ebXML, Web Services and e-Commerce Standardization

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Outline

- Web page and XML
- E-commerce infrastructure
- Standardization bodies
- ebXML & Web Services
- Project Phoenix in HKU
- e-commerce Trends
How does the Web work?
Established in January 2002, the Center for E-Commerce Infrastructure Development (CECID) conducts e-commerce research and development with the vision of helping Hong Kong increase its competitiveness in the international arena. The mission is achieved by:

- Developing e-commerce enabling technologies
- Supporting local e-commerce standardization
- Participating in international e-commerce initiatives, and
- Transferring e-commerce technology, knowledge and skills to the community.

Our current R&D initiative is Project Phoenix. In January 2002, the Government's
<html>
<head>
<title>CECID – About CECID – Overview</title>
<meta http-equiv="Content-Type" content="text/html; charset=big5">
<link rel="stylesheet" href="script/layout.css" type="text/css">
<script src="script/util.js"></script>
</head>
<body marginwidth="5" marginheight="5" topmargin="5" leftmargin="5">
<table width="760" border="0" cellspacing="0" cellpadding="0">

Web – A Computer Human Interface

- Browser present a HTML file to the human user
Limitation of Web Page (HTML)

<HTML>
<body>
<h1>News Headlines</h1>
<br>
<ul>
<li> Hong Kong Government releases new policy to rescue real state market</li>
<li> Hang Seng Indice up 300 points</li>
</ul>
</body>
</html>

- Not for computer to computer interface
- Cannot be understood by a general computer program – no semantic
XML (eXtensible Markup Language) is a meta-language standard.

Use to describe the contents (meaning) of a document that have a structure.

Is XML a SOLUTION or another PROBLEM?

Likely a problem than a solution for most of us !! (one of two most important inventions for IT workers)
An email to Amazon

Title : Crossing The Chasm
Author : Geoffery A. Moore
Publisher : HarperPerennial
Copy date : 1999
Retail price : US$ 16.00
Publisher description : This is the best book in high-tech marketing

- This text file can’t be understood by a computer. (It is just a string of characters -- no meaning to the machine.)
Another email to Amazon

<book>
  <title>Crossing The Chasm</title>
  <author>Geoffery A. Moore</author>
  <publisher>HarperPerennial</publisher>
  <copydate>1999</copydate>
  <retailprice>US$ 16.00</retailprice>
  <publisherdescription>This is the best book in high-tech marketing.</publisherdescription>
</book>

- This email can be understood by a computer software. (Semantic defined by the vocabulary.)
XML – Technical Features

- A set of tags (elements), e.g., `<event>`, `<topic>`, `<date>` ......

- A particular XML file may have a DTD (schema) to define the hierarchical relationships between the tags (regular expression)
  - An `<event>` has (children)
    - `<event_name>`
    - `<topic>`
    - etc ..................
  - A `<speaker>` has (children)
    - `<name>`
    - `<organization>`
    - etc ..................

- An XML file is **well formed** (valid) if the tags are paired up properly
An XML Document

<event>
  <event_name>Component-Based Development and Web Services Symposium</event_name>
  <topic>ebXML, Web Services and e-Commerce Standardization</topic>
  <date>19-Nov-2002</date>
  <start-time>9:40am</start-time>
  <end-time>10:40am</end-time>
  <venue>Pacific Place Conference Centre</venue>
  <speaker>
    <name>Dr. David Cheung</name>
    <organization>
      <org_name>CECID, HKU</org_name>
      <title>Director</title>
    </organization>
    <organization>
      <org_name>CSIS, HKU</org_name>
      <title>Dr.</title>
    </organization>
  </speaker>
</event>
**XML – Semantics**

- An XML file contains self-descriptive data.
- The meaning of the value attached to a tag can be understood by a machine if the vocabularies have been given to the machine.
- Program can be written to interpret the value following a tag accordingly.

  - e.g. `<topic>The Role of ebXML</topic>`
  - (a program can extract the topic if it was told about the vocabulary `<topic>`)
**Technical Assessment**

- XML is machine understandable (HTML is not)
- Good for modeling hierarchical structured data
- Useful for defining data exchange (machine to machine) specification
- Overhead higher than conventional data processing (use it at your own risk!)
E-Commerce Infrastructure

- Benefit of B2B E-Commerce

- UN 2001 Report on E-Commerce - B2B can bring in 2% - 29% of cost saving to different businesses
- faster transactions & competition
What are the main B2B E-Commerce functionality?

- exchange business documents (data integration)
- execute business process to control the exchange (process integration)
1st Generation e-Com Infrastructure

- EDI (Electronic Data Interchange)
- Designed over 25 years ago
  - EDIFACT was standardized by UN
- Use Value-Added Network (VAN)
  - Not on Internet
  - Expensive, limited coverage
- Compact data format to reduce bandwidth utilization
  - Difficult to write programs to process cryptic EDI messages
- Only large companies can afford and benefit
  - Only 2% of the companies in the world use EDI
Sample EDI Message

ISA*02*SW404*00**ZZ*ABCINC*02*CN
*000831*1020*U*00306*0075732*0*P*> 
GS*AL*ABCINC*CN*000831*1020*1195*X*004010
ST*998*011950001
ZD*404*0229643*ABCU*231704*21146096*000831*
CA*ABCY
SE*003*011950001
GE*1*1195
IEA*1*0075732
What is e-Com Infrastructure?

- A set of traffic rules for document transportation on open network (Internet)
What is e-Com Infrastructure?

- a set of content description standard in XML

The University of Hong Kong
Center for E-Commerce Infrastructure Development (CECID)
Department of Computer Science and Information Systems
The University of Hong Kong
Phone +852 28592180   Fax +852 25598447

To: ABC Company

Date: 30-Oct-02

Attn: May Chan
Ship Via: -
Tel: 2135 5656
Fax: 2689 2623

CIF/FOB: -
Credit Terms: 30 Days

Buyer: -

PO No: PO12345
Date: 30-Oct-02
Ship Via: -

CIF/FOB: -
Credit Terms: 30 Days

Buyer: -

Shipment to be made no later than date required shown below, otherwise we reserve the right to cancel without penalty.

Please invoice to: Center for E-Commerce Infrastructure Development (CECID) Do not deviate from this order in anyway without our permission.

Date: 30-Oct-02
Delivery Date: 30-Oct-02

Authorized Signature
Vendor Signature and Date

PO: PO12345

Website Name

Authorized Signature

Authorized Signature
2nd Generation e-Com Infrastructure

- Run on Internet
- Messaging Protocol Standardization (data integration)
  - a set of traffic rules for document transportation
  - reliable delivery (once & only once)
  - non-reputable (digital signature)
- Content Format Standardization
  - XML based
  - Industry based vocabulary
- Business Process Standardization (process integration)
- Merits
  - Open standards provide interoperability opportunity
  - Open standards bring in competition, drive down cost and open up market
Popular e-Com Standards

Message Protocols:
- Web Services
- ebXML

Content standards:
- RosettaNet: electronic components
- HL7: health care
- NewsML: news media
- XBRL: financial reporting
- etc
Standardization Bodies

- **W3C : World Wide Web Consortium**
- **Background :** Founded by Tim Bernes-Lee in 1994 in MIT
- **Mission :**
  “By promoting interoperability and encouraging an open forum for discussion, W3C commits to leading the technical evolution of the Web ..”
- **Developed over 40 specifications for the Web’s infrastructure in the last seven years**
W3C in 7 points

1. Universal Access: To make the Web accessible to all
2. Semantic Web: To share knowledge on the Web such that computer can understand
3. Trust: To consider novel legal, commercial, and social issues raised by this technology such as XML signatures
4. Interoperability: design open (non-proprietary) standardized computer languages and protocols to avoid the market fragmentation, through consensus.

5. Evolvability: strive to build a Web that can easily evolve (at least technically) into an even better Web.

6. Decentralization: no central control; flexibility is the necessary companion of distributed systems.

7. Cooler Multimedia!
W3C’s orientation

1. One of the most influential bodies
2. More technical oriented than many other standardization bodies
3. More academic pursuits
4. Support from academics and industry alike
5. Very committed to Open Source software
6. Web + XML are the key focus
7. All angle applications – not just e-commerce
Standardization Bodies

- OASIS: Organization for the Advancement of Structured Information Standards

Background:
- Founded in 1993 under the name SGML Open
- Changed to OASIS in 1998 to reflect an expanded scope of technical work, including XML.

Mission:
- “a not-for-profit, global consortium that drives the development, convergence and adoption of e-business standards”

- Developed over 35 e-business related standards
- Has more than 500 members (corporations & individuals) from 100+ countries
OASIS technical work in 4 categories:

- **Vertical industry applications**: develop applications of XML, such as schemas/DTDs and style sheets for specific vertical industries.

- **Horizontal and e-business framework**: specifications for building systems for the exchange of business information.

- **Interoperability**: specifications and standards that define how other standards can work in an XML world.

- **Conformance testing**: test scenarios and cases that can determine the conformance to a standard.
OASIS TC Processes

OASIS technical committee 6 processes:

- **Open** TC open to all OASIS members, and the archives are visible to the world.
- **Accountable** TC ensures a formal audit trail
- **Democratic** TC process encourages consensus but retains traditional democratic processes for resolving conflicting
- **Flexible** TC process allows multiple entry and exit points as well as flexibility in deliverables
- **Scalable** TC process is designed to handle any number of technical efforts through a bottom-up approach.
- **Language Neutral** TC may work in a language that best suits the needs of its members
OASIS Standards

- **ebXML (e-business XML)**: a global framework for e-business exchange
- **UDDI (Universal Description, Discovery and Integration)**: for web services directory
- **LegalXML**: legal documents markup language
- **SAML (Security Assertion Markup Language)**: XML-based security standard for exchanging authentication and authorization information
- **UBL (Universal Business Language)**: a standard library of XML business documents (purchase orders, invoices, etc.)
- **XML.org**: clearing house for XML standards
OASIS’s orientation

- More e-business oriented than many other standardization bodies
- One of the most influential bodies in e-business
- Very strong support from the industry
- A very effective process in developing standards
- Growth rate: 150% in 2001 on memberships
A Practical Solution - ebXML

- We need something similar to EDI on Internet
- ebXML (electronic business XML) rises on the successful experience of EDI – to develop a low cost data exchange solution on the Internet
- purchase order, delivery notes now can be defined in XML format (no cryptic EDI format)
- Backed by UN/CEFACT & OASIS
- Strong EDI background - use similar business model
Sponsored by UN/CEFACT

- ebXML spec were released by UN/CEFACT and OASIS in May 2001
- United Nations Center for Trade Facilitation and Electronic Business
- Sets worldwide policy and technical development in trade facilitation and electronic business
- Developed international EDI standard, UN/EDIFACT
  - one of only four international bodies able to set standards
Sponsored by OASIS

- World’s largest independent, non-profit organization dedicated to the standardization of XML applications (Organization for the Advancement of Structured Information Standards)
- More than 200 member companies plus individuals (IBM, Microsoft, Sun, Ariba, CommerceOne, BEA, .....)
- Operates XML.ORG Registry, the open community clearinghouse of XML application schemas
- Standards being developed by Technical Committees and reviewed by voting members
- A proposal requires at least 10% supporting votes from the members
ebXML Business Process Model

Profile of Company A

Profile of Company B

Registry

Profile of Company B

Company A

Collaboration Protocol Agreement (CPA)

Company B

Transport, Routing and Packaging of Business Documents
ebXML and business processes

- Many “good practices” have been developed in the EDI experience – need to capture and share among businesses
- ebXML has a standard to specify Business Processes (BPSS)

```xml
<BusinessTransaction name="Create Order">
    <RequestingBusinessActivity name=""
        isNonRepudiationRequired="true"
        timeToAcknowledgeReceipt="P2D"
        timeToAcknowledgeAcceptance="P3D">
        <DocumentEnvelope BusinessDocument="Purchase Order"/>
    </RequestingBusinessActivity>

    <RespondingBusinessActivity name=""
        isNonRepudiationRequired="true"
        timeToAcknowledgeReceipt="P5D">
        <DocumentEnvelope isPositiveResponse="true"
            BusinessDocument="PO Acknowledgement"/>
    </RespondingBusinessActivity>
</BusinessTransaction>
```
**ebXML vs EDI**

**ebXML**
- V1 specs finalized in May 2001
- Runs on the Internet
  - Economical, worldwide coverage
- E-documents in XML
  - Powerful in describing data
  - Rich software support with lots of open-source tools available
- An emerging standard
  - Can scale up for large corporations for advanced commerce automation
  - Can scale down for SMEs for basic commerce
- Need to create schema

**EDI**
- Designed over two decades ago
- Runs on private VAN
  - Expensive, limited coverage
- Messages in very compact form
  - Saves bandwidth
  - Difficult to program because of lack of software support
- Popular in large corporations
  - SMEs cannot afford costs and IT expertise
What is Web Services?

- Application to application requests and responses over the web stack
  - SSL
  - HTTP/SMTP/...
  - XML
  - SOAP
  - ebXML/UDDI
- Registry
- RPC vs Business Messaging Integration
- all loosely coupled...
Web Services Operation Flow

1. Publish

2. Find Service

3. Service Information Response

4. Bind to Service

5. Use Service

Service Requestor
Company A

Service Registry

Service Provider
Company B
RPC-based Web Services

- Implemented using a stateless session EJB.
- Appears as a remote object to the client application.
- The interaction centers around a service-specific interface.
- Tightly coupled and resemble traditional distributed object paradigms, such as RMI or DCOM.
- Synchronous, meaning that when a client sends a request, it waits for a response before doing anything else (RPC-based).
Message-based Web Services

- Loosely coupled and document-driven
- Client invokes a message-based Web Service by sending it an entire document, such as a purchase order, rather than a discrete set of parameters.
- The Web Service accepts the entire document, processes it, and may or may not return a result message.
- Promotes a looser coupling between client and server and provide additional benefits beyond RPC-based Web Services
- ebXML is a message-based WS
Protocols for Web Services

- Simple Object Access Protocol (SOAP)
  - W3C XML Protocol WG – SOAP v1.2
- Web Services Description Language (WSDL)
  - WSDL v1.1 (IBM & MS) W3C Note Mar. 2001
  - W3C WS Description WG started Jan. 2002
- Universal Description, Discovery and Integration (UDDI)
  - UDDI.org v2.0 specification June 2001
- Supported by bizTalk, Websphere, etc.
ebXML vs Web Services

- ebXML is one of the earliest adoptions of Web Services (SOAP, WSDL, UDDI...)
- ebXML implements features that basic Web Services lack for business applications
  - Secure communication
  - Reliable messaging
  - Messaging choreography for business process execution
  - Reusable core components for business data (which has become UBL’s focus)
  - Interoperability and conformance specifications
Project Phoenix –
Establishment of an ebXML Software Infrastructure in Hong Kong


Project Coordinator: Dr. Francis Lau
Principal Investigator: Dr. David Cheung
Project Manager: Mr. Thomas Lee

Amount: HK $9.5M from ITF
Total Funding: $10.7M
Collaborators

- MTR Corporation Limited
- Hong Kong Air Cargo Terminals Limited
- Saggio (Asia Pacific) Company Limited
- The Hong Kong General Chamber of Commerce
- Hong Kong Article Numbering Association
- E1 Media Technology Limited
- IBM China/Hong Kong Limited
Infrastructure Deliverables

- **ebXML Registry**
  - To establish an ebXML Registry for pilots
  - OASIS Registry V2 Reference Implementation completed – demo on JavaOne Expo in March

- **ebXML Business Router**
  - A technology for companies to execute business processes

- **ebXML API Library for developing applications**
  - E.g. ebXML Message Services Handler
  - Opensource ebXML spec implementations
Application Deliverables

- **ebMail**
  - A simple ebXML application for SMEs to exchange business documents using e-mail on the Internet

- **Pilot Applications**
  - **B2B Pilot**
    - e-procurement automation between Saggio and MTRC
  - **B2G Pilots**
    - With Dept of Health: prototype system for pharmaceutical product import / export licensing
    - With Marine Dept: submission of dangerous goods manifests in XML messages
E-Procurement Pilot

- Between MTRC and its supplier Saggio
- To enable Saggio to electronically send delivery notes, statements, and invoices to MTRC
- To automate the current manual reconciliation of delivery and statement records in MTRC
At each month end, Saggio sends the monthly statements and invoices to Financial Control. The monthly statements and invoices will be batched by Property Management and Railway Operation.

Financial Control distributes the monthly statements and invoices to Cost Centre heads. Also, a reconciliation between the monthly statements and invoices is required by Financial Control.

Cost Centre Head/Delegate checks the monthly statement.

Cost Centre Head/Delegate follows up with Saggio for revision of statement if there is any discrepancy found in the statement.

Cost Centre Head endorses/verifies authorizes the statement and forwards it to Financial Control.

Financial Control creates a non-order invoice, consolidated by the total amount of statement, in Accounts Payable.

### Semi-electronic procurement

### Full-electronic procurement
**Current Process**

- MTRC has >200 offices
- Users purchase office supplies on SaggioDirect Website
  - SaggioDirect provides MTRC with a full-featured procurement system (e.g. procurement authorization, costing analysis...)
- Each delivery is with a paper delivery note
- At month ends, Saggio mails to MTRC paper invoices and statements
- Resource-consuming manual reconciliation is required at MTRC
Automated Process in Pilot

- Saggio sends electronic purchasing documents to MTRC using ebXML message service
  - An XML delivery note at every delivery
  - XML invoices at month ends
- MTRC stores procurement data for
  - Automatic reconciliation
  - Customized data analysis
1. MTRC users place an order through SaggioDirect.com
2. Saggio delivers goods to MTRC
3. Saggio prepares invoice related documents in XML format
4. Saggio sends XML documents
5. MTRC receive XML documents
6. MTRC process XML documents and stores data into database
7. MTRC users can check data through Intranet application
A shipping company should submit a Dangerous Goods (DG) Manifest >48 hours before the arrival of the vessel.

The manifests will be scrutinized and acknowledged by fax within the next working day of submission.

Paper-based and Web-based submission.

Web submission launched since 1998.

~4600 submissions per month.

95% of submissions already use Web.
XMLDG Project

- Facilitates shipping companies to automate submission of DG Manifests to Marine Dept in form of XML messages
- DG messages will be sent from shipping companies to Marine Department using the ebXML messaging service protocol through the Internet
- **International Marine Organization (IMO)** recommends EDI or XML
1 Paper submission

2 Web submission

3 XML submission

Shipping Company

Marine Dept

ebXML Message Packaging Library

ebXML Message Service

over HTTPS
www.freebXML.org

- Pronounce as free-b-xml
- A site to provide free sharing of ebXML products – open sources
- Supported by more than 10 international vendors and organizations – e.g. Sun Micro, Sybase, Cyclone, XML Global, Fujitsu etc..
- More than 22 countries has download our software
- User communities being formed
Trends

- Open & Standardized Data Format
  - open standardized data format will start out in B2B interoperability requirements
  - from vertical industries to horizontal (e.g. UBL)
  - anti proprietary data format movement appearing from alliance of governments and users
  - even basic office-type software products may need to handle open standardized data format
  - Excel can be converted to XML
**Trends**

- Open source software will become production grade
  - OSS go beyond Linux and Apache - MySQL becomes standard of OSS database product
  - Open standards and open source go hand-in-hand
  - OSS e-commerce products could be a norm
  - In 10 years, 80% of software will be OSS
  - A recent report from Mitre confirms FOSS contribute positively to DOD’s software reliability (115 FOSS applications in DOD)
  - Many OSS licenses allow other parties to make profit by provide added value products and software
Trends

- A few open & standard business exchange protocols will co-exists
  - Web Services
  - ebXML
- A few standard business process specification languages will emerge and will be interoperable
  - BPSS
  - BPES4L
**Trends**

- Vendor will compete on how “open” their software are
  - export/import standardized data
  - compatible to multiple messaging standards
  - can run different business process specified by different standards
- B2B e-commerce will become reality in a few years and change business flow and hence user behavior on both ends
- Competition will drive down software cost; major expenses will be on services
Thank You

and

Q & A