



A Contextual-Based Enterprise Ontology

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1. Introduction

An increasingly large portion of enterprise knowledge is held, processed and distributed by applications.

Enterprise knowledge is “local knowledge” by its nature. There is, however, a need to reach and maintain the common understanding about the knowledge across the enterprise(s), in other words a need for semantic and pragmatic interoperability among the applications.

Understanding meanings of things requires knowledge of what purposes the things are intended for, by whom, when and where, of how the things are related to one another and to environment, etc.

Shortly, it is necessary to know about **contexts** in which the things appear, have appeared, and/or will be appeared.

Context is commonly used to specify and interpret meanings in several disciplines, such as formal logic, knowledge representation and reasoning, pragmatics, sociolinguistics, organizational theory, sociology, cognitive psychology, etc.



1. Introduction (continues..)

There are several enterprise and business ontologies and frameworks:

- TOVE (Fox 1992)
- Enterprise Ontology (Uschold et al. (1998)
- EKD approach (Loucopoulos et al. (1998)
- REA (Geert et al. 2000)
- etc.

There are also many enterprise modelling languages:

- IEM (Lin 1999)
- EEML (EXTERNAL, 2000)
- GRAI/Actigrams (Doumeingts et al. 1992)
- UEML (Berio et al. 2004)
- etc.



1. Introduction (continues..)

The main purpose of an *enterprise ontology* is to promote common understanding between people across different enterprises, as well as to advance communication between people and applications and between different applications.

There are many approaches according to which current enterprise ontologies have been engineered.

Our objective is to present a context-based enterprise ontology, as a top-level ontology, which provides a unified view of the enterprise as an aggregate of contexts, as well as generic concepts for each of the contextual domains.

The concepts in the ontology are defined in English and presented in meta models in a UML-based ontology representation language.



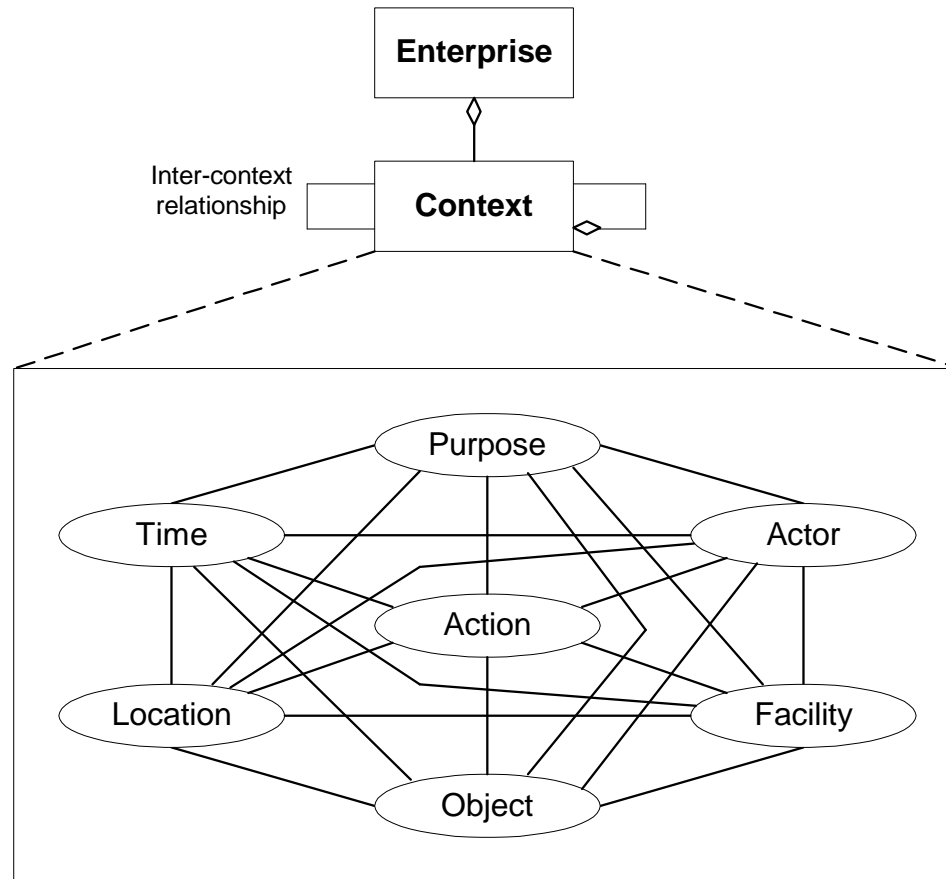
2. Context and Contextual Approach

Context is a whole that is composed of things connected to one another with contextual relationships. A thing gets its meaning through the relationships it has to the other things in that context.

Based on semantics (“sentence context”), pragmatics (“conversation context”) and the activity theory (“action context”), and some “contextual” approaches, we distinguish between seven contextual domains: purpose, actor, action, object, facility, location, and time.

Structuring the concepts within and between the domains is guided by the seven S’s scheme:

***Somebody* (actor) *does* *Something* (action), *for Some reasons* (purpose), *for Someone* (object), *with the help of Something* (facility), *Somewhere* (location) and *Sometimes* (time).**



General structure of the enterprise ontology



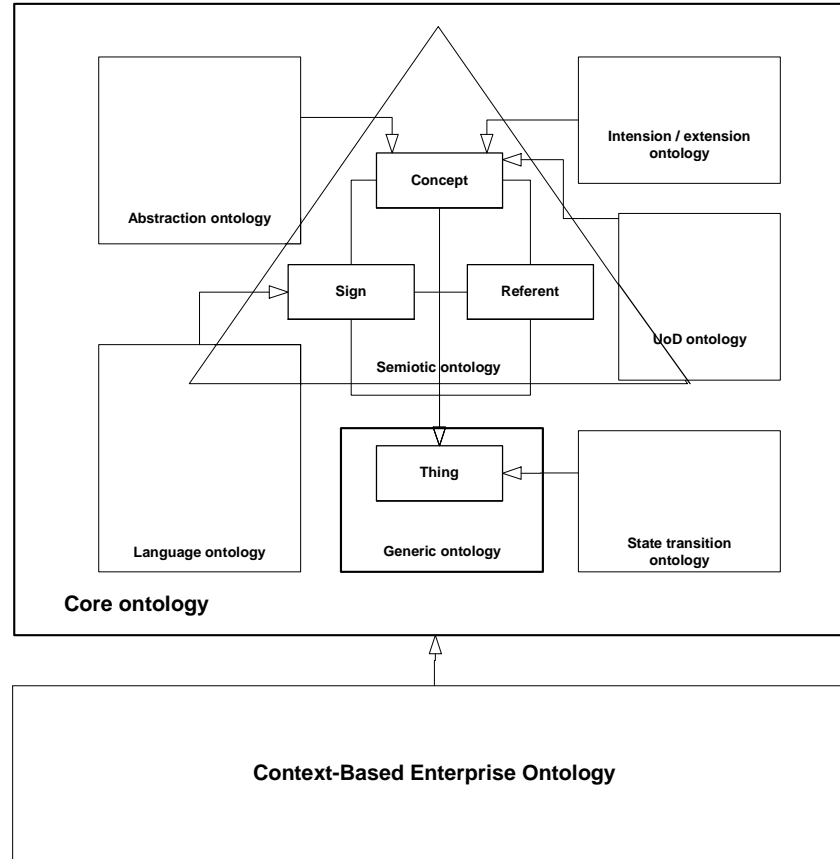
2. Context and Contextual Approach (continues..)

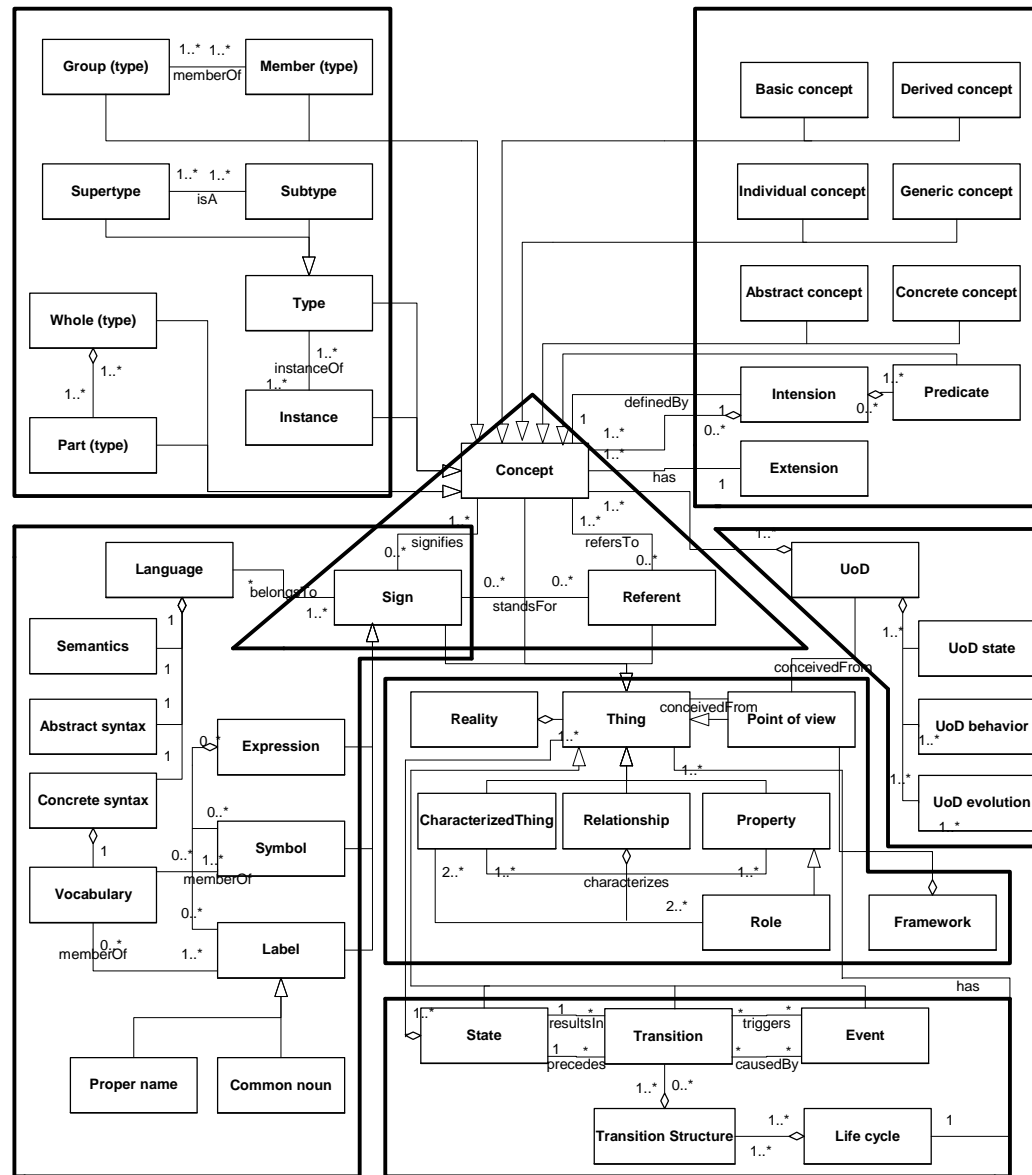
An *enterprise* is an aggregate of contexts that are composed of people, information and technologies, performing functions in a defined organizational structure, for agreed purposes, and responding to events, both internal and external, and needs of stakeholders.

The *context-based enterprise ontology* is a top level ontology which aims to promote the understanding of the nature, purposes and meanings of the things in the enterprise, with providing concepts and constructs for conceiving, structuring, and representing things within contexts, and/or as contexts.

It is intended to assist the acquisition, representation, and manipulation of enterprise knowledge.

3. Contextual Domains





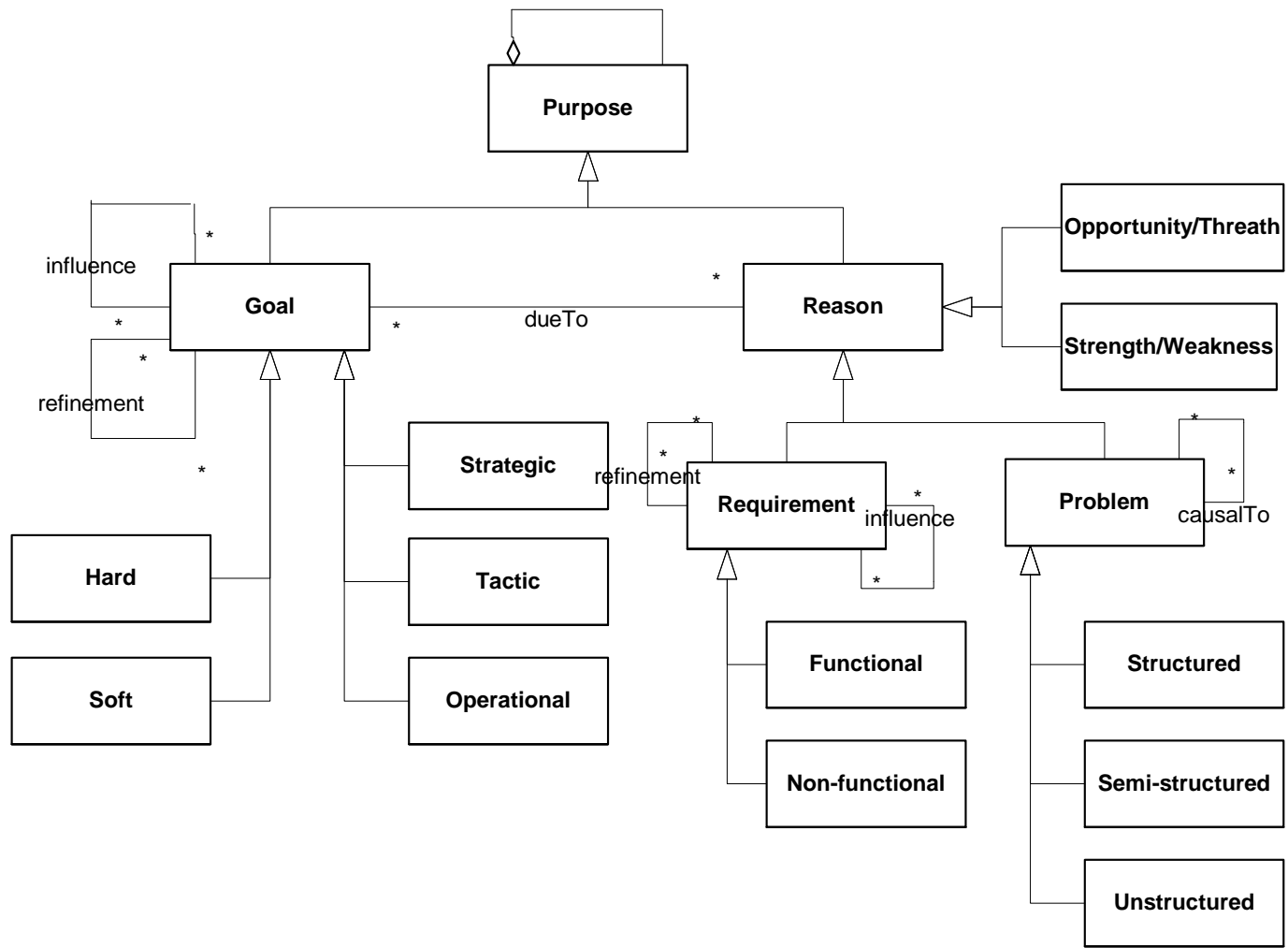
Core ontology



3.1. Purpose domain

Purpose domain consists of those concepts and constructs which refer to goals, motives, or intentions of someone or some thing. They may also express reasons for why someone exists, why something has been done, why someone is used, etc. in a context.

Purpose	Reason	dueTo
Goal	Requirement	influence
Hard goal	Problem	refinement
Soft goal	Opportunity/Threath	causalTo
Strategic goal	Strength/Weakness	
Tactic goal		
Operational goal		



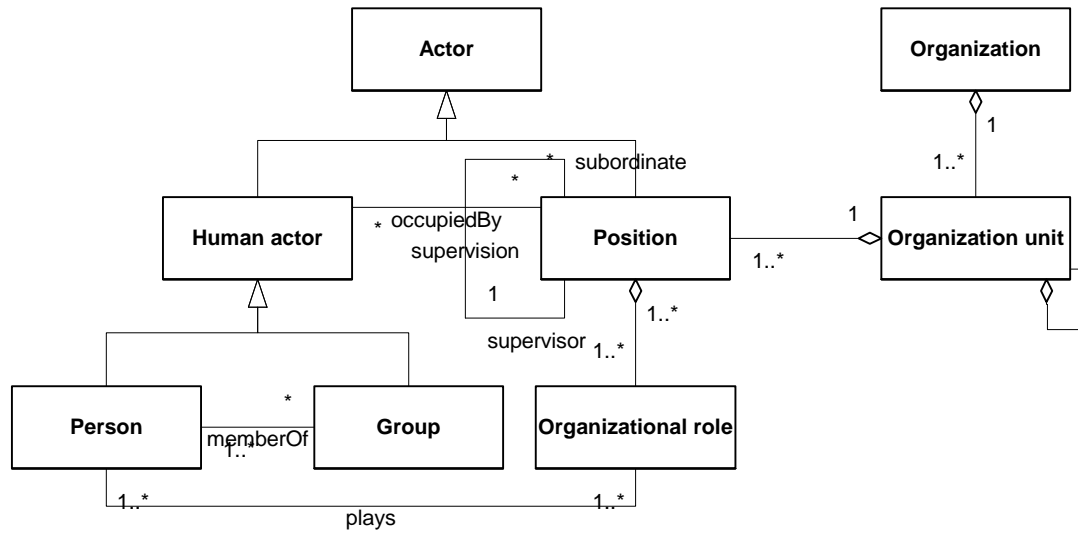
Purpose domain



3.2. Actor Domain

Actor domain encompasses those concepts and constructs, which refer to individuals, groups, positions, organizations, or parts thereof.

Actor	Organization	occupiedBy
Human actor	Organization unit	supervision
Person	Position	plays
Group	Organizational role	memberOf



Actor domain



3.3. Action Domain

Action domain is composed of those concepts and constructs which refer to functions, activities, tasks, or operations carried out in a context.

Action

Action structure

Decomposition structure

Control structure

Temporal structure

Mgmt-exec structure

Rule

Event

Condition

Work procedure

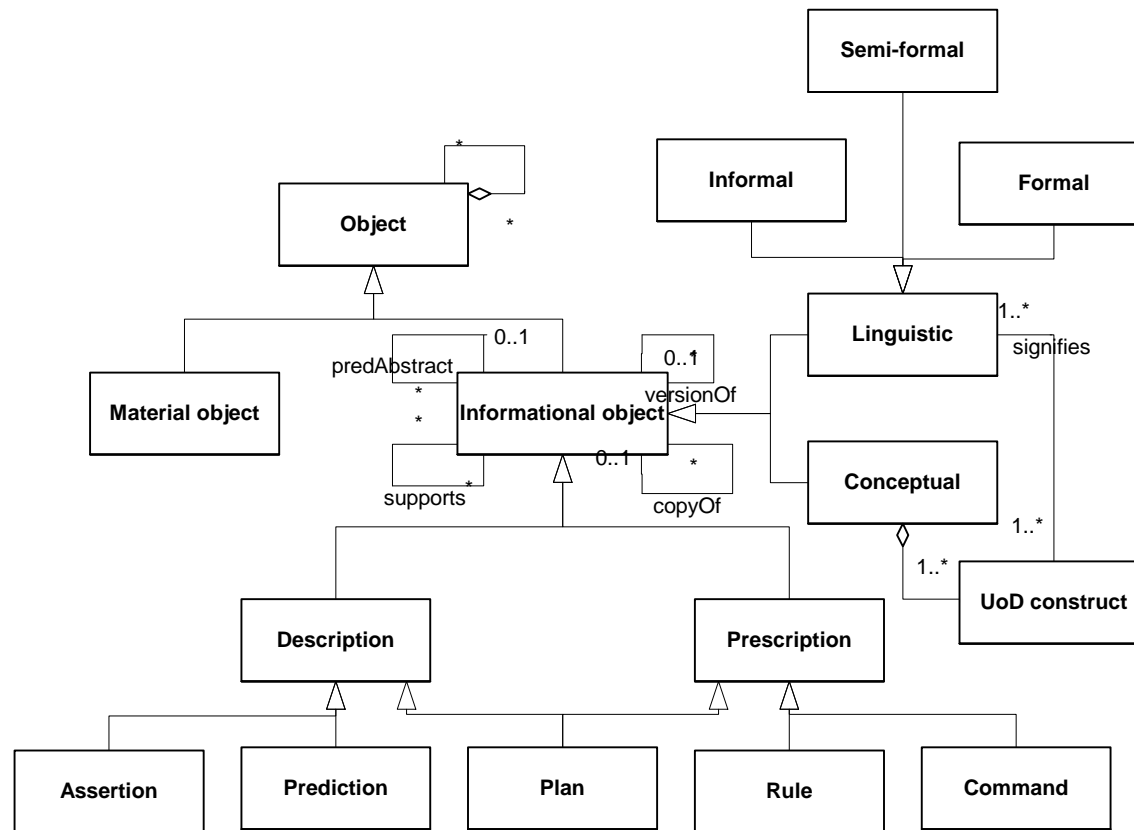
Process



3.4. Object Domain

Object domain comprises those concepts and constructs which refer to something which an action is targeted to. The object can be material or informational.

Object	Description	supports
Material object	Prescription	signifies
Informational object	Assertion	versionOf
Linguistic object	Prediction	copyOf
Conceptual object	Plan	predAbstract
Informal object	Rule	
Semi-formal object	Command	
Formal object		
UoD construct		



Object domain



3.5. Facility Domain

Facility domain consists of those concepts and constructs which refer to means, whether tools or resources, by which something can be done or is done.

Facility

Tool

Computerized tool

Computer-aided tool

Manual tool

Configuration

Component

Resource

Energy

Money

Manpower

Capital

compatibility

configured

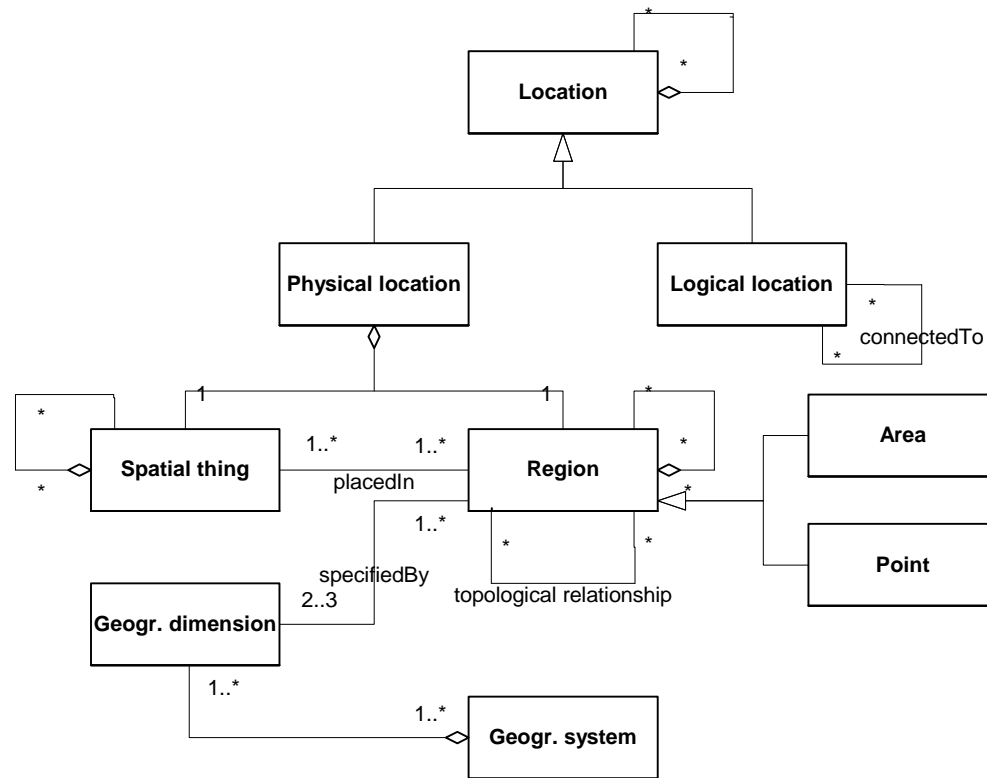
versionOf



3.6. Location Domain

Location domain is composed of those concepts and constructs which refer to parts of space occupied by someone or something. The location can be physical, like a room or a building, or logical, like a site in a communication network.

Location	Area	connectedTo
Physical location	Point	placedIn
Spatial thing	Logical location	specifiedBy
Region		topological rel.
Geographical dimension		
Geographical system		



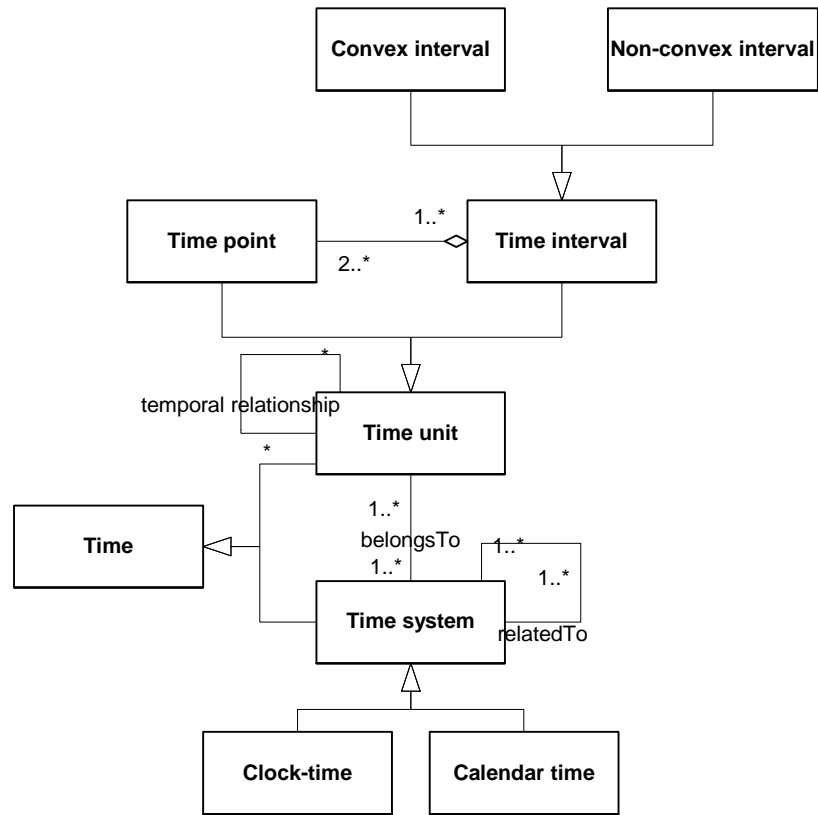
Location domain



3.7. Time Domain

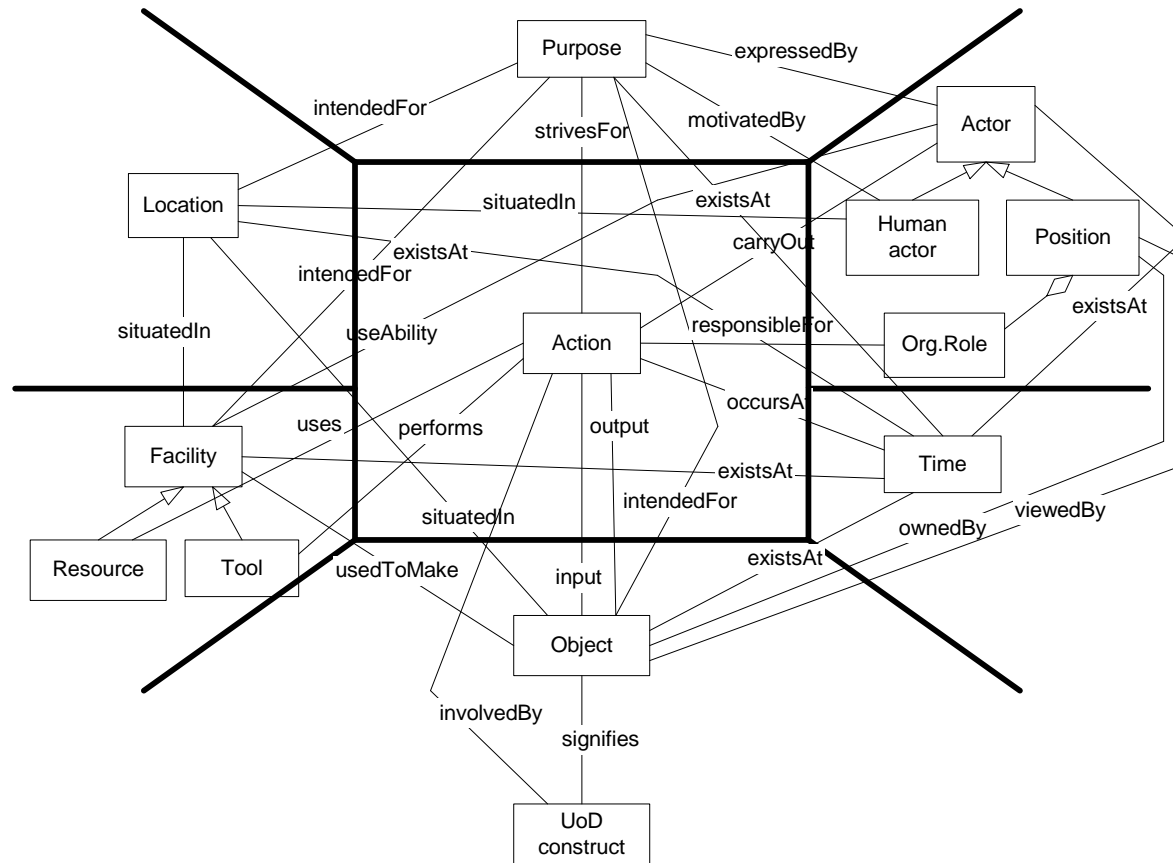
Time domain includes those concepts and constructs which refer to temporal aspects in a context.

Time	Convex interval
Time point	Non-convex interval
Time interval	
Time unit	temporal relationship
Time system	belongsTo
Clock time	relatedTo
Calendar time	



Time domain

3.8. Inter-Domain Relationships





4. Conclusions

We have engineered a context-based enterprise ontology in order to promote the understanding of the nature, purposes, and meanings of things about which information is stored, processed in, and transmitted between, various enterprise applications.

The ontology is a top-level ontology that can be used

- as a frame to analyze and compare other enterprise ontologies in terms of contextuality and
- as a baseline to be specialized into a task ontology, or a domain ontology for the needs of a specific business task or field.

Validation of the ontology is our next step towards a more concrete ontology.



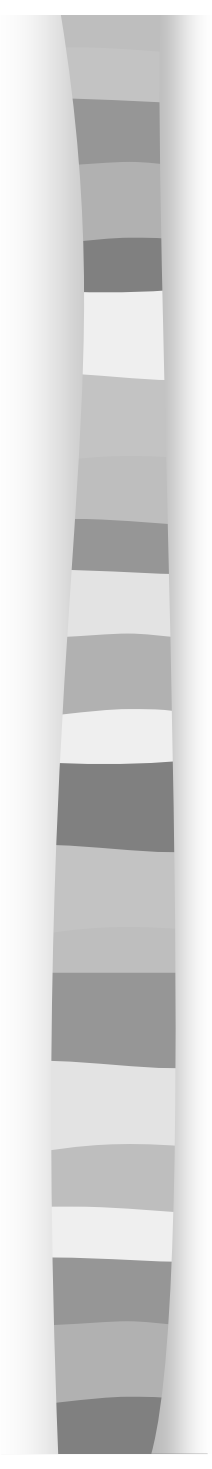
4 Conclusions (continues...)

Our ontology differs from others (e.g. Fox 1992, Uschold et al. 1995, Loucopoulos et al. 1998, Geerts et al. 2000), e.g. in that

- it serves as a theory-based, comprehensive foundation for deriving more specialized concepts.
- it inherently highlights seven main types of aspects which are essential to understanding contextual meanings of things.


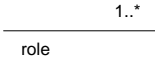
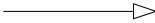


ACTIVITY	ORGANIZATION	STRATEGY	MARKETING	TIME
Activity	Person	Purpose	Sale	Time line
T-Begin	Machine	Hold-purpose	Potential sale	Time point
T-End	Corporation	Purpose-holder	For sale	Calendar date
Pre-Condition	Partnership	Objective	Vendor	Relative time point
Effect	Partner	Vision	Actual customer	Duration
Doer	Legal Entity	Mission	Potential customer	Duration bounds
Sub-Activity	Organisational unit	Goal	Customer	Time interval
Activity decomposition	Manage	Achieve	Reseller	Before
Authority	Delegate	Help achieve	Product	Same or before
Activity owner	Management link	Strategy	Asking price	After
Event	Orgn. Structure	Strategic planning	Sale price	Same of after
Plan	(non-)legal ownership	Strategic action	Market	Distance
Execute	Ownership	Decision	Segmentation	Earliest start time
Sub-plan	Owner	Assumption	variable	Latest start time
Planning	Asset	(non-) critical	Market segment	Earliest end time
Process specification.	Stakeholder	assumption	Market research	Latest end time
Capability	Contract of employment	Influence factor	Brand	Interval before
Skill	Share	(non-) critical	Image	Interval during
Resource	shareholder	influence factor	Feature	Interval overlaps
Resource alloc.		Critical success	Need	Interval disjoint
Resource substitute		factor	Market need	
		Risk	Promotion	
			competitor	

The Enterprise Ontology (Uschold et al., 1995)



GOAL MODELLING	ACTOR-ROLE MODELLING	OBJECT MODELLING	RULES MODELLING
Goal Means Stakeholder Issue Business process	Role Actor Activity	Object class Object attribute Object association Event External event Internal event Operation	Business rule Constraint rule Derivation rule Action rule Role interaction rule Object rule

**ELECTRA (Electrical Enterprise Knowledge for Transforming Applications),
(Loucopoulos et al. 1998)**

Ontology representation language		
Concepts	Definition	Notation
Class	A description of a set of concepts that share the same predicates.	
Association	An semantic connection between two classes, each one associated in a specific role. For each association end a range of allowed cardinalities is specified with the multiplicity.	
Generalization	A taxonomic association between a more general class and a more specific class.	
Aggregation	A special form of association that specifies a whole-part relationship between a whole and its part in such a way that the parts in the whole are inter-related.	
Composition	A special form of aggregation which requires that a part instance is included in at most one whole at a time, and that the lifetimes of the parts are coincident with the lifetime of the whole.	

UML-based ontology representation language