Integrating design document management systems using the RosettaNet e-business framework

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NetData project
- Focus areas
  - Product development / design process between companies
  - Inter-company document management
- Funding Tekes + pilot-companies
- 9 researchers (5 full-time) @ SoberIT
- Results 11/03
  - Proposed inter-company standard processes
  - Software prototype for inter-company DMS integration

http://www.soberit.hut.fi/netdata/
NetData Background: Change in business environment

- One company is developing a new product
- A network of suppliers are developing/manufacturing components to this new product
- This development work is done in a concurrent way
  => Need for frequent communication between companies

NetData objectives

"To create a basis for product development network integration"

1) To build a new information transfer process model in order to minimize rework due to product changes

2) To build a concept and a prototype for integration of PDM systems in system level. To find out if RosettaNet messaging can be used in integration
**B2B integration levels**

1. Human-to-human integration (flexible)
2. Human-to-systems – common user interface
3. System-to-System - common standard
4. Common database
5. Common applications (the most rigid)

**Motivation for IT support for networked PD**

- Problems in networked product development
  - extra work caused by old document versions
  - extra delays due to lack of documents
  - Poor handling of documents causes problems in the controllability of the projects
- Delivery of new design documents should happen in a controlled and secure way
  - There are many companies involved
  - No unnecessary human-intervention
  - System-to-System integration using standards
Motivation for e-business frameworks

- e-business frameworks are needed for efficient communication
- XML has been central element in recent B2B standardization but XML alone is not enough
- Although following are all human readable, computers have problems in these things
  
  ```xml
  <e-business/>
  <date>2.2.2004</date>
  <eBusiness/>
  <date>2nd February 2004</date>
  <E-business/>
  <xs:date>2004-02-02</xs:date>
  ```
- Agreeing on meaning and content of individual elements is not an easy task
  - XML helps only in lexical and syntactical analyses
  - Need for standard semantics (e-business frameworks)

E-business framework

- Incompatible business documents, business processes, and information systems
- e-business framework is a standard for information sharing between trading partners
- What information share, when to share information, and how to share information?
- Combines standards, specifications, and classification
E-business frameworks for PDM integration

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<th>Processes</th>
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<th>RosettaNet</th>
<th>OAGIS 8.0</th>
<th>PDX</th>
<th>STEP</th>
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<tr>
<td>(ebBPSS)</td>
<td>PIP</td>
<td>(Example scenarios)</td>
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<td>PIP DTD</td>
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<td>Industrial usage</td>
<td>No/Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No/Yes</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

() Means no concrete specification, but some assistance or guidelines are provided to define the content.

RosettaNet

- RosettaNet is a non-profit organization that directs business process and supply chain standardization. It is especially strong in the electronics industry even though it is not limiting itself to any particular industry.
- Over 500 members (HP, Cisco, Intel, Microsoft, Nokia, Sun...)
  - Electronic Components (EC),
  - Information Technology (IT),
  - Semiconductor Manufacturing (SM),
  - Telecommunication (TC),
  - Solution Provider (SP)
RosettaNet

- Standardizes inter-company "public" processes (PIPs)
- The related messages (DTD + Message guidelines) = Business documents
- Standard messaging framework (RNIF).
- Defines dictionaries (RNTD and RNBD) and codes (GTIN and DUNS)
- Trading partner agreement (TPA)
- RN technical dictionary only really industry specific part

RosettaNet messaging principle

Company A

- Company Specific processing
- SAP ERP
- Internet & XML
- Translate from RosettaNet standards to Company A system data set.

Company B

- Company Specific processing
- I2 APS
- Internet & XML
- Translate from RosettaNet standards to Company B system data set.

RosettaNet defines processes and a framework for how data gets passed over the Web and certain handshake criteria.

source: RosettaNet
RosettaNet PIP process composition

5 Companies willing to pay and implement

RosettaNet experts

Business issues

Technical issues

PIP xYz

Business Dictionary

Technical Dictionary

Codes and UIDs

UN/SPSC

GTIN

DUNS

Run-time collaboration

Company A

Company B

ERP

PDM

EAI

Gateway server

PIP

in RNIF

Envelop

over Internet

extra
ted

extra
ted

ERP

PDM

xyz

yxz
Objective: After NetData

Defined between companies:

- Standard workflows (ECs etc.) + messages (contents) in RosettaNet format (PIP 2D.*)
- Semantics, notation (XML), structure (schema) of messages (NextGEN-format?)
- Dictionary of most important concepts

High-level architecture, logical view
Processes needed for

- New document delivery / document version delivery
- I would like to change this CAD-model, what are the effects on the network?
- What documents should I have?

=> Need of (at least) 3 "PIP"s

1. Inform about new document (version) creation (DEMO)
2. Exchange of preliminary information (vs. EC management!)
3. Query of all allowed documents
SoberIT
Software Business and Engineering Institute

Use case: Design document update

- Project manager defines rules for design document exchange with partners
- Designer makes changes to a document in the PDM system
- After the design change is approved PDM system informs PDM adapter of the document state change
- PDM adapter begins rule evaluation in the rule engine to see if the changed document needs to be sent to partners

Rule engine decides based on predefined rules that the design document must be sent to partner A
PDM adapter retrieves the document file and its metadata from the PDM system
PDM adapter creates an XML representation of the metadata, decides what PIP to use, and transforms the metadata to PIP payload
Use case: Design document update

- PDM adapter sends the PIP payload, document file, and the name of Partner A to RN adapter web service
- RN adapter validates the document delivery request and adds RosettaNet specific delivery information to the request
- RN adapter instructs RosettaNet server to begin PIP transaction with Partner A

RosettaNet challenges

- The specifications are being improved, which means they are changing.
  I totally agree on these points – I’d emphasize the work needed to build internal automated processes is quite big.

  But still consider RosettaNet the best standard to choose
- There are many “standards” from which to choose.
- Possible convergence with other standards
Experiences

- RosettaNet standard can be used to integrate different document management systems
  - Proof-of-concept demonstration
  - Is designed extendable and not information system specific
- Big attachments might cause some problems
- The metadata for documents lacks things like document life-cycles
- No decent PIP for document exchange → Can lead to miss using the standard → leads to poorer interoperability

Experiences

- Easy
  - Application server part (setting up messaging)
- Hard
  - private process (rules, functionality, adapter, initiation)
Experiences RosettaNet

- Easy
  - RNIF 2.0 – Although there were minor bugs in the implementation
  - RNBD – Readable, the semantics of elements quite well specified
- Hard
  - RN PIPs investigated 2A1, 2C*
  - RNTD
- Other
  - PIP Specification documents used (versions of the PIP old )
  - PIP validations (DTD+MG)
    - Message guidelines on “ContactInformation”
    - Constraint: At least one occurrence of “EmailAddress” or “telephoneNumber” is required.
    - Corresponding DTD
      ```
      <!ELEMENT ContactInformation(contactName, EmailAddress, facsimileNumber?, telephoneNumber)>
      ```