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06. December 2008

Online at <http://mpra.ub.uni-muenchen.de/12407/>

MPRA Paper No. 12407, posted 29. December 2008 / 13:18

Enterprise Planning Model Using REA Ontology

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Abstract

The aim of the paper is to describe using REA framework to model enterprise planning not only at the operational level but also at the policy level. Using policy level enlarges the possibility of the models on the base of the REA framework because the policy level in this way represents metalevel of the model. The policy level of the REA framework itself is comprised of both the typification and grouping semantic abstractions and the Commitment entity. This entity may be viewed as either a sublayer or a middle layer of the REA framework. The Commitment entity belongs to the fundamental entities of the policy level but has some specifications that are expressed by the fulfillment relationship. This many-to-many relationship forms the link to the operational level. The paper thinks over the problem and suggests some solution that gets the Commitment entity closer to the typification semantic abstraction.

Keywords: REA framework; policy level; production planning model; typification; grouping; cardinality

Introduction

Two core semantic abstractions represent policy level at the REA framework by Geerts and McCarthy (2006): typification and grouping. In short, the main task of the policy level is to give answer to the questions: what could, should or must occur. In general the policy level also gives the answers to the questions: what is planned or scheduled. The later questions are answered by the Commitment entity, which has the main relation to the Event entity at the operational level. At the first sight the Commitment entity contains planned or scheduled information while the Event entity comprises the actual information, which may be the same or different from the scheduled information.

From this point of view it may be seemed that the typification semantic abstraction can be also use in this case. However, the relationship between the Commitment entity and the Event entity has also broader meaning that is expressed by a many-to-many relationship. There are not only cases when a Commitment entity is related to one or several Event entities but there also exist cases when a single Event entity is related to several Commitment entities. This gives the reason why the relationship between the Commitment entity and the Event entity is created by the fulfillment relationship.

The grouping semantic abstraction is used when set-level characteristics are of interest and may even create an integral part together with the typification semantic abstraction. By this semantic abstraction a collection of individual entities may be specified with respect to some common properties.

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Method of Advancement and Results

Enterprise Planning Model, which is used for illustration of our approach, is composed of three parts: Material Purchase Model – Fig. 1, Production Planning Model – Fig. 2 and Sale Model – Fig. 3. In the schematic representation of the models we were also inspired by the Purchase Order pattern and the Schedule pattern described by Hruby (2006). Material Purchase Model describes a Purchase Order between Enterprise (purchaser) and Supplier. The model has two commitments, the Purchase Line and the Payment Line. In the model material under the specification of the material type was purchased at the price agreed before (Cash Type) and paid in the form of Cash.

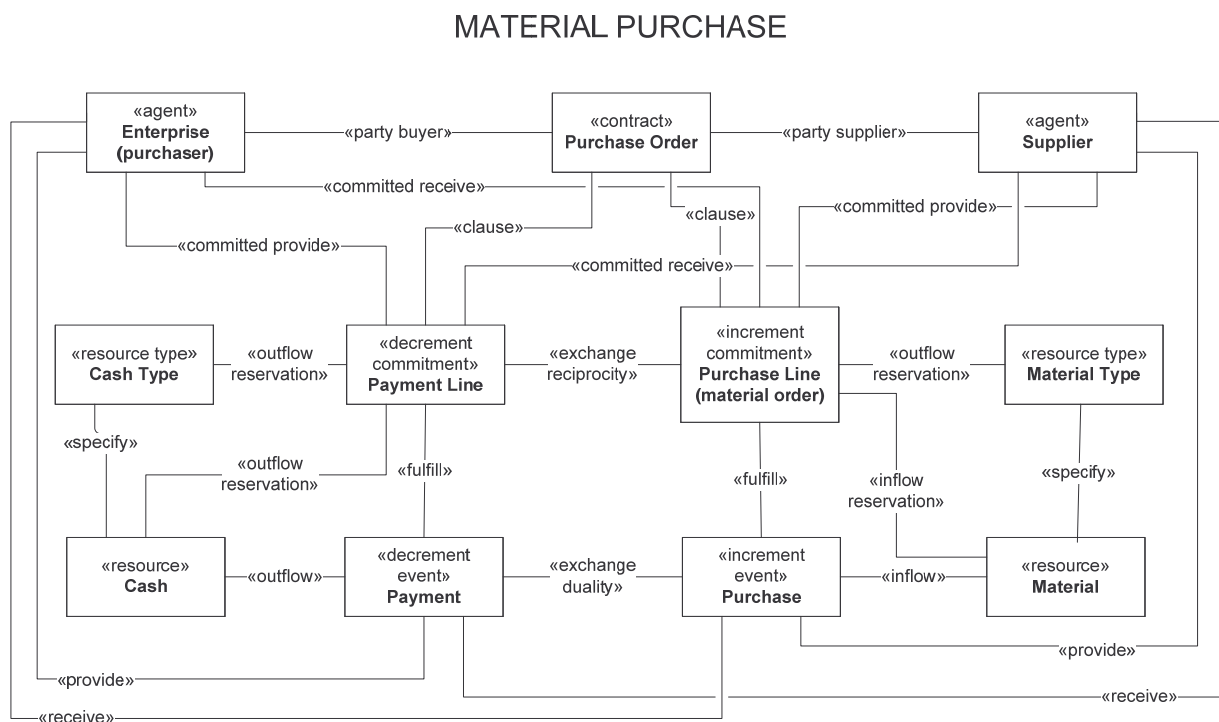


Fig. 1 Material Purchase Process

The Production Planning consists of five decrement commitments; Labor Requisition, Workplace Requisition, Tool Requisition, Part Requisition and Material Requisition paired through conversion reciprocity with the increment commitment Production Line. The Part Requisition commitment and Material Requisition commitment are promises by a Warehouse Clerk to make a specific amount of Part Types and Material Type available to the Worker. The Tool Requisition commitment is a promise by the Workhouse Clerk that tools of specified Tool Types will be available to the Worker, and a promise by the Worker to deliver the tools back. The Labor Requisition commitment is a promise by the Worker to the Supervisor to consume worker's Labor in a specific time. The Workplace commitment is a promise by the Supervisor to the Worker that a specified Workplace will be available to the Worker in specific time. Each commitment either uses reservation or consumes reservation of the adequate resource type. The operational level of the model is closely bounded with the policy level and contains five adequate

Economic Event corresponding earlier described commitments. Resource types have their counterparts in the operational level in the form of resources.

PRODUCTION PLANNING

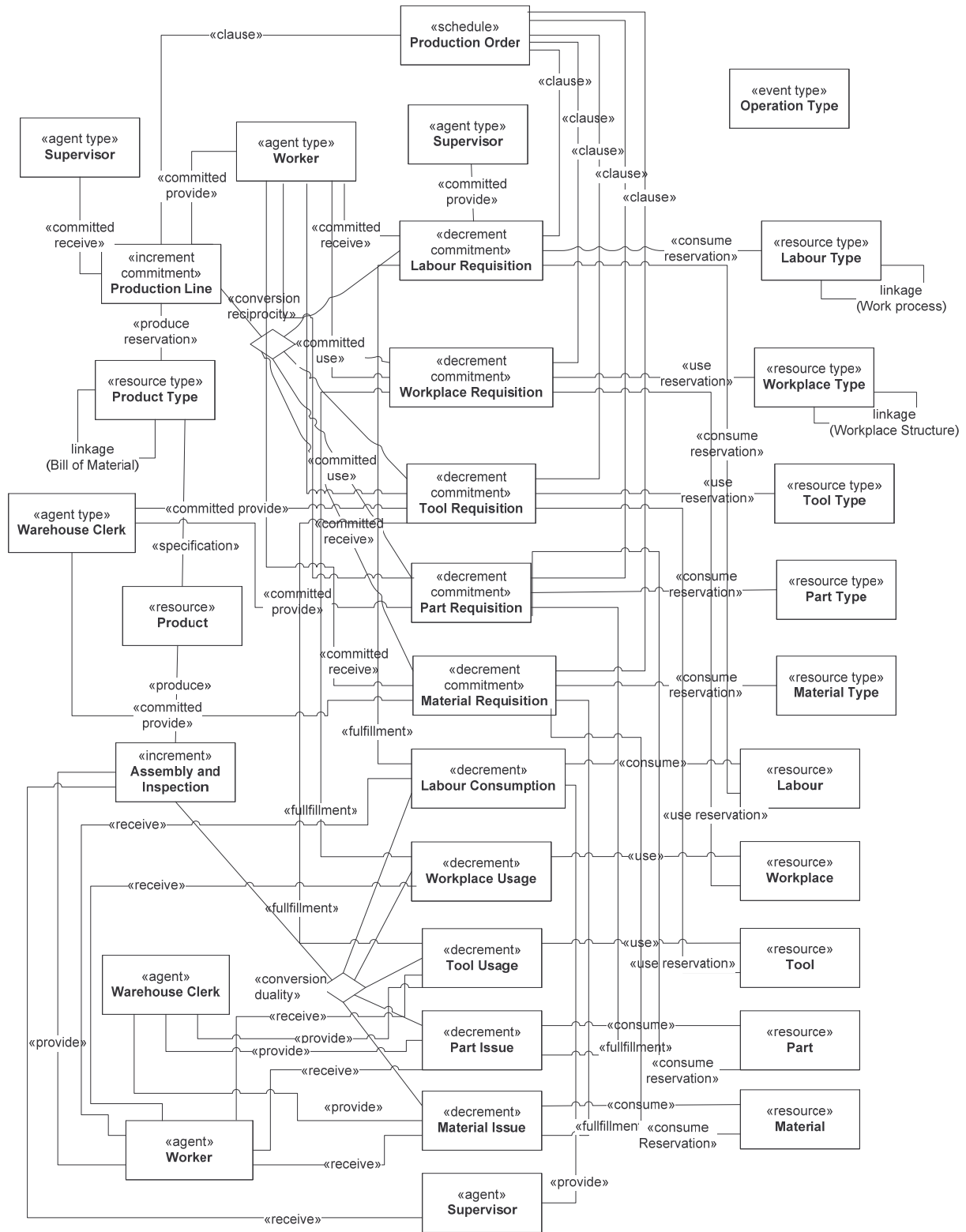


Fig. 2 Production Planning Process

The third model describes Sale Model and is composed of the Customer Order as a contract with relationship to the Customer and Enterprise entity. The Customer Order comprises two commitments, the Order Line and the Payment Line. At the operational level each commitment has its corresponding event entity.

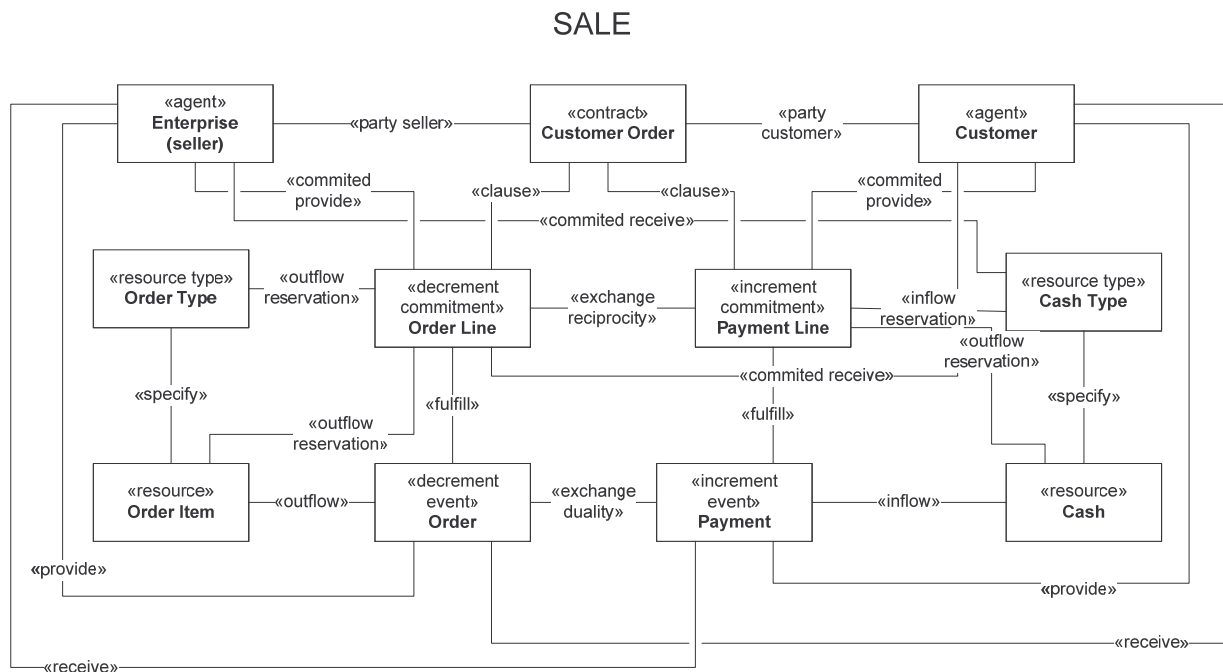


Fig. 3 Sale process

Discussion

In the presented results the Commitment entity plays an important role at the policy level of the REA framework. The current REA framework distinguishes two levels, the operation level (lower level) connected with the current facts that occurred in a company and the policy level (upper level) linked with the future activities and guidelines such as plans, commitments and control activities. However, the policy level is not a homogenous one but is created by two “sublevels”. One is represented by the Commitment entity with the fulfillment relationship by which it is related to the operational level. The other represents entities created by the typification and grouping semantic abstractions, which use the typification, grouping and policy relationship. It can be said that two sublevels form “stratification” of the policy level.

By its character the Commitment entity is semantically very close to the other “typed” entities in the policy level in the scope of the relationship to the operational level. The main difference between the fulfillment relationship and the typification relationship is cardinality. While the typification relationship represents a one-to-many relation, the fulfillment relationship forms a many-to-many relationship. Commitment Pattern see Hruby (2006) describes it all in a more detailed way – see the Fig. 4.

The issue is that one economic commitment can be fulfilled by several economic events, and one economic event can be fulfilled by several economic commitments. A typical example of this situation is production run resulting in a lot that has been planned based on several sales contracts. The main aim of the proposal is to replace a many-to-many relationship by one-to-many relationship, which is unambiguous and in general more acceptable for software systems.

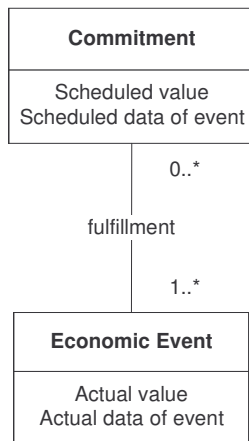


Fig. 4 Commitment and economic event

Source Hruby (2006)

This ambiguity between both entities requires some specific solution in the form of unambiguous relationship. In case of the unambiguous relationship between the commitment entity and event entity the current fulfillment relationship could be replaced by the typification relationship.

To make the relationship unambiguous some auxiliary entity has to be added to the current structure. In this case the *CommittedElement* entity is used to divide The Commitment entity into smaller parts so that each part corresponds only to one event entity. The whole solution is illustrated in the Fig. 5, where we use {or} restriction to indicate that only one relationship is in force.

Conclusion

The typification and grouping semantic abstractions specify policy-level extension of the REA framework. These abstractions enable to work with the types of declared entities and with a special form of aggregation with set-level characteristics. The Economic Commitment entity with its fulfillment relationship stands a bit outside of the above mentioned abstractions. In the paper we tried to bring this entity closer to the typification and grouping semantic abstractions by introducing a new entity called *CommittedElement*. The Commitment entity can be composed in this way of these entities. In the proposal there are two possibilities separated by the {or} relationship. In this way there are two possible cases:

- there is a one-to many relationship between the Commitment Entity and the Event entity expressed by the typification relationship;

- or the Commitment entity consists the CommittedElement entities with the grouping relationship, and next there is a relation one-to-many expressed by the fulfillment relationship between the Event entity and the CommittedElement entity.

In our view the proposed solution gets the Commitment entity closer to the typification and grouping semantic abstraction.

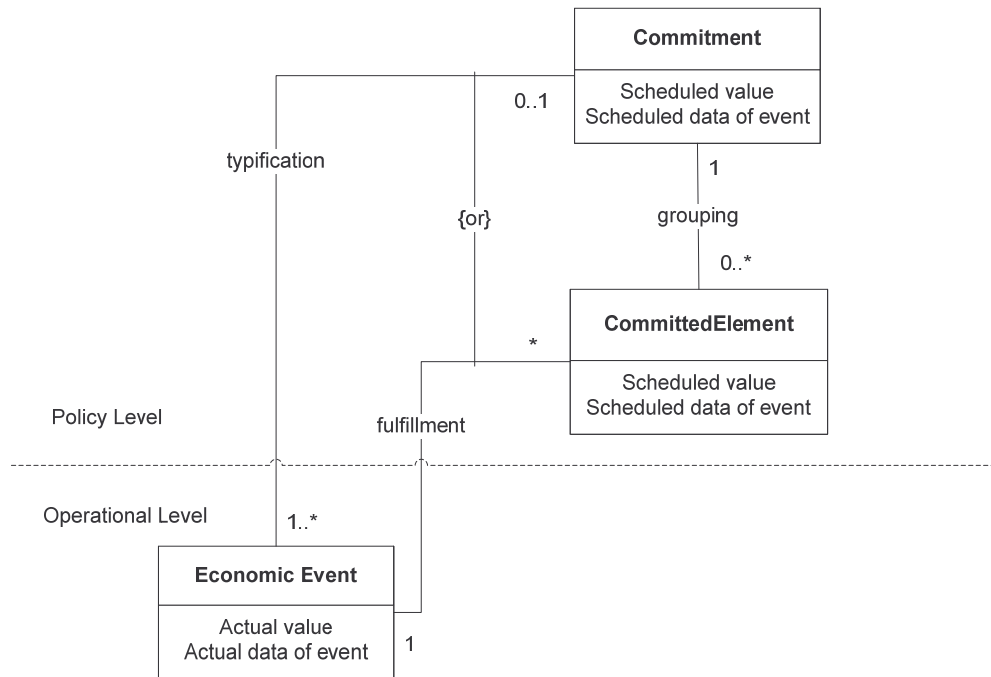


Fig.5. Proposed modification of Commitment and economic event

Acknowledgements

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

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