EENGM4221:
Broadband Wireless Communications

Lecture 4: Wireless MACs

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Medium Access Control (1)

- A suitable Multiple Access strategy gives us a method for dividing the channel up for use by multiple users
  - There is no definitive term for these 'parts of the resource'
    - Time-slots, sub-bands, codes, etc
  - They may also be of fixed or variable size
- Even with a suitable Multiple Access strategy in any domain (time/frequency/code/space) or combination of domains, the problem remains how these fractions of the overall resource are allocated for communications purposes

Medium Access Control (2)

- It is perhaps intuitively easiest to consider the problem in time
    - Essentially: 'Whose turn is it to transmit'
    - Extension to other domains just requires a little extra thought
- It is the job of the MAC protocol to:
    - Decide who's 'turn' it is
    - Make sure everyone knows who's turn it is
- If the MAC protocol fails, there is a risk of communications failure

Medium Access Control (3)

- The challenges in designing a MAC protocol are:
  - Efficiency
    - Don't let the resource go unused if it is needed
    - Minimise Overhead's (deadtime, signalling, etc)
  - Flexibility
    - Can the MAC protocol support Mesh, multihop, ad-hoc, etc
  - Provision of QoS
    - Fairness/Priority(Controlled Unfairness)
- Real protocols rarely achieve all of these goals

Wireless Medium Access Control
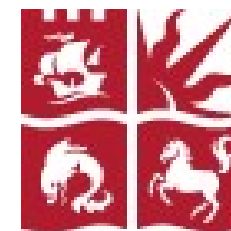
- Wireless MACs face additional challenges compared to the generic MAC tasks:
  - Collision Detection
  - Time Varying Channels
  - Errors, Error Bursts
  - Signal Attenuation:
    - Hidden Nodes
    - Exposed Nodes
    - Capture
  - Power Efficiency

Ref: Gummalla, et. Al. "Wireless Medium Access Control Protocols," IEEE Communications Magazine 2000.

Review of Lecture 4
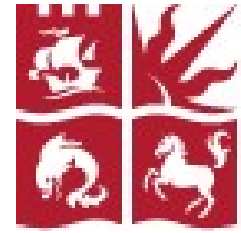
- We have identified the challenges associated with MAC protocol design in general

- We have identified the further challenges associated with MAC protocol design for wireless systems

- A lot of these issues are best understood by example. So in our next synchronous class we will design some human MAC protocols