CprE 530

Advanced Protocols and Network Security

Lecture 2

Today's Topics

- Protocol Specifications
- Protocol Addresses
- Protocol Headers

Protocol Specifications

- Open vs. Closed
- Specification methods
  - English descriptions
  - Flow & timing diagrams
  - Open to interpretation
- Implementation flaws

Network Standards

- Specifies
  - Services provided
  - Services expected
  - Functions provided
  - Protocol and packet formats
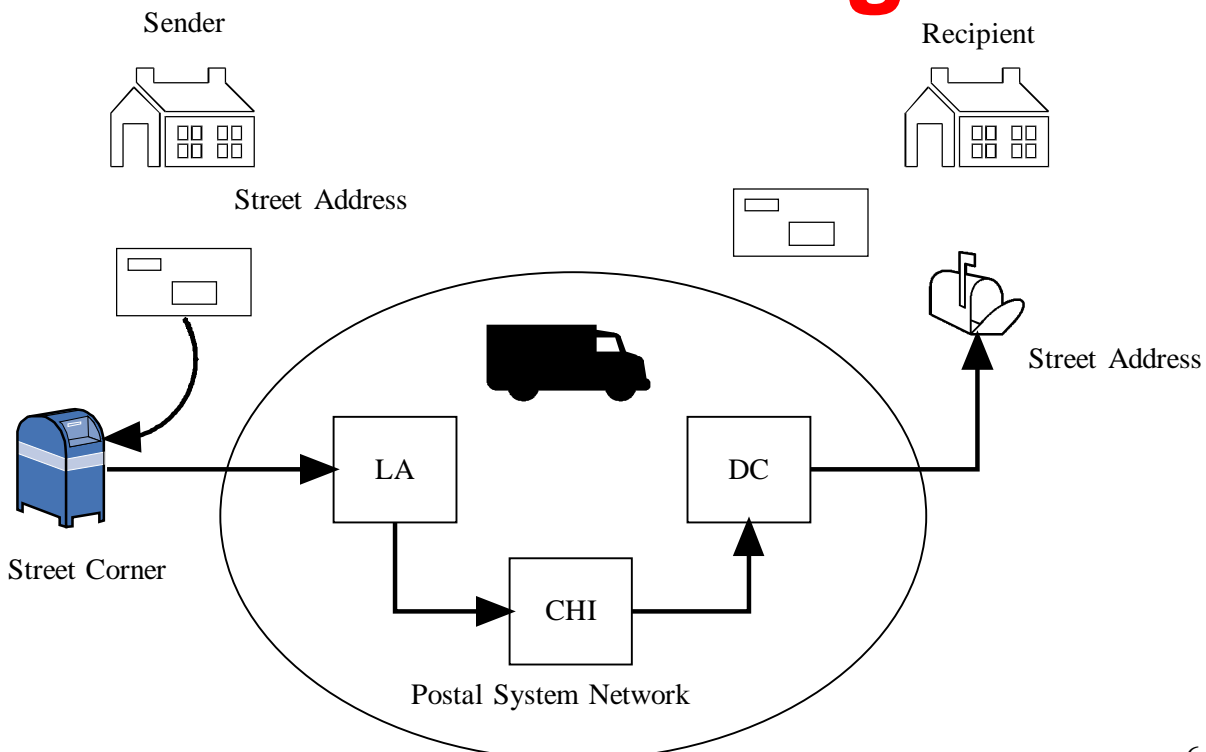 - Timing and sequence of the packets

Standards Organizations

- **American National Standards Institute (ANSI):** ANSI is a private organization whose membership is made up of professional societies, government groups and other associations. They develop standards that help groups complete in the global market.
- **Institute of Electrical and Electronics Engineers (IEEE):** IEEE is an international professional society that creates international standards in many different areas.
- **International Standards Organization (ISO):** A group whose membership is standards committees from across the world. ANSI represents the United States on ISO.
- **International Telecommunications Union-Telecommunications Standards Sector (ITU-T):** A group created by the United Nations that creates standards primarily for the phone system.
- **Internet Engineering Task Force (IEFT):** This group develops standards for the Internet and consists of members from various organizations and is open to any person that has an interest.
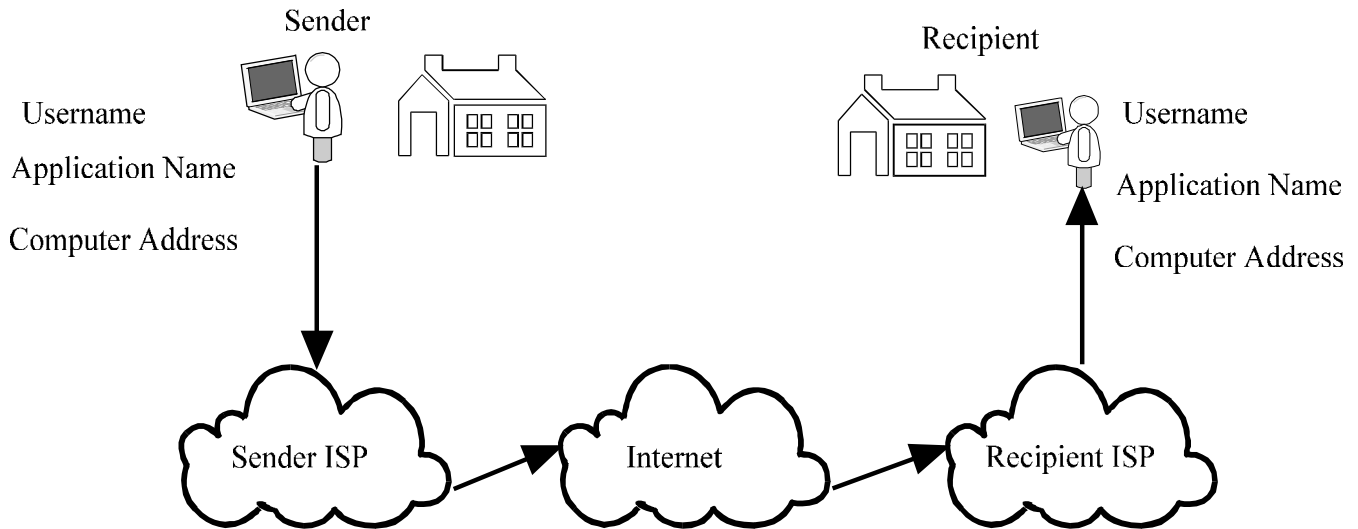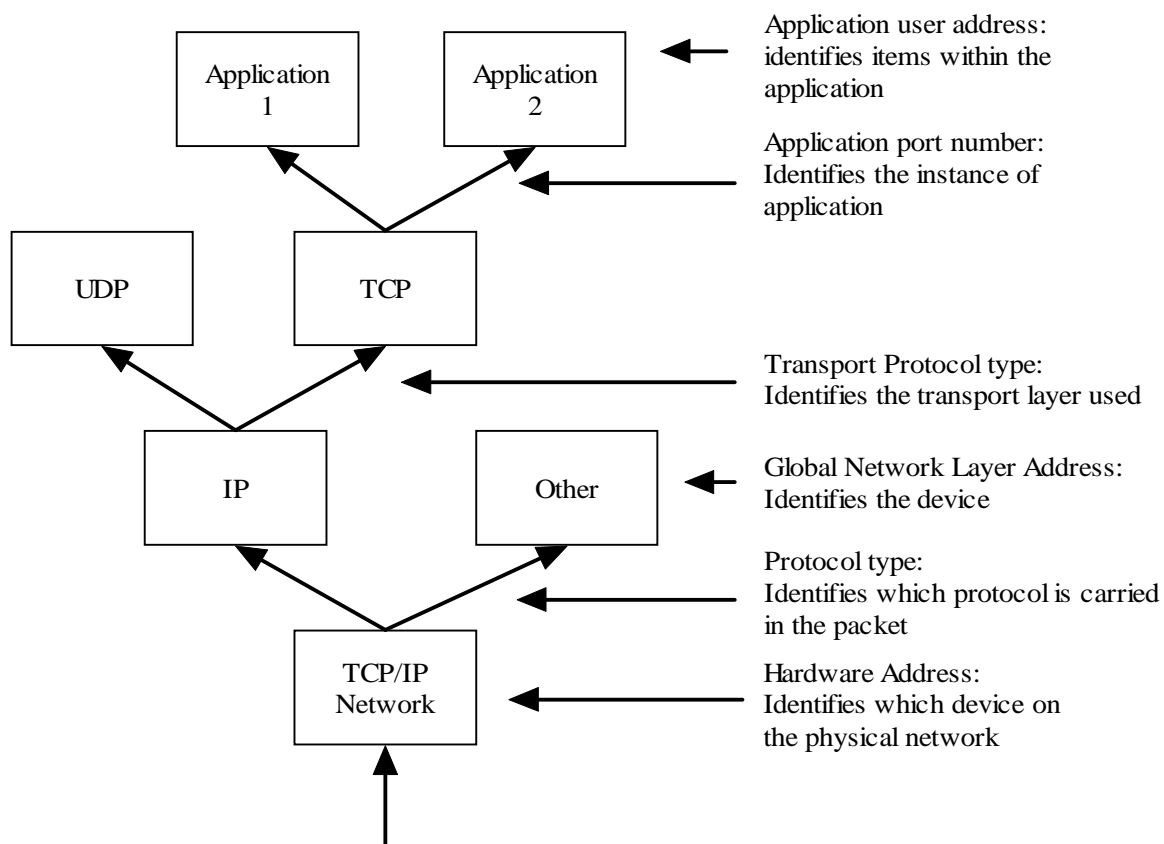
Addressing

Sender

Recipient

Street Address

Street Address

Street Corner

LA

CHI

DC

Postal System Network

Addressing

Sender

Recipient

Username

Application Name

Computer Address

Username

Application Name

Computer Address

Sender ISP → Internet → Recipient ISP

Addresses

Application 1

Application 2

Application user address: identifies items within the application

Application port number: Identifies the instance of application

UDP

TCP

Transport Protocol type: Identifies the transport layer used

IP

Other

Global Network Layer Address: Identifies the device

Protocol type: Identifies which protocol is carried in the packet

TCP/IP Network

Hardware Address: Identifies which device on the physical network

Address Assignment - How

- Static
  - Configuration
  - Built in
- Dynamic
  - Protocol discovery
  - User provided

Address Assignment – Who

- Central Authority
- Ad-hoc
- Locally based

Hardware address assignment

- Hardware
  - Vendor assigned
  - Address used as a filter
  - Address can be changed

IP address assignment

- Global address allocation
- Address assignment
  - Protocol based (DHCP)
  - Static
  - Locally controlled
- Addresses can be changed

Application address assignment

- Port Number (much less control)
  - Well known ports
  - Protocol based discovery
  - Configuration based
  - User input based

Hostname assignment

- Often political and/or commercially driven
- Assignment via central authority
- Protocol to find the IP address given a name (DNS)

Protocol Headers

- Fixed packet type
  - Easy to parse
  - Limited functionality
- Freeform type
  - Harder to parse
  - Easy to extend

Fixed packet header

Fixed	Options	Payload	Trailer

Fixed:
- Addresses (Layer addresses and payload type)
- Payload data
- Control data
- Header data

Options:
- Extended fixed data
- Optional control data
- Optional Payload control

Payload: Content is not a concern of the header

Trailer:
Optional field often used for error control

Freeform header

<Start Header>
<Data type = application 7>
<Data length = 400>
<Data encoding = ASCII>
</End Header>
<Start Data>
(the data)
</End Data>