Cross-Organizational Workflow Management

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Two Parts

Part 1
Introduction to Cross-Organizational Workflow Management - or - Workflow Support for eBusiness

Part 2
CrossFlow - An Approach to Combining Workflow Management and Electronic Commerce
Part 1: XO-WFM

Workflow Support for eBusiness
Overview Part 2

• Recap Workflow Management
  – concepts
  – architecture

• Cross-Organizational Workflows
  – concepts
  – process models

• XO-WFM Architectures
  – models
  – technologies
Workflow Management: Concepts & Architecture

a short recapitulation of workflow basics
Workflow Management

- WFM = Administrative 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
WFM Concepts (Summarized)

role

agent

organiz. model

dyn.

activity

process model

uses

info element

info model

stat.
WFMS Architecture

- UIS
- WF Design
- WF Clients
- WF Server
- DBMS
- AS/OS
- CS
- data stores
- AS/OS/DBMS
- WF Server
WFM 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**
Cross-Organizational Workflows

having business processes crossing boundaries
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.

Both forms can be coupled or integrated to get complete process support in virtual organizations.
• Cross-organizational workflows
  – workflow instance enacted by multiple organizations
  – tight coupling of business processes of multiple organizations

• Application areas
  – production chains
  – comakerships
  – service outsourcing
  – virtual enterprises
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
XO-WFM
Software Architectures

system support for
cross-organizational workflows
CrossFlow: WFM + EC

Distribution in XO-WFM

internet

2 parties: 3 possibilities
3 parties: 6 possibilities
4 parties: 4 possibilities

total 13 possibilities
Remote Client Architecture (1)

- **Fat client**
  - dedicated WF client software
  - arbitrary functionality
  - platform dependent
  - distributed maintenance
  - stable virtual organizations

![Diagram of WF Client and WF Engine connected by internet](image)
Remote Client Architecture (2)

- Thin client
  - Java applet in web browser
  - functionality limited by Java VM
  - platform independent
  - limited distributed maintenance
  - stable - temporary virtual organizations
Remote Client Architecture (3)

- Ultrathin client
  - DHTML pages in web browser
  - limited functionality
  - platform independent
  - no distributed maintenance
  - stable virtual organizations - ad hoc use
Distributed Server Architecture (1)

- Direct WFE interoperability
  - proprietary interface
  - WfMC IF4
  - remotely defined workflow invocation
  - dynamic remote workflow installation
  - stable virtual organizations
Distributed Server Architecture (2)

- WFE interoperation via Mediator
  - static connection (connection mediator, e.g., for complex interaction patterns)
  - dynamic connection (workflow broker, for dynamic VEs - CrossFlow approach in Part 2)
Current status

- Remote client technology
  - well understood
  - supported by commercial WFMSs
  - centralized process enactment!

- Distributed server technology
  - technology/standards not yet matured
  - unclear interaction model
  - support for homogeneous direct connection
  - heterogeneous direct connection IF4?
  - mediator approach research status
Part 2: CrossFlow
An Approach to Integrating WFM and eCommerce
Overview Part 2

- CrossFlow context
  - workflow management, electronic commerce
- CrossFlow project
  - CrossFlow = WFM + EC
- CrossFlow architecture
  - illustration of technical solution
- Electronic contracts
- Cooperation in CrossFlow
- Status quo of project
CrossFlow Overview: Context and Project

*a brief introduction into the CrossFlow project*
Workflow Management

- WFM ‘commonplace’ for streamlined intra-organizational process management:
  - structured, standardized processes
  - automated information logistics
  - workload balancing, deadline monitoring
  - management information

- Use in VEs requires support for
  - cross-organizational processes
  - organizational autonomy
  - heterogeneous platforms
Electronic Commerce

- Electronic trading systems (markets) widespread in electronic commerce
- Focus on trading discrete objects (physical or non-physical) or materials
- Creation of dynamic virtual enterprises requires processes (services) to be traded
  - specification of process structures, process parameters, QoS guarantees, control options
  - standardization of services in specific vertical domains
CrossFlow: WFM + EC

• Advanced workflow support for dynamic virtual enterprises
  – VEs based on service outsourcing paradigm
  – Outsourced services based on market standards, defined in bilateral electronic contracts
  – Service enactment by WFM in heterogeneous environments with organizational autonomy
  – Extensible cooperation support, e.g.:
    • Process monitoring & control
    • Transaction management
    • Flexible process support
CrossFlow Approach

Virtual Organization

Invocation and Result

Monitoring and Control

Service Consumer

Service Provider

Business Goal

Service Consumer Service Provider
CrossFlow Fact Sheet

ESPRIT, 4th Framework, now IST
Planned Turnover ~3 MEuro
Planned Effort ~30 PY
6 Partners + 1 Assoc. + 1 Sub. + 1 Client
Kickoff 22 September 1998 at Böblingen
End 21 September 2000 at Zurich
Goal: WF Support for Dynamic VEs
CrossFlow Consortium

IBM
ZRL
BBL
LGR
GMD-IPSI
UT
KPN Research
Allianz C&G
Sema Group
CrossFlow Technology: Architecture & Contracts

a detailed illustration of the CrossFlow approach
CrossFlow Architecture (Phase 1: EC)
CrossFlow Architecture (Phase 2: Setup)

Contract Mngr -> Config Mngr -> Contract -> Config Mngr

WM  BES  WFMS

BES  WM  WFMS
CrossFlow Architecture (Phase 2: Setup)

QoS, LoC, FCC, other extensions
CrossFlow Architecture (Phase 3: WFM)
CrossFlow Architecture (Phase 4: Completed)
CrossFlow Architecture (revisited)
Contract Framework Development

- Literature, Design
- Reqs.
- Model
- Language
- Logistics Scenario
- Insurance Scenario
- Mapping
CrossFlow Contract Model

- Contract
  - Has enactment clause
  - Has usage clause
  - Has concept
  - Has national language description

- Concept
  - Has workflow schema
  - Has schema
    - Consists of workflow element

- Workflow element
  - Refs. to

- Workflowschema
  - Refs. to

- National language description
  - Refs. to

- Usage clause
  - Refs. to

- Enactment clause
  - Refs. to
Process Model in XML

<!ELEMENT WorkFlow (Activity | Transition )+ >
<!ELEMENT Activity (Name, Description?, Split?, Join?, ExtAttr*)>
<!ATTLIST Activity ActID ID #REQUIRED Performer CDATA #IMPLIED >
<!ELEMENT Split (TransRef*) >
<!ATTLIST Split Type (AND|XOR) "AND">  
<!ELEMENT Join EMPTY >
<!ATTLIST Join Type (AND|XOR) "AND">  
<!ELEMENT ExtAttr (Name, Type, Value)>  
<!ELEMENT Type (#PCDATA) >  
<!ELEMENT Value (#PCDATA) >
<!ELEMENT Transition (Name, Description?, To, From, Condition?)>
<!ATTLIST Transition TransID ID #REQUIRED>  
<!ELEMENT To (ActRef) >  
<!ELEMENT From (ActRef) >  
<!ELEMENT Condition (#PCDATA | ParamRef | DataItemRef | ActRef)*>  
<!ATTLIST Condition type CDATA #REQUIRED>  
<!ELEMENT ActRef EMPTY >
<!ATTLIST ActRef ActID IDREF #REQUIRED>  
<!ELEMENT TransRef EMPTY >  
<!ATTLIST TransRef TransID IDREF #REQUIRED>
Cooperation in the CrossFlow Project

*a short analysis of working in a consortium*
CrossFlow Architecture (revisited)

- CORBA Trading
- Java
- RMI
- MQSeries WF
- MQSeries
- DB2
- XML
- XSL
- XML
- XSL
- XML XSL
- CROSSFLOW: WFM + EC
  - Config Mngr
  - WFMS
  - WM
  - WMBES
  - ContractMngr
  - MQSeries WF
  - DB2
  - CORBA Trading
  - MQSeries
  - WIDE TM
  - XML
  - XSL
  - XML
  - XSL
  - XML XSL
  - CROSSFLOW: WFM + EC
  - Config Mngr
  - WFMS
  - WM
  - WMBES
  - ContractMngr
  - MQSeries WF
  - DB2
  - CORBA Trading
  - MQSeries
  - WIDE TM
Cooperation (1)

• Required fields of expertise:
  – workflow management
  – electronic trading
  – transaction management
  – distributed systems

• Required types of expertise
  – academic models and prototypes
    e.g. transaction management subsystem
  – industrial standards and software platforms
    e.g. MQSeries Workflow
• project in ‘tension field’ between academic ideas and real-world requirements
• can lead to more innovation than ‘pure’ industrial R&D
• can lead to more significance and impact than ‘pure’ academic research
• even more important in fast-paced, multi-aspect areas like e-business
CrossFlow Status Quo

- Concluding symposium Sept. ‘00 at ZRL
- Integrated prototype software environment
- Application in two demonstrators
  - Logistics scenario (KPN/TNT)
  - Insurance Scenario (ACG)
- Contract model and language
- Scientific publications:
  - RIDE’99, CAiSE’99, IPTW’99, WECWIS’00, CAiSE’00, ISDO’00, EC-Web’00, CoopIS’00, IJCSSE (15) 5
CrossFlow Information

www.crossflow.org