ADELFE FRAGMENTATION

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The creation of the new design process for a specific situation using the method engineering approach is based on the composition of a set of reusable method fragments. Thus, we have fragmented ADELFE, an agent-oriented methodology for designing Adaptive Multi-Agent System (AMAS).
For describe identified fragments, we use size of documentation which proposed by Cossentino and al.

1. Rules for fragmentation

ADELFE is divided in Work Definitions, Activities and Steps. So, one of this three levels will be opted for unit of fragment decomposition. Work Definition contains a lot of activities of development process. Conversely, Step is an atomic element which enrolls in activities. Step isn't enough "self-sufficient" to establish the fragmentation on steps. On the other hand, an Activity represent "working unit", thus it corresponds at the level of detail looked for a fragment.

That's why activity was held like unit to the granularity level of fragmentation. However, an activity doesn't necessarily correspond to fragment. In fact, some activities are tightly linked by produced documents or by meta-model elements, to be among the same fragment. These activities do not join together in ADELFE because they bring into play different actors. Conversely, ADELFE activity can decompose in several fragments as we are going to see it.

Moreover a part of fragmentation work was to determine echoed them of the fragmentation with regard to the meta-model elements of ADELFE. The result of this work is summarized in section 3.b.

2. Item of fragmentation

a. Fragmentation of the WD1

The first phase of process is composed by two fragments: *Requirements Description* which includes the activities A1, A2 and A3, and *Finalize Requirements* which includes the activities A3 and A4.

In this work definition, we have chosen to bring the three first activities. They aim at identify and clarify the user requirements. They work on a *Requirement Set* although they are separated in ADELFE since different actors step in.

However the activities A4 and A5 are in second fragment because their objective is to formalize requirement expression. Moreover A4 and A5 are tightly linked and will be often realized together because requirements set [final] is going to use keywords set [final] defined in glossary.

This fragmentation is depicted in Figure 1.

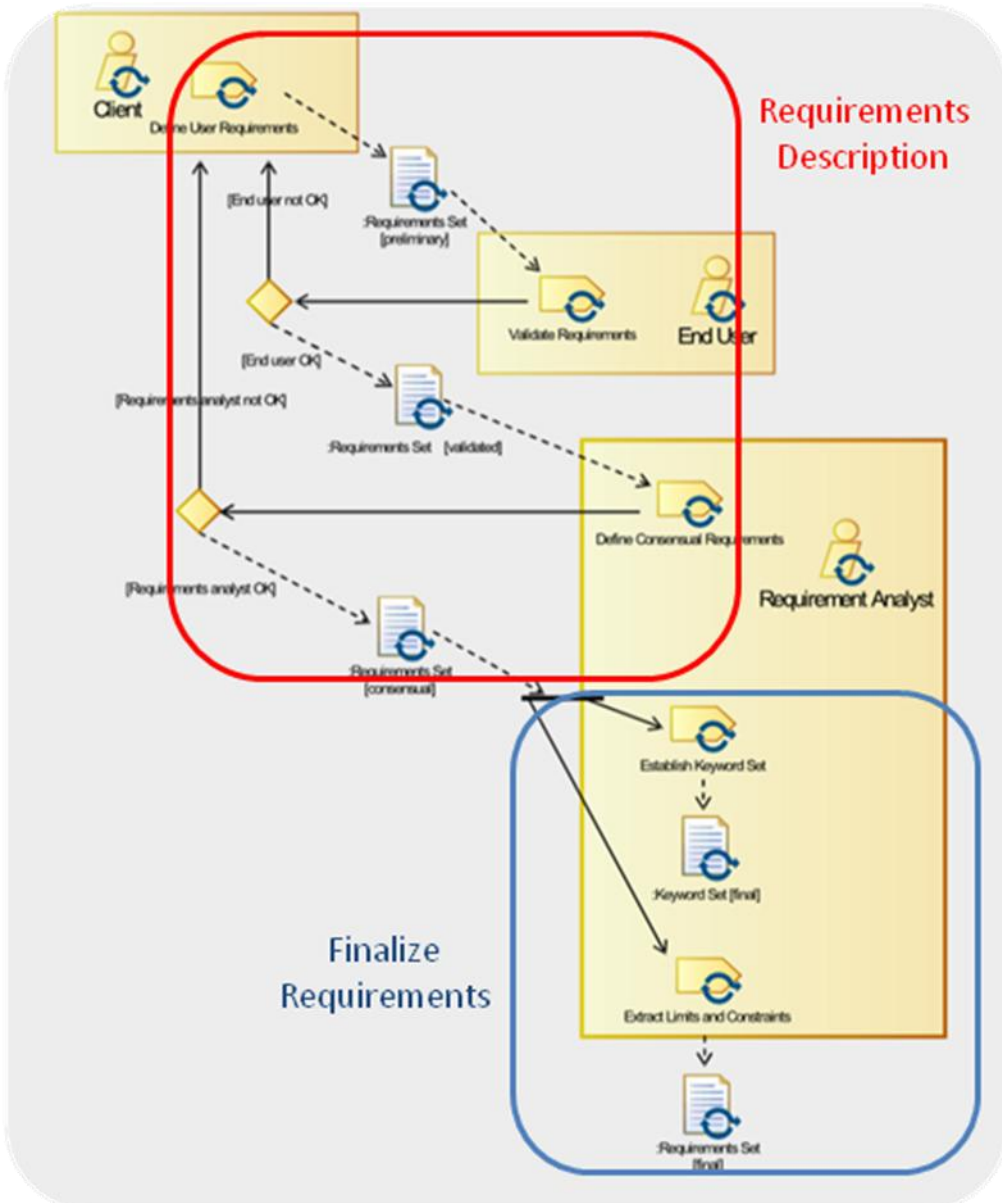


FIGURE 1: FRAGMENTATION OF THE WD1

The aim of fragment *Requirement Description* is to produce requirements set for the system to be designed.

The aim of fragment *Requirement Description* is to finalize requirements set and also to produce keywords set.

b. Fragmentation of the WD2

The second phase of process is composed by three fragments: *Environment Description* which matches to activity A6, *Use Case Definition* which matches to activity A7 and *UI Prototyping* which includes the activities A8 and A9.

A8 and A9 are together because these two activities are tightly bound to the work of prototyping.

This fragmentation is depicted in Figure 2.

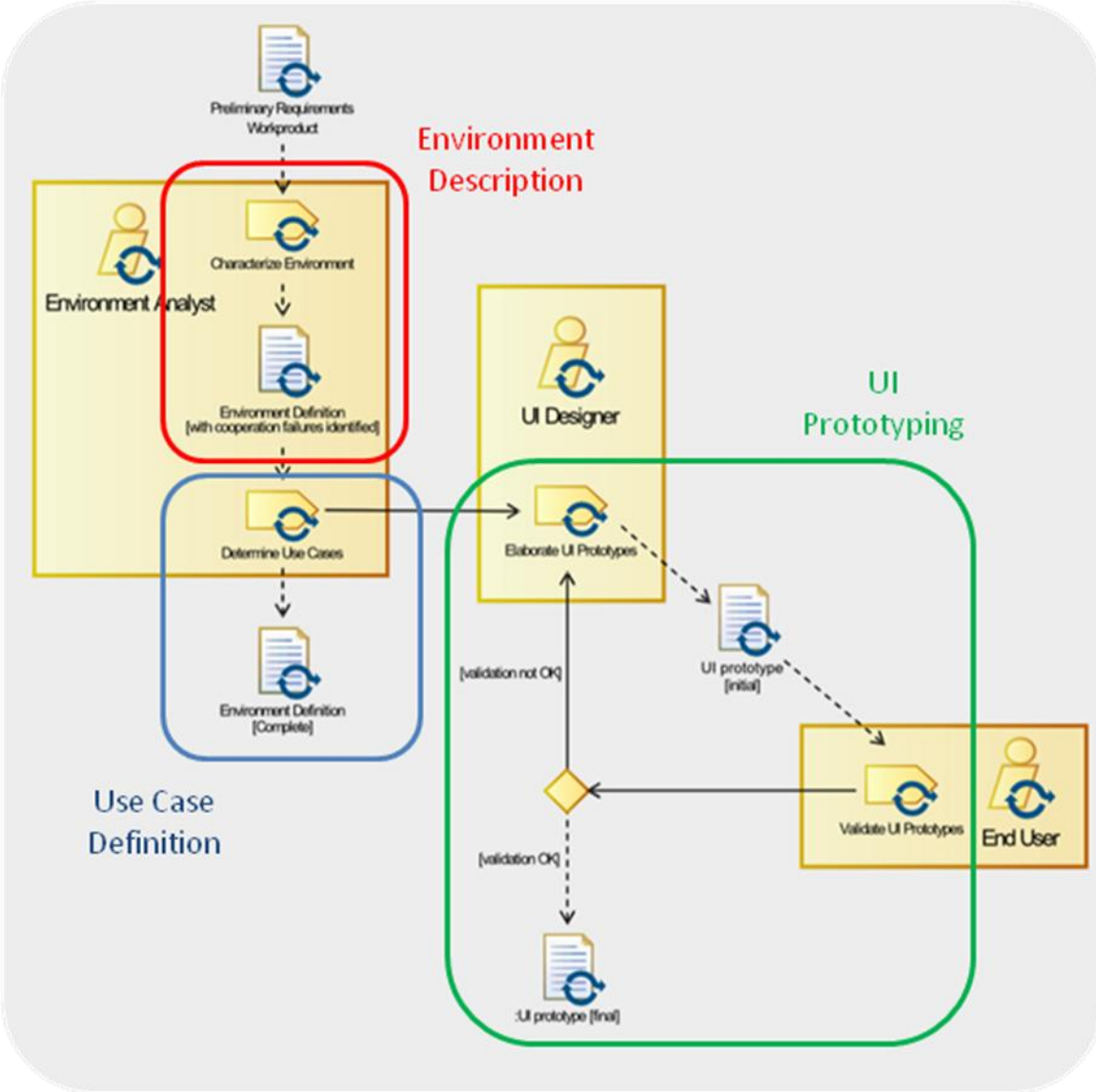


FIGURE 2: FRAGMENTATION OF THE WD2

The role of these fragments is equal to these of corresponding activities.

c. *Fragmentation of the WD3*

The third phase of process is composed by four fragments: *Domain Analysis* which matches to activity A10, *Verify AMAS Adequacy* which matches to activity A11, *Agent Identification* which matches to activity A12 and *Entities Interaction Study* which matches to activity A13

This fragmentation is depicted in Figure 3.

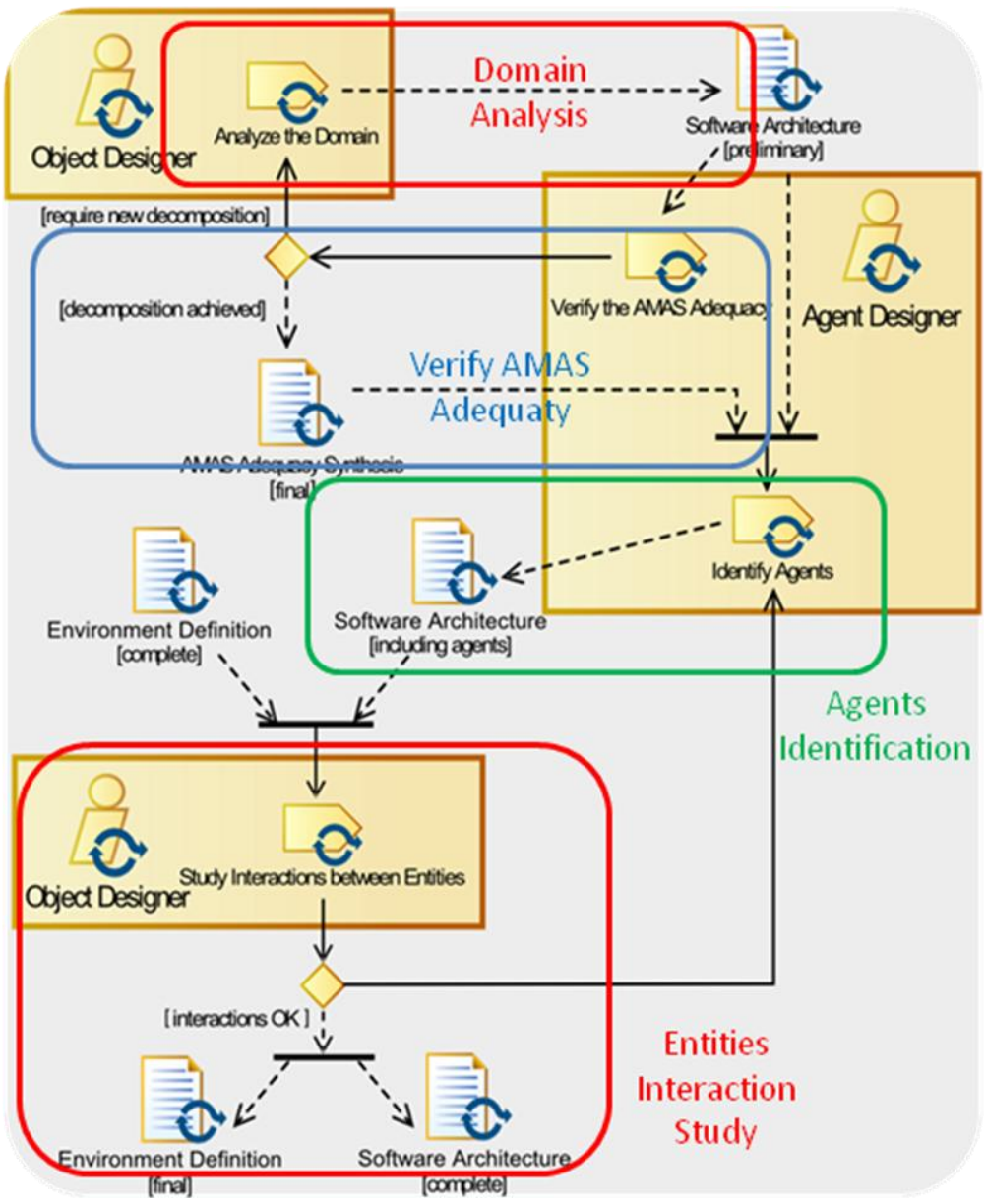


FIGURE 3: FRAGMENTATION OF THE WD3

The role of these fragments is equal to these of corresponding activities.

d. Fragmentation of the WD4

The fourth phase of process is composed by six fragments: *Architecture Definition* which matches to activity A14, *Interaction Language Definition* which matches to activity A15, *Agent Definition* which matches with one part of activity A16, *Non Cooperative Situation Definition* which matches with the other part of activity A16, *Fast Prototyping* which matches to activity A17 and *Architecture Refinement* which matches to activity A18.

This fragmentation is depicted in Figure 4.

This Work Definition is the one which was divided in most large number of fragments. In fact the parting of interaction language definition and agent definition allow to combine ADELFE with others agent architectures. We went farther by dividing A16 into two fragments (the one divide into several fragments). This fragmentation joins in a more global work of the team SMAC which advances a separation between the nominal behavior and the cooperative behavior.

Finally, it is not so surprising to notice that this WD is the one which corresponds to most large number of fragments, given the detail the attention of which it paid in the process ADELFE.

Fragments summary table

	Title	WD-Activities	Description	Required Documents	Product Documents	Actors	Input	Define	Relate	Quote
1	Requirements Description	WD1-A1, A2, A3	The goal of this fragment is to produce a list of (text) requirements for the system to be designed.	none	Requirement set [consensual]	Client, End User, Requirement Analyst	-	Actor Functional Requirement Non Functional Requirement	Actor-Functional requirement Functional Requirement – non Functional Requirement Actor-Functional requirement	-
2	Finalize Requirements	WD1-A4, A5	The goal of this fragment is to produce a finalized list of (text) requirements for the system to be designed and a list of keywords to define the concepts used to describe the application.	Requirement set [consensual]	Requirement Set [final], keywords set	Requirement Analyst	Actor Functional Requirement Non Functional Requirement	Keyword Constraint Limit	Non Funct. Req. – (Limit, Constraint) Keyword –(Funct. Req., Non Funct. Req.)	-
3	Environment Description	WD2-A6	The goal of this fragment is to describe the environment of the system.	Requirement set	Enviroment Definition	Enviroment Analyst	Actor Funct. Req Non Funct. Req. Limit Constraint	Active Entities Passive Entities Environment Environment attribute	Passive Entity-System Active Entity-System Environment-Environment attribute	-
4	Use Case Definition	WD2-A7	The purpose of this fragment is to clarify the different functionalities that the system must provide.	Environment Definition [with cooperation failures identified]	Environment Definition [complete], Use Case Diagrams	Enviroment Analyst	Active Entity Passive Entity Environment Environment attribute	Use Case Association UC_Relationship	Use Case – UseCase Text Description	Actor
5	UI Prototyping	WD2-A8,A9	The goal of this fragment is to define and to test the Graphic User Interface (GUI) that allows the user to interact with the system.	Environment Definition	Prototypes UI	UI Designer, End User	Active Entity Passive Entity Environment Use Case	UI Txt Description UI Mockup	UI Txt Description-UI Mockup	-
6	Domain Analysis	WD3-A10	The goal of this fragment is to give a static view and an abstraction of the real work established form the description of the system to be designed.	Requirement set, keyword set, environment definition	Software architecture [preliminary]	Object Analyst	Requirement Active Entity Passive Entity	Analysis Active Entity Analysis Passive Entity	Analysis Active Entity-Analysis Passive Entity	-

	Title	WD-Activities	Description	Required Documents	Produced Documents	Actors	Input	Define	Relate	Quote
7	Verify AMAS adequacy	WD3-A11	In this fragment, we verify that one (maybe more) Adaptive Multi-Agent System (AMAS) is needed to realize the system to be. We must study the adequacy at a global and a local level.	Software architecture [preliminary]	AMAS adequacy synthesis	Agent Analyst	Use Case Analysis Active Entity Environment Environment Attribute	Answer	Question-Answer	Question
8	Agents Identification	WD3-A12	This fragment aims at finding what we will consider as agents in the system to be.	Software architecture [preliminary], AMAS Adequacy synthesis	Software Architecture [including agents]	Agent Analyst	Analysis Active Entity	Agent	-	Analysis Active Entity
9	Entities Interaction Study	WD3-A13	This fragment aims at making clear interactions between the identified entities.	Environment definition [complete], software architecture [including agents]	Environment definition [final], software architecture [complete]	Domain Analyst	Agent Analysis Active Entity Analysis Passive Entity	Potential Cooperation Failure	Agent-(Agent, Analysis Active Entity, Analysis Passive Entity)	Agent Analysis Active Entity Analysis Passive Entity
10	Architecture Definition	WD4-A14	The main objective of this fragment is to define the detailed architecture of the system in term of packages, classes, objects and agents.	Software architecture [complete]	Detailed architecture [initial]	Object Designer	Entities Agent	AdaptativeMultiAgentsSystem	-	-
11	Interaction language Definition	WD4-A15	In this fragment we define the way the agents will interact	Detailed architecture [initial]	Interaction languages[initial]	Agent Designer	Agent	CooperativeInteractionProtocol Message	CooperativeInteractionProtocol-Message Message-Message Message-ActiveEntity	-

	Title	WD-Activities	Description	Required Documents	Produced Documents	Actors	Input	Define	Relate	Quote
12	Agent Definition	WD4-A16	This fragment, for every agent previously identified, aims to define its behavior: the skill, the aptitudes, an interaction language, a world representation.	Detailed architecture [initial], Interaction languages [initial]	Detailed architecture [intermediate], Interaction languages [intermediate]	Agent Designer	Agent CooperativeInteractionProtocol Message	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule	Action-Actuator Perception-Sensor Skill-Action Skill-Aptitude Rule-DecisionResult Rule-AgentStete	NonCooperativesSituationType
13	Non Cooperative Situations Identification	WD4-A16	The objective of this fragment is to define the different Non Cooperative Situations (NCS) and the ways they are handled by the agents	Detailed architecture [intermediate], Interaction languages [intermediate]	Detailed architecture [draft], Interaction languages [draft]	Agent Designer	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule Condition DecisionResult CooperativeRule	-	NonCooperativesSituationType Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule

	Title	WD-Activities	Description	Required Documents	Produced Documents	Actors	Input	Define	Relate	Quote
14	Fast Prototyping	WD4-A17	In this fragment, the identified behaviors of an agent are tested	Detailed architecture [draft], Interaction languages [draft]	Detailed architecture [including agent model], Interaction languages [final]	Agent Designer	Agent Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Rule Skill AgentState Condition CooperativeRule DecisionResult StandardRule	-	-	-
15	Architecture Refinement	WD4-A18	This fragment aims to complete the system architecture and the design activities.	Detailed architecture [including agent model]	Detailed architecture [final]	Object Designer	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule	StateExpression StateVariable	StateExpression- StateVariable	-

	Title	WD-Activities	Description	Required Documents	Produced Documents	Actors	Input	Define	Relate	Quote
16	Architecture Extraction	WD5-A19, A20	In this fragment, a muADL model is generated from the AMAS-ML model	Detailed architecture [final], Interaction languages [final]	muADL Model	Agent Architecture Analyst	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule Condition DecisionResult CooperativeRule StateExpression StateVariable	MuArchitecture MuComponent Level LevelComponent ContainerLevel ApplicationLevel MethodReference MethodVisibility Element DataType Feature Method Model	MuComponent-Interface	-
17	Architecture Implementation	WD5 A21, A22, A23	In this fragment, an API for the modelised agent type is generated.	muADL Model	Specific Cooperative Agent API (java library)	Java Developper	MuArchitecture MuComponent Level LevelComponent ContainerLevel ApplicationLevel MethodReference MethodVisibility Element DataType Feature Method Model	AMAS-ML model jar	-	-
18	Behaviour Implementation	WD5-A24, A25	The goal of this fragment is to generate and implement the behavioural rules of the agents.	Specific Cooperative Agent API (java library)	AMAS Code	AMAS Developper	AMAS-ML model jar	Java class	-	-

1 - Requirements Description (atomic) Fragment

Introduction

In this fragment, the user requirements for the to-be-designed system are determined consensually by the client, the end user and the requirement analyst.

The purpose of the Requirement Set is for one part to assure that the client and the designer of the system have a common vision of what will the system be, and for another part to ensure that the functionalities of the system will be in adequacy of the user's real needs.

This fragment is, for example, a part of the ADELFE process, where it is positioned in the beginning of the first Phase: Preliminary requirements (activities A1 to A3). Its purpose is to describe the to-be-designed system and its environment.

Fragment Description

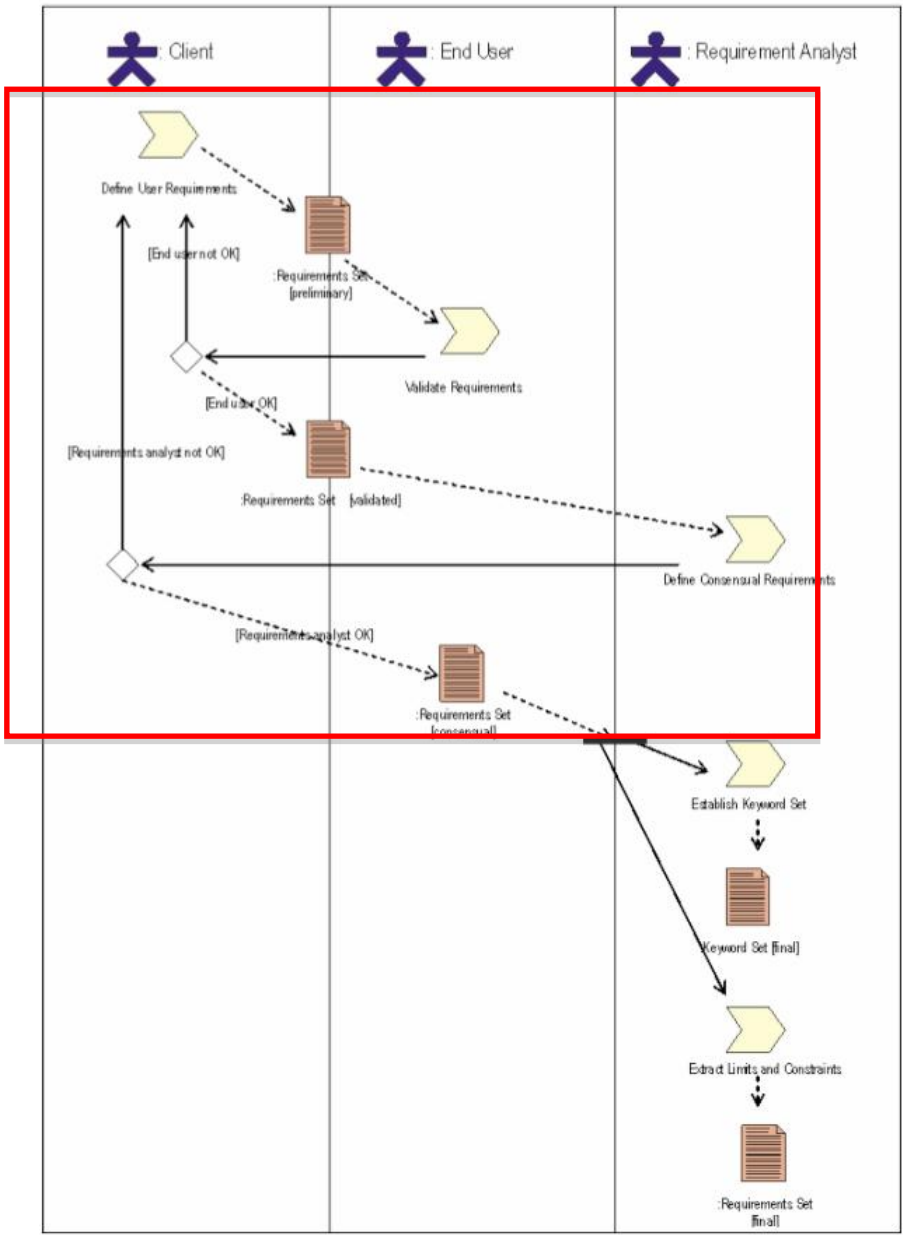
The goal of this fragment is to produce a list of (text) requirements for the system to be designed.

Input: none

Output: Requirement set [consensual]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented as a SPEM diagram:



Activities description:

Activity	Activity Description	Roles involved
Define User Requirements	Describe the system and its environment. Define what is to be build or what will be the most adapted system for the end user	Client
Validate Requirements	Check and approve the	End User

	content of the Requirement Set document. If the document is not approved, then it is necessary to go back to the “Define User Requirements” activity	
Define Consensual Requirements	Update and complete the Requirement Set document by including the consensual requirements. As for the precedent activity, if the document is not approved then it is necessary to go back to the “Define User Requirements” activity	Requirement Analyst

Roles involved in this fragment are:

Client, End User, Requirement Analyst

They are described in the following subsections:

Client

Responsibilities of *Client* are:

- To list the potentials requirements
- To give the context in which the system will be deployed
- To establish the functional and non functional requirements

End User

Responsibilities of *End User* are:

- To check and approve the requirements listed by the client

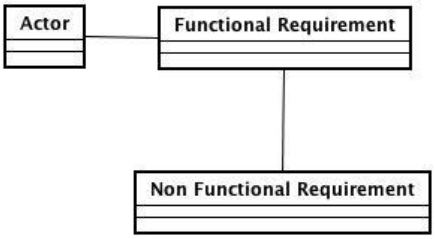
Requirement Analyst

Responsibilities of *Requirement Analyst* are:

- To update the requirement set with the consensual requirements.

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Functional Requirements of the system to be designed
- Non Functional Requirements of the system to be designed
- Actor

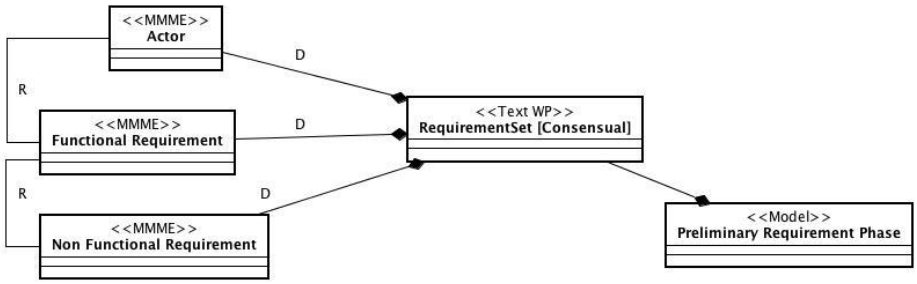
Deliverables

Requirement Set [Consensual]

The Requirement Set is a textual description of the to-be-designed system's basic specifications. Its purpose is to define the goals of the system and to give a formal description of the user requirements.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
	Requirements Description [consensual]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Actor Functional Requirement *(Text)* Non Functional Requirement (*Text)* [?][?][?]	Actor Functional Requirement Non Functional Requirement	Actor-Functional requirement Functional Requirement – non Functional Requirement	

Guideline

End-users, clients, analysts and designers have to list the potential requirements. The context in which the system will be deployed must be understood. The functional and non-functional requirements must be established.

The ***Requirements Set*** document must then be checked, approved and updated with consensual requirements.

Composition Guideline

The requirement set is a classic method used to define in a formal way the system to be designed. The requirement set purpose is to ensure that the client's and the designer's views of the system to be designed are similar enough. So in most approaches, this fragment is intended to be the first of the design process but it can also be preceded by a requirements elicitation fragment

Aspects of fragment

None

Dependency Relationships with other fragments

.None

Glossary

This Fragment refers these terms:

Consensual requirement: a condition or functionality the system must conform to, and upon what the client, end user and the requirement analyst agree.

Functional requirement: a requirement that specify a system function, as calculations, technical details, data manipulation and processing.

Non functional requirement: a requirement that specify the system properties, as the environmental or implementation constraints or constraints of performance, of dependency to a platform, of maintenance, of extensibility and of security.

2 - Finalize Requirements (atomic) Fragment

Introduction

In this fragment, keywords from requirements set should be extracted and limits and constraints of the system should be defined.

In this fragment, the requirement set is completed to take in account the limits and constraints of the system to be designed. It allows a more precise definition of these restrictions of the system, on which the client and designer can agree. The definition of a keyword list disambiguate the terms used in the Requirement Set.

This fragment is for instance present in the ADELFE process in the first Phase: Preliminary requirements (activities A4 and A5).

Fragment Description

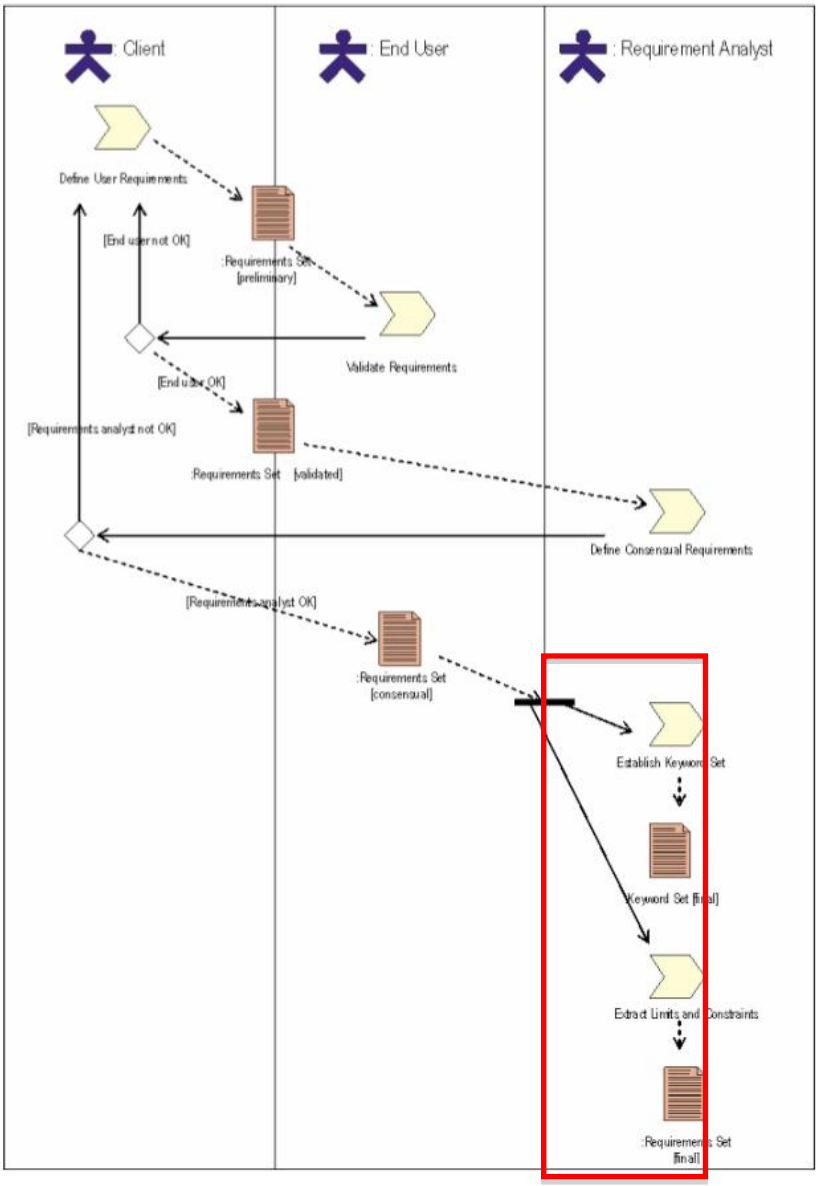
The goal of this fragment is to produce a finalized list of (text) requirements for the system to be designed and a list of keywords to define the concepts used to describe the application.

Input: Requirement Set [consensual]

Output: Requirement Set [final], keywords set

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Establish a glossary	List the primary concepts used to describe the application and its domain (system and environment).	Requirement Analyst
Extract limits and constraints	Define limits and constrains of the system to build. They can be	Requirement Analyst

	deduced of the non functional requirements expression and context definition	

Roles involved in this fragment are:

Requirement Analyst

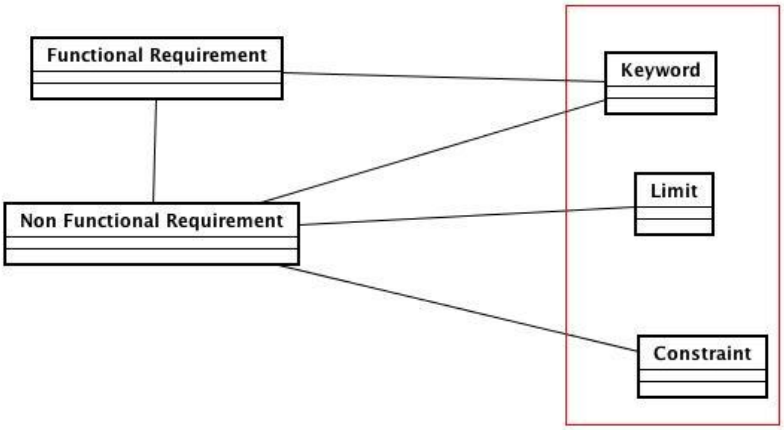
They are described in the following subsections:

Requirement Analyst
Responsibilities of *Requirement Analyst* are:

- To establish a keyword set
- To extract the limits and constraints of the system to be designed

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Keywords used in the Requirement Set
- Limits of the system to be designed
- Constraints of the system to be designed

Deliverables

Requirement Set [FINAL]

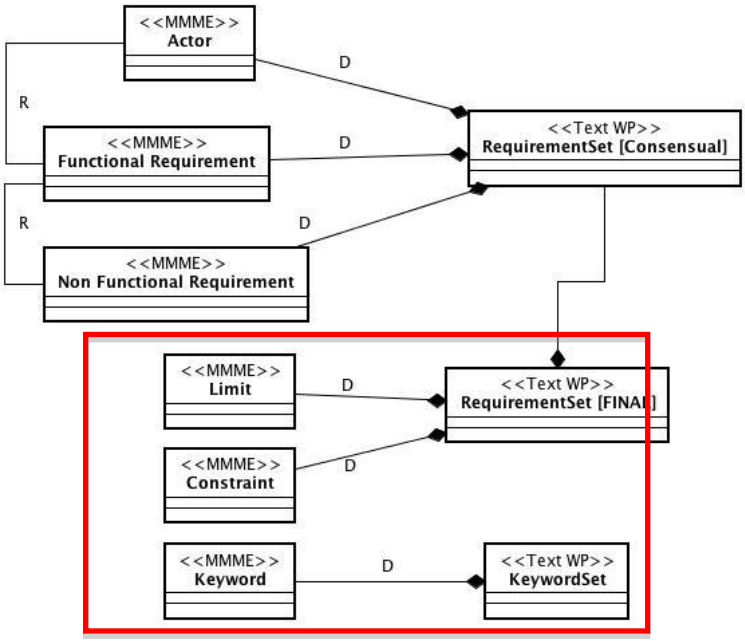
The Requirement Set is a textual description of the to-be-designed system's basic specifications. Its purpose is to define the goals of the system and to give a formal description of the user requirements.

Keywords Set

This document contains a definition of each primary concept used to describe the application and its domain

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Requirement Set [Consensual]	Keyword Set
	Requirement Set [Final]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Actor Funct. Req Non Funct. Req.	Keyword Constraint Limit	Non Funct. Req. – Limit, Constraint Keyword – Funct. Req., Non Funct. Req.	

Guideline

Limits and constraints can be found in the expression of non functional requirements and in the definition of the context in which the system will be deployed.

You have to list the main concepts used to describe the application and its domain (the system and its environment).

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

As this fragment needs a consensual requirement set, it should be preceded by a fragment which can product such a document, for example the Requirements Description fragment.

Glossary

This Fragment refers these terms:

Functional requirement: a requirement that specify a system function, as calculations, technical details, data manipulation and processing.

Non functional requirement: a requirement that specify a system property, as the environmental or implementation constraints, constraints of performance, of dependency to a platform, of maintenance, of extensibility and of security.

Environment description (atomic) fragment

Introduction

The principal objective of this fragment is to characterise the environment of the system to be designed. This definition will allow an easier definition of the use cases and constraints. These constraints and rules can make appear some environmental problems like non determination or discontinuity. It is important to start looking for this kind of characteristics as soon as possible in the process. This fragment is present in the ADELFE process on the second Phase: Final requirements (Activity A6)

Fragment Description

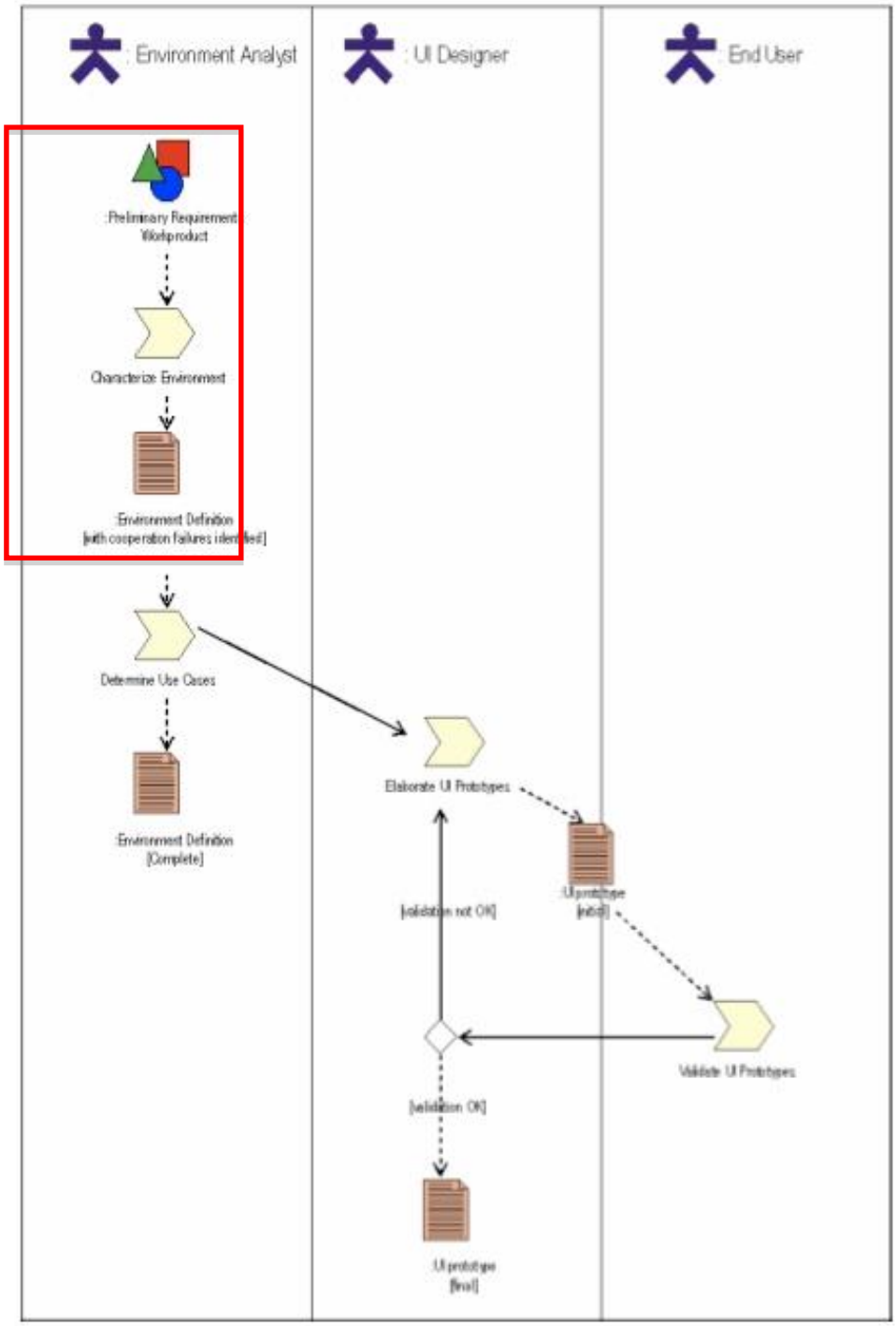
The goal of this fragment is to describe the environment of the system.

Input: Preliminary requirement workproduct.

Output: Environment definition [with cooperation failures identified]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Identify entities	Identify actives and passives entities in interaction with the	Environment Analyst

	system, as well as constraints on these interactions.	
Define context	Characterise the data flux and interactions between identified entities and the system.	Environment Analyst
Characterize Environment	Characterize the environment using the terms proposed by Russel and Norvig. [Be more precise?] [?]	Environment Analyst

Roles involved in this fragment are:

Environment Analyst

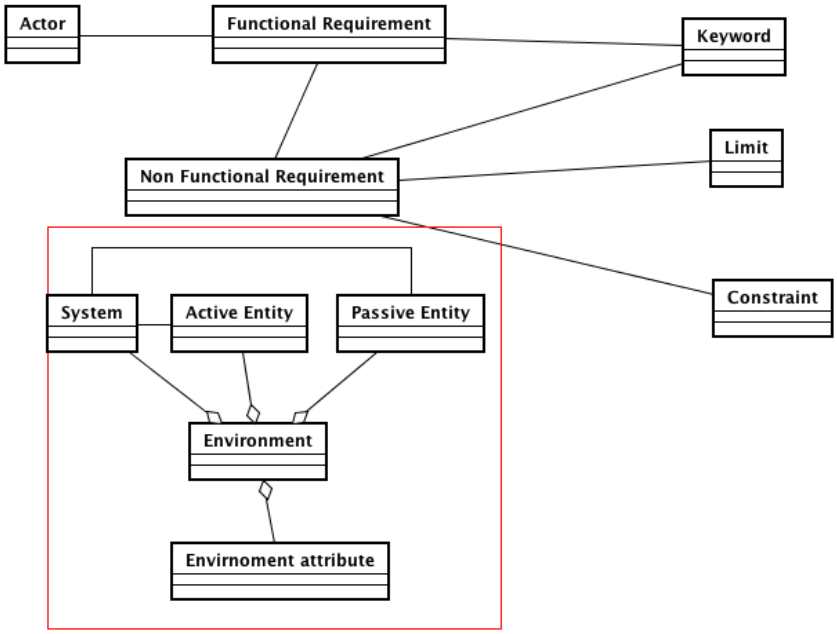
They are described in the following subsections:

Environment Analyst

Responsibilities of *Environment Analyst* are:

- To determine the entities in interaction with the system
- To define the context of these interactions
- To characterise the environment using terms defined by Russel and Norvig [?]

The portion of metamodel affected by this fragment is:



Report the metamodel and show the elements concerned with this fragment

This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- the entities (passive or active) in interaction with the system
- the context of these interactions
- the environment of the system

Environment definition [with cooperation failures identified]

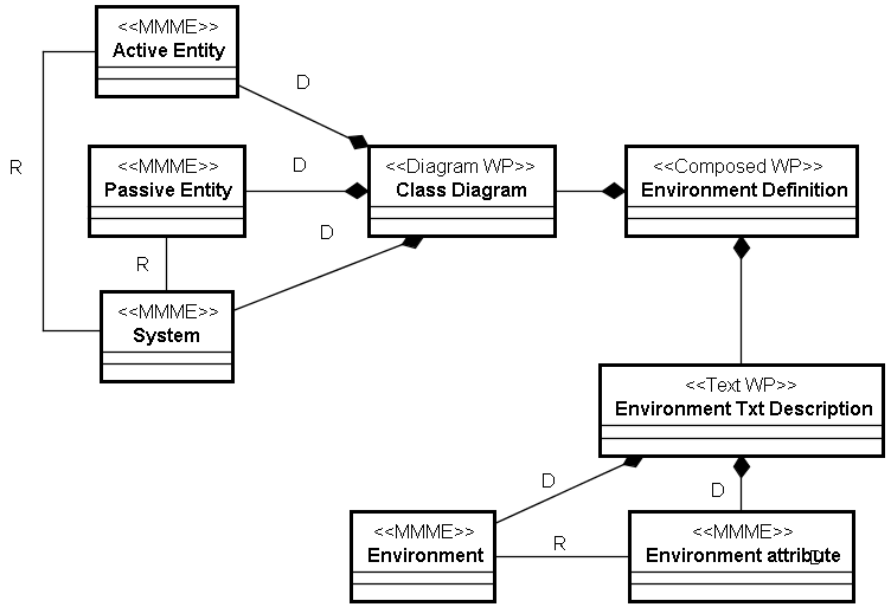
Report an example in a picture

Describe what type of diagram it is (class diagram, UML, Tropos …)

[?] Sequence/Collaboration Diagrams to describe the context [?]

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Requirement Set	Environment Definition

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Actor Funct. Req Non Funct. Req. Limit	Active Entities Passive Entities Environment Environment attribute	Passive Entity-System Active Entity-System Environment - Environment attribute	

Constraint			

Guideline

This fragment is characterized by three phases: to determine entities, to define context and to characterize environment.

The environment can be characterized by these terms:

-Accessible or not

-Deterministic or not

-Static or dynamic

-Discrete or continuous

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

One goal of this fragment is to make easier the definition of the use cases, so it is well placed when just before a use cases definition fragment.

To use this fragment, you need to have a clear vision of the system to be designed, so this fragment should be placed after a fragment or a composition of fragments that give a formal description of the system.

Glossary

This Fragment refers these terms:

Active Entity: An *entity* that can behave autonomously; for instance, by bringing modifications to their functioning constraints. They are able to act in a dynamical way with the system. Agents composing the system will be found among them

Entity: An actor in the UML sense; It is a set of coherent roles which the users of use cases play when they interact with use cases. In this fragment we make the distinction between *active entities* and *passive entities*.

Environment:

Passive Entity: An *entity* that can be considered as a resource by the system. Interactions with the system are restricted to data exchanges in order to realise the task the system must achieve. *Passive entities* may be used or modified by *active entities* but they do not change by themselves in an autonomous manner.

Dynamic: Teachers, Students groups, Rooms manager and Courses manager are unpredictable. They can add or modify constraints at any time.

Accessible: All the rooms are described

4 - Use Case Definition Fragment

Introduction

The main objective of this fragment is to clarify the different functionalities that the studied system must provide. Lately, these functionalities will be clustered in one or several use case diagrams between the entities and the system.

This fragment is used in the ADELFE process as the Activity 6 of the second Phase: Final Requirements.

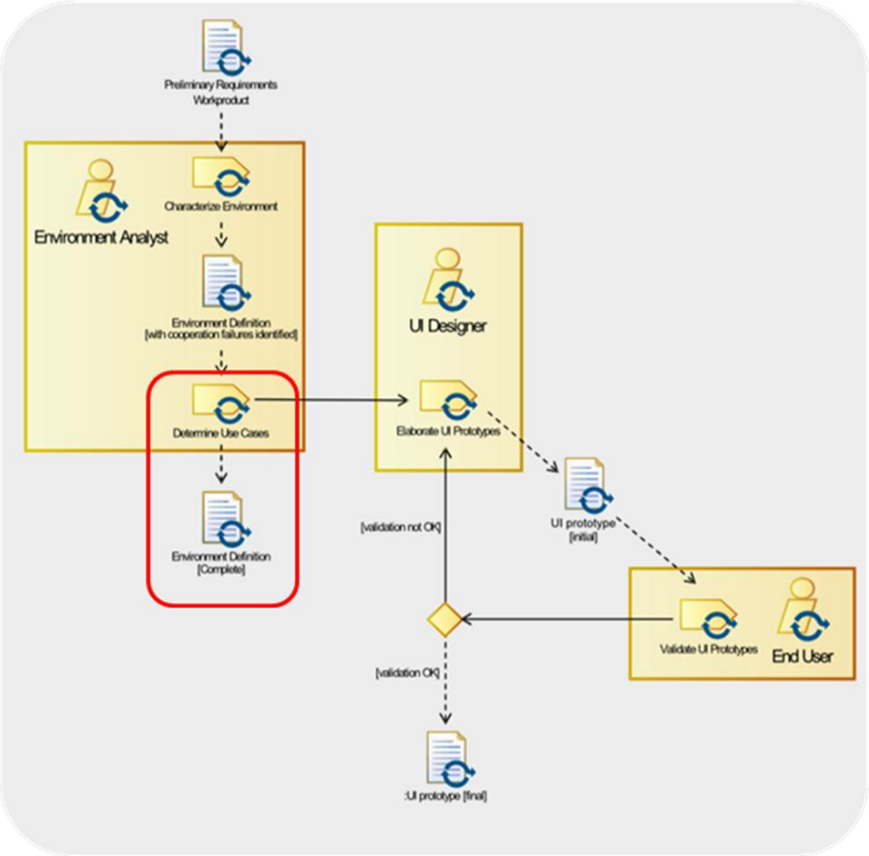
Fragment Description

The purpose of this fragment is to clarify the different functionalities that the system must provide.

Input: Environment Definition [with cooperation failures identified]
Output: Environment Definition [complete]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved

List use cases	Identify the different use cases that can exist for the system. Build the corresponding use case diagrams.	Environment Analyst
Identify cooperation failures	Determine events that can lead to situations not totally controlled by the system developer and potentially harmful.	Environment Analyst
Establish Sequence Diagrams	For each use case, make a corresponding sequence diagram.	Environment Analyst

Roles involved in this fragment are:

Environment Analyst

They are described in the following subsections:

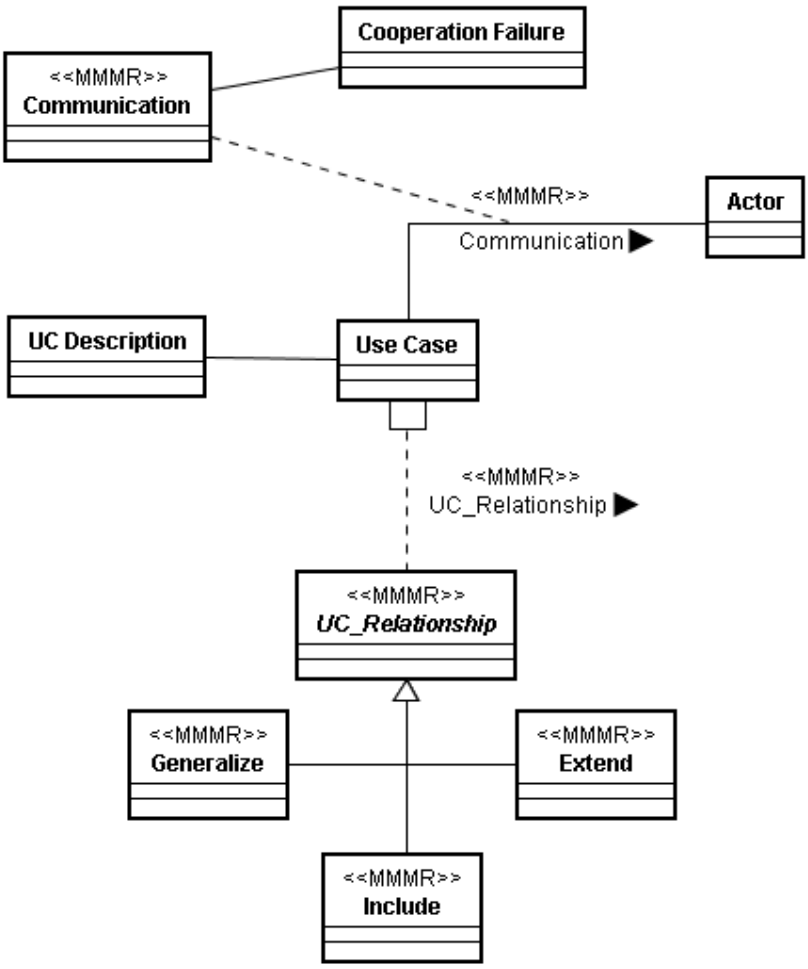
Environment Analyst

Responsibilities of *Environment Analyst* are:

- List the use cases
- For each use case, make a use case diagram
- Identify cooperation failures
- For each use case, make a corresponding sequence diagram

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- The different use cases ;
- The cooperation failures.

Deliverables

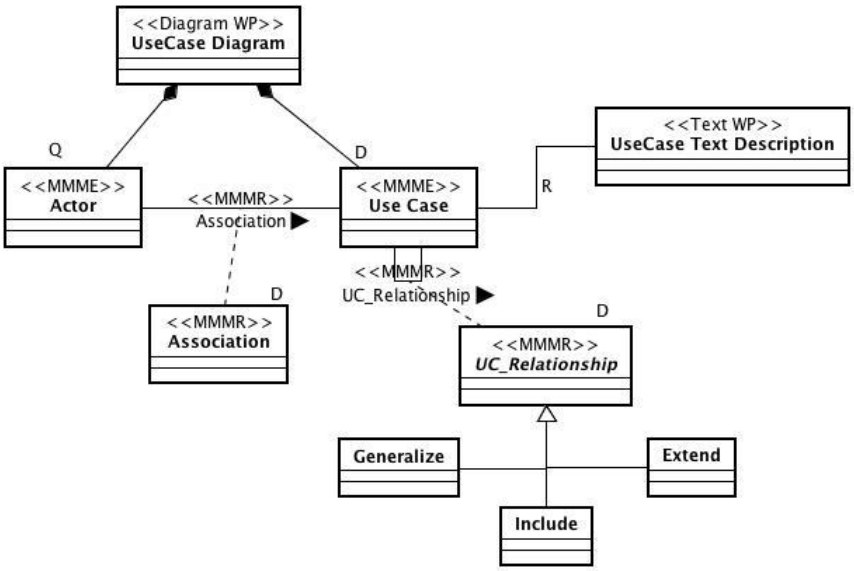
Environment Description [Complete]

The functionalities of the system are represented through use case diagrams in the Functional Description Model. This information completes the Environment Definition document.

A use case is detailed using a textual description and specific sequence diagrams. To manage a possible exception can be inserted a special box in the use case.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Environment Definition	Use Case diagram Environment Definition [complete]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Active Entities Passive Entities Environment Environment attribute	Use Case Association UC_Relationship	Use Case – UseCase Text Description	Actor

Guideline

The functionalities of the system are represented through use case diagrams in the Functional Description Model. This information completes the Environment Definition document.

A use case is detailed using a textual description and specific sequence diagrams. To manage a possible exception can be inserted a special box in the use case.

Composition Guideline

None

Aspects of fragment

Use Cases are expressed using UML diagrams.

Dependency Relationships with other fragments

This fragment depends of an Environment Description fragment since the use cases represent the system functionalities defined by studying the environment of the system.

5 - UI Prototyping

Introduction

Insert here a text description of the design process and the entire SPEM diagram that can help in positioning the fragment in the process workflow

Fragment Description

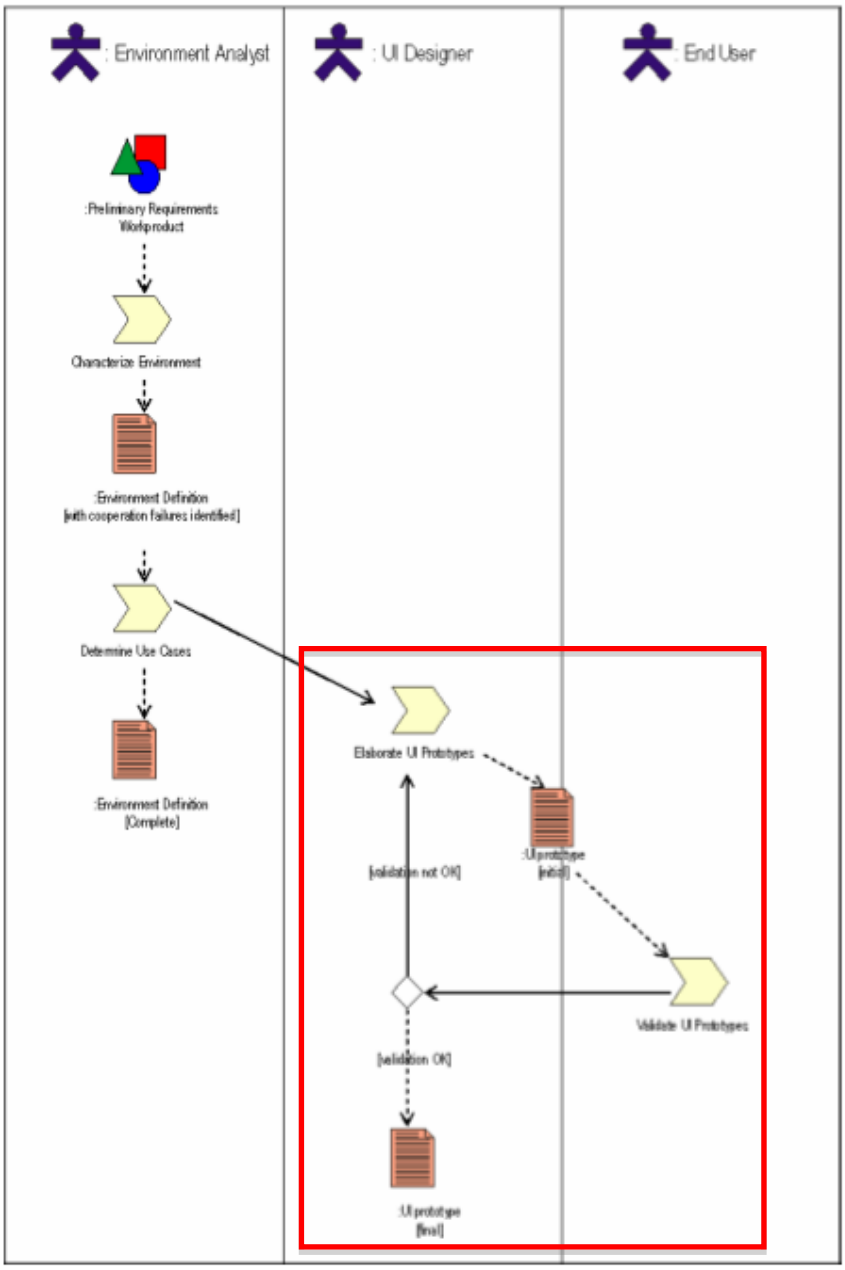
The goal of this fragment is to define and to test the Graphic User Interface (GUI) that allows the user to interact with the system.

Input: [?]

Output: UI Prototypes

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Elaborate UI Prototypes	Specify the Graphic User Interfaces (GUI) that will allow the user to interact with the system and define the relations between these interfaces.	UI Designer
Validate UI Prototypes	Study and judge the GUI	End User

	defined in the last activity from a functional and a non functional point of view. If the validation fail, it is necessary to redo the Elaborate UI Prototypes activity.	

Roles involved in this fragment are:

- UI Designer
- End User

They are described in the following subsections:

UI Designer

Responsibilities of *UI Designer* are:

- Elaborate UI Prototypes

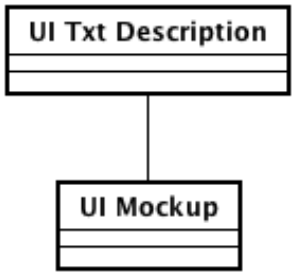
End User

Responsibilities of *End User* are:

- Validate UI Prototypes

Relationship with the MAS metamodel

The portion of metamodel of this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe …*<what?List of elements>* [?]

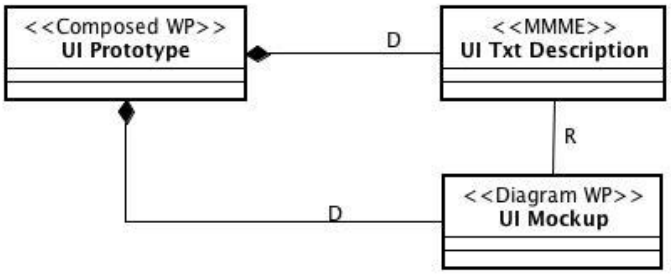
Deliverables

Prototypes UI

The GUIs must be described in the UI Prototype (final) document and on the Interface Models represented through UML diagrams.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
[?]	UI Prototypes

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
[?]	UI Txt Description UI Mockup	UI Txt Description-UI Mockup	

Guideline

Describe guidelines for performing the activities described in the fragment and correctly achieve the goal

Composition Guideline

None

Aspects of fragment

A possible means to describe the GUIs is to use the basic tool provided by OpenTool

Dependency Relationships with other fragments

To apply this fragment, you have to know the different use cases of the system, since the UI must be defined knowing the system functionalities. So this fragment must be preceded by a use cases fragment.

Glossary

This Fragment refers these terms:

6 - Domain Analysis

Introduction

Insert here a text description of the design process and the entire SPEM diagram that can help in positioning the fragment in the process workflow

Fragment Description

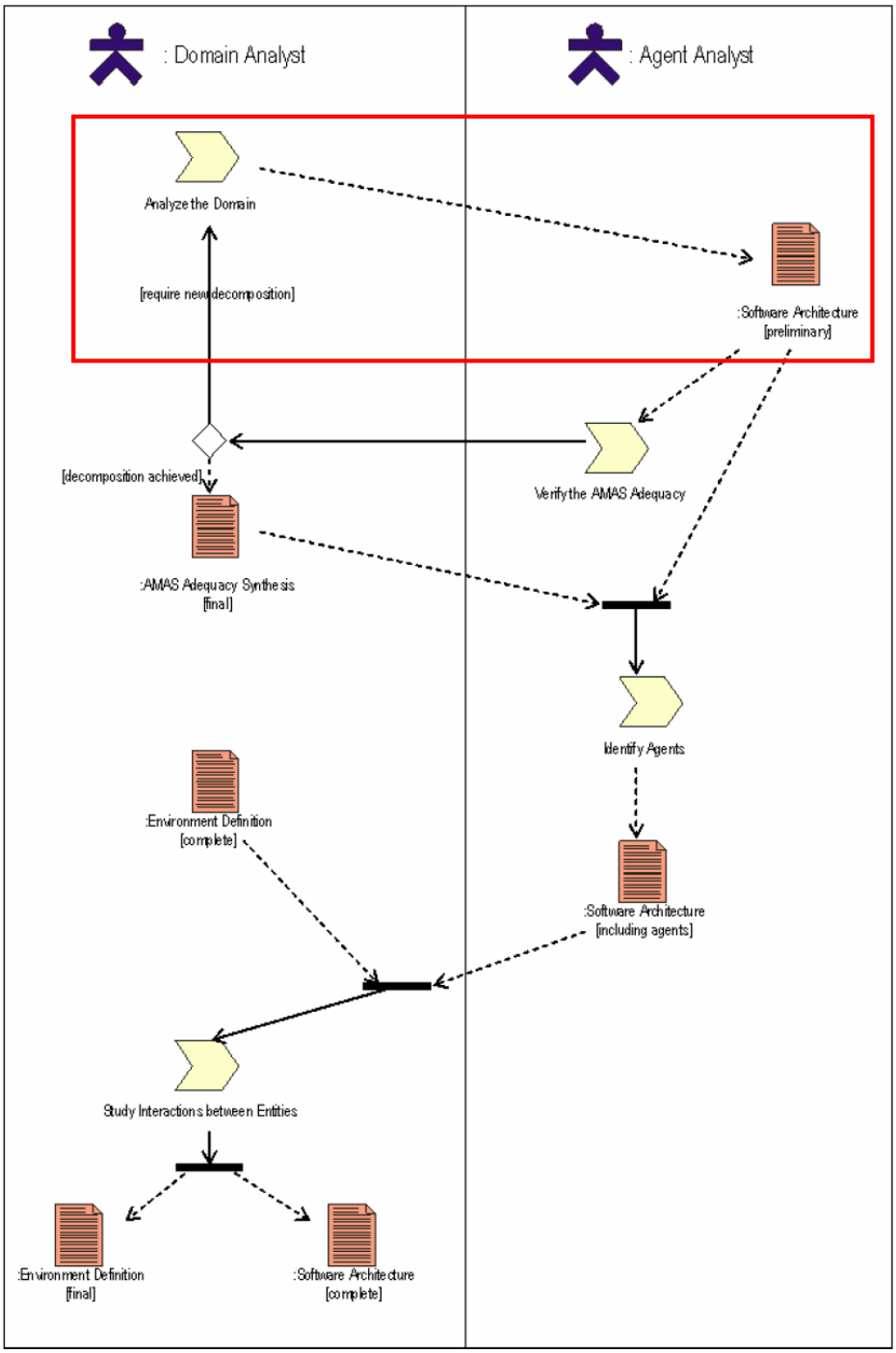
The goal of this fragment is to give a static view and an abstraction of the real work established form the description of the system to be designed.

Input: Requirement set, keyword set, environment definition

Output: Software architecture [preliminary]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram:



Activities description:

Activity	Activity Description	Roles involved
Identify classes	The set of use cases, the corresponding sequence diagrams and the keywords set must be	Object Analyst

	analysed to identify needed classes. When identifying these classes you may have to update the already given entities list	
Study relationships among classes	Study the interactions between the different classes by studying the use cases and sequence diagrams.	Object Analyst
Build preliminary class diagram	Once the different classes and their interactions are identified, construct the preliminary class diagram.	Object Analyst

Roles involved in this fragment are:

Object Analyst

They are described in the following subsections:

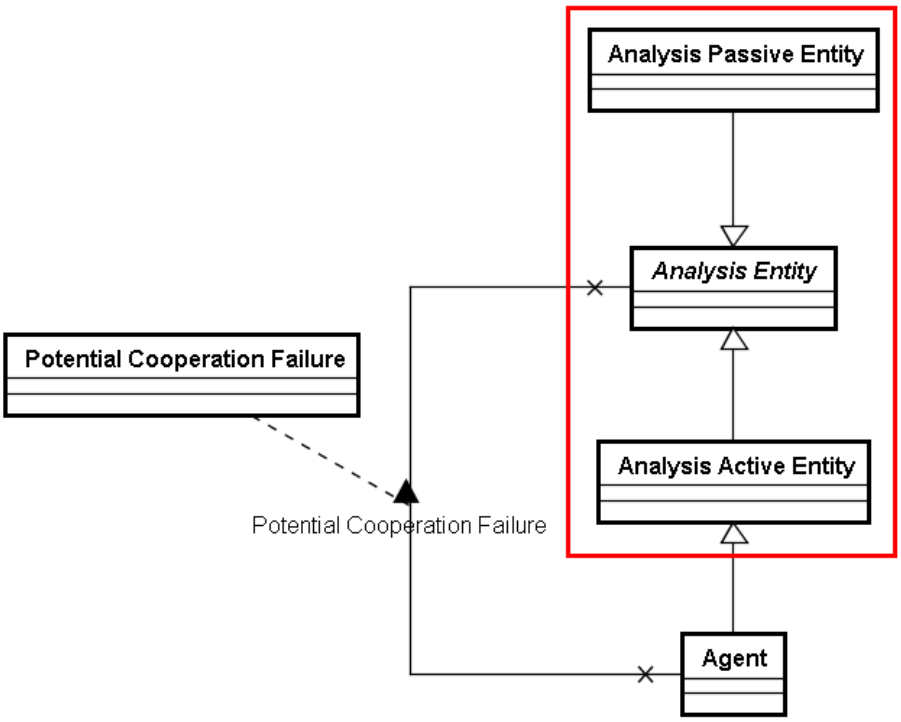
Object Analyst

Responsibilities of *Object Analyst* are:

- Identify classes
- Study relationship among classes
- Build preliminary class diagram

Relationship with the MAS metamodel

The portion of metamodel of this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Analysis Passive Entity
- Analysis Active Entity

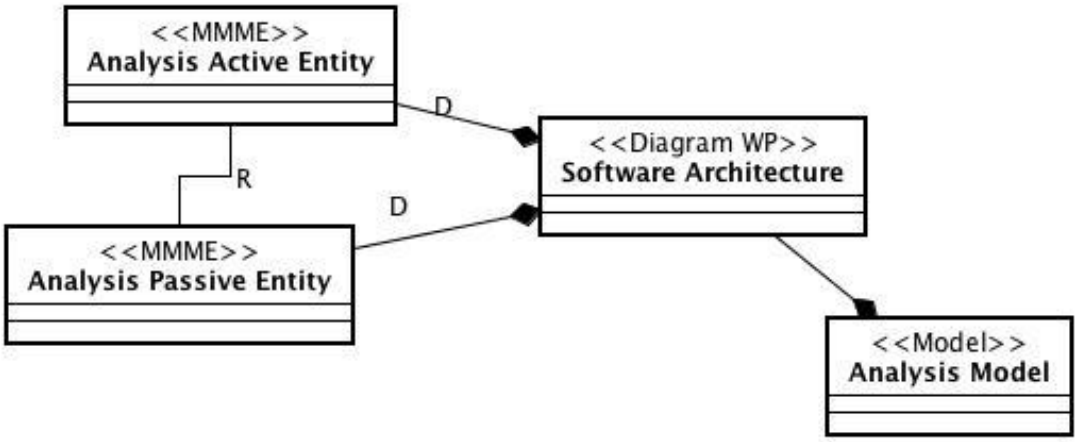
Deliverables

Software Architecture [preliminary]

The output will be a set of entities that will compose a preliminary class diagram (Domain Model) through UML notation and a Software Architecture (preliminary) document.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Requirement Set	Software Architecture class diagram [preliminary]
Keyword Set	
Environment Definition	

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Requirement Active Entity Passive Entity	Analysis Active Entity Analysis Passive Entity	Analysis Active Entity- Analysis Passive Entity	

Guideline

Describe guidelines for performing the activities described in the fragment and correctly achieve the goal

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends of two fragments, Requirement Description and Keywords

Identification since the domain is described using the Requirements Set and the Keywords Set documents.

Glossary

This Fragment refers these terms:

7 - Verify AMAS Adequacy

Introduction

Insert here a text description of the design process and the entire SPEM diagram that can help in positioning the fragment in the process workflow

Fragment Description

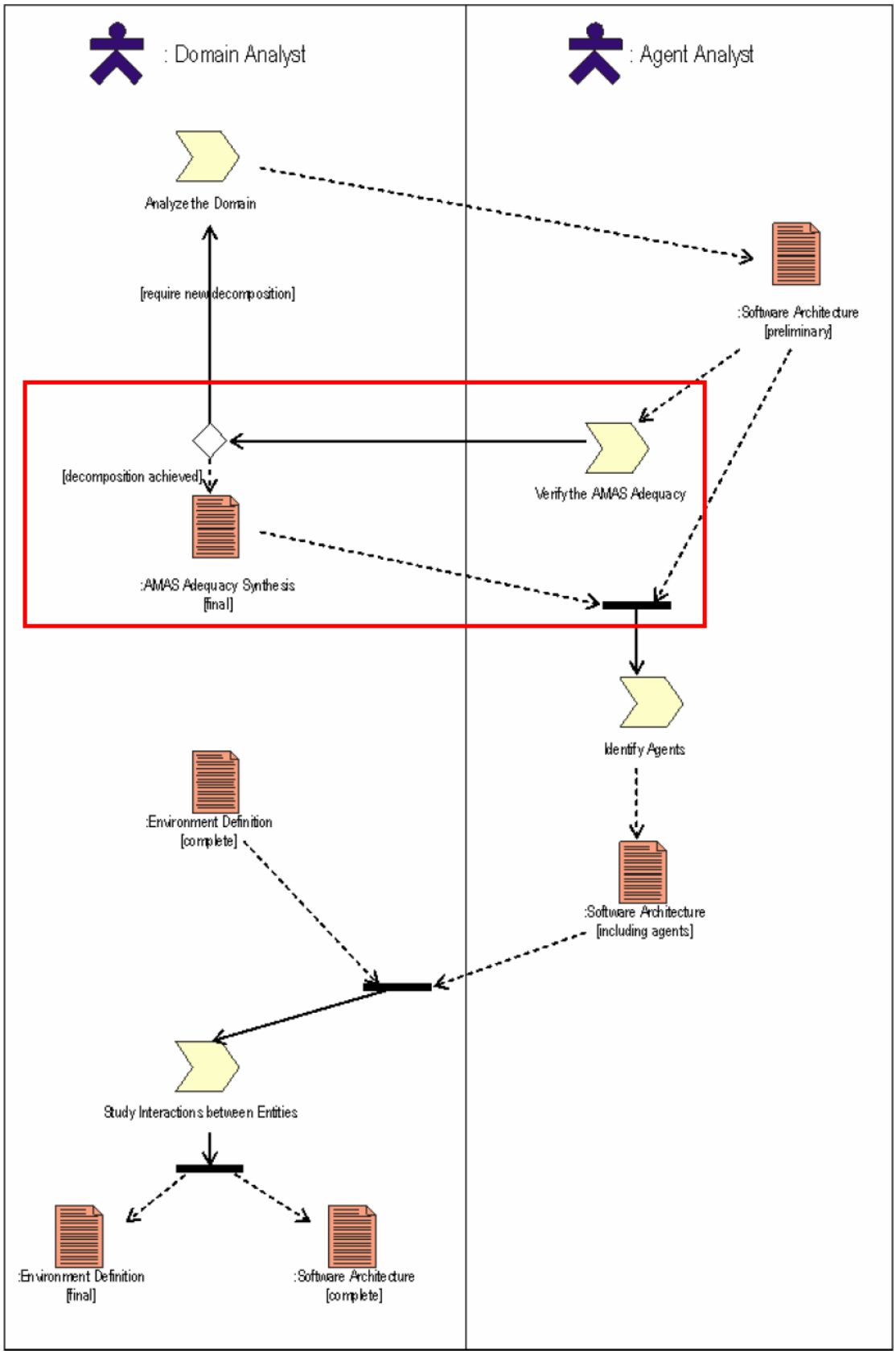
In this fragment, we verify that one (maybe more) Adaptive Multi-Agent System (AMAS) is needed to realize the system to be. We must study the adequacy at a global and a local level.

Input: Software architecture [preliminary]

Output: AMAS adequacy synthesis

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Compute Global AMAS Adequacy	At the global level answer to the question "is an AMAS required to implement the system?"	Agent Analyst
Compute Local AMAS Adequacy	At the local level try to determine if some agents are needed to be implemented like AMAS i.e. if a certain kind of decomposition or recursion is required during the building of your system.	Agent Analyst

Roles involved in this fragment are:

Agent Analyst

They are described in the following subsections:

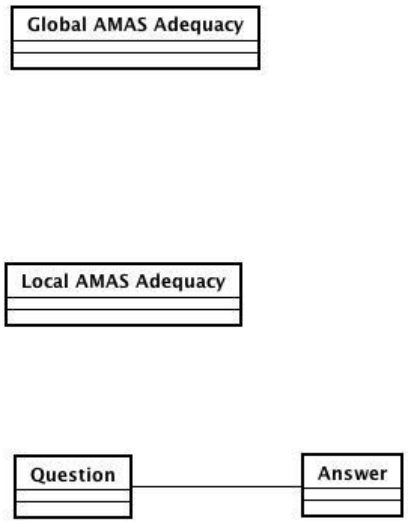
Agent Analyst

Responsibilities of *Agent Analyst* are:

- Compute Global AMAS adequacy
- Compute Local AMAS adequacy

Relationship with the MAS metamodel

The portion of metamodel of this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Global AMAS Adequacy
- Local AMAS Adequacy
- Answer

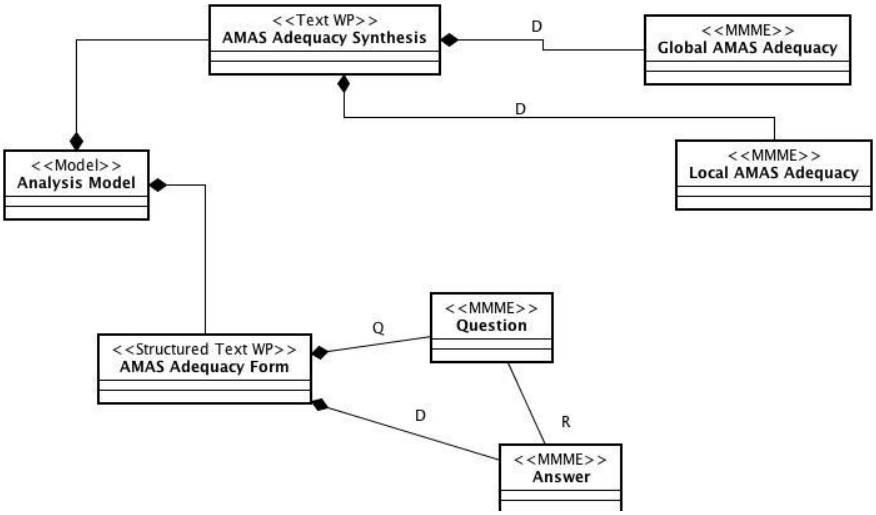
Deliverables

AMAS Adequacy Synthesis

The document in which the conclusions will be written on this verification

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Software Architecture [Preliminary] Environment Definition [?]	AMAS Adequacy Synthesis

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted

Use Case Analysis Active Entity Environment Environment Attribute	Answer Global AMAS Adequacy Local AMAS Adequacy	Question-Answer	Question

Guideline

It is possible to remake the description of the domain if decomposition has been detected, in order to precise the domain analysis and obtain a sufficient enough decomposition.

Composition Guideline

None

Aspects of fragment

The AMAS adequacy graphical tool of the ADELFE method can be used for the adequacy verification since it helps to answer to the questions on the global and local levels.

Dependency Relationships with other fragments

This fragment depends of the Domain Description fragment since the AMAS Adequacy is verified using the Software Architecture (preliminary) document.

8 - Agents Identification

Introduction

Insert here a text description of the design process and all the SPEM diagram that can help in positioning the fragment in the process workflow

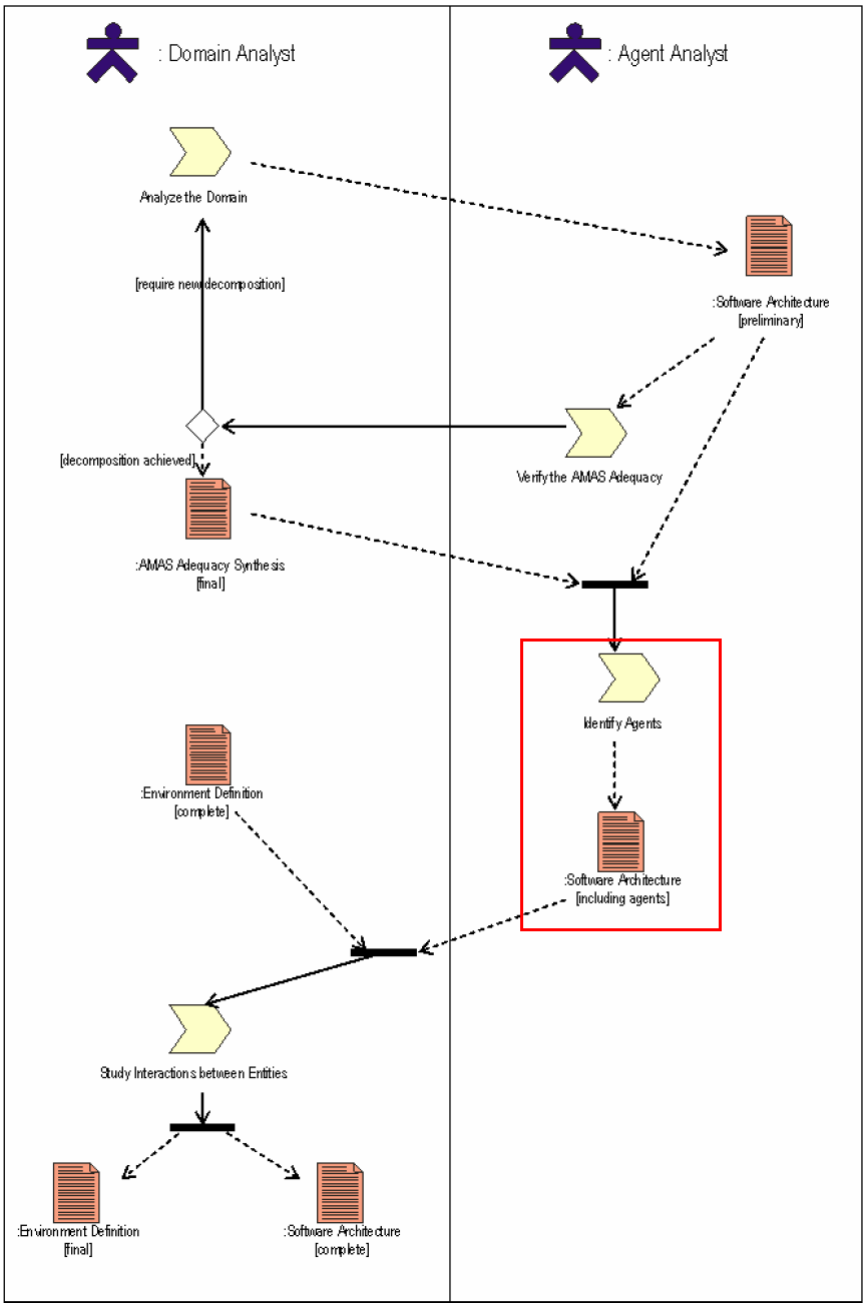
Fragment Description

This fragment aims at finding what we will consider as agents in the system to be.

In this fragment, we are only interested in agents which enable a designer to build AMAS. These agents are looked for among the identified entities in interaction with the system and previously defined classes.

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Study existing active entities	For each defined entity, you have to decide if it : -is autonomous -has a local goal to pursue	Agent Analyst

	-has to interact with some other entities And if it: -has a partial view of the environment -has some abilities of negotiation Entities verifying all the three criteria may be viewed as agents, additional characteristics will be studied in the next activity	
Identify potentially cooperative entities	For each entity coming from the previous activity, you have to determine if it: -has to move in a dynamic environment - has to face up to cooperation failures -has to treat Non Cooperative Situations Entities that are verifying at least the last criterion must be marked during the next activity	Agent Analyst
Define Agents	The entities coming from the previous activity can be now considered as agent. So, their class has now to be refereed as a	Agent Analyst

	Cooperative Agent	

Roles involved in this fragment are:

Agent Analyst

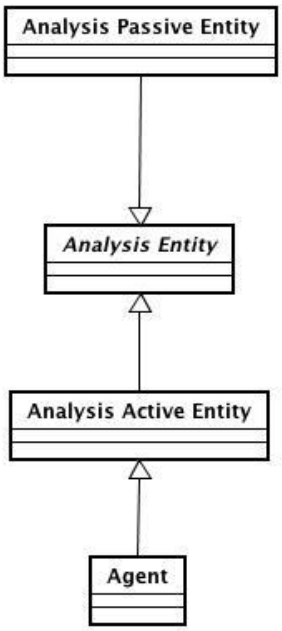
They are described in the following subsections:

Agent Analyst
Responsibilities of *Agent Analyst* are:

- Study existing active entities
- Identify potentially cooperative entities
- Define Agents

Relationship with the MAS metamodel

The portion of metamodel of this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

-Agents

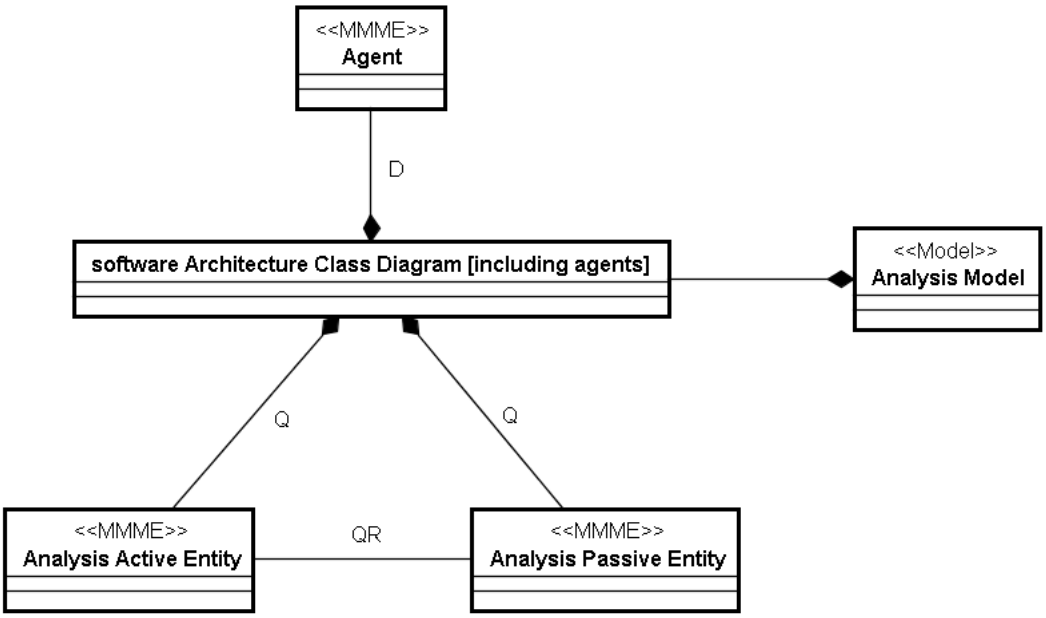
Deliverables

Software Architecture [including agents]

The Software Architecture document must be updated to indicate the classes that have been identified as agents.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Software Architecture AMAS Adequacy Synthesis	Software Architecture Class Diagram [including agents]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
	Agent		Analysis Active Entities

Guideline

To guaranty the good practice rules, you can stereotype the classes of entities identified as agent. It is for example used in the ADELFE method with the stereotype “cooperative agent”.

Composition Guideline

This fragment is based on the Adaptive Multi Agent System (AMAS) theory, so only cooperative agents are identified. It is recommended to compose it with fragments that take the AMAS theory in account.

Aspects of fragment

This fragment is based on the Adaptive Multi Agent System (AMAS) theory, so only cooperative entities are identified as agents. In other approaches, more entities could be agentified, but their non cooperative behaviour would be against the AMAS principle.

Dependency Relationships with other fragments

This fragment require the entities in interaction with the system to be identified and the classes of the system to be defined, so one or more fragments that do these tasks are needed before this fragment.

Also, before identifying agents, you should use a fragment that check if multi agent systems are adequate to the problem.

This fragment identifies agents, so it should go before fragments that work on agent concept.

9 - Entity Interactions Study

Introduction

Insert here a text description of the design process and the entire SPEM diagram that can help in positioning the fragment in the process workflow

Fragment Description

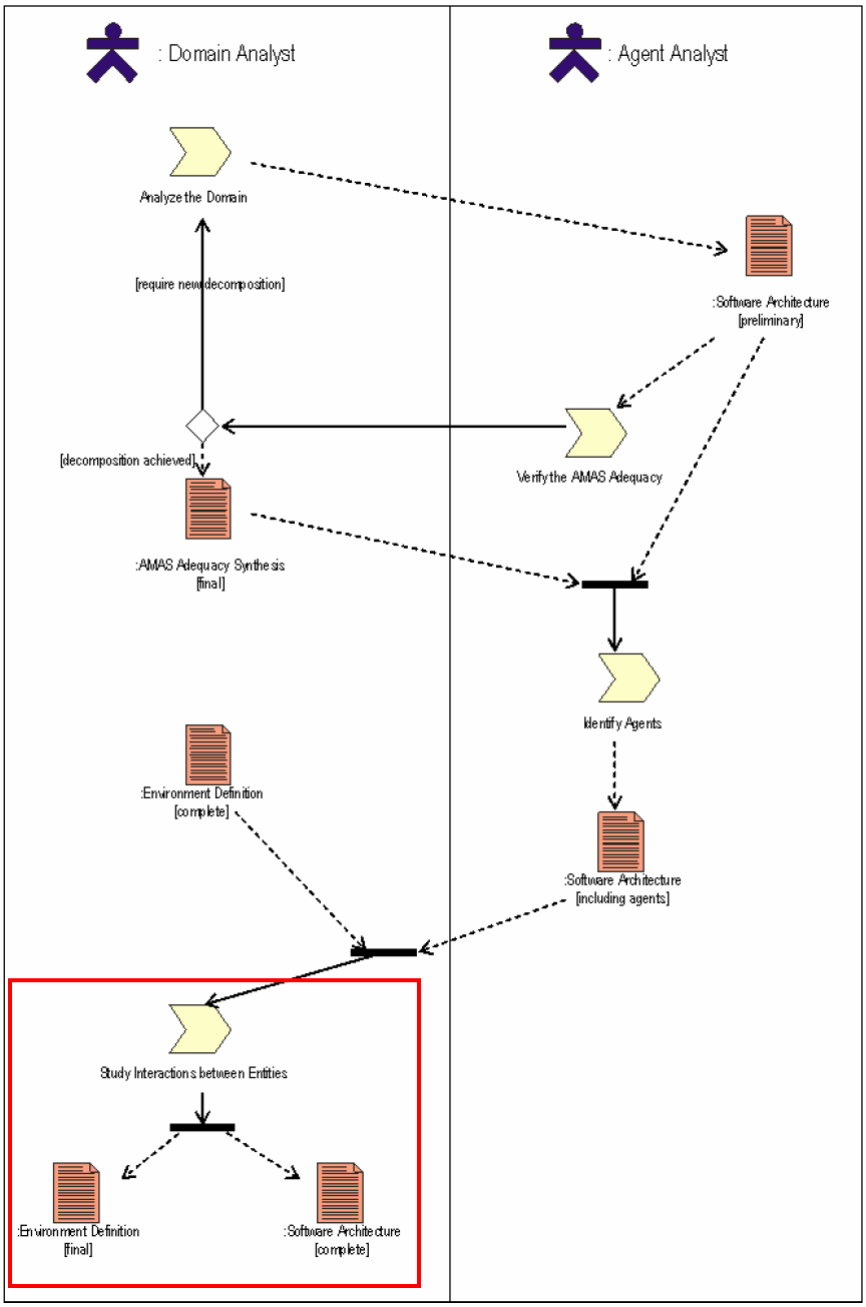
This fragment aims at making clear interactions between the identified entities.

Input: Environment definition [complete], software architecture [including agents]

Output: Environment definition [final], software architecture [complete]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Active-Passive Entity Relationship Study	Study the active-passive entities relationships and model them with sequence diagrams or collaboration diagrams	Object Analyst
Active Entity	Study the active entities relationships and model	Object Analyst

Relationships Study	them with sequence diagrams	
Agent Relationships Study	Study the agents relationships and model them with AUML protocol diagrams	Object Analyst

Roles involved in this fragment are:

Object Analyst

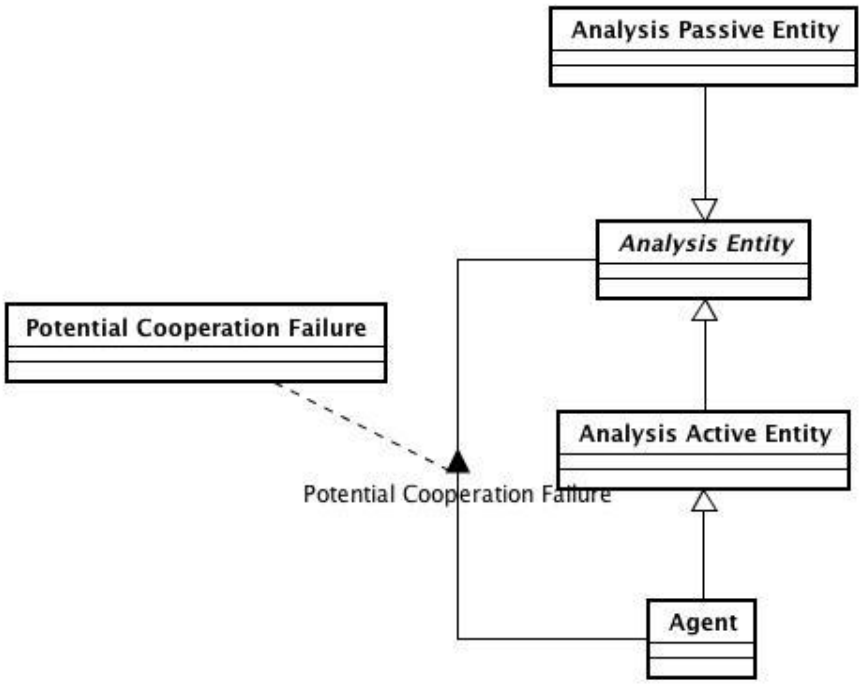
They are described in the following subsections:

Object Analyst
Responsibilities of *Object Analyst* are:

- Active-Passive Entity Relationship Study
- Active Entity Relationships Study
- Agent Relationships Study

Relationship with the MAS metamodel

The portion of metamodel of this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

-Potential Cooperation Failures

Deliverables

Environment Definition [final]

Report an example in a picture

Describe what type of diagram it is (class diagram, UML, Tropos, …)

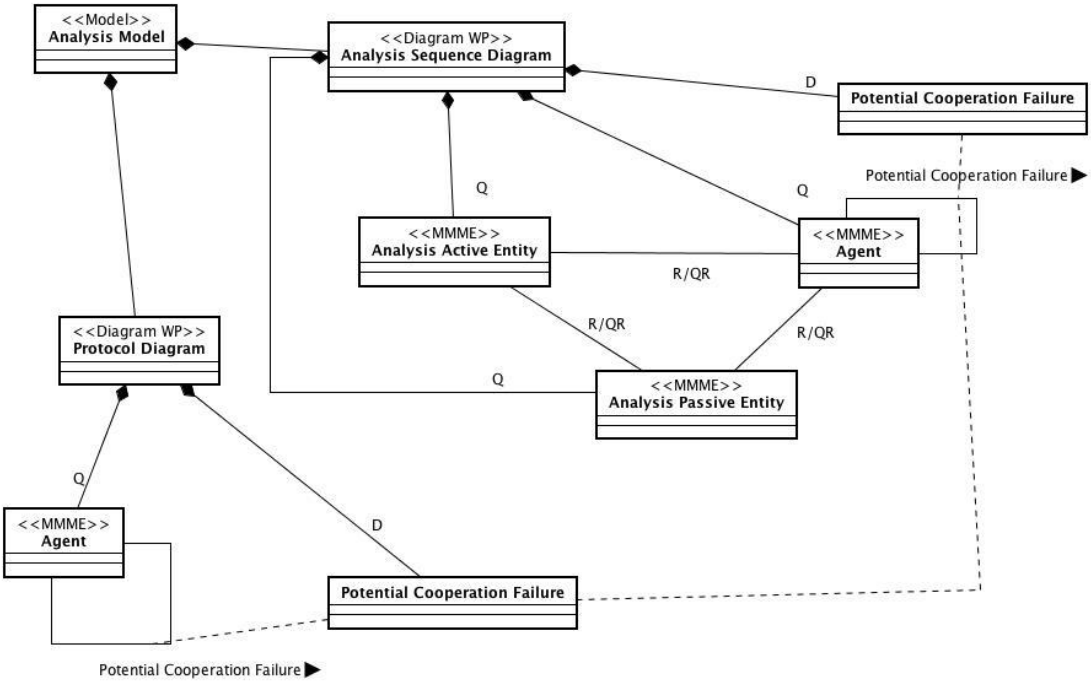
Software Architecture [complete]

Report an example in a picture

Describe what type of diagram it is (class diagram, UML, Tropos, …)

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Environment Definition [Complete]	Environment Definition [Final]
Software Architecture [including agents]	Software Architecture [Complete]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Agent Analysis Active Entity Analysis Passive Entity	Potential Cooperation Failure	Agent-(Agent, Analysis Active Entity, Analysis Passive Entity)	Agent Analysis Active Entity Analysis Passive Entity

Guideline

None

Composition Guideline

None

Aspects of fragment

The interactions can be expressed using UML and AUML diagrams.

Dependency Relationships with other fragments

To use this fragment, you need one or more fragments that identify the different agents and other entities of the system.

10 - ARCHITECTURE DEFINITION

Introduction

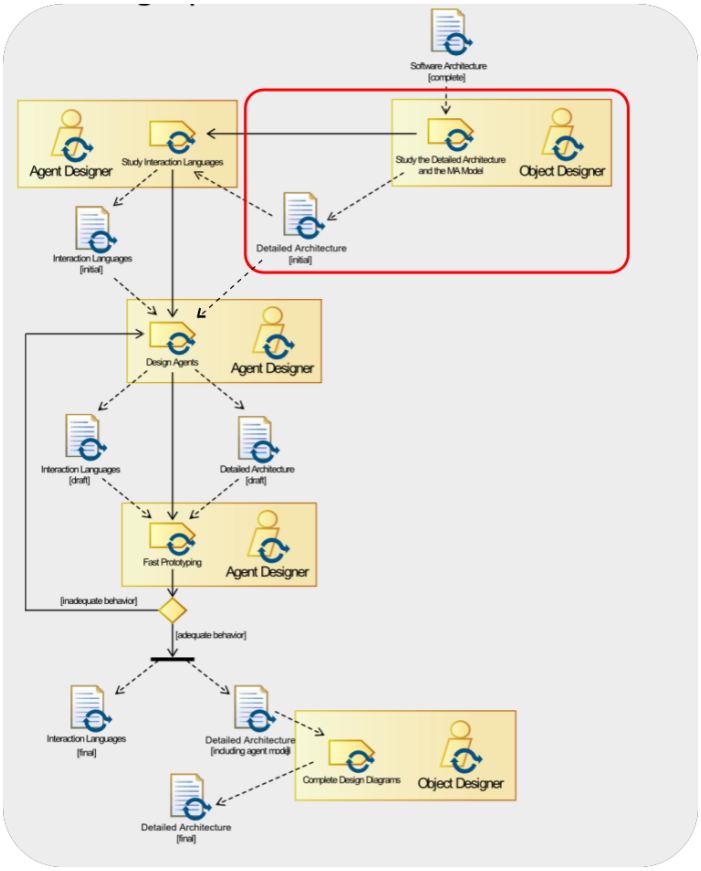
Fragment Description

The main objective of this fragment is to define the detailed architecture of the system in term of packages, classes, objects and agents.

Input: Software architecture [complete]
Output: Detailed architecture [initial]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved

Define Packages	Identify package in order to group classes by field : PackageAgent, PackageEnvironment (entity active and/or passive), PackageInterface, PackageContoller	Object Designer
Share out concepts	Share out concepts of Activity 10 in a good package	Object Designer

Roles involved in this fragment are:

Object Designer

They are described in the following subsections:

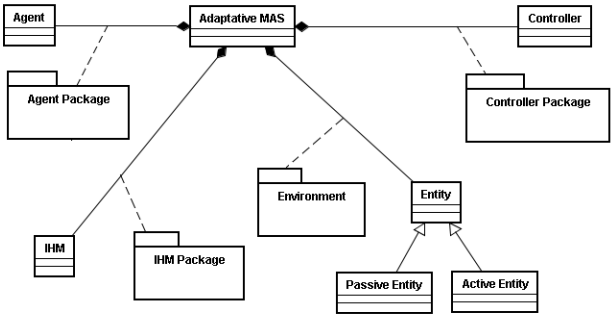
Object Designer

Responsibilities of *Object Designer* are:

- Define packs
- Share out classes into packs
- For each pack, make a class diagram

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Package definitions

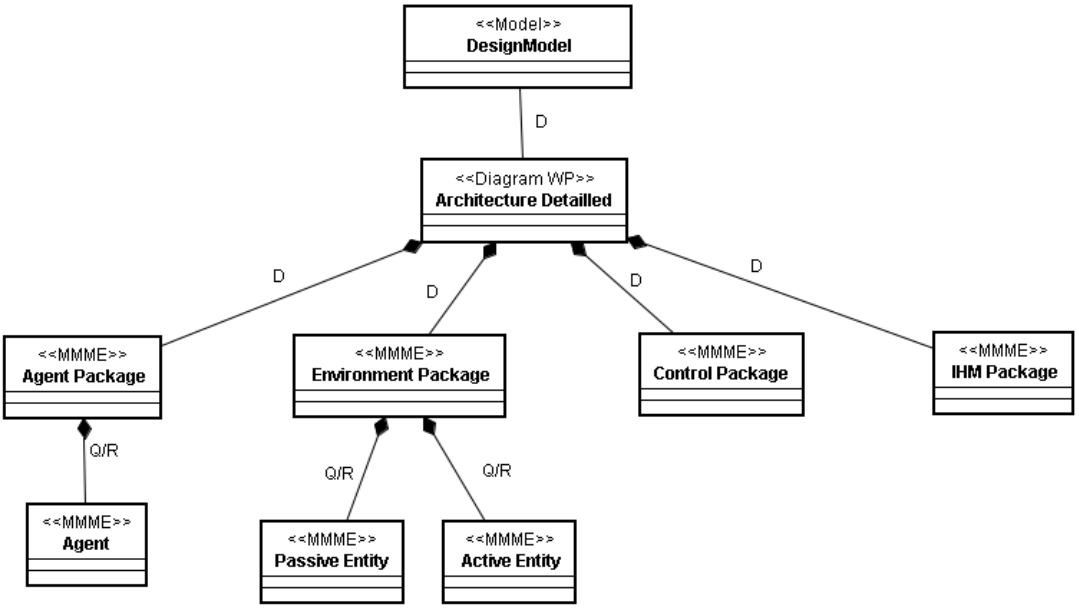
Deliverables

Detailed Architecture [Initial]

This fragment is composed by packages which contain concepts defined in A10.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Software architecture [complete]	Detailed Architecture [Initial]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Entities Agent	AdaptativeMultiAgentSystem		

Guideline

We define four packages:

- Agent package contains the agents
- Graphical interface package contains the graphical interface
- Control package contains the controller
- Environment package contains both the environment and the communication

Composition Guideline

None

Aspects of fragment

Class diagram are expressed using UML diagrams.

Dependency Relationships with other fragments

This fragment depends on the Agents Identification fragment and the Environment description fragment. These fragments must be realized before that one.

Glossary

None

11 - INTERACTION LANGUAGE DEFINITION

Introduction

We note that an interaction language is useless if the communication between agents is indirect, for instance, if the agents communicate via the environment.

If agents interact to communicate, for each scenario, they have to describe the exchanges of information between agents. These protocols will be specified via protocols diagram using AUML.

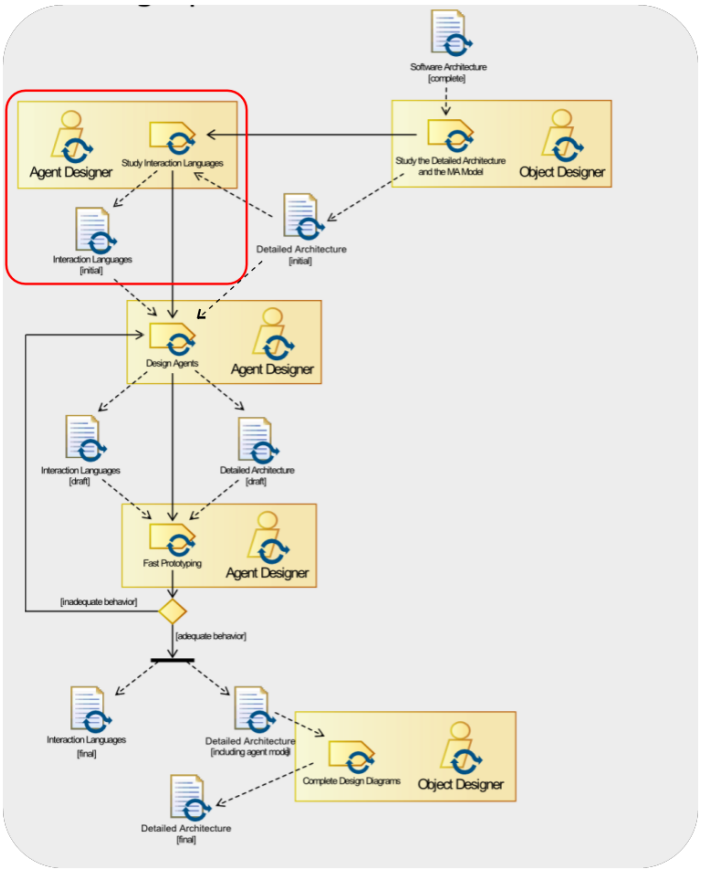
Fragment Description

In this fragment we define the way the agents will interact.

Input: Detailed architecture [initial]
Output: Interaction languages [initial]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Define interaction	**Define the way of communication between**	**Agent Designer**

	agents	

Roles involved in this fragment are:

Agent Designer

They are described in the following subsections:

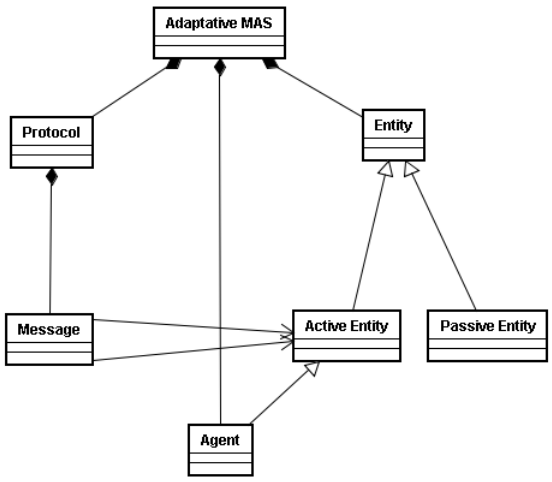
Agent Designer

Responsibilities of *Agent Designer* are:

- Define direct agent interaction

Relationship with the MAS meta-model

The portion of meta-model affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Protocol
- Message

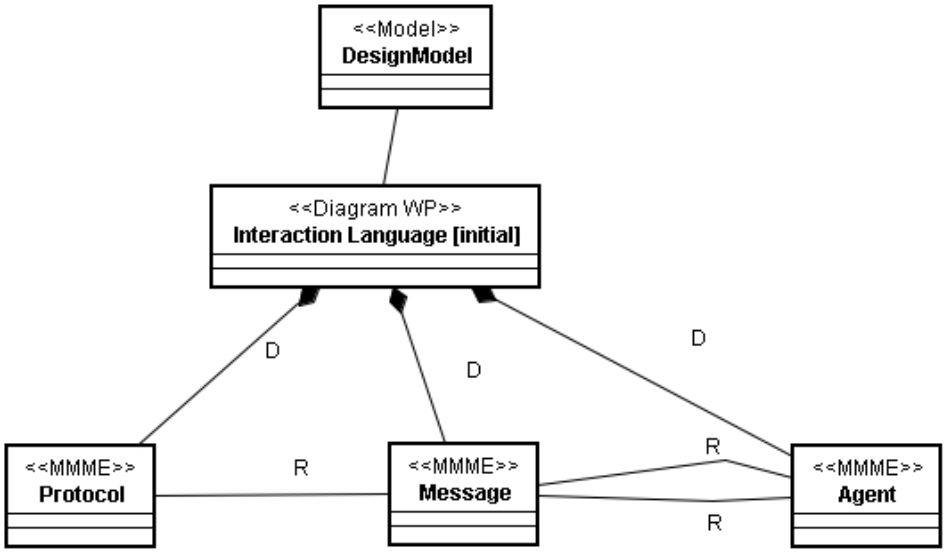
Deliverables

Interact Language [Initial]

Interact Language represent the language interaction diagrams.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Detailed Architecture [Initial]	Interaction language [Initial]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Agent	CooperativeInteractionProtocol Message	CooperativeInteractionProtocole – Message Message-Message Message-ActiveEntity	

Guideline

None

Composition Guideline

None

Aspects of fragment

Class diagram are expressed using UML diagrams.

Dependency Relationships with other fragments

This fragment depends on Agents identification fragment.

Glossary

None

12 - AGENT DEFINITION

Introduction

This fragment and the following fragment come from the same action but recent research shows that separate the nominal behavior of a cooperative agent from its cooperative one simplifies the visualization. This fragment defines the nominal behavior.

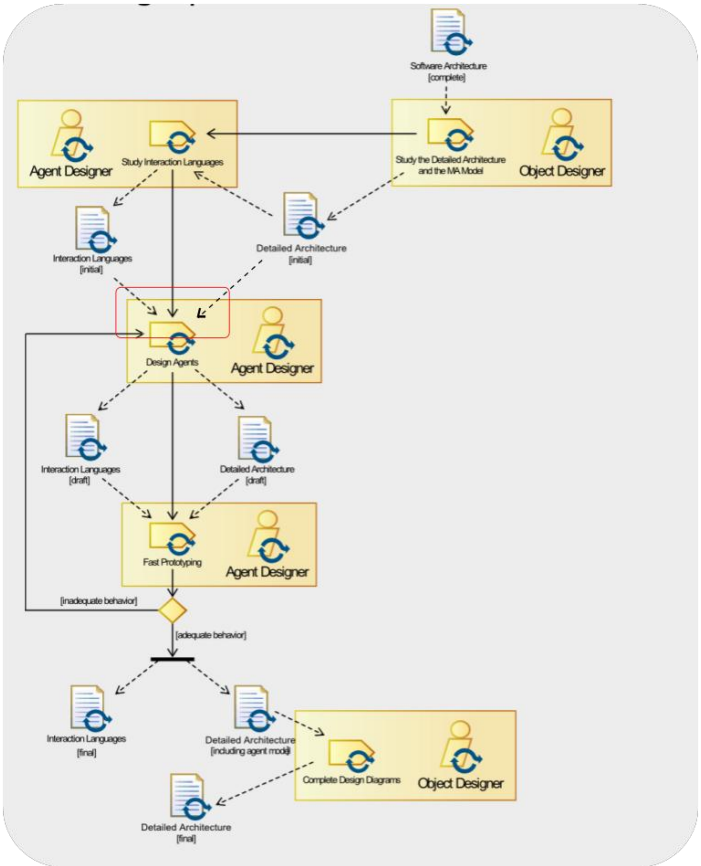
As future work, this fragment will be replaced by another one which comes from another methodology eventually more specific.

Fragment Description

This fragment, for every agent previously identified, aims to define its behavior: the skill, the aptitudes, an interaction language, a world representation.
Input: Detailed architecture [initial], Interaction Language [initial]
Output: Detailed architecture [intermediate], Interaction Language [intermediate]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved

Define nominal behavior	**Define agent diagram and agent behavior rules. These diagrams are complementary in their function. Behavior diagram allows identifying characteristics and representation. Representation specifies needs in terms of perception and communication. Reciprocally, the agent structure description specifies the composition of its representation module. Skills come from recursive definition in terms of another skill or elementary action. Aptitudes are independent capacities of field.**	**Agent Designer**

Roles involved in this fragment are:

Agent Designer

They are described in the following subsections:

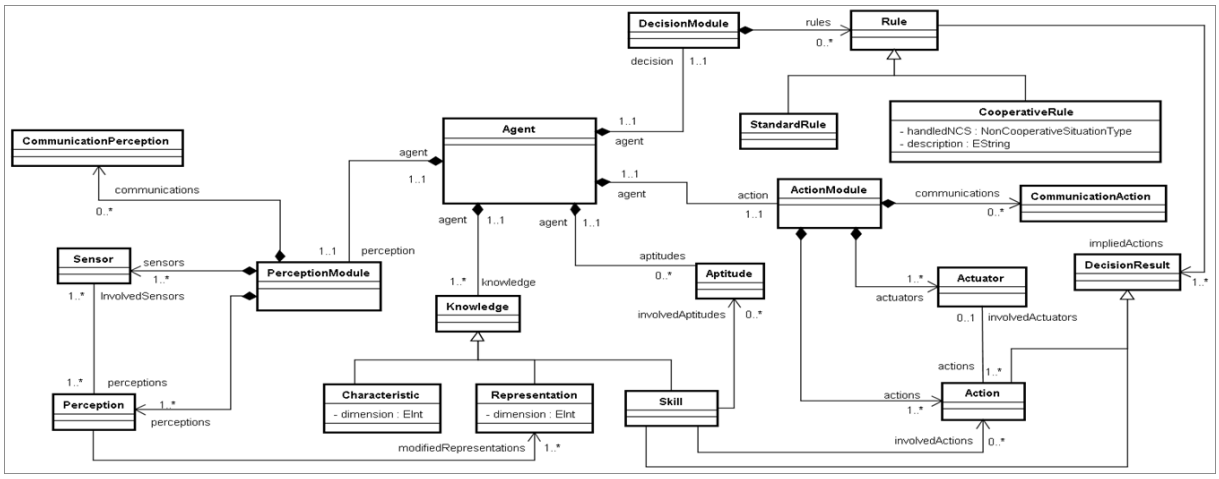
Agent Designer

Responsibilities of *Agent Designer* are:

- Define nominal behavior (structure and interaction language)

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Action
- Actuator
- Aptitude
- Characteristic
- CommunicationAction
- CommunicationPerception
- Perception
- Sensor
- Representation
- Skill
- AgentState
- Condition
- DecisionResult
- StandardRule

Deliverables

Detailed Architecture [intermediate]

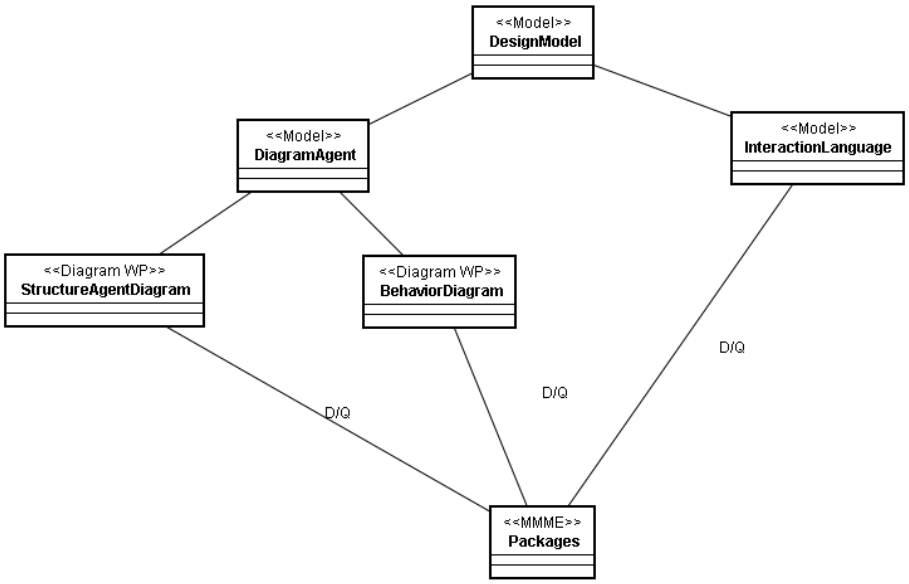
Detailed Architecture was enhanced with the nominal behavior

Interaction Language [intermediate]

Interact Language [intermediate] represent the language interaction diagrams composed by Interaction Language [initial] and interaction language of agent nominal behavior.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



For readability, all packages previously quoted bring together in <<MMME Packages>>.

Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Detailed Architecture [initial] Interaction Languages [initial]	Detailed Architecture [intermediate] Interaction Languages [intermediate]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Agent CooperativeInteractionProtocol Message	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule	Action-Actuator Perception-Sensor Skill-Aptitude Skill-Action Rule-DecisionResult RuleAgentState	

Guideline

The nominal behavior represents the basic behavior of an agent, what it does for achieving its local function.

cf. N. Bonjean, C. Bernon, P. Glize, Engineering Development of Agents using the Cooperative Behaviour of their Components, http://ceur-ws.org/Vol-494/masspaper5.pdf

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends on Architecture Definition fragment and Interaction Language Definition fragment.

Glossary

None

13 - NON COOPERATIVE SITUATION IDENTIFICATION

Introduction

This fragment and the following fragment come from the same action but recent research shows that separate the nominal behavior of a cooperative agent from its cooperative one simplifies the visualization. This fragment defines the cooperative behavior.

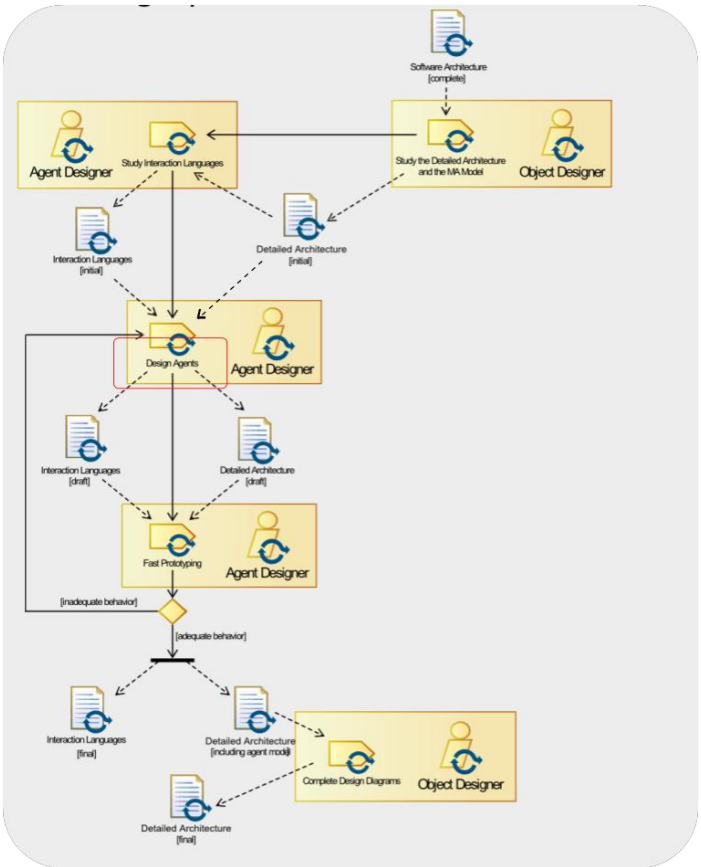
Fragment Description

The main objective of this fragment is to define the Non Cooperative Situation (NCS) and the ways they are handled by the agents.

Input: Detailed Architecture [intermediate], Interaction Language [intermediate]
Output: Detailed Architecture [draft], Interaction Language [draft]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Define cooperative	**Define tuning rules, reorganization and**	**Agent Designer**

Rules	**evolution rules. Added on top of the nominal one, these rules aims at dealing with these cooperative failures.**	

Roles involved in this fragment are:

Agent Designer

They are described in the following subsections:

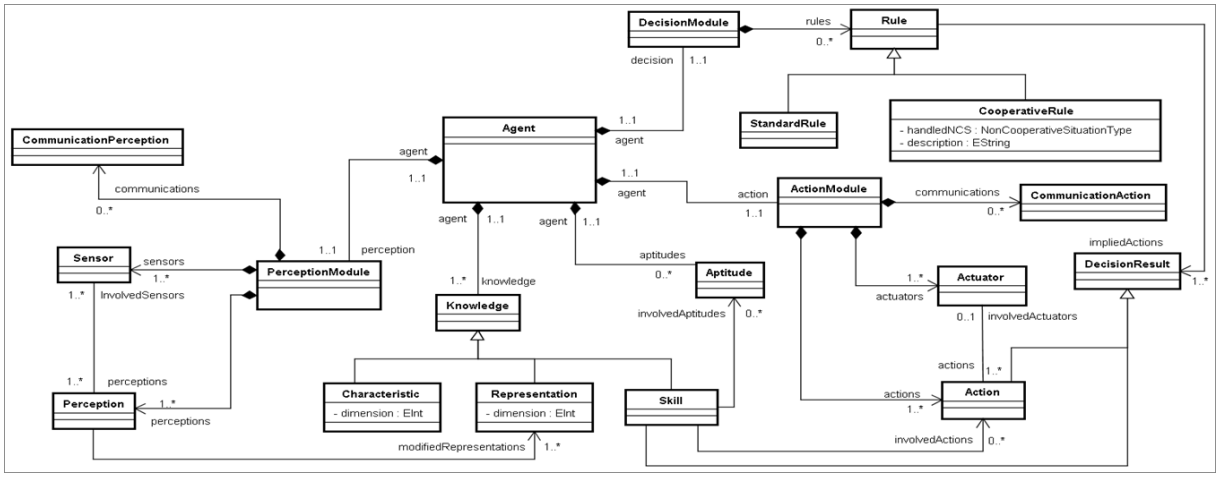
Agent Designer

Responsibilities of *Agent Designer* are:

- Define cooperative rules

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Condition
- DecisionResult
- CooperativeRules

Deliverables

Detailed Architecture [draft]

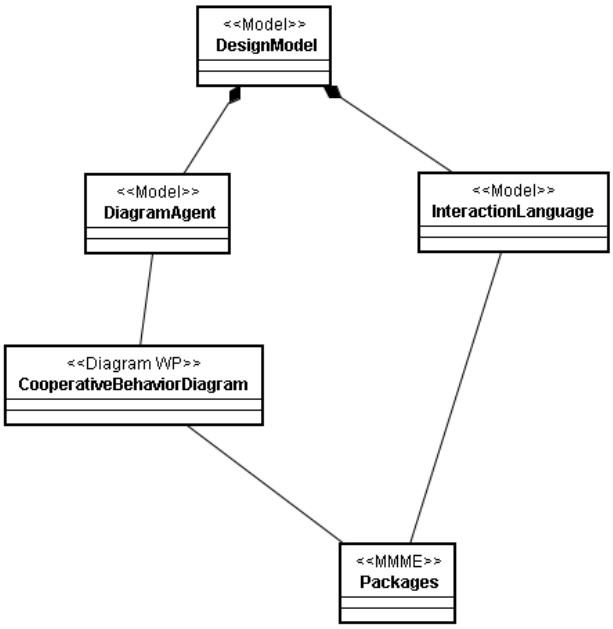
Detailed Architecture [draft] is composed by packages (environment, ihm, agent and controller) where agent package is defined.

Interaction Language [draft]

Interaction Language [draft] represents the interaction language contained in this system.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



For readability, all packages previously quoted bring together in <<MMME Packages>>.

Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Detailed Architecture [intermediate] Interaction Language [intermediate]	Detailed Architecture [draft] Interaction Language [draft]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted

Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule	Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule Condition DecisionResult CooperativeRule		Non Cooperative Situation Type Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule

Guideline

The adaptive behavior, added on top of the nominal one, aims at dealing with these cooperative failures in three different ways:

- by trying to adjust the values of the parameters used during the nominal behavior (tuning rules)
- by changing its relationships with others for trying to solve dead-ends (reorganization rules)
- by self-removing or creating other agents if NCS still remain (evolution rules)

cf. N. Bonjean, C. Bernon, P. Glize, Engineering Development of Agents using the Cooperative Behaviour of their Components, http://ceur-ws.org/Vol-494/masspaper5.pdf

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends on Agent Definition fragment.

Glossary

None

14 - FAST PROTOTYPING

Introduction

This fragment tests behavior during working. This simulation must be simulated and limited in terms of development and must allow identifying behavior lacks or behavioral anomalies.

Fragment Description

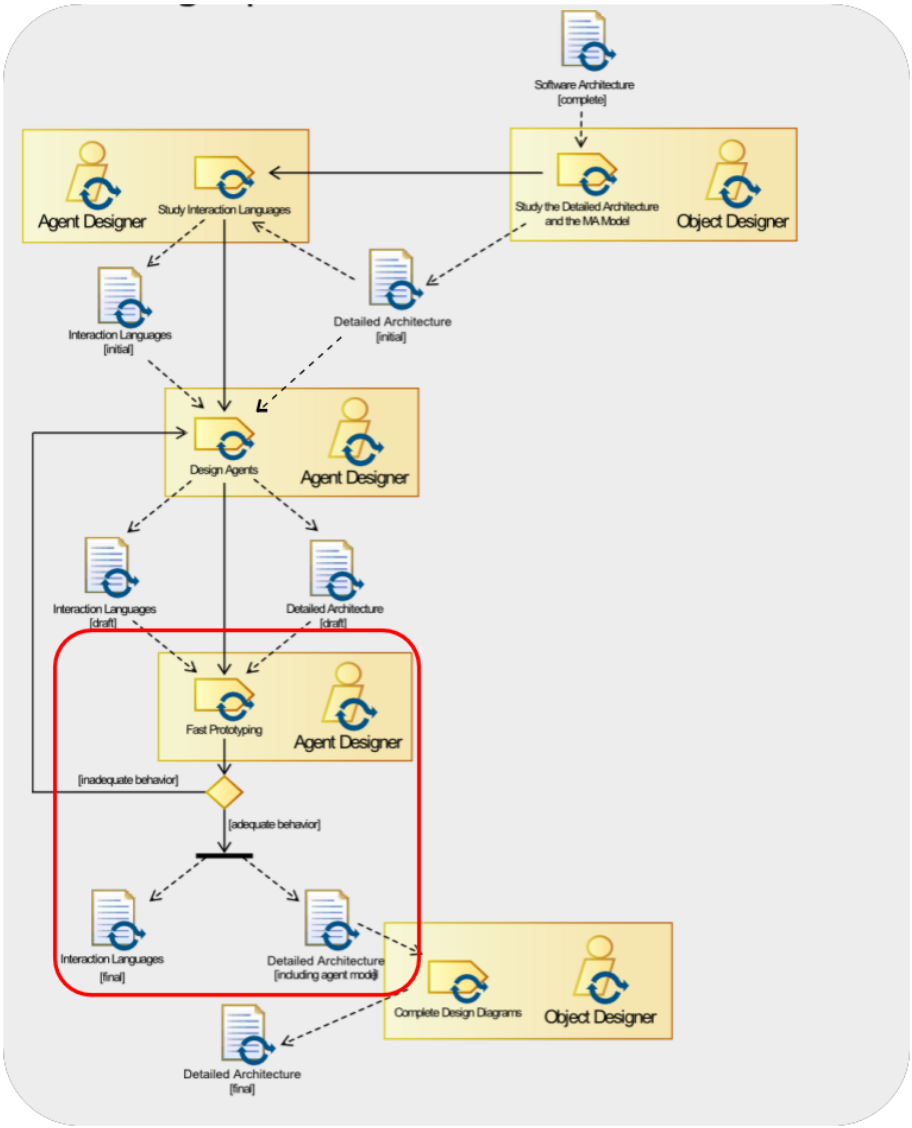
In this fragment, the identified behaviors of an agent are tested.

Input: Detailed Architecture [draft], Interaction Languages [draft]

Output: Detailed Architecture [including agent model], Interaction Languages [final]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Test agent beahvior	Define simulation environment and implement methods to test. If agent behavior is unsuitable, come back to Agent Definition fragment.	Agent Designer

Roles involved in this fragment are:

Agent Designer

They are described in the following subsections:

Agent Designer

Responsibilities of *Agent Designer* are:

- Test agent behavior

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:

This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

-

Deliverables

Detailed Architecture [Including agent model]

Detailed Architecture [Including agent model] is composed by packages (environment, ihm, agent and controller) where agent package is defined and verified.

Interaction Language [final]

Interaction Language [final] represents all the interaction languages contained in this system.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:

Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
DetailedArchitecture [draft] Interaction Languages [draft]	DetailedArchitecture [including agent model] Interaction Languages [final]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Agent Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Rule Skill AgentState Condition CooperativeRule DecisionResult			

StandardRule			

Guideline

None

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends on Non Cooperative Situations Identification fragment.

Glossary

None

15 - ARCHITECTURE REFINEMENT

Introduction

This fragment is the last fragment of WD4. Before beginning the establishment, the detailed architecture must be over and all the diagrams must be complete.

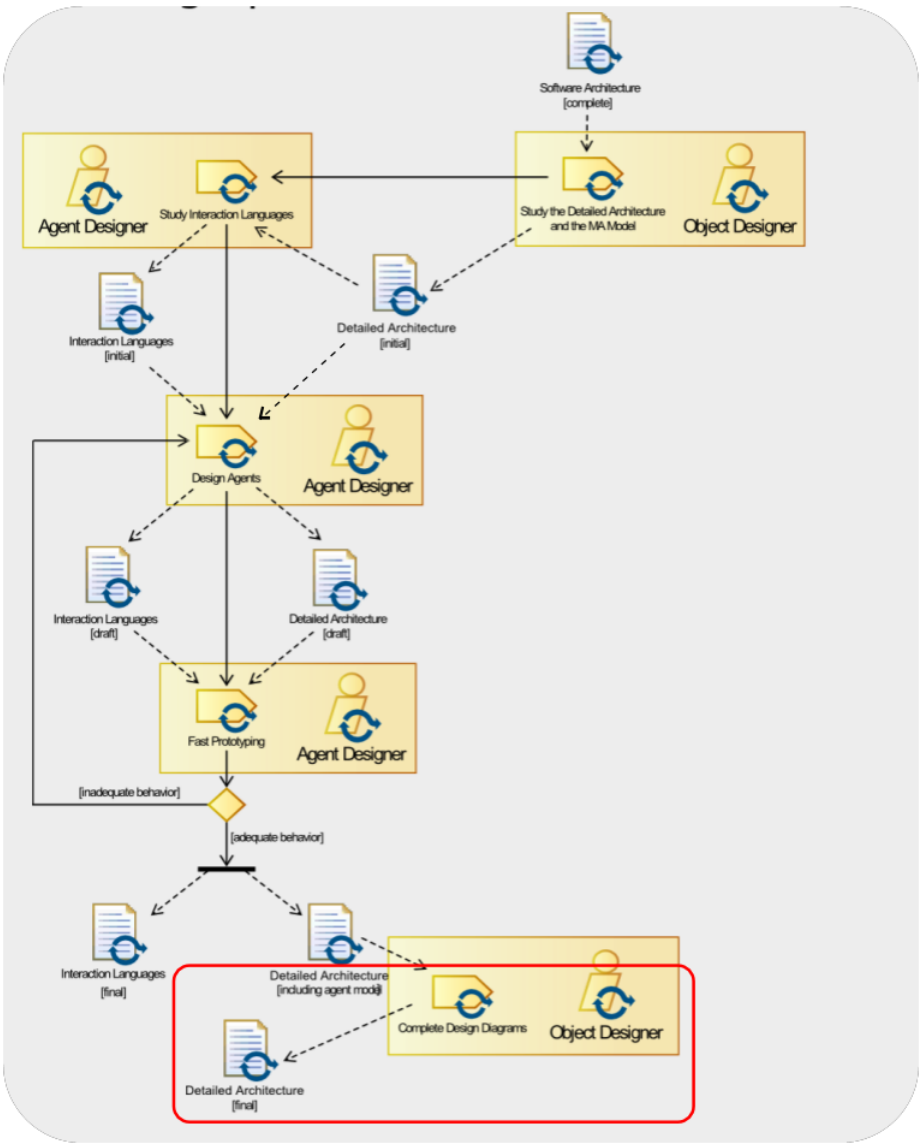
Fragment Description

This fragment aims to complete the system architecture and design activities.

Input: Detailed Architecture [including agent model]
Output: Detailed Architecture [final]

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Complete diagrams	Complete class diagrams previously established	Object Designer

Roles involved in this fragment are:

Object Designer

They are described in the following subsections:

Object Designer

Responsibilities of *Object Designer* are:

- Complete diagrams

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:

This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- State expression
- State Variable

Deliverables

Detailed Architecture [final]

Detailed Architecture [final] is textual documents which describe detailed architecture.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:

Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Detailed Architecture [including agent model]	Detailed Architecture [final]

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule	StateExpression StateVariable	StateExpression- StateVariable	

Guideline

None

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends on Fast Prototyping fragment.

Glossary

None

16 - ARCHITECTURE EXTRACTION

Introduction

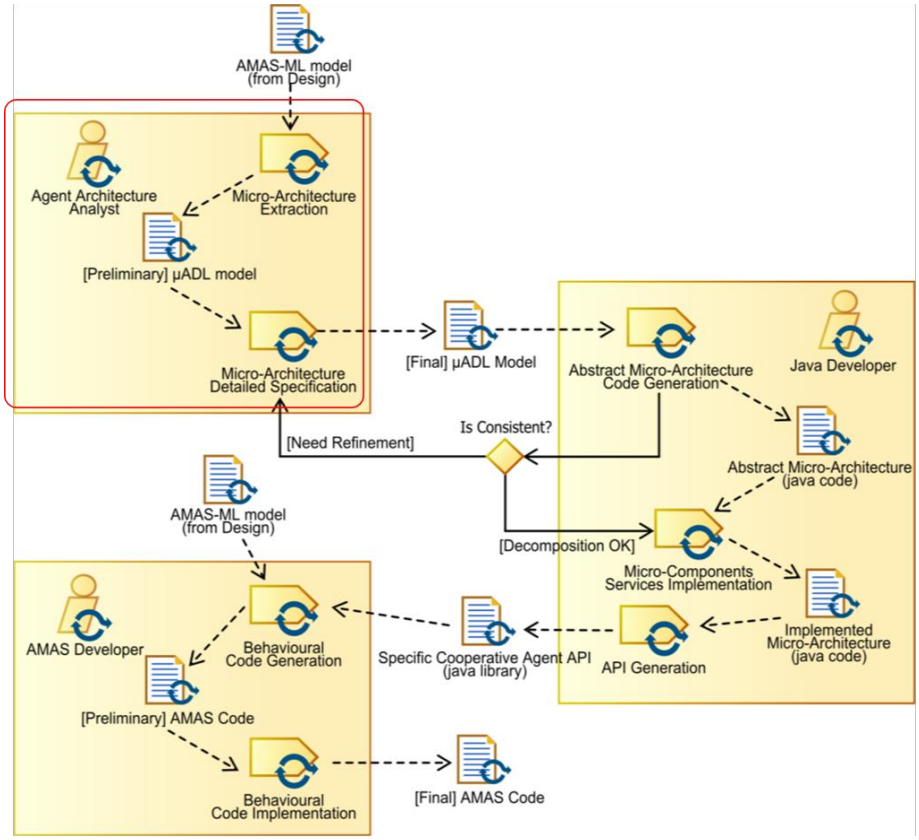
Fragment Description

In this fragment, a muADL model is generated from the AMAS-ML model.

Input: Architecture Detailed [final], Interaction Languages [final]
Output: muADL Model

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Micro-Architecture Extraction	Change model into first version of muADL model	Agent Architecture Analyst
Micro-Architecture Detailed Implementation	Verify the model transformation and modify muADL model if it need	Agent Architecture Analyst

Roles involved in this fragment are:

Agent Architecture Analyst

They are described in the following subsections:

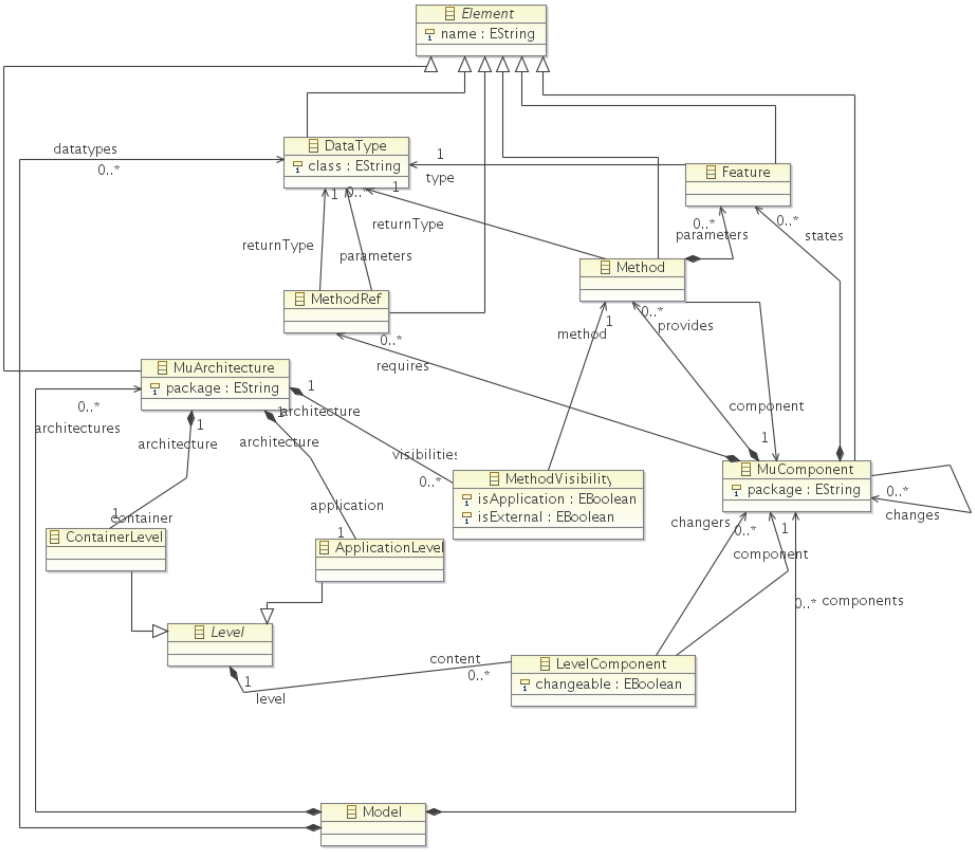
Agent Architecture Analyst

Responsibilities of *Agent Architecture Analyst* are:

- Micro-Architecture Extraction
- Micro-Architecture Detailed Implementation

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- MuArchitecture
- Mediator
- MuComponent
- Interface

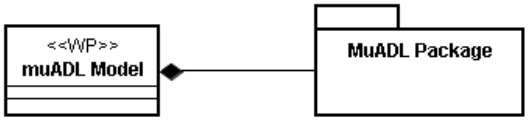
Deliverables

muADL Model

muADL Model is textual document which specify detailed muADL architecture.

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:



Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Detailed Architecture [final], Interaction Languages [final]	muADL Model

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
Action Actuator Aptitude Characteristic CommunicationAction CommunicationPerception Perception Sensor Representation Skill AgentState Condition DecisionResult StandardRule Condition DecisionResult CooperativeRule StateExpression StateVariable	MuArchitecture MuComponent Level LevelComponent ContainerLevel ApplicationLevel MethodReference MethodVisibility Element DataType Feature Method Model	MuComponent-Interface	

Guideline

None

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends on Agent Definition fragment, Non Cooperative Situations Identification fragment and Architecture Refinement fragment.

Glossary

None

17 - ARCHITECTURE IMPLEMENTATION

Introduction

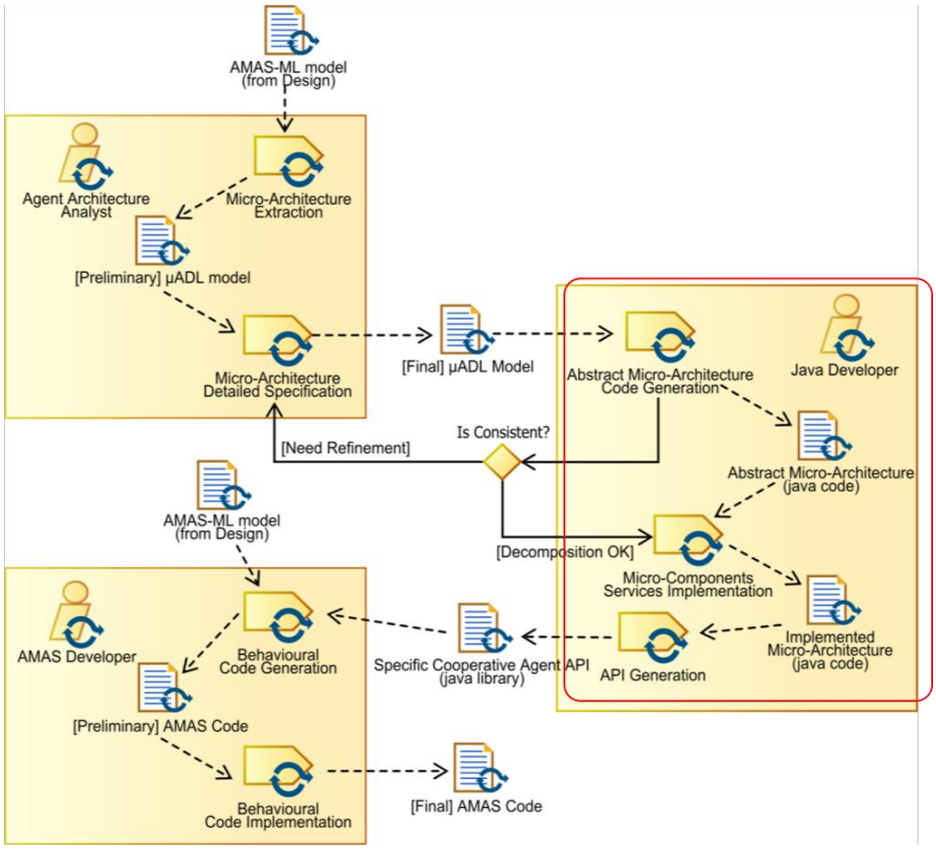
Fragment Description

In this fragment, an API for the modelised agent type is generated.

Input: muADL
Output: Specific Cooperative Agent API (java library)

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Abstract Micro-Architecture Code Generation	Generate automatically code from abstract Micro Architecture	Java Developer
Micro-Components Services Implementation	Implement manually micro-components in java code	Java developer

API generation	Generation of API in terms of jar	Java Developer

Roles involved in this fragment are:

Java Developper

They are described in the following subsections:

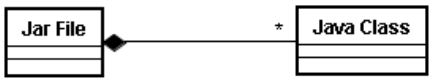
Java Developper

Responsibilities of *Java Developper* are:

- Generate automatically MAY into JavaCode
- Implement manually micro-composant
- Generate semi-automatically API

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Jar File

Deliverables

Specific Cooperative Agent API (java library)

Specific Cooperative Agent is

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:

Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
muADL Model	Specific Cooperation Agent API (java library)

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
MuArchitecture MuComponent Level LevelComponent ContainerLevel ApplicationLevel MethodReference MethodVisibility Element DataType Feature Method Model	AMAS-ML model jar		

Guideline

None

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

Architecture Implementation fragment depends on Architecture Extraction fragment.

Glossary

18 - BEHAVIOUR IMPLEMENTATION

Introduction

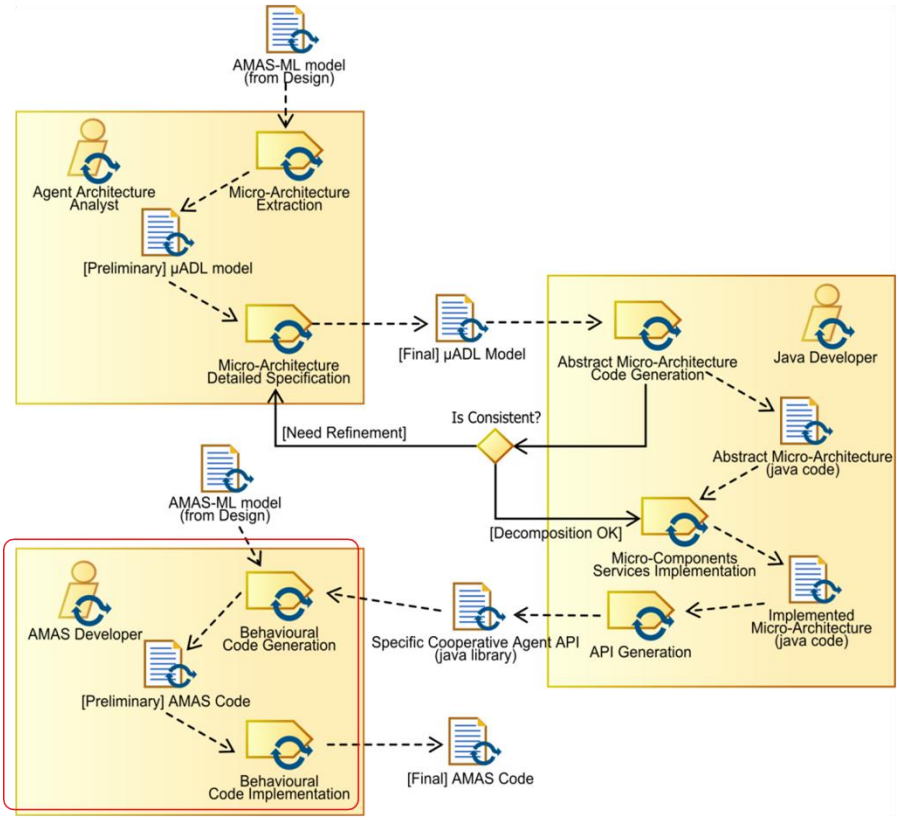
Fragment Description

The goal of this fragment is to generate and implement the behavioral rules of the agents.

Input: Specific Cooperative Agent API (java library)
Output: AMAS Code

Portion of Process workflow

The process that is to be performed in order to obtain the result is represented in the following as a SPEM diagram



Activities description:

Activity	Activity Description	Roles involved
Behavior code Generation	Generate the code automatically	AMAS Developper
Behavior Code Implementation	Generate the code manually	AMAS Developper

Roles involved in this fragment are:

AMAS Developper

They are described in the following subsections:

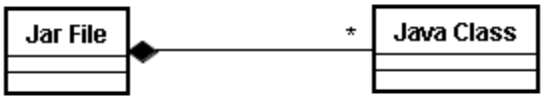
AMAS Developper

Responsibilities of *AMAS Developper* are:

-

Relationship with the MAS metamodel

The portion of metamodel affected by this fragment is:



This fragment refers to the MAS meta-model adopted in *ADELFE* and contributes to define and describe:

- Java Class

Deliverables

Deliverable relationships with the MMM

The following figure describes the structure of this fragment work products in relationship with the MAS model elements:

Preconditions and concepts to be defined

Input, output and elements to be designed in the fragment are detailed in the following tables.

As regards documents:

Input	Output
Specific Cooperative Agent API (java library)	AMAS Code

As regards MAS metamodel elements:

Input	To Be Designed	To be related	To be quoted
AMAS-ML model jar	Java Class		

Guideline

None

Composition Guideline

None

Aspects of fragment

None

Dependency Relationships with other fragments

This fragment depends on architecture implementation fragment.

Glossary