CSCI 460
Networks and Communications

Introduction

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Outline

- Computer Network
- Types of networks
  - Wired and wireless
  - Local Area Network
  - Wide Area Network
  - Internetworks (Internet)
  - Virtual Private Network (VPN)
- Network Protocols and Layers
- Network Reference Models
  - OSI Reference Model
  - TCP/IP Reference Model

Computer Network

A Computer Network is a connectivity setup among a group of autonomous computers that enables them to communicate with each other.
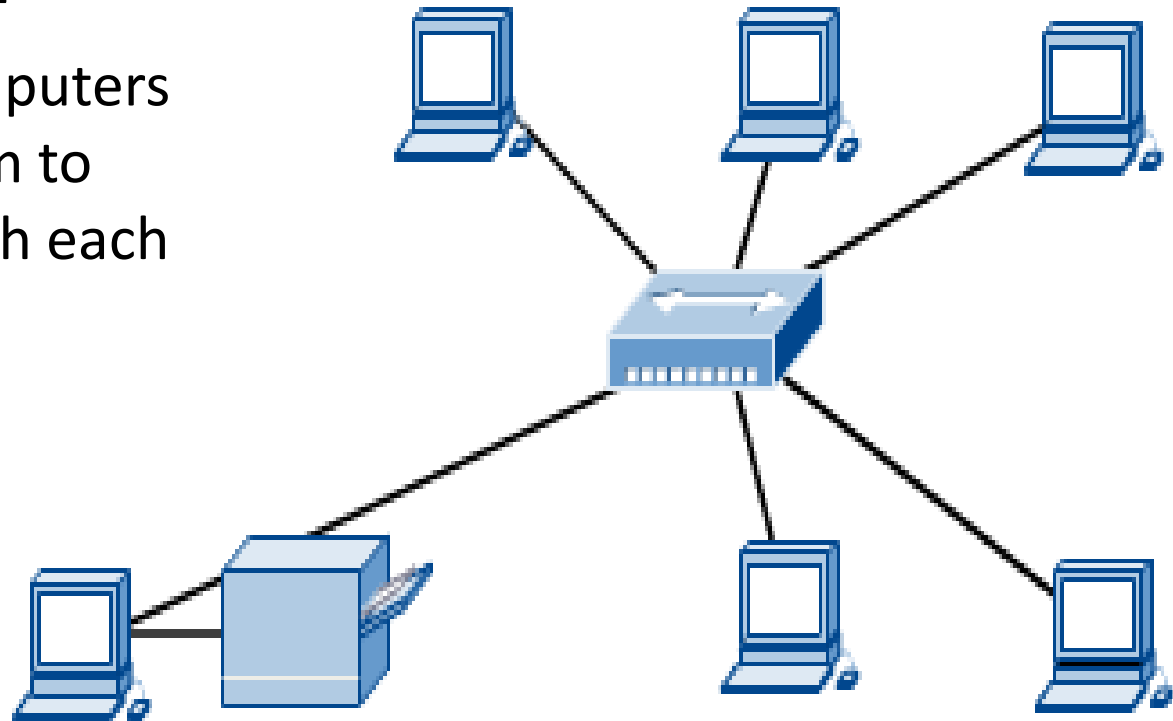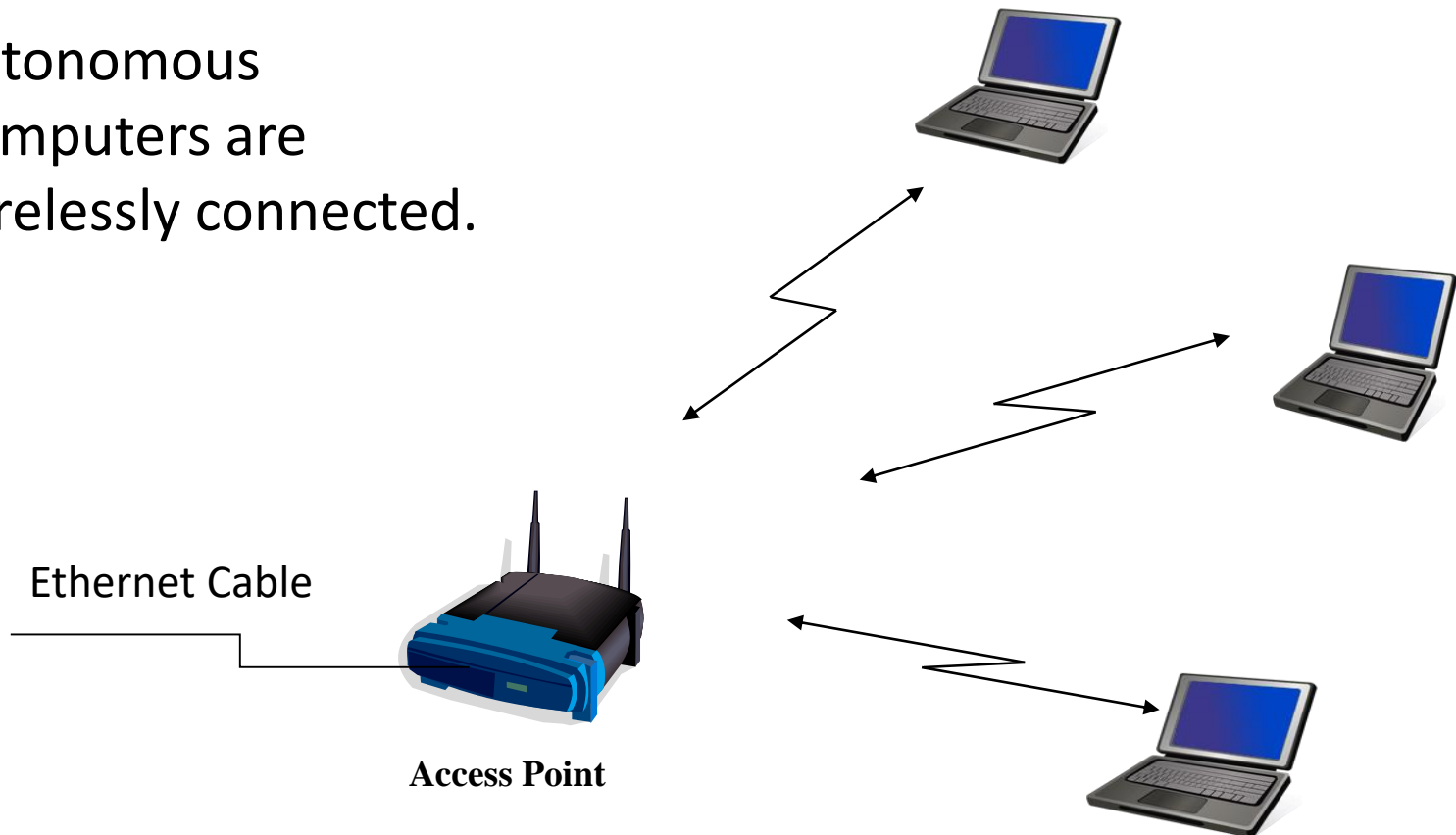
Wired Network
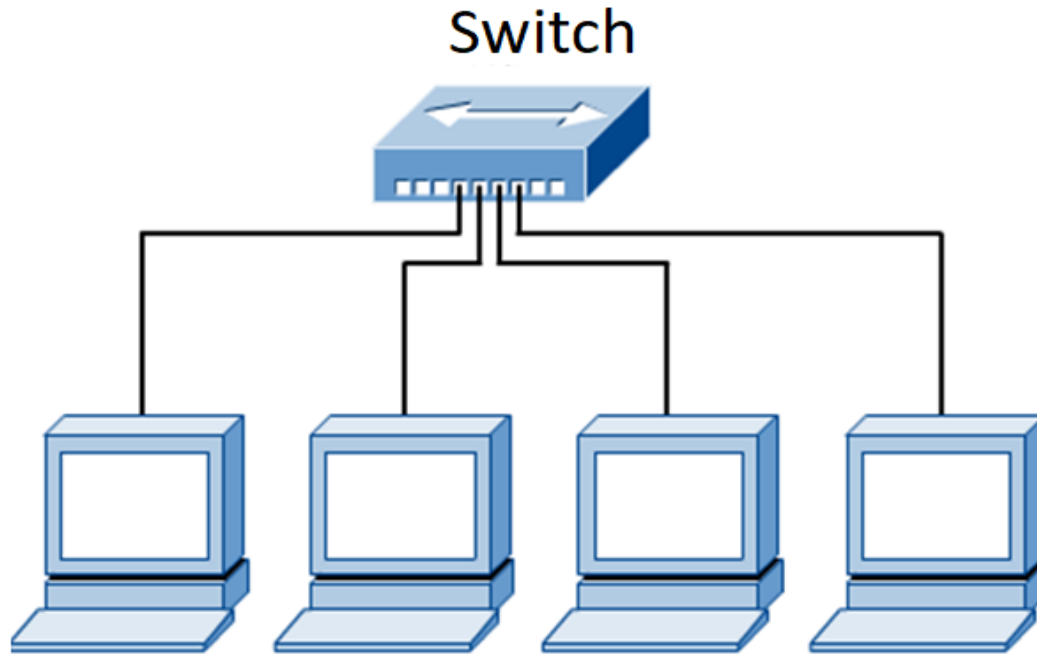
Autonomous Computers are physically connected through wires and network hardware, e.g., switch, hub etc.
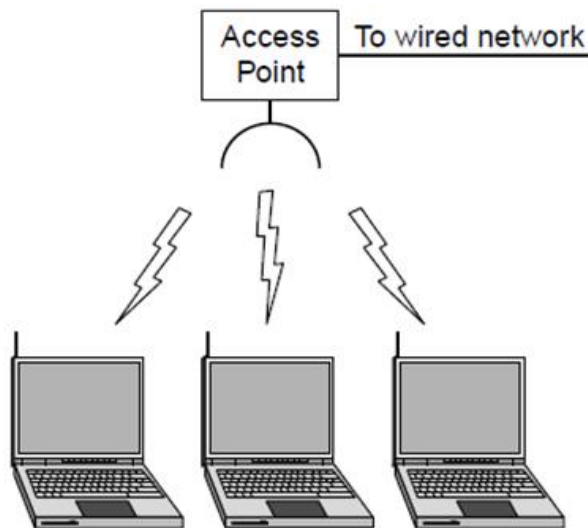
Wireless Network

Autonomous
Computers are
wirelessly connected.
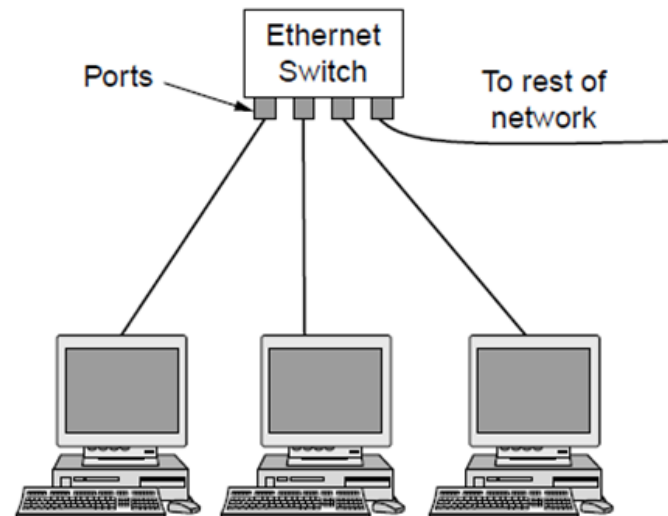
Ethernet Cable

Access Point

Local Area Networks

- Connect devices in a home, office building, or campus.

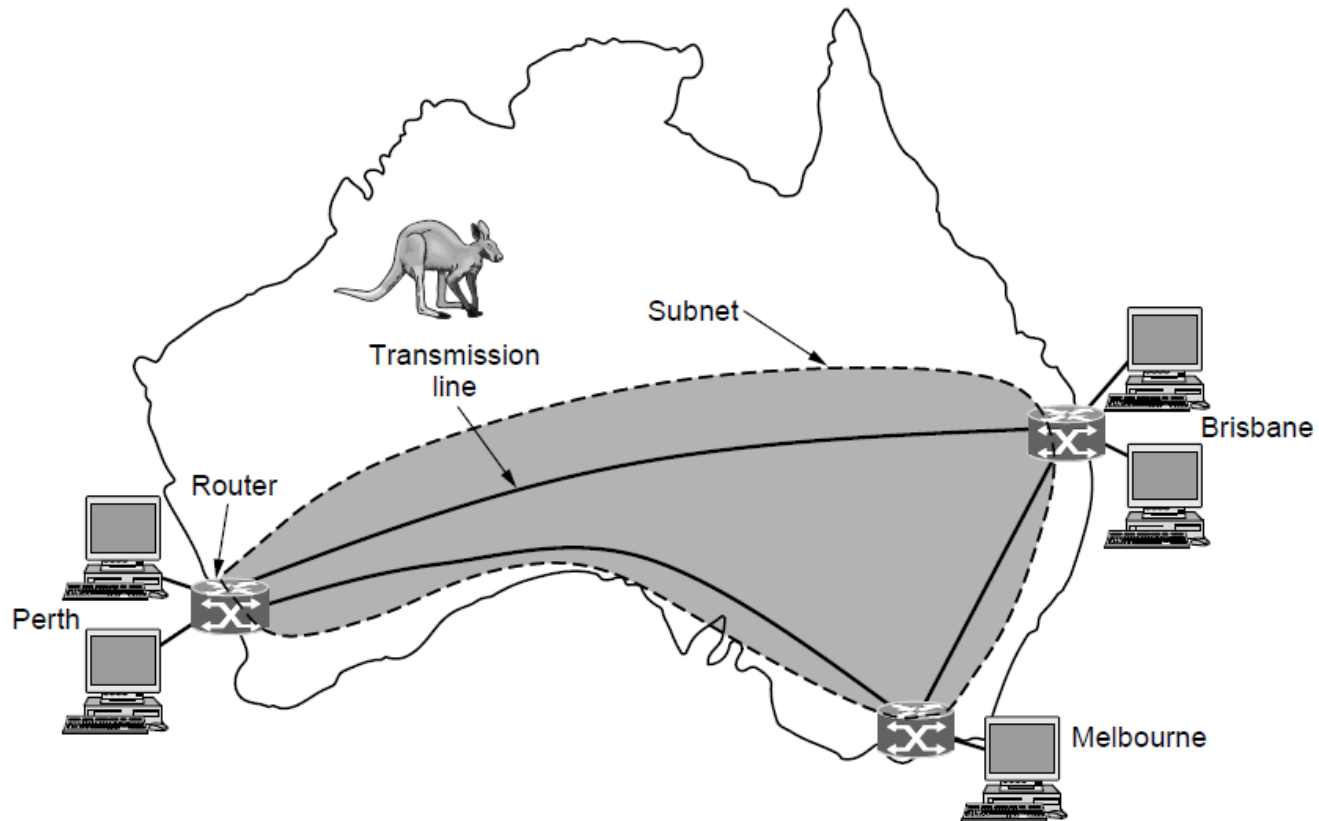- Called <u>enterprise network</u> in a company

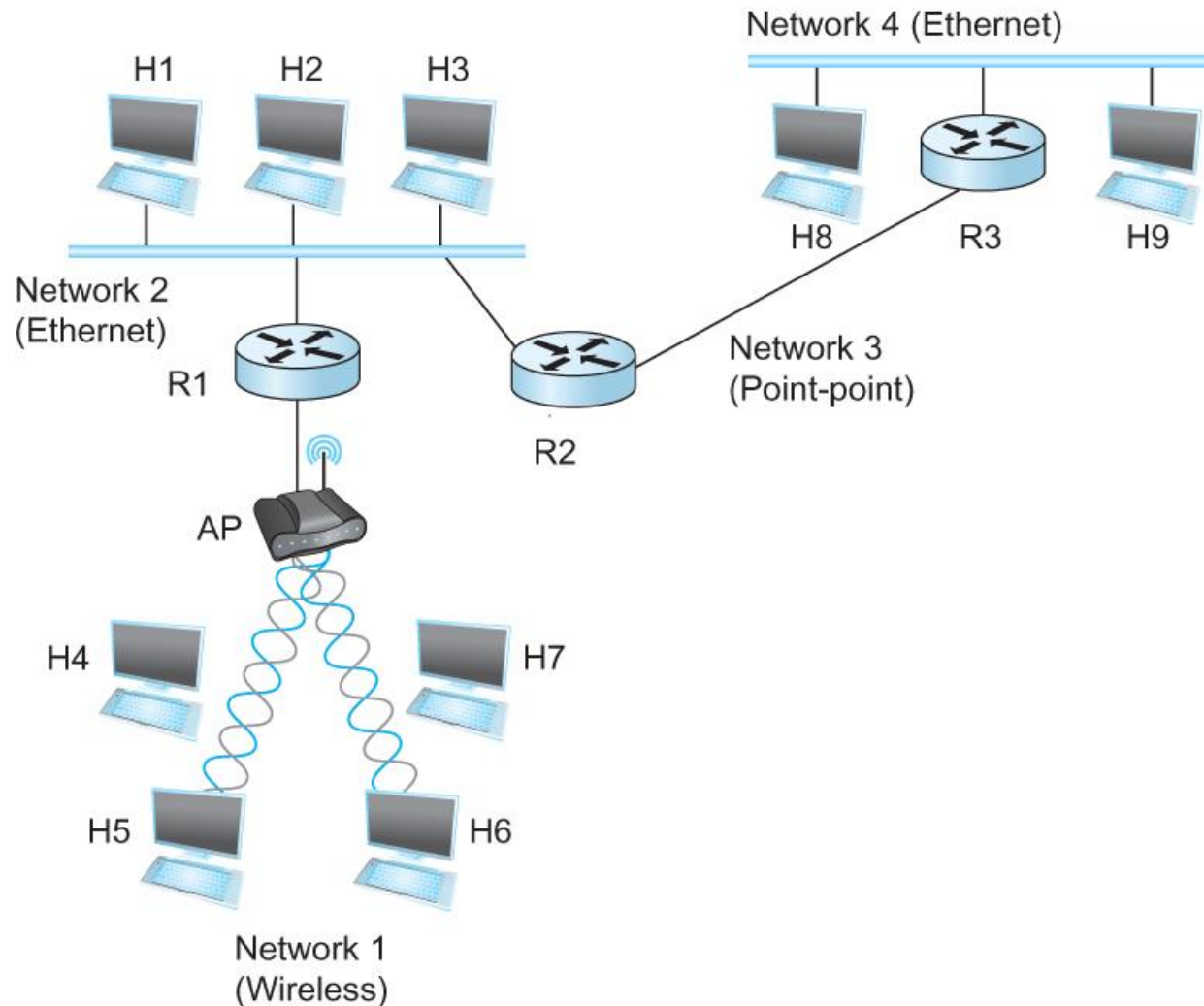Wireless LAN
with 802.11

Wired LAN with
switched Ethernet

Wide Area Networks

- Connect devices over a country
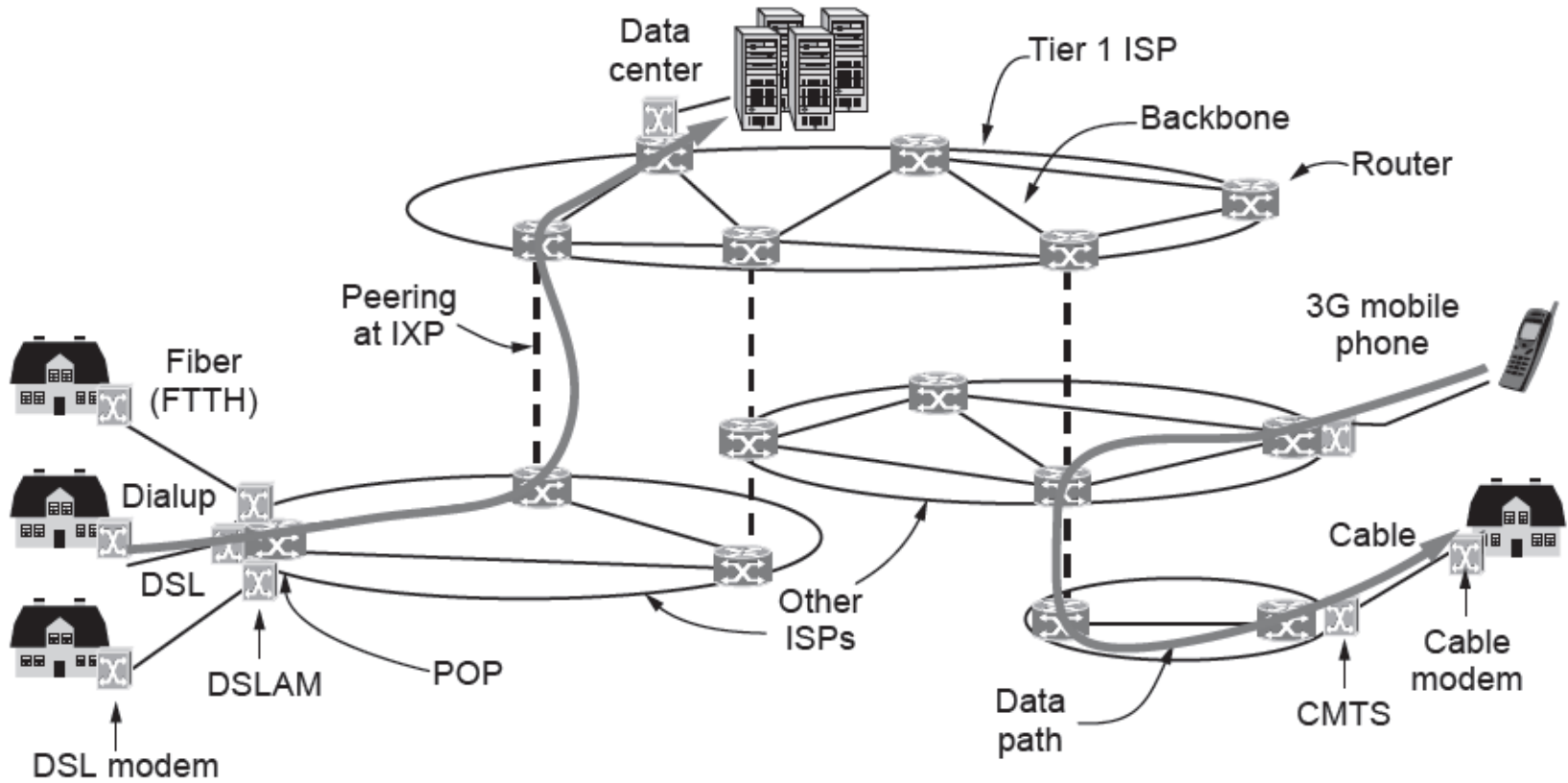- Example WANs connecting three branch offices:

Internetworking

An arbitrary collection of networks interconnected to provide host-host to packet delivery service, i.e., a network of networks
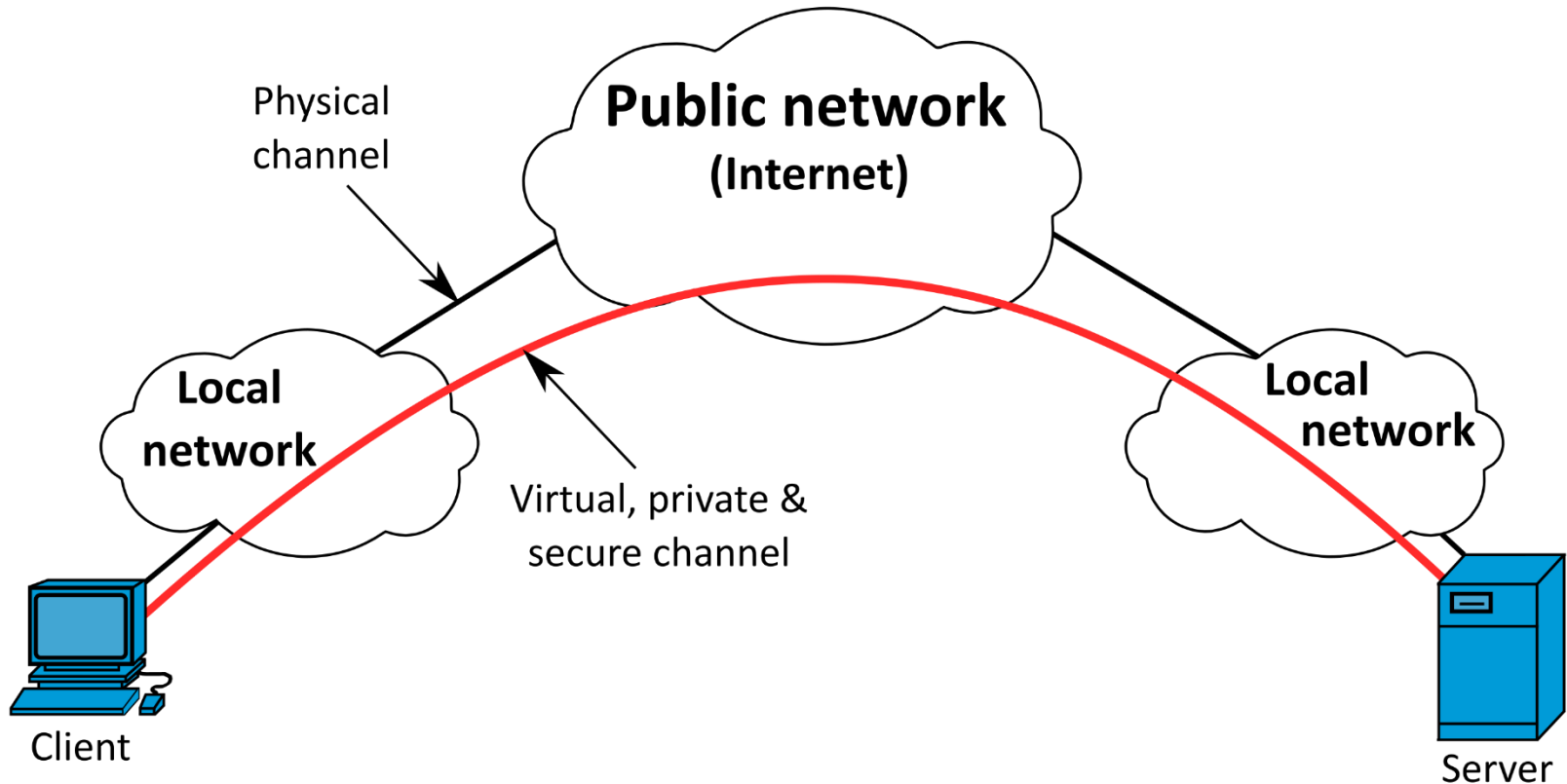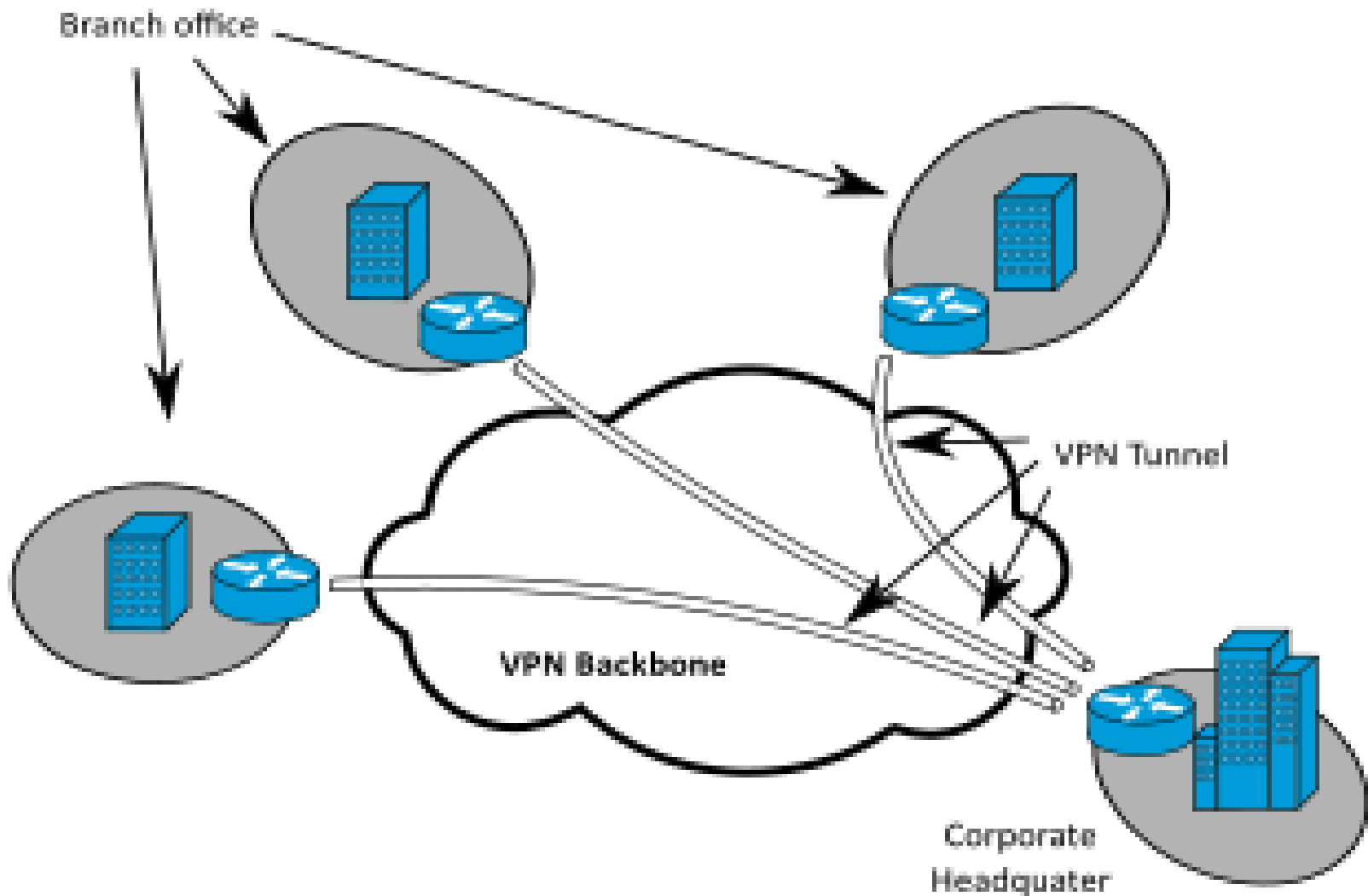
Internet

Architecture of the Internet

Virtual Private Network (VPN)

- A virtual private connection made through a public network
- Uses tunneling and encryption mechanisms

Virtual Private Network (VPN)

Protocol Layers

Protocol layering is the main structuring method used to divide up network functionality.

- Each protocol instance talks virtually to its <u>peer</u>
- Each layer communicates only by using the one below
- Lower layer <u>services</u> are accessed by an <u>interface</u>
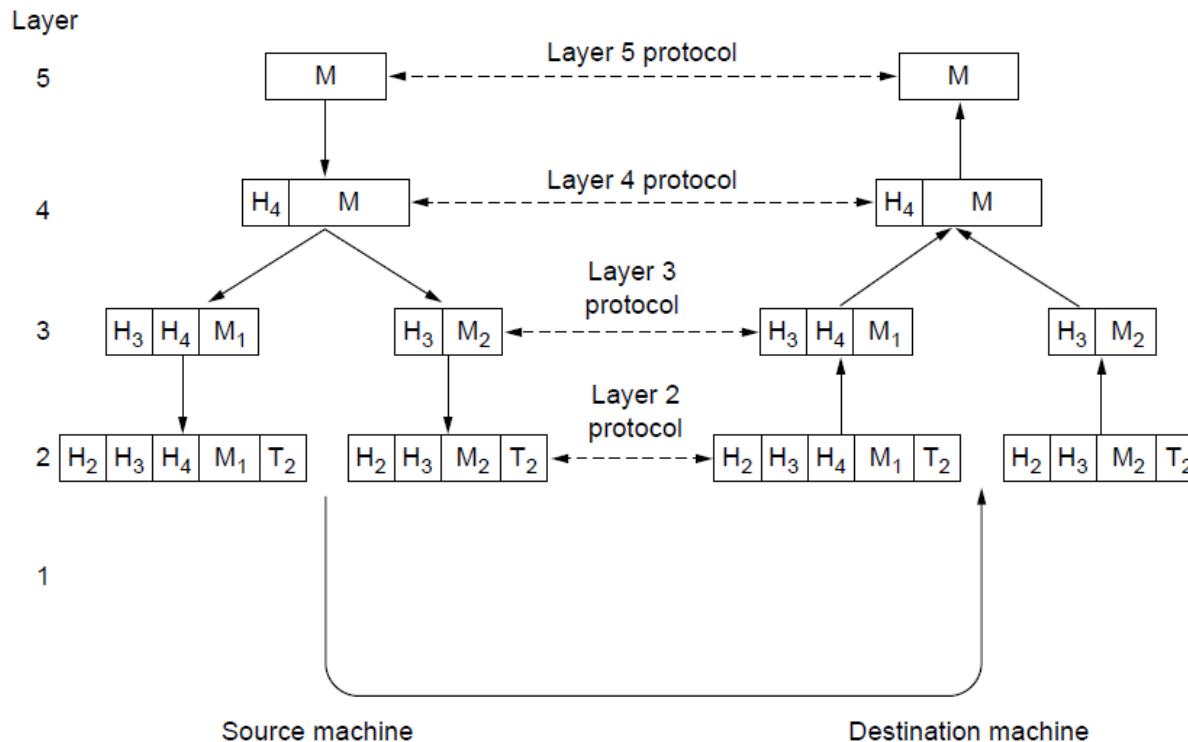- At bottom, messages are carried by the medium
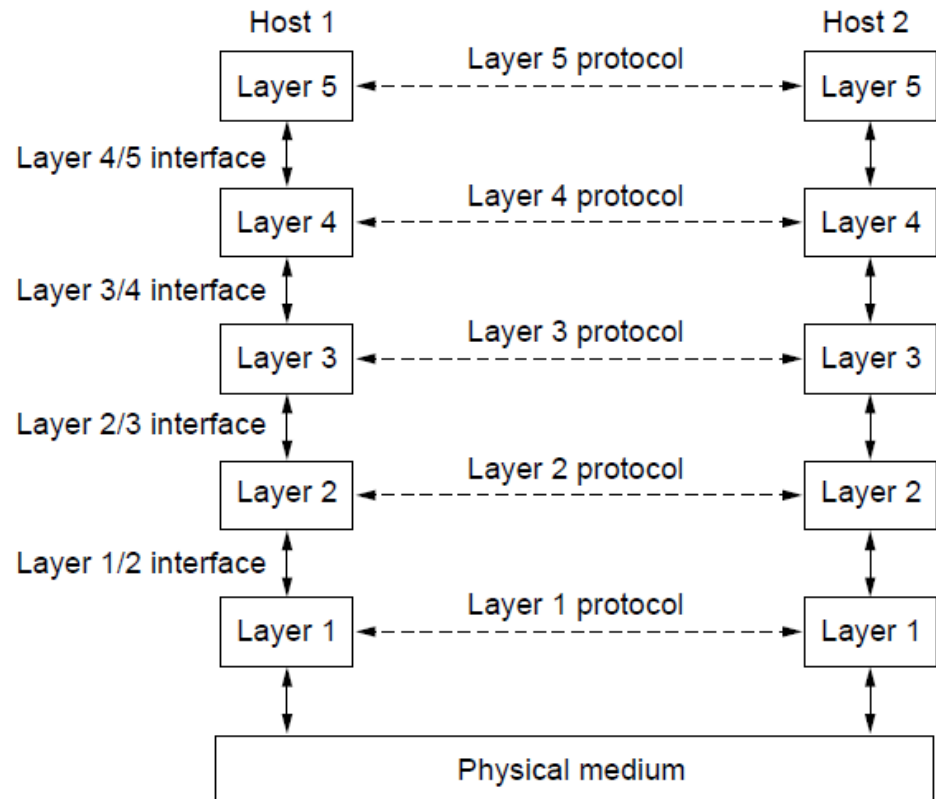
Protocol Layers

- Example: the philosopher-translator-secretary architecture
- Each protocol at different layers serves a different purpose
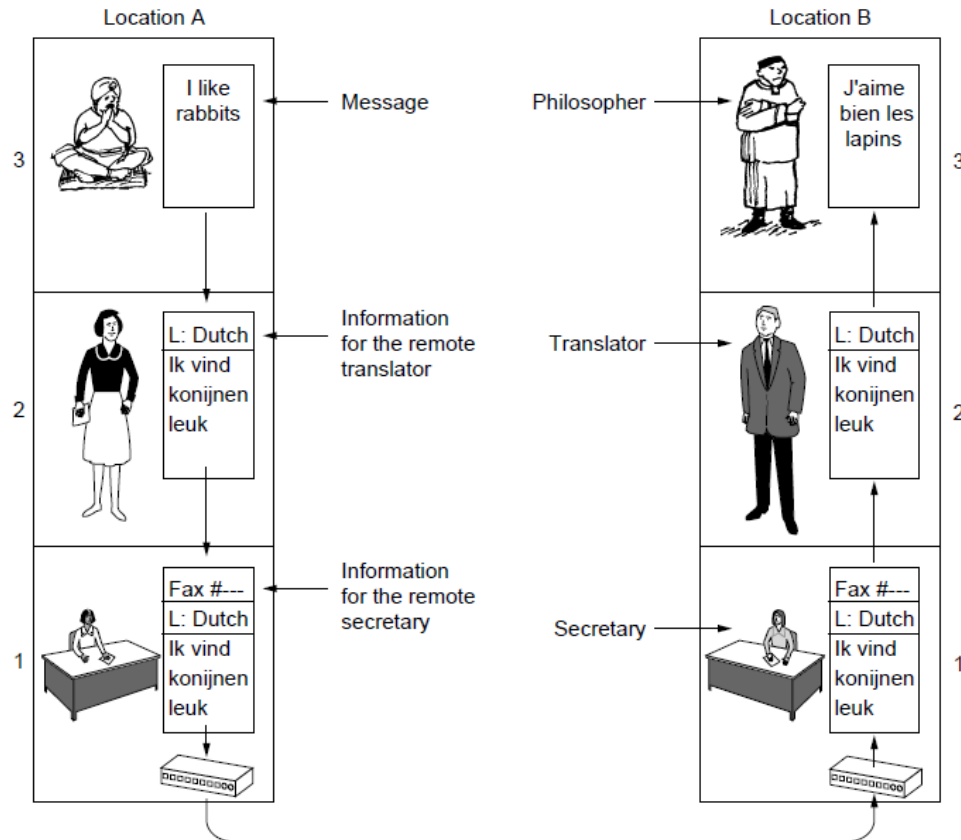
Protocol Layers

- Each layer adds its own <u>header</u> (with control information) to the message to transmit and removes it on receive
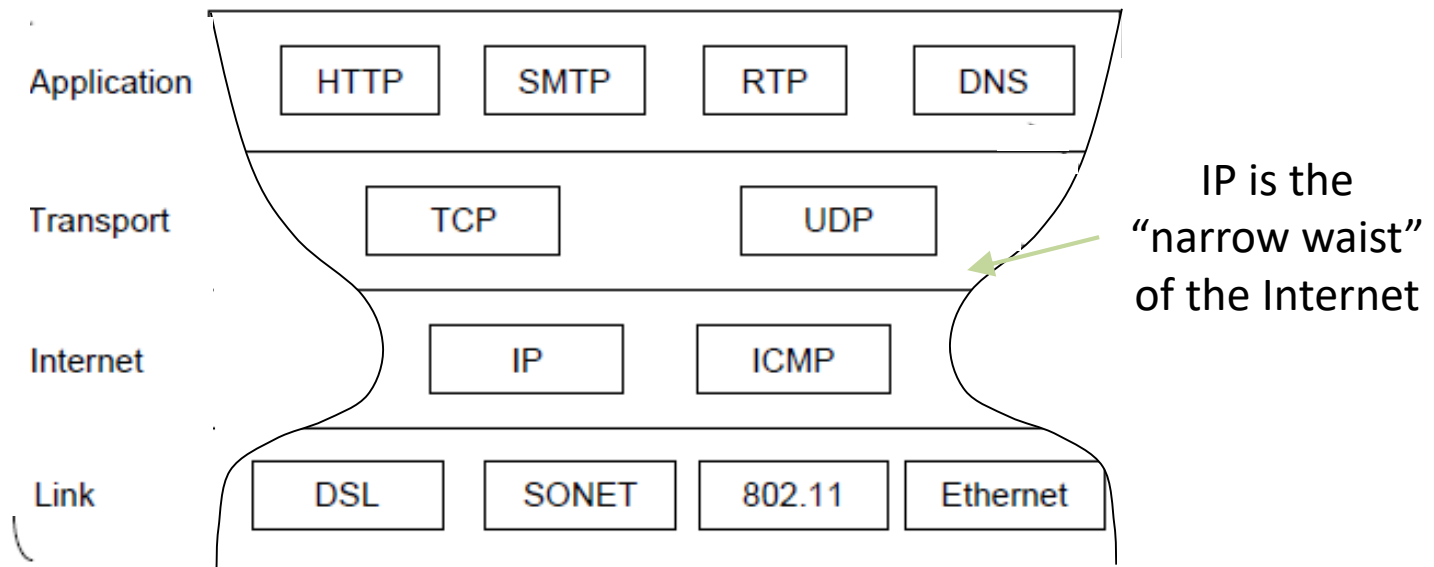- Layers may also split and join messages, etc.

OSI Reference Model

A principled, international standard, seven layer model to connect different systems

7	Application	– Provides functions needed by users
6	Presentation	– Converts different representations
5	Session	– Manages task dialogs (multiple messages)
4	Transport	– Provides host-to-host delivery of message
3	Network	– Routes datagrams over multiple hops
2	Data link	– Sends frames of information over single hop
1	Physical	– Sends bits as signals over physical media

TCP/IP Reference Model

A four layer model derived from experimentation; omits some OSI lavers and uses the IP as the network layer.

Application	HTTP	SMTP	RTP	DNS
Transport	TCP		UDP	
Internet	IP		ICMP	
Link	DSL	SONET	802.11	Ethernet

IP is the "narrow waist" of the Internet

Protocols are shown in their respective layers

Summary

- What is computer network?

- Types of networks
  - Wired and wireless
  - Local Area Network
  - Wide Area Network
  - Internetworks (Intranet and Internet)

- Network Protocols and Layers

- Network Reference Models
  - OSI Reference Model
  - TCP/IP Reference Model

Next

Physical Layer

- Wired Transmission
- Wireless Transmission
- Communication Satellites
- Public Switched Telephone Network
- Cable Networks