Prise de notes : Réseaux sans Fils/ Wireless Networks

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Définitions

Mot	***Définition***
SNIR	Signal to Noise and Interference Ratio
ARF	Auto Rate Fallback
ToF	Time of Flight
IoT	Inernet of Things

1. Waht is WI-FI ?

1.1. Last Year recall

1.1.1. Generalities

Standard 802.11 standard.

2 types of architecture:
1. WLAN
   - Connected to internet via Acess Point (with wires) ;
   - Clients can move ;
   - Clients communicate with AP wirelessly with Multiple Acess CHannel.
2. Ad-hoc (peer to peer)

Uses carrier sensing with Collision Avoidance.

ARQ : Automatic Request Acknowledgment

Truncated binary exponential backoff for handling congestion

1.1.2. Backoff

Backoff value Random() x SlotTime
- Random() : Pseudo-rand int from [O,CW] where $\mathrm{CW}_{\min} < \mathrm{CW} < \mathrm{CW}_{\max}$

1.1.3. QOS in WIFI (ou ==?)

- provide different priorities depending on app, user, data flow
- guarantee a certain level of performance to a data flow

We use a higher Data rate when we want less errors
- Donc pourquoi juste pas prendre le + haut débit si on a que des bénèfs?
- To adjust the rate based on the SNIR (if low ration: low Signal Noise, so we take lower bit rate)

diapo 44 : A peut detecter la qualité du signal, pour la distance avec le AP c'est compliqué. Le débit basé sur la distance peut être trompeur car il peut y avoir une distance faible mais des obstacles.

1.1.4. Auto-Rate Fallback (ARF)

- ARF initial bit rate: max available
- adjusts the bit rate for the destination based on critera
  - if packet is dropped => lowers rate
  - 10 sucessive transmitted packets => increases rate
- ARF adjust the rate base on :
  - move to a lowest if there is a drop
  - move to a higher if there is 10 success in a row
  - else we continue to the same

Weakness Does not react to retries

why Wi-fi drops packet ?
- If there is $\begin{cases} 4 \\ 7 \end{cases}$ ressend of packet, you drop it;
- We prefer A 24 bit rate with 1 try rather than 48 bit rate with 3 tries. as the effective rate for 48 is not 48, but $\frac{48}{3}$

1.1.5. Small Exercice (s 52):

We suppose 1 packet=24Mb

- Solution 1:

Half of the time you send a packet at 24Mbps.

The other half, you send a packet at 8Mbps.

So with 2 packets like this:

The 1st packet takes 1 second, and the second takes 3.

So in 4 seconds we sent 48Mbps, that's equal to 12Mbps on average.

- Other solution :

1/24 + 1/8 = 4/24 = 1/6 (2 packets)

So 2 packets recieved 1/6 of the time.

12 packets recieved on average

1.1.6. Small ex 2 s 58

There are 4 failures for the bit rate of 11 despite 16 tries, that's because for each packet, we try 4 times before dropping it. That means if all fails, you have 4x more tries than fails.

After 4 fails, the bit rate is lowered.

1.1.6.1. For the 2nd destination:

The bit rate of 11 has a to try twice before the packet is acknowledged, so there is a need of 2 packets to effectively transmit 1. As such, the effective bit rate is: $\frac{11}{2} = 5.5$. And for the bit rate of 5.5, the effective bit rate is: $5.5 \cdot \frac{46}{50}$, which is slightly worse than the one above. That is why the higher bit rate is better despite lower ack rate.

Cumulative Fraction of Links (CDF : Cumulative Distribution Function of the links = fonction de répartition)

1.2. Wifi Based Indoor Localisation

GPS is paid by the US gov. So we need to scale the GPS to work indoors: Possible solution use wifi.

Using signal power to determine the position is not efficient: **We will have difficulties due to the numerous walls.**

Using the time of flight: **at these distances, a slight error leads to big localisation differences** And also, in case of multiple paths, longer paths can lead to

TWR: Two Way Ranging

ToF = $\frac{(t_4 - t_1) - (t_3 - t_2)}{2}$

2. IoT

2.1. What is IOT

Bluetooth uses frequency hopping - freq changed every slot channel access ; TDD (1 master(odd-numbered slot) for up tp 7 slaves(even-numbered slot)). The freq hopping pattern is determined by the master

1. inquiry
2. paging

2.2. Next gen IoT