It is obvious generated query is not optimal by its structure, because inconsistency requirements were prompted. However taking into account all modern database systems have internal query optimization means and speed of system response is not critical important suggested approach suits main requirements. It is important to notice source of optimization consist in logical model. Logical model retrieves 1NF as a response of query included all attributes same of them can be not obligatory for query execution. Thus text query size and execution speed can be decreased by addition special functionality to logic model.

Conclusion

Suggested approach to development of reporting subsystem of CASE-system METAS allows to create flexible, user-oriented systems for reports and queries management. Using metadata allows avoiding writing queries on SQL when user needs to create new query. Developed reporting subsystem is an important part of integrated approach to electronic document management in CASE-system METAS.

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AN APPROACH TO REPRESENTING THE PROCESS OF INFORMATION BUSINESS MODELING

Nadezhda Filipova, Filcho Filipov

***Abstract**: The compact and visualized documenting of information business modeling is a major prerequisite for comprehending its basic concepts, as well as for its effective application and improvement. The documenting of this process is related to its modeling. Thus, the process of information business modeling can be represented by its own tools. Being based on this thesis, the authors suggest an approach to representing the process of information business modeling. A profile for its documenting has been developed for the purpose.*

***Keywords**: business modeling, SPEM, UML profile*

***ACM Classification Keywords**: I.6.5 Model Development - Modeling methodologies*

Introduction

Information business modeling (infBM) aims at visual representation of the business processes of the target organization by means of methods for information system development [Filipova, 2003]. This is a methodology for analysis and reengineering of organizations, as well as for developing adequate integrated computer information systems (CIS). Hence, infBM is a common business process, through which one could represent business processes, performed in organizations, including these for analysis and design, CIS development methodology, etc. This means that infBM is a process for modeling and representing other processes, i.e. this is a metaprocess. This basic feature of infBM emphasizes its importance, and the necessity to understand its components, tools and mechanisms.

According to us, the metamodel of infBM can be the basis to represent the process of its realization. Our researches in the field of the system development metaprocess, and our experience in object-oriented modeling make us assume that the infBM metamodel can be defined, using the SPEM metamodel and the UML profile mechanism.

In this context, our goal is to suggest an approach to representing the infBM process in a compact and visual way. For the purpose, a profile for the process of infBM will be defined on the first place, and then it will be transformed into a profile for its documenting.

I. A framework for representing the process of infBM

Information business modeling is a process that can be represented by the object-oriented approach. According to the modern concepts, a four-layer architecture can be used for object-oriented modeling of real processes and phenomena. Its layers are in hierarchical order, and each one can be represented through the concepts of the upper one (Table 1). We must note, that this is an architecture for representing both the process and the product or the system, created in its application.

Table 1. A four-layer architecture for object-oriented modeling

Layer	Name	Contents
M3	Metametamodel of the process	MOF(Meta Object Facility) – integrates methods and processes into a common framework. The metamodels in MOF are represented by a subset of the UML
M2	Metamodel of the process[1]	UML, SPEM, basic concepts / metamodel of infBM
M1	Model of the process	A concrete instance of the CIS development methodology – e.g. IBM RUP [Kruchten, 2003; Rational 2003], OPEN [Henderson-Sellers, 2000], MSF (Microsoft Solution Framework) [Duffy, 2003], XP, infBM, etc.
M0	Executable process	A real process for implementing a project

The dotted line in Table 1 shows the object of our research, namely layers M2 and M1 of the four-layer architecture.

The metamodel of the infBM process is a subset of SPEM [SPEM, 2005], on one side, and its specialization – on the other. The product at a metamodel level is represented by means of UML. The product of infBM however is specific, and in order UML to be applied adequately, the latter must also be specialized. The method specialization at the M2 layer may be accomplished through the UML profile[2] mechanism.

Therefore, the metamodel of the process of infBM can be defined as a specialization of the SPEM metamodel summarized in *a profile for the process of infBM*. Likewise, the UML possibilities applied in infBM can be summarized in *a profile for infBM*. Thus the M2 layer of the architecture is divided into two sublayers: a layer of the metamodel (M2.1), and a layer of the profiles (M2.2). M2.1 comprises the metamodels of UML and SPEM, whilst M2.2 includes the profile for infBM and the profile for the process of infBM. These two profiles exactly outline the framework for infBM representation. This framework is used to describe the model of the process of infBM at the M.1 layer of the architecture for object-oriented modelng. Aimed at the more compact and visual representing of infBM, we will use just a part of the profile for the process of its implementation, encapsulated into a profile for its documenting.

In order to document infBM on the basis of the framework defined, it is necessary to explore in details the two profiles, mentioned above, namely the profile for infBM and the profile for the process of infBM.

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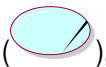
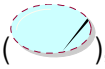
[1] This layer is also called a method layer

[2] The profile is defined as “lightweight extensibility mechanism”, consisting of stereotypes, tagged values, and constraints

II. Components of the profile for infBM

The profile for infBM is discussed in [Filipova, 2003; Kruchten, 2003; Rational 2003]. Its components are classified into three groups, as follows: model elements, models, diagrams. The information business models are comprised of model elements, and are represented as various diagrams.

The *model elements* include: Business use case (), Business actor (), Scope (), Business goal (), Business worker (), Business use case realization (), Business entity (), Business system (), Business event (), Business rule (). They are specializations of corresponding UML model elements.

Three major *models* are created in infBM:

1) Business use case model (BUCM) – this model reflects the business goals and intended functions of the organization, i.e it answers the question "What is done". The model is used to define the roles of the organization, and the products delivered. It represents the work of the organization as a set of business use cases, i.e. business processes.
2) Business analysis model (BAM) – represents the internal aspects (i.e the realization) of business use cases by modeling the interaction between business workers and business entities.
3) Object business model (OBM) – this is a partial BAM, including just business entities, but not the responsibilities of business workers. This model reflects the static aspects of the processes explored.

The static and dynamic aspects of information business models are visualized by UML diagrams, which are used in a specific way. They are summarized in Table 2.

Table 2. Diagrams of infBM at model levels

Model	Diagrams	
	Static	Dynamic
BUCM	- Business use case diagram	- Activity diagram
BAM	- Business class diagram	- Activity diagram - Business sequence diagram - Business communication (collaboration) diagram - State machine diagram
OBM	- Business entity diagram	

III. Defining the profile for the process of infBM

The initial prerequisites for defining the profile for the process of infBM follow:

the first, infBM is a business process;

the second, this profile is a subset of the SPEM profile, and interprets its components in a specific way;

the third, this profile uses as artifacts the components of the profile for infBM.

Our first conclusion, derived from the first prerequisite, is that the process can be represented by means of the profile for infBM. This is not a good decision however, as there will be overlapping between the representation of the process of infBM, on the one hand, and the representation of its product – on the other. Moreover, this can produce confusion in infBM process documenting. The stated problem was confirmed by our preliminary experiments on modeling the infBM process. Thus, it is necessary to define a specialized profile for representing the process of infBM.

Our second conclusion (resulting from the first prerequisite), which is also our thesis, is that there is a direct connection between the profile for infBM and the profile for the process of infBM. Therefore, we should find the

correspondence between their components. And the second prerequisite prompts that these components are inherited from the SPEM profile.

We will concern the consequences of the third prerequisite when discussing the profile for infBM documenting.

The initial prerequisites for defining the profile for the infBM process direct our strategy, i.e. we are going to seek semantic equivalence between the components of the infBM profile, on the one hand, and these of the SPEM profile, on the other. Furthermore, this comparison will be accomplished at levels of abstraction, i.e. models.

The major components of the SPEM profile are: Goal (), Workflow / Workflow details (), Phase / Iteration (), Artifact (), Process package / Discipline (), Process / Life cycle (), Role (), Activity ().

Following our strategy for defining the profile for the process of infBM, we must achieve complete equivalence between the components of the profiles, that we compare, for the first of the models, namely the Business use case model. We establish that there is neither Scope, nor Business actor in the SPEM profile. Our answer to this problem is:

- first, introduce a Scope component in the profile for the process of infBM with its meaning and icon, inherited from the infBM profile;
- second, in order to introduce a Business actor component however it is necessary to analyze its semantic. The business actor is a *user* of the products of the process of infBM. Besides, he is an external participant in this process, assisting in its implementation. Therefore, the Business actor is a user of the process, and a kind of a role with limited responsibilities. That's why we introduce a new stereotype, named Process user (), in the profile for the infBM process.

Unlike the Business use case model, we will seek just partial equivalence of the components of the Business analysis model and the Object business model. We find out difference in several components at BAM level, and to be precise these are: Business use case realization, Business event, Business rule, Activity.

The Business use case realization is a collaboration[3], i.e. it groups a set of dynamic and static diagrams, reflecting structure and behavior of a business use case. In this case the collaboration shows how a certain elementary process (a subprocess) of the infBM process is implemented through the interaction of activities, roles and artifacts, i.e. the workflow details are described. That's why we introduce a new stereotype in the profile for the process of infBM, which is similar to the Business use case realization - Workflow realization ().

The documenting experience, gathered in some methodologies, e.g. IBM RUP, proves that components such as Business event and Business rule are rarely used. Hence we will not look for their equivalences, and they will not be used in the profile for the infBM process.

We must point that the Activity component of the

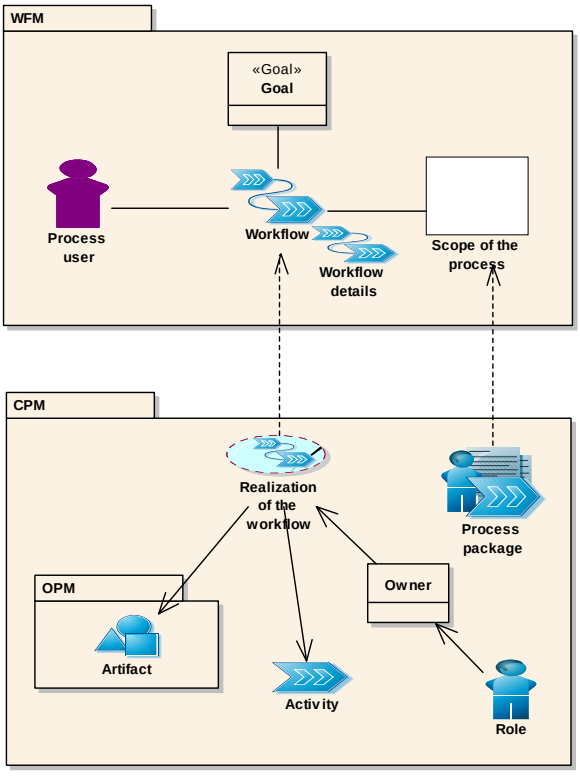


Fig. 1. Models and components of the profile for the process of infBM

[3] this is a standard UML component to implement behavior

profile for the process of infBM is an operation of the Business worker in the infBM profile.

The models in the profile for the process of infBM acquire different manifestations, which is a result of the semantic of their components. Thus, the workflow is a basic component of the Business use case model, which makes us name it Workflow model (WFM). Its static aspects are represented by Workflow diagram (analogous to Business use case diagram – Table 2), and its dynamic aspects are represented by Activity diagram. Concerning similar considerations, the Business analysis model is named Conceptual process model (CPM), and the Object business model – Object process model (OPM).

After these comments and elaborations, we can represent the components of the profile for the infBM process, and the relatios among them (Fig.1).

IV. Transforming the profile for the process of infBM into a profile for its documenting

Regarding the concepts of infBM, we assume it is adequate to build up a Business use case model, i.e. a Workflow model, in order to present a process which is both highly abstract and of wide scope, on the one side, and purposeful and easy to be understood, on the other. Hence, the profile for documenting the infBM process must encompass all the components of the WFM.

According to us, it is necessary to use the product model, represented by the infBM profile, in order to achieve greater purposefulness when modeling the workflows in infBM. This means that the components of the infBM profile are artifacts of the infBM process, and that only a part of the Conceptual process model will be used. The roles and activities of the infBM process will be used unstructurally, i.e. the relations among them are not going to be represented.

The profile for documenting the infBM process includes also the models and diagrams used. They are encapsulated into a package, named infBM models and diagrams.

The profile for documenting, we have defined, is depicted on fig.2. We must point again that the Conceptual process model of infBM has a wider scope. The profile for documenting however includes just a part of the Object process model, namely the packages Profile for infBM and infBM models and diagrams, and the Role and Activity components.

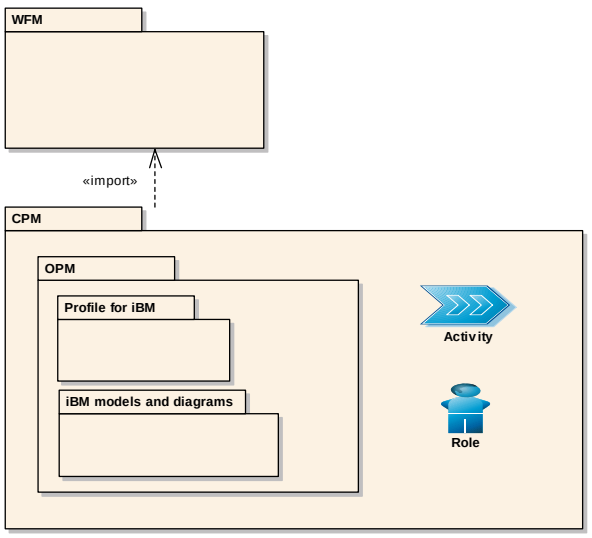
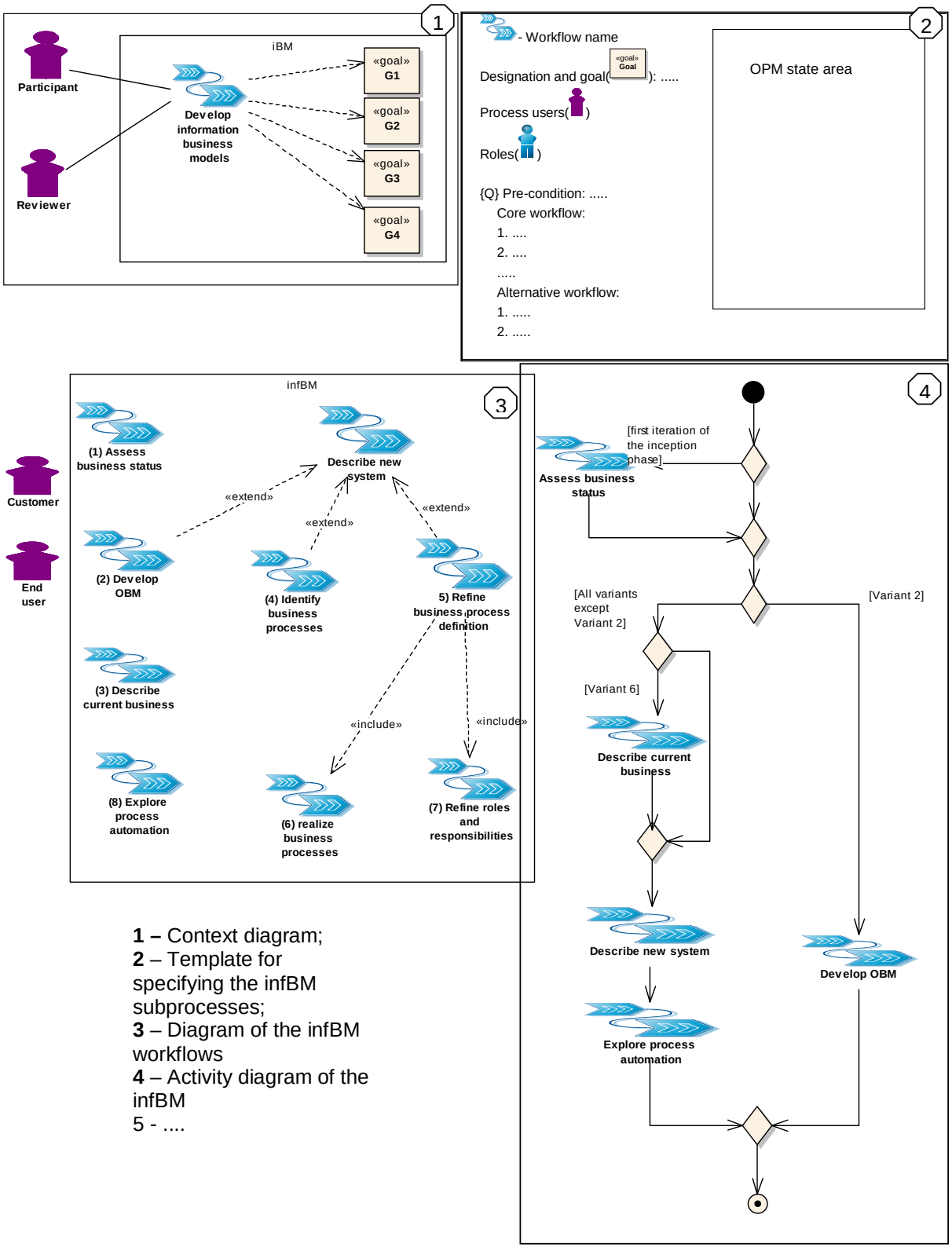


Fig.2. Profile for the documenting the process of infBM

Using the profile for documenting defined, we have made some experiments to model the process of infBM, that are based on the Business modeling workflow of IBM RUP. On the first place, we have developed a context diagram of infBM, which defines its goals and users, and decomposition diagrams, that identify its subprocesses. On the basis of a template, defined by us, the infBM subprocesses have been documented, and to be precise - their designation and goal, users and roles, pre-conditions and post-conditions, core and alternative workflows have been described. This background gave us the possibility to identify the relations among the infBM subprocesses, which is very important in order to build up its workflow diagram. We must point that a new subprocess, named Describe new system, is added in it to integrate several other subprocesses. Besides, for the purpose of not overloading the diagram, the relations among the process users (Customer and End user) and the subprocesses are not represented. The workflow diagram however does not represent the logic and the succession of the infBM process. The activity diagram with its tools that represent forking, conditions, transitions, etc., fits better this purpose.

Our suggestions for some of the diagrams for the infBM documenting are on fig. 3.



1 – Context diagram;
2 – Template for specifying the infBM subprocesses;
3 – Diagram of the infBM workflows
4 – Activity diagram of the infBM
5 - ....

Fig. 3. Diagrams and templates in documenting the infBM process

Conclusion

We will summarize the steps fulfilled in defining the profile for documenting the infBM process. On the first place, we have identified the components of the framework for representing the infBM process, i.e. the profile for infBM, and the profile for the process of infBM. Then the profile for the process of infBM has been defined, which was an important target of ours. This profile emerged on the basis of the SPEM profile, and was driven by our thesis for semantic correspondence between the profile for the product and the profile for the process of infBM. Afterwards, the profile for the infBM process has been transformed into a profile for its documenting, regarding the requirements to the model of the infBM process. Using this profile, we have made some experiments to represent the process of infBM. More precisely, we have built up the infBM workflow model and its subprocesses have been specified by the template defined for the purpose.

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DEVELOPMENT OF DATABASE FOR DISTRIBUTED INFORMATION MEASUREMENT AND CONTROL SYSTEM

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Abstract: The purpose of this work is the development of database of the distributed information measurement and control system that implements methods of optical spectroscopy for plasma physics research and atomic collisions and provides remote access to information and hardware resources within the Intranet/Internet networks. The database is based on database management system Oracle9i. Client software was realized in Java language. The software was developed using Model View Controller architecture, which separates application data from graphical presentation components and input processing logic. The following graphical presentations were implemented: measurement of radiation spectra of beam and plasma objects, excitation function for non-elastic collisions of heavy particles and analysis of data acquired in preceding experiments. The graphical clients have the following functionality of the interaction with the database: browsing information on experiments of a certain type, searching for data with various criteria, and inserting the information about preceding experiments.