CSE 550: Systems for all

Au 2021

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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

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