Could a Resource be Simultaneously a Schedule according to the REA Ontology?

Frantisek Hunka[1], Miroslav Hucka[2], Josef Kasik[2], Dominik Vymetal[3]
emails: frantisek.hunka@osu.cz, (miroslav.hucka, josef.kasik)@vsb.cz, vymetal@opf.slu.cz

Abstract
This paper describes using of the Resource-Event-Agent (REA) framework to model enterprise planning at operational level. The aim is to further utilize the possibilities and potential of the framework in the areas with prevailing conversion rather than exchange processes. During the modeling we came across the situation when an entity may be viewed as two different REA concepts, which breaks the REA ontology. In the next of the paper we suggest some rational possibility how to solve the problem. The paper also partly mentions the mechanism of inner or nested classes that can be used for implementation of the two different views on the entity in the given context.

Introduction

The area of enterprise models for production planning and control at operational and policy levels remains under standard and in many ways rather awkward planning and accountancy models. These models or at least their accountancy part are formed by traditional ways and means and brought adequate results. Despite their success, traditional methods have their limits. The main problems they have to tackle with are increasing complex of the ERP, which is more and more difficult to process the relevant data for the enterprise management.

We see a demand for enterprise resource planning systems that would be designed from the scratch for the use with information technologies, which enables full traceability of all, not only some activities that influence the value of the enterprise's resources. The further current demand is to calculate the value of the enterprise's resources on demand, and not only at determined time intervals.

On the other hand the REA framework offers a method that enables full traceability of all activities that influence the value of enterprise's resources. It shows up that the REA framework is also a tool for suitable model-driven design.

Production Planning and Control Model

In the literature we have studied, the greater attention is devoted to the REA exchange processes than the REA conversion processes. Perhaps it is done by the fact that exchange processes are more common and draw great attention mainly in the accountancy area. The area of the enterprise production planning and control at operational and policy level draws our attention from a number of reasons. The main reason is that most of the authors of the paper have detailed professional knowledge and information of that area gained in the past, when they used traditional methods and approaches to model the topic. However their achieved modeling results suffered from all earlier described drawbacks.

[1] University of Ostrava, [2] VSB – Technical University of Ostrava, [3] Silesian University in Opava
Czech Republic

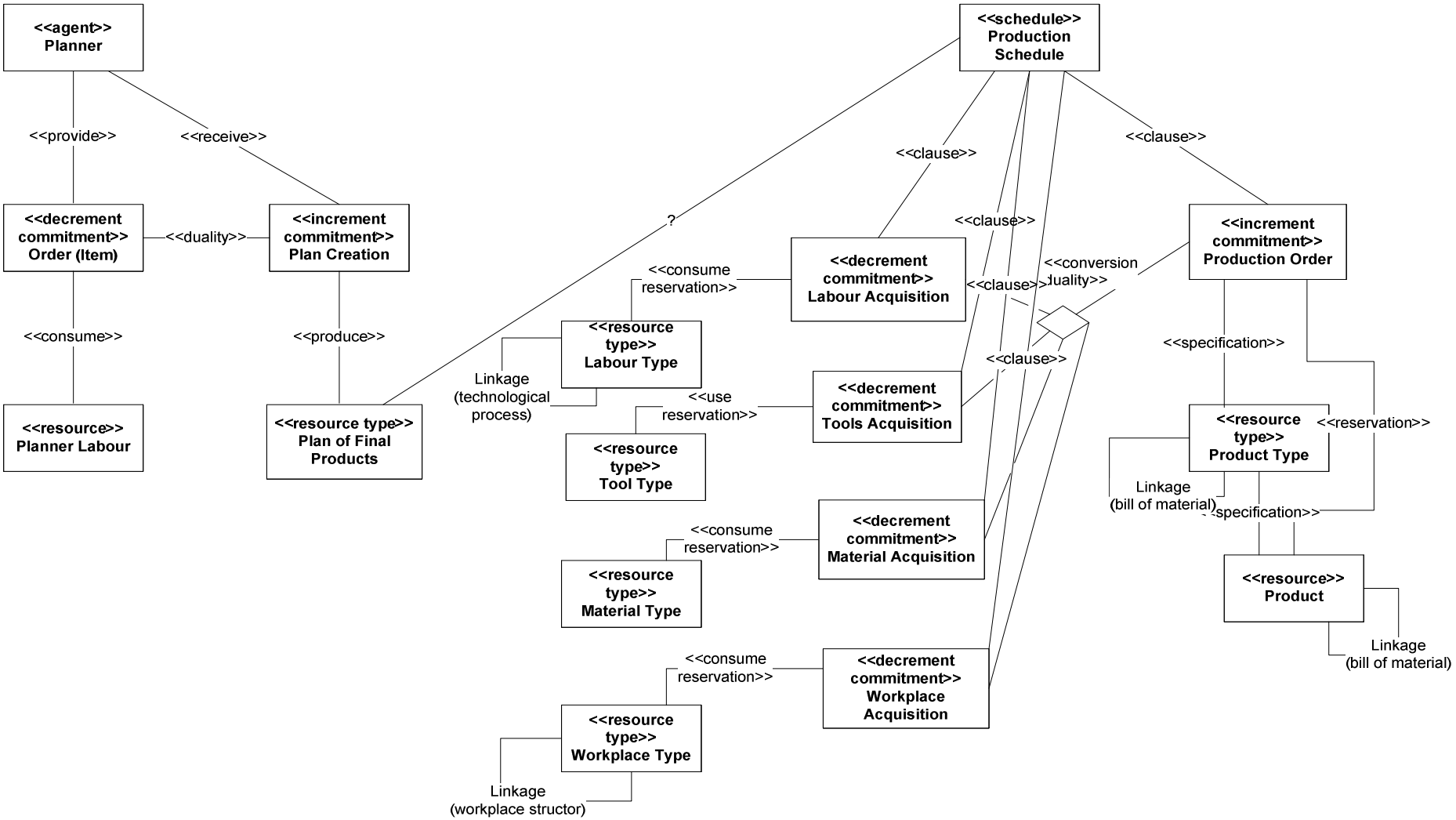

Fig. 1: Production Planning and Control Model – original design

The other reason for the special interest is that the authors of this paper were allocated by the grant that deals with modeling enterprise processes using REA ontology. The grant was allocated by the Grant Agency of the Czech Republic for the period of three years.

Fig. 1 illustrates an example of production planning at operational level by the REA concepts. It fully reflects the title of the paper. The example is simple one but with all characteristic features. The short but clear description follows.
In the enterprise a production plan is made up from the customer's orders. The production plan is a *resource* or *resource type* in the REA model because it was created by two agents, in particular by the planner – *Initiator* for the production manager - *Terminator*. At the same time *the production plan* is used as a *schedule* in this way for managing when events occur in the conversion process. In this context, *the production plan* (resource) contains *commitments.* However this construction is not allowed in the REA ontology. This entity seems to be a controversial as it may be viewed as a *resource* and as a *schedule* simultaneously.

Achieved Results

Controversial relationship is noted by the question mark and relates the *Plan of Final Products entity* to the *Production Schedule entity* see Fig. 1. To make the problem simple, we remain at the planning level as we use commitment entities and reservation relationship and do not go on into the detailed level with event and resource entities.

Being unsatisfied with the achieved results we made another a modified design of the same problem. The model is illustrated in Fig. 2 noted as a Production Planning and Control Model – modified design.

As may be seen from Fig 2 we still remain at the level of commitments to make the problem simple. *The Product Plan entity* is modeled as *an increment commitment entity* that is related to *the Production Schedule entity* by a clause relationship. *The Production Plan entity* is related by an exchange reciprocity relationship to the four decrement commitments named as Labour Acquisition, Workplace Acquisition, Tool Acquisition and Material Acquisition. All of these decrement commitments are related to adequate type by the reserve relationships.

Discussion

During modeling of enterprise production systems it is necessary to carefully distinguish between *actual situation* expressed by the event entity and *promising situation* expressed by the commitment entity. The other important thing that deserves attention is proper using of typing (distinguishing between entity type and entity).
In the example the idea that the *Plan of Final Product entity* is a resource is correct without any doubts. At the same time however, it must be a schedule as the *Production Schedule entity*. Except for the solution illustrated in Fig. 2, we could propose some solution based on the principle of using roles. However as the REA modeling framework provides only concept of agent this way does not provide any rational solution. Instead of roles some other type of relationship between the resource entity and the schedule entity should be used.

Generally ambiguous view at an entity was described in the literature as the *Prototype Abstraction Relation Problem,* formulated by Brian Smith. The problem is that an entity (a prototype) may be also viewed as its instance. To model this it is necessary to be able to describe an entity both as an instance and as a class.

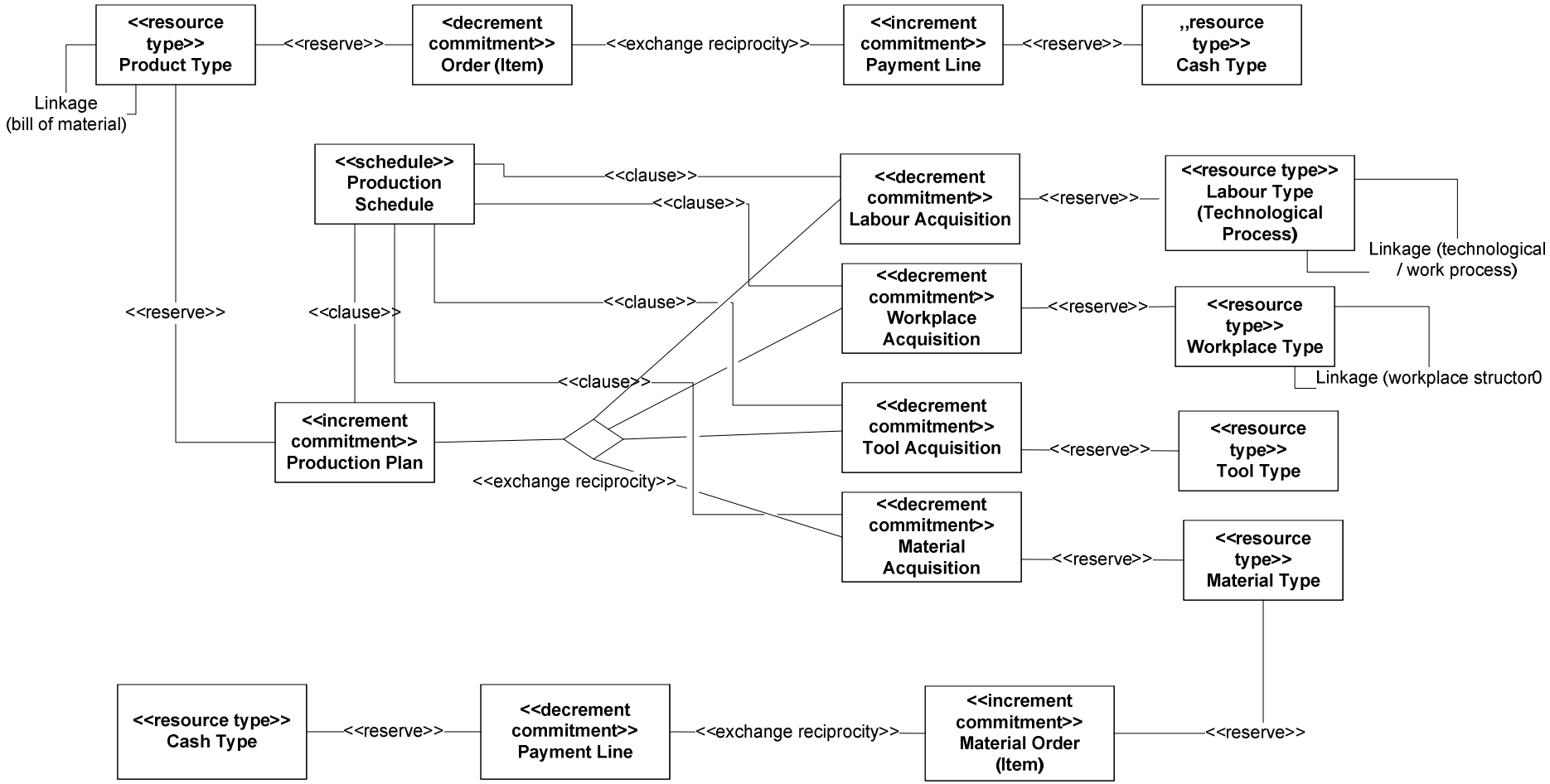

Fig. 2: Production Planning and Control Model – modified design

This is possible in the block and object oriented languages with the possibility for declaring nested classes (Java, Beta, Simula). Inside a class (outer class) another class (inner/ nested class) is declared. The outer class represents a prototype. Instances of the inner class are bound to an instance of the outer class. At first an instance of the outer class is created and next instances of the inner class are created. Each instance of the inner class is declared *local* to the given instance of the outer class. So it is impossible for the instance of the inner class to be independent of the outer class instance. In other word an instance of the inner class can not be created without a given instance of the outer class. In terms of cardinality there can exists one instance of the outer class and zero or many instances of the inner class.

This mechanism can be used to implement the fulfillment relationship in the commitment pattern. In this case the commitment would represent an instance of the outer class and events would represent instances of the inner class. This solution however does not fully meet the requirements of the commitment pattern as it does not allow implementing one event entity related to many commitment entities.

Conclusion

The problem of two different views on the same entity was introduced and discussed in the paper. The aim of the paper was to draw attention to the problem and to find out some rational solution. The original design of the production plan model breaks the rules of the REA ontology. One of the ways to solve this issue is in extending the REA ontology to cope with the problem of different views on the same entity. This way should follow after examining all other modeling possibilities.
The paper however proposed another - modified design to the problem that is in compliance with the REA ontology. The Prototype Abstraction Relation Problem, which was partly mentioned as an alternative to two different views on the same entity have some drawbacks. It can be used for implementation of the commitment pattern but only partly as it does not fulfilled cardinality of the pattern completely. Anyway the problem of two different views on the same entity is an interesting one and deserves to be examined.

Acknowledgements

The paper was supported by the grant reference No. 402/08/0277 provided by The Grant Agency of the Czech Republic.

References

Geerts GL, McCarthy WE (2000a) The Ontological Foundation of the REA Enterprise Information Systems. Paper presented at the Annual Meeting of the American Accounting Association. Philadelphia, PA.

Geerts GL, McCarthy WE (2002) An Ontological Analysis of the Primitives of the Extended REA Enterprise Information Architecture at http://www.msu.edu/user/mccarth4/

Hruby P (2006) Model-Driven Design Using Business Patterns. Springer-Verlag Berlin Heidelberg

Smith B. (1984) Personal Communication. Stanford

Eckel B. (2000) Thinking in Java. Prentice Hall