Invensys

PDM Integration with ERP

Case Study

OAG Meeting

April 2003
Agenda

• Information Highway overview
• Powerware PDM project case study
• Lessons learned
• OAG within Invensys
Information Highway Overview
Traditional Application Integration Approach

Knowledge Systems

- Customer & Supplier Access
  - CRM

- Project Engineering
  - Product Management

- After sales Parts & Support

- Performance Reporting / KPIs

- Market /Customer / Supplier Intelligence

Decision Support

Business Unit Transaction Systems

- BU SAP
- BU QAD
- BU Others
- BU BaaN
- BU BPCS

Technology Infrastructure / Data Centres

Systems are independent, not connected except by virtue of one-off interfaces
Definition/Scope of Information Highway

- “a set of technologies, practices, and standards that will enable the automated execution of business transactions and the collection and/or exchange of information”

  - **System-independent exchange of information**
    - Open, message-oriented communication channel for passing standards-formatted data between applications

  - **Automation of Business transaction information**
    - Standard message sets (OAGIS, etc.)

  - **Standard definition of data**
    - Invensys Data standards
    - Common master data to prevent redundantly maintained std data

  - **Collection of and access to information**
    - Facilities that permit the collection, integration, delivery and presentation of business information
Value Proposition

• Flexible architecture
  – Extensibility
    » Provides ability to add new functionality
    » Maintain backward compatibility
  – Open specifications
    » Adaptable and allows for future changes in technology
    » Application to application (A2A)
    » Business to business (B2B)
  – Plug and Play IT systems
    » Once integrated, systems plug into Information Highway
    » Reduced maintenance on interfaces
    » Provides a common framework / architecture for integration

• Incremental implementation
  – Doesn’t require ‘big bang’ approach
  – Standard methodology for integration
The Information Highway Solution

To cost-effectively integrate the islands of information resident in knowledge and business systems and make the resultant knowledge useable across Invensys.
Powerware PDM Project

- Objectives
- Business requirements
- OAG scenario
- Mappings
- Logical views
Objectives

• **PDM to ERP Application Integration**
  – Integration through the use of standard, application-neutral messages
  – Becomes part of the PDM to ERP implementation template

• **“Plug and Play”**
  – The ability to upgrade and/or replace an application without affecting existing integrations
    » Applications can be upgraded independently
    » Technology can be upgraded independently
  – Loosely coupled and asynchronous vs. highly coupled point-to-point
  – Publish and subscribe model where applications “subscribe” to information of interest
  – Leverage data standards (unit of measure, country, currency, etc.)

• **Reusability**
  – Once a particular application transaction/event is mapped to a standard message(s), it can be made available to any other application
  – Integrations can be reused on additional application instances
Business Requirements – High Level

• Integration of data between Baan PDM and ERP systems
  – Engineering Change Notice (ECN)
    » Item, Bill of Material, Approved Manufacturer List
  – Item
    » Standard costs, Actual costs
  – Bill of Materials

• PDM System
  – Baan PDM (Win NT) (Raleigh)

• ERP Systems
  – QAD MFG/Pro (HP/UX) (San Diego) – Initial
  – CA PRMS (AS/400) (Raleigh) – Future
## Business Process Scenarios

<table>
<thead>
<tr>
<th>Business Process Scenario</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP01</td>
<td>Transfer of Engineering Change Notice (ECN) data from the PDM system to backend ERP systems</td>
</tr>
<tr>
<td></td>
<td><strong>Business Object Document</strong>: Engineering Change Document</td>
</tr>
<tr>
<td></td>
<td><strong>Data</strong>: Item, bill of material (BOM), approved manufacturer list (AML)</td>
</tr>
<tr>
<td>BP02</td>
<td>Transfer of cost information from the ERP system to the PDM system</td>
</tr>
<tr>
<td></td>
<td><strong>Business Object Document</strong>: Item Master</td>
</tr>
<tr>
<td></td>
<td><strong>Data</strong>: Standard cost, actual cost</td>
</tr>
<tr>
<td>BP03</td>
<td>Retrieval of BOM information from an ERP system and the PDM system for the purpose of comparing the BOMs</td>
</tr>
<tr>
<td></td>
<td><strong>Business Object Document</strong>: Bill of Material</td>
</tr>
<tr>
<td></td>
<td><strong>Data</strong>: Bill of material list</td>
</tr>
</tbody>
</table>

- **Note**: Initial phase is focused on BP01
OAG 49 - Engineering Changes Scenario
# Mapping Requirements

<table>
<thead>
<tr>
<th>ID</th>
<th>Phase</th>
<th>Message</th>
<th>From</th>
<th>To</th>
<th>IH Scope</th>
<th>Extensions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>ECN</td>
<td>BaanPDM</td>
<td>Baan ECN XML</td>
<td>N</td>
<td>Y</td>
<td>ECO header; AML</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>ECN</td>
<td>Baan ECN XML</td>
<td>OAG ECN</td>
<td>Y</td>
<td>Y</td>
<td>Quantity; Reference Designator at Item level; AML</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>ECN</td>
<td>OAG ECN</td>
<td>EISPlus ECN</td>
<td>Y</td>
<td>Y</td>
<td>See previous</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>ECN</td>
<td>EISPlus ECN</td>
<td>QAD ERP</td>
<td>N</td>
<td>Y</td>
<td>AML processing</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>ECN</td>
<td>EISPlus ECN</td>
<td>PRMS ERP</td>
<td>N</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>ItemMaster</td>
<td>QAD ERP</td>
<td>QAD Item Temp</td>
<td>N</td>
<td>n/a</td>
<td>Need for intermediate file to be determined</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>ItemMaster</td>
<td>QAD Item Temp</td>
<td>OAG Item</td>
<td>Y</td>
<td>tbd</td>
<td>To be determined</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>ItemMaster</td>
<td>OAG Item</td>
<td>Baan Item XML</td>
<td>Y</td>
<td>tbd</td>
<td>See previous</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>BOM</td>
<td>QAD ERP</td>
<td>QAD BOM Temp</td>
<td>N</td>
<td>n/a</td>
<td>Need for intermediate file to be determined</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>BOM</td>
<td>QAD BOM Temp</td>
<td>OAG Item</td>
<td>Y</td>
<td>tbd</td>
<td>To be determined</td>
</tr>
<tr>
<td>11</td>
<td>3</td>
<td>BOM</td>
<td>OAG BOM</td>
<td>Baan BOM XML</td>
<td>Y</td>
<td>tbd</td>
<td>See previous</td>
</tr>
</tbody>
</table>

**Candidate OAG BODs:**

- Sync EngineeringChangeDocument
- Sync ItemMaster
- Get/Show BillOfMaterial
Engineering Change Notice (ECN) – Logical View

Baan PDM 6.1
Release ECN

Baan XML ECN
- ECO (header)
- E-Item Rev
- E-Item BOM
- AML

Adapter [PDM]
Receive Baan XML ECN
Transform
From: Baan XML ECN
To: OAG ECN
“Publish” to ECN topic
- QAD
- PRMS

OAG XML ECN
- ECN Header
- Part (Item)
- BOM
- AML (New Extension)
- Attachments

Raleigh

QAD ECN “App”
Get EISPlus flatfile
Import to QAD staging

QAD
ECN Stage Area

San Diego

EISPlus Flatfile ECN ECN
- Item (header)
- Item detail (BOM)
- Attachments
- AML (New Extension)
- Control/audit

Adapter [ERP]
“Subscribe” to ECN topic
Transform
From: OAG ECN
To: EISPlus flatfile ECN
“Post” to ERP ECN “directory”
- QAD
- PRMS

Publish / Subscribe
Item (Cost Data) – Logical View

Baan PDM 6.1
Update Cost Data

Baan XML
E-Item Rev
• E-Item Rev

AT Adapter [PDM]
“Subscribe” item cost topic
Transform
From: OAG Item Master
To: Baan XML E-Item Rev
“Post” to Baan PDM

OAG XML
Item Master
• Item header
• Item detail
- Actual cost
- Standard cost

Publish / Subscribe

Raleigh

QAD
Release Cost Data

QAD Query “App”
Query QAD cost data
Note: This may be a function of the adapter

QAD “Local”
Item Master
• Item header
• Item detail
- Actual cost
- Standard cost

AT Adapter [ERP]
Receive QAD “Local” format
Transform
From: QAD Item Master
To: OAG Item Master
“Publish” to item cost topic

San Diego
Powerware PDM Project

- SyncEngineeringChangeDocument extensions
- Implementation approach
SyncEngineeringChangeDocument Extensions

- **EngineeringChangeDoc**
  - No changes
- **Revised BOM**
  - Added
  » Attachments
SyncEngineeringChangeDocument Extensions (cont.)

- RevisedBOMComponent
  - Added:
    » Balloon Number
    » BOMQuantity
    » AML
    » Attachments
Implementation

• Phased approach
  – Point to point manual
    » Physical view
  – Point to point event driven
  – Pub/sub event driven

• Advantages
Phase 1 – Baan PDM 6.1

Baan PDM 6.1
Exporter
Baan XML

Baan PDM 6.1
XML Reader
XML Reader
XSLT
MQ Series PUT
MQ Series GET

FF Writer
MQ Series GET

FF Writer

QAD

PRMS

Current FF

Current FF

OAG XML

OAG XML

Invensys
Phase 1 – Baan PDM 6.1

1. ECN released
2. Baan PDM export initiated – MANUAL
3. Baan XML ECN generated into directory
4. Adapter reads Baan XML from directory
5. Baan XML transformation to OAG SyncECD
6. MQ Series “Put” from PDM adapter to ERP adapters
   1. Note: Initially, this is a point-to-point process
7. Adapter (QAD) receives (MQ Series “Get”) OAG SyncECD
8. Adapter transforms SyncECD to EIS Plus flat-file format
9. Adapter places EIS Plus format flat-file in QAD staging directory
Phase 1 – Baan PDM 6.1.x
Phase 2 – Baan PDM 6.2.x

Event driven
Phase 2 – Baan PDM 6.2.x

1. ECN released
2. Baan PDM export initiated – EVENT DRIVEN
3. Baan XML ECN generated into directory
4. Adapter reads Baan XML from directory
5. Baan XML transformation to OAG SyncECD
6. MQ Series “Put” from PDM adapter to ERP adapters
   1. Note: Initially, this is a point-to-point process
7. Adapter (QAD) receives (MQ Series “Get”) OAG SyncECD
8. Adapter transforms SyncECD to EIS Plus flat-file format
9. Adapter places EIS Plus format flat-file in QAD staging directory
Phase 3 – Information Highway Pub/Sub

Event driven

Baan PDM 6.1

HTTP Post

Baan XML

HTTP Listener

XSLT

JMS Post

OAG XML

QAD

Current FF

FF Writer

JMS Sub

Filter

OAG XML

PRMS

Current FF

FF Writer

JMS Sub

Filter

OAG XML

IH
Phase 3 – Information Highway Pub/Sub

1. ECN released
2. Baan PDM export initiated – EVENT DRIVEN
3. Baan XML ECN generated into directory
4. Adapter reads Baan XML from directory
5. Baan XML transformation to OAG SyncECD
6. JMS Post from PDM adapter to publish/subscribe broker
   1. ECN is published to appropriate topic
7. Adapter (QAD) subscribes to ECN events
   1. Based on appropriate filters
8. Adapter (QAD) receives OAG SyncECD
9. Adapter transforms SyncECD to EIS Plus flat-file format
10. Adapter places EIS Plus format flat-file in QAD staging directory
Phase 3 – Message Sequence Diagram

itemMaster/SBU1 [source="PDM1", sbu = "SBU1", ECN = "xxx"]

1. PDM
2. Contents Based Re-Pub
3. Add JMS Header
4. itemMaster/SBU1 [source="PDM1", sbu = "SBU1", ECN = "069xxx"]
5. itemMaster/SBU1 [source="PDM1", sbu = "SBU1", ECN = "CNECTxxx"]
6. itemMaster/SBU1 [source="PDM1", sbu = "SBU1", ECN = "9170xxx"]
Advantages

• Current ERP logic can be reused
  – Utilizes current “EISPlus” flat-file format and custom import applications for QAD and PRMS
• Framework is set to slowly migrate to the final vision, with minimal re-work
• All the parts exist today to achieve Phase 1
• Additional ERPs can be added without revisiting current integrations
Lessons Learned

• Mapping takes effort and requires a combination of:
  – Business domain knowledge
  – Application knowledge
  – Technical expertise

• Requirements are key to success
  – What is the “real” business process?

• Remain flexible
  – Requirements change
  – Environments change
OAGIS within Invensys

• **Internal**
  – Application integration (PDM, ERP, etc.)

• **External**
  – BaanERP “6”
    » Baan XML will utilize OAG core components
    » Flat structure that can be transformed to various standards
      – OAGIS, RosettaNet, etc.
  – Avantis Asset Management
    » OAGIS 7.x used for integration interfaces
Questions