Mobile Computing
Lecture 4
Medium Access Control

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- Introduction
- Need for MAC algorithm
- Multiple Access
- Motivation
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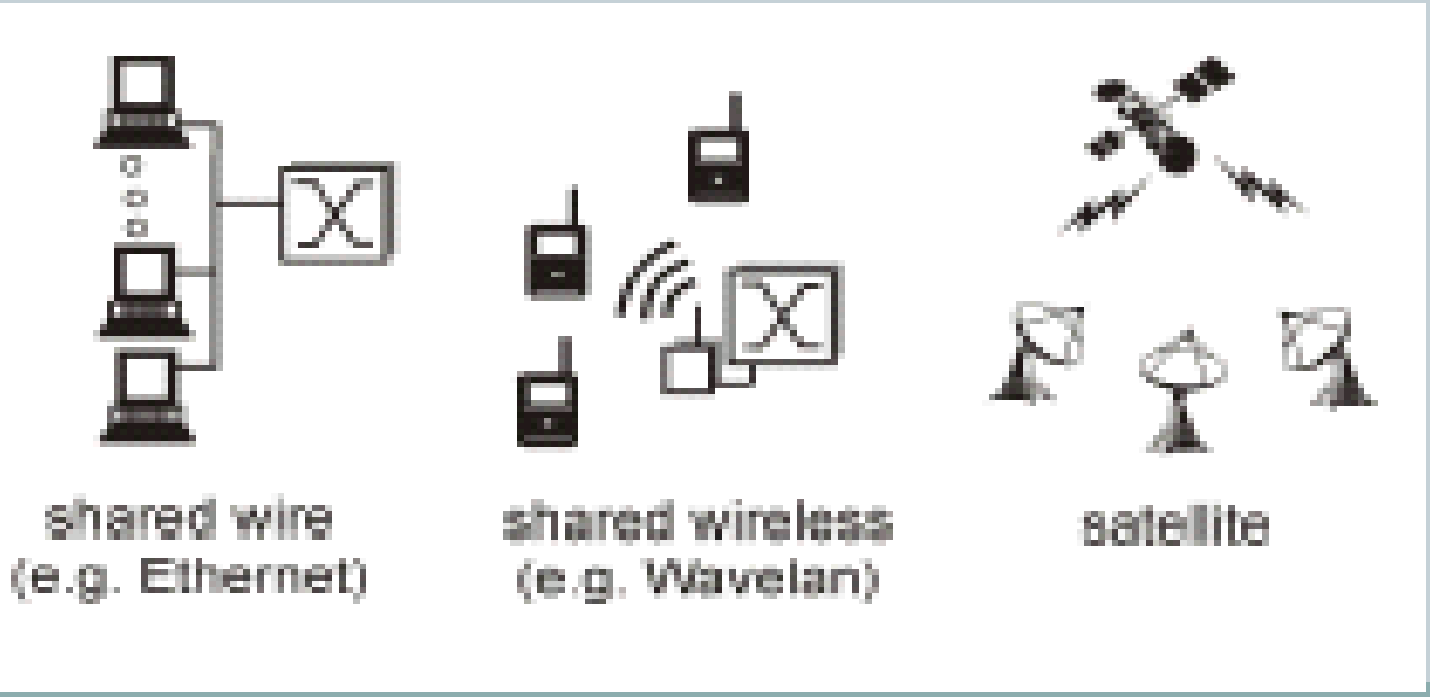
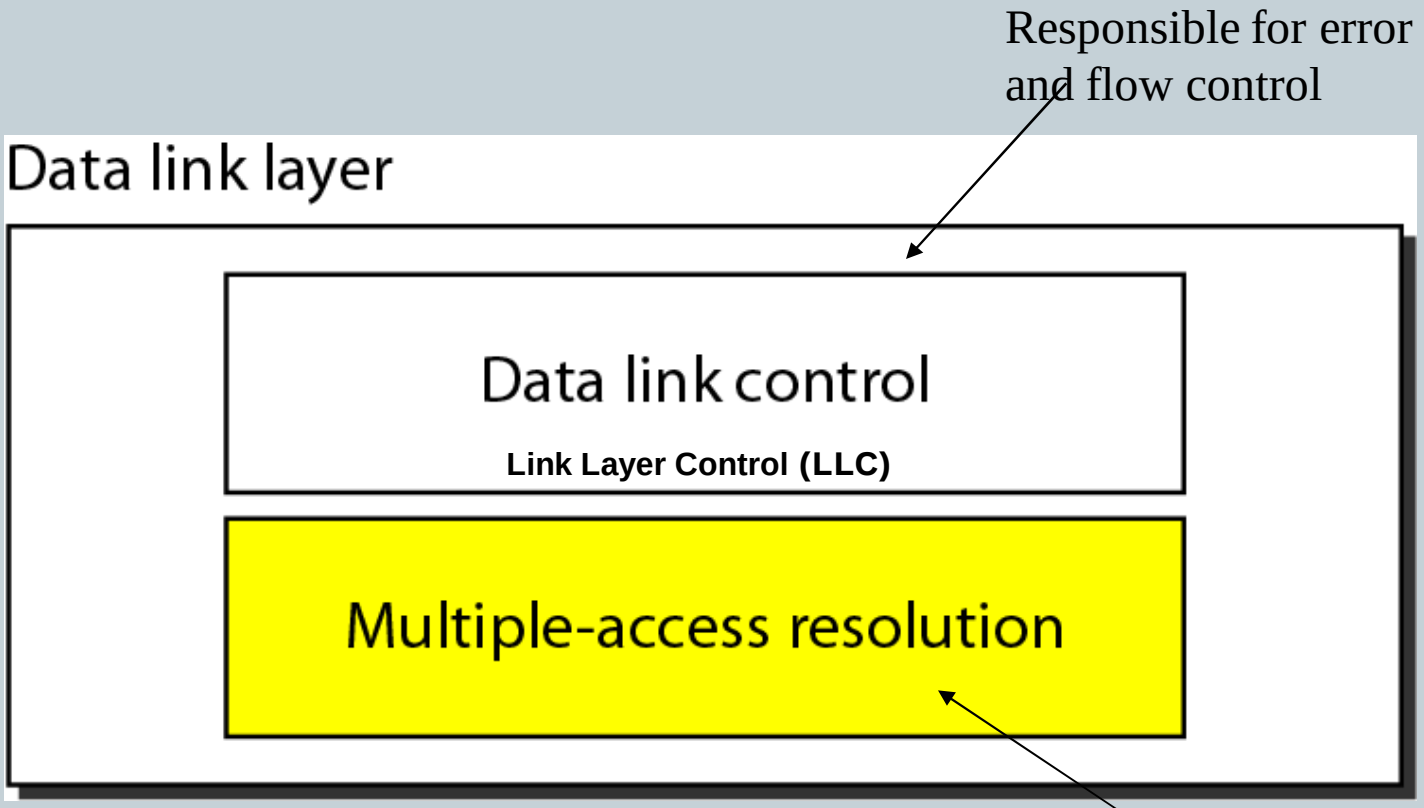
Multiple Access

- **Broadcast link** used in LAN consists of multiple sending and receiving nodes connected to or use a single shared link

Broadcast links Examples



Data link layer divided into two functionality-oriented sublayers



Multiple Access

- **Problem**: When two or more nodes transmit at the same time, their frames will collide and the link bandwidth is **wasted** during collision
  - How to coordinate the access of multiple sending/receiving nodes to the shared link**???**
- **Solution**: We need a **protocol** to coordinate the transmission of the active nodes
- These protocols are called **Medium or Multiple Access Control (MAC) Protocols** belong to a **sublayer** of the data link layer called **MAC** (Medium Access Control)
- What is expected from Multiple Access Protocols:
  - Main task is to **minimize collisions** in order to **utilize the bandwidth** by:
    - Determining **when** a station can use the link (medium)
    - **what** a station should do when the link is **busy**
    - **what** the station should do when it is involved in **collision**

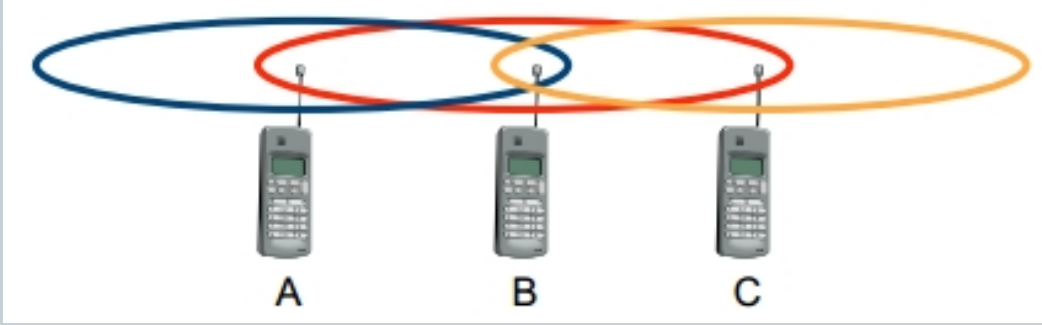
Motivation: Hidden and exposed terminals

Hidden terminals

- A sends to B, C cannot receive A
- C wants to send to B, C senses a “free” medium (CS fails)
- collision at B, A cannot receive the collision (CD fails)
- A is “hidden” for C

Exposed terminals

- B sends to A, C wants to send to another terminal (not A or B)
- C has to wait, CS signals a medium in use
- but A is outside the radio range of C, therefore waiting is not necessary
- C is “exposed” to B

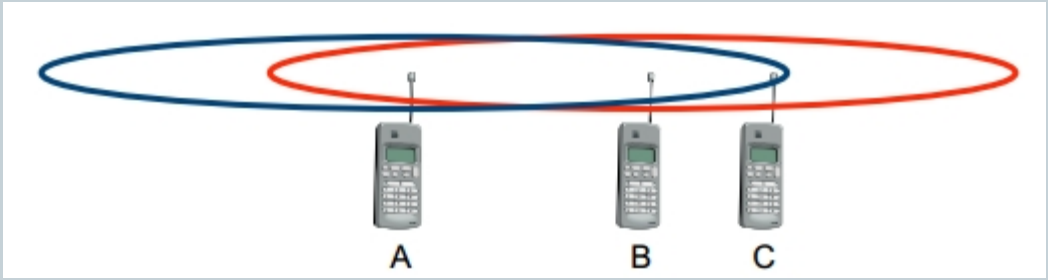


Motivation - near and far terminals

Terminals A and B send, C receives

- signal strength decreases proportional to the square of the distance
- the signal of terminal B therefore drowns out A's signal
- C cannot receive A

- If C for example was an arbiter for sending rights, terminal B would drown out terminal A already on the physical layer
- Also severe problem for CDMA-networks - precise power control needed!



Taxonomy of multiple-access protocols