Business to Business Integration with Electronic Trading-Partner Agreements

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Outline of Presentation

- Problems of business to business business
- Electronic trading-partner agreements
- ebXML standardization of electronic TPA
- Details of profiles and agreements
- B2B middleware and tools
- Agreement life cycle
Companies have not been able to tightly integrate their Web commerce application to their back-end systems.

- Dozens of complex ERP and business application systems
- 90% of the Fortune 1000 run on at least three different operating systems, further complicating business integration.

And few e-commerce Web sites are integrated with existing business systems today.

- Our own research indicates that as little as 2% of all e-commerce sites integrate with their back-end systems.

Business integration is complex, time-consuming.

- "70% of the cost of writing an application is writing the infrastructure" -- Gartner
**Solution**

Streamline the process of setting up and doing business between businesses.

IBM Research proof-of-concept prototype:

- Electronic Trading Partner Agreement (TPA)
  - "Trading Partner Markup Language" (tpaML)
- Business to Business Protocol Framework (BPF)
  - Run-time support for TPA
Cross-enterprise Application Integration

- **Heterogeneous applications and platforms**
  - Partners not required to use same middleware

- **Loose coupling of business platforms**
  - Each party's internal processes independent of other's
  - No party can lock resources at other parties
  - Explicit recourse actions instead of rollback
    - Cancel the reservation
  - Logs provide needed correlations among parties

- **Untrusted application components**
  - Controlled & monitored
  - Check that prescribe sequence of actions is followed
Inter-enterprise Integration

Trading Partner

No Shared Middleware

Long-Running Conversations

Untrusted Access

Back-end Integration

Workflow

Application

Business Process

XML

BPF: Business-to-business Protocol Framework
Electronic TPA

- Rules of interaction between independent businesses
  - Not a complete definition of the application
- Independent of the internal business processes at each party
- XML document
  - Authoring tool (understands TPA semantics)
- Automatic generation of customization code at each party
  - Formal specification of TPA avoids misinterpretation
  - Assures that parties configured compatibly
Using the Electronic TPA to do Business

- Parties agree on how to interact
- Write application code
- Write a TPA that expresses the agreement
- Generate TPA code at each partner's site
- Register (install) information from TPA
- Do business under the TPA
**Long-Running Conversation**

- TPA defines a single conversation
  - Unit of business under a TPA
  - Instantiate many conversations, serial or concurrent

- Sequence of related business transactions

- Asynchronous or synchronous messages

- Each party maintains history and enforces TPA

- Each party maintains correlations across conversations

- Each party invokes own internal business logic
**OBI: Open Buying on the Internet**

**Buyer organization**

1. Requisitioner
2. Web Server
3. OBI Server
4. Validation
5. Approval Process
6. TPA
7. OBI Server
8. Payment Process (SET)
9. Fulfillment Process
10. Merchant Server

**Seller organization**
Standardizing the TPA

- Interoperability is essential to wide-spread B2B e-commerce
  - Avoid vendor-dependent solutions
  - Partners with different implementations must be able to do business

- Create a vendor-neutral standard TPA language

- ebXML has begun a standardization activity on electronic TPAs based on the IBM tpaML proposal
ebXML

- Broad-based industry consortium for electronic commerce standards (approx. 120 companies)
- Open XML-based infrastructure for global e-business information
  - Lower e-business entry barrier for small/medium enterprises and developing nations
- Project teams related to electronic TPA
  - Business process methodology
  - Message structure and routing
  - Trading partner profiles and TPA
  - Registry and repository
Mission

- Define a specification for creating the IT part of a partner profile and a TPA.
- Enable automated configuration generation from TPA.

TPA

- IT configuration file, specifies only things that middleware can manage and enforce.
- No business information.
- No business semantics except message names/schemas and transition rules.
  - Derive from BP metamodel
**ebXML Profiles and Agreements**

- **Collaboration Protocol Profile (CPP)**
  - Describes party's IT capabilities
    - Communication protocols
    - Security requirements
    - Business processes it supports

- **Collaboration Protocol Agreement (CPA)**
  - Agreed IT capabilities
  - Business process to be performed
    - Definition of business transactions, transition rules, etc.

- CPA is intersection of two parties' CPPs plus results of negotiating variable parameters
Composing a CPA

What Parties WILL do

CPA

intersection,

negotiation

What Parties CAN do

Party 1
CPP

Party 2
CPP
## Key CPA Information

<table>
<thead>
<tr>
<th>Overall properties</th>
<th>Agreement duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>Business partner info.</td>
</tr>
<tr>
<td>Communication properties</td>
<td>HTTP</td>
</tr>
<tr>
<td>Document-exchange properties</td>
<td>Message protocol</td>
</tr>
<tr>
<td>Security properties</td>
<td>Authentication, non-repudiation</td>
</tr>
<tr>
<td>Roles</td>
<td>Buyer, seller, broker</td>
</tr>
<tr>
<td>Business transactions</td>
<td>Reserve, modify</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Timeout</td>
</tr>
<tr>
<td>Transition rules</td>
<td>Modify after reserve</td>
</tr>
<tr>
<td>Error handling</td>
<td>Retries, actions invoked</td>
</tr>
<tr>
<td>Comments</td>
<td>ID of accompanying paper</td>
</tr>
</tbody>
</table>
Main sections of CPP and CPA

- Party identification
- Transport
  - Protocol, encoding, timeout, security, etc.
- Document exchange
  - Messaging protocol, security, etc.
- Collaboration protocol
  - Business transaction definitions
  - Derived from business process metamodel
<CollaborationProtocolProfile id = "id"
    various namespace attributes...>
    <Party partyId = "N01">
        ...
    </Party>
    <!--CollaborationProtocol: one or more-->
    <CollaborationProtocol version = "1.0" id = "N07"
        xlink:type = "locator"
        xlink:href = "http://www.ebxml.org/services/purchasing.xml">
        Buy and Sell
    </CollaborationProtocol>
    <ds:Signature>any combination of text and elements
    </ds:Signature>
</CollaborationProtocolProfile>
Party Information in CPP

```xml
<Party partyId = "N01">
  <PartyId type="uriReference">duns:...</PartyID>
  <PartyDetails xlink.../> <!--link to additional information-->
  <Role certId="N03" roleID="N02" name""buyer">
    <ServiceBinding xlink:type = "...">
      <!--link to collaboration protocol-->
    </ServiceBinding> N/Role>
  <Certificate certId = "N03"> <!-- ref. to certificate definition-->
    <ds:KeyInfo>XMLDSIG</ds:KeyInfo>
    <!--certificate information in line or remote-->
  </Certificate>
  <DeliveryChannel> ... </DeliveryChannel>
  <Transport> ... </Transport> <!--Transport-->
  <DocExchange> ... </DocExchange>
</Party>
```
Roles

- Collaboration protocol defined in terms of roles
  - Buyer, seller, etc.

- CPP indicates which roles party can play

- CPA binds specific parties to roles
Delivery Channels

Delivery Channel ID=DC1
- Transport ID=T1
- Doc.Exch. ID=D1

Delivery Channel ID=DC2
- Transport ID=T2
- Doc.Exch. ID=D2

Delivery Channel ID=DC3
- Transport ID=T3
- Doc.Exch. ID=D3
Delivery Channel Contents

- Combination of
  - One transport definition
  - One doc exchange definition

- Multiple delivery channels in CPA
  - Dynamically selected for each message
  - Statically bound to individual business transactions or individual message definitions
<DeliveryChannel channelId = "N04" transportId = "N05"
docExchangeId = "N06">
  <Characteristics
    nonrepudiationOfOrigin = "true"
    nonrepudiationOfReceipt = "true"
    secureTransport = "true"
    confidentiality = "true"
    authenticated = "true"
    authorized = "true"/>
  <ServiceBinding xlink:type = "locator"
    xlink:href ="http://www.example.com/services/purchasing"/>
</DeliveryChannel>
Key Transport Elements

- Communication
  - Protocol
    - HTTP, SMTP, FTP
  - Addresses
  - Timeout information

- Transport Security
  - Encryption definition
  - Authentication definition
  - Certificates
    - Each party's certificate (1 or more) information
Key Document-Exchange Elements

- Message exchange protocol
  - ebXML messaging, XP, etc.

- Message encoding

- Reliable Messaging parameters
  - Semantics (e.g. OnceAndOnlyOnce)
  - Idempotency, timeouts, retries

- Security
  - Nonrepudiation
    - Certificates, protocol, hash function, encryption algorithm, signature algorithm
  - Digital envelope
    - Certificates, encryption algorithm
Collaboration Protocol

- Set of business transactions to be performed.
- Defined by ebXML Business Process Metamodel
  - Separate XML document

```
<CollaborationProtocol version = "1.0" id = "N07"
  xlink:type = "locator"
  xlink:href = "http://www.ebxml.org/services/purchasing.xml">
  Buy and Sell
</CollaborationProtocol>
```
Business Transactions Examples

Business transactions in a CPA are defined by the business process, not mandated by the CPA standard.

- In a procurement CPA
  - Process purchase order
  - Modify purchase order
  - Cancel purchase order

- In an airline reservation CPA
  - Reservation request
  - Modify reservation
  - Cancel reservation
  - Confirm reservation
Elements of Business Transaction Definition

- Request name
- Request message (schema)
- Delivery channel
- Reply name and schema
- Exception reply name and schema
- Maximum allowed service time
- Transition rules
Some BPF Services

- TPA Registration
- Message Routing
- Transition Rules checking
- Business document generation and parsing
- Security
- Correlation of conversations
- Logging
- Recovery
Functional Layer Comparison

Layer:
- Business Logic
- Business Protocol
- Doc Exchange
- Transport

ebXML:
- Business Process
- Message Exchange
- Messaging Protocol
- Transport Envelope

Implementation:
- Application
- Business Protocol
- Delivery Channel

CPA

BPF

Configuration of partners
Supporting Tools

Value-added tools, not part of formal standard (IBM Research proof of concept)

- Authoring tool
  - Understands CPP semantics
- Code customizer/generator
  - Converts CPA to code at each party's system
  - Automatic registration of CPA at each party
  - Parameters of party identification, communications, security, and business protocol
- Application can be up and running within minutes of finalizing CPA.
Automation of CPA Life Cycle

Discovery/Negotiation based on partner profiles

- Partner profile
- Services advertisement and discovery
  - Repository of partner profiles, query capability
  - Discovery and negotiation services
- Negotiation of business parameters
- Negotiation of CPA details between partners
- Build CPA from profiles and negotiation results
- Register negotiated CPA at partner sites
- Do business
Partner Profiles

- Profiles can be placed in public repositories
  - ebXML Repository
  - Discovery of prospective business partners

- Business description
  - Products or services
  - Prices, volumes, shipping times, etc.
  - What is negotiable

- CPP information
  - Supported business processes, communication protocols, etc.
Negotiation Process

- CPA negotiation is a business process
- Controlled by a negotiation CPA
  - Between partners
  - Between each partner and negotiation service
- Initial inputs are CPPs of two prospective partners
- Offer, counter-offer information in business messages exchanged by business transactions
- Successful result is a CPA

Future: spontaneous e-commerce
Summary

- Partner profile (CPP)
- Executable agreement (CPA)
- Can support existing standards (e.g. OBI), new processes

- CPP and CPA functions
  - B to B protocol (business transaction definitions)
  - Document exchange definitions
  - Communication definitions

- CPA composed from two parties' CPPs
  - Negotiation process possible