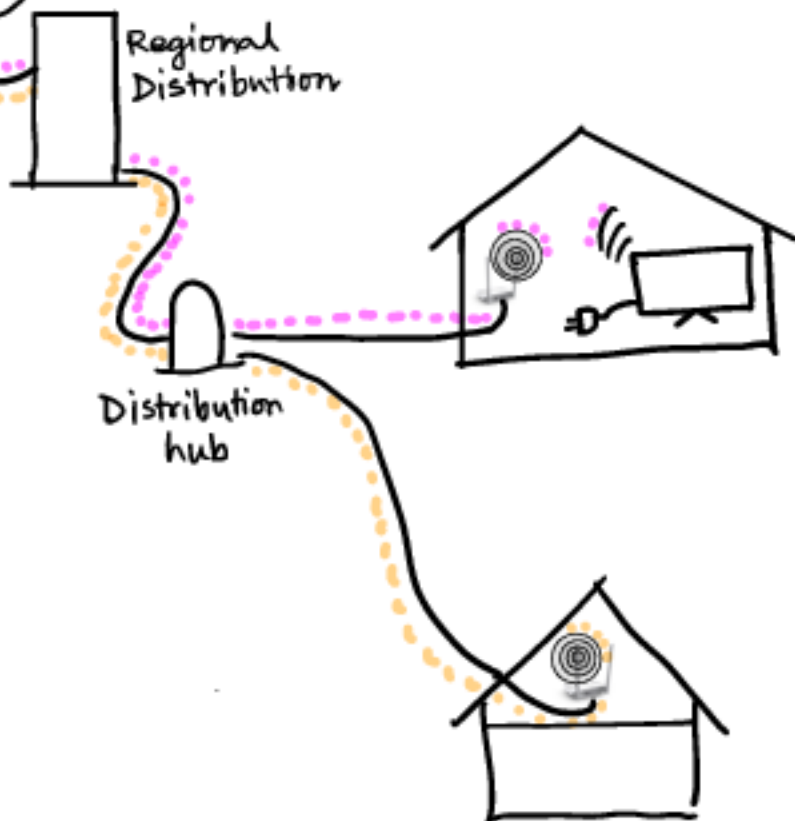
# ① How does Wifi connect your home to the Internet?

Electricity

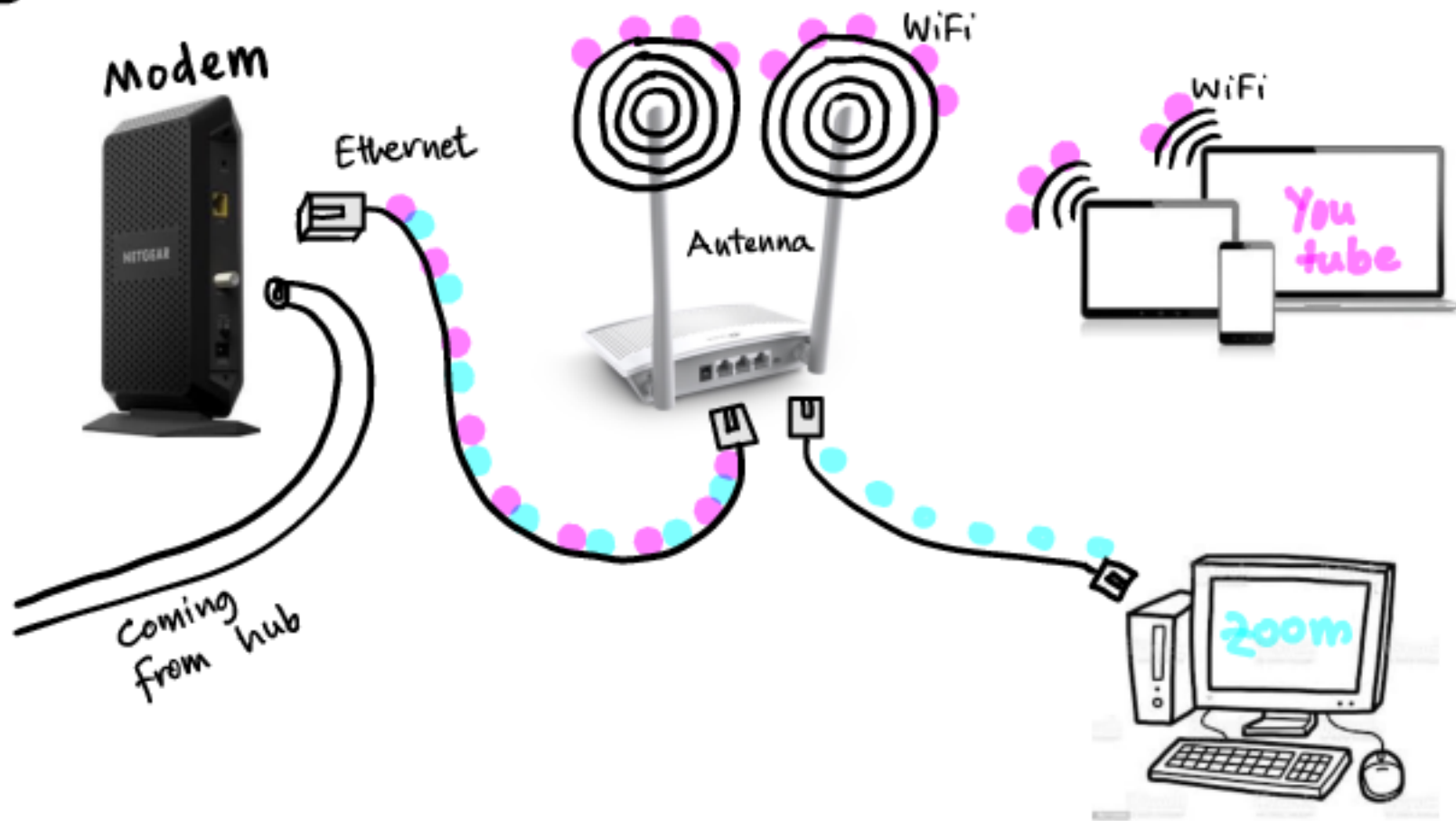


Internet

WiFi

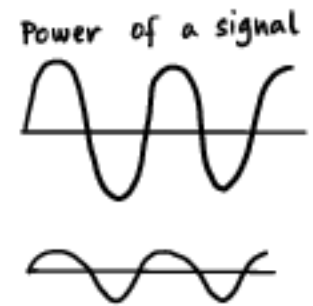
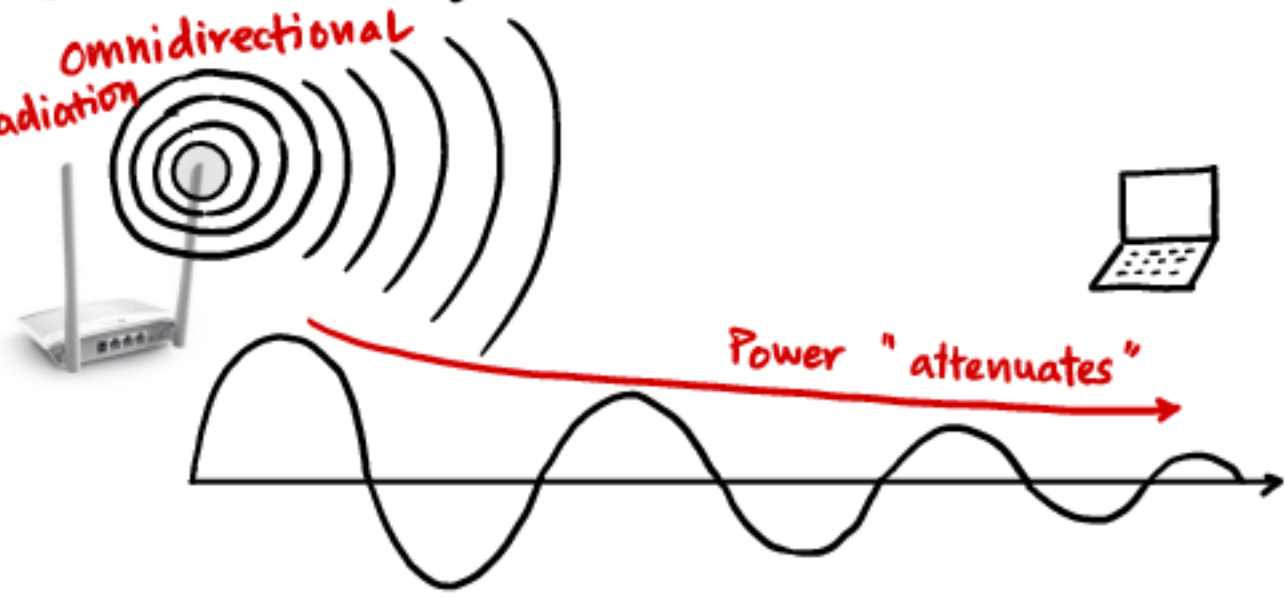


## ② How does WiFi connect devices in your home?



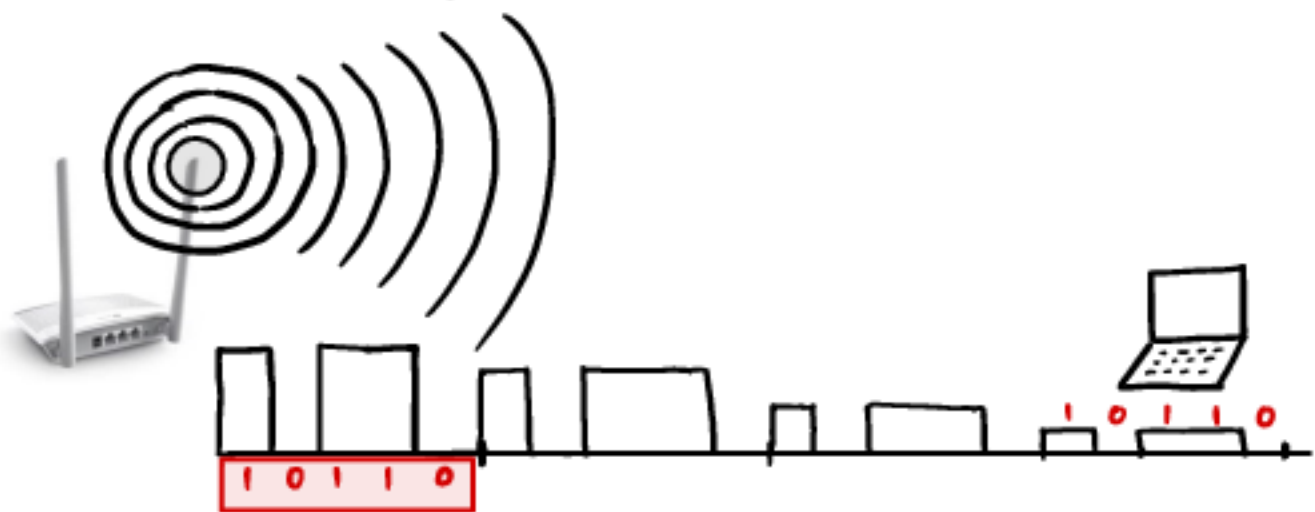
### ③ Understanding Wifi radiation and power

Omnidirectional radiation

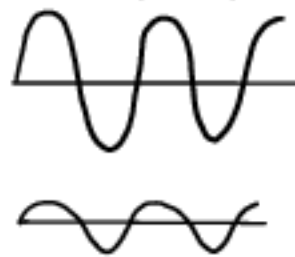


high-speed data transfer over short distances using radio waves

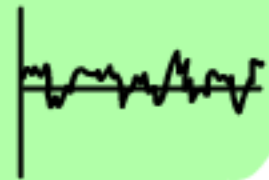
# ④ Understanding noise and bit errors



Power of a signal



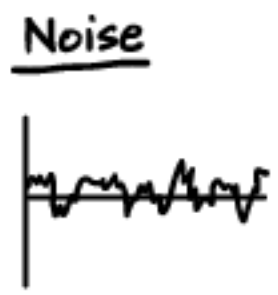
Noise



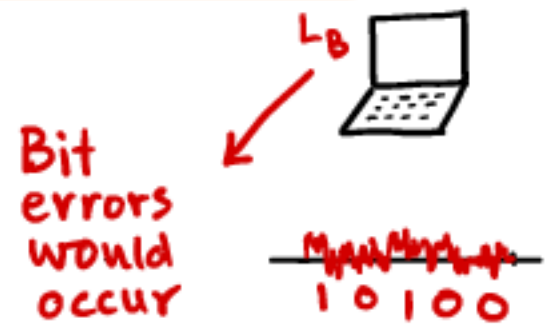
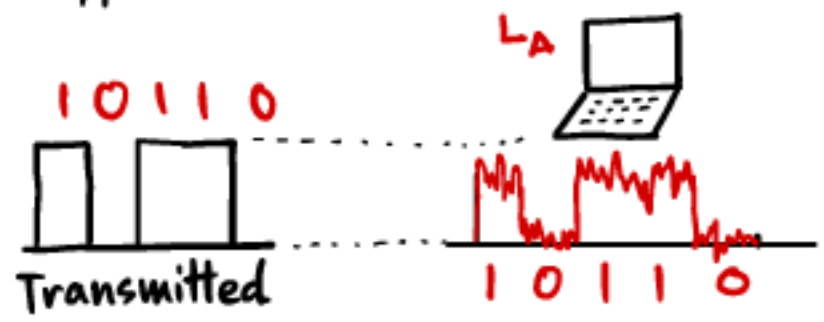
$$\begin{array}{c} \text{[Pulse 1]} \quad \text{[Pulse 2]} \\ + \\ \text{[Noise]} \\ = \\ \text{[Received signal]} \end{array}$$

Can you see the bits still?

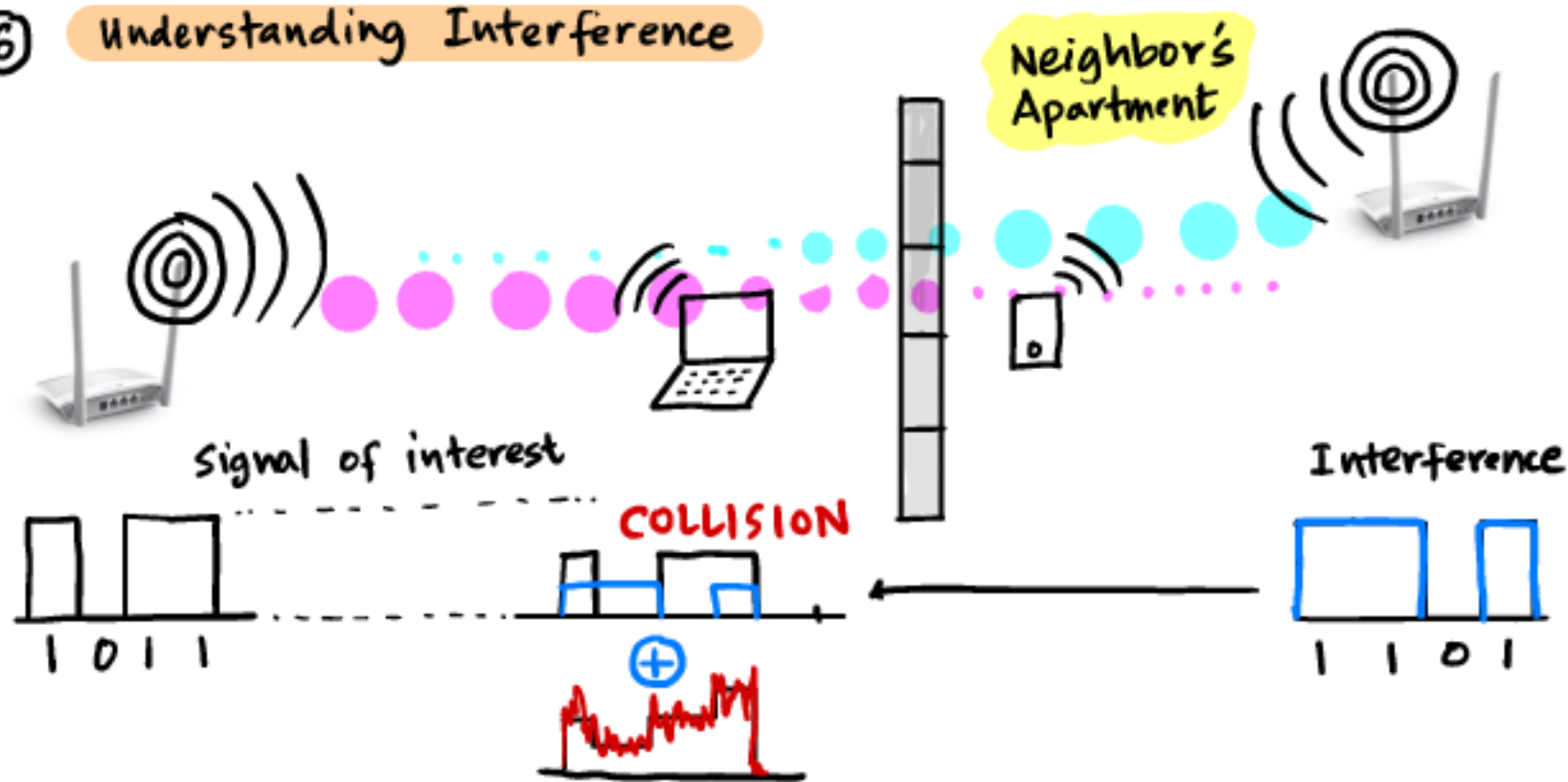
# ⑤ Bit errors with distance



What happens when the laptop moves closer or further?



## ⑥ Understanding Interference



- What does laptop receive?
- How to reduce bit errors?

⑦ Lot of WiFi technology focussed on minimizing collisions

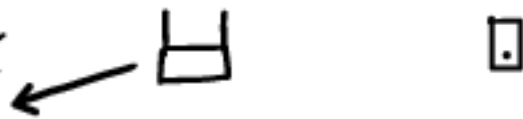
You



Collision



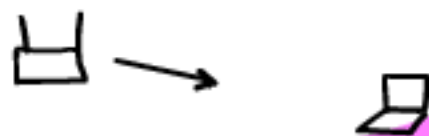
Neighbor



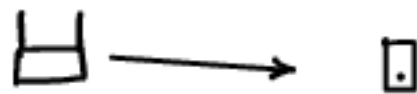
When will collision happen at phone but not at laptop?



⑧ Wifi : Each participant must take turns

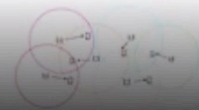
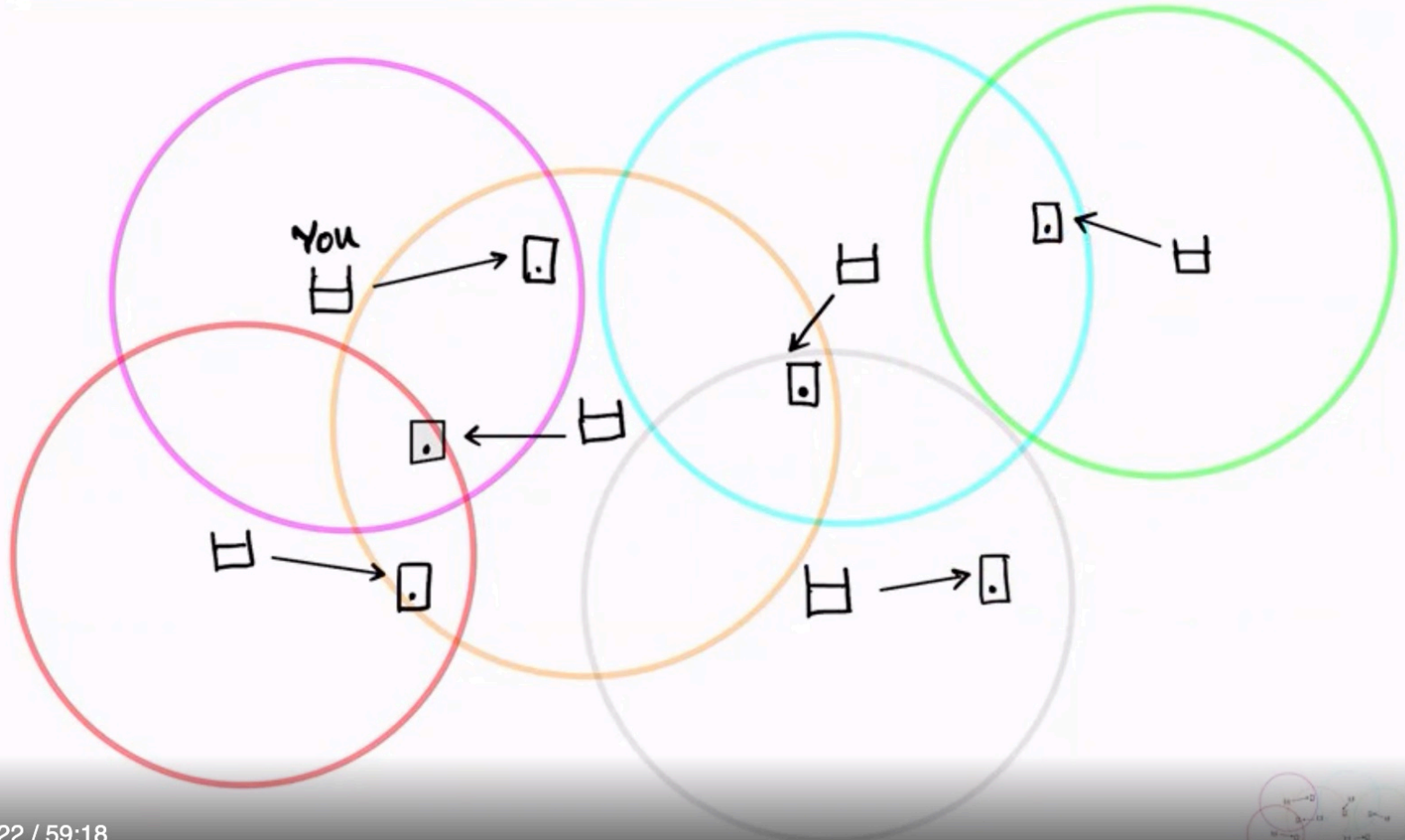


Round robin happens at the time scale of 100 microseconds.



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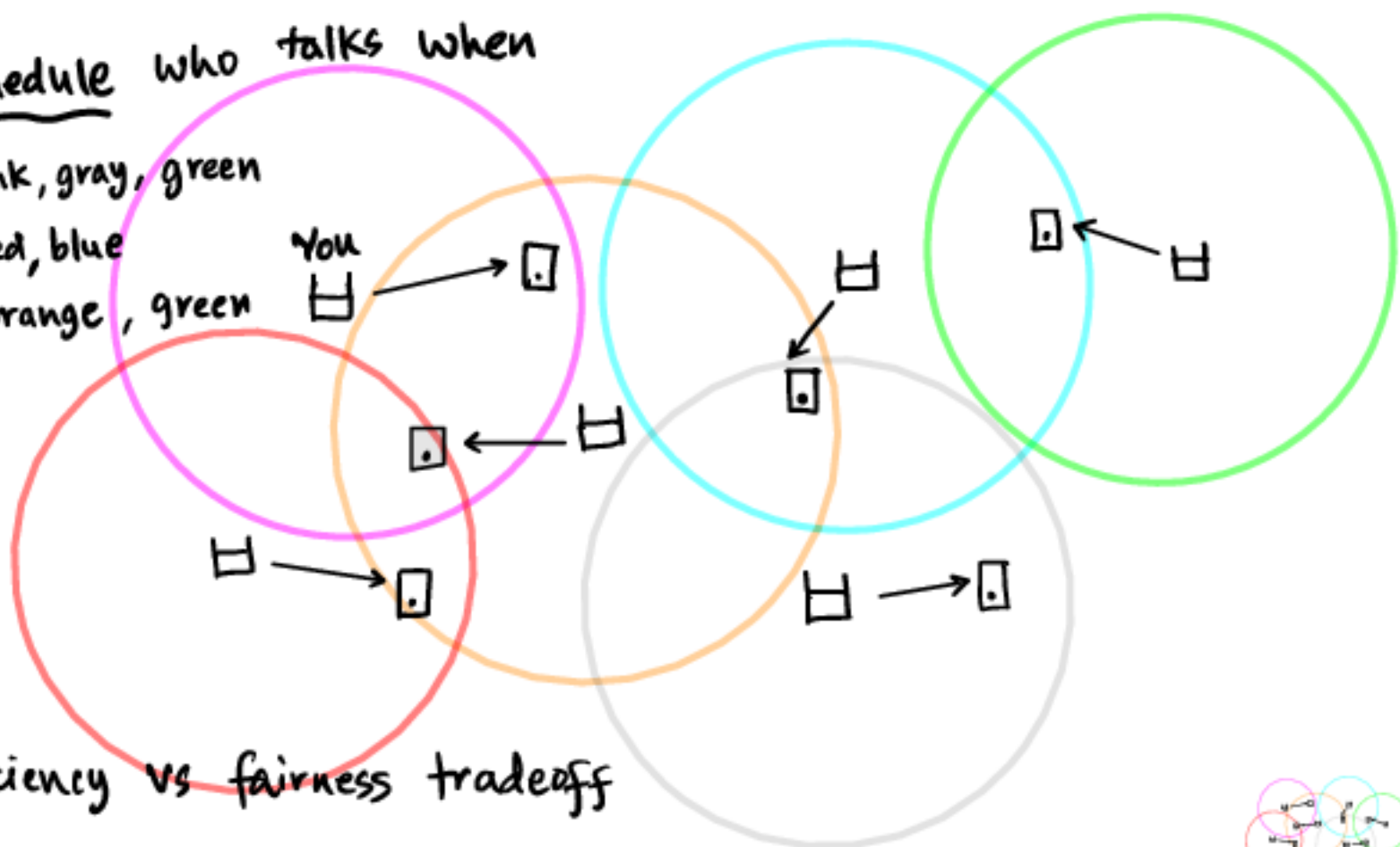
But who should wait and who should talk?



9 But who should wait and who should talk?

schedule who talks when

- $t_1$ : Pink, gray, green
- $t_2$ : red, blue
- $t_3$ : orange, green

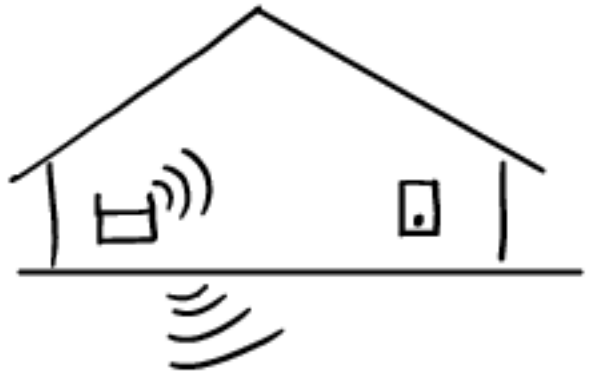


efficiency vs fairness tradeoff

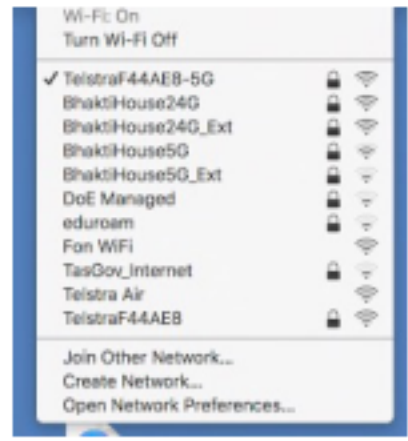


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# Overhearing Wifi and Security



Associate to a WiFi router or access point or base station.



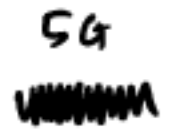
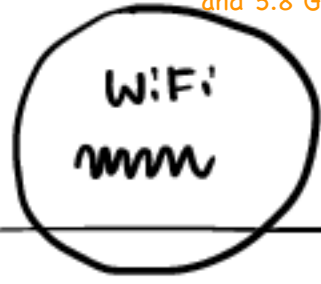
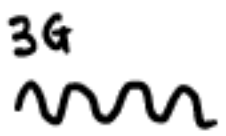
- \* ensure you are using the official Wi Fi
- \* stick to https (s - secure)
- \* don't transmit sensitive info (wait till you are on a secure connection)
- \* use VPN

②

# Wifi in society

A 1985 ruling by the U.S. Federal Communications Commission released the bands of the radio spectrum at 900 megahertz (MHz), 2.4 gigahertz (GHz), and 5.8 GHz for unlicensed use by anyone.

- Wifi is free spectrum

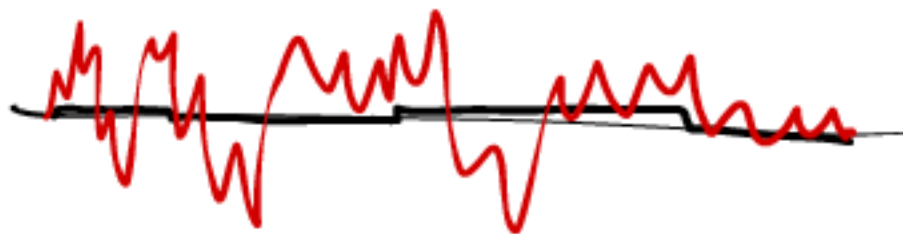
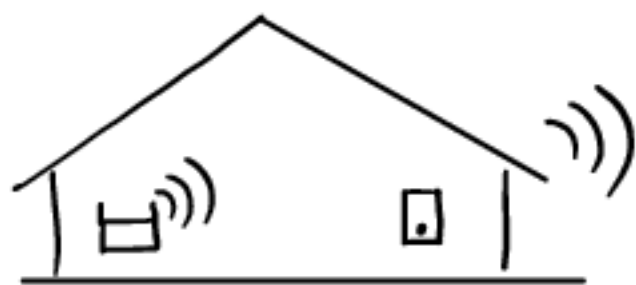


- Wifi and digital divide

- Wifi and family life (tech free family evenings)



⑫ So why not use Wifi when I am driving?



Motivates our next topic

A hand-drawn banner with a black outline and a white interior. The banner is slightly curved at the bottom. Inside the banner, the words "Cellular" and "Networks" are written in a bold, rounded, cyan-colored font with black outlines. "Cellular" is on the top line and "Networks" is on the bottom line.

Cellular  
Networks