

CSE 461: Computer Networks

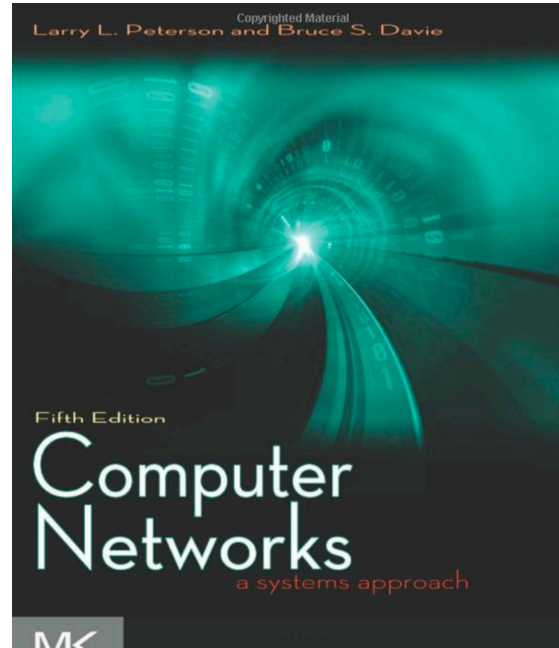
Shyam Gollakota

Course Webpage

[Cs.washington.edu/461](https://cs.washington.edu/461)

Textbook

<https://github.com/SystemsApproach/book>



Teaching Assistants

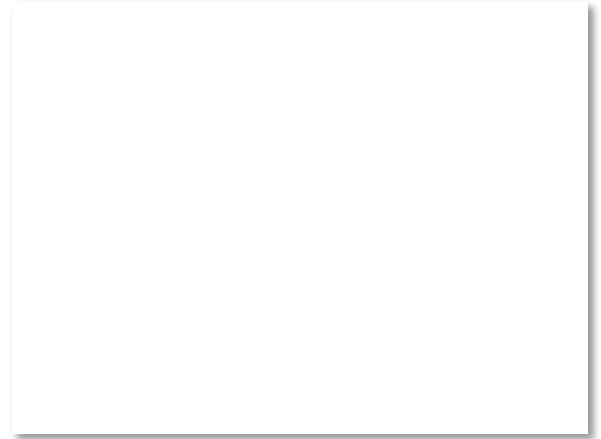
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Grading

- Midterm (15%)
- Final (20%)
- Assignments (20%) – A recurring SDN programming assignment
- Surprise Quizzes (10%)
- 3 projects (10%+10%+15%)

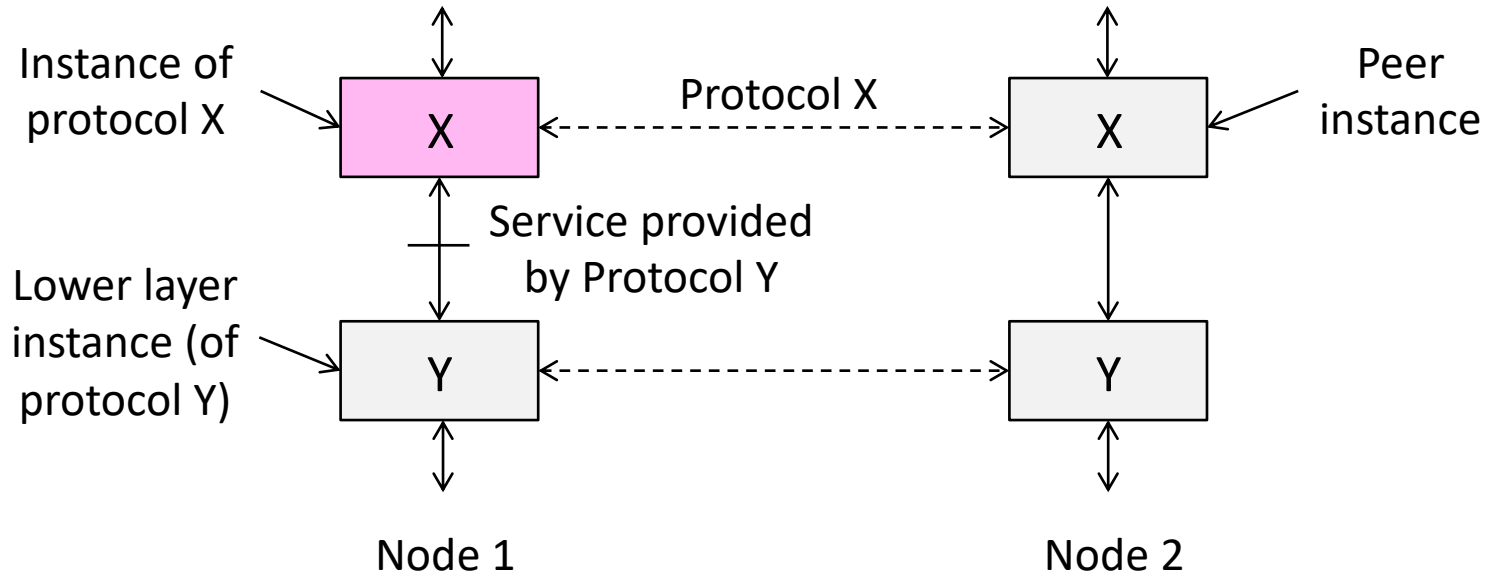
Protocols and Layers

- Protocols and layering is the main structuring method used to divide up network functionality
 - Each instance of a protocol talks virtually to its peer using the protocol
 - Each instance of a protocol uses only the services of the lower layer



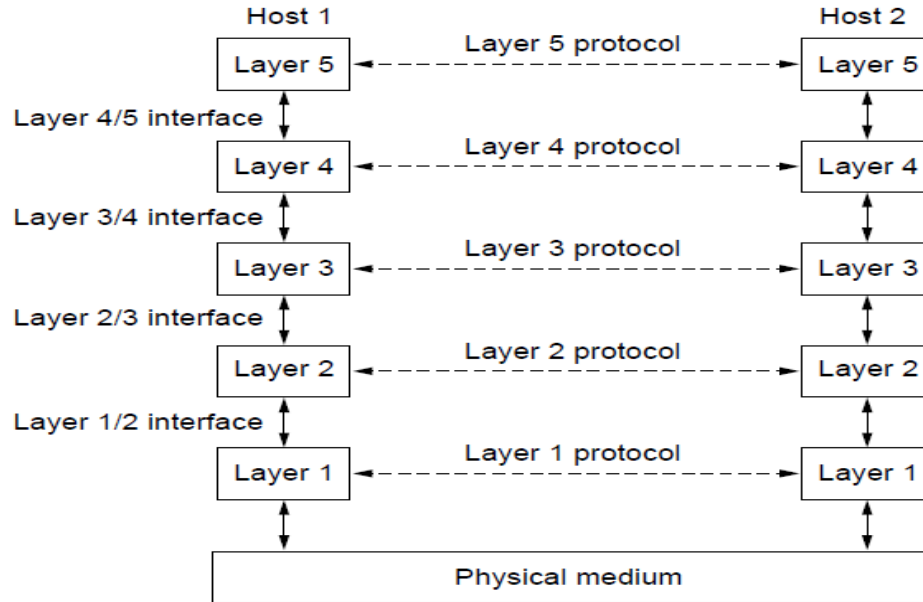
Protocols and Layers (3)

- Protocols are horizontal, layers are vertical



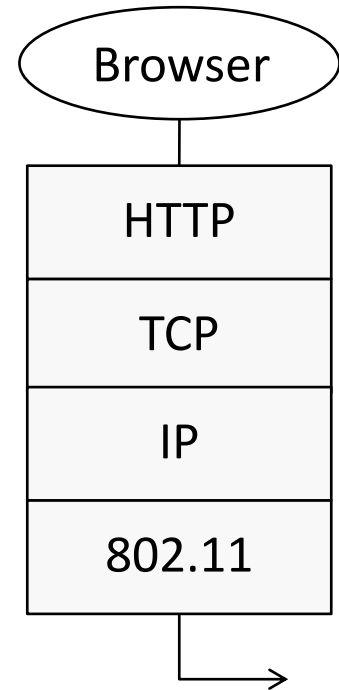
Protocols and Layers (4)

- Set of protocols in use is called a protocol stack



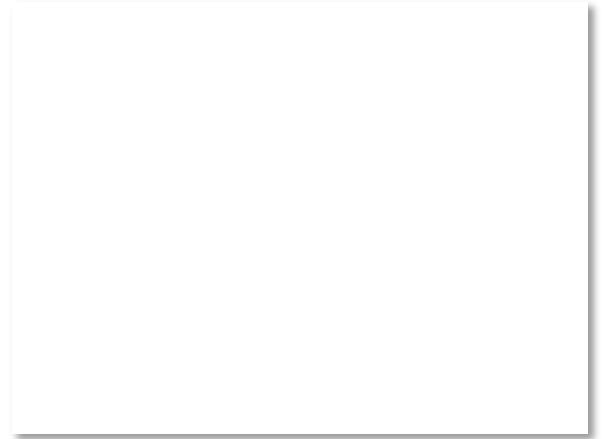
Protocols and Layers (6)

- Protocols you've probably heard of:
 - TCP, IP, 802.11, Ethernet, HTTP, SSL, DNS, ... and many more
- An example protocol stack
 - Used by a web browser on a host that is wirelessly connected to the Internet



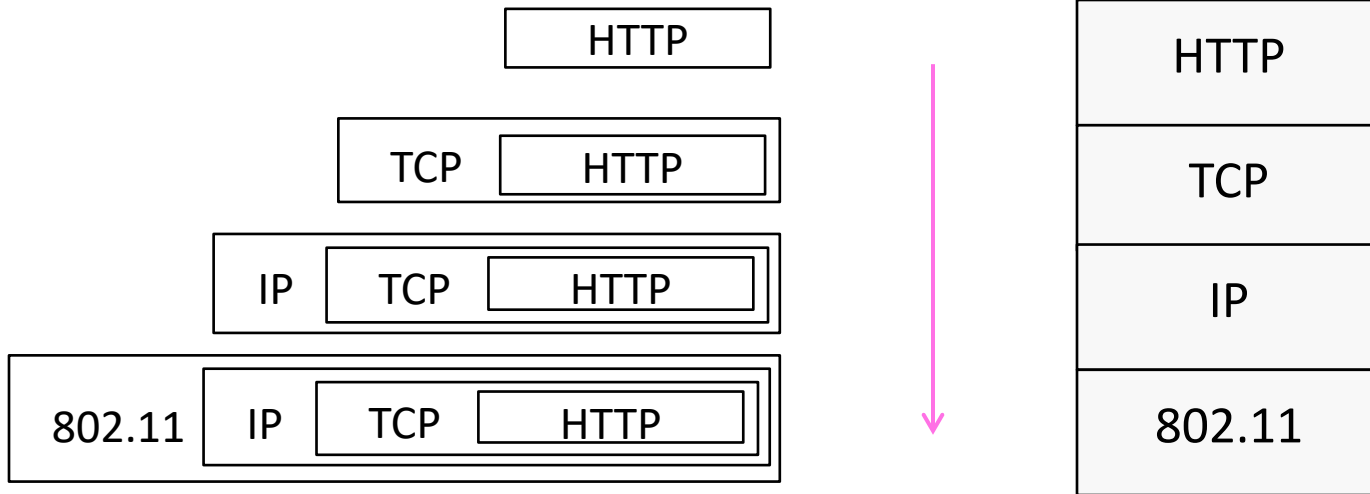
Encapsulation

- Encapsulation is the mechanism used to effect protocol layering
 - Lower layer wraps higher layer content, adding its own information to make a new message for delivery
 - Like sending a letter in an envelope; postal service doesn't look inside

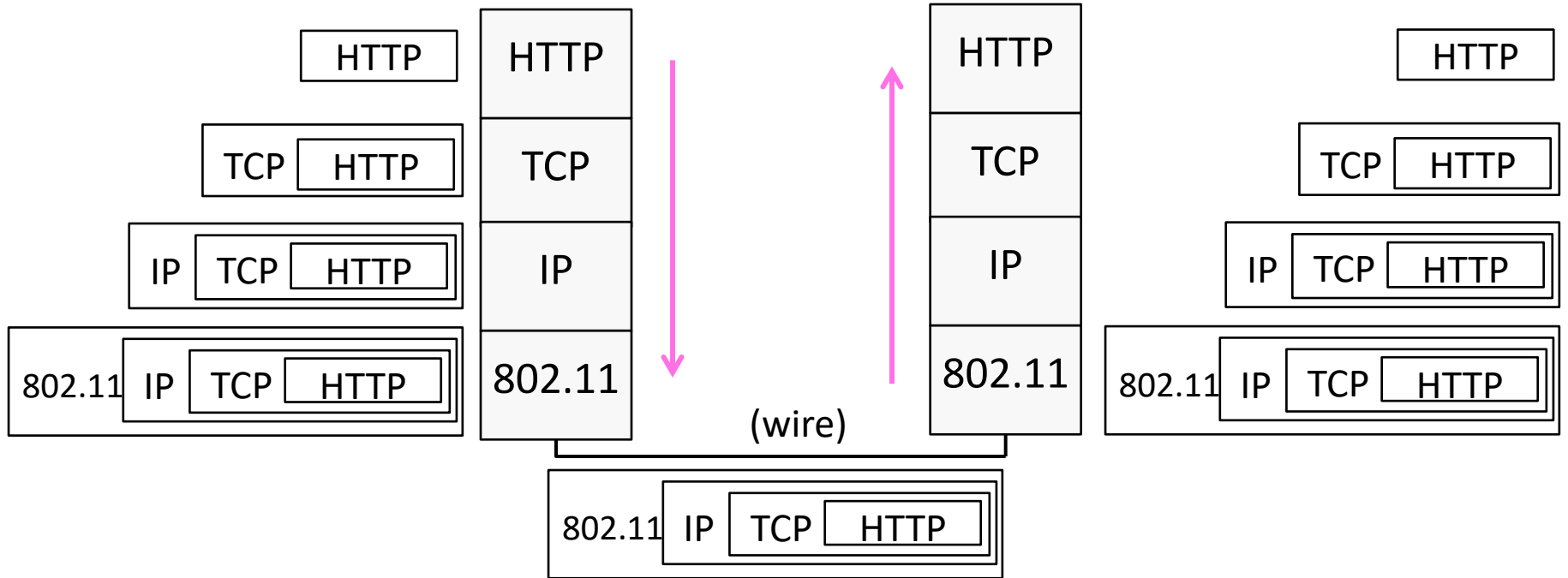


Encapsulation (3)

- Message “on the wire” begins to look like an onion
 - Lower layers are outermost

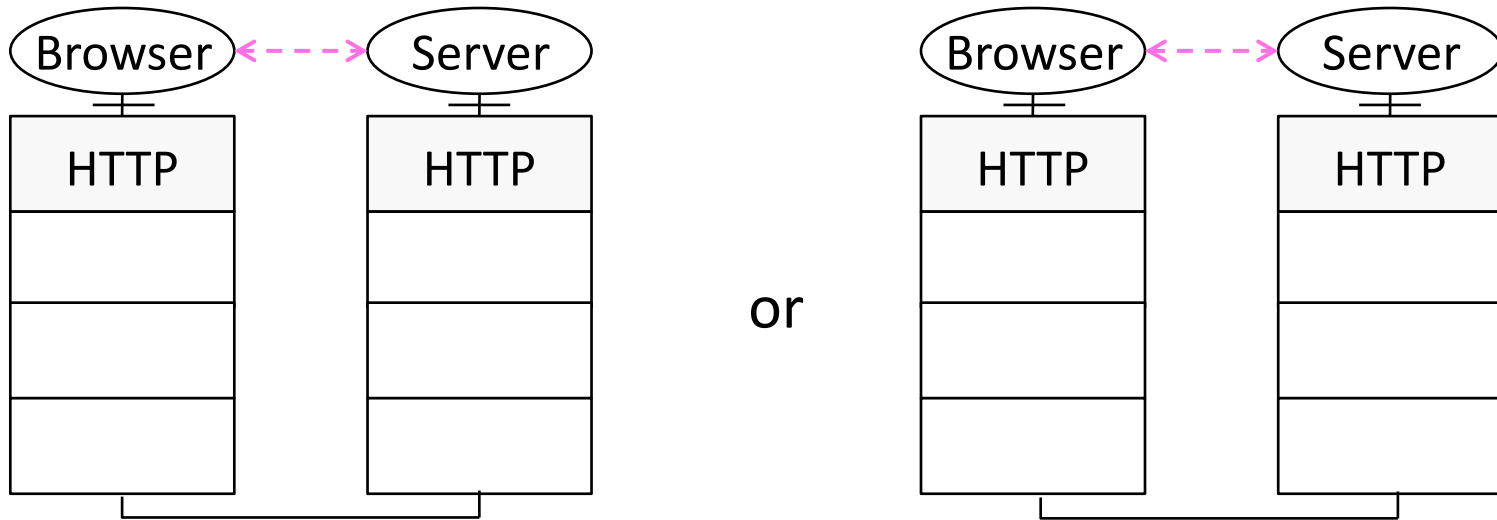


Encapsulation (4)



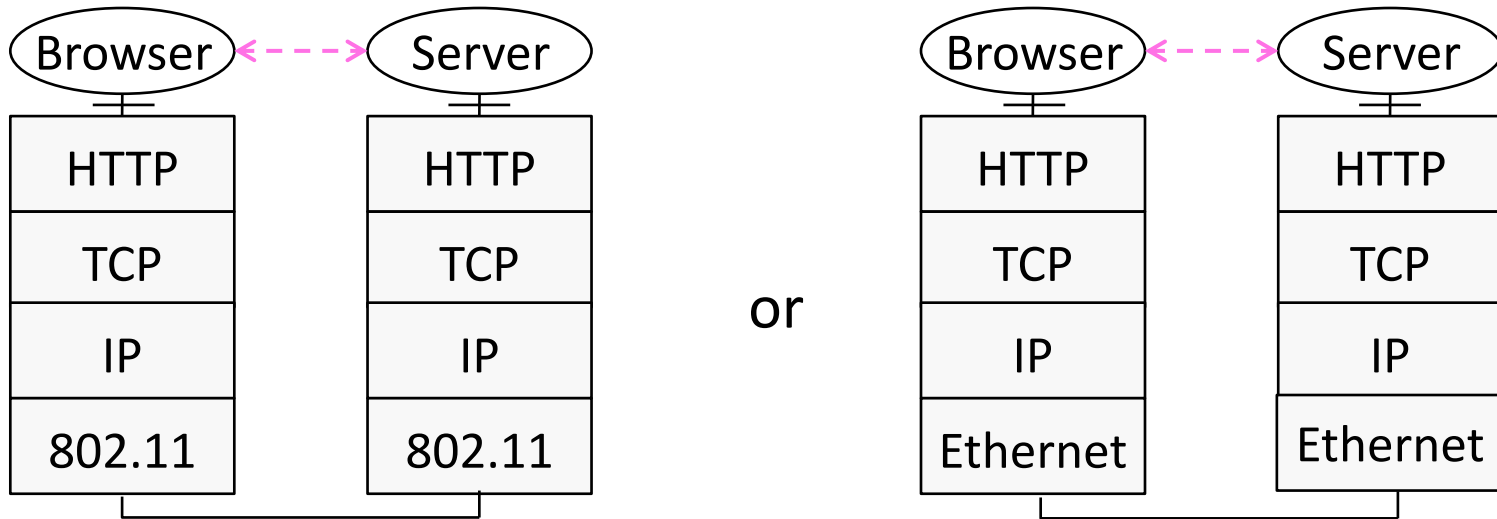
Advantage of Layering

- Information hiding and reuse



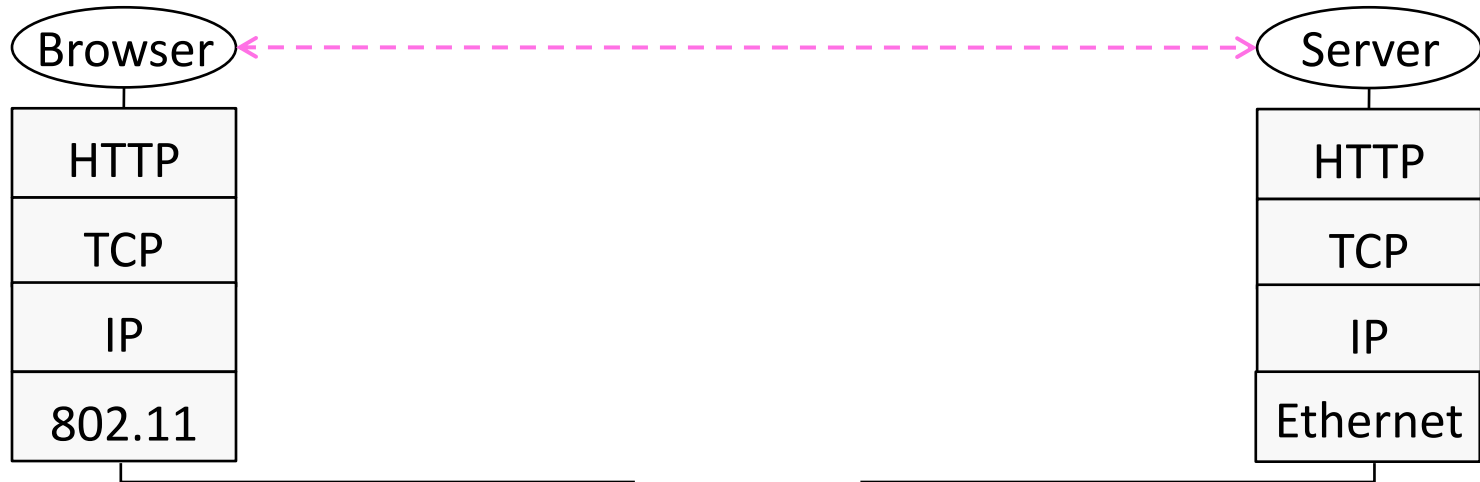
Advantage of Layering (2)

- Information hiding and reuse



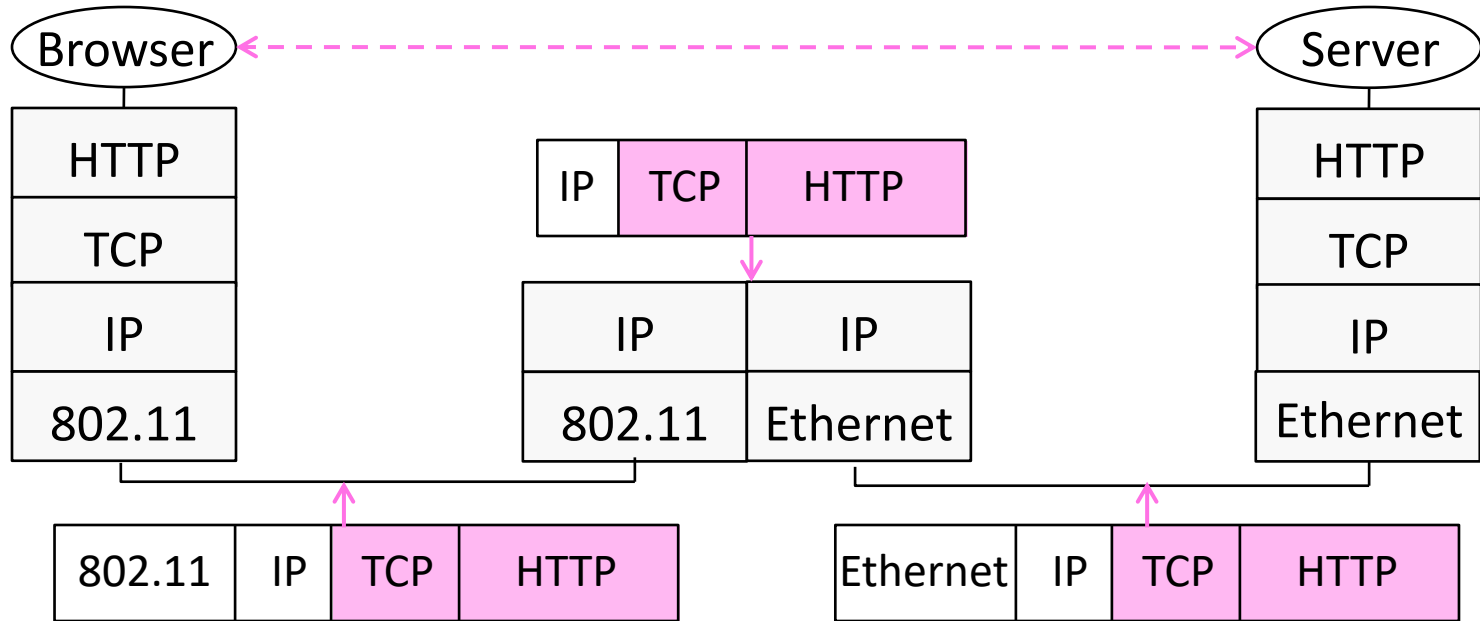
Advantage of Layering (3)

- Using information hiding to connect different systems



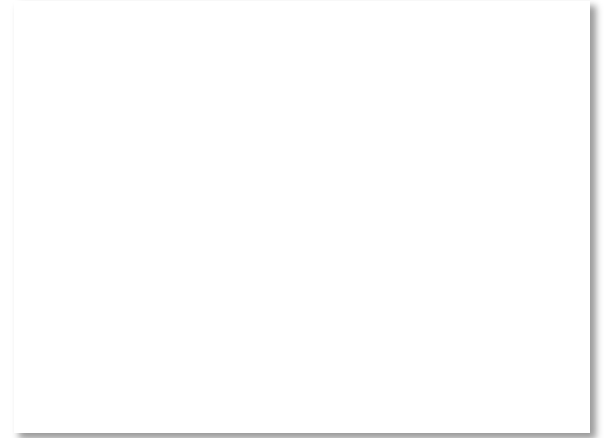
Advantage of Layering (4)

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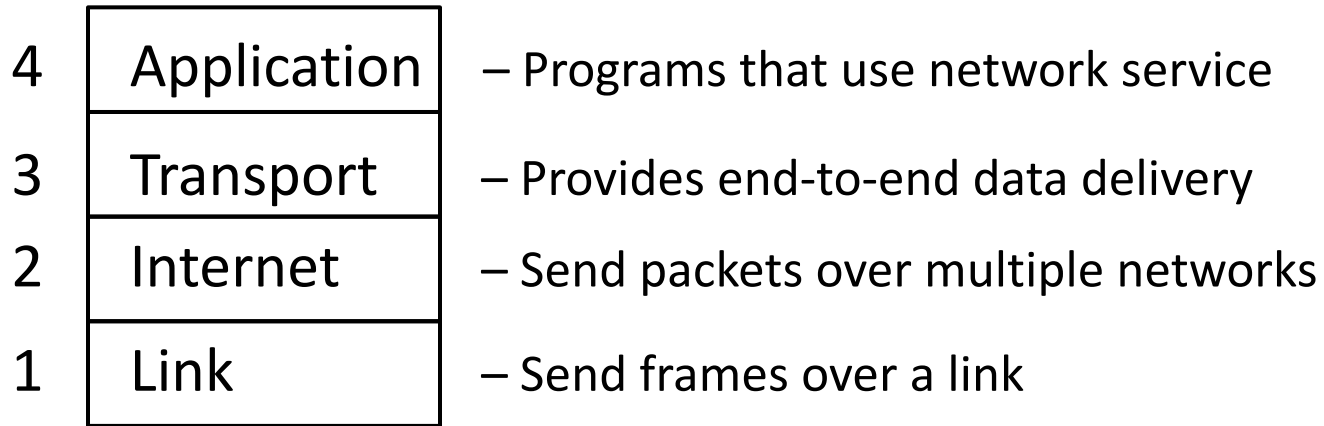
Disadvantage of Layering

- ??



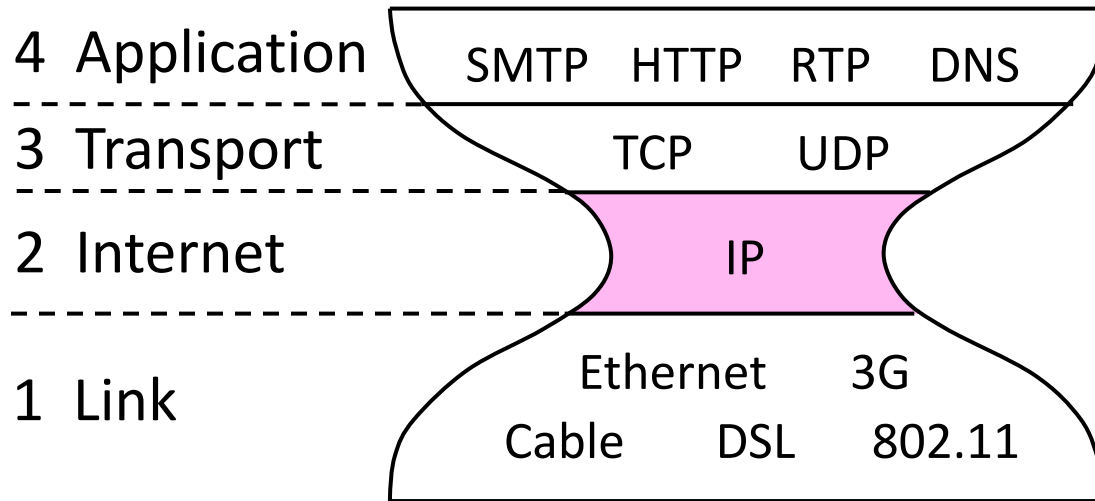
Internet Reference Model

- A four layer model based on experience; omits some OSI layers and uses IP as the network layer.



Internet Reference Model (3)

- IP is the “narrow waist” of the Internet
 - Supports many different links below and apps above



Layer-based Names (2)

- For devices in the network:

Repeater (or hub)

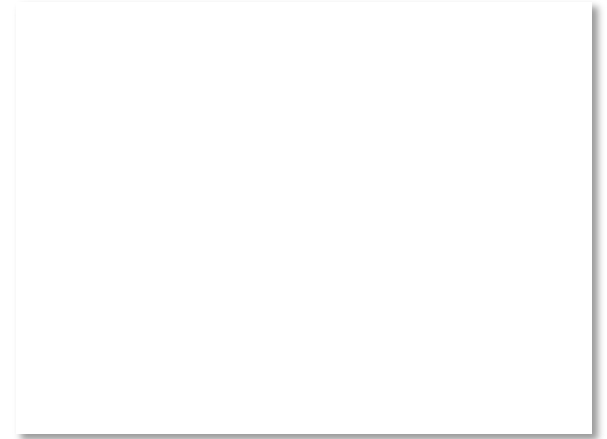
Physical	Physical
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Switch (or bridge)

Link	Link
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Router

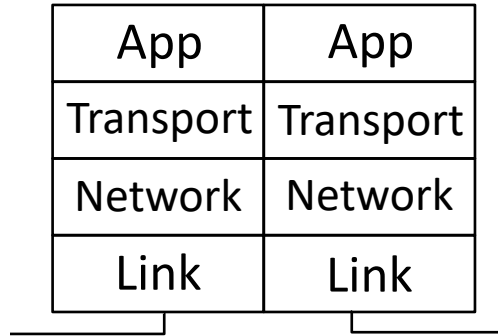
Network	Network
Link	Link



Layer-based Names (3)

- For devices in the network:

Proxy or
middlebox
or gateway



But they all
look like this!

