Micro-Workflow: An Object-Oriented Workflow Architecture for Embedded Workflow

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Background: Research Focus

- Software patterns
- Object-oriented frameworks
- Workflow management
Software Patterns

- Data flow and multimedia
- Information retrieval
- eBusiness
Object-Oriented Frameworks

- Telecommunications billing
- Patient tracking and object-relational persistence
- eBusiness (stateful Web-based applications, customer care, presentation)
Workflow Management

- Object-oriented process and product models
- Patterns for workflow management
- Workflow architectures
- Object-oriented workflow frameworks
- Micro-workflow
What is Workflow?

Process Logic (what?)

Flow Tier

Controls and Automates

Work Tier

Performs Activities for

Process Activities (how?)
Workflow Application Domains

Workflow for process-centric applications:

- (e)Business
- Insurance
- Financial
- Manufacturing
- Scientific
Micro-workflow: Motivation

- Three object-oriented frameworks: Objectiva (telecommunications billing), the Hartford Insurance Framework, and the Argo framework (school administration)
- All three implement processes with workflow
- The architects used a custom workflow solution
- Why not use one of the 200-300 existing workflow systems?
Workflow in Object-Oriented Applications

Typically application objects provide functionality along four dimensions:

<table>
<thead>
<tr>
<th>What to do</th>
<th>Process logic</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to do it</td>
<td></td>
</tr>
<tr>
<td>Who does it</td>
<td></td>
</tr>
<tr>
<td>How to do it</td>
<td>Task logic</td>
</tr>
</tbody>
</table>

Implement the process logic with a workflow system; the application becomes flow-independent [Leymann+2000]:

- Separates concerns
- Change one without changing the other
- Simulate (before) and analyze (after) the process
- Use other workflow features
The Research Problem

Evolution: late 70s, office automation (e.g., OfficeTalk); early 90s, business processes (e.g., the Coordinator); late 90s, middleware (OMA’s Workflow Management Facility).

Current workflow systems

- Target non-programmers
- Focus on packaging many features
- Regard objects as an implementation technique
- All-or-nothing solution
- Monolithic, heavyweight architectures

Embedded workflow

- Target programmers
- Full control over the features
- Integrate with applications and systems
- Gradual transition
- Customizable, reusable architectures
The Solution: Micro-Workflow

The Solution

Micro-workflow

Persistence framework

C1

C2

Application components

Core

Persistence

History

Monitoring

Federated workflow

Worklist

Manual intervention

Execution

Synchro

Process

Event synchronizer

C3

C4
## Micro-workflow Components

Add workflow features by plugging in components

<table>
<thead>
<tr>
<th>Component</th>
<th>How to add to the core</th>
</tr>
</thead>
<tbody>
<tr>
<td>History</td>
<td>Plug a logging strategy into the workflow session</td>
</tr>
<tr>
<td>Persistence</td>
<td>Select a persistent logging strategy; plug a database session manager into the workflow session</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Register a procedure monitor as a dependent of the workflow session</td>
</tr>
<tr>
<td>Manual intervention</td>
<td>Plug a rewinder class into the workflow session</td>
</tr>
<tr>
<td>Worklist</td>
<td>Replace domain objects with worklists</td>
</tr>
<tr>
<td>Federated workflow</td>
<td>Use SubworkflowProcedure on a facade; register the facade with the name service</td>
</tr>
</tbody>
</table>
Implementation

Micro-workflow framework (Smalltalk, Opentalk, GemStone/S)

Have built three applications:

- Administrative process (NCSA allocations)
- Patient management and tracking
- Newborn followup (Illinois Department of Public Health)
Summary

- Workflow is moving from an end-user application to middleware services
- Current workflow architectures are based on requirements and assumptions that make them unsuitable for embedded workflow
- Micro-workflow solves the problems of current workflow architectures in the context of object-oriented software development
Coming Soon

- *Several Patterns for eBusiness Applications*, accepted at PLoP 2001 (Monticello, IL)

- *An Extensible Workflow Architecture with Objects and Patterns*, in review for TOOLSEE 2001 (Varna, Bulgaria)

- *Why Java is Not Suitable for Object-Oriented Frameworks* (poster), accepted at OOPSLA 2001 (Tampa Bay, FL)