COMPUTER SYSTEMS FUNDAMENTALS
(4COSC004W)

Lecture: Week 12. Part 2

Contact details

- Module Leader:

This week's lecture

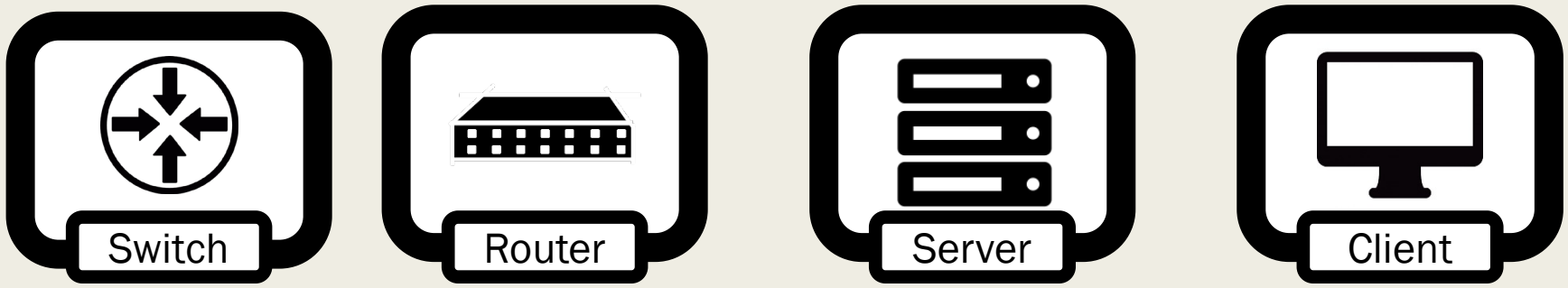
- Network topologies
  - *Physical & Logical*
- Types of network
- Network components
- Network Collisions
  - *Avoidance*
- Network Infrastructure
- IP Addressing
  - *Calculations*
  - *Masking*
  - *Classless & Classful systems*
- Subnetting calculations

NETWORKS

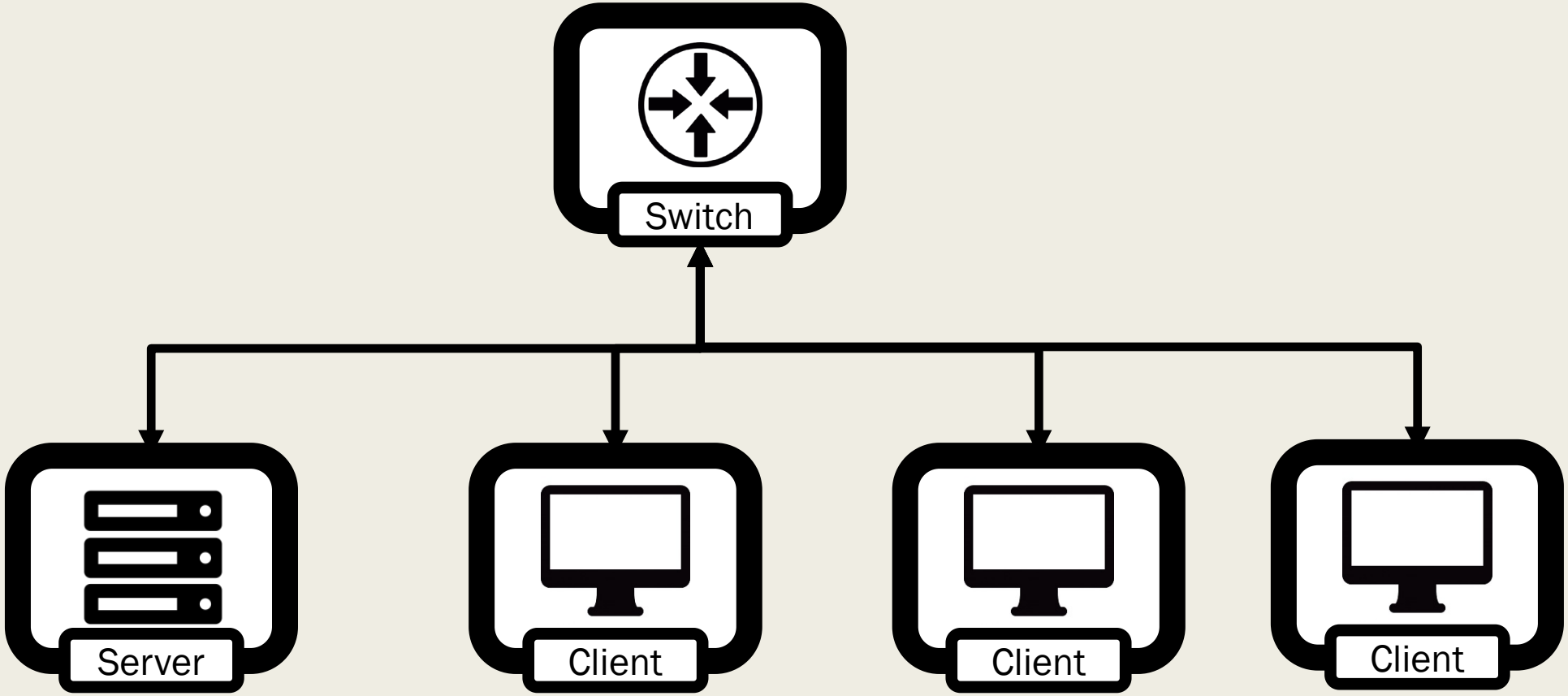
NETWORK COMPONENTS

Actors on the Network

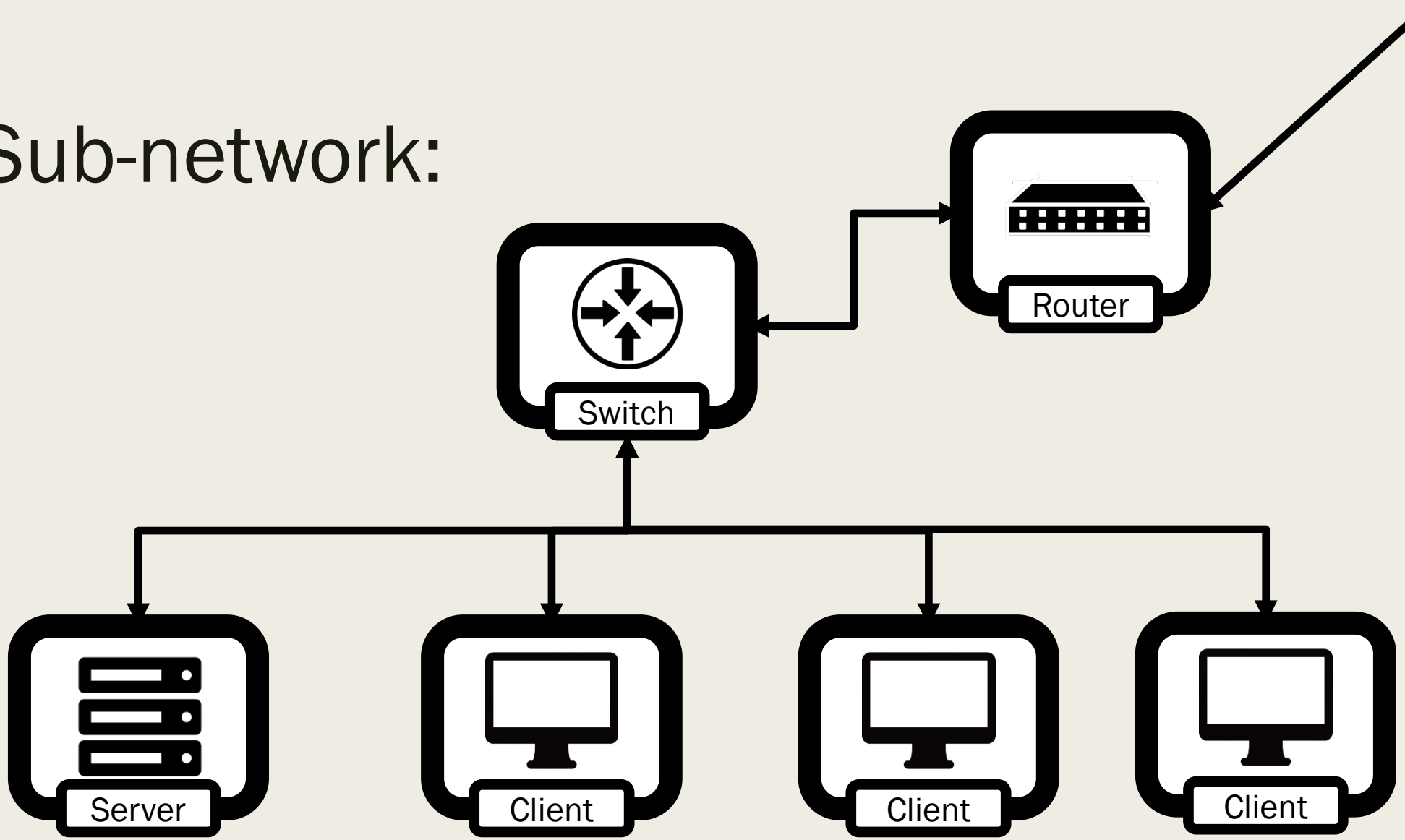
Network components:



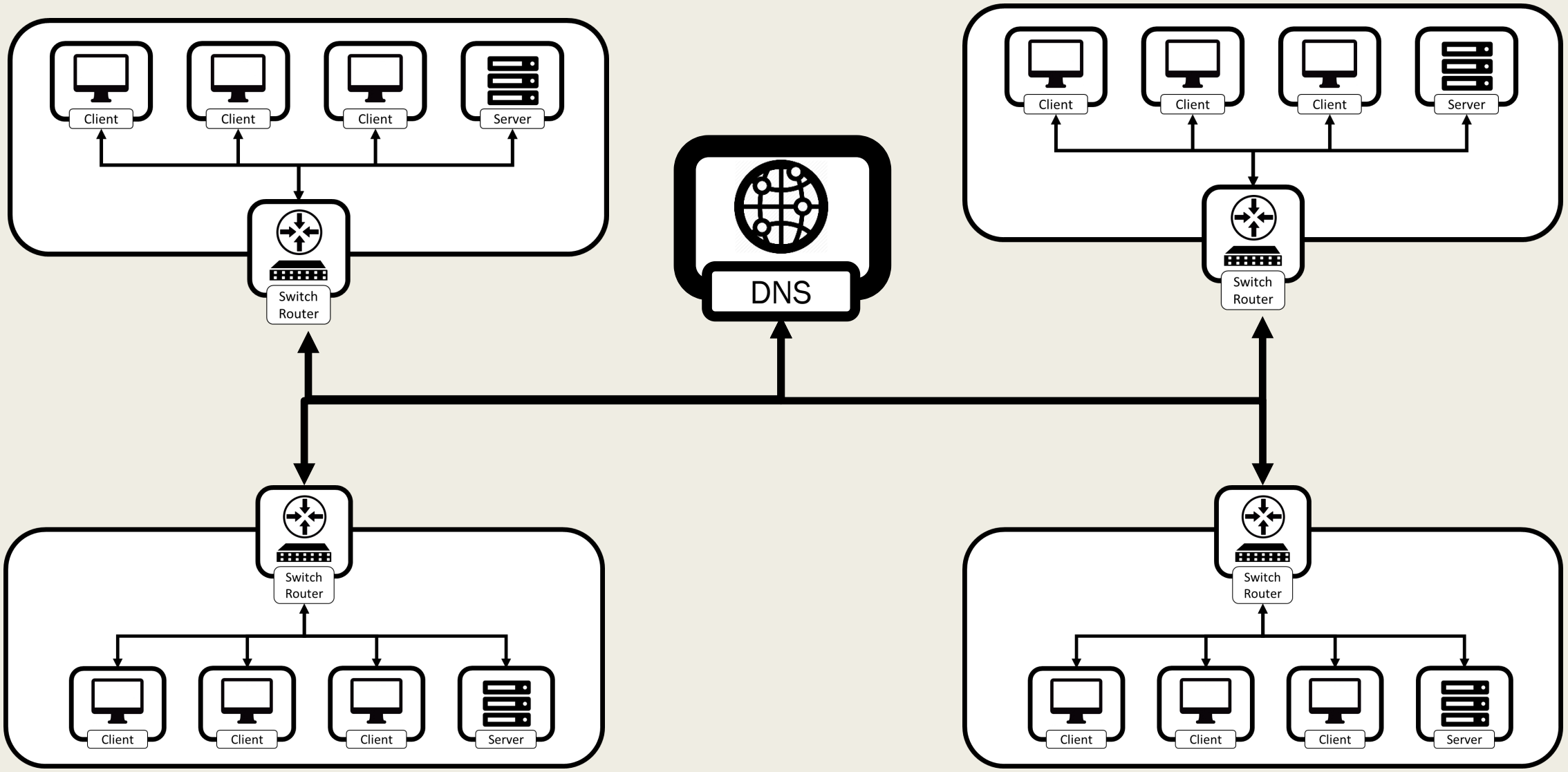
Closed network:



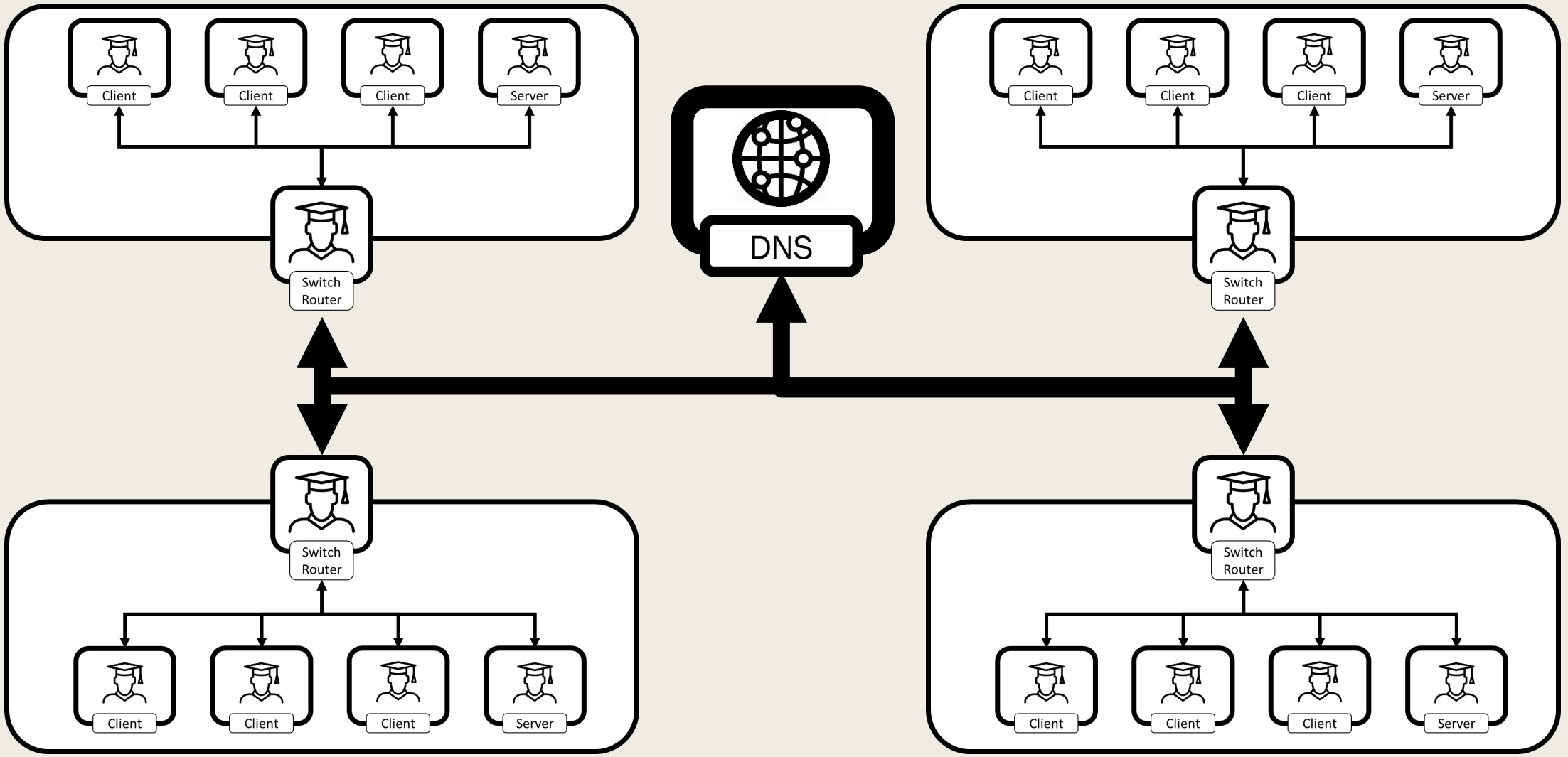
Sub-network:



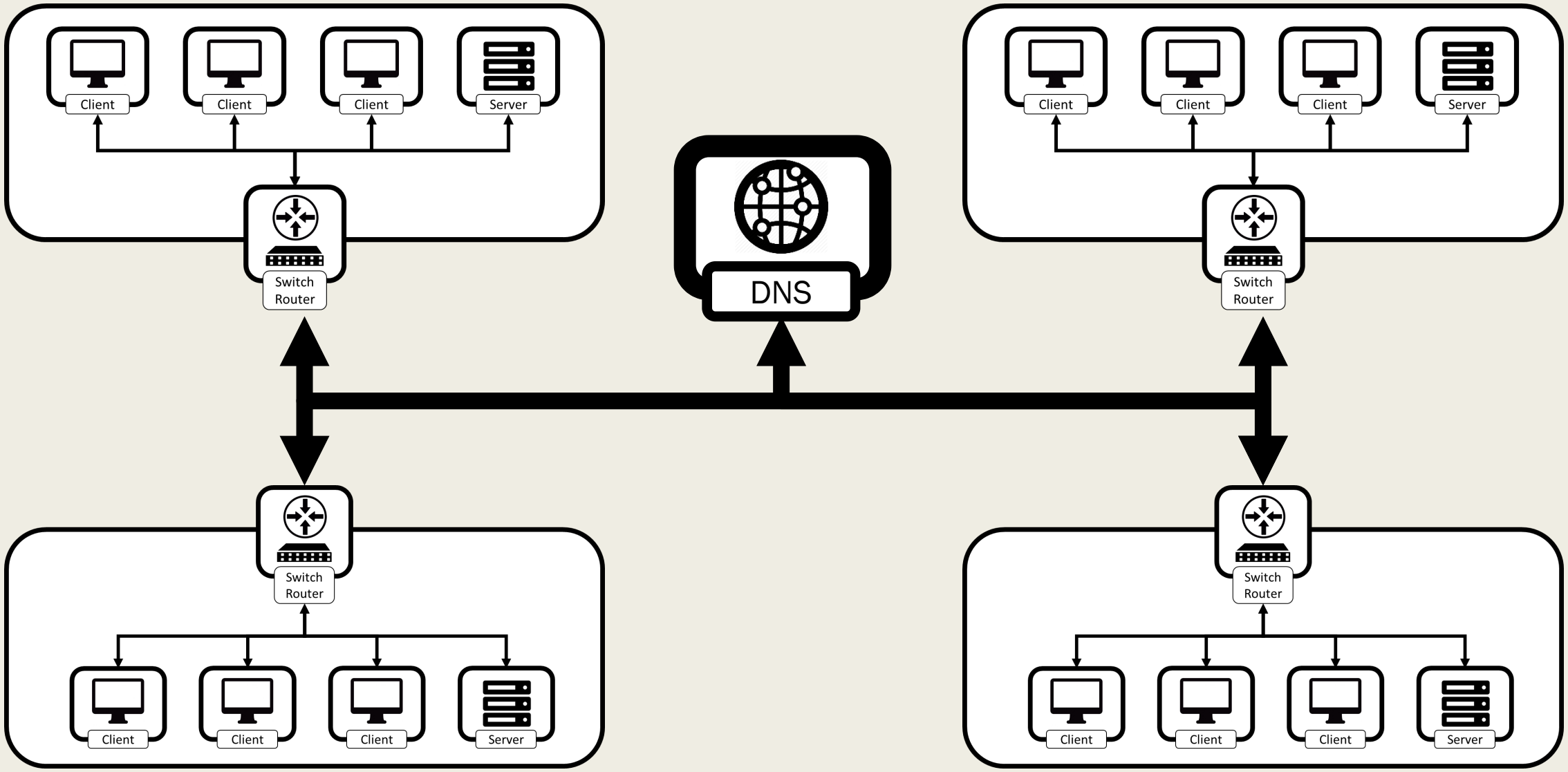
Complete network:



Complete Network – Tutorial



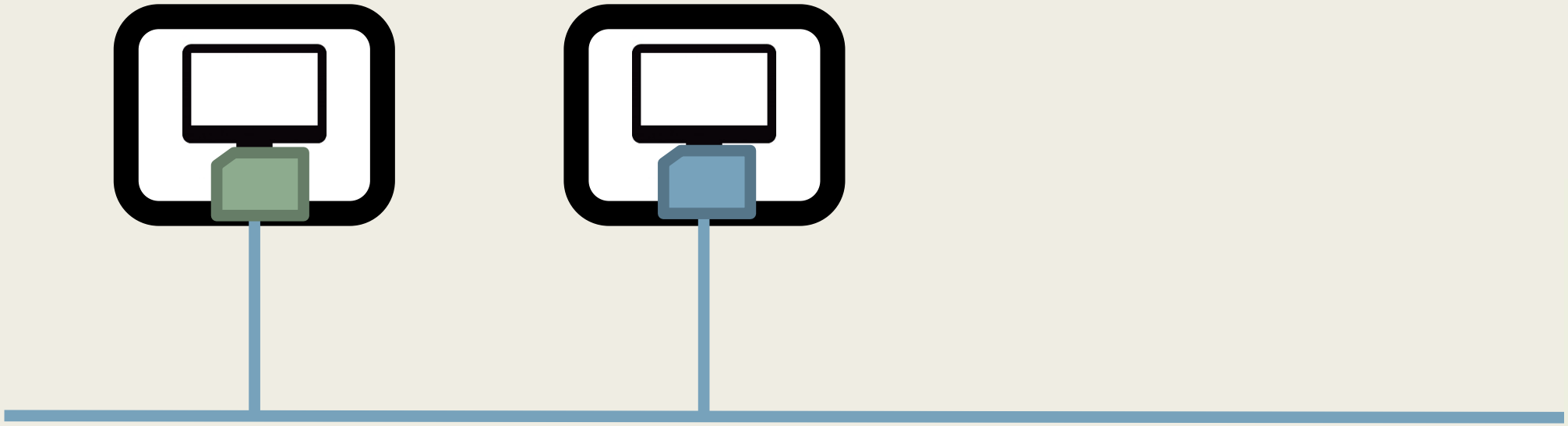
Complete Network – Reality



NETWORK COLLISIONS

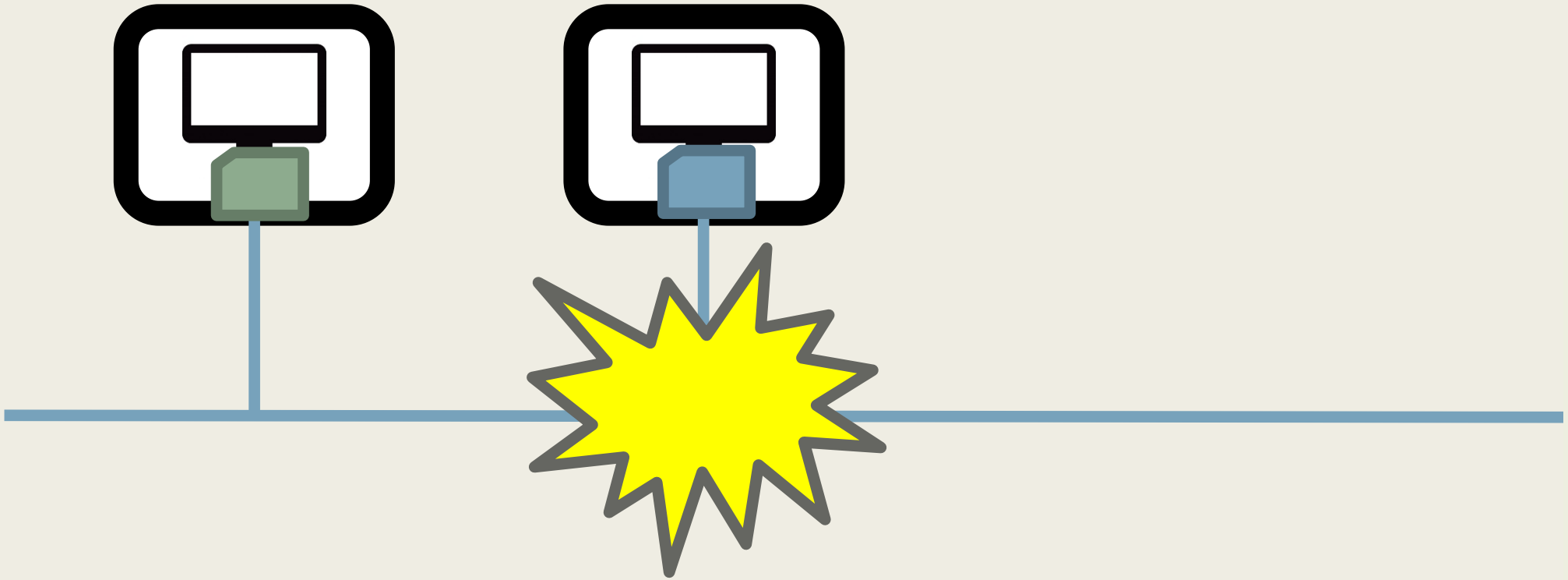
Contention-Based Network Access

Collisions : non-collision scenario



- Occur in Broadcast topologies where nodes use shared media

Collisions : collision scenario

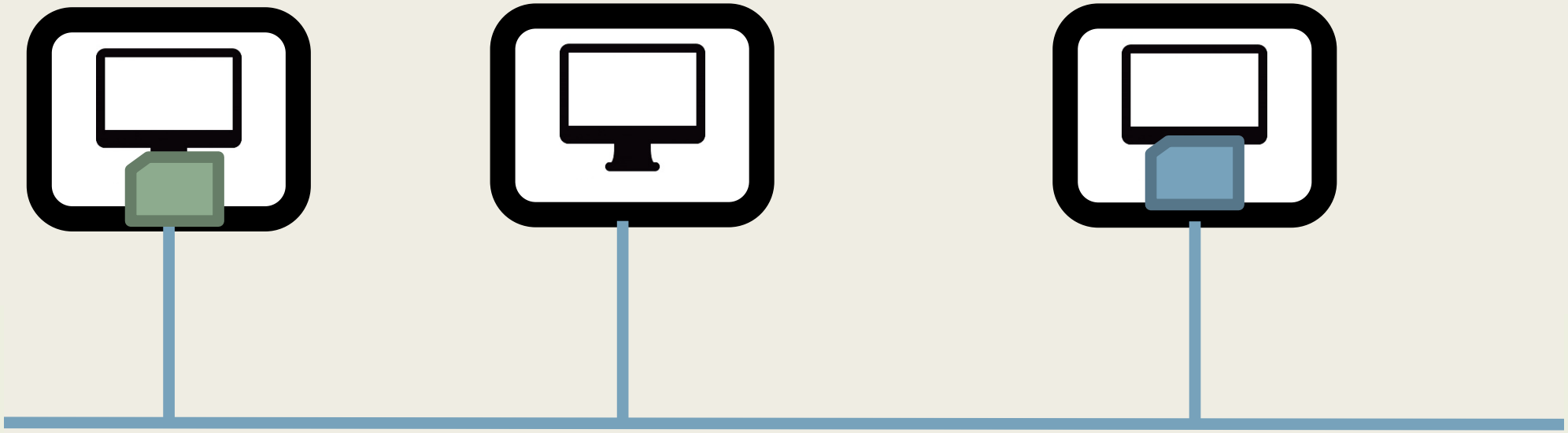


- Occur in Broadcast topologies where nodes use shared media

Contention-Based Network Access

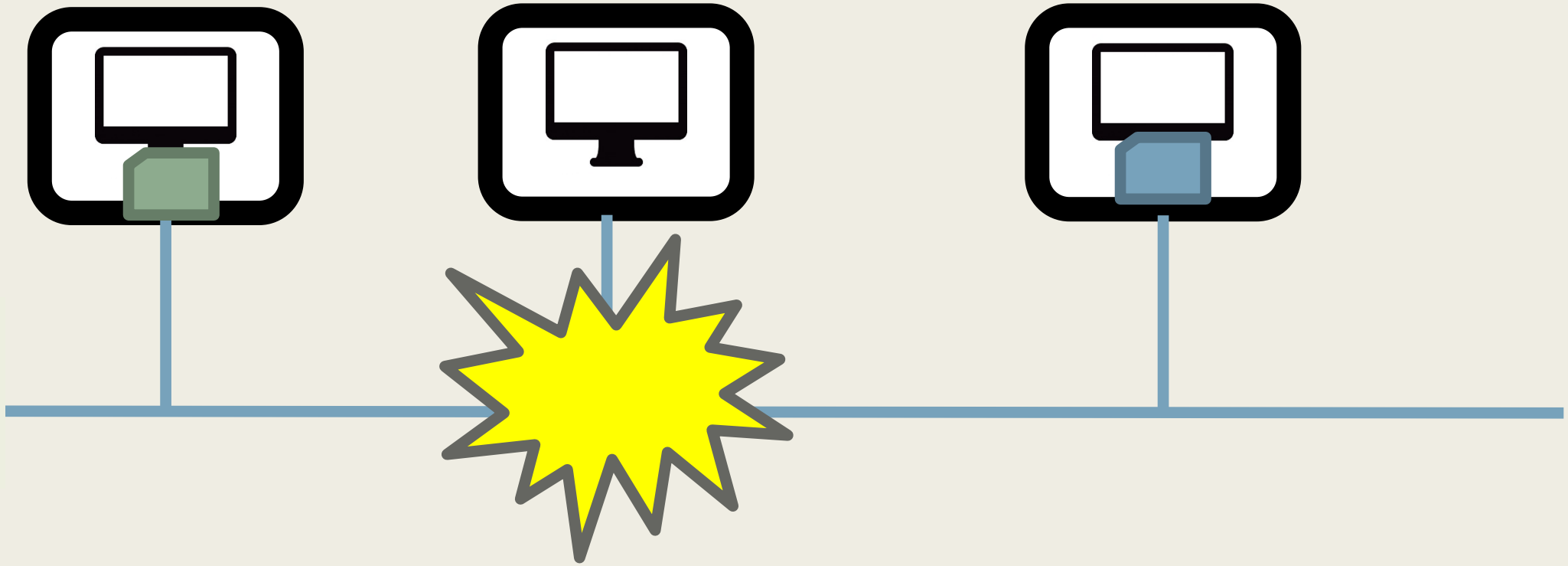
- Carrier Sense Multiple Access / Collision Detection
  - *CSMA/CD*
  - *Commonly used in Wired Ethernet*
- Carrier Sense Multiple Access / Collision Avoidance
  - *CSMA/CA*
  - *WiFi*

CSMA/CD
Carrier Sense Multiple Access / Collision Detection



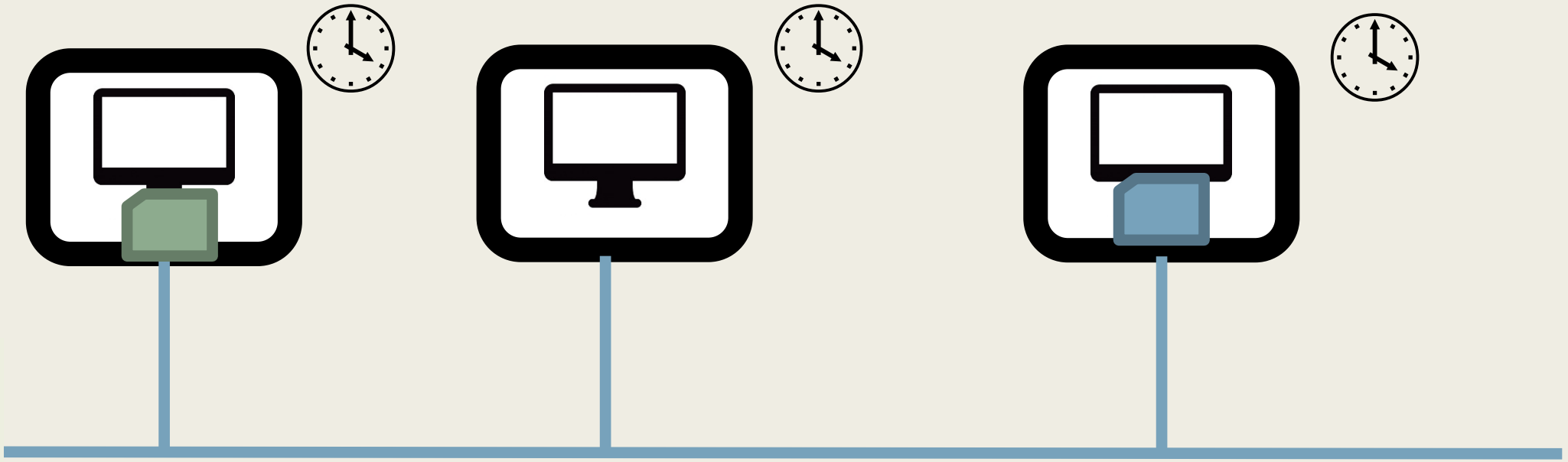
- Sending node will wait till it can hear no traffic on the network

CSMA/CD
Carrier Sense Multiple Access / Collision Detection



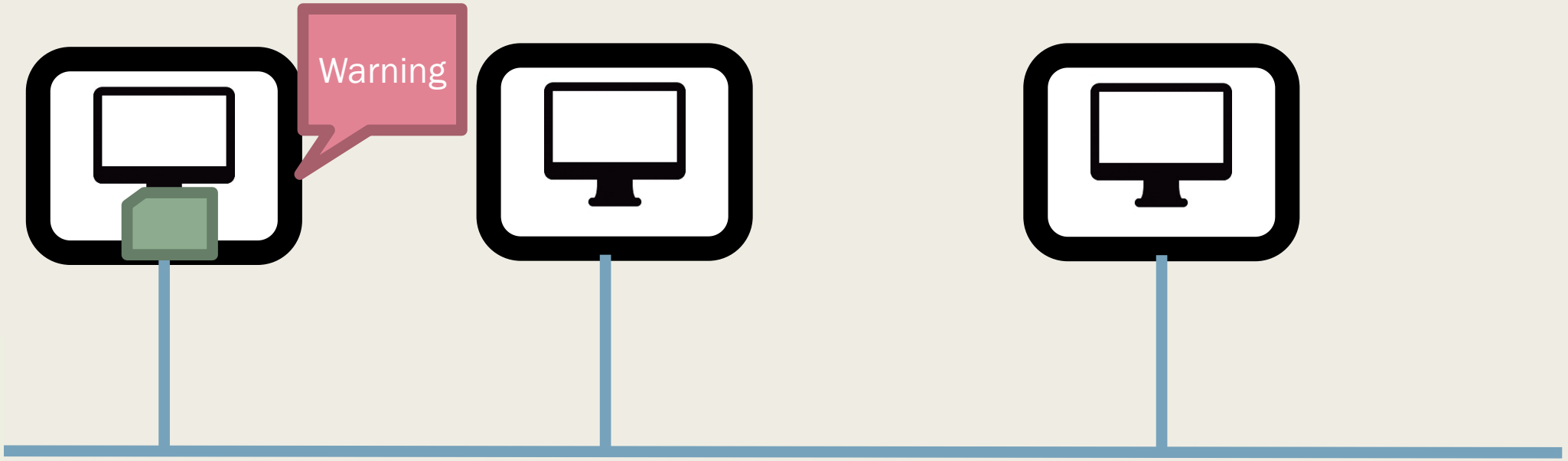
- All hosts hear noise of collision
- Jamming signal sent out

CSMA/CD
Carrier Sense Multiple Access / Collision Detection



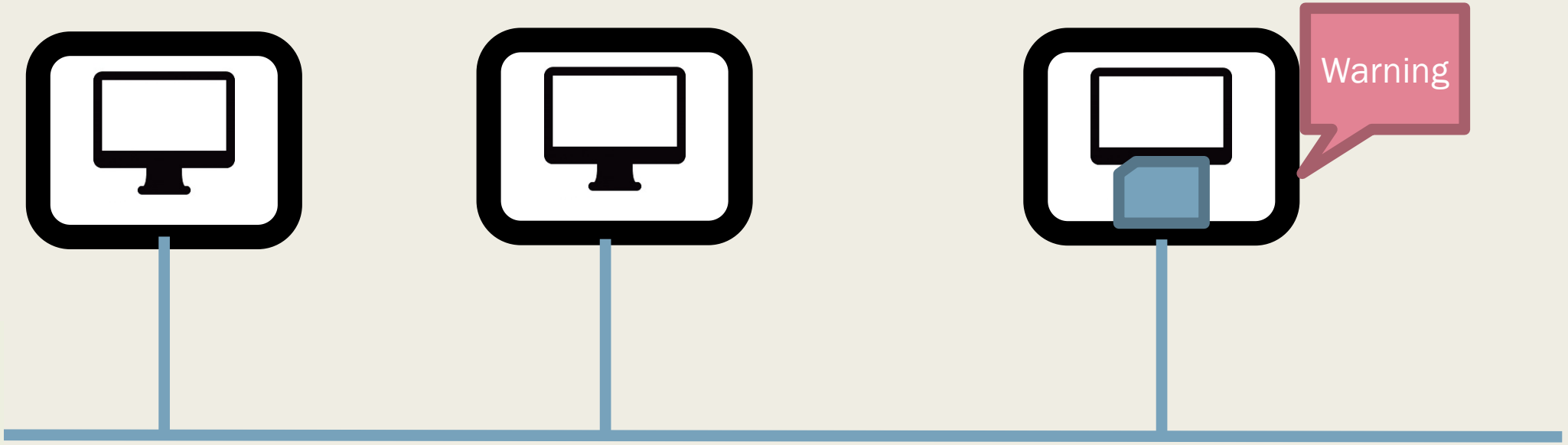
- All hosts wait random length of time before resending packet

CSMA/CA
Carrier Sense Multiple Access / Collision Avoidance



- Before sending a message, host sends out a warning.
- When other hosts hear warning, they wait to hear package fly by

CSMA/CA
Carrier Sense Multiple Access / Collision Avoidance



- Before sending a message, host sends out a warning.
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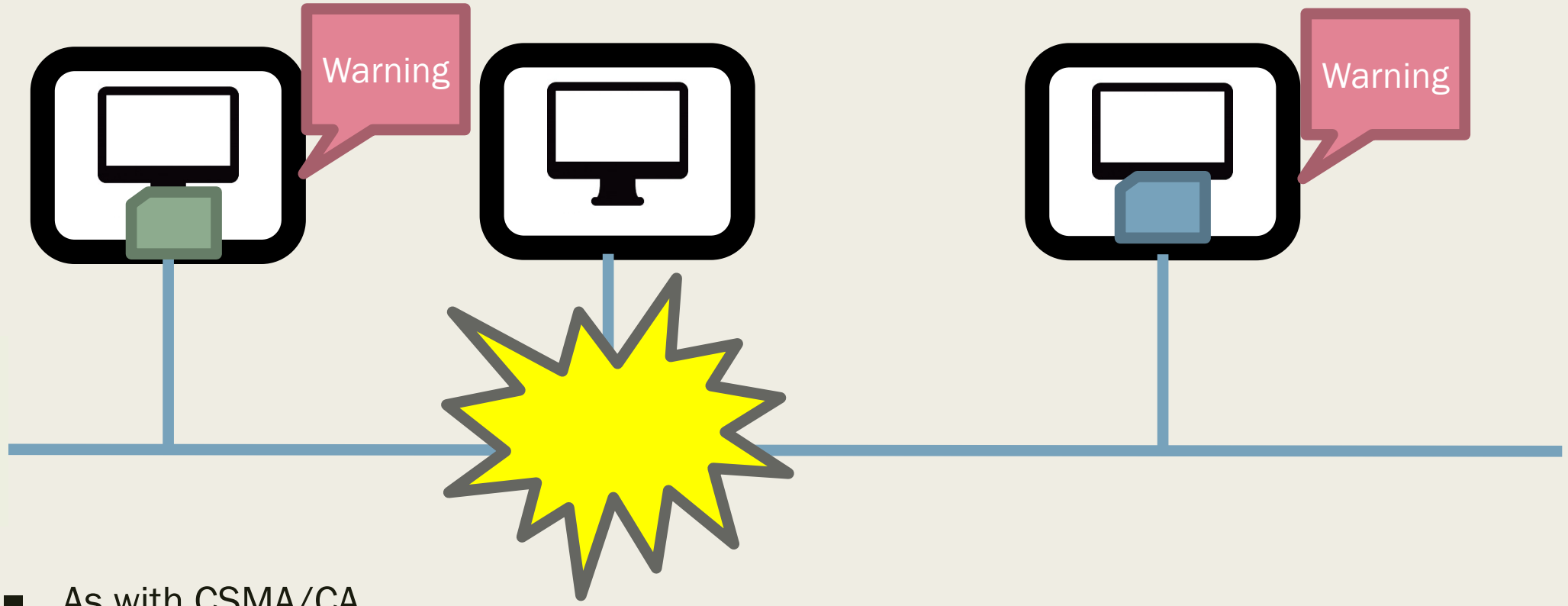
CSMA/CA
Carrier Sense Multiple Access / Collision Avoidance



- As with CSMA/CA,
  - *Jamming Signal sent out*
  - *All hosts delay random length*

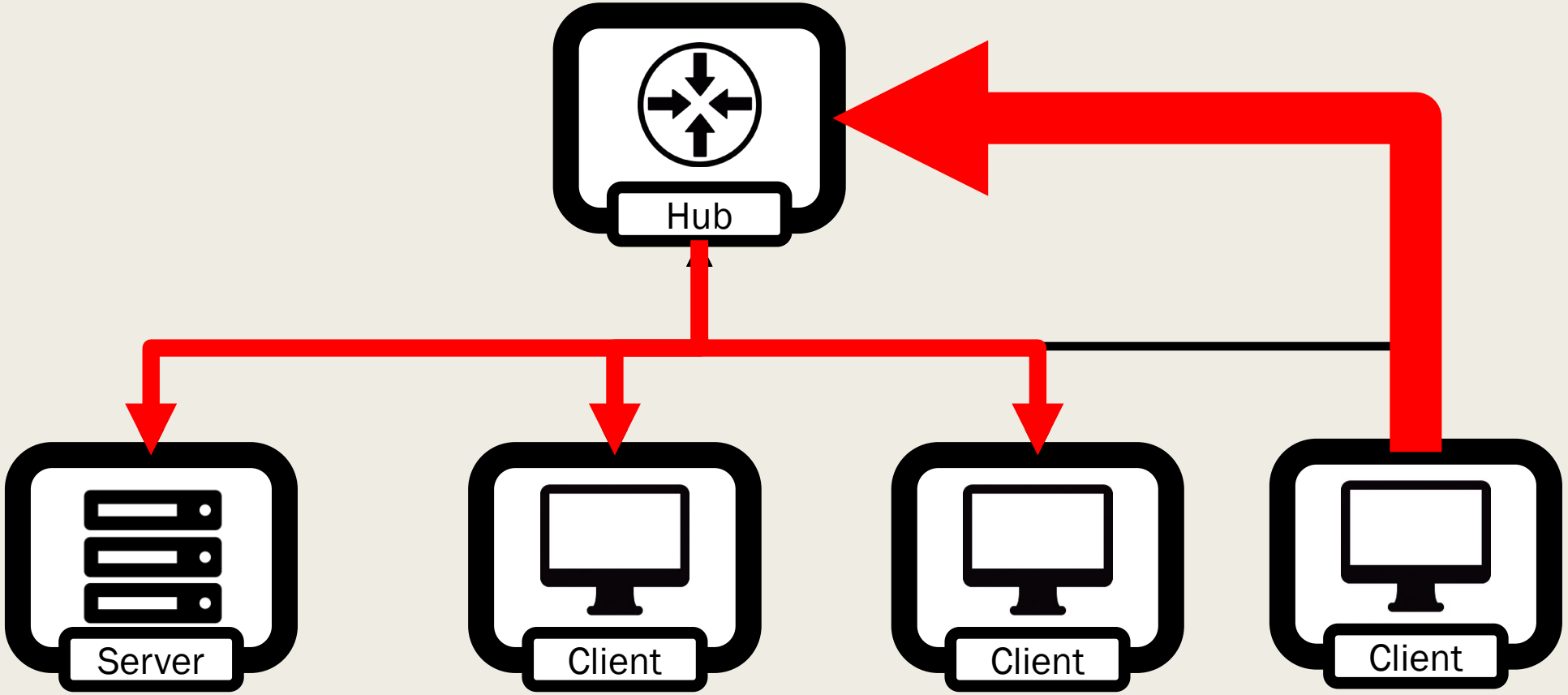
Terminology: Collision Ethernet

- CS
  - *Carrier Sense*
- MA
  - *Multiple Access*
- CD
  - *Collision Detection*
- CA
  - *Collision Avoidance*

NETWORK INFRASTRUCTURE

Hub, Switch, Bridge, Router

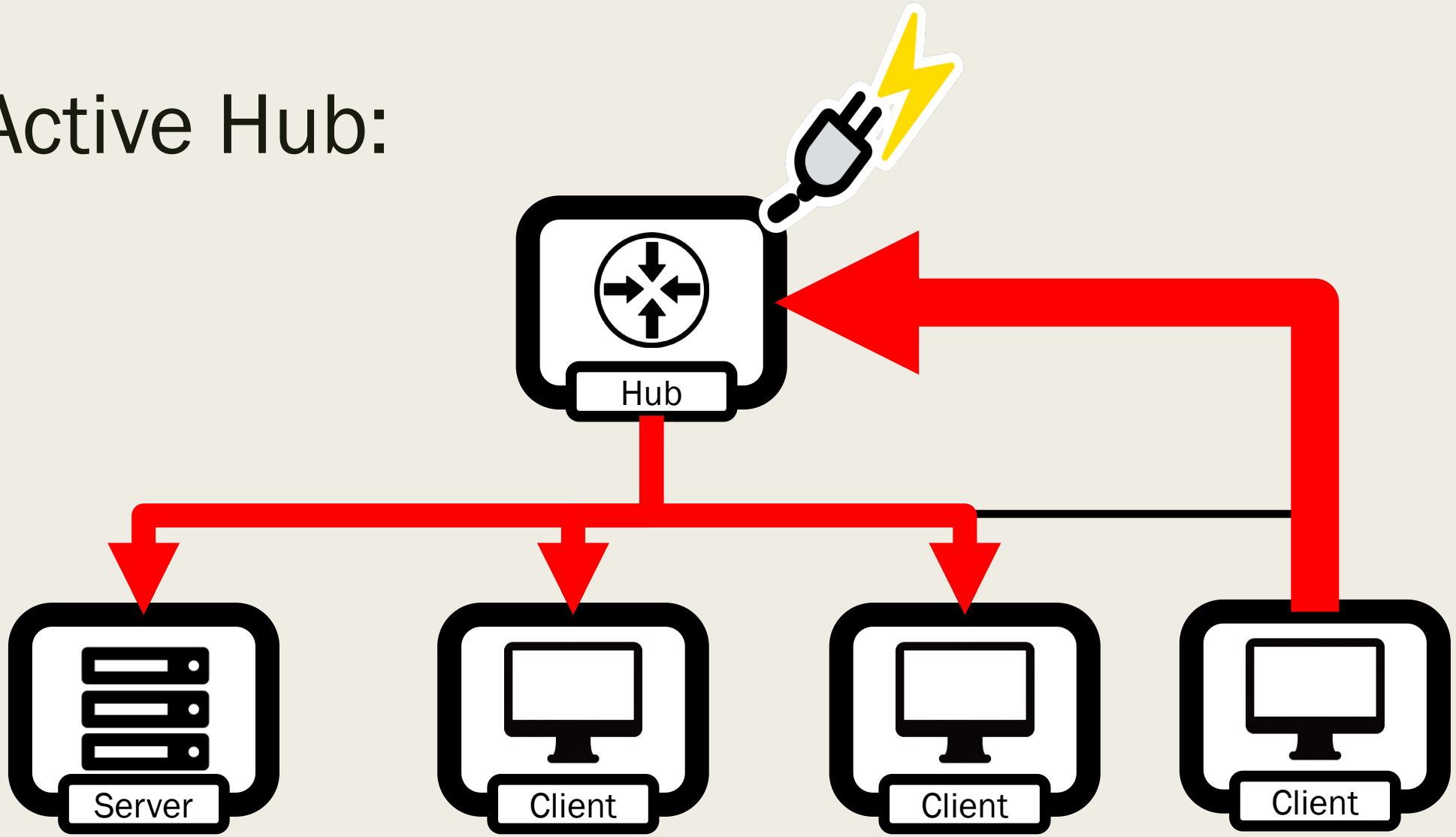
Passive Hub:



Passive Hubs:

- Cable splitter
- Broadcasts any message received to all connected devices
- Bus topology
  - *Risk of collisions*
- No power-source
  - *Signal weakening*

Active Hub:



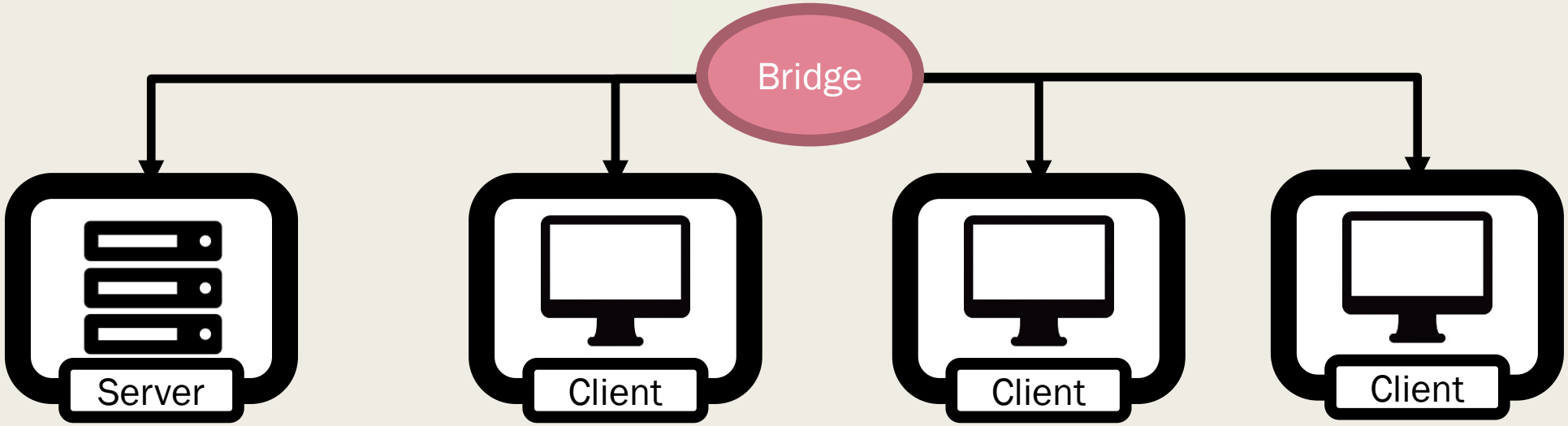
Active Hubs:

- Same broadcast
  - *Bus topology*
  - *Risk of collision*
- But has a power source
  - *Strengthens signal*
- Can be connected to other Active Hubs

Intelligent Hubs:

- Active Hubs with extra functionality
  - *Diagnostics*
  - *Management of ports*

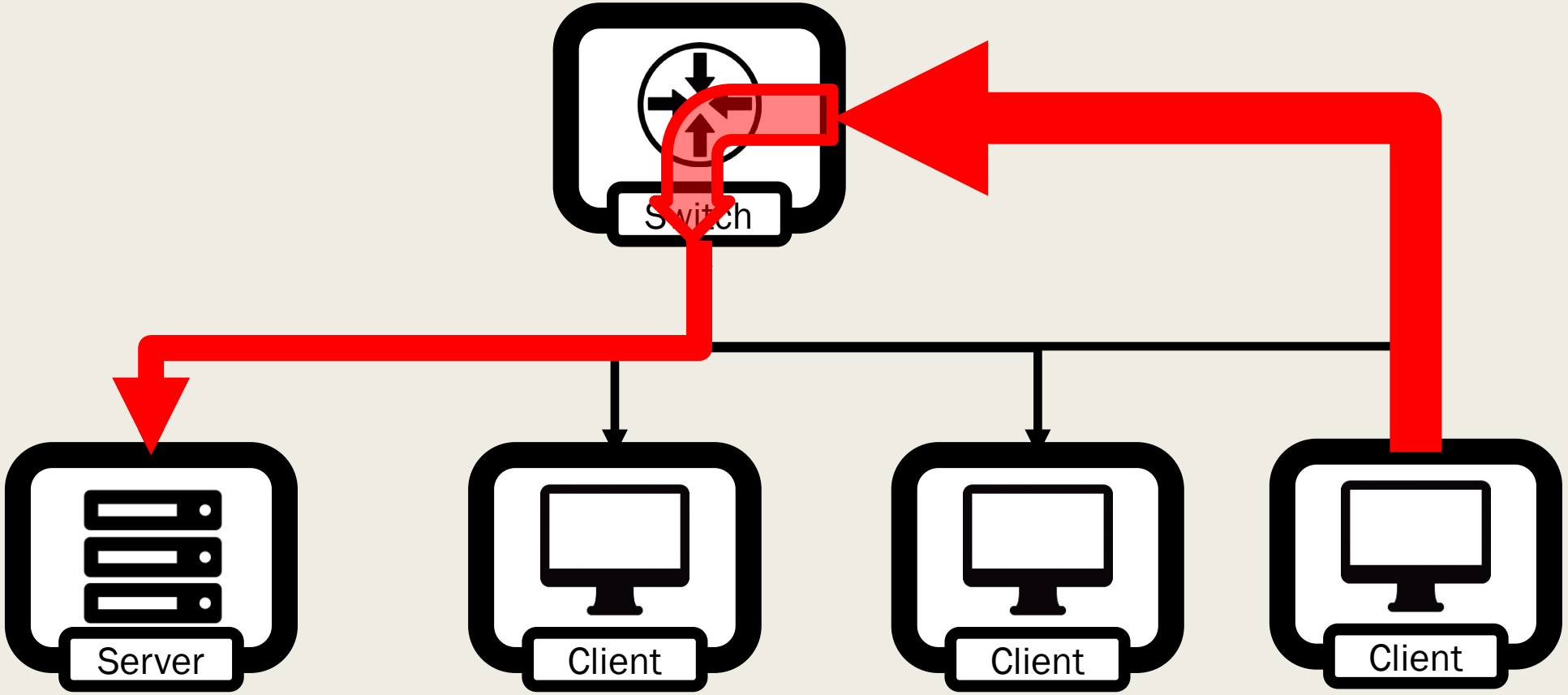
Bridge:



Bridge:

- Breaks up large network into smaller sets of connected hosts:
  - *Collision Domains*
- Will only allow through traffic destined to hosts beyond that Bridge.
- Helps to avoid collisions

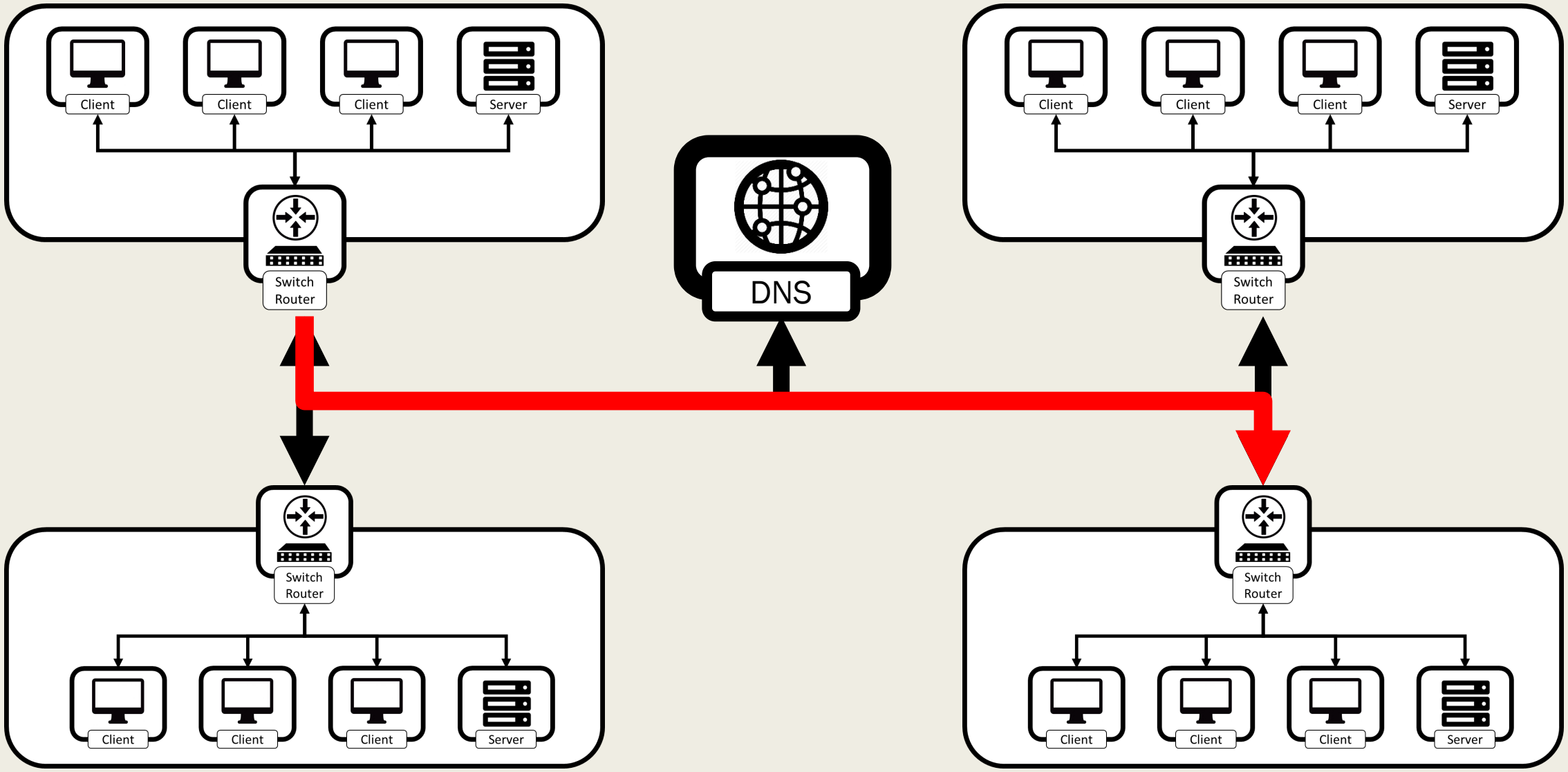
Switch:



Switch:

- Point-to-point connection
- Collision Domain of two machines
- Can also interface between media

Router:


Client
Client
Client
Server
Switch
Router
DNS
Client
Client
Client
Server
Switch
Router
Switch
Router
Client
Client
Client
Server
Switch
Router
Client
Client
Client
Server

What we have covered in this video:

- Network components
- Collisions
- Infrastructure

In the next video we will cover:

- IP Addressing
  - *Calculations*
  - *Masking*
  - *Classless & Classful systems*
- Subnetting calculations

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