Interaction Soundness for Service Orchestration

Frank Puhlmann
(Joint work with Mathias Weske)

Business Process Technology Group
Hasso Plattner Institut
Potsdam, Germany

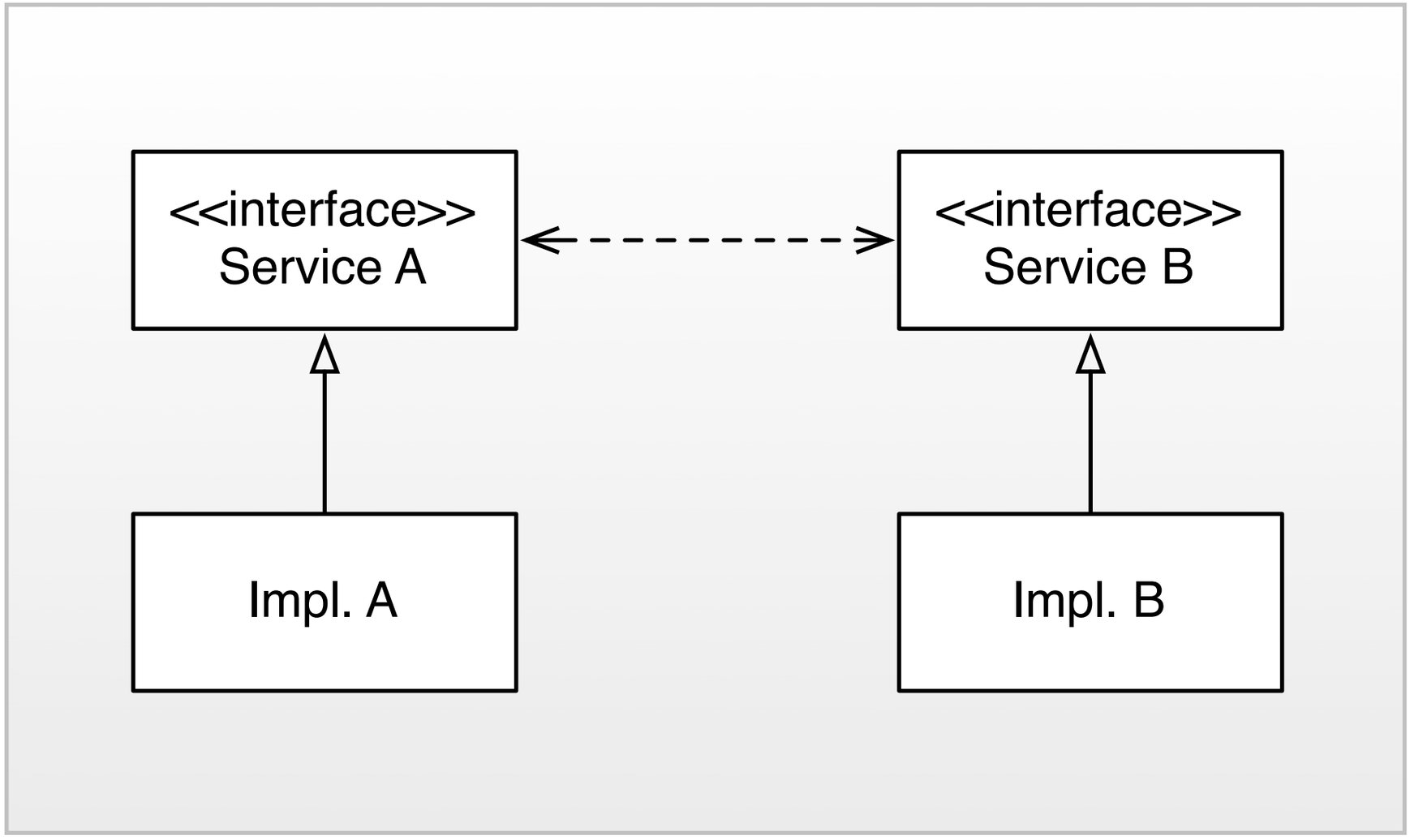
Outline

- Motivation
- Preliminaries
- Interaction Soundness
- Conclusion

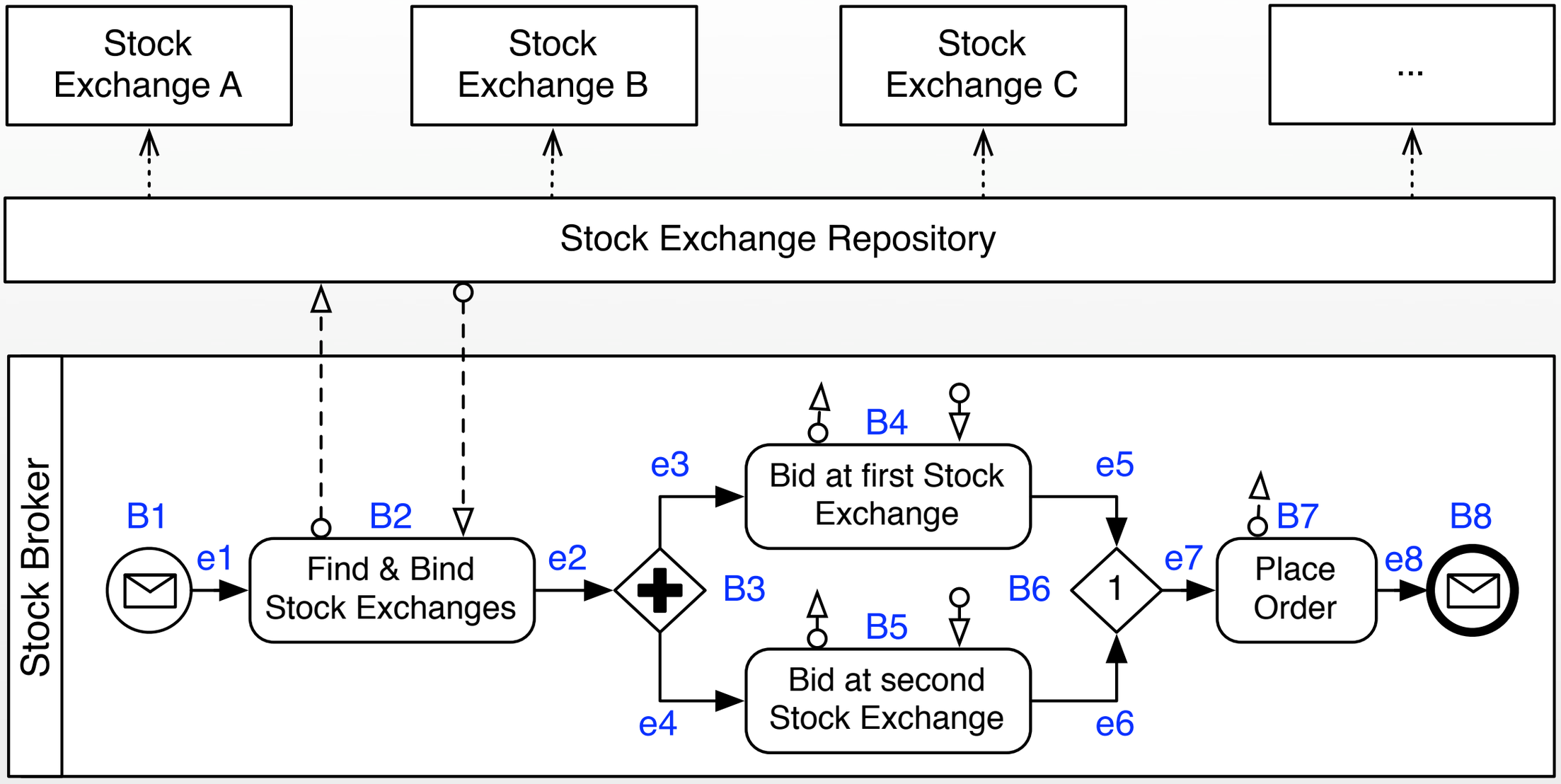
Motivation

Problem

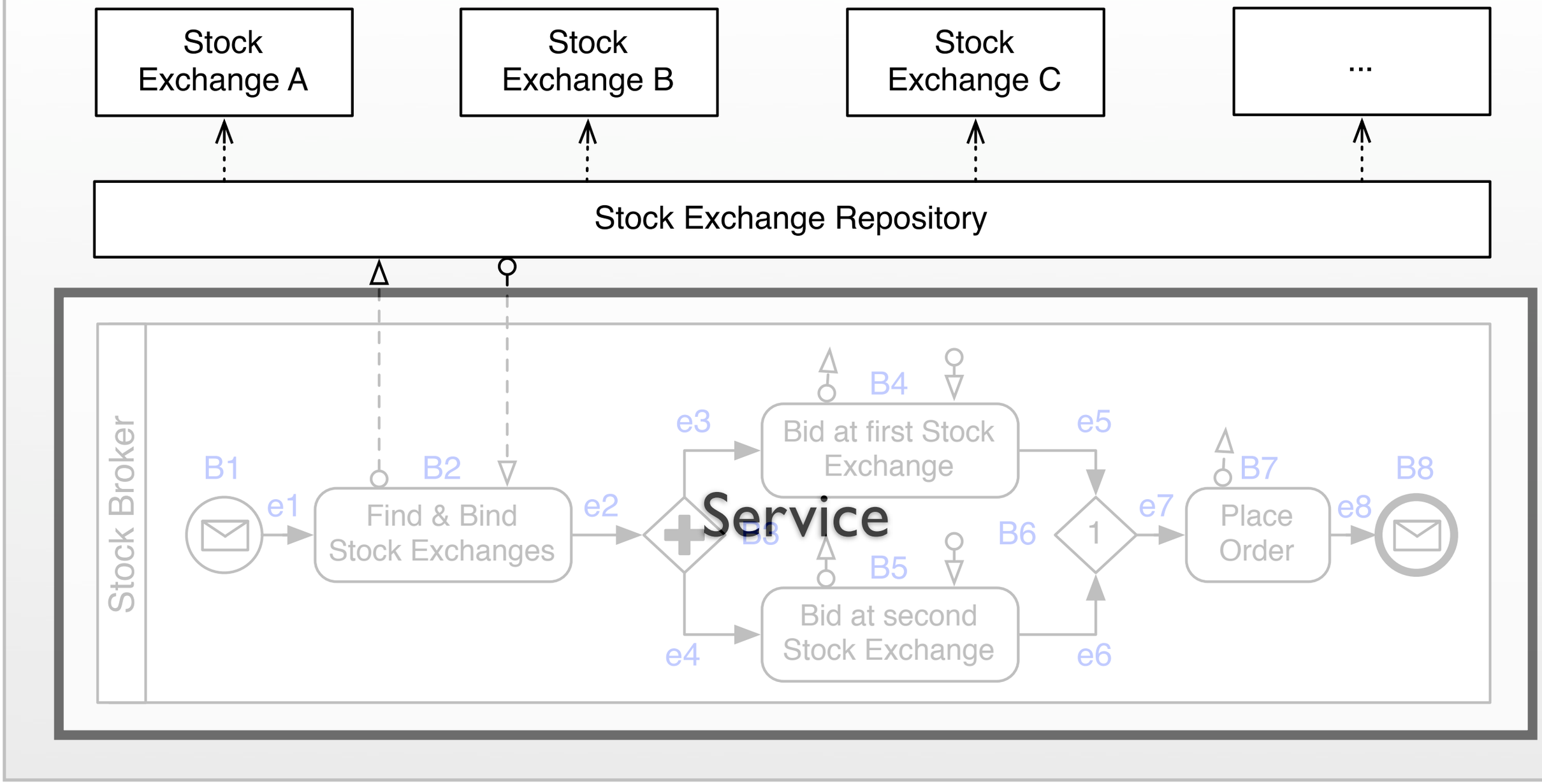
- We would like to investigate the compatibility of a service with a given environment
- In contrast to existing approaches, only a subset of connections between the service and the environment is static
- Other connections are acquired during runtime using dynamic binding



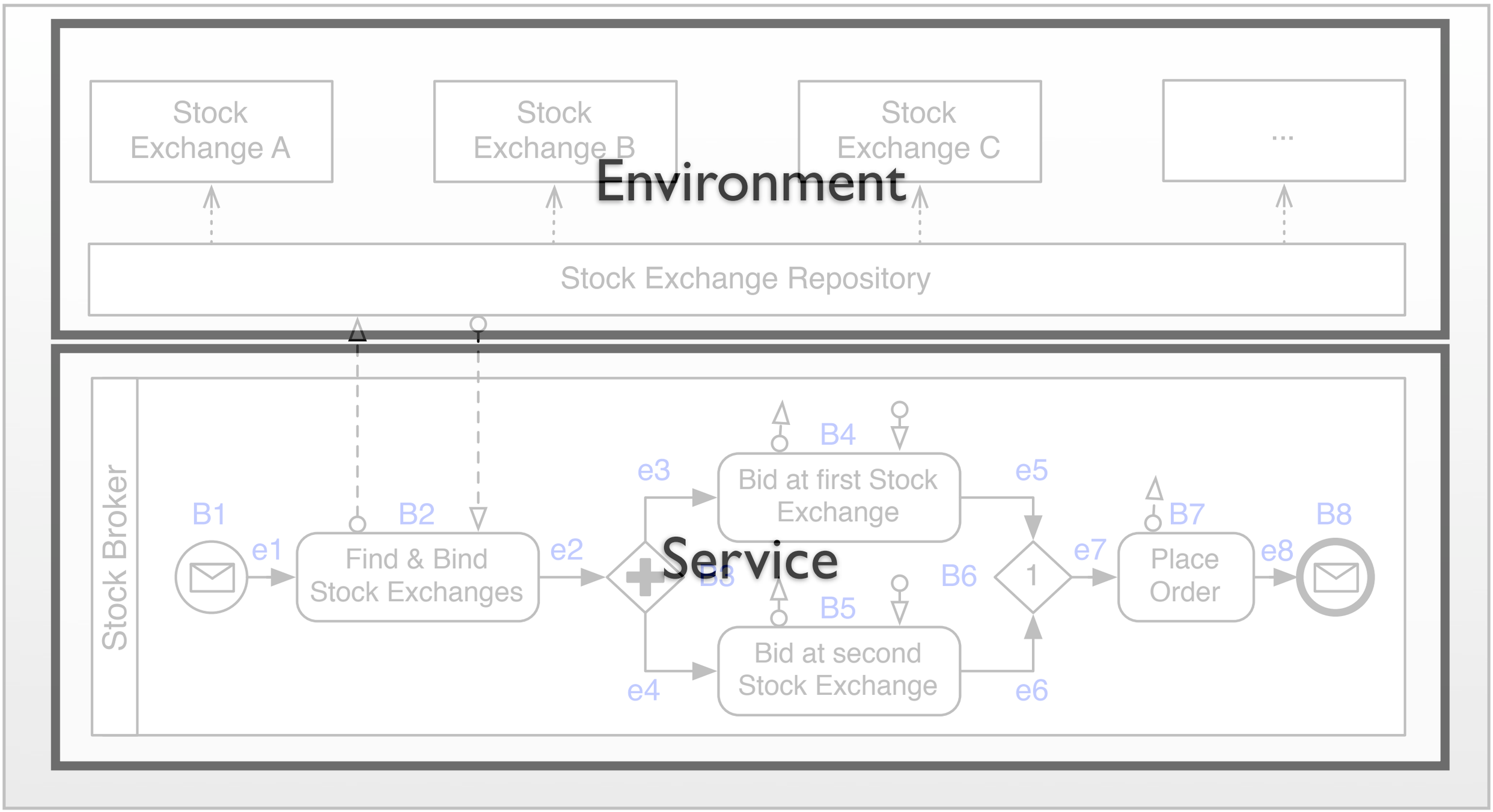
Conformance vs. Compatibility



Stock Exchange Choreography



Stock Exchange Choreography

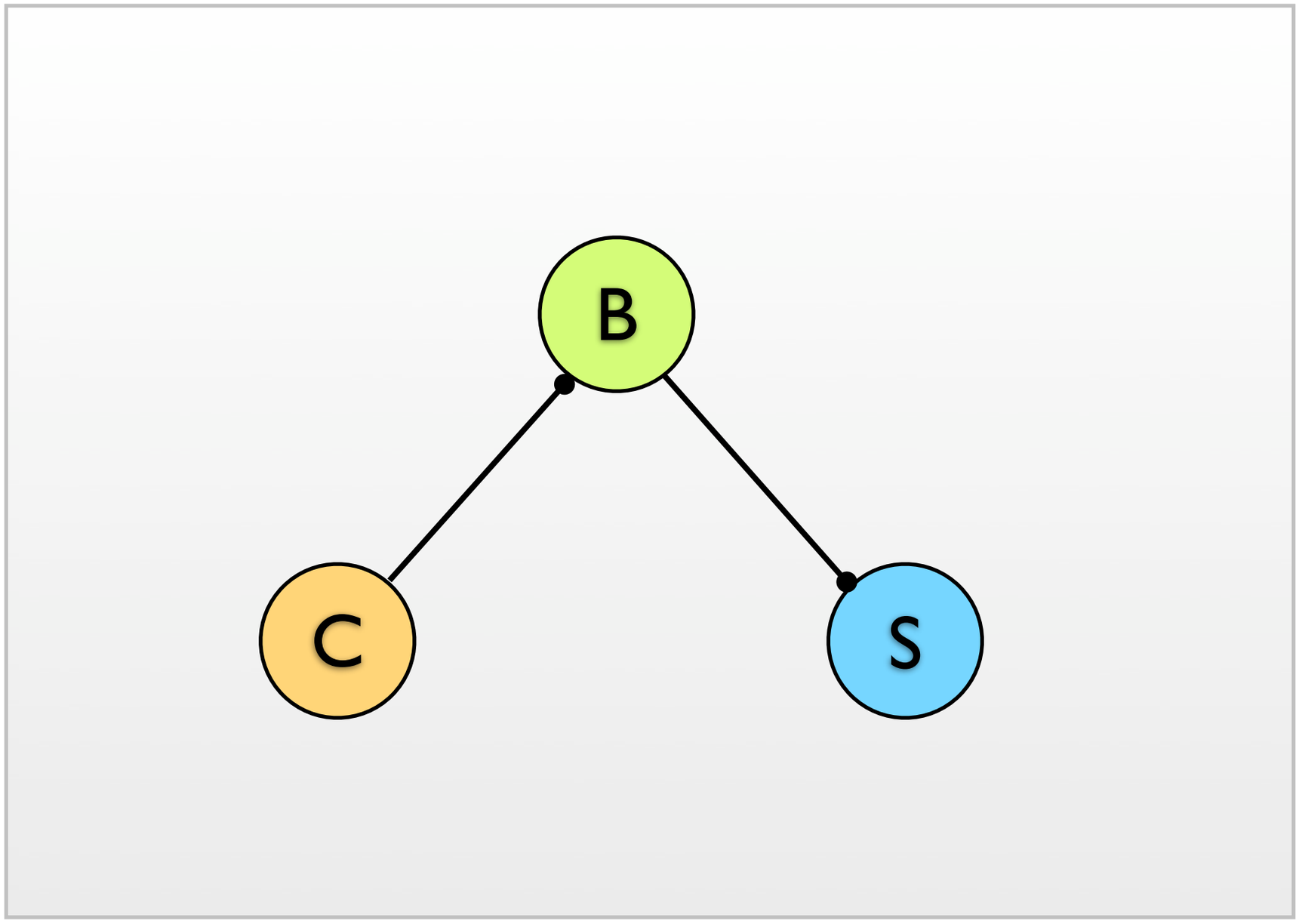


Stock Exchange Choreography

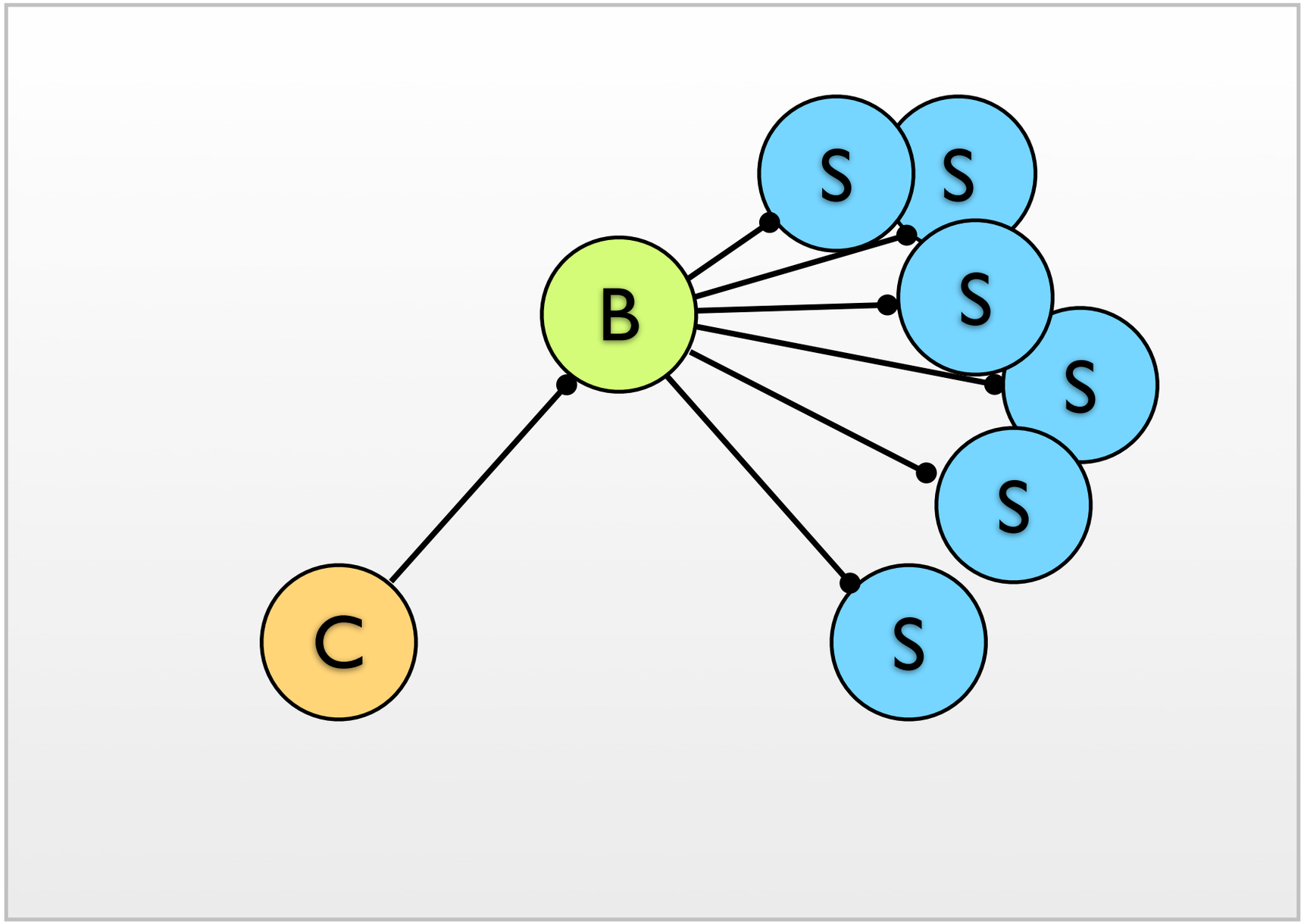
Preliminaries

Preliminaries

- A theory capable of directly supporting dynamic binding as well as common process and interaction patterns
  - The Pi-Calculus (DWP‘05)
- An applicable soundness criterion
  - Lazy Soundness (BPM‘06)



Pi-Calculus Link Passing Mobility



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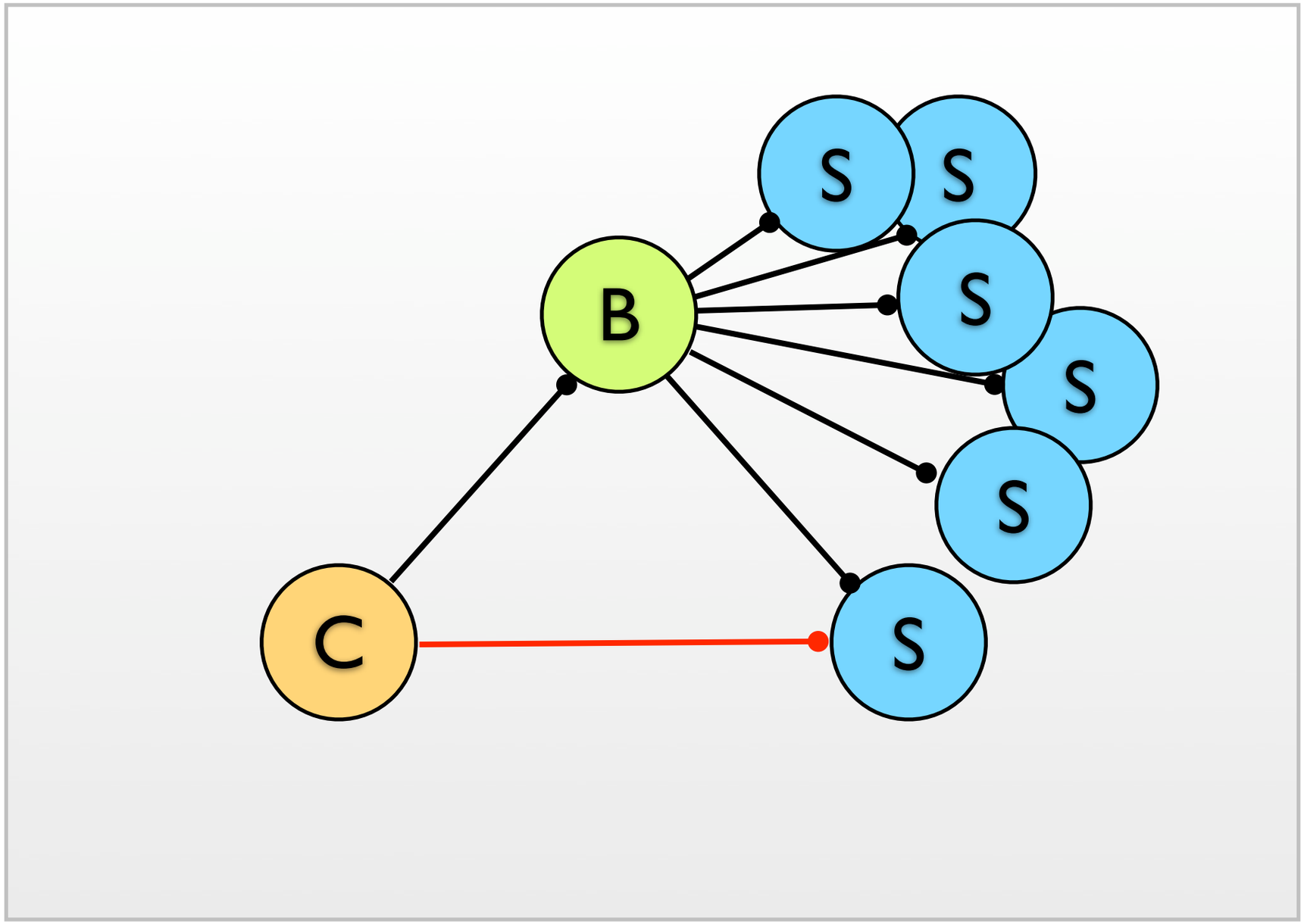

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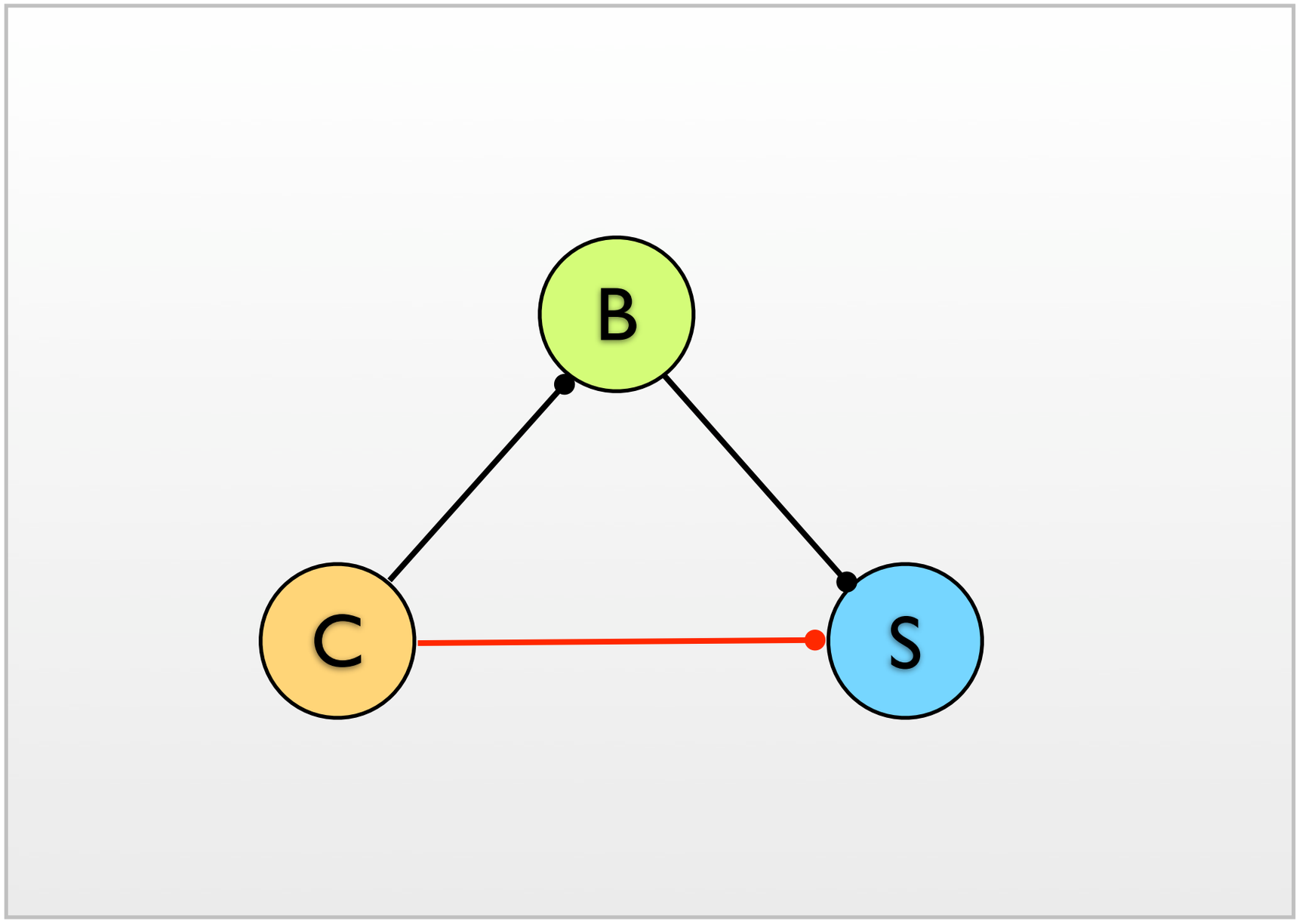
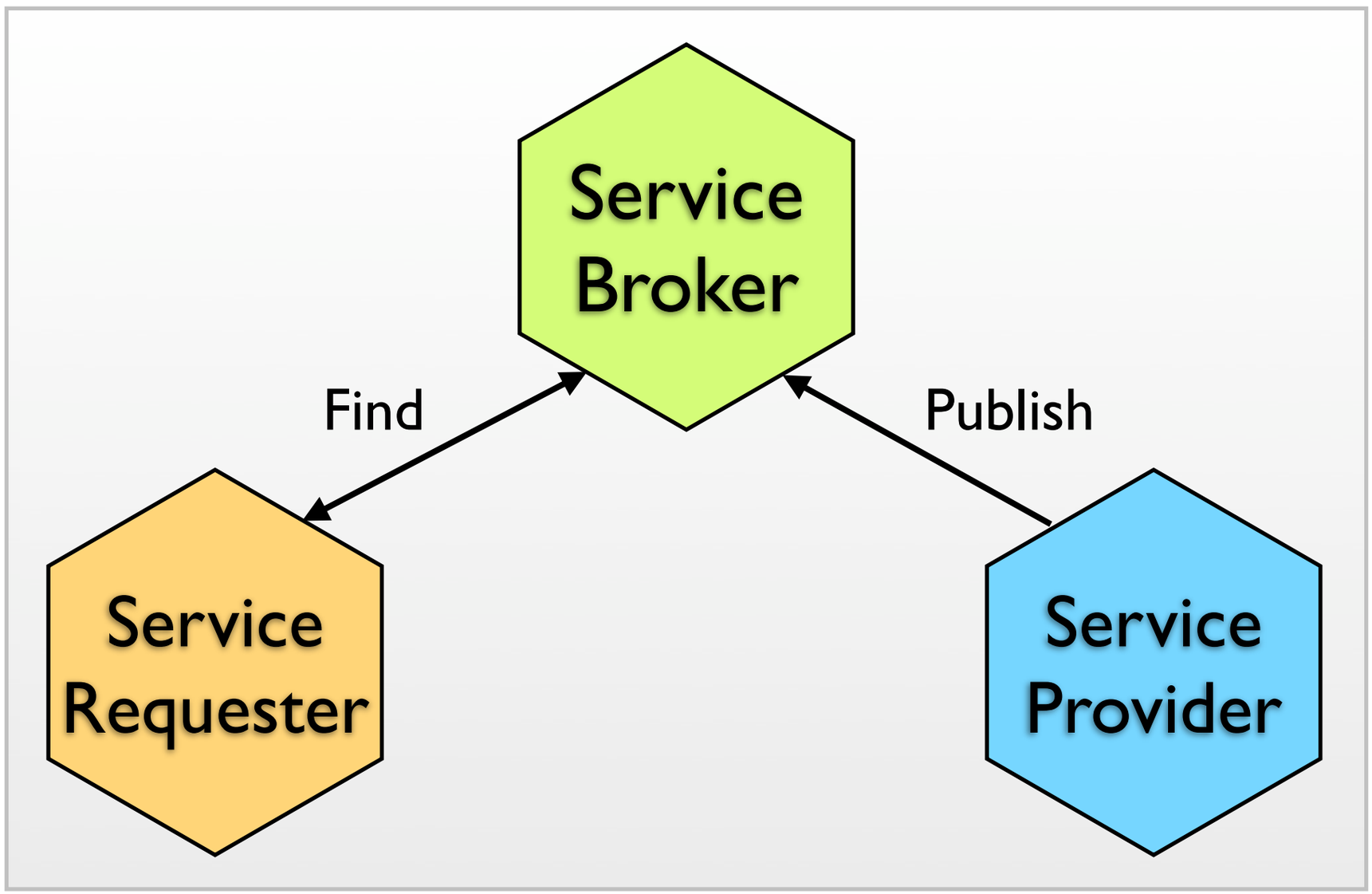
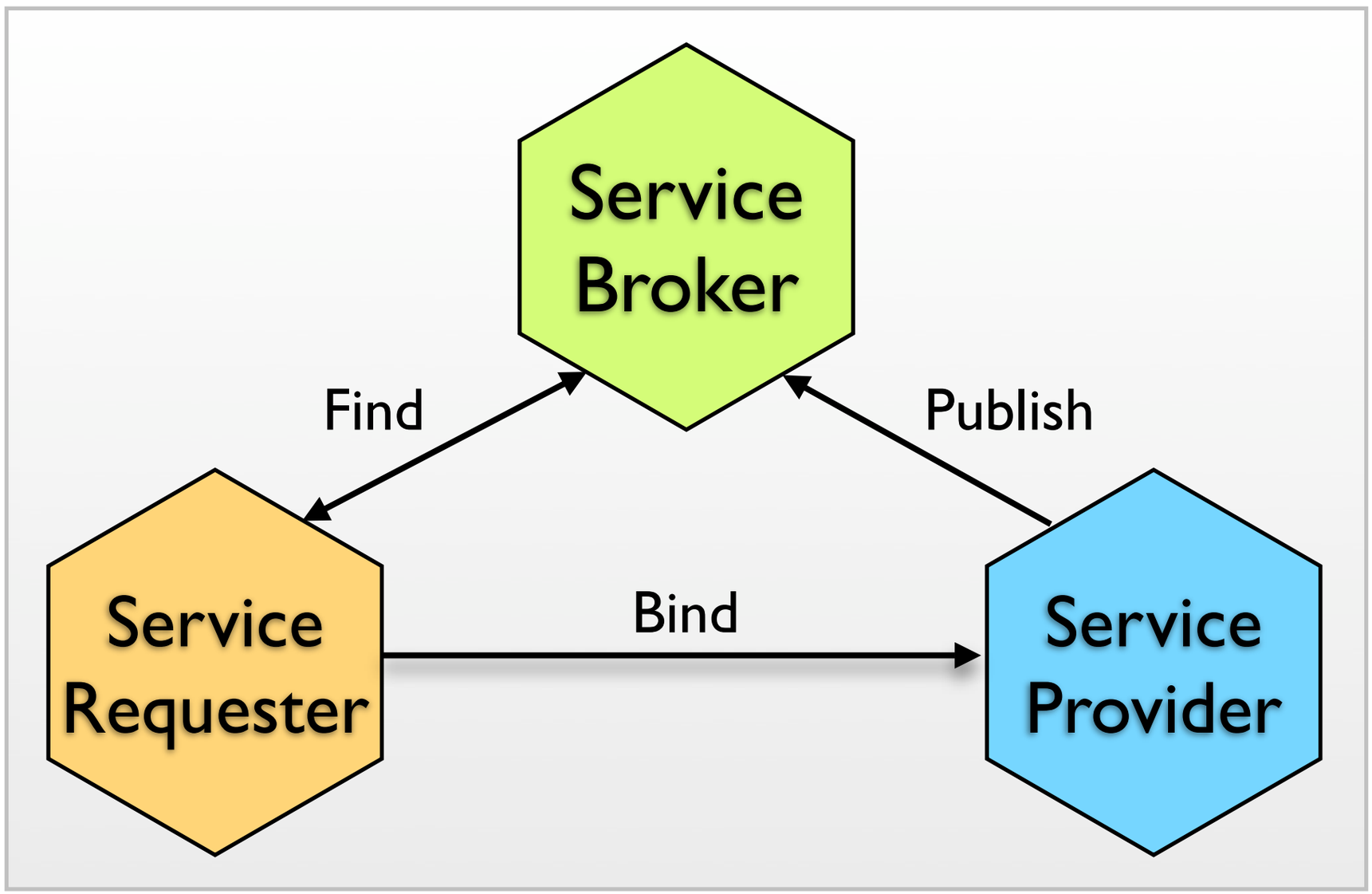


Pi-Calculus Link Passing Mobility


Service Broker
Find
Publish
Service Requester
Service Provider

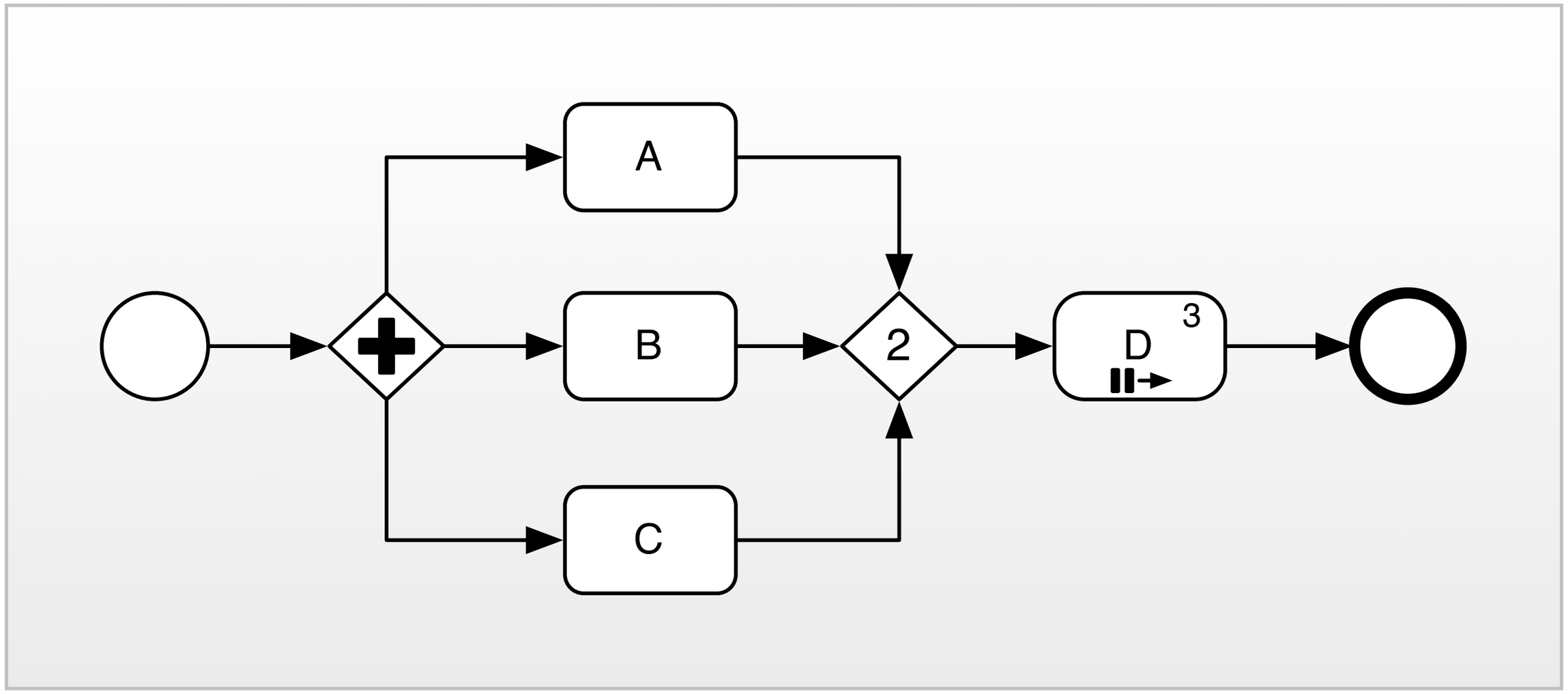
SOA


Service Broker
Find
Publish
Service Requester
Bind
Service Provider

SOA

Lazy Soundness

- Defined for abstract process graphs
- States that a process graph is
  - Free of deadlocks and livelocks as long as the final node has not been reached
  - The final node is reached exactly once



Lazy Soundness Example

Applicability

- Lazy soundness can be proved for pi-calculus representations of process graphs
- Based on bisimulation techniques
- Bisimulations which consider link passing mobility for pi-calculus are available, i.e. late and open bisimulation

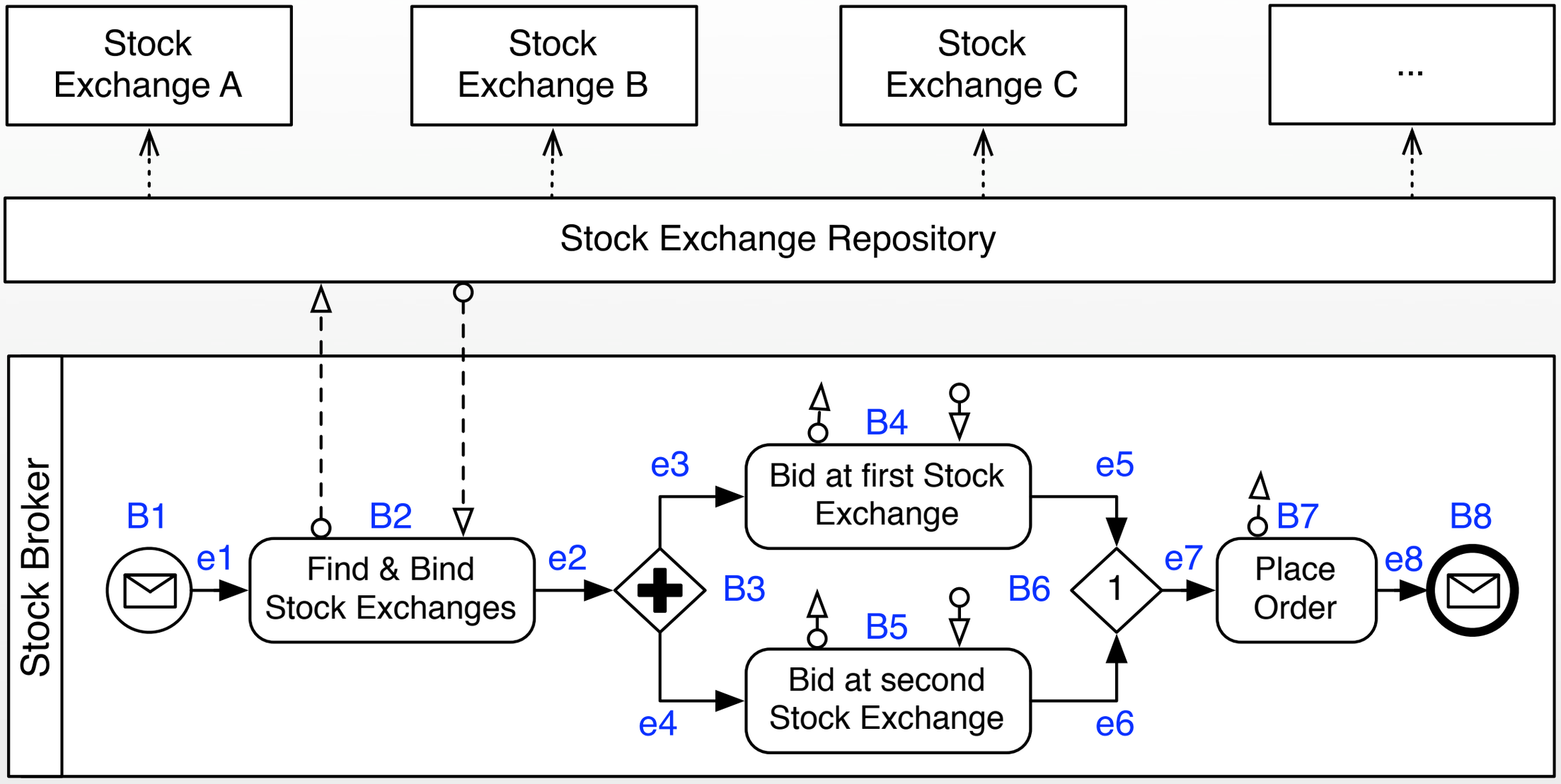
Interaction Soundness

Interaction Soundness

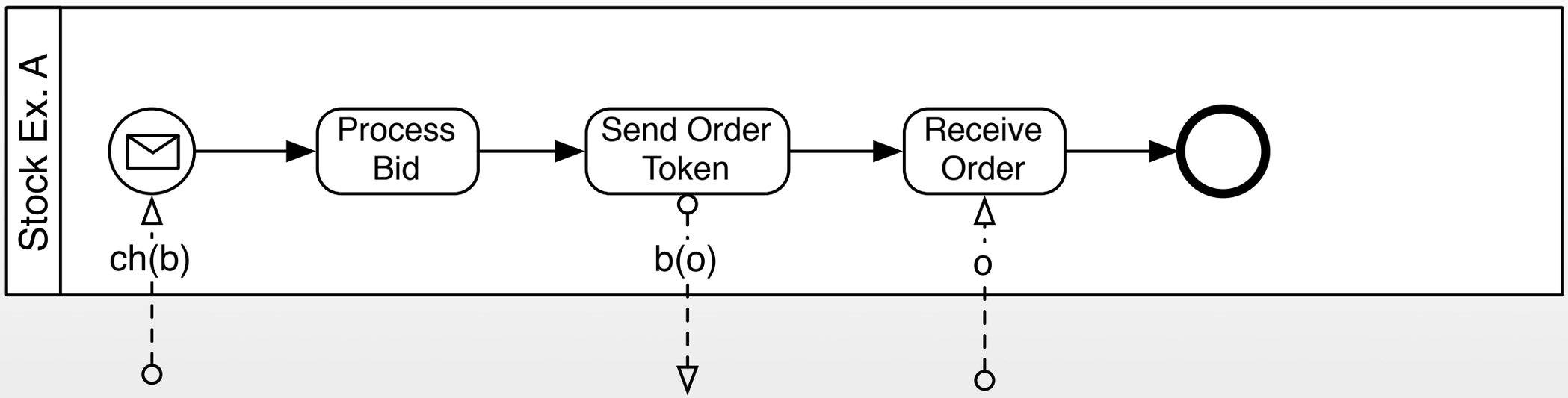
- Interaction Soundness is defined for an extension of process graphs, called service graphs unified with an environment
- A service graph is a process graph enhanced with in- and outbound interaction edges
  - Static and dynamic
- An environment E for a service graph SG is given if E utilizes at least one static interaction edge of SG

Definition

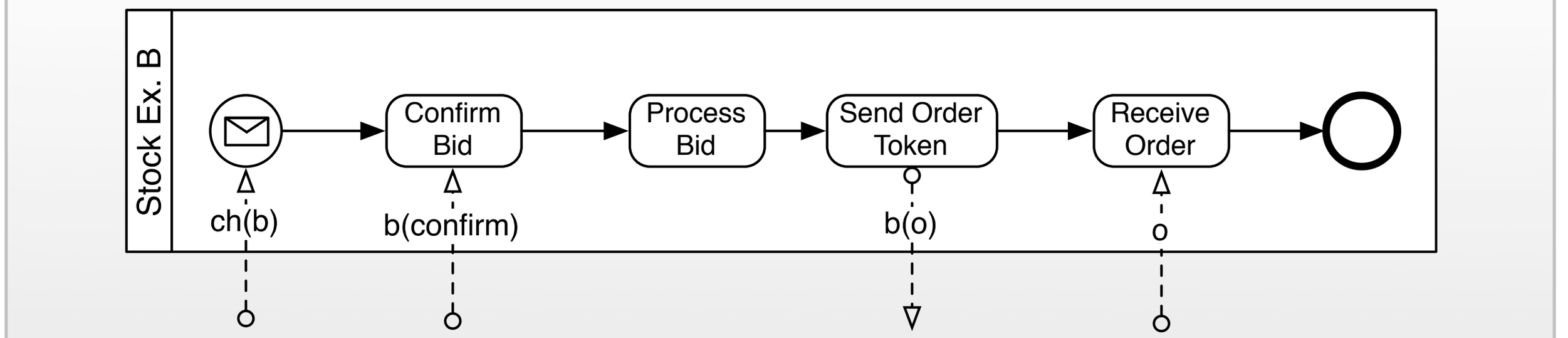
- A service graph SG is interaction sound regarding environment E if and only if SG unified with E is lazy sound



Stock Exchange Choreography



Stock Exchange Type 1



Stock Exchange Type 2

Reasoning

- Interaction soundness can be proved formally using
  - The pi-calculus representation of the service graph combined with
  - A pi-calculus process representing an environment
- Using weak late/open bisimulation

Conclusion

Conclusion

- We presented a compatibility notion for services/ environments that supports dynamic binding
- Interaction soundness can be proved formally using bisimulation
- Support for common process and interactions patterns (published at BPM‘05,BPM‘06)
  - Allows checking a large set of choreographies

Questions?