Flexible Artifact-Centric Process Models

Marlon Dumas
University of Tartu, Estonia

Guy Redding, Arthur H.M. ter Hofstede
Queensland University of Technology, Australia

Adrian Iordachescu
FlowConnect, Australia
Activity-Centric vs. Artifact-Centric
Background: FlowConnect

- Small BPM solution provider (ca. 15 people)
- Over many years, it has built a workflow engine based on *business objects* (artifacts)
- At design level, processes are *informally* captured as interconnected state machines
- At the implementation level, state machines are encoded in relational tables
- Manual design-to-implementation conversion
- Needs a more formalised design language
Base FlowConnect Model

- Object model = set of object types
- Object behavior = state machine where:
  - Transitions are labelled with ECA rules
  - States contain one or multiple tasks
  - States have input/output gateways for inter-object communication

- Signals
  - Spawn signals \((1..1, 0..1, 1..n, 0..n)\)
  - Messages
  - Return signals

- Signals are buffered
Base FlowConnect Model (cont.)

- Structure of a state
Base FlowConnect Model (cont.)

- Synchronization time:
  - *Optimistic*: send then receive
  - *Pessimistic*: receive then send

- Synchronization condition
  - *Wait-for-one*: one signal of any type
  - *Wait-for-all*: one signal of each type
  - *Wait-for-some*: condition on the set of received signals
A state may have multiple tasks
- Compulsory
- Optional tasks
- More generally: $N..M$ constraints ($M \geq N \geq 0$)
Overview of Operational Semantics

[Diagram showing state transitions and signal flow between Gateway Entered, Optimistic Gateway, Processing Sub-state, Pessimistic Gateway, and GatewayExited.]
FlowConnect to YAWL
Phase 2: Flexibility

- In 2007, FlowConnect engaged in a major project in the human services domain.
- Base model was found too rigid, e.g.
  - A Health Assessment process may require additional Tests and Treatments, but we don’t know in advance which ones nor when.
  - During a homelessness process a social worker may discover additional issues (e.g. alcoholism, drugs) outside the scope of the homelessness process.
Additional concepts

- Distinction between:
  - Coordination objects
  - Job Objects (tasks)
  - Referral objects (for runtime referral)
Additional concepts

- *Creation regions*: grouping of states
- Dynamic (creation) signals
  - Signals that are enabled within the boundaries of a creation region
  - Can be raised anywhere in a creation region (or anywhere in a lifecycle)
Direct Creation Flexibility
Indirect Creation Flexibility
How it looks at the end…
Phase 3: Simulation

- Motivation
  - Detect bottlenecks (cycle time analysis, resource utilization analysis)
- Costing
  - Assign costs to artifacts
  - Understand how much flexibility costs

How should simulation specs for object-centric models look like?
Towards simulation

- Colored Petri Net (CPN) encoding a CPN interpreter
- Tool for transforming FlexConnect models into SML data structures to feed the CPN
- Future: Extending FlexConnect with resource pools, resource capacity, cost, probability distributions for task durations, transition firing, signal sending, etc.
CPN encoding: Fire Transition
CPN Encoding: Dynamic Signal