CS 640 Introduction to Computer Networks

Lecture 6

Today’s lecture

- 802.11 wireless LANs
- Network adaptors

Carrier Sense not good for wireless

Hidden terminal
(can lead to frame loss)

Exposed terminal
(waste opportunity to send)
Wireless LANs (802.11)

- 802.11 uses MACA (collision avoidance)
  - Sender sends Request To Send (RTS) frame
  - Receiver sends a Clear To Send (CTS) frame
  - Sender sends data frame
  - Receiver sends an ACK
  - RTS/CTS are optional (nodes can send data directly and wait for an ACK)
- 802.11 solves hidden terminal, not exposed terminal

Wireless LANs (contd.)

- Power matters
  - Endhosts vs. base stations/access points
  - Range depends on the power levels
  - Access points use multiple frequency bands (FDM) to avoid interfering

802.11 frame format

- Has space for four 48-bit addresses
  - Not all 4 are used in all frames
  - All 4 needed when transiting distribution system
  - Example: A, AP-1, AP-3, D
The 802.11 family

- 802.11b 11 Mbps 2.4 GHz
  - 3 separate channels (frequency bands)
- 802.11a 54Mbps 5 GHz
  - 12 separate channels
- 802.11g 54Mbps 2.4 GHz
  - 3 separate channels

Networking at endhosts

<table>
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<tr>
<th>What</th>
<th>Where</th>
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<tbody>
<tr>
<td>Application</td>
<td>User space</td>
</tr>
<tr>
<td>Layer 3</td>
<td>Layer 4</td>
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<tr>
<td>Layer 2</td>
<td>Layer 1</td>
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<tr>
<td>Kernel</td>
<td>Adaptor</td>
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</table>

Network adaptors

- Device drivers in OS kernel hide details of interaction with network adaptors
- Control interactions
  - Interrupts
  - Registers
- Data transfer
  - Programmed I/O (explicit writes/reads by CPU)
  - Direct memory access (DMA)
  - Data needs not be contiguous in memory