Dynamic Interorganizational Business Process Management

Paul Grefen
ICTA/IS/TM/TUE
Google ("Paul Grefen")

Overview

• Chapter 1: The Basics
  – Intra- and Inter-organizational processes
• Chapter 2: The Concepts
  – Framework, ingredients (CF, Tx, QoS, Dyn)
• Chapter 3: The Technologies
  – SOC, extension, architecture
• Chapter 4: Now & Further
  – Project, developments, conclusion

Chapter 1
The Basics

• Intra-Organizational BPM
• Inter-Organizational BPM

Intra-Organizational Business Process Management
The Bare Basics

Workflow Management

• WFM = Information Logistics
• Getting
  – the right information (documents)
  – at the right time
  – to the right person
• Emphasis
  – on structure of work processes (workflows)
  – not on contents of work processes (AIS!)
Workflow Management Aspects

- Routing of information/documents
- Allocation of tasks to actors
- Scheduling of tasks in time
- Scheduling of scarce resources
- Monitoring flow of work
- Handling exceptional situations
- Providing management information

Example WF

START
select accommodation
select transport
calculate costs
contact accommodation
contact transport
send documents
prepare invoice
send invoice
check payment
send reminder
STOP

WFMS Architecture (1)

Process Definition Tools
WF API & Interchange Format
Invoked Applications
Workflow Enactment Service
Invoked Applications
Workflow Enactment Service
Workflow Enactment Service

WFMS Concepts

role
agent
activity
process model
info element
info model

WFM Concepts (Summarized)

role
dyn.
agent
organizational model
stat.
activity
process model
uses

WFMS as Infrastructure

AS 1
AS 2
AS 3
AS 4
WFMS
DBMS
WFMS Architecture (2)

WF in eBusiness

- eBusiness context
  - competitiveness
    - efficient process execution
    - short response times
    - just-in-time processes
  - changing markets
    - flexibility in processes and products
    - changes in process structures
    - changes in process data
- Explicit, structured process management

Inter-Organizational Business Process Management

The Background

• Intra-organizational WFM in eBusiness uses automated support for business process management within organization boundaries
• Cross-organizational WFM in eBusiness uses automated support for business processes management across organization boundaries - eCommerce
• Both forms can be coupled or integrated to get complete process support in virtual organizations

Supporting DIBPM

• Efficiency
  - Setup of integration
  - Enactment of integrated process
• Effectiveness
  - Functional complete
  - Interoperable in market
• Flexibility
  - Adapted to dynamic market
  - Fit for evolving requirements

DIBPM

• Concentration on core business competence
  - Dynamic business process outsourcing
  - Asymmetric (business level client/server)
  - Horizontal and vertical markets
  - E.g. financial and logistics markets (XF)
• Combination of highly specialized functions
  - Dynamic cooperative business networks
  - Symmetric (peer-to-peer business level)
  - Usually vertical markets
  - E.g. automotive and construction markets (XW)
An interorganizational business process is a business process enacted by two or more autonomous organizations, of which at least one organization exposes the explicit control flow structure of a non-trivial process to the other organization(s).

**Example XO-WF**

1. START
2. select accounts
3. select transport
4. calculate costs
5. book trip
6. send acknowledgment
7. prepare document
8. check payment
9. send invoice
10. send reminder
11. cancel accounts
12. cancel transport
13. send documents
14. prepare invoice
15. send invoice
16. send reminder
17. STOP

**WFM Concepts (XO)**

- **organiz. model**
- **process model**
- **activity**
- **uses**
- **info element**
- **agent**
- **role**

**XO-WF Aspects (1)**

- **Distribution**
  - distributed process definition
  - distributed process enactment
- **Heterogeneity**
  - different process/data standards
  - different software/hardware platforms
- **Autonomy**
  - local decisions w.r.t. workflow enactment

**XO-WF Aspects (2)**

- **Encapsulation (abstraction)**
  - hiding of private details (competition)
  - hiding of uninteresting details (service)
- **Standardization**
  - process structures
  - data structures
  - interaction protocols
  - abstraction for right level
  - bilateral or market segments

**Chapter 2**

**The Concepts**

- Three-Layer Framework
- XO Control Flow
- XO Tx and QoS
- Dynamism
Three-Level Framework

- External Process
  - project
  - Conceptual Process
    - map
    - Internal Process
  - Process Initiator
  - Process Responder

XO Control Flow

Ingredient Number 1

Control flow interface levels

- Black box
  - Initiator sees no details of responder
- Glass box
  - Initiator sees details of responder
- Half-open box
  - Initiator can control details of responder
- Open box
  - Initiator is controlled by responder

Black Box Process

Glass Box Process

Half-Open Box Process
Open Box Process

XO Tx and QoS

Ingredients Number 2 and 3

Transactional processes

- Three-level model \implies multi-level Tx model
  - E.g. WIDE Tx model, XTC BTF
- Long-running, multi-phase processes \implies multi-phase Tx model
  - E.g. XTC BTF
- Business process structure and semantics \implies flexible Tx semantics
  - E.g. atomicity criteria, XTC ATC

QoS Agreements

- QoS dimensions:
  - Execution times
  - Reaction/wait times
  - Availability of resources
  - Quality/precision of results
- Electronic contracting
  - Contract structure
    - XF QoS CSS clauses, 4W
  - Contract specification language
    - Samuil, XTC

Dynamism

Ingredient Number 4
A dynamic interorganizational business process is an interorganizational business process that is formed dynamically by the (automatic) integration of the subprocesses of the involved organizations. Here dynamically means that during process enactment, collaborator organizations are found by searching business process market places and the subprocesses are integrated with the running processes.

Logistics application

- Service consumer: telecom company
- Service provider: logistics company
- Outsourced service: delivery of mobile phones

Chapter 3
The Technologies

- CrossFlow Technology
- SOC Technology
- BPWS Model
- Architecture Blueprint

CrossFlow Technology
An Early Prototype
CrossFlow Architecture (Phase 2: Setup)

Contract

QoS, LoC, FCC, other extensions

CrossFlow Architecture (Phase 3: WFM)

CrossFlow Architecture (Phase 4: Completed)

CrossFlow Architecture (revisited)

SOC Technology

What is Out There?
### SOC Technology

- **Platform:**
  - HTTP, SOAP, WSDL
- **Control flow:**
  - BPEL (WSFL+XLANG)
- **Transaction:**
  - WS-C, WS-T
- **Quality of Service:**
  - WS-A (+ WSDL, JSDL, WSLA)
- **Dynamism (brokering):**
  - UDDI, OWL-S

### BPWS

*An Approach to SOC4DIBPM*
**BP-WS-G Architecture**

- **SPEC**
- **ACT**
- **MON**
- BP Engine

**BP-WS-H Architecture**

- **SPEC**
- **ACT**
- **CTRL**
- **MON**

**BP-WS-O Architecture**

- **SPEC**
- **CTRL**
- **MON**
- **SYNC**

**Tx aspects**

- **Black box**
  - Simple: atomic service
- **Glass box**
  - Observable BPEL
- **Half-open box**
  - BPEL+ (spheres, comp.act., Tx savepoints)
- **Open Box**
  - As above, but symmetric

**QoS aspects**

- **Black box**
  - Simple: only overall
- **Glass box**
  - BPEL + detailed QoS (WSLA) – via SPEC
- **Half-open box**
  - As above, but as input to process control
- **Open Box**
  - As above, but now symmetric

**Brokering aspects**

- **Name-based**
  - Très, très simple
- **Attribute-based (XF)**
  - Predefined attributes (matching space)
  - Name (of course), QoS, Tx
- **Semantics-based**
  - Meaning of services, OWL-S
- **Structure-based (XW?)**
  - Process matching
Process Matching

An Architecture Blueprint

Getting More Practical (at least a bit)

Architecture is the art of how to waste space

Philip Johnson, 1964

Three-Level Framework Revisited

Integration Architecture
Chapter 4
Now & Further

- Example Project: CrossWork
- Current Developments
- Conclusions

An Example Project in DIBPM

The start

CrossWork Abstracted Architecture

NoAE
Prod. Spec.
XW
Design/Production
OEM

What
Who
How
With

external
conceptual &
internal levels
Current Developments and Conclusion

Let's be Brief and Clear

Current Developments

• Integration of slightly separated worlds:
  – (cross-organizational) workflow management
  – service-oriented computing
• Attention for advanced aspects:
  – (cross-organizational) transaction management
  – quality of service management
  – service level agreements, contracts
  – process matching
  – semantic brokering
• Application in advanced domains

Conclusion

• DIBPM essential for efficient process management in dynamic e-business
• Necessary concepts currently being developed – based on WFM – but not yet standardized
• Standard technology based on Service Oriented Computing
• Other technology may be embedded, e.g., agent technology
• Link to legacy information systems important but difficult (interfaces, wrappers)