CS 640 Introduction to Computer Networks

Lecture 18

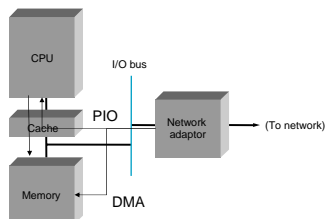CS 640

Today's lecture

- Network adaptors
- 802.11 wireless LANs

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Networking at endhosts

What	Where
Application	User space
Layer 3 Layer 4	Kernel
Layer 2 Layer 1	Adaptor

CPU

I/O bus

PIO

Cache

Network adaptor
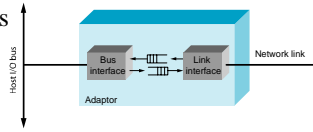
(To network)

Memory

DMA

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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)
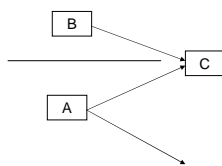 - Data needs not be contiguous in memory

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Today's lecture
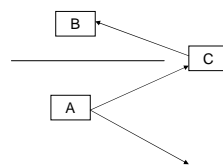
- Network adaptors
- 802.11 wireless LANs

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Carrier Sense not good for wireless

Hidden terminal

(can lead to frame loss)

Exposed terminal

(waste opportunity to send)

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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 ack)
- 802.11 solves hidden terminal, not exposed terminal
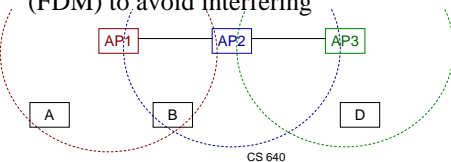
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How are 802.11 LANs organized?

- Ad hoc communication between mobile devices
- Infrastructure mode
  - Mobile nodes talk only to fixed access points
  - Before actual communication, they exchange messages associating mobile host with AP
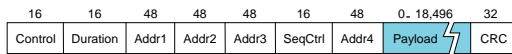 - Access points connected by wired network

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Power and frequency bands

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

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802.11 frame format

16	16	48	48	48	16	48	0 - 18,496	32
Control	Duration	Addr1	Addr2	Addr3	SeqCtrl	Addr4	Payload	CRC

- 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

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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
- In the works – 802.11n 540Mbps 2.4 or 5 GHz

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