Interaction Soundness for Service Orchestration

Frank Puhlmann
(Joint work with Mathias Weske)

Business Process Technology Group
Hasso Plattner Institut
Potsdam, Germany

Outline

- Motivation

- Preliminaries
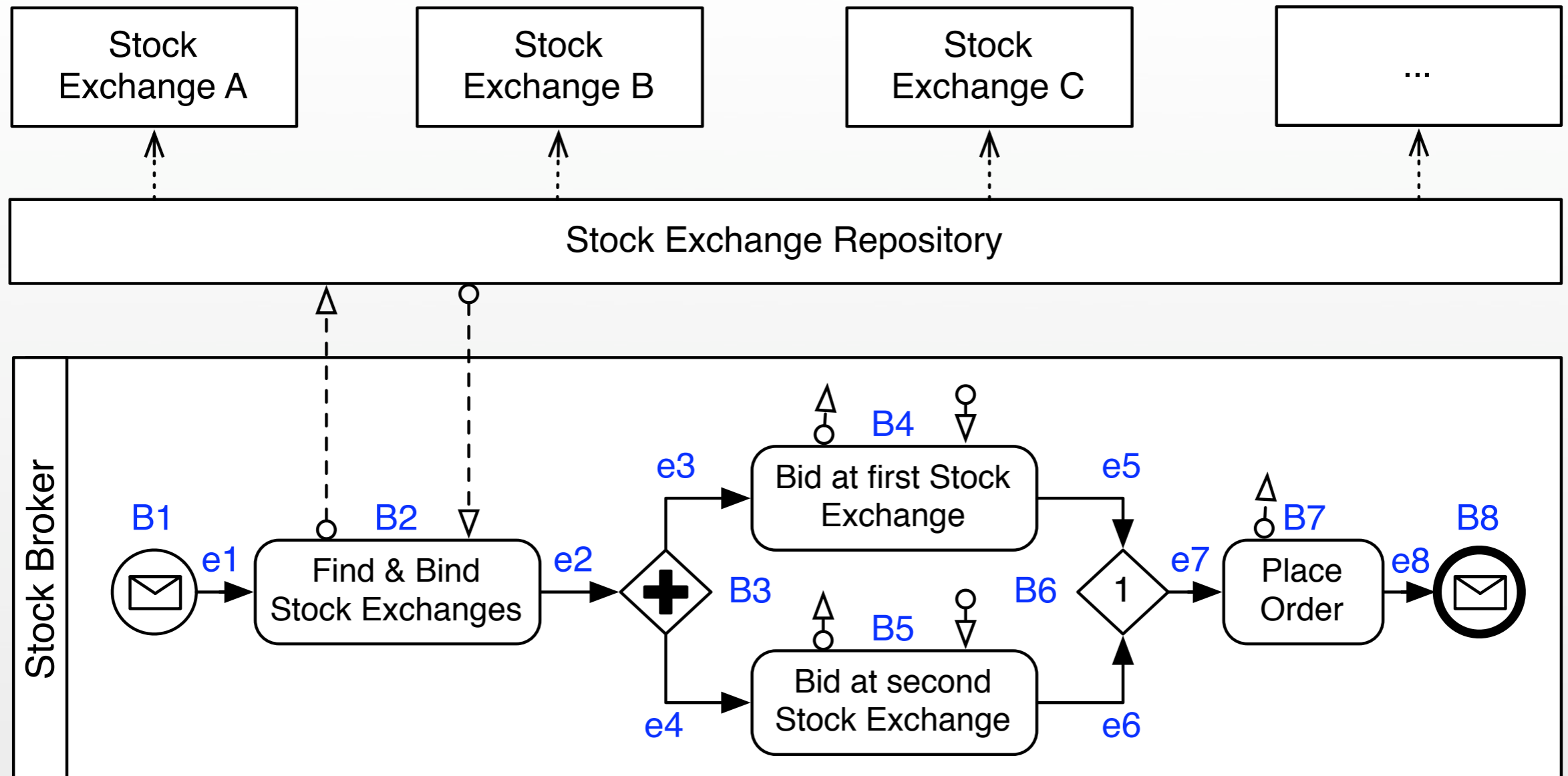
- Interaction Soundness

- 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

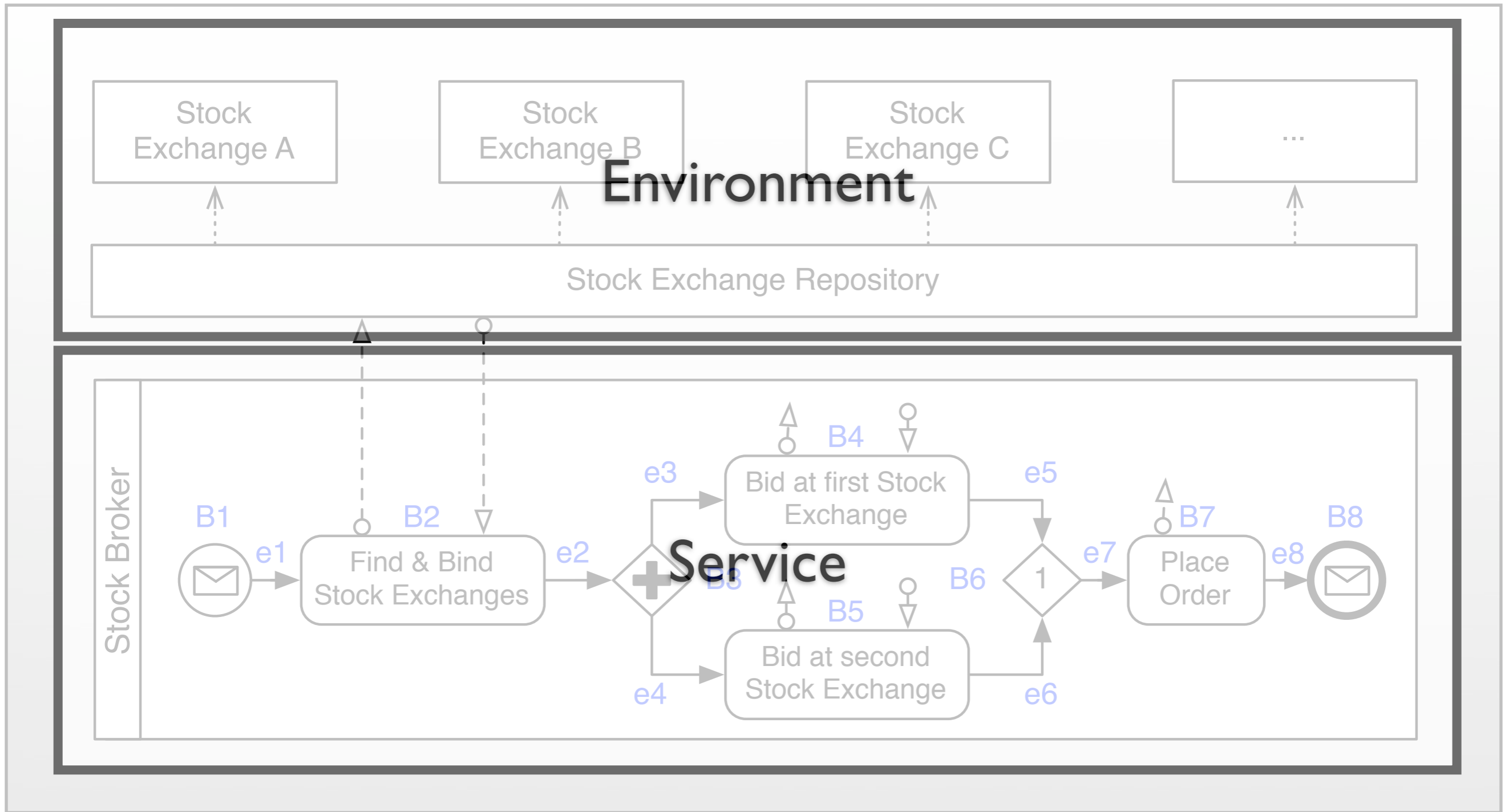- Other connections are acquired during runtime using dynamic binding
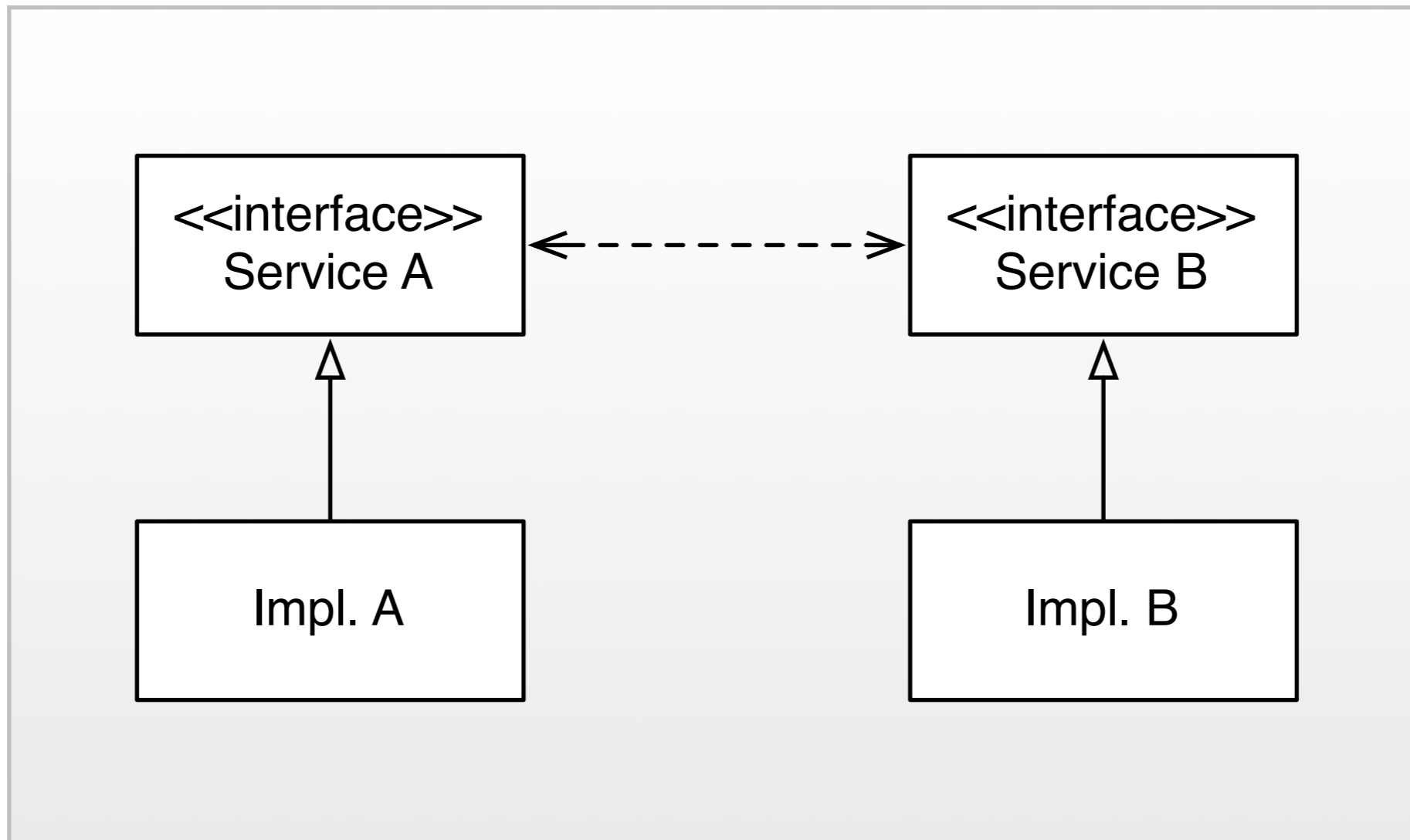
Conformance vs. Compatibility

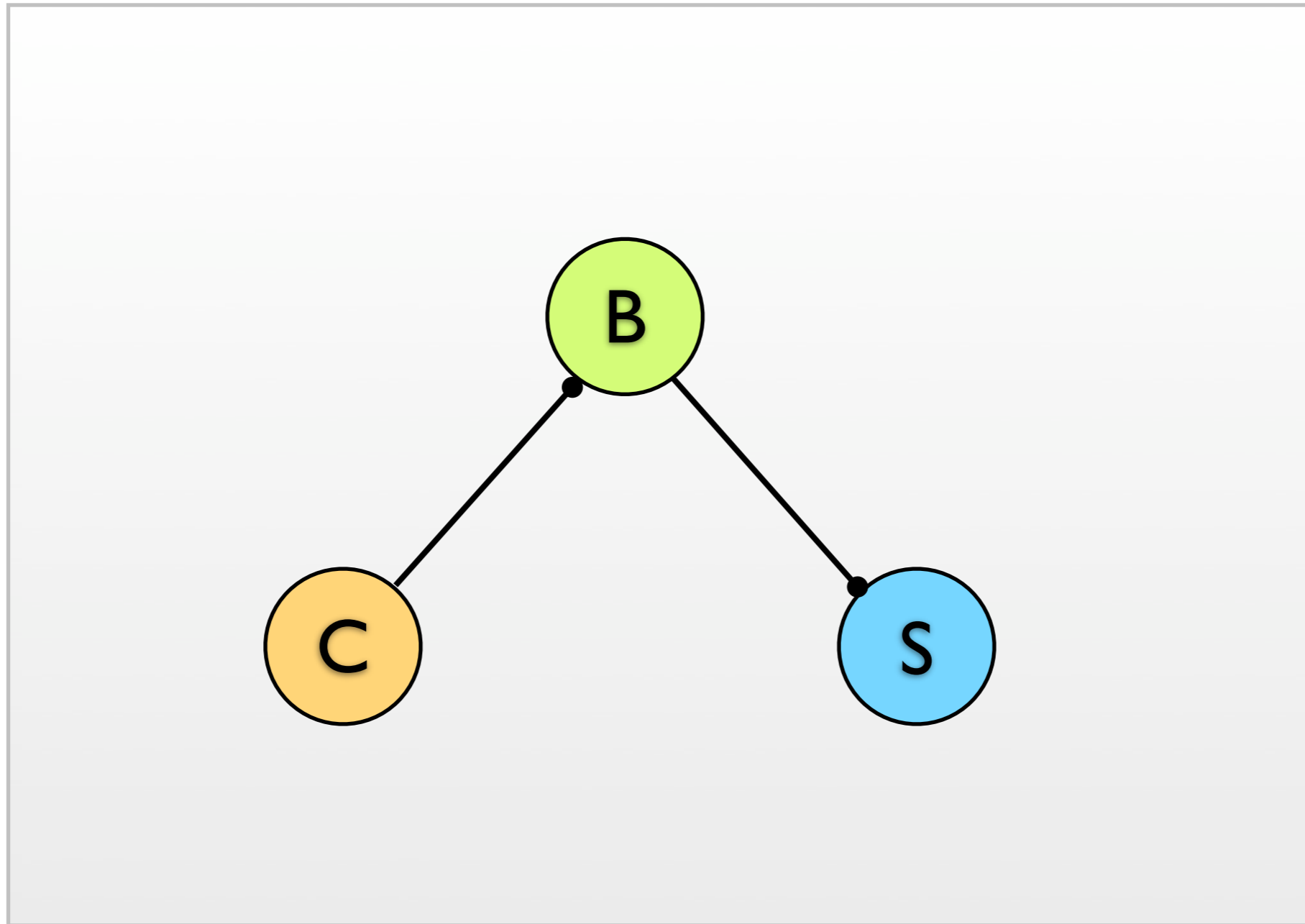Stock Exchange Choreography
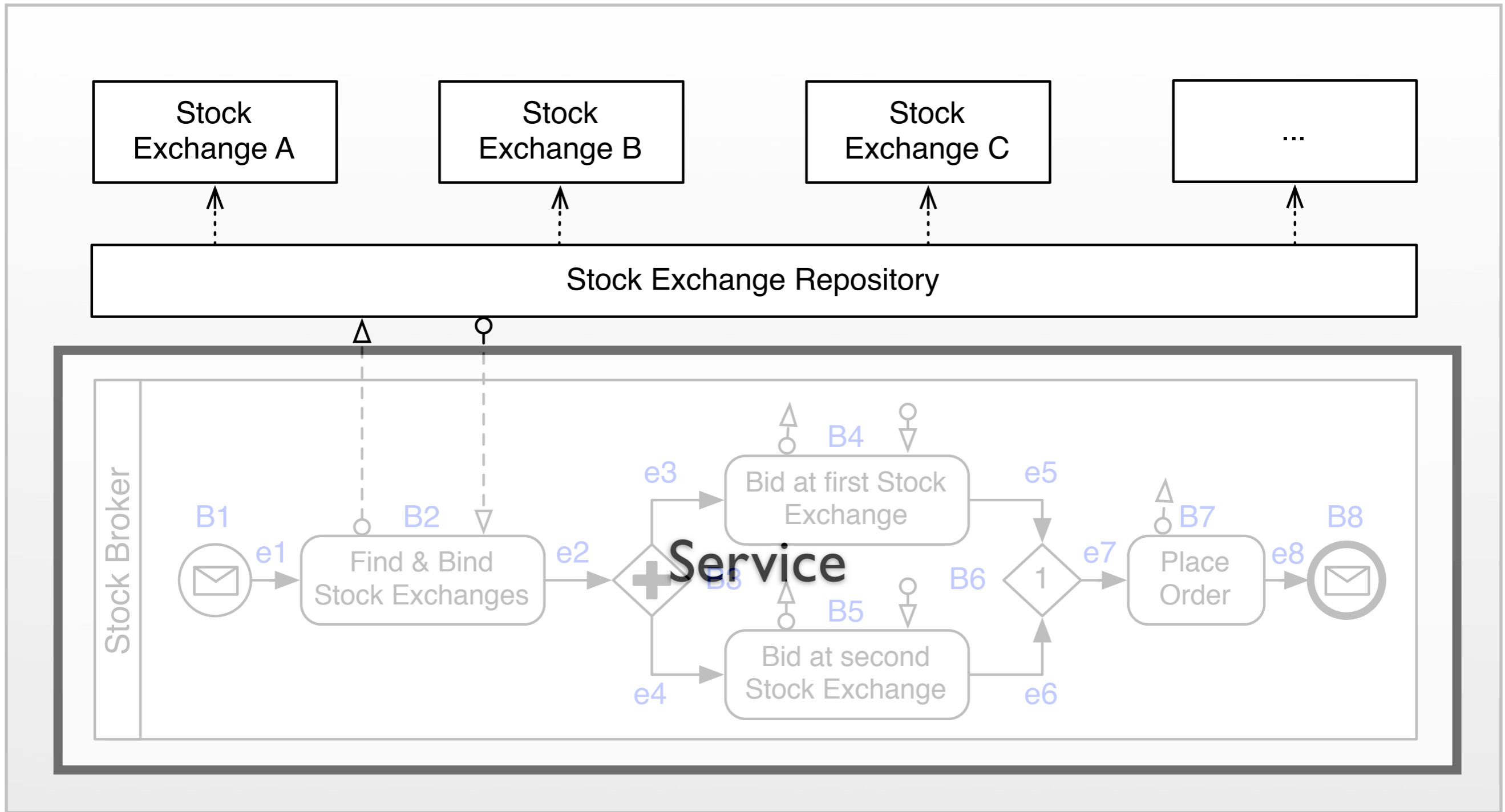
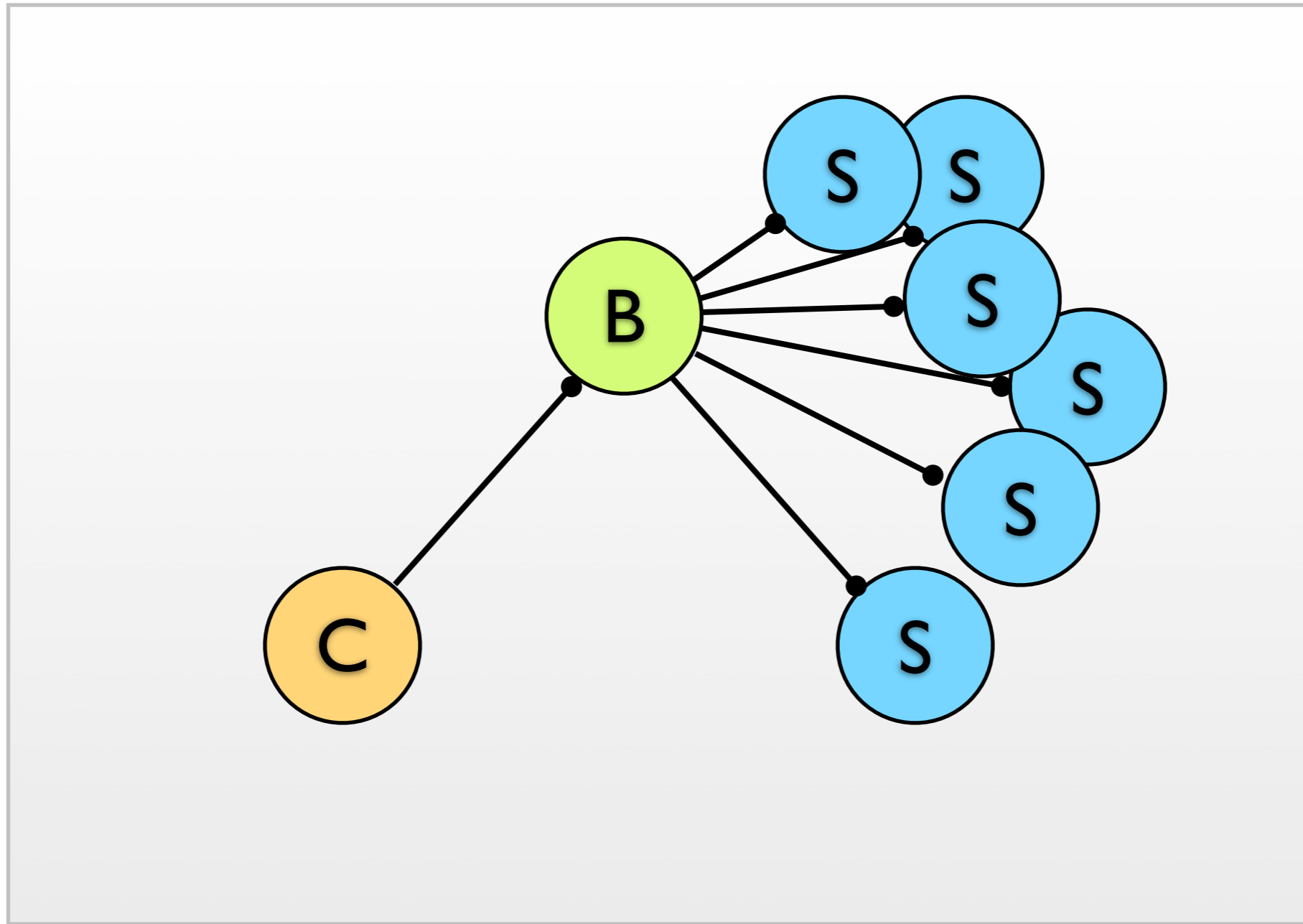Stock Exchange Choreography

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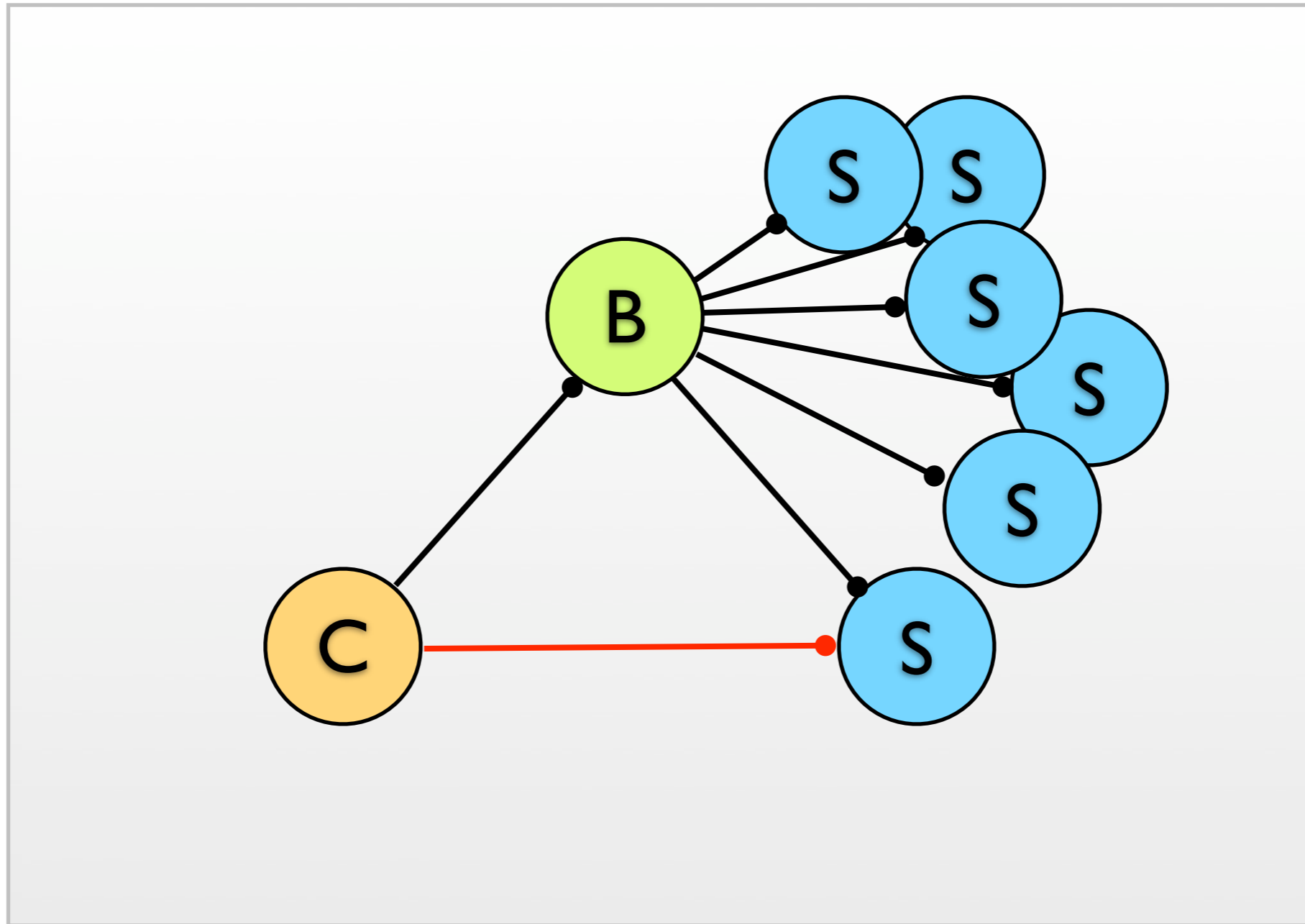
Preliminaries

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
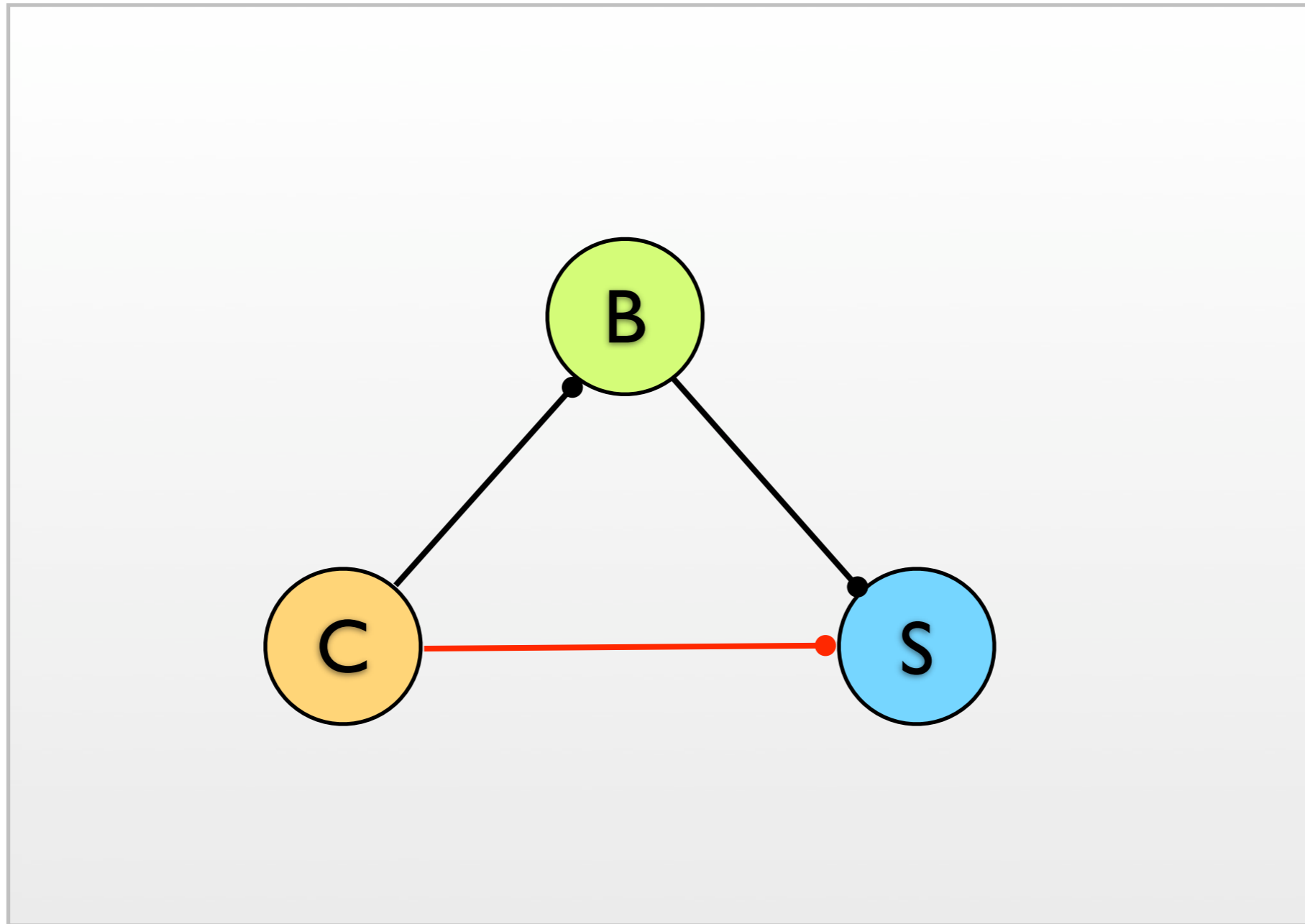
  - Lazy Soundness (BPM'06)
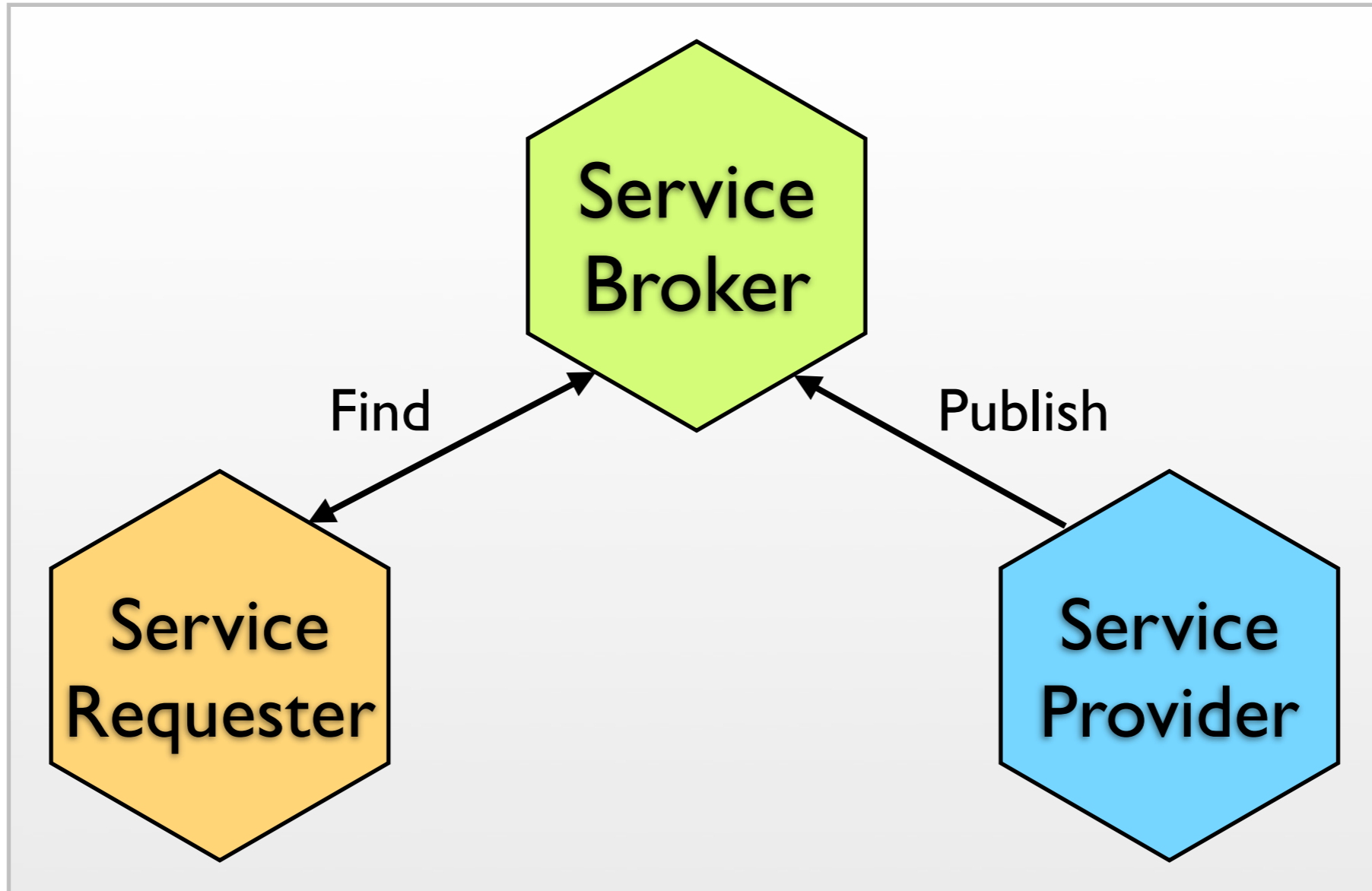
Pi-Calculus Link Passing Mobility
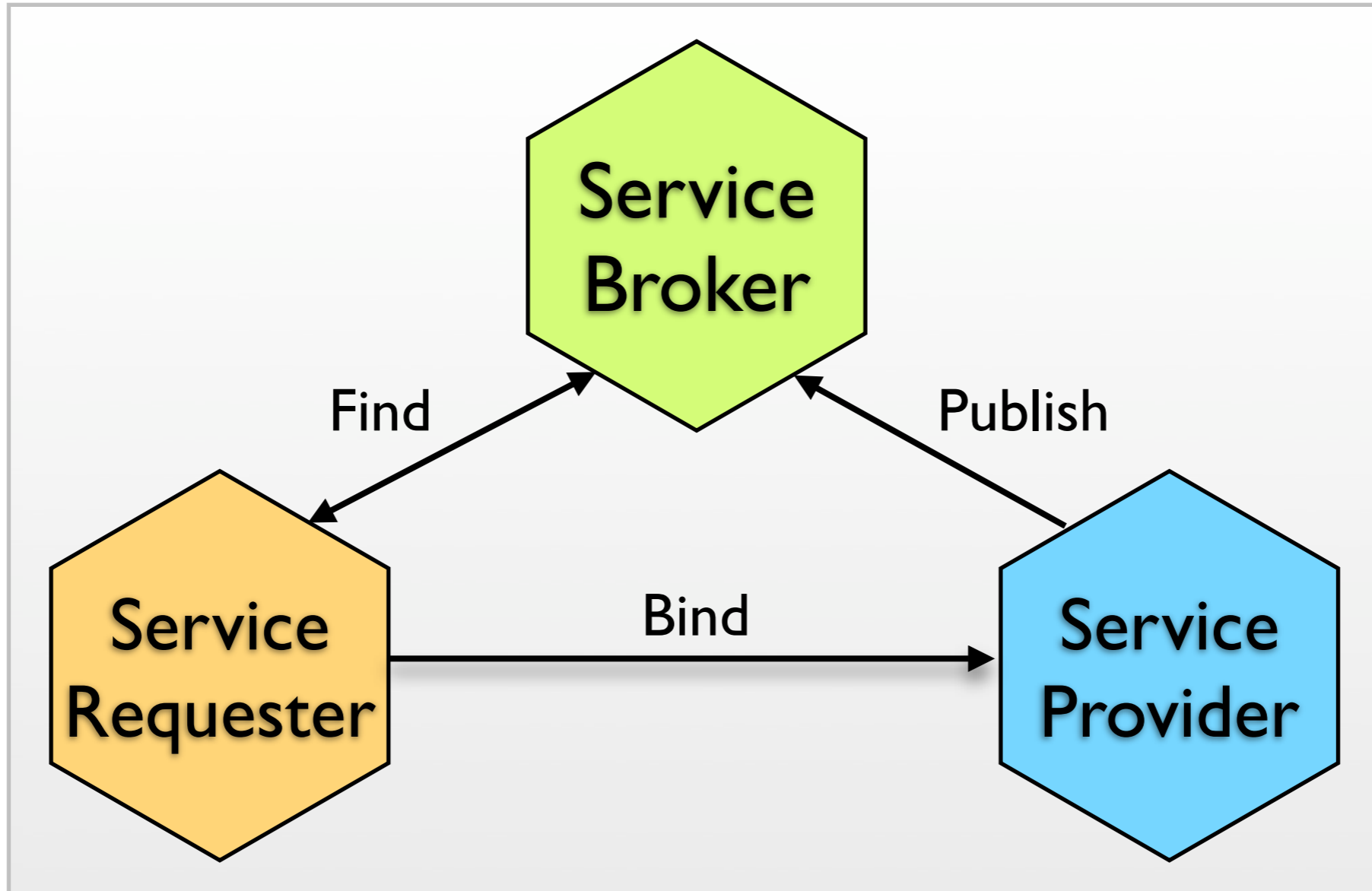
Pi-Calculus Link Passing Mobility

Pi-Calculus Link Passing Mobility

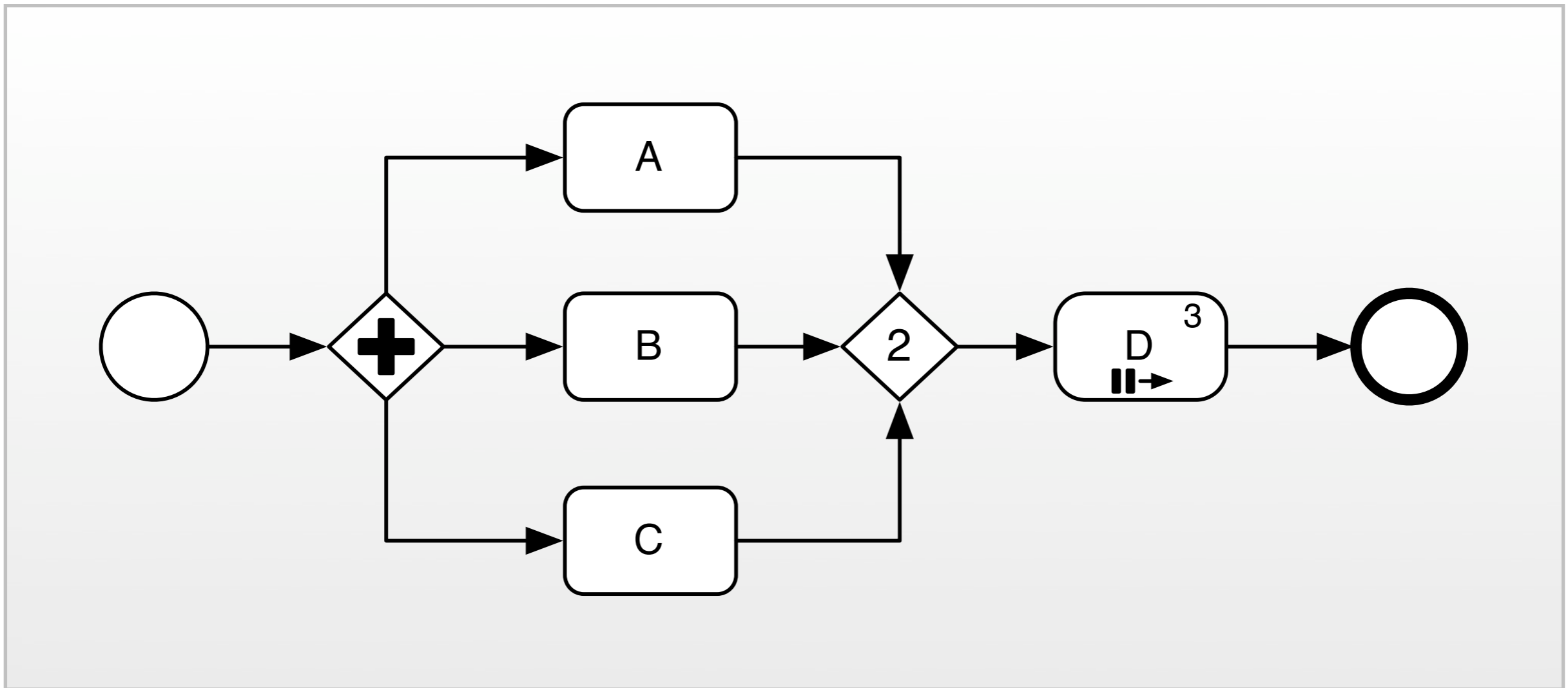Pi-Calculus Link Passing Mobility

SOA

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
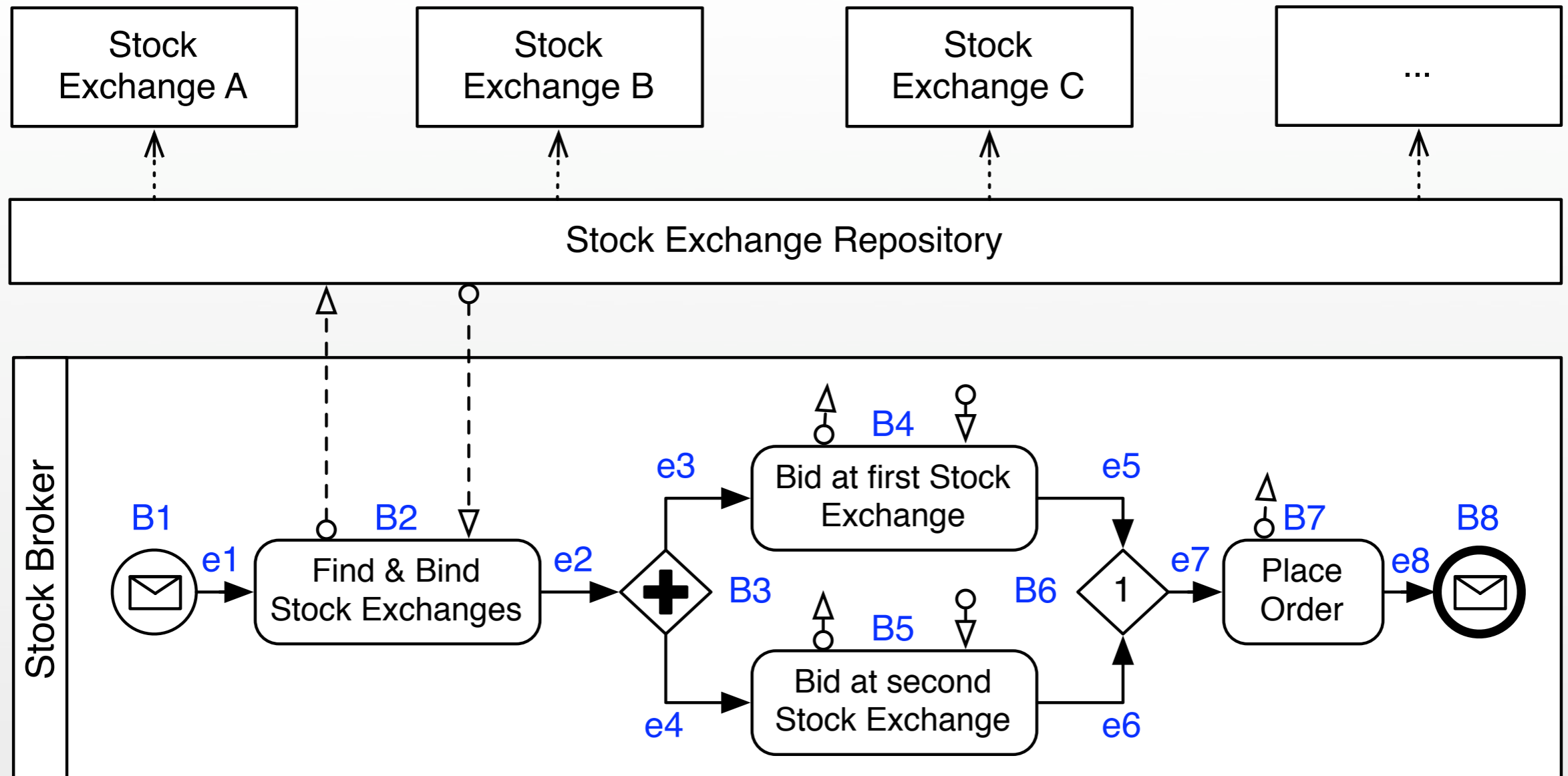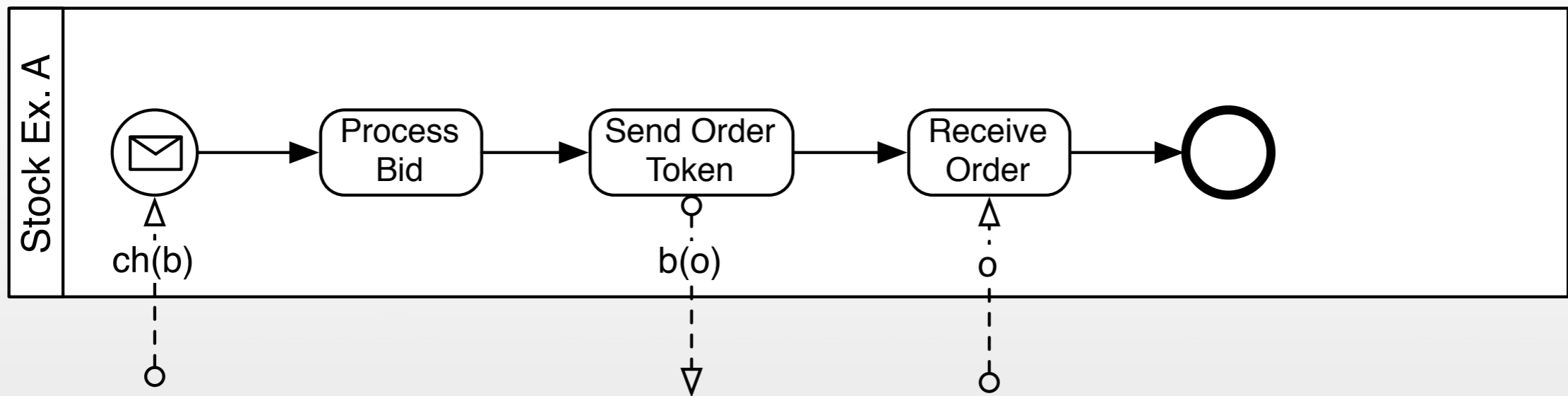
Interaction Soundness

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
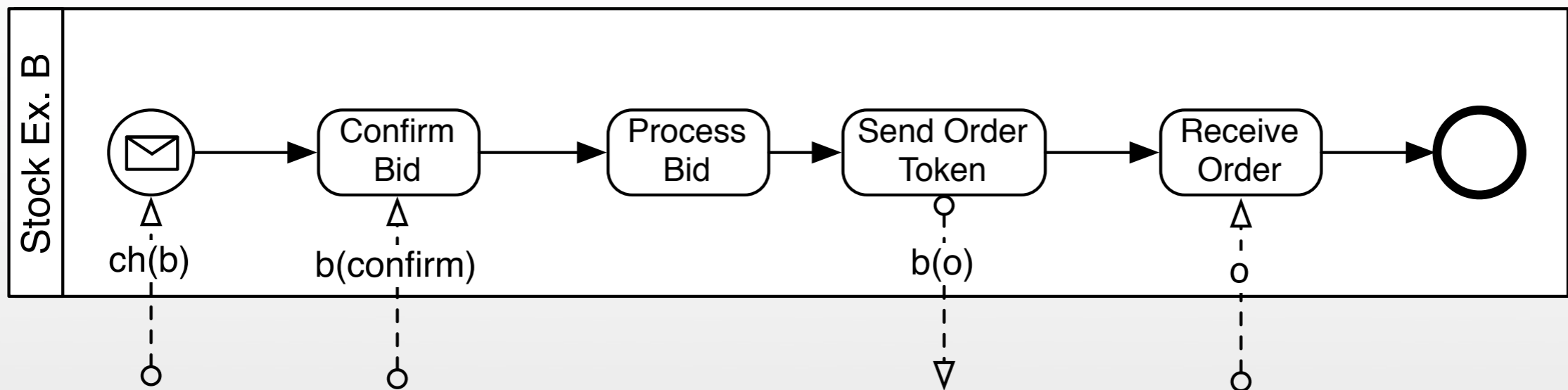
Definition

- 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?