Mind Your P’s: Processes, Policies, and Protocols

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Processes

- Ultimate goal: Design processes
- How:
  - Design from scratch
  - Process integration
- Composing distributed processes
  - Process-process interaction
Policies and Protocols

- Policies: Constraints on process interactions based on factors such as business considerations, optimization, etc.
  - Exceptions may be okay, with or without a penalty

- Protocols: Constraints on process interactions based on execution model
  - Violations may result in execution failure
Process Interactions

- Communication through messages

- Synchronous messaging
  - Sender knows that the receiver gets it
  - Typical in process algebras: \( ...c!a... || ...c?x... \)

- Asynchronous messaging
  - Sender knows that the received will eventually get it
  - Typically using FIFO queues
  - E.g., email, JMS
Behavior Signatures

Typing the capability of “action” and “reaction” by a process

Can be viewed as “local constraints” on interactions
Conversation Protocols

- Global constraints on interactions
  - Must “match” behavioral signature
    \[(\text{title} \; \text{price})^* \; \text{order} \; \text{ship} \; \text{pay}\]
  
  Studied variously
  - IBM conversation project, WSCL
  - Mealy conversations [Bultan et al, WWW’03]
Asynchronous messaging: not well understood

- Queues are used to store messages
- The conversation is not regular!
- Example: all words with the following properties:
  1. The same number of title and price messages
  2. Each prefix has no less title messages than price messages
Conversation protocols

- Significant difference between synchronous and asynchronous messaging
  - Asynchronous is harder

- Characterization cases that guarantee regular conversations in asynchronous case

- Verifying conversation properties
  - BPEL with XML contents [WWW ’04, ICWS ’04]