

Formalizing Service Interactions

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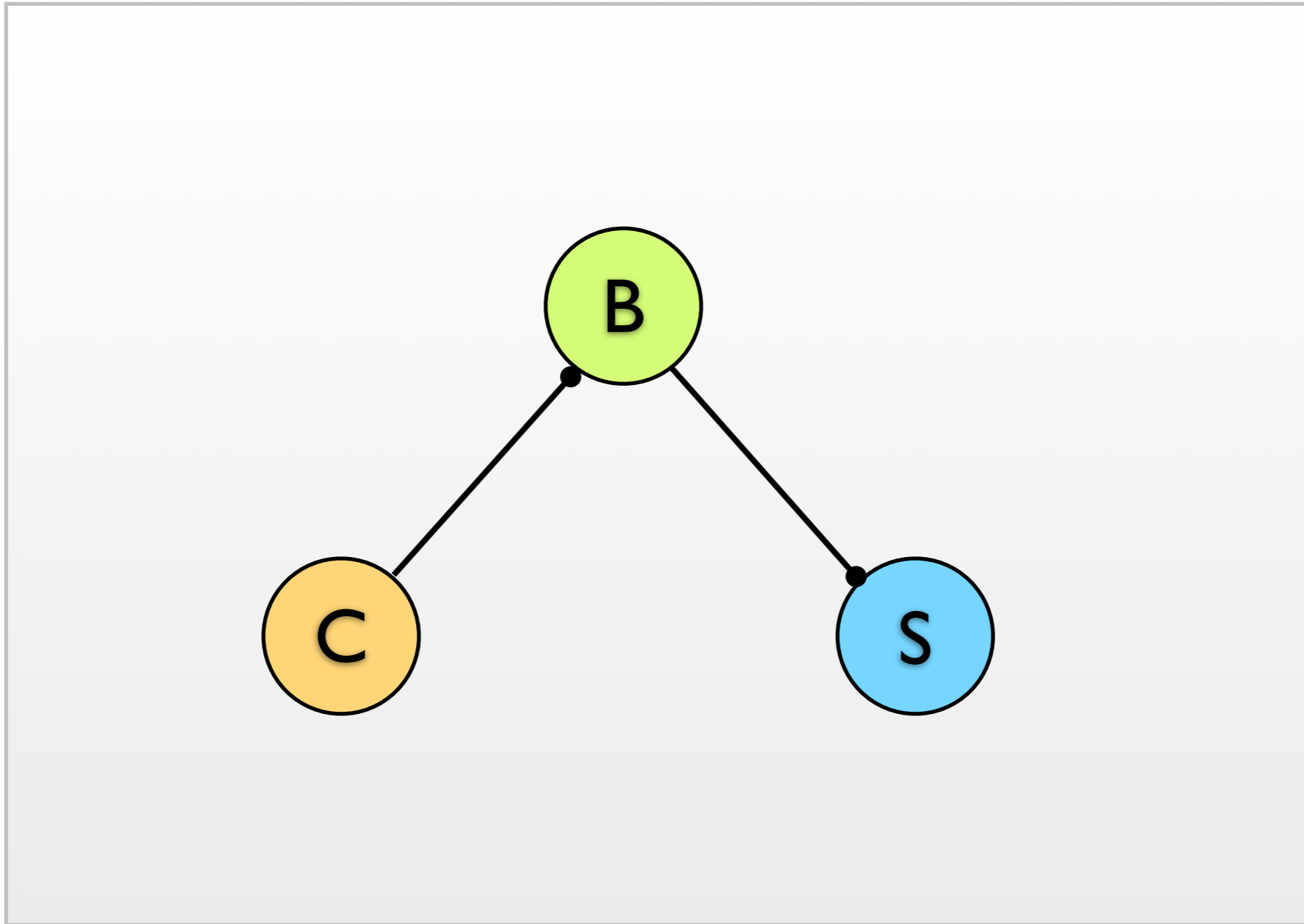
Outline

- The Pi-Calculus
- Service-oriented Architectures
- Sample Pattern
- Conclusion

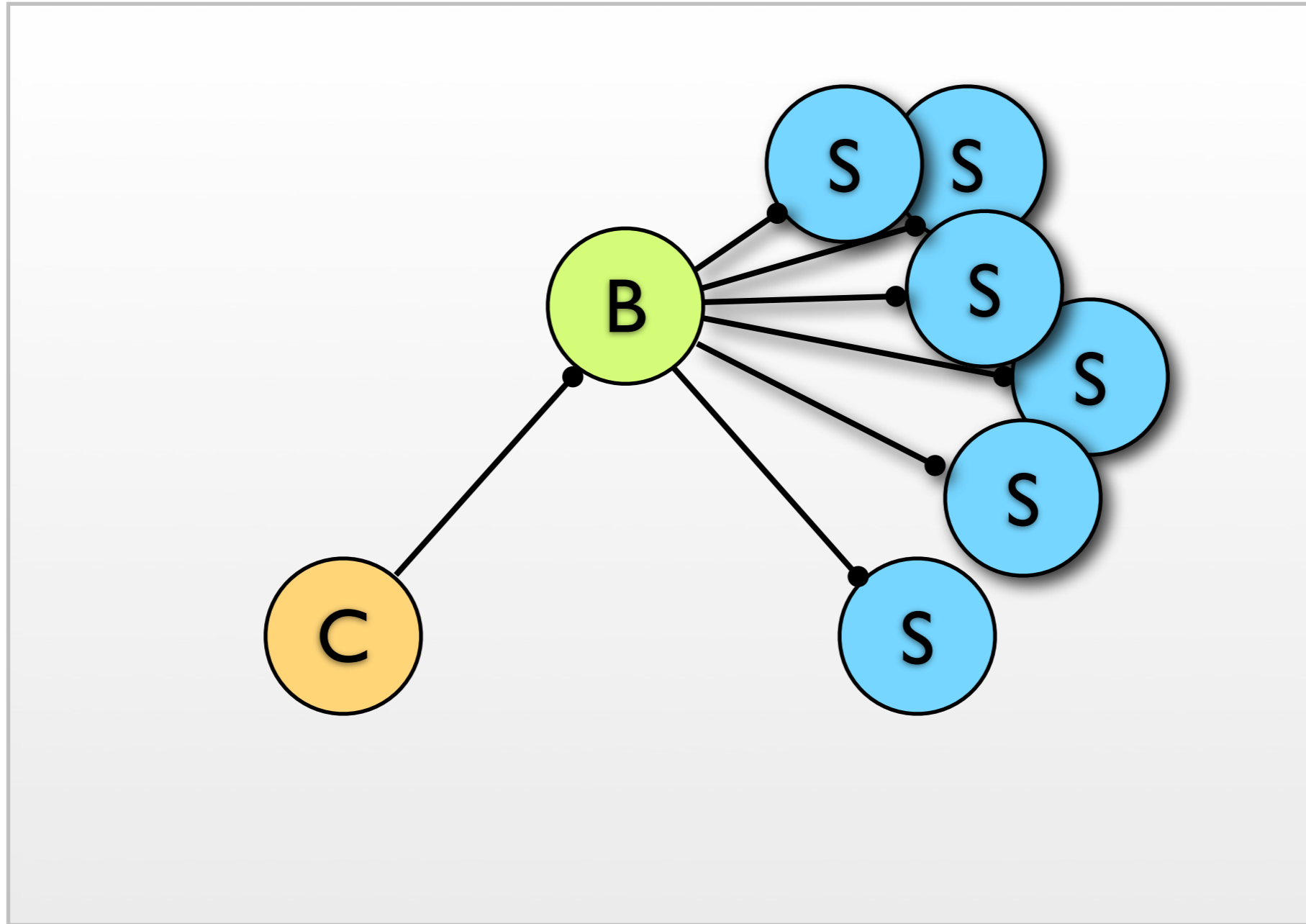
The Pi-Calculus

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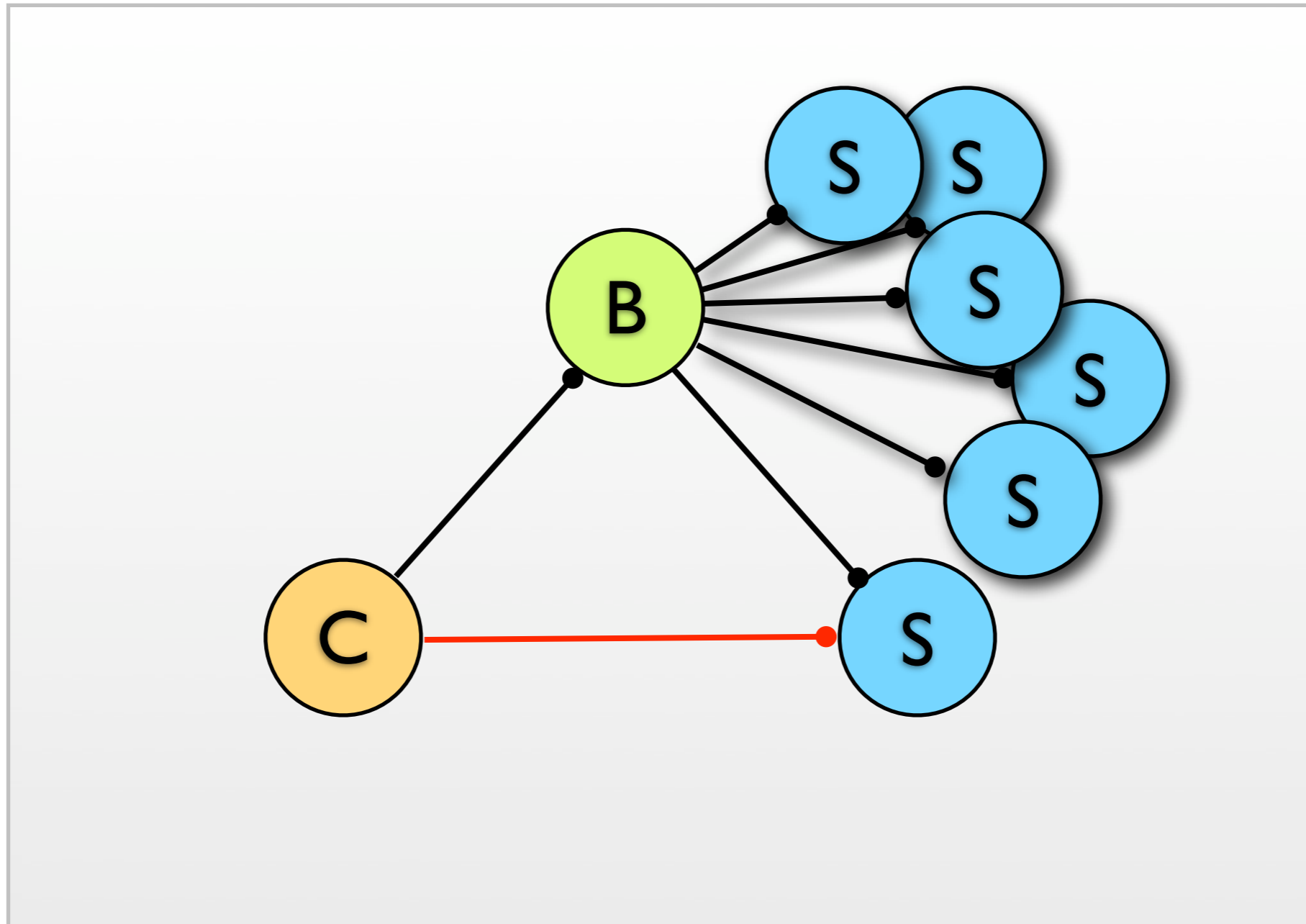
- Introduced in 1989
- Process algebra (succeeds CCS)
- Formal description of systems with changing structures
- Link Passing Mobility



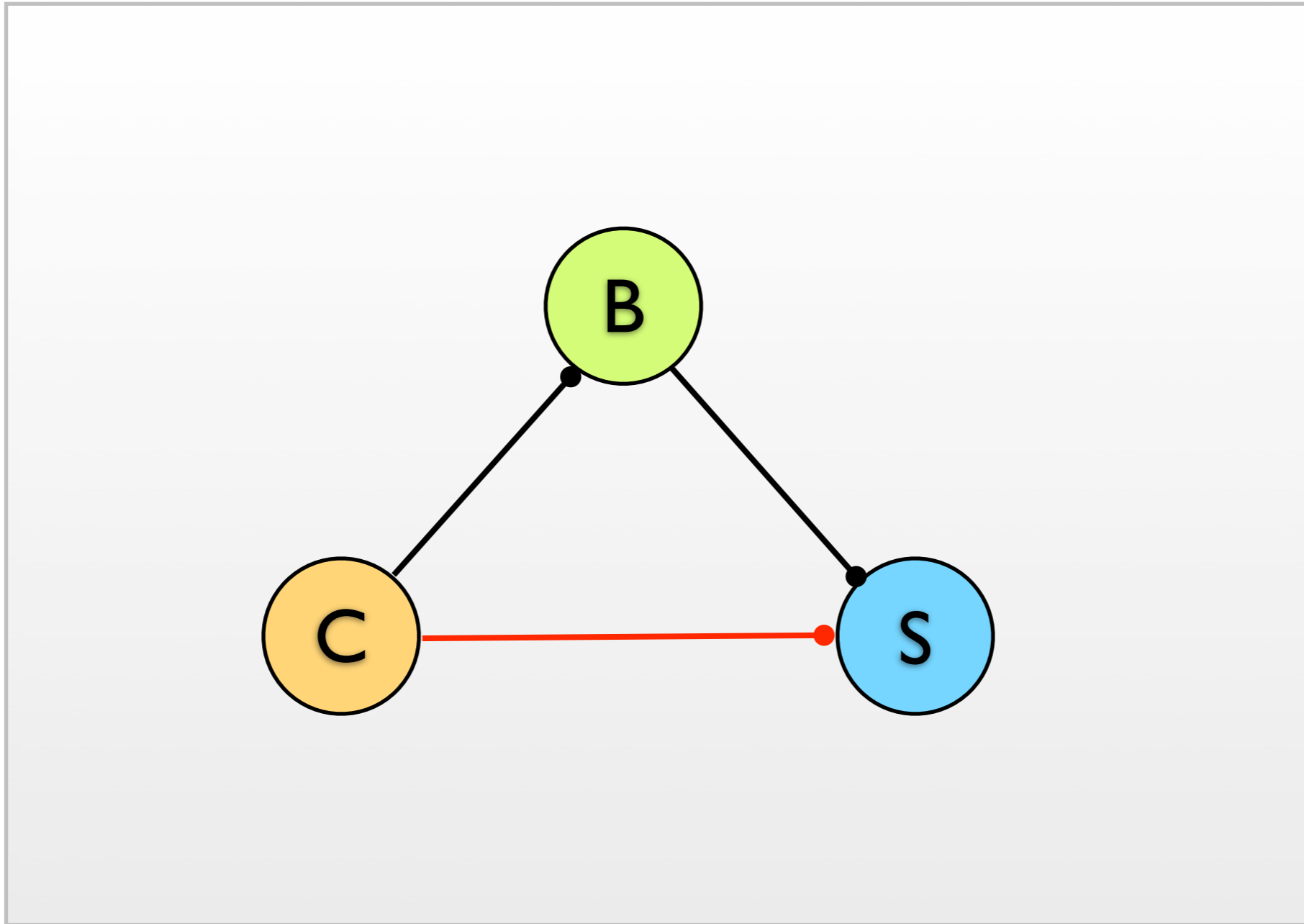
Link Passing Mobility



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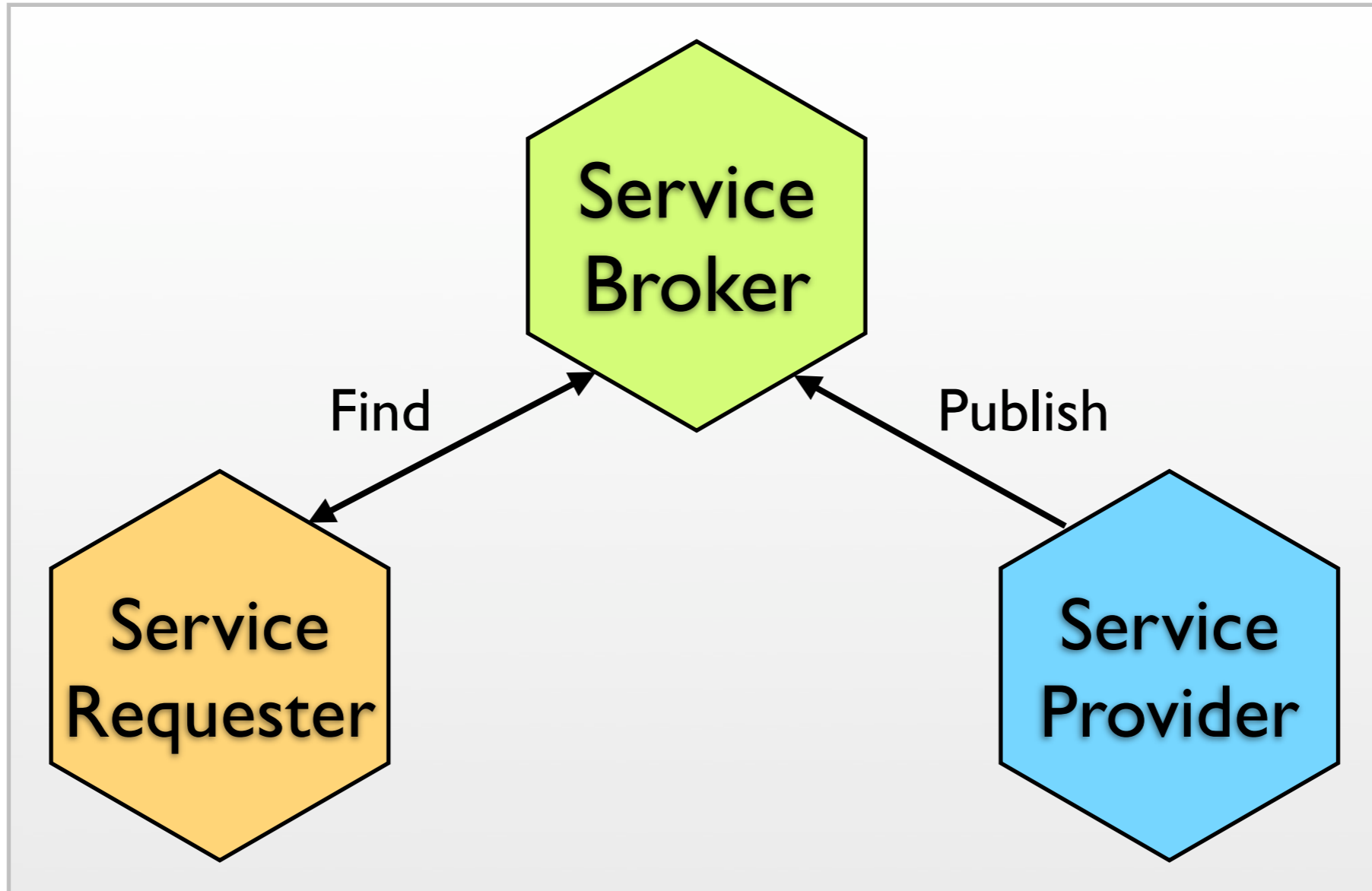


Link Passing Mobility

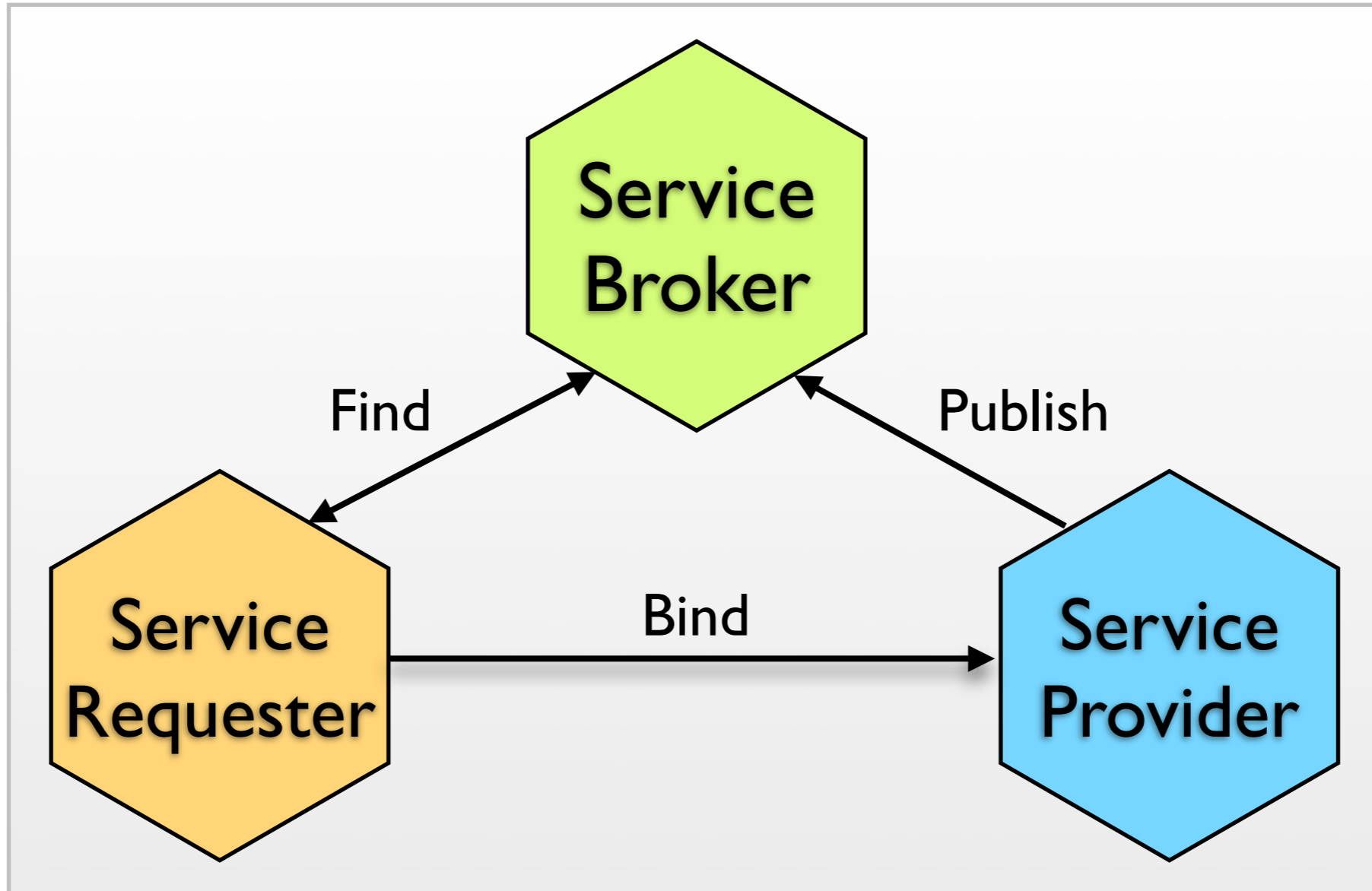


Link Passing Mobility

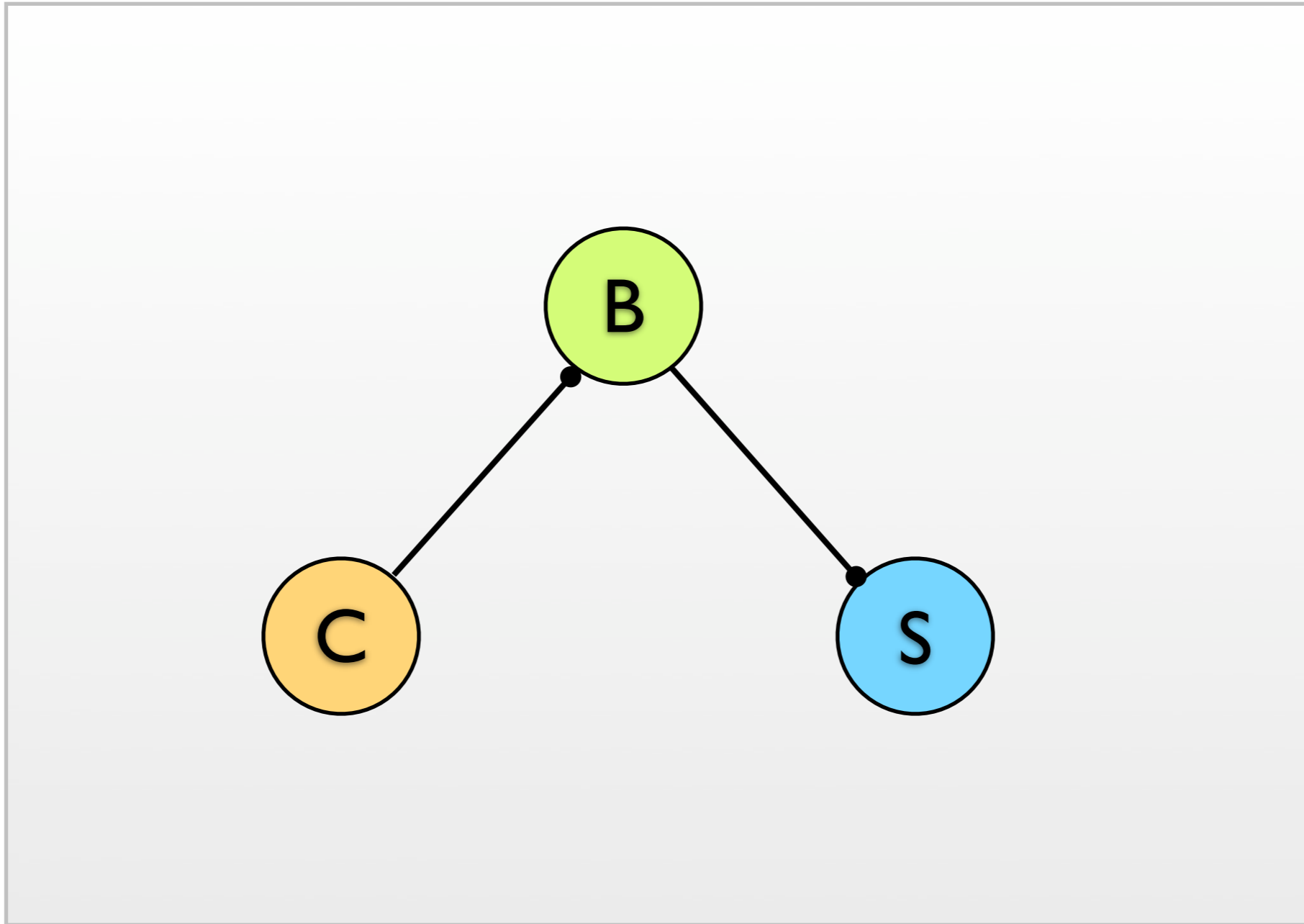
Service-oriented Architectures



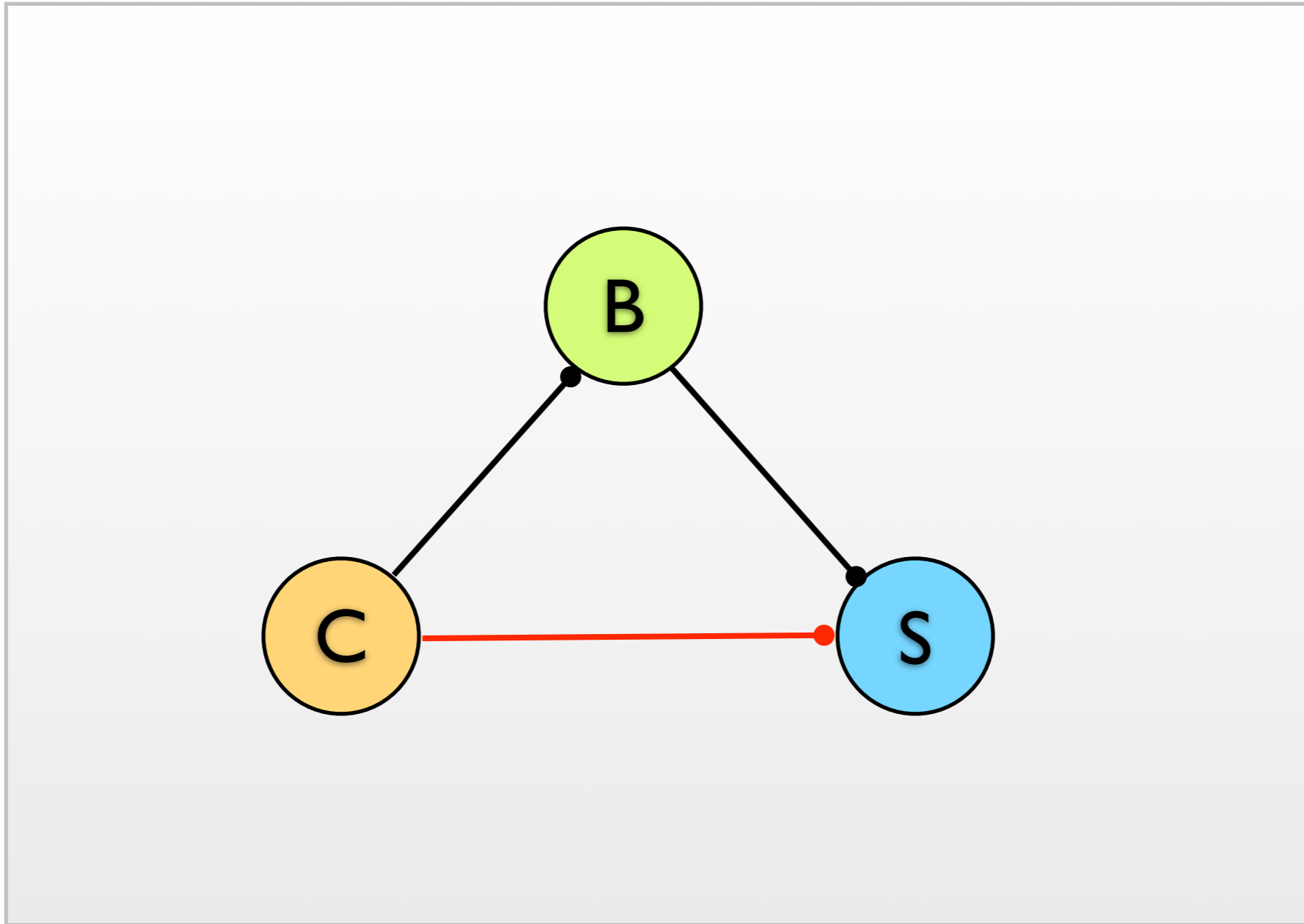
SOA



SOA



Dynamic Binding



Dynamic Binding

Sample Pattern

Service Interaction Patterns

- Describe common behavior found in service interactions
- Informal description
- 10 out of 13 pattern require dynamic binding not found in Petri nets!

Send Pattern: Blocking Semantics

- *Description: A party sends a message to another party*
- **Blocking semantics:**

$$A = \bar{b}\langle msg \rangle . A'$$

$$B = b(msg) . B'$$

Send Pattern: Bindings

- Static binding:

$$CHO_S = \mathbf{v}b(A|B)$$

- Dynamic binding:

$$CHO_D = \mathbf{v}lookup(lookup(b).A|\mathbf{v}b(B|D))$$

$$D = \overline{lookup\langle b \rangle}.D$$

Send Pattern: Non-blocking Semantics

- Non-blocking semantics:

$$A = \bar{b}\langle msg \rangle | A'$$

$$B = b(msg).B'$$

Conclusion

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- Link passing mobility directly resembles a SOA
- Formalization of all service interaction patterns in Pi-Calculus possible
- Foundation for simulation and analysis
 - PiVizTool
 - Interaction Soundness & Equivalence

Questions?