Implementation of a Middleware for Hybrid Adaptive Multicast (H∀Mcast)

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Gliederung

Motivation

Problem Statement

- Multicast is most efficiently implemented on the lowest layer available
- Deployment status largely varies throughout the Internet
- Native (IPv4/v6) multicast is not globally reliably deployed

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$\Rightarrow$ Overlay multicast globally available but of lesser efficiency

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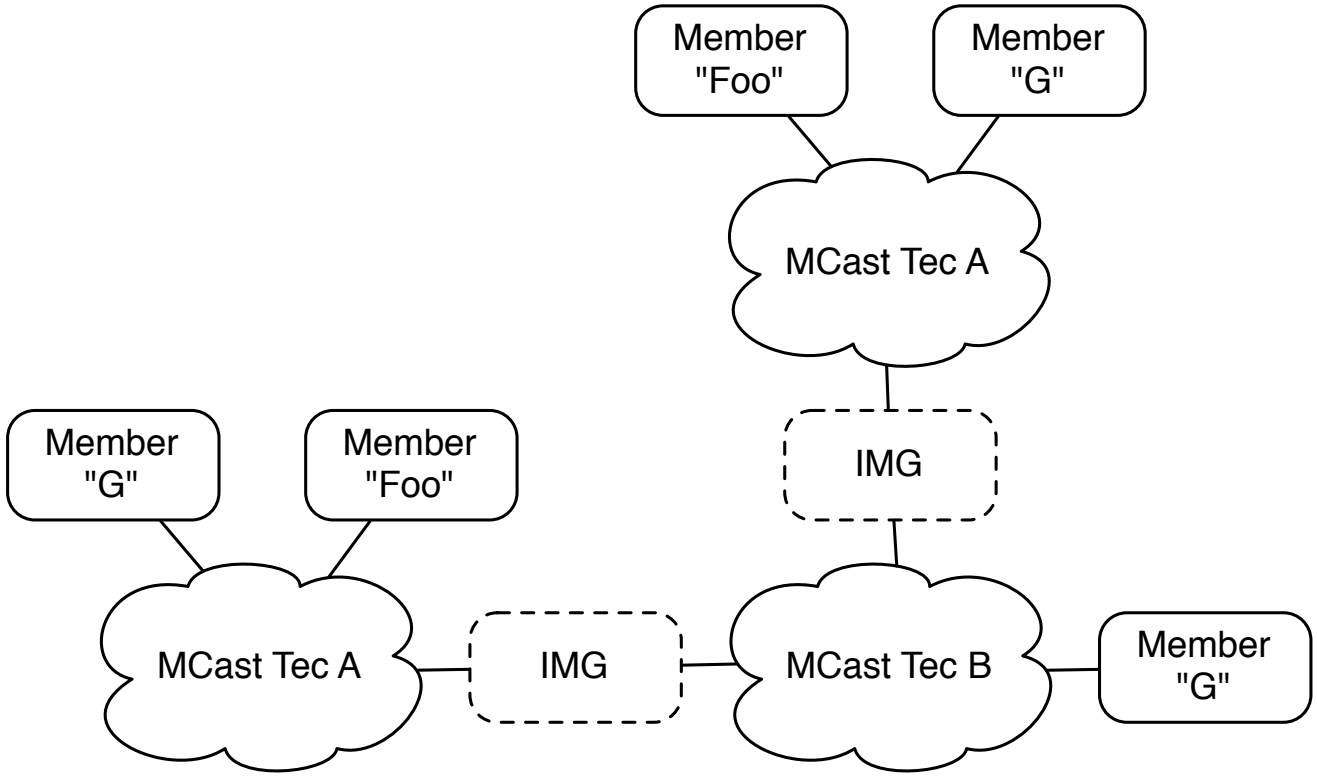
H∀Mcast Reference Scenario



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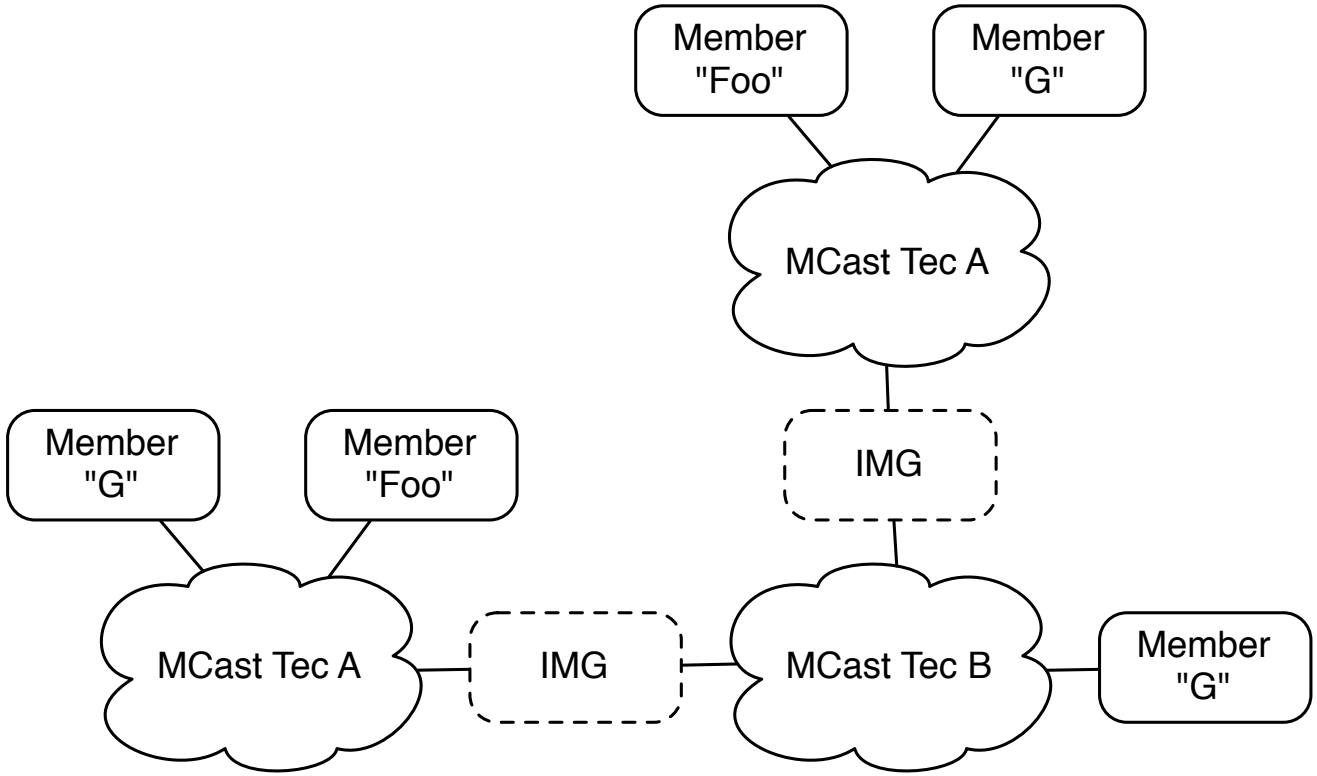

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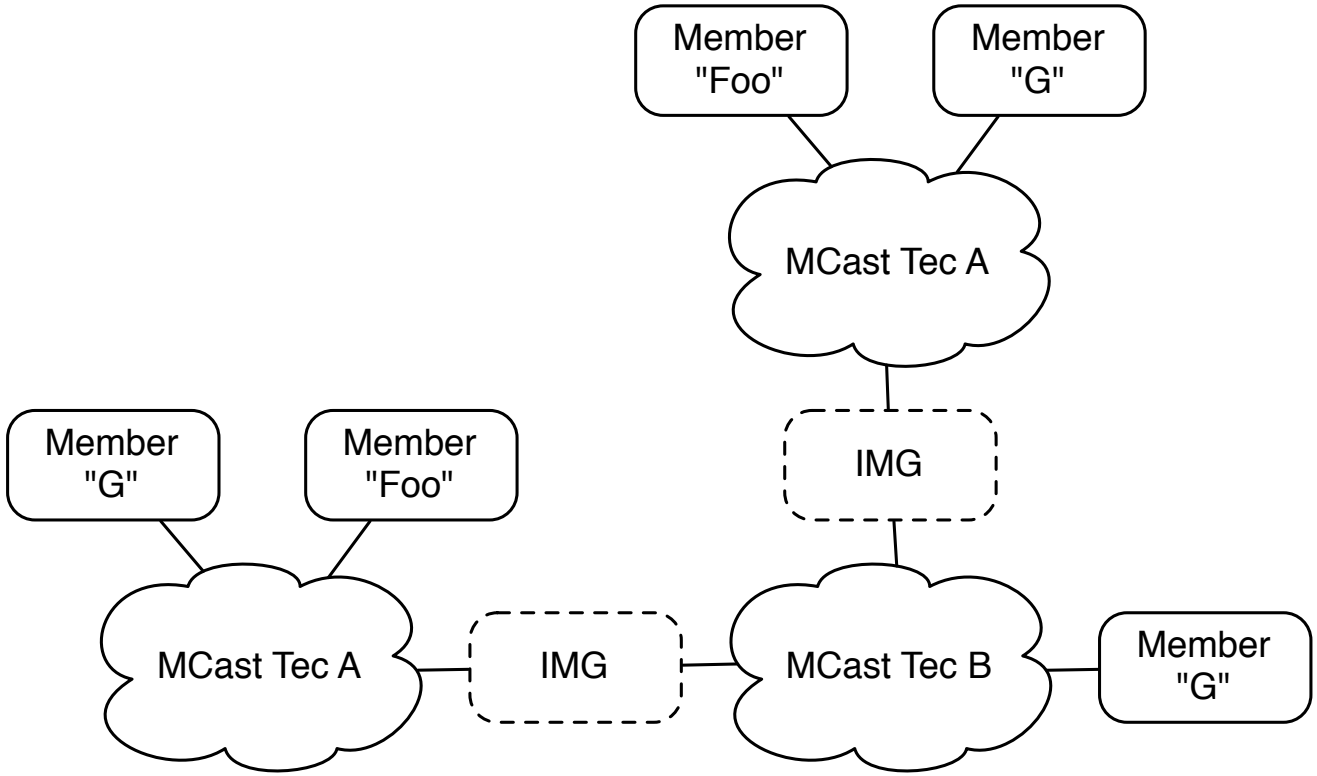

- Hosts are members of the **same group** but use **distinct technologies**
- Hosts of the same group use **identical technologies**, but in **separated domains** (walled gardens)

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- Forward multicast data between different technologies
  - Deploy Interdomain Multicast Gateways (IMGs)

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- API describes a virtual multicast layer whose capabilities are not known at compile time
- Forward multicast data between different technologies
  - Deploy Interdomain Multicast Gateways (IMGs)
- Late binding
  - Technology selection at runtime
  - Locator/ID split (generic group addressing)

  $\Rightarrow$ make applications future-proof and technology independent

- API
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- Middleware
  - Implements the virtual multicast layer
  - Dispatches send/receive/join calls to *Service Modules*

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  - Modules are loaded at startup and perform a Service Discovery
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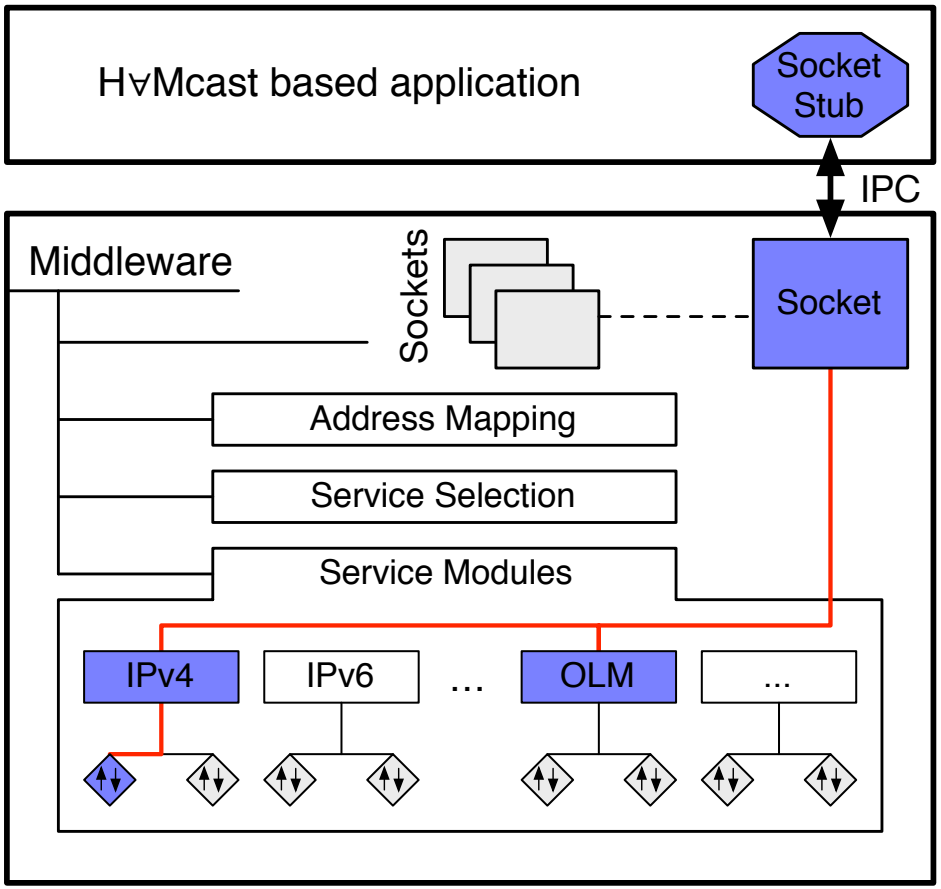
- Service Selection
  - Chooses the most efficient module available for a given identifier
  - Based on the results of the Service Discoveries

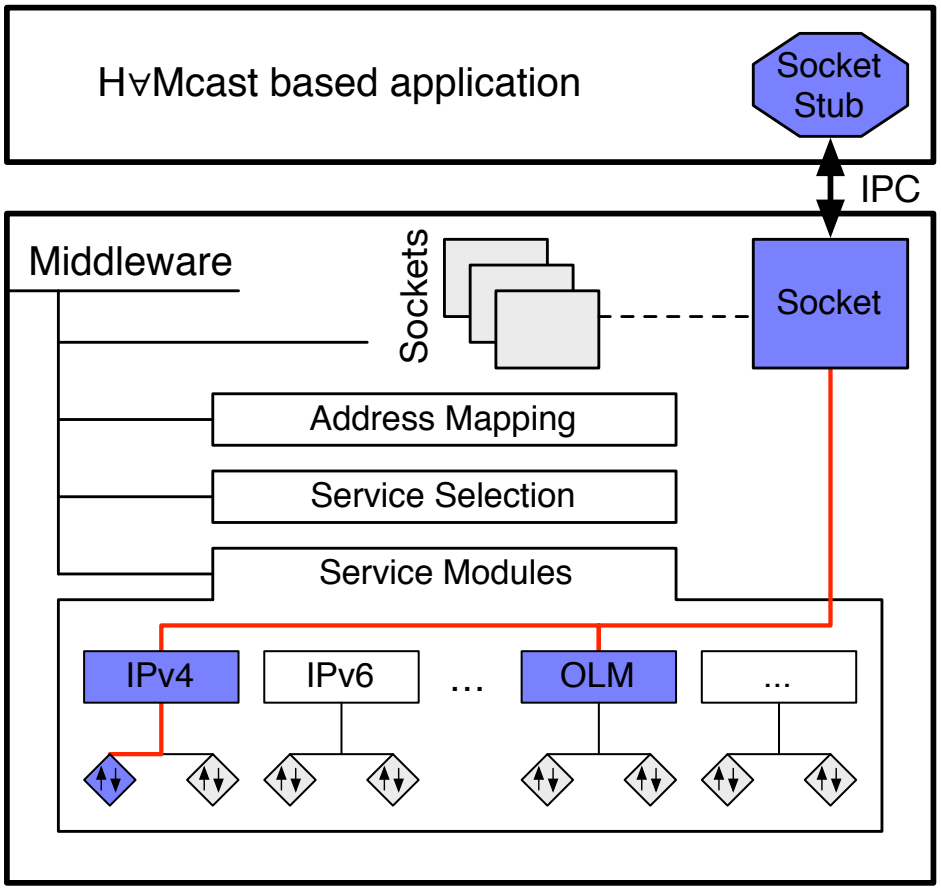


A H∀Mcast socket ...

- Unites any number of tech. specific sockets

Architecture

Middleware Components – H∀Mcast Sockets



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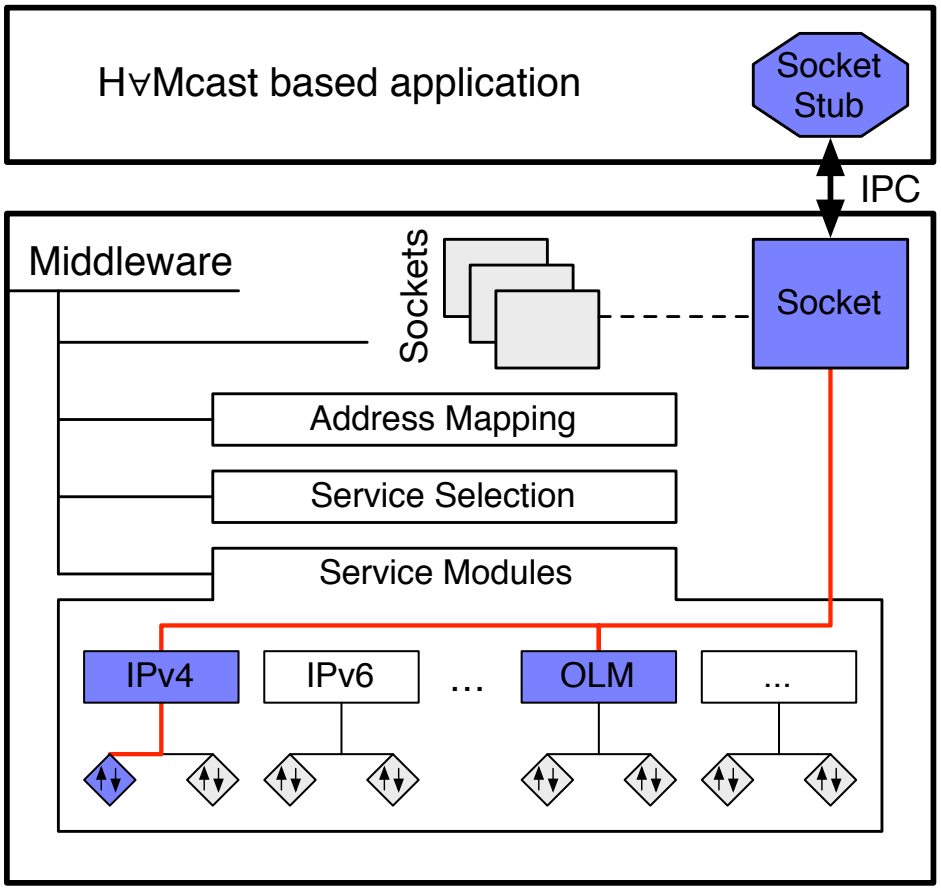
- Send call:
  - Forward data to all assigned modules
  - Assign modules (if needed) by Service Selection



A H∀Mcast socket ...

- Unites any number of tech. specific sockets
- `Send` call:
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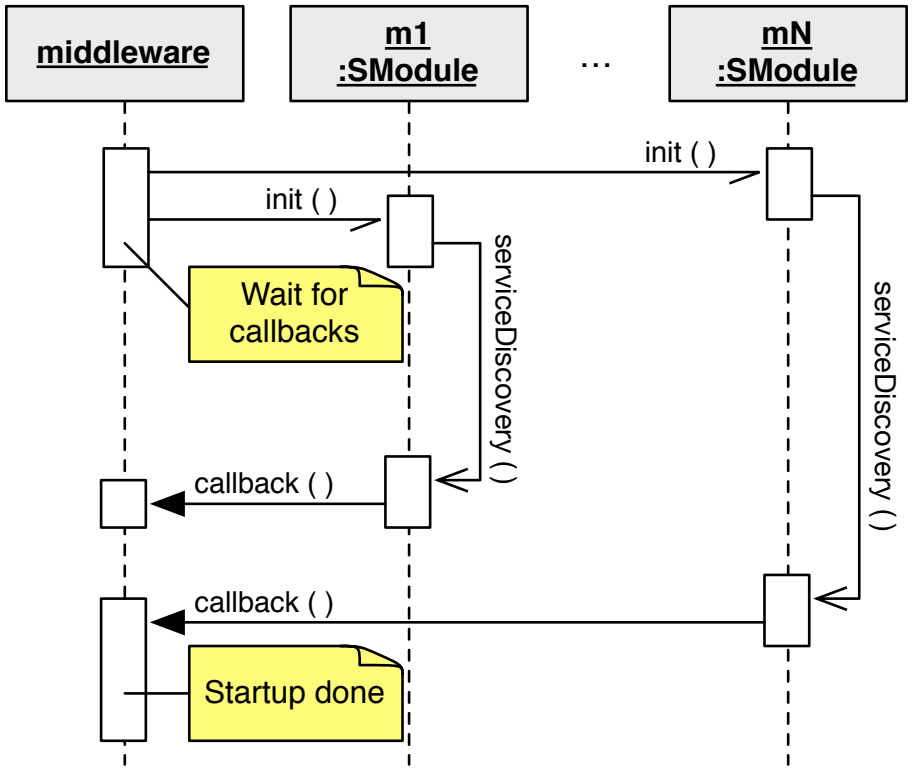
- `Receive` call:
  - Round-robin on all associated tech. sockets

Middleware

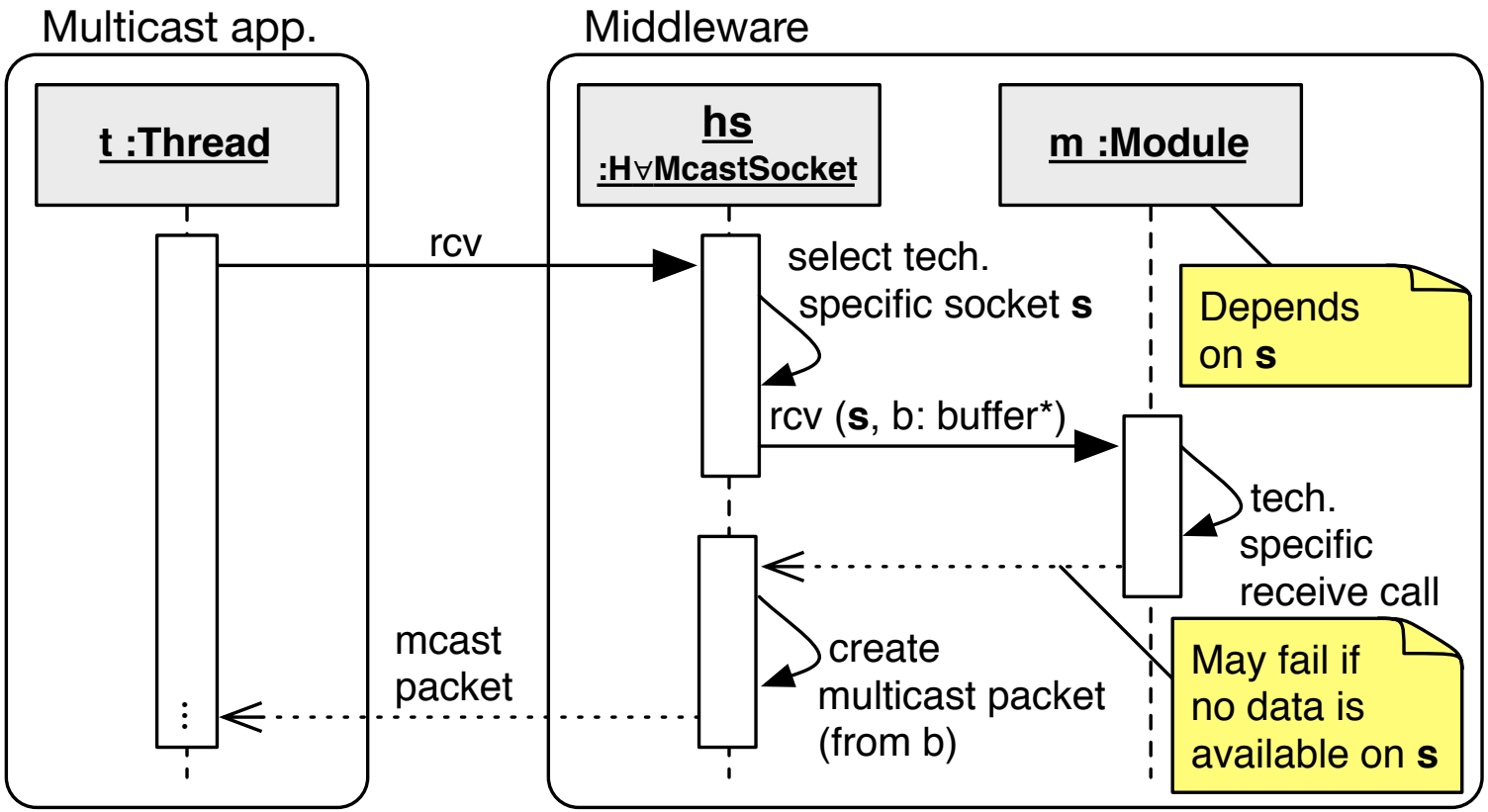
Startup Phase



- Service Discoveries (and/or Bootstrapping) runs asynchronously & parallell to minimize startup time
- The Service Discoveries are needed by the Service Selection

Middleware

Receive Calls



- **hs** selects tech. specific socket in round-robin order (avoid starvation)

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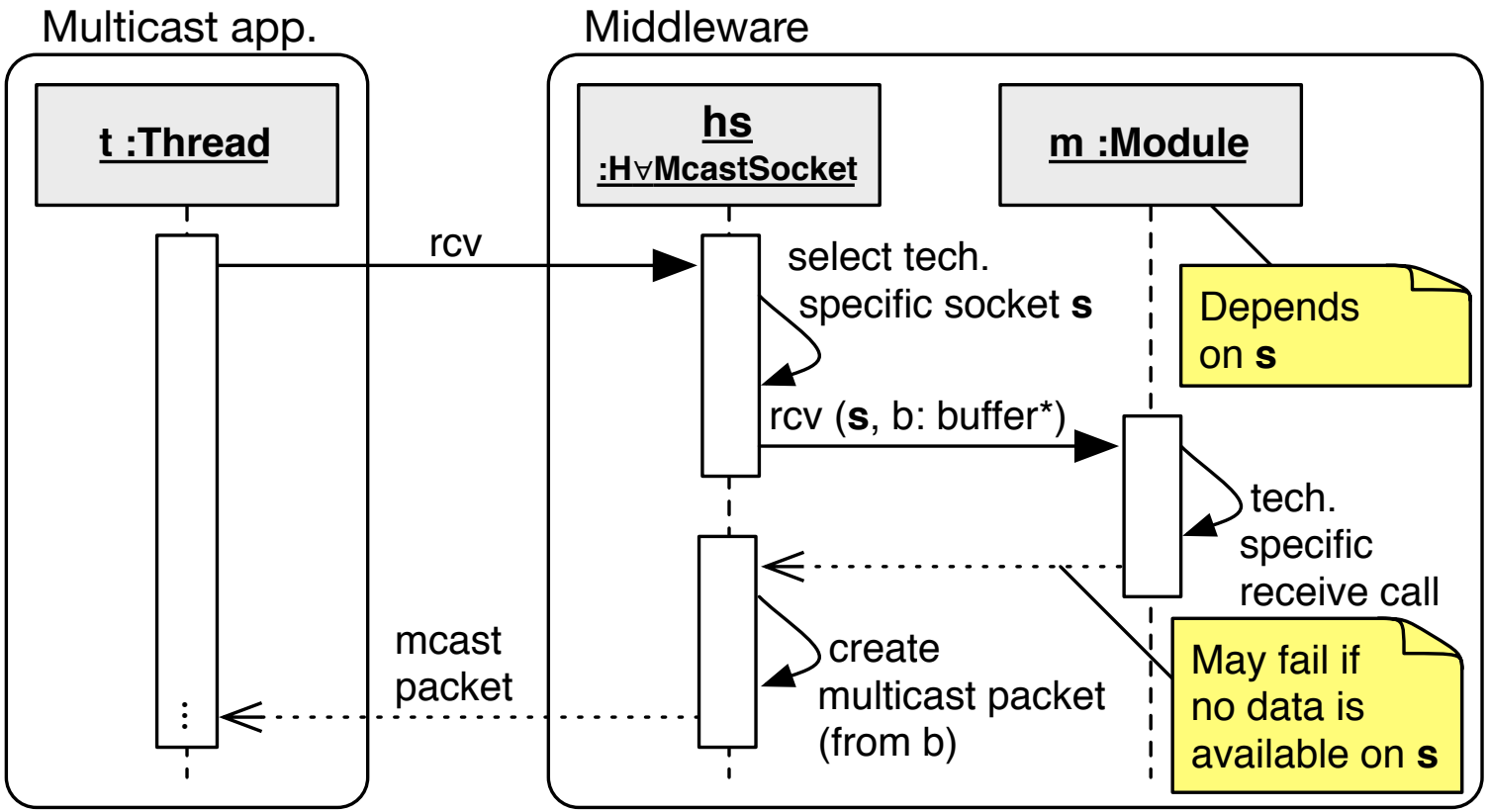
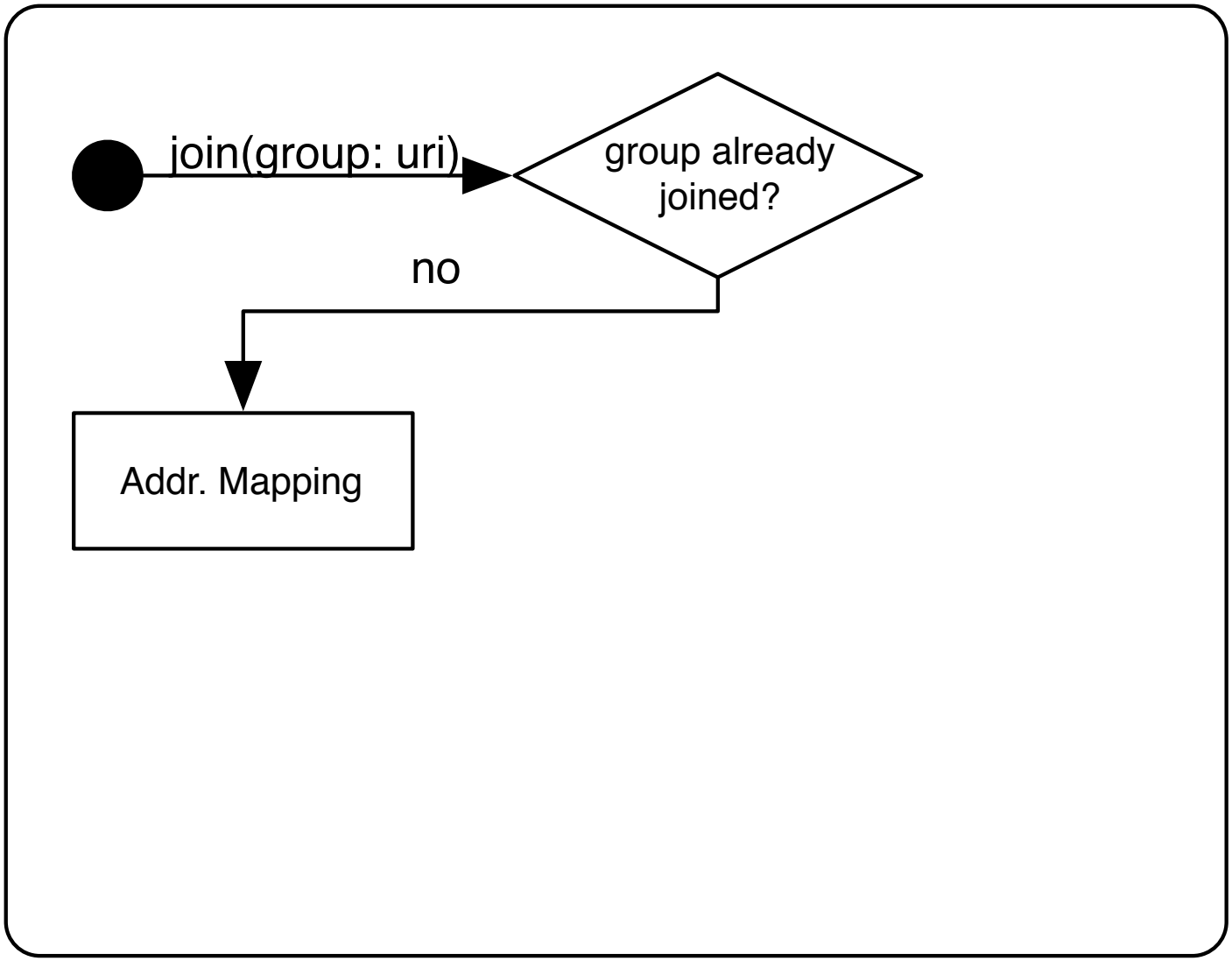
Receive Calls

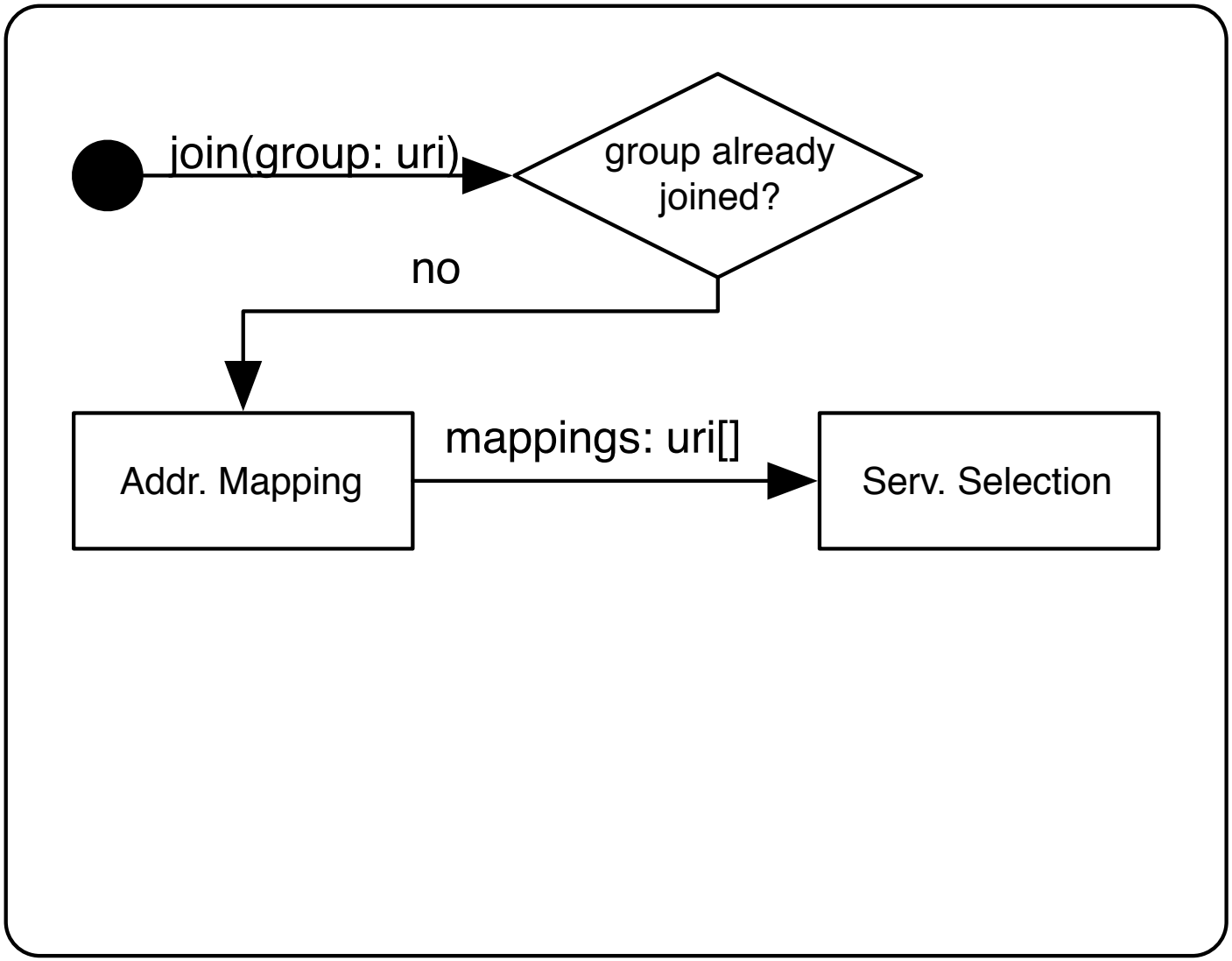


- **hs** selects tech. specific socket in round-robin order (avoid starvation)
- `Send` call is implemented similar


join(group: uri)
group already joined?
no
Addr. Mapping

Middleware

Join Calls



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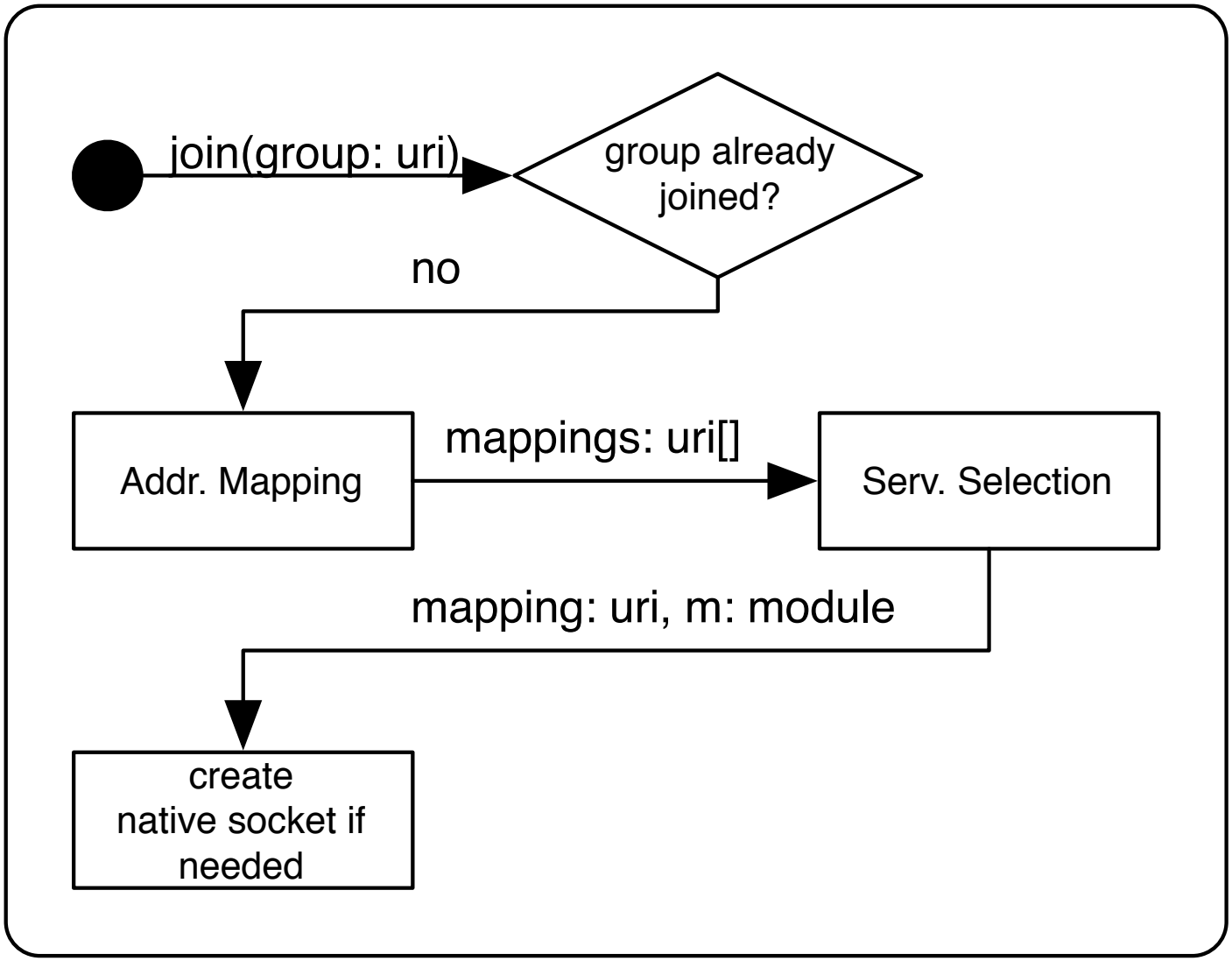

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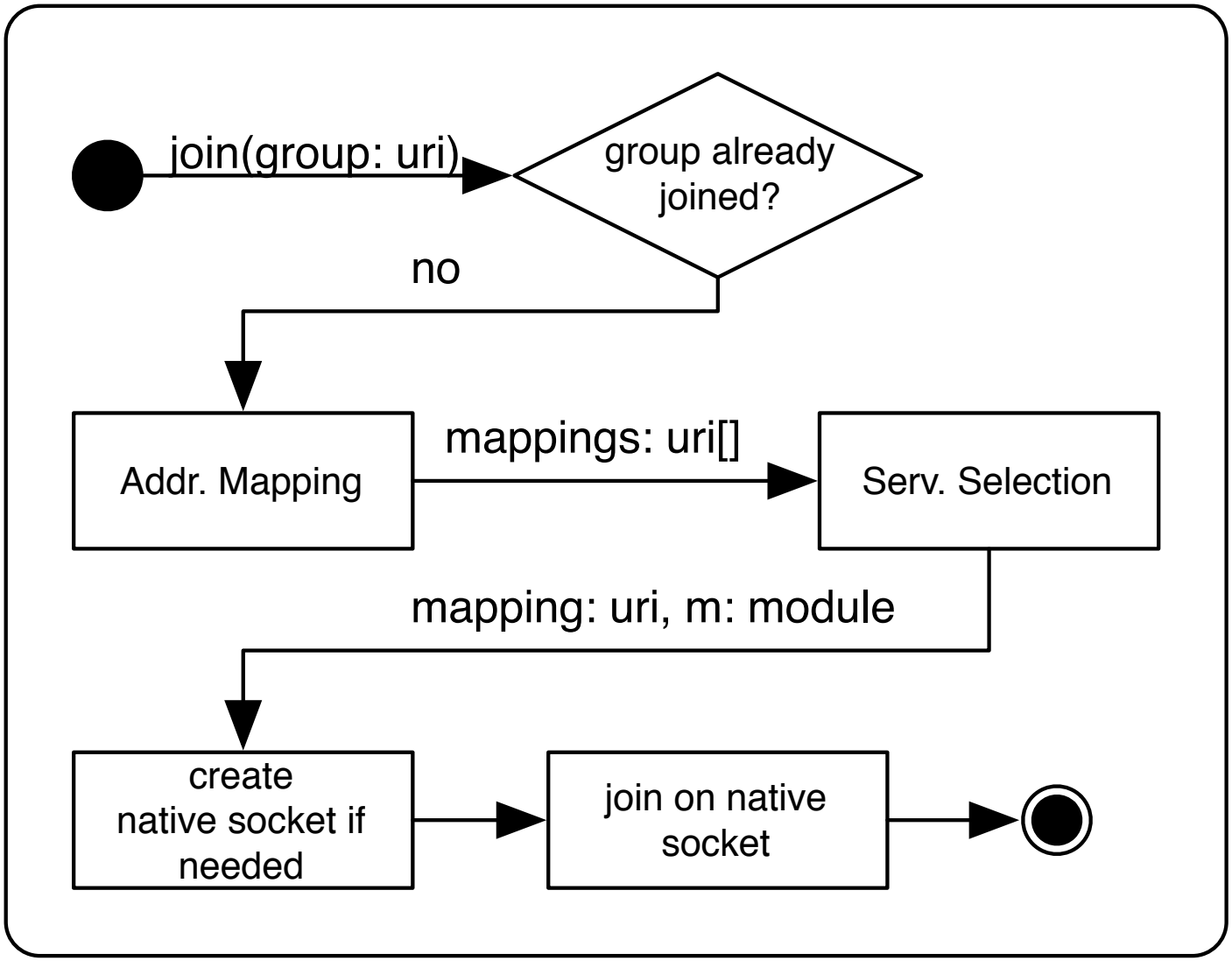

Middleware
IPC

H∀Mcast uses a localhost socket IPC implementation

- Data is serialized directly to sockets (no unnecessary overhead)
- IPC interface is independent of any platform/OS or language
- H∀Mcast API could be provided to every language that supports localhost sockets (almost every one: Java, C#, C, ...)

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Current state of the implementation

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- IPC runs, but at this time there's only a C++ binding
- IPv4/v6 and Scribe modules implemented; except for service discovery
- Service selection is mocked (always chooses the first available module)
- Mapping Service is an open issue

Outlook

Current ToDo List

- (Configurable) Logging to ease debugging of modules & middleware

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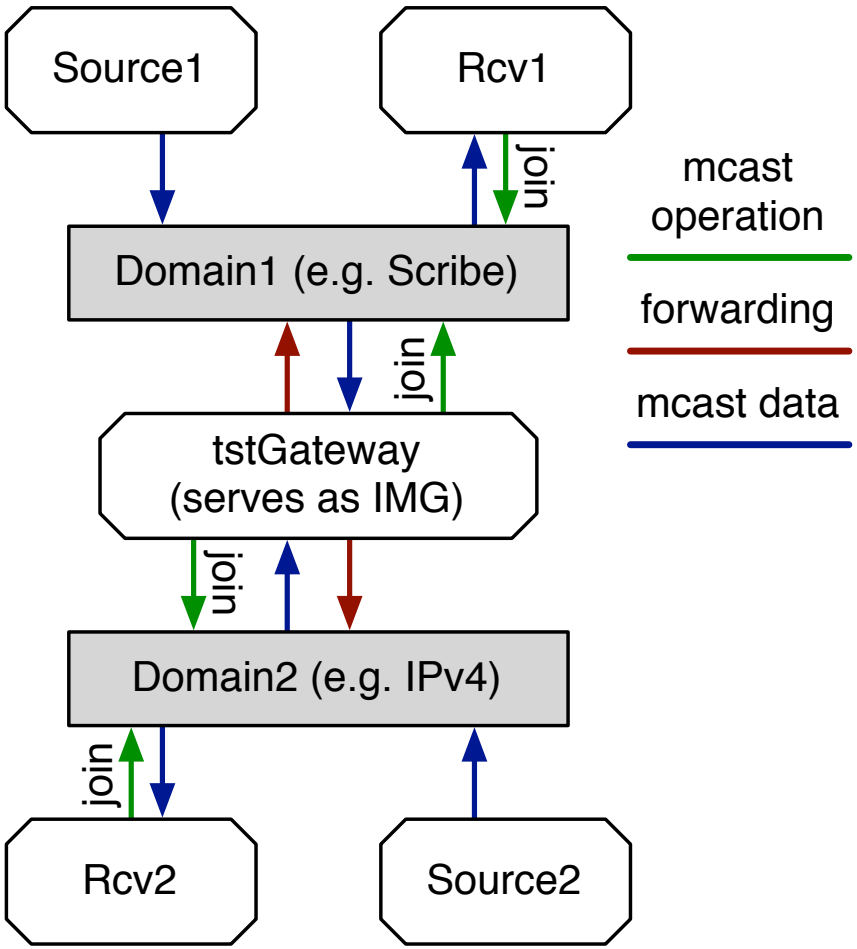
- Implementation of an (IMG) test scenario (next slide)

Outlook

Test Scenario



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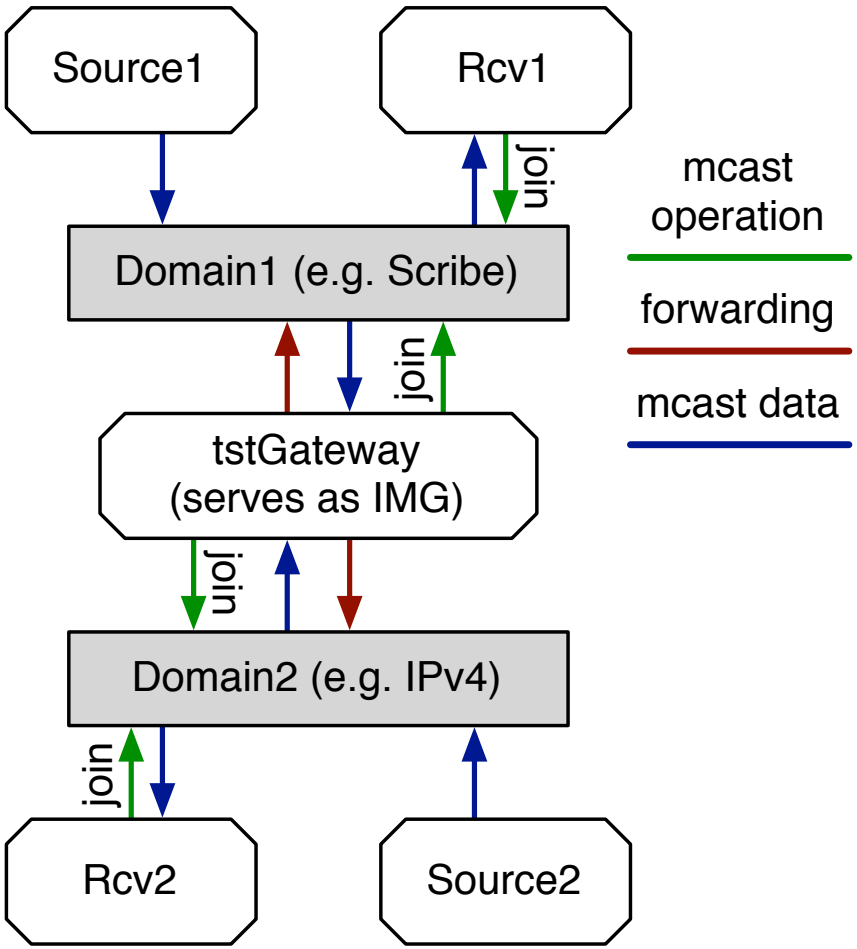

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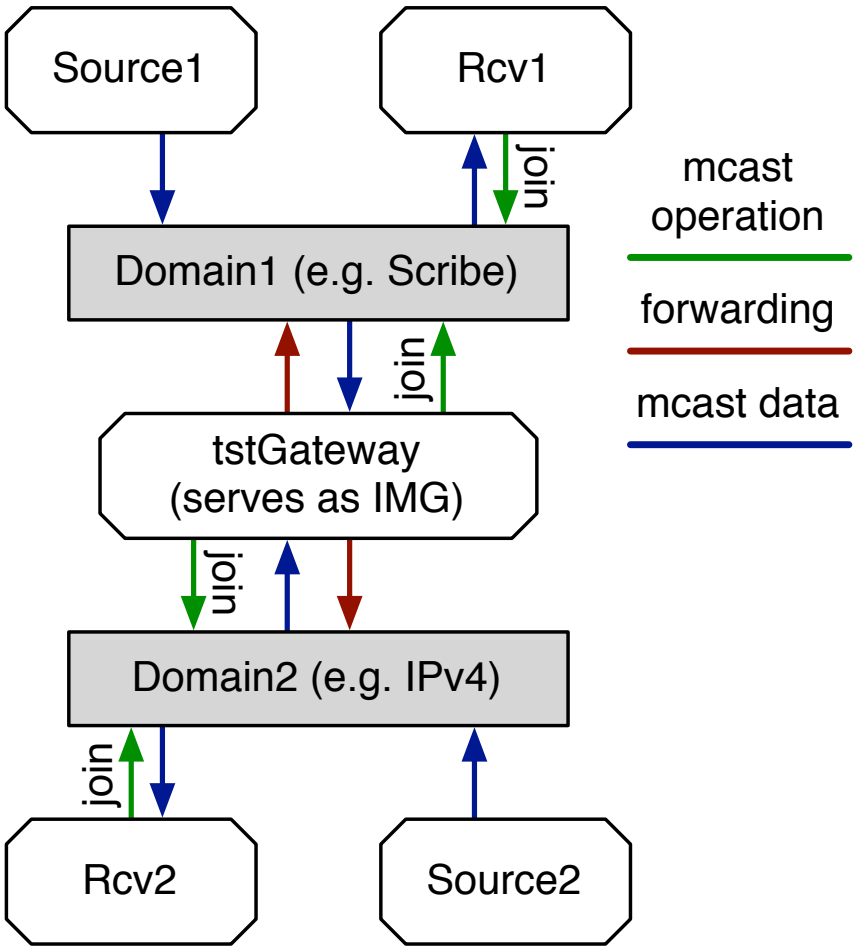

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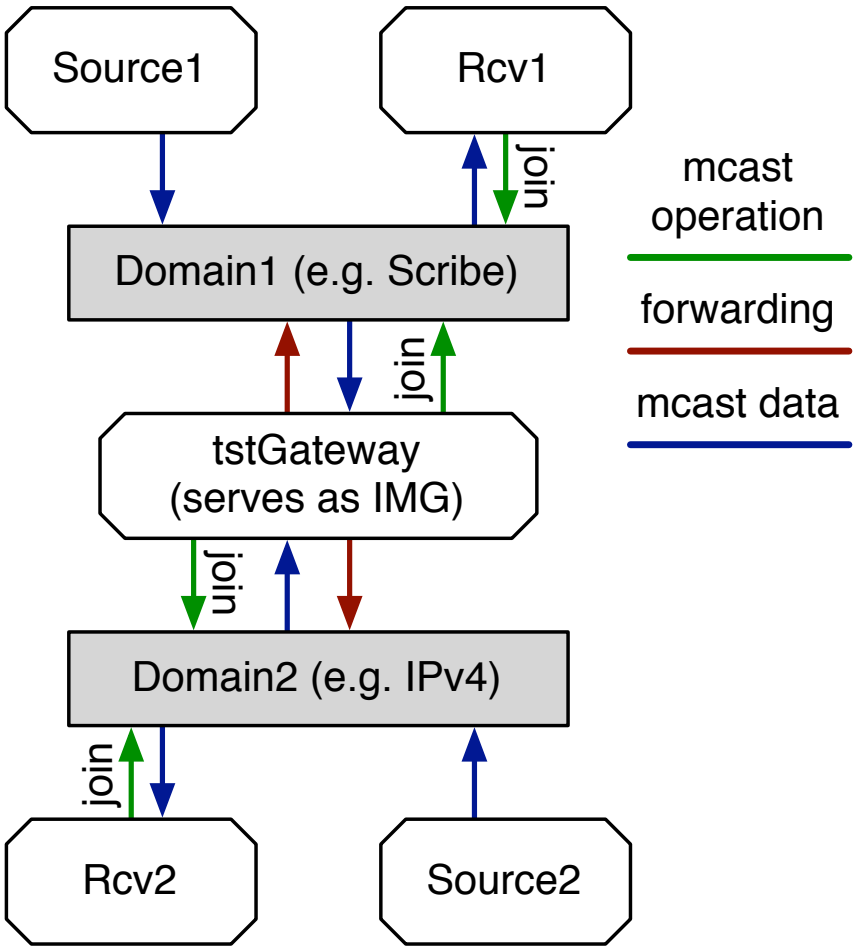

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- Joins the multicast group in Domain1 & Domain2
- Forwards data from Domain1 to Domain2 and vice versa
- Test of middleware and modules in a realistic test case

Thank you for your attention!

Questions?