Ecole d'Ingénieurs
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Mines de Douai
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Pharo

Networking by Example

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"Deep Into Smalltalk" Spring School
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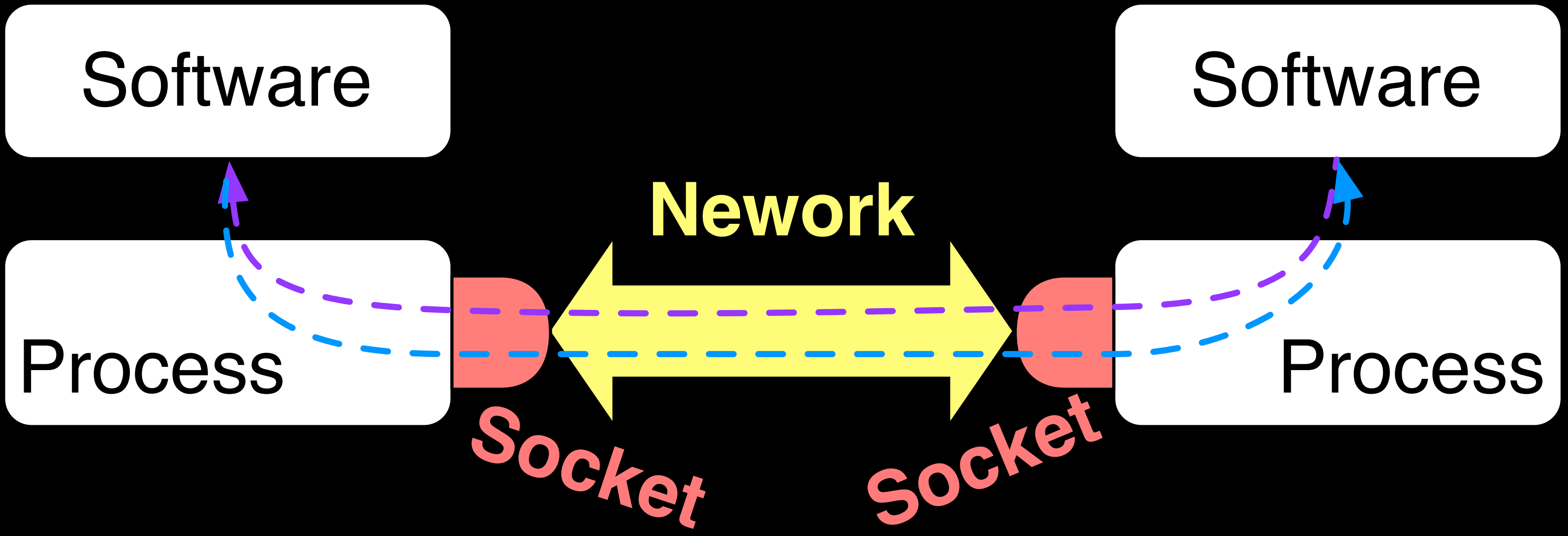
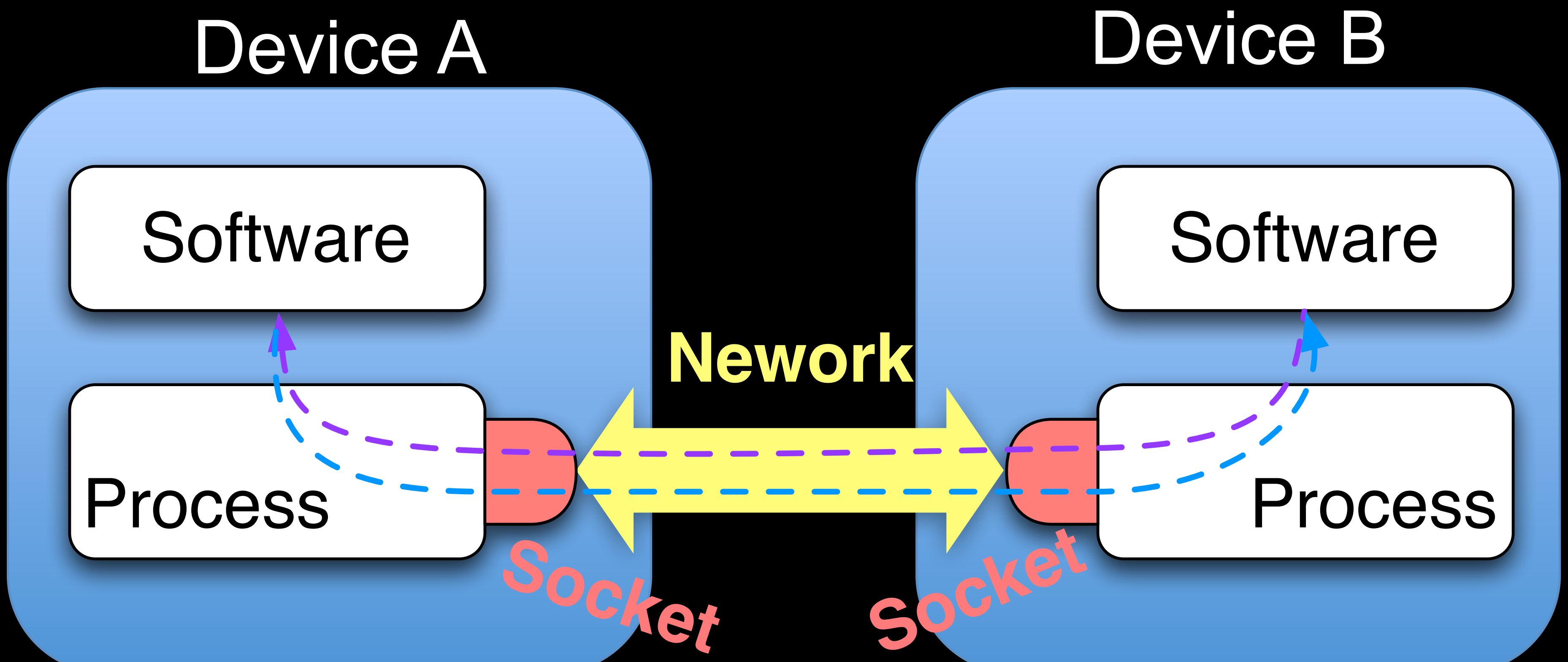
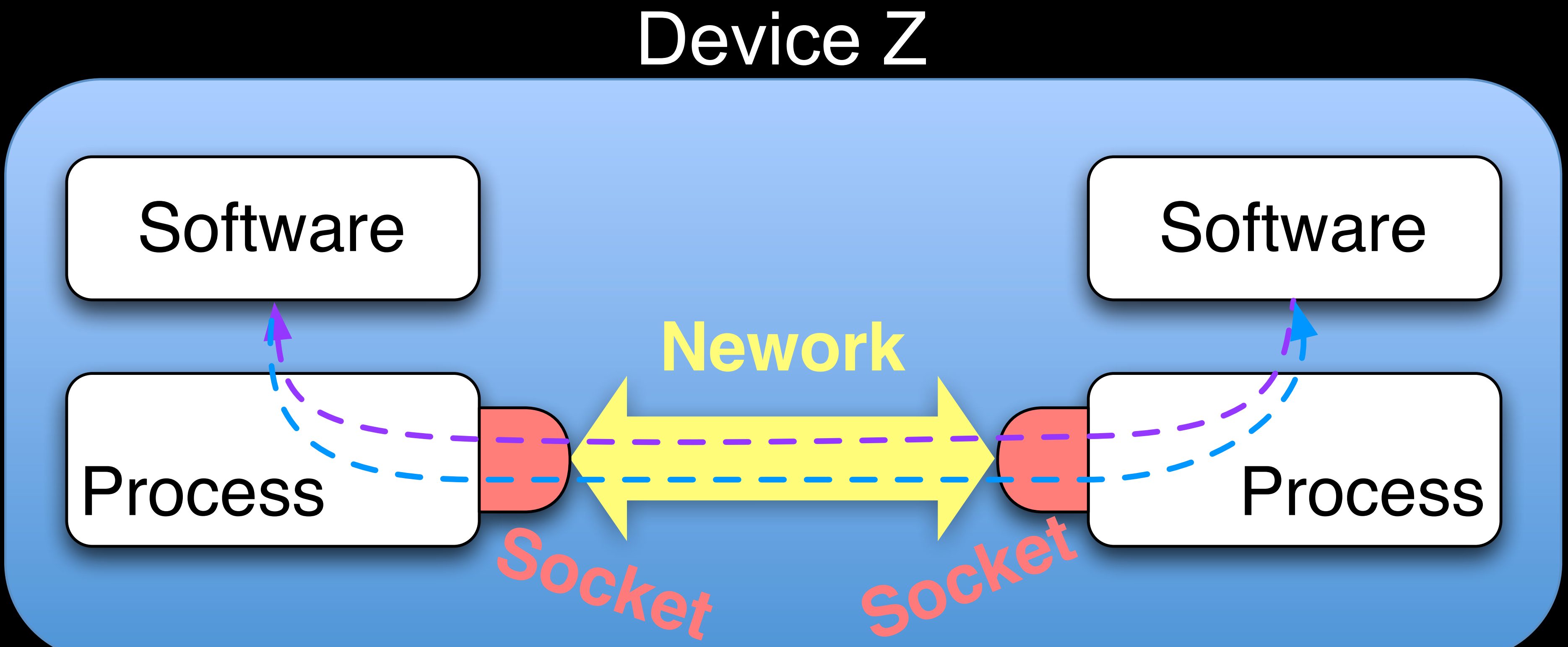
Agenda

- Networking Basics
  - Sockets and protocols
  - Client vs. Server
  - Hands-on with SocketStream
- Serving
  - Connection vs. communication
  - Hands-on Concurrency
- Complex interactions
  - Exchanging objects over a network
  - Remote messaging Hands-on



Bi-directional communication


Device A
Device B
Software
Software
Process
Process
Nework
Socket
Socket


Device Z
Software
Software
Nework
Process
Process
Socket
Socket

2 Main Transport Protocols

TCP

Transmission Control Protocol

UDP

User Datagram Protocol

2 Main Transport Protocols

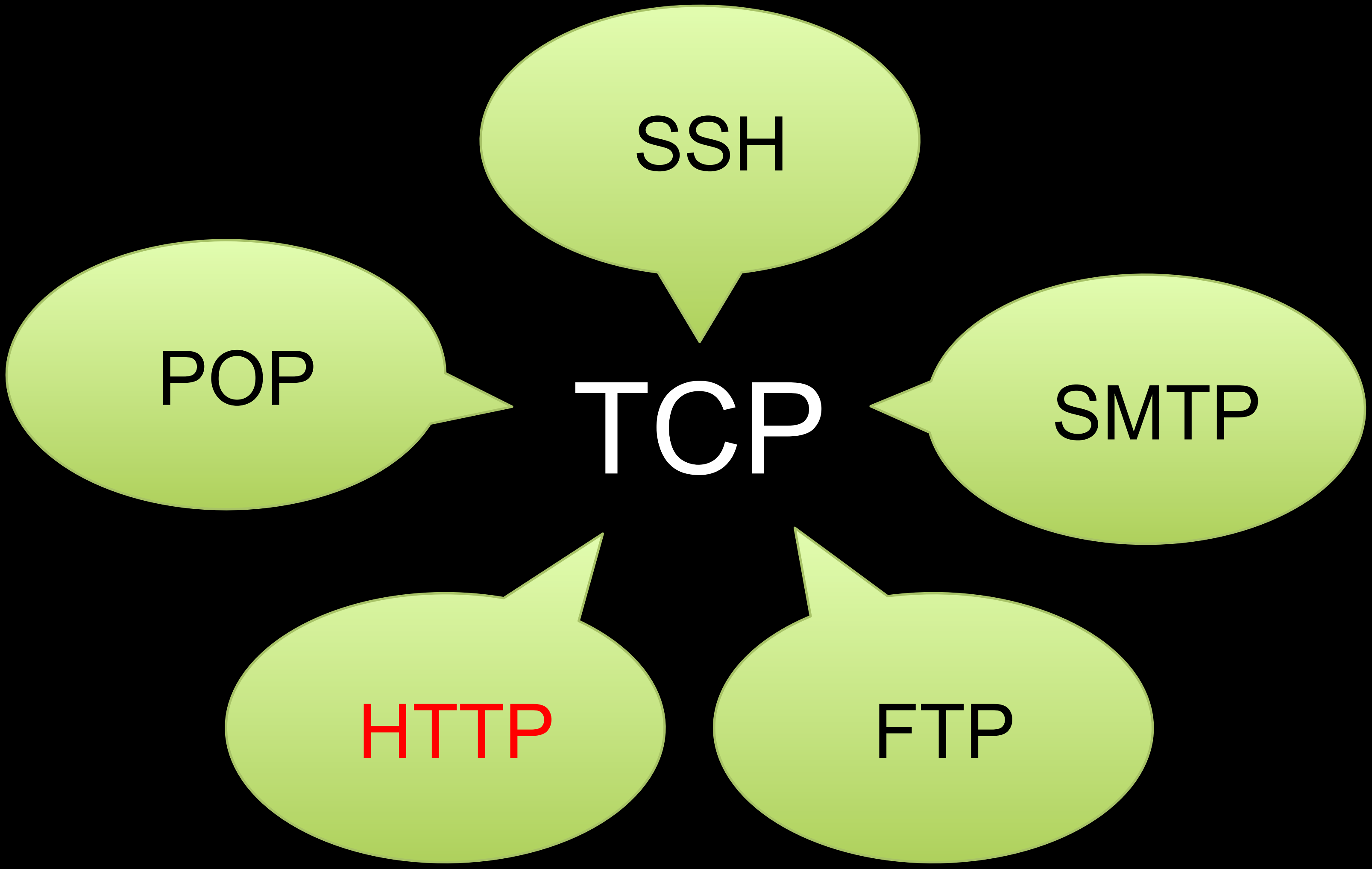
TCP

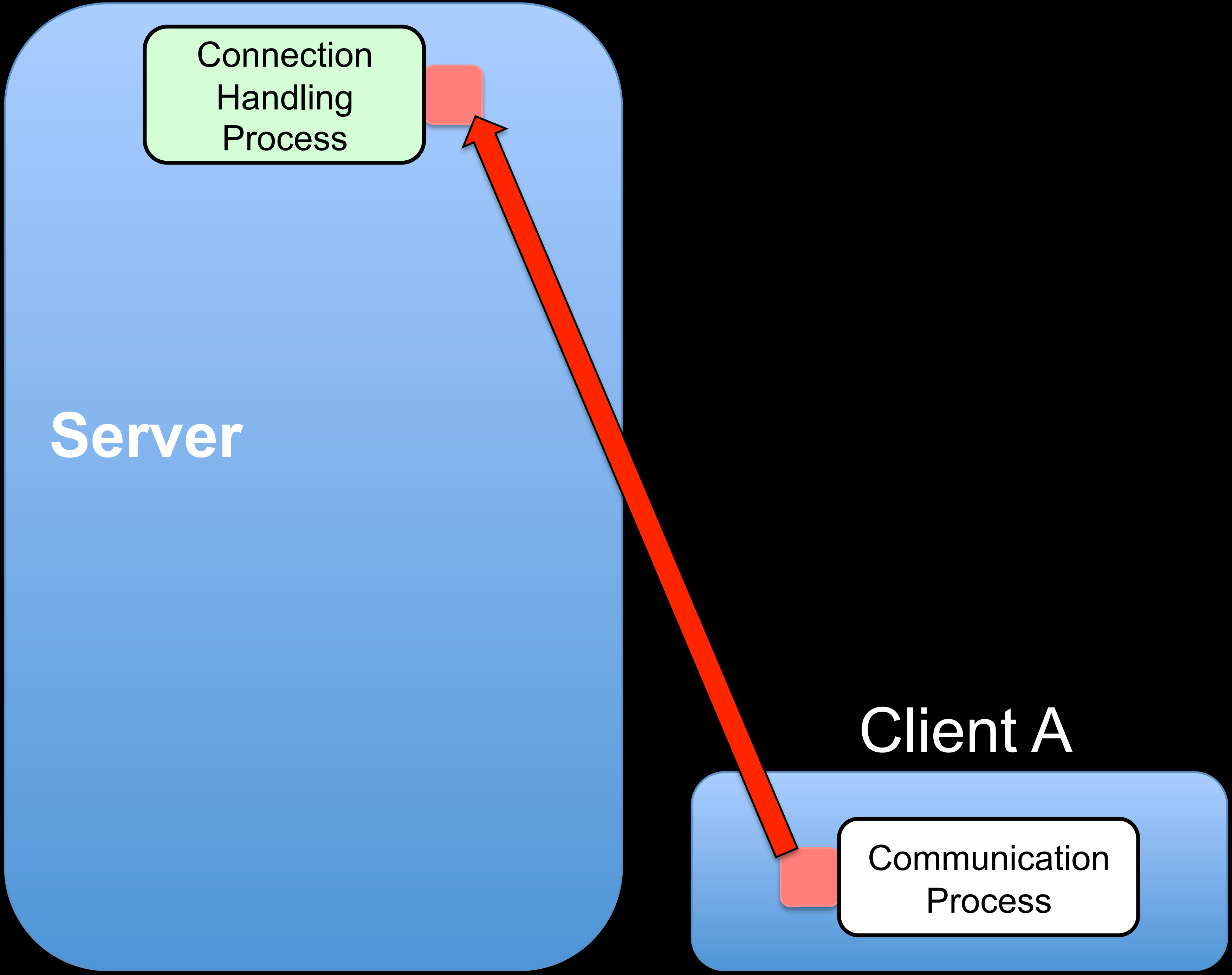
- Connected
- Reliable
- Streams

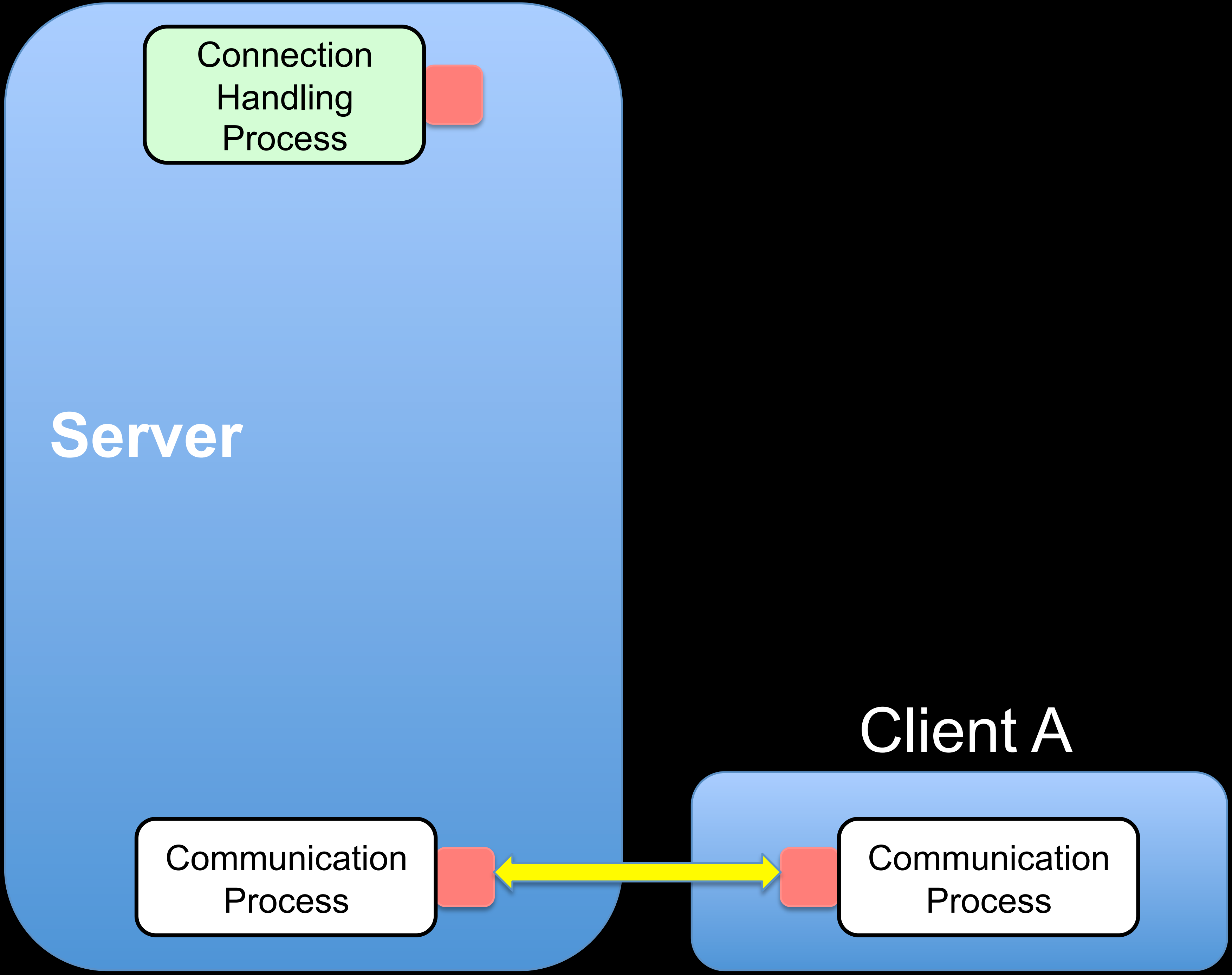
UDP

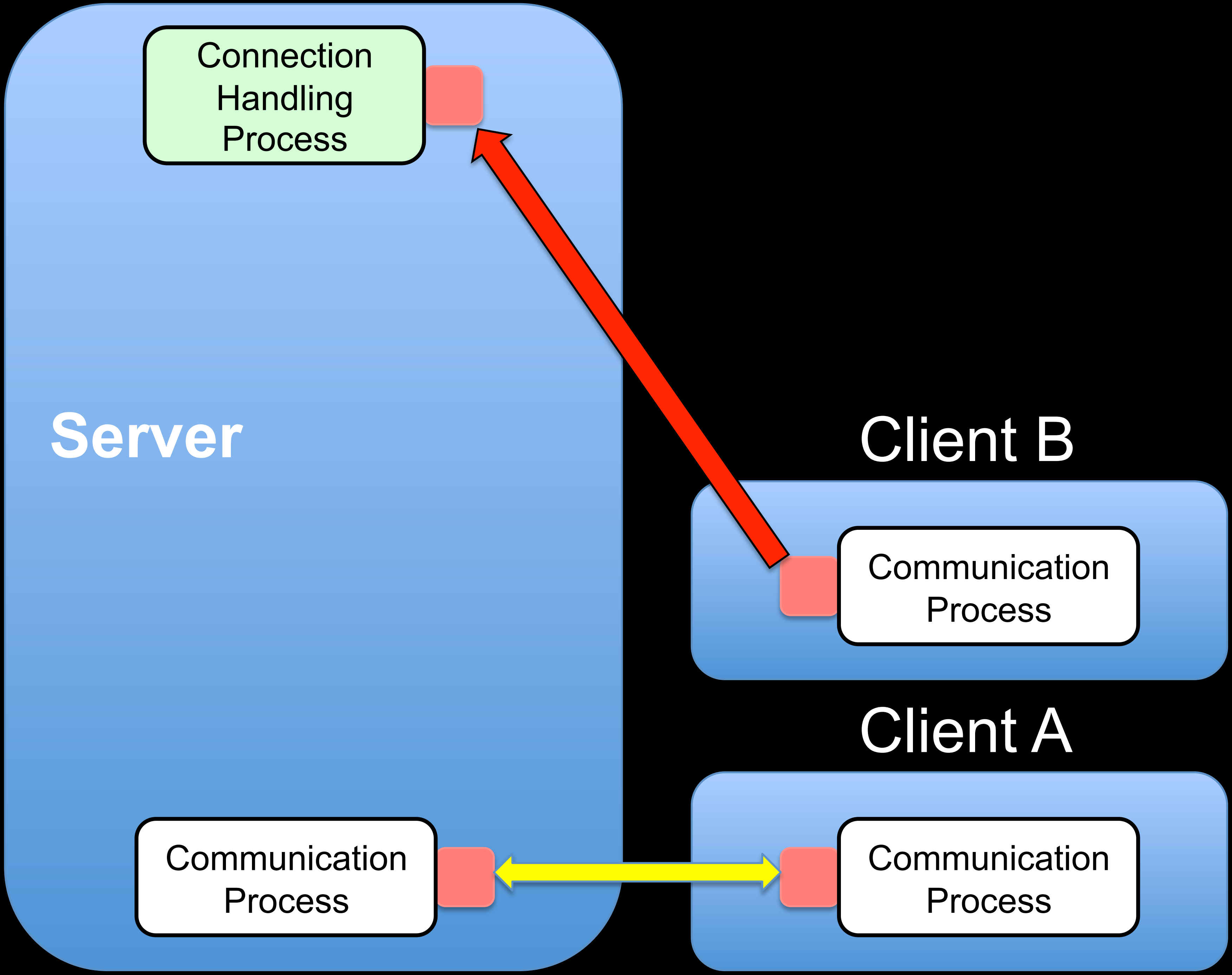
- Connection free
- Unreliable
- Limited size

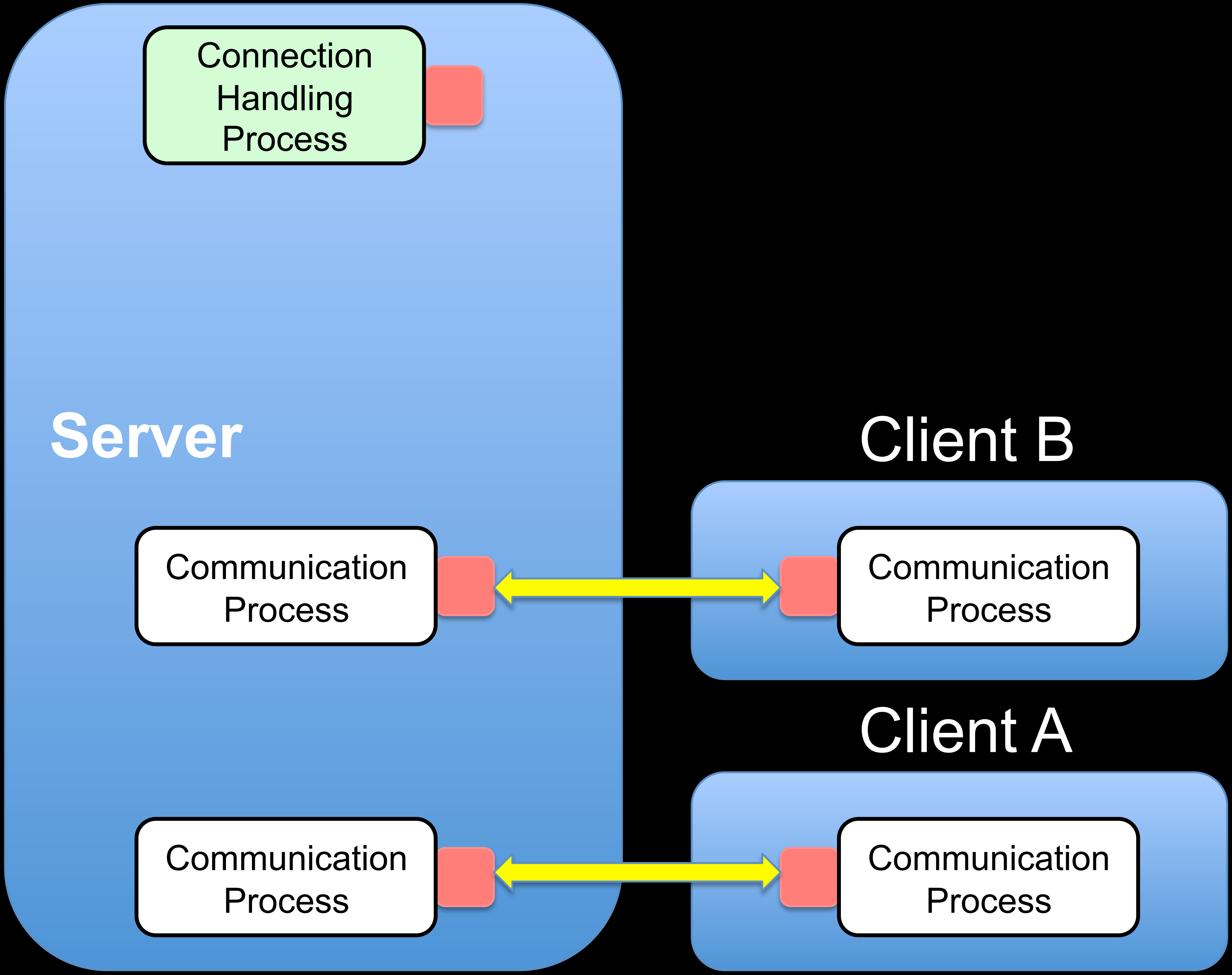
Focus

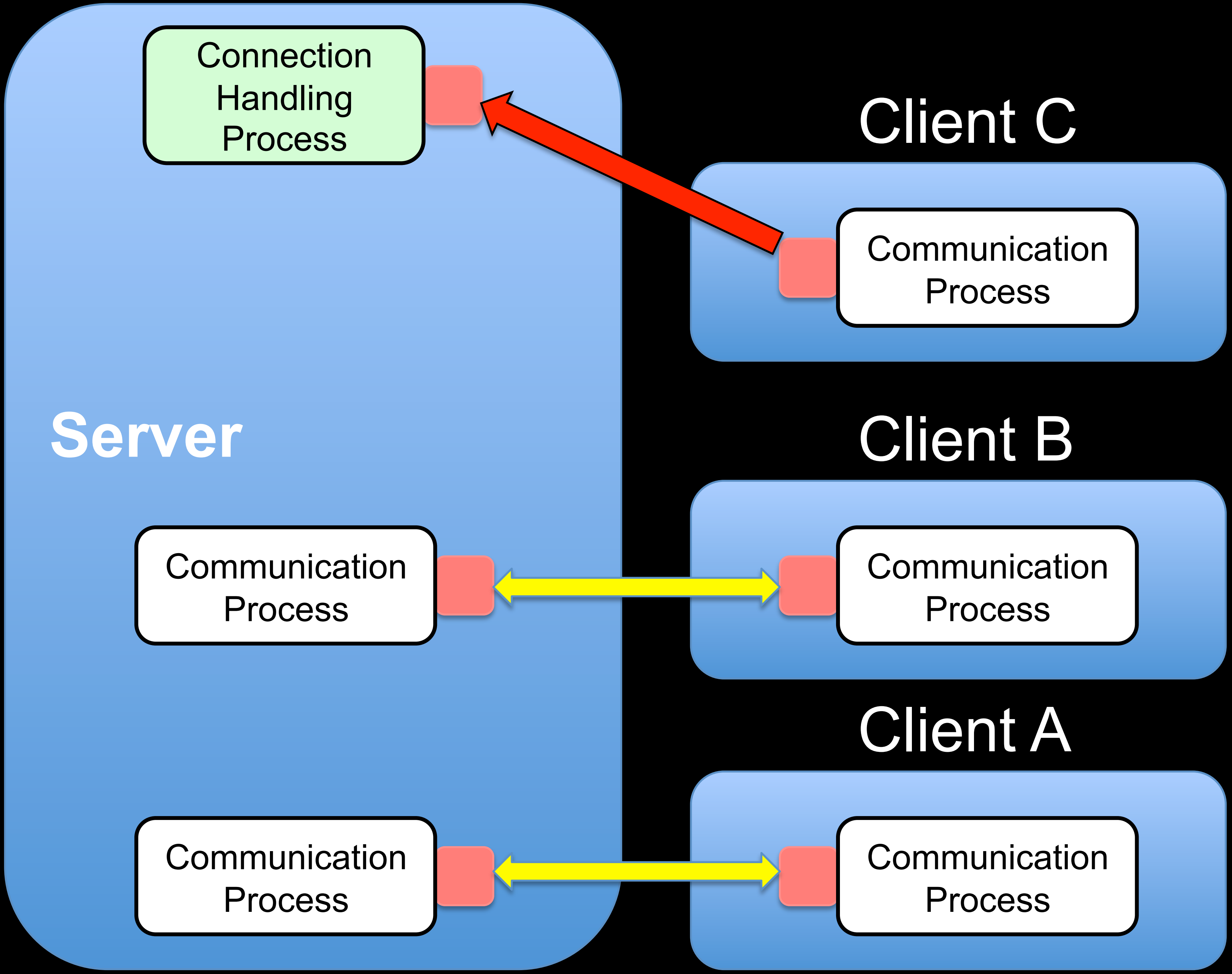


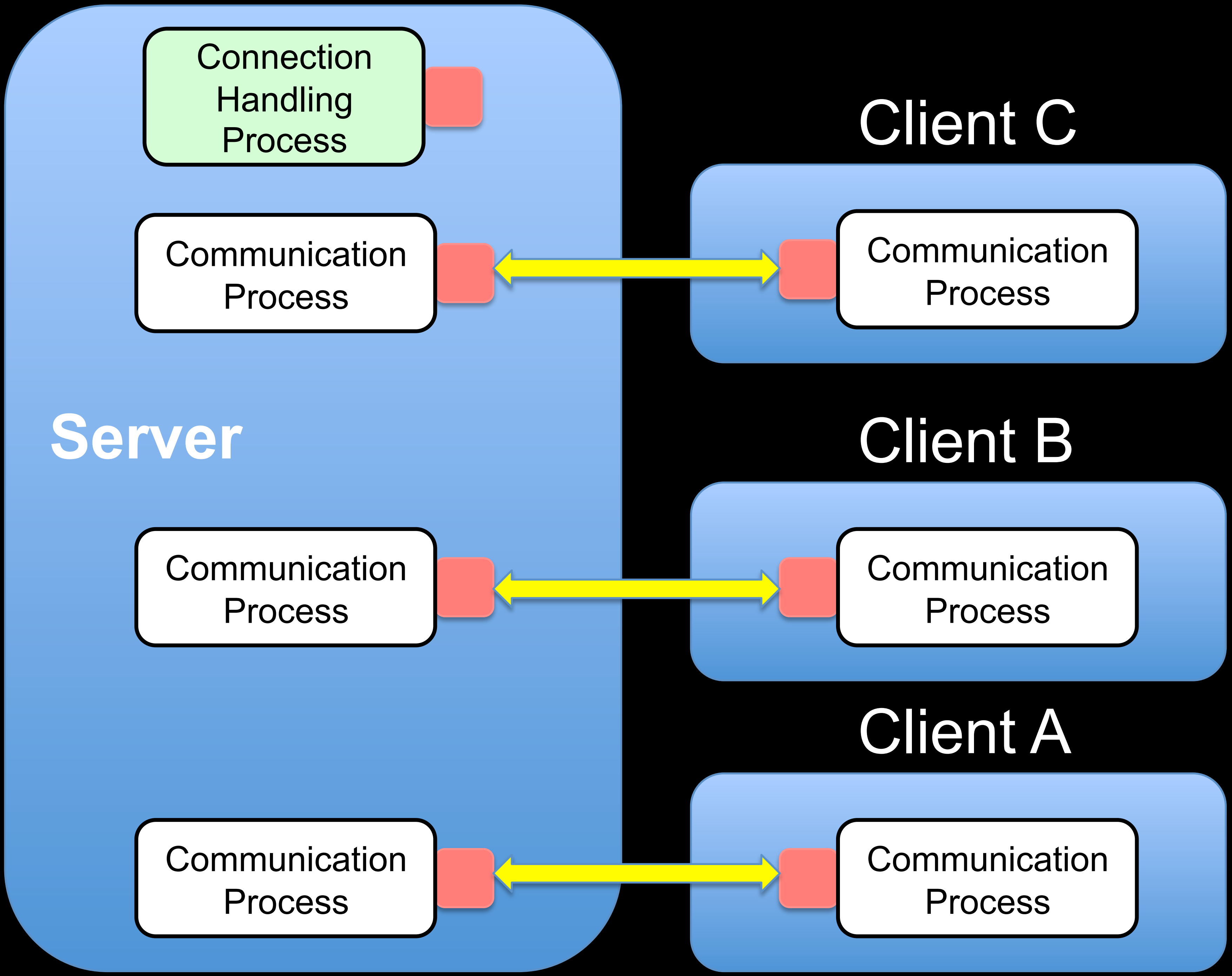

Connection Handling Process
Server
Client A
Communication Process


Connection Handling Process
Server
Client A
Communication Process
Communication Process


Connection Handling Process
Server
Client B
Communication Process
Client A
Communication Process
Communication Process


Connection Handling Process
Server
Client B
Communication Process
Communication Process
Client A
Communication Process
Communication Process


Connection Handling Process
Server
Communication Process
Communication Process
Client C
Communication Process
Client B
Communication Process
Client A
Communication Process


Connection Handling Process
Communication Process
Server
Communication Process
Communication Process
Client C
Communication Process
Client B
Communication Process
Client A
Communication Process

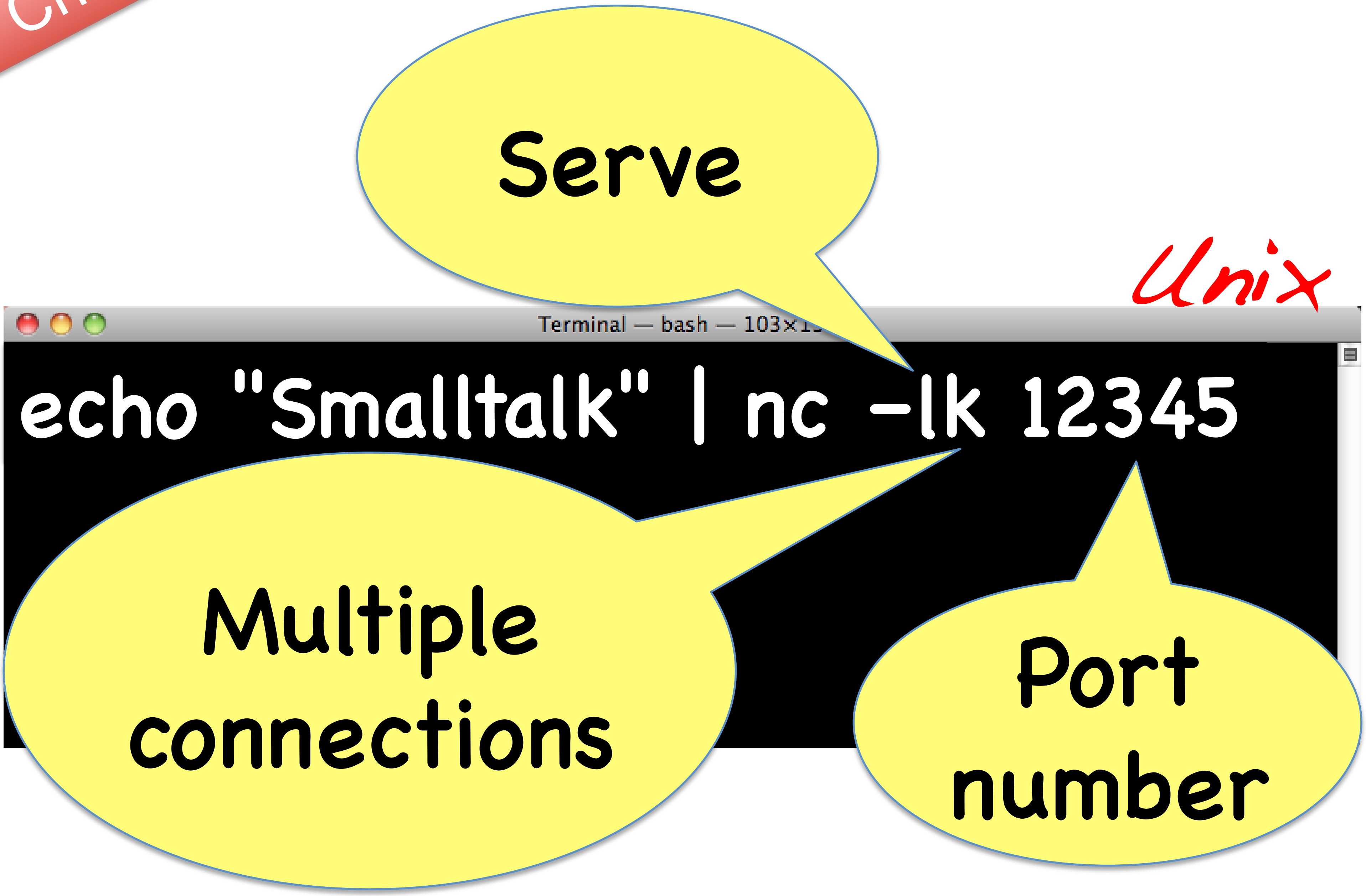
Challenge 1

Client ~~Socket~~ SocketStream

1. Connect to a server
2. Send a String
3. Receive a String
4. Close

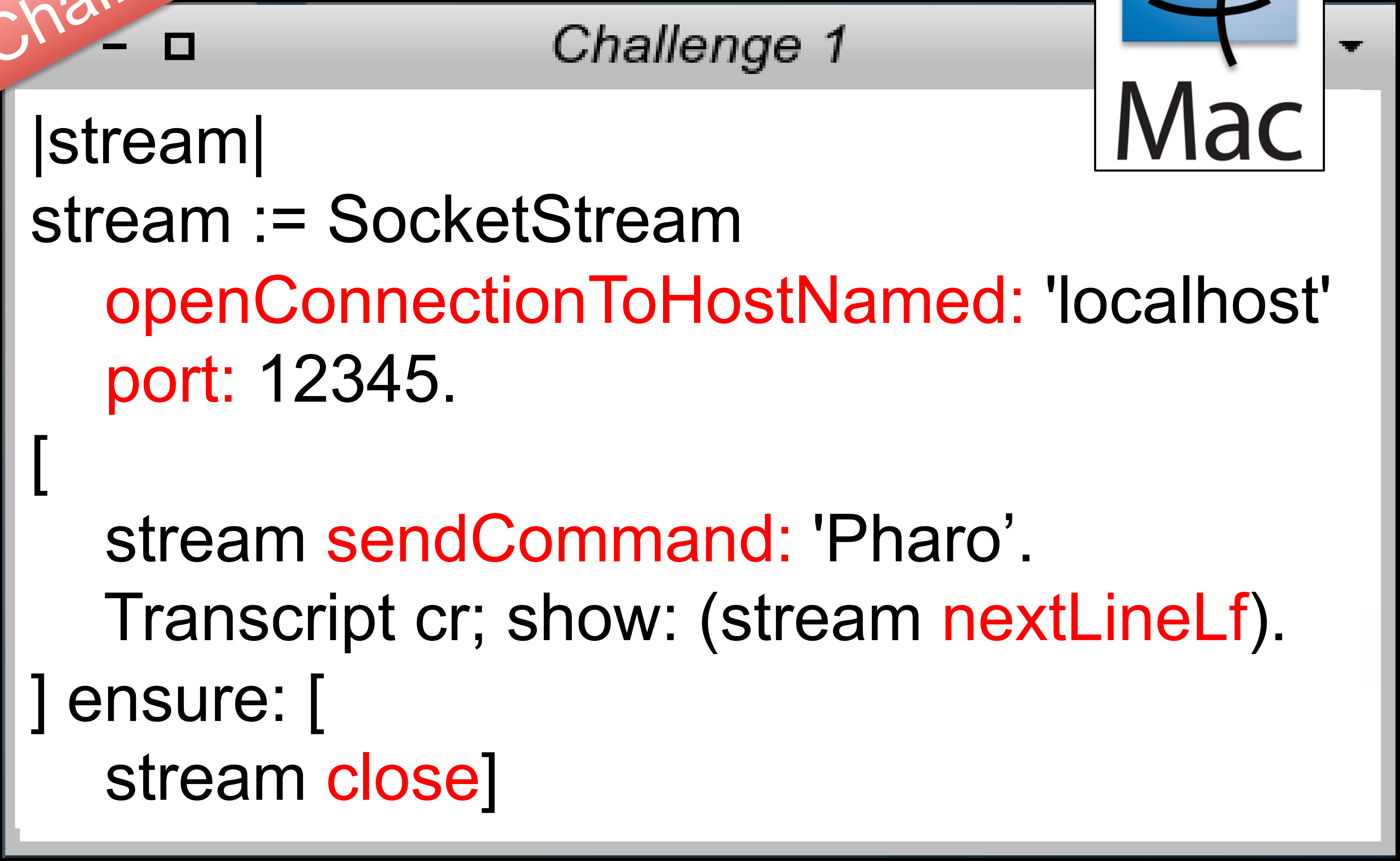
Challenge 1

Server for Tests



```
echo "Smalltalk" | nc -lk 12345
```

Challenge 1



```
|stream|
stream := SocketStream
    openConnectionToHostNamed: 'localhost'
    port: 12345.
[
    stream sendCommand: 'Pharo’.
    Transcript cr; show: (stream nextLineLf).
] ensure: [
    stream close]
```

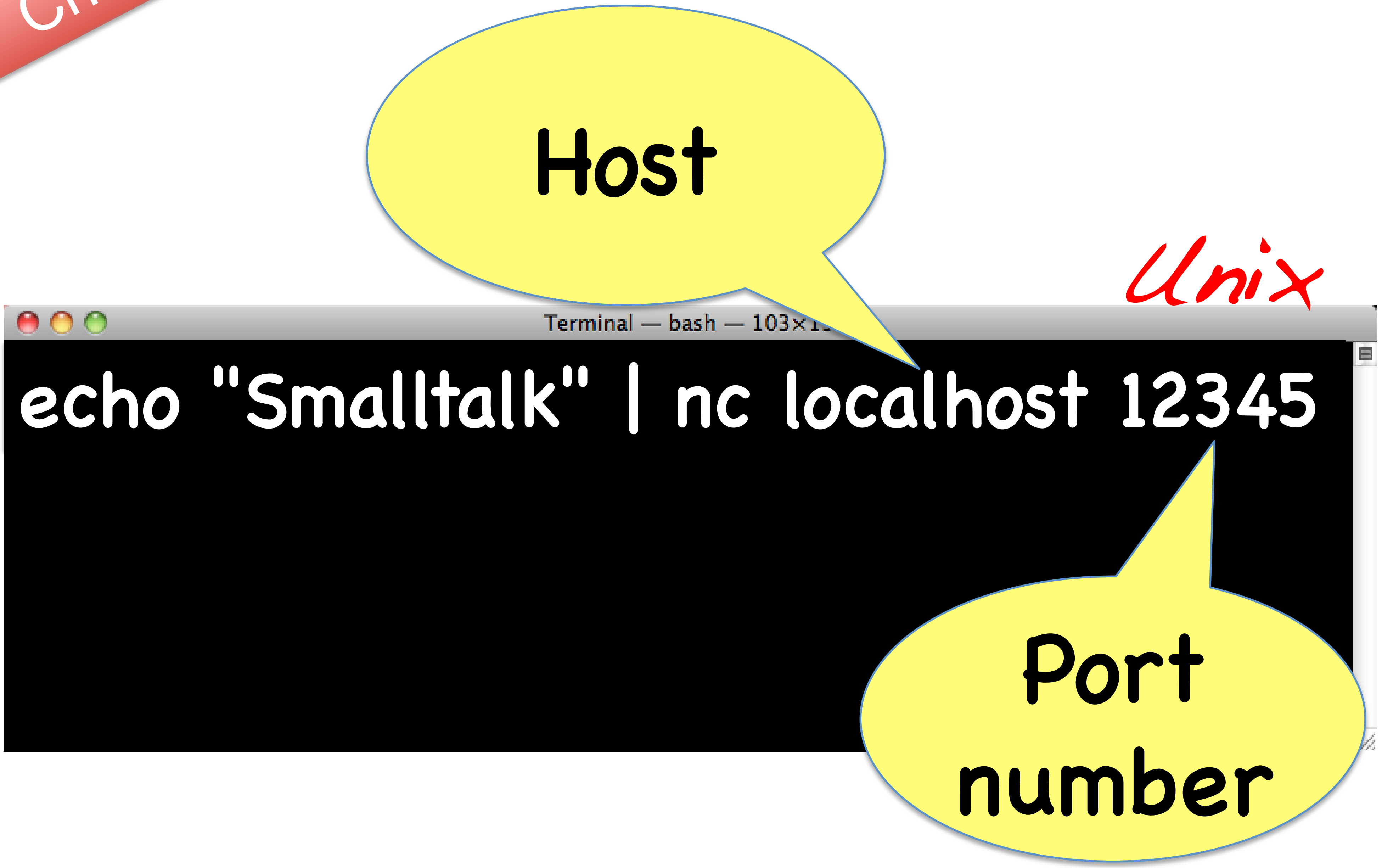
Challenge 2

Simplest Possible Server

1. Listen on some port
2. Accept 1 single client connection
3. Send a String
4. Receive a String
5. Close

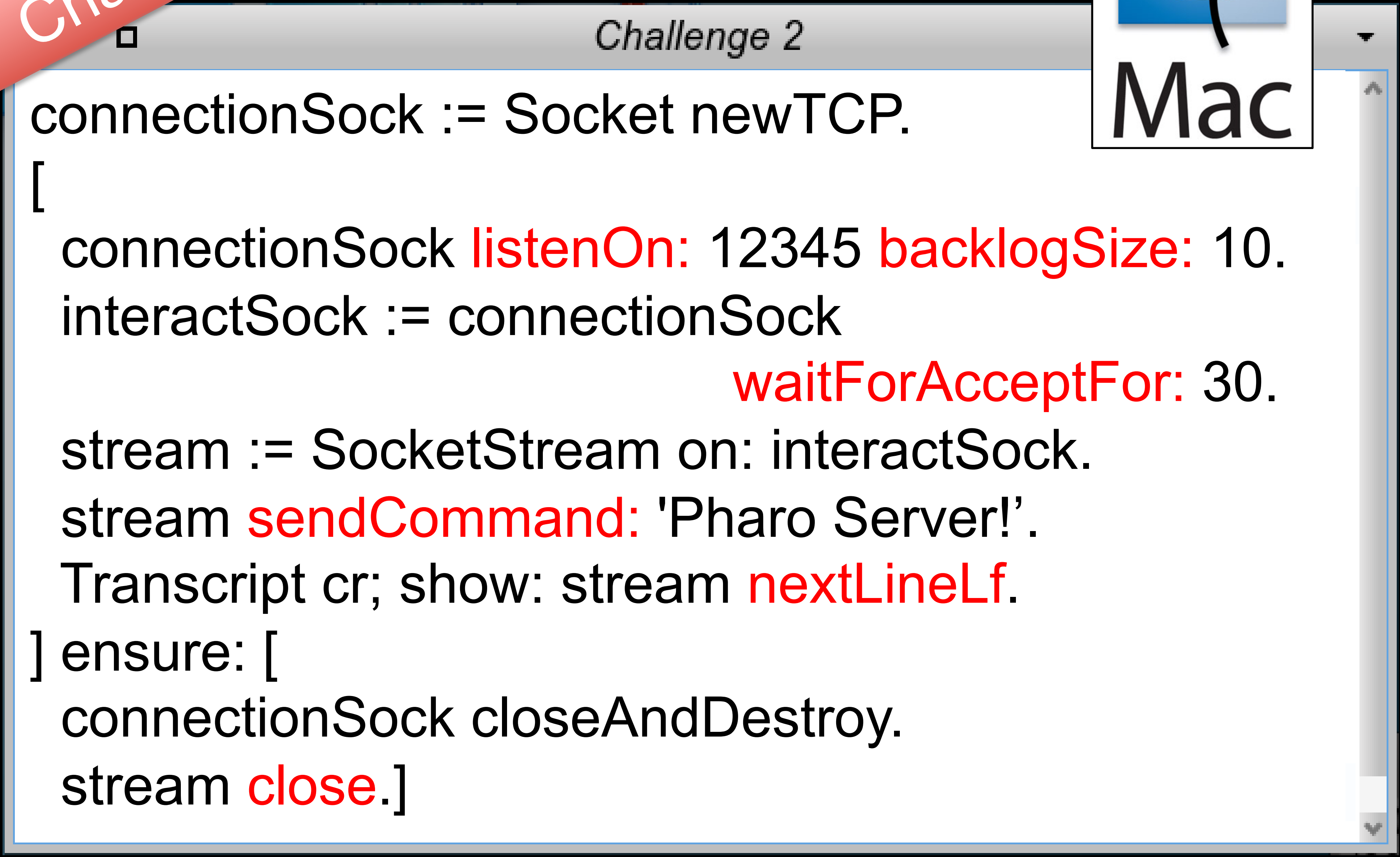
Challenge 2

Client for Tests



```
echo "Smalltalk" | nc localhost 12345
```

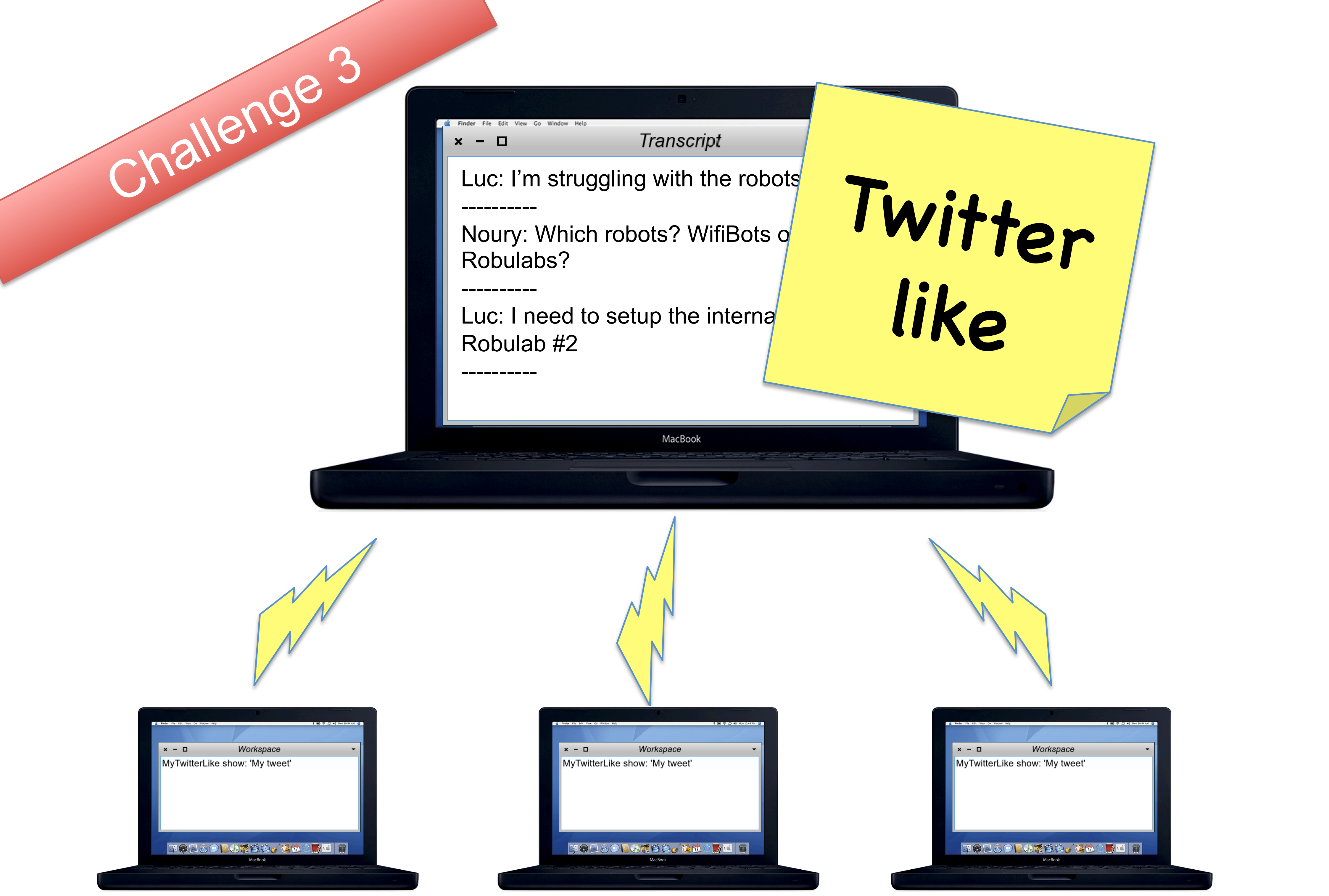
Challenge 2



Challenge 2

```
connectionSock := Socket newTCP.
[
  connectionSock listenOn: 12345 backlogSize: 10.
  interactSock := connectionSock
                                   waitForAcceptFor: 30.
  stream := SocketStream on: interactSock.
  stream sendCommand: 'Pharo Server!’.
  Transcript cr; show: stream nextLineLf.
] ensure: [
  connectionSock closeAndDestroy.
  stream close.]
```

Mac


Challenge 3
Twitter like
Transcript
Luc: I'm struggling with the robots

Noury: Which robots? WifiBots o
Robulabs?

Luc: I need to setup the interna
Robulab #2

MacBook
Workspace
MyTwitterLike show: 'My tweet'
Workspace
MyTwitterLike show: 'My tweet'
Workspace
MyTwitterLike show: 'My tweet'

Challenge 3

Multi-threaded Server

1 process for connections

1 process for each client

Sycnrhonization is needed

Challenge 3

Multi-threaded Server

fork

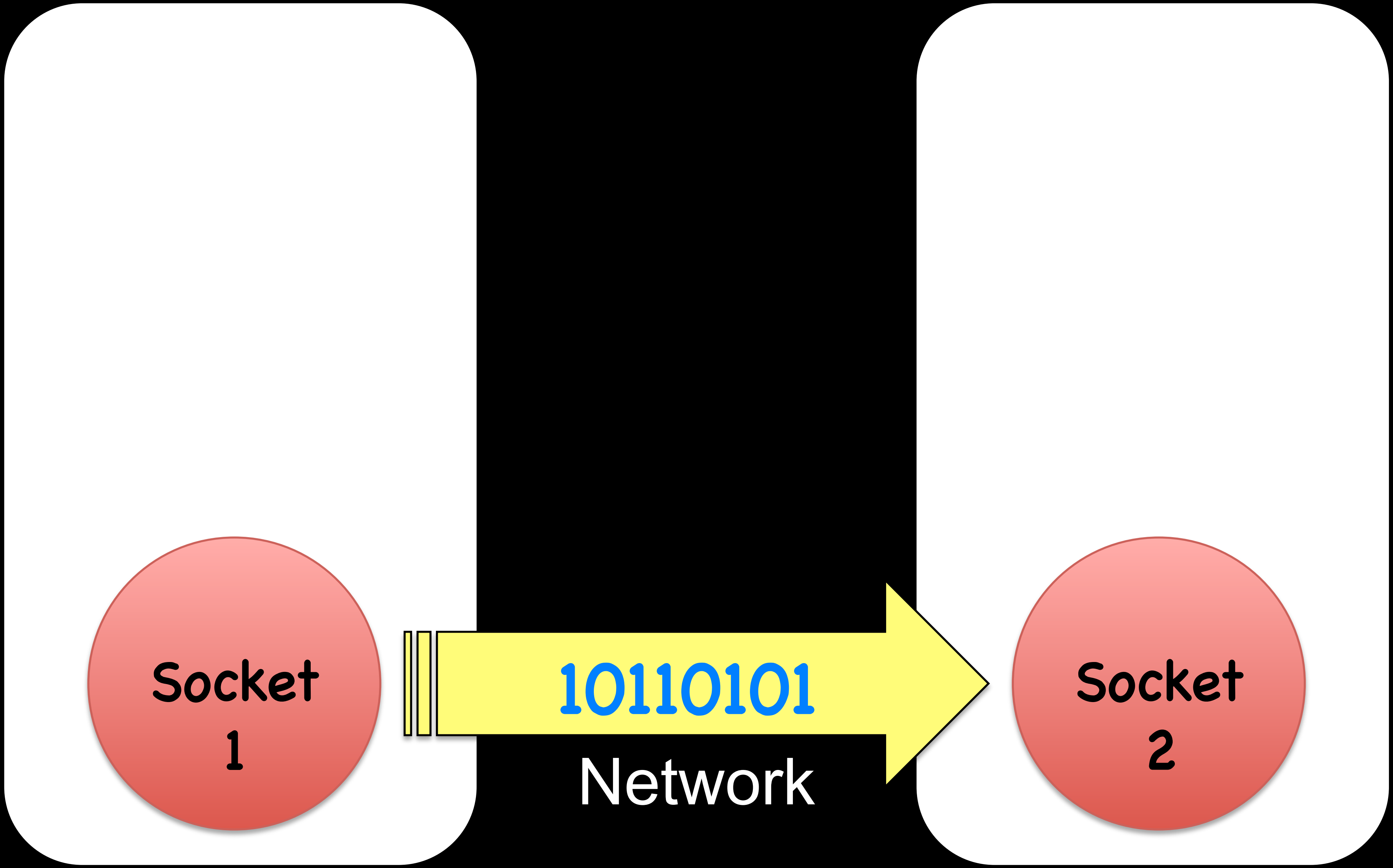
1 process for connections

1 process for <u>each</u> client

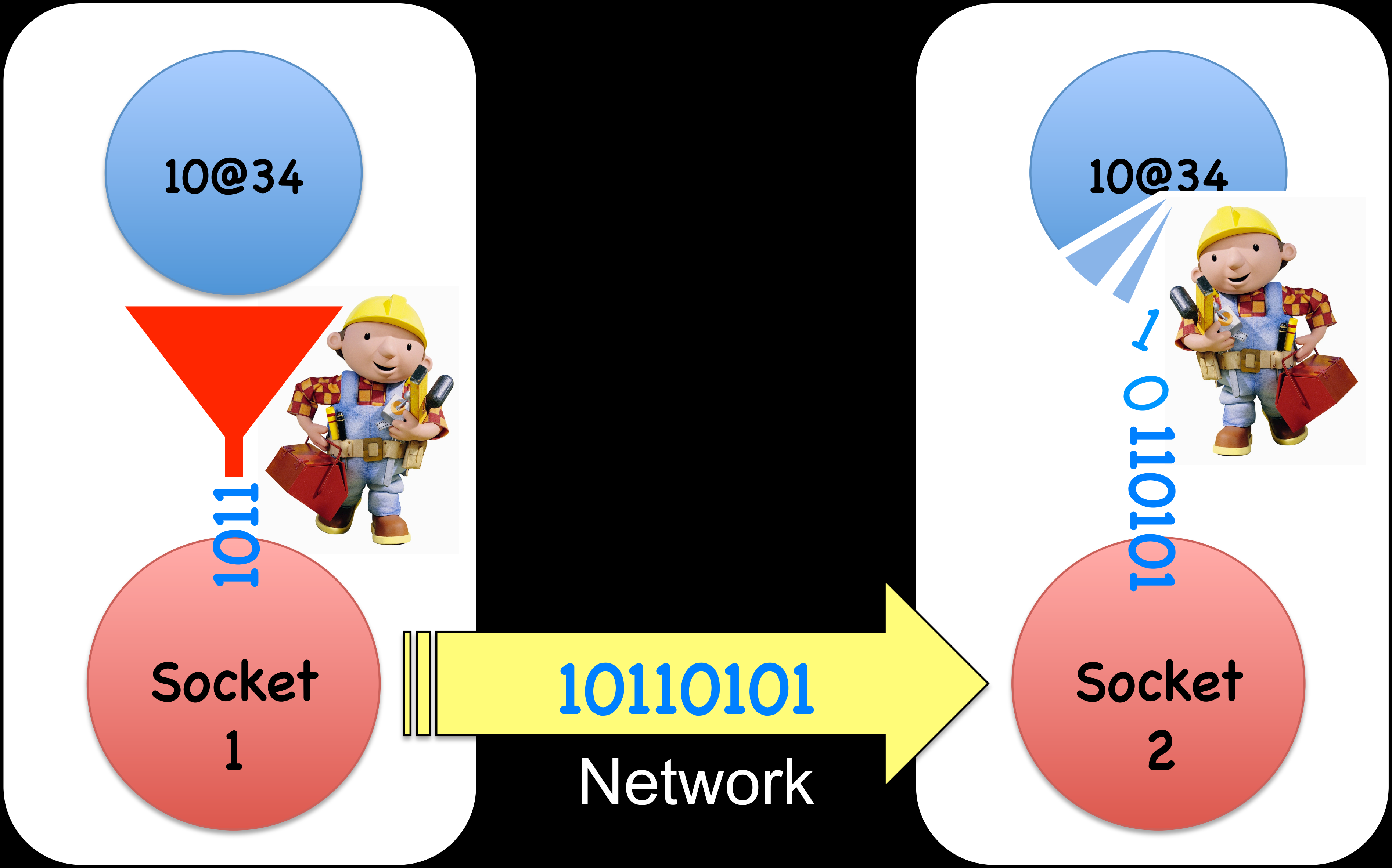
Mutex

Sycnrhonization is needed

critical:


Socket
1
10110101
Network
Socket
2

Copying an object !



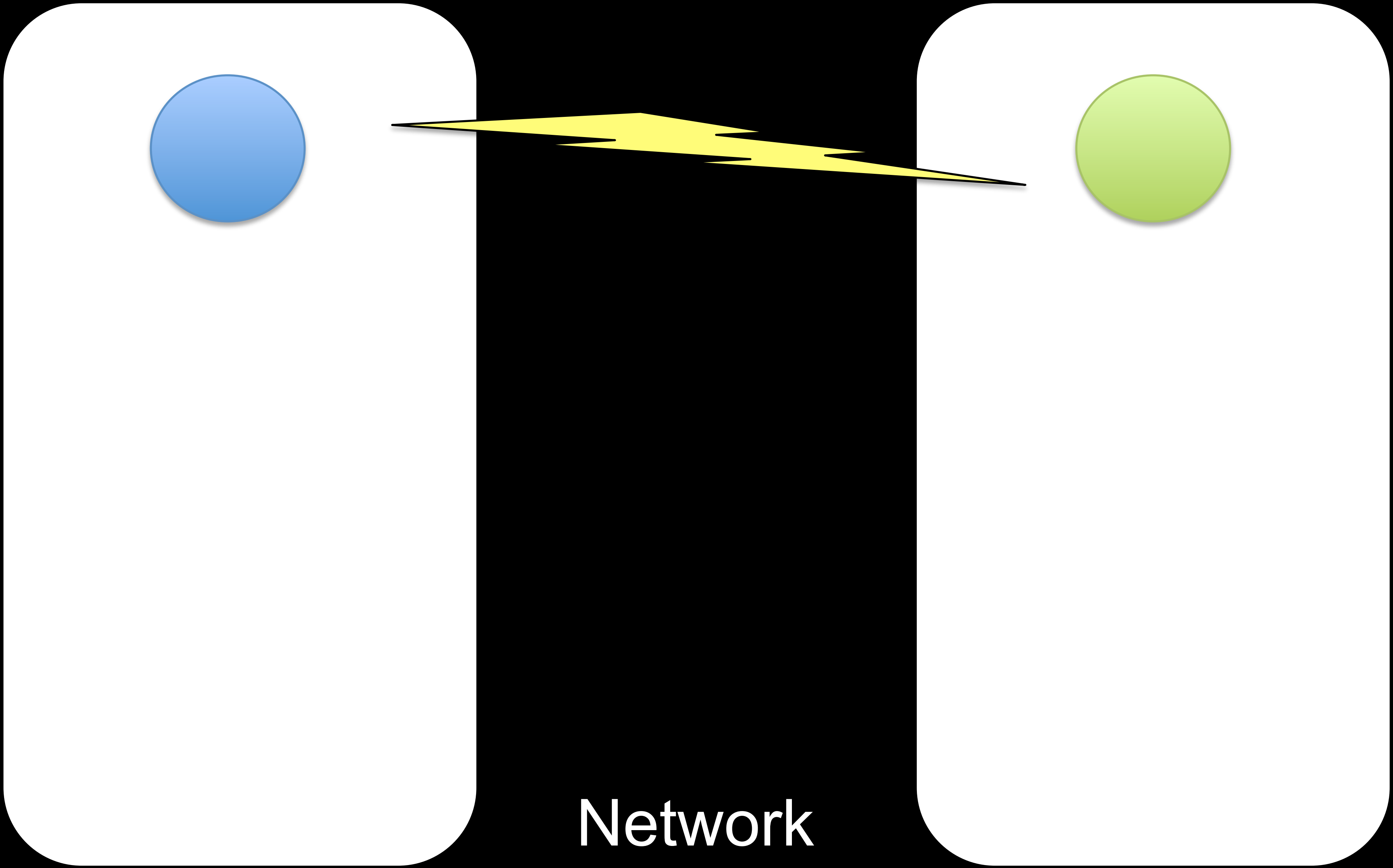
ReferenceStream

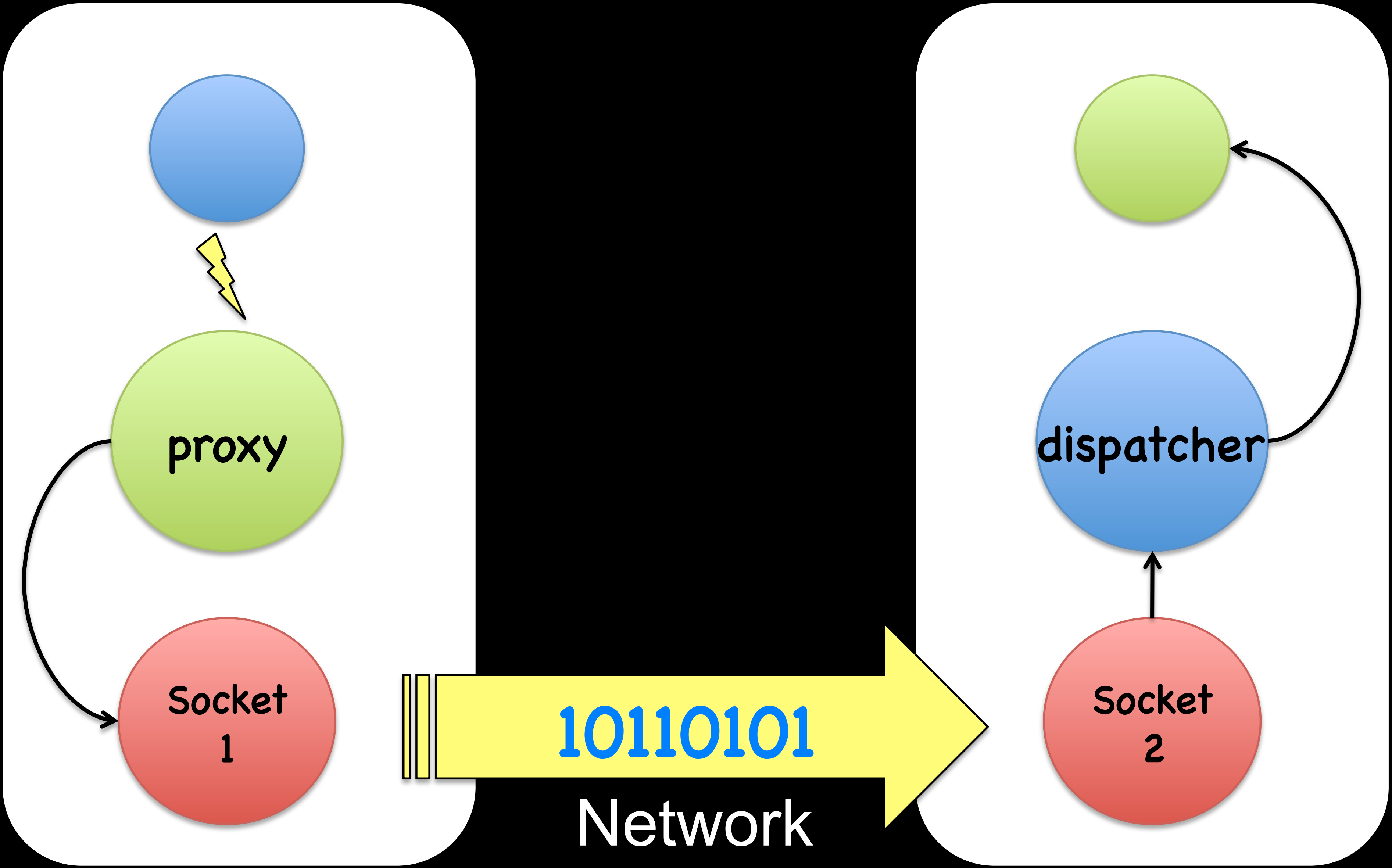
unStream: aByteArray

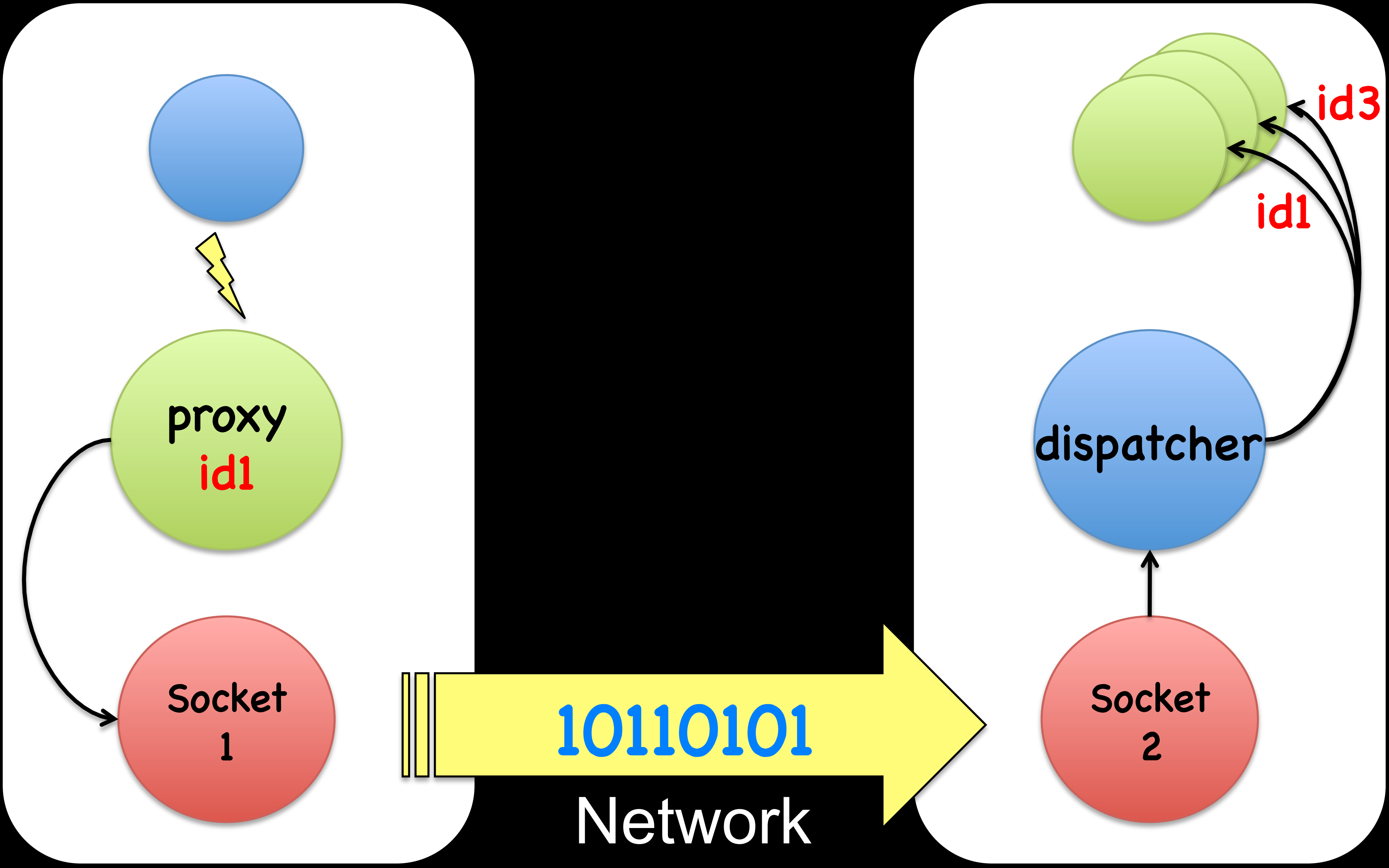
streamedRepresentationOf: 10@34

Classes should be on both sides ⚠️

Remote messaging




proxy
Socket 1
10110101
Network
dispatcher
Socket 2


proxy
id1
Socket
1
10110101
Network
Socket
2
dispatcher
id3
id1

Challenge 4

Remote Transcript

Challenge 4

Proxy

Code Deployment

(De-)Serializing Messages

Message passing control

Argument passing by reference

Garbage Collection?

Proxy

Message passing control

doesNotUnderstand:

ReferenceStream

unStream: aString

(De-)Serializing Messages

streamedRepresentationOf: anObject

What Next?

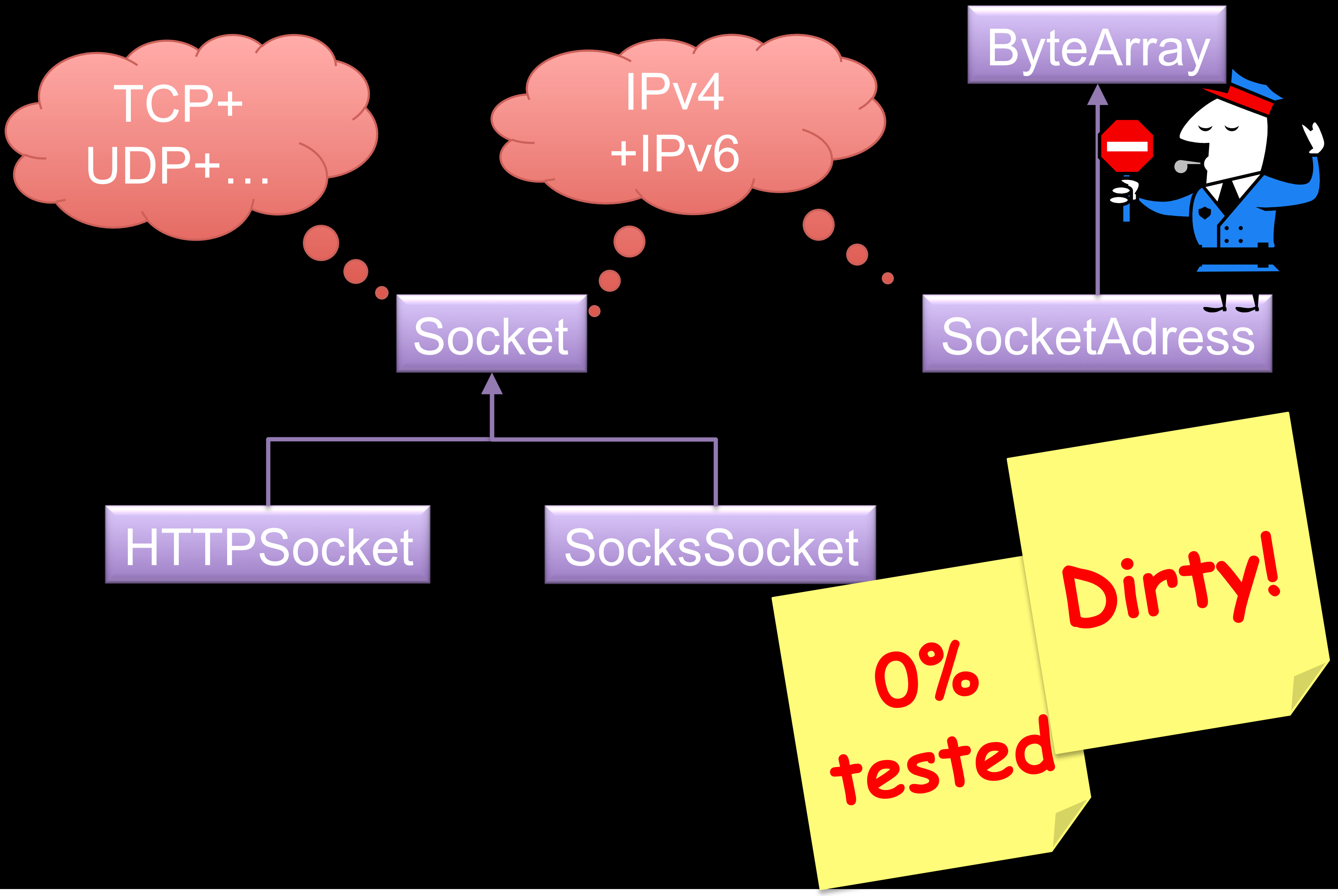
OCEAN
New Socket Library

Distributed-Objects (rST)

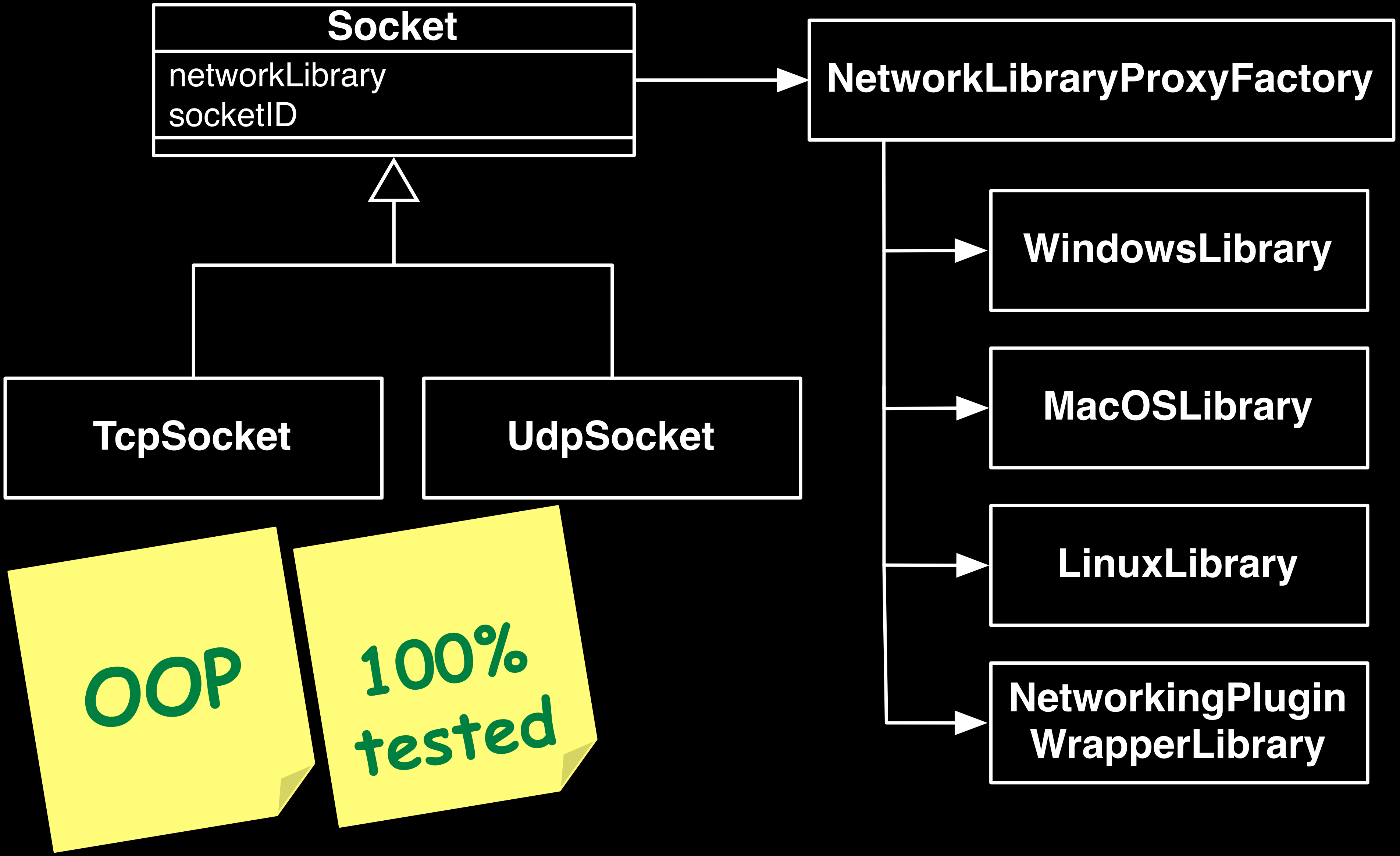
OCEAN

a Clean, Portable
Networking Library

Current network library

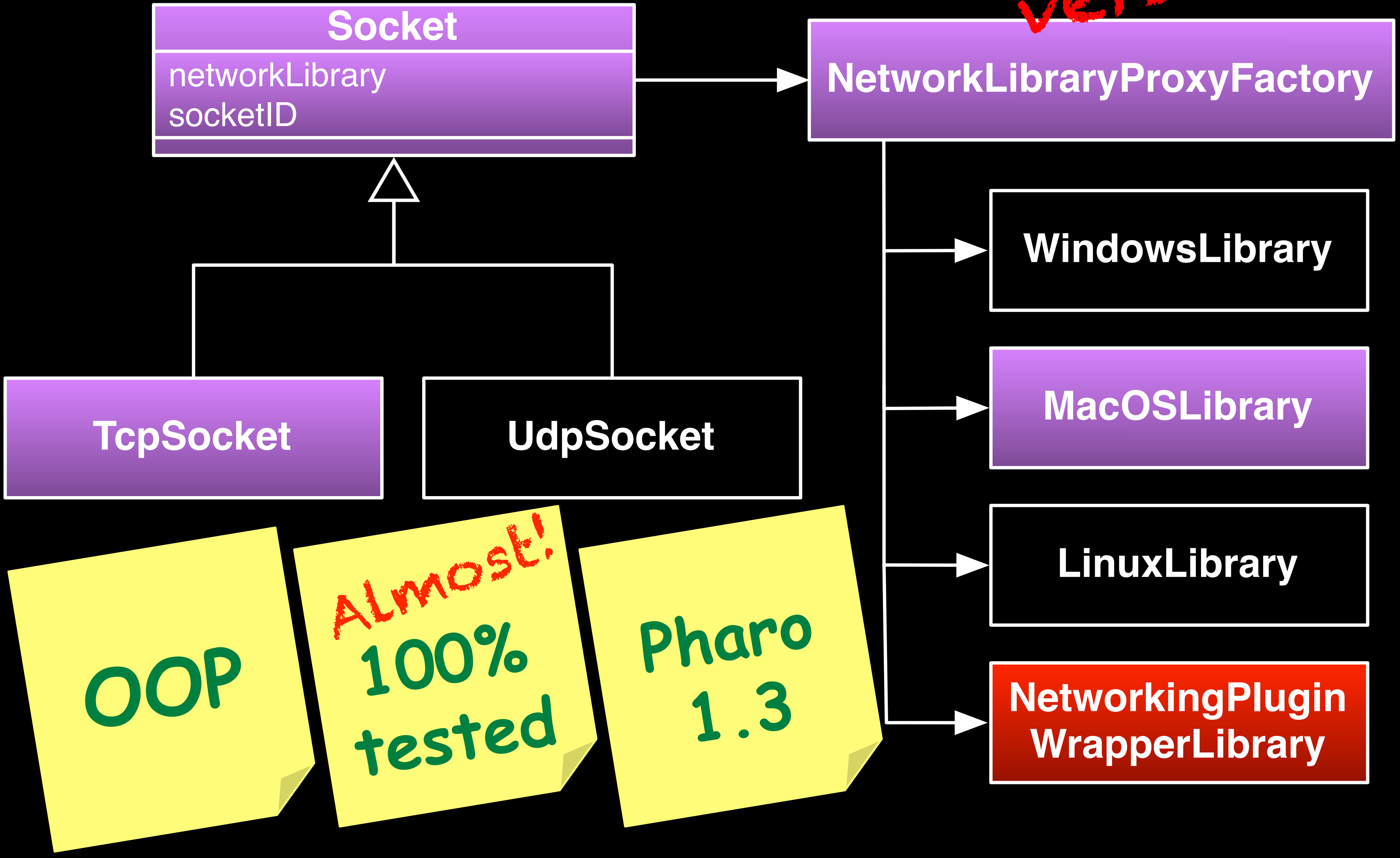


OCEAN Library

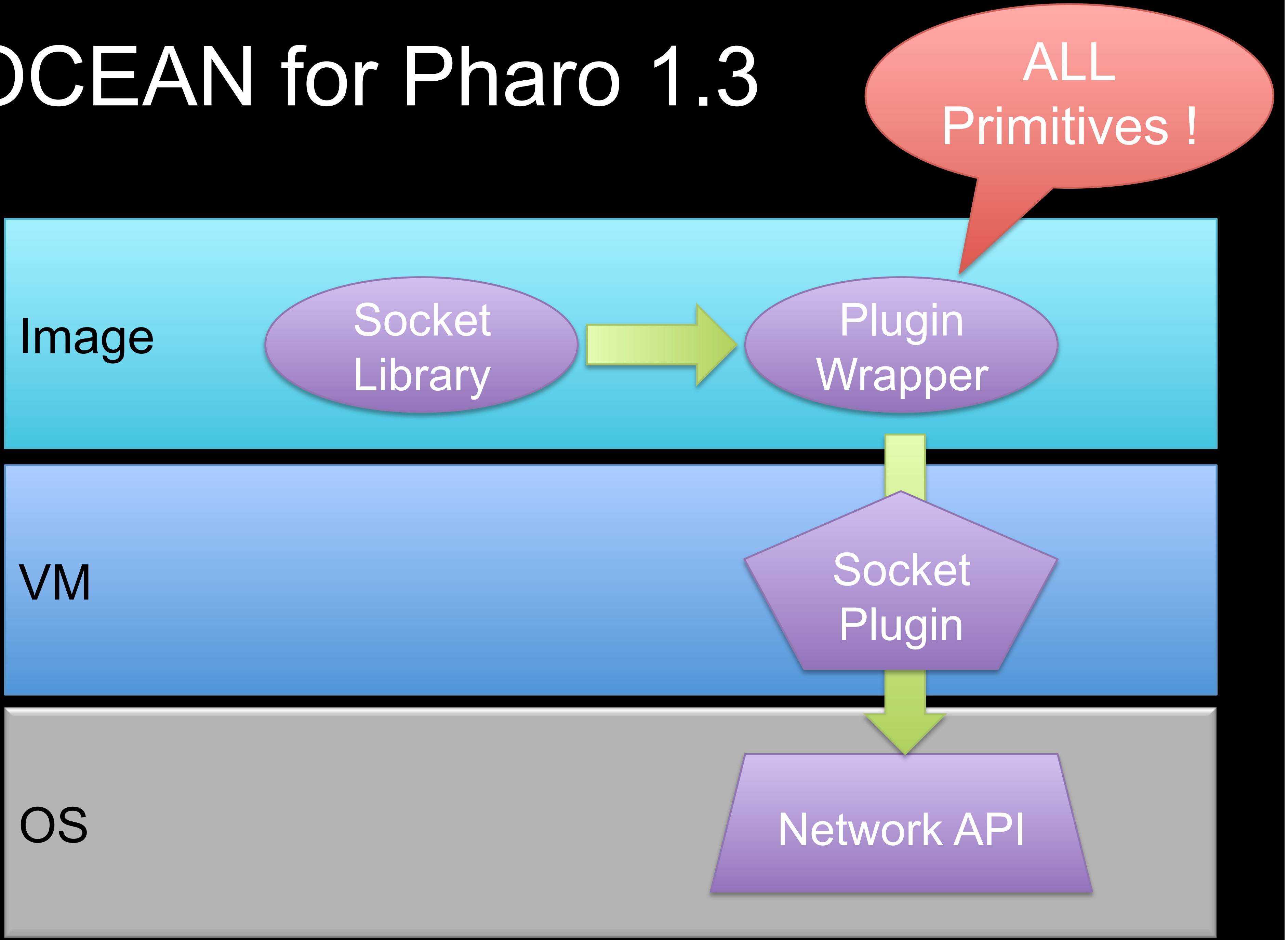


OCEAN Library

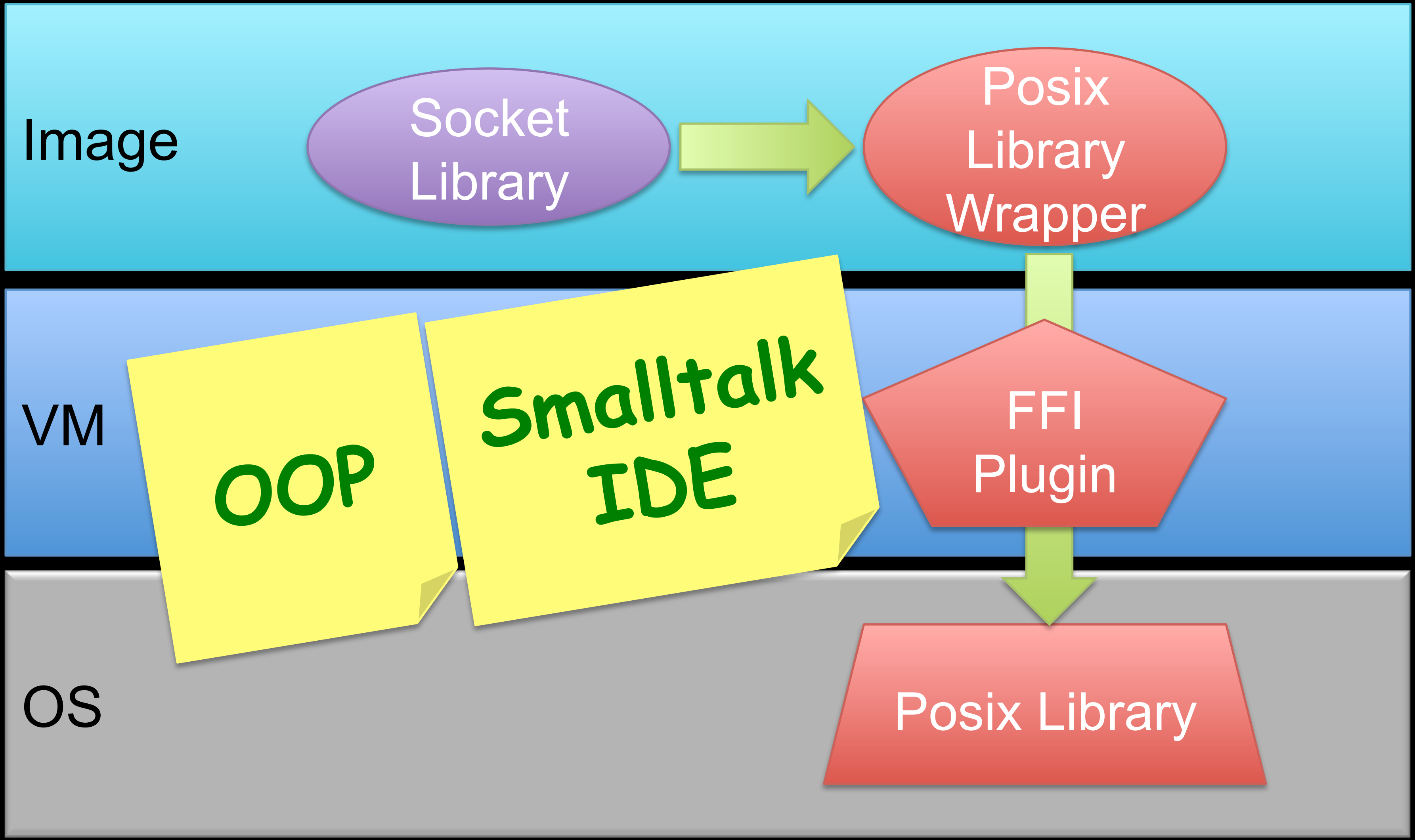
Latest version



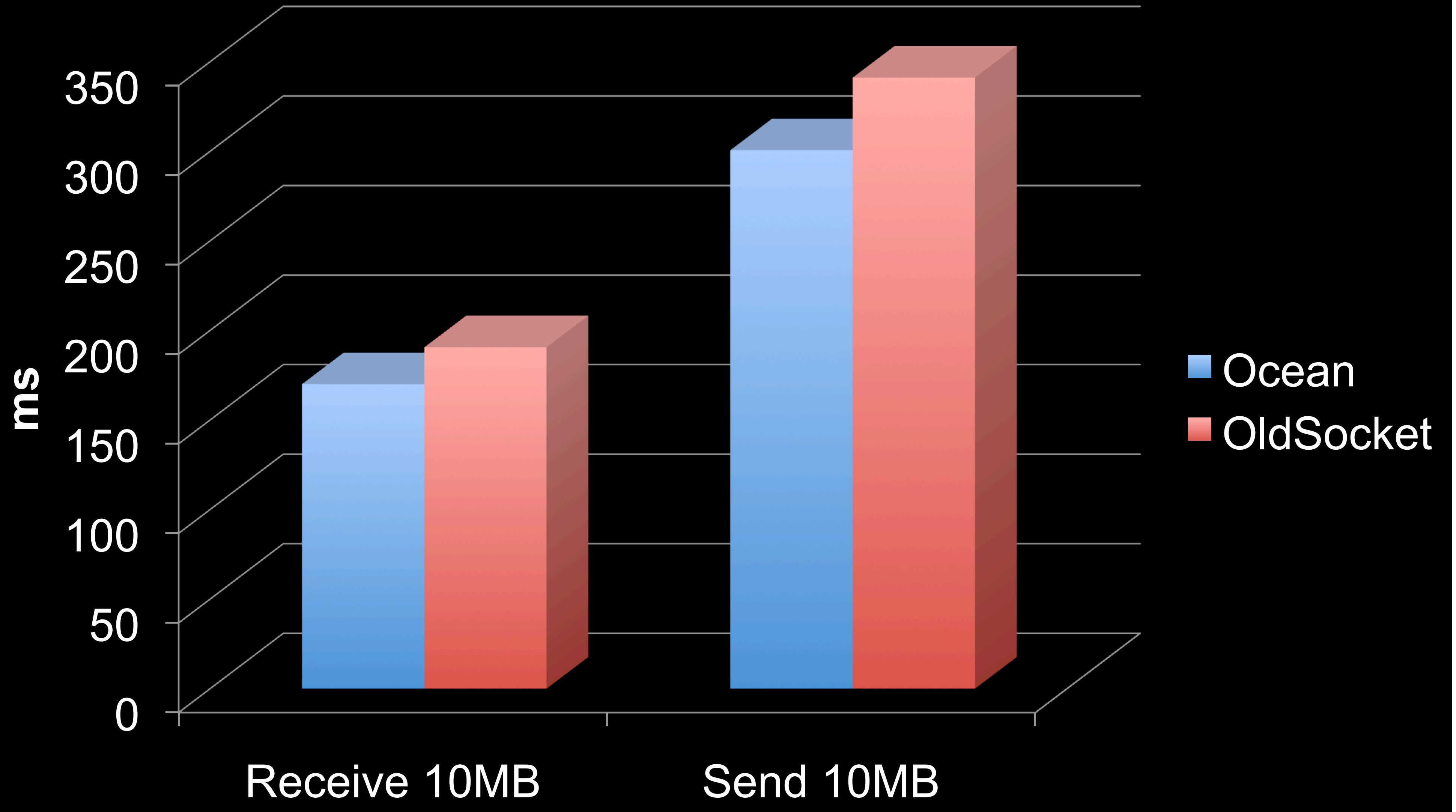
OCEAN for Pharo 1.3



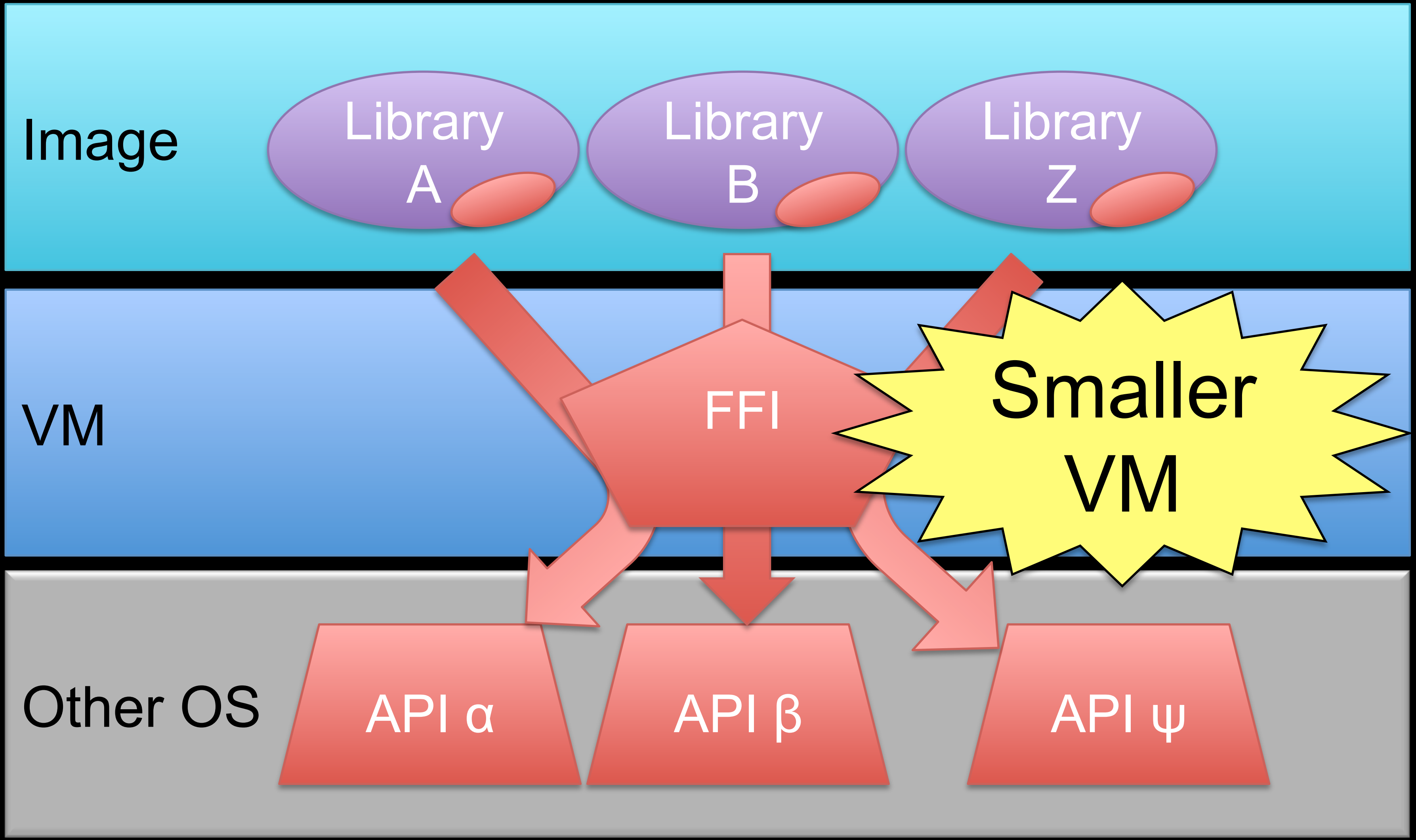
OCEAN for Pharo 1.4?



OCEAN + FFI + Posix



Generalization



That's all Folks!