

# **DISTRIBUTED SYSTEMS**

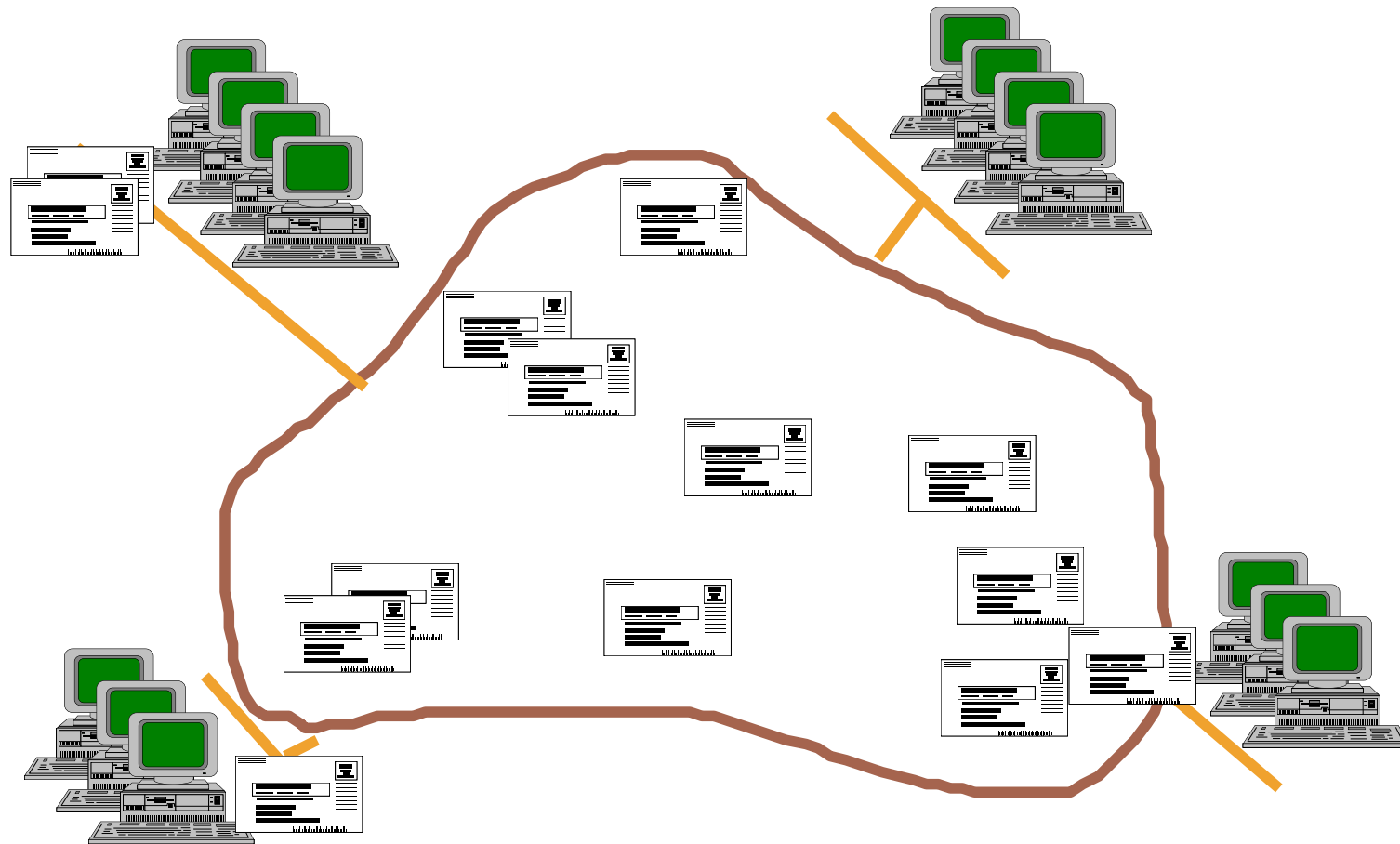
# Some terminology

- A **program** is the code you type in
- A **process** is what you get when you run it
- A **message** is used to communicate between processes.
- A **packet** is a fragment of a message that might travel on the wire.
  - Variable size
  - Limited size
- A **protocol** is an algorithm by which processes cooperate to do something using message exchanges.

# More terminology

- A **network** is the infrastructure that links the computers, etc.
  - routers
  - communication links
- **Network application**: fetches needed data from servers over the network
- **Distributed system**: multiple processes that cooperate to do something

A network is like a “mostly reliable” post office



# Loss of reliability

- Links can corrupt messages
  - Internet “backbone”
  - Wireless connections, cable modems, ADSL
- Routers can get overloaded
- Solution: retransmission protocols

# Distributed systems vs network applications

- Distributed systems
  - many components
  - often mimic a single, non-distributed process
- Networked application
  - centered around the user or computer where it runs

# What about the Web?

- Browser is independent
- REST: Web servers don't keep track of clients.
  - Cookies
  - Database of account info
- Two network applications that talk to each other

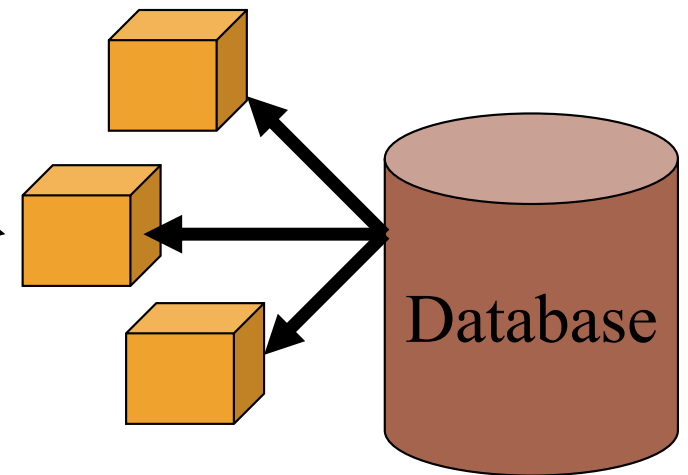
# What about the Web?

Cookie identifies this  
user, encodes past  
preferences



Web browser with  
stashed cookies

HTTP request



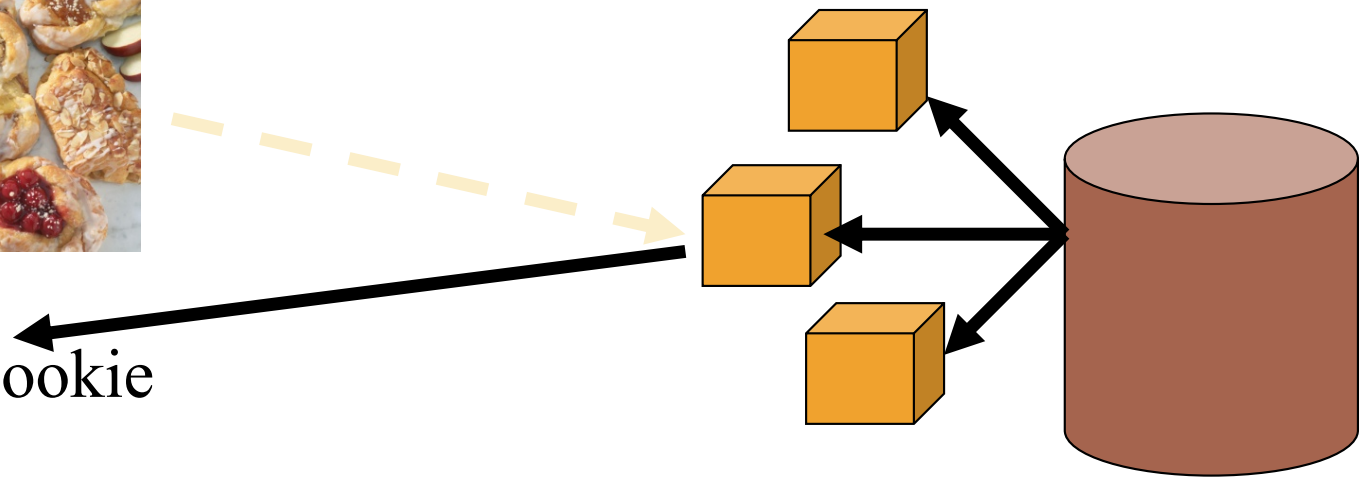


# What about the Web?



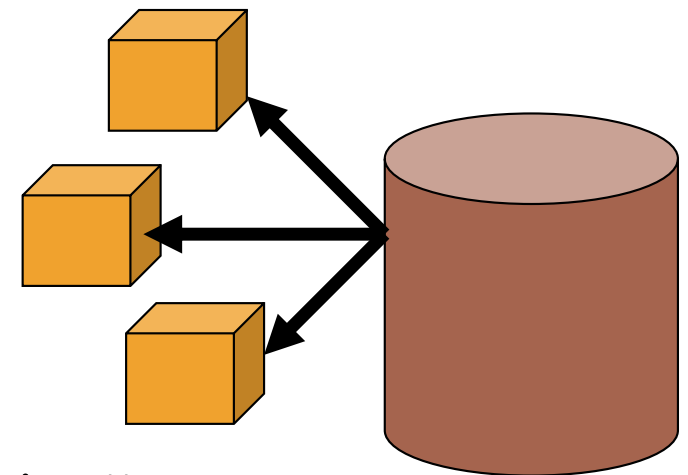
Reply updates cookie

Web servers immediately forget the interaction



# What about the Web?

Web servers have no  
memory of the interaction



Purchase is a “transaction”  
on the database

# What about the Cloud?

- Data center or cloud is a complex distributed system
  - Many servers
  - Routing clients to servers
  - Data replicated
    - load balancing
    - high availability
  - Complex security and administration policies
- **“Network application”** talking to a **“distributed system”**

# NETWORKS