Execution Interoperability

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Overview

- Kinds of interoperability.
- Metamodelling and interoperability.
- Composing execution.
- Execution events.
- Capturing common elements in orchestration and choreography.
- BPMN execution examples.
Kinds of Interoperability

- **Diagrams:**
  - Bitmaps (PNG, etc), Shapes (SVG, etc).
  - Receiver’s *screen* same as Sender’s.

- **Repository (metamodels):**
  - Orchestrations, choreographies.
  - Receiver’s *repository* same as Sender’s.

- **Execution (runtime):**
  - Performance or enactment of orchestration and choreography.
  - Receiver’s *execution* same as Sender’s.
Uniform Execution

- Large organizations have many kinds of execution tools from many vendors.
- Not enough to exchange diagrams and repository contents.
- Orchestrations and choreographies must execute the same way before and after interchange.
- Otherwise: cost overruns due to rework and managing different versions of the same process for different platforms.
Metamodels and Execution

- Not all metamodels are created equal.
- Some carry only modeling terminology, with runtime behavior relegated to text.
- Result: nonuniform execution, higher cost, lower ROI, fragile assets.
- Others account for runtime behavior, depending less on text.
- Result: more uniform execution, lower cost, higher ROI, assets hold value.
Metamodelling Without Execution

- Cannot instantiate and specialize user models (they are individuals, not classes).
- No runtime execution (M0).
M1 orchestrations and choreographies are classes, can be specialized in M1 and instantiated at M0. M1 constraints apply to M0 executions.
Composing Execution (Orch.)

MetaModel (M2)

Orchestration
Step

Submit Requirements

Evaluate Response

Request Quote

User Model (M1)

Execution (M0)

Submit Req.

3/15/07

Request Quote 3/15-17/07

Eval. Response

3/17/07

3/15/07

part Of

happens After

part Of

happens After
Execution Lifecycle Events

- **MetaModel (M2)**
  - Behavioral Happening
  - Behavioral Change

- **Model Library (M1)**
  - Universal
  - Start, End

- **User Model (M1)**
  - Submit Requirements
  - Evaluate Response

- **Execution (M0)**
  - Request Quote 3/15-17/07
  - Submit Req. (End: 3/15/07 1:09pm ET)
  - Eval. Response (Start: 3/16/07 9:10am ET)
Composing Execution (Chor.)

- **MetaModel** (M2)
- **User Model** (M1)
- **Execution** (M0)

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**Choreography**

- **Message** happens After **Quote**

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**Requirements**

- **Msg.** 3/15/07
- **Quote**
  - **Msg.** 3/17/07
  - **3/15-17/07**

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**part Of**

- happens After
Execution Events (Messages)

- MetaModel (M2)
- Model Library (M1)
- User Model (M1)
- Execution (M0)

**Behavioral Happening** produces **Behavioral Change**

**Universal** produces **Start, End**

**Requirements Message** produces **Quote Message**

- **Request Quote 3/15-17/07**
- **Requirements Msg.** (End: 3/15/07 1:09pm ET)
- **Quote Msg.** (Start: 3/16/07 9:10am ET)
“Happens After” (Succession)

- One step or message happens sometime after another.
- Enables orchestration and choreography to:
  - be partially defined (say only what you need to).
  - form taxonomies (subtyping).
- Semantics can be expressed as constraints on execution derived from M1 models (PSL).
- Compare to token movement:
  - Happens immediately.
  - Total definitions.
  - No taxonomies.
  - Semantics overlaid on models.
**BPMN Execution:**

- Multi-instance loops have one notation (M1, above), but four execution patterns (M0):

  1. **End of all iterations:**
     - Behavioral Change (BPDM M1)
     - (End: 3/16/07 9:13am ET)

  2. **End of each iteration:**
     - Condition (User M1)
     - (Iteration End: 9:13am ET)
     - (Iteration End: 9:12am ET)
     - (Iteration End: 9:11am ET)

  3. **End of some iterations:**
     - Condition (BPDM M1)
     - (Iteration End: 9:13am ET, condition succeeds)
     - (Iteration End: 9:12am ET, condition fails)
     - (Iteration End: 9:11am ET, condition succeeds)

  4. **End of first iteration:**
     - Condition (BPDM M1)
     - (Iteration End: 9:13am ET, “first” fails)
     - (Iteration End: 9:12am ET, “first” fails)
     - (Iteration End: 9:11am ET, “first” succeeds)
BPMN Execution:

- Event-based decisions and attached events have two notations (M1):

  - but one execution pattern (M0):

    - happen at the same time
    - happens immediately after

  Racing Behavior (BPDM M1)
BPMN Execution:

- Diagram can have multiple start events (M1):
- but only one is used per execution (M0):

Behavioral Change (BPDM M1)
Summary

- Diagram, modeling, and execution interoperability.
- Metamodelling for execution.
- Executions and their lifecycles events.
- Common execution patterns in orchestration and choreography.
- Capturing BPMN execution semantics.
- Benefits: significantly improved communication, implementation, and interoperability.