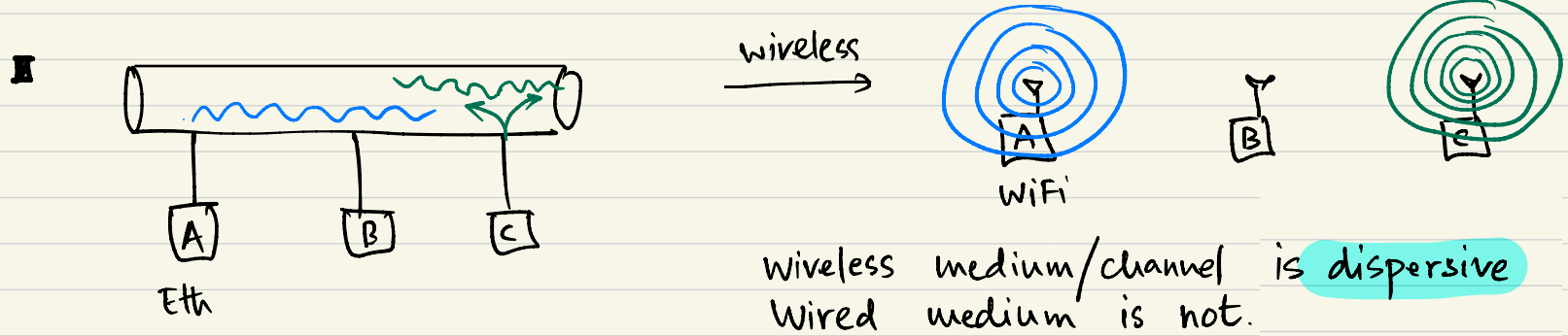


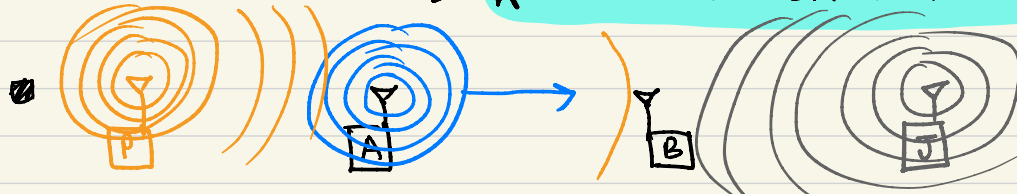
■ Link Layer → Wireless



■ Implication is that CSMA/CD is at stake.

If Transmitted Signal NOT = Overheard Signal, Then Collision at the Rx.

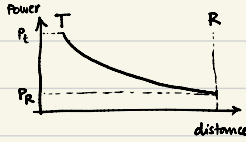
→ A assumes channel is non dispersive.



Should A assume that a collision has occurred at B due to the orange signal?

↳ Depends on SINR \Rightarrow Signal to noise + interference ratio at the R_x .

$$P_R = \frac{P_t}{\text{surface of sphere}} = \frac{P_t}{4\pi r_{AB}^2}$$


$$\text{Interference} = \frac{\text{orange signal power received at B}}{P_t} = \frac{P_t}{4\pi r_{PB}^2}$$

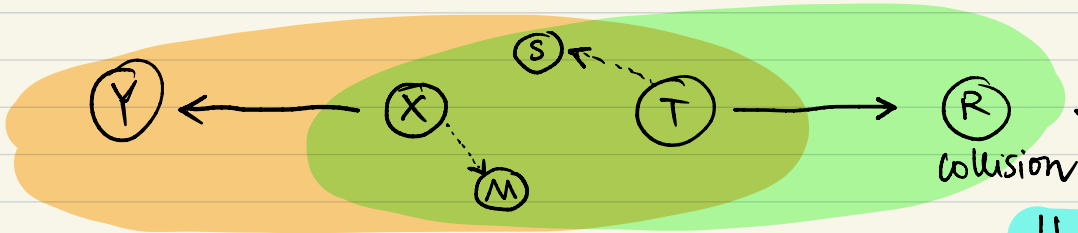
B also has
hardware wise
= n

$$SINR_B = \frac{\frac{P_t}{4\pi r_{AB}^2}}{n + \frac{P_t}{4\pi r_{PB}^2}}$$

For B to
decode a
pkt successfully

$$\text{SINR} \geq \tau \geq 1$$

- Hidden terminal problem (HTP)



■ Exposed Terminal Prob. (ETP)

H is hidden to T.

Since X carrier senses (and channel is busy)

X does not transmit even though it should have in this case ... **BECAUSE X does not**

even though it should
BECAUSE X does not interfere R , and T does not
interfere Y .

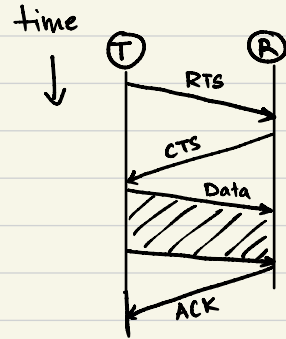
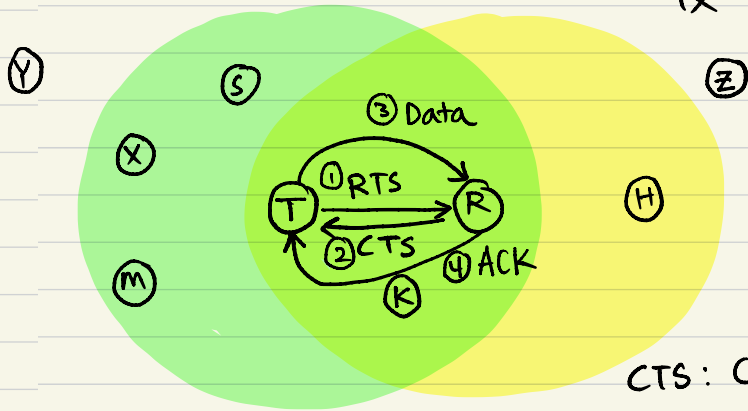
2 conditions to satisfy :

$$\text{SINR}_R^T \geq \tau \quad \text{AND} \quad \text{SINR}_Y^X \geq \tau$$

No way for X and T to learn whether both these conditions hold or not, because there is no central/global coordinator or scheduler,

WiFi (IEEE 802.11) :

Block the channel before transmitting data so that no one in the neighborhood of Tx and Rx talks during data transmission.



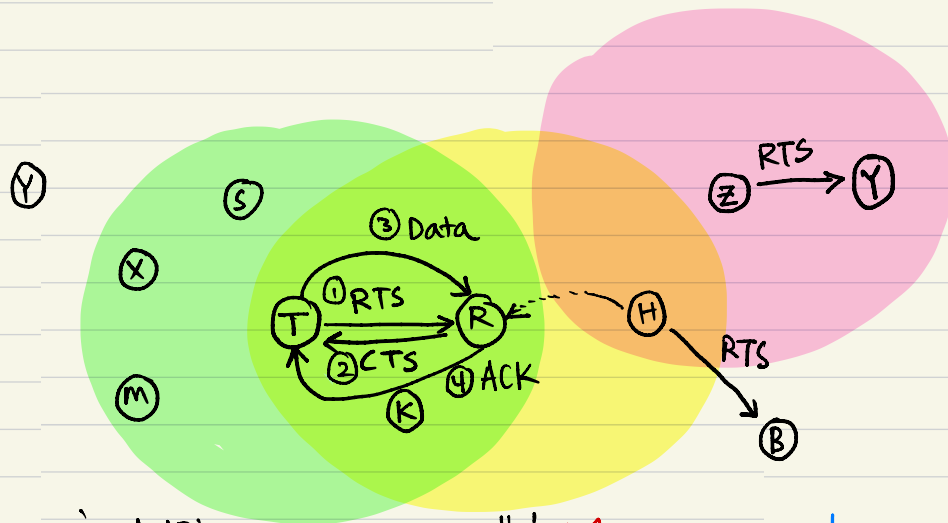
CTS: Clear to send \rightarrow H notes duration of pkt exchange.

RTS: Request to Send
X, S, K, M all noted the duration of imminent pkt exchange.

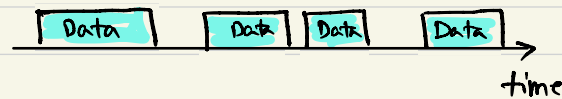
RTS/CTS are broadcast packets (link layer dest. address: FF:FF:FF:FF)

Does RTS/CTS solve the HTP and ETP.

↳ conservative protocol ... doesn't even try to solve ETP.



Eth.



$\bar{T} \rightarrow \bar{R} \Rightarrow \text{SINR is high}$

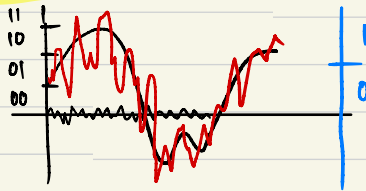


$\bar{T} \xrightarrow{\text{Low bit rate}} \bar{R}$

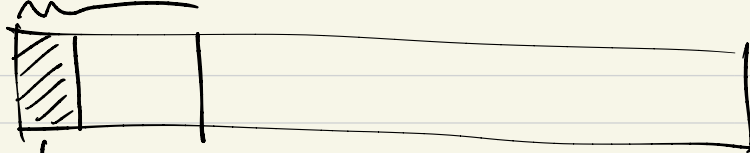


Failures in WiFi

- ① Bit errors
- ② Interference.
- ③ Mobility / distance.
- ④ Collision (major issue in dense scenarios, e.g., football field).

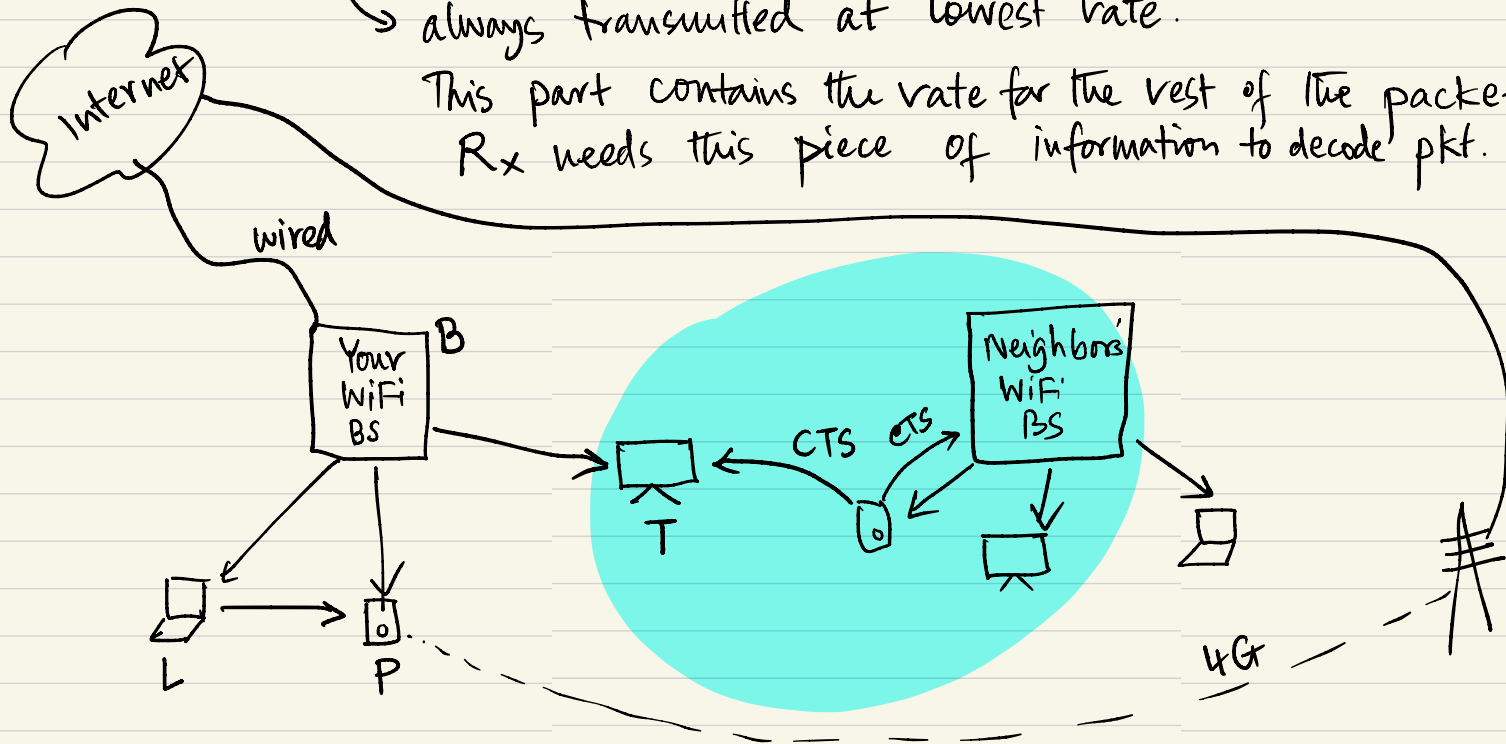


Link layer header.

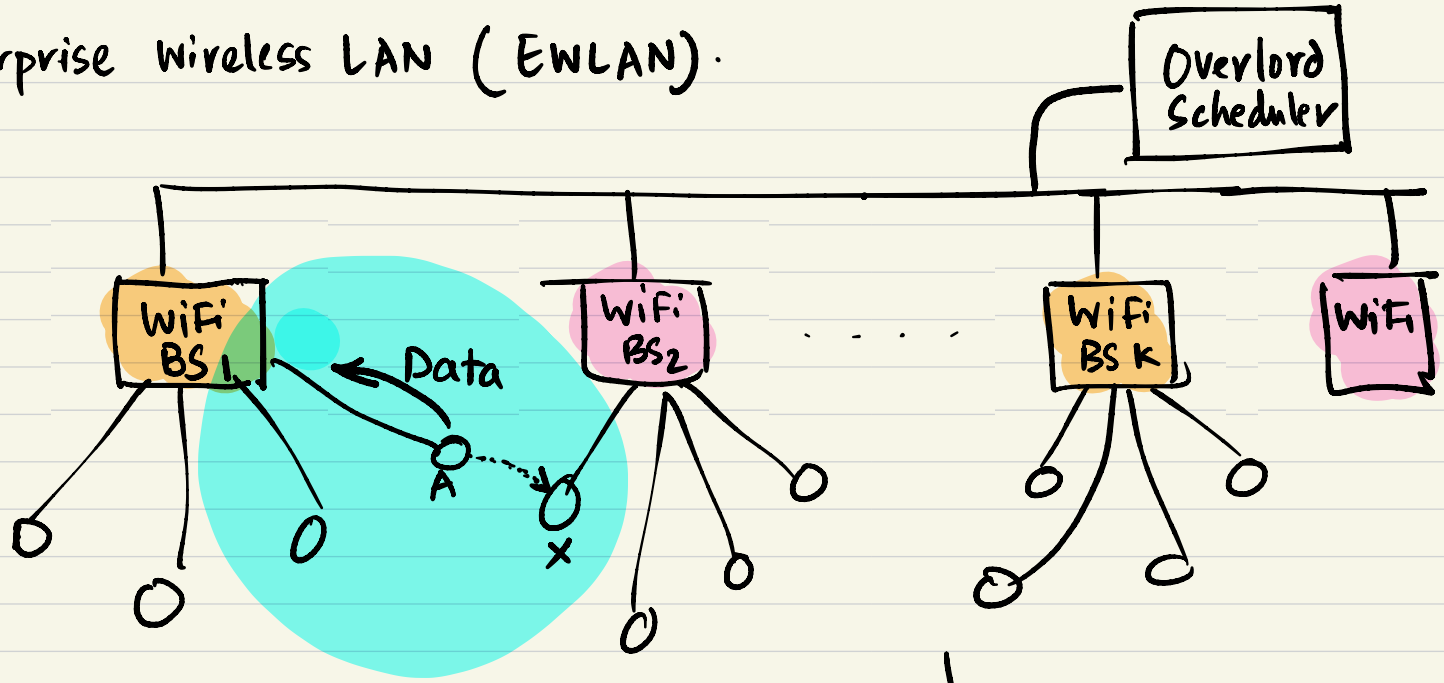


always transmitted at lowest rate.

This part contains the rate for the rest of the packet.
Rx needs this piece of information to decode pkt.



■ Enterprise Wireless LAN (EWLAN).



Can you completely centralize the protocol.

WiFi at 2.4 GHz , 5 GHz → Free spectrum

