

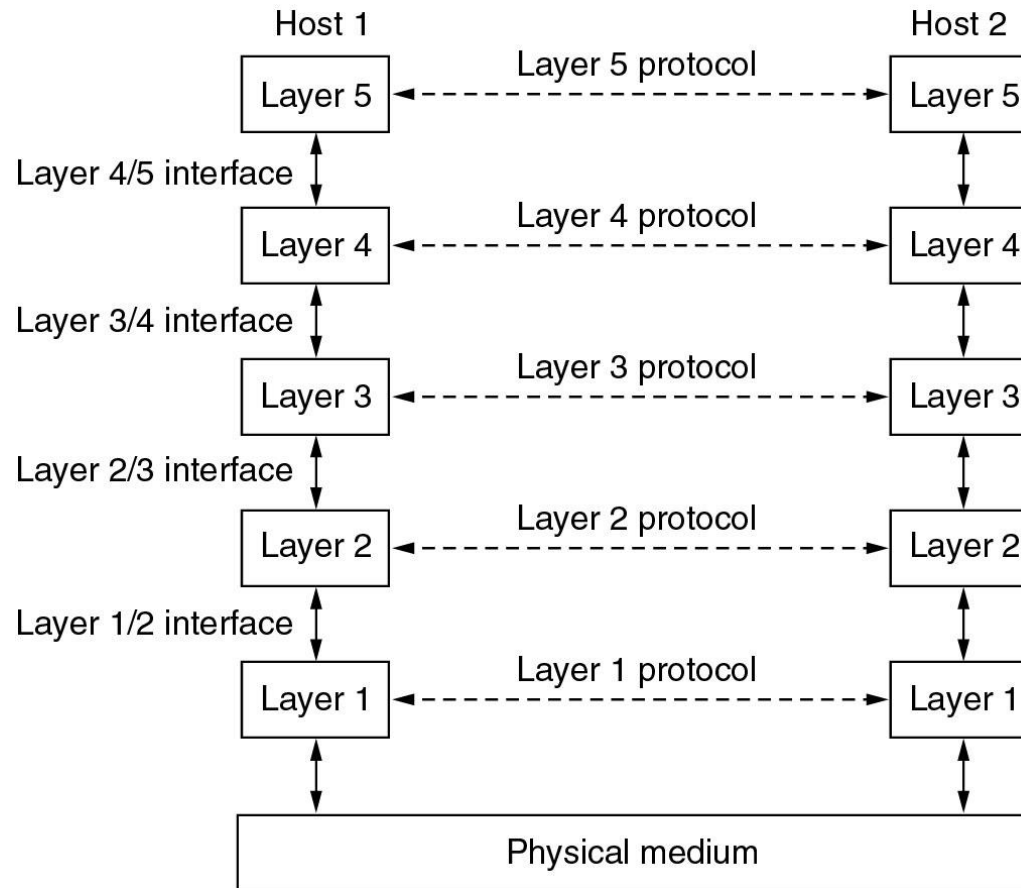
Network Software Architecture and its Layers and Protocols

CSE306

Network Software

- Protocol Hierarchies
- Design Issues for the Layers
- Connection-Oriented and Connectionless Services
- Service Primitives
- The Relationship of Services to Protocols

Network Software Protocol Hierarchies

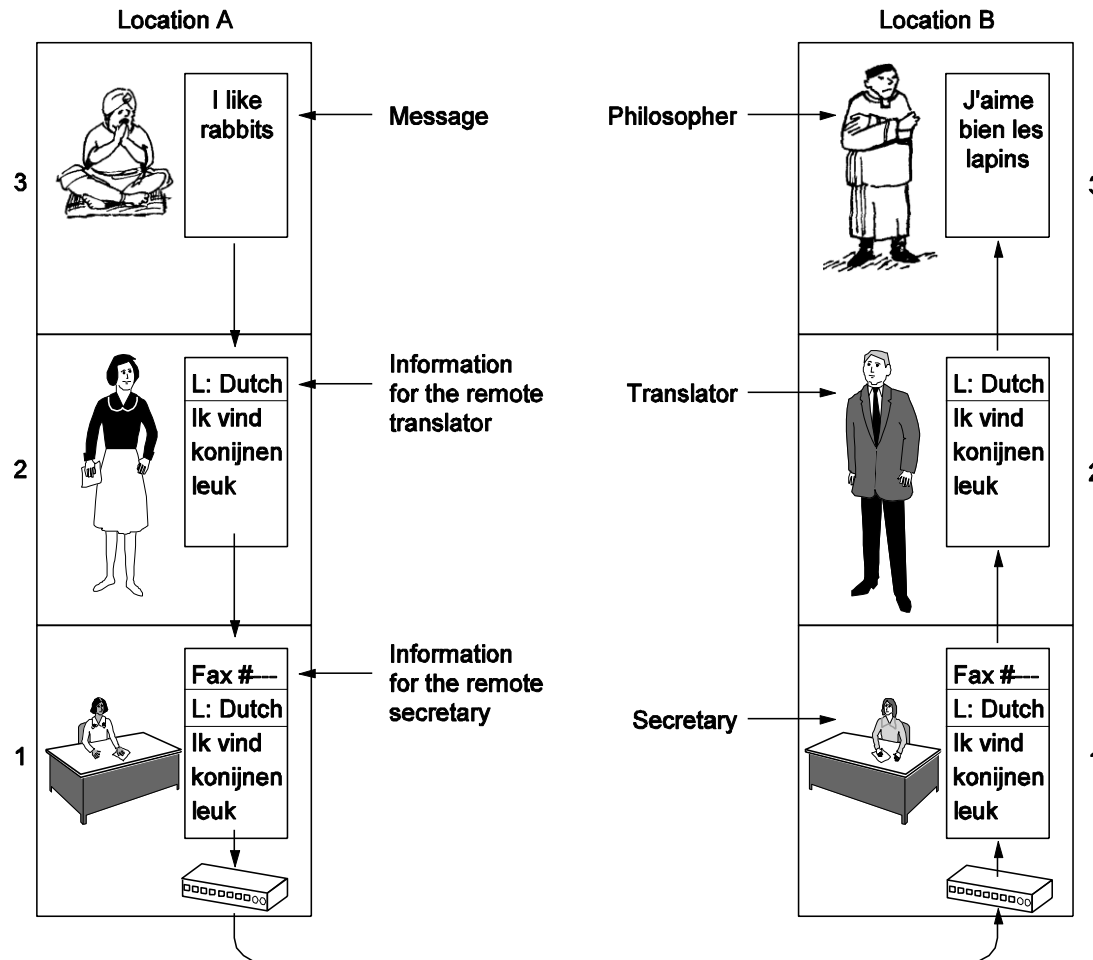


- Layers, protocols, and interfaces- **Network Architecture**

- A **protocol** is an agreement between the communicating parties on how communication is to proceed.
- The entities comprising the corresponding layers on different machines are called **peers**. The peers may be software processes, hardware devices, or even human beings. In other words, it is the peers that communicate by using the protocol to talk to each other.
- A list of the protocols used by a certain system, one protocol per layer, is called a **protocol stack**.

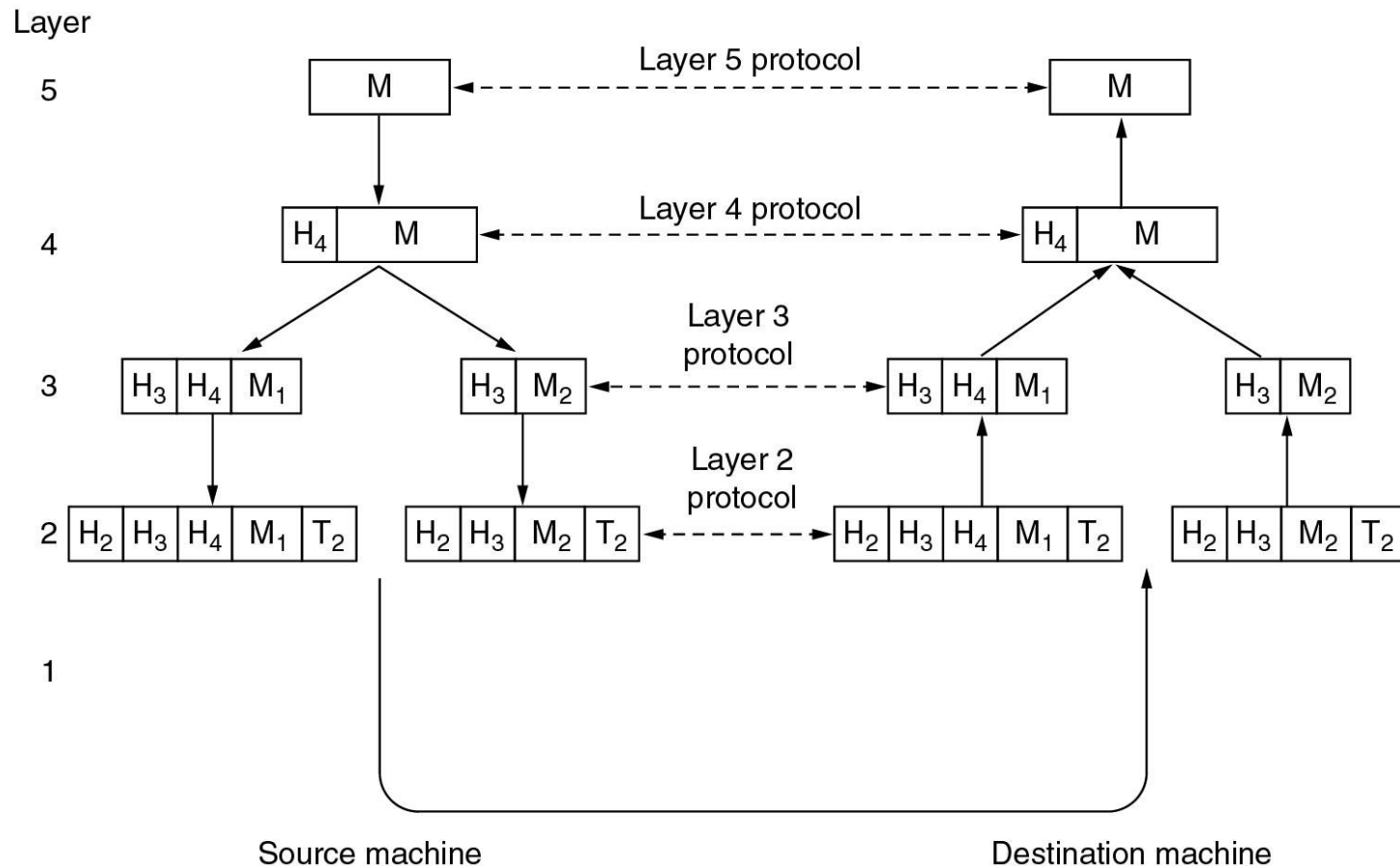
Protocol Hierarchies (2)

- The philosopher-translator-secretary architecture.



Protocol Hierarchies (3)

- Example information flow supporting virtual communication in layer 5.



Design Issues for the Layers

- Addressing or naming
- Error Control
- Flow Control---*Congestion*
- Statistical Multiplexing
- Routing
- Scalable
- QoS---*real time*
- Reliability
- Security



Connection-Oriented and Connectionless Services

- A **circuit** is another name for a connection with associated **resources**, such as a fixed bandwidth.
- This dates from the telephone network in which a circuit was a path over copper wire that carried a phone conversation.
- In contrast to connection-oriented service, **connectionless service is modeled** after the postal system.
- Each message (letter) carries the full destination address, and each one is routed through the intermediate nodes inside the system independent of all the subsequent messages.
- **Store or forward switching**
- **Cut through switching**

- Each kind of service can further be characterized by its reliability. Some services are reliable in the sense that they never lose data.
- Usually, a reliable service is implemented by having the receiver acknowledge the receipt of each message so the sender is sure that it arrived.
- Reliable connection-oriented service has two minor variations: **message sequences and byte streams**.
- The acknowledgement process introduces overhead and delays, which are often worth it but are sometimes undesirable.
- One such application is digitized voice traffic for voice over IP.
- Unreliable (meaning not acknowledged) connectionless service is often called **datagram service**.

Connection-Oriented and Connectionless Services

- Six different types of service.

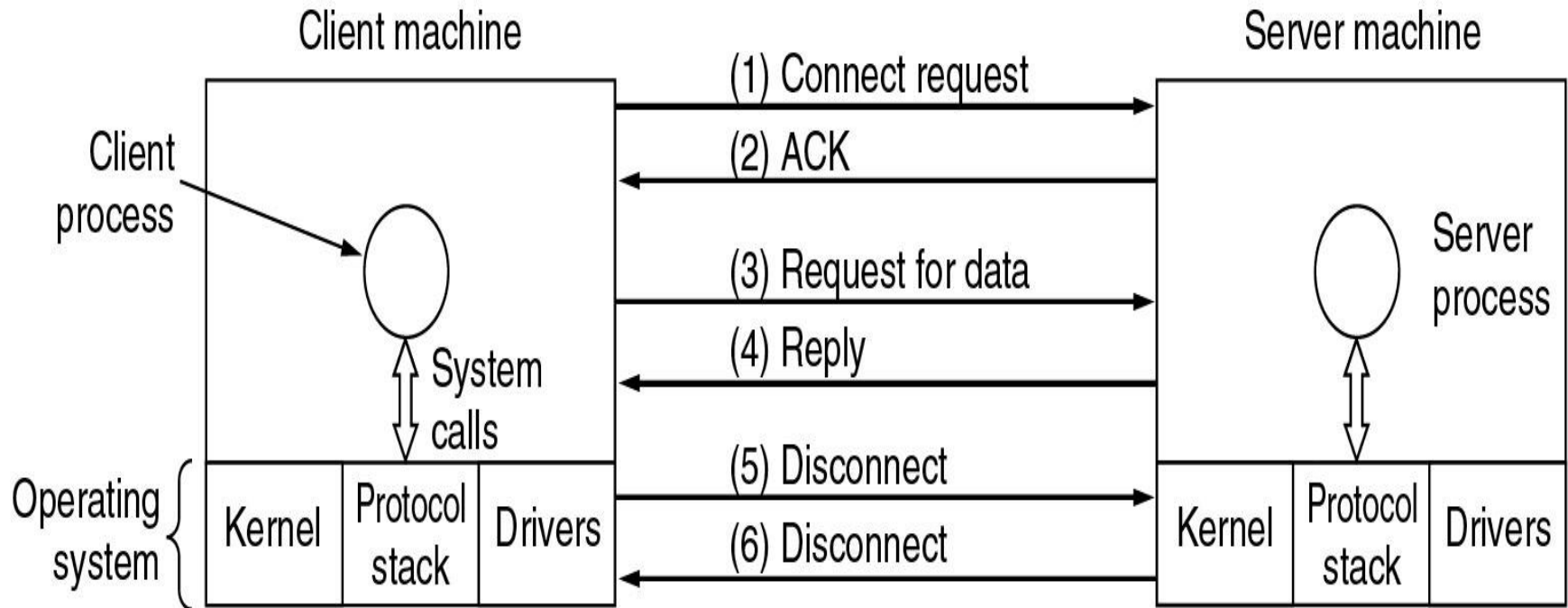
| | | Service | Example |
|---------------------|---|-------------------------|----------------------|
| Connection-oriented | { | Reliable message stream | Sequence of pages |
| | | Reliable byte stream | Remote login |
| | | Unreliable connection | Digitized voice |
| Connection-less | { | Unreliable datagram | Electronic junk mail |
| | | Acknowledged datagram | Registered mail |
| | | Request-reply | Database query |

Service Primitives

| Primitive | Meaning |
|------------|--|
| LISTEN | Block waiting for an incoming connection |
| CONNECT | Establish a connection with a waiting peer |
| RECEIVE | Block waiting for an incoming message |
| SEND | Send a message to the peer |
| DISCONNECT | Terminate a connection |

- Five service primitives for implementing a simple connection-oriented service.

Service Primitives (2)



- Packets sent in a simple client-server interaction on a connection-oriented network.

Services to Protocols Relationship

- The relationship between a service and a protocol.

