ICS 351: Today's plan

- Wireless Ad-hoc Networks
- Wireless Sensor Networks
Wireless Ad-hoc Networks

- Mobile computers: laptops (and everything else), vehicle-mounted computers, etc.
- Fields of sensors, including building monitoring, bridge monitoring, environmental monitoring
- Radios with low power and short range: 802.11/Wifi (< 150m), 802.15.4/Zigbee (< 50m), Bluetooth (< 10m)
- Ad-hoc networking: every computer can relay data for others
Ad-hoc Network Research Issues

- Routing: minimal overhead, any-to-any or any-to-sink routing
- Broadcasting/Flooding
- Security
- Initialization and Configuration
- Reliable transmission
Wireless Ad-hoc Networks: Routing and Broadcasting

- The sink can broadcast an initial message
- Everyone in range of the sink retransmits it, increasing the distance field in the header
- Everyone at distance 2 retransmits the packet
- At the end, everyone knows:
  - O Their distance to the sink
  - O The node to use to reach the sink
- But flooding can lead to mutual interference
Wireless Ad-hoc Networks: Security

- Monitoring networks can be used to detect forest fires or enemy attack.
- An adversary (or a prankster) might wish to send a false positive signal.
- Or a false negative, suppressing a real alarm.
- It is likely that the adversary will obtain access to one or more nodes.
- What should be protected?
- Which node(s) should be trusted?
Wireless Ad-hoc Networks: Reliable Transmission

- Assume a number of nodes in a straight line
- Each node is only in range of two other nodes
- When the second node receives a packet, it must retransmit it, but this may interfere with the second packet transmitted by the first node
- So, transmit in blocks, use acks to confirm
- Hardware acks acknowledge reception by the hardware, but packet may still be discarded due to lack of buffer space
Wireless Ad-hoc Networks: Applications

- Monitoring of wide areas, buildings, dangerous locations, long-term unintrusive monitoring, etc.
- Communications between vehicles and either other vehicles, or roadside/trackside equipment.
- Example: robots for rescuing people in damaged buildings.
- Communication at a conference, classroom etc.