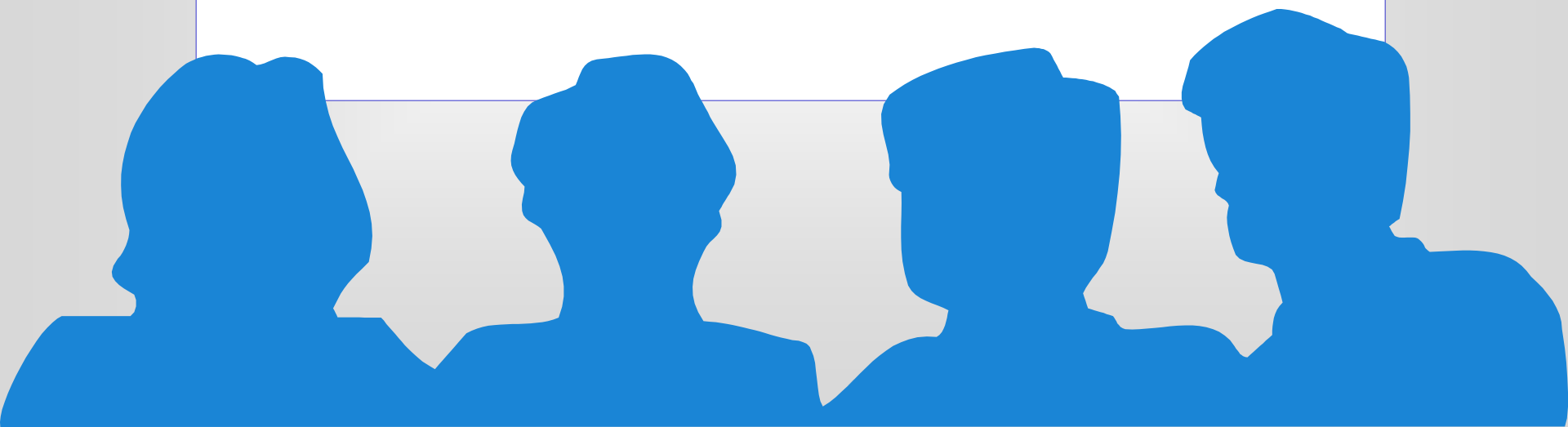
LESSON 17

Networking Basics

This lesson includes the following sections:

- The Uses of a Network
- How Networks are Structured
- Network Topologies for LANs (Local Area Networks)
- Network Media and Hardware
- Network Software



The Uses of a Network

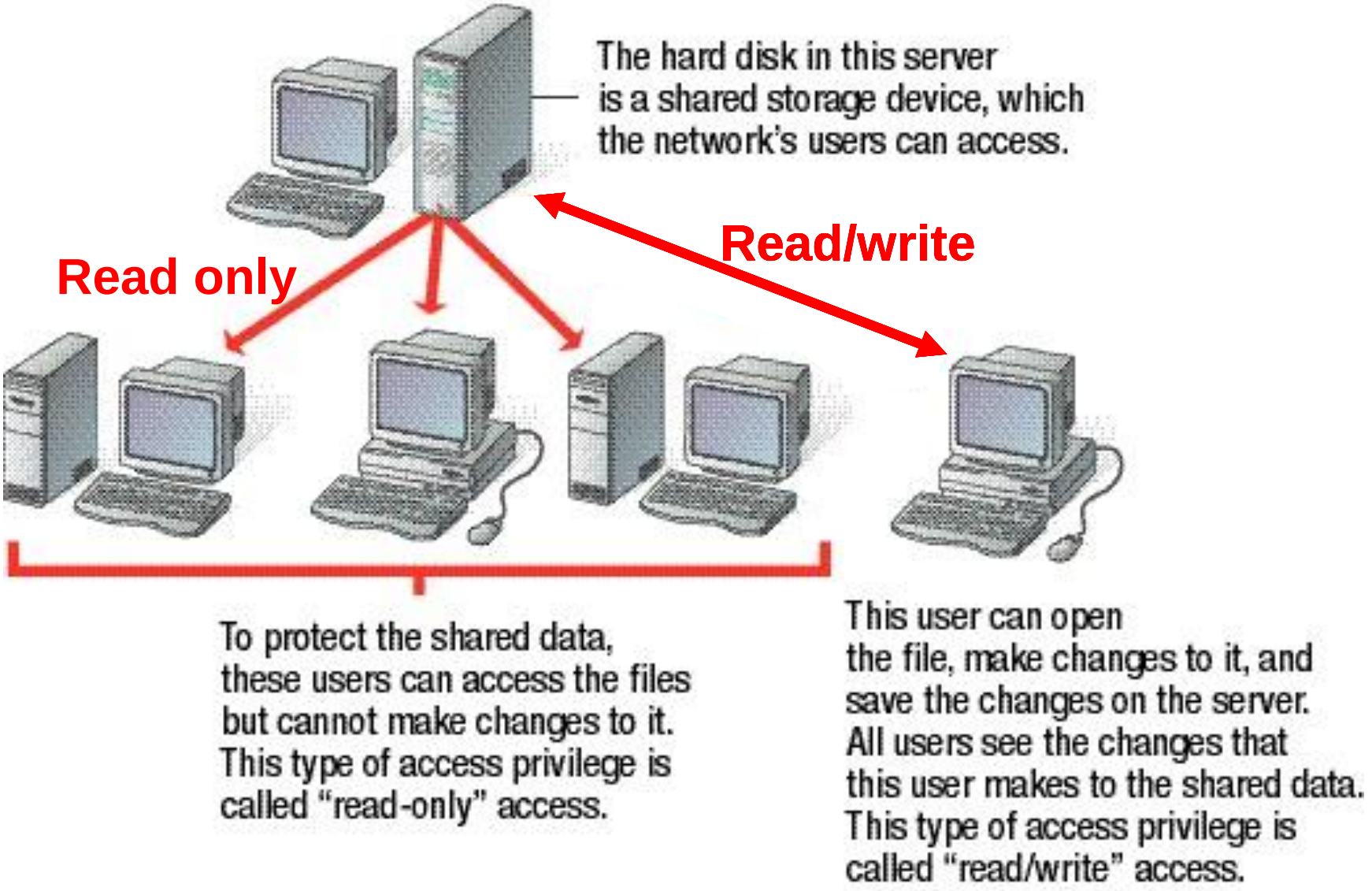
A network connects computers so they can communicate, exchange information, and share resources.

The main benefits of using a network are:

- **Simultaneous Access**
- **Shared Peripheral Devices**
- **Personal Communication**
- **Easier Backup**

The Uses of a Network - Simultaneous Access

- In organizations, many people may need to use the same data or programs. A network solves this problem.
- Shared data and programs can be stored on a central network server. A server that stores data files may be called a file server.
- Managers may assign access rights to users. Some users may only be able to read data, others may be able to make changes to existing files.


The hard disk in this server is a shared storage device, which the network's users can access.
Read only
Read/write
To protect the shared data, these users can access the files but cannot make changes to it. This type of access privilege is called "read-only" access.
This user can open the file, make changes to it, and save the changes on the server. All users see the changes that this user makes to the shared data. This type of access privilege is called "read/write" access.

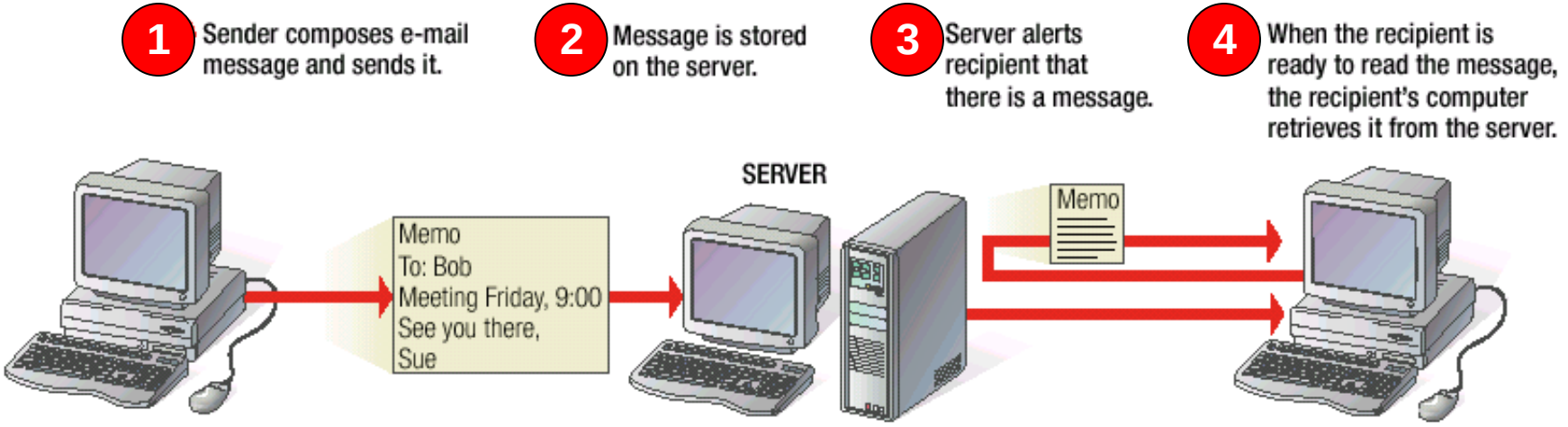
The Uses of a Network - Shared Peripheral Devices

- Because peripheral (external) devices like printers can be expensive, it is cost-effective to connect a device to a network so users can share it.

- Through a process called spooling, users can send multiple documents (called print jobs) to a networked printer at the same time. The documents are temporarily stored on the server and printed in turn.

The Uses of a Network - Personal Communication

- One of the most common uses of networks is for electronic mail (e-mail).
- An e-mail system enables users to exchange written messages (often with data files attached) across the local network or over the Internet.
- Two other popular network-based communications systems are teleconferencing and videoconferencing.


1
Sender composes e-mail message and sends it.
2
Message is stored on the server.
3
Server alerts recipient that there is a message.
4
When the recipient is ready to read the message, the recipient's computer retrieves it from the server.
SERVER
Memo
To: Bob
Meeting Friday, 9:00
See you there,
Sue
Memo

The Uses of a Network - Easier Backup

- **Networks enable managers to easily back up (make backup copies of) important data.**

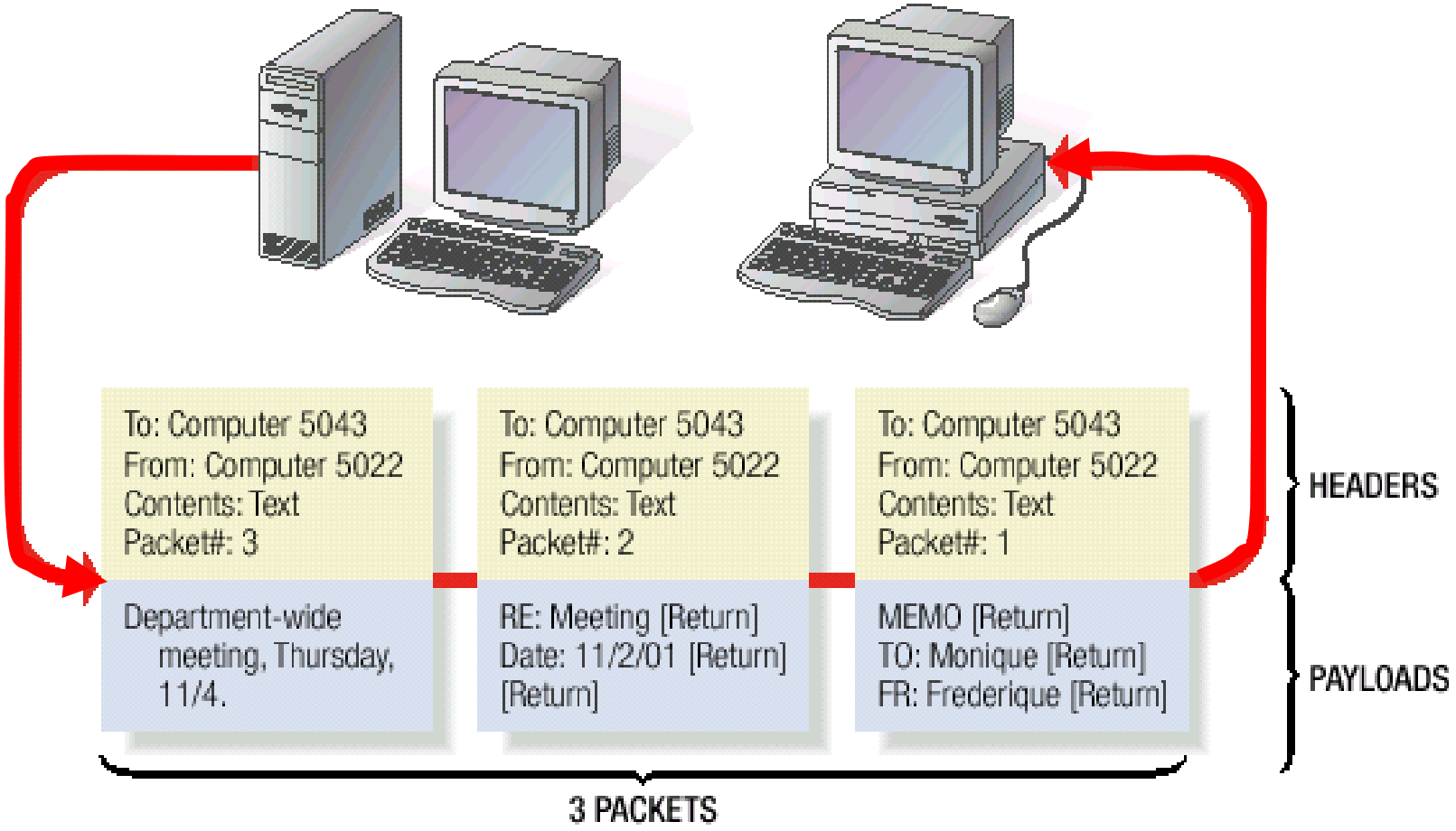
- **Administrators commonly back up shared data files stored on the server, but may also use the network to back up files on users' PCs.**

How Networks are Structured

- Local Area Networks (LANs)
- Wide Area Networks (WANs)
- Server-Based Networks
- Client/Server Networks
- Peer-to-Peer Networks

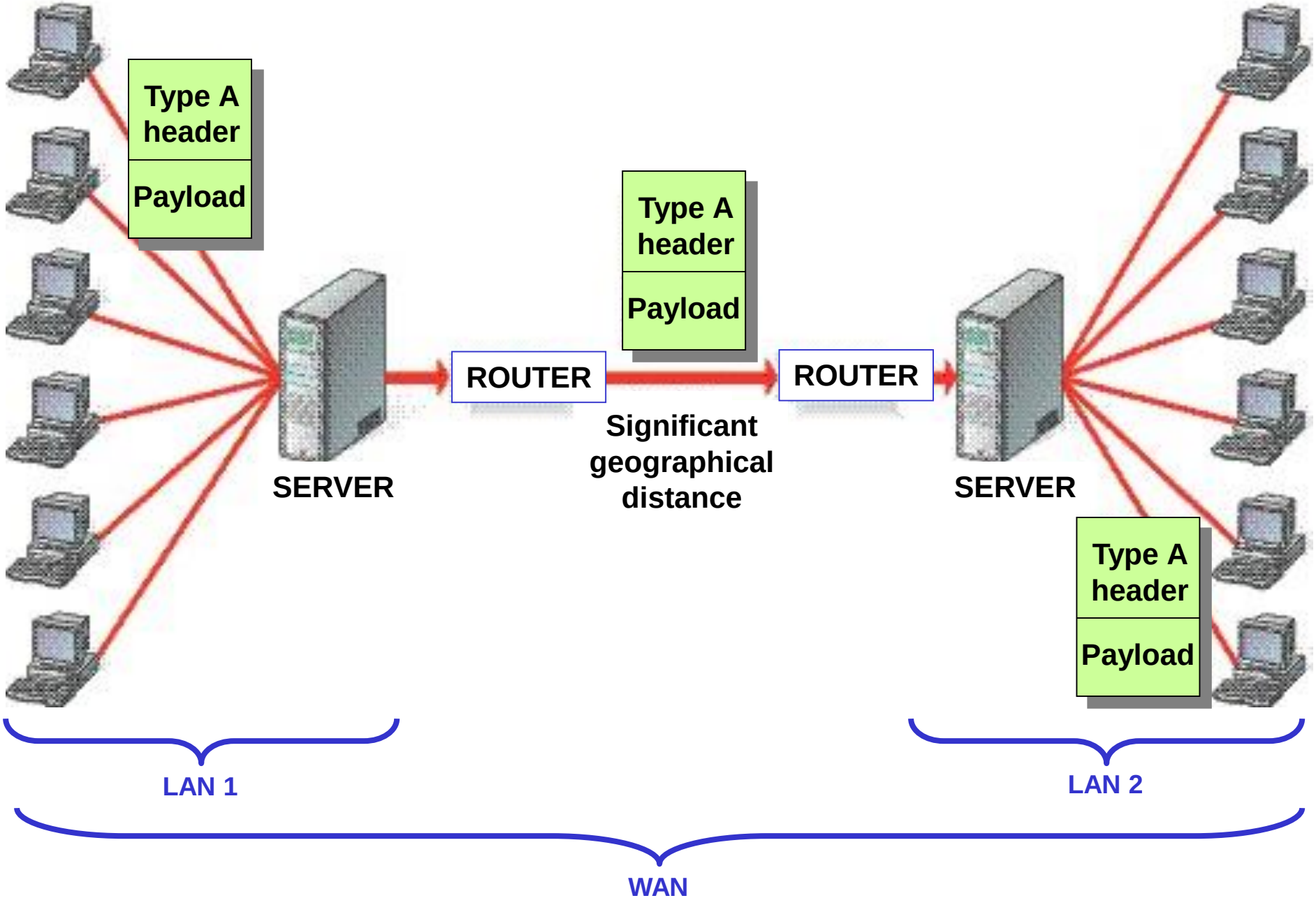
How Networks are Structured – Local Area Networks (LANs)

- **A LAN is a network whose computers are located relatively near one another. The nodes may be connected by a cable, infrared link, or small transmitters.**
- **A network transmits data among computers by breaking it into small pieces, called packets.**
- **Every LAN uses a protocol – a set of rules that governs how packets are configured and transmitted.**


To: Computer 5043
From: Computer 5022
Contents: Text
Packet#: 3
Department-wide meeting, Thursday, 11/4.
To: Computer 5043
From: Computer 5022
Contents: Text
Packet#: 2
RE: Meeting [Return]
Date: 11/2/01 [Return]
[Return]
To: Computer 5043
From: Computer 5022
Contents: Text
Packet#: 1
MEMO [Return]
TO: Monique [Return]
FR: Frederique [Return]
HEADERS
PAYLOADS
3 PACKETS

How Networks are Structured – Wide Area Networks (WANs)

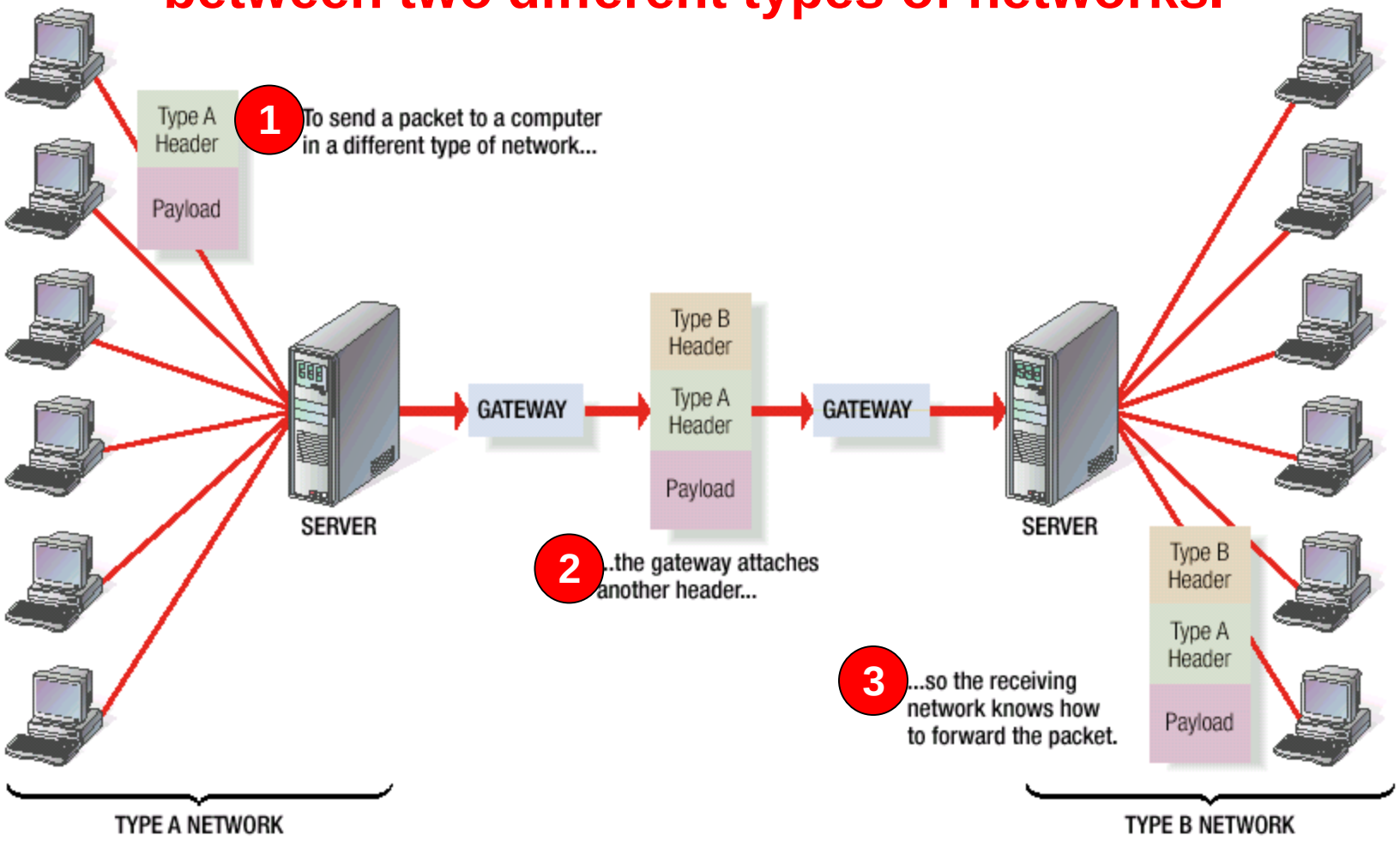
- **Multiple LANs can be connected together using devices such as bridges, routers, or gateways, which enable them to share data.**
- **A WAN is two or more LANs connected together. The LANs can be many miles apart.**
- **To cover great distances, WANs may transmit data over leased high-speed phone lines or wireless links such as satellites.**


Type A header
Payload
SERVER
ROUTER
Type A header
Payload
Significant geographical distance
ROUTER
SERVER
Type A header
Payload
LAN 1
LAN 2
WAN

How Networks are Structured – Server-Based Networks

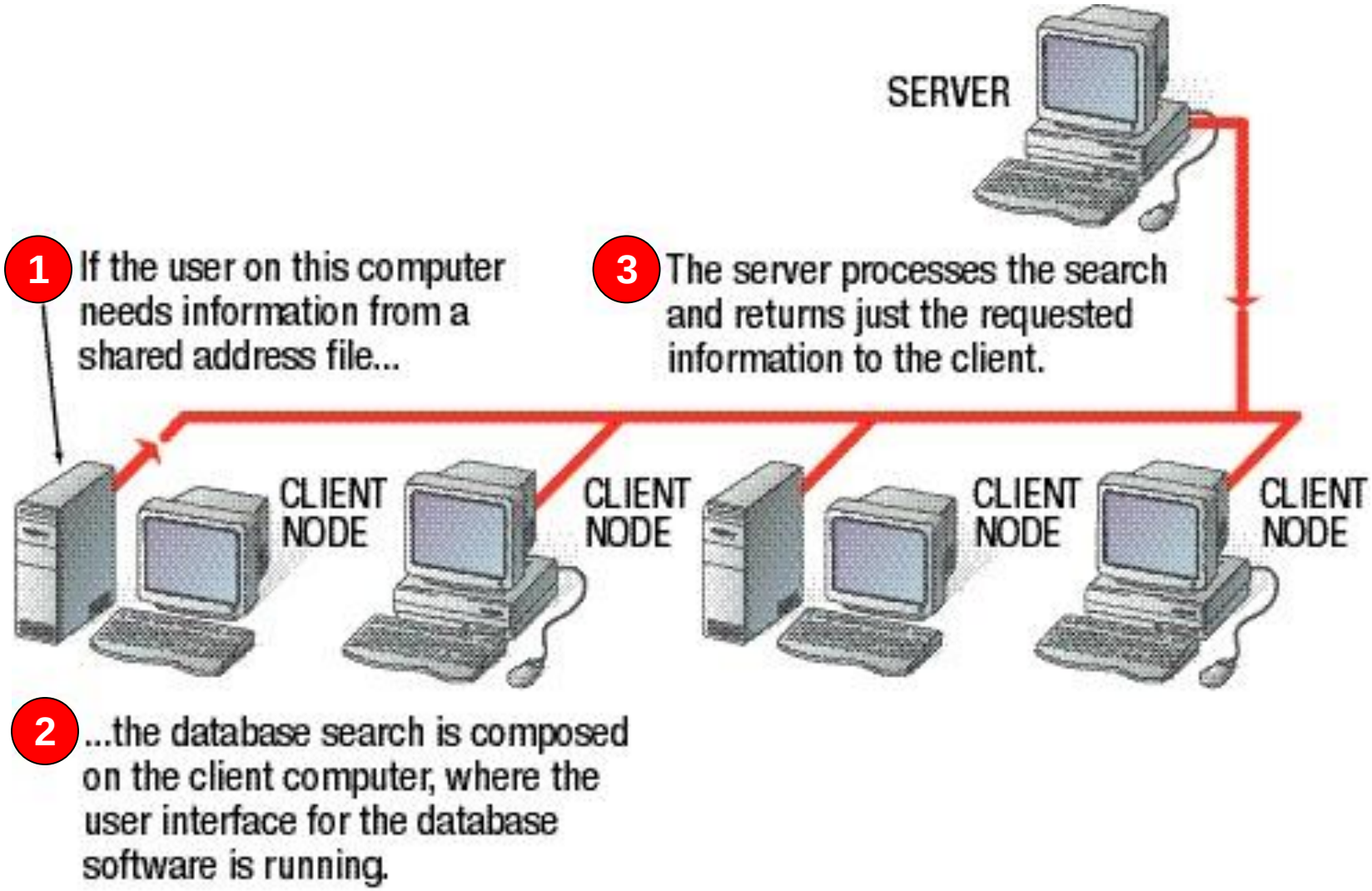
- In addition to the individual users' PCs (nodes), many networks use a central computer, called a server.
- A server has a large hard disk for shared storage. It may provide other services to the nodes, as well.
- In a file server network, nodes can access files on the server, but not necessarily on other nodes.

A gateway performs the translation between two different types of networks.



How Networks are Structured – Client/Server Networks

- In client/server computing, individual nodes share the processing and storage workload with the server.
- Client/server networks require specialized software that enables nodes and the server to collaborate on processing and storage, but no special type of network hardware.


SERVER
1
If the user on this computer needs information from a shared address file...
3
The server processes the search and returns just the requested information to the client.
CLIENT NODE
CLIENT NODE
CLIENT NODE
CLIENT NODE
2
...the database search is composed on the client computer, where the user interface for the database software is running.

How Networks are Structured – Peer-to-Peer Networks

- In a peer-to-peer network, all nodes have an equal relation to one another.
- Each node usually has access to some resources on other nodes, so users can share files, programs, or devices on other users' systems.
- Some peer-to-peer networks use a server, but some do not.

Network Topologies for LANs

A network's topology is the layout of the cables and devices that connect the nodes. The four most common network topologies are:

- **Bus.** **Each node is connected in series along a single conduit.**
- **Star.** **All nodes are connected to a central hub.**
- **Ring.** **Nodes are connected in a circular chain, with the conduit beginning and ending at the same computer.**
- **Mesh.** **Each node has a separate connection to every other node.**

Network Media and Hardware

- In a network, the media are the wires, cables and other means by which data travels from its source to its destination.
- The most common network media are twisted-pair cable, coaxial cable, fiber-optic cable, and wireless links.
- Each node uses a special device, called a network interface card (NIC). The card connects to the network media and controls the flow of data.
- NICs must use a common network technology to communicate. The most popular network technologies for LANs are Ethernet, Fast Ethernet, and Token Ring.

Network Software

A network operating system (NOS) is the group of programs that manages the resources on a network.

Common network operating systems for PC-based networks include:

- **Novell NetWare**
- **Microsoft Windows NT Server**
- **Microsoft Windows 2000**
- **Banyan VINES**
- **AppleShare**
- **Linux**