oueees-202306 topic 02:

Packet switching

Routing basics

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Lecture notes and reporting

- https://github.com/jj1bdx/oueees-202306-public/
- Check out the README.md file and the issues!
- Keyword at the end of the talk
- URL for submitting the report at the end of the talk

Packet Switching

Packet switching

What if you can split a stream into the *packets* and let them be delivered through *different links* for each packet?

How to form a packet (1/2)

- Split a stream into multiple pieces of data

```
ABCDEFHIJ -> ABC DEF HIJ
```

- Put a header on each piece

```
ABC DEF HIJ -> P1-ABC P2-DEF P3-HIJ
```

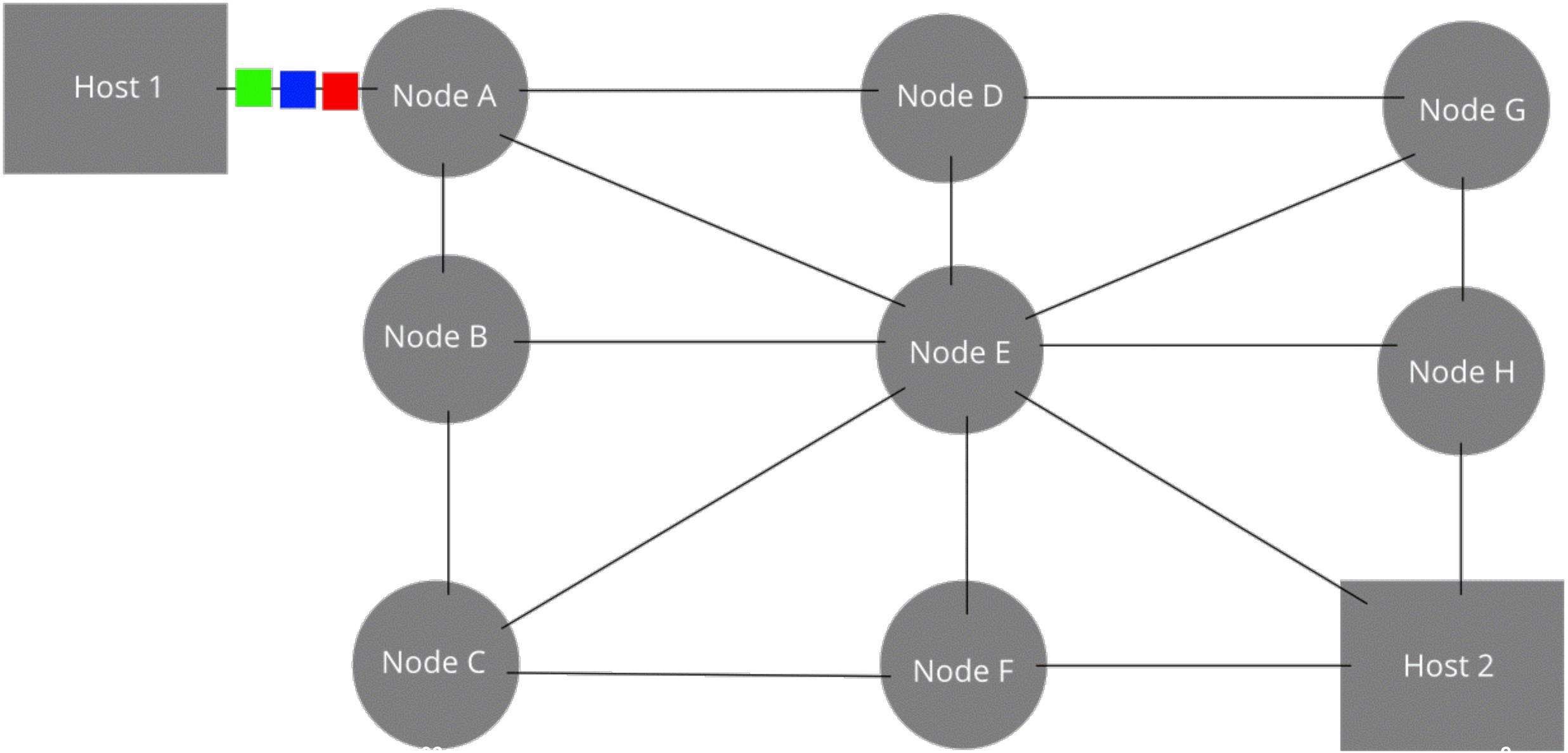
How to form a packet (2/2)

- Add source and destination addresses to each packet

```
P1-ABC P2-DEF P3-HIJ
 ->  FromXtoY-P1-ABC
     FromXtoY-P2-DEF
     FromXtoY-P3-HIJ
```

- Then send them on the network!

The original message is Green, Blue, Red.

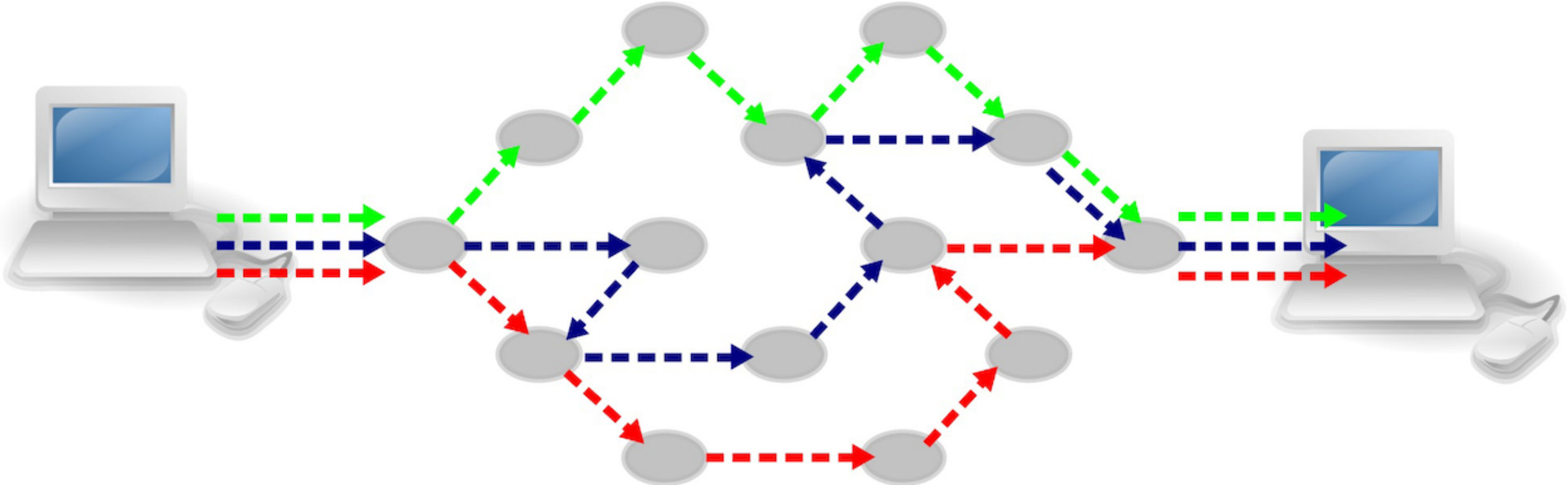


Packet switching and the nodes

- Each communication node must know how to assemble/ disassemble information to/from the packets
- Each communication node must know which link should be used to send a packet for the given destination
- Packets can be lost; relaying nodes cannot detect a lost packet

Packet (dis)assembly issues

- The sequence of delivered packets may differ from that of the sender intents; holding the out-of-sequence packets are required
- Retransmission is required to recover a lost packet for a reliable communication

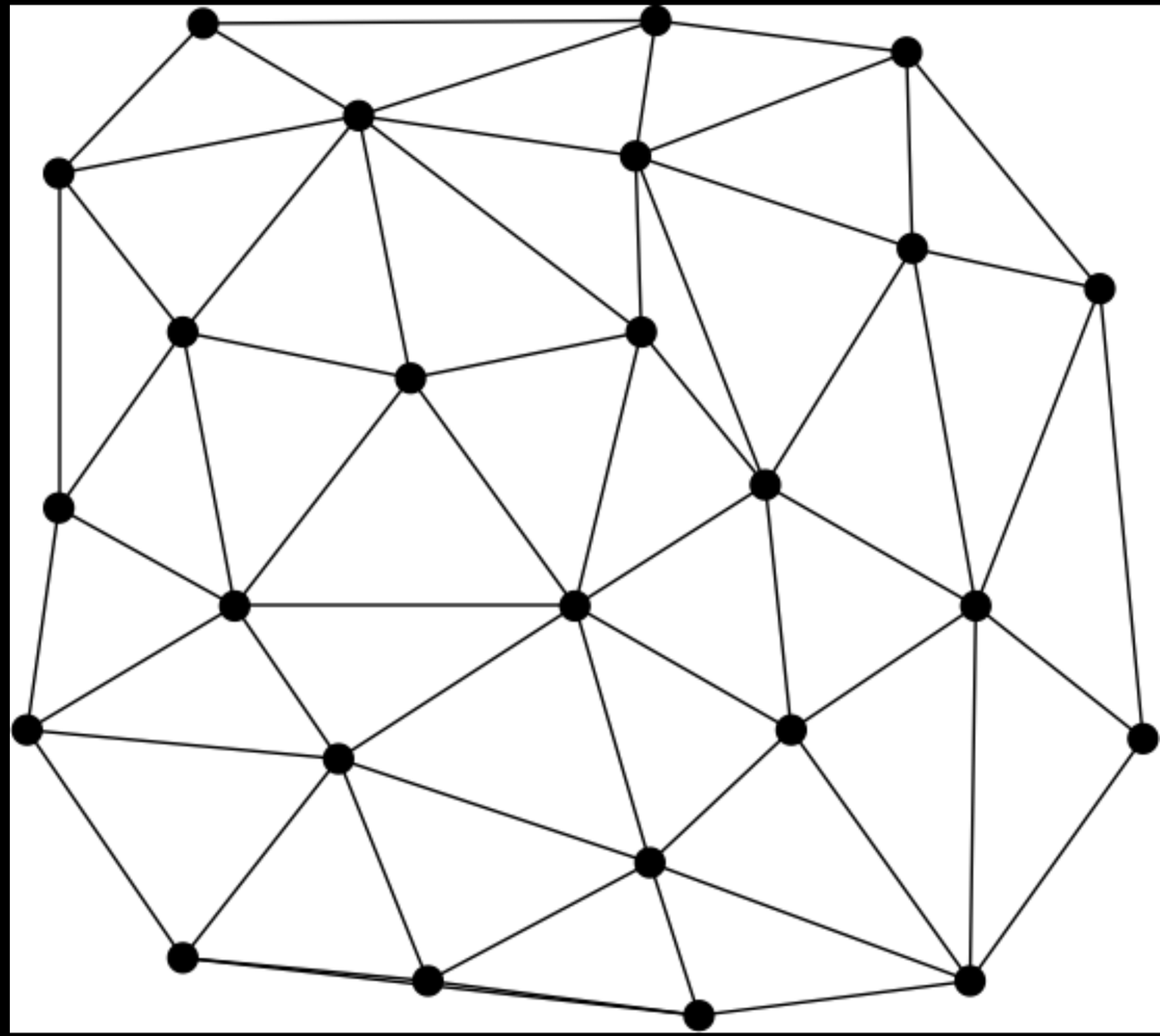


Packet switching enables

- Changing the packet relay routes *during* the communication
- Using multiple routes for a single communication link
- Aggregating multiple communication links into a physical link
- Connectionless *and* connection-oriented communication simultaneously

Truly distributed networks are feasible by packet switching

- No centralized nodes
- Each link can be utilized by all nodes
- A disconnection of the link will not be fatal so long as one link is connected to a node



Disadvantages of packet switching

- Each node must be able to form/generate and decode/interpret a packet
- Forming and decoding a packet takes time and the computing resources
- Reliability and latency can be a trade-off
- Relay nodes can be neutralized by denial-of-service attacks
- Difficult to manage

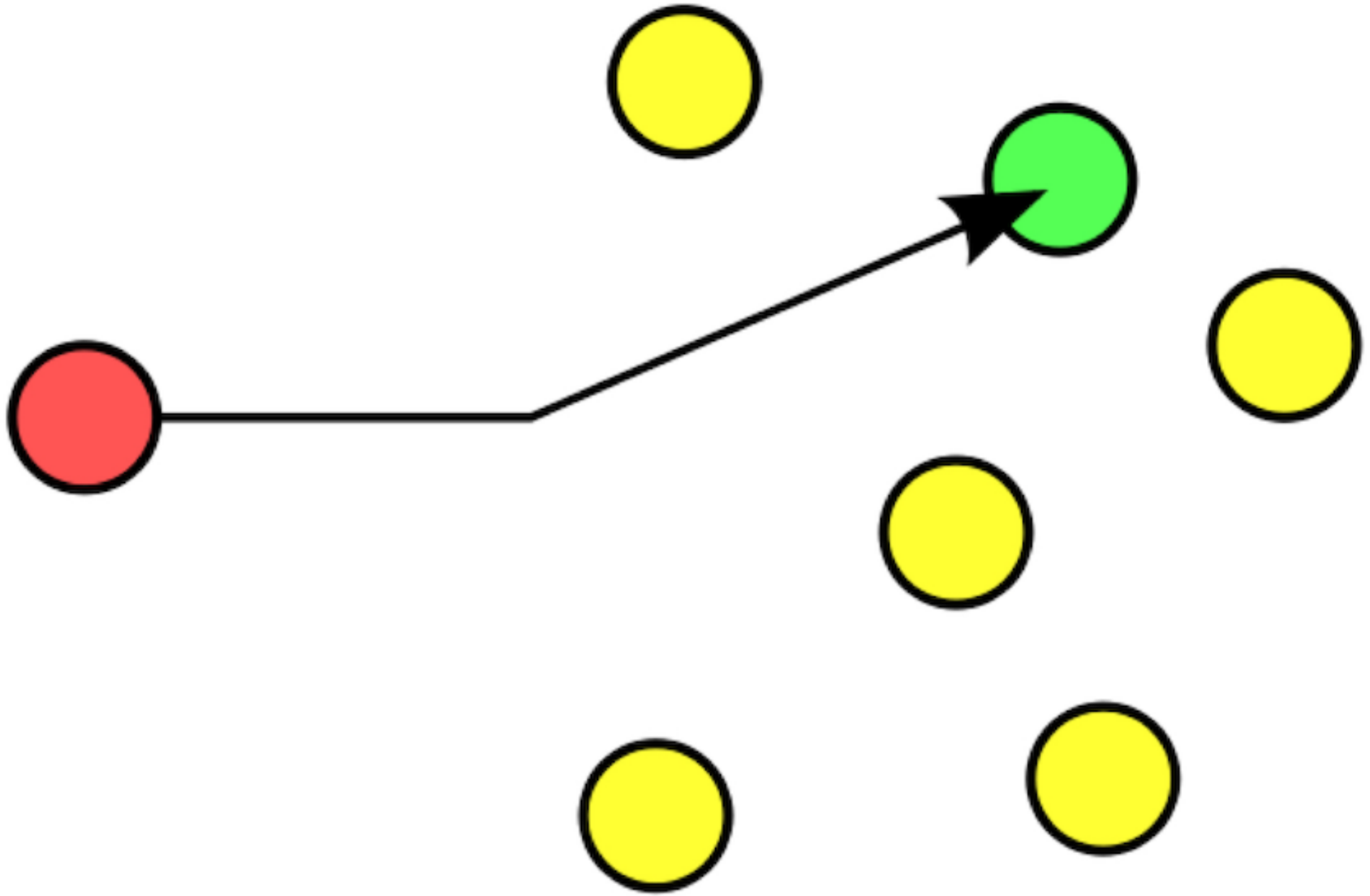
Routing basics

Various aspects of routing

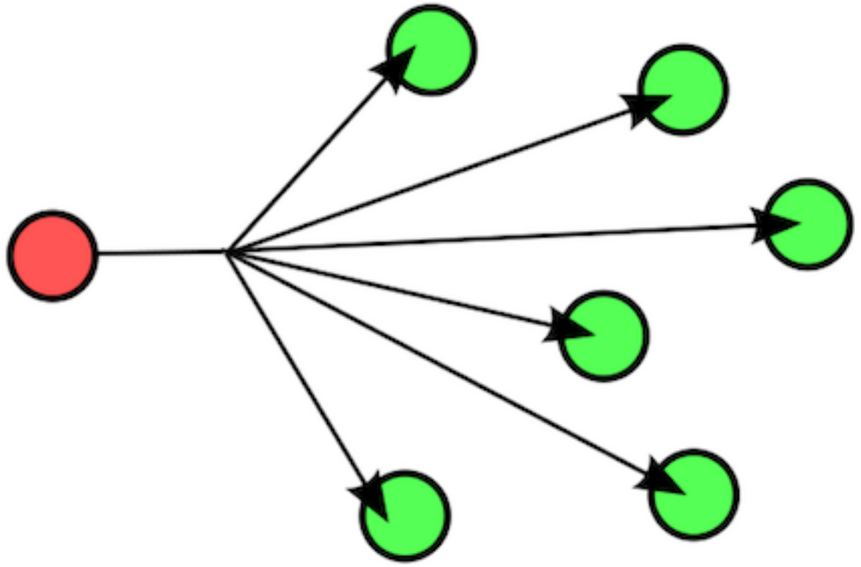
- Delivery
- Addresses
- Static or dynamic
- Route aggregation
- Security

Delivery schemes

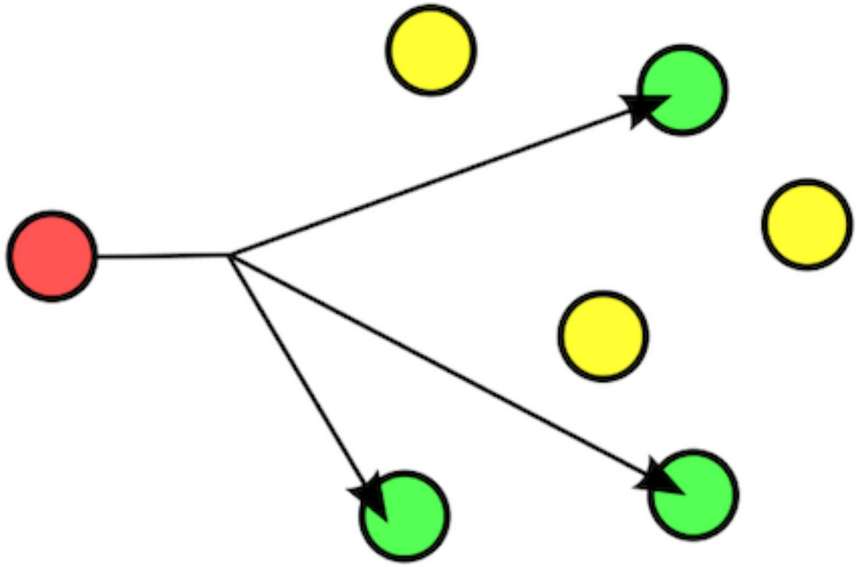
- Unicast
- Broadcast/Multicast/Anycast



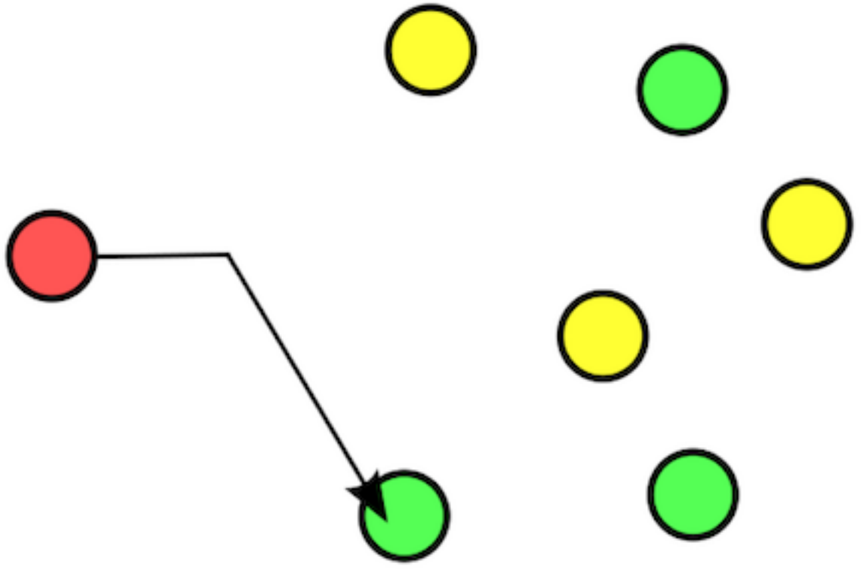
Unicast



Broadcast



Multicast



Anycast

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