HKSAR Government Site Visit to Center for E-Commerce Infrastructure Development (CECID)

Organized by OGCIO
8 June 2007

Professor David WL Cheung
Director, CECID
Head, Dept. of Computer Science

OASIS Member
RosettaNet Partner
ebXML Asia Committee
Center for E-Commerce Infrastructure Development

HKU E-Commerce R&D Center established since 2002

To create an infrastructure and environment that allows e-commerce to pervade large and small businesses through technology innovation, industry collaboration, and knowledge cultivation.

HK$40M Innovation and Technology Fund

- ebXML HK$9.5M
- Interoperability HK$14M
- SOA HK$9.2M
- Web 2.0 HK$1M
- eLogistics Appliance HK$6M
- Industry Sponsorship

Making e-commerce everyday commerce Center for E-commerce Infrastructure Development
Awards

Linux Business Award 2005
Asia Pacific ICT Awards 2004
6th HKCS IT Excellence Awards
ebXML Asia Interoperability Certificate
Hermes Users (Local)

- HKSAR Government (G2B document submission)
  - Dangerous Goods Manifest Submission (Marine Dept)
  - Notifiable Infectious Disease Information Messaging System (Health Dept)
  - E-Government Infrastructure Services (EGIS) (OGCIO)
  - Vehicle Insurance Data Exchange for License Renewal (Transport Dept)
  - T21 Contract Staff Administration System (OGCIO)
- MTRC (HK major subway operator)
- bigBOXX.com (office supplies vendor)
- OOCL (international shipping company)
Hermes Users (Overseas)

- NetBay (Thailand)
- Spherion Technology (IT consulting in Australia/partner of Telstra)
- Tedis (IT consulting Australia)
- US National Institute of Health (NIH)
- Viatel (partner of British Telecom)
- Deutsche Betriebskrankenkasse (German health insurance company and its 15 partners)
Global Penetration

Recorded over 13,000 downloads from 80+ economies
Submission of Dangerous Goods Manifest

1. Paper submission
2. Web submission
3. ebXML submission over HTTPS or VPN

Shipping Agent
B2B Connector
Internet
Hermes MSH
Marine Dept
E-Gov Infrastructure Services (EGIS)

Benefits to Society & Scale of Deployment

OGCIO
Dept B
Dept C

HKSARG OGCIO

Web Services
Hermes / ebXML

e-Government Infrastructure Service (EGIS)

Recruitment Agencies
Insurance Companies
Shipping Agents
Clinics

Other products

Making e-commerce everyday commerce Center for E-commerce Infrastructure Development
XML Schema Design and Management Guide

- XML schema modeling methodology for developing e-govt applications
- Based on ebXML Core Components & UBL approach
- Standardized Common Schemas
  - person’s name, HKID#, address, etc.
- Central Data Registry
  - www.xml.gov.hk
- Part of the government Interoperability Framework
- One of OASIS eGovernment best practices
  - http://egovernment.xml.org
1. Purchase on web

2. Office supplies goods

3. Electronic invoice

4. Auto reconciliation

- Intranet System
- Hermes ebMS Gateway
- ebXML Messaging Service
- Procurement Website
- Hermes ebMS Gateway
- MTR Corporation

Making e-commerce Innovation Center for E-commerce Infrastructure Development
Digital Trade & Transportation Network

The DTTN

- Electronic message transformation services
- Data inheritance services
- Information security services
- Portal services
- Statistical and analytical reporting services
- Electronic message routing services

- Inspection agencies
- Banks and financial institutions
- CargoSmart
- GT Nexus
- Bolero

- Freight forwarders
- Government & its agencies
- Sellers/exporters
- HK SAR
- Overseas

- Insurance companies
- Terminals
- Buyers/importers
- Air
- Sea
- INTTRA
- Tradalink
- TradCard

- Carriers
- Sea
- Air
- Truckers
- Rail
- Other service providers
Thank You

Prof. David Cheung
dcheung@cs.hku.hk
http://www.cecid.hku.hk
B2B Connector
Information Exchange Device

CECID

OASIS Member
ROSETTANet Partner
ebXML Asia Committee
Challenges

- Specific delivery mechanism
- Automation
- Large file transfer
Specific Delivery Mechanism

Reason:
- Ensure messages are sent reliably and securely

Solution:
- B2BC is capable to send ebMS and AS2 messages.
E-Government Infrastructure Service (EGIS)
T21 Contract Staff Administration System
Typical Implementation

- Setup environment
- Deploy ebMS server
- Develop program in sending ebMS message
**T21 Implementation**

- **Deploy B2B Connector**

Diagram showing the flow of information from OGCIO CSAS Server Application to T21 Contract Supplier via B2B Connector.
Automation

Reason:
- Reduce manual error
- Streamline business process

Solution:
- B2BC can work in peer to peer mode
- Shared folder on B2BC allow easier integration
Large File Transfer

Reason:

- Allow file exchange that is too large to send as email

Solution:

- SFRM (Simple File Reliable Messaging) to the rescue
There's more from B2BC

- Setup Wizard
- Multiple Message Protocol
- Document Conversion
- Integration Interface
- E-certificate Management
- System Update and Backup
- And much more …
Improving Data Interoperability/Quality in e-Business Collaboration

Wellwin Kwok
Chief Technology Officer, CECID
Agenda

- 10 minutes on Enterprise Information Architecture
- Case Sharing
**Importance of Information**

- Important asset – presents strategic values in supporting business objectives
- Expansion, Mergers and Acquisitions, Join-up Services ➔ information consolidation
  - reduce business costs in different operations
  - speed up business response and time-to-market
- Different hierarchy levels have different information views but
  - understanding in all levels must align with business strategies
  - view in lower level must be projected to support those views in upper levels

![Information Hierarchy Diagram]

- Strategic
- Tactical
- Operational
Typical Integration Problem – Data Spaghetti

Ad hoc and peer-to-peer data mappings

Ref: “Leveraging Enterprise Information Model in a Heterogeneous Environment”, CECID
Need Information Architecture

- **Quality**
  - Top down and holistic view of enterprise information architecture
    - c.f. individual & non-interoperable views by uncommunicated teams
  - Alignment with business need
    - c.f. minor untracked tunings by programmers

- **Reusability**
  - Reusable & documented understanding in information
    - reduce learning curve & misunderstanding due to ambiguity of multiple sources
  - Reduce redundancy
    - reduce mistakes due to integrity problem

- **Maintainability**
  - Factored models ensure consistent propagation of changes, e.g. change in length or format in phone numbers
Enterprise Information Architecture (EIA)

An integrated set of:

- methodologies
- software tools
- information patterns
- documentations

To complement traditional technique such as Entity-Relationship (ER) modeling
To provide a high-level view of business activities
To identify the information needs that align with the business strategies
Deliverables

- To support the development of business systems and applications
  - A centralized enterprise information architecture
    - to project a holistic view of an enterprise
  - Documentations of information models
    - to facilitate easy and harmonized business understanding
  - Technical artifacts, e.g. document schema
    - to facilitate business systems development
Enterprise Information Architecture
Step-by-Step

- Business Process Analysis
- Business Information Analysis
- Enterprise Information Model Design & Development
- Message Design & Development
- DB schema
- Information Model and Data Component
- XML Schemas & Documentation
- doc
- XSD
A Neat and Controlled Way

HRMS → Billing System → Provisioning System → POS System

Finance & Accounting System → Data Warehouse

CRM Tool → Data Warehouse

cf.: peer-to-peer mapping complexity in Data Spaghetti
Airport Authority initialized an AODB (Airport Operation Database) Revamp Project

Data exchange through database tables
Objectives

- Build an information hub so that different parties can integrate the same set of enterprise information models using Web Services
- Real-time data update among Airport Authority and its external business parties
- XML Schemas to be designed
Scope

- Information exchange among 18 external parties
- ~120 database tables analyzed
- Meetings for review and clarification of requirements and data models
- Knowledge transfer
- Completed in 4 man-months
- 2.5 months in elapsed time
The centralized enterprise information model provides a common business understanding to all business parties and thus minimize the ambiguity during integration.

Reduce the data mapping work from one system to all the others and thus speed up the information update.

Difficulties:
- Uncertainty in model design
  - lack of supporting documents for the database
  - lack of documents of how data is access by external business parties
- Uncertainty in data requirements from users
Case Sharing 2

Enterprise Application Integration
Case Background

- A mobile phone operator with numerous system improvement projects for daily operations, e.g. CRM, Accounting, Data Warehouse
- Enterprise Application Integration (EAI) initiative, e.g. how to integrate 2G and 3G billing information into a single bill
Objectives

- To build a well-designed enterprise data architecture that enables scalable EAI initiatives.
- Building an enterprise data model is one of the keys in the architecture to achieve data quality, reusability and maintainability.
Scope

- 93 database tables from multiple systems
- 8 interfaces for information exchange
- Definitions and relationships of databases in 3 other systems referenced
- Standards in the telecommunications industry, Shared Information/Data Model, referenced
- Knowledge transfer
- Completed in 10 man-months
- 3 months in elapsed time
Business Benefits

- Align the business understanding of information among the stakeholders of different systems
- Speed up the integration and thus lower the cost by reusing information models developed
- Information models consistently evolved and maintained across different business units to reduce redundancy

Difficulties
- The understandings of business information among different stakeholders are often different
- Harmonization of information requirements from different teams take ample time
Case Sharing 3
Content Standardization
A leading marketing arm in HK providing global services to facilitate trade opportunities

Business Challenges

Data Quality
- Arbitrary textual description of product/company
- Difficult to categorize the product, e.g. is a MP3 playing watch a watch or a MP3 player

Data Interoperability
- Thousands of data systems across different regions ➔ lack of a holistic view of business information
- Incompatible data formats and meaning
Objectives

- Establish information standard for product specification and company profile for different trading categories
- Better indexing and searching of products and companies information
Scope

- Analyze 24 business documents
  - Advertisement submission form
  - Sample web pages of product specification and company profile
- Refer to about 20 other sourcing and online shopping websites
- Training session
- Completed in 3 man-months
- 1.5 months in elapsed time
Business Benefits

- Improvement in data quality
  - Re-align inaccurate data fields in paper form or uploaded files with the designed data models
    - format restriction enforced
    - consistent business understanding
  - More appropriate company and product attributes to be indexed and thus improved search precision
- Reuse of data models to design other business data with more strategic values
  - Save cost from repetitive effort while data quality is still ensured
- Market Discovery is much improved by providing a more effective search buyer-supplier matching
Concept of SOA
Let’s say we are doing a study on the infrastructure of a Mobile Company
We maintain the **phone switch** and the **call log**. Every time our customer makes a call, our network base station will connect to the phone switch and request for a switch connection. That part is quite hardware related, and our work is to write a **custom C program** and deploy to the phone switch operating system. Every time the phone switch open or close a connection, it will call our C program, so that we can **check the access right, log down the call information** (e.g. the caller's number, the callee's number, the duration of the call, etc.) to our specially designed database.
We maintain the billing system. Every month, we issue statements to all our subscribers. It lists the service charge and usage report in the last month. There is a program written in PL/SQL, which runs once a month automatically. The program will do a processing job for each of the subscribers in the database. The process will look up the log database of the phone switch, compute the charge, and compile a usage summary for each subscriber. The processed result will be stored to the billing database. The process will also trigger the statement printer which will produce hard copies of the statement for sending out to the customers.
We maintain the **customer service system**. It is basically a **client server** system used only by the customer service representatives in the call center. The system is written using **PowerBuilder**. The customer service representatives will use the graphical user interface (**GUI**) of the client to **query subscriber records**, and **input requests from customers** (e.g. update address, request addition copy of statement, etc.). The GUI client will **connect to the database** of the billing system for reading the records, and **make updates** to the customer account database when needed.
Architecture

Billing

get subscriber info

retrieve bill

get call log

Phone Switch

Customer Account

get subscriber info

get call log

CS GUI
Tightly Coupled

- Internal implementation of one system affects all other systems
  - E.g. When the database schema of customer account changes, the CS GUI will be affected
- Business rule coupled with system design
  - E.g. The design of billing system highly depends on how the company manages the subscribers
Discussion

- How can we change the system if we want to send only one statement to each customer, instead of one per subscriber?
- How can we change the system if we want to display all related accounts in the CS system?
The Project

Billing

get subscriber info

retrieve bill

get call log

Customer Account

Phone Switch

get call log

CS GUI

get subscriber info
The SOA Way

CS GUI

Bill Generator

Billing

Phone Switch

Customer Account
SOA is a logical way of designing a software system to provide services to either end-user applications or other services distributed in a network through published and discoverable interfaces.

Observatory Service Bus

- Realization of basic SOA by delivering:
  - Technology neutrality
  - Loosely coupled service binding
  - Location transparency
Technology Development

Observatory Service Bus

- Extended SOA [1] support
  - Support aggregated service
  - Coordination
  - Monitoring
  - Conformance
- **Transaction support**
- **B2B extension**

### Observatory Service Bus

<table>
<thead>
<tr>
<th>SOA Requirement</th>
<th>OSB Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology neutrality</td>
<td>Support <strong>Process Agents (PAs)</strong> as agents to interact with divergent systems, either via in-process mode or out-of-process mode. Developed <strong>Service Assemblies</strong> to map PAs with logical names</td>
</tr>
<tr>
<td>Location transparency</td>
<td></td>
</tr>
<tr>
<td>Loosely coupled service binding</td>
<td>Support <strong>JBI API</strong> for service binding and consumptions</td>
</tr>
<tr>
<td>Support aggregated service</td>
<td>Devised <strong>RuleSet</strong> to represent bundled services</td>
</tr>
<tr>
<td>Coordination</td>
<td>Developed <strong>BP Tracking System</strong> to monitor and coordinate RuleSet execution; also the BP Tracking System will screen out non-conformant messages</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>Conformance</td>
<td></td>
</tr>
<tr>
<td>Transaction support</td>
<td>Support <strong>transaction</strong> in Process Agents</td>
</tr>
<tr>
<td>B2B extension</td>
<td>Integrated with <strong>Hermes</strong> to support B2B messaging</td>
</tr>
</tbody>
</table>
Mashing up B2B E-Commerce and Web 2.0
Findings from the research for Web 2.0 Report

Emphasis of Web 2.0

<table>
<thead>
<tr>
<th>Web 1.0</th>
<th>Web 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphic design</td>
<td>Usability</td>
</tr>
<tr>
<td>Navigation structure</td>
<td>Distribution media and channels</td>
</tr>
<tr>
<td>Information publishing</td>
<td>Service delivery</td>
</tr>
<tr>
<td>Content preparation</td>
<td>Content aggregation</td>
</tr>
<tr>
<td>Number of visits</td>
<td>Community base</td>
</tr>
</tbody>
</table>
Web 2.0 architecture

- Web browser on PC
- Web server
- File system

Web 1.0 architecture

Web 2.0 architecture

- Browser / Mobile device
  - Syndication
  - Web API
  - Web application
  - Application server
  - Database system
## Findings from the research for Web 2.0 Report

### Features of Web 2.0

<table>
<thead>
<tr>
<th>User behavior aspect</th>
<th>Architecture of participation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Personalization of web resources</td>
</tr>
<tr>
<td></td>
<td>Power of the <em>Long Tail</em></td>
</tr>
<tr>
<td>Software design aspect</td>
<td>Deployment of rich applications</td>
</tr>
<tr>
<td></td>
<td>Perpetual beta release</td>
</tr>
<tr>
<td></td>
<td>Syndication of information and services</td>
</tr>
</tbody>
</table>
B2B E-Commerce

- Security Problem
  - Authentication
  - Non-repudiation
  - Authorization
- Reliability (Once-and-only-once)
- Data Quality Problem
Technology Development

1. Findings from the research for Web 2.0 Report deliverable

2. RSS/ATOM and AJAX Extension Modules
   - Business Document Feed Publisher – Add security measures to RSS/ATOM
   - Business Document Composer – Add rich interface to web form filling