B2B and M2M Connectivity
and Emerging Dynamic eCommerce

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B2B Protocols: Large number and Growing

Proprietary/Company Defined
- Ariba Punchout; cXML
- Commerce One round-trip; CBL
- mySAP punchout
- Intelisys OBI+

Standards/Consortia
- EDI/Internet-EDI
- OAG
- OBI
- RosettaNet
- ebXML
- tpaML
- SOAP
- UDDI

Fulfillment and Supply Chain Processes
Outline of Presentation

- Summary of Emerging B2B protocols
  - Standards / Consortia defined: EDI, OBI, RosettaNet, SOAP, ebXML
  - Proprietary / Company Defined: Ariba punchout, Intelisys/OBI+, mySAP punchout, CommereOne round-trip

- B2B Connectivity Requirements implied by Protocols
  - Supplier connectivity to marketplaces, marketplace-to-marketplace connectivity, exchanges

- Protocol Composition and Meta-Protocols for defining and instantiating protocols
  - Trading Partner Agreement Markup Language tpaML
  - Enterprise Business XML standards and tpaML WG

- Dynamic eBusiness
  - B2B life-cycle definition and "spontaneous" connectivity
Background and Environment

EDI Messages

-- Message Format/Syntax

"Implementation Conventions" (ICs) for Industry Specific Transactions
Trading Partner Agreements on EDI Transactions & ICs

-- EDI is legacy for Business-to-Business electronic commerce
-- Open EDI being proposed as paradigm shift
  * Shift the focus to Business Processes
-- OBI (Open Buying on the Internet), RosettaNet proposed standards
  * End-to-end process flow with EDI-equivalent messages

=> Move from messaging formats to end-to-end business processes
Move from VANs to Internet
Open Buying on the Internet (OBI)

Various Derivatives from OBI
- e.g. Ariba Punchout, RosettaNet Purchasing PIP

HTTPS, Certificate-based authentication, optional non-repudiation, base 64 encoding, EDI format; not specified -- retries, duplicate detection/idempotency, asynchronous response times, status queries, order confirmation, invoice...
Intelisys/Metiom OBI (+) Protocol for B2B Procurement

1. LOGIN

2. OBI B2B Protocol

3. catalog of goods and prices

4. Catalog URL

5. SHOPPING

6. PO Req. generation

7. OBI B2B Protocol

8. OBI POR

9. Approve PO

10. OBI PO

11. HTTP 200 OK

12. Order Fulfilment & Payment

13. Poll EDI 855

14. EDI 855

Buying Organization

Selling Organization

B2B Gateway

Processor

Supplier Bus. Logic

OBI B2B Protocol

OBI Messaging

HTTP/HTTPs Transport

IEC Link

Commerce Server, e.g. WebSphere Commerce Suite

Requisitioner

Browser

Approver

Browser

Intelisys Purchasing System

Intelisys/Metiom OBI (+) Protocol for B2B Procurement

HTTP/HTTPs Transport

Order Fulfilment & Payment

B2B Gateway

Supervisor

Internal firewall

External firewall

firewall
RosettaNet

- RosettaNet Consortium is Defining Partner Interface Processes (PIPs) originally for IT Supply Chain
- Defined as Clusters -> Segments -> PIPs
  - Cluster 0: Support; Segment A Admin.; PIP01A (failure)
  - Cluster 1: Partner, Product and Service Review
    - Segment A: Partner Review; PIP1A1,2 Acct. setup, maintain
    - Seg. B: Product and Service Review
  - Cluster 2: Product Introduction
  - Cluster 3: Order Management
    - Seg. A: Quote & Order entry; PIP3A1-7, req. quote, query price and avail., transfer shopping cart, PO, order status, PO acc.
  - Clus. 4: Inventory mgmt; Clus. 5 Mkt. info; Clus. 6 Service & Support
RosettaNet Manage Purchase Orders PIP

- Principal messages in PIP
  - Order Create
  - Order Change
  - Order Cancel
  - Similar flow for each message

Buyer

Order Create Message PO
Sync. Ack. -- HTTP 200 OK

Seller

Order Response
Sync. Ack. -- HTTP 200 OK
**Scenario:** Catalog Update  
**PIP:** Catalog Subscription 1B1

**Scenario:** Catalog Update PIP: Catalog Subscription 1B1
Simple Object Access Protocol - SOAP

- SOAP proposal submitted to W3C by Microsoft, IBM, others
- XML-based lightweight protocol for distributed info. exch.
- Defines envelope for describing what is in msg., encoding rules for app. defined data types, and RPC conventions
- SOAP is stateless; no bi-di communications specified

Client

HTTP Post <envelope>[hdr]<body>

Server

Sync. Ack. -- HTTP 200/500

<body> either arbitrary message or RPC; convention for RPC calls and responses
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B2B Connectivity to Marketplaces: The Problem

- Many Buyers have selected a horizontal /procurement network
- Different protocols for each network
- Need to support a growing number of B2B protocols
Supplier Connectivity Requirements

Horizontals

Intelisys

i2

Marketplc.

i2 Commerce One

mySAP

Marketplaces

Buyers

Connectivity to key marketplaces

Ariba Punchout (cxml)

OBI+

Ariba

Suppliers

ibm.com

Supplier1

Sellers

Supplier n
Marketplace Connectivity Requirements

- Ariba
- Intelisys
- i2
- Commerce One
- mySAP
- Mktplc. 1
- Inter-Mktplc. connectivity package
- Supplier n
- Supplier 2
- B2B hub
- ibm.com
- Ariba Punchout (cxml)
- OBI+

Integration of external suppliers
B-B Protocols for Ventro
Supplier connectivity to Mktplc.

New M2M Protocols needed
B2B Protocol Exchange Requirement

Horizontals

Ariba

Punchout (cxml)

i2

B2B Protocol Exchange

Intelisys

Commerce One

mySAP

Mktplc. n

Supplier 2

Supplier n

Supplier chosen protocol

IBM Research
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Inter-enterprise Integration

NO Shared Middleware
Loose Coupling
No 2-phase commits

Long-Running Conversations

Back-end Integration
Hide internal process
Untrusted Access

Application

Business Process

B2Bi

Workflow

XML

TPAs
B2B Architecture

TPA/Service Contract

<table>
<thead>
<tr>
<th>Overall properties</th>
<th>Identification</th>
<th>Comm. properties</th>
<th>Security properties</th>
<th>Roles</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Examples

// Contract duration
// Business partner info.
// HTTP, SMTP, etc.
// Authentication, non-repudiation
// Buyer, seller, broker, etc.
// Reserve, modify, etc.
// Timeout
// Modify after reserve
// Modify before 6 p.m
// Refund, etc.
// Retries, actions invoked
// Penalty if unreachable

B2B Layering

General B2B Process Flow

TPA

Local Business Process

Supplier Marketplace
Service Provider
Agency
Warehouse
Consolidator...

Sub-contractor
Supplier
Service provider
Payment process...

B2B Architecture

Long running distributed processes and transactions on the Internet

Trading Partner Agreement (TPA)

Doc. Exch.

EMI

EDX

XML/EDI

PO

RFQ

XML

VP

MQ

VAN

HTTP

SMTP

Reliable msging.

Business protocols/processes

Parsing, generation, doc repository
Logging, audit trail, time stamp
security, query

B2B Process Flow

Requisitioner

Web Server

OBI Server

Validation

Approval Process

Merchant Server

Fulfillment Process

Payment Process (SET)

Negotiation

Reconciliation
**Key TPA Elements To Be Specified**

<table>
<thead>
<tr>
<th>Overall properties</th>
<th>TPA duration, Business protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
<td>Business partner info.</td>
</tr>
<tr>
<td>Communication properties</td>
<td>HTTPs, FTP, SMTP, Messaging</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>Actions</td>
<td>PO, PO change</td>
</tr>
<tr>
<td>Responsiveness</td>
<td>Time-out</td>
</tr>
<tr>
<td>Sequencing rules</td>
<td>Change after PO</td>
</tr>
<tr>
<td>Constraints</td>
<td>Change within 24 hours</td>
</tr>
<tr>
<td>Recourse actions</td>
<td>Refund</td>
</tr>
<tr>
<td>Error handling</td>
<td>Retries, actions invoked</td>
</tr>
<tr>
<td>Comments</td>
<td>ID of accompanying paper contract</td>
</tr>
</tbody>
</table>

*Examples*

- Formal Specification of TPA Avoids Misinterpretation
- Existing protocols specified as special cases
**ebXML: Enterprise Business XML**

- 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
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 proposal
- Draft tpaML proposal available from http://xml.org/xmlorg-resources/b2bxml.shtml
Mission

- Define a specification for creating the IT part of a partner profile and a TPA, which is a combination of two partner profiles
- Enable automated configuration generation from TPA

TPA

- IT configuration file, specifies only things that TRP messaging service can manage and enforce
- No business information
- No business semantics except message names/schemas and sequencing rules
  - Derive from BP metamodel
XML based TPA Structure

<TPA>
  <TPAInfo>
    <!--TPA name, participants, etc.-->
  </TPAInfo>
  <Transport>
    <!--communication, transport security-->
  </Transport>
  <DocExchange>
    <!--message formats, message security-->
  </DocExchange>
  <BusinessProtocol>
    <!--Action Menu for each party-->
  </BusinessProtocol>
</TPA>
Key Document-Exchange Elements

- Message encoding
- Option to check for duplicate messages
- Message Retries
- Message security
  - Nonrepudiation
    - certificates
  - Digital envelope
    - certificates
Key Transport Elements

- Communication
  - Protocol
    - HTTP, SMTP, FTP, VAN-EDI
  - Addresses

- Transport Security
  - Encryption definition
  - Authentication definition
  - Certificates
    - Each party's certificate URL
    - Certificate authorities' certificate URLs
    - Key length
Roles

TPA may be in terms of actual parties or roles

- Example of roles: buyer, seller

Roles used to build prototype TPAs

Authoring tool or registration tool resolves roles

- Replace roles by specific parties everywhere in TPA
- Fill in party-specific information such as addresses

```xml
<Role>
  <RoleDefn> <!--1 for each party-->  
    <RoleName>rosettanetseller</RoleName>
    <RolePlayer>IBM</RolePlayer>
  </RoleDefn>
</Role>
```
**Action Examples**

Actions in a TPA are defined by the business application, not mandated by the TPA standard.

- **Actions in a procurement TPA**
  - Process purchase order
  - Modify purchase order
  - Cancel purchase order

- **Actions in an airline reservation TPA**
  - Reservation request
  - Modify reservation
  - Cancel reservation
  - Confirm reservation
Elements of Action Definition

- Request name
- Request message (schema)
- Delivery channel
- Reply name
- Exception reply name
- Maximum allowed service time
- Sequencing rules
Action Definition

<Action>
  <Request>
    <RequestName>processOBIPOR</RequestName>
    <RequestMessage>OBIPOR</RequestMessage>
    <Channel ChannelID="name" />
  </Request>
  <Response>
    <ResponseName>name</ResponseName>
  </Response>
  <ExceptionResponse>
    <ExceptionResponseName>name</ExceptionResponseName>
    ...</ExceptionResponseName>
  </ExceptionResponse>
  <ResponseServiceTime>
    <ServiceTime>time</ServiceTime>
  </ResponseServiceTime>
  <Sequencing>
    ...
  </Sequencing>
</Action>
Sequencing Rules

- Directly under Service Interface tag

```xml
<StartEnabled>
  <RequestName>action_name</RequestName>
  <!--one for each action allowed as initial action-->
</StartEnabled>
```

- Inside Action Definition

```xml
<Sequencing>
  <Enable>  <!--actions permitted after this one-->
    <RequestName>name_of_action</RequestName>
    <!--one or more-->
  </Enable>
  <Disable>  <!--actions not permitted after this one-->
    <RequestName>name_of_action</RequestName>
    <!--one or more-->
  </Disable>
</Sequencing>
```
B2B Integration Framework and TPAs

Set I’

Local Business Processes

Workflow

ERP Packages

Business Applications

Rules

Code

Registration

Tools

'The Helpers'

Application Interfaces

Parsers

Security Handlers

Encoders

Sensitive

Application Interfaces

Registration Database

Executable Files

Run Time

BPF Manager

Document Exchange

Runtime Services

Logging

Document Repository

Network

Sub Contractors

'Inbound' Request/Replies

'Outbound' Request/Replies

TPAs

XML

Registration

Tools

Authoring Tool

Generation Tool

(c)

(c)

Run Time

HTTP

SMTP

MQSeries

EDI

Network

Network
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- Dynamic eBusiness
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Vision of Spontaneous e-Commerce

Locate services provided by other businesses, create agreement and invoke services

- Quick and easy business-to-business integration
- Dynamic business processes
  - partner discovery and selection, negotiation of terms & conditions, contracts, connectivity set-up, order/message flow, fulfillment...
Universal Description, Discovery, and Integration: UDDI

- UDDI spec. released Sept. 6/00 by Ariba, IBM and Microsoft
- UDDI provides Web-based registries for business description, discovery and interfaces
  - White Pages: Business name, text description, contact info. (names, phone #, Web sites, etc.), identifiers (e.g. DUNS number)
  - Yellow Pages: Business categories; 3 taxonomies in V1,
    - Industry: NAICS (US Govt.), Prod./Svc.: UN/SPSC (ECMA), Location
  - Green Pages: Business services, service descriptions, binding info.
    - tModel provides reference to info. on spec. of interface
    - tpaML template could be a tModel for B2B service
  - UDDI API provides functions for registering and finding information
    - SOAP messaging over HTTP used to access UDDI service
**Automatic Contract Enabling System (ACES)**

**ACES Objectives**

- Definition of automated contracts
- Registration and discovery of partner profiles
  - Could be done using UDDI
- Negotiation of contract
  - Protocols, business parameters
- Tools/infrastructure
  - Automate contract setup process
TPA/Service Negotiation Prototype:
Remote partner registration

1. TPA/service template creation/setup
2. Service advertisement/discovery
3. TPA/service negotiation
4. TPA/service agreement submission/approval/registration/instantiation
5. Execution of B2B process
Summary and Conclusions

- A large number of B2B conn. protocols emerging
  - EDI, OBI, RosettaNet, SOAP, ebXML, UDDI, Ariba punchout, Intelisys/OBI+, mySAP punchout, etc.
- Connectivity becomes complex to implement
  - Supplier connectivity to marketplaces, marketplace-to-marketplace connectivity, exchanges
- These Protocols can be composed, specified and quickly implemented using tpaML
  - tpaML is being standardized under ebXML
- Dynamic eBusiness is emerging as a new paradigm
  - B2B specification, discovery, negotiation, and set-up for "spontaneous" connectivity