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# CSCI 165

## Introduction to the Internet and the World Wide Web

### Lecture 1: The Internet



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2024 Spring Semester (S1)

# Overview

- Focus: Course Introduction
- Architecture: Computer Network, WWW
- Core Ideas:
  1. The Internet Architecture

# What is the Internet?

- In the beginning, it was the "Interconnection of Networks"
- A computer network: computers, connected together
  - Exchange information



# Before the Internet



1. IBM Mainframe from 1970s



# Before the Internet

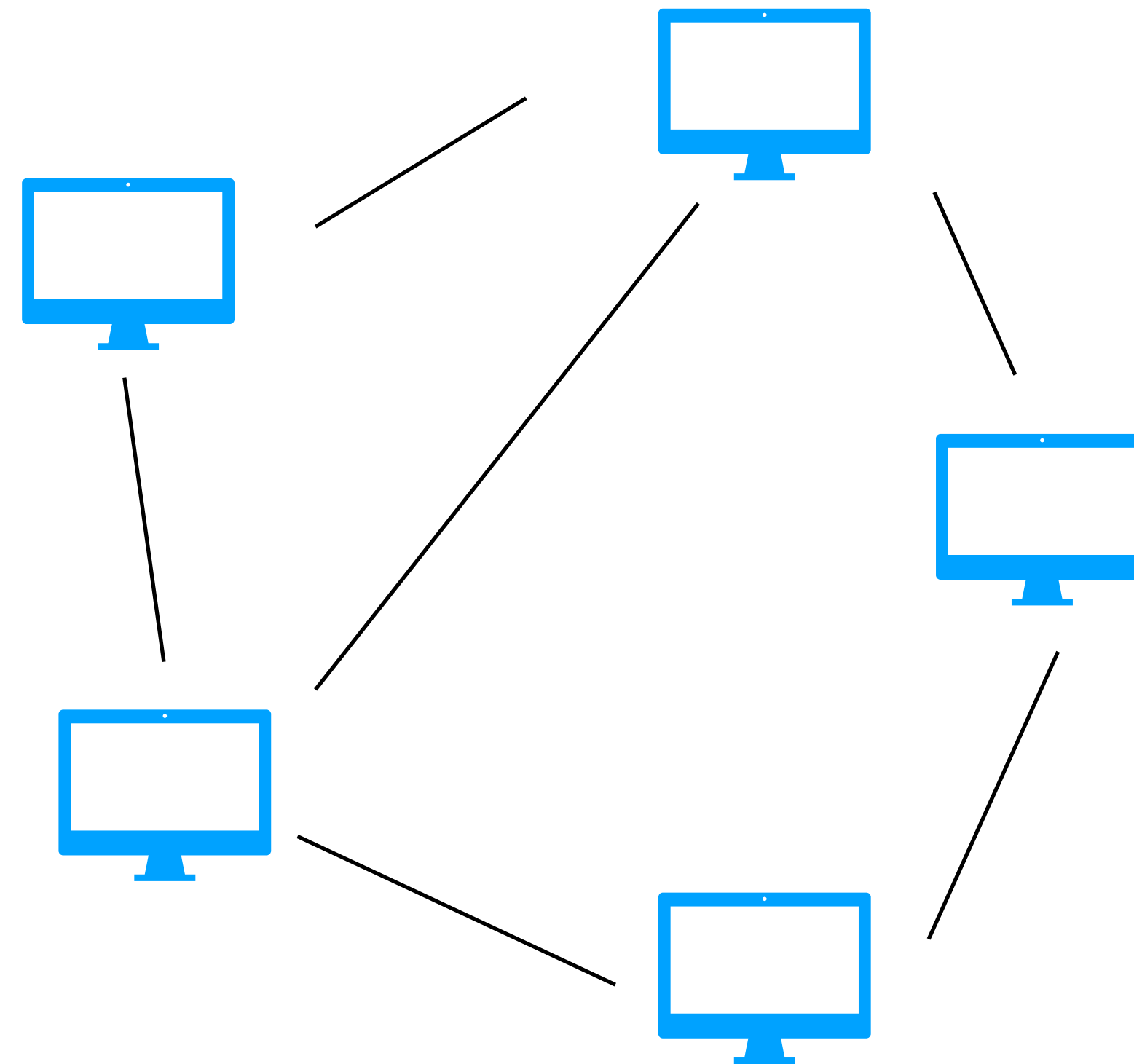
- ARPANET (1969)  
First network to use modern packet switching network
- Internet Protocol (IP) with Transmission Control Protocol (TCP) (1974)  
Still used today

- 1980s: war of telecoms  **AT&T**   **CISCO**  **NORTEL**
- Late 1980s into 1990s: the internet is here!



# The Internet

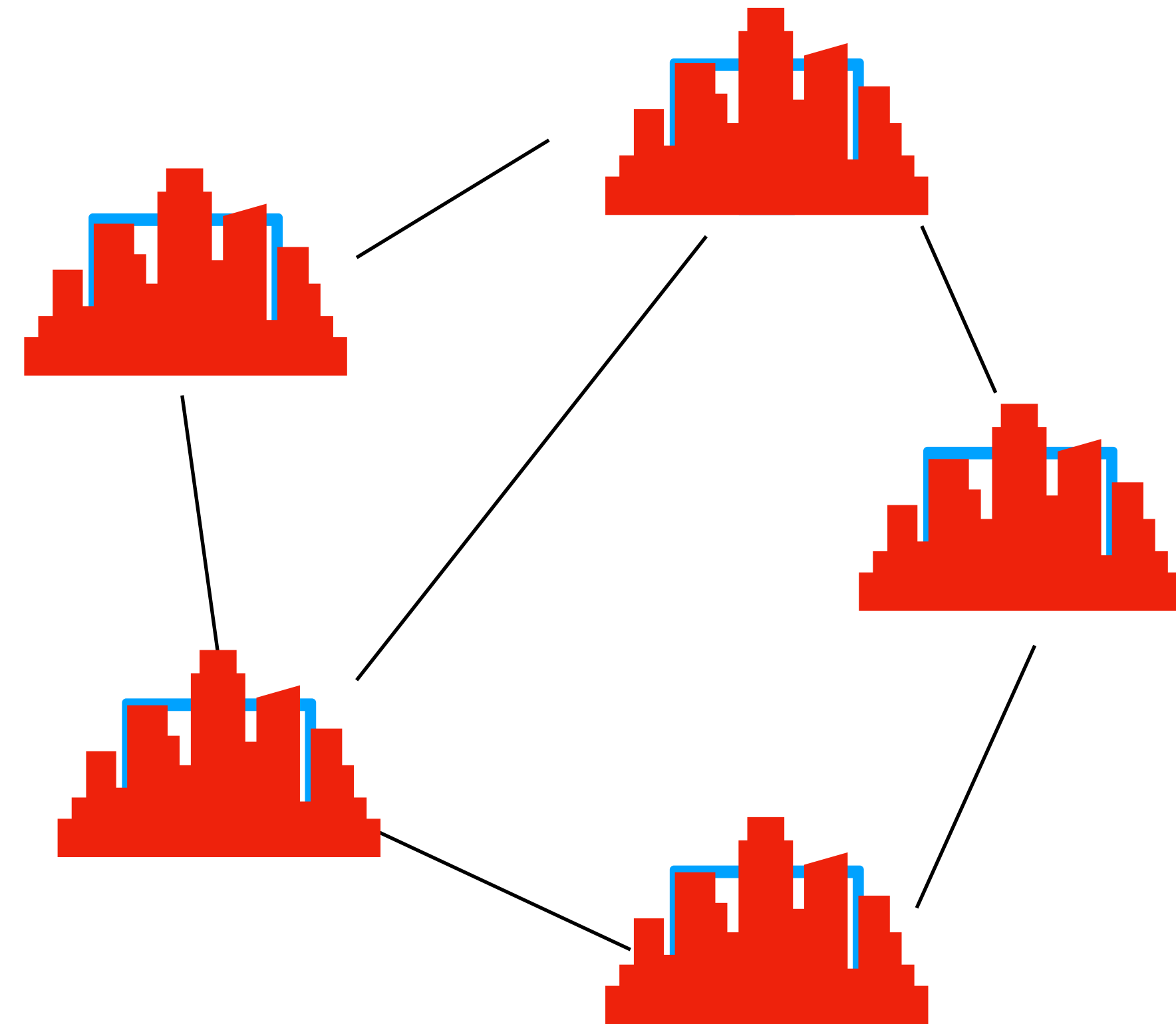
- Computers, but connected
- Decentralised
- If a single point in the network fails, it doesn't affect the rest of the network





# The Internet

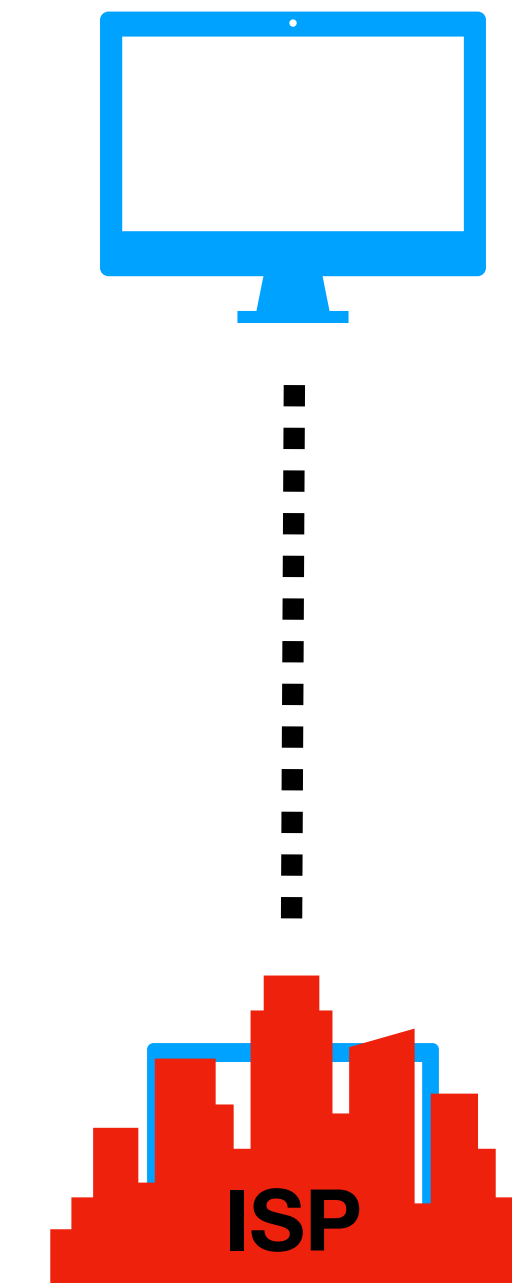
- Computers, but connected
- Decentralised
- If a single point in the network fails, it doesn't affect the rest of the network
- But only at the upper-level





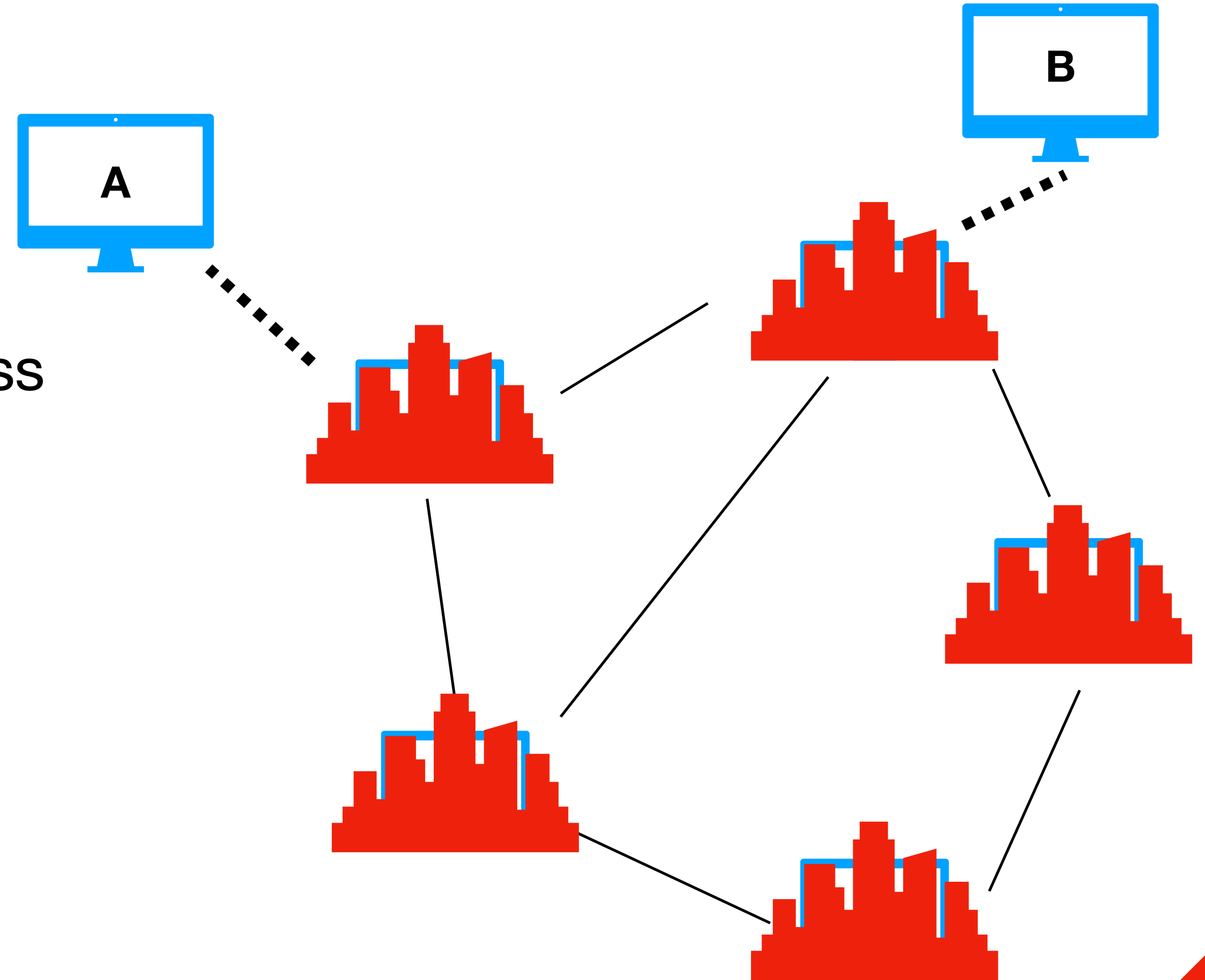
# The Internet

- End users (Ours)
- Uses **Gateways**  
Gateway allows you to connect to an **Internet Service Provider (ISP)**
- e.g. Your traffic flows through CC's network, CC is connected to Vancouver's network grid, which has higher level of **ISPs**



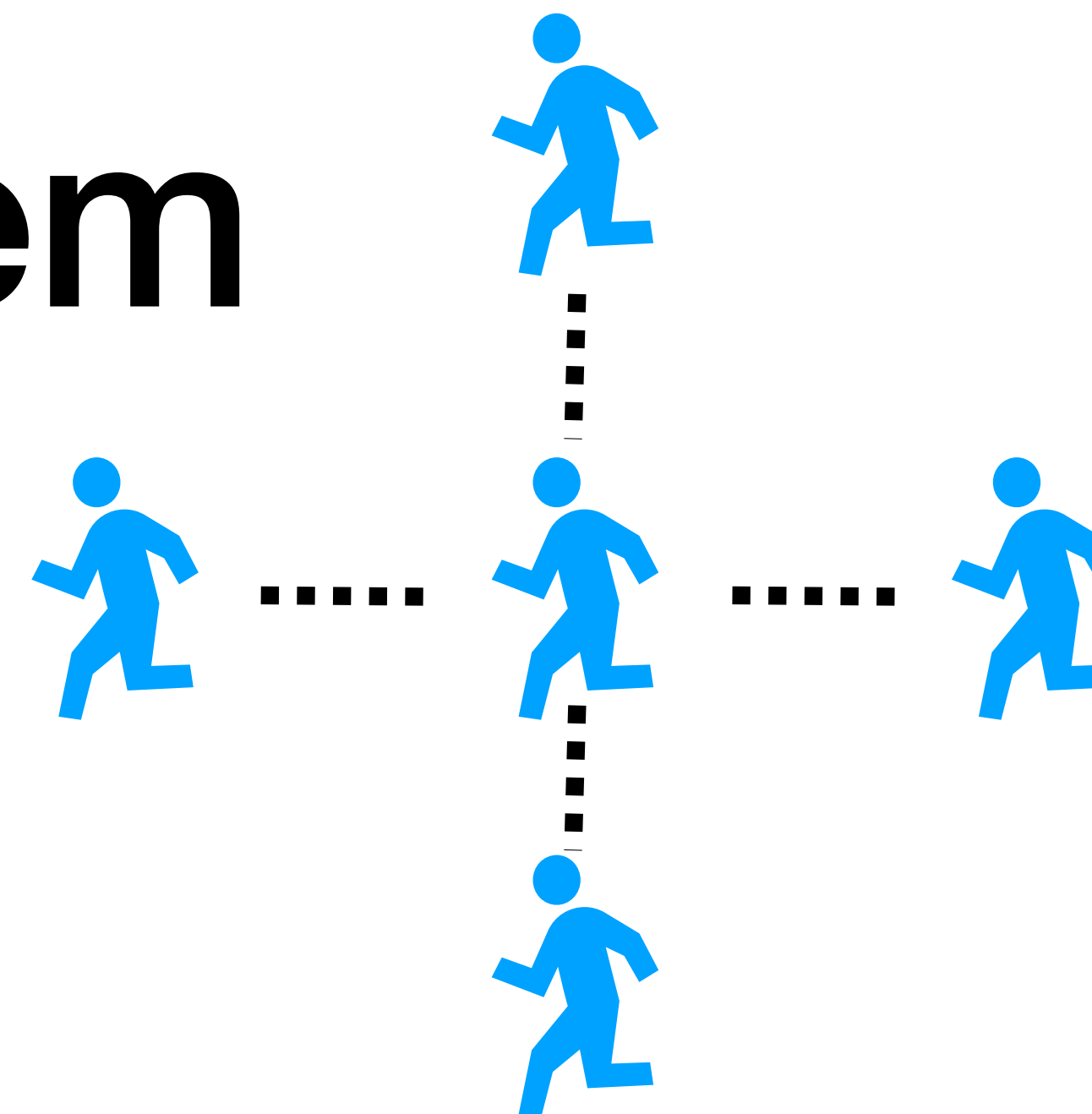
# The Internet

- How do computers know how to pass on information?
- This is called the **Routing** problem
- Exists for network of any sizes (except for maybe 2)





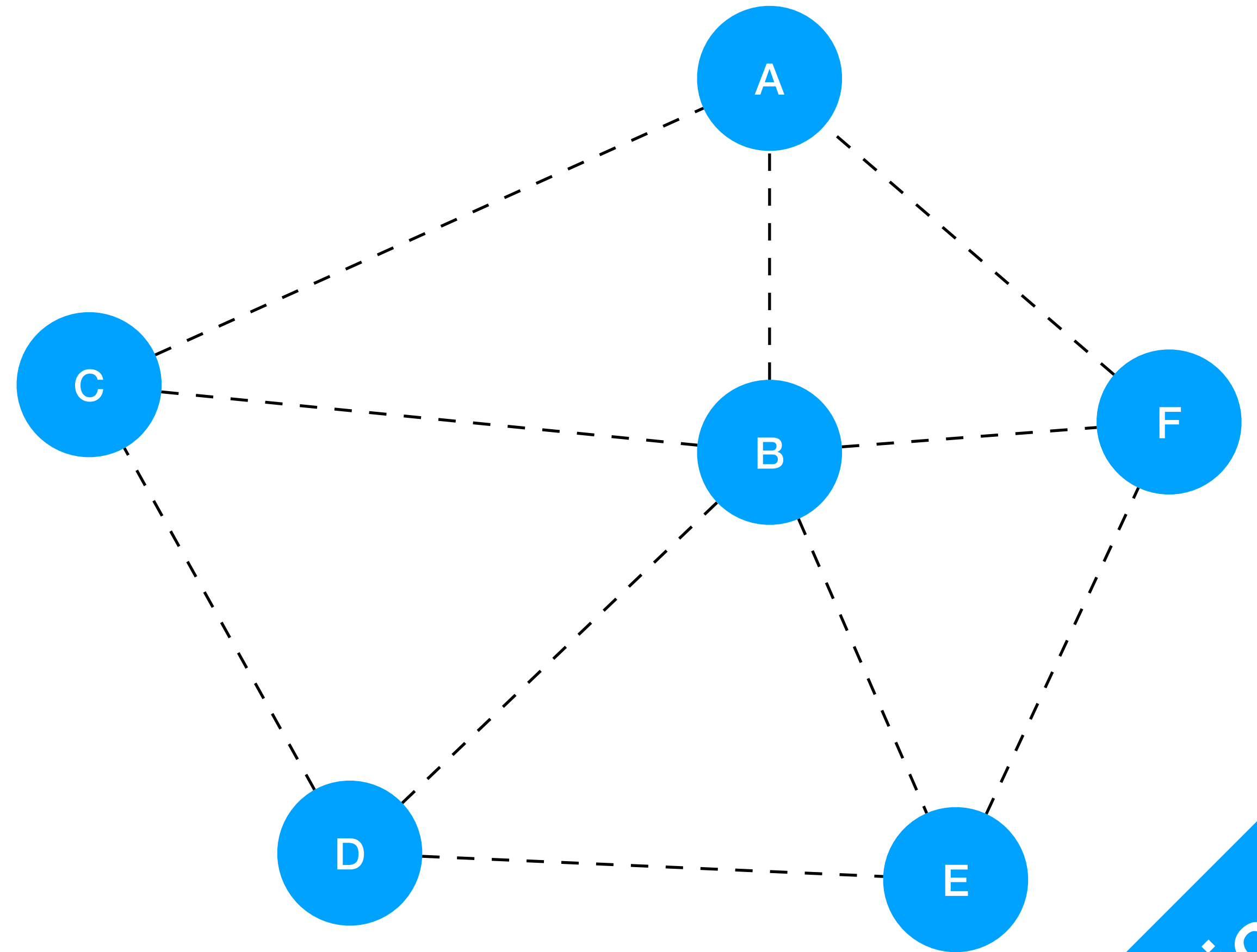
# Routing Problem



- Let's play a game
- You are a computer
- You are connected to the computer sitting next to you, as well as in front and behind you
- You are identified by an IP address, unique in this network
- How can you pass information to an arbitrary IP address in the network?

# Routing Problem

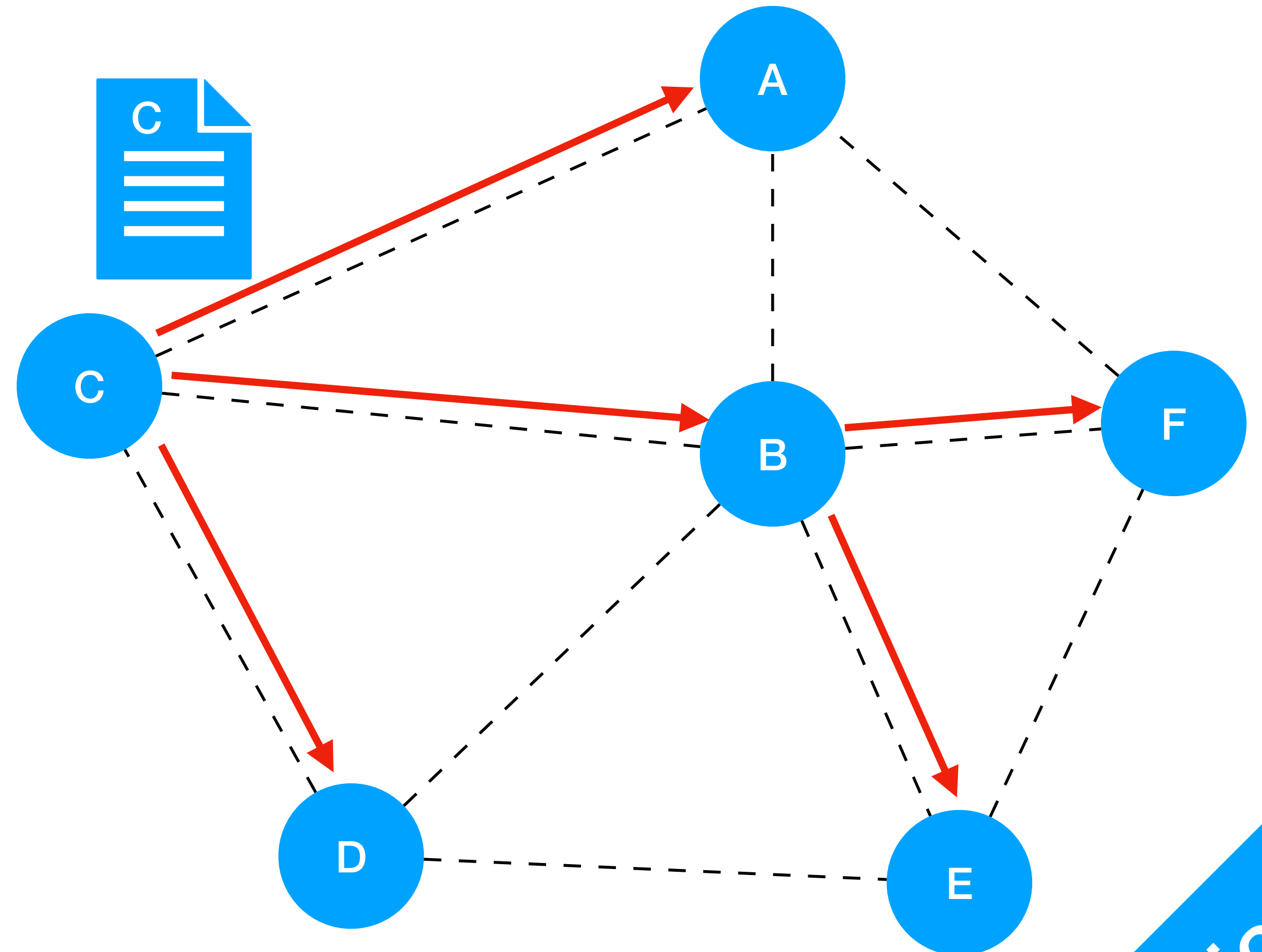
- How to send a packet from C to F?
  - C **knows** which nodes it is connected to (**neighbours**)
  - using A, B, or D and E as **hops**
- Multiple algorithms and protocols exist for different types of networks
  - Static
  - Routing Information Protocol (RIP)
  - Open Shortest Path First (OSPF); etc.





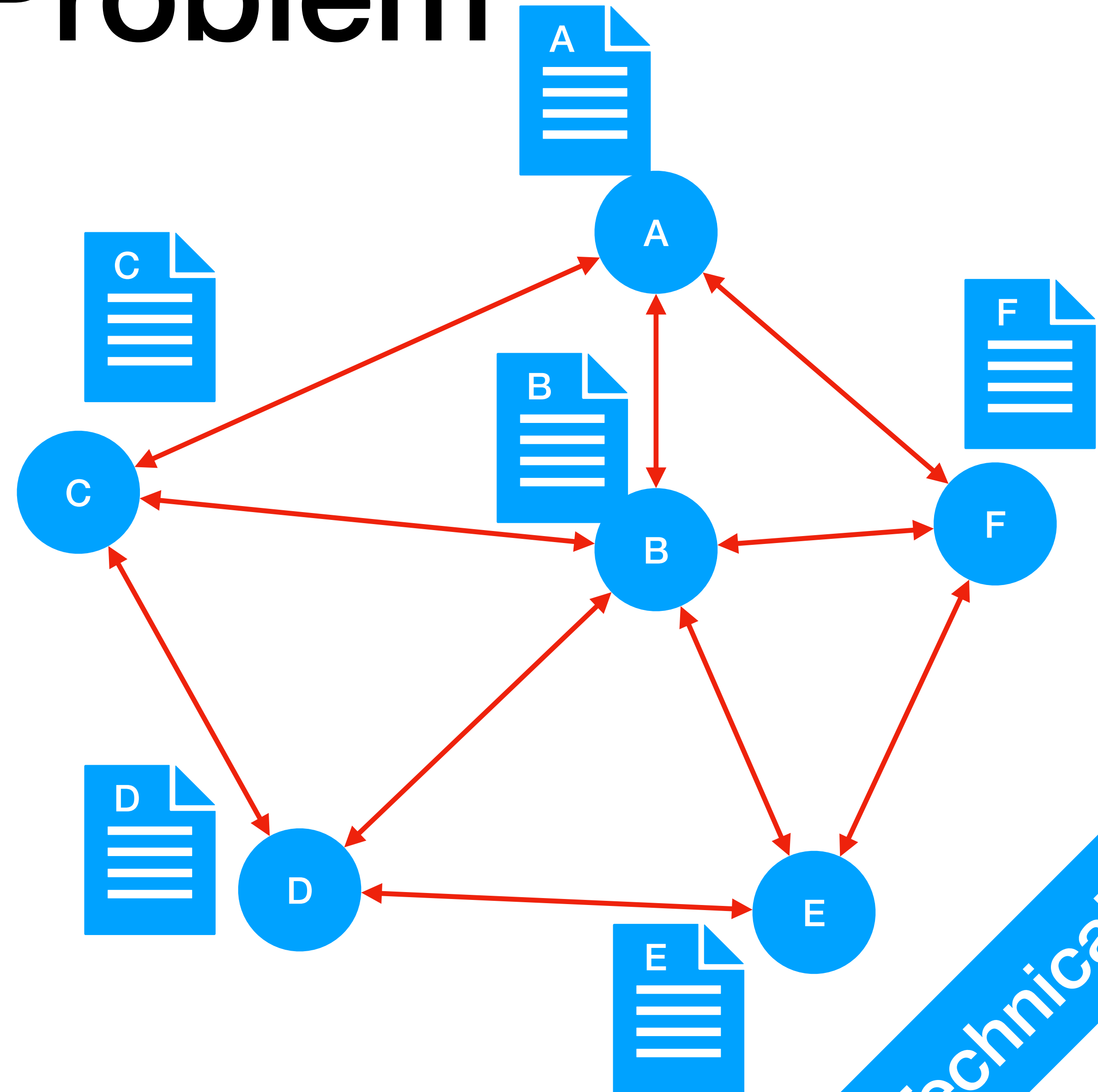
# Routing Problem

- Uses **routing table**
- This is a **possible** routing table for **C**  
Dest A: -> A  
Dest B: -> B  
Dest D: -> D  
Dest F: -> B -> F  
Dest E: -> B -> E
- Static  
Routing table is static (not updated)
- Secure, but not flexible



# Routing Problem

- **Routing Information Protocol (RIP)**  
Entire routing tables are shared between all devices periodically
- Slow, sometimes insecure
- **Open Shortest Path First (OSPF)**  
Most **efficient** route is calculated **every time** based on available routing tables. Routing tables exchanged on request.
- Large overhead



Technical



# IP addresses

- Internet Protocol (IP) address
  - numerical label assigned to each device connected to a network that uses the TCP/IP protocol for communication
- versions
  - IPv4 (most common), 32 bits long,  
e.g. 192.168.0.1
  - IPv6 (gradually expanding), 128 **bits** long,  
e.g. FE80:CD00:0000:0CDE:1257:0000:211E:729C

# Important Concepts

- TCP/IP
- IP address
- Routing Tables