MODELLING ASPECTS IN SOFTWARE ENGINEERING

SERVICE GENERATION AND DESIGN CONTEXTUALIZED BY INFORMATION SYSTEM ARCHITECTURE

Jacques Simonin
jacques.simonin@imt-atlantique.fr

CONTEXTUALIZATION OF MDA APPROACH: EA RECOMMENDATIONS

Software engineering
Model Driven Architecture

Enterprise Architecture (EA)
TOGAF (The Open Group Architecture Framework)

CIM
Business Service model

PIM
Logical architecture of generated IS services

PDM
Running environment model

PSM
Physical architecture of generated IS services
CONTEXTUALIZATION OF MDA APPROACH: EA RECOMMENDATIONS

Software engineering contextualized by Enterprise Architecture (EA)

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EA recommendations
CIM2PIM: IS logical application components
PIM2PSM: IS services

META-MODELING LANGUAGES AND TOOLING

Operational-QVT model transformation language (plugin Eclipse)
UML2 meta-model TOGAF meta-model

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**CIM2PIM CONTEXT ILLUSTRATION**

**IS LOGICAL APPLICATION COMPONENTS**

**Pattern** System-of-Services-Logical-Architecture-Design

**IS = System of Services**

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**CIM2PIM TRANSFORMATION CONTEXTUAL MODEL**

CTe: enrich a business service model by a mapping with the IS functional (logical) model (TCMe)
Who: functional architect and business expert

ET: IS Service Generation Algorithm
Who: operational-QVT transformation

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**CIM** Business Service model

CTe

TCMe IS Logical architecture model

CICM Contextualized Data Entity Attribute model

ET

PIM Logical architecture of generated IS services
CIM – BUSINESS SERVICE MODEL

1. Business Service
   - BSCreateOrderExistingCustomer
     - Business Task: Order number 1
       - Verb: CRUD read
       - Data Entity: Customer
         - Attribute: name (String)
         - Attribute: address (String)
         - Condition: guard: <> null
     - Business Task: Order number 2
       - Verb: CRUD read
       - Data Entity: Product
         - Attribute: name (String)
         - Attribute: cost (String)
         - Loops: List("true")
     - Business Task: Order number 3
       - Verb: CRUD create
       - Data Entity: Order
         - Attribute: date (String)
         - Attribute: reference (Integer)

CIM - CONTEXTUALIZED BUSINESS SERVICE MODEL

Data Entity Attribute contextualized by IS Logical Application Component

- LACCustomerManagement
- LACProductManagement
- LACOrderManagement
PIM LOGICAL ARCHITECTURE OF GENERATED IS SERVICES

IS Service Generation Algorithm (1/2)
PIM conforms to CICM

IS Service Generation Algorithm (2/2)
PIM conforms to TCMe
CTs: substitute a set of logical operations by a list of existing IS services (from TCMs), whose logical architecture matches this set

Who: operational-QVT transformation

ST: usual model driven architecture transformation constrained by a PDM, reused services included

Who: operational-QVT transformation
PICM – CONTEXTUALIZED IS SERVICE MODEL

Logical Operations contextualized by existing IS services

PSM

PHYSICAL ARCHITECTURE OF GENERATED IS SERVICES

Three layers architecture:
Presentation
Business
Data

PSM conforms to PICM constrained by PDM (Business layer)

PSM constrained by PDM with relational database rules
**PSM - PHYSICAL DATA MODEL AND SCRIPT RESULTING FROM PHYSICAL ARCHITECTURE OF GENERATED IS SERVICES**

```sql
-- Drop tables
drop table if exists "jointpdorderpdproduct";
drop table if exists "pdproduct";
drop table if exists "pdorder";
drop table if exists "pdcustomer";
-- Create tables
create table "pdcustomer"
  (id serial primary key,
   name varchar(100) not null,
   address varchar(100) not null);
create table "pdorder"
  (id serial primary key,
   date varchar(100) not null,
   reference integer,
   pdorderpdcustomer_fk integer not null references "pdcustomer");
create table "pdproduct"
  (id serial primary key,
   name varchar(100) not null,
   cost varchar(100) not null);
create table "jointpdorderpdproduct"
  (id serial primary key,
   jointpdorderpdproductpdorder_fk integer not null references "pdorder",
   jointpdorderpdproductpdproduct_fk integer not null references "pdproduct");
```

**PSM – SERVICE CODE SKELETON RESULTING FROM PHYSICAL ARCHITECTURE OF GENERATED IS SERVICES**

```java
@Override
public void BOCreateOrderExistingCustomer:createOrder_date(String nameCustomer, String addressCustomer, String dateOrder, int referenceOrder, String nameProduct, String costProduct) {
  /**
   * Exception if not: <>null
   */
  customerDAO.DOreadCustomer_name(customer);
  /**
   * Exception if not: <>null
   */
  orderDAO.DOcreateOrder_date(order);
  /**
   * Loop start
   */
  Customer customer =
      this.BOReadAProduct:readProduct_name(nameCustomer, addressCustomer);
  /**
   * Loop end
   */
  jointorderproductDAO.DOcreateJointOrderProduct(jointorderproduct);
}
```

Java code skeleton results directly from sequence diagram of IS service designed during physical architecture.
CONTEXUALIZATION OF MDA APPROACH

CONCLUSION

Contribution of the respect of the Enterprise Architecture recommendations by a quasi automation of the development of IS services from a business service specification

Only the task of contextualizing of the CIM is in the hands of functional (logical) architect and business expert

The transition between the business requirements and the logical support of the IS remains critical

CONTEXUALIZATION OF MDA APPROACH

PERSPECTIVE

Is Dynamic Software Update a perspective for contextualized MDA approach?

Enhancement, Substitution and Removal for

CIM2PIM
IS logical application component
IS logical application dependency
Business service
Business task

PIM2PSM
IS service
Layer pattern
Layer framework

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