IF2230 Jaringan Komputer

Layers and protocols

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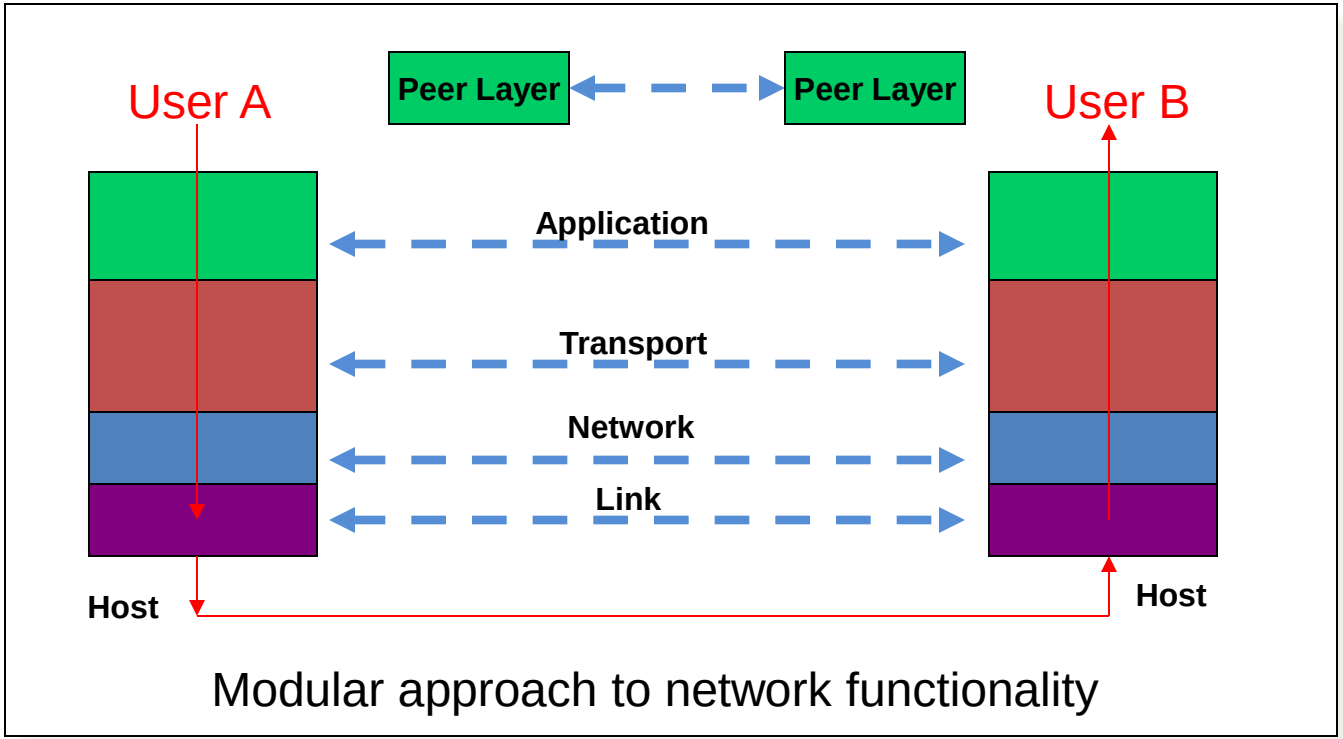
Today's Lecture

- Layers and protocols

What is Layering?



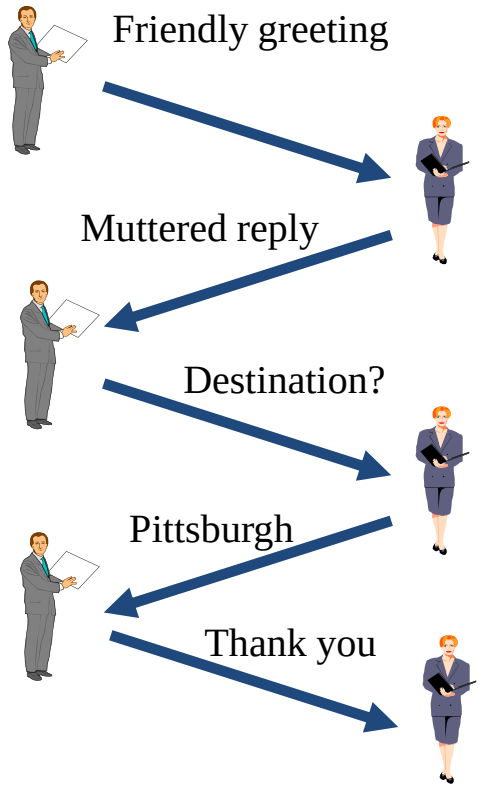
Modular approach to network functionality

Layering Characteristics

- Each layer relies on services from layer below and exports services to layer above
- Interface defines interaction with peer on other hosts
- Hides implementation - layers can change without disturbing other layers (black box)

What are Protocols?

- An agreement between parties on how communication should take place
- Module in layered structure
- Protocols define:
  - Interface to higher layers (API)
  - Interface to peer (syntax & semantics)
    - Actions taken on receipt of a messages
    - Format and order of messages
    - Error handling, termination, ordering of requests, etc.
- Example: Buying airline ticket



The Internet Engineering Task Force

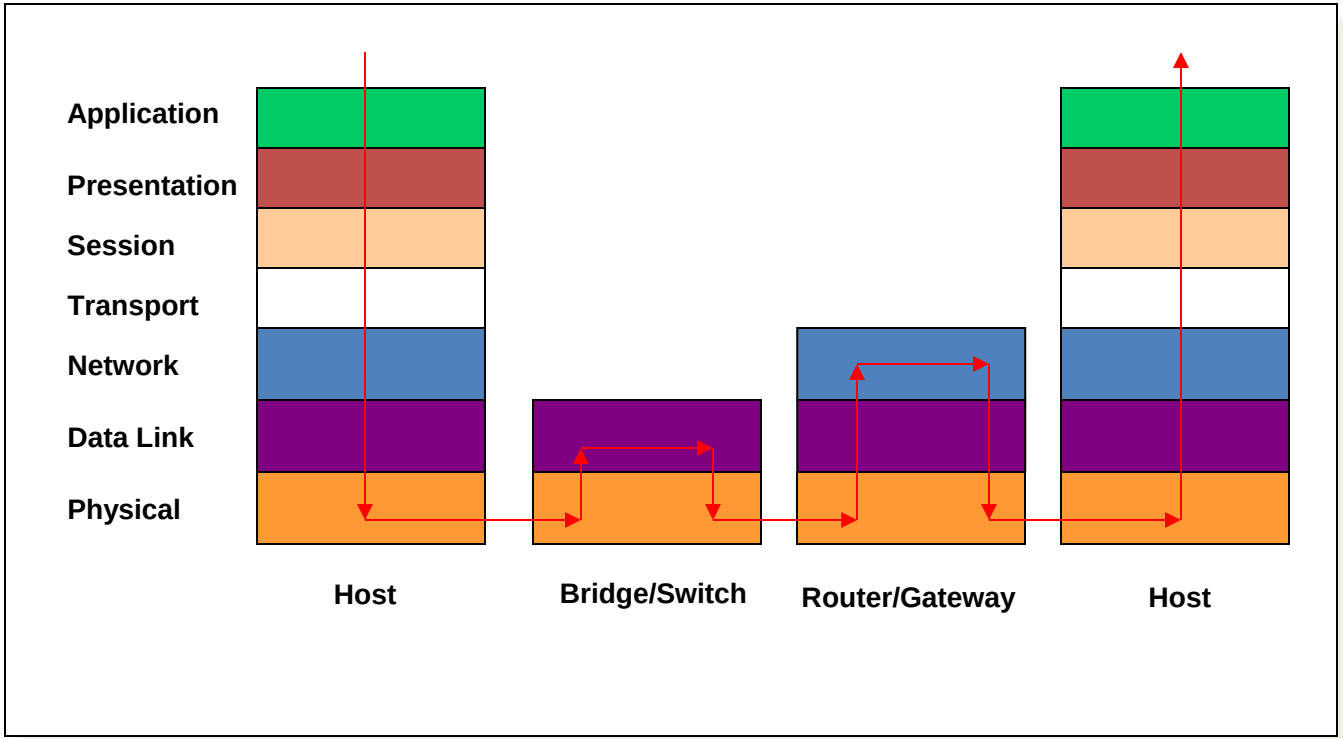
- Standardization is key to network interoperability
  - The hardware/software of communicating parties are often not built by the same vendor → yet they can communicate because they use the same protocol
- Internet Engineering Task Force
  - Based on working groups that focus on specific issues
- Request for Comments
  - Document that provides information or defines standard
  - Requests feedback from the community
  - Can be “promoted” to standard under certain conditions
    - consensus in the committee
    - interoperating implementations
  - Project 1 will look at the Internet Relay Chat (IRC) RFC

OSI Model: 7 Protocol Layers

- Physical: how to transmit bits
- Data link: how to transmit frames
- Network: how to route packets
- Transport: how to send packets end2end
- Session: how to tie flows together
- Presentation: byte ordering, security
- Application: everything else

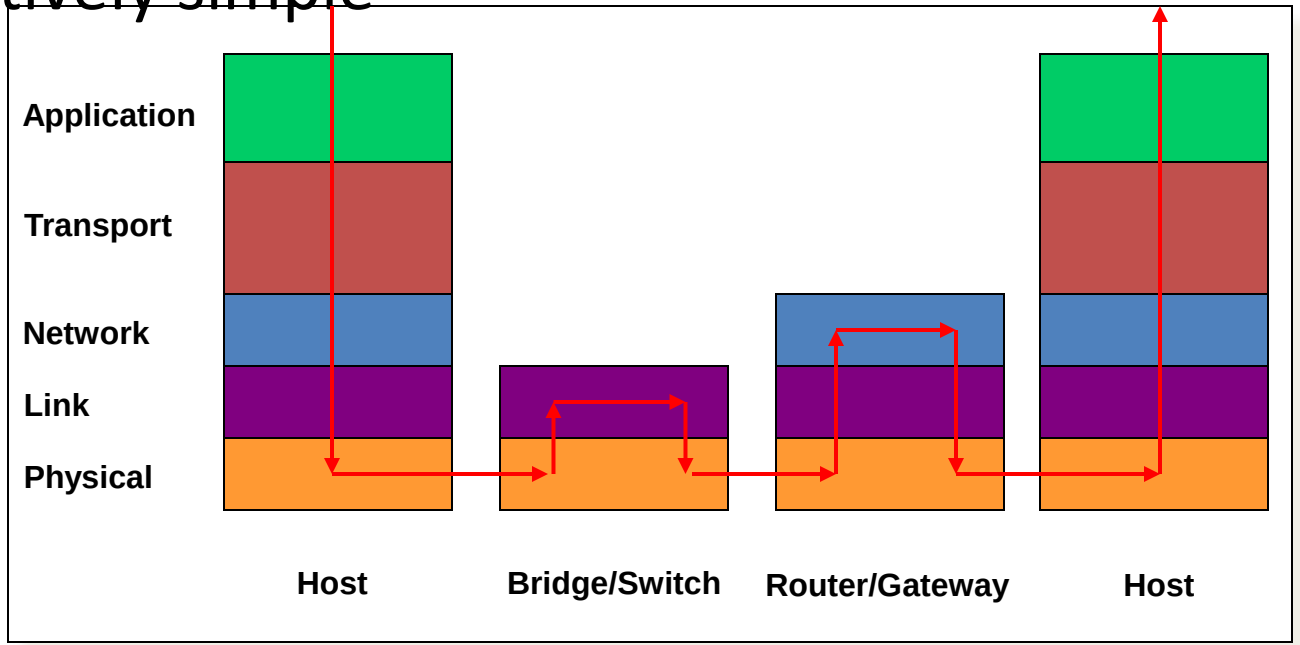
- TCP/IP has been amazingly successful, and it's not based on a rigid OSI model. The OSI model has been very successful at shaping thought

OSI Layers and Locations

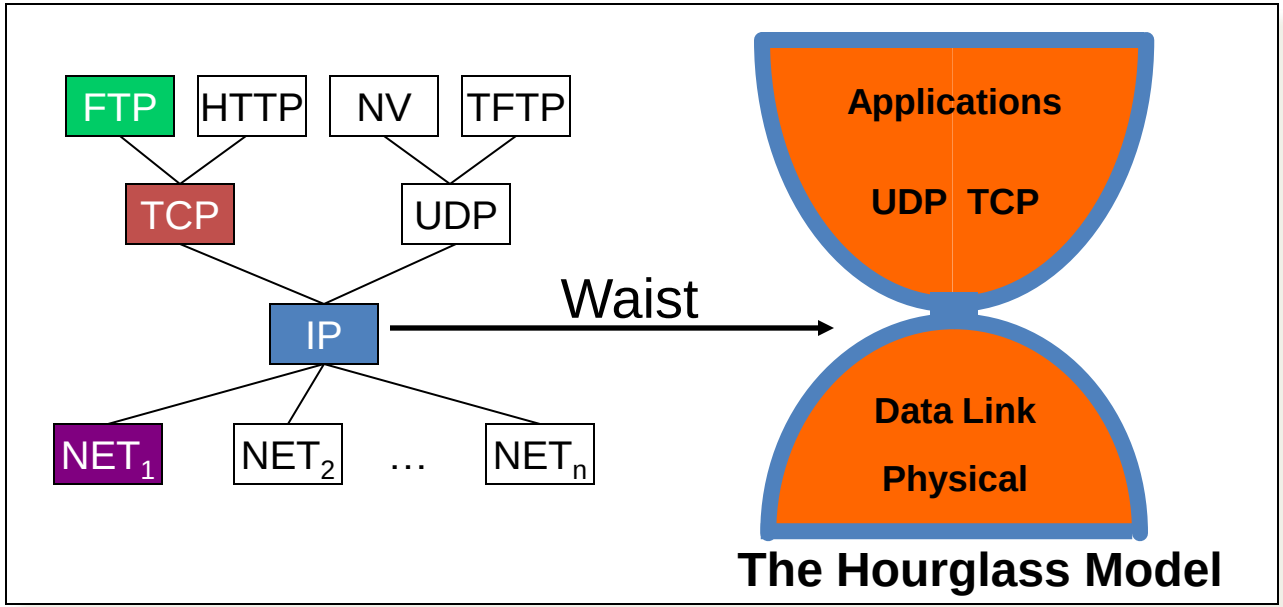


IP Layering

- Relatively simple

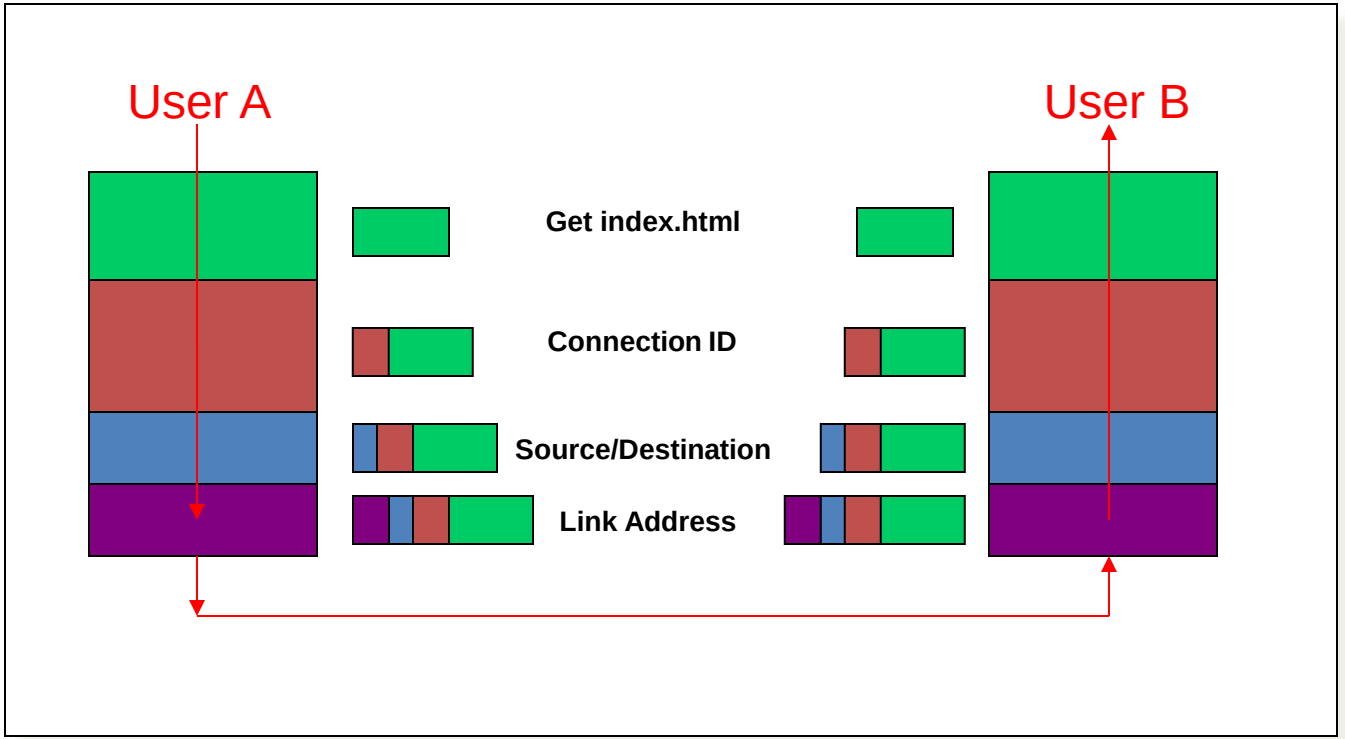


The Internet Protocol Suite



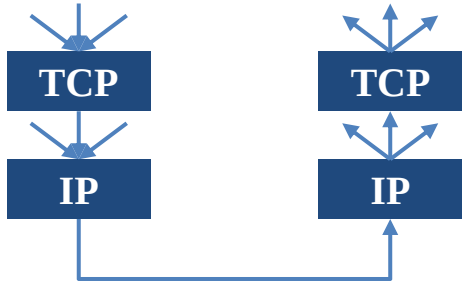
The waist facilitates interoperability

Layer Encapsulation



Multiplexing and Demultiplexing

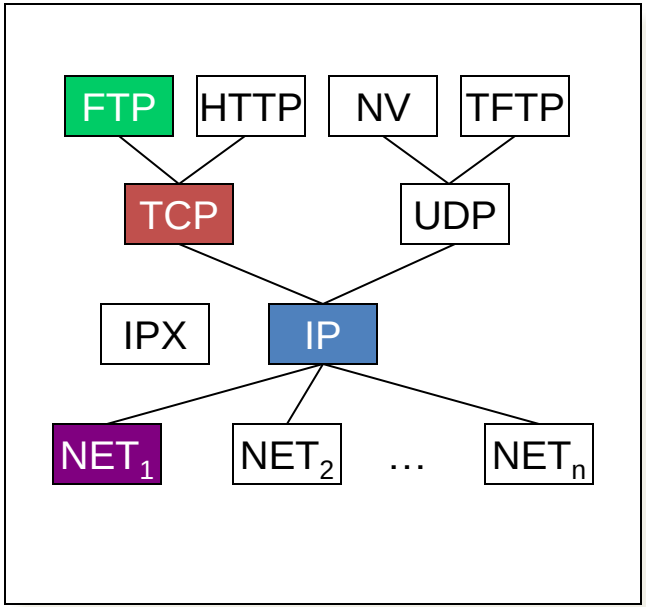
- There may be multiple implementations of each layer.
  - How does the receiver know what version of a layer to use?
- Each header includes a demultiplexing field that is used to identify the next layer.
  - Filled in by the sender
  - Used by the receiver
- Multiplexing occurs at multiple layers. E.g., IP, TCP, …

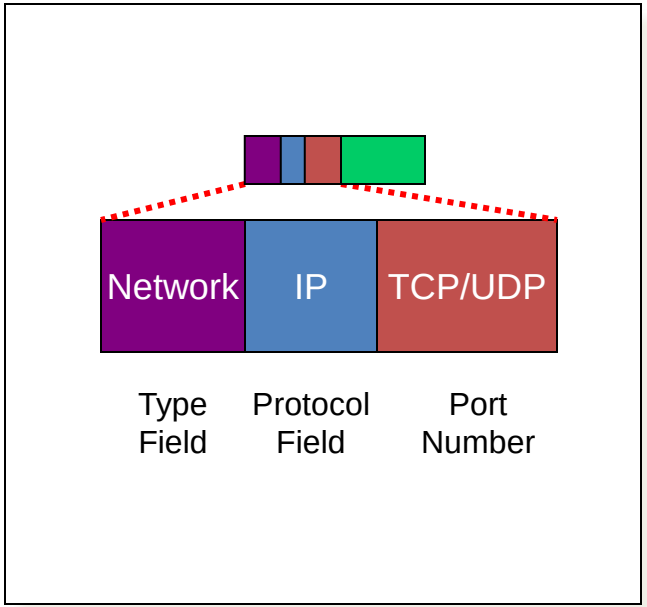


V/HL	TOS	Length
ID		Flags/Offset
TTL	Prot.	H. Checksum
Source IP address		
Destination IP address		
Options..		

Protocol Demultiplexing

- Multiple choices at each layer





Is Layering Harmful?

- Layer N may duplicate lower level functionality (e.g., error recovery)
- Layers may need same info (timestamp, MTU)
- Strict adherence to layering may hurt performance
- Some layers are not always cleanly separated.
  - Inter-layer dependencies in implementations for performance reasons
  - Some dependencies in the standards (header checksums)
- Interfaces are not really standardized.
  - It would be hard to mix and match layers from independent implementations, e.g., windows network apps on unix (w/out compatibility library)
  - Many cross-layer assumptions, e.g. buffer management