

# **MODIFICATION OF WORKFLOW MANAGEMENT SYSTEM ARCHITECTURE TAKING INTO ACCOUNT PROPERTIES OF WFM PARTICIPANT**

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## **ABSTRACT**

This paper discusses the problem of managing resources by Workflow Management System taking into account the properties of participant of the Workflow Management System. The possible solution of the problem could be metadata modification of process definition and Workflow Management Engine. The main idea of this modification will be discussed in paper.

## **1 INTRODUCTION**

Workflow Management System (WfMS) is used for support of implementation of process oriented management to company. WfMS provides functions for managing processes according to process definition, assignment resources to tasks in a business process, monitoring, auditing etc.

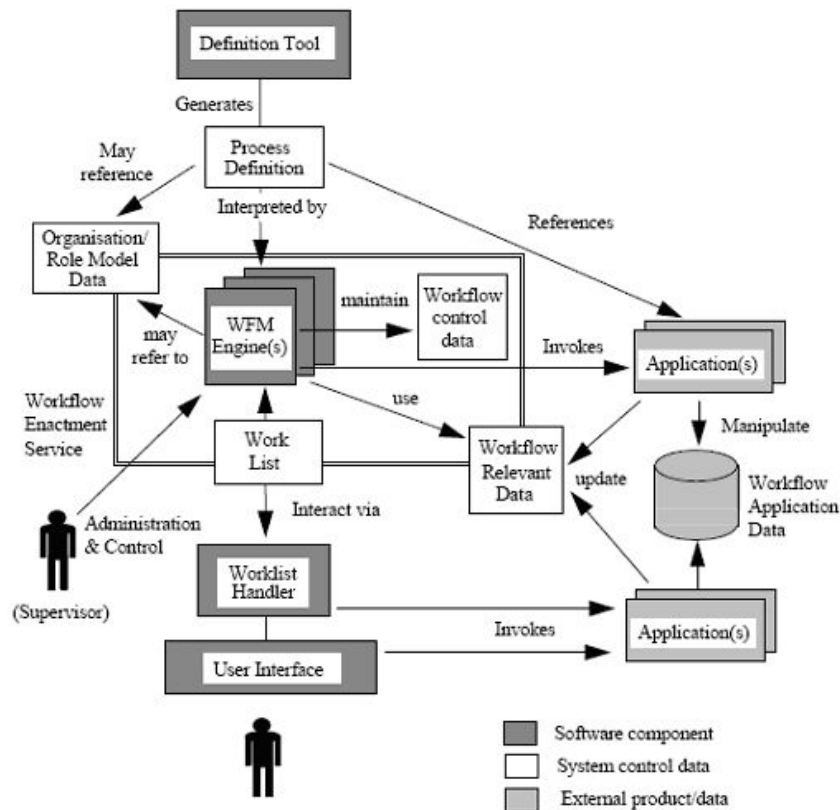
The main purpose of WfMS lies in coordination of resources according to process definition which is usually created by company management. The process definition is not hard-coded into system.

## **2 WORKFLOW MANAGEMENT SYSTEM**

Workflow Management System is used for automation of business processes. It can manage a mutual cooperation of WfMS participants (including human and software interaction) in order to perform a business process. It can also help a company to adapt to changes in business processes. An overview of Workflow Management System is summarized in [5].

According to [2] Workflow Management System should consist of:

- Process Definition Tool,
- WFM Engine,
- Worklist Handler,
- User Interface.



**Figure 1:** Architecture of Workflow Management System, see [2].

A creation of the process definition is the first part of the process deployment in Workflow Management System. This is usually done by Process Definition Tool. A process described by WFDL (workflow definition language) is an output of this tool. XPDL (XML Process Definition Language) and BPEL (business Process Execution Language) are usually used as WFDL.

Process definition should include information about tasks including information such as who can perform the task (mostly role-based approach) and information about routing between tasks. Business process execution logic can be described as routing mentioned later more in detail.

The process definition is transported to the WfM Engine, where one process definition can be launched as a process instance. Instances (particular processes) originate from the process definition. Worklist is created by running particular instance according to process definition with specific data for instance.

Worklist Handler manages an assignment of the task to resources e.g. human or software (mostly web services) after launching the process instance.

The WfMS participant is the object in WfMS which participates in the process instance (usually human or web service).

All information about the performance of particular process can be audited for monitoring and analysis purposes.

More information about WfMS architecture can be found in [2].

### **3 MODELING WORKFLOW USING PETRI NETS**

Petri Nets formalism is widely used to model dynamic aspects in system. Petri Nets consist of places, transitions and arcs. Places represent conditions in workflow. Transitions represent performing task. Oriented arcs connect places with transitions. We can simulate performing process under conditions by moving tokens from places to places within Petri Net.

We use specific patterns in Petri Nets to model business process such as: AND-split, AND-join, OR-split, OR-join, more patterns in [10].

According to [1] there are four types of routing: sequential, parallel, selective, iteration. For sequential routing it is necessary to perform one task after another, because there are dependencies between them. All tasks run concurrently in parallel routing, construction consists of AND-split and AND-join. In selective routing, just one branch is performed, construction uses OR-split and OR-join. In iteration routing, certain part of Petri Net is repeated until the appropriate condition is passed.

More information about modeling business processes can be found in [1] and [6].

### **4 BASIC ATTITUDES TO ASSIGNMENT IN WFMS**

There are two basic attitudes to assigning WfMS participant to task: manual assignment and automatic assignment based on role mentioned in process definition.

There is a person who is responsible for assignment the item from worklist to the WfMS participant in manual assignment. Manual assignment has main advantage in taking into account WfMS participant properties. But there are also some disadvantages:

- Person who makes assignment could be overloaded (queues).
- Person has to know properties of all WfMS participants very well in order to utilize the main advantage.
- Manual assignment usage is more expensive and slower than automatic assignment.

Another and more preferable way is to automate the assignment items from worklist to WfMS participants. There is information about which group of WfMS participants can manage the task within workflow (role) in process definition. WfMS participant is chosen from a group which is capable to perform task just before performing the work item. Automatic assignment according to [2] has advantage of saving cost. Performance of the system is also higher. On the other hand we lose the ability to choose resources more individually. The improvement of automatic assignment could be decision based on more suitable parameters.

### **5 PROBLEM WITH HANDLING WFMS PARTICIPANT IN WFMS ACCORDING TO WFMC**

There are more ways how to perform certain work, but Workflow Management System can't distinguish between WfMS participant from the same group and thus it deals with them only according to participation in certain groups, therefore, the system interacts with a beginner in the same way as with an expert.

We need to keep some level of quality of the process, because we need to check if everything is going well in certain states of performing the task. If we set the process definition taking into account only a beginner, we will make the process less suitable for an expert (for example too many checkpoints and reports). The expert won't be comfortable with the system and his productivity will even decrease as result of it. If we make process just according to the expert, the beginner will need to be checked more often in order to reveal mistakes earlier.

Another problem could be, for example, with the different nationalities. Every nationality has a different culture background, therefore, WfMS should be able to deal with this property as well and there are even more properties which we should take into account in order to deal with WfMS participant in the proper way.

## **6 PROCESS DEFINITION – MODIFICATION OF META MODEL**

Motivation for the modification is mainly due to better managing WfMS participant within WfMS.

Process definition contains:

- information about task in process (task properties, role of resource)
- and routing (sequential, parallel, selective, iterative).

In order to solve the problem mentioned before we need to extent routing information (especially guard functions and arc expresion functions using variables based on properties of resource). We will need to change the definition model of the business process as well.

We can model this extension in Hi-level Petri Nets, commonly used for process modeling:

- We use current model process definition built from patterns, see [10].
- Token has to carry data necessary for performing task and routing information. We will add information containing set of properties of WfMS participant assigned to task to token, because we will use it for routing.
- We have to add guard functions, arc expresion funtions which will use WfM properties as the input.
- We will build new subnets of Petri Net according to preceding rules.

The fact we can still describe extended model by Hi-level Petri Nets means that we can use the same analysis as we could use before extension, but we gain the process definition which can describe different behavior depending on WfMS participant properties. WfM Engine can interact with an expert in a different way than with a beginner even if they are in the same group that qualifies them for performing certain tasks.

From implementation point of view we will have to change metadata of process definition and we will have to adapt WFM Engine for performing the modified process definition.

The extended model could be very useful for business process analysis as well, because we can record current state of WfMS participant during running instance of process by using profiles of the assigned WfMS participant.

We could also improve the assignment algorithm using the extended model. According to setting priority of business process (cost, time, quality) we can make automatic assignment based on properties of WfM participant.

## **7 CONCLUSION**

The goal of this article was describing an idea of extension of process definition metamodel. This extension could improve modeling abilities at describing business process more precisely and thus WfMS could deal with WfM participant more individually. The extended model is useful for the more detailed analysis of business processes.

## **ACKNOWLEDGEMENT**

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