Formalizing Service Interactions

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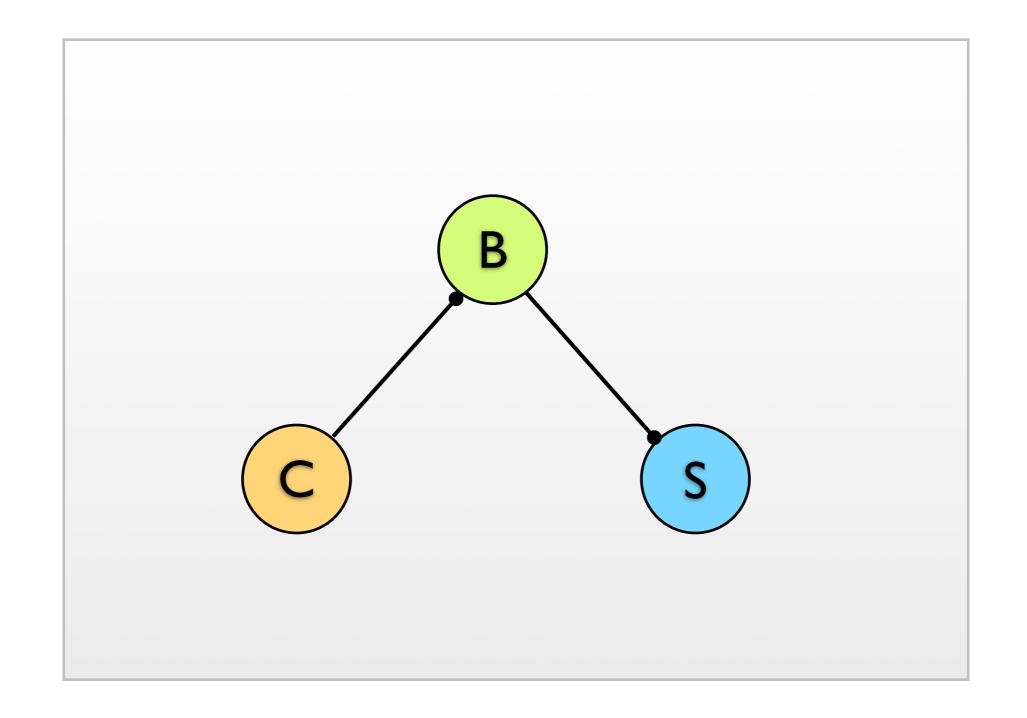
Outline

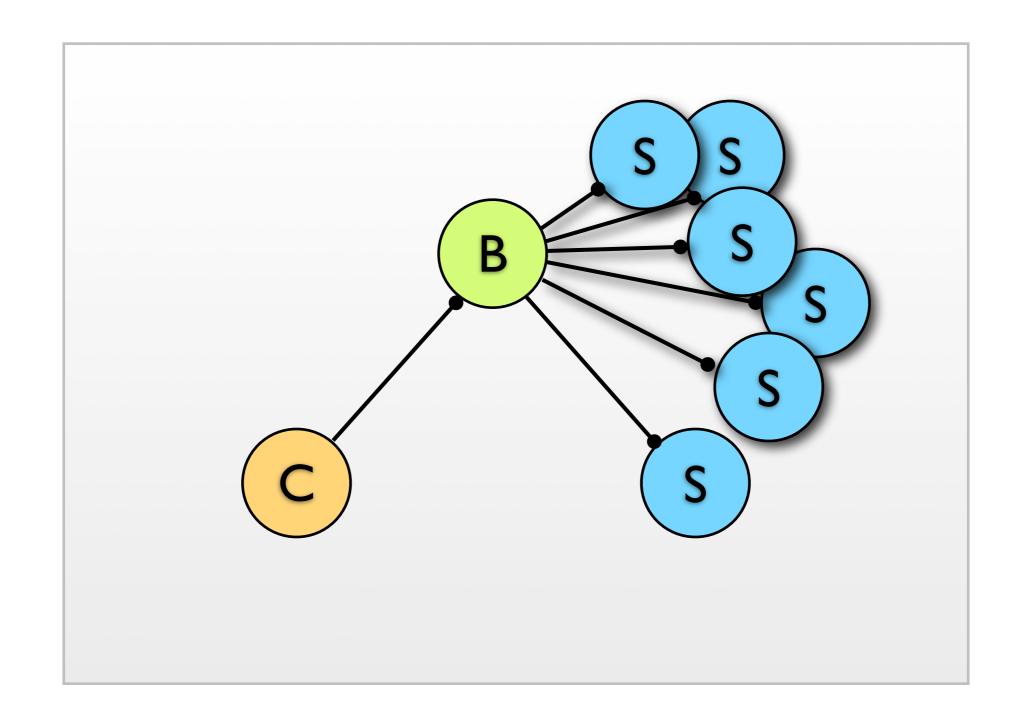
- The Pi-Calculus
- Service-oriented Architectures
- Sample Pattern
- Conclusion

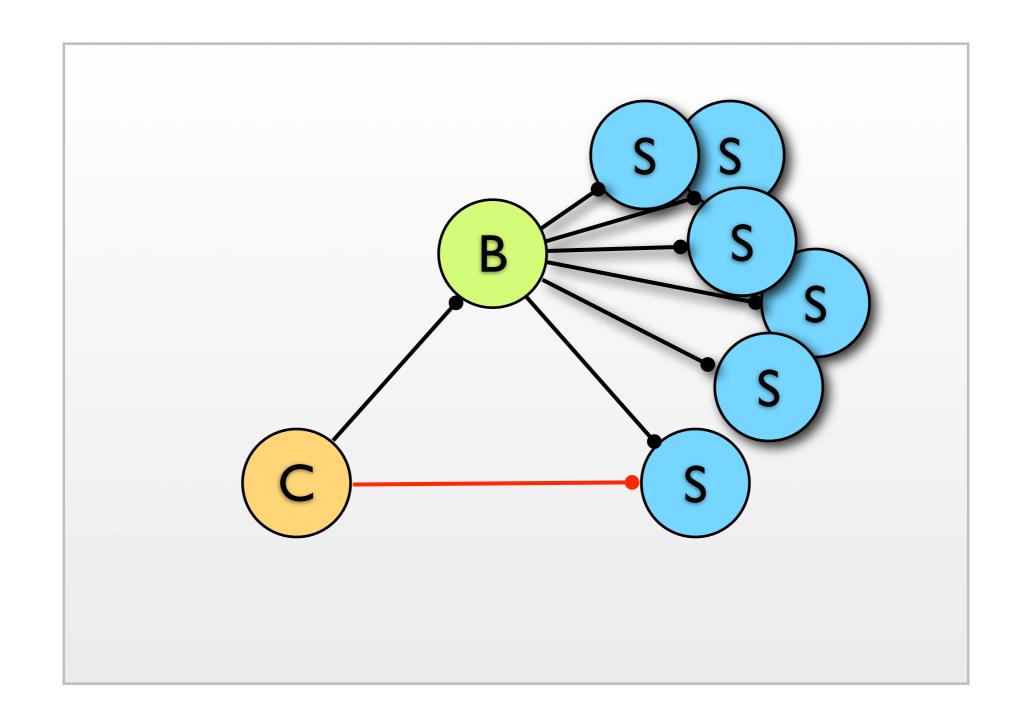
The Pi-Calculus

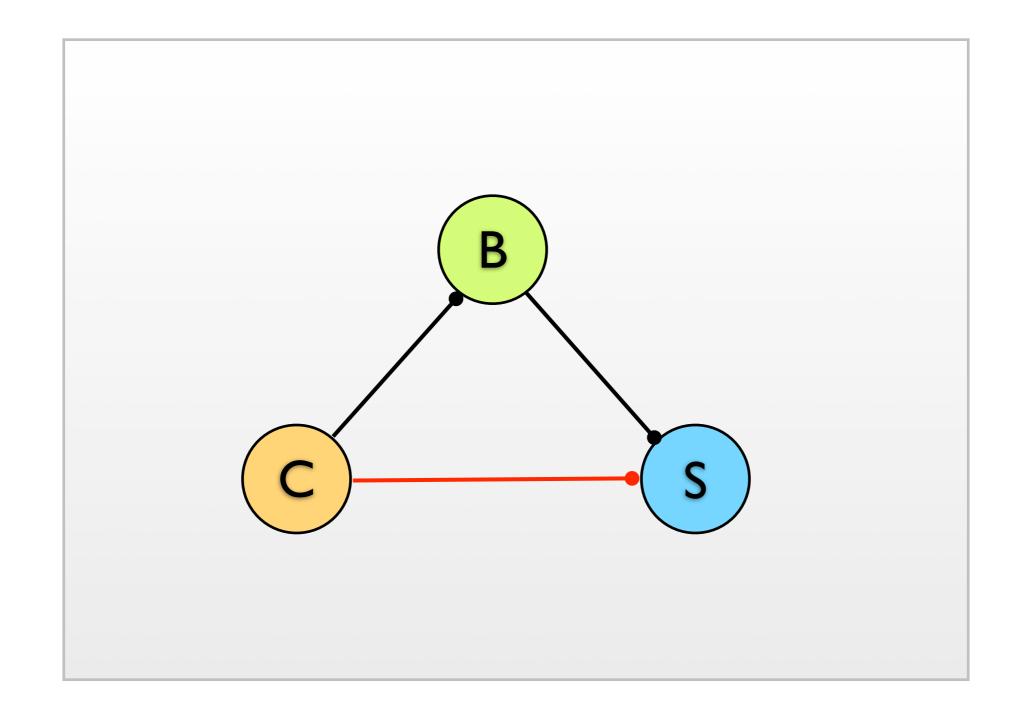
The Pi-Calculus

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

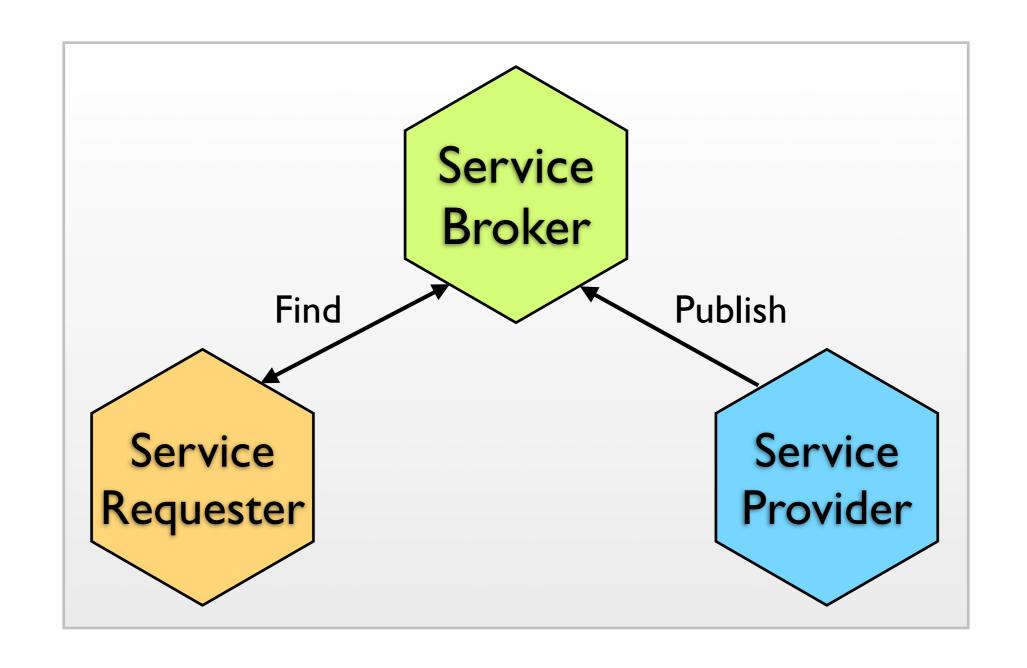




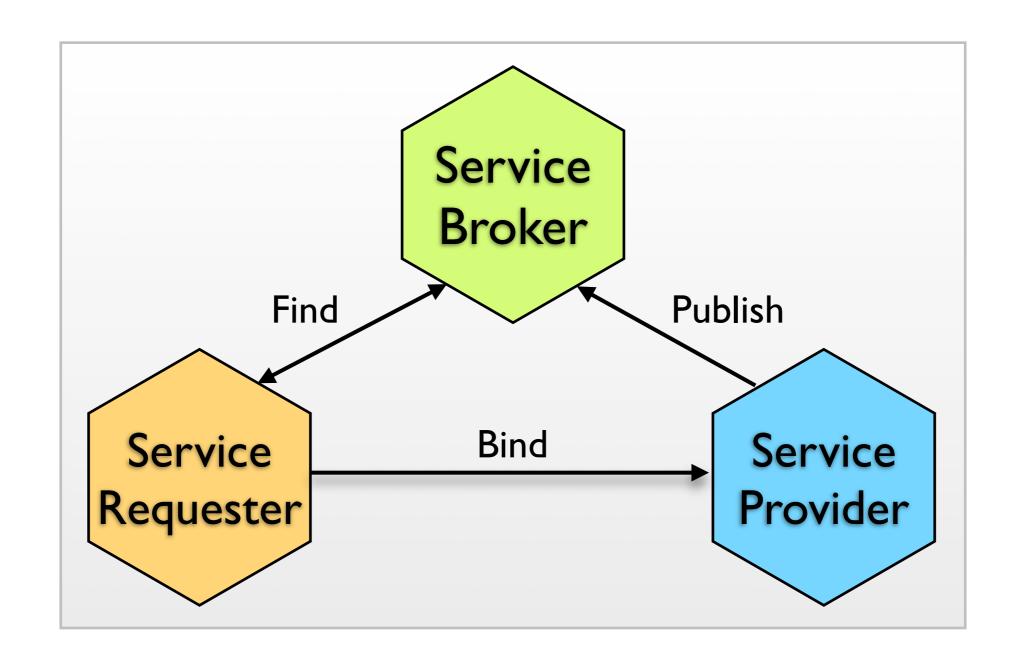




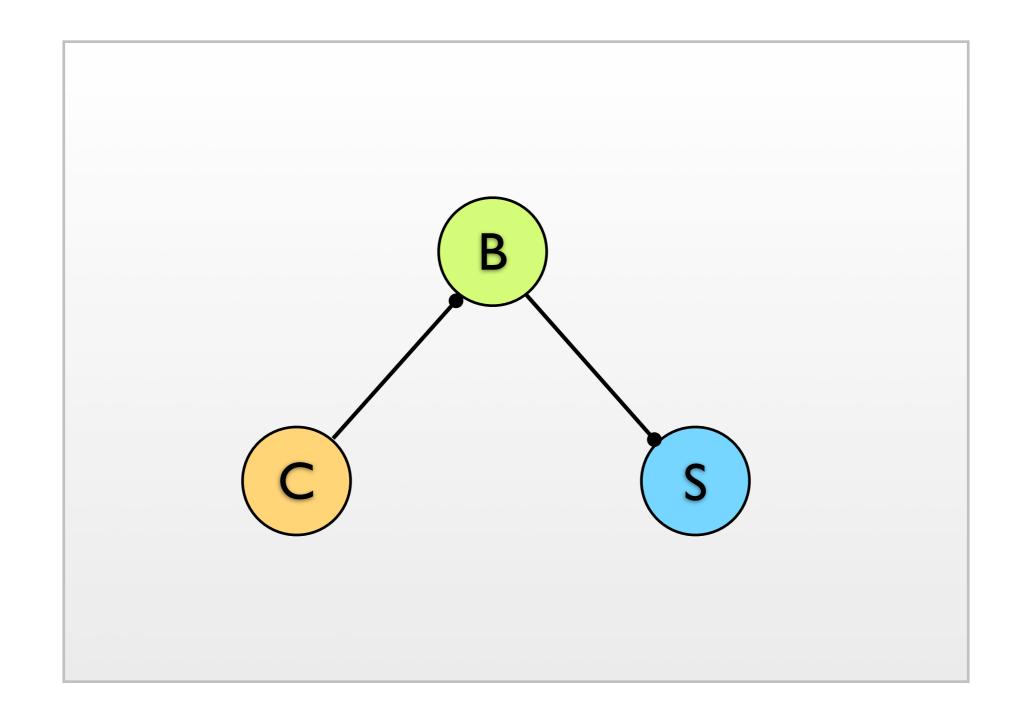
Service-oriented Architectures



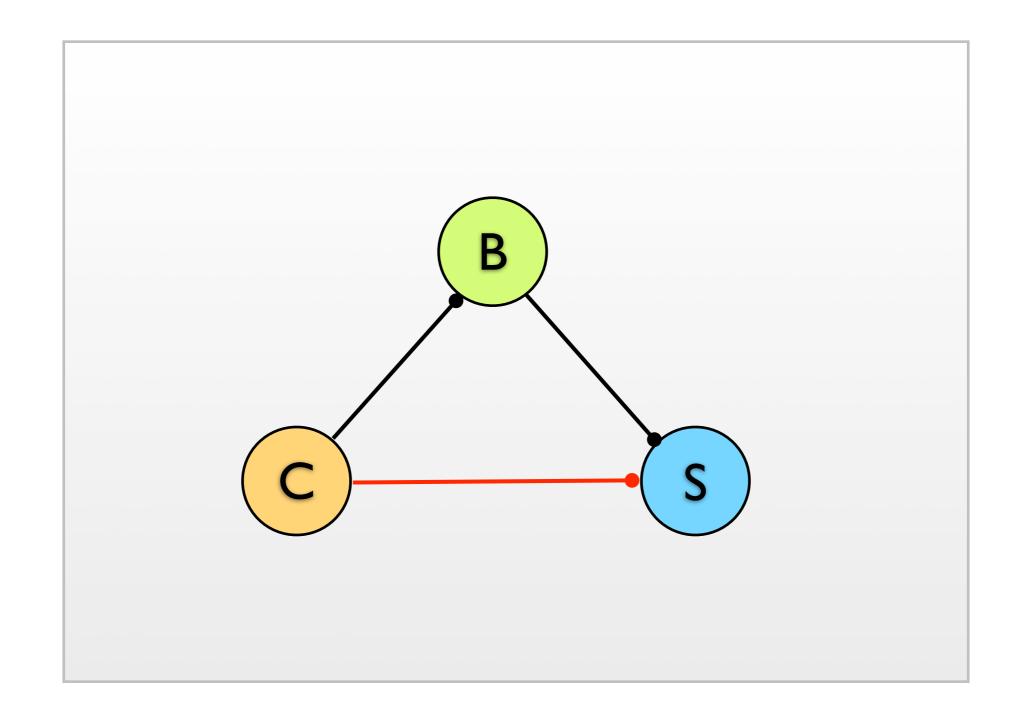
SOA



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:

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

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

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:

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

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

Conclusion

Conclusion

- 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?