Enterprise Federation through Web Services based Contracts Architecture

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Overview

- Contracts in e-commerce
- Support for automated contract management … Business Contracts Architectures (BCA)
- BCA Web services model
- Web services issues
- Future work
Contracts in e-commerce

• Pervasive
  – in any X2Y relationship (X, Y: legal entities) -
    • most prominently B2B and B2C
  – in any vertical domain: finance, sales, government …
• Increasingly involving more than two parties
  – enabling forming strategic alliances
• Tendency for highly sophisticated terms
  – conditional agreements, rebates, incentives, compliance levels…
• Need to be integrated with enterprise back-end systems
  – collect various **data** from within or outside the enterprise
  – monitor **actions** and **events** from trading partner organisations
  – e.g. procurement systems, supply-chain systems …
• Manual management is becoming implausible and very costly
  – need for automated contract management systems
Business Contracts Architecture (BCA)

- Electronic representation of *contract documents*
  - standard contract forms (templates) and agreed contracts
- Automation of typical contract management *activities*
  - drafting, negotiation, monitoring, enforcement
- *Extensible* and *tailorable* architecture
  - for variety of contract types (simple to complex, small to large), contractual environments and management needs
  - enabling B2B integration
  - aimed to be standards compliant (e.g. ebXML, RosettaNet …)
- *Flexible integration* with
  - organisations’ IT systems (in-house or ERP systems)
  - other e-commerce applications (trading hubs, supply chains …)
- *Technology-neutral*
  - J2EE, .NET, Web Services …
Contract Drafting

- **Standard contract form**
  - basis for signed contract instances
  - *structural* and *behavioural* semantics
- **Contract clause**
  - a collection of terms and conditions
    - what trading partners are obliged, prohibited, permitted to do
  - in BCA system
    - clause contains text and *value-slots*
    - terms and conditions can be represented as *executable policies*
    - value slots and executable policies - automation and B2B integration
    - digital signatures section for signing of contract instances
- **Contract forms editor**
  - Word-processor-like editor tailored for contract forms drafting
    - including drafting of, and/or composing from, clauses and value-slots
Contract Repository and Notary

**Contract Repository**

- database of commonly used building blocks for construction of contract forms
  - standard contract forms
  - standard contract clauses
  - standard value-slots
- ‘standard’ can either be
  - industry consortium recommendations, or
  - frequently used templates
- options for Contract Repository provisioning
  - owned by one or both trading partners
  - third-party offering

**Notary**

- database with contract instances
  - successfully negotiated and signed by trading partners
  - govern actual business transactions
- different options for completion of value-slots
  - ‘sign-only’ (as in credit-card agreements)
  - ‘negotiable’ (as in most buy/sell transactions)
- can be used as an input to the monitoring of parties’ obligations
- implementation options
  - a certified service provider (most likely)
  - one of the parties to the contract
Contract Monitoring

• **Aim**
  – assist with contract compliance to the agreed contract
  – performed by Contract Monitor role

• **Approach**
  – monitors contract-significant events
    • e.g. money withdrawal event
  – on occurrence of these events, evaluate related policies
    • e.g. policy about maximum allowed withdrawal amount
    • policy evaluators can be custom-made plug-ins
    • policy language for defining business rules
  – to this end it typically compares
    • information carried by this event (e.g. withdrawal amount)
    • agreed contract values stored in Notary (e.g. maximum amount)
Contract Enforcer

- acts in response to events sent by the monitor
  - execute actions that may be needed to deal with contract non-compliance
    - e.g. revoking digital certificates
  - in most cases a human intervention
    - but in certain cases may be automated

Contract Notifier

- acts in response to the events sent by the monitor
  - sends notifications to relevant parties
- kinds of notifications
  - time-based events
    - e.g. approaching of contract renewal date
  - contract non-compliance events
    - e.g. withdrawal of more money than agreed
Business Contracts Architecture

Notary
Agreed Contracts

Contract Forms Editor

Contract Monitor

Enforcer/Notifier

Contract Repository
Contract Policies

HTML Form

HTTP

XSLT

Contract Forms Editor

Trading Partner A
Local Repository

Trading Partner B
Local Repository

Negotiation
Digital Signing
Business Transactions
Technology Overview

- Monitor
- Enforcer
- Contract Repository
- Notifier
- Notary
- State Manager
- Value Manager
- Intermediary
- Event Manager
- Event Distributor

Misc Data Formats
- "Normalized" XML format
- E-mail, SOAP, etc

Contract Environment
- Infrastructure Components
- Functional Components

- J2EE/ CORBA
- BizTalk/.NET
- .NET
- Websphere
- Sun ONE

- SAP
- PeopleSoft
- Oracle
Financial services and BCA

- Web based transactions
  - Product offerings
  - Tracking and CRM
- Usually based on standards
  - Clearing association rules apply to all financial institutions
    - E.g. Australian Payment Clearing Association
- Complex transaction system
  - One contract causes transaction between multiple parties
    - Loan, fund management etc
  - Volume of data
    - Management issues
    - Obligation tracking problems
**DDR Scenario**

- Request Agreement
- Send Agreement Form(s)
- Send Completed Agreement
- Send Approval/Acknowledgement
- Create DDR Agreements

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**Customer**

- Digital Signature
- Notary
  - Signed Contracts
- Repository
  - Contract Template
- Contract Monitor
- DDR Details
- Standard Reporting
- Editor
- DDR Request
- DDR Funds Transfer
- Repeat as Required
- DB User
- DB User's Bank

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**Customer's Bank**

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12
B2Bi with BizTalk Server Technologies

Pary A: ERP

BizTalk Server

Orchestration

Notary

SQL/XML
XML eXtender

SAP

BizTalk Adaptor for SAP

Notary SQL/DB2

Pary B:

Http, SMTP, FTP Interfaces to LOB applications

Messaging

Intermediary

Distribution

BCA Monitor

Notifier

Dynamic routing
BCA and MDA

- Business Message Definition
- Event Definition
- State Definition
- Policy Definition
- Etc, etc

- Business Messages Language
- Event Language
- State Language
- Policy Language

- Written in
- Executes

- Intermediary
- Event Manager
- State Manager
- Monitor
Web services and BCA Implementation Stack

• Ideal for third party offerings
  – deployment
  – discovery
  – binding

• Ease of Integration
  – technology neutral service specification : WSDL
  – proxy generation support for WSDL

• Emerging support for process level integration
  – WSFL
  – XLANG

• Based on Standards
  – SOAP, XML
BCA Web Services Model
Design Considerations

- Role based architecture
  - user profile
    - usage analysis
    - security

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<th>Users</th>
<th>Usage</th>
<th>Security</th>
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<tbody>
<tr>
<td>CTRpository</td>
<td>Lawyers community</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Notary</td>
<td>Specific Monitor Component</td>
<td>Low</td>
<td>high</td>
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- Business logic
  - Monitor Component: design of complex infrastructural components
  - Notifier: forwarding mechanisms. ISVs like ZixMail.net
Development: BCA Contract Template Repository

Using ...

- IBM WSTK – Websphere technologies
- OfficeXP
Web Services Issues: WSDL and UDDI

• WSDL
  – Interface definition Vs. business service definition
  – Service level Agreements
    • reliability descriptors
    • Business constraints
  – Interoperability

• UDDI
  – Security / Access Control
    • once published can be accessed by anyone
  – Subscription of multiple service
    • business aspects
    • dependencies
  – WSDL in UDDI
Web Services Issues: SOAP and services composition

SOAP Intermediary

- intercepts the request from the Service Client and provides added functionality while forwarding.
- could also be added in reverse path
- Useful for non-functional services
- Implementations
  - Apache AXIS project
  - Microsoft WS-Routing specification

Web services composition

- Composing services
  - exposing operations
  - linking services
- Chain of services
  - UDDI/WSDL issues
  - transaction Control, Performance etc
  - management, accounting etc
- Standards and Tools support
  - WSFL (web Services PMT)
  - XLANG (future releases of BizTalk?)
BCA and Intermediaries

Web Service Client TP_A

SOAP Intermediary

BCA Event Receiver

HTTP/SOAP Request

SOAP Intermediary

BCA Evaluator

HTTP/SOAP Request

SOAP Intermediary

BCA Notary

Response

Web Service Provider TP_B

Response
BCA Services Composition

Event Generator

Event Distributor

Monitor Core

Internal Work Flow
Future work

- Contract drafting
  - transformation of clauses into executable rules
  - contract specifications and ebXML

- Contract monitoring
  - policy evaluation framework
  - security and distributed transaction management

- Prototyping
  - ERP Integration
    - SAP Research labs Brisbane
  - web services
    - services compositions – WSFL, XLANG
    - deployment as intermediary service – WSTK (IBM), WS-Routing (MS)