Implementing RIM based software

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Case Processium

- Due to demand for increased productivity in healthcare, decision of development for a new product for supporting care path driven processes in healthcare was done in Intensium Ltd in 2004
  - The company had background in measuring healthcare processes as well as implementing clinical information systems

- Product development began on middle of 2004
- First version in production on 2006 in Kuopio University hospital (cardiology, open heart surgery)
- Decision to go on to anesthesia market in 2007, first version on production in 2009

- Company was acquired by Tieto corp. in 2010.
- By now several implementations in production (cardiology, heart surgery, orthopedics and perioperative care)
How to do it

• Lessons learned before
  • It’s easier to build a new product with small, dedicated team of professionals than doing it in sideline of big business
  • Traditional project models do not fit to need of rapid development at all – better to focus on customers and product instead of project
  • Doing the information model for healthcare takes time and easily leads to far too narrow and fixed view of the complex healthcare reality
  • Being followed HL7 since early 90’s (and being got in troubles with document based models) the changes made to reference model around 2001 looked promising
    • Included a model of process
    • Was based on idea of Acts in center of the model (like Activity in workflow models)
    • Abstract but focused on healthcare unlike workflow models
Try and progress

• In first round we thought the way to go is RIM in database, kind of R-MIMs in service level and solution specific DTOs in application level
  • Kind of R-MIM because we didn’t have experiment on how to use RIM in practice
  • Lead to two ways to do modeling and caused unnecessary disruption between team members developing the user applications and services
• When development of the second version began, we decided to move to R-MIMs on app level too
  • Moving to critical care area caused re-writing to application level, so why not to do it at the same time
  • Quite some experiment during the proto development
  • Some cleaning was done to db and service models too and data types were implemented to support clinical calculations
  • Workflow engine was replaced with RIM based solution
Prosessium architecture

Browser
- Prosessium app
  - Browser+Flash

External system
- HL7, WebService, LDAP, File

Monitor
Pump
Ventriculator

Proprietary device protocol

Adobe LCDS
JBoss

Mule
MULE ESB
JRE

PCDGateway
JBoss

JMS
Prosessium Server

JBoss rules
JScience implementation of PQ

Hibernate
EHCache

SQL-Server 2005

Production DB

ETL

Data mart for reporting

HL7 RIM
Database model
Connecting model to application
Anesthesia solution

![Image of anesthesia solution software](image.png)

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropin 1 mg/ml</td>
<td>1.00 mg</td>
<td></td>
</tr>
<tr>
<td>Dexmedetomidine 1 mg/ml</td>
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<td></td>
</tr>
<tr>
<td>Fentanyl 50 µg/ml</td>
<td>1.20 ml</td>
<td></td>
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<tr>
<td>Glycopyrrolate 0.5 mg/ml</td>
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<tr>
<td>Midazolam 2 mg/ml</td>
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<tr>
<td>Propofol 10 mg/ml</td>
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<tr>
<td>NaCl 9 mg/ml</td>
<td>1000 ml</td>
<td></td>
</tr>
<tr>
<td>Ringer</td>
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</tr>
</tbody>
</table>

Diuresis: 67.0 ml

![Image of anesthesia solution software](image.png)
System load in perioperative production
Findings

• It is both technically possible and reasonable from business perspective to implement whole product line on RIM based architecture

• There are, however, few technical issues
  • There are no support for some core ideas in infrastructure (yet?), most needed being the RIM data types.
  • There are impedance mismatch between R-MIM and models of UI components, mostly due the link objects (ActRelationship, Participation). The same problem applies to general rule engines too. Wrapper between the models is needed to make it easier.
  • Implementing RIM to database easily leads to heavy load on few core tables. Partly caused by missing data types.

• As well as issues related to using the model
  • Whole team have to understand the very basic idea of RIM. Being abstract model it gives the modeler a lot of ways to go (to wrong directions too).
  • It’s obvious there is still a lot to do to easy modeling and implementation of models in practice.
  • The best documentation so far has been the ballot material. But the ballots does not cover all anymore.

• And more when you try to use it to renew existing