

Basic Concepts In Computer Networking

Antonio Carzaniga

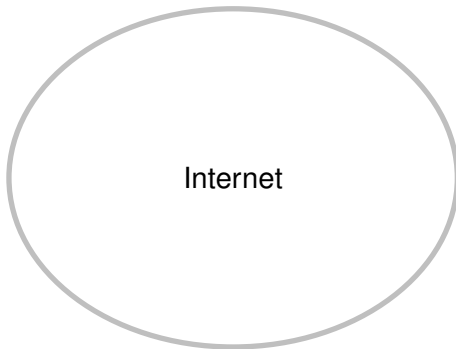
Faculty of Informatics
University of Lugano

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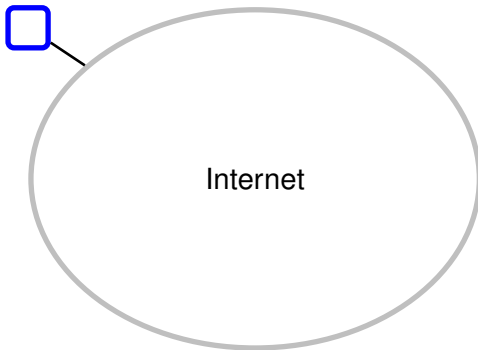
Outline

- ◆ What is the Internet?
- ◆ Types of network
- ◆ Types of service
- ◆ Protocols
- ◆ The Internet protocol stack

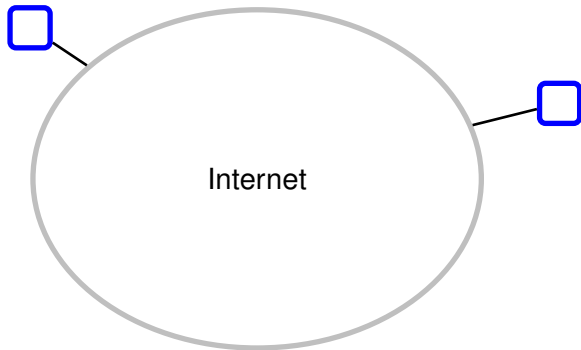
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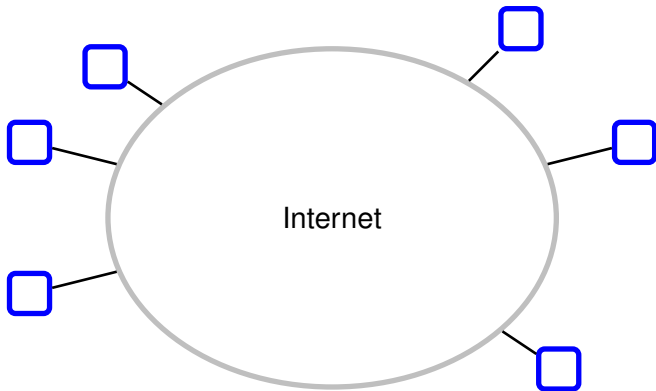
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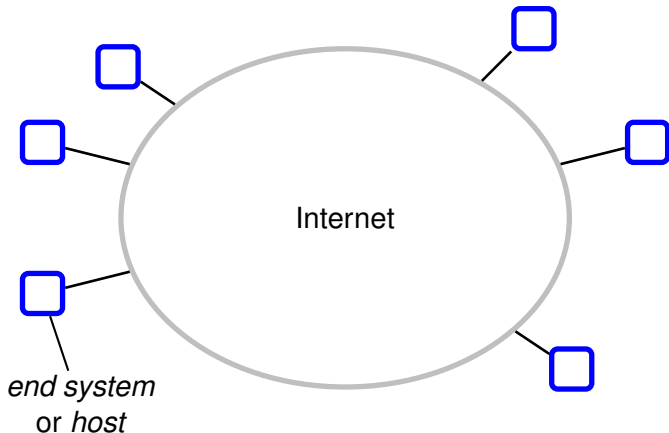
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- ◆ *end system* or *host* ()


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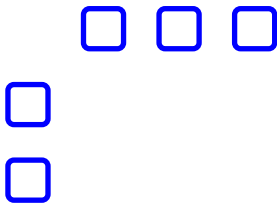
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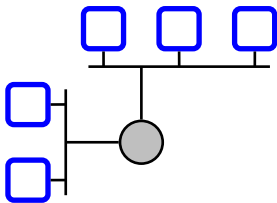
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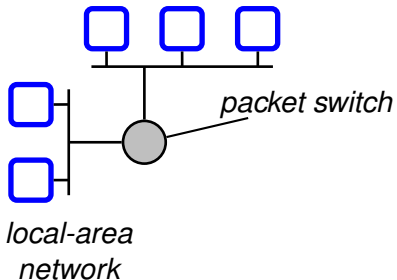
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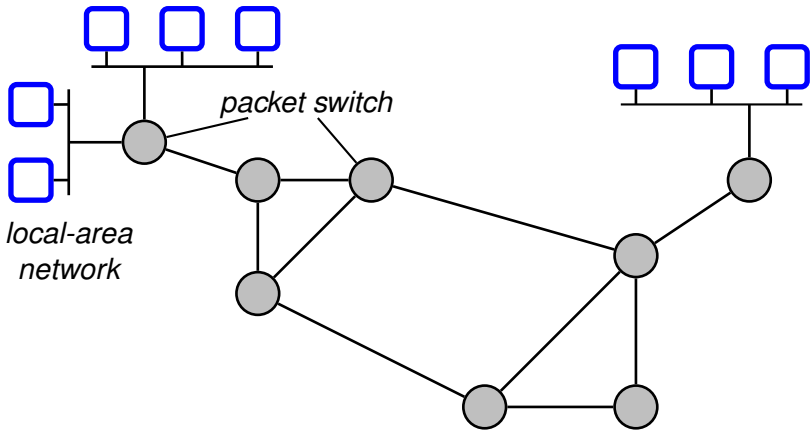
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- ◆ *Packet switch*: a *link-layer switch* or a *router*
- ◆ *Route*: sequence of switches that a packet goes through (a.k.a. *path*)
- ◆ *Protocol*: control the sending and receiving of information to and from end systems and packet switches

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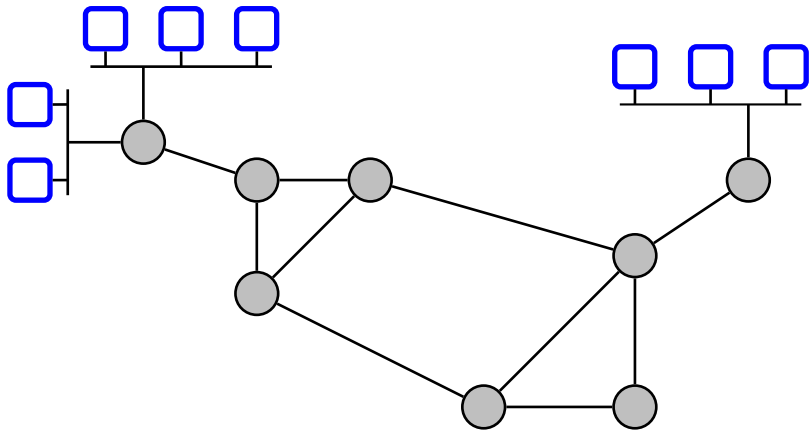
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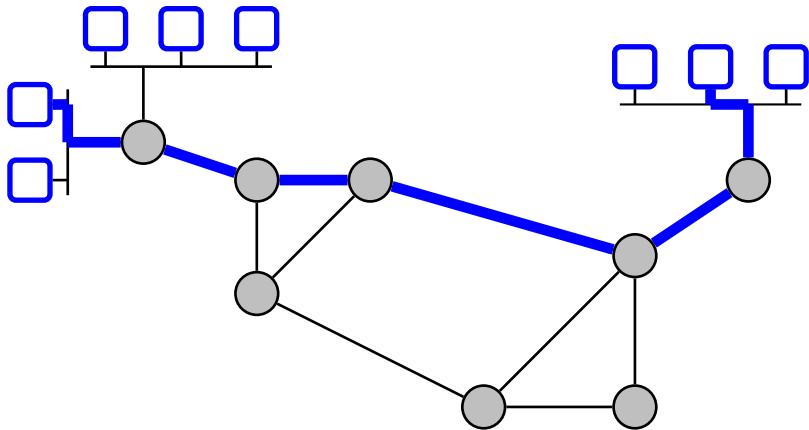
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- ◆ Every forwarding decision is done on the basis of the information contained in the packet

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- ◆ When the conversation ends, the network tears down the connection, freeing the corresponding resources (links, buffers, etc.) for other connections

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- ◆ Circuit switching admits a straightforward implementation of quality-of-service guarantees, because network resources are reserved at connection setup time
- ◆ Guaranteeing any quality of service with packet switching is very difficult

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- ◆ Packet switching achieves a much better utilization of network resources, because it is designed specifically to share links (buffers, etc.)

Virtual Circuits

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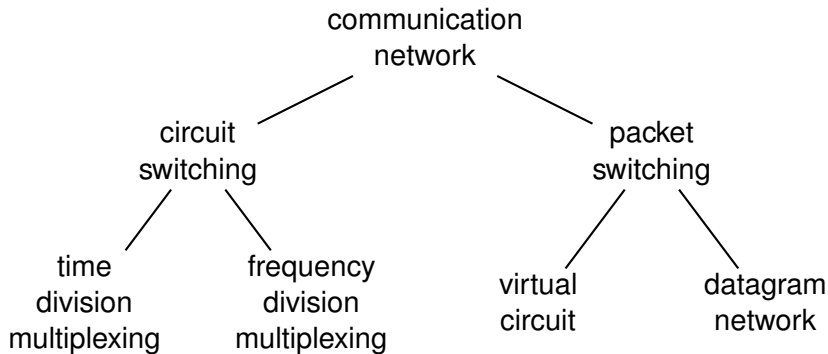
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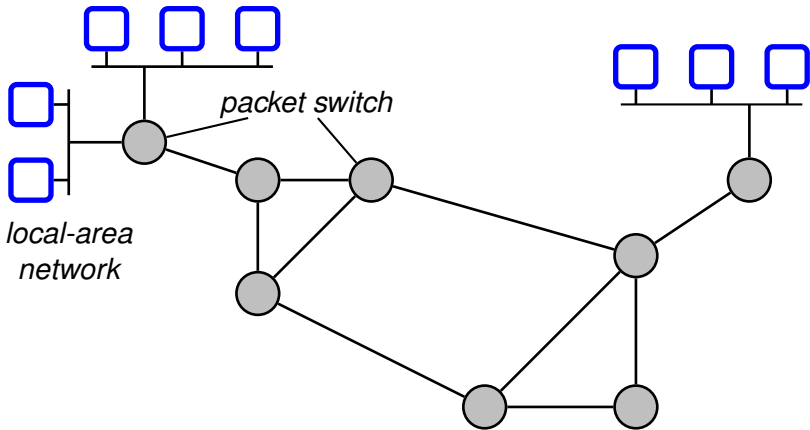
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- ◆ Packets carry a virtual circuit identifiers, which allow very fast processing (forwarding) and incur a space low-overhead

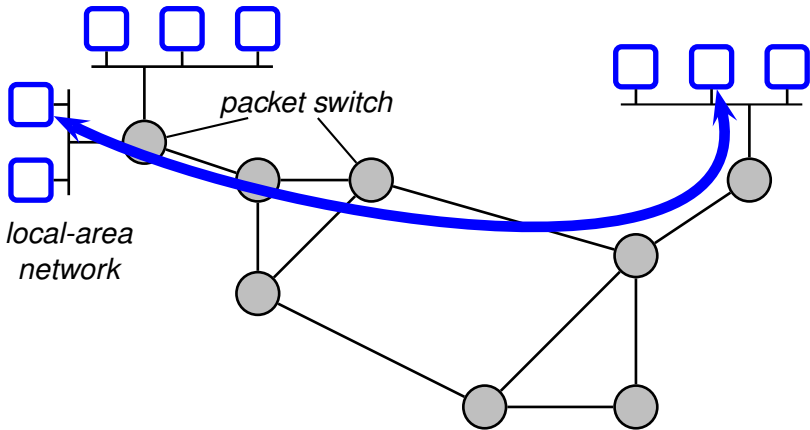
Taxonomy of Networks



Service Perspective



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- ◆ What kind of *service* does the Internet offer to end systems?

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- ◆ *Connection-oriented reliable*
 - ▶ virtual duplex communication channel ($A \leftrightarrow B$)—conceptually similar to a telephone service
 - ▶ information is transmitted “reliably” and in order
- ◆ *Connectionless unreliable*
 - ▶ the network accepts “datagrams” for delivery—this is conceptually similar to the postal service
 - ▶ “unreliable” service (a.k.a. “best effort”)

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- ◆ The term “reliable” means that information will eventually reach its destination if a route is viable within a certain amount of time.
- ◆ The network makes absolutely no guarantees on *latency* (i.e., the time it takes to transmit some information from a source to a destination)

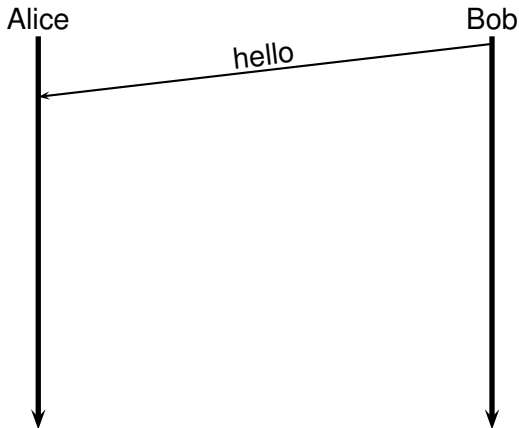
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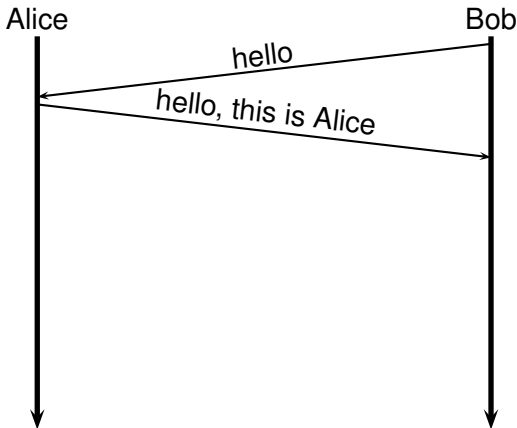
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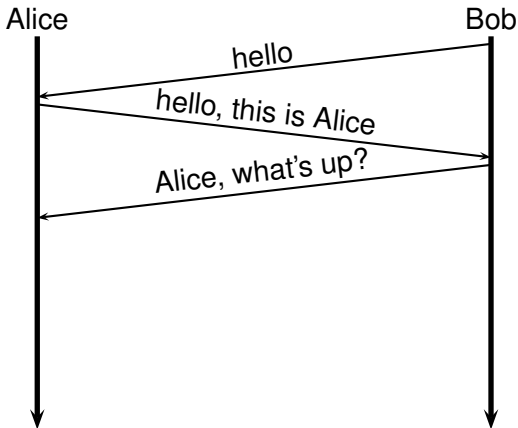
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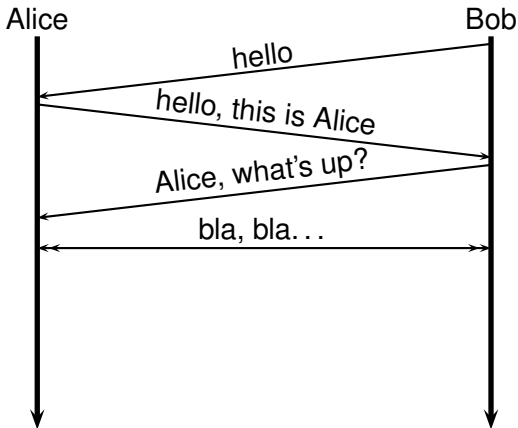
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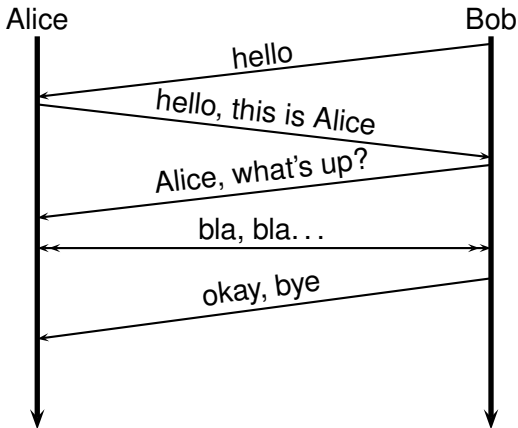
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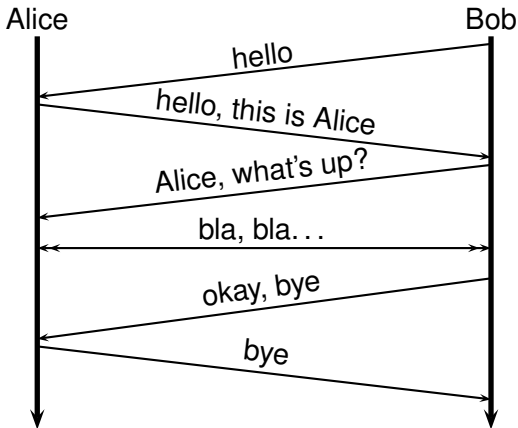
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 - ▶ *handshake* establishes the identity and/or the context for a conversation
 - ▶ *conversation* free-form exchange
 - ▶ *closing* terminates the conversation
- ◆ This protocol assumes a connection-oriented medium
- ◆ The protocol involves two parties (Alice and Bob)
- ◆ ...

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- ▶ Delta 800, unable at the moment

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- ◆ “Master” role

Communication Protocols (3)

- ◆ Let's revisit the phone-call protocol

Alice

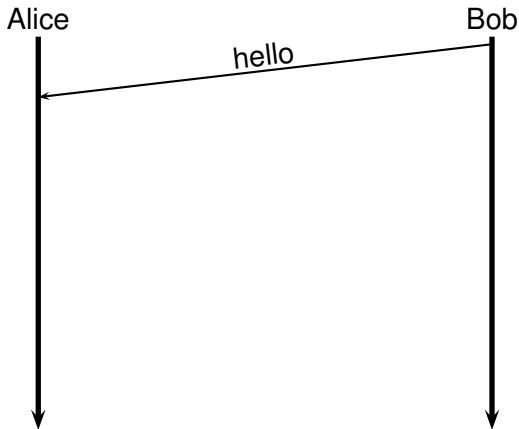


Bob



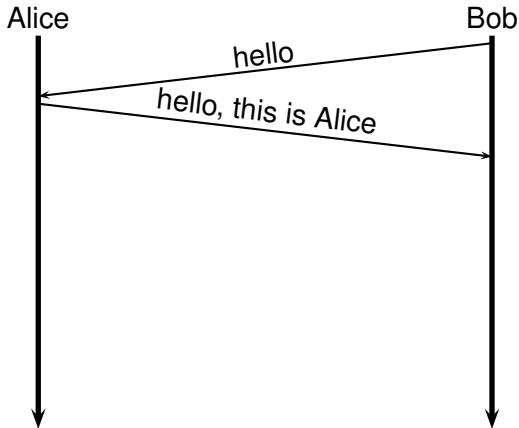
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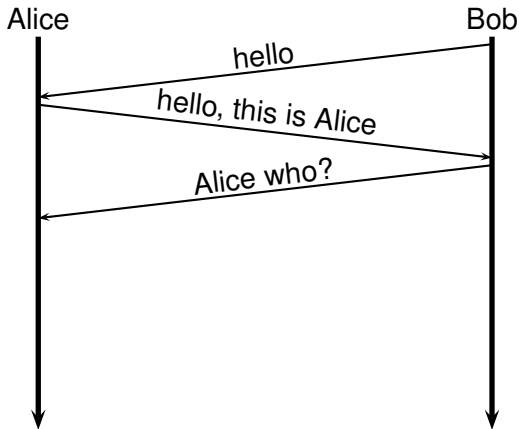
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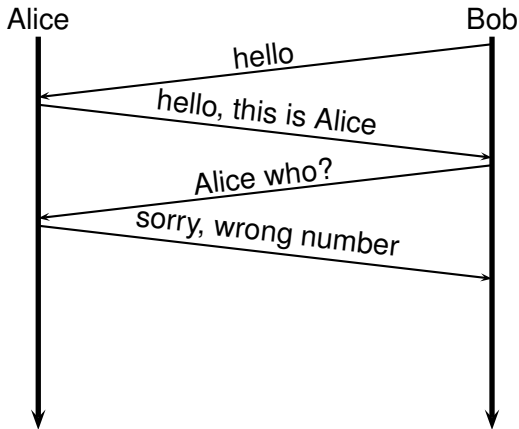
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Communication Protocols (4)

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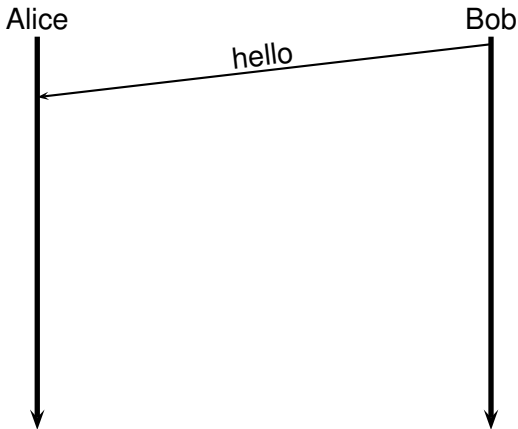


Bob



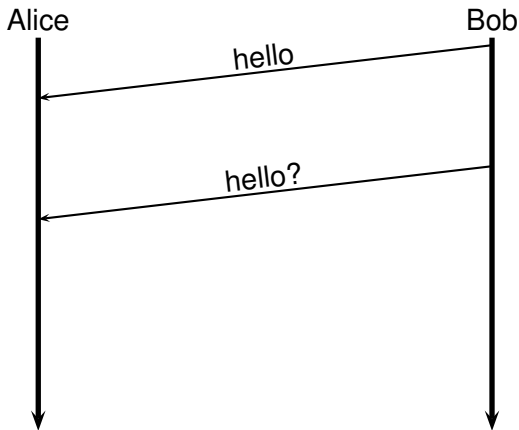
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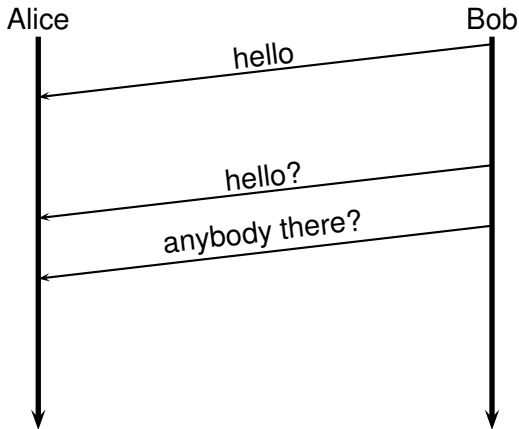
Communication Protocols (4)

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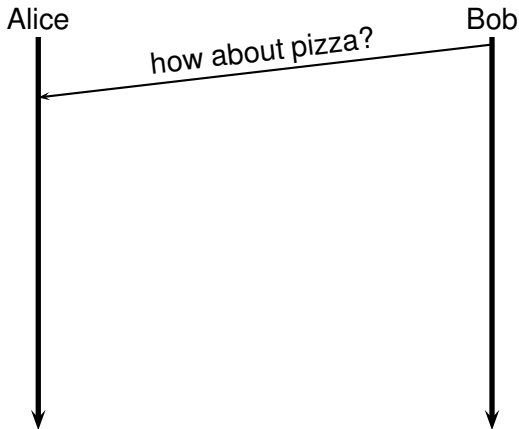
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 - ▶ i.e., it must include actions and/or responses for all possible situations and all possible messages
- ◆ A network protocol must also define all the necessary *message formats*

Communication Protocols (5)

- ◆ Another protocol: deciding where to go for dinner

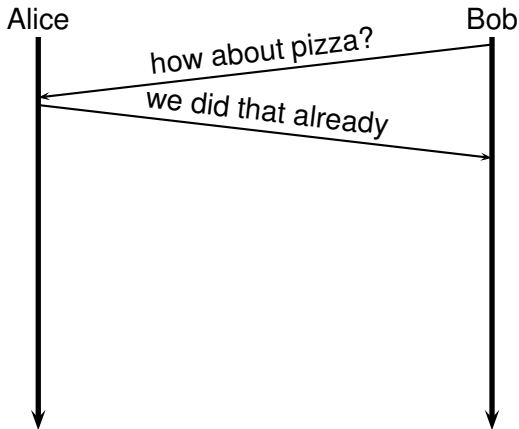
Communication Protocols (5)

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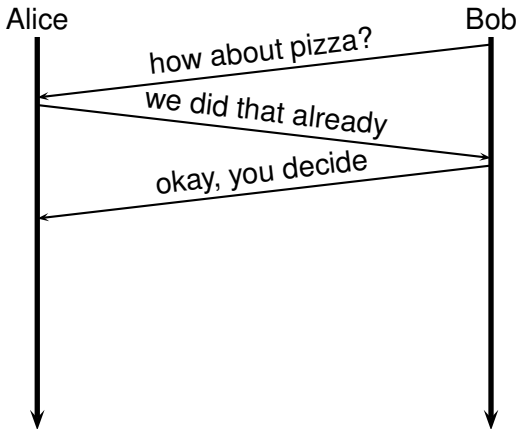
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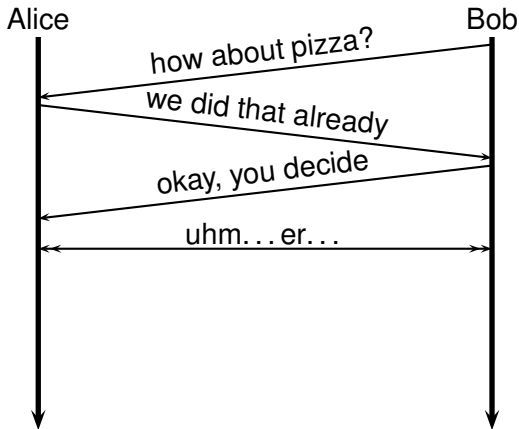
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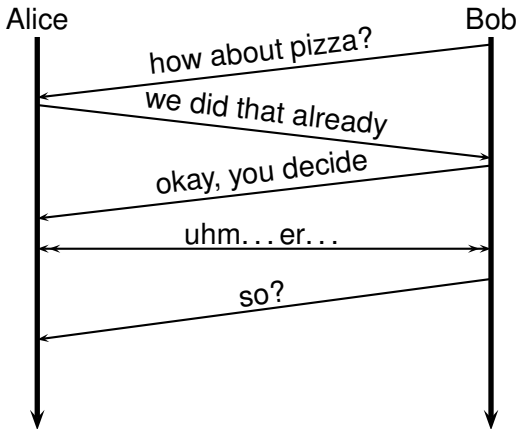
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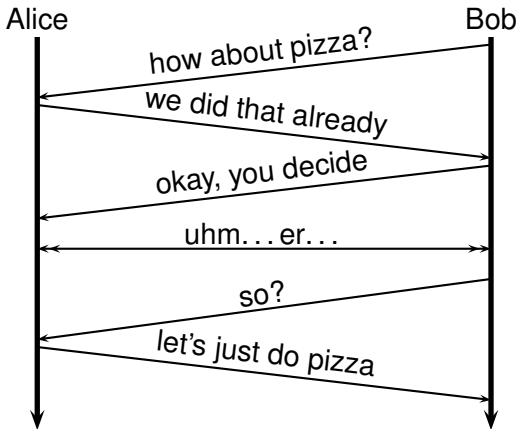
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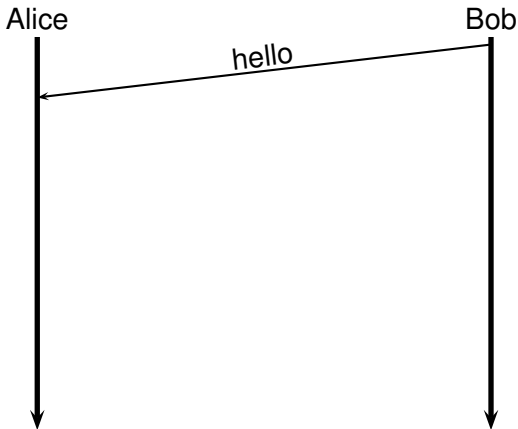


Protocol Layering

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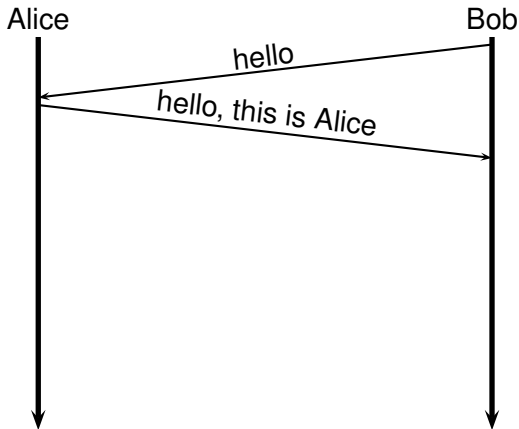
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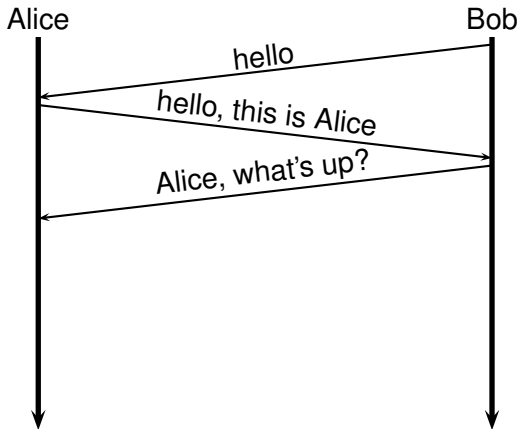
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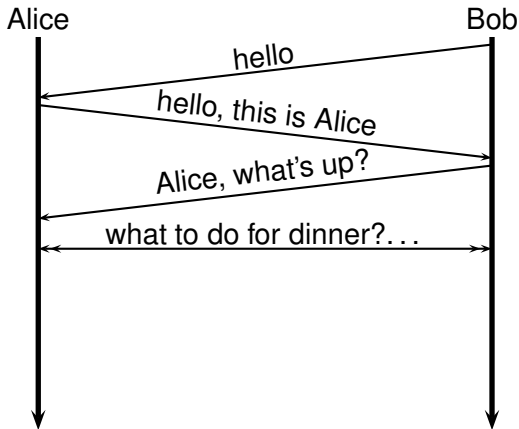
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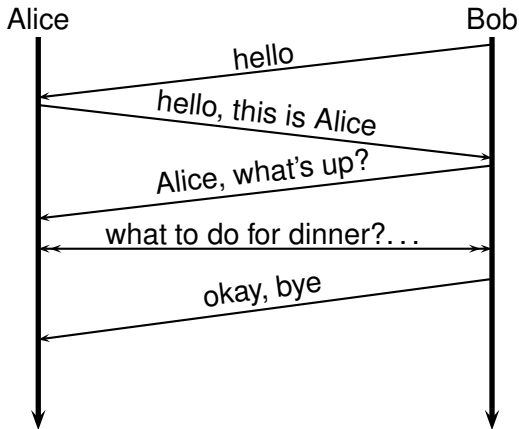
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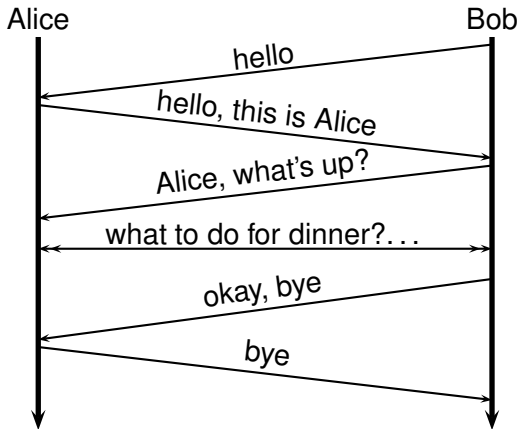
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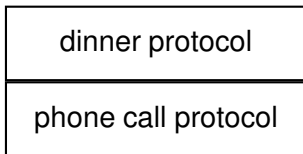
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phone call protocol

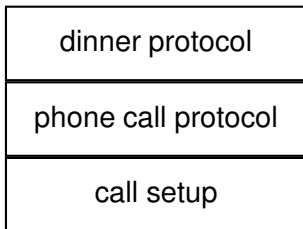
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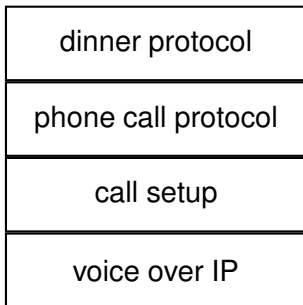
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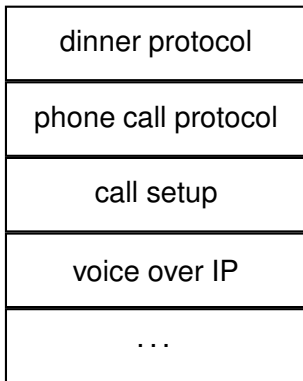
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Internet Protocol Stack

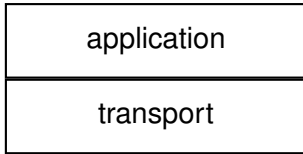
Internet Protocol Stack



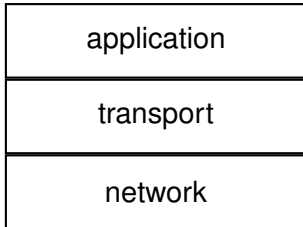
application

The diagram consists of a single rectangular box with a black border. Inside the box, the word 'application' is written in a black, sans-serif font, centered horizontally and vertically.

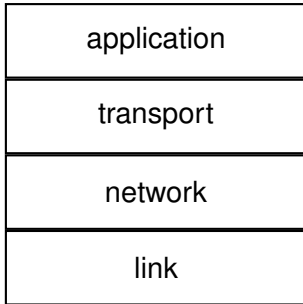
Internet Protocol Stack



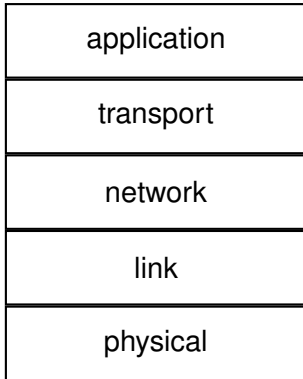
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Internet Protocol Stack (2)

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