

CSE 550: Systems for all

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Ratul Mahajan

Building a global network to rule them all

1. Accommodate all applications
2. Accommodate all networking technologies

What should networks do for apps?

- Make and break connections
- Find a path through the network
- Transfers information reliably
- Transfers arbitrary length information
- Send as fast as the network allows
- Shares bandwidth among users
- Secures information in transit
- Lets many new hosts be added
- ...

Example networking technologies

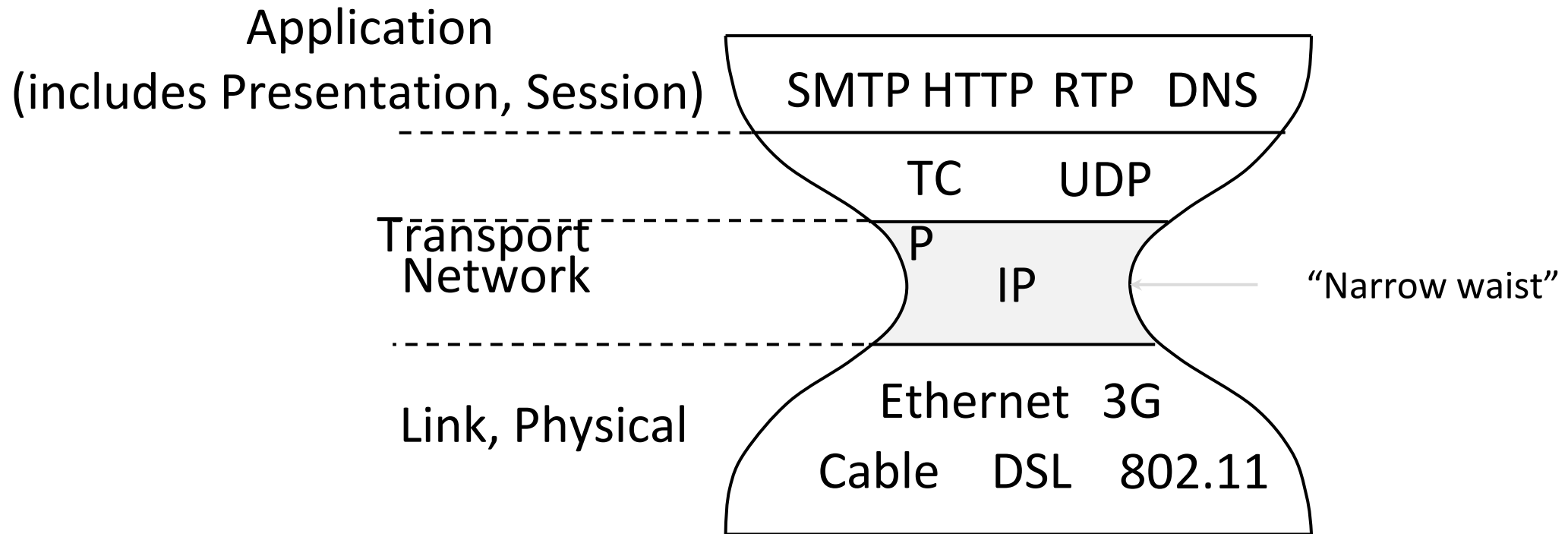
- WiFi (802.11) – few rooms
- Ethernet – building
- Optical fibers – continents and oceans
- Coaxial cables – metro area
- Cellular (2G, 3G, 4G, 5G) – few KMs
- Bluetooth – personal space
- Twisted pair – metro area
- Satellite – space
- ...

Need modularity to help manage
complexity and support reuse

Networking layers (OSI)

Layer	Function	Example
Application (7)	Services that are used with end user applications	SMTP,
Presentation (6)	Formats the data so that it can be viewed by the user Encrypt and decrypt	JPG, GIF, HTTPS, SSL, TLS
Session (5)	Establishes/ends connections between two hosts	NetBIOS, PPTP
Transport (4)	Responsible for the transport protocol and error handling	TCP, UDP
Network (3)	Reads the IP address from the packet.	Routers, Layer 3 Switches
Data Link (2)	Reads the MAC address from the data packet	Switches
Physical (1)	Send data on to the physical wire.	Hubs, NICs, Cable

Networking layers (Internet)



Design philosophy of Internet

Principles that help *explain* the Internet design

- Not explicitly articulated when the network was being designed

More generally: Building systems is about trade-offs

- Prioritize some goals over others

Q: What are the design goals of the road network?

End-to-end argument

What functionality to put in the network?

- E2E: As little as possible

Q: When does the principle fail or does not help?

Over to Benedikt and Milan