MyPrecious

First Steps Towards a Modular Middleware

IMT Nord Europe
École Mines-Télécom
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Noury Bouraqadi

Mobile Apps

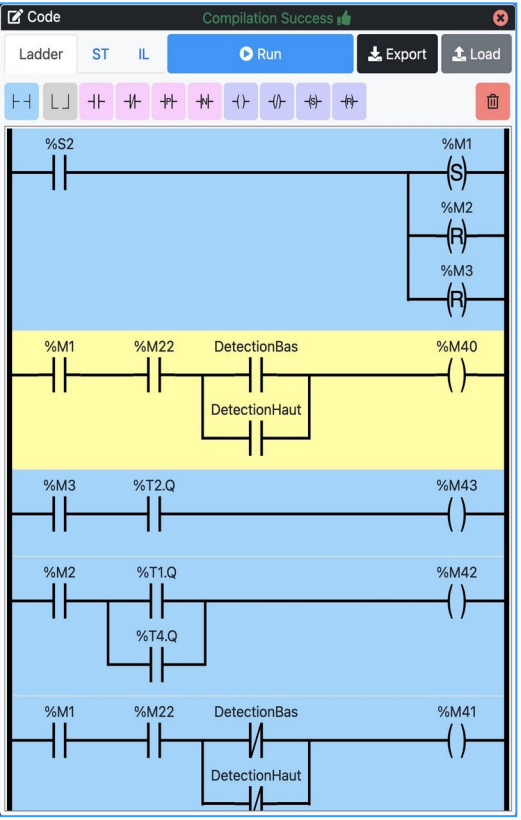

Carrier
11:31 AM
1.2 mi
Share
Vallco Farmers' Market
99 Ranch Market
Junipero Serra Fwy
Apple Infinite Loop
N De Anza Blvd
N Wolfe Rd
280
Whole Foods Market
Cupertino
Stevens Creek Blvd
Vallco Pkwy
Farmers Market
10101 N. Wolfe Rd.
Cupertino 95014, California
Schedule
January to December
Fri. 9:00 AM-1:00 PM
Products
Fruits
Vegetables
Dairy Products

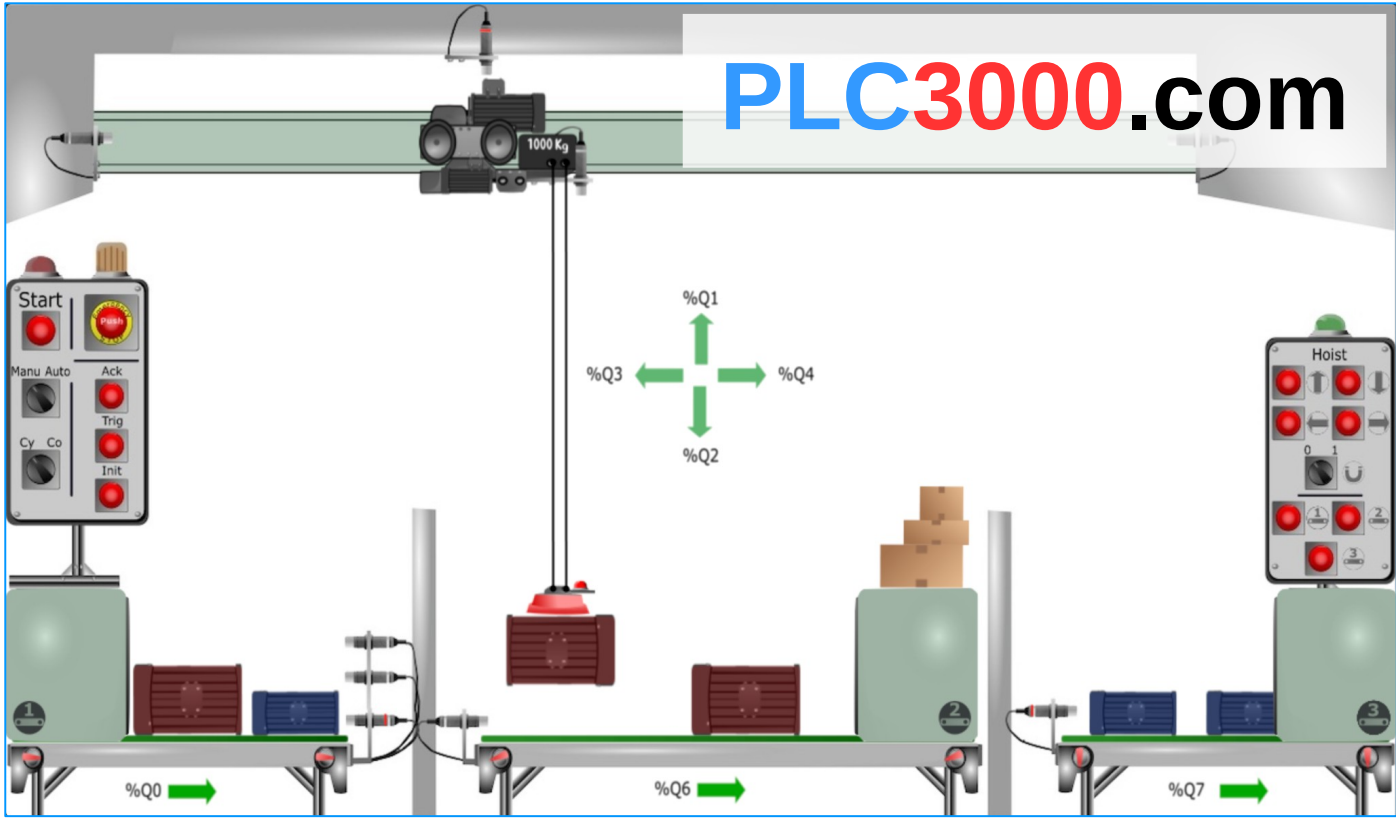

ANDROID


iOS


11:19
Mexico is one of the most
Brain Treats
Fun Facts Everyday
the last two Ayapenaco
Share with
Podcast Republic
WhatsApp
Messages
Telegram
Keep Notes
Add to Firefox
Slack
Copy to clipboard

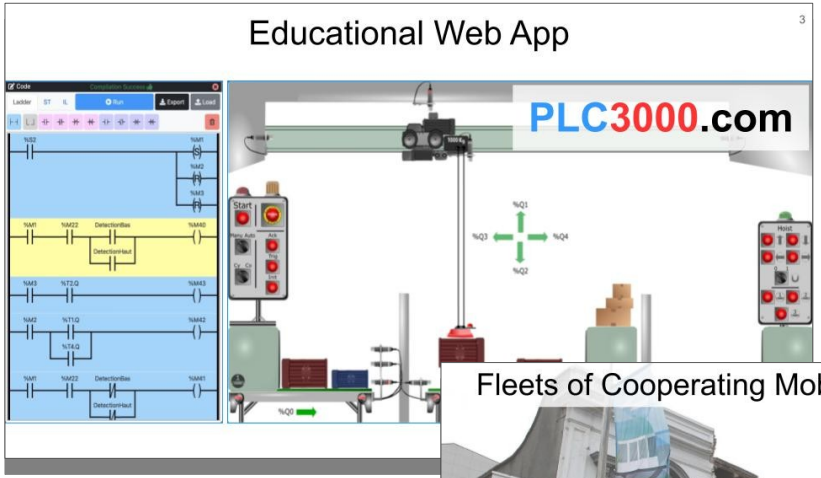
Educational Web App

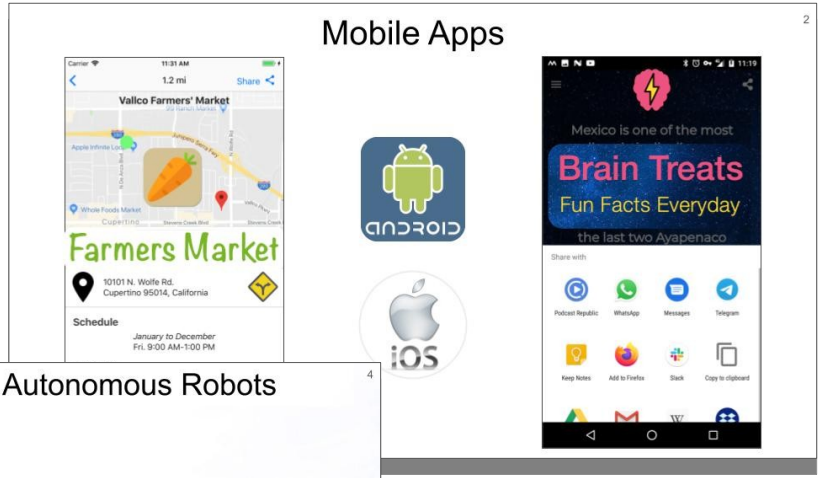




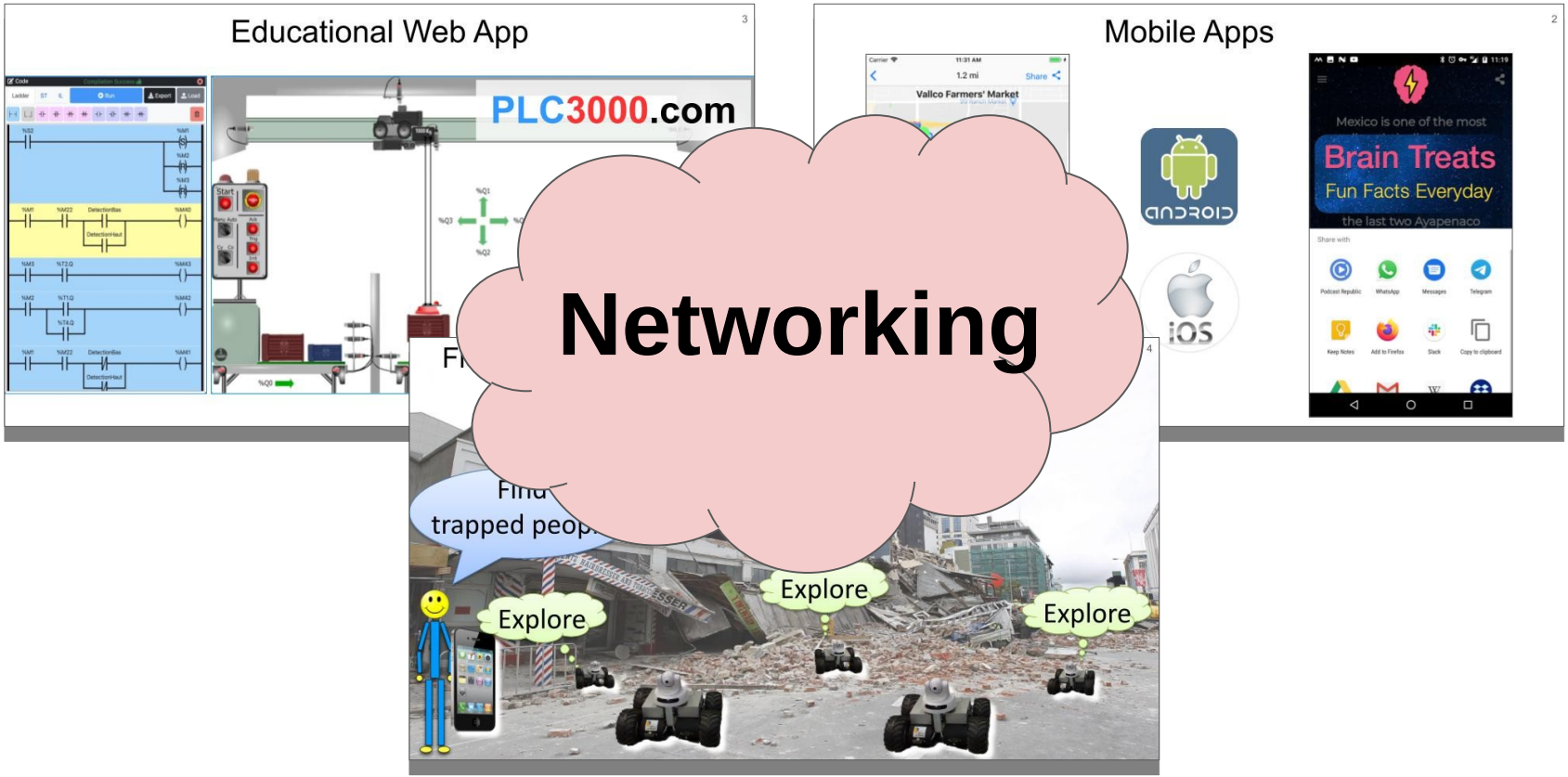
Fleets of Cooperating Mobile Autonomous Robots

What do these have in common?



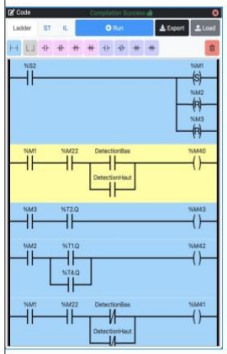


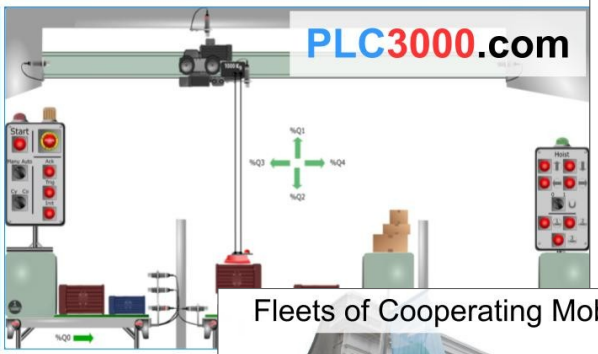
What do these have in common?



Spot the Difference?

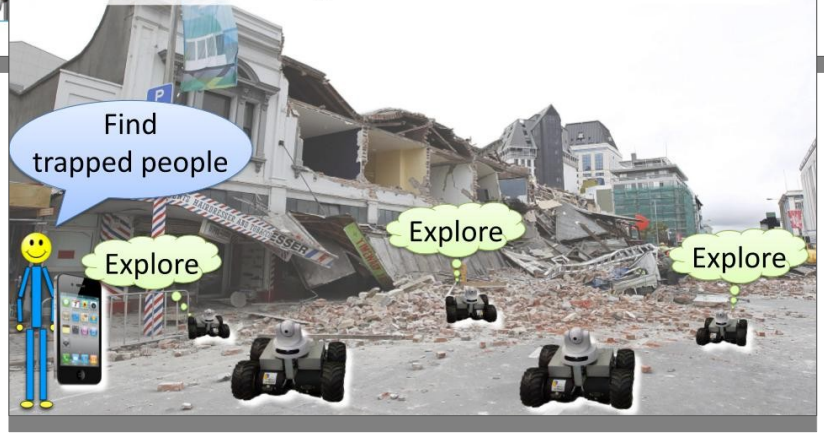
Educational Web App



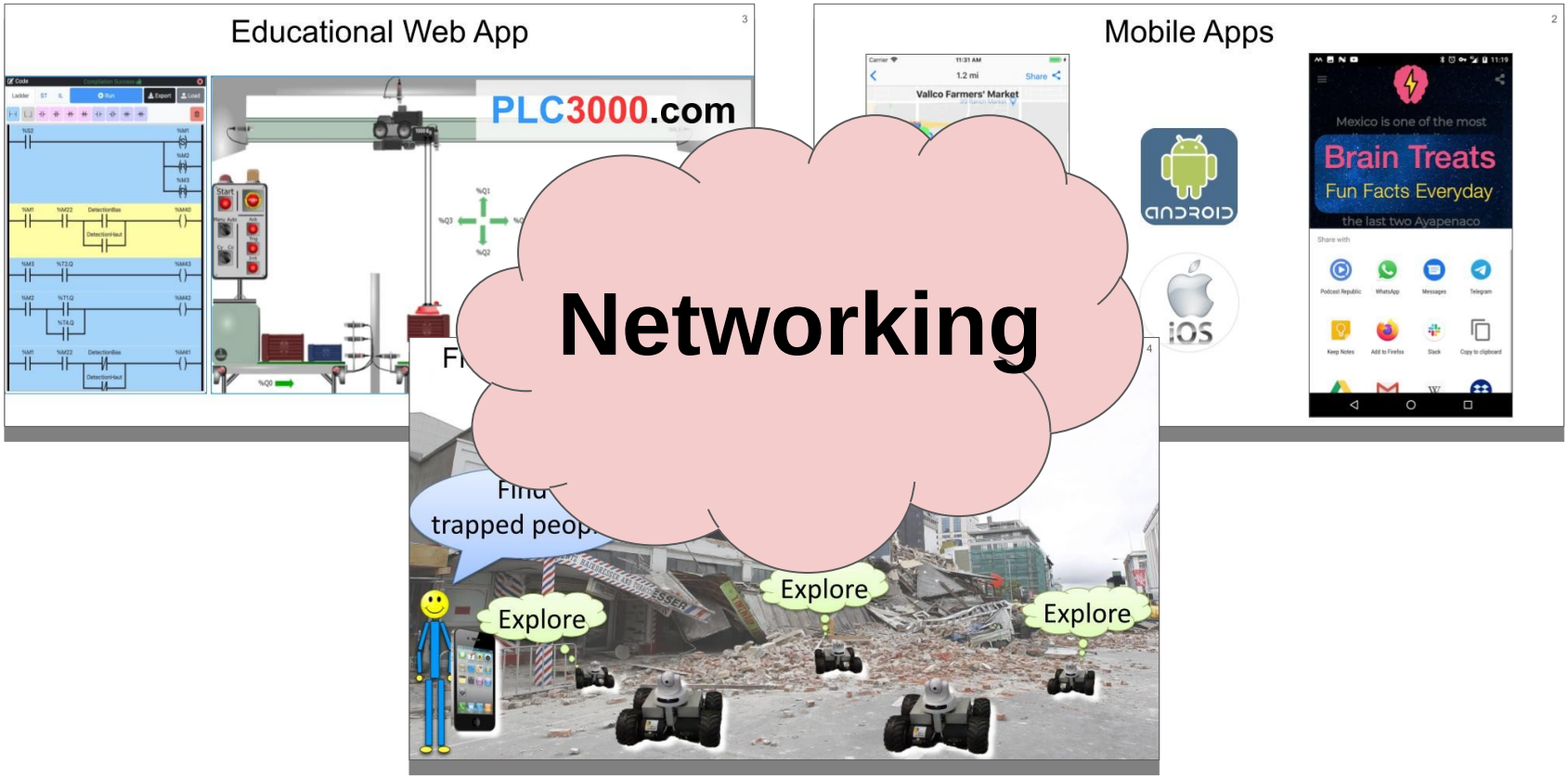


Mobile Apps

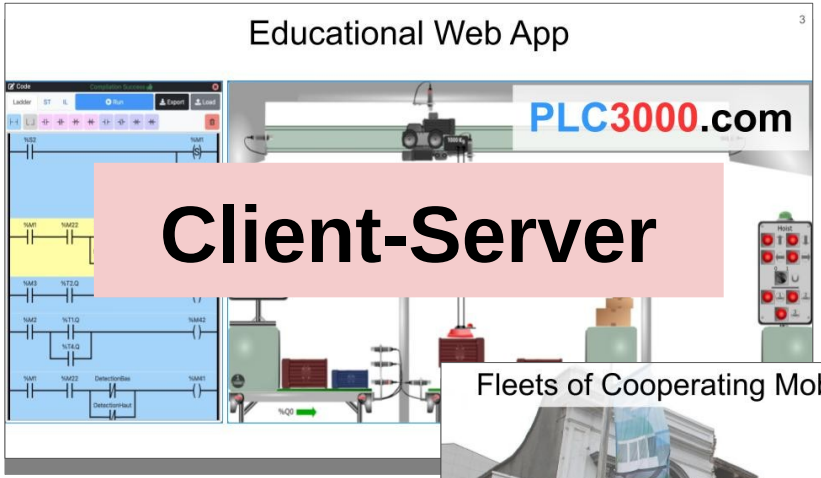
Fleets of Cooperating Mobile Autonomous Robots



Spot the Difference?



Architecture Difference



Client-Server

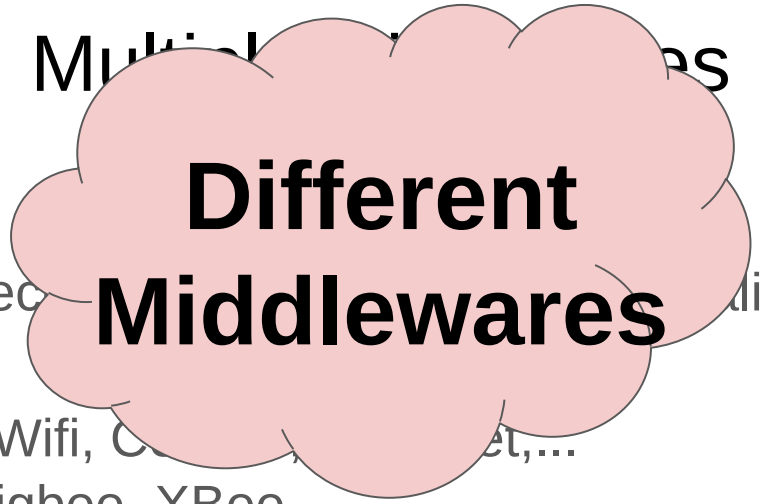
Local

P2P

Multiple Differences

- **Architecture**
  - Centralized, Decentralized (P2P), Hybrid (Coalitions, Federations)
- **Networks**
  - Infrastructure: Wifi, Cellular, Ethernet,...
  - Ad hoc: Wifi, Zigbee, XBee,…
- **Protocols**
  - Connection-based: HTTP, TCP, WebSocket…
  - Disconnected: UDP Unicast, Multicast, Broadcast, …
- **Communication Modes**
  - Synchronous, Asynchronous
  - One way Request, Request+Response, Streaming
  - 1 to 1, 1 to Many, 1 to All

Multi[illegible]es



- **Architecture**
  - Centralized, Dec[illegible]ditions, Federations)
- **Networks**
  - Infrastructure: Wifi, C[illegible]et,...
  - Ad hoc: Wifi, Zigbee, XBee,…
- **Protocols**
  - Connection-based: HTTP, TCP, WebSocket…
  - Disconnected: UDP Unicast, Multicast, Broadcast, …
- **Communication Modes**
  - Synchronous, Asynchronous
  - One way Request, Request+Response, Streaming
  - 1 to 1, 1 to Many, 1 to All

Multi[illegible]es

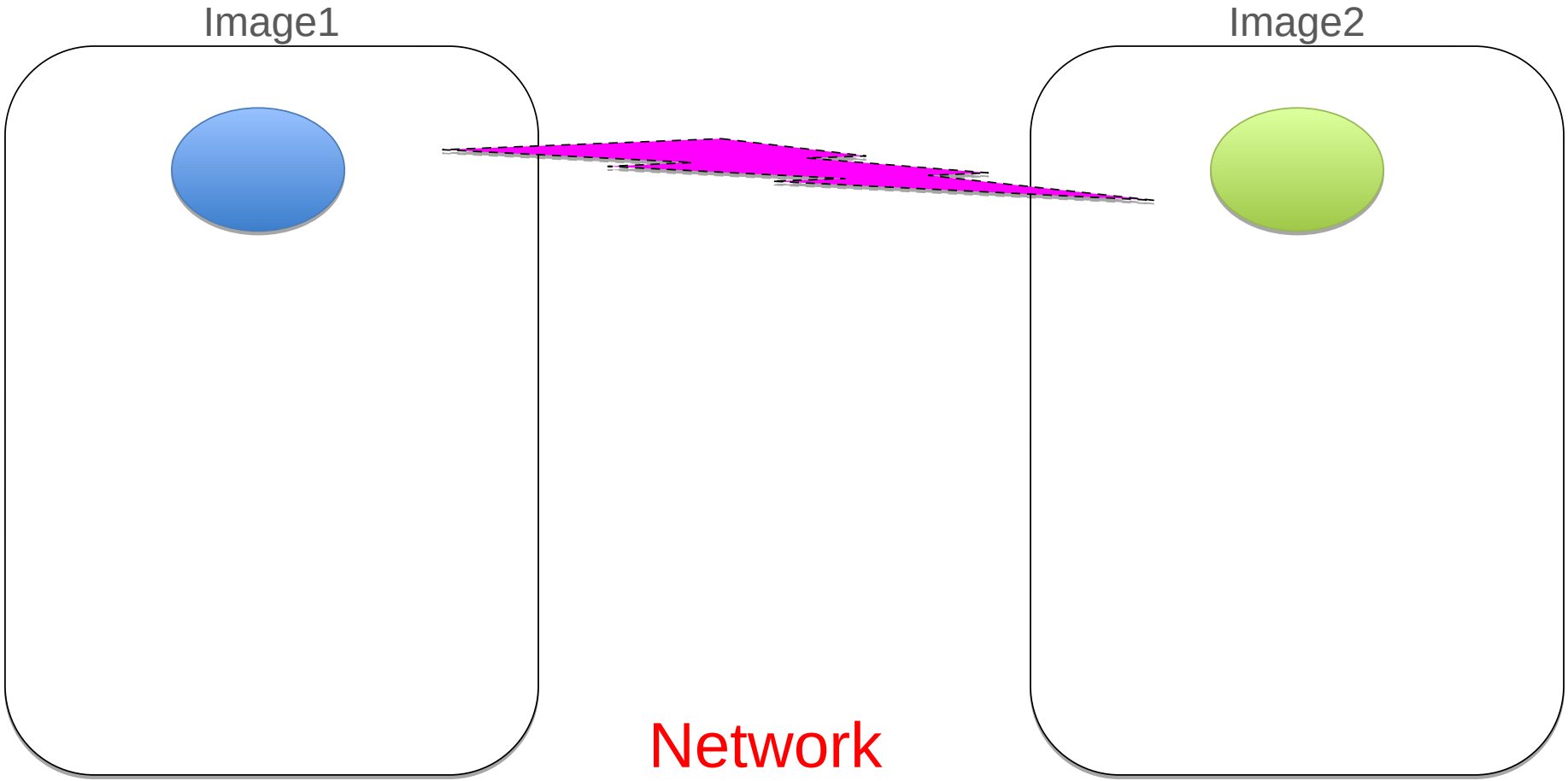
Different Middlewares

- **Architecture**
  - Centralized, Dec[illegible]itions, Federations)
- **Networks**
  - Infrastructure: Wifi, C[illegible]et,...
  - Ad hoc: Wifi, Zigbee, XBee,…
- **Proto[illegible]**
  - [illegible]CP, WebSocket…
  - [illegible]ulticast, Broadcast, …
  - [illegible]
  - [illegible], Request+Response, Streaming
  - [illegible]1 to 1, 1 to Many, 1 to All

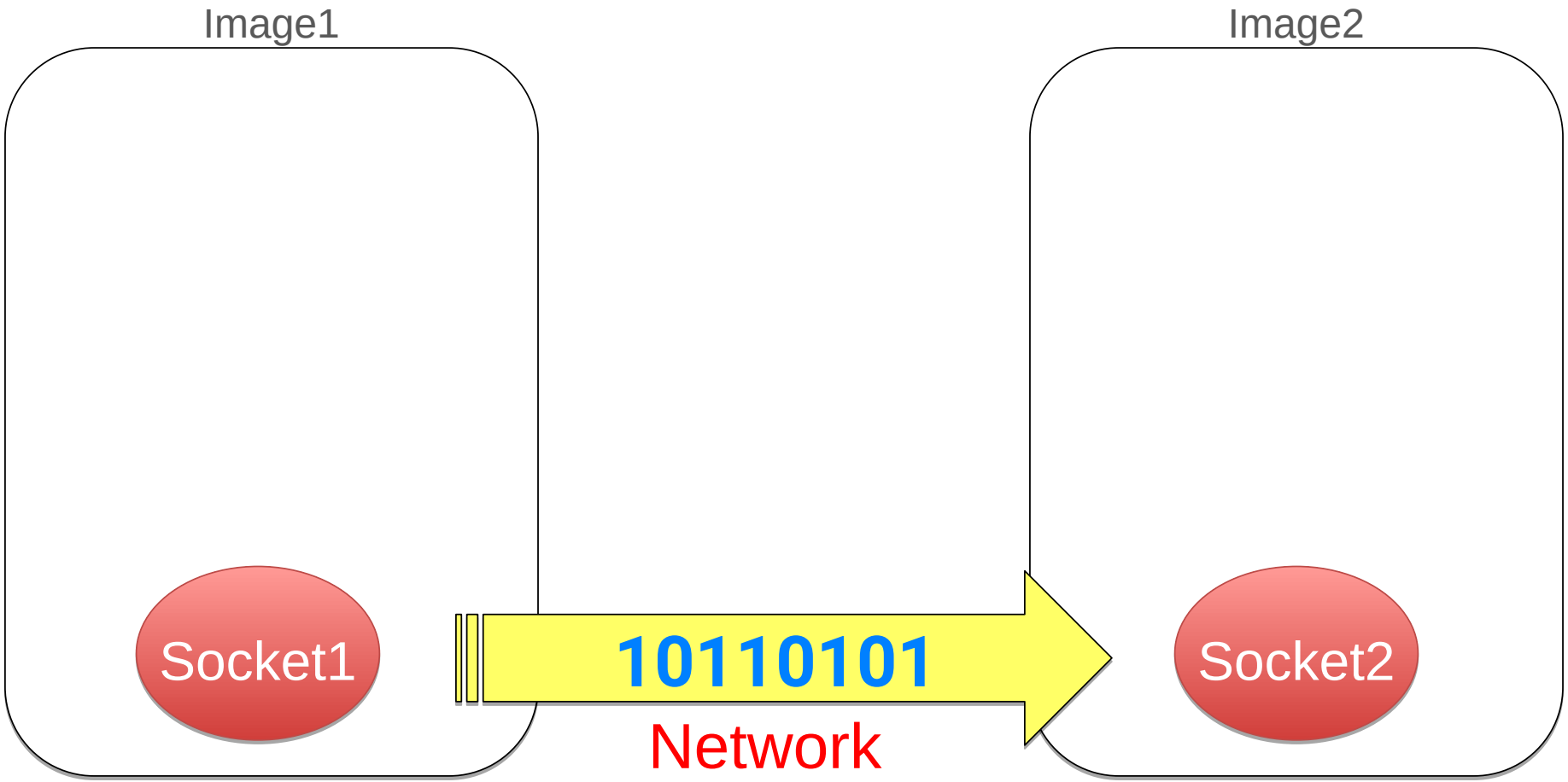
What's a Middleware?

From Sockets
To Middlewares

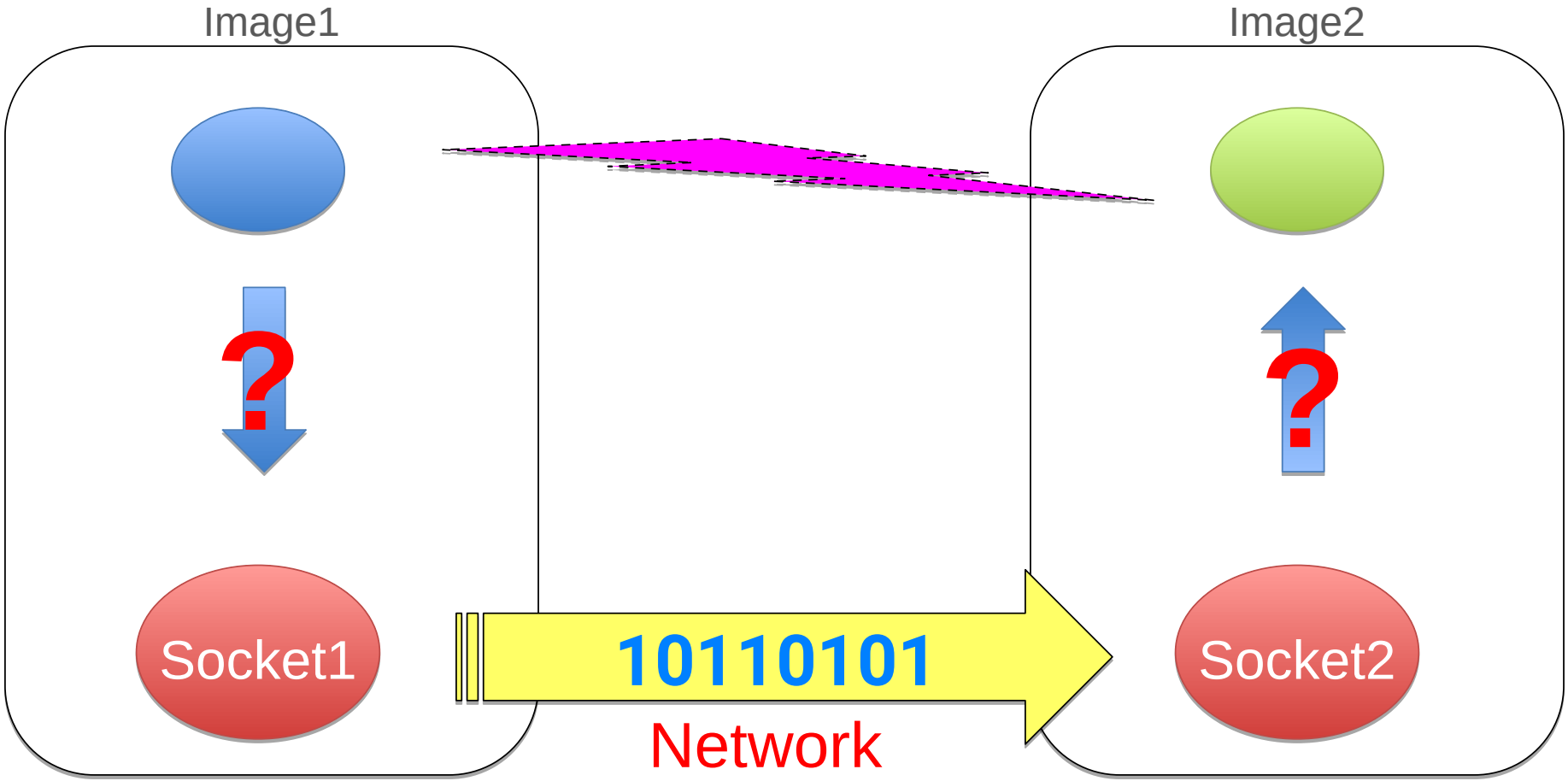
Networking = Remote messages



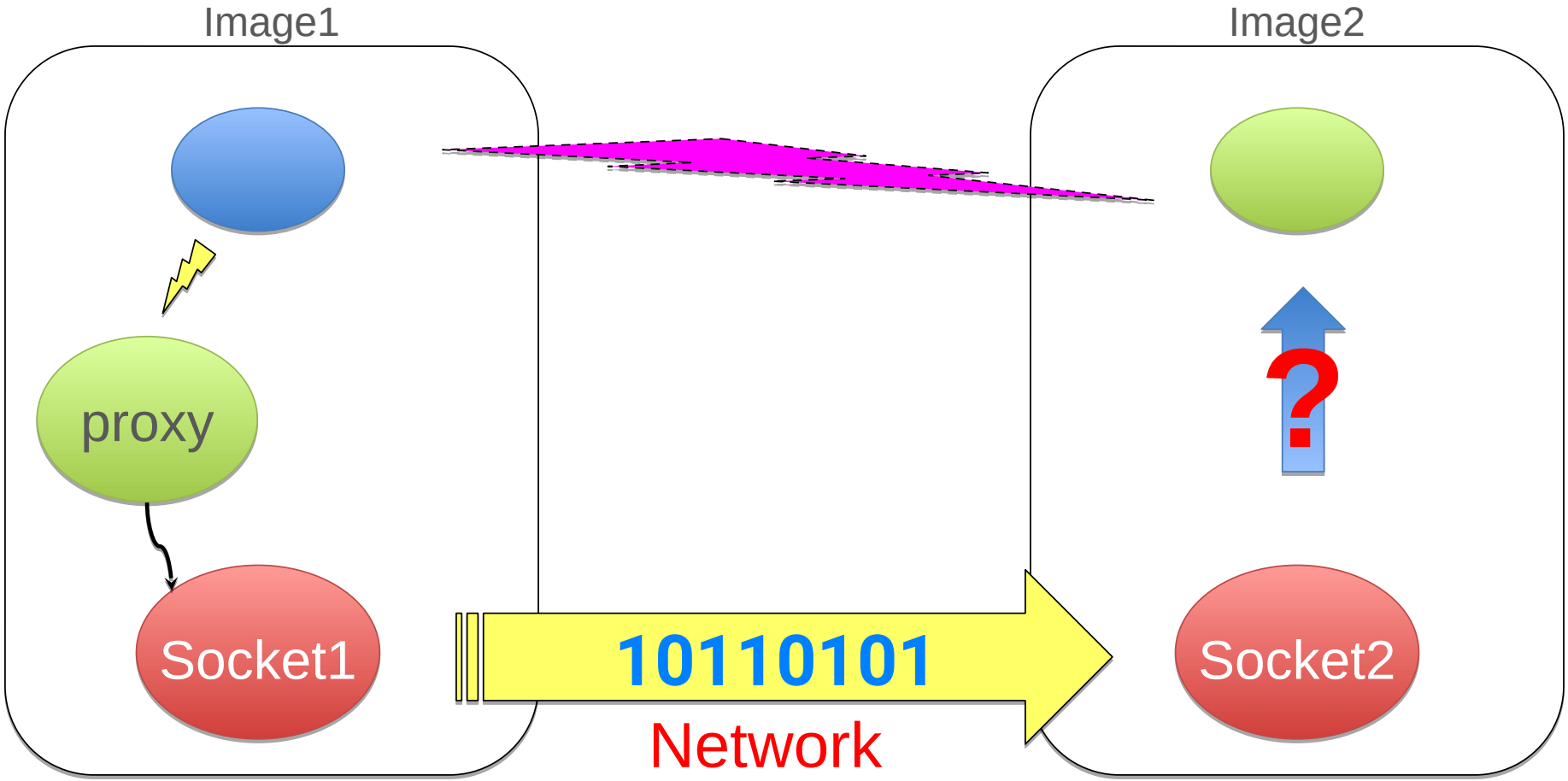
Sockets = Low-level Communication



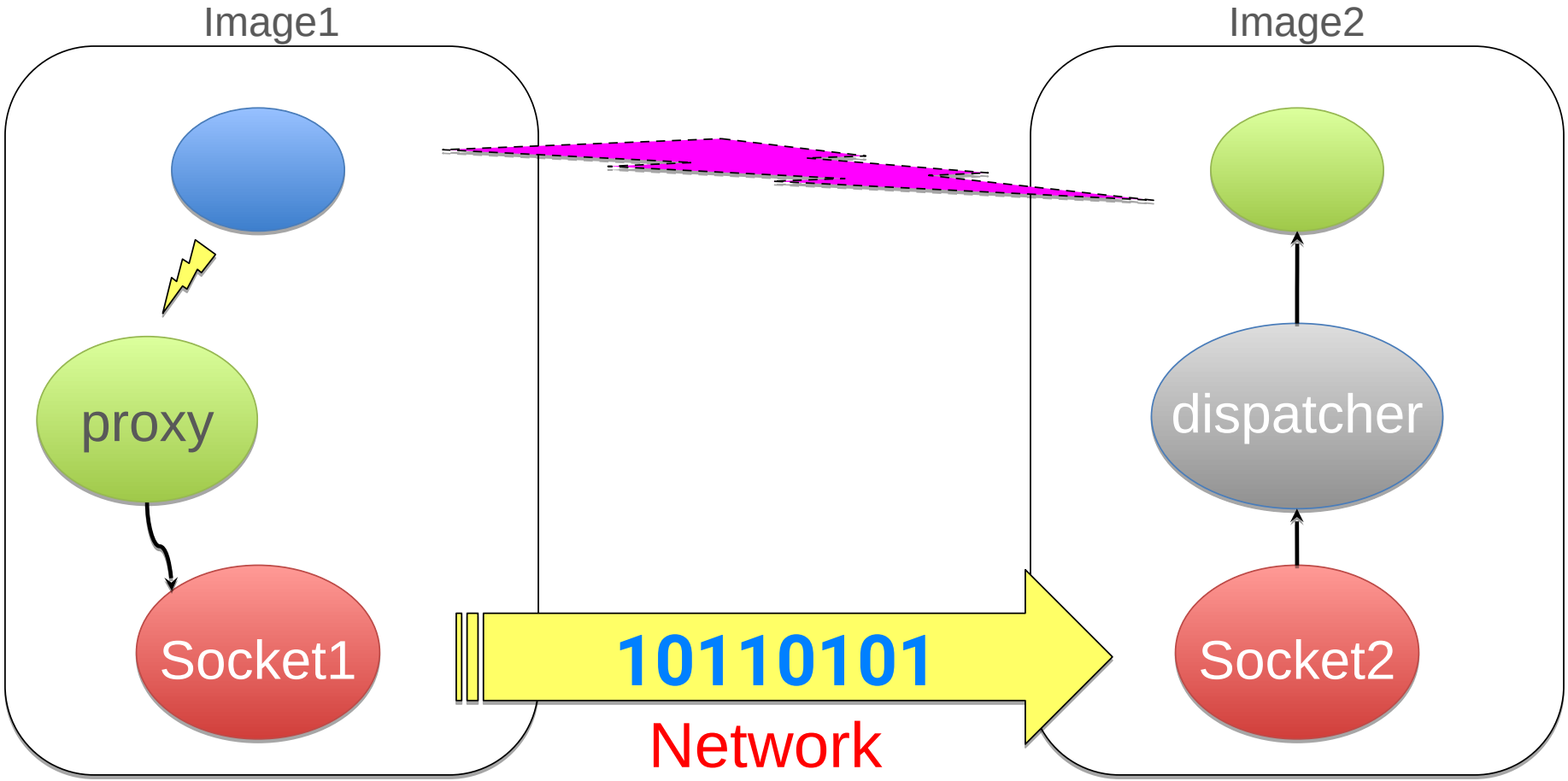
Remote Messages vs Sockets?



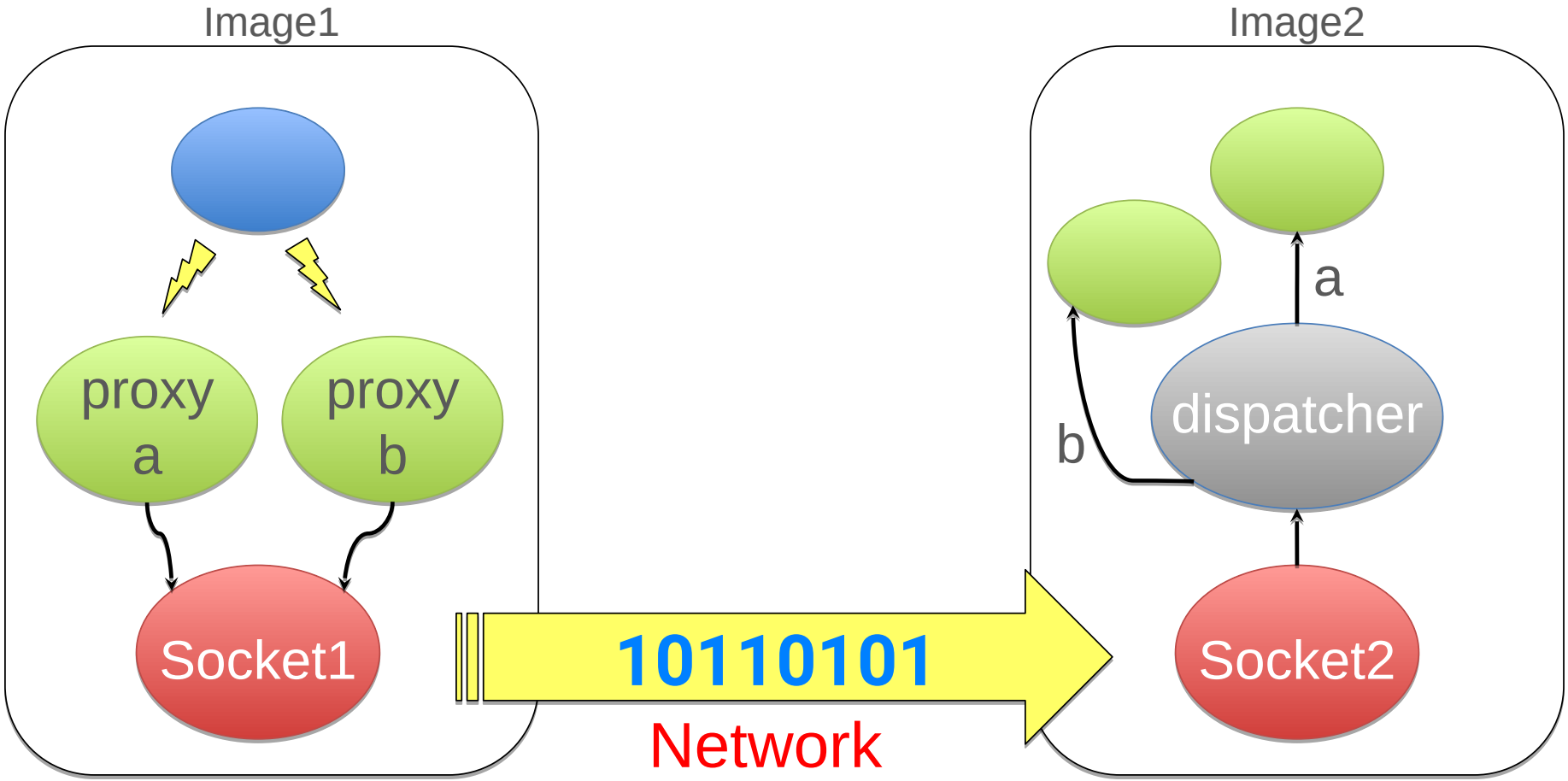
Proxy = Placeholder for remote object



Dispatcher delivers message to the actual receiver



Multiple Remote Objects



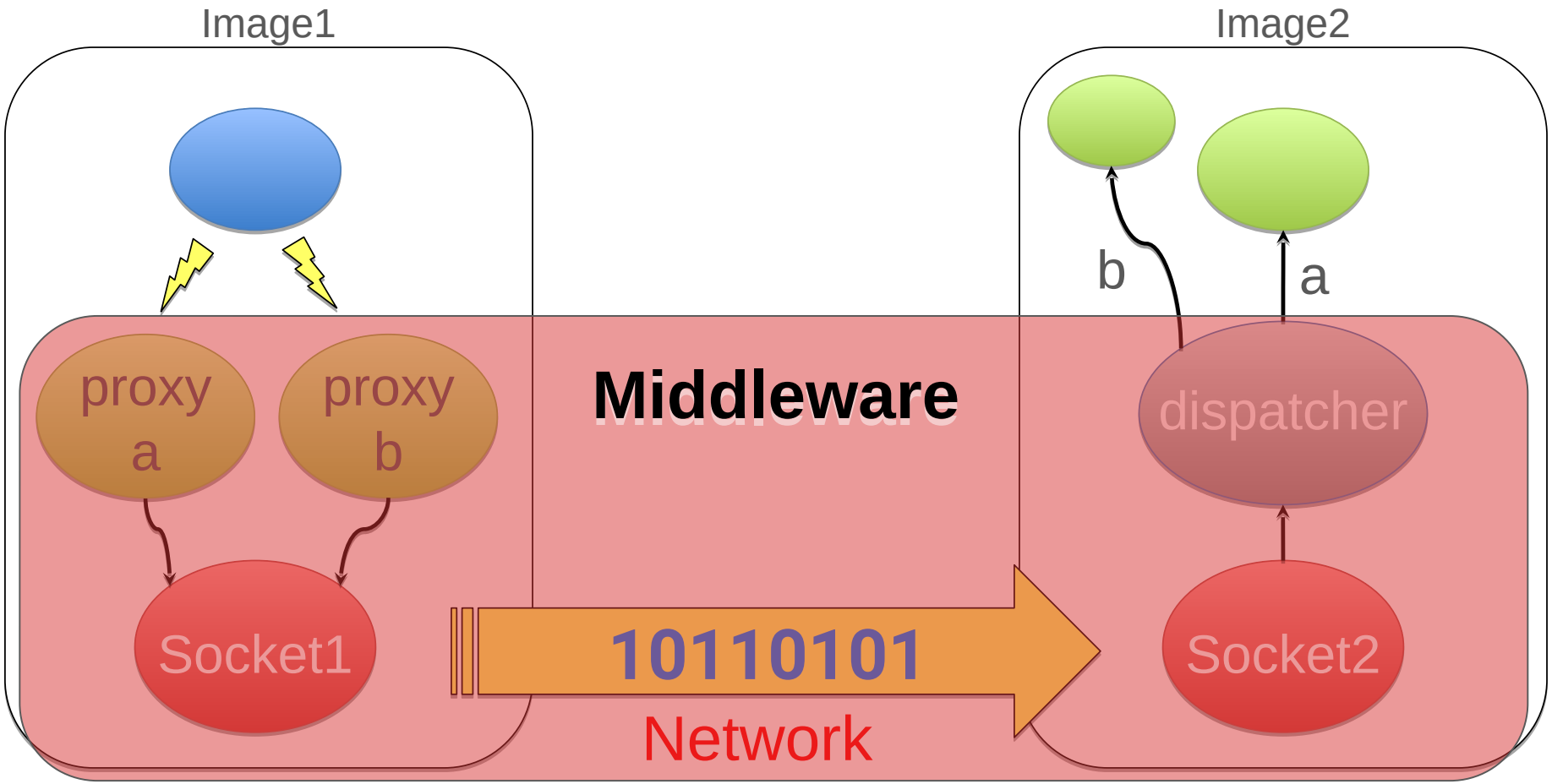
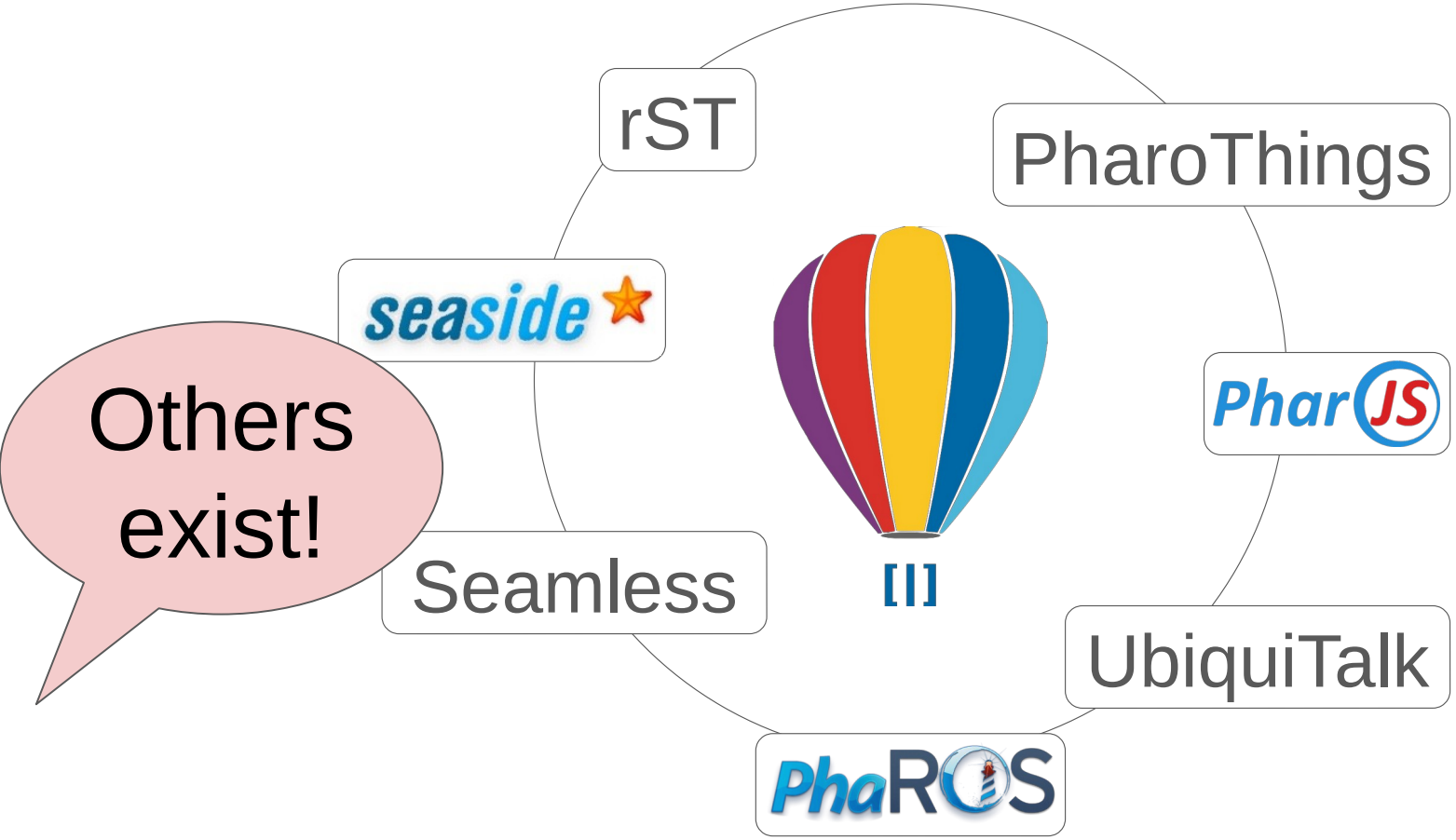


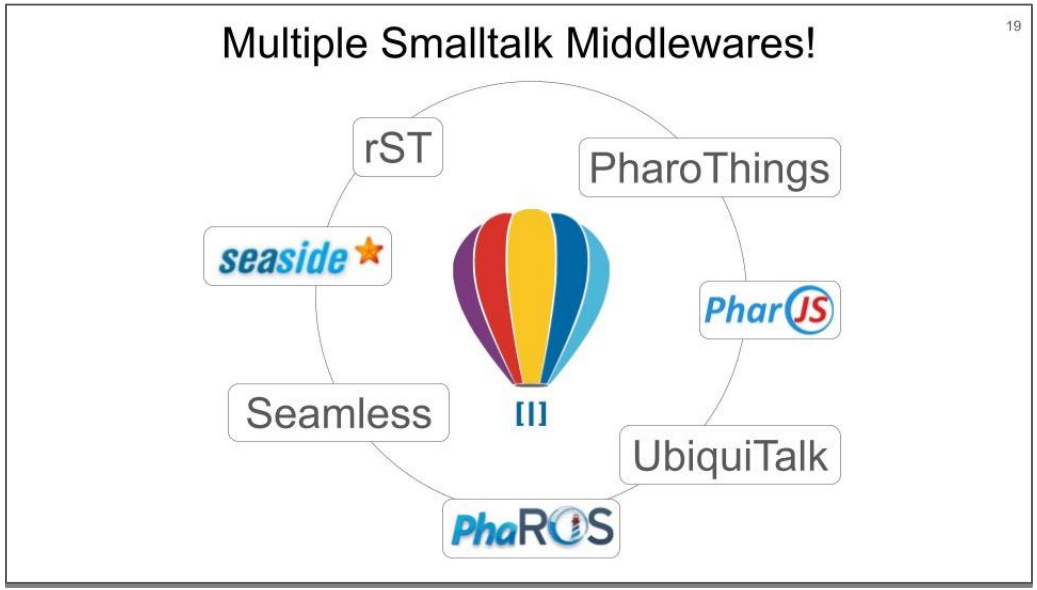
Image1
Image2
b
a
proxy a
proxy b
Middleware
dispatcher
Socket1
10110101
Socket2
Network

Multiple Smalltalk Middlewares!



Ye shall unite!

All features in **1 middleware**?



Middleware Facets

Deployment

Communication

Networking

Reliability

Sharing

Security

Variations in Middleware Facets

- **Networking**
  - Protocols
  - Discovery
- **Communication**
  - Local vs Remote
  - RPC vs Events
  - Sync vs Async
- **Sharing**
  - Remote References vs Copy
  - GC
  - Concurrency
- **Deployment**
  - Static vs On Demand
  - Mobile Code
- **Reliability**
  - Latency
  - Bandwidth
  - Disconnections
- **Security**
  - Authorization: Access Rights
  - Authentication: Identity
  - Obfuscation

Variations in Middleware Facets

ESUG, Plovdiv, Bulgaria, July 7th - 10th, 2026

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First Steps Towards
a **Modular** Middleware

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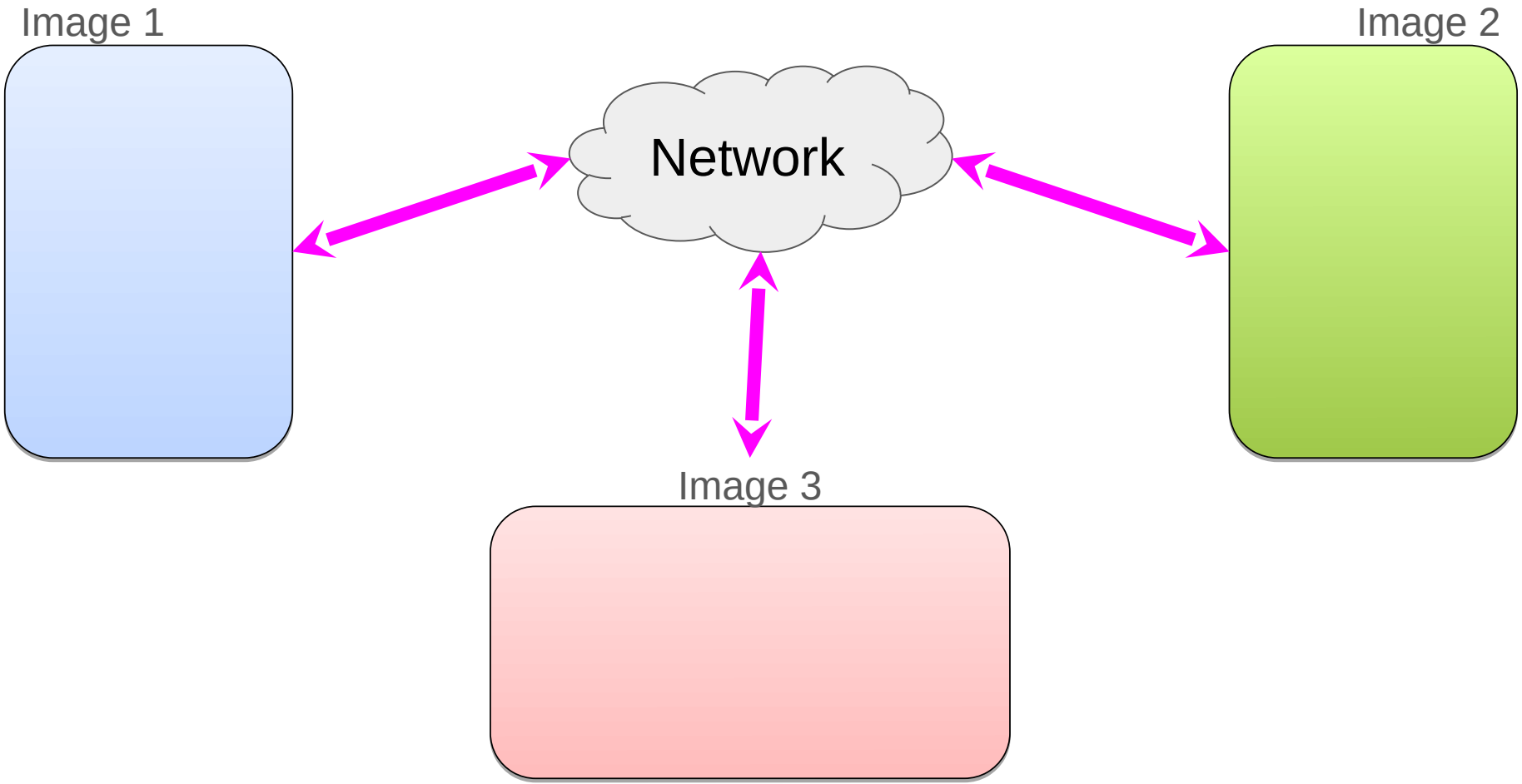
Current Design

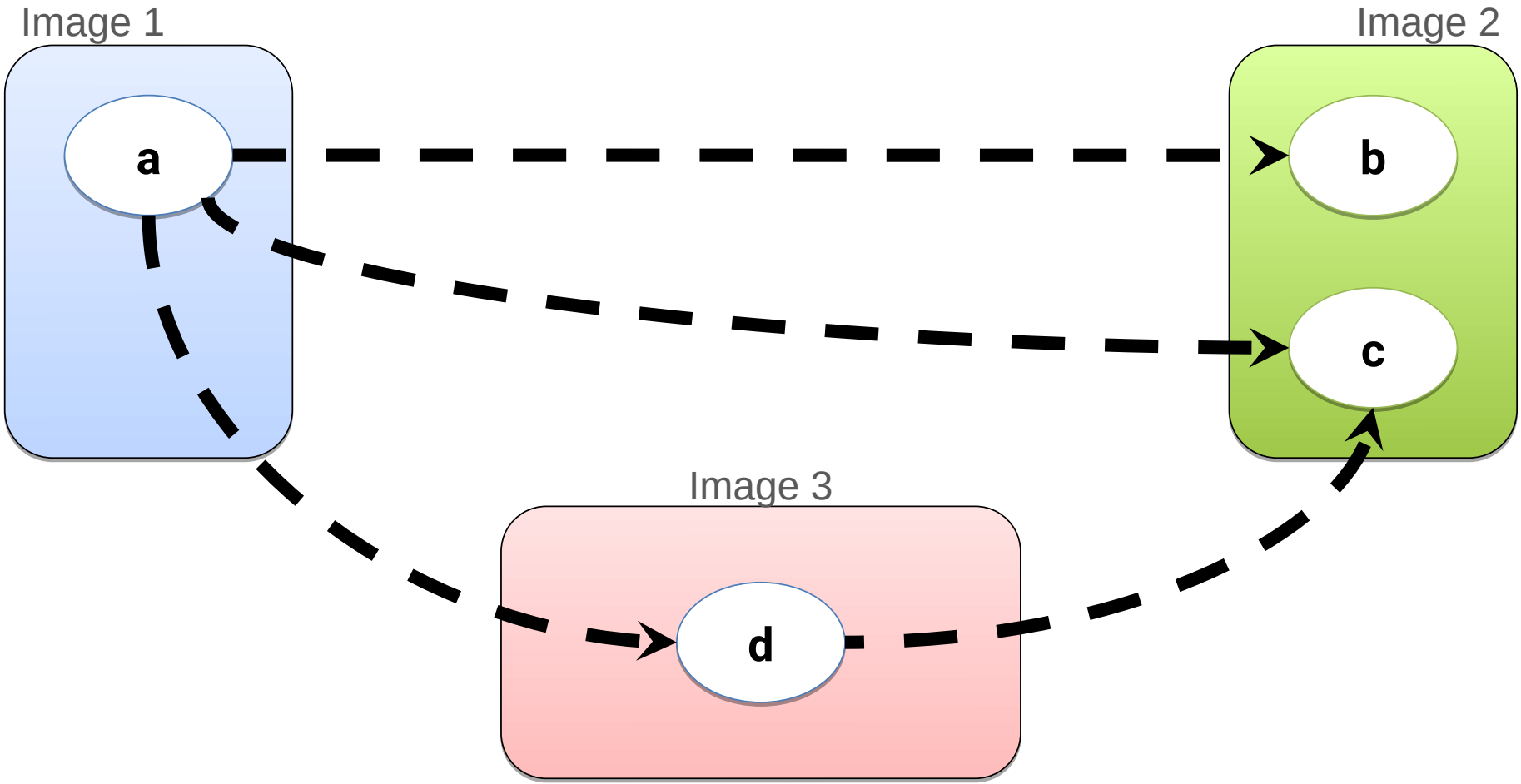
Remote Communication



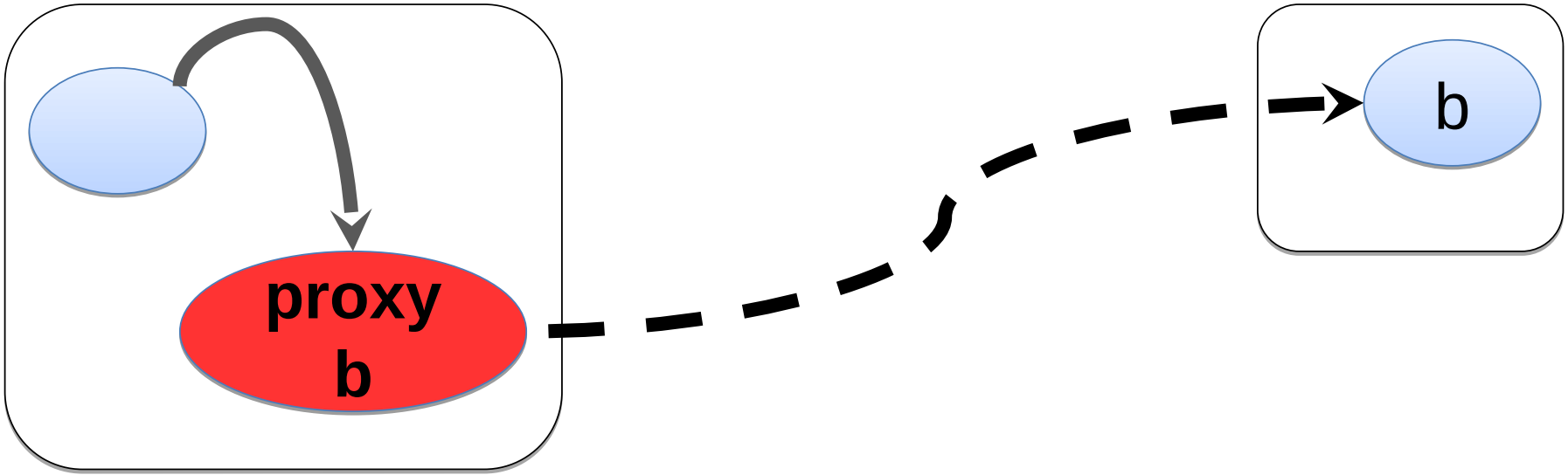
Remote Communication the Smalltalk Way

Messages!

Remote Messages



Remote Message Receiver = Proxy



Proxy = Remote Object Placeholder

- ProtoObject << #Proxy

- doesNotUnderstand: aMessage

Proxy Implementation

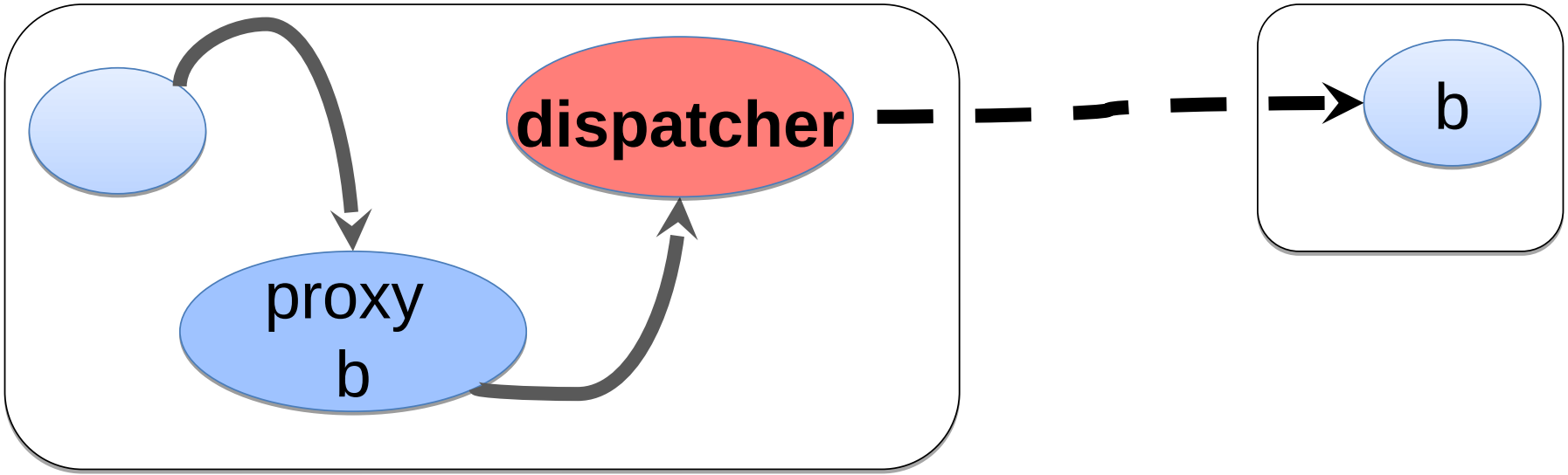
- ProtoObject << #Proxy

  slots: {#id. #**dispatcher**}

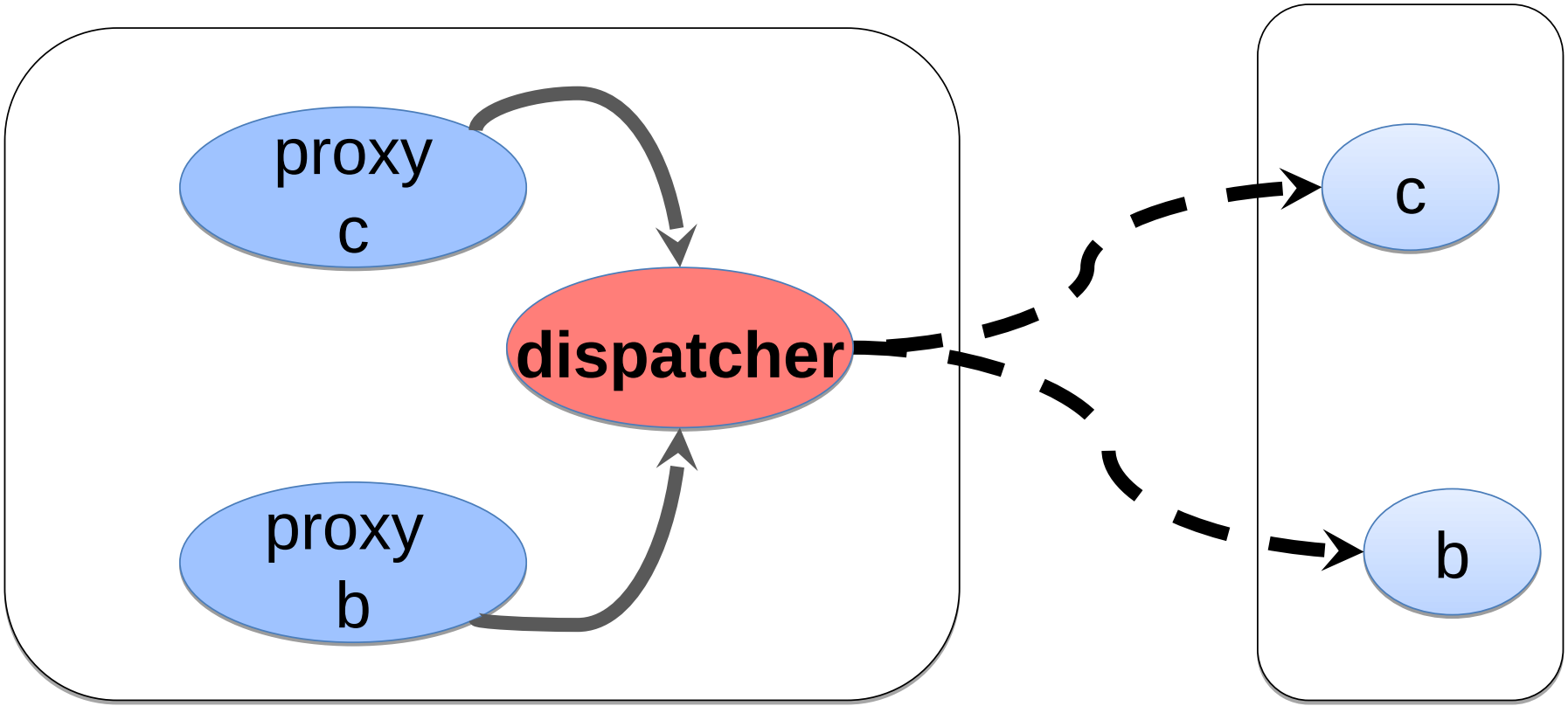
- doesNotUnderstand: aMessage

  ^**dispatcher** dispatch: aMessage targetId: id

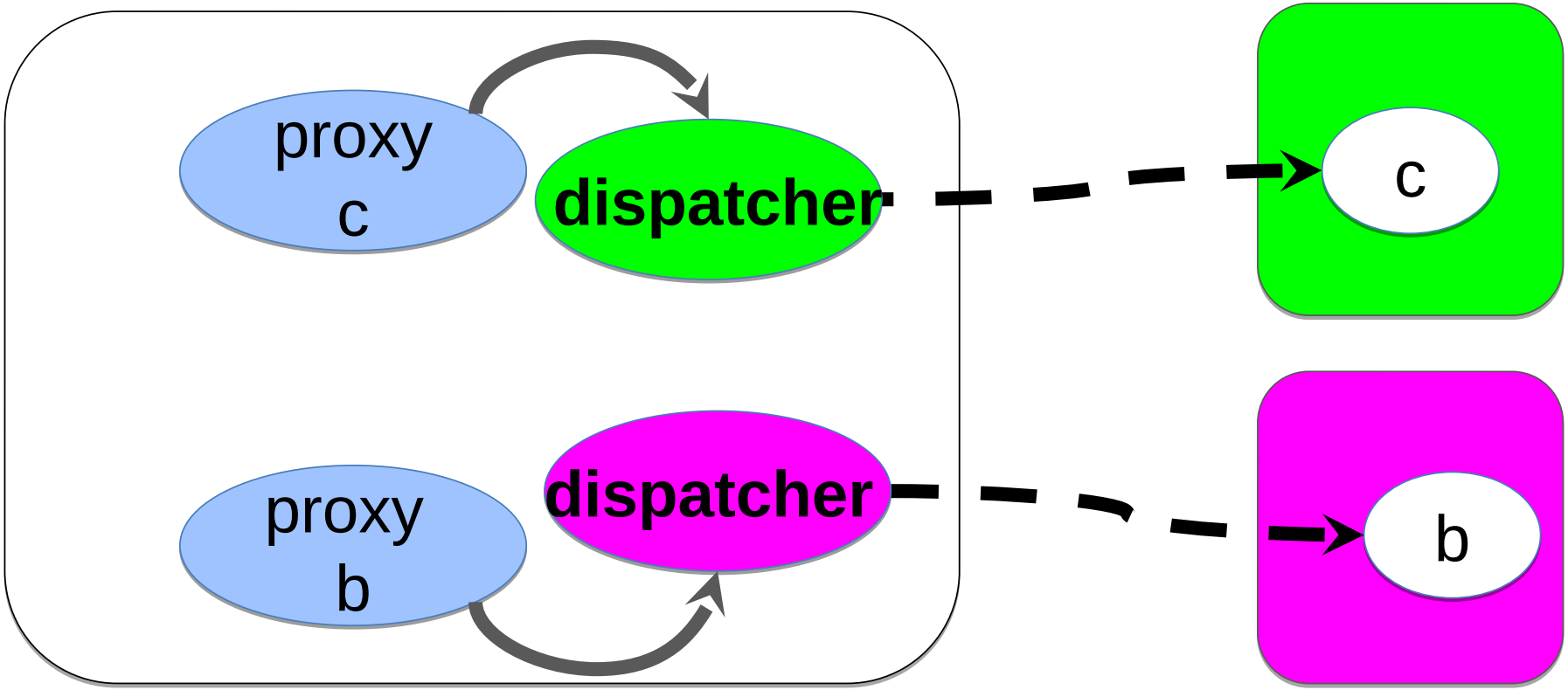
Remote Message Dispatcher



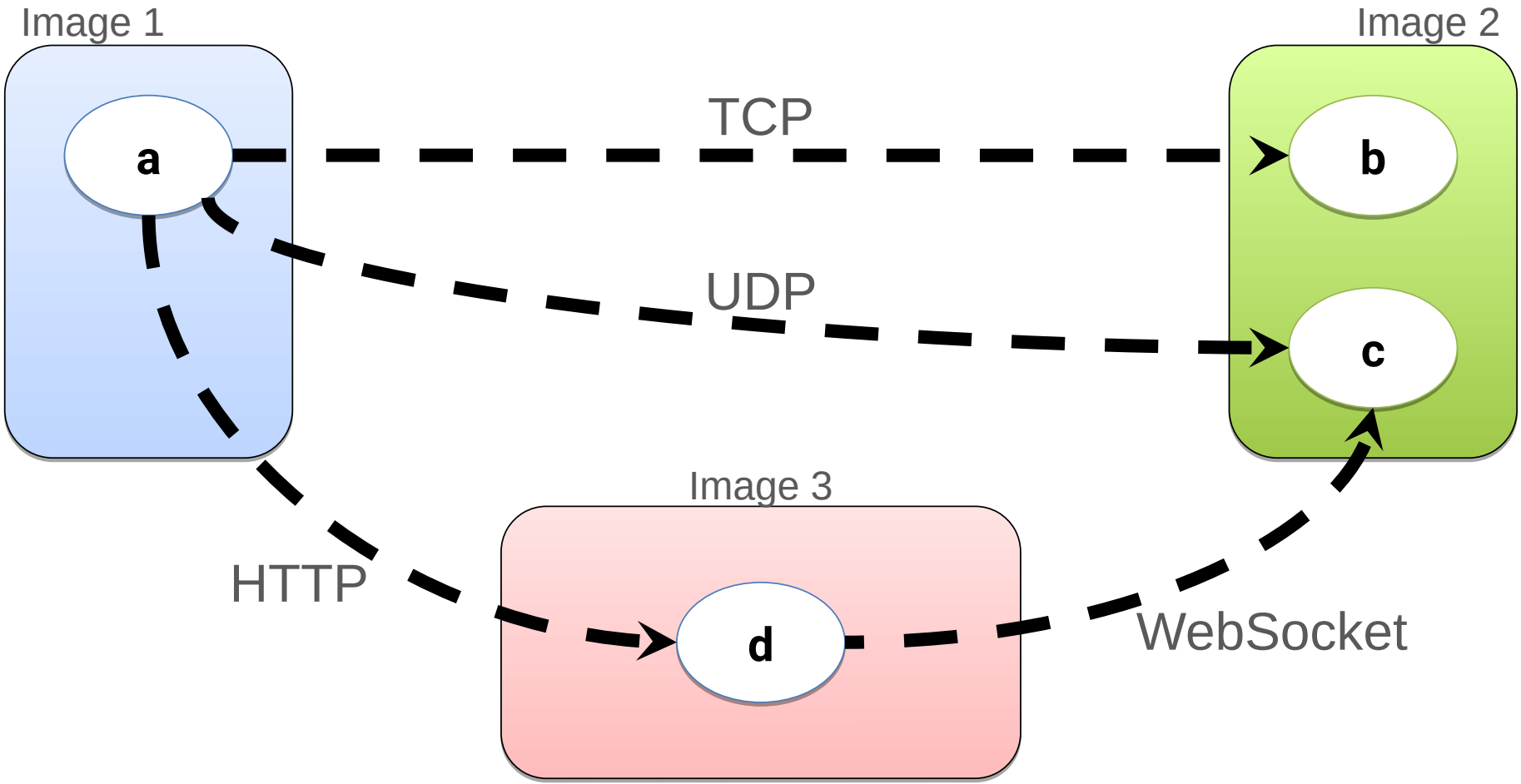
Remote Dispatcher Shared Among Proxies



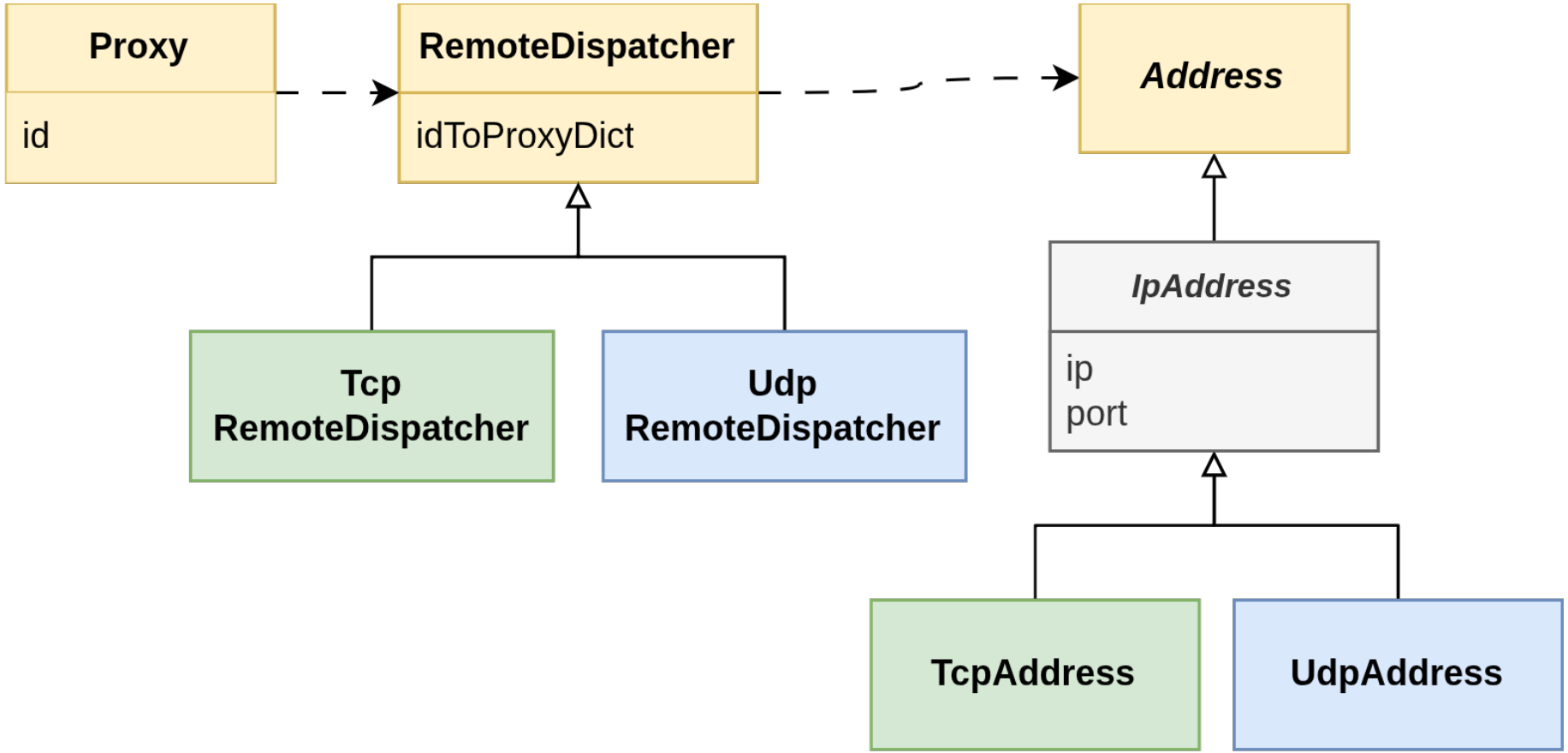
1 Remote Dispatcher per “Memory Space”



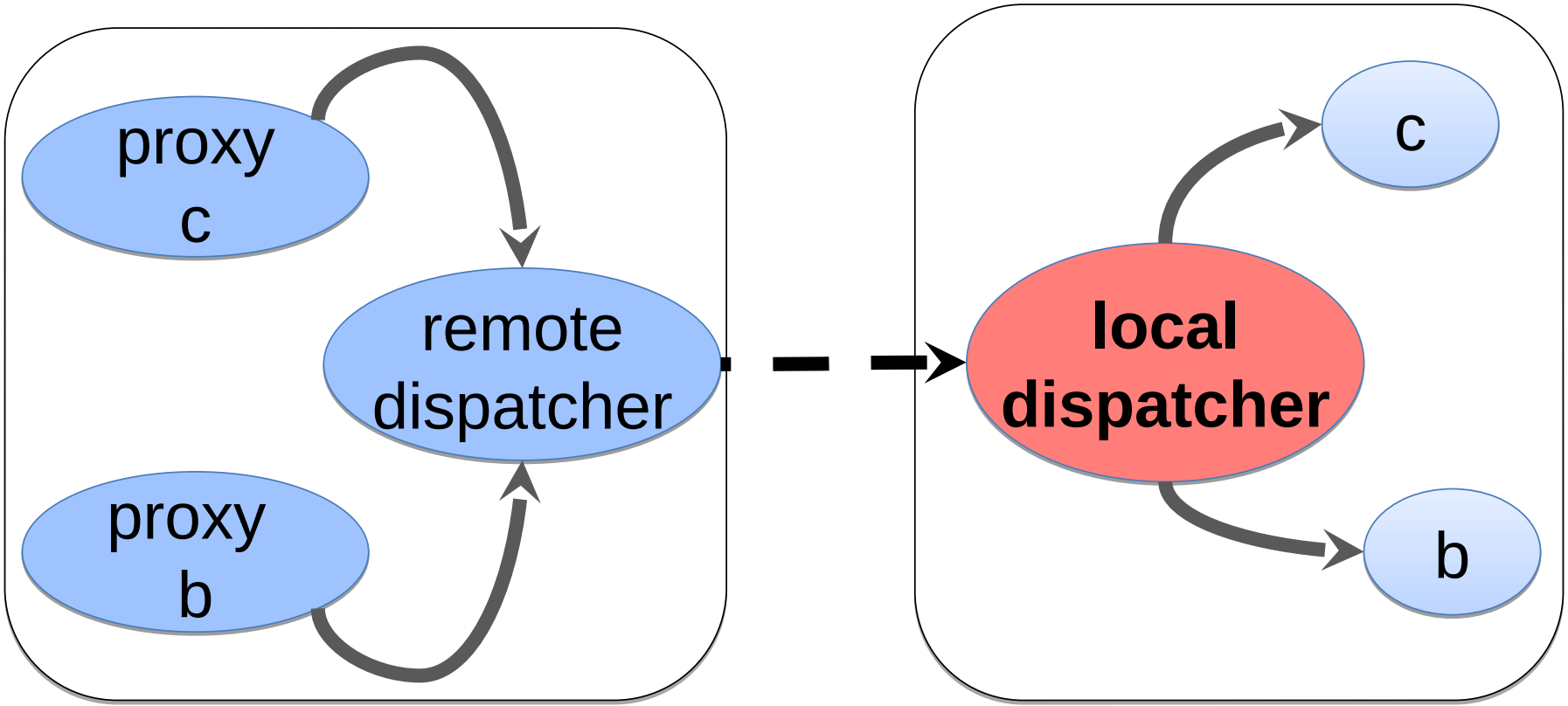
Multiple Protocols at Once



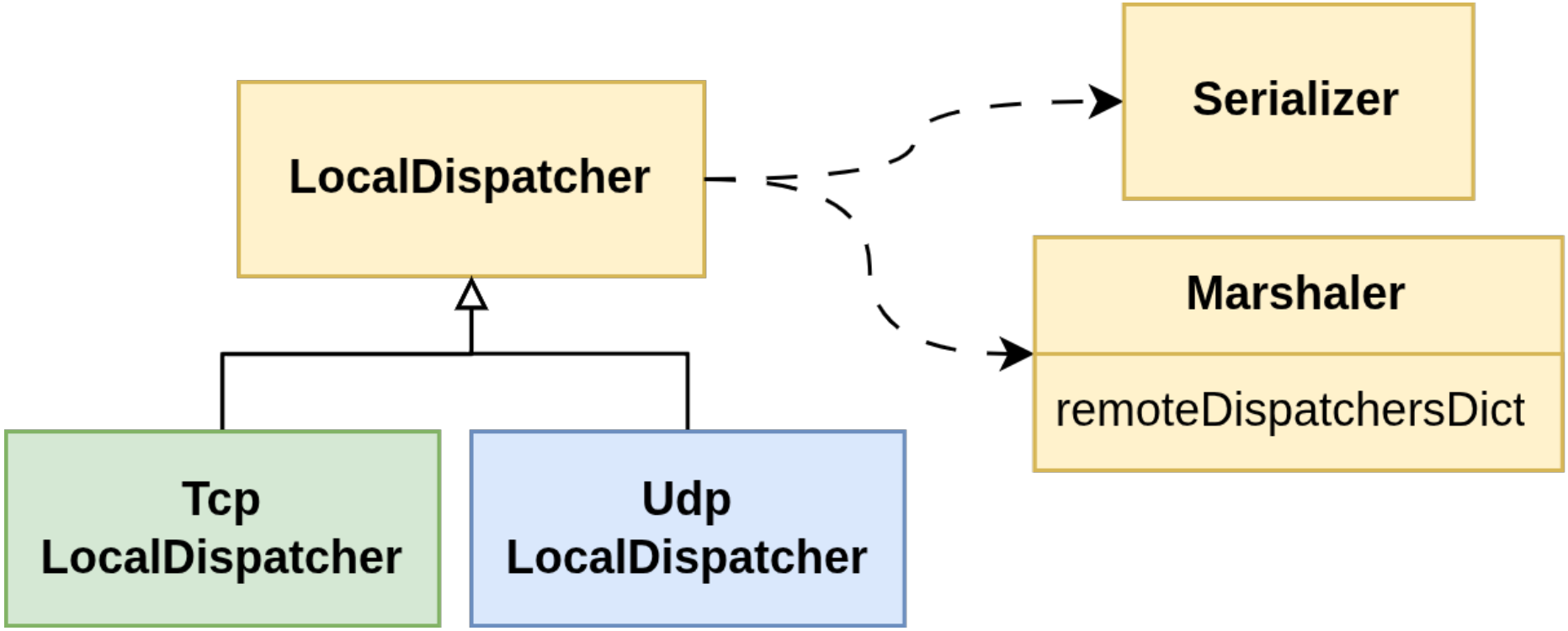
Remote Dispatcher Defines Protocol



Dispatcher Local to the Receiver



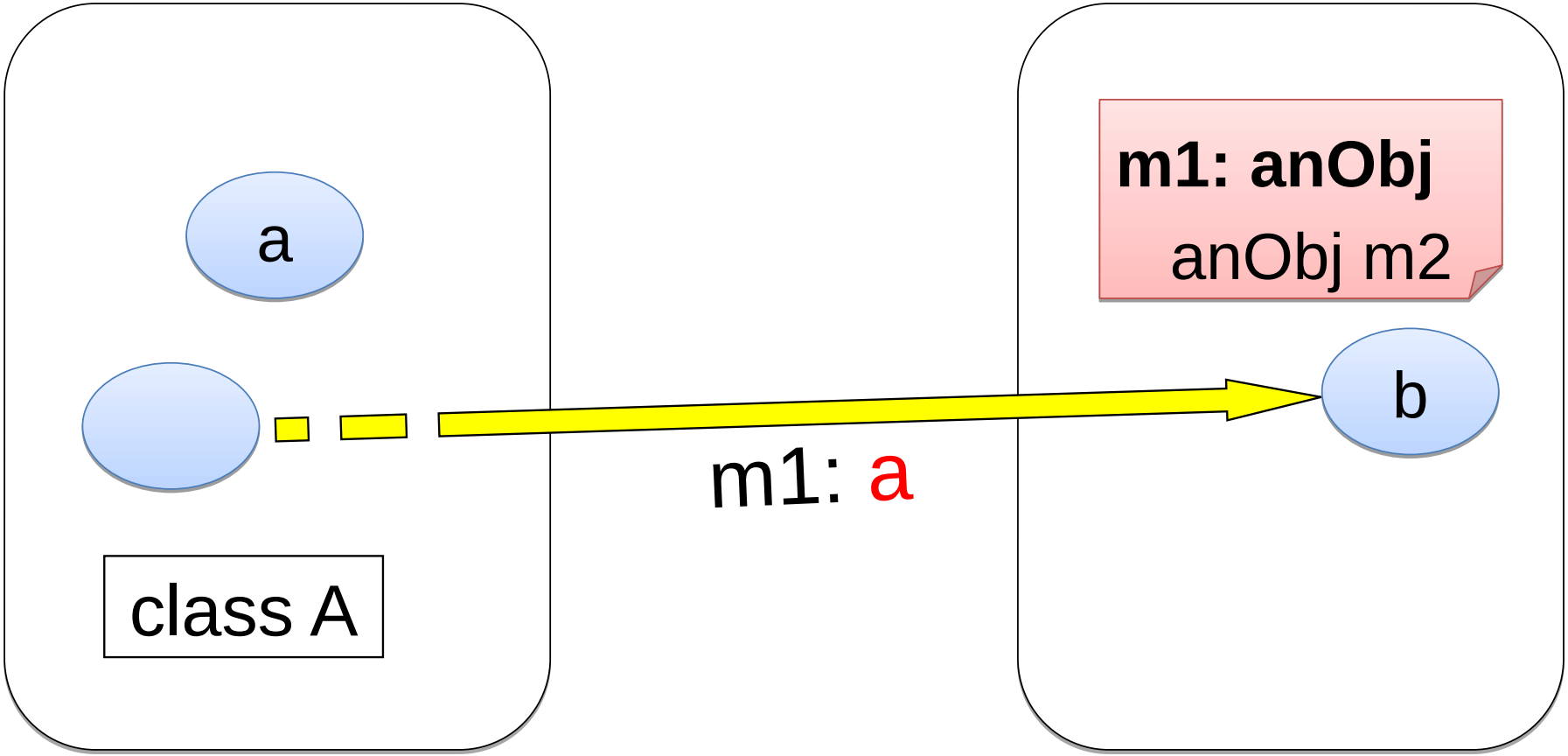
1 Local Dispatcher Per Accepted Protocol



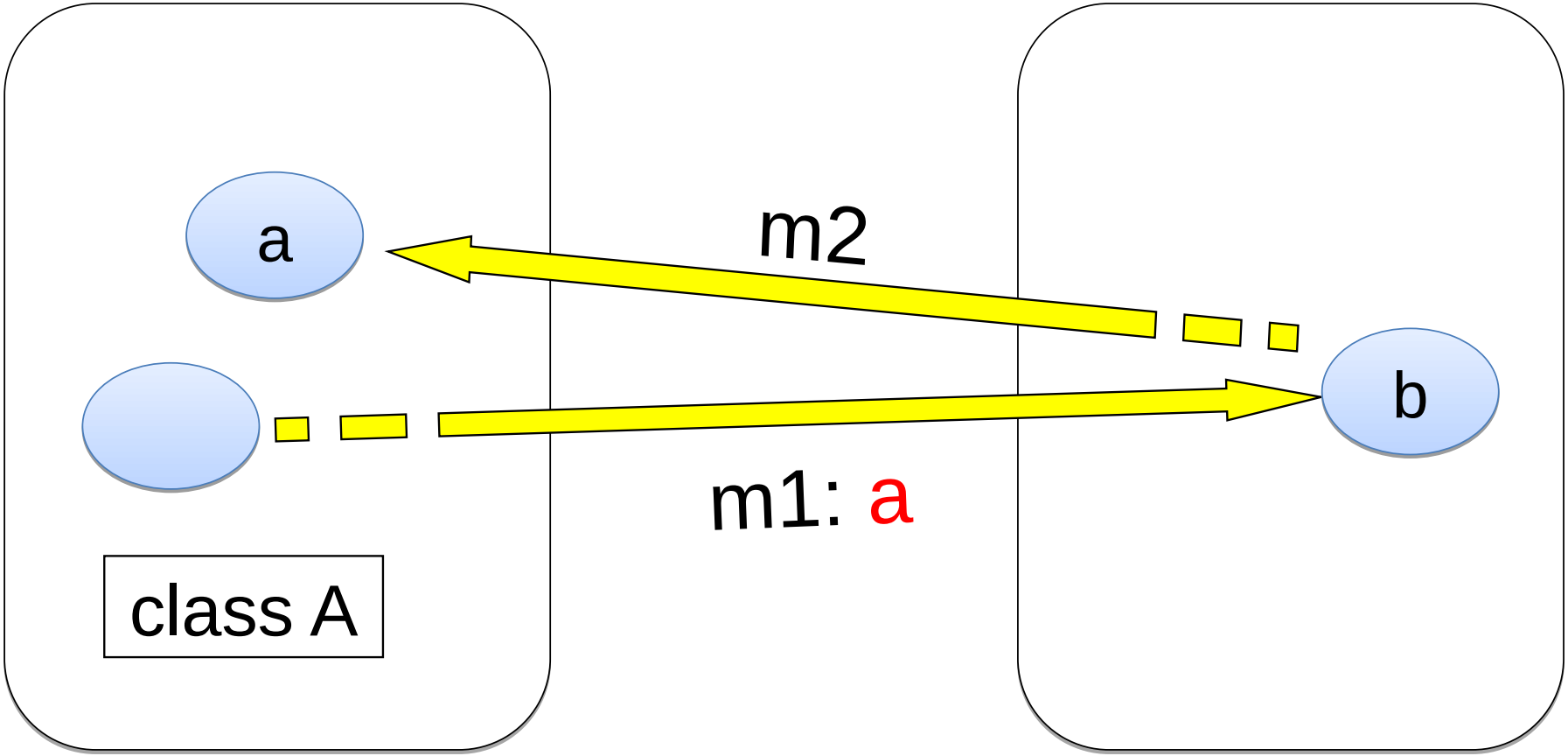
Remote Communication the Smalltalk Way

- Message
  - Receiver
  - Arguments

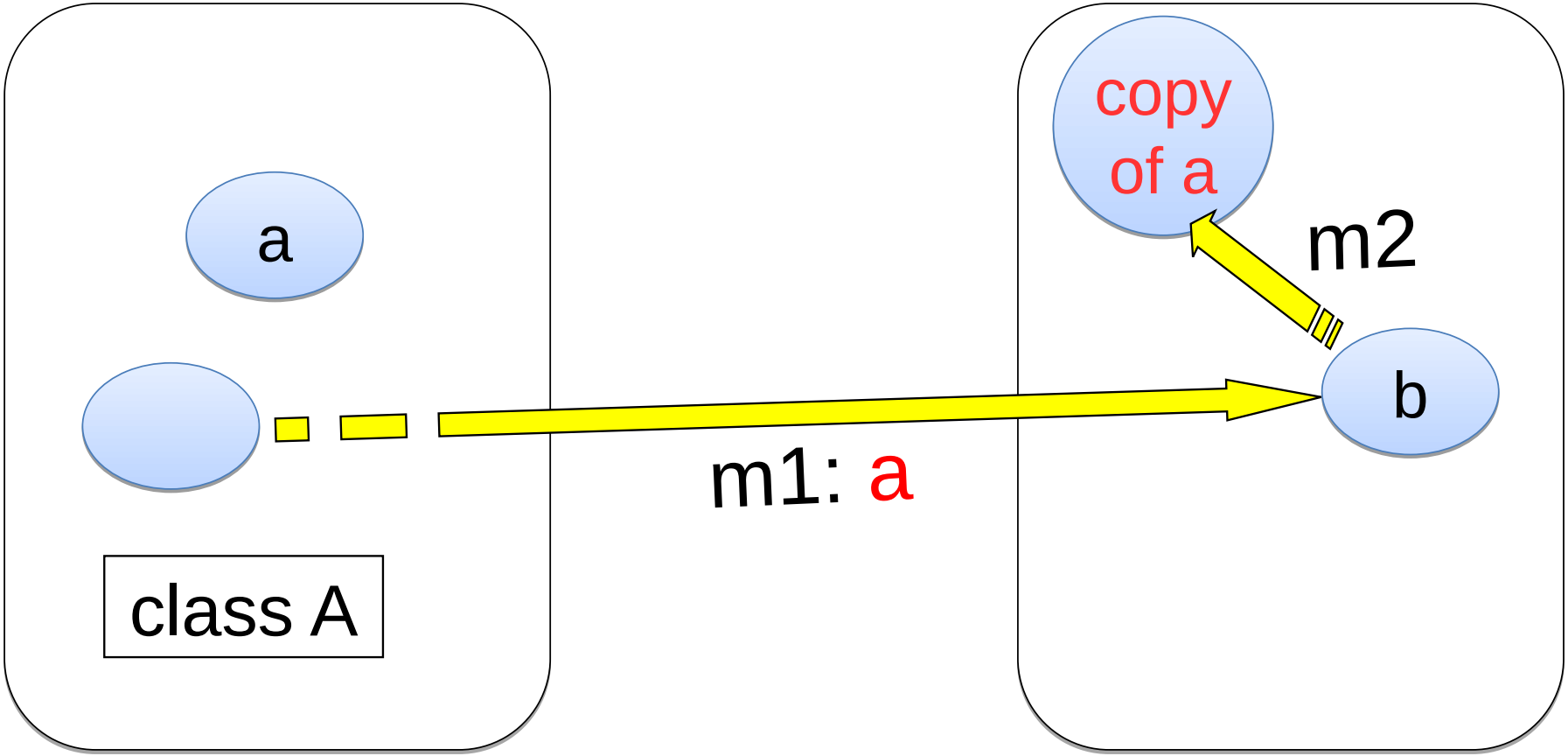
Passing an Argument



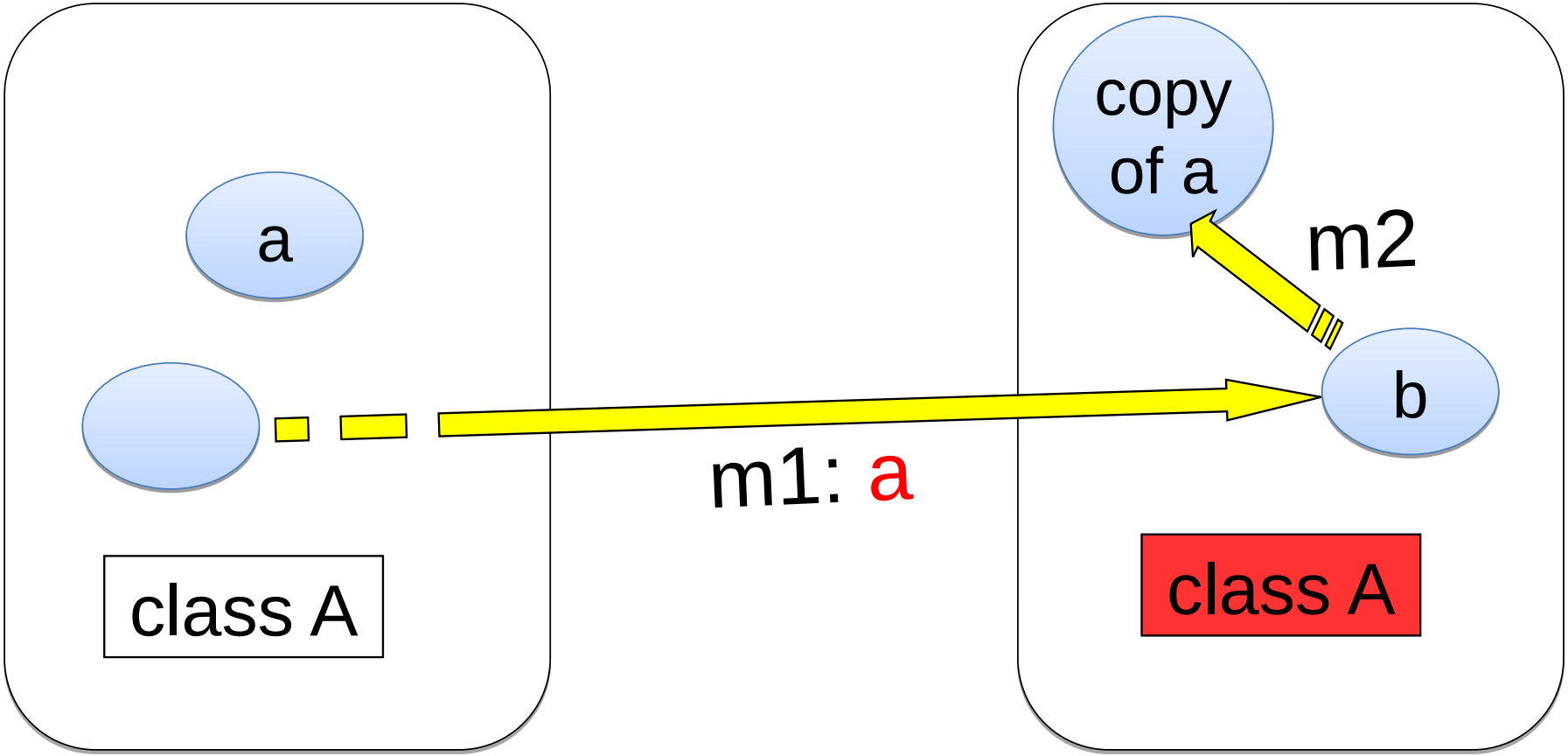
Passing an Argument **by Reference**



Passing an Argument **by Copy**



Passing an Argument **by Copy**

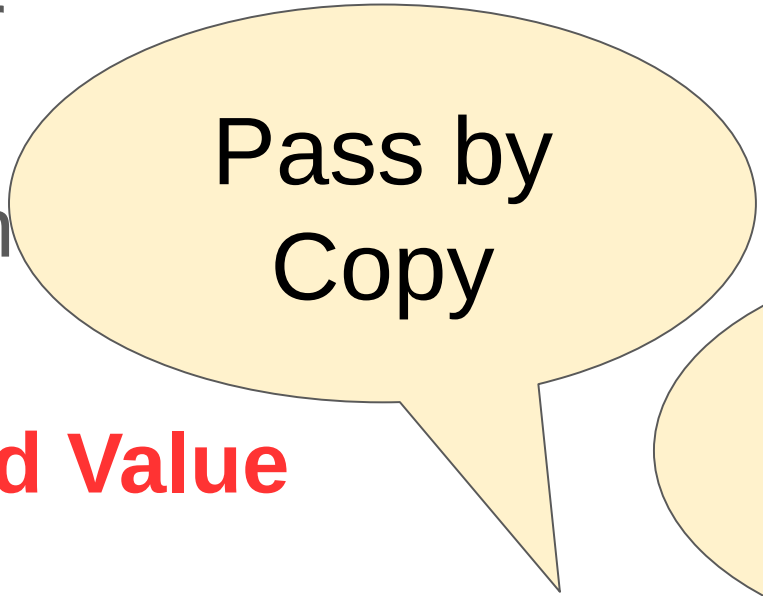


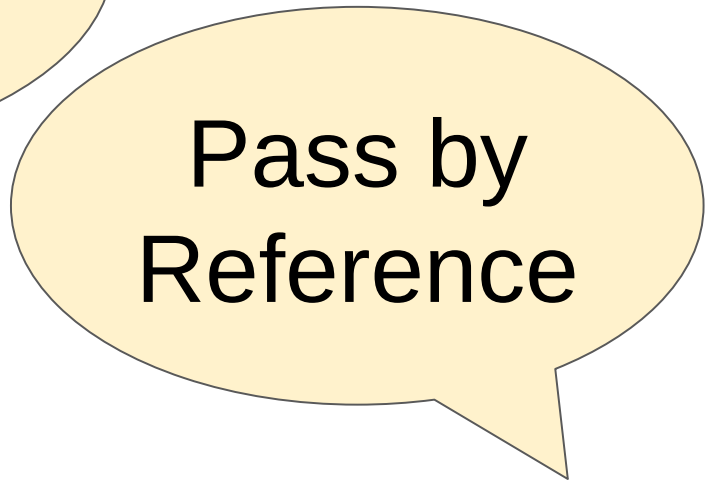
Remote Communication the Smalltalk Way

- Message
  - Receiver
  - Arguments
- **Response**

Remote Communication the Smalltalk Way

- Message
  - Receiver
  - Argumen
- Response
  - **Returned Value**

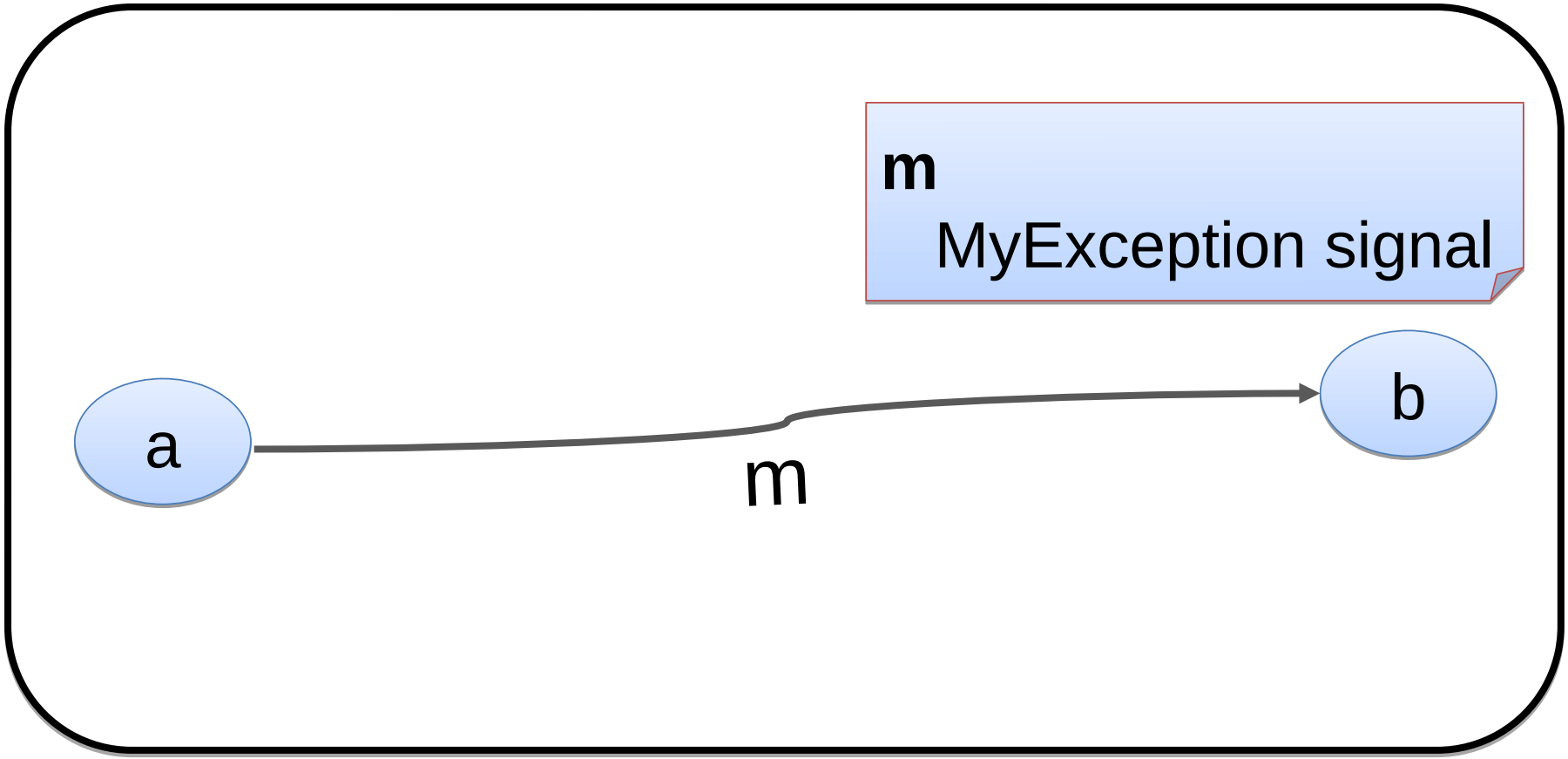




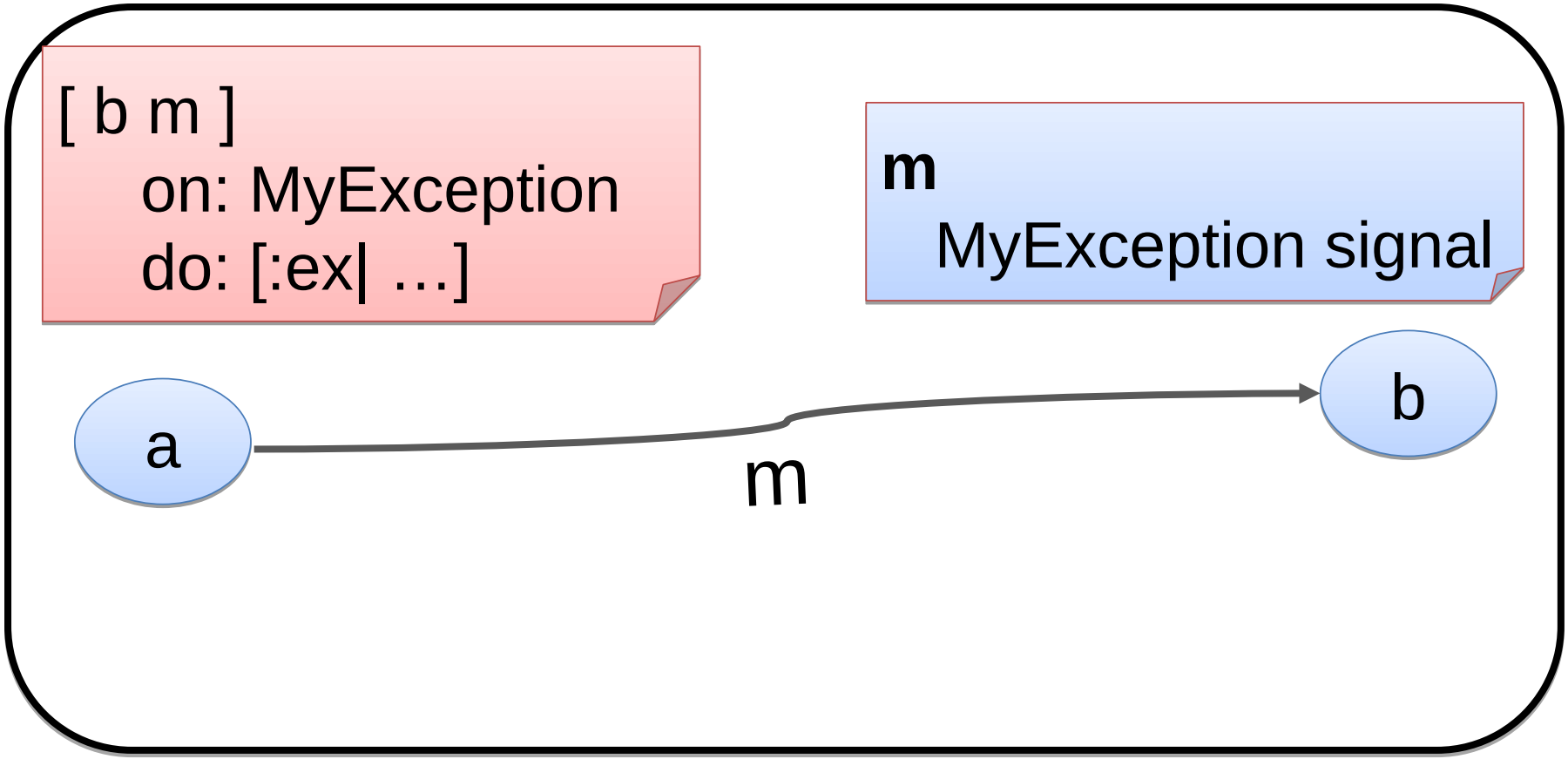
Remote Communication the Smalltalk Way

- Message
  - Receiver
  - Arguments
- Response
  - Returned Value
  - **Signaled Exception**

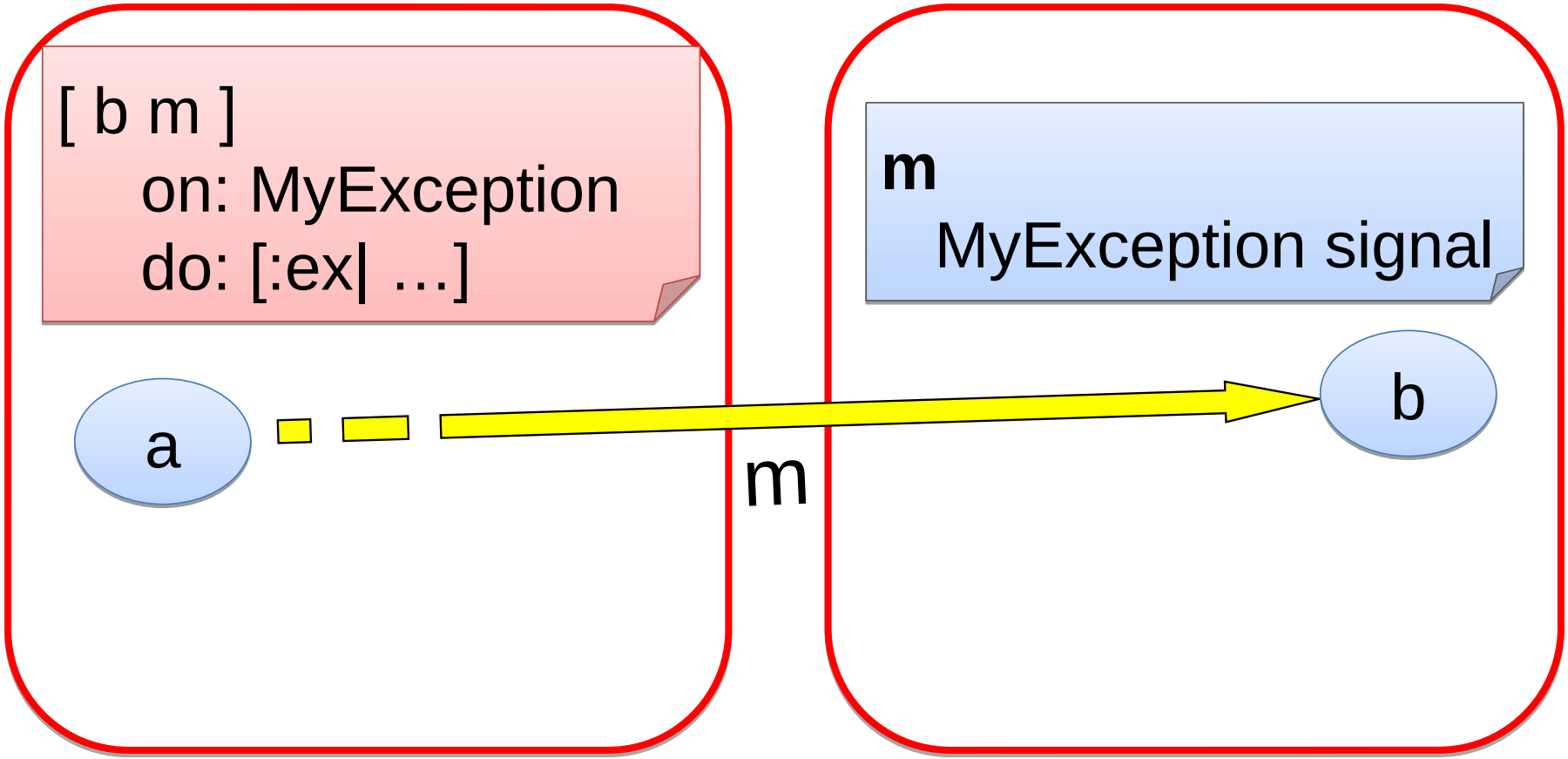
Distribution Agnostic Code



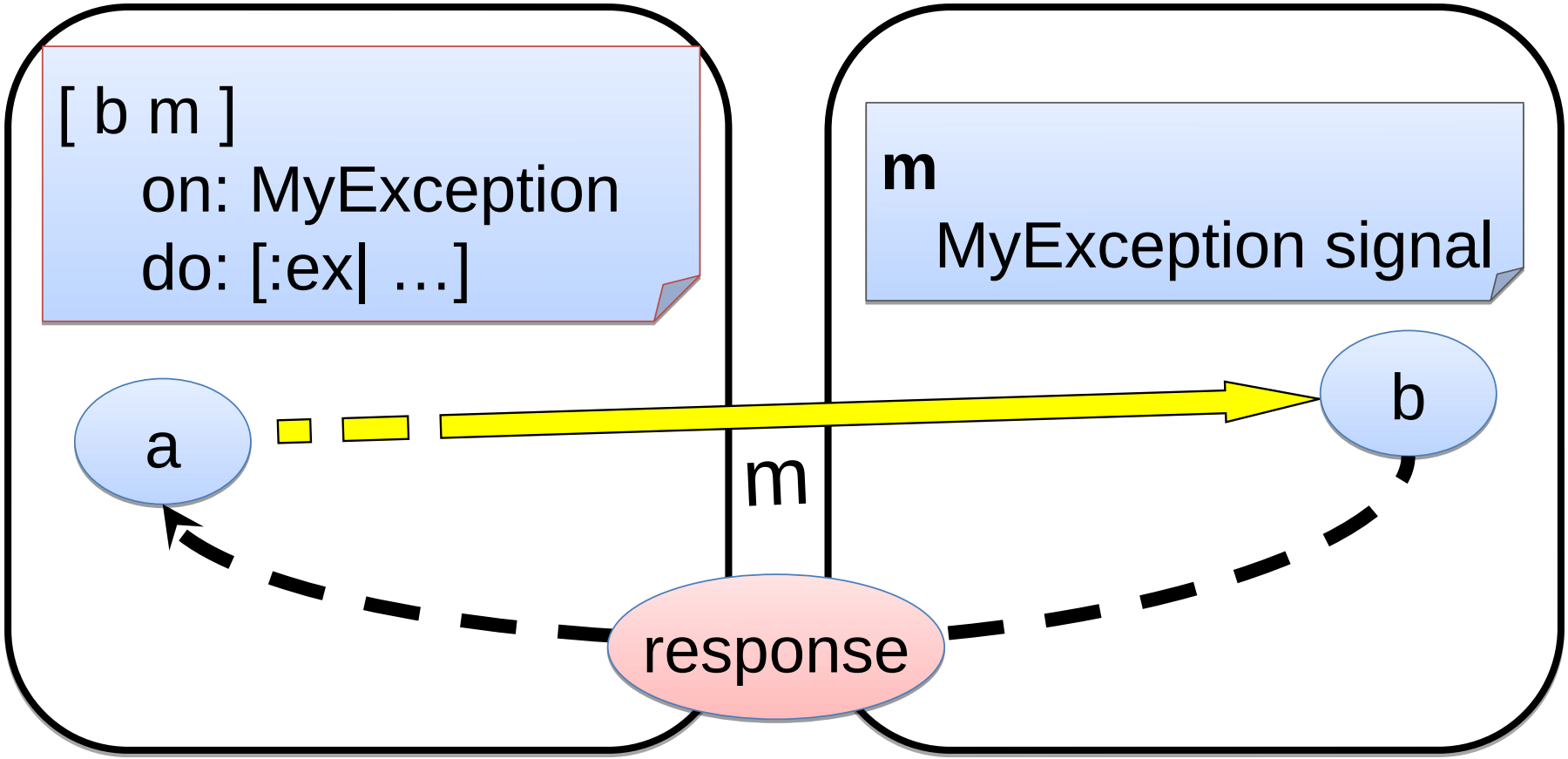
Distribution Agnostic Code



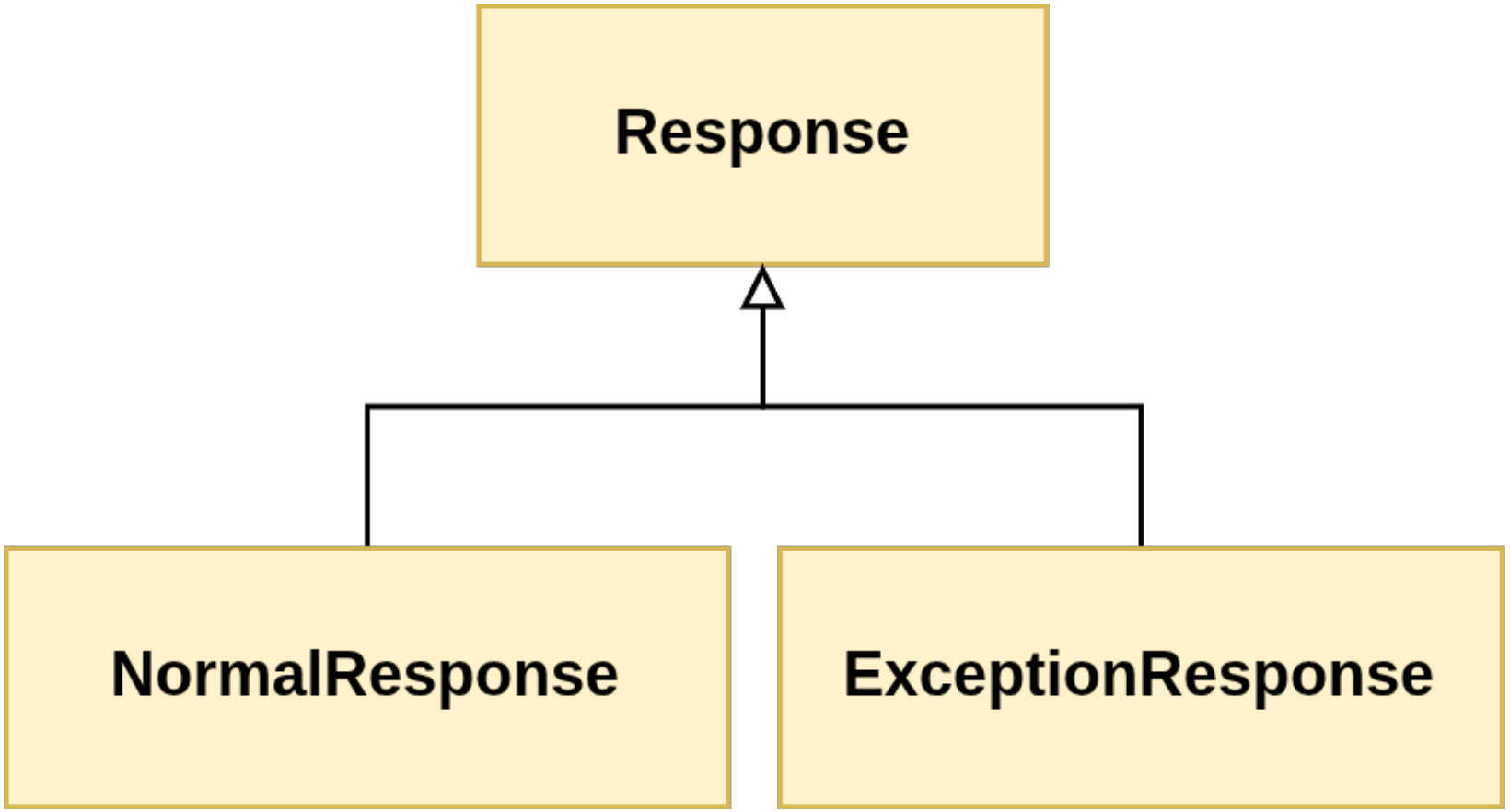
Distribution Agnostic Code



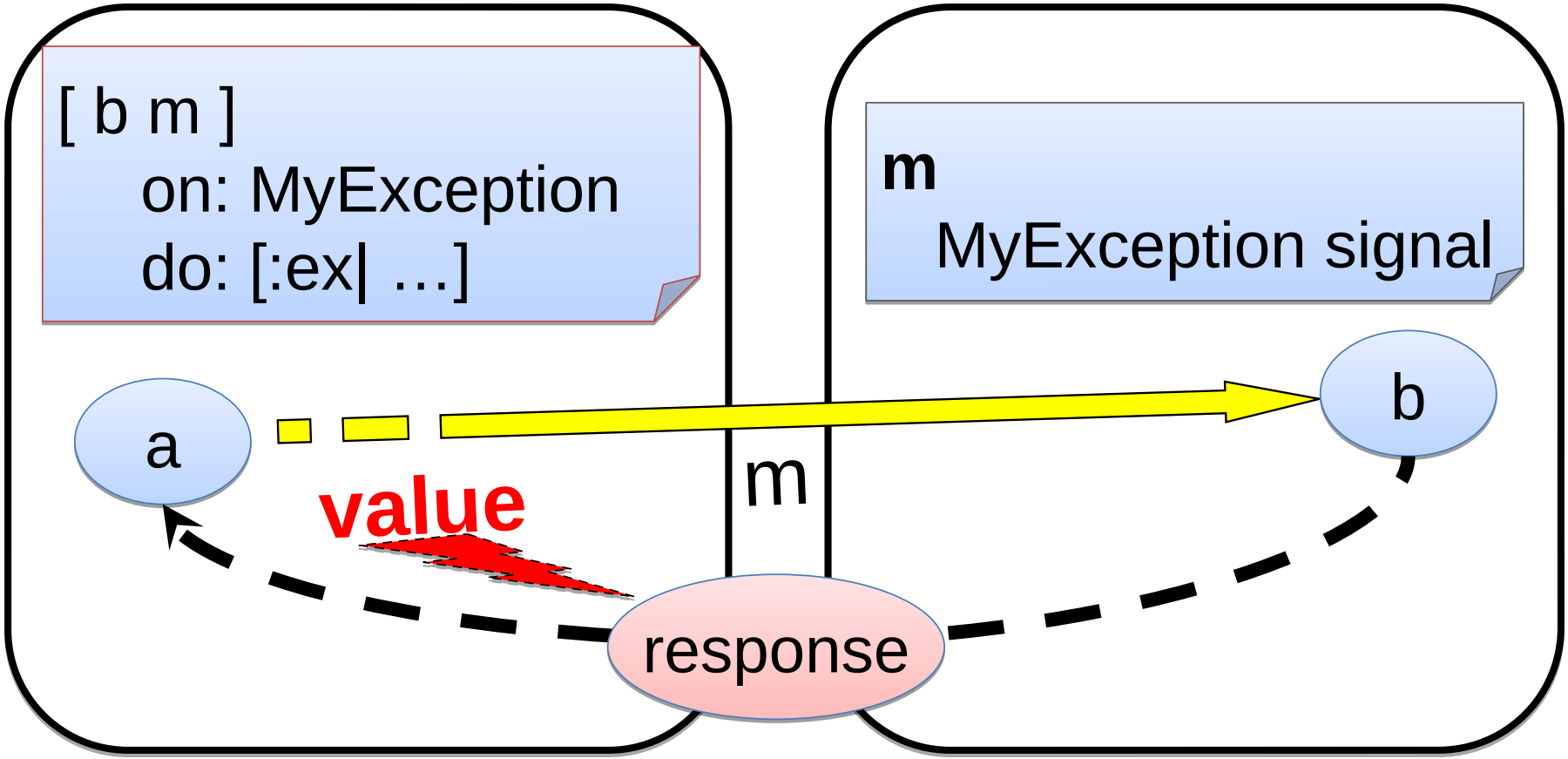
Reified Response



Responses are Reified



Reified Response



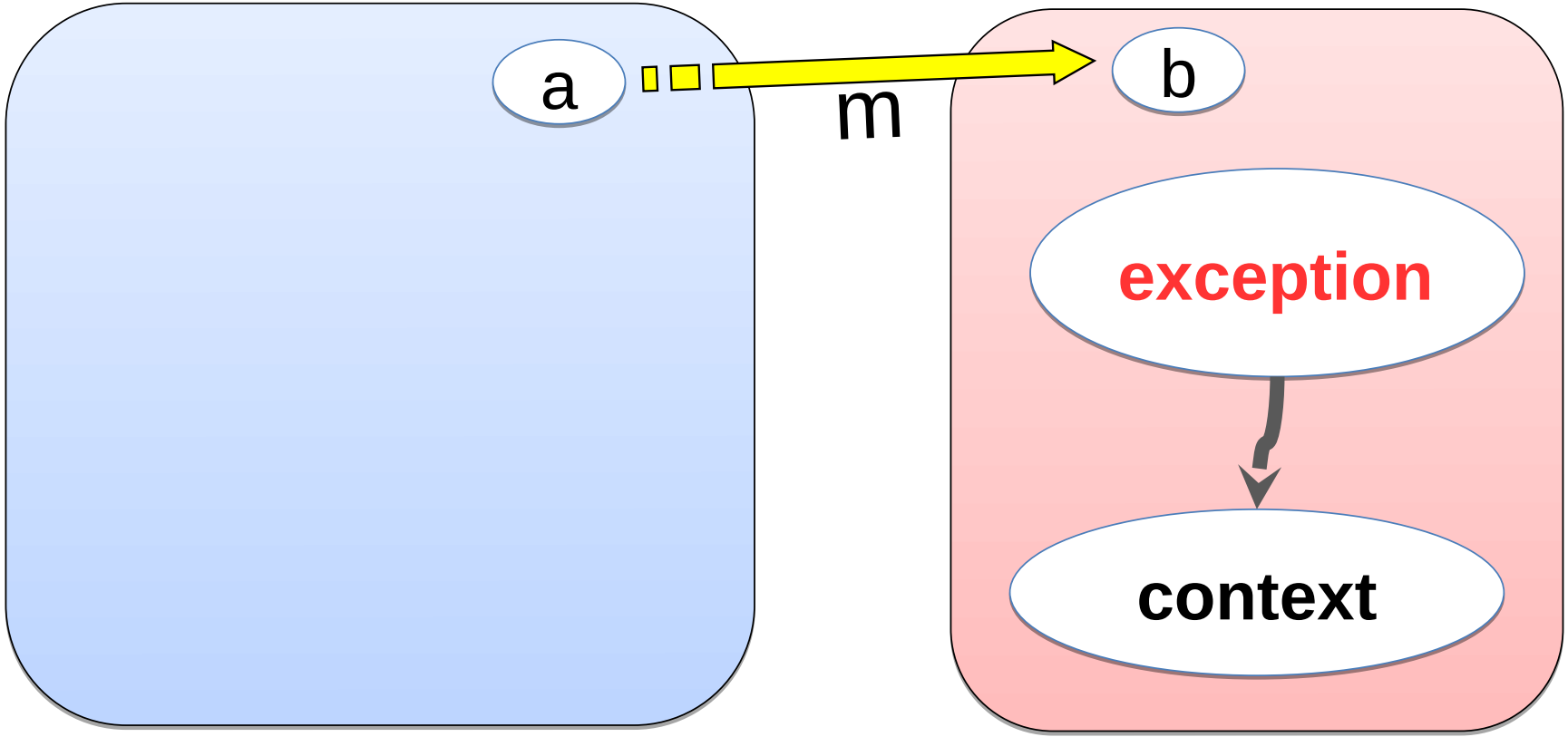
Responses are Reified

- normalResponse value
  - An object is returned

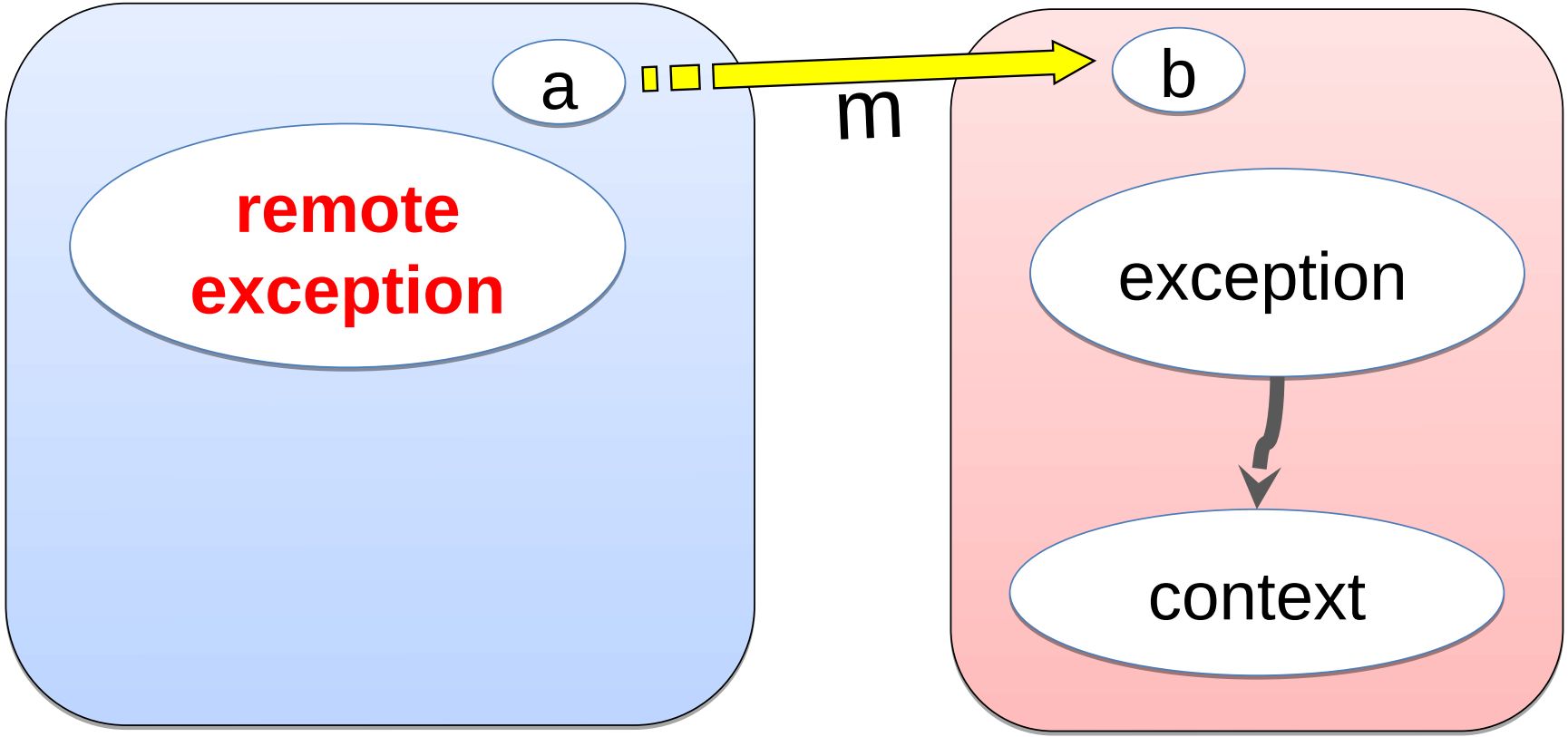
Responses are Reified

- normalResponse value
  - An object is returned
- exceptionResponse value
  - An **exception** is **signaled**

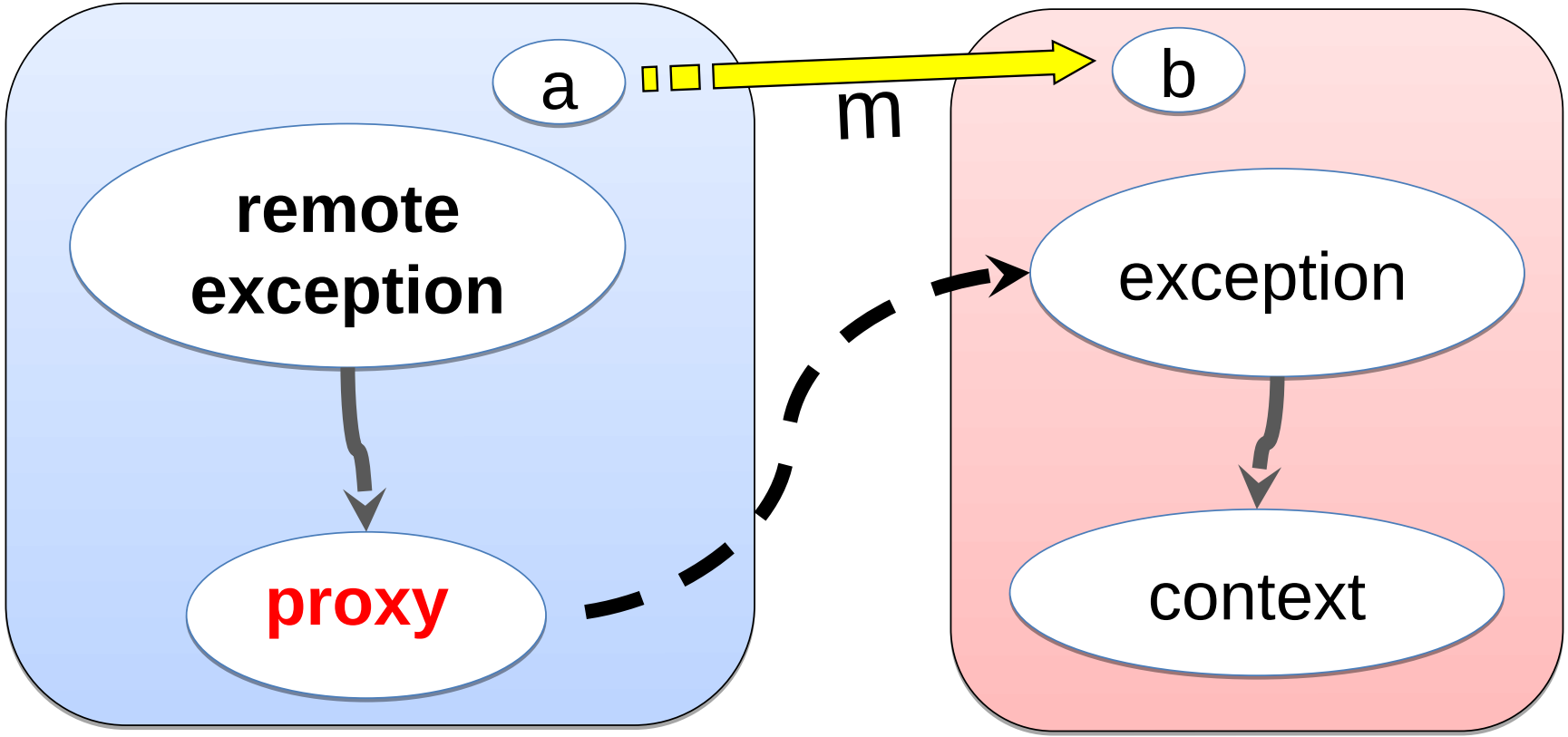
Exception Passing



Exception Passing



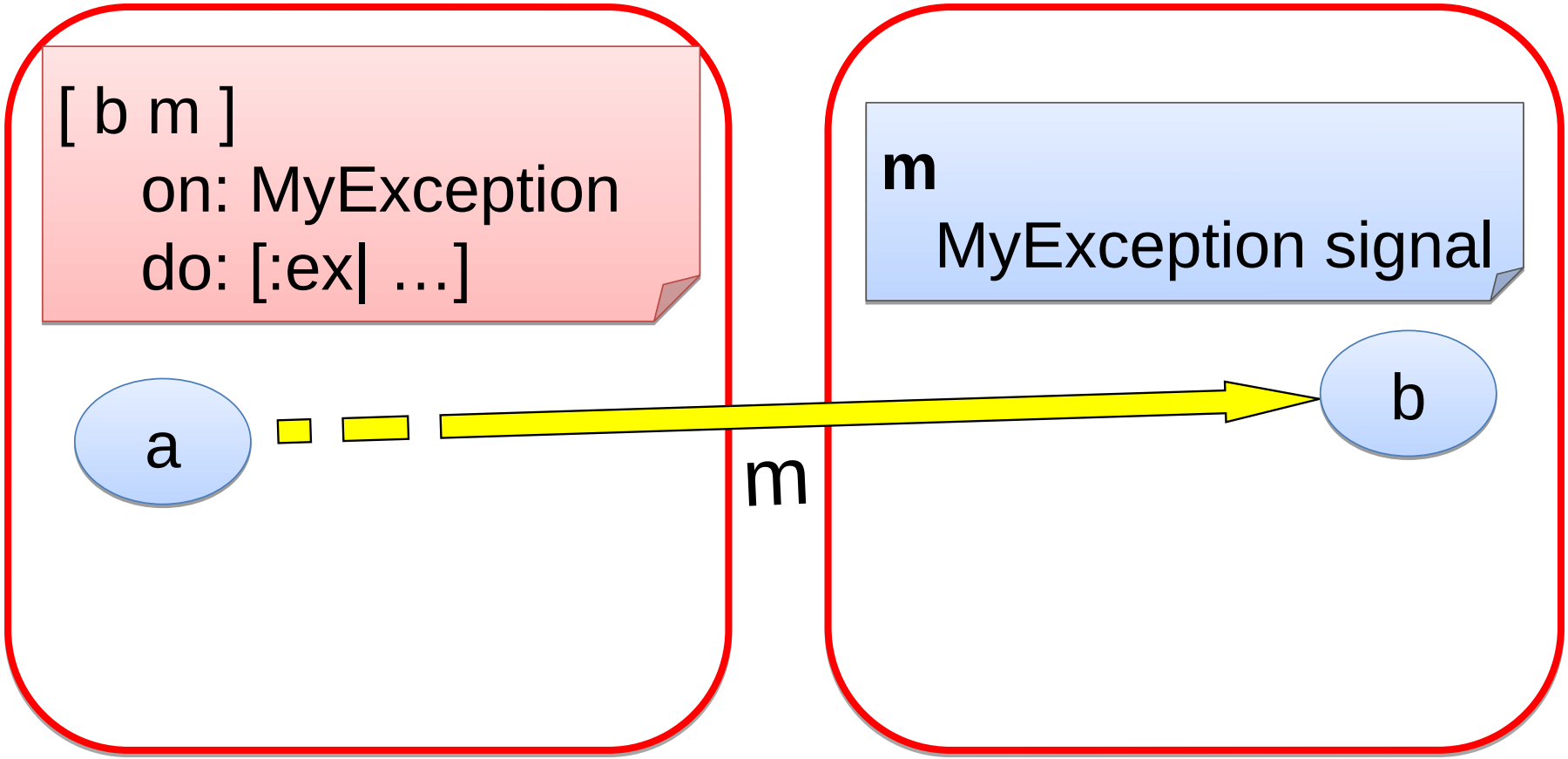
Exception Passing



Remote Exception

- Is an exception
- Signaled on the sender side
- Accepts the same handlers as the origin exception

Distribution Agnostic Code



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MyPrecious

https://github.com/SmalltalkWeb/MyPrecious

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First Steps Towards a Modular Middleware

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