Transport Layer, TCP and Floods

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About Me

- Linux and Computer Network Deep Diver
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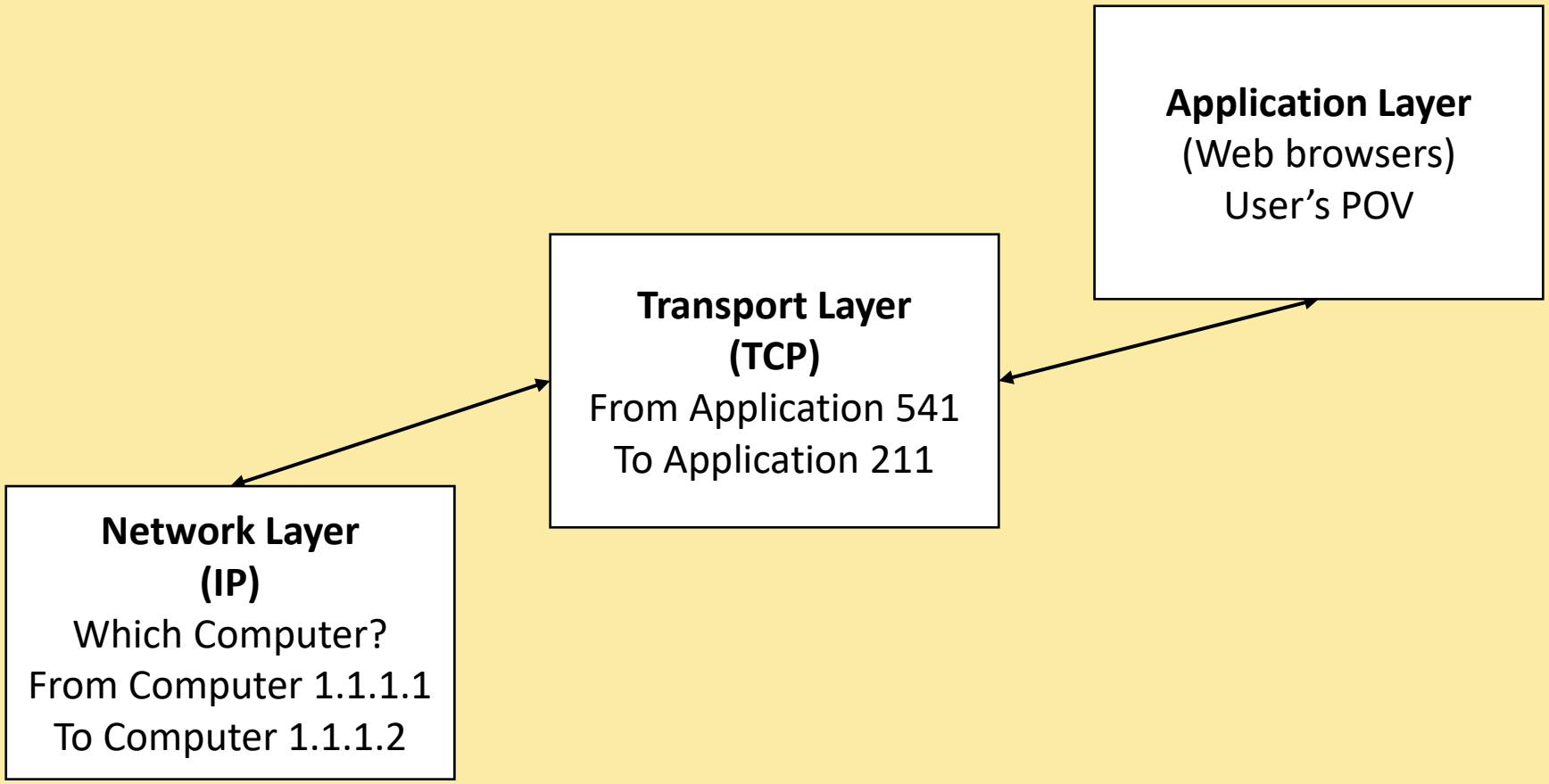
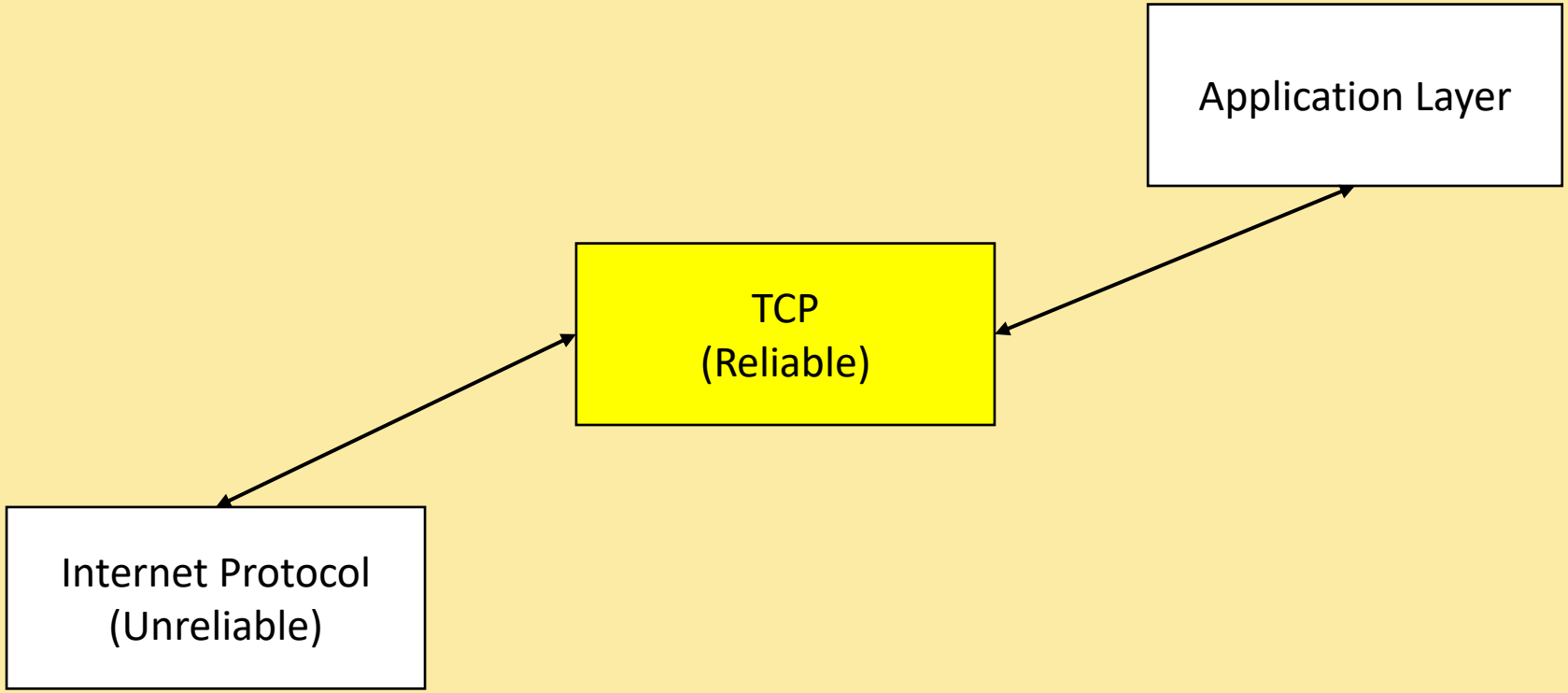
Table of contents

Transport Layer in TCP/IP Stack



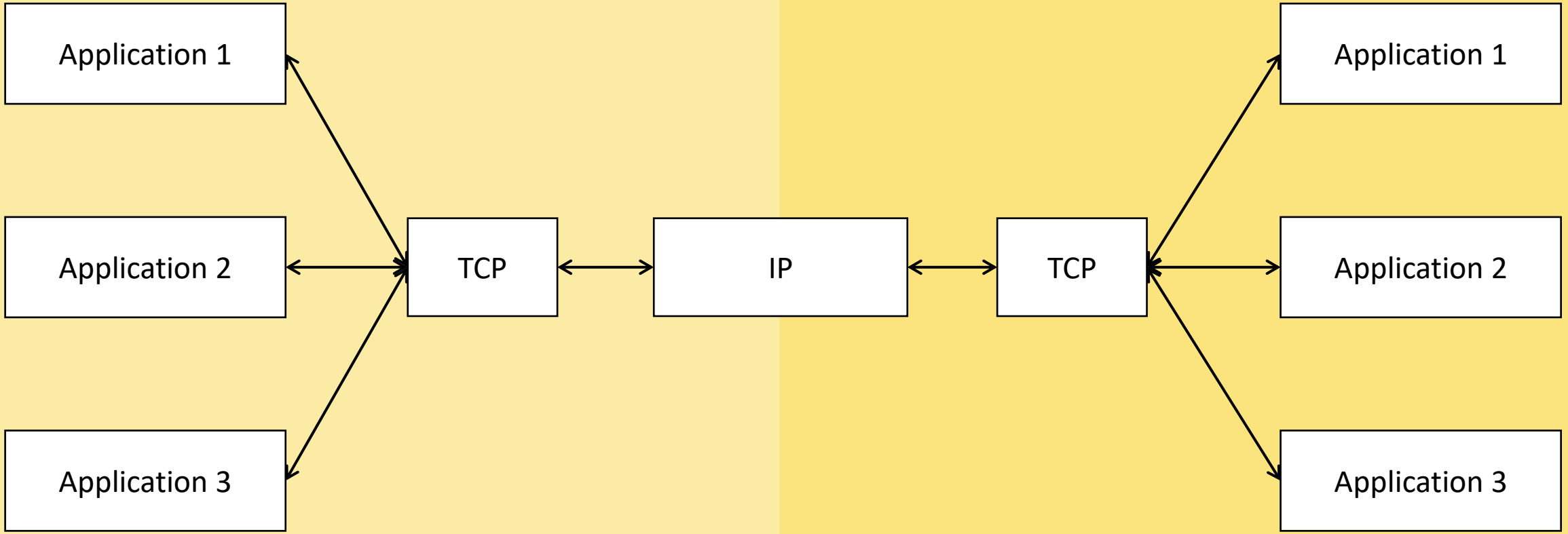
TCP


Application Layer
TCP
(Reliable)
Internet Protocol
(Unreliable)

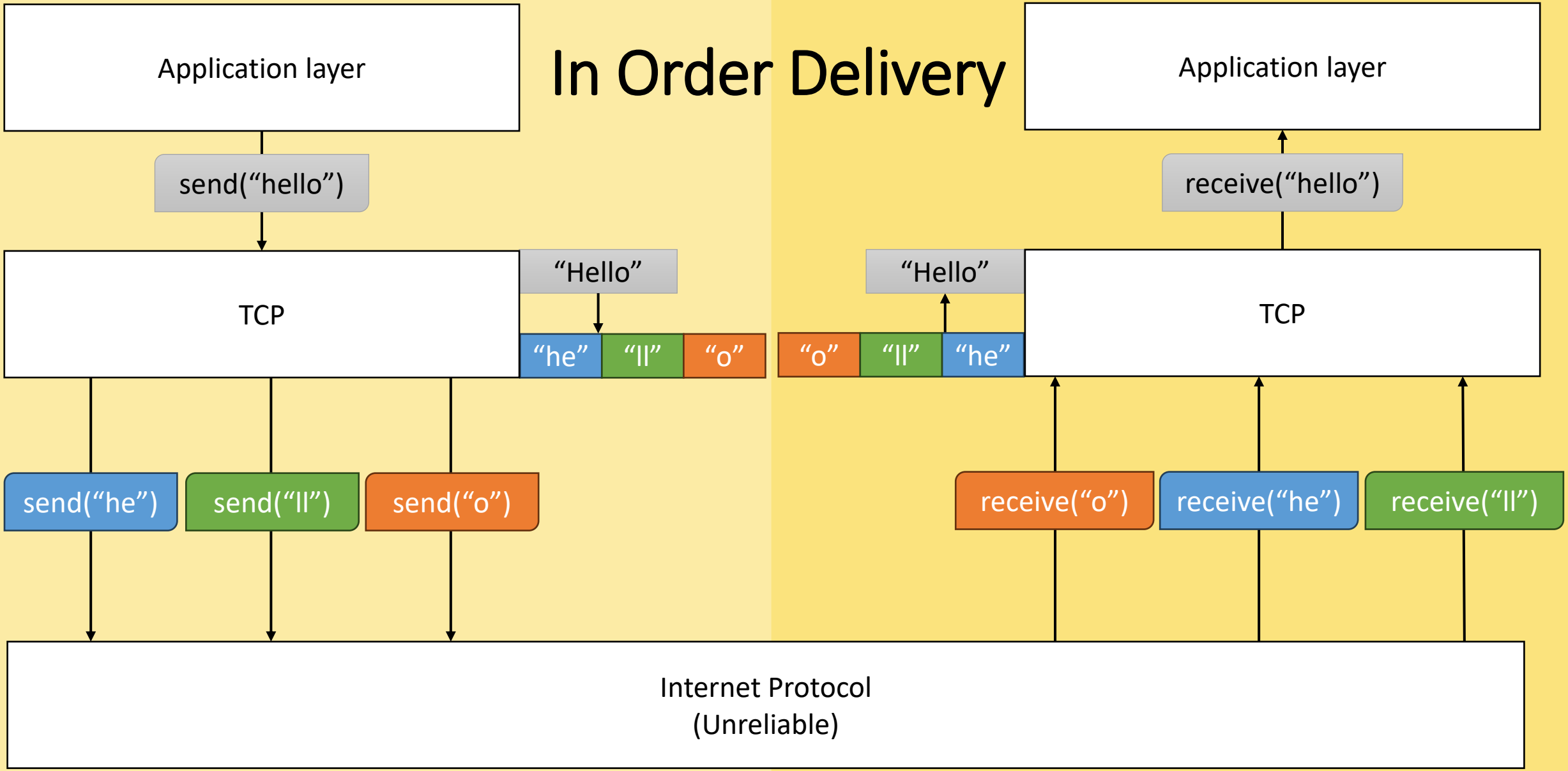
TCP’s Fields

- Source Port (From Which Application)
- Destination Port (To Which Application)
- Sequence Number
- Acknowledgement Number
- Flags
- …

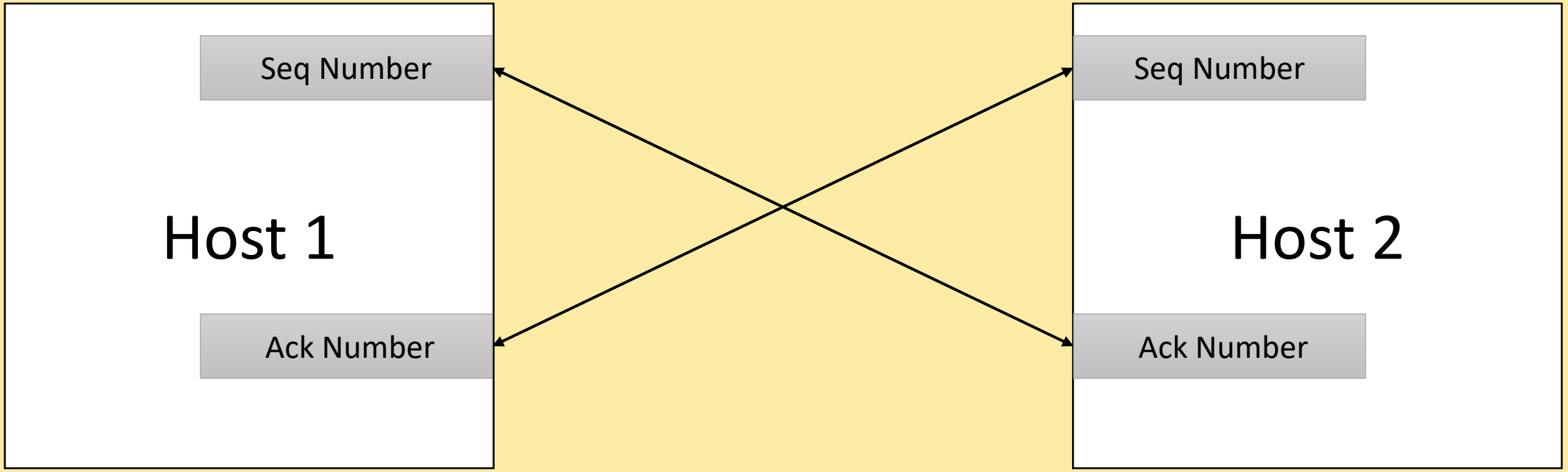
Multiplexing / Demultiplexing



In Order Delivery



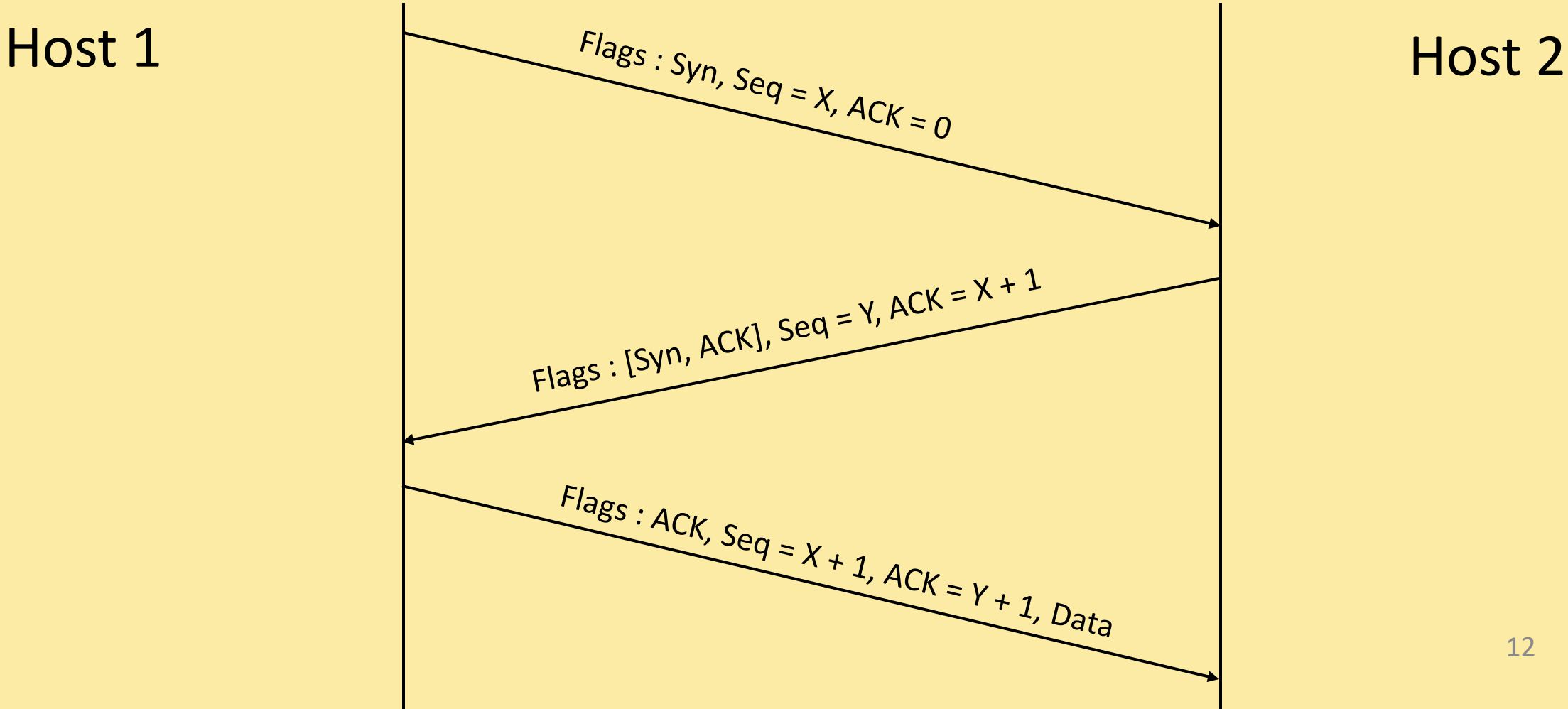
Sequence And Acknowledgement Number



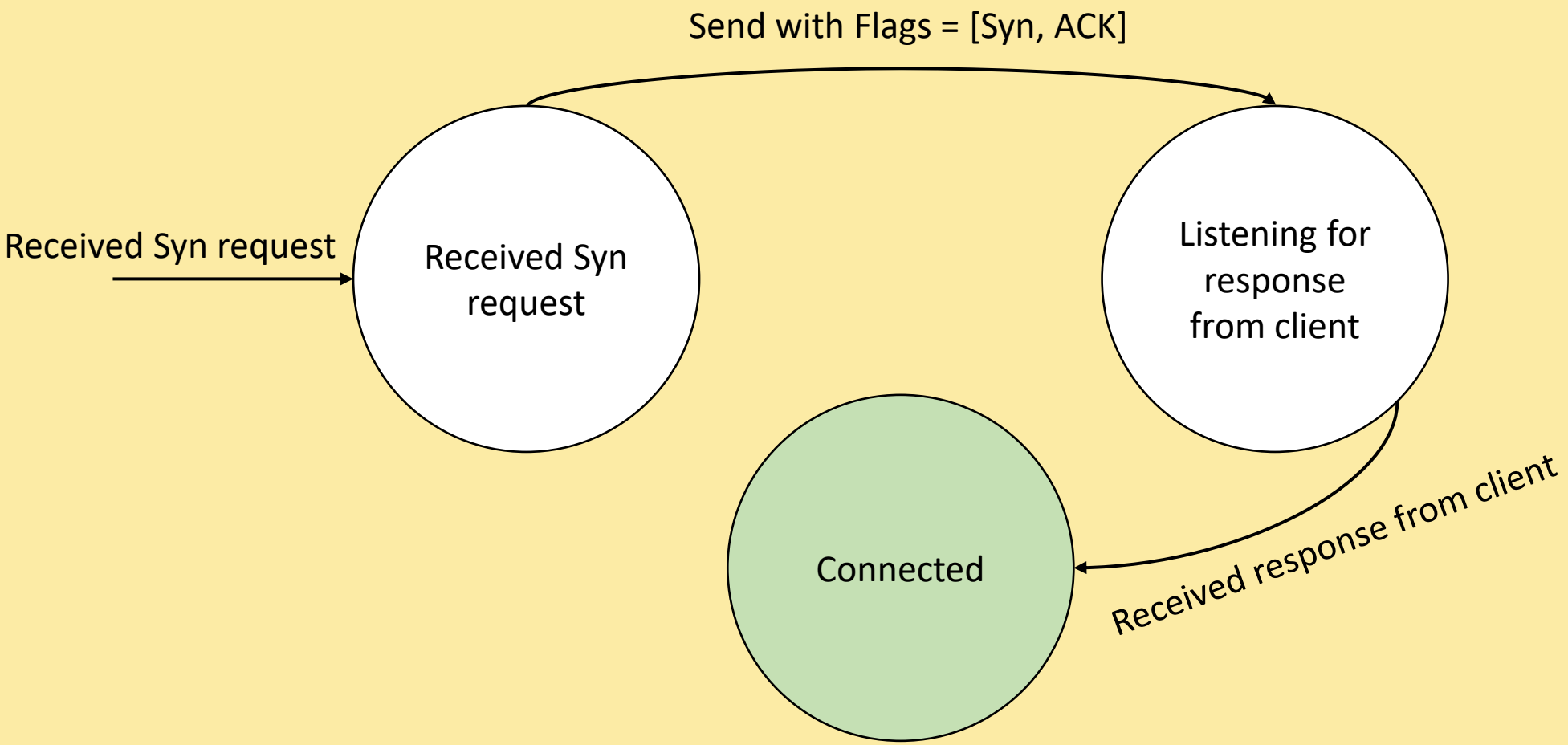
TCP Flags

```
000. .... .... = Reserved
...0 .... .... = Accurate ECN
.... 0... .... = Congestion Window Reduced
.... .0.. .... = ECN-Echo
.... ..0. .... = Urgent
.... ...0 .... = Ack
.... .... 0... = Push
.... .... .0.. = Reset
.... .... ..0. = Syn
.... .... ...0 = Fin
```

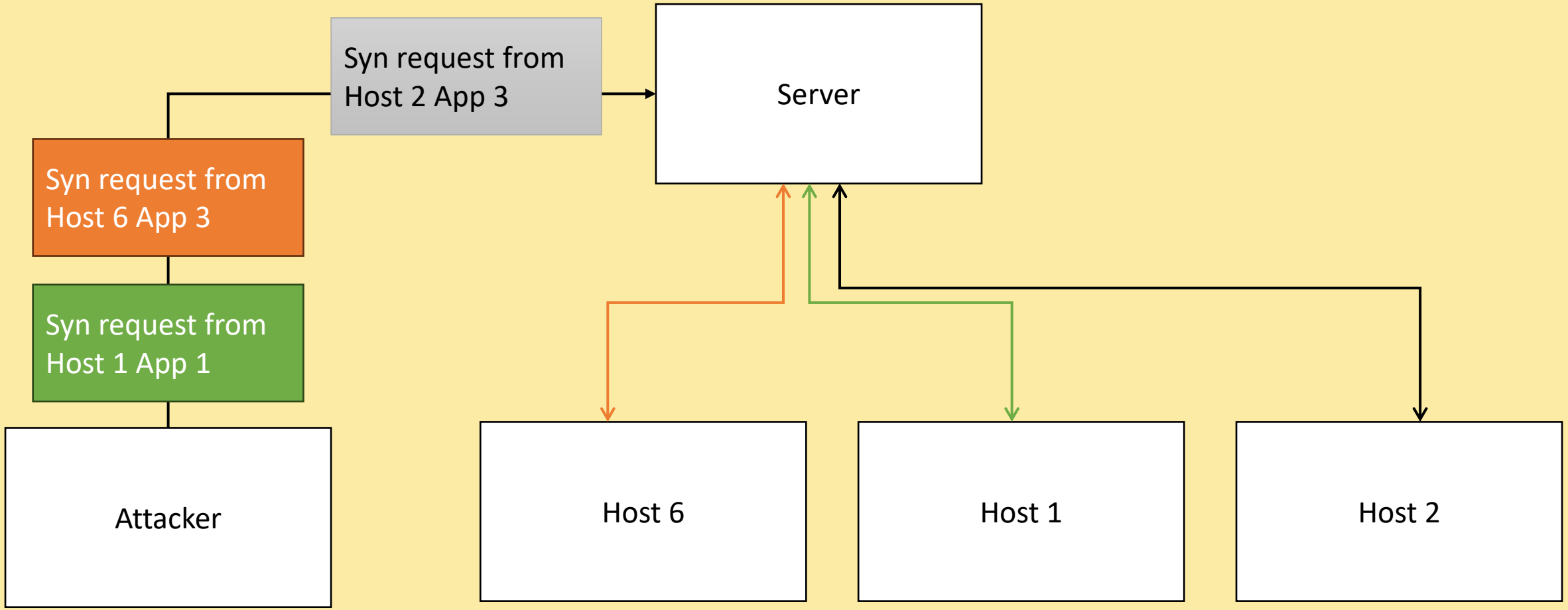
The Tree Way Handshake



State Machine of a TCP Server

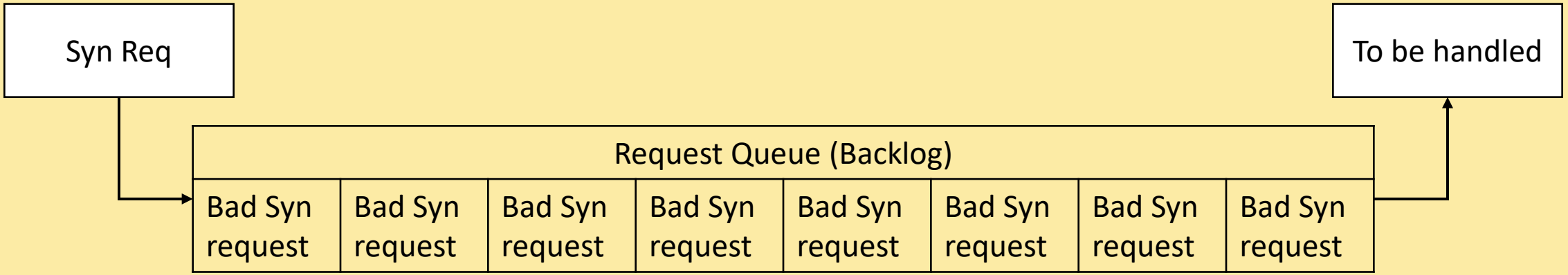


SYN Floods


Syn request from
Host 2 App 3
Server
Syn request from
Host 6 App 3
Syn request from
Host 1 App 1
Attacker
Host 6
Host 1
Host 2

SYN Flooding is Cheap

Always Waiting on Non-Existing Clients



Solution

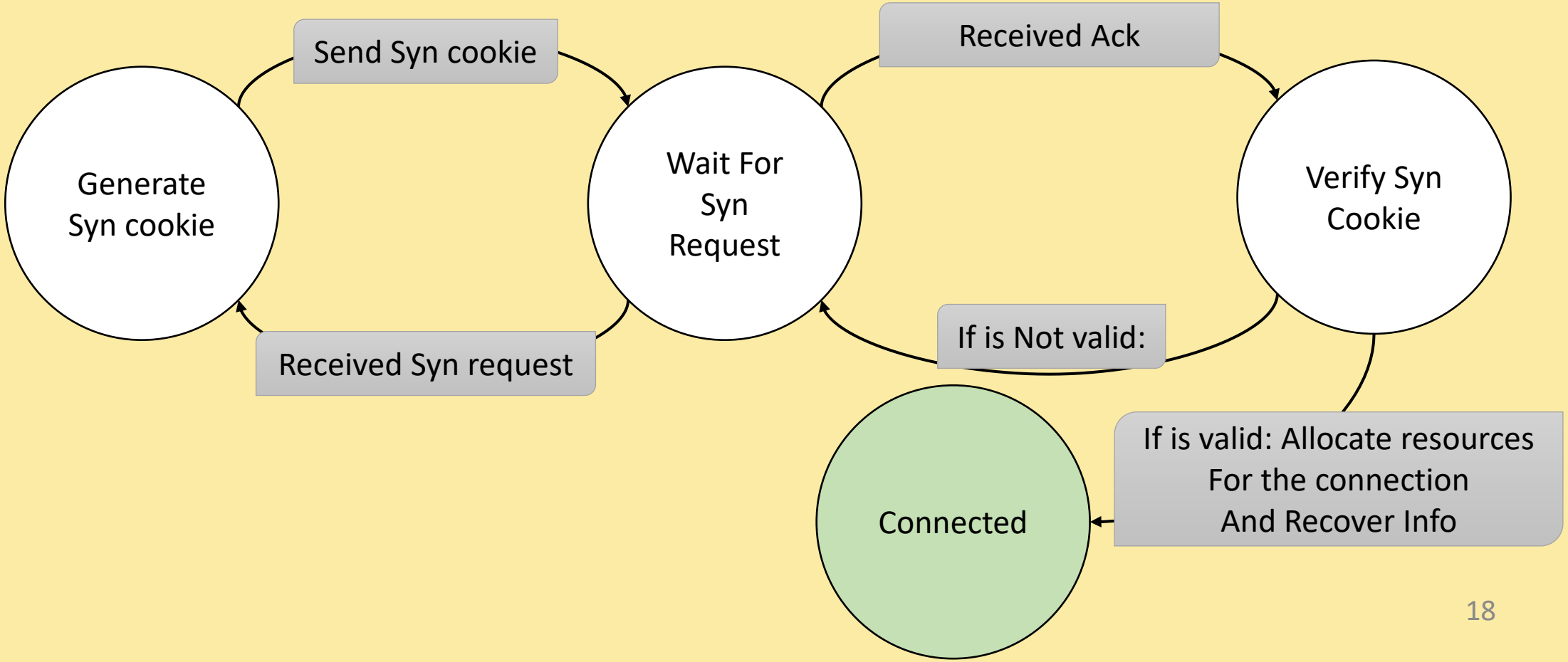
Break the Protocol?

Syn Cookies

- Handle the Handshake Statelessly
- No More Request Queue (Backlog)
- Reconstructing the Connection

How is it Done?

Forget the Connection But Not Really



Information to Recover

- Server and Client's IP Address
- Server and Client's Sequence Number
- Server and Client's Port
- Server and Client Maximum Segment Size (MSS)
- TCP Options (Optional but Important)

Why Encoding Stuff?

- Preventing Against Connection Spoofing
- Being Flooded with Acks

Benefits and Drawbacks of Syn Cookies

- Higher Cost of Syn floods
- Lower Memory Usage
- No Direct Support For TCP Options
- Higher CPU Usage
- Complexity

Learn More

- linux/net/ipv4/syncookies.c
- `lwn.net/Articles/277146`

Questions

Presentation Files:
github.com/AliGhaffarian/university_thingies