



*iCrash* :  
A Crisis Management Case Study  
**MESSIR** Analysis Document  
- v 1.4 -

(Report type: Definition)

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# Chapter 1

## Introduction

### 1.1 Overview

*iCrash* is a simple system dedicated to any person who wants to inform of a car crash crisis situation in order to allow for crisis handling. At anytime and anywhere, anyone can be the witness or victim of a car crash and might be in a situation allowing for alerting this crisis. The *iCrash* system has for objectives to support crisis declaration and secure administration and crisis handling by the *iCrash* professional users.

### 1.2 Purpose and recipients of the document

This document is an analysis document complying with the **Messip** methodology [?]. Its intent is to provide an example of a precise specification of the functional properties of the *iCrash* system.

The recipients of this document are:

- the *iCrash* system's buyer company (ABC): this document is used as a contractual document jointly with any other document considered as useful (as requirement elicitation document, ...) in order to have a higher degree of precision in requirement description. It is also used as a basis document for the *iCrash* system validation using specification based testing.
- the *iCrash* system development company (ADC) is expected to use this document as the basis for development (mainly design, implementation, maintenance). It is also used for verification and validation using test plans defined using the analysis models described in this document and according to the **Messip** methodology.

### 1.3 Application Domain

The *iCrash* system belongs to the Crisis Management Systems Domain. It is a system dedicated to crisis professional and non professional end users. It has to be considered as an autonomous and external service for the society. It is not an institutional system certified and guaranteed by any governmental entity and thus, must be used with caution.

### 1.4 Definitions, acronyms and abbreviations

N.A.

## 1.5 Document structure

The document structure is designed to be coherent with the **Messip** methodology [?]. Section 2 provides a general description of the system purpose, its users, its environment and some general non functional requirements. A more detailed description of the non functional requirements, if any, are provided in section ?. The **system operation** triggered by events sent by the external **actors** belonging to the environment are described in Section 3. The *iCrash* concepts used to represent the any persistent or transient information is given in Section 4. The precise specification of the system operations in term of system's state changes, events sent together with the constraints on the allowed sequences of system operations are described in Section 5.

# Chapter 2

## General Description

In the context of the **Messip** method, the information provided in this section is intended to present the system for which the **Messip** analysis is provided. The content of this section is made accordingly to the requirements elicitation document that might have been done during the project but also adapted coherently in order to be an abstract introduction to the **Messip** analysis.

### 2.1 Domain Stakeholders

All stakeholders of the system are detailed in this section. After a brief description of a stakeholder, its objectives are first stated. Thereafter, the responsibilities of the stakeholder are detailed which help to achieve the stakeholder objectives to a certain degree. While the objectives characterize the general problems addressed by the *iCrash* system, the responsibilities describe concrete actions that are expected from a stakeholder. Some of these responsibilities can be traced looking at the use case described in Section B.1, and hence must be supported by the *iCrash* system. All stakeholders listed in this section have an interest in the system or are affected by the system in some way, but only a subset of the stakeholders are directly involved in the use cases described. Let us remind that use case diagrams or descriptions are not **Messip** analysis phase mandatory outputs. They are proposed as informal means to help understanding the semantics of the system specification made of the mandatory analysis models, which provide a complete executable specification.

#### 2.1.1 Communication Company

A Communication Company is a company that has the capacity to ensure communication of information between its customers and the *iCrash* system. The objectives of a Communication Company are:

- to be able to deliver any SMS sent by any human to the *iCrash* 's phone number.
- to be able to transmit SMS messages from the ABC company that owns the *iCrash* system to any human having an SMS compatible device accessible using a phone number.

In order to achieve these objectives, the responsibilities of a Communication Company are:

- ensure confidentiality and integrity of the information sent by a human to the *iCrash* system or from the system to a human.
- to be always available and reliable.

### 2.1.2 Humans

A human is any person who considers himself related to a car crash either as a witness, a victim or an anonymous person. The objectives of a human are:

- inform the *iCrash* system about the crisis situation he detected.
- be sure that the ABC company has been informed about the situation.
- to be informed about the situation of the crisis he is related to as a victim or witness.

In order to achieve these objectives, the responsibilities of a human are:

- to provide as much details as possible concerning the crisis to the ABC company.
- to declare a crisis only if the crisis is real.
- to have access to the SMS compatible communication device he used to communicate with the *iCrash* system.

### 2.1.3 Coordinators

A coordinator is an employee of the ABC company being responsible of handling one or several crises. The objectives of a coordinator are:

- to securely monitor the existing alerts and crisis.
- to securely manage alerts and crisis until their termination.

In order to achieve these objectives, the responsibilities of a coordinator are:

- to be capable to determine how an alert received should be considered.
- to be available to react to requests to handle alerts and crisis.
- to be autonomous in handling crisis and to report on its handling.
- to be able to decide when a crisis or an alert can be closed.
- to know its system identification information for secure usage of the system.

### 2.1.4 Administrator

An administrator is an employee of the ABC company being responsible of administrating the *iCrash* system. The objectives of an administrator are:

- to add or delete coordinator actors from the system and its environment.

In order to achieve these objectives, the responsibilities of a coordinator are:

- know the company employees that can be coordinators and that have access to the system.
- to know its system identification information for secure usage of the system.
- to know the security policy of the ABC company.
- to communicate the coordinators their identification information for secure system usage.

### 2.1.5 Creator

Any system has a `Creator` stakeholder which is a technician who is installing the *iCrash* system on the targeted deployment infrastructure.

The objectives of a `Creator` are:

- to install the *iCrash* system
- to define the values for the initial system's state
- to define the values for the initial system's environment
- to ensure the integration of the *iCrash* system with its initial environment

In order to achieve these objectives, the responsibilities of a `Creator` are:

- provide the necessary data to the *iCrash* system for its initialization.

### 2.1.6 Activator

An `activator` is a logical representation of the active part the *iCrash* system. It represents an implicit stakeholder belonging to the system's environment that interacts with the *iCrash* system autonomously without the need of a external entity. It is usually used for representing time triggered functionalities.

The objectives of a `activator` are:

- to communicate the current time to the system
- to notify the administrator that some crisis are still pending for a too long time.

In order to achieve these objectives, the responsibilities of a `activator` are:

- to know the current universal time
- to send the messages to the system according to the time constraints specifically defined for it.

## 2.2 System's Actors

The objective of this section is not to provide the full requirement elicitation document in this section but to reuse a part of this document to provide a informal introduction to the **Messir** specification of the system under development. The use case model is made of a use case diagrams modelling abstractly and informally the actors and their use cases together with a set of use cases descriptions. In addition, those diagrams and description tables are adapted to the **Messir** specification since actor and messages names together with parameters are partly adapted to be consistent with the specification identifiers (see [?] for more details).

Among all the stakeholders presented in the previous section, we can determine five types of direct actors<sup>1</sup>:

- `actComCompany`: for the Communication Company stakeholder.
- `actAdministrator`: for the Administrator stakeholder.
- `actCoordinator`: for the Coordinators stakeholders.
- `actActivator`: for the Activator stakeholder.
- `actMsrCreator`: for the Creator stakeholder.

In addition to those system actors, we can add five other types of actors related to the system's ones. Those five actors are grouped into two categories:

- *Indirect actors*
  - *Witness*: for any human that is a witness of a car crash
  - *Victim*: for any human that is a victim of a car crash
  - *Anonymous*: for any human that want to inform about a car crash while staying anonymous.
- *Abstract actors*
  - `actHuman`: represent abstractly any kind of human being actor wanting to communicate with the ABC system in the context of a car crash.
  - `actAuthenticated`: for the logical Activator stakeholder.

## 2.3 Use Cases Model

This section contains the use cases elicited during the requirements elicitation phase. The use cases are textually described as suggested by the **Messir** method and inspired by the standard Cokburn template [?].

### 2.3.1 Use Cases

#### 2.3.1.1 summary-suDeployAndRun

The goal is to install the iCrash system on its infrastructure and to exploit its capacities related to the secure administration and efficient handling of car crash situations depending on alerts received.

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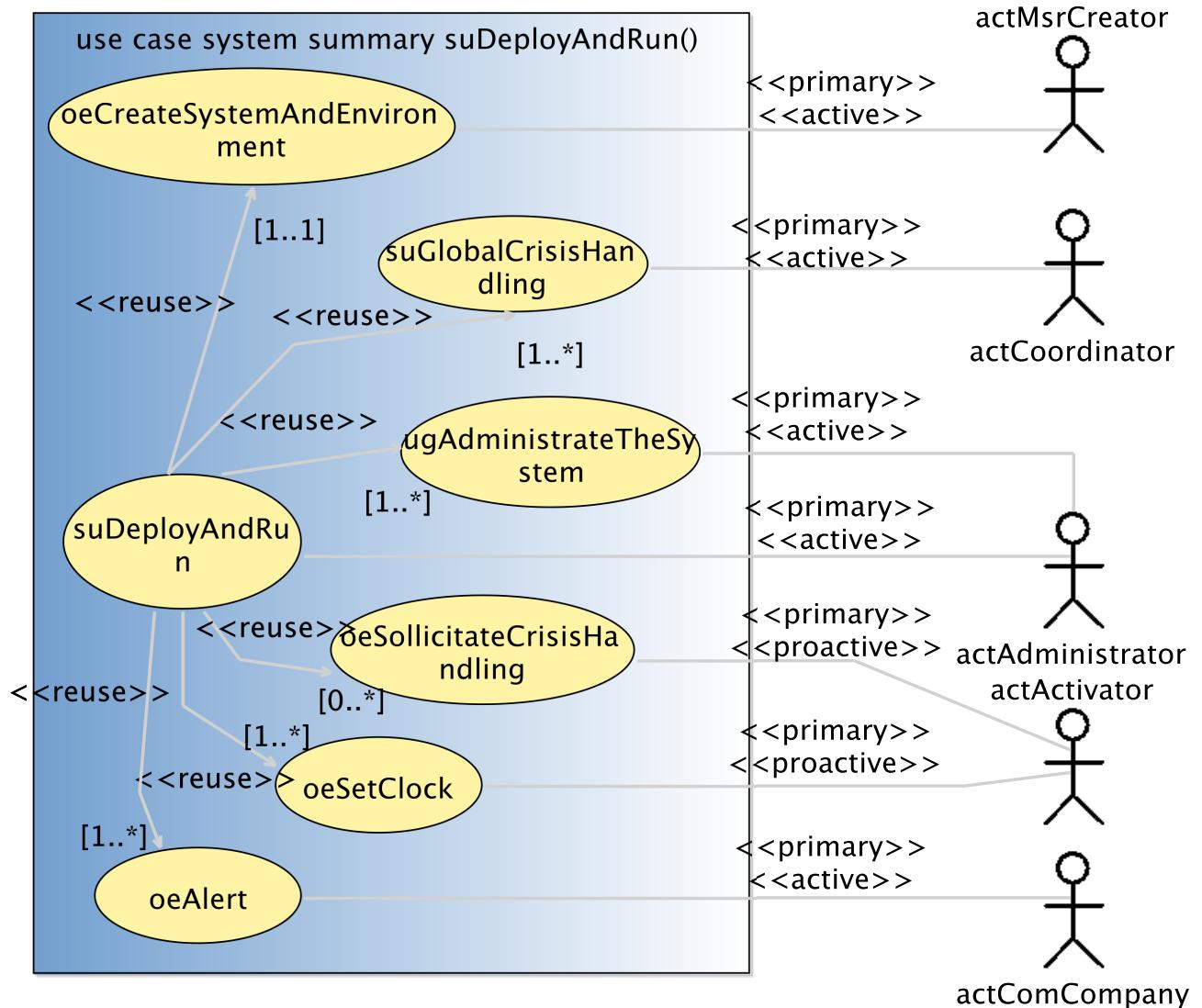
<sup>1</sup>The naming conventions in **Messir** propose to start each type name by lowercase letters indicating the meta model type used (i.e. act for actors, ct for class type, ....). In addition to ease the reading it makes the translational semantics into Prolog code more straightforward.

<b>USE-CASE DESCRIPTION</b>	
<i>Name</i>	suDeployAndRun
<i>Scope</i>	system
<i>Level</i>	summary
<b>Primary actor(s)</b>	
1	actAdministrator [active]
<b>Secondary actor(s)</b>	
1	actMsrCreator [active]
2	actCoordinator [active, multiple]
3	actActivator [proactive]
4	actComCompany [active]
<b>Goal(s) description</b>	
The goal is to install the iCrash system on its infrastructure and to exploit its capacities related to the secure administration and efficient handling of car crash situations depending on alerts received.	
<b>Reuse</b>	
1	<u>oeCreateSystemAndEnvironment [1..1]</u>
2	<u>ugAdministrateTheSystem [1..*]</u>
3	<u>suGlobalCrisisHandling [1..*]</u>
4	<u>oeSetClock [1..*]</u>
5	<u>oeSollicitateCrisisHandling [0..*]</u>
6	<u>oeAlert [1..*]</u>
<b>Protocol condition(s)</b>	
1	the iCrash system has never been deployed and used
<b>Pre-condition(s)</b>	
1	none
<b>Main post-condition(s)</b>	
1	the iCrash system has been created and has handled the crisis situations for which it received alerts through the communication company.
<b>Main Steps</b>	
a	the actor actMsrCreator executes the <u>oeCreateSystemAndEnvironment</u> use case
b	the actor actAdministrator executes the <u>ugAdministrateTheSystem</u> use case
c	the actor actComCompany executes the <u>oeAlert</u> use case
d	the actor actActivator executes the <u>oeSetClock</u> use case
e	the actor actActivator executes the <u>oeSollicitateCrisisHandling</u> use case
f	the actor actCoordinator executes the <u>suGlobalCrisisHandling</u> use case
<b>Steps Ordering Constraints</b>	
1	step (a) must be always the first step.
2	step (f) can be executed by different actCoordinator actors.
3	if (e) then previously (d).

Figure 2.1 shows the use case diagram for the suDeployAndRun summary use case

### 2.3.1.2 summary-suGlobalCrisisHandling

the actCoordinator's goal is to monitor the alerts received and the corresponding crisis in order to act as necessary to handle the crisis.

Figure 2.1: `suDeployAndRun` summary use case

<b>USE-CASE DESCRIPTION</b>	
<i>Name</i>	suGlobalCrisisHandling
<i>Scope</i>	system
<i>Level</i>	summary
<b>Primary actor(s)</b>	
1	actCoordinator [active]
<b>Goal(s) description</b>	
the actCoordinator's goal is to monitor the alerts received and the corresponding crisis in order to act as necessary to handle the crisis.	
<b>Reuse</b>	
1	ugSecurelyUseSystem [1..*]
2	ugMonitor [1..*]
3	ugManageCrisis [1..*]
<b>Protocol condition(s)</b>	
1	the iCrash system has been deployed
2	the coordinator actor involved in the use case has been declared by the actor actAdministrator
<b>Pre-condition(s)</b>	
1	none
<b>Main post-condition(s)</b>	
1	modifications have been made by the coordinator on existing alerts or crisis OR the coordinator requested an updated status on existing alerts or crisis.
<b>Main Steps</b>	
a	the actor actCoordinator executes the ugSecurelyUseSystem use case
b	the actor actCoordinator executes the ugMonitor use case
c	the actor actCoordinator executes the ugManageCrisis use case
<b>Steps Ordering Constraints</b>	
1	steps (a) (b) and (c) executions are interleaved (steps (b) and (c) have their protocol constrained by steps of (a)).
2	steps (a) (b) and (c) can be executed multiple times.

Figure 2.2 shows the use case diagram for the suGlobalCrisisHandling user goal use case

### 2.3.1.3 usergoal-ugAdministateTheSystem

the actAdministrator's goal is to follow an identification procedure to be allowed to add or delete the necessary crisis coordinators that will be granted the responsibility to handle alerts and crisis.

<b>USE-CASE DESCRIPTION</b>	
<i>Name</i>	ugAdministateTheSystem
<i>Scope</i>	system
<i>Level</i>	usergoal
<b>Primary actor(s)</b>	
1	actAdministrator [active]
<b>Goal(s) description</b>	
the actAdministrator's goal is to follow an identification procedure to be allowed to add or delete the necessary crisis coordinators that will be granted the responsibility to handle alerts and crisis.	

*continues in next page ...*

**... Use-Case Description table continuation**

<b>Reuse</b>
1 <u>ugSecurelyUseSystem [1..*]</u>
2 <u>oeAddCoordinator [1..*]</u>
3 <u>oeDeleteCoordinator [0..*]</u>
4 <u>oeAddHospital [0..*]</u>
5 <u>oeDeleteHospital [0..*]</u>
<b>Protocol condition(s)</b>
1      the iCrash system has been deployed
<b>Pre-condition(s)</b>
1      none
<b>Main post-condition(s)</b>
1      modifications have been made to the system and its environment concerning existing or new coordinators.
<b>Main Steps</b>
a      the actor <code>actAdministrator</code> executes the <u>ugSecurelyUseSystem</u> use case
b      the actor <code>actAdministrator</code> executes the <u>oeAddCoordinator</u> use case
c      the actor <code>actAdministrator</code> executes the <u>oeDeleteCoordinator</u> use case
d      the actor <code>actAdministrator</code> executes the <u>oeAddHospital</u> use case
e      the actor <code>actAdministrator</code> executes the <u>oeDeleteHospital</u> use case
<b>Steps Ordering Constraints</b>
1      steps (a) (b) and (c) executions are interleaved (steps (b) (c) (d) and (e) have their protocol constrained by steps of (a)).
2      steps (a) (b) (c) (d) and (e) can be executed multiple times.

Figure 2.3 shows the use case diagram for the ugAdministrateTheSystem user goal use case

### 2.3.1.4 usergoal-ugManageCrisis

The goal is to do an action that makes the handling of a crisis or an alert progress.

USE-CASE DESCRIPTION	
Name	ugManageCrisis
Scope	system
Level	usergoal
<b>Primary actor(s)</b>	
1	<code>actCoordinator[active]</code>
<b>Goal(s) description</b>	
The goal is to do an action that makes the handling of a crisis or an alert progress.	
<b>Reuse</b>	
1	<u>oeValidateAlert [0..*]</u>
2	<u>oeSetCrisisStatus [0..*]</u>
3	<u>oeSetCrisisHandler [0..*]</u>
4	<u>oeReportOnCrisis [0..*]</u>
5	<u>oeCloseCrisis [0..*]</u>
6	<u>oeInvalidateAlert [0..*]</u>
7	<u>oeSendHospitalInfo [0..*]</u>

*continues in next page ...*

**... Use-Case Description table continuation**

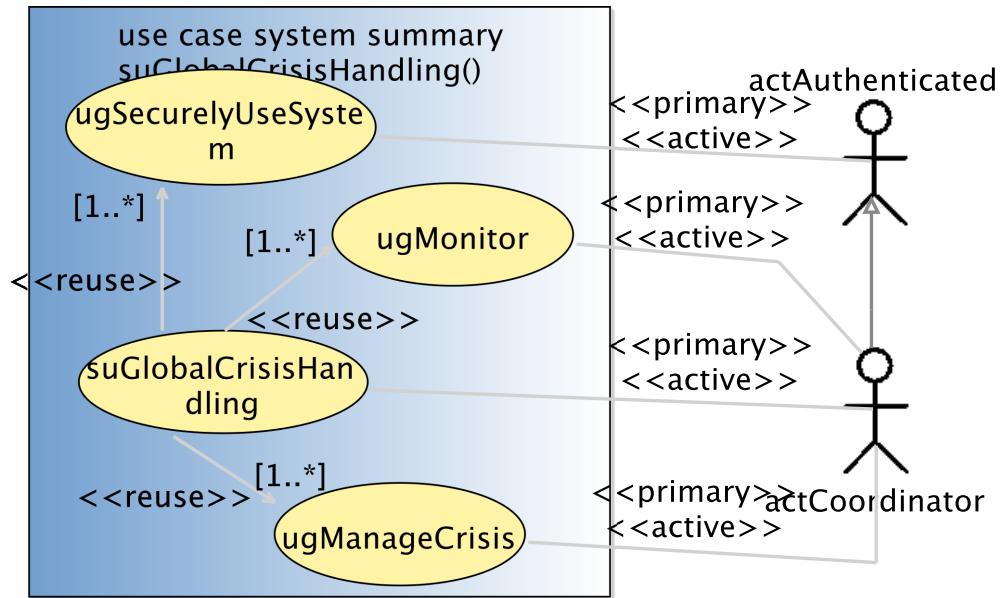
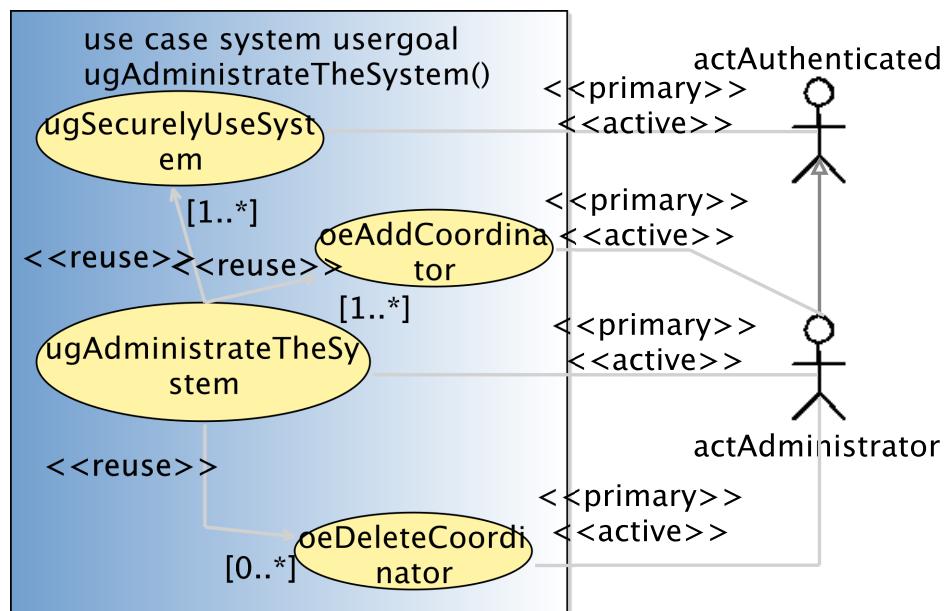
<b>Protocol condition(s)</b>
1 the iCrash system has been deployed
<b>Pre-condition(s)</b>
1 none
<b>Main post-condition(s)</b>
1 there exist one alert or one crisis whose related information has been changed.
<b>Main Steps</b>
a the actor actCoordinator executes the <u>oeValidateAlert</u> use case
b the actor actCoordinator executes the <u>oeSetCrisisStatus</u> use case
c the actor actCoordinator executes the <u>oeSetCrisisHandler</u> use case
d the actor actCoordinator executes the <u>oeReportOnCrisis</u> use case
e the actor actCoordinator executes the <u>oeCloseCrisis</u> use case
f the actor actCoordinator executes the <u>oeInvalidateAlert</u> use case
g the actor actCoordinator executes the <u>oeSendHospitalInfo</u> use case
<b>Steps Ordering Constraints</b>
1 managing a crisis is doing one of the indicated use cases.

Figure 2.4 shows the use case diagram for the ugManageCrisis user goal use case

**2.3.1.5 usergoal-ugMonitor**

the actCoordinator's goal is to get the detailed list of existing crisis or alerts to decide on next actions to undertake.

USE-CASE DESCRIPTION	
Name	ugMonitor
Scope	system
Level	usergoal
<b>Primary actor(s)</b>	
1	actCoordinator[active]
<b>Goal(s) description</b>	
the actCoordinator's goal is to get the detailed list of existing crisis or alerts to decide on next actions to undertake.	
<b>Reuse</b>	
1	<u>oeGetCrisisSet</u> [0..*]
2	<u>oeGetAlertsSet</u> [0..*]
<b>Protocol condition(s)</b>	
1	the iCrash system has been deployed
<b>Pre-condition(s)</b>	
1	none
<b>Main post-condition(s)</b>	
1	none
<b>Main Steps</b>	
a	the actor actCoordinator executes the <u>oeGetAlertsSet</u> use case
b	the actor actCoordinator executes the <u>oeGetCrisisSet</u> use case

Figure 2.2: `suGlobalCrisisHandling` user goal use caseFigure 2.3: `ugAdministateTheSystem` user goal use case

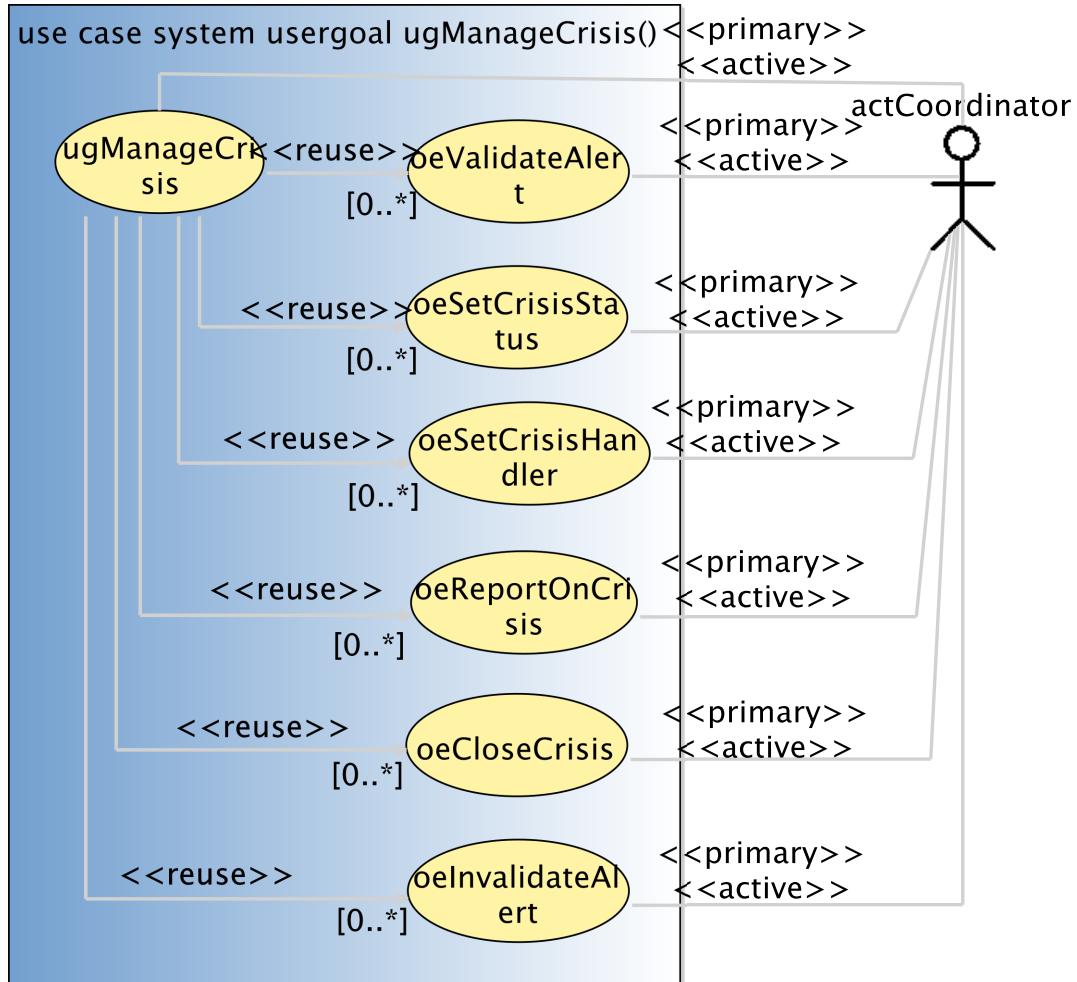


Figure 2.4: ugManageCrisis user goal use case

Figure 2.5 shows the use case diagram for the ugMonitor user goal use case

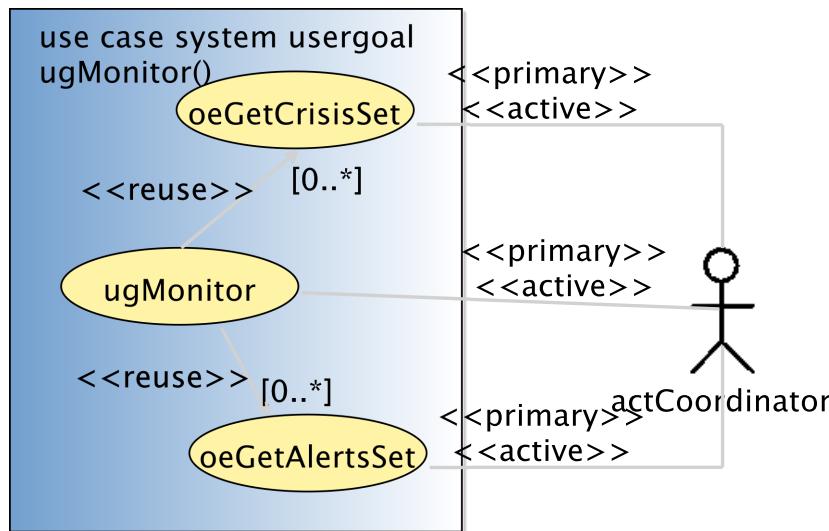


Figure 2.5: ugMonitor user goal use case

### 2.3.1.6 usergoal-ugSecurelyUseSystem

the actAdministrator's goal is to follow an identification procedure to be allowed to add or delete the necessary crisis coordinators that will be granted the responsibility to handle alerts and crisis.

USE-CASE DESCRIPTION	
Name	ugSecurelyUseSystem
Scope	system
Level	usergoal
<i>Primary actor(s)</i>	
1	actAuthenticated[active]
<i>Goal(s) description</i>	
the actAdministrator's goal is to follow an identification procedure to be allowed to add or delete the necessary crisis coordinators that will be granted the responsibility to handle alerts and crisis.	
<i>Reuse</i>	
1	<u>oeLogin</u> [1..1]
2	<u>oeLogout</u> [1..1]
<i>Protocol condition(s)</i>	
1	the iCrash system has been deployed
<i>Pre-condition(s)</i>	
1	none
<i>Main post-condition(s)</i>	
1	the actAuthenticated is known by the system not to be logged.
<i>Main Steps</i>	
a	the actor actAuthenticated executes the <u>oeLogin</u> use case
b	the actor actAuthenticated executes the <u>oeLogout</u> use case

*continues in next page ...*

**... Use-Case Description table continuation**

<i>Steps Ordering Constraints</i>
1 step (a) must always precede step (b).

Figure 2.6 shows the use case diagram for the ugSecurelyUseSystem user goal use case

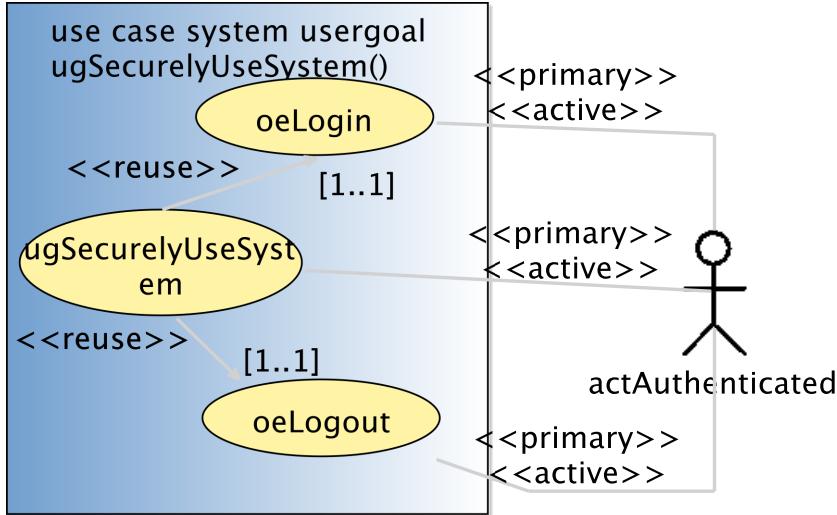


Figure 2.6: ugSecurelyUseSystem user goal use case

### 2.3.1.7 subfunction-oeAddHospital

The administrator add a new Hospital in the system

USE-CASE DESCRIPTION
Name oeAddHospital
Scope system
Level subfunction
Parameters
AdtHospitalID: dtHospitalID 1
AdtGPSLocation: dtGPSLocation 2
Primary actor(s)
1 actAdministrator [active]
Goal(s) description
The administrator add a new Hospital in the system
Protocol condition(s)
1 The system is running, and the administrator is logged in
Pre-condition(s)
1
Main post-condition(s)

*continues in next page ...*

**... Use-Case Description table continuation**

1	The new hospital is added to the system
<b>Additional Information</b>	
none	

Figure 2.7 The administrator add a new Hospital to the system

**2.3.1.8 subfunction-oeDeleteHospital**

A coordinator delete a hospital from the system

USE-CASE DESCRIPTION	
Name	oeDeleteHospital
Scope	system
Level	subfunction
<b>Primary actor(s)</b>	
1	actAdministrator[active]
<b>Goal(s) description</b>	
A coordinator delete a hospital from the system	
<b>Protocol condition(s)</b>	
1	
<b>Pre-condition(s)</b>	
1	
<b>Main post-condition(s)</b>	
1	
<b>Additional Information</b>	
none	

**2.3.1.9 subfunction-oeSendHospitalInfo**

send selected information to near hospitals

USE-CASE DESCRIPTION	
Name	oeSendHospitalInfo
Scope	system
Level	subfunction
<b>Parameters</b>	
The selected information to the hospitals AdtHospitalInfo: dtHospitalInfo 1	
The crisis that the information belongs to AdtCrisisID: dtCrisisID 2	
<b>Primary actor(s)</b>	
1	actCoordinator[active]
<b>Secondary actor(s)</b>	
1	actHospital[passive, multiple]
<b>Goal(s) description</b>	
send selected information to near hospitals	

*continues in next page ...*

**... Use-Case Description table continuation**

<b>Protocol condition(s)</b>
1      The coordinator is already logged in
2      The system is already initialized
<b>Pre-condition(s)</b>
1      Exists a crisis that is being handling by this coordinator
<b>Main post-condition(s)</b>
1      The system sends information to near hospitals
<b>Additional Information</b>
none

**2.3.1.10 subfunction-oeSetCrisisHandler**

goal is to declare himself as been the handler of a crisis having the specified id.

USE-CASE DESCRIPTION	
Name	oeSetCrisisHandler
Scope	system
Level	subfunction
<b>Parameters</b>	
AdtCrisisID: dtCrisisID 1	
<b>Primary actor(s)</b>	
1	actCoordinator [active]
<b>Secondary actor(s)</b>	
1	actCoordinator [passive]
2	actComCompany [passive, multiple]
<b>Goal(s) description</b>	
goal is to declare himself as been the handler of a crisis having the specified id.	
<b>Protocol condition(s)</b>	
1	
<b>Pre-condition(s)</b>	
1	
<b>Main post-condition(s)</b>	
1	
<b>Additional Information</b>	
none	

Figure 2.8 shows the use case diagram for the oeSetCrisisHandler subfunction use case

**2.3.1.11 subfunction-oeSollicitateCrisisHandling**

the actActivator's goal is to decrease the number of unhandled crisis.

USE-CASE DESCRIPTION	
Name	oeSollicitateCrisisHandling
Scope	system

*continues in next page ...*

**... Use-Case Description table continuation**

Level	subfunction
<b>Primary actor(s)</b>	
1	actActivator[proactive]
<b>Secondary actor(s)</b>	
1	actCoordinator[passive, multiple]
2	actAdministrator[passive]
<b>Goal(s) description</b>	
the actActivator's goal is to decrease the number of unhandled crisis.	
<b>Protocol condition(s)</b>	
1	the iCrash system has been deployed.
2	there exist some crisis still pending and for which no solicitation has been sent to the administrator and the coordinators for more than a predefined maximum delay.
<b>Pre-condition(s)</b>	
1	none
<b>Main post-condition(s)</b>	
1	a simple text message ieMessage('There are alerts not treated since more than the defined delay. Please REACT !') is sent to the system administrator and to all the coordinators of the environment for each crisis that is known to be not handled and for which no solicitation has been sent to the administrator and the coordinators for more than a predefined maximum delay.')
2	the reminder period for the concerned crisis is initialized.

Figure 2.9 shows the use case diagram for the oeSollicitateCrisisHandling subfunction use case

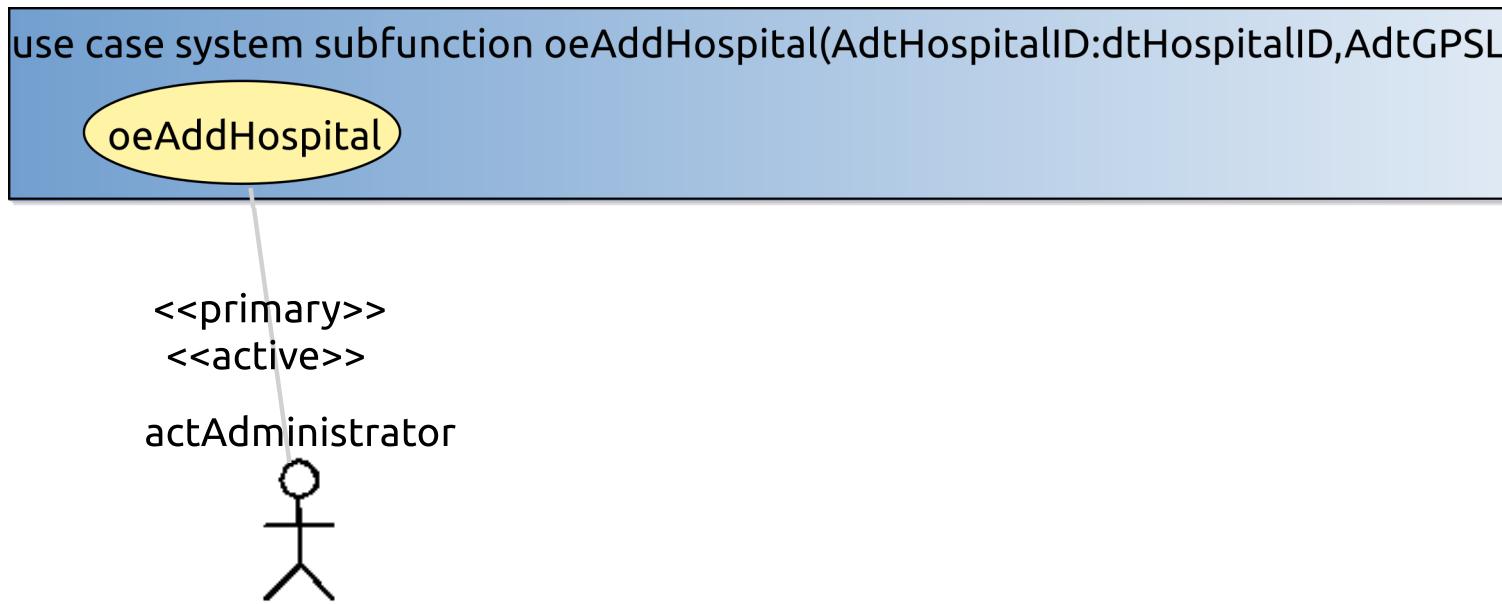


Figure 2.7:

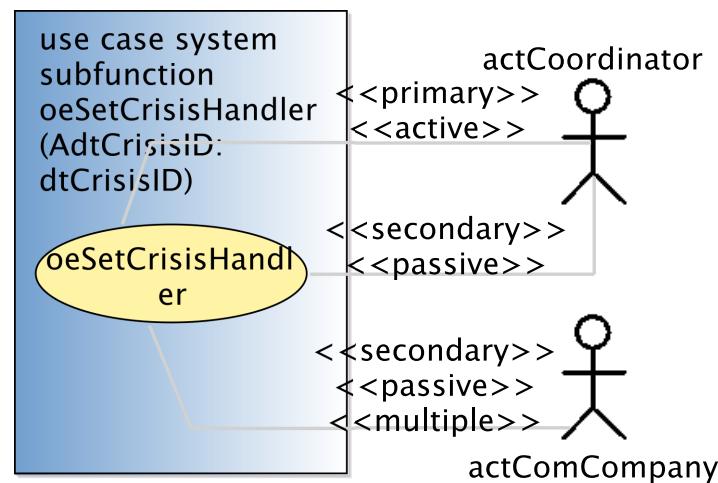


Figure 2.8: oeSetCrisisHandler subfunction use case

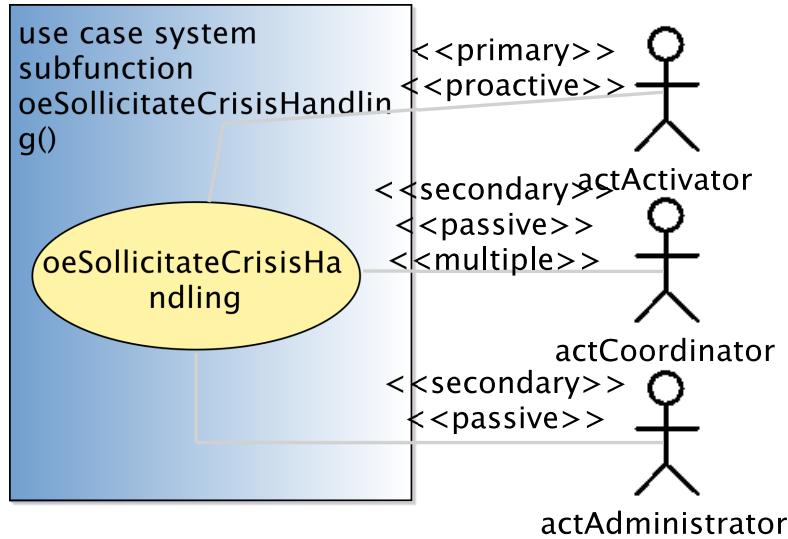


Figure 2.9: oeSollicitateCrisisHandling subfunction use case

### 2.3.2 Use Case Instance(s)

#### 2.3.2.1 Use-Case Instance - uciSimpleAndCompletePart01:suDeployAndRun

First part of a use case instance for the summary use case suDeployAndRun illustrating a simple and complete interaction scenario primarily handled by an administrator in a concrete situation.

SUMMARY USE-CASE INSTANCE	
<i>Instantiated Use Case</i>	
suDeployAndRun	
<i>Instance ID</i>	
uciSimpleAndCompletePart01	
<i>Remarks</i>	
a	shows the system initialization and the first administrative tasks by the administrator.
b	The unique and always existing actMsrCreator actor instance (named here theCreator) requests the initialization of the system and its environment (made of one administrator identified here by bill), one activator actor (identified by theClock) and indicating that the number of communication company actor instances for the system's environment is 4 (one of them is identified here by tango)
c	the administrator logs in to initialize a coordinator
d	an alert is received. Time is going on without having the coordinator handling the alert which lets the proactive actor trigger the automatic solicitation of crisis handling.
e	this first part stops before the coordinator logs in the system.

Figure 2.10 shows the sequence diagram representing the first part of a simple and complete use case instance for the summary use case suDeployAndRun.

#### 2.3.2.2 Use-Case Instance - uciSimpleAndCompletePart02:suDeployAndRun

Second part of a simple and complete use case instance for the summary use case suDeployAndRun illustrating a simple and complete interaction scenario primarily handled by an administrator in a concrete situation.

SUMMARY USE-CASE INSTANCE	
<i>Instantiated Use Case</i>	
suDeployAndRun	

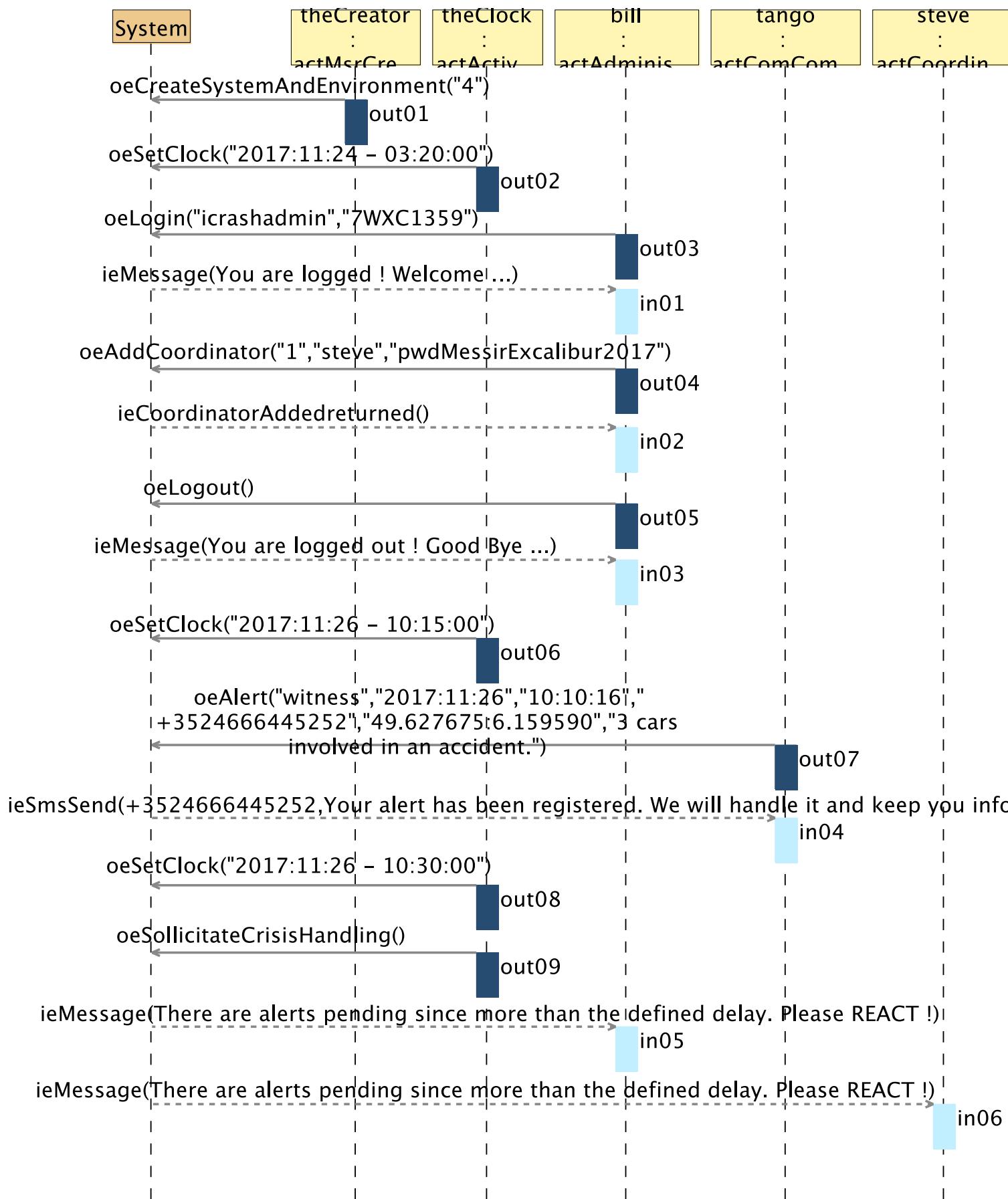


Figure 2.10: uci-suDeployAndRun-uciSimpleAndComplete-Part01

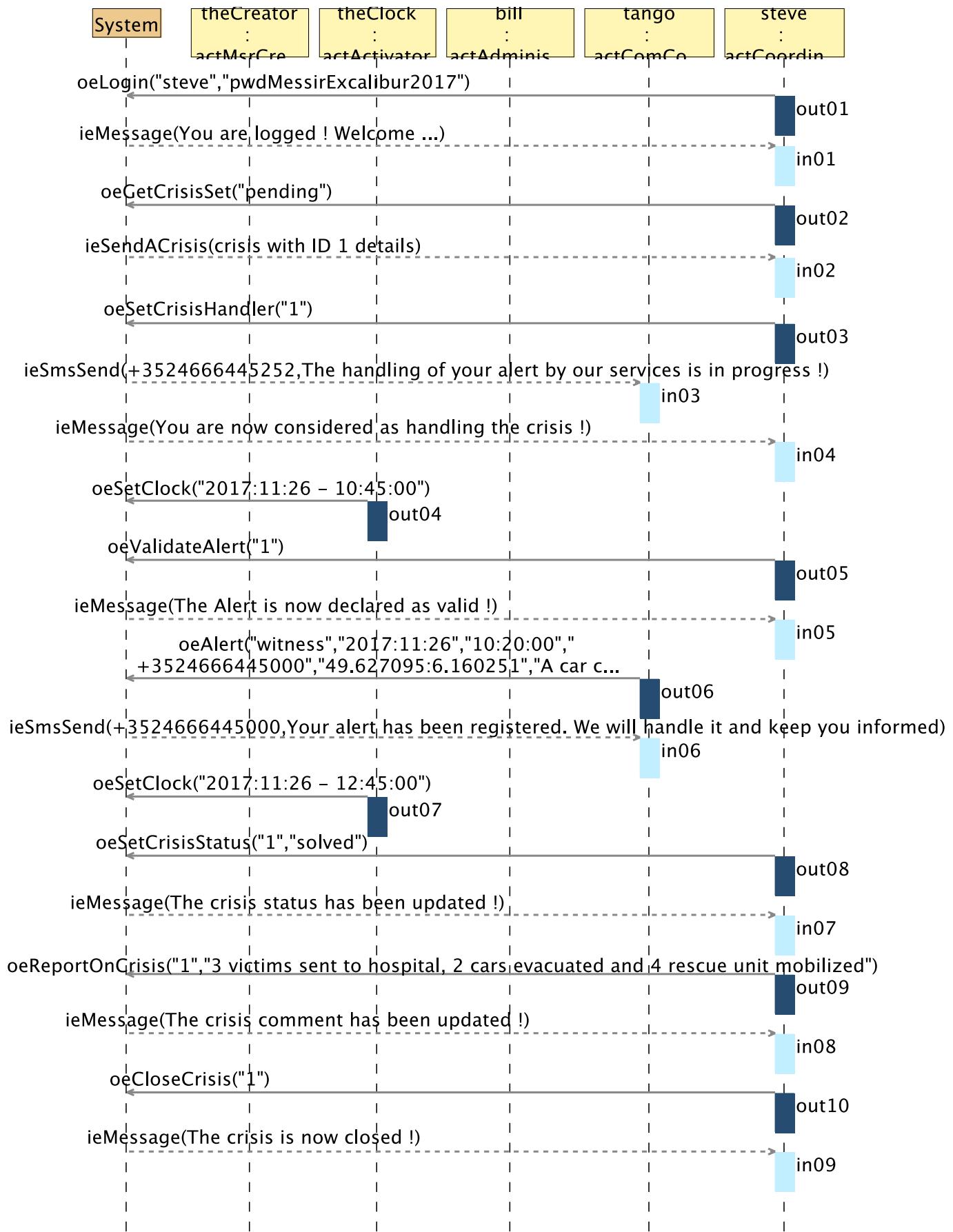


Figure 2.11: uci-suDeployAndRun-uciSimpleAndComplete-Part02 use case instance sequence diagram

USERGOAL USE-CASE INSTANCE
<i>Instantiated Use Case</i> ugSecurelyUseSystem
<i>Instance ID</i> uciugSecurelyUseSystem

Figure 2.12



Figure 2.12:

### 2.3.2.4 Use-Case Instance - ucioeAddHospital:oeAddHospital

The Administrator Jose add the Hospital with ID 'HECA' to the system

SUBFUNCTION USE-CASE INSTANCE
<i>Instantiated Use Case</i> oeAddHospital
<i>Instance ID</i> ucioeAddHospital

Figure 2.13

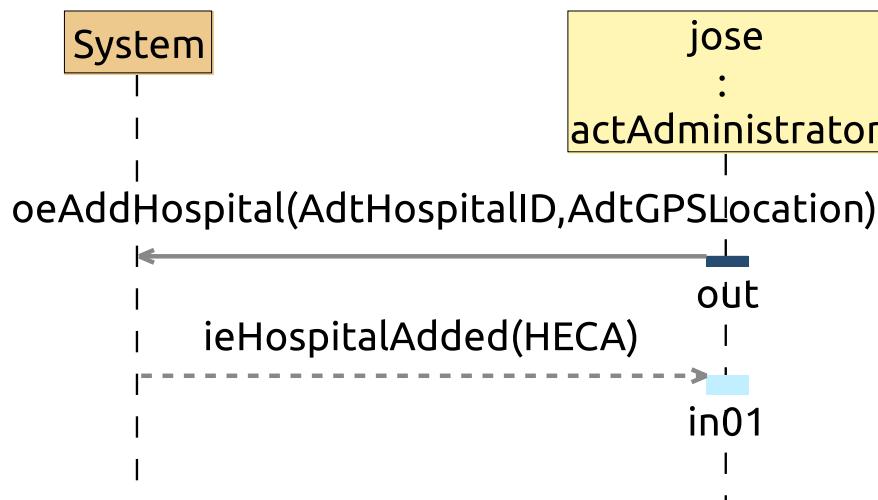


Figure 2.13:

### 2.3.2.5 Use-Case Instance - ucioeSendHospitalInfo:oeSendHospitalInfo

Instance of a Coordinator sending info to the hospital

SUBFUNCTION USE-CASE INSTANCE
<i>Instantiated Use Case</i> <code>oeSendHospitalInfo</code>
<i>Instance ID</i> <code>ucioeSendHospitalInfo</code>

Figure 2.14 Use case instance of a coordinator sending information to near hospital, in this case HECA

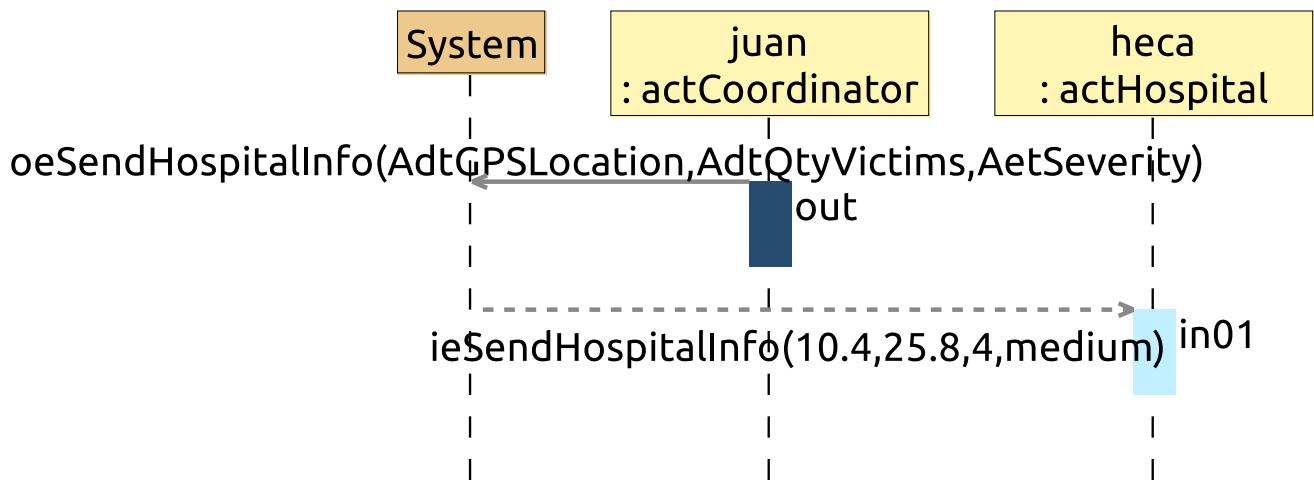


Figure 2.14:

# Chapter 3

## Environment Model

We provide below the view(s) defined for the **Messip** environment model (cf. [?]) of the system.

### 3.1 Local view 01

Figure 3.1 shows the local view giving the second part of the environment model of the system in term of its state class, actors with their input and output interfaces and all related associations.

### 3.2 Local view 02

Figure 3.2 shows the local view giving the second part the environment model of the system in term of its state class, actors with their input and output interfaces and all related associations.

### 3.3 Local view 03

Figure 3.3 shows the local view for the administrator actor and interfaces

### 3.4 Local view 04

Figure 3.4 shows the local view for the coordinator actor and interfaces

### 3.5 Local view 05

Figure 3.5 shows the local view for the authenticated actor and interfaces

### 3.6 Global view 01

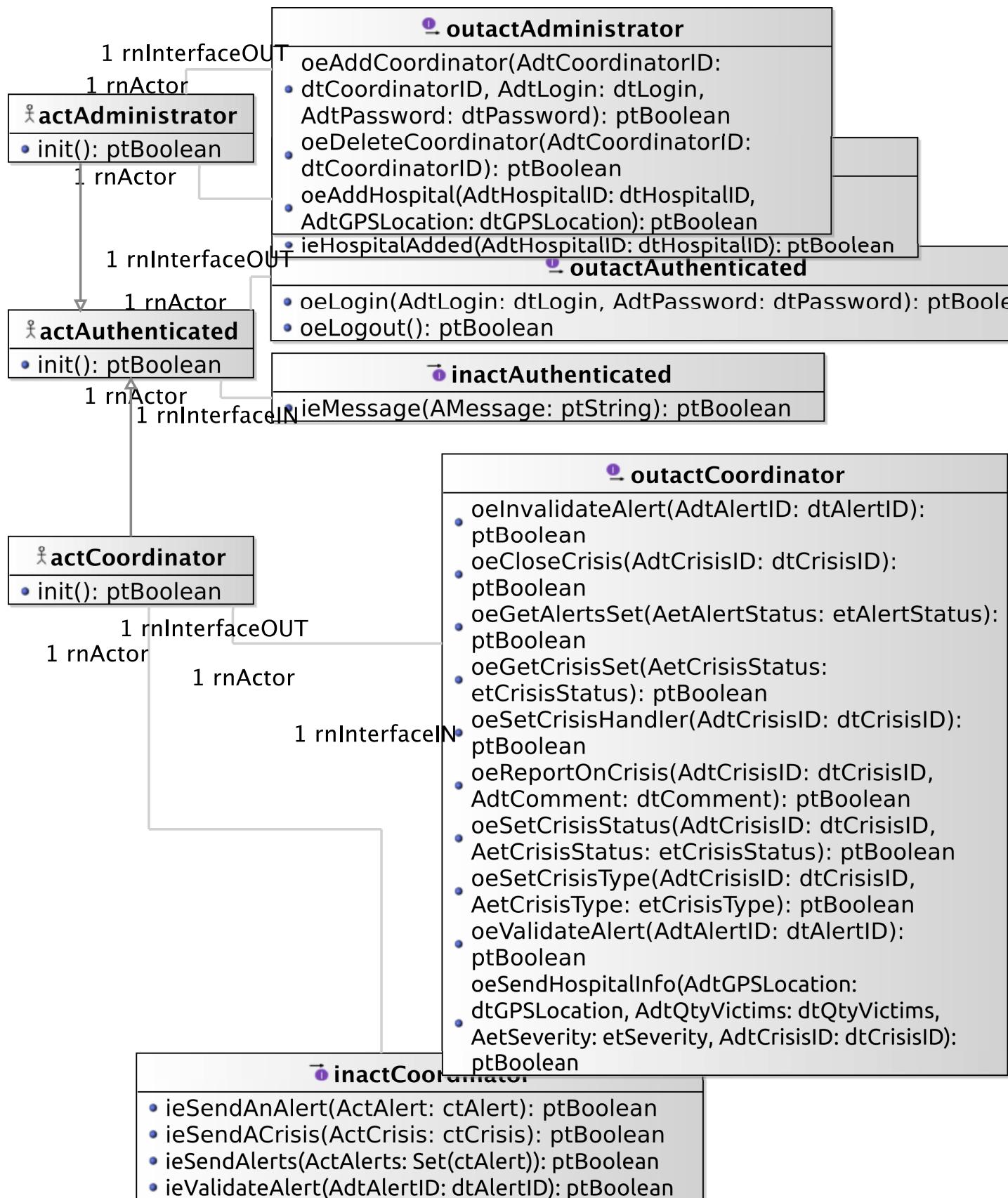


Figure 3.1: Environment Model - Local View 01. environment model local view - Part 1.

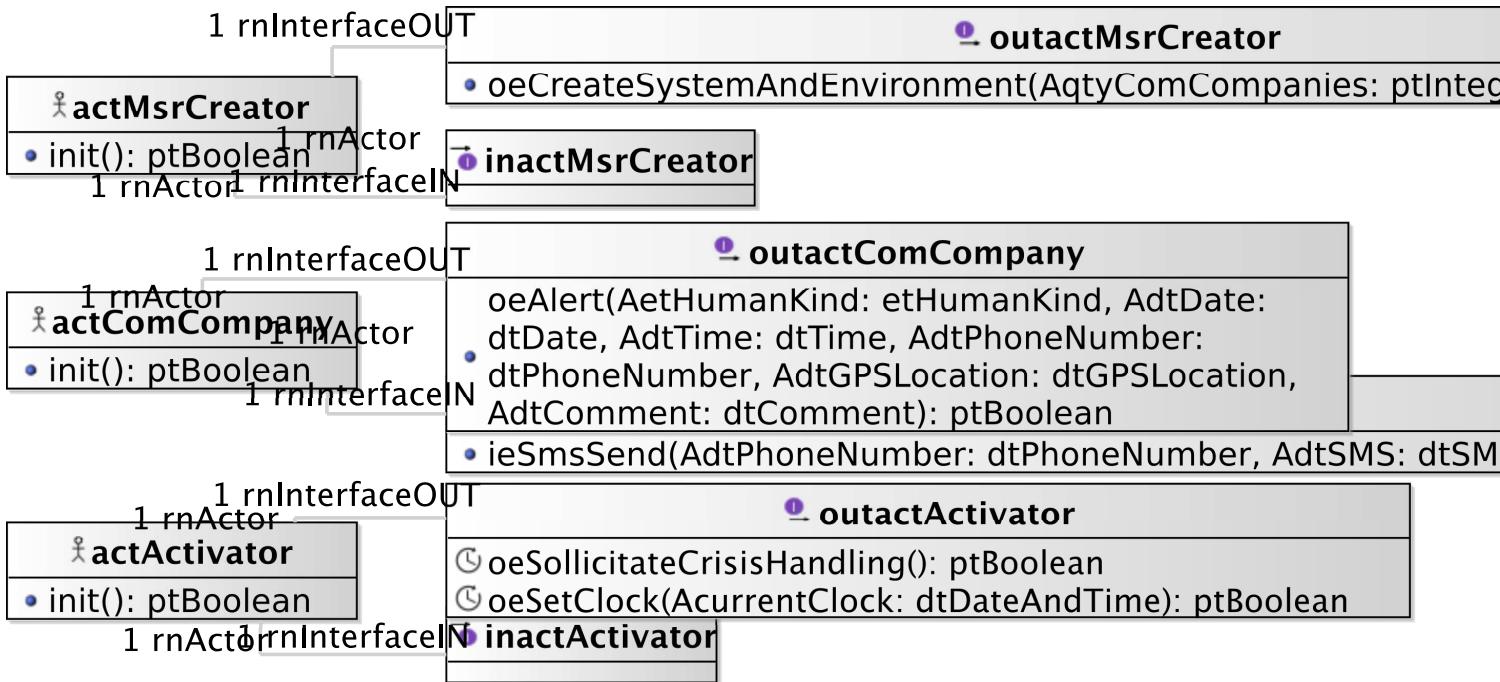


Figure 3.2: Environment Model - Local View 02. environment model local view - Part 2.

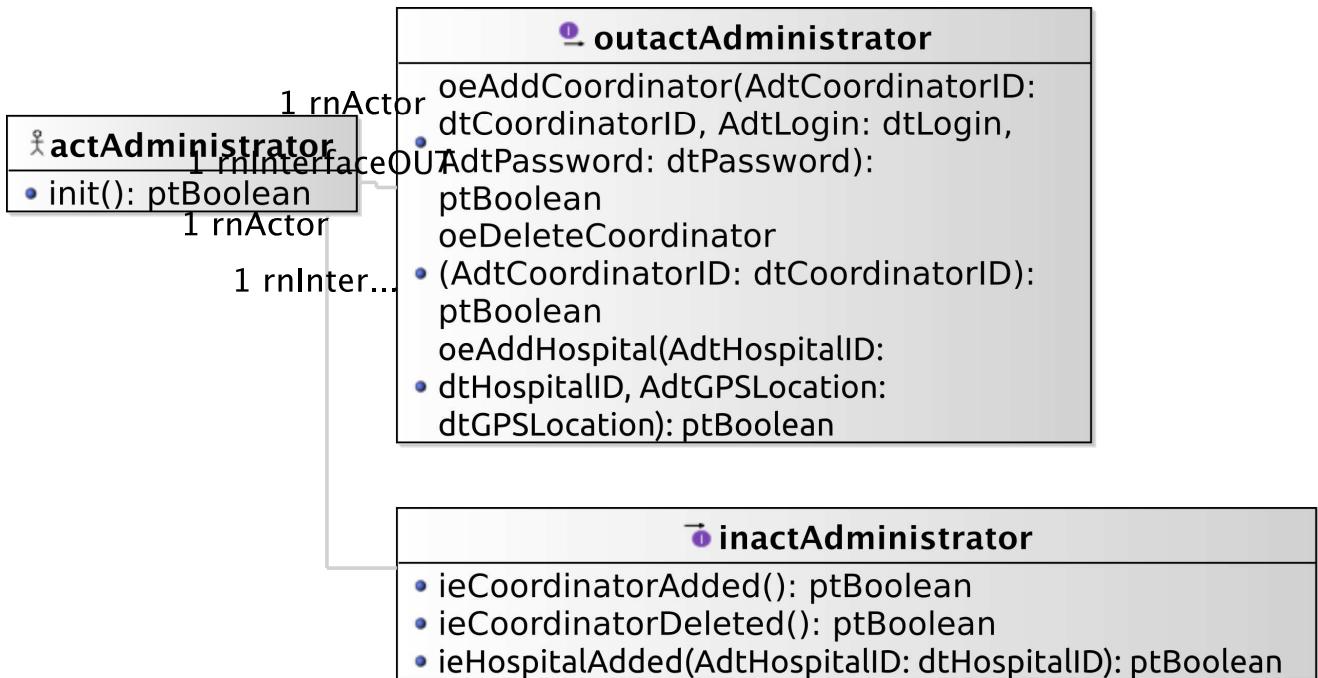


Figure 3.3: Environment Model - Local View 03. administrator actor environment model view.

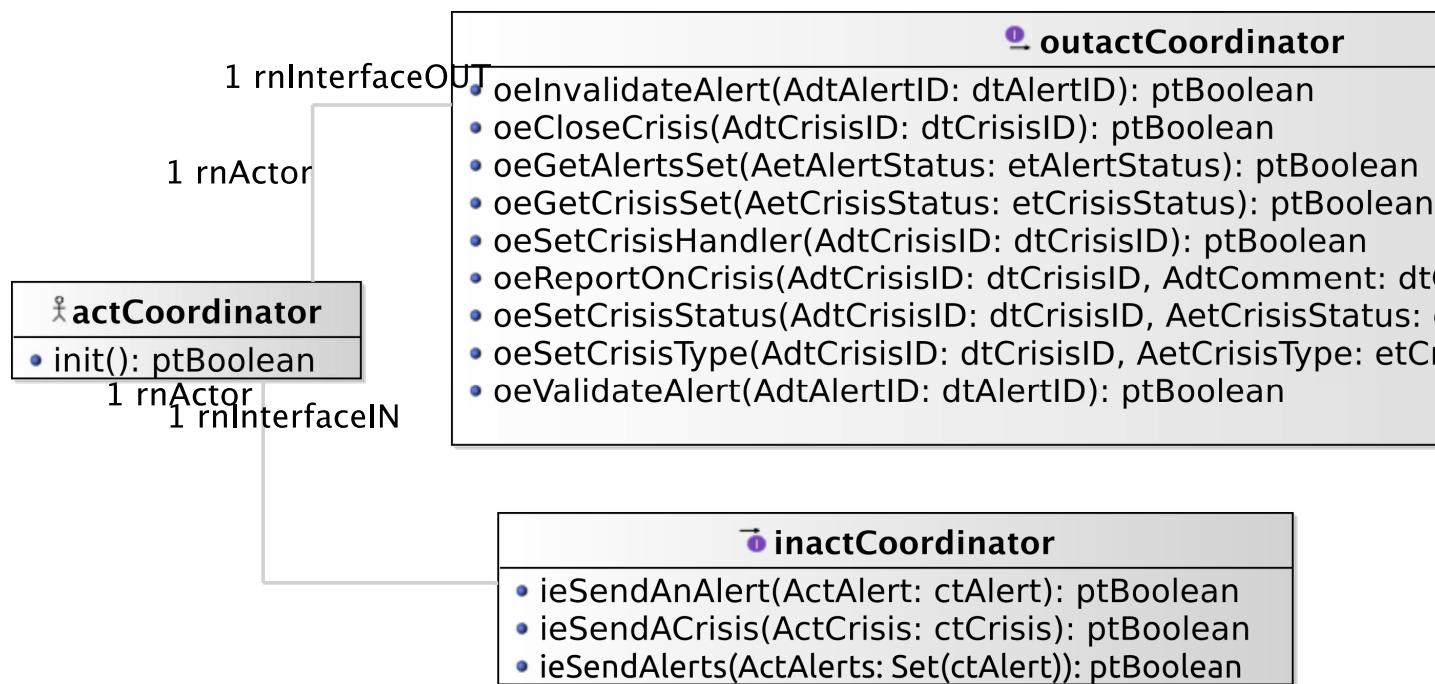


Figure 3.4: Environment Model - Local View 04. coordinator actor environment model view.

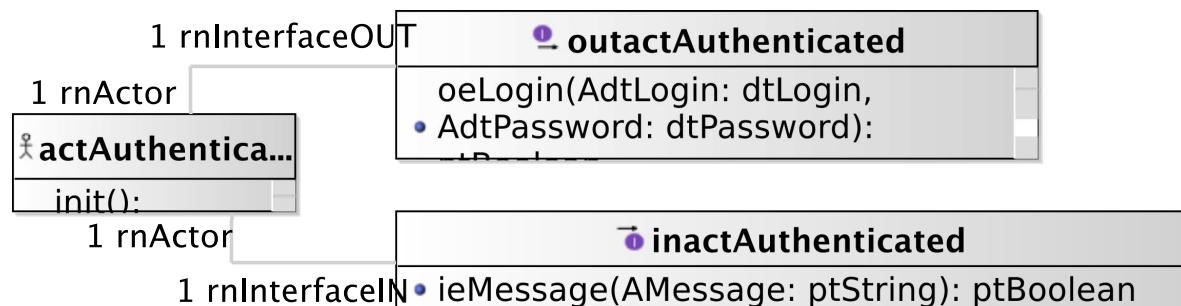


Figure 3.5: Environment Model - Local View 05. authenticated actor environment model local view.

Figure 3.6 shows a global view for all actors with their relationships with ctState

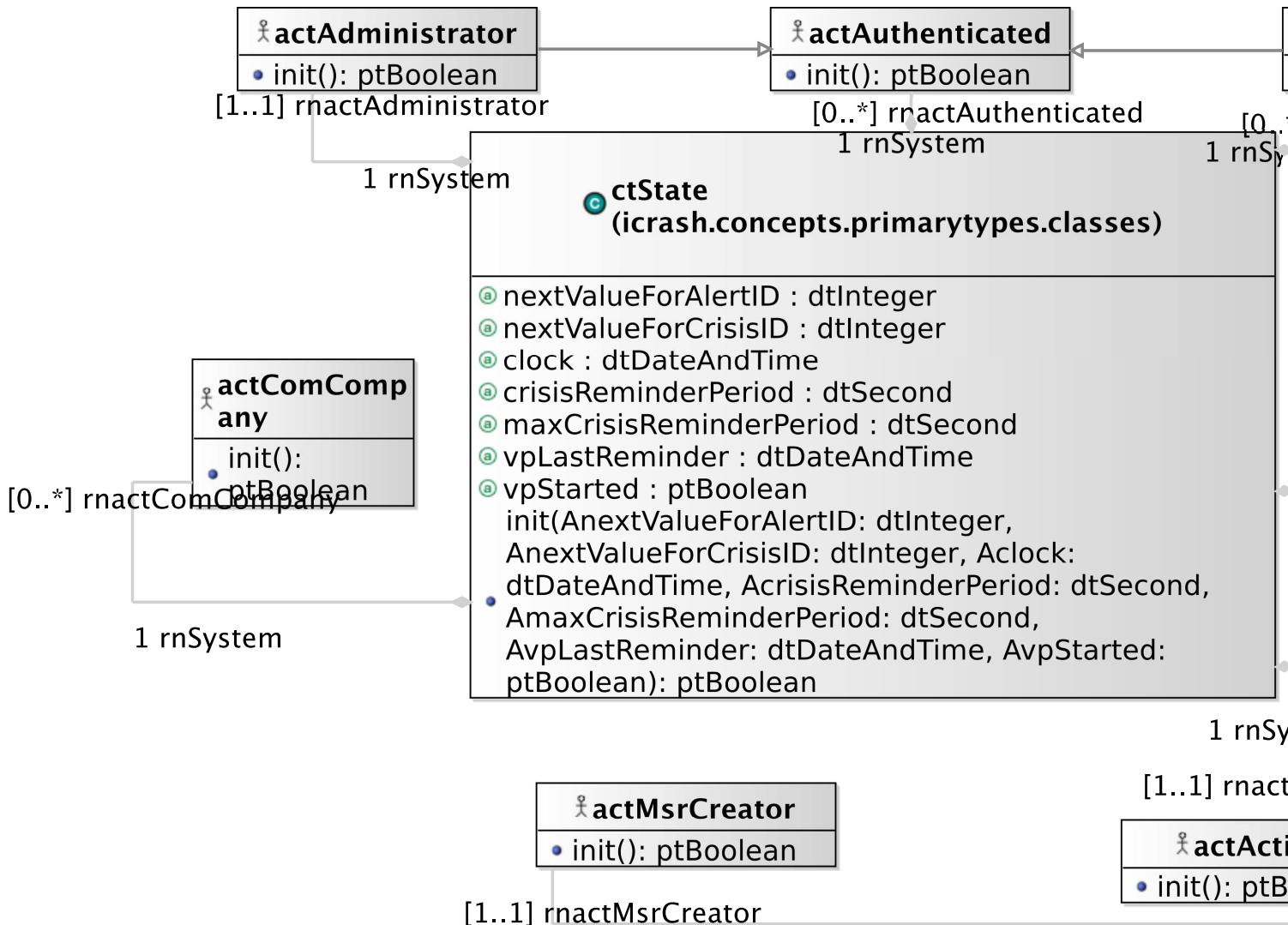


Figure 3.6: Environment Model - Global View 01. em-gv-01 environment model global view.

## 3.7 Actors and Interfaces Descriptions

We provide for the given views the description of the actors together with their associated input and output interface descriptions.

### 3.7.1 actActivator Actor

ACTOR
<i>actActivator</i>
represents a logical actor for time automatic message sending based on system's or environment status.

*continues in next page ...*

*... Actor table continuation*

<i>OutputInterfaces</i>	
OUT 1	<b>[proactive] oeSollicitateCrisisHandling() :ptBoolean</b> used to avoid crisis to stay too long in an not handled status.
OUT 2	<b>[proactive] oeSetClock(AcurrentClock:dtDateAndTime) :ptBoolean</b> used to update the system's time

**3.7.2 actAdministrator Actor**

<b>ACTOR</b>	
<i>actAdministrator</i>	
	represents an actor responsible of administration tasks for the <i>iCrash</i> system.
<i>Extends</i>	
	icrash.environment.actAuthenticated
<i>OutputInterfaces</i>	
OUT 1	<b>oeAddCoordinator(AdtCoordinatorID:dtCoordinatorID, AdtLogin:dtLogin, AdtPassword:dtPassword) :ptBoolean</b> sent to add a new coordinator in the system's post state and environment's post state.
OUT 2	<b>oeDeleteCoordinator(AdtCoordinatorID:dtCoordinatorID) :ptBoolean</b> sent to delete an existing coordinator in the system's post state and environment's post state.
<i>InputInterfaces</i>	
IN 1	<b>ieCoordinatorAdded() :ptBoolean</b> its reception confirms the creation of the requested coordinator.
IN 2	<b>ieCoordinatorDeleted() :ptBoolean</b> its reception confirms the deletion of the requested coordinator.

**3.7.3 actAuthenticated Actor**

<b>ACTOR</b>	
<i>actAuthenticated</i>	
	abstract actor providing reusable input and output interfaces for actors that need to authenticate themselves.
<i>OutputInterfaces</i>	
OUT 1	<b>oeLogin(AdtLogin:dtLogin, AdtPassword:dtPassword) :ptBoolean</b> sent to request authorization to request access secured system operations.
OUT 2	<b>oeLogout() :ptBoolean</b> sent to end the secured access to specific system operations.
<i>InputInterfaces</i>	
IN 1	<b>ieMessage(AMessage:ptString) :ptBoolean</b> allows for receiving general textual messages.

**3.7.4 actComCompany Actor**

<b>ACTOR</b>	
<i>actComCompany</i>	
<i>continues in next page ...</i>	

**...Actor table continuation**

represents the communication company stakeholder ensuring the input/ouput of textual messages with humans having communicaiton devices.

<b>OutputInterfaces</b>
OUT 1 <b>oeAlert (AetHumanKind:etHumanKind, AdtDate:dtDate, AdtTime:dtTime, AdtPhoneNumber:dtPhoneNumber, AdtGPSLocation:dtGPSLocation, AdtComment:dtComment) :ptBoolean</b> sent to alert of a potential crisis situation.
<b>InputInterfaces</b>
IN 1 <b>ieSmsSend (AdtPhoneNumber:dtPhoneNumber, AdtSMS:dtSMS) :ptBoolean</b> allows for receiving textual messages to be dispatched to the communication company customers having the provided phone number.

**3.7.5 actCoordinator Actor**

<b>ACTOR</b>
<b>actCoordinator</b>
represents actor responsible of handling one or several crisis for the <i>iCrash</i> system.
<b>Extends</b>
icrash.environment.actAuthenticated
<b>OutputInterfaces</b>
OUT 1 <b>oeInvalidateAlert (AdtAlertID:dtAlertID) :ptBoolean</b> sent to indicate that an alert should be considered as closed.
OUT 2 <b>oeCloseCrisis (AdtCrisisID:dtCrisisID) :ptBoolean</b> sent to indicate that a crisis should be considered as closed.
OUT 3 <b>oeGetAlertsSet (AetAlertStatus:etAlertStatus) :ptBoolean</b> sent to request all the ctAlert instances having a specific status.
OUT 4 <b>oeGetCrisisSet (AetCrisisStatus:etCrisisStatus) :ptBoolean</b> sent to request all the ctCrisis instances having a specific status.
OUT 5 <b>oeSetCrisisHandler (AdtCrisisID:dtCrisisID) :ptBoolean</b> sent to declare himself as been the handler of a crisis having the specified id.
OUT 6 <b>oeReportOnCrisis (AdtCrisisID:dtCrisisID, AdtComment:dtComment) :ptBoolean</b> sent to update the textual information available for a specific handled crisis.
OUT 7 <b>oeSetCrisisStatus (AdtCrisisID:dtCrisisID, AetCrisisStatus:etCrisisStatus) :ptBoolean</b> sent to define the handling status of a specific crisis.
OUT 8 <b>oeSetCrisisType (AdtCrisisID:dtCrisisID, AetCrisisType:etCrisisType) :ptBoolean</b> sent to define the gravity type of a specific crisis.
OUT 9 <b>oeValidateAlert (AdtAlertID:dtAlertID) :ptBoolean</b> sent to indicate that a specific alert is not a fake.
<b>InputInterfaces</b>
IN 1 <b>ieSendAnAlert (ActAlert:ctAlert) :ptBoolean</b> allows for receiving a requested ctAlert instance.
IN 2 <b>ieSendACrisis (ActCrisis:ctCrisis) :ptBoolean</b> allows for receiving a requested ctCrisis instance.

**3.7.6 actHospital Actor**

ACTOR
<i>actHospital</i>
represents a hospital in some place
<i>InputInterfaces</i>
IN 1 <b>ieSendHospitalInfo (AdtHospitalInfo:dtHospitalInfo) :ptBoolean</b>
allow a hospital to receive certain information related to a crisis

### 3.7.7 **actMsrCreator** Actor

ACTOR
<i>actMsrCreator</i>
Represents the creator stakeholder in charge of state and environment initialization.
<i>OutputInterfaces</i>
OUT 1 <b>oeCreateSystemAndEnvironment (AqtyComCompanies:ptInteger) :ptBoolean</b>
sent to request the initialization of the system's class instances and the environment actors instances.

# Chapter 4

## Concept Model

### 4.1 PrimaryTypes-Classes

#### 4.1.1 Local view 01

Figure 4.1 shows the local view on all the primary types class types.

#### 4.1.2 Local view 02

Figure 4.2 shows the local view of the ctState primary type class type.

#### 4.1.3 Local view 03

Figure 4.3 shows the local view of the ctAlert primary type class type.

#### 4.1.4 Local view 04

Figure 4.4 shows the local view of the ctCrisis primary type class type.

#### 4.1.5 Local view 08

Figure 4.5 A class to represent a Hospital in the System

#### 4.1.6 Global view 01

Figure 4.6 shows the global view on primary types class types showing the association(s) types with the actor classes of the environment model.

### 4.2 PrimaryTypes-Datatypes

#### 4.2.1 Local view 06

Figure 4.7

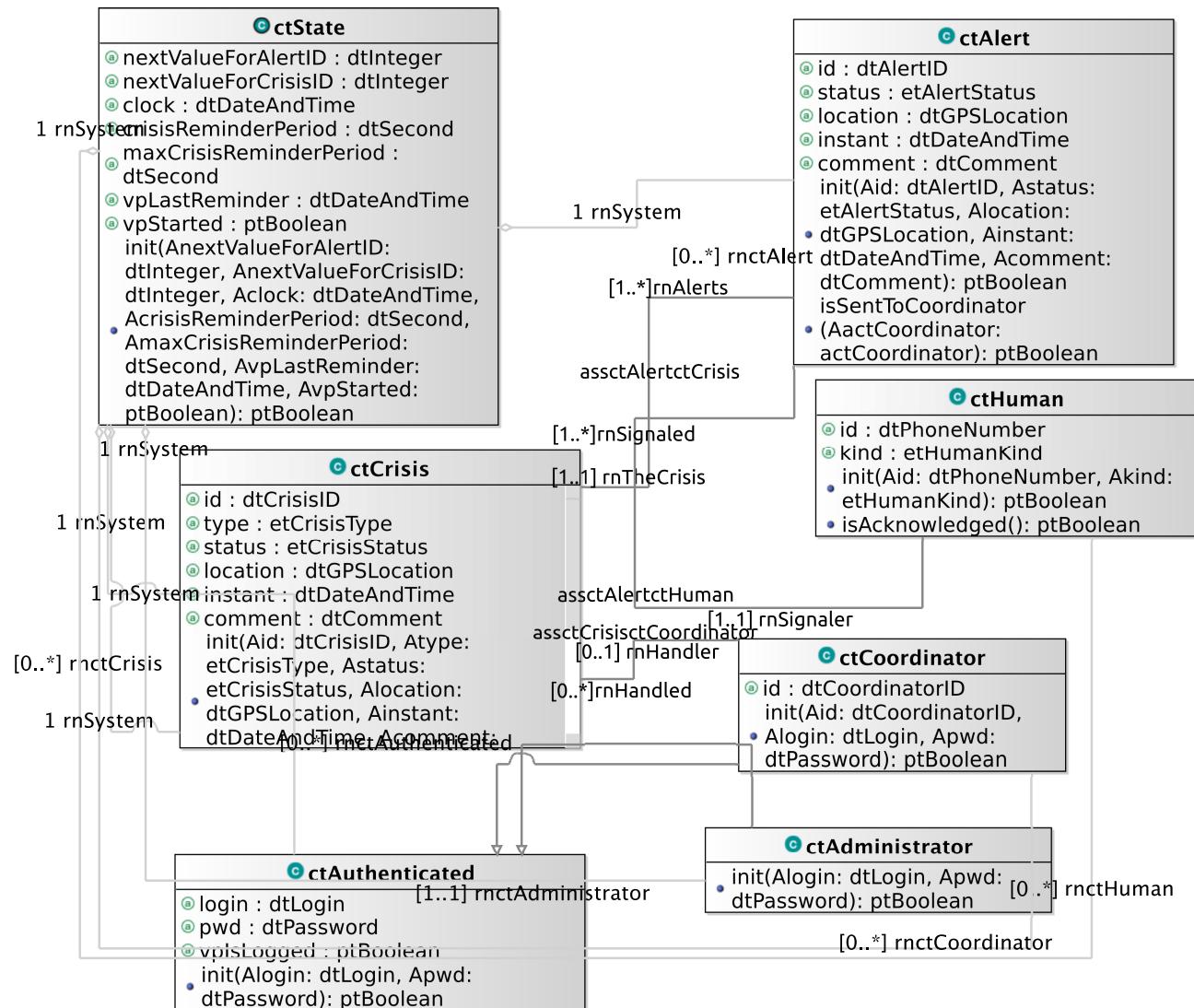


Figure 4.1: Concept Model - PrimaryTypes-Classes local view 01. Local view of all the primary types class types .

<b>c ctState</b>
<ul style="list-style-type: none"> <li>④ nextValueForAlertID : dtInteger</li> <li>④ nextValueForCrisisID : dtInteger</li> <li>④ clock : dtDateAndTime</li> <li>④ crisisReminderPeriod : dtSecond</li> <li>④ maxCrisisReminderPeriod : dtSecond</li> <li>④ vpLastReminder : dtDateAndTime</li> <li>④ vpStarted : ptBoolean           <ul style="list-style-type: none"> <li>init(AnextValueForAlertID: dtInteger, AnextValueForCrisisID: dtInteger, Aclock: dtDateAndTime,</li> <li>• AcrisisReminderPeriod: dtSecond, AmaxCrisisReminderPeriod: dtSecond, AvpLastReminder: dtDateAndTime, AvpStarted: ptBoolean): ptBoolean</li> </ul> </li> </ul>

Figure 4.2: Concept Model - PrimaryTypes-Classes local view 02. local view of the ctState primary type.

<b>c ctAlert</b>
<ul style="list-style-type: none"> <li>init(Aid: dtAlertID, Astatus: etAlertStatus, Alocation: dtGPSLocation, Ainstant: • dtDateAndTime, Acomment: dtComment): ptBoolean</li> </ul>

Figure 4.3: Concept Model - PrimaryTypes-Classes local view 03. local view of the ctAlert primary type.

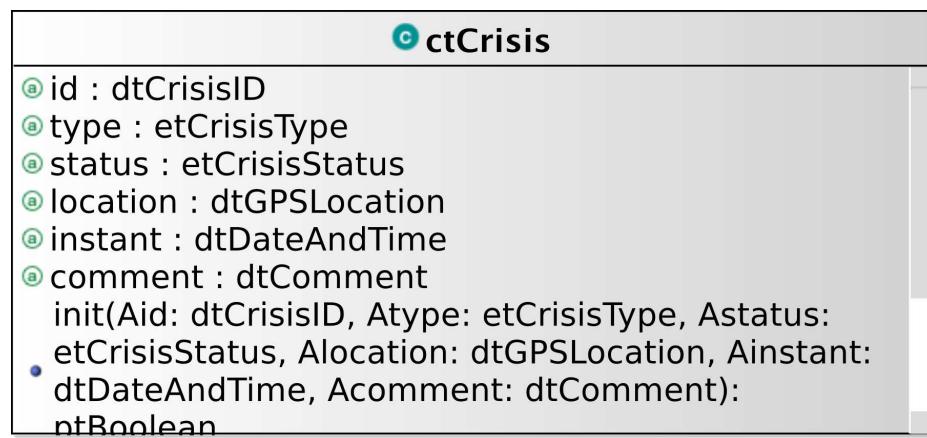


Figure 4.4: Concept Model - PrimaryTypes-Classes local view 04. local view of the ctCrisis primary type.



Figure 4.5: Concept Model - PrimaryTypes-Classes local view 08. .

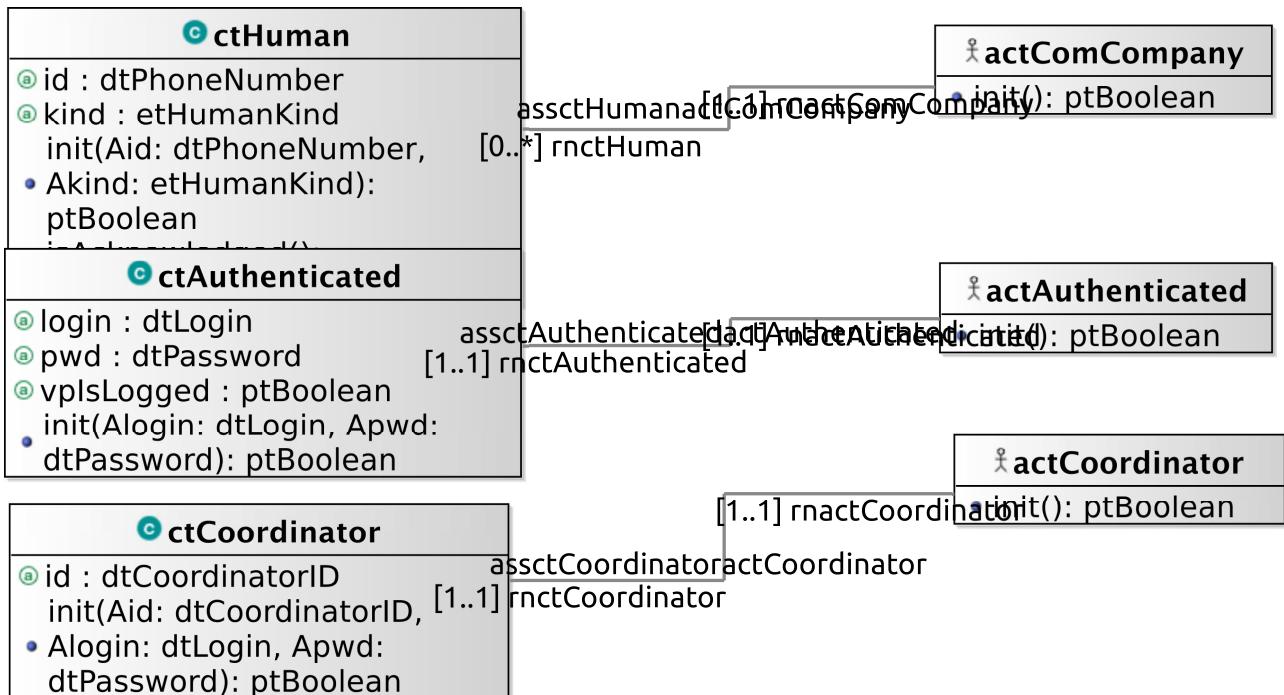


Figure 4.6: Concept Model - PrimaryTypes-Classes global view 01. Primary types class types global view - cm-pt-ct-gv-01 .

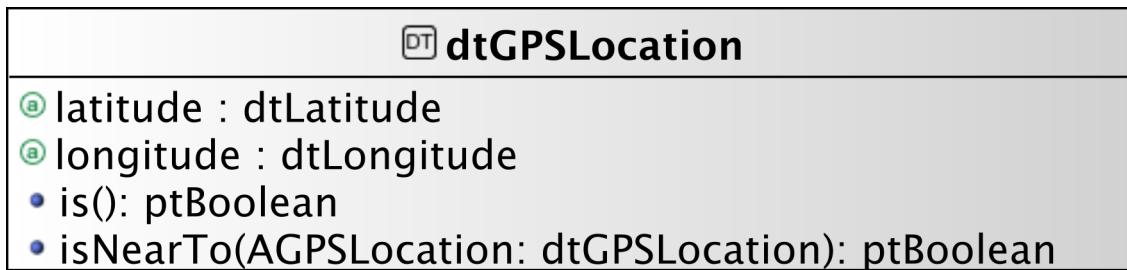


Figure 4.7: Concept Model - PrimaryTypes-Datatypes local view 06. .

#### 4.2.2 Global view 01

Figure 4.8 shows a global view on the *iCrash* primary types datatype types.

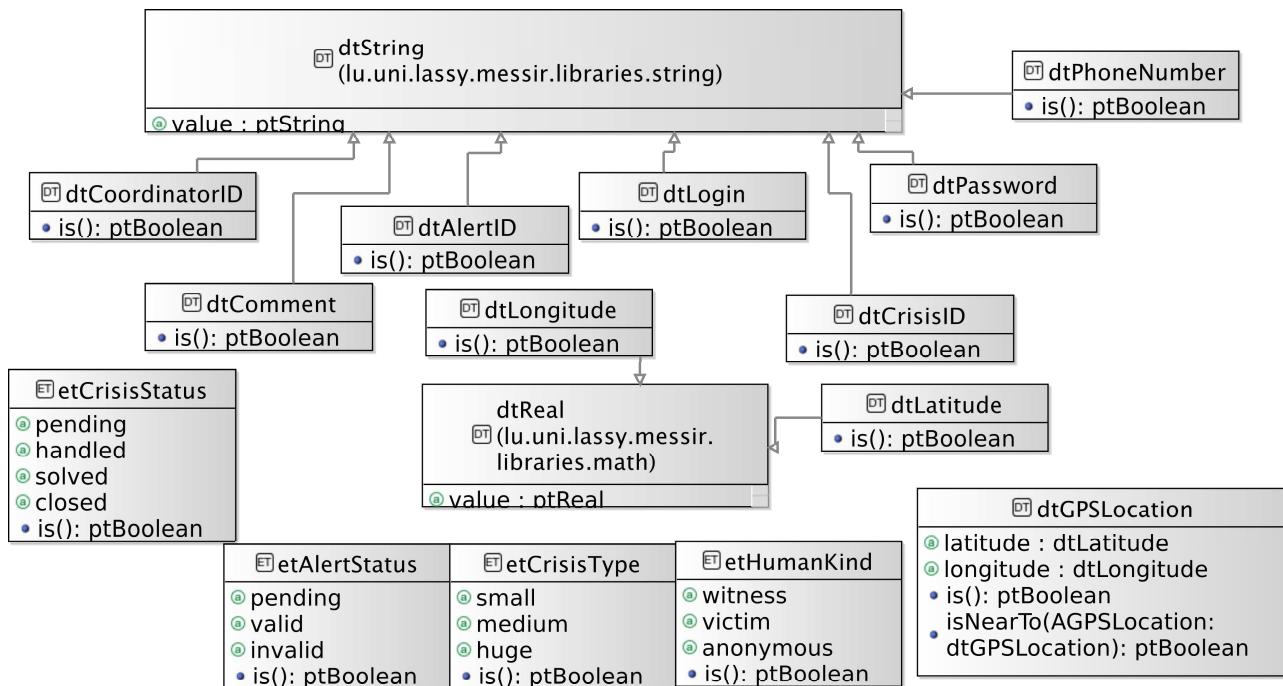


Figure 4.8: Concept Model - PrimaryTypes-Datatypes global view 01. global view of primary types datatype types - cm-pt-dt-gv-01 .

### 4.3 SecondaryTypes-Datatypes

#### 4.3.1 Local view 01

Figure 4.9 shows the local view of the secondary types datatype types.



Figure 4.9: Concept Model - SecondaryTypes-Datatypes local view 01. Local view of the secondary types datatype types.

## 4.4 Concept Model Types Descriptions

This section provides the textual descriptions of all the types defined in the concept model and that can be part of the graphical views provided.

### 4.4.1 Primary types - Class types descriptions

The table below is providing comments on the graphical views given for the class types of the primary types. Type logical operations are precisely specified in the operation model.

CLASSES	
<i>ctAdministrator</i>	
used to characterize internally the entity that is responsible of administrating the <i>iCrash</i> system.	
extends	icrash.concepts.primarytypes.classes.ctAuthenticated
operation	<b>init (Alogin:dtLogin, Apwd:dtPassword) :ptBoolean</b> used to initialize the current object as a new instance of the ctAdministrator type.
<i>ctAlert</i>	
Used to model crisis alerts sent by any human having communication capability using communication companies belonging to the system's environment	
extends	icrash.concepts.primarytypes.classes.ctAlertAC
operation	<b>init (Aid:dtAlertID, Astatus:etAlertStatus, Alocation:dtGPSLocation, Ainstant:dtDateAndTime, Acomment:dtComment, AdtHash:dtHash) :ptBoolean</b> used to initialize the current object as a new instance of the ctAlert type.
<i>ctAlertAC</i>	
Represent an abstract class of an Alert	
attribute	<b>comment: dtComment</b> a textual description providing unstructured information on the alert.
attribute	<b>id: dtAlertID</b> the alert unique identification information.
attribute	<b>instant: dtDateAndTime</b> the date and time at which the alert notification has been sent.
attribute	<b>location: dtGPSLocation</b> the position of the alert provided by the space-based satellite navigation system used by the human using the communication company to inform the <i>iCrash</i> system of a crisis.
attribute	<b>status: etAlertStatus</b> the alert validation status

*continues in next page ...*

***... Classes table continuation***

operation	<b>init (Aid:dtAlertID, Astatus:etAlertStatus, Alocation:dtGPSLocation, Ainstant:dtDateAndTime, Acomment:dtComment, AdtHash:dtHash) :ptBoolean</b> used to initialize the current object as a new instance of the ctAlert type.
operation	<b>isSentToCoordinator (AactCoordinator:actCoordinator) :ptBoolean</b> used to provide a given coordinator with current alert information.
<b><i>ctAlertBackup</i></b>	
Represents the backup of an alert	
extends	icrash.concepts.primarytypes.classes.ctAlertAC
operation	<b>init (Aid:dtAlertID, Astatus:etAlertStatus, Alocation:dtGPSLocation, Ainstant:dtDateAndTime, Acomment:dtComment, AdtHash:dtHash) :ptBoolean</b>
<b><i>ctAuthenticated</i></b>	
used to model system's representation about actors that need to authenticate to access some specific functionalities.	
attribute	<b>login: dtLogin</b> an identifier for authentication.
attribute	<b>pwd: dtPassword</b> a key for authentication.
attribute	<b>vpiIsLogged: ptBoolean</b> used to determine the access status.
operation	<b>init (Alogin:dtLogin, Apwd:dtPassword) :ptBoolean</b> used to initialize the current object as a new instance of the ctAuthenticated type.
<b><i>ctCoordinator</i></b>	
used to model system's representation about the actors that have the responsibility to handle alerts and crisis.	
extends	icrash.concepts.primarytypes.classes.ctAuthenticated
attribute	<b>id: dtCoordinatorID</b> a unique identification information.
operation	<b>init (Aid:dtCoordinatorID, Alogin:dtLogin, Apwd:dtPassword) :ptBoolean</b> used to initialize the current object as a new instance of the ctCoordinator type.
<b><i>ctCrisis</i></b>	
Used to model crisis that are inferred from the reception of at least one alert message. Crisis are entities that are handled by the <i>iCrash</i> system.	
attribute	<b>comment: dtComment</b> a textual description providing unstructured information on the crisis handling.
attribute	<b>id: dtCrisisID</b> the crisis unique identification information.
attribute	<b>instant: dtDateAndTime</b> the date and time at which the first related alert notification has been sent.
attribute	<b>location: dtGPSLocation</b> the position of the crisis equal by the one of the first alert received and associated to the crisis.
attribute	<b>status: etCrisisStatus</b> the crisis handling status.
attribute	<b>type: etCrisisType</b>

*continues in next page ...*

**... Classes table continuation**

operation	an indication of the gravity of the crisis. <b>handlingDelayPassed() :ptBoolean</b>
operation	used to determine if the crisis stood too longly in a pending status since last reminder. <b>init (Aid:dtCrisisID, Atype:etCrisisType, Astatus:etCrisisStatus, Alocation:dtGPSLocation, Ainstant:dtDateAndTime, Acomment:dtComment) :ptBoolean</b>
operation	used to initialize the current object as a new instance of the ctAlert type. <b>isAllocatedIfPossible() :ptBoolean</b>
operation	used to allocate a crisis to a coordinator if any or to alert the administrator of crisis waiting to be handled.
operation	<b>isSentToCoordinator (AactCoordinator:actCoordinator) :ptBoolean</b>
operation	used to provide a given coordinator with current crisis information. <b>maxHandlingDelayPassed() :ptBoolean</b>
	used to determine if the crisis stood too longly in a pending status since its creation.
<b><i>ctHospital</i></b>	
This class is used to represent a hospital in the system	
attribute	<b>attLocation: dtGPSLocation</b>
<b><i>ctHuman</i></b>	
used to model system's representation about the indirect actors that has alerted of potential crisis.	
attribute	<b>id: dtPhoneNumber</b>
the number of the communication device used to send an alert to <i>iCrash</i> system.	
attribute	<b>kind: etHumanKind</b>
role with respect to the alert notified.	
operation	<b>init (Aid:dtPhoneNumber, Akind:etHumanKind) :ptBoolean</b>
init: used to initialize the current object as a new instance of the ctHuman type.	
<b><i>ctState</i></b>	
used to model the system. Each system specified using <b>Messip</b> must include a ctState class for which there is only one instance at any state of the abstract machine after creation.	
attribute	<b>clock: dtDateAndTime</b>
used to represent the system local time.	
attribute	<b>crisisReminderPeriod: dtSecond</b>
used to define the delay between two reminders after which a reminder must be sent to the administrator and to the known coordinators to encourage them to handle the crisis.	
attribute	<b>maxCrisisReminderPeriod: dtSecond</b>
used to define the maximum delay after which the crisis is randomly allocated to a coordinator if any or an alert message is sent to the administrator in order to encourage him to add coordinators.	
attribute	<b>nextValueForAlertID: dtInteger</b>
nextValueForAlertID: dtInteger: used to associate each alert declared with a unique identification value.	
attribute	<b>nextValueForCrisisID: dtInteger</b>
used to associate each crisis declared with a unique identification value.	
attribute	<b>vpLastReminder: dtDateAndTime</b>
date and time of the last reminder.	
attribute	<b>vpStarted: ptBoolean</b>

*continues in next page ...*

**... Classes table continuation**

	used to avoid reacting to an actor message if the system is not started (i.e. oeCreateSystemAndEnvironment not executed).
operation	<pre><b>init (AnextValueForAlertID:dtInteger, AnextValueForCrisisID:dtInteger,</b> <b>Aclock:dtDateAndTime, AcrisisReminderPeriod:dtSecond,</b> <b>AmaxCrisisReminderPeriod:dtSecond, AvpLastReminder:dtDateAndTime,</b> <b>AvpStarted:ptBoolean) :ptBoolean</b></pre> <p>used to initialize the current object as a new instance of the ctState type.</p>

**4.4.2 Primary types - Datatypes types descriptions**

The table below is providing comments on the graphical views given for the datatype types of the primary types.

<b>DATATYPES</b>	
<b><i>dtAlertID</i></b>	
	A string used to identify alerts.
<i>extends</i>	dtString
operation	<pre><b>is () :ptBoolean</b></pre> <p>used to determine which strings are considered as valid alert identifiers.</p>
<b><i>dtComment</i></b>	
	a datatype made of a string value used to receive, store and send textual information about crisis and alerts.
<i>extends</i>	dtString
operation	<pre><b>is () :ptBoolean</b></pre> <p>used to determine which strings are considered as valid comments.</p>
<b><i>dtCoordinatorID</i></b>	
	A string used to identify coordinators.
<i>extends</i>	dtString
operation	<pre><b>is () :ptBoolean</b></pre> <p>used to determine which strings are considered as valid coordinators identifiers.</p>
<b><i>dtCrisisID</i></b>	
	A string used to identify crisis.
<i>extends</i>	dtString
operation	<pre><b>is () :ptBoolean</b></pre> <p>used to determine which strings are considered as valid crisis identifiers.</p>
<b><i>dtGPSLocation</i></b>	
	used to define coordinates of geographical positions on earth. It is defined a couple made of a latitude and a longitude.
attribute	<b>latitude: dtLatitude</b> for the latitude part of the coordinate.
attribute	<b>longitude: dtLongitude</b> for the longitude part of the coordinate.
operation	<pre><b>is () :ptBoolean</b></pre> <p>used to determine which couples are considered as valid dtGPSLocation values.</p>
operation	<pre><b>isNearTo (AGPSLocation:dtGPSLocation) :ptBoolean</b></pre> <p>used to determine if locations are considered enough close to be treated as equivalent in the application domain context.</p>
<b><i>dtHash</i></b>	

*continues in next page ...*

**... Datatypes table continuation**

This type is used to have a Hash of an alert, to check data integrity	
extends	dtString
operation	<b>is () :ptBoolean</b> used to determine which strings are considered as valid crisis identifiers.
<b>dtHospitalID</b>	
this type is used to identify a hospital	
extends	dtString
operation	<b>is () :ptBoolean</b>
<b>dtHospitalInfo</b>	
The Information that is send to the hospitals that are near to the crisis	
attribute	<b>location: dtGPSLocation</b> The location of the crisis
attribute	<b>qtyVictims: dtQtyVictims</b> The estimated number of victims
attribute	<b>severity: etSeverity</b> The estimated severity of the crisis
operation	<b>is () :ptBoolean</b> none
<b>dtLatitude</b>	
used to define a latitude value of a geographical positions on earth.	
extends	dtReal
operation	<b>is () :ptBoolean</b> used to determine which strings are considered as valid dtLatitude.
<b>dtLogin</b>	
a login string used to authentify an <i>iCrash</i> user	
extends	dtString
operation	<b>is () :ptBoolean</b> used to determine which strings are considered as valid dtLogin.
<b>dtLongitude</b>	
used to define a longitude value of a geographical positions on earth.	
extends	dtReal
operation	<b>is () :ptBoolean</b> used to determine which strings are considered as valid dtLongitude.
<b>dtPassword</b>	
a password string used to authentify an <i>iCrash</i> user	
extends	dtString
operation	<b>is () :ptBoolean</b> used to determine which strings are considered as valid dtPassword.
<b>dtPhoneNumber</b>	
a string used to store the phone number from the human declaring the crisis or the alert.	
extends	dtString
operation	<b>is () :ptBoolean</b> used to determine which strings are considered as valid dtPhoneNumber.
<b>dtQtyVictims</b>	
this dt is used to express the number of victims on a crash	
extends	dtInteger

*continues in next page ...*

***... Datatypes table continuation***

operation	<b>is () :ptBoolean</b>
-----------	-------------------------

**ENUMERATIONS*****etAlertStatus***

this type is used to indicate the different validation status of an alert.

operation	<b>is () :ptBoolean</b>
-----------	-------------------------

used to determine which litteral belongs to the enumeration.

***etCrisisStatus***

this type is used to indicate the different handling status of a crisis.

operation	<b>is () :ptBoolean</b>
-----------	-------------------------

used to determine which litteral belongs to the enumeration.

***etCrisisType***

this type is used to indicate the different types of a crisis.

operation	<b>is () :ptBoolean</b>
-----------	-------------------------

used to determine which litteral belongs to the enumeration.

***etHumanKind***

this type is used to indicate the kind of human that informs about a car crash crisis.

operation	<b>is () :ptBoolean</b>
-----------	-------------------------

used to determine which litteral belongs to the enumeration.

***etSeverity***

Express the severity of a crash

operation	<b>is () :ptBoolean</b>
-----------	-------------------------

**4.4.3 Primary types - Association types descriptions**

The table below is providing comments on the association types of the primary types.

**ASSOCIATIONS*****assctAlertctCrisis***

a crisis is related to one or more alerts as the alerts judged to concern all the same crisis due to their location. An alert alerts exactly one crisis.

***assctAlertctHuman***

alerts are notified by human through the communication company. We need to keep an internal representation of those human to allow for communication of alert handling.

***assctAuthenticatedactAuthenticated***

mainly used to determine if the login request of an authenticated actor can be granted based on the given credentials and the registered ones.

***assctCoordinatoractCoordinator***

frequent messages must be sent to coordinator especially in relation to crisis they handle.

***assctCrisisctCoordinator***

at any point in time we need to know if a coordinator is handling existing crisis or not.

***assctHospitalactHospital***

The association between a ctHospital (system) and the actuals Hospitals

***assctHumanactComCompany***

***continues in next page ...***

**...Associations table continuation**

in order to communicate with humans who informed about potential crisis, we need to record the communication company to use to send them messages.

**4.4.4 Primary types - Aggregation types descriptions**

There are no aggregation types for the primary types.

**4.4.4.1 Primary types - Composition types descriptions**

There are no composition types for the primary types.

**4.4.5 Secondary types - Class types descriptions**

There are no elements in this category in the system analysed.

**4.4.6 Secondary types - Datatypes types descriptions**

The table below is providing comments on the graphical views given for the datatype types of the secondary types.

DATATYPES	
<i>dtSMS</i>	a datatype made of a string value used to send textual information to human mobile devices.
attribute	<b>value: ptString</b> the textual information.
operation	<b>is() :ptBoolean</b> used to determine which strings are considered as valid comments.

**4.4.7 Secondary types - Association types descriptions**

There are no association types for the secondary types.

**4.4.8 Secondary types - Aggregation types descriptions**

There are no aggregation types for the secondary types.

**4.4.9 Secondary types - Composition types descriptions**

There are no composition types for the secondary types.

# Chapter 5

# Operation Model

This section contains the operation schemes of each operation defined in either an actor, its output interface, in a primary or secondary type (class, datatype or enumeration types). The **Messir** OCL code listing is joined to the comment table.

## 5.1 Environment - Out Interface Operation Scheme for actActivator

### 5.1.1 Operation Model for oeSetClock

The oeSetClock operation has the following properties:

OPERATION	
<i>oeSetClock[proactive]</i>	
An active message used to statically set the date and time information in the system's state.	
Parameters	
1	AcurentClock: dtDateAndTime the date and time to be considered as the actual one.
Return type	
ptBoolean	
Pre-Condition (protocol)	
PreP 1	the system is supposed to be created and initialized and the provided date and time value is greater than the one known by the system.
Pre-Condition (functional)	
PreF 1	none
Post-Condition (functional)	
PostF 1	the ctState instance post-state is updated to have its clock attribute equal to the given date and time.
Post-Condition (protocol)	
PostP 1	none

### 5.1.2 Operation Model for oeSollicitateCrisisHandling

The oeSollicitateCrisisHandling operation has the following properties:

OPERATION	
<i>oeSollicitateCrisisHandling[proactive]</i>	
<i>continues in next page ...</i>	

***... Operation table continuation***

A proactive message (message of a pro-active actor with no parameter triggered automatically if the pre protocol condition is true) used to avoid crisis to stay too long in an not handled status.

<b><i>Return type</i></b>
ptBoolean
<b><i>Pre-Condition (protocol)</i></b>
PreP 1 the system is started
PreP 2 there exist some crisis that are in pending status and for which the duration between the current ctState clock information and the last reminder is greater than the crisis reminder period duration.
<b><i>Pre-Condition (functional)</i></b>
PreF 1 none
<b><i>Post-Condition (functional)</i></b>
PostF 1 if there exist coordinators and crisis who stood in a not handled status more than the maximum allowed time then those crisis are randomly allocated to the existing coordinators.
PostF 2 for all other crisis who stood too longly in a not handled status but not more than the maximum delay allowed then a reminder message is sent to the administrator and all coordinator actors of the environment to sollicitate handling of those crisis.
<b><i>Post-Condition (protocol)</i></b>
PostP 1 the value of the last reminder known by the system at post state is the system's clock value.

Figure 5.1 shows concept model elements in the scope of the oeSollicitateCrisisHandling operation

## 5.2 Environment - Out Interface Operation Scheme for actAdministrator

### 5.2.1 Operation Model for oeAddCoordinator

The oeAddCoordinator operation has the following properties:

<b>OPERATION</b>
<b><i>oeAddCoordinator</i></b>
sent to add a new coordinator in the system's post state and environment's post state.
<b><i>Parameters</i></b>
1 <b>AdtCoordinatorID: dtCoordinatorID</b> used to initialize the id field
2 <b>AdtLogin: dtLogin</b> used to initialize the login field
3 <b>AdtPassword: dtPassword</b> used to initialize the password field
<b><i>Return type</i></b>
ptBoolean
<b><i>Pre-Condition (protocol)</i></b>
PreP 1 the system is started
PreP 2 the actor logged previously and did not log out ! (i.e. the associated ctAdministrator instance is considered logged)

*continues in next page ...*

***...Operation table continuation***

<b><i>Pre-Condition (functional)</i></b>	
PreF 1	it is supposed that there cannot exist a ctCoordinator instance with the same id attribute as the one the administrator wants to delete.
<b><i>Post-Condition (functional)</i></b>	
PostF 1	the environment has a new instance of coordinator actor allowing for input/output message communication with the system.
PostF 2	the system's state has a new instance of ctCoordinator initialized with the given values.
PostF 3	the new actor instance and ctCoordinator instance are related.
PostF 4	the new actor instance and ctCoordinator instance are related according to the authenticated association.
PostF 5	the administrator actor is informed about the satisfaction of its request.
<b><i>Post-Condition (protocol)</i></b>	
PostP 1	none

**5.2.2 Operation Model for oeAddHospital**

The oeAddHospital operation has the following properties:

<b>OPERATION</b>	
<b><i>oeAddHospital</i></b>	
The administrator add a new hospital in the system	
<b>Parameters</b>	
1	<b>AdtHospitalID: dtHospitalID</b> The ID of the hospital to add to the system
2	<b>AdtGPSLocation: dtGPSLocation</b> The localization of the hospital to add
<b>Return type</b>	
ptBoolean	
<b><i>Pre-Condition (protocol)</i></b>	
PreP 1	The vpStarted is true
PreP 2	ctAuthenticated instance of the administrator is considered logged
<b><i>Pre-Condition (functional)</i></b>	
PreF 1	There no exists a Hospital with the same ID that the one is being created
<b><i>Post-Condition (functional)</i></b>	
PostF 1	The system has a new ctHospital instance with the data of the new hospital
PostF 2	the environment has a new instance of hospital actor allowing for input/output message communication with the system.
PostF 3	The administrator actor is informed about the success of its request
PostF 4	the new actor instance and ctHospital instance are related according to the authenticated association.
PostF 5	the administrator actor is informed about the satisfaction of its request.
<b><i>Post-Condition (protocol)</i></b>	
PostP 1	none

**5.2.3 Operation Model for oeDeleteCoordinator**

The oeDeleteCoordinator operation has the following properties:

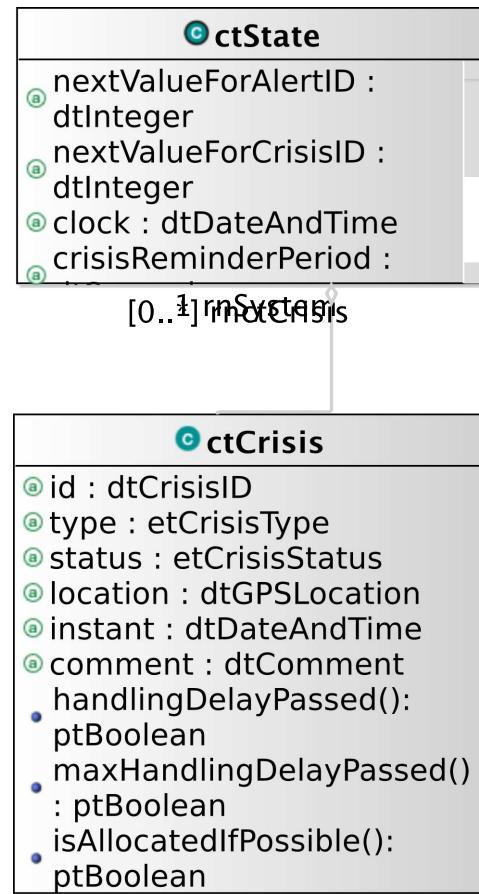


Figure 5.1: oeSollicitateCrisisHandling operation scope

<b>OPERATION</b>	
<b><i>oeDeleteCoordinator</i></b>	
sent to delete an existing coordinator in the system's post state and environment's post state.	
<b>Parameters</b>	
1	<b>AdtCoordinatorID: dtCoordinatorID</b> used for ctCoordinator instance retrieval
<b>Return type</b>	
ptBoolean	
<b>Pre-Condition (protocol)</b>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctAdministrator instance is considered logged)
<b>Pre-Condition (functional)</b>	
PreF 1	it is supposed that there exist one ctCoordinator instance with the same id attribute than the one the administrator wants to create.
<b>Post-Condition (functional)</b>	
PostF 1	the ctCoordinator class instance having the required id do not belong anymore to the post state as well as is related actCoordinator actor instance.
PostF 2	the administrator actor is informed about the satisfaction of its request.
<b>Post-Condition (protocol)</b>	
PostP 1	none

#### 5.2.4 Operation Model for oeDeleteHospital

The oeDeleteHospital operation has the following properties:

<b>OPERATION</b>	
<b><i>oeDeleteHospital</i></b>	
Operation to delete a Hospital from the system	
<b>Parameters</b>	
1	<b>AdtHospitalID: dtHospitalID</b>
<b>Return type</b>	
ptBoolean	
<b>Pre-Condition (protocol)</b>	
PreP 1	The vpStarted is true
PreP 2	ctAuthenticated instance of the administrator is considered logged
<b>Pre-Condition (functional)</b>	
PreF 1	it is supposed that there exist one ctHospital instance with the same id attribute than the one the administrator wants to delete.
<b>Post-Condition (functional)</b>	
PostF 1	the ctHospital class instance having the required id do not belong anymore to the post state as well as is related actHospital actor instance.
PostF 2	the administrator actor is informed about the satisfaction of its request.
<b>Post-Condition (protocol)</b>	
PostP 1	

### 5.3 Environment - Out Interface Operation Scheme for actAuthenticated

#### 5.3.1 Operation Model for oeLogin

The oeLogin operation has the following properties:

<b>OPERATION</b>	
<i>oeLogin</i>	
sent to request authorization to request access secured system operations.	
<i>Parameters</i>	
1	<b>AdtLogin: dtLogin</b> first information used to determine accessibility rights for the actual actor.
2	<b>AdtPassword: dtPassword</b> second information used to determine accessibility rights for the actual actor.
<i>Return type</i>	
ptBoolean	
<i>Pre-Condition (protocol)</i>	
PreP 1	the system is started
PreP 2	the actor is not already logged in ! (i.e. the associated ctAuthenticated instance is not considered logged)
<i>Pre-Condition (functional)</i>	
PreF 1	none
<i>Post-Condition (functional)</i>	
PostF 1	if the login and password provided by the actor correspond to the ones that belong to the ctAuthenticated instance he is related to then a welcome message is sent to the actor (n.b. the logged status is changed as a post-protocol condition); else the actor is notified that he gave incorrect data and all the administrator actors existing in the environment are notified of an intrusion attempt.
<i>Post-Condition (protocol)</i>	
PostP 1	if the authentication information is correct then the actor is known to be logged in ! (i.e. the associated ctAuthenticated instance with given login and password is considered logged)

#### 5.3.2 Operation Model for oeLogout

The oeLogout operation has the following properties:

<b>OPERATION</b>	
<i>oeLogout</i>	
sent to end the secured access to specific system operations.	
<i>Return type</i>	
ptBoolean	
<i>Pre-Condition (protocol)</i>	
PreP 1	the system is started
PreP 2	the actor is currently logged in ! (i.e. the associated ctAuthenticated instance is considered logged)
<i>Pre-Condition (functional)</i>	
PreF 1	

*continues in next page ...*

**...Operation table continuation**

<b>Post-Condition (functional)</b>	
PostF 1	a logout confirmation message is sent to the actor (n.b. the logged status is changed as a post-protocol condition)
<b>Post-Condition (protocol)</b>	
PostP 1	the actor is known to be logged out ! (i.e. the associated ctAuthenticated instance with given login and password is considered logged out)

## 5.4 Environment - Out Interface Operation Scheme for actComCompany

### 5.4.1 Operation Model for oeAlert

The oeAlert operation has the following properties:

<b>OPERATION</b>	
<b>oeAlert</b>	
Any human having a phone able to connect to the communication companies using the <i>iCrash</i> system can send his company an sms message with structured information in order to declare an alert.	
<b>Parameters</b>	
1	<b>AetHumanKind: etHumanKind</b> the kind of human informing of an alert.
2	<b>AdtDate: dtDate</b> the date of the alert
3	<b>AdtTime: dtTime</b> the time of the alert
4	<b>AdtPhoneNumber: dtPhoneNumber</b> the phone number of the human sending the alert SMS message
5	<b>AdtGPSLocation: dtGPSLocation</b> the GPS position of the phone at the date and time the message was sent.
6	<b>AdtComment: dtComment</b> a free text message sent by the human providing information on the alert that he wants to declare
<b>Return type</b>	
ptBoolean	
<b>Pre-Condition (protocol)</b>	
PreP 1	the system is supposed to be created and initialized.
<b>Pre-Condition (functional)</b>	
PreF 1	the date and time the alert is declared is supposed to be in the past with respect to the current time known by the system.
<b>Post-Condition (functional)</b>	
PostF 1	the ctState attribute for the next value for alert IDs is incremented by one at post.
PostF 2	a new alert instance exists in the post state with status pending, instant information (resp. GPS location and comment) based on date and time provided (resp. position and comment); and with alert ID being a string conversion of the dtInteger value available in the pre state in the ctState instance.

***continues in next page ...***

**... Operation table continuation**

PostF 3	if there exist no already registered alert near to the alert currently declared then a new crisis is added in the post state and initialized with: its ID being the one provided by the ctState instance (which is incremented by one in the post state), its type considered as small, its status being pending, its declared time being the same than the alert and a default comment indicating that a report will come later on. else the crisis to which the new alert must be related to is the one related to any alert nearby in the pre-state.
PostF 4	the post state relates the new alert to the previously characterized crisis.
PostF 5	if there is no ctHuman instance having same phone number and same kind in the pre-state then a new one is added in the post-state with given phone number and kind and is associated to the communication company actor used to declare the alert. else the pre-state one is chosen
PostF 6	and this specified ctHuman is related to the new alert thus indicating he has signed the alert.
<b>Post-Condition (protocol)</b>	
PostP 1	none

Figure 5.2 shows concept model elements in the scope of the oeAlert operation

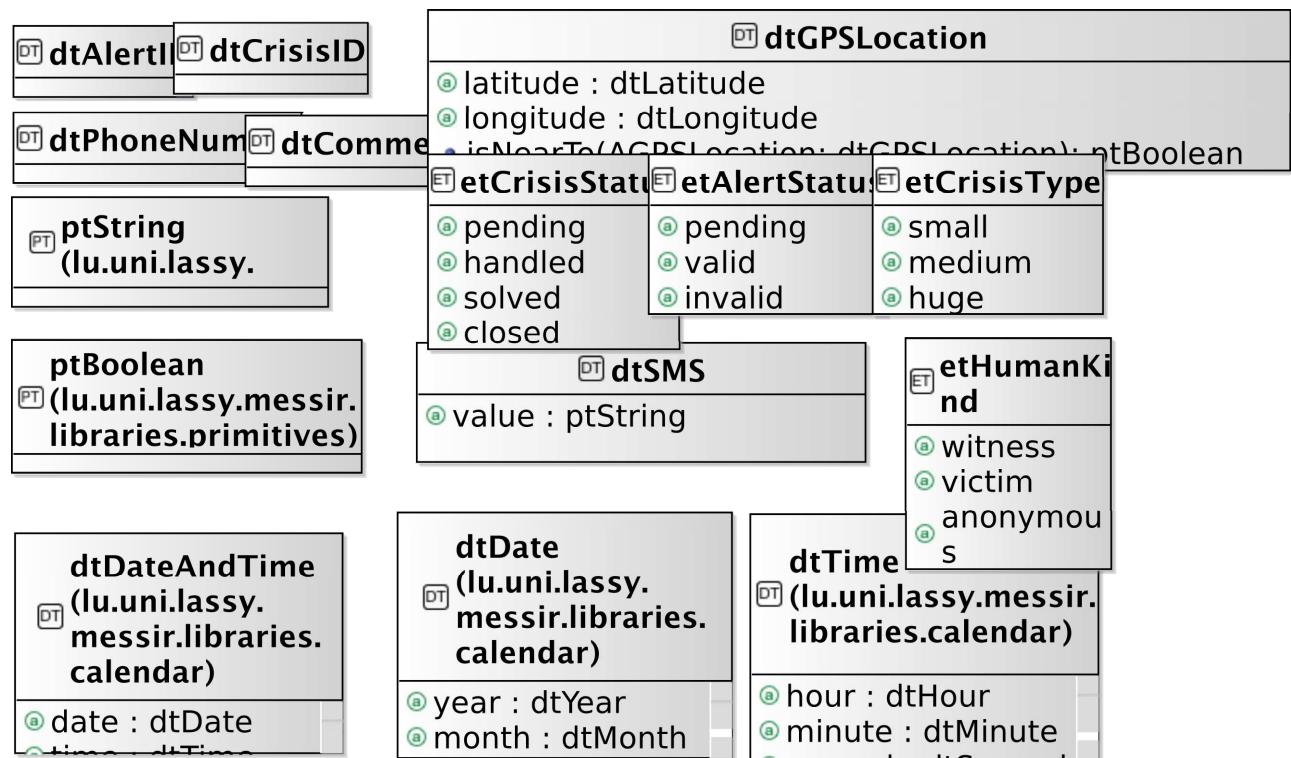


Figure 5.2: oeAlert operation scope

Figure 5.3 shows concept model elements in the scope of the oeAlert operation

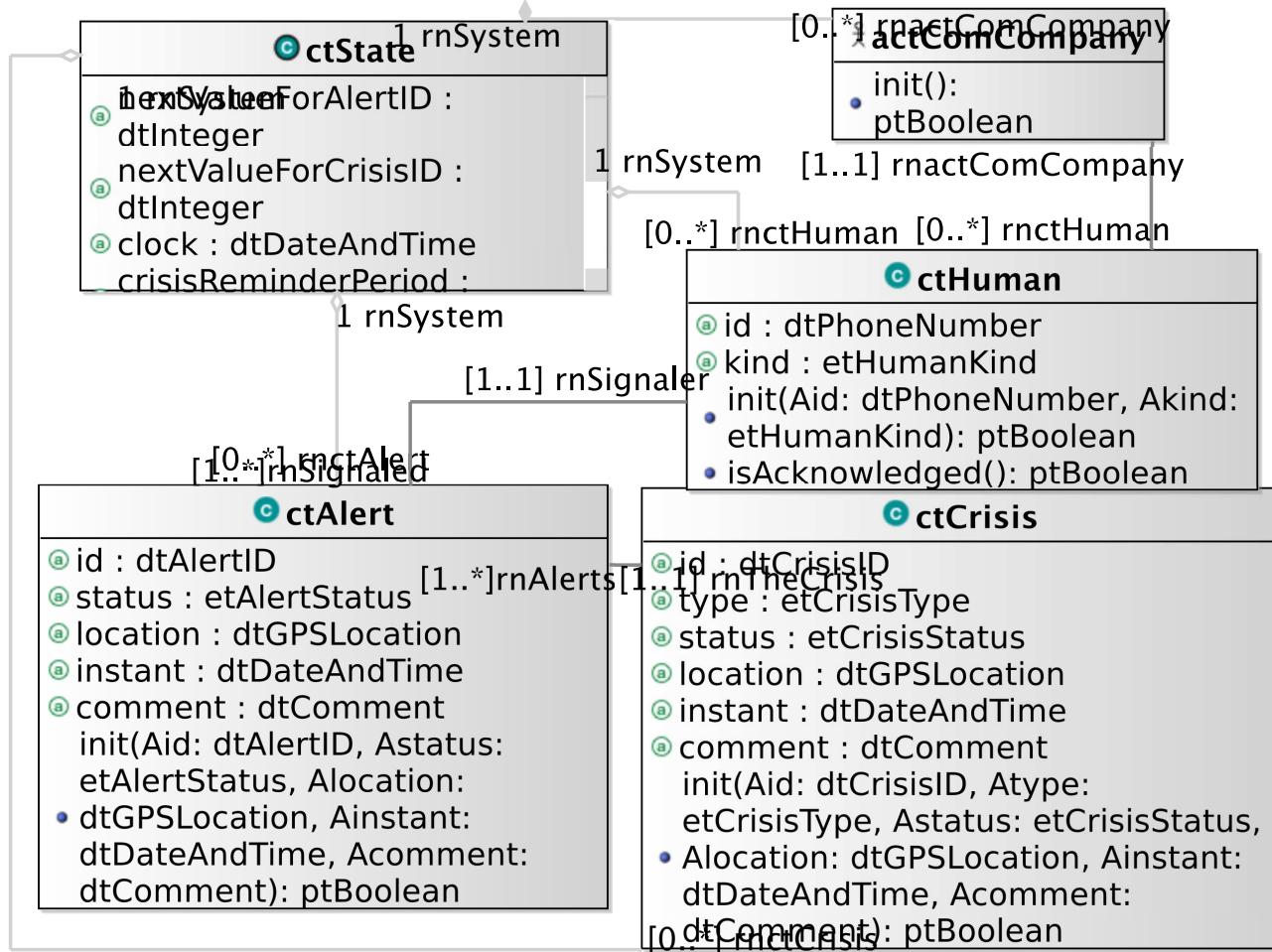


Figure 5.3: oeAlert operation scope

## 5.5 Environment - Out Interface Operation Scheme for actCoordinator

### 5.5.1 Operation Model for oeCloseCrisis

The `oeCloseCrisis` operation has the following properties:

<b>OPERATION</b>	
<i>oeCloseCrisis</i>	
sent to indicate that a crisis should be considered as closed.	
<i>Parameters</i>	
1	<b>AdtCrisisID: dtCrisisID</b> the identification information used to determine the crisis to close
<i>Return type</i>	
ptBoolean	
<i>Pre-Condition (protocol)</i>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<i>Pre-Condition (functional)</i>	
PreF 1	it is supposed that there exist one ctCrisis instance with the same <code>id</code> attribute value as the one provided by the coordinator actor who wants to close.
<i>Post-Condition (functional)</i>	
PostF 1	the ctCrisis class instance having the provided id is considered closed in the post state.
PostF 2	There is no handler declared in the system as associated to the crisis.
PostF 3	all the alert instances associated to this crisis do not belong any more to the system's post state.
PostF 4	the coordinator actor is informed about the satisfaction of its request.
<i>Post-Condition (protocol)</i>	
PostP 1	none

### 5.5.2 Operation Model for oeGetAlertsSet

The `oeGetAlertsSet` operation has the following properties:

<b>OPERATION</b>	
<i>oeGetAlertsSet</i>	
sent to request all the ctAlert instances having a specific status.	
<i>Parameters</i>	
1	<b>AetAlertStatus: etAlertStatus</b> the criteria used to select the alerts to send back to the actor
<i>Return type</i>	
ptBoolean	
<i>Pre-Condition (protocol)</i>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<i>Pre-Condition (functional)</i>	

*continues in next page ...*

**...Operation table continuation**

PreF 1	none
<b>Post-Condition (functional)</b>	
PostF 1	the post state is the one obtained by satisfying the <code>isSentToCoordinator</code> predicate for each alert having the provided status and for the actor sending the message. (cf. specification of <code>isSentToCoordinator</code> predicate given for the <code>ctAlert</code> type.
<b>Post-Condition (protocol)</b>	
PostP 1	none

**5.5.3 Operation Model for oeGetCrisisSet**

The `oeGetCrisisSet` operation has the following properties:

<b>OPERATION</b>
<b><i>oeGetCrisisSet</i></b>
sent to request all the <code>ctCrisis</code> instances having a specific status.
<b>Parameters</b>
1 <b>AetCrisisStatus: etCrisisStatus</b> the status information used to determine the crisis to send back to the actor
<b>Return type</b>
<code>ptBoolean</code>
<b>Pre-Condition (protocol)</b>
PreP 1    the system is started PreP 2    the actor logged previously and did not log out ! (i.e. the associated <code>ctCoordinator</code> instance is considered logged)
<b>Pre-Condition (functional)</b>
PreF 1    none
<b>Post-Condition (functional)</b>
PostF 1    the post state is the one obtained by satisfying the <code>isSentToCoordinator</code> predicate for each crisis having the provided status and for the actor sending the message <code>ieSendACrisis</code> . (cf. specification of <code>isSentToCoordinator</code> predicate given for the <code>ctCrisis</code> type.
<b>Post-Condition (protocol)</b>
PostP 1    none

**5.5.4 Operation Model for oeInvalidateAlert**

The `oeInvalidateAlert` operation has the following properties:

<b>OPERATION</b>
<b><i>oeInvalidateAlert</i></b>
sent to indicate that an alert should be considered as closed.
<b>Parameters</b>
1 <b>AdtAlertID: dtAlertID</b> the identification information used to determine the alert to close
<b>Return type</b>
<code>ptBoolean</code>

*continues in next page ...*

***... Operation table continuation***

<b><i>Pre-Condition (protocol)</i></b>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<b><i>Pre-Condition (functional)</i></b>	
PreF 1	it is supposed that there exist one ctAlert instance with the same id attribute value as the one provided by the coordinator actor who wants to close.
<b><i>Post-Condition (functional)</i></b>	
PostF 1	the ctAlert class instance having the provided id is considered closed in the post state.
PostF 2	the coordinator actor is informed about the satisfaction of its request.
<b><i>Post-Condition (protocol)</i></b>	
PostP 1	none

**5.5.5 Operation Model for oeReportOnCrisis**

The oeReportOnCrisis operation has the following properties:

<b>OPERATION</b>	
<i>oeReportOnCrisis</i>	
sent to update the textual information available for a specific handled crisis.	
<b>Parameters</b>	
1	<b>AdtCrisisID: dtCrisisID</b> the identification information used to determine the crisis to report on
2	<b>AdtComment: dtComment</b> the textual information commenting the crisis
<b>Return type</b>	
ptBoolean	
<b>Pre-Condition (protocol)</b>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<b>Pre-Condition (functional)</b>	
PreF 1	it is supposed that there exist one crisis in the pre state having the given id.
<b>Post-Condition (functional)</b>	
PostF 1	the comment attribute of the crisis instance having the given id is replaced by the given one and the requesting actor is notified of this update.
<b>Post-Condition (protocol)</b>	
PostP 1	none

**5.5.6 Operation Model for oeSendHospitalInfo**

The oeSendHospitalInfo operation has the following properties:

<b>OPERATION</b>	
<i>oeSendHospitalInfo</i>	
The coordinators send selected information to all hospitals that are near of alert's location	

***continues in next page ...***

*... Operation table continuation*

<i>Parameters</i>	
1	AdtHospitalInfo: dtHospitalInfo
2	AdtCrisisID: dtCrisisID
<i>Return type</i>	
ptBoolean	
<i>Pre-Condition (protocol)</i>	
PreP 1	The vpStarted is true
<i>Pre-Condition (functional)</i>	
PreF 1	The actCoordinator have the crisis whose information he wants to share
<i>Post-Condition (functional)</i>	
PostF 1	All the actHospital that are near of the alert's location, receive the corresponding information
<i>Post-Condition (protocol)</i>	
PostP 1	True

**5.5.7 Operation Model for oeSetCrisisHandler**

The `oeSetCrisisHandler` operation has the following properties:

<b>OPERATION</b>	
<b><i>oeSetCrisisHandler</i></b>	
sent to declare himself as been the handler of a crisis having the specified id.	
<i>Parameters</i>	
1	AdtCrisisID: dtCrisisID the identification information used to determine the crisis
<i>Return type</i>	
ptBoolean	
<i>Pre-Condition (protocol)</i>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<i>Pre-Condition (functional)</i>	
PreF 1	there exist one crisis having the given id in the pre-state.
<i>Post-Condition (functional)</i>	
PostF 1	the ctCrisis instance having the provided id is in handled status at poststate and is associated to the actor that sends the message (which himself is notified with a textual message as confirmation).
PostF 2	All the alerts related to this crisis are sent to the actor such that he can decide how to handle them.
PostF 3	if the crisis was already handled at pre-state then the associated handler actor is notified about the change of handler for one of his crisis (n.b. it might be the same even if not relevant).
PostF 4	a message is sent to the communication company for any human related to an alert associated to the crisis. A human will receive as many messages as alerts he sent despite the fact that they might relate to the same crisis (i.e. one alert, one acknowledgement).

*continues in next page ...*

***... Operation table continuation***

<b><i>Post-Condition (protocol)</i></b>	
PostP 1	none

**5.5.8 Operation Model for oeSetCrisisStatus**

The `oeSetCrisisStatus` operation has the following properties:

<b><i>OPERATION</i></b>	
<b><i>oeSetCrisisStatus</i></b>	
sent to define the handling status of a specific crisis.	
<b><i>Parameters</i></b>	
1	<b>AdtCrisisID: dtCrisisID</b> the identification information used to determine the crisis
2	<b>AetCrisisStatus: etCrisisStatus</b> the new status value
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Pre-Condition (protocol)</i></b>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<b><i>Pre-Condition (functional)</i></b>	
PreF 1	it is supposed that there exist one crisis in the pre state having the given id.
<b><i>Post-Condition (functional)</i></b>	
PostF 1	the crisis status attribute of the crisis instance having the given id is replaced by the given one and the requesting actor is notified of this update.
<b><i>Post-Condition (protocol)</i></b>	
PostP 1	none

**5.5.9 Operation Model for oeSetCrisisType**

The `oeSetCrisisType` operation has the following properties:

<b><i>OPERATION</i></b>	
<b><i>oeSetCrisisType</i></b>	
sent to define the gravity type of a specific crisis.	
<b><i>Parameters</i></b>	
1	<b>AdtCrisisID: dtCrisisID</b> the identification information used to determine the crisis
2	<b>AetCrisisType: etCrisisType</b> the new type value
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Pre-Condition (protocol)</i></b>	
PreP 1	the system is started

*continues in next page ...*

**... Operation table continuation**

PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<b>Pre-Condition (functional)</b>	
PreF 1	it is supposed that there exist one crisis in the pre state having the given id.
<b>Post-Condition (functional)</b>	
PostF 1	the crisis type attribute of the crisis instance having the given id is replaced by the given one and the requesting actor is notified of this update.
<b>Post-Condition (protocol)</b>	
PostP 1	none

**5.5.10 Operation Model for oeValidateAlert**

The `oeValidateAlert` operation has the following properties:

OPERATION	
<i>oe ValidateAlert</i>	
sent to indicate that a specific alert is not a fake.	
<b>Parameters</b>	
1	<b>AdtAlertID: dtAlertID</b> the identification information used to determine the alert instance
<b>Return type</b>	
ptBoolean	
<b>Pre-Condition (protocol)</b>	
PreP 1	the system is started
PreP 2	the actor logged previously and did not log out ! (i.e. the associated ctCoordinator instance is considered logged)
<b>Pre-Condition (functional)</b>	
PreF 1	it is supposed that there exist one ctAlert instance with the same <code>id</code> attribute value as the one provided by the coordinator actor who wants to validate.
<b>Post-Condition (functional)</b>	
PostF 1	the ctAlert class instance having the provided id is considered as valid in the post state and the coordinator actor is informed about the satisfaction of its request.
PostF 2	If the hash of the actual alert it is not equal to the hash of the backup, then the actual alert is replaced by the backup alert, because the integrity has been corrupted
<b>Post-Condition (protocol)</b>	
PostP 1	none

**5.6 Environment - Out Interface Operation Scheme for actMsrCreator****5.6.1 Operation Model for oeCreateSystemAndEnvironment**

The `oeCreateSystemAndEnvironment` operation has the following properties:

OPERATION	
<i>oeCreateSystemAndEnvironment</i>	
<i>continues in next page ...</i>	

**... Operation table continuation**

sent to request the initialization of the system's class instances and the environment actors instances.

<b>Parameters</b>	
1	<b>AqtyComCompanies:</b> ptInteger the quantity of communication companies to create in the environment
<b>Return type</b>	
ptBoolean	
<b>Pre-Condition (protocol)</b>	
PreP 1 none	
<b>Pre-Condition (functional)</b>	
PreF 1 none	
<b>Post-Condition (functional)</b>	
PostF 1	the ctState instance is initialized with the integer 1 for the crisis and alert counters used for their identifications, a value for the clock corresponding to a default initial time (i.e. January 1st, 1970) the crisis reminder period is set to 300 seconds, the maximum crisis reminder period is fixed to 1200 seconds (i.e. 20 minutes), an initial value for the automatic reminder period equal to the current date and time and the system is considered in a started state. <b>Those predicates must be satisfied first since all the other depend on the existence of a ctState instance !</b>
PostF 2	the actMsrCreator actor instance is initiated (remember that since the oeCreateSystemAndEnvironment is a special event its role is to make consistent the post state thus creating the actor and its interfaces is required even though the sending of this message logically would need the actor and its interfaces to already exist ...).
PostF 3	the environment for communication company actors, in the post state, is made of AqtyComCompanies instances allowing for receiving and sending messages to humans.
PostF 4	the environment for administrator actors, in the post state, is made of one instance.
PostF 5	the environment for activator actors, in the post state, is made of one instance allowing for automatic message sending based on current system's and environment state'.
PostF 6	the set of ctAdministrator instances at post is made of one instance initialized with 'icrashadmin' (resp. '7WXC1359') for login (resp. password) values.
PostF 7	the association between ctAdministrator and actAdministrator is made of one couple made of the conjointly specified instances.
<b>Post-Condition (protocol)</b>	
PostP 1	none is given since the only protocol variable to be modified in the post state is the one initialized with the ctState instance (i.e. vpStarted).

Figure 5.4 shows all the concept model elements in the scope of the oeCreateSystemAndEnvironment operation

## 5.7 Environment - Actor Operation Scheme for actMsrCreator

### 5.7.1 Operation Model for init

The init operation has the following properties:

**OPERATION**

*continues in next page ...*

**...Operation table continuation**

<b>init</b>
used to create an instance of the actor together with its interface instances and update the associations with the <code>ctState</code> instance.
<b>Return type</b>
<code>ptBoolean</code>

## 5.8 Primary Types - Operation Schemes for Class ctAdministrator

### 5.8.1 Operation Model for init

The `init` operation has the following properties:

<b>OPERATION</b>
<b>init</b>
used to initialize the current object as a new instance of the <code>ctAdministrator</code> type.
<b>Parameters</b>
1 <b>Alogin: dtLogin</b> used to initialize the login field
2 <b>Apwd: dtPassword</b> used to initialize the password field
<b>Return type</b>
<code>ptBoolean</code>
<b>Post-Condition (functional)</b>
PostF 1    true iff the system poststate includes the current object as a new <code>ctAdministrator</code> instance having its login and password attributes equal to the one provided as parameters and its <code>vpIsLogged</code> attribute equal to false.

## 5.9 Primary Types - Operation Schemes for Class ctAlertAC

### 5.9.1 Operation Model for isSentToCoordinator

The `isSentToCoordinator` operation has the following properties:

<b>OPERATION</b>
<b>isSentToCoordinator</b>
used to provide a given coordinator with current alert information.
<b>Parameters</b>
1 <b>AactCoordinator: actCoordinator</b>
<b>Return type</b>
<code>ptBoolean</code>
<b>Post-Condition (functional)</b>
PostF 1    true iff the message <code>ieSendAnAlert</code> is sent to the input interface of the given coordinator actor with the current alert as parameter value

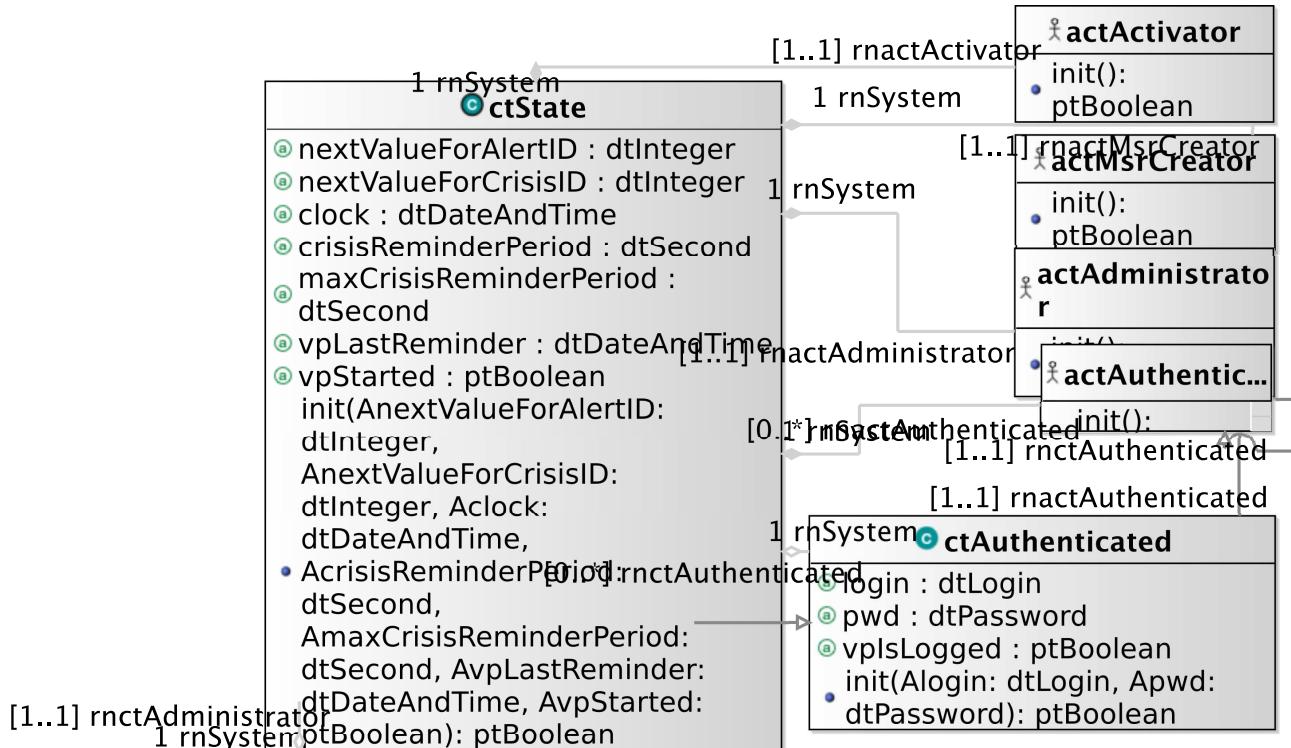


Figure 5.4: oeCreateSystemAndEnvironment operation scope

## 5.10 Primary Types - Operation Schemes for Class ctAuthenticated

### 5.10.1 Operation Model for init

The `init` operation has the following properties:

OPERATION	
<i>init</i>	
used to initialize the current object as a new instance of the <code>ctAuthenticated</code> type.	
<i>Parameters</i>	
1	<b>Alogin: dtLogin</b> used to initialize the login field
2	<b>Apwd: dtPassword</b> used to initialize the password field
<i>Return type</i>	
ptBoolean	
<i>Post-Condition (functional)</i>	
PostF 1	true iff the system poststate includes the current object as a new <code>ctAuthenticated</code> instance having its attributes equal to the ones provided as parameters.

## 5.11 Primary Types - Operation Schemes for Class ctCoordinator

### 5.11.1 Operation Model for init

The `init` operation has the following properties:

OPERATION	
<i>init</i>	
used to initialize the current object as a new instance of the <code>ctCoordinator</code> type.	
<i>Parameters</i>	

<b>OPERATION</b>	
<b><i>init</i></b>	
used to initialize the current object as a new instance of the ctCrisis type.	
<b><i>Parameters</i></b>	
1	<b>Aid: dtCrisisID</b> used to initialize the id field
2	<b>Atype: etCrisisType</b> used to initialize the type field
3	<b>Astatus: etCrisisStatus</b> used to initialize the status field
4	<b>Alocation: dtGPSLocation</b> used to initialize the location field
5	<b>Ainstant: dtDateAndTime</b> used to initialize the instant field
6	<b>Acomment: dtComment</b> used to initialize the comment field
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Post-Condition (functional)</i></b>	
PostF 1	true iff the system poststate includes the current object as a new ctCrisis instance having its attributes equal to the ones provided as parameters.

### 5.12.2 Operation Model for handlingDelayPassed

The handlingDelayPassed operation has the following properties:

<b>OPERATION</b>	
<b><i>handlingDelayPassed</i></b>	
used to determine if the crisis stood too longly in a pending status since last reminder.	
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Post-Condition (functional)</i></b>	
PostF 1	true iff the crisis is in pending status and if the duration between the current ctState clock information and the last reminder is greater than the crisis reminder period duration.

### 5.12.3 Operation Model for maxHandlingDelayPassed

The maxHandlingDelayPassed operation has the following properties:

<b>OPERATION</b>	
<b><i>maxHandlingDelayPassed</i></b>	
used to determine if the crisis stood too longly in a pending status since its creation.	
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Post-Condition (functional)</i></b>	
PostF 1	true iff the crisis is in pending status and if the duration between the current ctState clock information and the crisis instant is greater than the maximum reminder period duration.

### 5.12.4 Operation Model for isSentToCoordinator

The `isSentToCoordinator` operation has the following properties:

<b>OPERATION</b>	
<i>isSentToCoordinator</i>	
used to provide a given coordinator with current crisis information.	
<i>Parameters</i>	
1	<b>AactCoordinator: actCoordinator</b> the message destination actor
<i>Return type</i>	
ptBoolean	
<i>Post-Condition (functional)</i>	
PostF 1	true iff the message <code>ieSendACrisis</code> is sent by the simulator to the input interface of the given coordinator actor with the current crisis as parameter value.

### 5.12.5 Operation Model for isAllocatedIfPossible

The `isAllocatedIfPossible` operation has the following properties:

<b>OPERATION</b>	
<i>isAllocatedIfPossible</i>	
used to allocate a crisis to a coordinator if any or to alert the administrator of crisis waiting to be handled.	
<i>Return type</i>	
ptBoolean	
<i>Post-Condition (functional)</i>	
PostF 1	true iff the duration between the crisis creation and the system's clock is greater than the maximum delay defined and
PostF 2	if there exist at least one coordinator then (a) the post state associates to the crisis any of the existing coordinators and (b) the coordinator is informed that he is now the handlers of the crisis whose ID is communicated
PostF 3	else a message is sent to all known administrators to request creation of new coordinators.

## 5.13 Primary Types - Operation Schemes for Class ctHuman

### 5.13.1 Operation Model for init

The `init` operation has the following properties:

<b>OPERATION</b>	
<i>init</i>	
used to initialize the current object as a new instance of the <code>ctHuman</code> type.	
<i>Parameters</i>	
1	<b>Aid: dtPhoneNumber</b> used to initialize the id field
2	<b>Akind: etHumanKind</b> used to initialize the kind field

*continues in next page ...*

**...Operation table continuation**

<b>Return type</b>
ptBoolean
<b>Post-Condition (functional)</b>
PostF 1 true iff the system poststate includes the current object as a new ctHuman instance having its attributes equal to the ones provided as parameters.

**5.13.2 Operation Model for isAcknowledged**

The `isAcknowledged` operation has the following properties:

<b>OPERATION</b>
<b><i>isAcknowledged</i></b>
used to specify the property of having sent an alert acknowledge message to the human having declared the alert through its own communication company.
<b>Return type</b>
ptBoolean
<b>Post-Condition (functional)</b>
PostF 1 true iff the message <code>ieSmsSend</code> is sent to the related input interface of the related communication company actor with the human phone number and the generic message 'The handling of your alert by our services is in progress !'

**5.14 Primary Types - Operation Schemes for Class ctState****5.14.1 Operation Model for init**

The `init` operation has the following properties:

<b>OPERATION</b>
<b><i>init</i></b>
used to initialize the current object as a new instance of the <code>ctState</code> type.
<b>Parameters</b>
1 <b>AnextValueForAlertID: dtInteger</b> used to initialize the nextValueForAlertID field
2 <b>AnextValueForCrisisID: dtInteger</b> used to initialize the nextValueForCrisisID field
3 <b>Aclock: dtDateAndTime</b> used to initialize the clock field
4 <b>AcrisisReminderPeriod: dtSecond</b> used to initialize the crisisReminderPeriod field
5 <b>AmaxCrisisReminderPeriod: dtSecond</b> used to initialize the maxCrisisReminderPeriod field
6 <b>AvpLastReminder: dtDateAndTime</b> used to initialize the vpLastReminder field
7 <b>AvpStarted: ptBoolean</b> used to initialize the vpStarted field
<b>Return type</b>
ptBoolean

*continues in next page ...*

***... Operation table continuation***

<b><i>Post-Condition (functional)</i></b>	
PostF 1	true iff the system poststate includes the current object as a new ctState instance having its attributes equal to the ones provided as parameters.

**5.15 Primary Types - Operation Schemes for Datatype dtAlertID****5.15.1 Operation Model for is**

The `is` operation has the following properties:

<b>OPERATION</b>	
<i>is</i>	
	used to determine which strings are considered as valid alert identifiers.
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Post-Condition (functional)</i></b>	
PostF 1	if the length of the value attribute of a dtAlertID is a ptInteger greater than zero and lower or equal to 20 then the operation returns the ptBoolean true, else the ptBoolean false.

**5.16 Primary Types - Operation Schemes for Datatype dtComment****5.16.1 Operation Model for is**

The `is` operation has the following properties:

<b>OPERATION</b>	
<i>is</i>	
	used to determine which strings are considered as valid comments.
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Post-Condition (functional)</i></b>	
PostF 1	true iff the length of the string value is not more than 160 characters.

**5.17 Primary Types - Operation Schemes for Datatype dtCoordinatorID****5.17.1 Operation Model for is**

The `is` operation has the following properties:

<b>OPERATION</b>	
<i>is</i>	
	used to determine which string are considered as valid alert identifiers.
<b><i>Return type</i></b>	
ptBoolean	
<b><i>Post-Condition (functional)</i></b>	

*continues in next page ...*

**...Operation table continuation**

PostF 1	if the length of the value attribute of a dtCoordinatorID is a ptInteger greater than zero and lower or equal to 5 than the operation returns the ptBoolean true, else the ptBoolean false.
---------	---

## 5.18 Primary Types - Operation Schemes for Datatype dtCrisisID

### 5.18.1 Operation Model for is

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which strings are considered as valid crisis identifiers.
<i>Return type</i>
ptBoolean
<i>Post-Condition (functional)</i>
PostF 1 if the length of the value attribute of a dtCrisisID is a ptInteger greater than zero and lower or equal to 10 than the operation returns the ptBoolean true, else the ptBoolean false.

## 5.19 Primary Types - Operation Schemes for Datatype dtGPSLocation

### 5.19.1 Operation Model for is

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which couples are considered as valid dtGPSLocation values.
<i>Return type</i>
ptBoolean
<i>Post-Condition (functional)</i>
PostF 1 true if both latitude and longitude are valid values according to their <code>is</code> operation.

### 5.19.2 Operation Model for isNearTo

The `isNearTo` operation has the following properties:

OPERATION
<i>isNearTo</i>
used to determine if locations are considered enough close to be treated as equivalent in the application domain context. In the context of the iCrash system, we compute the distance between two GPS locations using the following Haversine formula. (more details can be found at: <a href="http://www.movable-type.co.uk/scripts/latlong.html">http://www.movable-type.co.uk/scripts/latlong.html</a> and <a href="http://www.gpsvisualizer.com/calculators#distance">http://www.gpsvisualizer.com/calculators#distance</a> )
<i>Parameters</i>
1 <b>AGPSLocation: dtGPSLocation</b> the GPS location to be compared to.

*continues in next page ...*

***... Operation table continuation***

<b><i>Return type</i></b>
ptBoolean
<b><i>Post-Condition (functional)</i></b>
PostF 1 if the Haversine formula ( $\text{ACOS}(\text{SIN}(\text{lat1}) * \text{SIN}(\text{lat2}) + \text{COS}(\text{lat1}) * \text{COS}(\text{lat2}) * \text{COS}(\text{lon2} - \text{lon1})) * 6371$ , in which latitudes and longitudes are in radians applied to the two dtGPS coordinates is lower to 100 meters) then the predicate is true and false otherwise.

**5.20 Primary Types - Operation Schemes for Datatype dtLatitude****5.20.1 Operation Model for is**

The `is` operation has the following properties:

<b>OPERATION</b>
<b><i>is</i></b>
used to determine which strings are considered as valid dtLatitude.
<b><i>Return type</i></b>
ptBoolean
<b><i>Post-Condition (functional)</i></b>
PostF 1 is true if the value is a real in the interval [-90.0 , +90.0].

**5.21 Primary Types - Operation Schemes for Datatype dtLogin****5.21.1 Operation Model for is**

The `is` operation has the following properties:

<b>OPERATION</b>
<b><i>is</i></b>
used to determine which strings are considered as valid dtLogin.
<b><i>Return type</i></b>
ptBoolean
<b><i>Post-Condition (functional)</i></b>
PostF 1 is true if the length of the string value is not more than 20 characters.

**5.22 Primary Types - Operation Schemes for Datatype dtLongitude****5.22.1 Operation Model for is**

The `is` operation has the following properties:

<b>OPERATION</b>
<b><i>is</i></b>
used to determine which strings are considered as valid dtLongitude.
<b><i>Return type</i></b>
ptBoolean

*continues in next page ...*

***...Operation table continuation***

<i>Post-Condition (functional)</i>	
PostF 1	is true if the value is a real in the interval [-180.0 , +180.0].

**5.23 Primary Types - Operation Schemes for Datatype dtPassword****5.23.1 Operation Model for is**

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which strings are considered as valid dtPassword.
<i>Return type</i>
ptBoolean
<i>Post-Condition (functional)</i>
PostF 1 is true of the length of the string value is at least 6 characters long.

**5.24 Primary Types - Operation Schemes for Datatype dtPhoneNumber****5.24.1 Operation Model for is**

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which strings are considered as valid dtPhoneNumber.
<i>Return type</i>
ptBoolean
<i>Post-Condition (functional)</i>
PostF 1 is true of the length of the string value is from 4 to 30 characters. No standard is applied !

**5.25 Primary Types - Operation Schemes for Enumeration etAlertStatus****5.25.1 Operation Model for is**

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which litteral belongs to the enumeration.
<i>Return type</i>
ptBoolean
<i>Post-Condition (functional)</i>
PostF 1 true iff the value is equal to one of the following values: pending, valid, invalid

## 5.26 Primary Types - Operation Schemes for Enumeration etCrisisStatus

### 5.26.1 Operation Model for is

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which literal belongs to the enumeration.
<i>Return type</i>
<code>ptBoolean</code>
<i>Post-Condition (functional)</i>
PostF 1 true iff the value is equal to one of the following values: <code>pending</code> , <code>handled</code> , <code>solved</code> , <code>closed</code> .

## 5.27 Primary Types - Operation Schemes for Enumeration etCrisisType

### 5.27.1 Operation Model for is

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which literal belongs to the enumeration.
<i>Return type</i>
<code>ptBoolean</code>
<i>Post-Condition (functional)</i>
PostF 1 true iff the value is equal to one of the following values: <code>small</code> , <code>medium</code> , <code>huge</code>

## 5.28 Primary Types - Operation Schemes for Enumeration etHumanKind

### 5.28.1 Operation Model for is

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which literal belongs to the enumeration.
<i>Return type</i>
<code>ptBoolean</code>
<i>Post-Condition (functional)</i>
PostF 1 true iff the value is equal to one of the following values: <code>witness</code> , <code>victim</code> , <code>anonym</code>

## 5.29 Secondary Types - Operation Schemes for Classes

There are no elements in this category in the system analysed.

## 5.30 Secondary Types - Operation Schemes for Datatype dtSMS

### 5.30.1 Operation Model for is

The `is` operation has the following properties:

OPERATION
<i>is</i>
used to determine which strings are considered as valid comments
<i>Return type</i>
ptBoolean
<i>Post-Condition (functional)</i>
PostF 1 true iff the length of the string value is not more than 160 characters.

## 5.31 Secondary Types - Operation Schemes for Enumerations

There are no elements in this category in the system analysed.



# Chapter 6

## Test Model(s)

### 6.1 Test Model for testcase01

this positive test case intends to verify the correctness of the execution of a simple instance of the suDeployAndRun use case.

#### 6.1.1 Test Steps Specification

##### 6.1.1.1 testcase01-ts01oeCreateSystemAndEnvironment-actMsrCreator.outactMsrCreator.oeCreateSy

The testcase01-ts01oeCreateSystemAndEnvironment-actMsrCreator.outactMsrCreator.oeCreateSy has the following properties:

TEST STEP	
<i>ts01oeCreateSystemAndEnvironment</i>	
This test step initializes the system state and environment.	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:Creator</b></p> <p>sends to system</p> <p><b>actMsrCreator.outactMsrCreator.oeCreateSystemAndEnvironment</b> (AqtyComCompanies)</p>
<i>Variables</i>	
V 1	<b>Creator:icrash.environment.actMsrCreator</b> only actMsrtCreator actors can trigger the system and environment creation and initialization.
<i>Constraints</i>	
C 1	the number of communication company actor instances present in the environment is equal to four to represent all the communication companies available in Luxembourg.
<i>Oracle Constraints</i>	
OC 1	true for testing only the executability (is available and can be triggered) of the operation.

### 6.1.1.2 testcase01-ts02oeSetClock-actActivator.outactActivator.oeSetClock

The testcase01-ts02oeSetClock-actActivator.outactActivator.oeSetClock has the following properties:

<b>TEST STEP</b>	
<i>ts02oeSetClock</i>	
test the update of the current time.	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actActivator.outactActivator.oeSetClock (ACurrentClock)</b></p>
<i>Variables</i>	
V 1	<p><b>TheActor:actActivator</b></p> <p>proactive actor responsible of requesting the update of the system's clock.</p>
<i>Constraints</i>	
C 1	TheActor is any instance existing in the current environment status.
C 2	ACurrentClock is a fixed date equal to the 24th November 2017 at 15:20:00 using a 24-hours notation <sup>1</sup> .
<i>Oracle Constraints</i>	
OC 1	true for testing only the executability (is available and can be triggered) of the operation.

### 6.1.1.3 testcase01-ts03oeLogin-actAdministrator.outactAdministrator.oeLogin

The testcase01-ts03oeLogin-actAdministrator.outactAdministrator.oeLogin has the following properties:

<b>TEST STEP</b>	
<i>ts03oeLogin</i>	
test the authentified access of the administrator	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actAdministrator.outactAdministrator.oeLogin (AdtLogin, AdtPassword)</b></p>
<i>Variables</i>	
V 1	<p><b>TheActor:actAdministrator</b></p> <p>an actAdministrator actor as subtype of actAuthenticated can send oeLogin messages to the system.</p>
<i>Constraints</i>	

*continues in next page ...*

<sup>1</sup>for more details see the ISO 8601 Data elements and interchange formats - Information interchange - Representation of dates and times - <http://www.iso.org/iso/home/standards/iso8601.htm>

**... Test Step table continuation**

C 1	TheActor is any <code>actAdministrator</code> instance existing in the environment. It is thus expected that there exist at least one.
C 2	<code>AdtLogin</code> has its value attribute equal to the primitive string 'icrashadmin' (which is the correct administrator login known by the system after the step one.)
C 3	<code>AdtPassword</code> has its value attribute equal to the primitive string '7WXC1359' (which is the correct administrator password known by the system after the step one.)
<b>Oracle Constraints</b>	
OC 1	the <code>AMessage</code> value is expected to be equal to the primitive string 'You are logged ! Welcome ...'
OC 2	TheActor receives from system <code>ieMessage(AMessage)</code>

**6.1.1.4 testcase01-ts04oeAddCoordinator-actAdministrator.outactAdministrator.oeAddCoordinator**

The `testcase01-ts04oeAddCoordinator-actAdministrator.outactAdministrator.oeAddCoordinator` has the following properties:

<b>TEST STEP</b>	
<b><i>ts04oeAddCoordinator</i></b>	
to test the add of a new coordinator by an administrator.	
<b><i>Test Sent Message</i></b>	
TSM 1	<b>out:TheActor</b> <b>sends to system</b> <b>actAdministrator.outactAdministrator.oeAddCoordinator</b> ( <code>AdtCoordinatorID</code> , <code>AdtLogin</code> , <code>AdtPassword</code> )
<b><i>Variables</i></b>	
V 1	<b>TheActor:actAdministrator</b> actAdministrator actors as being the only one allowed to add coordinators.
<b><i>Constraints</i></b>	
C 1	TheActor is any <code>actAdministrator</code> instance existing in the environment. It is expected that there exists at least one which is the same during all the test case.
C 2	<code>AdtCoordinatorID</code> is equal to 1 to set the new coordinator ID
C 3	<code>AdtLogin</code> has its value attribute equal to the primitive string 'steve' which is the ID defined for the new coordinator.
C 4	<code>AdtPassword</code> has its value attribute equal to the primitive string 'pwdMessirExcalibur2017' which is the password to be set for steve.
<b><i>Oracle Constraints</i></b>	
OC 1	the administrator should have been acknowledged for the adding of the new coordinator.

**6.1.1.5 testcase01-ts05oeLogout-actAdministrator.outactAdministrator.oeLogout**

The `testcase01-ts05oeLogout-actAdministrator.outactAdministrator.oeLogout` has the following properties:

<b>TEST STEP</b>	
<i>continues in next page ...</i>	

*... Test Step table continuation*

<i>ts05oeLogout</i> to test the logout of a connected administrator.	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actAdministrator.outactAdministrator.oeLogout ()</b></p>
<i>Variables</i>	
V 1	<b>TheActor:actAdministrator</b> an actAdministrator actor as subtype of actAuthenticated can send oeLogout messages to the system.
<i>Constraints</i>	
C 1	TheActor is any actAdministrator instance existing in the environment. It is expected that there exists at least one which is the same during all the test case.
<i>Oracle Constraints</i>	
OC 1	the AMessage value is expected to be equal to the primitive string 'You are logged out ! Good Bye ...'
OC 2	the administrator should have received the message AMessage.

**6.1.1.6 testcase01-ts06oeSetClock02-actActivator.outactActivator.oeSetClock**

The testcase01-ts06oeSetClock02-actActivator.outactActivator.oeSetClock has the following properties:

<b>TEST STEP</b>	
<i>ts06oeSetClock02</i> test the update of the current time.	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actActivator.outactActivator.oeSetClock (ACurrentClock)</b></p>
<i>Variables</i>	
V 1	<b>TheActor:icrash.environment.actActivator</b> proactive actors responsible of requesting the update of the system's clock.
<i>Constraints</i>	
C 1	TheActor is any instance existing in the current environment status.
C 2	ACurrentClock is a fixed date equal to the 26th November 2017 at 10:15:00 using a 24-hours notation.
<i>Oracle Constraints</i>	
OC 1	true for testing only the executability (is available and can be triggered) of the operation.

### 6.1.1.7 testcase01-ts07oeAlert1-actComCompany.outactComCompany.oeAlert

The testcase01-ts07oeAlert1-actComCompany.outactComCompany.oeAlert has the following properties:

<b>TEST STEP</b>	
<i>ts07oeAlert1</i>	
tests the declaration of a new alert functionality.	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actComCompany.outactComCompany.oeAlert</b> (AetHumanKind, AdtDate, AdtTime, AdtPhoneNumber, AdtGPSLocation, AdtComment)</p>
<i>Variables</i>	
V 1	<p><b>TheActor:actComCompany</b></p> <p>actComCompany actors transfer alert declaration messages.</p>
<i>Constraints</i>	
C 1	TheActor is any instance existing in the current environment status. It is expected to exist at least one.
C 2	AetHumanKind is equal to witness
C 3	AdtDate is equal to the 26th of November 2017
C 4	AdtTime is equal to 10:10:16 using a 24-hours.
C 5	AdtPhoneNumber is equal to the ptString value '+3524666445252'.
C 6	AdtGPSLocation is equal to (49.627675 , 6.159590).
C 7	AdtComment is equal to '3 cars involved in an accident.'
<i>Oracle Constraints</i>	
OC 1	AdtSMS is equal to the ptString 'Your alert has been registered. We will handle it and keep you informed'.
OC 2	AdtSMS is sent to the phone number AdtPhoneNumber using the communication company having sent the alert using its ieSmsSend input message.

### 6.1.1.8 testcase01-ts08oeSetClock03-actActivator.outactActivator.oeSetClock

The testcase01-ts08oeSetClock03-actActivator.outactActivator.oeSetClock has the following properties:

<b>TEST STEP</b>	
<i>ts08oeSetClock03</i>	
test the update of the current time.	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actActivator.outactActivator.oeSetClock</b> (ACurrentClock)</p>

*continues in next page ...*

*... Test Step table continuation*

<i>Variables</i>	
V 1	<b>TheActor:actActivator</b> proactive actor responsible of requesting the update of the system's clock.
<i>Constraints</i>	
C 1	TheActor is any instance existing in the current environment status.
C 2	ACurrentClock is a fixed date equal to the 26th November 2017 at 10:30:00 using a 24-hours notation.
<i>Oracle Constraints</i>	
OC 1	true for testing only the executability (is available and can be triggered) of the operation.

**6.1.1.9 testcase01-ts09oeSollicitateCrisisHandling-actActivator.outactActivator.oeSollicitateCrisisHandling()**

The testcase01-ts09oeSollicitateCrisisHandling-actActivator.outactActivator.oeSollicitateCrisisHandling() has the following properties:

<i>TEST STEP</i>	
<i>ts09oeSollicitateCrisisHandling</i>	
test the proactive sollication to handle an alert.	
<i>Test Sent Message</i>	
TSM 1	<b>out:TheActor</b> sends to system <b>actActivator.outactActivator.oeSollicitateCrisisHandling ()</b>
<i>Variables</i>	
V 1	<b>TheActor:icrash.environment.actActivator</b> proactive actor responsible of triggering sollicitation functionality.
<i>Constraints</i>	
C 1	TheActor is any instance existing in the current environment status. It is expected to exist at least one.
<i>Oracle Variables</i>	
OV 1	<b>TheAdministrator:actAdministrator</b> actAdministrator actors can be sollicitated to handle alerts.
OV 2	<b>TheCoordinator:actCoordinator</b> actCoordinator actors can be sollicitated to handle alerts.
OV 3	<b>AMessageForCrisisHandlers:ptString</b> messages sent to sollicitated actors are of type ptString.
<i>Oracle Constraints</i>	
OC 1	TheAdministrator is any instance existing in the current environment status. It is expected to exist at least one.
OC 2	TheCoordinator is any instance existing in the current environment status. It is expected to exist at least one.
OC 3	AMessageForCrisisHandlers is equal to the ptString 'There are alerts pending since more than the defined delay. Please REACT !'
OC 4	TheCoordinator and TheAdministrator have received the message AMessagForCrisisHandlers.

### 6.1.1.10 testcase01-ts10oeLogin02-actAuthenticated.outactAuthenticated.oeLogin

The testcase01-ts10oeLogin02-actAuthenticated.outactAuthenticated.oeLogin has the following properties:

<b>TEST STEP</b>	
<i>ts10oeLogin02</i>	
test the authentified access of the coordinator	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actAuthenticated.outactAuthenticated.oeLogin (AdtLogin, AdtPassword)</b></p>
<i>Variables</i>	
V 1	<p><b>TheActor:actCoordinator</b></p> <p>an actCoordinator actor as subtype of actAuthenticated can send oeLogin messages to the system.</p>
<i>Constraints</i>	
C 1	TheActor is any actAdministrator instance existing in the environment. It is thus expected that there exist at least one.
C 2	AdtLogin has its value attribute equal to the primitive string 'icrashadmin' (which is the correct administrator login known by the system after the step one.)
C 3	AdtPassword has its value attribute equal to the primitive string '7WXC1359' (which is the correct administrator password known by the system after the step one.)
<i>Oracle Constraints</i>	
OC 1	the AMessage value is expected to be equal to the primitive string 'You are logged ! Welcome ...'

### 6.1.1.11 testcase01-ts11oeGetCrisisSet-actCoordinator.outactCoordinator.oeGetCrisisSet

The testcase01-ts11oeGetCrisisSet-actCoordinator.outactCoordinator.oeGetCrisisSet has the following properties:

<b>TEST STEP</b>	
<i>ts11oeGetCrisisSet</i>	
cf. actor documentation	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actCoordinator.outactCoordinator.oeGetCrisisSet (AetCrisisStatus)</b></p>
<i>Variables</i>	
V 1	<p><b>TheActor:icrash.environment.actCoordinator</b></p> <p>cf. actor documentation</p>
V 2	<p><b>AetCrisisStatus:icrash.concepts.primarytypes.datatypes.etCrisisStatus</b></p> <p><b><i>continues in next page ...</i></b></p>

**... Test Step table continuation**

V 3	cf. actor documentation <b>ActCrisis:icrash.concepts.primarytypes.classes.ctCrisis</b> cf. actor documentation
<b>Constraints</b>	
C 1	TheActor is the coordinator actor related to a coordinator in the system's state having steve as login value
C 2	AetCrisisStatus value is pending
<b>Oracle Constraints</b>	
OC 1	ActCrisis is any ctCrisis instance that has been sent to TheActor.

**6.1.1.12 testcase01-ts12oeSetCrisisHandler-actCoordinator.outactCoordinator.oeSetCrisisHandler**

The `testcase01-ts12oeSetCrisisHandler-actCoordinator.outactCoordinator.oeSetCrisisHandler` has the following properties:

<b>TEST STEP</b>	
<i>ts12oeSetCrisisHandler</i>	
cf. actor documentation	
<b>Test Sent Message</b>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actCoordinator.outactCoordinator.oeSetCrisisHandler</b> (<code>AdtCrisisID</code>)</p>
<b>Variables</b>	
V 1	<b>TheActor:icrash.environment.actCoordinator</b> cf. actor documentation
V 2	<b>TheComCompany:icrash.environment.actComCompany</b> cf. actor documentation
V 3	<b>TheCoordinator:icrash.environment.actCoordinator</b> cf. actor documentation
V 4	<b>AdtCrisisID:icrash.concepts.primarytypes.datatypes.dtCrisisID</b> cf. actor documentation
V 5	<b>AMessage:lu.uni.lassy.messir.libraries.primitives.ptString</b> cf. actor documentation
V 6	<b>AdtPhoneNumber:icrash.concepts.primarytypes.datatypes.dtPhoneNumber</b> cf. actor documentation
V 7	<b>AdtSMS:icrash.concepts.secondarytypes.datatypes.dtSMS</b> cf. actor documentation
V 8	<b>ActAlert:icrash.concepts.primarytypes.classes.ctAlert</b> cf. actor documentation
<b>Constraints</b>	
C 1	TheActor is the coordinator actor related to a coordinator in the system's state having steve as login value
C 2	AdtCrisisID as a value of 1
C 3	AMessage is the string 'You are now considered as handling the crisis !'

*continues in next page ...*

**... Test Step table continuation**

C 4	AdtPhoneNumber
C 5	AdtSMS has for value the string 'The handling of your alert by our services is in progress !'
<b>Oracle Constraints</b>	
OC 1	there is a communication company actor that received the message ieSmsSend(AdtPhoneNumber,AdtSMS)
OC 2	there is a coordinator actor that received an alert using the message ieSendAnAlert(ActAlert)

**6.1.1.13 testcase01-ts13oeSetClock04-actActivator.outactActivator.oeSetClock**

The `testcase01-ts13oeSetClock04-actActivator.outactActivator.oeSetClock` has the following properties:

TEST STEP	
<i>ts13oeSetClock04</i>	
cf. actor documentation	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actActivator.outactActivator.oeSetClock (ACurrentClock)</b></p>
<i>Variables</i>	
V 1	TheActor:icrash.environment.actActivator cf. actor documentation
V 2	ACurrentClock:lu.uni.lassy.messir.libraries.calendar.dtDateAndTime cf. actor documentation
<i>Constraints</i>	
C 1	TheActor
C 2	ACurrentClock

**6.1.1.14 testcase01-ts14oeValidateAlert-actCoordinator.outactCoordinator.oeValidateAlert**

The `testcase01-ts14oeValidateAlert-actCoordinator.outactCoordinator.oeValidateAlert` has the following properties:

TEST STEP	
<i>ts14oeValidateAlert</i>	
cf. actor documentation	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actCoordinator.outactCoordinator.oeValidateAlert (AdtAlertID)</b></p>
<i>Variables</i>	

*continues in next page ...*

*... Test Step table continuation*

V 1	TheActor:icrash.environment.actCoordinator cf. actor documentation
V 2	AdtAlertID:icrash.concepts.primarytypes.datatypes.dtAlertID cf. actor documentation
V 3	AMessage:lu.uni.lassy.messir.libraries.primitives.ptString cf. actor documentation
<i>Constraints</i>	
C 1	TheActor is the coordinator actor related to a coordinator in the system's state having steve as login value
C 2	AdtAlertID
C 3	AMessage
<i>Oracle Constraints</i>	
OC 1	

**6.1.1.15 testcase01-ts15oeAlert2-actComCompany.outactComCompany.oeAlert**

The `testcase01-ts15oeAlert2-actComCompany.outactComCompany.oeAlert` has the following properties:

TEST STEP	
<i>ts15oeAlert2</i>	
cf. actor documentation	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actComCompany.outactComCompany.oeAlert</b> (AetHumanKind, AdtDate, AdtTime, AdtPhoneNumber, AdtGPSLocation, AdtComment)</p>
<i>Variables</i>	
V 1	TheActor:icrash.environment.actComCompany cf. actor documentation
V 2	AetHumanKind:icrash.concepts.primarytypes.datatypes.etHumanKind cf. actor documentation
V 3	AdtDate:lu.uni.lassy.messir.libraries.calendar.dtDate cf. actor documentation
V 4	AdtTime:lu.uni.lassy.messir.libraries.calendar.dtTime cf. actor documentation
V 5	AdtPhoneNumber:icrash.concepts.primarytypes.datatypes.dtPhoneNumber cf. actor documentation
V 6	AdtGPSLocation:icrash.concepts.primarytypes.datatypes.dtGPSLocation cf. actor documentation
V 7	AdtComment:icrash.concepts.primarytypes.datatypes.dtComment cf. actor documentation
V 8	AdtSMS:icrash.concepts.secondarytypes.datatypes.dtSMS cf. actor documentation

*continues in next page ...*

*... Test Step table continuation*

<i>Constraints</i>	
C 1	TheActor
C 2	AetHumanKind
C 3	AdtDate
C 4	AdtTime
C 5	AdtPhoneNumber
C 6	AdtGPSLocation
C 7	AdtComment
C 8	AdtSMS
<i>Oracle Constraints</i>	
OC 1	

## 6.1.1.16 testcase01-ts16oeSetClock05-actActivator.outactActivator.oeSetClock

The `testcase01-ts16oeSetClock05-actActivator.outactActivator.oeSetClock` has the following properties:

<b>TEST STEP</b>	
<i>ts16oeSetClock05</i>	
cf. actor documentation	
<i>Test Sent Message</i>	
TSM 1	<p><b>out:TheActor</b></p> <p>sends to system</p> <p><b>actActivator.outactActivator.oeSetClock (ACurrentClock)</b></p>
<i>Variables</i>	
V 1	TheActor:icrash.environment.actActivator
V 2	cf. actor documentation
	<b>ACurrentClock:lu.uni.lassy.messir.libraries.calendar.dtDateAndTime</b>
	cf. actor documentation
<i>Constraints</i>	
C 1	TheActor
C 2	ACurrentClock

## 6.1.1.17 testcase01-ts17oeSetCrisisStatus-actCoordinator.outactCoordinator.oeSetCrisisStatus

The `testcase01-ts17oeSetCrisisStatus-actCoordinator.outactCoordinator.oeSetCrisisStatus` has the following properties:

<b>TEST STEP</b>	
<i>ts17oeSetCrisisStatus</i>	
cf. actor documentation	
<i>Test Sent Message</i>	

*continues in next page ...*

*... Test Step table continuation*

TSM 1	<p><b>out:TheActor</b>  <b>sends to system</b></p> <p><b>actCoordinator.outactCoordinator.oeSetCrisisStatus</b> (AdtCrisisID, AetCrisisStatus)</p>
<b>Variables</b>	
V 1	TheActor:icrash.environment.actCoordinator cf. actor documentation
V 2	AdtCrisisID:icrash.concepts.primarytypes.datatypes.dtCrisisID cf. actor documentation
V 3	AetCrisisStatus:icrash.concepts.primarytypes.datatypes.etCrisisStatus cf. actor documentation
V 4	AMessage:lu.uni.lassy.messir.libraries.primitives.ptString cf. actor documentation
<b>Constraints</b>	
C 1	TheActor is the coordinator actor related to a coordinator in the system's state having steve as login value
C 2	AdtCrisisID
C 3	AetCrisisStatus
C 4	AMessage
<b>Oracle Constraints</b>	
OC 1	

**6.1.1.18 testcase01-ts18oeReportOnCrisis-actCoordinator.outactCoordinator.oeReportOnCrisis**

The `testcase01-ts18oeReportOnCrisis-actCoordinator.outactCoordinator.oeReportOnCrisis` has the following properties:

<b>TEST STEP</b>	
<i>ts18oeReportOnCrisis</i>	
cf. actor documentation	
<b>Test Sent Message</b>	
TSM 1	<p><b>out:TheActor</b>  <b>sends to system</b></p> <p><b>actCoordinator.outactCoordinator.oeReportOnCrisis</b> (AdtCrisisID, AdtComment)</p>
<b>Variables</b>	
V 1	TheActor:icrash.environment.actCoordinator cf. actor documentation
V 2	AdtCrisisID:icrash.concepts.primarytypes.datatypes.dtCrisisID cf. actor documentation
V 3	AdtComment:icrash.concepts.primarytypes.datatypes.dtComment

*continues in next page ...*

**... Test Step table continuation**

V 4	cf. actor documentation <b>AMessage:lu.uni.lassy.messir.libraries.primitives.ptString</b> cf. actor documentation
<b>Constraints</b>	
C 1	TheActor is the coordinator actor related to a coordinator in the system's state having steve as login value
C 2	AdtCrisisID
C 3	AdtComment
C 4	AMessage
<b>Oracle Constraints</b>	
OC 1	

**6.1.1.19 testcase01-ts19oeCloseCrisis-actCoordinator.outactCoordinator.oeCloseCrisis**

The `testcase01-ts19oeCloseCrisis-actCoordinator.outactCoordinator.oeCloseCrisis` has the following properties:

<b>TEST STEP</b>	
<i>ts19oeCloseCrisis</i> cf. actor documentation	
<b>Test Sent Message</b>	
TSM 1	<b>out:TheActor</b> <b>sends to system</b> <b>actCoordinator.outactCoordinator.oeCloseCrisis (AdtCrisisID)</b>
<b>Variables</b>	
V 1	<b>TheActor:icrash.environment.actCoordinator</b> cf. actor documentation
V 2	<b>AdtCrisisID:icrash.concepts.primarytypes.datatypes.dtCrisisID</b> cf. actor documentation
V 3	<b>AMessage:lu.uni.lassy.messir.libraries.primitives.ptString</b> cf. actor documentation
<b>Constraints</b>	
C 1	TheActor is the coordinator actor related to a coordinator in the system's state having steve as login value
C 2	AdtCrisisID
C 3	AMessage
<b>Oracle Constraints</b>	
OC 1	

**6.1.2 Test Case Instance - instance01****6.1.3 Test Case Instance - instance01Part01**

Figure 6.1 Sequence diagram representing the first part of a simple and complete testcase instance for *iCrash*.



Figure 6.1: tci-testcase01-instance01-Part01 testcase instance sequence diagram

#### 6.1.4 Test Case Instance - instance01Part02

Figure 6.2 Sequence diagram representing the second part of a simple and complete testcase instance for *iCrash*.

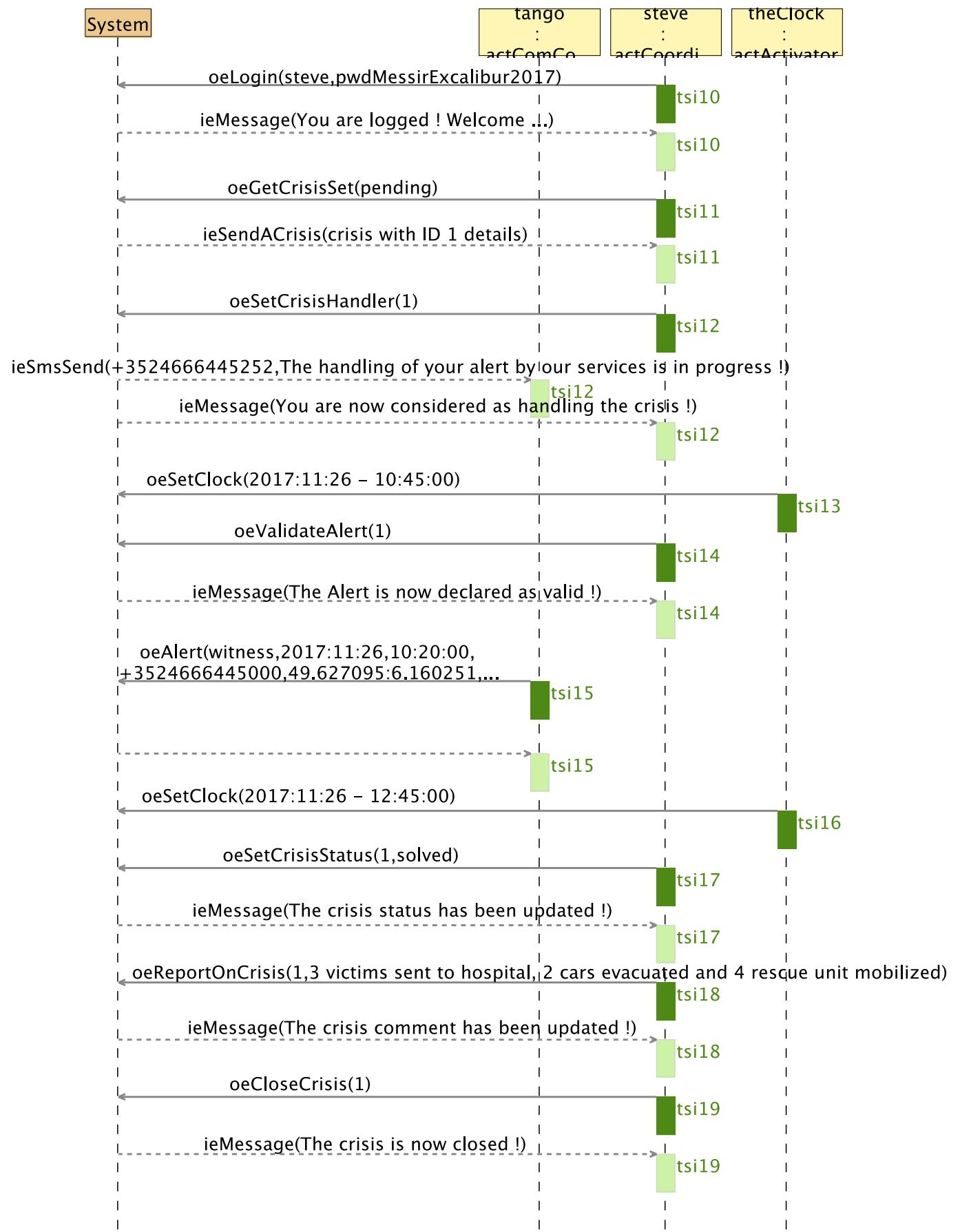


Figure 6.2: tci-testcase01-instance01-Part02 testcase instance sequence diagram

# Chapter 7

## Additional Constraints

### 7.1 Quality Constraints

Description of all the constraints that concern the required quality criteria according to their ISO definition [?].

#### 7.1.1 Functional suitability

Constraints on the degree to which the product provides functions that meet stated and implied needs when the product is used under specified conditions.

##### 7.1.1.1 Functional completeness

List of requirements on the degree to which the set of functions covers all the specified tasks and user objectives.

1. (to be filled)

##### 7.1.1.2 Functional correctness

List of requirements on the degree to which the set of functions covers all the specified tasks and user objectives.

1. (to be filled)

##### 7.1.1.3 Functional appropriateness

List of requirements on the degree to which the functions facilitate the accomplishment of specified tasks and objectives.

1. (to be filled)

### 7.1.2 Performance efficiency

Constraints on the performance relative to the amount of resources used under stated conditions

#### 7.1.2.1 Time behaviour

List of requirements on the degree to which the response and processing times and throughput rates of a product or system, when performing its functions, meet requirements.

1. (to be filled)

### 7.1.2.2 Resource utilization

List of requirements on the degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements.

1. (to be filled)

### 7.1.2.3 Capacity

List of requirements on the degree to which the maximum limits of a product or system parameter meet requirements.

1. (to be filled)

## 7.1.3 Compatibility

Constraints on the degree to which a product, system or component can exchange information with other products, systems or components, and/or perform its required functions, while sharing the same hardware or software environment.

### 7.1.3.1 Co-existence

List of requirements on the degree to which a product can perform its required functions efficiently while sharing a common environment and resources with other products, without detrimental impact on any other product.

1. (to be filled)

### 7.1.3.2 Interoperability

List of requirements on the degree to which two or more systems, products or components can exchange information and use the information that has been exchanged.

1. (to be filled)

## 7.1.4 Usability

Constraints on the usability degree to which a product or system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.

### 7.1.4.1 Appropriateness recognizability

List of requirements on the degree to which users can recognize whether a product or system is appropriate for their needs.

1. (to be filled)

### 7.1.4.2 Learnability

List of requirements on the degree to which a product or system can be used by specified users to achieve specified goals of learning to use the product or system with effectiveness, efficiency, freedom from risk and satisfaction in a specified context of use.

1. (to be filled)

#### 7.1.4.3 Operability

List of requirements on the degree to which a product or system has attributes that make it easy to operate and control.

1. (to be filled)

#### 7.1.4.4 User error protection

List of requirements on the degree to which a system protects users against making errors.

1. (to be filled)

#### 7.1.4.5 User interface aesthetics

List of requirements on the degree to which a user interface enables pleasing and satisfying interaction for the user.

1. (to be filled)

#### 7.1.4.6 Accessibility

List of requirements on the degree to which a product or system can be used by people with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.

1. (to be filled)

### 7.1.5 Reliability

Constraints on the degree to which a system, product or component performs specified functions under specified conditions for a specified period of time.

#### 7.1.5.1 Maturity

List of requirements on the degree to which a system, product or component meets needs for reliability under normal operation.

1. (to be filled)

#### 7.1.5.2 Availability

List of requirements on the degree to which a system, product or component is operational and accessible when required for use.

1. (to be filled)

#### 7.1.5.3 Fault tolerance

List of requirements on the degree to which a system, product or component operates as intended despite the presence of hardware or software faults.

1. (to be filled)

#### 7.1.5.4 Recoverability

List of requirements on the degree to which, in the event of an interruption or a failure, a product or system can recover the data directly affected and re-establish the desired state of the system.

1. (to be filled)

#### 7.1.6 Security

Constraints on the degree to which a product or system protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization.

##### 7.1.6.1 Confidentiality

List of requirements on the degree to which a product or system ensures that data are accessible only to those authorized to have access.

1. (to be filled)

##### 7.1.6.2 Integrity

List of requirements on the degree to which a system, product or component prevents unauthorized access to, or modification of, computer programs or data.

1. (to be filled)

##### 7.1.6.3 Non-repudiation

List of requirements on the degree to which actions or events can be proven to have taken place, so that the events or actions cannot be repudiated later.

1. (to be filled)

##### 7.1.6.4 Accountability

List of requirements on the degree to which the actions of an entity can be traced uniquely to the entity.

1. (to be filled)

##### 7.1.6.5 Authenticity

List of requirements on the degree to which the identity of a subject or resource can be proved to be the one claimed.

1. (to be filled)

#### 7.1.7 Maintainability

Constraints on the degree of effectiveness and efficiency with which a product or system can be modified by the intended maintainers.

### 7.1.7.1 Modularity

List of requirements on the degree to which a system or computer program is composed of discrete components such that a change to one component has minimal impact on other components.

1. (to be filled)

### 7.1.7.2 Reusability

List of requirements on the degree to which an asset can be used in more than one system, or in building other assets.

1. (to be filled)

### 7.1.7.3 Analysability

List of requirements on the degree of effectiveness and efficiency with which it is possible to assess the impact on a product or system of an intended change to one or more of its parts, or to diagnose a product for deficiencies or causes of failures, or to identify parts to be modified.

1. (to be filled)

### 7.1.7.4 Modifiability

List of requirements on the degree to which a product or system can be effectively and efficiently modified without introducing defects or degrading existing product quality.

1. (to be filled)

### 7.1.7.5 Testability

List of requirements on the degree of effectiveness and efficiency with which test criteria can be established for a system, product or component and tests can be performed to determine whether those criteria have been met.

1. (to be filled)

## 7.1.8 Portability

Constraints on the degree of effectiveness and efficiency with which a system, product or component can be transferred from one hardware, software or other operational or usage environment to another.

### 7.1.8.1 Adaptability

List of requirements on the degree to which a product or system can effectively and efficiently be adapted for different or evolving hardware, software or other operational or usage environments.

1. (to be filled)

### 7.1.8.2 Installability

List of requirements on the degree of effectiveness and efficiency with which a product or system can be successfully installed and/or uninstalled in a specified environment.

1. (to be filled)

### 7.1.8.3 Replaceability

List of requirements on the degree to which a product can replace another specified software product for the same purpose in the same environment.

1. (to be filled)

## 7.2 Other Constraints

Any other unclassified constraints judged as required for the product under development.

# Appendix A

## Undocumented Messir Specification Elements

### A.1 Undocumented Use Case Instances

#### A.1.1 Undocumented User-Goal Level Use Case Instances

- usecases.uciugSecurelyUseSystem.uciugSecurelyUseSystem

#### A.1.2 Undocumented Use Case Instance Views

- uci-ucioeAddHospital
- uci-uciugSecurelyUseSystem

### A.2 Undocumented Concept Model Views

- cm-pt-dt-lv-02-dtGPSLocation

### A.3 Undocumented Operation Specifications

- icrash.concepts.primarytypes.datatypes.dtHash.is
- icrash.concepts.primarytypes.datatypes.dtHospitalID.is
- icrash.concepts.primarytypes.datatypes.dtHospitalInfo.is
- icrash.concepts.primarytypes.datatypes.dtQtyVictims.is
- icrash.concepts.primarytypes.datatypes.etSeverity.is

### A.4 Undocumented Test-Case Instance Specifications

- lu.uni.lassy.excalibur.examples.icrash.tests.testcase01.instance01.instance01
- lu.uni.lassy.excalibur.examples.icrash.tests.testcase01.instance01.instance01Part01
- lu.uni.lassy.excalibur.examples.icrash.tests.testcase01.instance01.instance01Part02



## Appendix B

Specification project  
`lu.uni.lassy.excalibur.examples.icrash`

## B.1 Use Cases Model

This section contains the use cases elicited during the requirements elicitation phase. The use cases are textually described as suggested by the **Messir** method and inspired by the standard Cokburn template [?].

### B.1.1 Use Cases

#### B.1.1.1 subfunction-oeCloseCrisis

the actCoordinator's goal is to declare a crisis as closed.

USE-CASE DESCRIPTION	
Name	oeCloseCrisis
Scope	system
Level	subfunction
<i>Primary actor(s)</i>	
1	actCoordinator[active]
<i>Goal(s) description</i>	
the actCoordinator's goal is to declare a crisis as closed.	
<i>Protocol condition(s)</i>	
1	the iCrash system has been deployed.
<i>Pre-condition(s)</i>	
1	none
<i>Main post-condition(s)</i>	
1	the crisis is known by the system to be closed.
2	a message ieMessage(AMessage) is sent to the actCoordinator to inform him that his crisis is now considered as closed.

Figure B.1 shows the use case diagram for the oeCloseCrisis subfunction use case

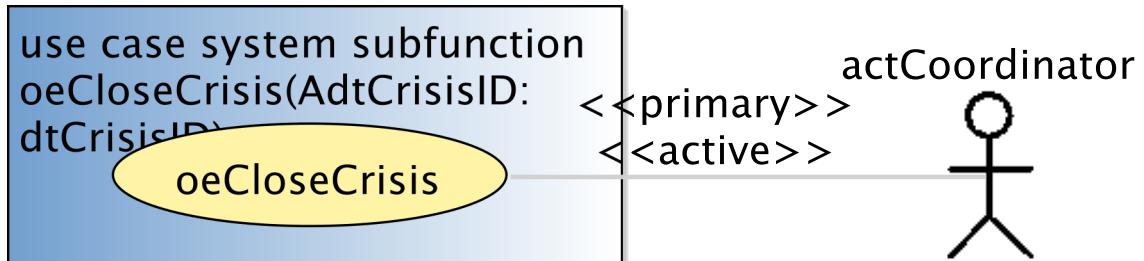


Figure B.1: oeCloseCrisis subfunction use case

# Appendix C

## Messir Specification Files Listing

### C.1 File ./src-gen/messir-spec/.views.msr

```
1 //  
2 //DON'T TOUCH THIS FILE !!!  
3 //  
4 package uuid7e0d382938204f3c9036c123484468fb {  
5   Concept Model {}  
6 }
```

Listing C.1: Messir Spec. file .views.msr.

### C.2 File ./src-gen/messir-spec/operations/concepts/secondarytypes-datatatypes/dtSMS.msr

```
1 package icrash.operations.concepts.secondarytypes.datatypes.dtSMS{  
2  
3 import lu.uni.lassy.messir.libraries.primitives  
4 import lu.uni.lassy.messir.libraries.calendar  
5 import lu.uni.lassy.messir.libraries.math  
6  
7 import icrash.concepts.primarytypes.datatypes  
8 import icrash.concepts.primarytypes.classes  
9 import icrash.concepts.secondarytypes.datatypes  
10 import icrash.concepts.secondarytypes.classes  
11  
12 Operation Model {  
13 operation: icrash.concepts.secondarytypes.datatypes.dtSMS.is():ptBoolean{  
14   postF{  
15     let TheResult: ptBoolean in  
16     let MaxLength: ptInteger in  
17     ( if  
18       ( MaxLength = 160  
19         and self.value.length().leq(MaxLength)  
20       )  
21     then (TheResult = true)  
22     else (TheResult = false)  
23     endif  
24     result = TheResult  
25   })  
26 prolog{ "src/Operations/Concepts/SecondaryTypesDatatypes/SecondaryTypesDatatypes-dtSMS-is.pl"}  
27 }  
28 }  
29 }
```

Listing C.2: Messir Spec. file dtSMS.msr.

### C.3 File ./src-gen/messir-spec/operations/environment/environment-actActivator-oeSetClock.msr

```

1 package icrash.operations.environment.actActivator.oeSetClock {
2
3 import icrash.environment
4
5 import lu.uni.lassy.messir.libraries.primitives
6 import lu.uni.lassy.messir.libraries.calendar
7 import lu.uni.lassy.messir.libraries.math
8
9 import icrash.concepts.primarytypes.datatypes
10 import icrash.concepts.primarytypes.classes
11
12 Operation Model {
13
14 operation: actActivator.outactActivator.oeSetClock(AcurrentClock:dtDateAndTime) :ptBoolean
15 {
16 preP{
17 let TheSystem: ctState in
18 let AvpStarted: ptBoolean in
19
20 /* PreP01 */
21 self.rnActor.rnSystem = TheSystem
22 and self.rnActor.rnSystem.vpStarted = AvpStarted
23 and AvpStarted = true
24 and TheSystem.clock.lt(AcurrentClock)
25 }
26 preF{true}
27
28 postF{
29 let TheSystem: ctState in
30 self.rnActor.rnSystem = TheSystem
31
32 /* PostF01 */
33 and TheSystem@post.clock = AcurrentClock
34 }
35 postP{true}
36
37 prolog{"src/Operations/Environment/OUT/outactActivator-oeSetClock.pl"}
38
39 }
40 }
41 }
```

Listing C.3: Messir Spec. file environment-actActivator-oeSetClock.msr.

### C.4 File ./src-gen/messir-spec/operations/environment/environment-actActivator-oeSollicitateCrisisHandling.msr

```

1 package icrash.operations.environment.actActivator.oeSollicitateCrisisHandling {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7
8 import icrash.concepts.primarytypes.datatypes
9 import icrash.concepts.primarytypes.classes
10 import icrash.environment
11
12 Operation Model {
13
14 operation: actActivator.outactActivator.oeSollicitateCrisisHandling():ptBoolean
15 {
16 preP{
17 let TheSystem: ctState in
```

```

18 let AvpStarted: ptBoolean in
19 let ColctCrisisToHandle:
20     Bag(ctCrisis) in
21
22 self.rnActor.rnSystem = TheSystem
23
24 /* PreP01 */
25 and TheSystem.vpStarted
26
27 /* PreP02 */
28 and TheSystem.rnctCrisis->select(handlingDelayPassed())
29     = ColctCrisisToHandle
30 and ColctCrisisToHandle->size().geq(1)
31 }
32 preF{true}
33
34 postF{
35 let TheSystem: ctState in
36 let AMessageForCrisisHandlers: dtComment in
37 let ColctCrisisToAllocateIfPossible:Bag(ctCrisis) in
38
39 self.rnActor.rnSystem = TheSystem
40 /* PostF01 */
41 and TheSystem.rnctCrisis->select(maxHandlingDelayPassed())
42     = ColctCrisisToAllocateIfPossible
43 and ColctCrisisToAllocateIfPossible->forAll(isAllocatedIfPossible())
44
45 /* PostF02 */
46 and TheSystem.rnctCrisis->select(handlingDelayPassed())
47     = ColctCrisisToHandle
48
49 and ColctCrisisToHandle->msrColSubtract(ColctCrisisToAllocateIfPossible)
50     = ColctCrisisToRemind
51
52 and if (ColctCrisisToRemind->size().geq(1))
53     then (AMessageForCrisisHandlers.value
54         ='There are alerts pending since more than the defined delay. Please REACT !'
55         and TheSystem.rnactAdministrator.
56             rnInterfaceIN^ieMessage(AMessageForCrisisHandlers)
57         and TheSystem.rnactCoordinator
58             ->forAll(rnInterfaceIN^ieMessage(AMessageForCrisisHandlers))
59     )
60 else true
61 endif
62 }
63 postP{
64 let TheSystem: ctState in
65 let TheClock: dtDateAndTime in
66
67 self.rnActor.rnSystem = TheSystem
68 and TheSystem.clock = TheClock
69 and TheSystem@post.vpLastReminder = TheClock
70 }
71
72 prolog{"src/Operations/Environment/OUT/outactActivator-oeSollicitateCrisisHandling.pl"}
73 }
74 }
75 }

```

Listing C.4: Messir Spec. file environment-actActivator-oeSollicitateCrisisHandling.msr.

## C.5 File ./src-gen/messir-spec/operations/environment/environment-actAdministrator-oeAddCoordinator.msr

```

1 package icrash.operations.environment.actAdministrator.oeAddCoordinator {
2
3 import lu.uni.lassy.messir.libraries.primitives
4

```

```

5 import icrash.concepts.primarytypes.datatypes
6 import icrash.concepts.primarytypes.classes
7 import icrash.environment
8
9 Operation Model {
10
11 operation: actAdministrator.outactAdministrator.oeAddCoordinator(AdtCoordinatorID:dtCoordinatorID,
12 AdtLogin:dtLogin, AdtPassword:dtPassword):ptBoolean
12 {
13 prep{
14 let TheSystem: ctState in
15 let TheActor:actAdministrator in
16
17 self.rnActor.rnSystem = TheSystem
18 and self.rnActor = TheActor
19
20 /* PreP01 */
21 and TheSystem.vpStarted = true
22 /* PreP02 */
23 and TheActor.rnctAuthenticated.vpIsLogged = true
24 }
25 preF{
26 let TheSystem: ctState in
27 let TheActor:actAdministrator in
28 let ColctCoordinators:Bag(ctCoordinator) in
29
30 self.rnActor.rnSystem = TheSystem
31 and self.rnActor = TheActor
32 /* PreF01 */
33 and TheSystem.rnctCoordinator->select(id.eq(AdtCoordinatorID))
34 = ColctCoordinators
35 and ColctCoordinators->isEmpty() = true
36 }
37 postF{
38 let TheSystem: ctState in
39 let TheactCoordinator:actCoordinator in
40 let ThectCoordinator:ctCoordinator in
41 self.rnActor.rnSystem = TheSystem
42 and self.rnActor = TheActor
43 /* PostF01 */
44 TheactCoordinator.init()
45 /* PostF02 */
46 and ThectCoordinator.init(AdtCoordinatorID,AdtLogin,AdtPassword)
47
48 /* PostF03 */
49 and TheactCoordinator@post.rnctCoordinator = ThectCoordinator
50
51 /* PostF04 */
52 and ThectCoordinator@post.rnactAuthenticated = TheactCoordinator
53
54 /* PostF05 */
55 and TheActor.rnInterfaceIN^ieCoordinatorAdded()
56 }
57 postP{true}
58
59 prolog{"src/Operations/Environment/OUT/outactAdministrator-oeAddCoordinator.pl"}
60 }
61 }
62 }

```

Listing C.5: Messir Spec. file environment-actAdministrator-oeAddCoordinator.msr.

## C.6 File ./src-gen/messir-spec/operations/environment/environment-actAdministrator-oeAddHospital.msr

```

1 package icrash.environment.operations.actAdministrator.outactAdministrator.oeAddHospital {
2
3 import lu.uni.lassy.messir.libraries.primitives

```

```

4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.concepts.primarytypes.classes
9 import icrash.environment
10
11 Operation Model {
12
13     operation: icrash.environment.actAdministrator.outactAdministrator.oeAddHospital(AdtHospitalID:
14         AdtGPSLocation:dtGPSLocation
15     ):ptBoolean(
16         // include below the specification information (pre,post or ocl or prolog)
17
18         preP {
19             let TheSystem: ctState in
20             let TheActor:actAdministrator in
21
22             self.rnActor.rnSystem = TheSystem
23             and self.rnActor = TheActor
24
25             /* PreP01 */
26             and TheSystem.vpStarted = true
27             /* PreP02 */
28             and TheActor.rnctAuthenticated.vpIsLogged = true
29         }
30
31         preF{
32             let TheSystem: ctState in
33             let TheActor:actAdministrator in
34             let TheHospitals:Bag(ctHospital) in
35
36             self.rnActor.rnSystem = TheSystem
37             and self.rnActor = TheActor
38             /* PreF01 */
39             and TheSystem.rnctCoordinator->select(id.eq(AdtHospitalID)) = TheHospitals
40             and TheHospitals->isEmpty() = true
41         }
42
43         postF{
44             let TheSystem: ctState in
45             let TheActor:actAdministrator in
46             let ThectHospital: ctHospital in
47             let TheactHospital: actHospital in
48
49             self.rnActor.rnSystem = TheSystem
50             and self.rnActor = TheActor
51
52             and TheactHospital.init()
53
54             and ThectHospital.init(AdtHospitalID, AdtGPSLocation)
55
56             and TheactHospital@post.rnctHospital = ThectHospital
57
58             and ThectHospital@post.rnactHospital = TheactHospital
59
60             and TheActor.rnInterfaceIN^ieHospitalAdded()
61         }
62
63         postP{true}
64
65     }
66 }
67 }
```

Listing C.6: Messir Spec. file environment-actAdministrator-oeAddHospital.msr.

## C.7 File ./src-gen/messir-spec/operations/environment/environment-actAdministrator-oeDeleteCoordinator.msr

```

1 package icrash.operations.environment.actAdministrator.oeDeleteCoordinator {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.calendar
6
7 import icrash.environment
8
9 import icrash.concepts.primarytypes.datatypes
10 import icrash.concepts.primarytypes.classes
11
12 Operation Model {
13
14 operation: actAdministrator.outactAdministrator.oeDeleteCoordinator(AdtCoordinatorID:dtCoordinatorID
15 ) :ptBoolean
16 {
17 prep{
18 let TheSystem: ctState in
19 let TheActor:actAdministrator in
20
21 self.rnActor.rnSystem = TheSystem
22 and self.rnActor = TheActor
23
24 /* PreP01 */
25 and TheSystem.vpStarted = true
26 /* PreP02 */
27 and TheActor.rnctAuthenticated.vpIsLogged = true
28 }
29 preF{
30 let TheSystem: ctState in
31 let TheActor:actAdministrator in
32
33 self.rnActor.rnSystem = TheSystem
34 and self.rnActor = TheActor
35 /* PreF01 */
36 TheSystem.rnctCoordinator->select(id.eq(AdtCoordinatorID))
37 = ColctCoordinators
38 and ColctCoordinators->size().eq(1)
39 }
40 postF{
41 let TheSystem: ctState in
42 let TheActor:actAdministrator in
43 let ThectCoordinator:ctCoordinator in
44
45 self.rnActor.rnSystem = TheSystem
46 and self.rnActor = TheActor
47
48 /* PostF01 */
49 TheSystem.rnctCoordinator->select(id.eq(AdtCoordinatorID))
50 = ThectCoordinator
51 and ThectCoordinator.rnactCoordinator->forAll(msrIsKilled)
52 and ThectCoordinator.msrIsKilled
53
54 /* Post Protocol:*/
55 /* PostP01 */
56 and true
57 }
58 postP{true}
59
60 prolog{"src/Operations/Environment/OUT/outactAdministrator-oeDeleteCoordinator.pl"}
61 }
62 }
63 }

```

Listing C.7: Messir Spec. file environment-actAdministrator-oeDeleteCoordinator.msr.

## C.8 File ./src-gen/messir-spec/operations/environment/environment-actAdministrator-oeDeleteHospital.msr

```

1 package icrash.environment.operations.actAdministrator.outactAdministrator.oeDeleteHospital {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.concepts.primarytypes.classes
9 import icrash.environment
10
11 Operation Model {
12
13     operation: icrash.environment.actAdministrator.outactAdministrator.oeDeleteHospital(
14         AdtHospitalID:dtHospitalID
15     ):ptBoolean{
16         // include below the specification information (pre,post or ocl or prolog)
17         preP {
18             let TheSystem: ctState in
19                 let TheActor:actAdministrator in
20
21                 self.rnActor.rnSystem = TheSystem
22                 and self.rnActor = TheActor
23                 and TheSystem.vpStarted = true
24                 and TheActor.rnctAuthenticated.vpIsLogged = true
25         }
26
27         preF {
28             let TheSystem: ctState in
29                 let TheActor:actAdministrator in
30                 let TheHospitals: Set(ctHospital) in
31
32                     self.rnActor.rnSystem = TheSystem
33                     and self.rnActor = TheActor
34
35                     TheSystem.rnctHospital->select(id.eq(AdtHospitalID)) = TheHospitals
36                     and TheHospitals->size() = 1
37     }
38
39     postF{
40         let TheSystem: ctState in
41             let TheActor:actAdministrator in
42                 let TheHospital:ctHospital in
43
44                     self.rnActor.rnSystem = TheSystem
45                     and self.rnActor = TheActor
46
47                     TheSystem.rnctHospital->select(id.eq(AdtHospitalID)) = TheHospital //Consultar
48                     and TheHospital.rnactHospital->forAll(msrIsKilled)
49                     and TheHospital.msrIsKilled
50
51                     and TheActor.rnInterfaceIN^ieHospitalDeleted(AdtHospitalID)
52     }
53
54     postP{true}
55 }
56 }
57 }
```

Listing C.8: Messir Spec. file environment-actAdministrator-oeDeleteHospital.msr.

## C.9 File ./src-gen/messir-spec/operations/environment/environment-actAuthenticated.msr

```
1 package icrash.operations.environment.actAuthenticated{
```

```

2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 import icrash.concepts.primarytypes.datatypes
6 import icrash.concepts.primarytypes.classes
7 import icrash.concepts.secondarytypes.datatypes
8 import icrash.concepts.secondarytypes.classes
9 import icrash.environment
10
11 Operation Model {
12
13 operation: actAuthenticated.outactAuthenticated.oeLogin(AdtLogin:dtLogin, AdtPassword:dtPassword):
14     ptBoolean
15 {
16     let TheSystem: ctState in
17     let TheActor:actAuthenticated in
18     self.rnActor.rnSystem = TheSystem
19     and self.rnActor = TheActor
20
21 /* PreP01 */
22 and TheSystem.vpStarted = true
23 /* PreP02 */
24 and TheActor.rnctAuthenticated.vpIsLogged = false
25 }
26 preF{
27 /* PreF01 */
28 true
29 }
30 postF{
31 let TheSystem: ctState in
32 let TheactAuthenticated:actAuthenticated in
33
34 let AptStringMessageForTheactAuthenticated: ptString in
35 let AptStringMessageForTheactAdministrator:ptString in
36
37 self.rnActor.rnSystem = TheSystem
38 and self.rnActor = TheactAuthenticated
39
40 and /* PostF01 */
41     if (TheactAuthenticated.rnctAuthenticated.pwd
42         = AdtPassword
43         and TheactAuthenticated.rnctAuthenticated.login
44         = AdtLogin
45     )
46     then (AptStringMessageForTheactAuthenticated.eq('You are logged ! Welcome ...')
47         and TheactAuthenticated.rnInterfaceIN^ieMessage(AptStringMessageForTheactAuthenticated)
48     )
49     else (AptStringMessageForTheactAuthenticated
50         .eq('Wrong identification information ! Please try again ...')
51         and TheactAuthenticated.rnInterfaceIN^ieMessage(AptStringMessageForTheactAuthenticated)
52         and AptStringMessageForTheactAdministrator.eq('Intrusion tentative !')
53         and TheSystem.rnactAdministrator
54             .rnInterfaceIN^ieMessage(AptStringMessageForTheactAdministrator)
55     )
56 endif
57 }
58 postP{
59 let TheSystem: ctState in
60 let TheactAuthenticated:actAuthenticated in
61
62 self.rnActor.rnSystem = TheSystem
63 and self.rnActor = TheactAuthenticated
64 /* PostP01 */
65 if (TheactAuthenticated.rnctAuthenticated.pwd = AdtPassword
66     and TheactAuthenticated.rnctAuthenticated.login = AdtLogin
67     )
68 then (TheactAuthenticated.rnctAuthenticated@post.vpIsLogged = true)
69 else true
70 endif

```

```

71 }
72 prolog {"src/Operations/Environment/OUT/outactAuthenticated-oeLogout.pl"}
73 }
74 /* ----- */
75
76 operation: actAuthenticated.outactAuthenticated.oeLogout () :ptBoolean{
77
78 preP{
79   let TheSystem: ctState in
80   let TheActor:actAdministrator in
81   self.rnActor.rnSystem = TheSystem
82   and self.rnActor = TheActor
83
84 /* PreP01 */
85   and TheSystem.vpStarted = true
86 /* PreP02 */
87   and TheActor.rnctAuthenticated.vpIsLogged = true
88 }
89 preF{
90 /* PreF01 */
91 true
92 }
93 postF{
94   let TheSystem: ctState in
95   let TheactAuthenticated:actAuthenticated in
96   AptStringMessageForTheactAuthenticated: ptString in
97
98   self.rnActor.rnSystem = TheSystem
99   and self.rnActor = TheactAuthenticated
100
101 /* PostF01 */
102 AptStringMessageForTheactAuthenticated.eq('You are logged out ! Good Bye ...')
103   and TheactAuthenticated.rnInterfaceIN^ieMessage(AptStringMessageForTheactAuthenticated)
104 }
105 postP{
106   let TheSystem: ctState in
107   let TheactAuthenticated:actAuthenticated in
108
109   self.rnActor.rnSystem = TheSystem
110   and self.rnActor = TheactAuthenticated.asset
111 /* PostP01 */
112   TheactAuthenticated.rnctAuthenticated@post.vpIsLogged = false
113 }
114 prolog {"src/Operations/Environment/OUT/outactAuthenticated-oeLogout.pl"}
115 }
116 }
117 }

```

Listing C.9: Messir Spec. file environment-actAuthenticated.msr.

## C.10 File ./src-gen/messir-spec/operations/environment/environment-actComCompany.msr

```

1 // Do not add/remove lines because code is inserted in slides
2
3 package icrash.operations.environment.actComCompany{
4
5 import lu.uni.lassy.messir.libraries.primitives
6 import lu.uni.lassy.messir.libraries.calendar
7 import lu.uni.lassy.messir.libraries.math
8
9 import icrash.concepts.primarytypes.datatypes
10 import icrash.concepts.primarytypes.classes
11 import icrash.concepts.secondarytypes.datatypes
12
13 import icrash.environment
14
15 Operation Model {

```

```

16
17 operation: actComCompany.outactComCompany.oeAlert(
18   AetKind:etHumanKind,
19   AdtMyDate:dtDate,
20   AdtTime:dtTime,
21   AdtPhoneNumber:dtPhoneNumber,
22   AdtGPSLocation:dtGPSLocation,
23   AdtComment:dtComment
24 ) :ptBoolean{
25
26 preP{
27   let TheSystem: ctState in
28   self.rnActor.rnSystem = TheSystem
29
30 /* PreP01 */
31 and TheSystem.vpStarted = true
32 }
33 preF{
34   let TheSystem: ctState in
35   self.rnActor.rnSystem = TheSystem
36
37 /* PreF01 */
38 and (TheSystem.clock.date.gt(AdtDate)
39   or (TheSystem.clock.date.eq(AdtDate)
40     and TheSystem.clock.time.gt(AdtTime)
41   )
42 )
43 }
44 postF{
45   let TheSystem: ctState in
46
47   let ActHuman:ctHuman in
48   let TheactComCompany:actComCompany in
49   let ActAlert:ctAlert in
50   let AAlertInstant:dtDateAndTime in
51   let AetAlertStatus:etAlertStatus in
52   let ActAlertNearBy:ctAlert in
53   let ActCrisis:ctCrisis in
54   let AdtCrisisID:dtCrisisID in
55   let AetCrisisType:etCrisisType in
56   let AetCrisisStatus:etCrisisStatus in
57   let ACrisisInstant:dtDateAndTime in
58   let ACrisisdtComment:dtComment in
59   let AptStringMessage:ptString in
60   let AdtSMS:dtSMS in
61   let AdtAlertID:dtAlertID in
62
63   self.rnActor.rnSystem = TheSystem
64   and self.rnActor = TheactComCompany
65 /* PostF01 */
66 TheSystem.nextValueForAlertID=PrenextValueForAlertID
67 and PrenextValueForAlertID.add(1) = PostnextValueForAlertID
68 and TheSystem@post.nextValueForAlertID = PostnextValueForAlertID
69
70 /* PostF02 */
71 and AAlertInstant.date=AdtDate
72 and AAlertInstant.time=AdtTime
73
74 and AetAlertStatus=pending
75
76 and TheSystem.nextValueForAlertID.todtString().eq(AdtAlertID)
77
78 and ActAlert.init(AdtAlertID,
79   AetAlertStatus,
80   AdtGPSLocation,
81   AAlertInstant,
82   AdtComment)
83
84 /* PostF03 */
85 and TheSystem.rnctAlert.select(location.isNearTo(AdtGPSLocation)) = ColctAlertsNearBy

```

```

86 and if (ColctAlertsNearBy->size()=0)
87   then (TheSystem.nextValueForCrisisID = PrenextValueForCrisisID
88     and PrenextValueForCrisisID.add(1) = PostnextValueForCrisisID
89     and TheSystem@post.nextValueForCrisisID = PostnextValueForCrisisID
90     and TheSystem.nextValueForCrisisID.todtString().eq(AdtCrisisID)
91     and AdtCrisisType = small
92     and AetCrisisStatus = pending
93     and ACrisisInstant= AAlertInstant
94     and ACrisisdtComment = 'no reporting yet defined'
95     and ActCrisis.init( AdtCrisisID,
96       AdtCrisisType,
97       AetCrisisStatus,
98       AdtGPSLocation,
99       ACrisisInstant,
100      ACrisisdtComment)
101    )
102 else (ColctAlertsNearBy.rnTheCrisis->msrAny(true) = ActCrisis)
103 endif
104
105 /* PostF04 */
106 and ActAlert@post.rnTheCrisis = ActCrisis
107
108 /* PostF05 */
109 and TheSystem.rnctHuman->select(id.eq(AdtPhoneNumber)) = HumanColl
110
111 and HumanColl->select(kind.etEq(AetHumanKind)) = HumanCol2
112 and if (HumanCol2->msrIsEmpty)
113   then (ActHuman.init(AdtPhoneNumber,AetHumanKind)
114     and ActHuman@post.rnactComCompany = TheactComCompany
115   )
116 else (HumanCol2->any(true) = ActHuman)
117 endif
118
119 and ActHuman.rnSignaled->msrIncluding(ActAlert) = ColAlerts
120
121 and ActHuman@post.rnSignaled = ColAlerts
122
123 /* PostF06 */
124 AdtSMS.value = 'Your alert has been registered. We will handle it and keep you informed'
125 and TheactComCompany.rnInterfaceIN^ieSmsSend(AdtPhoneNumber,AdtSMS)
126 }
127 /* Post Protocol:*/
128 /* PostP01 */
129 postP{true}
130
131 prolog{"src/Operations/Environment/OUT/outactComCompany-oeAlert.pl"}
132 }
133 }
134 }

```

Listing C.10: Messir Spec. file environment-actComCompany.msr.

## C.11 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeCloseCrisis.msr

```

1 package icrash.operations.environment.actCoordinator.oeCloseCrisis {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9
10 Operation Model {
11
12 operation: actCoordinator.outactCoordinator.oeCloseCrisis(AdtCrisisID:dtCrisisID):ptBoolean{
13 prolog{"src/Operations/Environment/OUT/outactCoordinator-oeCloseCrisis.pl"}

```

```

14 }
15 }
16 }
```

Listing C.11: Messir Spec. file environment-actCoordinator-oeCloseCrisis.msr.

## C.12 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeGetAlertsSet.msr

```

1 package icrash.operations.environment.actCoordinator.oeGetAlertsSet {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7
8 import icrash.concepts.primarytypes.datatypes
9 import icrash.environment
10
11 import icrash.concepts.primarytypes.classes
12
13 Operation Model {
14
15   operation: actCoordinator.outactCoordinator.oeGetAlertsSet(
16     AetAlertStatus:etAlertStatus
17   ):ptBoolean{
18
19   preP {
20     let TheSystem: ctState in
21       let TheActor:actAuthenticated in
22         self.rnActor.rnSystem = TheSystem
23         and self.rnActor = TheActor
24
25       /* PreP01 */
26       and TheSystem.vpStarted = true
27       /* PreP02 */
28       and TheActor.rnctAuthenticated.vpIsLogged = false
29   }
30
31   preF {true}
32
33   postF {
34     let
35       theSystem: ctState = self.rnActor.rnSystem,
36       theAlerts: Set(ctAlert) = Set{}
37     in
38       theAlerts = theSystem.rnctAlert-> select(a:ctAlert | a.status = AetAlertStatus) and
39       self.rnActor.rnInterfaceIN^ieSendAlerts(theAlerts)
40   }
41
42   postP {true}
43
44 //prolog("src/Operations/Environment/OUT/outactCoordinator-oeGetAlertsSet.pl")
45 }
46 }
47 }
```

Listing C.12: Messir Spec. file environment-actCoordinator-oeGetAlertsSet.msr.

## C.13 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeGetCrisisSet.msr

```

1 package icrash.operations.environment.actCoordinator.oeGetCrisisSet {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
```

```

5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9
10 Operation Model {
11
12 operation: actCoordinator.outactCoordinator.oeGetCrisisSet(AetCrisisStatus:etCrisisStatus) :ptBoolean
13 {
14     prolog{"src/Operations/Environment/OUT/outactCoordinator-oeGetCrisisSet.pl"}
15 }
16 }
```

Listing C.13: Messir Spec. file environment-actCoordinator-oeGetCrisisSet.msr.

## C.14 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeInvalidateAlert.msr

```

1 package icrash.operations.environment.actCoordinator.oeInvalidateAlert {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9 import icrash.concepts.primarytypes.classes
10
11 Operation Model {
12
13 operation: actCoordinator.outactCoordinator.oeInvalidateAlert(AdtAlertID:dtAlertID) :ptBoolean{
14     preP{
15         let theSystem: ctState in
16         let theActor:actAuthenticated in
17         self.rnActor.rnSystem = TheSystem
18         and self.rnActor = TheActor
19
20         /* PreP01 */
21         and TheSystem.vpStarted = true
22         /* PreP02 */
23         and TheActor.rnctAuthenticated.vpIsLogged = true
24     }
25
26     preF{
27         let theSystem: ctState = self.rnActor.rnSystem in
28         let theAlerts: Set(ctAlert) = theSystem.rnctAlert in
29         theAlerts -> exists(a: ctAlert | a.id = AdtAlertID)
30     }
31
32     postF{
33         let theSystem: ctState in
34         let theAlerts: Set(ctAlert) in
35         let theAlert: ctAlert in
36         theSystem = self.rnActor.rnSystem and
37         theAlerts = theSystem.rnctAlert and
38
39         theAlerts->any(a: ctAlert | a.id = AdtAlertID) = theAlert //  

40         theAlert@post.status = "invalid"
41
42         self.rnActor.rnInterfaceIN^ieInvalidateAlert(theAlert.id)
43     }
44
45     postP{true}
46     prolog{"src/Operations/Environment/OUT/outactCoordinator-oeInvalidateAlert.pl"}
47 }
48 }
```

49 }

Listing C.14: Messir Spec. file environment-actCoordinator-oeInvalidateAlert.msr.

## C.15 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeReportOnCrisis.msr

```

1 package icrash.operations.environment.actCoordinator.oeReportOnCrisis {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9
10 Operation Model {
11
12 operation: actCoordinator.outactCoordinator.oeReportOnCrisis(AdtCrisisID:dtCrisisID, AdtComment:
13     dtComment):ptBoolean{
14     prolog {"src/Operations/Environment/OUT/outactCoordinator-oeReportOnCrisis.pl"}
15 }
16 }
17 }
```

Listing C.15: Messir Spec. file environment-actCoordinator-oeReportOnCrisis.msr.

## C.16 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeSendHospitalInfo.msr

```

1 package icrash.environment.operations.actCoordinator.outactCoordinator.oeSendHospitalInfo {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.concepts.primarytypes.classes
9 import icrash.environment
10
11 Operation Model {
12
13     operation: icrash.environment.actCoordinator.outactCoordinator.oeSendHospitalInfo(AdtHospitalInfo:
14         dtHospitalInfo,
15         AdtCrisisID:dtCrisisID):ptBoolean{
16         // include below the specification information (pre,post or ocl or prolog)
17
18         preP {
19             let
20                 TheSystem: ctState
21             in
22                 self.rnActor.rnSystem = TheSystem
23                 TheSystem.vpStarted = true
24             }
25
26         preF {
27             let
28                 TheSystem: ctState,
29                 TheCrises: Set(ctCrisis),
30                 TheCrisis: ctCrisis,
31                 TheActCoordinator : actCoordinator,
32                 TheCtCoordinator: ctCoordinator,
33                 TheHandledCrisis: Set(ctCrisis)
34             in
35                 self.rnActor.rnSystem = TheSystem
36         }
37
38         postP {
39             let
40                 TheSystem: ctState
41             in
42                 self.rnActor.rnSystem = TheSystem
43         }
44
45         postF {
46             let
47                 TheSystem: ctState
48             in
49                 self.rnActor.rnSystem = TheSystem
50         }
51
52         ocl {
53             self.rnActor.rnSystem = TheSystem
54         }
55     }
56
57     postP {
58         let
59             TheSystem: ctState
60         in
61             self.rnActor.rnSystem = TheSystem
62     }
63
64     postF {
65         let
66             TheSystem: ctState
67         in
68             self.rnActor.rnSystem = TheSystem
69     }
70
71     ocl {
72         self.rnActor.rnSystem = TheSystem
73     }
74 }
```

```

35   TheActCoordinator = self.rnActor
36   TheActCoordinator.rnctCoordinator = TheCtCoordinator
37   TheCtCoordinator.rnHandled = TheHandledCrisis
38   TheHandledCrisis -> exists (c:ctCrisis | c.id = AdtCrisisID)
39 }
40
41 postF {
42   let
43     TheSystem: ctState,
44     TheHospitals: Set(ctHospital)
45   in
46     self.rnActor.rnSystem = TheSystem
47     TheSystem.rnctHospital = TheHospitals
48     TheHospitals -> forAll(h:ctHospital | h.attLocation.isNearTo(AdtHospitalInfo.location) and h.
49       rnactHospital.rnInterfaceIN^ieSendHospitalInfo(AdtHospitalInfo))
50   }
51   postP{true}
52
53 }
54 }
55 }
```

Listing C.16: Messir Spec. file environment-actCoordinator-oeSendHospitalInfo.msr.

## C.17 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeSetCrisisHandler.msr

```

1 package icrash.operations.environment.actCoordinator.oeSetCrisisHandler {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7
8 import icrash.concepts.primarytypes.datatypes
9 import icrash.concepts.primarytypes.classes
10 import icrash.concepts.secondarytypes.datatypes
11 import icrash.environment
12
13 Operation Model {
14
15 operation: actCoordinator.outactCoordinator.oeSetCrisisHandler(AdtCrisisID:dtCrisisID):ptBoolean{
16   prolog {"src/Operations/Environment/OUT/outactCoordinator-oeSetCrisisHandler.pl"}
17 }
18
19 }
20 }
```

Listing C.17: Messir Spec. file environment-actCoordinator-oeSetCrisisHandler.msr.

## C.18 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeSetCrisisStatus.msr

```

1 package icrash.operations.environment.actCoordinator.oeSetCrisisStatus {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9
10 Operation Model {
11
12 operation: actCoordinator.outactCoordinator.oeSetCrisisStatus(AdtCrisisID:dtCrisisID,
13   AetCrisisStatus:etCrisisStatus):ptBoolean{
```

```

13 prolog{"src/Operations/Environment/OUT/outactCoordinator-oeSetCrisisStatus.pl"}
14 }
15
16 }
17 }
```

Listing C.18: Messir Spec. file environment-actCoordinator-oeSetCrisisStatus.msr.

### C.19 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeSetCrisisType.msr

```

1 package icrash.operations.environment.actCoordinator.oeSetCrisisType {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9
10 Operation Model {
11
12 operation: actCoordinator.outactCoordinator.oeSetCrisisType(AdtCrisisID:dtCrisisID, AetCrisisType:
    etCrisisType):ptBoolean{
13 prolog{"src/Operations/Environment/OUT/outactCoordinator-oeSetCrisisType.pl"}
14 }
15
16 }
17 }
```

Listing C.19: Messir Spec. file environment-actCoordinator-oeSetCrisisType.msr.

### C.20 File ./src-gen/messir-spec/operations/environment/environment-actCoordinator-oeValidateAlert.msr

```

1 package icrash.operations.environment.actCoordinator.oeValidateAlert {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.string
6 import lu.uni.lassy.messir.libraries.calendar
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.environment
9 import icrash.concepts.primarytypes.classes
10
11 Operation Model {
12
13 operation: actCoordinator.outactCoordinator.oeValidateAlert(
14     AdtAlertID:dtAlertID
15 ):ptBoolean{
16
17 preP {
18     let theSystem: ctState in
19     let theActor:actAuthenticated in
20     self.rnActor.rnSystem = TheSystem
21     and self.rnActor = TheActor
22
23 /* PreP01 */
24     and TheSystem.vpStarted = true
25 /* PreP02 */
26     and TheActor.rnctAuthenticated.vpIsLogged = true
27 }
28
29 preF {
30     let theSystem: ctState = self.rnActor.rnSystem in
31     let theAlerts: Set(ctAlert) = theSystem.rnctAlert in
```

```

32     theAlerts -> exists(a: ctAlert | a.id = AdtAlertID)
33 }
34
35 postF {
36     let theSystem: ctState in
37     let theAlerts: Set(ctAlert) in
38     let theAlert: ctAlert in
39     let theAlertsBackup: Set(ctAlertBackup) in
40     let theAlertBackup: ctAlertBackup in
41
42     theSystem = self.rnActor.rnSystem and
43     theAlerts = theSystem.rnctAlert and
44     theAlertsBackup = theSystem.rnctAlertBackup and
45     theAlerts->any(a: ctAlert | a.id = AdtAlertID) = theAlert and
46     theAlertsBackup->any(a: ctAlertBackup | a.id = AdtAlertID) = theAlertBackup and
47
48     // Checking integrity
49     if (theAlert.hash.isEqual(theAlertBackup.hash))
50     then (theAlert@post.status = "valid")
51     else (theAlert@post = theAlertBackup
52         and theAlert@post.status = "valid"
53         and theAlerts@post = (theAlerts.excluding(theAlert)).including(theAlert@post)
54     )
55     endif
56     self.rnActor.rnInterfaceIN^ieValidateAlert(theAlert.id)
57 }
58
59 postP {
60     true
61 }
62
63 //prolog("src/Operations/Environment/OUT/outactCoordinator-oeValidateAlert.pl")
64 }
65
66 }
67 }
```

Listing C.20: Messir Spec. file environment-actCoordinator-oeValidateAlert.msr.

## C.21 File ./src-gen/messir-spec/operations/environment/environment-actMsrCreator-init.msr

```

1 package icrash.operations.icrash.environment.actMsrCreator.init {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import icrash.environment
5
6 Operation Model {
7
8 operation: actMsrCreator.init():ptBoolean{}
9 // generic operation provided by the simulator
10 }
11 }
```

Listing C.21: Messir Spec. file environment-actMsrCreator-init.msr.

## C.22 File ./src-gen/messir-spec/operations/environment/environment-actMsrCreator-oeCreateSystemAndEnvironment.msr

```

1 package icrash.operations.environment.actMsrCreator.oeCreateSystemAndEnvironment{
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.calendar
6
7 import icrash.concepts.primarytypes.datatypes
```

```

8 import icrash.concepts.primarytypes.classes
9 import icrash.concepts.secondarytypes.datatypes
10 import icrash.concepts.secondarytypes.classes
11 import icrash.environment
12
13 Operation Model {
14
15 operation: actMsrCreator.outactMsrCreator.oeCreateSystemAndEnvironment (AqtyComCompanies:ptInteger):
16     ptBoolean
17 {preP{true}
18 preF{true}
19 postF{
20     let TheSystem: ctState in
21     let AactMsrCreator: actMsrCreator in
22     let AactAdministrator: actAdministrator in
23     let AnextValueForAlertID: dtInteger in
24     let AnextValueForCrisisID: dtInteger in
25     let Aclock: dtDateAndTime in
26     let AcrisisReminderPeriod: dtSecond in
27     let AmaxCrisisReminderPeriod: dtSecond in
28     let AvpStarted: ptBoolean in
29
30     /* PostF01 -- MUST ALWAYS BE MADE FIRST -- */
31     AnextValueForAlertID.value.eq(1)
32     and AnextValueForCrisisID.value.eq(1)
33     and Aclock.date.year.value = 1970
34     and Aclock.date.month.value = 01
35     and Aclock.date.day.value = 01
36     and Aclock.time.hour.value = 00
37     and Aclock.time.minute.value = 00
38     and Aclock.time.second.value = 00
39
40     and AcrisisReminderPeriod.value.eq(300)
41     and AmaxCrisisReminderPeriod.value.eq(1200)
42     and AvpStarted = true
43     and TheSystem.init(AnextValueForAlertID,
44         AnextValueForCrisisID,
45         Aclock,
46         AcrisisReminderPeriod,
47         AmaxCrisisReminderPeriod,
48         Aclock,
49         AvpStarted
50     )
51     /* PostF02*/
52     and AactMsrCreator.init()
53     /* PostF03 */
54     and let AactComCompanyCol: Bag(actComCompany) in
55     AactComCompanyCol->size() = AqtyComCompanies
56     AactComCompanyCol-> forAll(init())
57     /* PostF04*/
58     and AactAdministrator.init()
59     /* PostF05*/
60     and let AactActivator:actActivator in
61     AactActivator.init()
62     /* PostF06 */
63     and let ActAdministrator:ctAdministrator in
64     let AdtLogin:dtLogin in
65     let AdtPassword:dtPassword in
66     AdtLogin.value.eq('icrashadmin')
67     and AdtPassword.value.eq('7WXC1359')
68     and ActAdministrator.init(AdtLogin,AdtPassword)
69     /* PostF07*/
70     and ActAdministrator@post.rnactAuthenticated = AactAdministrator
71 postP{true}
72 prolog{ "src/Operations/Environment/OUT/outactMsrCreator-oeCreateSystemAndEnvironment.pl"}
73
74 }
75 }
76

```

77 }

Listing C.22: Messir Spec. file environment-actMsrCreator-oeCreateSystemAndEnvironment.msr.

## C.23 File ./src-gen/messir-spec/environment/environment.msr

```

1 package icrash.environment{
2
3 import icrash.concepts.primarytypes.datatypes
4 import icrash.concepts.primarytypes.classes
5 import icrash.concepts.secondarytypes.datatypes
6 import lu.uni.lassy.messir.libraries.primitives
7 import lu.uni.lassy.messir.libraries.math
8 import lu.uni.lassy.messir.libraries.calendar
9
10 Environment Model {
11
12   actor actMsrCreator role rnactMsrCreator cardinality [1..1] {
13
14     operation init():ptBoolean
15
16     input interface inactMsrCreator {
17     }
18     output interface outactMsrCreator {
19       operation oeCreateSystemAndEnvironment(AqtyComCompanies:ptInteger ):ptBoolean
20     }
21   }
22
23   actor actAdministrator
24     role rnactAdministrator
25     cardinality [1..1]
26     extends actAuthenticated {
27
28     operation init():ptBoolean
29
30     output interface outactAdministrator{
31
32       operation oeAddCoordinator(
33         AdtCoordinatorID:dtCoordinatorID ,
34         AdtLogin:dtLogin ,
35         AdtPassword:dtPassword ):ptBoolean
36
37       operation oeDeleteCoordinator(
38         AdtCoordinatorID:dtCoordinatorID ):ptBoolean
39       operation oeAddHospital(AdtHospitalID: dtHospitalID,
40         AdtGPSLocation: dtGPSLocation): ptBoolean
41       operation oeDeleteHospital(AdtHospitalID: dtHospitalID): ptBoolean
42     }
43
44     input interface inactAdministrator{
45
46       operation ieCoordinatorAdded():ptBoolean
47       operation ieCoordinatorDeleted():ptBoolean
48       operation ieHospitalAdded(AdtHospitalID: dtHospitalID):ptBoolean
49       operation ieHospitalDeleted(AdtHospitalID: dtHospitalID):ptBoolean
50     }
51   }
52
53   actor actCoordinator
54     role rnactCoordinator
55     cardinality [0..*]
56     extends actAuthenticated{
57
58     operation init():ptBoolean
59
60     output interface outactCoordinator{
61       operation oeInvalidateAlert(AdtAlertID:dtAlertID ):ptBoolean
62       operation oeCloseCrisis(AdtCrisisID:dtCrisisID ):ptBoolean
63       operation oeGetAlertsSet(AetAlertStatus:etAlertStatus ):ptBoolean

```

```

64  operation oeGetCrisisSet(AetCrisisStatus:etCrisisStatus ):ptBoolean
65  operation oeSetCrisisHandler(AdtCrisisID:dtCrisisID ):ptBoolean
66  operation oeReportOnCrisis(
67      AdtCrisisID:dtCrisisID ,
68      AdtComment:dtComment
69      ):ptBoolean
70  operation oeSetCrisisStatus(
71      AdtCrisisID:dtCrisisID ,
72      AetCrisisStatus:etCrisisStatus
73      ):ptBoolean
74  operation oeSetCrisisType(
75      AdtCrisisID:dtCrisisID ,
76      AetCrisisType:etCrisisType
77      ):ptBoolean
78  operation oeValidateAlert(AdtAlertID:dtAlertID ):ptBoolean
79  operation oeSendHospitalInfo(AdtHospitalInfo: dtHospitalInfo, AdtCrisisID:dtCrisisID ):ptBoolean
80 }
81
82 input interface inactCoordinator{
83  operation ieSendAnAlert(ActAlert:ctAlert ):ptBoolean
84  operation ieSendACrisis(ActCrisis:ctCrisis ):ptBoolean
85  operation ieSendAlerts(ActAlerts: Set(ctAlert)):ptBoolean
86  operation ieValidateAlert(AdtAlertID: dtAlertID): ptBoolean
87  operation ieInvalidateAlert(AdtAlertID: dtAlertID): ptBoolean
88 }
89 }
90
91 actor actComCompany role rnactComCompany cardinality [0..*]{
92
93  operation init():ptBoolean
94
95  output interface outactComCompany{
96  operation oeAlert(
97      AetHumanKind:etHumanKind ,
98      AdtDate:dtDate ,
99      AdtTime:dtTime ,
100     AdtPhoneNumber:dtPhoneNumber ,
101     AdtGPSLocation:dtGPSLocation ,
102     AdtComment:dtComment
103     ):ptBoolean
104 }
105
106 input interface inactComCompany{
107  operation ieSmsSend(AdtPhoneNumber:dtPhoneNumber ,
108      AdtSMS:dtSMS
109      ):ptBoolean
110 }
111 }
112
113 actor actAuthenticated role rnactAuthenticated cardinality [0..*]{
114
115  operation init():ptBoolean
116
117  output interface outactAuthenticated{
118  operation oeLogin(AdtLogin:dtLogin , AdtPassword:dtPassword ):ptBoolean
119  operation oeLogout():ptBoolean
120 }
121
122  input interface inactAuthenticated{
123  operation ieMessage(AMessage:ptString):ptBoolean
124  }
125 }
126
127 actor actActivator[proactive] role rnactActivator cardinality [1..1]{
128
129  operation init():ptBoolean
130
131  output interface outactActivator{
132  proactive operation oeSollicitateCrisisHandling():ptBoolean
133  proactive operation oeSetClock(AcurrentClock:dtDateAndTime ):ptBoolean

```

```

134     }
135
136     input interface inactActivator{
137     }
138 }
139 actor actHospital role rnactHospital cardinality[0 .. *] {
140   operation init():ptBoolean
141
142   input interface inactHospital {
143     operation ieSendHospitalInfo(AdtHospitalInfo: dtHospitalInfo):ptBoolean
144   }
145   output interface outactHospital {
146   }
147 }
148
149 }
150 }
```

Listing C.23: Messir Spec. file environment.msr.

## C.24 File [./src-gen/messir-spec/concepts/primarytypes-associations.msr](#)

```

1 package icrash.concepts.primarytypes.associations {
2
3   import icrash.concepts.primarytypes.datatypes
4   import icrash.concepts.primarytypes.classes
5   import icrash.environment
6   import lu.uni.lassy.messir.libraries.primitives
7
8   Concept Model {
9
10   Primary Types{
11
12   // Internal
13
14   association assctAlertctCrisis
15     ctAlert(rnAlerts)[1..*]
16     ctCrisis (rnTheCrisis)[1..1]
17
18   association assctAlertctHuman
19     ctAlert(rnSignaled)[1..*]
20     ctHuman (rnSignaler)[1..1]
21
22   association assctCrisisctCoordinator
23     ctCrisis(rnHandled)[0..*]
24     ctCoordinator(rnHandler)[0..1]
25
26   // With Actors
27
28   association assctHumanactComCompany
29     ctHuman(rnctHuman)[0..*]
30     actComCompany(rnactComCompany)[1..1]
31
32   association assctCoordinatoractCoordinator
33     ctCoordinator(rnctCoordinator)[1..1]
34     actCoordinator(rnactCoordinator)[1..1]
35
36   association assctAuthenticatedactAuthenticated
37     ctAuthenticated(rnctAuthenticated)[1..1]
38     actAuthenticated(rnactAuthenticated)[1..1]
39
40   association assctHospitalactHospital
41     ctHospital(rnctHospital) [1..1]
42     actHospital(rnactHospital) [1..1]
43
44   }
45 }
```

46 }

Listing C.24: Messir Spec. file primarytypes-associations.msr.

### C.25 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctAdministrator.msr

```

1 package icrash.operations.concepts.primarytypes.classes.ctAdministrator{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 import icrash.concepts.primarytypes.datatypes
6 import icrash.concepts.primarytypes.classes
7
8 Operation Model {
9
10 operation: icrash.concepts.primarytypes.classes.ctAdministrator.init(
11   Alogin:dtLogin ,
12   Apwd:dtPassword
13   ):ptBoolean{
14   postF{
15     if
16     (
17       let Self:ctAdministrator in
18       /* Post F01 */
19       Self.login(Alogin)
20     and Self.pwd = Apwd
21     and Self.vpIsLogged = false
22
23     /* Post F02 */
24     and (Self.oclIsNew and self = Self)
25   )
26   then (result = true)
27   else (result = false)
28   endif
29 }
30 prolog{ "src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctAdministrator-init.pl"
31 }
32 }
33 }
```

Listing C.25: Messir Spec. file primarytypes-classes-ctAdministrator.msr.

### C.26 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctAlert.msr

```

1 package icrash.operations.concepts.primarytypes.classes.ctAlert{
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.calendar
5
6 import icrash.concepts.primarytypes.datatypes
7 import icrash.concepts.primarytypes.classes
8
9 import icrash.environment
10
11 Operation Model {
12
13   operation: icrash.concepts.primarytypes.classes.ctAlertAC.isSentToCoordinator(AactCoordinator:
14     actCoordinator ):ptBoolean
15   {
16     postF{
17       if
18       (
19         /* Post F01 */
20         AactCoordinator.rnInterfaceIN.ieSendAnAlert(self)
21       )
```

```

20 )
21 then (result = true)
22 else (result = false)
23 endif
24 }
25 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctAlert-isSentToCoordinator.
    pl"}
26
27 }
28 }
29 }
```

Listing C.26: Messir Spec. file primarytypes-classes-ctAlert.msr.

## C.27 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctAuthenticated.msr

```

1 package icrash.operations.concepts.primarytypes.classes.ctAuthenticated {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import icrash.concepts.primarytypes.datatypes
5 import icrash.concepts.primarytypes.classes
6
7 Operation Model {
8
9 operation: icrash.concepts.primarytypes.classes.ctAuthenticated.init (Alogin:dtLogin, Apwd:dtPassword
    ):ptBoolean{
10 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctAuthenticated-init.pl"}
11 }
12 }
13
14 }
```

Listing C.27: Messir Spec. file primarytypes-classes-ctAuthenticated.msr.

## C.28 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctCoordinator.msr

```

1 package icrash.operations.concepts.primarytypes.classes.ctCoordinator.init {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import icrash.concepts.primarytypes.datatypes
5 import icrash.concepts.primarytypes.classes
6
7 Operation Model {
8
9 operation: icrash.concepts.primarytypes.classes.ctCoordinator.init (Aid:dtCoordinatorID, Alogin:
    dtLogin, Apwd:dtPassword):ptBoolean
10 {
11 postF{
12 if
13 (
14 /* Post F01 */
15 let Self:ctCoordinator in
16 Self.id = Aid
17 and Self.login = Alogin
18 and Self.pwd = Apwd
19 and Self.vpIsLogged = false
20 /* Post F02 */
21 and (Self.oclIsNew and self = Self)
22 )
23 then (result = true)
24 else (result = false)
25 endif}
26 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctCoordinator-init.pl"}
27 }
```

```
28 }
29 }
```

Listing C.28: Messir Spec. file primarytypes-classes-ctCoordinator.msr.

### C.29 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctCrisis.msr

```
1 package icrash.operations.concepts.primarytypes.classes.ctCrisis {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5 import lu.uni.lassy.messir.libraries.calendar
6
7 import icrash.concepts.primarytypes.datatypes
8 import icrash.concepts.primarytypes.classes
9 import icrash.concepts.secondarytypes.datatypes
10 import icrash.concepts.secondarytypes.classes
11 import lu.uni.lassy.messir.libraries.primitives
12
13 import icrash.environment
14
15 Operation Model {
16 /**
17 operation: icrash.concepts.primarytypes.classes.ctCrisis.init(
18     Aid:dtCrisisID,
19     Atype:etCrisisType,
20     Astatus:etCrisisStatus,
21     Alocation:dtGPSLocation,
22     Ainstant:dtDateAndTime,
23     Acomment:dtComment
24     ):ptBoolean{
25 postF{
26 if
27 (
28 /* Post F01 */
29 let Self:ctCrisis in
30 Self.id = Aid
31 and Self.type = Atype
32 and Self.status = Astatus
33 and Self.location = Alocation
34 and Self.instant = Ainstant
35 and Self.comment = Acomment
36 /* Post F02 */
37 and (Self.oclIsNew and self = Self)
38 )
39 then (result = true)
40 else (result = false)
41 endif)
42 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctCrisis-init.pl"}}
43 /**
44 operation: icrash.concepts.primarytypes.classes.ctCrisis.handlingDelayPassed():ptBoolean
45 {
46 postF{
47 let TheSystem:ctState in
48 let CurrentClockSecondsQty:dtInteger in
49 let vpLastReminderSecondsQty:dtInteger in
50 let CrisisReminderPeriod:dtSecond in
51 if
52 ( /* Post F01 */
53 self.rnSystem = TheSystem
54 and self.status = pending
55 and TheSystem.clock.toSecondsQty() = CurrentClockSecondsQty
56 and TheSystem.vpLastReminder.toSecondsQty() = vpLastReminderSecondsQty
57 and TheSystem.crisisReminderPeriod = CrisisReminderPeriod
58 and CurrentClockSecondsQty.sub(vpLastReminderSecondsQty).gt(CrisisReminderPeriod) = true
59 )
60 then (result = true)
```

```

61 else (result = false)
62 endif
63 }
64 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctCrisis-handlingDelayPassed
       .pl"})
65 //-----
66 operation: icrash.concepts.primarytypes.classes.ctCrisis.maxHandlingDelayPassed():ptBoolean
67 {
68 postF{
69 let TheSystem:ctState in
70 let CurrentClockSecondsQty:dtInteger in
71 let CrisisInstantSecondsQty:dtInteger in
72 let MaxCrisisReminderPeriod:dtSecond in
73 if
74 ( /* Post F01 */
75 self.rnSystem = TheSystem
76 and self.status = pending
77 and TheSystem.clock.toSecondsQty() = CurrentClockSecondsQty
78 and Self.instant.toSecondsQty() = CrisisInstantSecondsQty
79 and TheSystem.maxCrisisReminderPeriod = MaxCrisisReminderPeriod
80 and CurrentClockSecondsQty.sub(CrisisInstantSecondsQty)
81           .gt(MaxCrisisReminderPeriod)
82 )
83 then (result = true)
84 else (result = false)
85 endif
86 }
87 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctCrisis-
       maxHandlingDelayPassed.pl"}
88 //-----
89 operation: icrash.concepts.primarytypes.classes.ctCrisis.isSentToCoordinator(AactCoordinator:
       actCoordinator):ptBoolean
90 {
91 postF{
92 if
93 (
94 /* Post F01 */
95 AactCoordinator.rnInterfaceIN.ieSendACrisis(self)
96 )
97 then (result = true)
98 else (result = false)
99 endif}
100 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctCrisis-isSentToCoordinator
       .pl" })
101 //-----
102 operation: icrash.concepts.primarytypes.classes.ctCrisis.isAllocatedIfPossible():ptBoolean
103 {
104 postF{
105 if (
106 /* Post F01 */
107 self.maxHandlingDelayPassed()
108 and
109 if (TheSystem.rnactCoordinator->msrIsEmpty = false)
110 then (
111 /* Post F02 */
112 TheSystem.rnactCoordinator->msrAny(true) = TheCoordinatorActor
113 and TheCoordinatorActor.rnctCoordinator = TheCoordinator
114 and self@post.rnHandler = TheCoordinator
115 and self@post.status = handled
116 and self.id.value = TheCrisisIDptString
117 and 'You are now considered as handling the crisis having ID: '
118     .ptStringConcat(TheCrisisIDptString) = TheMessage
119 and TheCoordinatorActor.rnInterfaceIN^ieMessage(TheMessage)
120 )
121 else ( /* Post F03 */
122 TheSystem.rnactAdministrator
123 ->forall(rnInterfaceIN.ieMessage('Please add new coordinators to handle pending crisis !'))
124 )
125 endif
126 )

```

```

127 then (result = true)
128 else (result = false)
129 endif
130 }
131 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctCrisis-
           isAllocatedIfPossible.pl"}
132 }
133 }
134 }
```

Listing C.29: Messir Spec. file primarytypes-classes-ctCrisis.msr.

### C.30 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctHuman.msr

```

1 package icrash.operations.concepts.primarytypes.classes.ctHuman.init {
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import icrash.concepts.primarytypes.datatypes
5
6 import icrash.concepts.primarytypes.classes
7
8 Operation Model {
9
10 operation: icrash.concepts.primarytypes.classes.ctHuman.init(Aid:dtPhoneNumber, Akind:etHumanKind):
          ptBoolean
11 {
12 postF{
13 if
14 (
15 /* Post F01 */
16 let Self:ctHuman in
17
18 Self.id = Aid
19 and Self.kind = Akind
20
21 /* Post F02 */
22 and (Self.ocliIsNew and self = Self)
23 )
24 then (result = true)
25 else (result = false)
26 endif
27 }
28 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctHuman-init.pl"}
29 }
30 operation: icrash.concepts.primarytypes.classes.ctHuman.isAcknowledged():ptBoolean{
31 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctHuman-isAcknowledged.pl"}
32 }
33 }
34 }
```

Listing C.30: Messir Spec. file primarytypes-classes-ctHuman.msr.

### C.31 File ./src-gen/messir-spec/operations/concepts/primarytypes-classes/primarytypes-classes-ctState.msr

```

1 package icrash.operations.concepts.primarytypes.classes.ctState{
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.calendar
5 import lu.uni.lassy.messir.libraries.math
6
7 import icrash.concepts.primarytypes.classes
8
9 Operation Model {
10 }
```

```

11 operation: icrash.concepts.primarytypes.classes.ctState.init(
12   AnextValueForAlertID: dtInteger,
13   AnextValueForCrisisID: dtInteger ,
14   dtAclock:dtDateAndTime,
15   AcrisisReminderPeriod: dtSecond,
16   AmaxCrisisReminderPeriod: dtSecond ,
17   AvpLastReminder: dtDateAndTime ,
18   AvpStarted:ptBoolean ):ptBoolean{
19 postF{
20 if
21 (
22 /* Post F01 */
23 let Self:ctState in
24
25 Self.nextValueForAlertID = AnextValueForAlertID
26 and Self.nextValueForCrisisID = AnextValueForCrisisID
27 and Self.clock = Aclock
28 and Self.crisisReminderPeriod = AcrisisReminderPeriod
29 and Self.maxCrisisReminderPeriod = AmaxCrisisReminderPeriod
30 and Self.vpLastReminder = AvpLastReminder
31 and Self.vpStarted = AvpStarted
32
33 and (Self.oclIsNew and self = Self)
34 )
35 then (result = true)
36 else (result = false)
37 endif
38 }
39 prolog"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesClasses-ctState-init.pl" }
40 }
41 }
42 }
```

Listing C.31: Messir Spec. file primarytypes-classes-ctState.msr.

## C.32 File ./src-gen/messir-spec/concepts/primarytypes-classes.msr

```

1 package icrash.concepts.primarytypes.classes {
2
3 import icrash.concepts.primarytypes.datatypes
4 import icrash.environment
5 import lu.uni.lassy.messir.libraries.primitives
6 import lu.uni.lassy.messir.libraries.math
7 import lu.uni.lassy.messir.libraries.calendar
8
9 Concept Model {
10
11 Primary Types{
12
13   state class ctState {
14     attribute nextValueForAlertID:dtInteger
15     attribute nextValueForCrisisID:dtInteger
16     attribute clock:dtDateAndTime
17     attribute crisisReminderPeriod:dtSecond
18     attribute maxCrisisReminderPeriod:dtSecond
19     attribute vpLastReminder:dtDateAndTime
20     attribute vpStarted:ptBoolean
21
22   operation init( AnextValueForAlertID:dtInteger,
23     AnextValueForCrisisID:dtInteger,
24     Aclock:dtDateAndTime,
25     AcrisisReminderPeriod:dtSecond ,
26     AmaxCrisisReminderPeriod:dtSecond ,
27     AvpLastReminder:dtDateAndTime ,
28     AvpStarted:ptBoolean ) : ptBoolean
29   }
30
31   class ctHospital role rnctHospital cardinality [0..*]{
32     attribute id: dtHospitalID
```

```

33     attribute attLocation: dtGPSLocation
34 }
35
36 class ctAlertAC role rnctAlertAC cardinality [0..*] {
37     attribute id: dtAlertID
38     attribute status: etAlertStatus
39     attribute location: dtGPSLocation
40     attribute instant: dtDateAndTime
41     attribute comment: dtComment
42     attribute hash: dtHash
43
44     operation init(    Aid:dtAlertID ,
45                     Astatus:etAlertStatus ,
46                     Alocation:dtGPSLocation ,
47                     Ainstant:dtDateAndTime ,
48                     Acomment:dtComment ,
49                     AdtHash: dtHash):ptBoolean
50     operation isSentToCoordinator(AactCoordinator:actCoordinator ):ptBoolean
51 }
52
53 class ctAlert role rnctAlert cardinality [0..*] extends ctAlertAC {
54     operation init(    Aid:dtAlertID ,
55                     Astatus:etAlertStatus ,
56                     Alocation:dtGPSLocation ,
57                     Ainstant:dtDateAndTime ,
58                     Acomment:dtComment ,
59                     AdtHash: dtHash):ptBoolean
60 }
61
62 class ctAlertBackup role rnctAlertBackup cardinality [0..*] extends ctAlertAC {
63     operation init(    Aid:dtAlertID ,
64                     Astatus:etAlertStatus ,
65                     Alocation:dtGPSLocation ,
66                     Ainstant:dtDateAndTime ,
67                     Acomment:dtComment ,
68                     AdtHash: dtHash):ptBoolean
69 }
70
71 class ctCrisis role rnctCrisis cardinality [0..*]{
72     attribute id:dtCrisisID
73     attribute type:etCrisisType
74     attribute status: etCrisisStatus
75     attribute location:dtGPSLocation
76     attribute instant:dtDateAndTime
77     attribute comment:dtComment
78
79     operation init(
80                     Aid:dtCrisisID ,
81                     Atype:etCrisisType ,
82                     Astatus:etCrisisStatus ,
83                     Alocation:dtGPSLocation ,
84                     Ainstant:dtDateAndTime ,
85                     Acomment:dtComment ):ptBoolean
86
87     operation handlingDelayPassed():ptBoolean
88     operation maxHandlingDelayPassed():ptBoolean
89     operation isSentToCoordinator(AactCoordinator:actCoordinator ):ptBoolean
90     operation isAllocatedIfPossible():ptBoolean
91 }
92
93 class ctHuman role rnctHuman cardinality [0..*]{
94     attribute id:dtPhoneNumber
95     attribute kind:etHumanKind
96
97     operation init(
98                     Aid:dtPhoneNumber ,
99                     Akind:etHumanKind ):ptBoolean
100    operation isAcknowledged():ptBoolean
101 }
102

```

```

103 class ctAuthenticated
104   role rnctAuthenticated
105   cardinality [0..*]{
106
107   attribute login:dtLogin
108   attribute pwd: dtPassword
109   attribute vpIsLogged:ptBoolean
110
111   operation init(
112     Alogin:dtLogin ,
113     Apwd:dtPassword ):ptBoolean
114   }
115
116 class ctCoordinator
117   role rnctCoordinator
118   cardinality [0..*]
119   extends ctAuthenticated{
120
121   attribute id:dtCoordinatorID
122
123   operation init(
124     Aid:dtCoordinatorID ,
125     Alogin:dtLogin ,
126     Apwd:dtPassword ):ptBoolean
127   }
128
129 class ctAdministrator
130   role rnctAdministrator
131   cardinality [1..1]
132   extends ctAuthenticated{
133
134   operation init(
135     Alogin:dtLogin ,
136     Apwd:dtPassword ):ptBoolean
137   }
138 }
139 }
140 }
```

Listing C.32: Messir Spec. file primarytypes-classes.msr.

### C.33 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatatypes/primarytypes-datatypes-dtAlertID.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtAlertID{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.dtAlertID.is():ptBoolean{
8
9     postF{
10       let TheResult: ptBoolean in
11       (if
12         (self.value.length().gt(0)
13         and self.value.length().leq(20)
14       )
15       then (TheResult = true)
16       else (TheResult = false)
17       endif
18       result = TheResult
19     })
20     prolog"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtAlertID-is.pl"
21   }
22 }
```

23 }

Listing C.33: Messir Spec. file primarytypes-datatatypes-dtAlertID.msr.

### C.34 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-dtComment.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtComment{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.dtComment.is():ptBoolean{
8
9     postF{
10       let TheResult: ptBoolean in
11       ( if
12         ( MaxLength = 160
13           and self.value.length().leq(MaxLength)
14         )
15         then (TheResult = true)
16         else (TheResult = false)
17       endif
18       result = TheResult
19     )
20   }
21   prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtComment-is.pl"}
22 }
23 }
24 }
```

Listing C.34: Messir Spec. file primarytypes-datatatypes-dtComment.msr.

### C.35 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-dtCoordinatorID.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtCoordinatorID{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6   operation: icrash.concepts.primarytypes.datatypes.dtCoordinatorID.is():ptBoolean{
7
8     postF{
9       let TheResult: ptBoolean in
10      ( if
11        ( self.value.length().gt(0)
12          and self.value.length().leq(5)
13        )
14        then (TheResult = true)
15        else (TheResult = false)
16      endif
17      result = TheResult
18    )
19  }
20  prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtCoordinatorID-is.pl"
21  }
22 }
23 }
```

Listing C.35: Messir Spec. file primarytypes-datatypes-dtCoordinatorID.msr.

## C.36 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatatypes-dtCrisisID.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtCrisisID{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.dtCrisisID.is():ptBoolean{
8
9     postF{
10       let TheResult: ptBoolean in
11       ( if
12         ( self.value.length().gt(0)
13           and self.value.length().leq(10)
14         )
15         then (TheResult = true)
16         else (TheResult = false)
17       endif
18       result = TheResult
19     )
20   }
21   prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtCrisisID-is.pl"}
22 }
23 }
24 }
```

Listing C.36: Messir Spec. file primarytypes-datatatypes-dtCrisisID.msr.

## C.37 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatatypes-dtGPSLocation.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtGPSLocation{
2
3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.math
5
6 import icrash.concepts.primarytypes.datatypes
7 import icrash.concepts.primarytypes.classes
8 import icrash.concepts.secondarytypes.datatypes
9 import icrash.concepts.secondarytypes.classes
10
11 Operation Model {
12
13   operation: icrash.concepts.primarytypes.datatypes.dtGPSLocation.is():ptBoolean{
14     postF{
15       let TheResult: ptBoolean in
16       ( if
17         ( self.latitude.is()
18           and self.longitude.is
19         )
20         then (TheResult = true)
21         else (TheResult = false)
22       endif
23       result = TheResult
24     )
25   }
26   prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtGPSLocation-is.pl"}
27 }
28   operation: icrash.concepts.primarytypes.datatypes.dtGPSLocation.isNearTo(aGPSLocation:
29     dtGPSLocation):ptBoolean{
30     postF{
31       let TheResult: ptBoolean in true
32       let EarthRadius: dtReal in
33       let MaxDistance: dtReal in
```

```

33 let CompaedLatitude: dtLatitude in
34 let CompaedLongitude: dtLongitude in
35 let R1: dtReal in let R1a: dtReal in
36 let R2: dtReal in let R2a: dtReal in
37
38 ( if
39   ( EarthRadius.value = 6371
40     and MaxDistance.value = 100
41
42   and self.latitude = CompaedLatitude
43   and self.longitude = CompaedLongitude
44   and self.latitude.sin() = R1a
45   and self.latitude.sin().mul(R1a) = R1
46   and self.latitude.cos() = R2a
47   and self.latitude.cos().mul(R2a) = R2
48
49   and self.longitude = CompaedLongitude
50   and self.longitude.sub(CompaedLongitude).cos().mul(R2)
51     .add(R1).acos().mul(EarthRadius).sub(MaxDistance)
52     .value.leq(0)
53 )
54 then (TheResult = true)
55 else (TheResult = false)
56 endif
57 result = TheResult
58 )
59 }
60 prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtGPSLocation-isNearTo
       .pl"}
61 }
62 operation: icrash.concepts.primarytypes.datatypes.dtLatitude.is():ptBoolean{
63 postF{
64   let TheResult: ptBoolean in
65   ( if
66     ( AdtValue.value.geq(-90.0)
67       and AdtValue.value.leq(+90.0)
68     )
69     then (TheResult = true)
70     else (TheResult = false)
71   endif
72   result = TheResult
73 )
74 prolog{ "src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtLatitude-is.pl"}
75 }
76 operation: icrash.concepts.primarytypes.datatypes.dtLongitude.is():ptBoolean{
77 postF{
78   let TheResult: ptBoolean in
79   ( if
80     ( AdtValue.value.geq(-180.0)
81       and AdtValue.value.leq(+180.0)
82     )
83     then (TheResult = true)
84     else (TheResult = false)
85   endif
86   result = TheResult
87 )
88 prolog{ "src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtLongitude-is.pl"}
89 }
90 }
91 }

```

Listing C.37: Messir Spec. file primarytypes-datatypes-dtGPSLocation.msr.

### C.38 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-dtLogin.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtLogin{
2

```

```

3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.dtLogin.is():ptBoolean{
8     postF{
9       let TheResult: ptBoolean in
10      let MaxLength: ptInteger in
11      ( if
12        ( MaxLength = 20
13          and self.value.length().leq(MaxLength)
14        )
15        then (TheResult = true)
16        else (TheResult = false)
17      endif
18      result = TheResult
19    )
20  }
21  prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtLogin-is.pl"}
22 }
23 }
24 }
```

Listing C.38: Messir Spec. file primarytypes-datatypes-dtLogin.msr.

## C.39 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatype-dtPassword.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtPassword{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.dtPassword.is():ptBoolean{
8     postF{
9       let TheResult: ptBoolean in
10      let MinLength: ptInteger in
11      ( if
12        ( MinLength = 6
13          and self.value.length().geq(MinLength)
14        )
15        then (TheResult = true)
16        else (TheResult = false)
17      endif
18      result = TheResult
19    )
20  }
21  prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtPassword-is.pl"}
22 }
23 }
24 }
```

Listing C.39: Messir Spec. file primarytypes-datatypes-dtPassword.msr.

## C.40 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatype-dtPhoneNumber.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.dtPhoneNumber{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.dtPhoneNumber.is():ptBoolean{
8 }
```

```

9  postF{
10  let TheResult: ptBoolean in
11  ( if
12    ( self.value.length().gt(4)
13      and self.value.length().leq(30)
14    )
15  then (TheResult = true)
16  else (TheResult = false)
17  endif
18  result = TheResult
19  )
20 }
21 prolog{"src/Operations/Concepts/PrimaryTypesDatatypes/PrimaryTypesDatatypes-dtPhoneNumber-is.pl"}
22 }
23 }
24 }
```

Listing C.40: Messir Spec. file primarytypes-datatypes-dtPhoneNumber.msr.

#### C.41 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-etAlertStatus.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.etAlertStatus{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.etAlertStatus.is():ptBoolean{
8     postF{
9       let TheResult: ptBoolean in
10      ( if
11        ( self = pending
12          or self = valid
13          or self = invalid
14        )
15      then (TheResult = true)
16      else (TheResult = false)
17      endif
18      result = TheResult
19    )
20  }
21 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesDatatypes-etAlertStatus-is.pl"}
22 }
23 }
24 }
```

Listing C.41: Messir Spec. file primarytypes-datatypes-etAlertStatus.msr.

#### C.42 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-etCrisisStatus.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.etCrisisStatus{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.etCrisisStatus.is():ptBoolean{
8     postF{
9       let TheResult: ptBoolean in
10      ( if
11        ( self = pending
12          or self = handled
13          or self = solved
14          or self = closed
15        )
16      then (TheResult = true)
17      else (TheResult = false)
18      endif
19      result = TheResult
20    )
21  }
22 }
23 }
24 }
```

```

15    )
16    then (TheResult = true)
17    else (TheResult = false)
18    endif
19    result = TheResult
20  )
21 }
22 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesDatatypes-etCrisisStatus-is.pl"}
23 }
24 }
25 }

```

Listing C.42: Messir Spec. file primarytypes-datatatypes-etCrisisStatus.msr.

### C.43 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-etCrisisType.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.etCrisisType{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.etCrisisType.is():ptBoolean{
8     postF{
9       let TheResult: ptBoolean in
10      ( if
11        ( self = small
12        or self = medium
13        or self = huge
14      )
15      then (TheResult = true)
16      else (TheResult = false)
17      endif
18      result = TheResult
19    )
20  }
21 prolog{"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesDatatypes-etCrisisType-is.pl"}
22 }
23 }
24 }

```

Listing C.43: Messir Spec. file primarytypes-datatypes-etCrisisType.msr.

### C.44 File ./src-gen/messir-spec/operations/concepts/primarytypes-datatypes/primarytypes-datatypes-etHumanKind.msr

```

1 package icrash.operations.concepts.primarytypes.datatypes.etHumanKind{
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 Operation Model {
6
7   operation: icrash.concepts.primarytypes.datatypes.etHumanKind.is():ptBoolean{
8     postF{
9       let TheResult: ptBoolean in
10      ( if
11        ( self = witness
12        or self = victim
13        or self = anonymous
14      )
15      then (TheResult = true)
16      else (TheResult = false)
17      endif
18      result = TheResult
19    }

```

```

20 prolog {"src/Operations/Concepts/PrimaryTypesClasses/PrimaryTypesDatatypes-etHumanKind-is.pl"}
21 }
22 }
23 }
```

Listing C.44: Messir Spec. file primarytypes-datatatypes-etHumanKind.msr.

### C.45 File [./src-gen/messir-spec/concepts/primarytypes-datatypes.msr](#)

```

1 package icrash.concepts.primarytypes.datatypes {
2
3   import lu.uni.lassy.messir.libraries.primitives
4   import lu.uni.lassy.messir.libraries.string
5   import lu.uni.lassy.messir.libraries.math
6   import lu.uni.lassy.messir.libraries.calendar
7   import icrash.concepts.primarytypes.classes
8
9   Concept Model {
10
11     Primary Types {
12
13       datatype dtAlertID extends dtString {
14         operation is():ptBoolean
15       }
16       datatype dtCrisisID extends dtString {
17         operation is():ptBoolean
18       }
19       datatype dtLogin extends dtString {
20         operation is():ptBoolean
21       }
22       datatype dtPassword extends dtString {
23         operation is():ptBoolean
24       }
25       datatype dtCoordinatorID extends dtString {
26         operation is():ptBoolean
27       }
28       datatype dtPhoneNumber extends dtString {
29         operation is():ptBoolean
30       }
31       datatype dtComment extends dtString {
32         operation is():ptBoolean
33       }
34       datatype dtLatitude extends dtReal {
35         operation is():ptBoolean
36       }
37       datatype dtLongitude extends dtReal {
38         operation is():ptBoolean
39       }
40       datatype dtGPSLocation {
41         attribute latitude: dtLatitude
42         attribute longitude: dtLongitude
43         operation is():ptBoolean
44         operation isNearTo(AGPSLocation:dtGPSLocation ):ptBoolean
45     }
46
47     enum etCrisisStatus {
48       constants["pending", "handled", "solved","closed"]
49       operation is():ptBoolean
50     }
51     enum etAlertStatus {
52       constants["pending", "valid", "invalid"]
53       operation is():ptBoolean
54     }
55     enum etCrisisType {
56       constants["small", "medium", "huge"]
57       operation is():ptBoolean
58     }
```

```

59 enum etHumanKind {
60   constants["witness", "victim", "anonymous"]
61   operation is():ptBoolean
62 }
63 datatype dtHospitalID extends dtString {
64   operation is():ptBoolean
65 }
66 datatype dtQtyVictims extends dtInteger {
67   operation is():ptBoolean
68 }
69 enum etSeverity {
70   constants["low", "medium", "high"]
71   operation is():ptBoolean
72 }
73 datatype dtHash extends dtString {
74   operation is(): ptBoolean
75 }
76 datatype dtHospitalInfo {
77   attribute location: dtGPSLocation
78   attribute qtyVictims: dtQtyVictims
79   attribute severity: etSeverity
80   operation is(): ptBoolean
81 }
82 }
83 }
84 }
```

Listing C.45: Messir Spec. file primarytypes-datatatypes.msr.

#### C.46 File                    ./src-gen/messir-spec/concepts/secondarytypes-associations.msr

```

1 package icrash.concepts.secondarytypes.associations {
2
3 Concept Model {
4
5   Secondary Types{
6
7   }
8 }
9 }
```

Listing C.46: Messir Spec. file secondarytypes-associations.msr.

#### C.47 File                    ./src-gen/messir-spec/concepts/secondarytypes-classes.msr

```

1 package icrash.concepts.secondarytypes.classes {
2
3 Concept Model {
4
5   Secondary Types{
6
7   }
8 }
9 }
```

Listing C.47: Messir Spec. file secondarytypes-classes.msr.

#### C.48 File                    ./src-gen/messir-spec/concepts/secondarytypes-datatypes.msr

```

1 package icrash.concepts.secondarytypes.datatypes {
2
```

```

3 import lu.uni.lassy.messir.libraries.primitives
4 import lu.uni.lassy.messir.libraries.string
5
6 import icrash.concepts.primarytypes.datatypes
7
8 Concept Model {
9
10 Secondary Types {
11
12 datatype dtSMS {
13   attribute value: ptString
14   operation is():ptBoolean
15 }
16 }
17 }
18 }
```

Listing C.48: Messir Spec. file secondarytypes-datatatypes.msr.

## C.49 File ./src-gen/messir-spec/usecases/subfunctions-usecases.msr

```

1 package icrash.usecases.subfunctions {
2
3 import lu.uni.lassy.messir.libraries.primitives
4
5 import icrash.concepts.primarytypes.datatypes
6 import icrash.concepts.primarytypes.classes
7 import icrash.concepts.secondarytypes.datatypes
8 import lu.uni.lassy.messir.libraries.primitives
9 import lu.uni.lassy.messir.libraries.math
10 import lu.uni.lassy.messir.libraries.calendar
11
12 import icrash.environment
13
14 Use Case Model {
15
16 //-----
17 use case system subfunction oeAddCoordinator(AdtCoordinatorID:dtCoordinatorID, AdtLogin:dtLogin,
18   AdtPassword:dtPassword) {
19   actor actAdministrator[primary,active]
20   returned messages {
21     ieCoordinatorAdded() returned to actAdministrator
22   }
23 //}
24 use case system subfunction oeAlert(
25   AetKind:etHumanKind,
26   AdtMyDate:dtDate,
27   AdtTime:dtTime,
28   AdtPhoneNumber:dtPhoneNumber,
29   AdtGPSLocation:dtGPSLocation,
30   AdtComment:dtComment) {
31   actor actComCompany[primary,active]
32   returned messages {
33     ieSmsSend(AdtPhoneNumber,AdtSMS) returned to actComCompany
34   }
35 }
36 //}
37 use case system subfunction oeInvalidateAlert(AdtAlertID:dtAlertID) {
38   actor actCoordinator[primary,active]
39   actor actComCompany[secondary,passive]
40   returned messages {
41     ieMessage(AMessage) returned to actCoordinator
42   }
43 }
44 //}
45 use case system subfunction oeCloseCrisis(AdtCrisisID:dtCrisisID) {
46   actor actCoordinator[primary,active]
47   returned messages {
```

```

48     ieMessage(AMessage) returned to actCoordinator
49   }
50 /**
51 use case system subfunction oeCreateSystemAndEnvironment(AqtyComCompanies:ptInteger) {
52   actor actMsrCreator[primary,active]
53 }
54 /**
55 use case system subfunction oeDeleteCoordinator(AdtCoordinatorID:dtCoordinatorID) {
56   actor actAdministrator[primary,active]
57   returned messages {
58     ieCoordinatorDeleted() returned to actAdministrator
59   }
60 }
61 /**
62 use case system subfunction oeGetAlertsSet(AetAlertStatus:etAlertStatus) {
63   actor actCoordinator[primary,active]
64   returned messages {
65     ieSendAnAlert(ActAlert) returned to actCoordinator
66   }
67 }
68 /**
69 use case system subfunction oeGetCrisisSet(AetCrisisStatus:etCrisisStatus) {
70   actor actCoordinator[primary,active]
71   returned messages {
72     ieSendACrisis(ActCrisis) returned to actCoordinator
73   }
74 }
75 /**
76 use case system subfunction oeSetCrisisHandler(AdtCrisisID:dtCrisisID) {
77   actor actCoordinator[primary,active]
78   actor actCoordinator[secondary,passive]
79   actor actComCompany[secondary,passive,multiple]
80   returned messages {
81     ieMessage(AMessage)
82     returned to actCoordinator
83     ieSendAnAlert(ActAlert)
84     returned to actCoordinator
85     ieSmsSend(AdtPhoneNumber,AdtSMS)
86     returned to actComCompany
87   }
88 }
89 /**
90 use case system subfunction oeLogin(AdtLogin:dtLogin , AdtPassword:dtPassword) {
91   actor actAuthenticated[primary,active]
92   returned messages {
93     ieMessage(AMessage) returned to actAuthenticated
94   }
95 }
96 /**
97 use case system subfunction oeLogout() {
98   actor actAuthenticated[primary,active]
99   returned messages {
100    ieMessage(AMessage) returned to actAuthenticated
101  }
102 }
103 /**
104 use case system subfunction oeReportOnCrisis(AdtCrisisID:dtCrisisID,AdtComment:dtComment) {
105   actor actCoordinator[primary,active]
106   returned messages {
107     ieMessage(AMessage) returned to actCoordinator
108   }
109 }
110 /**
111 use case system subfunction oeSetClock(AcurrentClock:dtDateAndTime) {
112   actor actActivator[primary,proactive]
113 }
114 /**
115 use case system subfunction oeSetCrisisStatus(AdtCrisisID:dtCrisisID ,AetCrisisStatus:
116   etCrisisStatus) {
117   actor actCoordinator[primary,active]

```

```

117  returned messages {
118      ieMessage(AMessage) returned to actCoordinator
119  }
120 }
121 //-----
122 use case system subfunction oeSollicitateCrisisHandling() {
123     actor actActivator[primary, proactive]
124     actor actCoordinator[secondary, passive, multiple]
125     actor actAdministrator[secondary, passive]
126     returned messages {
127         ieMessage(AMessage) returned to actCoordinator
128         //ieMessage(AMessage) returned to actAdministrator
129     }
130 }
131 //-----
132 use case system subfunction oeValidateAlert(AdtAlertID:dtAlertID) {
133     actor actCoordinator[primary, active]
134     returned messages {
135         ieMessage(AMessage) returned to actCoordinator
136     }
137 }
138 //-----
139 use case system subfunction oeSendHospitalInfo(AdtHospitalInfo: dtHospitalInfo, AdtCrisisID: dtCrisisID) {
140     actor actCoordinator[primary, active]
141     actor actHospital[secondary, passive, multiple]
142     returned messages {
143         ieSendHospitalInfo(AdtHospitalInfo) returned to actHospital
144     }
145 }
146 use case system subfunction oeAddHospital(AdtHospitalID: dtHospitalID, AdtGPSLocation:dtGPSLocation ) {
147     actor actAdministrator[primary, active]
148     returned messages {
149         ieHospitalAdded(AdtHospitalID) returned to actAdministrator
150     }
151 }
152 use case system subfunction oeDeleteHospital(AdtHospitalID: dtHospitalID) {
153     actor actAdministrator[primary, active]
154     returned messages {
155         ieHospitalDeleted(AdtHospitalID) returned to actAdministrator
156     }
157 }
158 }
159
160 }

```

Listing C.49: Messir Spec. file subfunctions-usecases.msr.

## C.50 File ./src-gen/messir-spec/test/tc-testcase01.msr

```

1 package lu.uni.lassy.excalibur.examples.icrash.tests.testcase01 {
2
3 import lu.uni.lassy.messir.libraries.string
4 import lu.uni.lassy.messir.libraries.primitives
5 import lu.uni.lassy.messir.libraries.math
6 import lu.uni.lassy.messir.libraries.calendar
7
8 import icrash.concepts.primarytypes.associations
9 import icrash.concepts.primarytypes.classes
10 import icrash.concepts.primarytypes.datatypes
11 import icrash.concepts.secondarytypes.datatypes
12 import icrash.environment
13
14 Test Model{
15     test case testcase01 order 01 {
16 //-----
17     test step ts01oeCreateSystemAndEnvironment order 01 {
18         variables{

```

```

19   Creator:actMsrCreator
20   AqtyComCompanies: ptInteger
21   }
22 constraints{
23   AqtyComCompanies = 4
24   }
25 test message{
26   out:Creator sends to system actMsrCreator.outactMsrCreator.oeCreateSystemAndEnvironment(
27     AqtyComCompanies)
28   }
29 oracle{
30   constraints{
31     true
32   }
33   prolog{"src/Tests/system/01/system-sim-01-01-oeCreateSystemAndEnvironment.pl"}
34   }
35 /**
36 test step ts02oeSetClock order 02{
37   variables{
38     TheActor:actActivator
39     ACurrentClock:dtDateAndTime
40     }
41   constraints{
42     TheActor=TheSystem.rnactActivator->any2(true)
43     }
44   ACurrentClock.date.year.value = 2017
45   ACurrentClock.date.month.value = 11
46   ACurrentClock.date.day.value = 24
47   ACurrentClock.time.hour.value = 15
48   ACurrentClock.time.minute.value = 20
49   ACurrentClock.time.second.value = 00
50   }
51 test message{
52   out:TheActor sends to system actActivator.outactActivator.oeSetClock(ACurrentClock)
53   }
54 oracle{
55   constraints{
56     true
57   }
58   }
59   }
60 /**
61
62 test step ts03oeLogin order 03{
63   variables{
64     TheActor : actAdministrator
65     AdtLogin:dtLogin
66     AdtPassword:dtPassword
67     }
68   constraints{
69     TheActor=TheSystem.rnactAdministrator->any2(true)
70     AdtLogin.value.eq('icrashadmin')
71     AdtPassword.value.eq('7WXC1359')
72   }
73 test message{
74   out:TheActor sends to system actAdministrator.outactAdministrator.oeLogin(AdtLogin,AdtPassword)
75   }
76 oracle{
77   variables{
78     AMessag:ptString
79   }
80   constraints{
81     AMessag = 'You are logged ! Welcome ...'
82     TheActor.inactAdministrator.ieMessage(AMessag)
83   }
84   }
85   }
86 /**
87 test step ts04oeAddCoordinator order 04{

```

```

88  variables{
89      TheActor : actAdministrator
90      AdtCoordinatorID : dtCoordinatorID
91      AdtLogin:dtLogin
92      AdtPassword:dtPassword
93  }
94  constraints{
95      TheActor = TheSystem.rnactAdministrator->any2(true)
96      AdtCoordinatorID.value.eq('1')
97      AdtLogin.value.eq('steve')
98      AdtPassword.value.eq('pwdMessirExcalibur2017')
99  }
100 test message{
101     out:TheActor
102     sends to system actAdministrator.outactAdministrator.oeAddCoordinator
103             (AdtCoordinatorID,
104                 AdtLogin,
105                 AdtPassword)
106 }
107 oracle{
108     constraints{
109         TheActor.inactAdministrator.ieCoordinatorAdded()
110     }
111 }
112 }
113 //-----
114 test step ts05oeLogout order 05{
115     variables{
116         TheActor : actAdministrator
117     }
118     constraints{
119         TheActor = TheSystem.rnactAdministrator->any2(true)
120     }
121     test message{
122         out:TheActor sends to system actAdministrator.outactAdministrator.oeLogout()
123     }
124     oracle{
125         variables{
126             AMessag:ptString
127         }
128         constraints{
129             AMessag = 'You are logged out ! Good Bye ...'
130             TheActor.inactAdministrator.ieMessage(AMessag)
131         }
132     }
133 }
134 //-----
135 test step ts06oeSetClock02 order 06{
136     variables{
137         TheActor:actActivator
138         ACurrentClock:dtDateAndTime
139     }
140     constraints{
141         TheActor=TheSystem.rnactActivator->any2(true)
142         ACurrentClock.date.year.value = 2017
143         ACurrentClock.date.month.value = 11
144         ACurrentClock.date.day.value = 26
145         ACurrentClock.time.hour.value = 10
146         ACurrentClock.time.minute.value = 15
147         ACurrentClock.time.second.value = 00
148     }
149     test message{
150         out:TheActor sends to system actActivator.outactActivator.oeSetClock(ACurrentClock)
151     }
152     oracle{
153         constraints{
154             true
155         }
156     }
157 }
```

```

158 //-----
159 test step ts07oeAlert1 order 07{
160   variables{
161     TheActor : actComCompany
162     AetHumanKind:etHumanKind
163     AdtDate:dtDate
164     AdtTime:dtTime
165     AdtPhoneNumber:dtPhoneNumber
166     AdtGPSLocation:dtGPSLocation
167     AdtComment:dtComment
168   }
169   constraints{
170     TheActor = TheSystem.rnactComCompany->any2(true)
171     AetHumanKind = witness
172     AdtDate.year.value = 2017
173     AdtDate.month.value = 11
174     AdtDate.day.value = 26
175     AdtTime.hour.value = 10
176     AdtTime.minute.value = 10
177     AdtTime.second.value = 16
178     AdtPhoneNumber.value = '+3524666445252'
179     AdtGPSLocation.latitude.value = 49.627675
180     AdtGPSLocation.longitude.value = 6.159590
181     AdtComment.value = '3 cars involved in an accident.'
182   }
183   test message{
184     out:TheActor
185     sends to system actComCompany.outactComCompany.oeAlert( AetHumanKind,
186                               AdtDate,
187                               AdtTime,
188                               AdtPhoneNumber,
189                               AdtGPSLocation,
190                               AdtComment)
191   }
192   oracle{
193     variables{
194       AdtSMS:dtSMS
195     }
196     constraints{
197       AdtSMS.value = 'Your alert has been registered. We will handle it and keep you informed'
198       TheActor.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
199     }
200   }
201 }
202 //-----
203 test step ts08oeSetClock03 order 08{
204   variables{
205     TheActor:actActivator
206     ACurrentClock:dtDateAndTime
207   }
208   constraints{
209     TheActor=TheSystem.rnactActivator->any2(true)
210     ACurrentClock.date.year.value = 2017
211     ACurrentClock.date.month.value = 11
212     ACurrentClock.date.day.value = 26
213     ACurrentClock.time.hour.value = 10
214     ACurrentClock.time.minute.value = 30
215     ACurrentClock.time.second.value = 00
216   }
217   test message{
218     out:TheActor sends to system actActivator.outactActivator.oeSetClock(ACurrentClock)
219   }
220   oracle{
221     constraints{
222       true
223     }
224   }
225 }
226 //-----
227 test step ts09oeSollicitateCrisisHandling order 09{

```

```

228  variables{
229      TheActor : actActivator
230  }
231  constraints{
232      TheActor = TheSystem.rnactActivator->any2(true)
233  }
234  test message{
235      out:TheActor sends to system actActivator.outactActivator.oeSollicitateCrisisHandling()
236  }
237  oracle{
238  variables{
239      TheAdministrator:actAdministrator
240      TheCoordinator:actCoordinator
241      AMessageForCrisisHandlers:ptString
242  }
243  constraints{
244      TheAdministrator = TheSystem.rnactAdministrator->any2(true)
245      TheCoordinator = TheSystem.rnactCoordinator->any2(true)
246      AMessageForCrisisHandlers = 'There are alerts pending since more than the defined delay. Please
REACT !'
247
248      TheAdministrator.inactAdministrator.ieMessage(AMessageForCrisisHandlers)
249      TheCoordinator.inactAdministrator.ieMessage(AMessageForCrisisHandlers)
250
251 /* this oracle should be written like this (not currently possible due to grammar limitations:
252
253     oracle{
254     variables{
255         TheAdministrator:actAdministrator
256         AMessageForCrisisHandlers:ptString
257     }
258     constraints{
259         AMessageForCrisisHandlers = 'There are alerts pending since more than the defined delay. Please
REACT !'
260         TheAdministrator = TheSystem.rnactAdministrator->any2(true)
261
262         TheSystem.rnactCoordinator->forAll(TheCoordinator:actCoordinator | TheCoordinator.
actAuthenticated.inactAuthenticated.ieMessage(AMessage))
263
264 */
265     }
266   }
267 }
268 //-----
269 test step ts10oeLogin02 order 10{
270  variables{
271      TheActor : actCoordinator
272      AdtLogin:dtLogin
273      AdtPassword:dtPassword
274  }
275  constraints{
276      TheActor = TheSystem.rnactCoordinator->select(a | a.rnctCoordinator.login.value.eq('steve'))->
any2(true)
277      AdtLogin.value.eq('steve')
278      AdtPassword.value.eq('pwdMessirExcalibur2017')
279  }
280  test message{
281      out:TheActor sends to system actAuthenticated.outactAuthenticated.oeLogin(AdtLogin,AdtPassword)
282  }
283  oracle{
284  variables{
285      AMessage:ptString
286  }
287  constraints{
288      AMessage = 'You are logged ! Welcome ...'
289      TheActor.inactAuthenticated.ieMessage(AMessage)
290  }
291 }
292 }
293 //-----

```

```

294 test step ts11oeGetCrisisSet order 11{
295   variables{
296     TheActor : actCoordinator
297     AetCrisisStatus : etCrisisStatus
298   }
299   constraints{
300     TheActor=TheSystem.rnactCoordinator
301     ->select(a | a.rnctCoordinator.login.value.eq('steve'))
302     ->any2(true)
303     AetCrisisStatus = pending
304   }
305   test message{
306     out:TheActor sends to system actCoordinator.outactCoordinator.oeGetCrisisSet(AetCrisisStatus)
307   }
308   oracle{
309 //TODO - make consistent with test step implementation by adding Prolog code for input messages
310   variables{
311     ActCrisis:ctCrisis
312   }
313   constraints{
314     TheActor.inactCoordinator.ieSendACrisis(ActCrisis)
315   }
316   }
317 }
318 /-----
319 test step ts12oeSetCrisisHandler order 12{
320   variables{
321     TheActor : actCoordinator
322     AdtCrisisID : dtCrisisID
323   }
324   constraints{
325     TheActor=TheSystem.rnactCoordinator
326     ->select(a | a.rnctCoordinator.login.value.eq('steve'))
327     ->any2(true)
328     //and AdtCrisisID.value= '1'
329   }
330   test message{
331     out:TheActor sends to system actCoordinator.outactCoordinator.oeSetCrisisHandler(AdtCrisisID)
332   }
333   oracle{
334   variables{
335     AMessage:ptString
336     AdtPhoneNumber:dtPhoneNumber
337     AdtSMS:dtSMS
338     ActAlert:ctAlert
339
340     TheComCompany: actComCompany
341     TheCoordinator:actCoordinator
342   }
343   constraints{
344     AMessage = 'You are now considered as handling the crisis !'
345     AdtSMS.value = 'The handling of your alert by our services is in progress !'
346     TheComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
347     TheCoordinator.inactCoordinator.ieSendAnAlert(ActAlert)
348     TheActor.inactAuthenticated.ieMessage(AMessage)
349   }
350   }
351 }
352 /-----
353 test step ts13oeSetClock04 order 13{
354   variables{
355     TheActor:actActivator
356     ACurrentClock:dtDateAndTime
357   }
358   constraints{
359     TheActor=TheSystem.rnactActivator->any2(true)
360     ACurrentClock.date.year.value = 2017
361     ACurrentClock.date.month.value = 11
362     ACurrentClock.date.day.value = 26
363     ACurrentClock.time.hour.value = 10

```

```

364     ACurrentClock.time.minute.value = 45
365     ACurrentClock.time.second.value = 00
366 }
367 test message{
368     out:TheActor sends to system actActivator.outactActivator.oeSetClock(ACurrentClock)
369 }
370 oracle{
371     constraints{
372         true
373     }
374 }
375 }
376 //-
377 test step ts14oeValidateAlert order 14{
378     variables{
379         TheActor : actCoordinator
380         AdtAlertID : dtAlertID
381     }
382     constraints{
383         TheActor=TheSystem.rnactCoordinator
384         ->select(a | a.rnctCoordinator.login.value.eq('steve'))
385         ->any2(true)
386         //and AdtAlertID.value= '1'
387     }
388     test message{
389         out:TheActor sends to system actCoordinator.outactCoordinator.oeValidateAlert(AdtAlertID)
390     }
391     oracle{
392         variables{
393             AMesssage:ptString
394         }
395         constraints{
396             AMesssage = 'The Alert is now declared as valid !'
397             TheActor.actAuthenticated.inactAuthenticated.ieMessage(AMesssage)
398         }
399     }
400 }
401 //-
402 test step ts15oeAlert2 order 15{
403     variables{
404         TheActor : actComCompany
405         AetHumanKind:etHumanKind
406         AdtDate:dtDate
407         AdtTime:dtTime
408         AdtPhoneNumber:dtPhoneNumber
409         AdtGPSLocation:dtGPSLocation
410         AdtComment:dtComment
411     }
412     constraints{
413         TheActor = TheSystem.rnactComCompany->any2(true)
414         AetHumanKind = witness
415         AdtDate.year.value = 2017
416         AdtDate.month.value = 11
417         AdtDate.day.value = 26
418         AdtTime.hour.value = 10
419         AdtTime.minute.value = 20
420         AdtTime.second.value = 00
421         AdtPhoneNumber.value = '+3524666445000'
422         AdtGPSLocation.latitude.value = 49.627095
423         AdtGPSLocation.longitude.value = 6.160251
424         AdtComment.value = 'A car crash just happened.'
425     }
426     test message{
427         out:TheActor
428         sends to system actComCompany.outactComCompany.oeAlert( AetHumanKind,
429                         AdtDate,
430                         AdtTime,
431                         AdtPhoneNumber,
432                         AdtGPSLocation,
433                         AdtComment)

```

```

434     }
435     oracle{
436       variables{
437         AdtSMS:dtSMS
438       }
439       constraints{
440         AdtSMS.value = 'Your alert has been registered. We will handle it and keep you informed'
441         TheActor.actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
442       }
443     }
444   }
445 //-----
446 test step ts16oeSetClock05 order 16{
447   variables{
448     TheActor:actActivator
449     ACurrentClock:dtDateAndTime
450   }
451   constraints{
452     TheActor=TheSystem.rnactActivator->any2(true)
453     ACurrentClock.date.year.value = 2017
454     ACurrentClock.date.month.value = 11
455     ACurrentClock.date.day.value = 26
456     ACurrentClock.time.hour.value = 12
457     ACurrentClock.time.minute.value = 45
458     ACurrentClock.time.second.value = 00
459   }
460   test message{
461     out:TheActor sends to system actActivator.outactActivator.oeSetClock(ACurrentClock)
462   }
463   oracle{
464     constraints{
465       true
466     }
467   }
468 }
469 //-----
470 test step ts17oeSetCrisisStatus order 17{
471   variables{
472     TheActor : actCoordinator
473     AdtCrisisID : dtCrisisID
474     AetCrisisStatus : etCrisisStatus
475   }
476   constraints{
477     TheActor=TheSystem.rnactCoordinator
478     ->select(a | a.rnctCoordinator.login.value.eq('steve'))
479     ->any2(true)
480     //and AdtCrisisID.value= '1'
481     //and AetCrisisStatus = solved
482   }
483   test message{
484     out:TheActor sends to system actCoordinator.outactCoordinator.oeSetCrisisStatus(AdtCrisisID,
485     AetCrisisStatus)
486   }
487   oracle{
488     variables{
489       AMessage:ptString
490     }
491     constraints{
492       AMessage = 'The crisis status has been updated !'
493       TheActor.inactAuthenticated.ieMessage(AMessage)
494     }
495   }
496 //-----
497 test step ts18oeReportOnCrisis order 18{
498   variables{
499     TheActor : actCoordinator
500     AdtCrisisID : dtCrisisID
501     AdtComment : dtComment
502   }

```

```

503   constraints{
504     TheActor=TheSystem.rnactCoordinator
505     ->select(a | a.rnctCoordinator.login.value.eq('steve'))
506     ->any2(true)
507     //and AdtCrisisID.value= '1'
508     //and AdtComment.value = '3 victims sent to hospital, 2 cars evacuated and 4 rescue unit
mobilized'
509   }
510   test message{
511     out:TheActor sends to system actCoordinator.outactCoordinator.oeReportOnCrisis(AdtCrisisID,
AdtComment)
512   }
513   oracle{
514     variables{
515       AMessage:ptString
516     }
517     constraints{
518       AMessage = 'The crisis comment has been updated !'
519       TheActor.inactAuthenticated.ieMessage(AMessage)
520     }
521   }
522 }
523 //-----
524 test step ts19oeCloseCrisis order 19{
525   variables{
526     TheActor : actCoordinator
527     AdtCrisisID : dtCrisisID
528   }
529   constraints{
530     TheActor=TheSystem.rnactCoordinator
531     ->select(a | a.rnctCoordinator.login.value.eq('steve'))
532     ->any2(true)
533     //and AdtCrisisID.value= '1'
534   }
535   test message{
536     out:TheActor sends to system actCoordinator.outactCoordinator.oeCloseCrisis(AdtCrisisID)
537   }
538   oracle{
539     variables {
540       AMessage:ptString
541     }
542     constraints{
543       AMessage = 'The crisis is now closed !'
544       TheActor.inactAuthenticated.ieMessage(AMessage)
545     }
546   }
547 }
548 }
549 }
550 }

```

Listing C.50: Messir Spec. file tc-testcase01.msr.

## C.51 File ./src-gen/messir-spec/test/tci-testcase01-instance01.msr

```

1 package lu.uni.lassy.excalibur.examples.icrash.tests.testcase01.instance01 {
2
3   import lu.uni.lassy.messir.libraries.string
4   import lu.uni.lassy.messir.libraries.primitives
5   import lu.uni.lassy.messir.libraries.math
6   import lu.uni.lassy.messir.libraries.calendar
7
8   import icrash.concepts.primarytypes.associations
9   import icrash.concepts.primarytypes.classes
10  import icrash.concepts.primarytypes.datatypes
11  import lu.uni.lassy.excalibur.examples.icrash.tests.testcase01
12  import icrash.environment
13
14 Test Model {

```

```

15 test case instance instance01:testcase01{
16 //-----
17 test step instance tsi01: testcase01.ts01oeCreateSystemAndEnvironment{
18 variables {
19   theCreator: testcase01.ts01oeCreateSystemAndEnvironment.Creator = "theCreator"
20   AqtyComCompanies : testcase01.ts01oeCreateSystemAndEnvironment.AqtyComCompanies="4"
21 }
22 oracle {
23   satisfaction = "true"
24 }
25 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
26 }
27 //-----
28 test step instance tsi02: testcase01.ts02oeSetClock{
29 variables {
30   theClock: testcase01.ts02oeSetClock.TheActor = "theClock"
31   ACurrentClock : testcase01.ts02oeSetClock.ACurrentClock= "2017:11:24 - 03:20:00"
32 }
33 oracle {
34   satisfaction = "true"
35 }
36 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
37 }
38 //-----
39 test step instance tsi03: testcase01.ts03oeLogin{
40 variables {
41   bill: testcase01.ts03oeLogin.TheActor="bill"
42   AdtLogin : testcase01.ts03oeLogin.AdtLogin= "icrashadmin"
43   AdtPassword : testcase01.ts03oeLogin.AdtPassword= "7WXC1359"
44 }
45 oracle {
46   satisfaction = "true"
47   received message {
48     AMessage : testcase01.ts03oeLogin.AMessage= 'You are logged ! Welcome ...'
49     tsi03.bill received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
50   }
51 }
52 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
53 }
54 //-----
55 test step instance tsi04: testcase01.ts04oeAddCoordinator{
56 variables {
57   reuse tsi03.bill as testcase01.ts04oeAddCoordinator.TheActor
58   AdtCoordinatorID : testcase01.ts04oeAddCoordinator.AdtCoordinatorID = "1"
59   AdtLogin : testcase01.ts04oeAddCoordinator.AdtLogin= "steve"
60   AdtPassword : testcase01.ts04oeAddCoordinator.AdtPassword = "pwdMessirExcalibur2017"
61 }
62 oracle {
63   satisfaction = "true"
64   received message {
65     tsi03.bill received from system actAdministrator.inactAdministrator.ieCoordinatorAdded()
66   }
67 }
68 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
69 }
70 //-----
71 test step instance tsi05: testcase01.ts05oeLogout{
72 variables {
73   reuse tsi03.bill as testcase01.ts05oeLogout.TheActor
74 }
75 oracle {
76   satisfaction = "true"
77   received message {
78     AMessage : testcase01.ts05oeLogout.AMessage= 'You are logged out ! Good Bye ...'
79     tsi03.bill received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
80   }
81 }
82 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
83 }
84 //-----

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```

85  test step instance tsi06: testcase01.ts06oeSetClock02{
86    variables {
87      reuse tsi02.theClock as testcase01.ts06oeSetClock02.TheActor
88      ACurrentClock : testcase01.ts06oeSetClock02.ACurrentClock= "2017:11:26 - 10:15:00"
89    }
90    oracle {
91      satisfaction = "true"
92    }
93    test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
94  }
95 //-----
96 test step instance tsi07: testcase01.ts07oeAlert1{
97  variables {
98    tango:testcase01.ts07oeAlert1.TheActor ="tango"
99    AetHumanKind : testcase01.ts07oeAlert1.AetHumanKind = "witness"
100   AdtDate : testcase01.ts07oeAlert1.AdtDate = "2017:11:26"
101   AdtTime : testcase01.ts07oeAlert1.AdtTime = "10:10:16"
102   AdtPhoneNumber : testcase01.ts07oeAlert1.AdtPhoneNumber = "+3524666445252"
103   AdtGPSLocation : testcase01.ts07oeAlert1.AdtGPSLocation = "49.627675:6.159590"
104   AdtComment : testcase01.ts07oeAlert1.AdtComment = "3 cars involved in an accident."
105  }
106 oracle {
107   satisfaction = "true"
108   received message {
109     AdtSMS : testcase01.ts07oeAlert1.AdtSMS= 'Your alert has been registered. We will handle it and
keep you informed'
110     tsi07.tango received from system actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
111   }
112 }
113 }
114 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
115 }
116
117 //-----
118 test step instance tsi08: testcase01.ts08oeSetClock03{
119  variables {
120    reuse tsi02.theClock as testcase01.ts08oeSetClock03.ACurrentClock
121    ACurrentClock : testcase01.ts08oeSetClock03.ACurrentClock = "2017:11:26 - 10:30:00"
122  }
123 oracle {
124   satisfaction = "true"
125 }
126 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
127 }
128 //-----
129 test step instance tsi09: testcase01.ts09oeSollicitateCrisisHandling{
130  variables {
131    reuse tsi02.theClock as testcase01.ts09oeSollicitateCrisisHandling.TheActor
132    reuse tsi03.bill as testcase01.ts09oeSollicitateCrisisHandling.TheAdministrator
133  }
134 oracle {
135   satisfaction = "true"
136   received message {
137     steve:testcase01.ts09oeSollicitateCrisisHandling.TheCoordinator ="steve"
138     AMesssageForCrisisHandlers : testcase01.ts09oeSollicitateCrisisHandling.
AMessageForCrisisHandlers= 'There are alerts pending since more than the defined delay. Please
REACT ! '
139
140     tsi03.bill received from system actAuthenticated.inactAuthenticated.ieMessage(
AMessageForCrisisHandlers)
141     tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(
AMessageForCrisisHandlers)
142   }
143 }
144 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
145 }
146
147 //-----
148 test step instance tsi10: testcase01.ts10oeLogin02{
149  variables {

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150  reuse tsi09.steve as testcase01.ts10oeLogin02.TheActor
151  AdtLogin : testcase01.ts10oeLogin02.AdtLogin = "steve"
152  AdtPassword : testcase01.ts10oeLogin02.AdtPassword= "pwdMessirExcalibur2017"
153 }
154 oracle {
155   satisfaction = "true"
156   received message {
157     AMessage : testcase01.ts10oeLogin02.AMessage= 'You are logged ! Welcome ...'
158     tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
159   }
160 }
161 }
162 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
163 }
164 //-----
165 test step instance ts11: testcase01.ts11oeGetCrisisSet{
166 variables {
167   reuse tsi09.steve as testcase01.ts11oeGetCrisisSet.TheActor
168   AetCrisisStatus : testcase01.ts11oeGetCrisisSet.AetCrisisStatus = "pending"
169 }
170 oracle {
171   satisfaction = "true"
172   received message {
173     ActCrisis : testcase01.ts11oeGetCrisisSet.ActCrisis= "crisis with ID 1 details"
174     tsi09.steve received from system actCoordinator.inactCoordinator.ieSendACrisis(ActCrisis)
175   }
176 }
177 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
178 }
179 //-----
180 test step instance ts12: testcase01.ts12oeSetCrisisHandler{
181 variables {
182   reuse tsi09.steve as testcase01.ts12oeSetCrisisHandler.TheActor
183   AdtCrisisID : testcase01.ts12oeSetCrisisHandler.AdtCrisisID = "1"
184
185   reuse tsi07.tango as testcase01.ts12oeSetCrisisHandler.TheComCompany
186
187 }
188 oracle {
189   satisfaction = "true"
190   received message {
191     AMessage : testcase01.ts12oeSetCrisisHandler.AMessage= 'You are now considered as handling the
192     crisis !'
193     AdtSMS : testcase01.ts12oeSetCrisisHandler.AdtSMS= 'The handling of your alert by our services
194       is in progress !'
195     AdtPhoneNumber : testcase01.ts12oeSetCrisisHandler.AdtPhoneNumber= "+3524666445252"
196
197     tsi07.tango received from system actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
198     tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
199   }
200 }
201 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
202 }
203 //-----
204 test step instance ts13: testcase01.ts13oeSetClock04{
205 variables {
206   reuse tsi02.theClock as testcase01.ts13oeSetClock04.TheActor
207   ACurrentClock : testcase01.ts13oeSetClock04.ACurrentClock = "2017:11:26 - 10:45:00"
208 }
209 oracle {
210   satisfaction = "true"
211 }
212 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
213 }
214 test step instance ts14: testcase01.ts14oeValidateAlert{
215 variables {
216   reuse tsi09.steve as testcase01.ts14oeValidateAlert.TheActor
217   AdtAlertID : testcase01.ts14oeValidateAlert.AdtAlertID = "1"

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218     }
219   oracle {
220     satisfaction = "true"
221     received message {
222       AMessage : testcase01.ts14oeValidateAlert.AMessage= 'The Alert is now declared as valid !'
223       tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
224     }
225   }
226 }
227 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
228 }
229 //-----
230 test step instance ts15: testcase01.ts15oeAlert2{
231   variables {
232     reuse tsi07.tango as testcase01.ts15oeAlert2.TheActor
233     AetHumanKind : testcase01.ts15oeAlert2.AetHumanKind ="witness"
234     AdtDate : testcase01.ts15oeAlert2.AdtDate= "2017:11:26"
235     AdtTime : testcase01.ts15oeAlert2.AdtTime= "10:20:00"
236     AdtPhoneNumber : testcase01.ts15oeAlert2.AdtPhoneNumber= "+3524666445000"
237     AdtGPSLocation : testcase01.ts15oeAlert2.AdtGPSLocation= "49.627095:6.160251"
238     AdtComment : testcase01.ts15oeAlert2.AdtComment= "A car crash just happened."
239   }
240   message {
241     tsi07.tango sent to system testcase01.ts15oeAlert2.out : actComCompany.outactComCompany.oeAlert(
242       AetHumanKind,AdtDate,AdtTime,AdtPhoneNumber,AdtGPSLocation,AdtComment)
243   }
244   oracle {
245     satisfaction = "true"
246     received message {
247       AdtSMS : testcase01.ts15oeAlert2.AdtSMS= 'Your alert has been registered. We will handle it and
248       keep you informed'
249       tsi07.tango received from system actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
250     }
251   }
252   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
253 }
254 //-----
255 test step instance ts16: testcase01.ts16oeSetClock05{
256   variables {
257     reuse tsi02.theClock as testcase01.ts16oeSetClock05.TheActor
258     ACurrentClock : testcase01.ts16oeSetClock05.ACurrentClock = "2017:11:26 - 12:45:00"
259   }
260   oracle {
261     satisfaction = "true"
262     received message {
263     }
264   }
265   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
266 }
267 }
268 //-----
269 test step instance ts17: testcase01.ts17oeSetCrisisStatus{
270   variables {
271     reuse tsi09.steve as testcase01.ts17oeSetCrisisStatus.TheActor
272     AdtCrisisID : testcase01.ts17oeSetCrisisStatus.AdtCrisisID = "1"
273     AetCrisisStatus : testcase01.ts17oeSetCrisisStatus.AetCrisisStatus= "solved"
274   }
275   oracle {
276     satisfaction = "true"
277     received message {
278       AMessage : testcase01.ts17oeSetCrisisStatus.AMessage= "The crisis status has been updated !"
279       tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
280     }
281   }
282   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
283 }
284 //-----
285 test step instance ts18: testcase01.ts18oeReportOnCrisis{

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286  variables {
287    reuse tsi09.steve as testcase01.ts18oeReportOnCrisis.TheActor
288    AdtCrisisID : testcase01.ts18oeReportOnCrisis.AdtCrisisID = "1"
289    AdtComment : testcase01.ts18oeReportOnCrisis.AdtComment= "3 victims sent to hospital, 2 cars
290      evacuated and 4 rescue unit mobilized"
291  }
292  oracle {
293    satisfaction = "true"
294    received message {
295      AMesssage : testcase01.ts18oeReportOnCrisis.AMessage= 'The crisis comment has been updated !'
296      tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
297    }
298  }
299  test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
300 }
301 //-----
302 test step instance tsi19: testcase01.ts19oeCloseCrisis{
303  variables {
304    reuse tsi09.steve as testcase01.ts19oeCloseCrisis.TheActor
305    AdtCrisisID : testcase01.ts19oeCloseCrisis.AdtCrisisID = "1"
306  }
307  oracle {
308    satisfaction = "true"
309    received message {
310      AMesssage : testcase01.ts19oeCloseCrisis.AMessage= 'The crisis is now closed !'
311      tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
312    }
313  }
314  }
315 }
316  test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
317 }
318 }
319 }
320 //-----
321 //-----
322 //-----
323 test case instance instance01Part01:testcase01{
324 //-----
325 test step instance tsi01:testcase01.ts01oeCreateSystemAndEnvironment{
326  variables {
327    theCreator:testcase01.ts01oeCreateSystemAndEnvironment.Creator = "theCreator"
328    AqtyComCompanies : testcase01.ts01oeCreateSystemAndEnvironment.AqtyComCompanies="4"
329  }
330  oracle {
331    satisfaction = "true"
332  }
333  test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
334 }
335 //-----
336 test step instance tsi02: testcase01.ts02oeSetClock{
337  variables {
338    theClock:testcase01.ts02oeSetClock.TheActor = "theClock"
339    ACurrentClock : testcase01.ts02oeSetClock.ACurrentClock= "2017:11:24 - 03:20:00"
340  }
341  oracle {
342    satisfaction = "true"
343  }
344  test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
345 }
346 //-----
347 test step instance tsi03: testcase01.ts03oeLogin{
348  variables {
349    bill:testcase01.ts03oeLogin.TheActor="bill"
350    AdtLogin : testcase01.ts03oeLogin.AdtLogin= "icrashadmin"
351    AdtPassword : testcase01.ts03oeLogin.AdtPassword= "7WXC1359"
352  }
353  oracle {
354    satisfaction = "true"

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355     received message {
356         AMessage : testcase01.ts03oeLogin.AMessage= 'You are logged ! Welcome ...'
357         tsi03.bill received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
358     }
359 }
360 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
361 }
362 //-----
363 test step instance tsi04: testcase01.ts04oeAddCoordinator{
364     variables {
365         reuse tsi03.bill as testcase01.ts04oeAddCoordinator.TheActor
366         AdtCoordinatorID : testcase01.ts04oeAddCoordinator.AdtCoordinatorID = "1"
367         AdtLogin : testcase01.ts04oeAddCoordinator.AdtLogin= "steve"
368         AdtPassword : testcase01.ts04oeAddCoordinator.AdtPassword = "pwdMessirExcalibur2017"
369     }
370     oracle {
371         satisfaction = "true"
372         received message {
373             tsi03.bill received from system actAdministrator.inactAdministrator.ieCoordinatorAdded()
374         }
375     }
376     test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
377 }
378 //-----
379 test step instance tsi05: testcase01.ts05oeLogout{
380     variables {
381         reuse tsi03.bill as testcase01.ts05oeLogout.TheActor
382     }
383     oracle {
384         satisfaction = "true"
385         received message {
386             AMessage : testcase01.ts05oeLogout.AMessage= 'You are logged out ! Good Bye ...'
387             tsi03.bill received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
388         }
389     }
390     test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
391 }
392 //-----
393 test step instance tsi06: testcase01.ts06oeSetClock02{
394     variables {
395         reuse tsi02.theClock as testcase01.ts06oeSetClock02.TheActor
396         ACurrentClock : testcase01.ts06oeSetClock02.ACurrentClock= "2017:11:26 - 10:15:00"
397     }
398     oracle {
399         satisfaction = "true"
400     }
401     test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
402 }
403 //-----
404 test step instance tsi07: testcase01.ts07oeAlert1{
405     variables {
406         tango:testcase01.ts07oeAlert1.TheActor ="tango"
407         AetHumanKind : testcase01.ts07oeAlert1.AetHumanKind = "witness"
408         AdtDate : testcase01.ts07oeAlert1.AdtDate = "2017:11:26"
409         AdtTime : testcase01.ts07oeAlert1.AdtTime = "10:10:16"
410         AdtPhoneNumber : testcase01.ts07oeAlert1.AdtPhoneNumber = "+3524666445252"
411         AdtGPSLocation : testcase01.ts07oeAlert1.AdtGPSLocation = "49.627675:6.159590"
412         AdtComment : testcase01.ts07oeAlert1.AdtComment = "3 cars involved in an accident."
413     }
414     oracle {
415         satisfaction = "true"
416         received message {
417             AdtSMS : testcase01.ts07oeAlert1.AdtSMS= 'Your alert has been registered. We will handle it and keep you informed'
418             tsi07.tango received from system actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
419         }
420     }
421     test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
422 }

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```

424 //-----
425 //-----
426 test step instance tsi08: testcase01.ts08oeSetClock03{
427   variables {
428     reuse tsi02.theClock as testcase01.ts08oeSetClock03.ACurrrentClock
429     ACurrentClock : testcase01.ts08oeSetClock03.ACurrrentClock = "2017:11:26 - 10:30:00"
430   }
431   oracle {
432     satisfaction = "true"
433   }
434   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
435 }
436 //-----
437 test step instance tsi09: testcase01.ts09oeSollicitateCrisisHandling{
438   variables {
439     reuse tsi02.theClock as testcase01.ts09oeSollicitateCrisisHandling.TheActor
440     reuse tsi03.bill as testcase01.ts09oeSollicitateCrisisHandling.TheAdministrator
441   }
442   oracle {
443     satisfaction = "true"
444     received message {
445       steve:testcase01.ts09oeSollicitateCrisisHandling.TheCoordinator ="steve"
446       AMesssageForCrisisHandlers : testcase01.ts09oeSollicitateCrisisHandling.
447       AMesssageForCrisisHandlers= 'There are alerts pending since more than the defined delay. Please
        REACT !'
448       tsi03.bill received from system actAuthenticated.inactAuthenticated.ieMessage(
449         AMesssageForCrisisHandlers)
450       tsi09.steve received from system actAuthenticated.inactAuthenticated.ieMessage(
451         AMesssageForCrisisHandlers)
452     }
453   }
454 }
455
456 //-----
457 //-----
458 //-----
459 test case instance instance01Part02: testcase01{
460
461 test step instance tsi10: testcase01.ts10oeLogin02{
462   variables {
463     steve : testcase01.ts10oeLogin02.TheActor
464     AdtLogin : testcase01.ts10oeLogin02.AdtLogin = "steve"
465     AdtPassword : testcase01.ts10oeLogin02.AdtPassword= "pwdMessirExcalibur2017"
466   }
467   oracle {
468     satisfaction = "true"
469     received message {
470       AMesssage : testcase01.ts10oeLogin02.AMessage= 'You are logged ! Welcome ...'
471       steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMesssage)
472     }
473   }
474 }
475 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
476 }
477 //-----
478 test step instance ts11: testcase01.ts11oeGetCrisisSet{
479   variables {
480     reuse tsi10.steve as testcase01.ts11oeGetCrisisSet.TheActor
481     AetCrisisStatus : testcase01.ts11oeGetCrisisSet.AetCrisisStatus = "pending"
482   }
483   oracle {
484     satisfaction = "true"
485     received message {
486       ActCrisis : testcase01.ts11oeGetCrisisSet.ActCrisis= "crisis with ID 1 details"
487       tsi10.steve received from system actCoordinator.inactCoordinator.ieSendACrisis(ActCrisis)
488     }
489 }

```

```

490  test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
491  }
492 //-----
493 test step instance tsi12: testcase01.ts12oeSetCrisisHandler{
494  variables {
495    reuse tsi10.steve as testcase01.ts12oeSetCrisisHandler.TheActor
496    AdtCrisisID : testcase01.ts12oeSetCrisisHandler.AdtCrisisID = "1"
497  }
498 oracle {
499   satisfaction = "true"
500   received message {
501     tango : testcase01.ts12oeSetCrisisHandler.TheComCompany
502     AMesssage : testcase01.ts12oeSetCrisisHandler.AMessage= 'You are now considered as handling the
crisis !'
503     AdtSMS : testcase01.ts12oeSetCrisisHandler.AdtSMS= 'The handling of your alert by our services
is in progress !'
504     AdtPhoneNumber : testcase01.ts12oeSetCrisisHandler.AdtPhoneNumber= "+3524666445252"
505
506     tango received from system actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
507     tsi10.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
508   }
509 }
510 }
511 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
512 }
513 //-----
514 test step instance tsi13: testcase01.ts13oeSetClock04{
515  variables {
516    theClock : testcase01.ts13oeSetClock04.TheActor
517    ACurrentClock : testcase01.ts13oeSetClock04.ACurrentClock = "2017:11:26 - 10:45:00"
518  }
519 oracle {
520   satisfaction = "true"
521 }
522 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
523 }
524 //-----
525 test step instance tsi14: testcase01.ts14oeValidateAlert{
526  variables {
527    reuse tsi10.steve as testcase01.ts14oeValidateAlert.TheActor
528    AdtAlertID : testcase01.ts14oeValidateAlert.AdtAlertID = "1"
529  }
530 oracle {
531   satisfaction = "true"
532   received message {
533     AMesssage : testcase01.ts14oeValidateAlert.AMessage= 'The Alert is now declared as valid !'
534     tsi10.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMessage)
535   }
536 }
537 }
538 test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
539 }
540 //-----
541 test step instance tsi15: testcase01.ts15oeAlert2{
542  variables {
543    reuse tsi12.tango as testcase01.ts15oeAlert2.TheActor
544    AetHumanKind : testcase01.ts15oeAlert2.AetHumanKind ="witness"
545    AdtDate : testcase01.ts15oeAlert2.AdtDate= "2017:11:26"
546    AdtTime : testcase01.ts15oeAlert2.AdtTime= "10:20:00"
547    AdtPhoneNumber : testcase01.ts15oeAlert2.AdtPhoneNumber= "+3524666445000"
548    AdtGPSLocation : testcase01.ts15oeAlert2.AdtGPSLocation= "49.627095:6.160251"
549    AdtComment : testcase01.ts15oeAlert2.AdtComment= "A car crash just happened."
550  }
551 message {
552   tsi12.tango sent to system testcase01.ts15oeAlert2.out : actComCompany.outactComCompany.oeAlert(
AetHumanKind,AdtDate,AdtTime,AdtPhoneNumber,AdtGPSLocation,AdtComment)
553 }
554 oracle {
555   satisfaction = "true"

```

```

557     received message {
558       AdtSMS : testcase01.ts15oeAlert2.AdtSMS= 'Your alert has been registered. We will handle it and
559       keep you informed'
560       tsil2.tango received from system actComCompany.inactComCompany.ieSmsSend(AdtPhoneNumber,AdtSMS)
561     }
562   }
563   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
564 }
565 //-
566 test step instance tsil6: testcase01.ts16oeSetClock05{
567   variables {
568     reuse tsil3.theClock as testcase01.ts16oeSetClock05.TheActor
569     AdtCurrentClock : testcase01.ts16oeSetClock05.AdtCurrentClock = "2017:11:26 - 12:45:00"
570   }
571   oracle {
572     satisfaction = "true"
573     received message {
574       }
575     }
576   }
577   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
578 }
579 //-
580 test step instance tsil7: testcase01.ts17oeSetCrisisStatus{
581   variables {
582     reuse tsil0.steve as testcase01.ts17oeSetCrisisStatus.TheActor
583     AdtCrisisID : testcase01.ts17oeSetCrisisStatus.AdtCrisisID = "1"
584     AetCrisisStatus : testcase01.ts17oeSetCrisisStatus.AetCrisisStatus= "solved"
585   }
586   oracle {
587     satisfaction = "true"
588     received message {
589       AMesssage : testcase01.ts17oeSetCrisisStatus.AMessage= "The crisis status has been updated !"
590       tsil0.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMesssage)
591     }
592   }
593   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
594 }
595 //-
596 test step instance tsil8: testcase01.ts18oeReportOnCrisis{
597   variables {
598     reuse tsil0.steve as testcase01.ts18oeReportOnCrisis.TheActor
599     AdtCrisisID : testcase01.ts18oeReportOnCrisis.AdtCrisisID = "1"
600     AdtComment : testcase01.ts18oeReportOnCrisis.AdtComment= "3 victims sent to hospital, 2 cars
601     evacuated and 4 rescue unit mobilized"
602   }
603   oracle {
604     satisfaction = "true"
605     received message {
606       AMesssage : testcase01.ts18oeReportOnCrisis.AMessage= 'The crisis comment has been updated !'
607       tsil0.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMesssage)
608     }
609   }
610   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
611 }
612 //-
613 test step instance tsil9: testcase01.ts19oeCloseCrisis{
614   variables {
615     reuse tsil0.steve as testcase01.ts19oeCloseCrisis.TheActor
616     AdtCrisisID : testcase01.ts19oeCloseCrisis.AdtCrisisID = "1"
617   }
618   oracle {
619     satisfaction = "true"
620     received message {
621       AMesssage : testcase01.ts19oeCloseCrisis.AMessage= 'The crisis is now closed !'
622     }
623     tsil0.steve received from system actAuthenticated.inactAuthenticated.ieMessage(AMesssage)
624

```

```

625     }
626   }
627   test results {pre-protocol = "true" pre-functional = "true" post-functional = "true"}
628 }
629
630 }
631 }
632
633 }

```

Listing C.51: Messir Spec. file tci-testcase01-instance01.msr.

## C.52 File [./src-gen/messir-spec/usecases/usecase-suDeployAndRun.msr](#)

```

1 package icrash.usecases.suDeployAndRun {
2   import icrash.concepts.primarytypes.datatypes
3   import icrash.environment
4   import icrash.usecases.suGlobalCrisisHandling
5   import icrash.usecases.ugAdministateTheSystem
6   import icrash.usecases.subfunctions
7
8   Use Case Model {
9     use case system summary suDeployAndRun() {
10       actor actAdministrator[primary,active]
11       actor actMsrCreator[secondary,active]
12       actor actCoordinator[secondary,active,multiple]
13       actor actActivator[secondary,proactive]
14       actor actComCompany[secondary,active]
15
16       reuse oeCreateSystemAndEnvironment[1..1]
17       reuse ugAdministateTheSystem[1..*]
18       reuse suGlobalCrisisHandling[1..*]
19       reuse oeSetClock[1..*]
20       reuse oeSollicitateCrisisHandling[0..*]
21       reuse oeAlert[1..*]
22
23       step a: actMsrCreator executes oeCreateSystemAndEnvironment
24       step b: actAdministrator executes ugAdministateTheSystem
25       step c: actComCompany executes oeAlert
26       step d: actActivator executes oeSetClock
27       step ^e: actActivator executes oeSollicitateCrisisHandling
28       step f: actCoordinator executes suGlobalCrisisHandling
29
30       ordering constraint
31         "step (a) must be always the first step."
32       ordering constraint
33         "step (f) can be executed by different actCoordinator actors."
34       ordering constraint
35         "if (e) then previously (d)."
36     }
37   //-----
38   //-----
39   //-----
40   use case instance uciSimpleAndComplete : suDeployAndRun {
41     actors {
42       theCreator : actMsrCreator
43       theClock : actActivator
44       bill : actAdministrator
45       tango : actComCompany
46       steve : actCoordinator
47     }
48     use case steps {
49   //-----
50     theCreator
51     executed instanceof subfunction
52       oeCreateSystemAndEnvironment("4") {}
53   //-----

```

```

54     theClock
55     executed instanceof subfunction
56         oeSetClock("2017:11:24 - 03:20:00"){}
57 //-
58     bill
59     executed instanceof subfunction
60         oeLogin("icrashadmin","7WXC1359"){
61             ieMessage('You are logged ! Welcome ...') returned to bill
62         }
63 //-
64     bill
65     executed instanceof subfunction
66         oeAddCoordinator("1","steve","pwdMessirExcalibur2017"){
67             ieCoordinatorAddedreturned returned to bill
68         }
69 //-
70     bill
71     executed instanceof subfunction
72         oeLogout{
73             ieMessage('You are logged out ! Good Bye ...') returned to bill
74         }
75 //-
76     theClock
77     executed instanceof subfunction
78         oeSetClock("2017:11:26 - 10:15:00"){}
79 //-
80     tango
81     executed instanceof subfunction
82         oeAlert("witness","2017:11:26","10:10:16","+3524666445252",
83             "49.627675:6.159590","3 cars involved in an accident."){
84             ieSmsSend("+3524666445252","Your alert has been registered. We will handle it and keep you
informed") returned to tango
85         }
86 //-
87     theClock
88     executed instanceof subfunction
89         oeSetClock("2017:11:26 - 10:30:00"){}
90 //-
91     theClock
92     executed instanceof subfunction
93         oeSollicitateCrisisHandling{
94             ieMessage("There are alerts pending since more than the defined delay. Please REACT !")
95             returned to bill
96             ieMessage("There are alerts pending since more than the defined delay. Please REACT !")
97             returned to steve
98         }
99 //-
100    steve
101    executed instanceof subfunction
102        oeLogin("steve","pwdMessirExcalibur2017"){
103            ieMessage('You are logged ! Welcome ...') returned to steve
104        }
105 //-
106    steve
107    executed instanceof subfunction
108        oeGetCrisisSet("pending"){
109            ieSendACrisis("crisis with ID 1 details") returned to steve
110        }
111 //-
112    steve
113    executed instanceof subfunction
114        oeSetCrisisHandler("1"){
115            ieSmsSend("+3524666445252","The handling of your alert by our services is in progress !")
116            returned to tango
117            ieMessage("You are now considered as handling the crisis !")
118            returned to steve
119        }
120 //-
121    theClock
122    executed instanceof subfunction

```

```

123      oeSetClock("2017:11:26 - 10:45:00") {}
124 //-----
125      steve
126      executed instanceof subfunction
127          oeValidateAlert("1"){
128              ieMessage('The Alert is now declared as valid !')
129              returned to steve
130          }
131 //-----
132      tango
133      executed instanceof subfunction
134          oeAlert("witness","2017:11:26","10:20:00","+3524666445000",
135              "49.627095:6.160251","A car crash just happened."){
136              ieSmsSend("+3524666445000","Your alert has been registered. We will handle it and keep you
informed") returned to tango
137          }
138 //-----
139      theClock
140      executed instanceof subfunction
141          oeSetClock("2017:11:26 - 12:45:00") {}
142 //-----
143      steve
144      executed instanceof subfunction
145          oeSetCrisisStatus("1","solved"){
146              ieMessage('The crisis status has been updated !')
147              returned to steve
148          }
149 //-----
150      steve
151      executed instanceof subfunction
152          oeReportOnCrisis("1","3 victims sent to hospital, 2 cars evacuated and 4 rescue unit
mobilized"){
153              ieMessage('The crisis comment has been updated !')
154              returned to steve
155          }
156 //-----
157      steve
158      executed instanceof subfunction
159          oeCloseCrisis("1"){
160              ieMessage('The crisis is now closed !')
161              returned to steve
162          }
163
164      }
165  }
166 //-----
167 //-----
168 //-----
169 use case instance uciSimpleAndCompletePart01 : suDeployAndRun{
170
171     actors {
172         theCreator : actMsrCreator
173         theClock : actActivator
174         bill : actAdministrator
175         tango : actComCompany
176         steve : actCoordinator
177     }
178     use case steps {
179 //-----
180         theCreator
181         executed instanceof subfunction
182             oeCreateSystemAndEnvironment("4") {}
183 //-----
184         theClock
185         executed instanceof subfunction
186             oeSetClock("2017:11:24 - 03:20:00") {}
187 //-----
188         bill
189         executed instanceof subfunction
190             oeLogin("icrashadmin","7WXC1359") {

```

```

191     ieMessage('You are logged ! Welcome ...') returned to bill
192 }
193 //-----
194 bill
195 executed instanceof subfunction
196     oeAddCoordinator("1","steve","pwdMessirExcalibur2017"){
197     ieCoordinatorAddedreturned returned to bill
198 }
199 //-----
200 bill
201 executed instanceof subfunction
202     oeLogout{
203     ieMessage('You are logged out ! Good Bye ...') returned to bill
204 }
205 //-----
206 theClock
207 executed instanceof subfunction
208     oeSetClock("2017:11:26 - 10:15:00){}
209 //-----
210 tango
211 executed instanceof subfunction
212     oeAlert("witness","2017:11:26","10:10:16","+3524666445252",
213         "49.627675:6.159590","3 cars involved in an accident."){
214     ieSmsSend("+3524666445252","Your alert has been registered. We will handle it and keep you
informed") returned to tango
215 }
216 //-----
217 theClock
218 executed instanceof subfunction
219     oeSetClock("2017:11:26 - 10:30:00){}
220 //-----
221 theClock
222 executed instanceof subfunction
223     oeSollicitateCrisisHandling{
224     ieMessage("There are alerts pending since more than the defined delay. Please REACT !")
225     returned to bill
226     ieMessage("There are alerts pending since more than the defined delay. Please REACT !")
227     returned to steve
228 }
229 }
230 }
231 //-----
232 //-----
233 //-----
234 use case instance uciSimpleAndCompletePart02 : suDeployAndRun{
235 actors {
236     theCreator : actMsrCreator
237     theClock : actActivator
238     bill : actAdministrator
239     tango : actComCompany
240     steve : actCoordinator
241 }
242 use case steps {
243
244 //-----
245     steve
246     executed instanceof subfunction
247     oeLogin("steve","pwdMessirExcalibur2017"){
248     ieMessage('You are logged ! Welcome ...') returned to steve
249 }
250 //-----
251     steve
252     executed instanceof subfunction
253     oeGetCrisisSet("pending"){
254     ieSendACrisis("crisis with ID 1 details") returned to steve
255 }
256 //-----
257     steve
258     executed instanceof subfunction
259     oeSetCrisisHandler("1"){

```

```

260     ieSmsSend("+3524666445252","The handling of your alert by our services is in progress !")
261     returned to tango
262     ieMessage("You are now considered as handling the crisis !")
263     returned to steve
264 }
265 //-----
266     theClock
267     executed instanceof subfunction
268     oeSetClock("2017:11:26 - 10:45:00") {}
269 //-----
270     steve
271     executed instanceof subfunction
272     oeValidateAlert("1"){
273         ieMessage('The Alert is now declared as valid !')
274         returned to steve
275     }
276 //-----
277     tango
278     executed instanceof subfunction
279     oeAlert("witness","2017:11:26","10:20:00","+3524666445000",
280         "49.627095:6.160251","A car crash just happened.")
281     ieSmsSend("+3524666445000","Your alert has been registered. We will handle it and keep you
282     informed") returned to tango
283 //-----
284     theClock
285     executed instanceof subfunction
286     oeSetClock("2017:11:26 - 12:45:00") {}
287 //-----
288     steve
289     executed instanceof subfunction
290     oeSetCrisisStatus("1","solved"){
291         ieMessage('The crisis status has been updated !')
292         returned to steve
293     }
294 //-----
295     steve
296     executed instanceof subfunction
297     oeReportOnCrisis("1","3 victims sent to hospital, 2 cars evacuated and 4 rescue unit
298     mobilized"){
299         ieMessage('The crisis comment has been updated !')
300         returned to steve
301     }
302     steve
303     executed instanceof subfunction
304     oeCloseCrisis("1"){
305         ieMessage('The crisis is now closed !')
306         returned to steve
307     }
308 }
309 }
310 }
311 }
312 }
```

Listing C.52: Messir Spec. file usecase-suDeployAndRun.msr.

### C.53 File [./src-gen/messir-spec/usecases/usecase-suGlobalCrisisHandling.msr](#)

```

1 package icrash.usecases.suGlobalCrisisHandling {
2 import lu.uni.lassy.messir.libraries.primitives
3 import icrash.environment
4 import icrash.usecases.subfunctions
5 import icrash.usecases.ugSecurelyUseSystem
6 import icrash.usecases.ugManageCrisis
7 import icrash.usecases.ugMonitor
```

```

8
9 Use Case Model {
10 use case system summary
11   suGlobalCrisisHandling() {
12     actor actCoordinator[primary,active]
13
14   reuse ugSecurelyUseSystem[1..*]
15   reuse ugMonitor[1..*]
16   reuse ugManageCrisis[1..*]
17
18   step a: actCoordinator
19     executes ugSecurelyUseSystem
20   step b: actCoordinator
21     executes ugMonitor
22   step c: actCoordinator
23     executes ugManageCrisis
24
25 ordering constraint
26   "steps (a) (b) and (c) executions are interleaved
27   (steps (b) and (c) have their protocol constrained by steps of (a))."
28 ordering constraint
29   "steps (a) (b) and (c) can be executed multiple times."
30 }
31 }

```

Listing C.53: Messir Spec. file usecase-suGlobalCrisisHandling.msr.

## C.54 File [./src-gen/messir-spec/usecases/usecase-ugAdministrateTheSystem.msr](#)

```

1 package icrash.usecases.ugAdministrateTheSystem {
2
3 import icrash.environment
4 import icrash.usecases.ugSecurelyUseSystem
5 import icrash.usecases.subfunctions
6
7 Use Case Model {
8
9   use case system usergoal
10   ugAdministrateTheSystem() {
11     actor actAdministrator[primary,active]
12
13   reuse ugSecurelyUseSystem[1..*]
14   reuse oeAddCoordinator[1..*]
15   reuse oeDeleteCoordinator[0..*]
16   reuse oeAddHospital[0..*]
17   reuse oeDeleteHospital[0..*]
18
19   step a: actAdministrator
20     executes ugSecurelyUseSystem
21   step b: actAdministrator
22     executes oeAddCoordinator
23   step c: actAdministrator
24     executes oeDeleteCoordinator
25   step d: actAdministrator
26     executes oeAddHospital
27   step e: actAdministrator
28     executes oeDeleteHospital
29
30 ordering constraint
31   "steps (a) (b) and (c) executions are interleaved
32   (steps (b) (c) (d) and (e) have their protocol constrained
33   by steps of (a))."
34 ordering constraint
35   "steps (a) (b) (c) (d) and (e) can be executed multiple times."
36 }
37 }

```

38 }

Listing C.54: Messir Spec. file usecase-ugAdministrateTheSystem.msr.

**C.55 File .**/src-gen/messir-spec/usecases/usecase-ugManageCrisis.msr

```

1 package icrash.usecases.ugManageCrisis {
2
3   import icrash.environment
4   import icrash.usecases.subfunctions
5
6   Use Case Model {
7
8     use case system usergoal ugManageCrisis() {
9       actor actCoordinator[primary, active]
10
11       reuse oeValidateAlert[0...*]
12       reuse oeSetCrisisStatus[0...*]
13       reuse oeSetCrisisHandler[0...*]
14       reuse oeReportOnCrisis[0...*]
15       reuse oeCloseCrisis[0...*]
16       reuse oeInvalidateAlert[0...*]
17       reuse oeSendHospitalInfo[0...*]
18
19       step a: actCoordinator executes oeValidateAlert
20       step b: actCoordinator executes oeSetCrisisStatus
21       step c: actCoordinator executes oeSetCrisisHandler
22       step d: actCoordinator executes oeReportOnCrisis
23       step f: actCoordinator executes oeCloseCrisis
24       step g: actCoordinator executes oeInvalidateAlert
25       step h: actCoordinator executes oeSendHospitalInfo
26
27     ordering constraint "managing a crisis is doing one of the indicated use cases."
28   }
29 }
30
31 }
32 }
```

Listing C.55: Messir Spec. file usecase-ugManageCrisis.msr.

**C.56 File .**/src-gen/messir-spec/usecases/usecase-ugMonitor.msr

```

1 package icrash.usecases.ugMonitor {
2
3   import icrash.environment
4   import icrash.usecases.subfunctions
5
6   Use Case Model {
7     use case system usergoal ugMonitor() {
8       actor icrash.environment.actCoordinator[primary,active]
9
10      reuse oeGetCrisisSet[0...*]
11      reuse oeGetAlertsSet[0...*]
12
13      step a: icrash.environment.actCoordinator executes oeGetAlertsSet
14      step b: icrash.environment.actCoordinator executes oeGetCrisisSet
15    }
16  }
17 }
```

Listing C.56: Messir Spec. file usecase-ugMonitor.msr.

**C.57 File**                    **./src-gen/messir-spec/usecases/usecase-ugSecurelyUseSystem.msr**

```

1 package icrash.usecases.ugSecurelyUseSystem {
2
3 import icrash.environment
4 import icrash.usecases.subfunctions
5
6 Use Case Model {
7
8 use case system usergoal
9 ugSecurelyUseSystem() {
10
11 actor actAuthenticated[primary,active]
12
13 reuse oeLogin[1..1]
14 reuse oeLogout[1..1]
15
16 step a: actAuthenticated
17   executes oeLogin
18 step b: actAuthenticated
19   executes oeLogout
20
21 ordering constraint
22 "step (a) must always precede step (b)."
23 }
24 }
25 }
```

Listing C.57: Messir Spec. file usecase-ugSecurelyUseSystem.msr.

**C.58 File**                    **./src-gen/messir-spec/usecases/usecaseinstance-oeAddHospital-ucioeAddHospital.msr**

```

1 package usecases.ocioeAddHospital {
2 import icrash.usecases.subfunctions
3 import icrash.environment
4
5 Use Case Model {
6
7 use case instance ucioeAddHospital : subfunction oeAddHospital{
8   actors {
9     jose: actAdministrator
10   }
11   ieHospitalAdded("HECA") returned to jose
12 }
13 }
14 }
```

Listing C.58: Messir Spec. file usecaseinstance-oeAddHospital-ucioeAddHospital.msr.

**C.59 File**                    **./src-gen/messir-spec/usecases/usecaseinstance-oeSendHospitalInfo-ucioeSendHospitalInfo.msr**

```

1 package usecases.ocioeSendHospitalInfo {
2 import icrash.usecases.subfunctions
3 import icrash.environment
4
5 Use Case Model {
6
7 use case instance ucioeSendHospitalInfo : subfunction oeSendHospitalInfo{
8   actors {
9     juan: actCoordinator
10    heca: actHospital
11   }
12 }
```

```

12     ieSendHospitalInfo("10.4,25.8", "4", "medium") returned to heca
13   }
14 }
15 }
```

Listing C.59: Messir Spec. file usecaseinstance-oeSendHospitalInfo-ucioeSendHospitalInfo.msr.

## C.60 File [./src-gen/messir-spec/usecases/usecaseinstance-ugSecurelyUseSystem-uciugSecurelyUseSystem.msr](#)

```

1 package usecases.uciugSecurelyUseSystem {
2   import icrash.usecases.ugSecurelyUseSystem
3   import icrash.usecases.ugSecurelyUseSystem
4   import icrash.concepts.primarytypes.datatypes
5   import icrash.environment
6   import icrash.usecases.suGlobalCrisisHandling
7   import icrash.usecases.ugAdministrateTheSystem
8   import icrash.usecases.subfunctions
9
10 Use Case Model {
11
12 //-----
13   use case instance uciugSecurelyUseSystem : ugSecurelyUseSystem {
14     actors {
15       bill:actAuthenticated
16     }
17   use case steps {
18 //-----
19     bill
20     executed instanceof subfunction
21       oeLogin("icrashadmin","7WXC1359"){
22         ieMessage('You are logged ! Welcome ...') returned to bill
23       }
24 //-----
25     bill
26     executed instanceof subfunction
27       oeLogout{
28         ieMessage('You are logged out ! Good Bye ...') returned to bill
29       }
30   }
31 }
32 }
33 }
```

Listing C.60: Messir Spec. file usecaseinstance-ugSecurelyUseSystem-uciugSecurelyUseSystem.msr.

## Appendix D

# Listing of the Prolog Files Referenced in the Operation Model Specification

### D.1

#### File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactActivatorSetClock.pl

```
1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactActivator,
7    oeSetClock,
8    [preProtocol,Self,
9     AcurrentClock
10    ],
11    []):-!
12/* Pre Protocol:*/
13/* PreP01 */
14 msrVar(ctState,TheSystem),
15 msrVar(ptBoolean,AvpStarted),
16
17 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
18
19 msrNav([Self],[rnActor,rnSystem,vpStarted],[AvpStarted]),
20 AvpStarted = [ptBoolean,true],
21
22 msrNav([TheSystem],
23     [clock,lt,[AcurrentClock]],
24     [[ptBoolean,true]]))
25 .
26
27msrop(outactActivator,
28    oeSetClock,
29    [preFunctional,Self,
30     AcurrentClock
31    ],
32    []):-!
33/* Pre Functional:*/
34/* PreF01 */
35true.
36
37msrop(outactActivator,
38    oeSetClock,
39    [post,Self,
40     AcurrentClock
41    ],
42    []):-!
43
```

```

44 msrVar(ctState,TheSystem),
45
46 /* Post Functional:*/
47
48 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
49
50 /* PostF01 */
51 msrNav([TheSystem],
52     [msmAtPost,clock],
53     [AcurrentClock]),
54
55 /* Post Protocol:*/
56 /* PostP01 */
57 true
58 .

```

Listing D.1: Prolog file outactActivator-oeSetClock.pl.

## D.2 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactActivator-oeSollicitateCrisisHandling.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6
7msrop(outactActivator,
8    oeSollicitateCrisisHandling,
9    [preProtocol,Self
10   ],
11   []):-!
12/* Pre Protocol:*/
13 msrVar(ctState,TheSystem),
14 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
15
16 msrVarCol(ctCrisis,_,ColctCrisisToHandle),
17
18/* PreP01 */
19 msrNav([TheSystem],
20     [vpStarted],
21     [[ptBoolean,true]]),
22
23/* PreP02 */
24 msrNav([TheSystem],
25     [rnctCrisis,msrSelect,
26      handlingDelayPassed,[]]
27   ],
28   ColctCrisisToHandle),
29
30 msrNav(ColctCrisisToHandle,
31     [msrSize,geq,[[ptInteger,1]]],
32     [[ptBoolean,true]]),
33.
34
35msrop(outactActivator,
36    oeSollicitateCrisisHandling,
37    [preFunctional,Self
38   ],
39   []):-!
40/* Pre Functional:*/
41/* PreF01 */
42true.
43
44msrop(outactActivator,
45    oeSollicitateCrisisHandling,
46    [post,Self
47   ],

```

```

48      []):-  

49  

50 msrVar(ctState,TheSystem),  

51 msrVar(dtComment,AMessageForCrisisHandlers),  

52 msrVar(dtDateAndTime, TheClock),  

53 msrVarCol(ctCrisis,_,ColctCrisisToAllocateIfPossible),  

54  

55/* Post Functional:*/  

56 msrNav([Self],[rnActor,rnSystem],[TheSystem]),  

57  

58 /* PostF01 */  

59 msrNav([TheSystem],  

60     [rnctCrisis,msrSelect,  

61      maxHandlingDelayPassed, []  

62    ],  

63    ColctCrisisToAllocateIfPossible),  

64  

65msrNav(ColctCrisisToAllocateIfPossible,  

66     [msrForAll,isAllocatedIfPossible,[],  

67     [[ptBoolean,true]]],  

68  

69 /* PostF02 */  

70 msrNav([TheSystem],  

71     [rnctCrisis,msrSelect,  

72      handlingDelayPassed, []  

73    ],  

74    ColctCrisisToHandle),  

75  

76 msrNav(ColctCrisisToHandle,  

77     [msrColSubtract,[ColctCrisisToAllocateIfPossible]  

78   ],  

79    ColctCrisisToRemind),  

80  

81 (msrNav(ColctCrisisToRemind,  

82     [msrSize,geq,[[ptInteger,1]]],  

83     [[ptBoolean,true]])  

84 -> (msrNav([AMessageForCrisisHandlers],  

85     [value],  

86     [[ptString,'There are alerts pending since more than the defined delay. Please REACT !']] ),  

87  

88 msrNav([TheSystem],  

89     [rnactAdministrator,rnInterfaceIN,  

90      ieMessage, [AMessageForCrisisHandlers]  

91    ],  

92    [[ptBoolean,true]]),  

93  

94 msrNav([TheSystem],  

95     [rnactCoordinator,msrForAll,rnInterfaceIN,  

96      ieMessage, [AMessageForCrisisHandlers]  

97    ],  

98    [[ptBoolean,true]]))  

99 )  

100 ; true  

101 ),  

102  

103/* Post Protocol:*/  

104/* PostP01 */  

105 msrNav([TheSystem],  

106     [clock],  

107     [TheClock]),  

108  

109 msrNav([TheSystem],  

110     [msmAtPost,vpLastReminder],  

111     [TheClock])  

112 .

```

Listing D.2: Prolog file outactActivator-oeSollicitateCrisisHandling.pl.

### D.3 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactAdm oeAddCoordinator.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5%-----%
6msrop(outactAdministrator,
7    oeAddCoordinator,
8    [preProtocol,Self,
9     AdtCoordinatorID,
10    AdtLogin,
11    AdtPassword
12    ],
13    []):-!
14/* Pre Protocol:*/
15 msrVar(ctState,TheSystem),
16 msrVar(actAdministrator,TheActor),
17 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
18 msrNav([Self],[rnActor],[TheActor]),
19 .
20/* PreP01 */
21 msrNav([TheSystem],
22     [vpStarted],
23     [[ptBoolean,true]]),
24 .
25/* PreP02 */
26 msrNav([TheActor],
27     [rnctAuthenticated,vpIsLogged],
28     [[ptBoolean,true]]),
29 .
30 .
31 .
32msrop(outactAdministrator,
33    oeAddCoordinator,
34    [preFunctional,Self,
35     AdtCoordinatorID,
36     AdtLogin,
37     AdtPassword
38    ],
39    []):-!
40/* Pre Functional:*/
41 msrVar(ctState,TheSystem),
42 msrVar(actAdministrator,TheActor),
43 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
44 msrNav([Self],[rnActor],[TheActor]),
45/* PreF01 */
46 msrNav([TheSystem],
47     [rnctCoordinator,
48      msrSelect,id,eq,[AdtCoordinatorID]],
49     ColctCoordinators),
50 msrNav(ColctCoordinators,
51     [msrIsEmpty],
52     [[ptBoolean,true]]),
53 .
54 .
55msrop(outactAdministrator,
56    oeAddCoordinator,
57    [post,Self,
58     AdtCoordinatorID,
59     AdtLogin,
60     AdtPassword
61    ],
62    []):-!
63 .
64/* Post Functional:*/
65 msrVar(ctState,TheSystem),
66 msrVar(actAdministrator,TheActor),

```

```

67 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
68 msrNav([Self],[rnActor],[TheActor]),
69
70 msrVar(actCoordinator,TheactCoordinator),
71 msrVar(ctCoordinator,ThectCoordinator),
72
73 /* PostF01 */
74 msrNav([TheactCoordinator],
75     [init,[]],
76     [[ptBoolean,true]]),
77
78 /* PostF02 */
79 msrNav([ThectCoordinator],
80     [init,[AdtCoordinatorID,AdtLogin,AdtPassword]],
81     [[ptBoolean,true]]),
82
83 /* PostF03 */
84 msrNav([TheactCoordinator],
85     [msmAtPost,rnctCoordinator],
86     [ThectCoordinator]),
87
88 /* PostF04 */
89 msrNav([ThectCoordinator],
90     [msmAtPost,rnactAuthenticated],
91     [TheactCoordinator]),
92
93 /* PostF05 */
94 msrNav([TheActor],
95     [rnInterfaceIN,
96     ieCoordinatorAdded,[]],
97     [[ptBoolean,true]]),
98
99 /* Post Protocol:*/
100 /* PostP01 */
101 true
102 .

```

Listing D.3: Prolog file outactAdministrator-oeAddCoordinator.pl.

## D.4 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactAdministrator-oeDeleteCoordinator.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactAdministrator,
7    oeDeleteCoordinator,
8    [preProtocol,Self,
9     AdtCoordinatorID
10    ],
11    []):-
12/* Pre Protocol:*/
13 msrVar(ctState,TheSystem),
14 msrVar(actAdministrator,TheActor),
15 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
16 msrNav([Self],[rnActor],[TheActor]),
17
18/* PreP01 */
19 msrNav([TheSystem],
20     [vpStarted],
21     [[ptBoolean,true]]),
22
23 msrNav([TheActor],
24     [rnctAuthenticated,vpIsLogged],
25     [[ptBoolean,true]]))
26.

```

```

27
28msrop(outactAdministrator,
29    oeDeleteCoordinator,
30    [preFunctional,Self,
31     AdtCoordinatorID
32    ],
33    []):-!
34/* Pre Functional:*/
35 msrVar(ctState,TheSystem),
36 msrVar(actAdministrator,TheActor),
37 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
38 msrNav([Self],[rnActor],[TheActor]),
39
40/* PreF01 */
41 msrNav([TheSystem],
42     [rnctCoordinator,
43      msrSelect,id,eq,[AdtCoordinatorID]],
44     ColctCoordinators),
45
46 msrNav(ColctCoordinators,
47     [msrSize,eq,[[ptInteger,1]]],
48     [[ptBoolean,true]]).
49
50msrop(outactAdministrator,
51    oeDeleteCoordinator,
52    [post,Self,
53     AdtCoordinatorID
54    ],
55    []):-!
56
57/* Post Functional:*/
58 msrVar(ctState,TheSystem),
59 msrVar(actAdministrator,TheActor),
60 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
61 msrNav([Self],[rnActor],[TheActor]),
62
63/* PostF01 */
64 msrNav([TheSystem],
65     [rnctCoordinator,
66      msrSelect,id,eq,[AdtCoordinatorID]],
67     [ThectCoordinator]),
68
69 msrNav([ThectCoordinator],
70     [rnactCoordinator,msrForAll,msrIsKilled],
71     [[ptBoolean,true]]),
72
73 msrNav([ThectCoordinator],
74     [msrIsKilled],
75     [[ptBoolean,true]]),
76
77 /* PostF02 */
78 msrNav([TheActor],
79     [rnInterfaceIN,
80      ieCoordinatorDeleted,[]]
81    ],
82    [[ptBoolean,true]]),
83
84 /* Post Protocol:*/
85/* PostP01 */
86 true
87 .

```

Listing D.4: Prolog file outactAdministrator-oeDeleteCoordinator.pl.

## D.5 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactAdministrator-oeLogin.pl

%%%%%%%%%%%%%

```

2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5%
6msrop(outactAuthenticated,
7    oeLogin,
8    [preProtocol,Self,
9     AdtLogin,
10    AdtPassword
11    ],
12    []):-.
13/* Pre Protocol:*/
14 msrVar(ctState,TheSystem),
15 msrVar(actAuthenticated,TheactAuthenticated),
16 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
17 msrNav([Self],[rnActor],[TheactAuthenticated]),
18
19 /* PreP01 */
20 msrNav([TheSystem],
21     [vpStarted],
22     [[ptBoolean,true]]),
23
24 msrNav([TheactAuthenticated],
25     [rnctAuthenticated,vpisLogged],
26     [[ptBoolean,false]])
27 .
28
29msrop(outactAuthenticated,
30    oeLogin,
31    [preFunctional,Self,
32     AdtLogin,
33     AdtPassword
34     ],
35    []):-.
36/* Pre Functional:*/
37/* PreF01 */
38true
39.
40
41msrop(outactAuthenticated,
42    oeLogin,
43    [post,Self,
44     AdtLogin,
45     AdtPassword
46     ],
47    []):-.
48
49 msrVar(ctState,TheSystem),
50 msrVar(actAuthenticated,TheactAuthenticated),
51
52 msrVar(ptString,AptStringMessageForTheactAuthenticated),
53 msrVar(ptString,AptStringMessageForTheactAdministrator),
54
55/* Post Functional:*/
56
57 msrNav([Self],[rnActor],[TheactAuthenticated]),
58 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
59
60/* PostF01 */
61
62 ( (msrNav([TheactAuthenticated],
63            [rnctAuthenticated,pwd],
64            [AdtPassword]),
65   msrNav([TheactAuthenticated],
66            [rnctAuthenticated,login],
67            [AdtLogin])
68 )
69 -> ( msrNav([AptStringMessageForTheactAuthenticated],
70              [eq,[[ptString,'You are logged ! Welcome ...']]],
71              [[ptBoolean,true]]),

```

```

72     msrNav([TheactAuthenticated],
73         [rnInterfaceIN,
74          ieMessage, [AptStringMessageForTheactAuthenticated]],
75          [[ptBoolean,true]])
76    )
77 ; ( msrNav([AptStringMessageForTheactAuthenticated],
78         [eq,[[ptString,'Wrong identification information ! Please try again ...']]],,
79         [[ptBoolean,true]]),
80     msrNav([TheactAuthenticated],
81         [rnInterfaceIN,
82          ieMessage, [AptStringMessageForTheactAuthenticated]],
83          [[ptBoolean,true]]),
84
85     msrNav([AptStringMessageForTheactAdministrator],
86         [eq,[[ptString,'Intrusion tentative !']]],,
87         [[ptBoolean,true]]),
88     msrNav([TheSystem],
89         [rnactAdministrator,rnInterfaceIN,
90          ieMessage, [AptStringMessageForTheactAdministrator]],
91          [[ptBoolean,true]])
92    )
93 ),
94
95 /* Post Protocol:*/
96/* PostP01 */
97 ( (msrNav([TheactAuthenticated],
98     [rnctAuthenticated,pwd],
99     [AdtPassword]),
100 msrNav([TheactAuthenticated],
101     [rnctAuthenticated,login],
102     [AdtLogin])
103 )
104 -> (msrNav([TheactAuthenticated],
105     [rnctAuthenticated,msmAtPost,vpIsLogged],
106     [[ptBoolean,true]])
107   )
108 ; true
109 )
110 .

```

Listing D.5: Prolog file outactAuthenticated-oeLogin.pl.

## D.6 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactAuthenticated-oeLogout.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactAuthenticated,
7    oeLogout,
8    [preProtocol,Self
9     ],
10    []):- 
11/* Pre Protocol:*/
12 msrVar(ctState,TheSystem),
13 msrVar(actAuthenticated,TheActor),
14 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
15 msrNav([Self],[rnActor],[TheActor]),
16
17/* PreP01 */
18 msrNav([TheSystem],
19     [vpStarted],
20     [[ptBoolean,true]]),
21
22 msrNav([TheActor],
23     [rnctAuthenticated,vpIsLogged],

```

```

24     [[ptBoolean,true]])  

25 .  

26  

27msrop(outactAuthenticated,  

28     oeLogout,  

29     [preFunctional,Self  

30     ],  

31     []):-  

32/* Pre Functional:*/  

33/* PreF01 */  

34true  

35.  

36  

37msrop(outactAuthenticated,  

38     oeLogout,  

39     [post,Self  

40     ],  

41     []):-  

42  

43 msrVar(ctState,TheSystem),  

44 msrVar(actAuthenticated,TheactAuthenticated),  

45  

46 msrVar(ptString,AptStringMessageForTheactAuthenticated),  

47  

48/* Post Functional:*/  

49 msrNav([Self],[rnActor],[TheactAuthenticated]),  

50 msrNav([Self],[rnActor,rnSystem],[TheSystem]),  

51  

52/* PostF01 */  

53 msrNav([AptStringMessageForTheactAuthenticated],  

54     [eq,[[ptString,'You are logged out ! Good Bye ...']]],  

55     [[ptBoolean,true]]),  

56 msrNav([TheactAuthenticated],  

57     [rnInterfaceIN,  

58      ieMessage,[AptStringMessageForTheactAuthenticated]],  

59     [[ptBoolean,true]]),  

60  

61 /* Post Protocol:*/  

62/* PostP01 */  

63msrNav([TheactAuthenticated],  

64     [rnctAuthenticated,msmAtPost,vpIsLogged],  

65     [[ptBoolean,false]]))  

66.

```

Listing D.6: Prolog file outactAuthenticated-oeLogout.pl.

## D.7 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactComCoeAlert.pl

```

1%%%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%%%
5-----  

6nico(A):-  

7 trace,  

8 write('here'),  

9 write('\n').  

10  

11msrop(outactComCompany,
12     oeAlert,  

13     [preProtocol,Self,
14      AetHumanKind,
15      AdtDate,
16      AdtTime,
17      AdtPhoneNumber,
18      AdtGPSLocation,
19      AdtComment

```

```

20      ],
21      []):-  

22 /* Pre Protocol:*/  

23 msrVar(ctState,TheSystem),  

24 msrNav([Self],[rnActor,rnSystem],[TheSystem]),  

25 /* PreP01 */  

26 msrNav([TheSystem],  

27     [vpStarted],  

28     [[ptBoolean,true]]))  

29 .  

30  

31 msrop(outactComCompany,  

32     oeAlert,  

33     [preFunctional,Self,  

34     AetHumanKind,  

35     AdtDate,  

36     AdtTime,  

37     AdtPhoneNumber,  

38     AdtGPSLocation,  

39     AdtComment  

40     ],  

41     []):-  

42 /* Pre Functional:*/  

43 /* PreF01 */  

44 msrVar(ctState,TheSystem),  

45 msrNav([Self],  

46     [msmAtPre,rnActor,rnSystem],  

47     [TheSystem]),  

48  

49 ( msrNav([TheSystem],[clock,date,gt,[AdtDate]],[[ptBoolean,true]]))  

50 ; (msrNav([TheSystem],[clock,date,eq,[AdtDate]],[[ptBoolean,true]]))  

51 , msrNav([TheSystem],[clock,time,gt,[AdtTime]],[[ptBoolean,true]]))  

52 )  

53 )  

54 .  

55  

56 msrop(outactComCompany,  

57     oeAlert,  

58     [post,Self,  

59     AetHumanKind,  

60     AdtDate,  

61     AdtTime,  

62     AdtPhoneNumber,  

63     AdtGPSLocation,  

64     AdtComment  

65     ],  

66     []):-  

67  

68 msrVar(ctState,TheSystem),  

69 msrVar(ctHuman,ActHuman),  

70 msrVar(actComCompany,TheactComCompany),  

71 msrVar(ctAlert,ActAlert),  

72 msrVar(dtDateAndTime,AAlertInstant),  

73 msrVar(etAlertStatus,AetAlertStatus),  

74% msrVar(ctAlert,ActAlertNearBy),  

75 msrVar(ctCrisis,ActCrisis),  

76 msrVar(dtCrisisID,AdtCrisisID),  

77% msrVar(etCrisisType,AetCrisisType),  

78 msrVar(etCrisisStatus,AetCrisisStatus),  

79 msrVar(dtDateAndTime,ACrisisInstant),  

80 msrVar(dtComment,ACrisisdtComment),  

81% msrVar(ptString,AptStringMessage),  

82 msrVar(dtSMS,AdtSMS),  

83 msrVar(dtAlertID,AdtAlertID),  

84  

85% msrVar(ptInteger,TheNextptIntegerValue),  

86% msrVar(ptInteger,UpdatedNextptIntegerValue),  

87% msrVar(inactComCompany,TheComCompanyIN),  

88% msrVar(dtComment,TheCommentStored),  

89% msrVar(dtString,TheCommentStoreddtString),

```

```

90
91/* Post Functional:*/
92
93 msrNav([Self], [rnActor], [TheactComCompany]),
94 msrNav([Self], [rnActor, rnSystem], [TheSystem]),
95
96/* PostF01 */
97 msrNav([TheSystem],
98     [nextValueForAlertID],
99     [PrenextValueForAlertID]),
100 msrNav([PrenextValueForAlertID],
101     [add, [[dtInteger, [[value, [ptInteger, 1]]], []]], [PostnextValueForAlertID]),
102     [PostnextValueForAlertID]),
103 msrNav([TheSystem],
104     [msmAtPost, nextValueForAlertID],
105     [PostnextValueForAlertID]),
106
107 /* PostF02 */
108 msrNav([AAlerInstant], [date], [AdtDate]),
109 msrNav([AAlerInstant], [time], [AdtTime]),
110
111 msrNav([AetAlertStatus],
112     [], [etAlertStatus,pending]),
113
114 msrNav([TheSystem],
115     [nextValueForAlertID,
116      todString, [], eq, [AdtAlertID]],
117     [[ptBoolean,true])),
118
119
120 msrNav([ActAlert],
121     [init, [AdtAlertID,
122             AetAlertStatus,
123             AdtGPSLocation,
124             AAlerInstant,
125             AdtComment]], [
126             [[ptBoolean,true]]),
127
128 /* PostF03 */
129 msrNav([TheSystem],
130     [rnctAlert,
131      msrSelect, location, isNearTo, [AdtGPSLocation]],
132     ColctAlertsNearBy),
133
134 ( (msrNav(ColctAlertsNearBy,
135     [msrIsEmpty],
136     [[ptBoolean,true]])
137   )
138 -> (
139   msrNav([TheSystem],
140     [nextValueForCrisisID,
141      [PrenextValueForCrisisID]),
142   msrNav([PrenextValueForCrisisID],
143     [add, [[dtInteger, [[value, [ptInteger, 1]]], []]], [PostnextValueForCrisisID]),
144     [PostnextValueForCrisisID]),
145   msrNav([TheSystem],
146     [msmAtPost, nextValueForCrisisID],
147     [PostnextValueForCrisisID]),
148
149   msrNav([TheSystem],
150     [nextValueForCrisisID,
151      todString, [], eq, [AdtCrisisID]],
152     [[ptBoolean,true])),
153
154   msrNav([AdtCrisisType], [], [[etCrisisType, small]]),
155   msrNav([AetCrisisStatus], [], [[etCrisisStatus, pending]]),
156   msrNav([ACrisisInstant], [], [AAlerInstant]),
157   msrNav([ACrisisdtComment],
158     [value],
159     [[ptString, 'no reporting yet defined']])),

```

```

160   msrNav([ActCrisis],[init,[AdtCrisisID,
161             AdtCrisisType,
162             AetCrisisStatus,
163             AdtGPSLocation,
164             ACrisisInstant,
165             ACrisisdtComment]],,
166             [[ptBoolean,true]]),
167
168   )
169 ; (
170   msrNav(ColctAlertsNearBy,
171             [rnTheCrisis,msrAny,msrTrue],
172             [ActCrisis])
173   ),
174 ),
175
176 /* PostF04 */
177
178 msrNav([ActAlert],
179         [msmAtPost,rnTheCrisis],
180         [ActCrisis]),
181
182 /* PostF05 */
183
184 msrNav([TheSystem],
185         [rnctHuman,
186           msrSelect,id,eq,[AdtPhoneNumber]],
187         HumanColl),
188
189 msrNav(HumanColl,
190         [msrSelect,kind,etEq,[AetHumanKind]],
191         HumanCol2),
192
193 (msrNav(HumanCol2,[msrIsEmpty],[[ptBoolean,true]]))
194 -> (msrNav([ActHuman],
195             [init,[AdtPhoneNumber,AetHumanKind]],
196             [[ptBoolean,true]]),
197   msrNav([ActHuman],
198             [msmAtPost,rnactComCompany],
199             [TheactComCompany])
200   )
201 ; msrNav(HumanCol2,
202             [msrAny],
203             [ActHuman])
204 ),
205
206msrNav([ActHuman],
207         [rnSignaled,msrIncluding,[ActAlert]],
208         ColAlerts),
209
210msrNav([ActHuman],
211         [msmAtPost,rnSignaled],
212         ColAlerts),
213
214/* PostF06 */
215msrNav([AdtSMS],
216         [value],
217         [[ptString,'Your alert has been registered. We will handle it and keep you informed']])),
218msrNav([TheactComCompany],
219         [rnInterfaceIN,
220           ieSmsSend,[AdtPhoneNumber,
221                         AdtSMS]],[[ptBoolean,true]]),
222
223/*
224
225 */
226
227 /* Post Protocol:*/
228 /* PostP01 */
229 true

```

230 .

Listing D.7: Prolog file outactComCompany-oeAlert.pl.

## D.8 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoord oeCloseCrisis.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactCoordinator,
7    oeCloseCrisis,
8    [preProtocol,Self,
9     AdtCrisisID
10    ],
11   []):-!
12/* Pre Protocol:*/
13 msrVar(ctState,TheSystem),
14 msrVar(actCoordinator,TheActor),
15 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
16 msrNav([Self],[rnActor],[TheActor]),
17 .
18/* PreP01 */
19 msrNav([TheSystem],
20        [vpStarted],
21        [[ptBoolean,true]]),
22 .
23/* PreP02 */
24 msrNav([TheActor],
25        [rnctAuthenticated,vpIsLogged],
26        [[ptBoolean,true]]),
27 .
28
29msrop(outactCoordinator,
30    oeCloseCrisis,
31    [preFunctional,Self,
32     AdtCrisisID
33    ],
34   []):-!
35/* Pre Functional:*/
36 msrVar(ctState,TheSystem),
37 msrVar(actCoordinator,TheActor),
38 .
39 msrVar(dtCrisisID,AdtCrisisID),
40 .
41 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
42 msrNav([Self],[rnActor],[TheActor]),
43 .
44/* PreF01 */
45 msrNav([TheSystem],
46        [rnctCrisis,
47         msrSelect,
48         id,eq,[AdtCrisisID]
49       ],
50       ColCrisis),
51 .
52 msrNav(ColCrisis,
53        [msrSize,eq,[[ptInteger,1]]],
54        [[ptBoolean,true]]),
55 .
56
57msrop(outactCoordinator,
58    oeCloseCrisis,
59    [post,Self,
60     AdtCrisisID
61    ],

```

```

62      []):-  

63  

64 /* Post Functional: */  

65 msrVar(ctState,TheSystem),  

66 msrVar(actCoordinator,TheActor),  

67  

68 msrVar(ctCrisis,TheCrisis),  

69 msrVar(dtCrisisID,AdtCrisisID),  

70  

71 msrNav([Self],[rnActor,rnSystem],[TheSystem]),  

72 msrNav([Self],[rnActor],[TheActor]),  

73  

74 /* PostF01 */  

75 msrNav([TheSystem],  

76     [rnctCrisis,  

77      msrSelect,  

78      id,eq,[AdtCrisisID]],  

79     [TheCrisis]),  

80  

81 msrNav([TheCrisis],  

82     [msmAtPost,status],  

83     [[etCrisisStatus,closed]]),  

84  

85 /* PostF02 */  

86 msrNav([TheCrisis],  

87     [msmAtPost,rnHandler],  

88     []),  

89  

90 /* PostF03 */  

91 msrNav([TheCrisis],  

92     [rnAlerts,msrForAll,msrIsKilled],  

93     [[ptBoolean,true]]),  

94  

95 /* PostF04 */  

96 msrNav([TheActor],  

97     [rnInterfaceIN,  

98      ieMessage,[[ptString,'The crisis is now closed !']]  

99    ],  

100   [[ptBoolean,true]]),  

101  

102 /* Post Protocol: */  

103 /* PostP01 */  

104 true  

105 .

```

Listing D.8: Prolog file outactCoordinator-oeCloseCrisis.pl.

## D.9 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoordinator-oeGetCrisisSet.pl

```

1%%%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */  

3:- multifile msrop/4.  

4%%%%%%%%%%%%%%%
5-----  

6msrop(outactCoordinator,  

7    oeGetCrisisSet,  

8    [preProtocol,Self,  

9     AetCrisisStatus  

10    ],  

11    []):-  

12/* Pre Protocol: */  

13 msrVar(ctState,TheSystem),  

14 msrVar(actCoordinator,TheActor),  

15 msrNav([Self],[rnActor,rnSystem],[TheSystem]),  

16 msrNav([Self],[rnActor],[TheActor]),  

17  

18/* PreP01 */

```

```

19 msrNav([TheSystem],
20   [vpStarted,
21   [[ptBoolean,true]]]),
22 .
23 msrNav([TheActor],
24   [rnctAuthenticated,vpIsLogged],
25   [[ptBoolean,true]])
26 .
27
28 msrop(outactCoordinator,
29   oeGetCrisisSet,
30   [preFunctional,Self,
31   AetCrisisStatus
32   ],
33   []):-!
34 /* Pre Functional:*/
35 /* PreF01 */
36 true
37 .
38
39 msrop(outactCoordinator,
40   oeGetCrisisSet,
41   [post,Self,
42   AetCrisisStatus
43   ],
44   []):-!
45
46 /* Post Functional:*/
47 msrVar(ctState,TheSystem),
48 msrVar(actCoordinator,TheActor),
49 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
50 msrNav([Self],[rnActor],[TheActor]),
51
52 /* PostF01 */
53 msrNav([TheSystem],
54   [rnctCrisis,
55   msrSelect,
56   status,etEq,[AetCrisisStatus]],
57   ColCrisisSet),
58
59 msrNav(ColCrisisSet,
60   [msrForAll,isSentToCoordinator,[TheActor]],
61   [[ptBoolean,true]]),
62
63 /* Post Protocol:*/
64 /* PostP01 */
65 true
66 .

```

Listing D.9: Prolog file outactCoordinator-oeGetCrisisSet.pl.

## D.10 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoordinator-oeInvalidateAlert.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactCoordinator,
7   oeInvalidateAlert,
8   [preProtocol,Self,
9   AdtAlertID
10  ],
11  []):-!
12/* Pre Protocol:*/
13 msrVar(ctState,TheSystem),
14 msrVar(actCoordinator,TheActor),

```

```

15 msrNav([Self], [rnActor,rnSystem], [TheSystem]),
16 msrNav([Self], [rnActor], [TheActor]),
17
18 /* PreP01 */
19 msrNav([TheSystem],
20     [vpStarted],
21     [[ptBoolean,true]]) ,
22
23 /* PreP02 */
24 msrNav([TheActor],
25     [rnctAuthenticated,vpIsLogged],
26     [[ptBoolean,true]])
27 .
28
29msrop(outactCoordinator,
30 oeInvalidateAlert,
31 [preFunctional,Self,
32 AdtAlertID
33 ],
34 []):-!
35 /* Pre Functional:*/
36 msrVar(ctState,TheSystem),
37 msrVar(actCoordinator,TheActor),
38
39 msrVar(dtAlertID,AdtAlertID),
40
41 msrNav([Self], [rnActor,rnSystem], [TheSystem]),
42 msrNav([Self], [rnActor], [TheActor]),
43
44 /* PreF01 */
45 msrNav([TheSystem],
46     [rnctAlert,
47      msrSelect,
48      id,eq,[AdtAlertID]
49 ],
50 ColAlert),
51
52 msrNav(ColAlert,
53     [msrSize,eq,[[ptInteger,1]]],
54     [[ptBoolean,true]])
55 .
56
57msrop(outactCoordinator,
58 oeInvalidateAlert,
59 [post,Self,
60 AdtAlertID
61 ],
62 []):-!
63
64 /* Post Functional:*/
65 msrVar(ctState,TheSystem),
66 msrVar(actCoordinator,TheActor),
67
68 msrVar(ctAlert,TheAlert),
69 msrVar(dtAlertID,AdtAlertID),
70
71 msrNav([Self], [rnActor,rnSystem], [TheSystem]),
72 msrNav([Self], [rnActor], [TheActor]),
73
74 /* PostF01 */
75 msrNav([TheSystem],
76     [rnctAlert,
77      msrSelect,
78      id,eq,[AdtAlertID]],
79     [TheAlert]),
80
81 msrNav([TheAlert],
82     [msmAtPost,status],
83     [[etAlertStatus,invalid]]),
84

```

```

85/* PostF02 */
86 msrNav([TheActor],
87     [rnInterfaceIN,
88      ieMessage, [[ptString,'The alert is now declared as invalid !']]
89    ],
90    [[ptBoolean,true]]),
91
92/* Post Protocol:*/
93/* PostP01 */
94 true
95 .

```

Listing D.10: Prolog file outactCoordinator-oeInvalidateAlert.pl.

## D.11 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoordinator-oeReportOnCrisis.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactCoordinator,
7    oeReportOnCrisis,
8    [preProtocol,Self,
9     AdtCrisisID,
10    AdtComment
11   ],
12  []):-!
13/* Pre Protocol:*/
14 msrVar(ctState,TheSystem),
15 msrVar(actCoordinator,TheActor),
16 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
17 msrNav([Self],[rnActor],[TheActor]),
18
19/* PreP01 */
20 msrNav([TheSystem],
21     [vpStarted],
22     [[ptBoolean,true]]),
23
24 msrNav([TheActor],
25     [rnctAuthenticated,vpIsLogged],
26     [[ptBoolean,true]])
27.
28
29msrop(outactCoordinator,
30    oeReportOnCrisis,
31    [prefunctional,Self,
32     AdtCrisisID,
33     AdtComment
34   ],
35  []):-!
36/* Pre Functional:*/
37 msrVar(ctState,TheSystem),
38 msrVar(actCoordinator,TheActor),
39
40 msrVar(dtCrisisID,AdtCrisisID),
41
42 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
43 msrNav([Self],[rnActor],[TheActor]),
44
45/* PreF01 */
46 msrNav([TheSystem],
47     [rnctCrisis,
48      msrSelect,
49      id,eq,[AdtCrisisID]
50    ],
51    ColCrisis),

```

```

52
53 msrNav(ColCrisis,
54     [msrSize, eq, [[ptInteger, 1]]]),
55     [[ptBoolean, true]])
56 .
57
58 msrop(outactCoordinator,
59     oeReportOnCrisis,
60     [post, Self,
61     AdtCrisisID,
62     AdtComment
63     ],
64     []):-!
65
66 /* Post Functional:*/
67 msrVar(ctState, TheSystem),
68 msrVar(actCoordinator, TheActor),
69
70 msrVar(ctCrisis, TheCrisis),
71 msrVar(dtCrisisID, AdtCrisisID),
72 msrVar(dtComment, AdtComment),
73
74 msrNav([Self], [rnActor, rnSystem], [TheSystem]),
75 msrNav([Self], [rnActor], [TheActor]),
76
77 /* PostF01 */
78 msrNav([TheSystem],
79     [rnctCrisis,
80      msrSelect,
81      id, eq, [AdtCrisisID]],
82     [TheCrisis]),
83
84 msrNav([TheCrisis],
85     [msmAtPost, comment],
86     [AdtComment]),
87
88 msrNav([TheActor],
89     [rnInterfaceIN,
90      ieMessage, [[ptString, 'The crisis comment has been updated !']]],
91     ],
92     [[ptBoolean, true]]),
93
94 /* Post Protocol:*/
95 /* PostP01 */
96 true
97 .

```

Listing D.11: Prolog file outactCoordinator-oeReportOnCrisis.pl.

## D.12 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoordinator-oeSetCrisisHandler.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactCoordinator,
7    oeSetCrisisHandler,
8    [preProtocol, Self,
9     AdtCrisisID
10    ],
11    []):-!
12/* Pre Protocol:*/
13 msrVar(ctState, TheSystem),
14 msrVar(actCoordinator, TheActor),
15 msrNav([Self], [rnActor, rnSystem], [TheSystem]),
16 msrNav([Self], [rnActor], [TheActor]),

```

```

17
18/* PreP01 */
19 msrNav([TheSystem],
20     [vpStarted],
21     [[ptBoolean,true]]),
22
23 msrNav([TheActor],
24     [rnctAuthenticated,vpIsLogged],
25     [[ptBoolean,true]])
26.
27
28msrop(outactCoordinator,
29    oeSetCrisisHandler,
30    [preFunctional,Self,
31     AdtCrisisID
32     ],
33     []):-!
34/* Pre Functional:*/
35 msrVar(ctState,TheSystem),
36 msrVar(actCoordinator,TheActor),
37
38 msrVar(dtCrisisID,AdtCrisisID),
39
40 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
41 msrNav([Self],[rnActor],[TheActor]),
42
43/* PreF01 */
44 msrNav([TheSystem],
45     [rnctCrisis,
46      msrSelect,
47      id,eq,[AdtCrisisID]
48      ],
49     ColCrisis),
50
51 msrNav(ColCrisis,
52     [msrSize,eq,[[ptInteger,1]]],
53     [[ptBoolean,true]]))
54 .
55
56msrop(outactCoordinator,
57    oeSetCrisisHandler,
58    [post,Self,
59     AdtCrisisID
60     ],
61     []):-!
62
63/* Post Functional:*/
64 msrVar(ctState,TheSystem),
65 msrVar(actCoordinator,TheActor),
66 msrVar(ctCoordinator,TheCoordinator),
67 msrVar(ctCoordinator,TheCurrentHandler),
68
69 msrVar(ctCrisis,TheCrisis),
70 msrVar(dtCrisisID,AdtCrisisID),
71
72 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
73 msrNav([Self],[rnActor],[TheActor]),
74
75/* PostF01 */
76 msrNav([TheSystem],
77     [rnctCrisis,
78      msrSelect,
79      id,eq,[AdtCrisisID]],
80     [TheCrisis]),
81
82 msrNav([TheCrisis],
83     [msmAtPost,status],
84     [[etCrisisStatus,handled]]),
85
86 msrNav([TheActor],

```

```

87      [rnctCoordinator],
88      [TheCoordinator]),
89 msrNav([TheCrisis],
90      [msmAtPost, rnHandler],
91      [TheCoordinator]),
92
93 msrNav([TheActor],
94      [rnInterfaceIN,
95      ieMessage, [[ptString, 'You are now considered as handling the crisis !']])
96      ],
97      [[ptBoolean,true]]),
98
99 /* PostF02 */
100 msrNav([TheCrisis],
101      [rnAlerts, msrForAll, isSentToCoordinator, [TheActor]],
102      [[ptBoolean,true]]),
103
104 /* PostF03 */
105 ( msrNav([TheCrisis],
106      [rnHandler, msrSize, eq, [[ptInteger,1]]],
107      [[ptBoolean,true]]),
108 -> (msrNav([TheCrisis],
109      [rnHandler],
110      [TheCurrentHandler]),
111      msrNav([TheCurrentHandler],
112      [rnactCoordinator, rnInterfaceIN,
113      ieMessage, [[ptString, 'One of the crisis you were handling is now handled by one of your
114      colleagues!']])
115      ],
116      [[ptBoolean,true]]))
117    )
118  ),
119
120 /* PostF04 */
121 msrNav([TheCrisis],
122      [rnAlerts, rnSignaler, msrForAll, isAcknowledged, []],
123      [[ptBoolean,true]]),
124
125 /* Post Protocol:*/
126/* PostP01 */
127 true
128 .

```

Listing D.12: Prolog file outactCoordinator-oeSetCrisisHandler.pl.

### D.13 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoordinator-oeSetCrisisStatus.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactCoordinator,
7  oeSetCrisisStatus,
8  [preProtocol, Self,
9   AdtCrisisID,
10  AetCrisisStatus
11  ],
12  []):-!
13/* Pre Protocol:*/
14 msrVar(ctState, TheSystem),
15 msrVar(actCoordinator, TheActor),
16 msrNav([Self], [rnActor, rnSystem], [TheSystem]),
17 msrNav([Self], [rnActor], [TheActor]),
18
19/* PreP01 */

```

```

20 msrNav([TheSystem],
21   [vpStarted],
22   [[ptBoolean,true]]),
23 .
24 msrNav([TheActor],
25   [rnctAuthenticated,vpIsLogged],
26   [[ptBoolean,true]])
27 .
28
29 msrop(outactCoordinator,
30   oeSetCrisisStatus,
31   [preFunctional,Self,
32     AdtCrisisID,
33     AetCrisisStatus
34   ],
35   []):-!
36 /* Pre Functional:*/
37 msrVar(ctState,TheSystem),
38 msrVar(actCoordinator,TheActor),
39 .
40 msrVar(dtCrisisID,AdtCrisisID),
41 .
42 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
43 msrNav([Self],[rnActor],[TheActor]),
44 .
45 /* PreF01 */
46 msrNav([TheSystem],
47   [rnctCrisis,
48     msrSelect,
49     id,eq,[AdtCrisisID]
50   ],
51   ColCrisis),
52 .
53 msrNav(ColCrisis,
54   [msrSize,eq,[[ptInteger,1]]],
55   [[ptBoolean,true]])
56 .
57
58 msrop(outactCoordinator,
59   oeSetCrisisStatus,
60   [post,Self,
61     AdtCrisisID,
62     AetCrisisStatus
63   ],
64   []):-!
65 .
66 /* Post Functional:*/
67 msrVar(ctState,TheSystem),
68 msrVar(actCoordinator,TheActor),
69 .
70 msrVar(ctCrisis,TheCrisis),
71 msrVar(dtCrisisID,AdtCrisisID),
72 msrVar(etCrisisStatus,AetCrisisStatus),
73 .
74 msrNav([Self],[rnActor,rnSystem],[TheSystem]),
75 msrNav([Self],[rnActor],[TheActor]),
76 .
77 /* PostF01 */
78 msrNav([TheSystem],
79   [rnctCrisis,
80     msrSelect,
81     id,eq,[AdtCrisisID]],
82   [TheCrisis]),
83 .
84 msrNav([TheCrisis],
85   [msmAtPost,status],
86   [AetCrisisStatus]),
87 .
88 msrNav([TheActor],
89   [rnInterfaceIN,

```

```

90     ieMessage, [[ptString, 'The crisis status has been updated !']])
91     ],
92     [[ptBoolean,true])),
93
94/* Post Protocol:*/
95/* PostP01 */
96 true
97 .

```

Listing D.13: Prolog file outactCoordinator-oeSetCrisisStatus.pl.

## D.14 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactCoordinator-oeSetCrisisType.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5-----
6msrop(outactCoordinator,
7    oeSetCrisisType,
8    [preProtocol,Self,
9     AdtCrisisID,
10    AetCrisisType
11    ],
12    []):-!
13/* Pre Protocol:*/
14 msrVar(ctState,TheSystem),
15 msrVar(actCoordinator,TheActor),
16 msrNav([Self], [rnActor,rnSystem], [TheSystem]),
17 msrNav([Self], [rnActor], [TheActor]),
18
19/* PreP01 */
20 msrNav([TheSystem],
21    [vpStarted],
22    [[ptBoolean,true])),
23
24 msrNav([TheActor],
25    [rnctAuthenticated,vpIsLogged],
26    [[ptBoolean,true]])
27.
28
29msrop(outactCoordinator,
30    oeSetCrisisType,
31    [preFunctional,Self,
32     AdtCrisisID,
33     AetCrisisType
34     ],
35    []):-!
36/* Pre Functional:*/
37 msrVar(ctState,TheSystem),
38 msrVar(actCoordinator,TheActor),
39
40 msrVar(dtCrisisID,AdtCrisisID),
41
42 msrNav([Self], [rnActor,rnSystem], [TheSystem]),
43 msrNav([Self], [rnActor], [TheActor]),
44
45/* PreF01 */
46 msrNav([TheSystem],
47    [rnctCrisis,
48     msrSelect,
49     id,eq,[AdtCrisisID]
50    ],
51    ColCrisis),
52
53 msrNav(ColCrisis,
54    [msrSize,eq,[[ptInteger,1]]]),

```

```

55      [[ptBoolean,true]])  

56 .  

57  

58msrop(outactCoordinator,  

59    oeSetCrisisType,  

60    [post,Self,  

61     AdtCrisisID,  

62     AetCrisisType  

63   ],  

64   []):-  

65  

66/* Post Functional:*/  

67 msrVar(ctState,TheSystem),  

68 msrVar(actCoordinator,TheActor),  

69  

70 msrVar(ctCrisis,TheCrisis),  

71 msrVar(dtCrisisID,AdtCrisisID),  

72 msrVar(etCrisisType,AetCrisisType),  

73  

74 msrNav([Self],[rnActor,rnSystem],[TheSystem]),  

75 msrNav([Self],[rnActor],[TheActor]),  

76  

77/* PostF01 */  

78 msrNav([TheSystem],  

79   [rnctCrisis,  

80    msrSelect,  

81    id,eq,[AdtCrisisID]],  

82   [TheCrisis]),  

83  

84 msrNav([TheCrisis],  

85   [msmAtPost,type],  

86   [AetCrisisType]),  

87  

88 msrNav([TheActor],  

89   [rnInterfaceIN,  

90    ieMessage,[[ptString,'The crisis type has been updated !']]  

91   ],  

92   [[ptBoolean,true]]),  

93  

94/* Post Protocol:*/  

95/* PostP01 */  

96 true  

97 .

```

Listing D.14: Prolog file outactCoordinator-oeSetCrisisType.pl.

## D.15 File ./src-gen/prolog-ref-spec/Operations/Environment/OUT/outactMsrCoeCreateSystemAndEnvironment.pl

```

1%%%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%%%
5/*
6*****
7MSRCreatorActor
8*****
9
10/** createSystemAndEnvironment ***/
11
12msrop(outactMsrCreator,
13  oeCreateSystemAndEnvironment,
14  [preFunctional,_Self,_AqtyComCompanies],
15  []):-  

16 true.
17
18msrop(outactMsrCreator,
19  oeCreateSystemAndEnvironment,

```

```

20     [preProtocol,_Self,_AqtyComCompanies],
21     []):-  

22 true.  

23  

24msrop(outactMsrCreator,  

25     oeCreateSystemAndEnvironment,  

26     [post,_Self,AqtyComCompanies],  

27     []):-  

28  

29 msrVar(ctState,TheSystem),  

30 msrVar(actMsrCreator,AactMsrCreator),  

31 msrVar(actAdministrator,AactAdministrator),  

32  

33 msrVar(dtInteger, AnextValueForAlertID),
34 msrVar(dtInteger, AnextValueForCrisisID),
35 msrVar(dtDateAndTime, Aclock),
36 msrVar(dtSecond, AcrisisReminderPeriod),
37 msrVar(dtSecond, AmaxCrisisReminderPeriod),
38 msrVar(ptBoolean, AvpStarted),
39  

40 /* PostF01 -- MUST ALWAYS BE MADE FIRST -- */
41 msrNav([AnextValueForAlertID],
42         [value,eq,[[ptInteger,1]]],  

43         [[ptBoolean,true]]),  

44  

45 msrNav([AnextValueForCrisisID],
46         [value,eq,[[ptInteger,1]]],  

47         [[ptBoolean,true]]),  

48  

49msrNav([Aclock],
50         [date,year,value],
51         [[ptInteger,1970]]),
52msrNav([Aclock],
53         [date,month,value],
54         [[ptInteger,01]]),
55msrNav([Aclock],
56         [date,day,value],
57         [[ptInteger,01]]),
58  

59msrNav([Aclock],
60         [time,hour,value],
61         [[ptInteger,00]]),
62msrNav([Aclock],
63         [time,minute,value],
64         [[ptInteger,00]]),
65msrNav([Aclock],
66         [time,second,value],
67         [[ptInteger,00]]),
68  

69 msrNav([AcrisisReminderPeriod],
70         [value,eq,[[ptInteger,300]]],  

71         [[ptBoolean,true]]),  

72  

73 msrNav([AmaxCrisisReminderPeriod],
74         [value,eq,[[ptInteger,1200]]],  

75         [[ptBoolean,true]]),  

76  

77 msrNav([AvpStarted],
78         [],  

79         [[ptBoolean,true]]),  

80  

81 msrNav([TheSystem],
82         [init,[AnextValueForAlertID,
83             AnextValueForCrisisID,
84             Aclock,
85             AcrisisReminderPeriod,
86             AmaxCrisisReminderPeriod,
87             Aclock,
88             AvpStarted
89             ]],

```

```

90      [[ptBoolean,true]]),
91
92     /* PostF02 */
93   msrNav([AactMsrCreator],
94         [init,[]],
95         [[ptBoolean,true]]),
96
97     /* PostF03 */
98   msrVarCol(actComCompany,AqtyComCompanies,AactComCompanyCol),
99
100  msrNav(AactComCompanyCol,
101        [msrForAll,init,[]],
102        [[ptBoolean,true]]),
103
104  /* PostF04 */
105  msrNav([AactAdministrator],
106        [init,[]],
107        [[ptBoolean,true]]),
108
109  /* PostF05 */
110  msrVar(actActivator,AactActivator),
111  msrNav([AactActivator],
112        [init,[]],
113        [[ptBoolean,true]]),
114
115  /* PostF06 */
116  msrVar(ctAdministrator,ActAdministrator),
117  msrVar(dtLogin,AdtLogin),
118  msrVar(dtPassword,AdtPassword),
119
120  msrNav([AdtLogin],
121        [value,eq,[[ptString,'icrashadmin']]],
122        [[ptBoolean,true]]),
123
124  msrNav([AdtPassword],
125        [value,eq,[[ptString,'7WXC1359']]],
126        [[ptBoolean,true]]),
127
128  msrNav([ActAdministrator],
129        [init,[AdtLogin,AdtPassword]],
130        [[ptBoolean,true]]),
131
132  /* PostF07 */
133  msrNav([ActAdministrator],
134        [msmAtPost,rnactAuthenticated],
135        [AactAdministrator]),
136
137  /* Post Protocol:*/
138  /* PostP01 */
139 true
140 .

```

Listing D.15: Prolog file outactMsrCreator-oeCreateSystemAndEnvironment.pl.

## D.16 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses ctAdministrator-init.pl

```

1%%%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%%%
5
6msrop(ctAdministrator,init,[Self,
7          Alogin,
8          Apwd],
9          Result):-
10 (
11msrVar(ctAdministrator,Self),

```

```

12
13 /* Post F01 */
14msrNav([Self], [login], [Alogin]),
15msrNav([Self], [pwd], [Apwd]),
16msrNav([Self], [vpIsLogged], [[ptBoolean, false]]),
17
18 /* Post F02 */
19 msrNav([Self], [msrIsNew], [Self])
20)
21-> Result = [ptBoolean, true]
22; Result = [ptBoolean, false]
23.

```

Listing D.16: Prolog file PrimaryTypesClasses-ctAdministrator-init.pl.

## D.17 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctAlert-isSentToCoordinator.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctAlert,isSentToCoordinator,[Self,AactCoordinator],
7      Result):-
8
9 /* Post F01 */
10(
11 msrNav([AactCoordinator],
12       [rnInterfaceIN,ieSendAnAlert,[Self]],
13       [[ptBoolean,true]])
14)
15-> Result = [ptBoolean, true]
16; Result = [ptBoolean, false]
17.

```

Listing D.17: Prolog file PrimaryTypesClasses-ctAlert-isSentToCoordinator.pl.

## D.18 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctAuthenticated-init.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctAuthenticated,init,[Self,
7                          Alogin,
8                          Apwd],
9      Result):-
10
11 /* Post F01 */
12(
13msrVar(ctAuthenticated,Self),
14
15msrNav([Self], [login], [Alogin]),
16msrNav([Self], [pwd], [Apwd]),
17msrNav([Self], [vpIsLogged], [[ptBoolean, false]]),
18
19 /* Post F02 */
20 msrNav([Self], [msrIsNew], [Self])
21)
22-> Result = [ptBoolean, true]
23; Result = [ptBoolean, false]
24.

```

Listing D.18: Prolog file PrimaryTypesClasses-ctAuthenticated-init.pl.

## D.19 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctCoordinator-init.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctCoordinator,init,[Self,
7    Aid,
8    Alogin,
9    Apwd],
10   Result):-
11
12/* Post F01 */
13(
14msrVar(ctCoordinator,Self),
15
16msrNav([Self],[id],[Aid]),
17msrNav([Self],[login],[Alogin]),
18msrNav([Self],[pwd],[Apwd]),
19msrNav([Self],[vpIsLogged],[[ptBoolean,false]]),
20
21/* Post F02 */
22 msrNav([Self],[msrIsNew],[Self])
23)
24-> Result = [ptBoolean,true]
25; Result = [ptBoolean,false]
26.

```

Listing D.19: Prolog file PrimaryTypesClasses-ctCoordinator-init.pl.

## D.20 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctCrisis-handlingDelayPassed.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctCrisis,handlingDelayPassed,[Self],
7   Result):-
8
9/* Post F01 */
10(
11 msrVar(ctState,TheSystem),
12 msrVar(dtInteger,CurrentClockSecondsQty),
13 msrVar(dtInteger,LastReminderSecondsQty),
14 msrVar(dtSecond,CrisisReminderPeriod),
15
16 msrNav([Self],[rnSystem],[TheSystem]),
17
18 msrNav([Self],
19   [status],
20   [[etCrisisStatus,pending]]),
21
22 msrNav([TheSystem],
23   [clock,toSecondsQty,[],],
24   [CurrentClockSecondsQty]),
25
26 msrNav([TheSystem],
27   [vpLastReminder,toSecondsQty,[],],
28   [LastReminderSecondsQty]),
29
30 msrNav([TheSystem],
31   [crisisReminderPeriod],
32   [CrisisReminderPeriod]),

```

```

33
34 msrNav([CurrentClockSecondsQty],
35   [sub,[LastReminderSecondsQty],
36     gt, [CrisisReminderPeriod]
37   ],
38   [[ptBoolean,true]])
39
40)
41-> Result = [ptBoolean,true]
42; Result = [ptBoolean,false]
43.

```

Listing D.20: Prolog file PrimaryTypesClasses-ctCrisis-handlingDelayPassed.pl.

## D.21 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctCrisis-init.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctCrisis,init,[Self,
7  Aid,
8  Atype,
9  Astatus,
10 Alocation,
11 Ainstant,
12 Acomment],
13 Result):-!
14
15/* Post F01 */
16(
17msrVar(ctCrisis,Self),
18
19msrNav([Self],[id],[Aid]),
20msrNav([Self],[type],[Atype]),
21msrNav([Self],[status],[Astatus]),
22msrNav([Self],[location],[Alocation]),
23msrNav([Self],[instant],[Ainstant]),
24msrNav([Self],[comment],[Acomment]),
25
26/* Post F02 */
27 msrNav([Self],[msrIsNew],[Self])
28)
29-> Result = [ptBoolean,true]
30; Result = [ptBoolean,false]
31.

```

Listing D.21: Prolog file PrimaryTypesClasses-ctCrisis-init.pl.

## D.22 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctCrisis-isAllocatedIfPossible.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctCrisis,isAllocatedIfPossible,[Self],
7  Result):-!
8(
9 msrVar(ctState,TheSystem),
10 msrNav([Self],[rnSystem],[TheSystem]),
11
12 msrVar(actCoordinator,TheCoordinatorActor),

```

```

13 msrVar(ctCoordinator,TheCoordinator),
14 msrVar(ptString,TheMessage),
15 msrVar(ptString,TheCrisisIDptString),
16
17 (
18 /* Post F01 */
19 msrNav([Self],
20 [maxHandlingDelayPassed, []],
21 [[ptBoolean,true]]),
22
23 ( msrNav([TheSystem],
24 [rnactCoordinator,msrIsEmpty],
25 [[ptBoolean,false]])
26 -> (
27 /* Post F02 */
28 msrNav([TheSystem],
29 [rnactCoordinator,msrAny,msrTrue],
30 [TheCoordinatorActor]),
31
32 msrNav([TheCoordinatorActor],
33 [rnctCoordinator],
34 [TheCoordinator]),
35
36 msrNav([Self],
37 [msmAtPost,rnHandler],
38 [TheCoordinator]),
39
40 msrNav([Self],
41 [msmAtPost,status],
42 [[etCrisisStatus,handled]]),
43
44 msrNav([Self],
45 [id,value],
46 [TheCrisisIDptString]),
47
48 msrNav([[ptString,'You are now considered as handling the crisis having ID: ']],
49 [ptStringConcat,[TheCrisisIDptString]],
50 [TheMessage]),
51
52 msrNav([TheCoordinatorActor],
53 [rnInterfaceIN,
54 ieMessage,[TheMessage]
55 ],
56 [[ptBoolean,true]])
57 )
58 ; /* Post F03 */
59 msrNav([TheSystem],
60 [rnactAdministrator,msrForAll,rnInterfaceIN,
61 ieMessage,[[ptString,'Please add new coordinators to handle pending crisis !']]],
62 [[ptBoolean,true]])
63 )
64 )
65 )
66)
67-> Result = [ptBoolean,true]
68; Result = [ptBoolean,false]
69.

```

Listing D.22: Prolog file PrimaryTypesClasses-ctCrisis-isAllocatedIfPossible.pl.

## D.23 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctCrisis-isSentToCoordinator.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5

```

```

6 msrop(ctCrisis,isSentToCoordinator,[Self,AactCoordinator],
7   Result):-_
8
9 /* Post F01 */
10 (
11   msrNav([AactCoordinator],
12     [rnInterfaceIN,ieSendACrisis,[Self]],[ptBoolean,true]))
13   [[ptBoolean,true]])
14 )
15 -> Result = [ptBoolean,true]
16 ; Result = [ptBoolean,false]
17 .

```

Listing D.23: Prolog file PrimaryTypesClasses-ctCrisis-isSentToCoordinator.pl.

## D.24 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctCrisis-maxHandlingDelayPassed.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6 msrop(ctCrisis,maxHandlingDelayPassed,[Self],
7   Result):-_
8
9 /* Post F01 */
10 (
11   msrVar(ctState,TheSystem),
12   msrVar(dtInteger,CurrentClockSecondsQty),
13   msrVar(dtInteger,CrisisInstantSecondsQty),
14   msrVar(dtSecond,MaxCrisisReminderPeriod),
15
16   msrNav([Self], [rnSystem], [TheSystem]),
17
18   msrNav([Self],
19     [status],
20     [[etCrisisStatus,pending]]),
21
22   msrNav([TheSystem],
23     [clock,toSecondsQty,[],],
24     [CurrentClockSecondsQty]),
25
26   msrNav([Self],
27     [instant,toSecondsQty,[],],
28     [CrisisInstantSecondsQty]),
29
30   msrNav([TheSystem],
31     [maxCrisisReminderPeriod],
32     [MaxCrisisReminderPeriod]),
33
34   msrNav([CurrentClockSecondsQty],
35     [sub,[CrisisInstantSecondsQty],
36       gt, [MaxCrisisReminderPeriod]
37     ],
38     [[ptBoolean,true]]))
39
40 )
41 -> Result = [ptBoolean,true]
42 ; Result = [ptBoolean,false]
43 .

```

Listing D.24: Prolog file PrimaryTypesClasses-ctCrisis-maxHandlingDelayPassed.pl.

## D.25 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctHuman-init.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctHuman,init,[Self,
7          Aid,
8          Akind],
9      Result):- 
10
11/* Post F01 */
12(
13msrVar(ctHuman,Self),
14
15msrNav([Self],[id],[Aid]),
16msrNav([Self],[kind],[Akind]),
17
18/* Post F02 */
19 msrNav([Self],[msrIsNew],[Self])
20)
21-> Result = [ptBoolean,true]
22; Result = [ptBoolean,false]
23.

```

Listing D.25: Prolog file PrimaryTypesClasses-ctHuman-init.pl.

## D.26 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctHuman-isAcknowledged.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctHuman,isAcknowledged,[Self],Result):-
7
8/* Post F01 */
9(msrVar(dtPhoneNumber,AdtPhoneNumber),
10 msrVar(dtSMS,AdtSMS),
11
12 msrNav([Self],
13         [id,eq,[AdtPhoneNumber]],
14         [[ptBoolean,true]]),
15 msrNav([AdtSMS],
16         [value,eq,[[ptString,'The handling of your alert by our services is in progress !']]],
17         [[ptBoolean,true]]),
18 msrNav([Self],
19         [rnactComCompany,rnInterfaceIN,ieSmsSend,[AdtPhoneNumber,AdtSMS]],
20         [[ptBoolean,true]])
21)
22-> Result = [ptBoolean,true]
23; Result = [ptBoolean,false]
24.

```

Listing D.26: Prolog file PrimaryTypesClasses-ctHuman-isAcknowledged.pl.

## D.27 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses-ctState-init.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6msrop(ctState,init,[Self,
7          AnextValueForAlertID,

```

```

8         AnextValueForCrisisID,
9         Aclock,
10        AcrisisReminderPeriod,
11        AmaxCrisisReminderPeriod,
12        AvpLastReminder,
13        AvpStarted],
14    Result):-!
15
16 /* Post F01 */
17(
18 msrVar(ctState,Self),
19
20 msrNav([Self], [nextValueForAlertID], [AnextValueForAlertID]),
21 msrNav([Self], [nextValueForCrisisID], [AnextValueForCrisisID]),
22 msrNav([Self], [clock], [Aclock]),
23 msrNav([Self], [crisisReminderPeriod], [AcrisisReminderPeriod]),
24 msrNav([Self], [maxCrisisReminderPeriod], [AmaxCrisisReminderPeriod]),
25 msrNav([Self], [vpLastReminder], [AvpLastReminder]),
26 msrNav([Self], [vpStarted], [AvpStarted]),
27
28 msrNav([Self], [msrIsNew], [Self])
29)
30-> Result = [ptBoolean,true]
31; Result = [ptBoolean,false]
32.

```

Listing D.27: Prolog file PrimaryTypesClasses-ctState-init.pl.

D.28 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDataAlertID-is.pl

38 yes  
39 \* /

Listing D.28: Prolog file PrimaryTypesDatatypes-dtAlertID-is.pl.

D.29 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypeComment-is.pl

Listing D.29: Prolog file PrimaryTypesDatatypes-dtComment-is.pl.

D.30 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypeCoordinatorID-is.pl

```
1%-----%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%-----%
5
6msrop(dtCoordinatorID,is,[AdtValue],Result):-%
7% msd01
8 msrVar(ptBoolean,TheResult),
9(
10 ( msrNav([AdtValue],
```

```

11     [value,length,[],gt,[[ptInteger,0]]],  

12     [[ptBoolean,true]]),  

13     msrNav([AdtValue],  

14     [value,length,[],leq,[[ptInteger,5]]],  

15     [[ptBoolean,true]]))  

16 )  

17 -> (TheResult = [ptBoolean,true])  

18 ; (TheResult = [ptBoolean,false])  

19 ),  

20 TheResult = Result  

21 .

```

Listing D.30: Prolog file PrimaryTypesDatatypes-dtCoordinatorID-is.pl.

### D.31 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypes-dtCrisisID-is.pl

```

1%%%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */  

3:- multifile msrop/4.  

4%%%%%%%%%%%%%%%
5  

6msrop(dtCrisisID,is,[AdtValue],Result):-  

7% msd01  

8 msrVar(ptBoolean,TheResult),  

9 (  

10 ( msrNav([AdtValue],  

11     [value,length,[],gt,[[ptInteger,0]]],  

12     [[ptBoolean,true]]),  

13     msrNav([AdtValue],  

14     [value,length,[],leq,[[ptInteger,10]]],  

15     [[ptBoolean,true]]))  

16 )  

17 -> (TheResult = [ptBoolean,true])  

18 ; (TheResult = [ptBoolean,false])  

19 ),  

20 TheResult = Result  

21 .  

22 /*  

23 | ?- X = [dtCrisisID,[],[[dtString,[[value,[ptString,'0123456789']]]],[]]],  

24 msrNav([X],[is,[],[Result]]).  

25 X = [dtCrisisID,[],[[dtString,[[value,[ptString,'0123456789']]]],[]]],  

26 Result = [ptBoolean,true] ?  

27 yes  

28  

29 | ?- X = [dtCrisisID,[],[[dtString,[[value,[ptString,'0123456789a']]]],[]]],  

30 msrNav([X],[is,[],[Result]]).  

31 X = [dtCrisisID,[],[[dtString,[[value,[ptString,'0123456789a']]]],[]]],  

32 Result = [ptBoolean,false] ?  

33 yes  

34 */

```

Listing D.31: Prolog file PrimaryTypesDatatypes-dtCrisisID-is.pl.

### D.32 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypes-dtGPSLocation-is.pl

```

1%%%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */  

3:- multifile msrop/4.  

4%%%%%%%%%%%%%%%
5  

6% dtPhoneNumber  

7  

8% msd01  

9msrop(dtGPSLocation,is,[AdtValue],Result):-

```

```

10msrVar(ptBoolean,TheResult),
11(
12  (
13    msrNav([AdtValue],
14      [latitude,is,[],[[ptBoolean,true]]]),
15    msrNav([AdtValue],
16      [longitude,is,[],[[ptBoolean,true]]])
17  )
20 -> TheResult = [ptBoolean,true]
21 ; TheResult = [ptBoolean,false]
22),
23
24 Result = TheResult
25.

```

Listing D.32: Prolog file PrimaryTypesDatatypes-dtGPSLocation-is.pl.

### D.33 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDataty... dtGPSLocation-isNearTo.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% dtGPSLocation
7
8msrop(dtGPSLocation,isNearTo,[Self,AdtValue],Result):-
9msrVar(ptBoolean,TheResult),
10msrVar(dtReal,EarthRadius),
11msrVar(dtReal,MaxDistance),
12
13msrVar(dtLatitude,ComparedLatitude),
14msrVar(dtLongitude,ComparedLongitude),
15
16msrVar(dtReal,R1),msrVar(dtReal,R1a),
17msrVar(dtReal,R2),msrVar(dtReal,R2a),
18
19(
20  (
21    (
22      % msd01
23      msrNav([EarthRadius],[value],[[ptReal,6371]]),
24      msrNav([MaxDistance],[value],[[ptReal,100]]),
25
26      msrNav([AdtValue],[latitude],[ComparedLatitude]),
27      msrNav([AdtValue],[longitude],[ComparedLongitude]),
28
29      msrNav([Self],[latitude,sin,[],[R1a]]),
30      msrNav([AdtValue],[latitude,sin,[],mul,[R1a]],[R1]),
31
32      msrNav([Self],[latitude,cos,[],[R2a]]),
33      msrNav([AdtValue],[latitude,cos,[],mul,[R2a]],[R2]),
34
35      msrNav([AdtValue],[longitude],[ComparedLongitude]),
36      msrNav([Self],[longitude,sub,[ComparedLongitude],cos,[],mul,[R2],
37        add,[R1],
38        acos,[],mul,[EarthRadius],
39        sub,[MaxDistance],
40        value,leq,[[ptReal,0]]],
41        [[ptBoolean,true]])
42    )
44 -> TheResult = [ptBoolean,true]
45 ; TheResult = [ptBoolean,false]
46 )

```

```
47) ,  
48 Result = TheResult  
49.
```

Listing D.33: Prolog file PrimaryTypesDatatypes-dtGPSLocation-isNearTo.pl.

D.34 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesData/latitudes-is.pl

```

1% % % % % % % % % % % % % % % % % % % % % % % % % % % %
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4% % % % % % % % % % % % % % % % % % % % % % % % % % %
5
6% msd01
7msrop(dtLatitude,is,[AdtValue],Result):-%
8msrVar(ptBoolean,TheResult),
9(
10 ( msrNav([AdtValue],
11   [value,geq,[[ptReal,-90.0]]]),
12   [[ptBoolean,true]]),
13   msrNav([AdtValue],
14   [value,leq,[[ptReal,+90.0]]],
15   [[ptBoolean,true]]))
16 )
17 -> (TheResult = [ptBoolean,true])
18 ; (TheResult = [ptBoolean,false])
19 ),
20Result = TheResult
21 .

```

Listing D.34: Prolog file PrimaryTypesDatatypes-dtLatitude-is.pl.

D.35 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesData/dtLogin-is.pl

```

1%{%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5%% dtComment
6
7%msd01
8msrop(dtLogin,is,[AdtValue],Result) :-
9 msrVar(ptBoolean,TheResult),
10 msrVar(ptInteger,MaxLength),
11(
12 (
13 (
14     MaxLength = [ptInteger,20],
15     msrNav([AdtValue],
16         [value,length,[],leq,[MaxLength]],
17         [[ptBoolean,true]]))
18 )
19     -> TheResult = [ptBoolean,true]
20     ; TheResult = [ptBoolean,false]
21 )
22),
23 Result = TheResult
24.
25/*
26| ?- X = [dtLogin,[],[[dtString,[[value,[ptString,'01234567']]]],[],[],[],[]].
27msrNav([X],[is,[],[Result]]).
28X = [dtLogin,[],[[dtString,[[value,[ptString,'01234567']]]],[],[],[],[]]],
29Result = [ptBoolean,true] ?
30yes

```

```

31
32| ?- X = [dtLogin,[],[[dtString,[[value,[ptString,'01234567a']]],[[]]]],[]
33msrNav([X],[is,[]],[Result]).
34X = [dtLogin,[],[[dtString,[[value,[ptString,'01234567a']]],[[]]]],[]
35Result = [ptBoolean,false] ?
36yes
37*/

```

Listing D.35: Prolog file PrimaryTypesDatatypes-dtLogin-is.pl.

## D.36 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypes-dtLongitude-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% dtPhoneNumber
7
8% msd01
9msrop(dtLongitude,is,[AdtValue],Result) :-
10msrVar(ptBoolean,TheResult),
11(
12  ( msrNav([AdtValue],
13    [value,geq,[[ptReal,-180.0]]],
14    [[ptBoolean,true]]),
15  msrNav([AdtValue],
16    [value,leq,[[ptReal,+180.0]]],
17    [[ptBoolean,true]]))
18 )
19 -> (TheResult = [ptBoolean,true])
20 ; (TheResult = [ptBoolean,false])
21),
22
23 Result = TheResult
24.

```

Listing D.36: Prolog file PrimaryTypesDatatypes-dtLongitude-is.pl.

## D.37 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypes-dtPassword-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5%% dtComment
6
7%msd01
8msrop(dtPassword,is,[AdtValue],Result) :-
9 msrVar(ptBoolean,TheResult),
10 msrVar(ptInteger,MinLength),
11(
12  (
13    (
14      MinLength = [ptInteger,6],
15      msrNav([AdtValue],
16        [value,length,[],geq,[MinLength]],
17        [[ptBoolean,true]]))
18  )
19  -> TheResult = [ptBoolean,true]
20  ; TheResult = [ptBoolean,false]
21  )
22,
23 Result = TheResult

```

```

24.
25/*
26| ?- X = [dtPassword,[],[[dtString,[[value,[ptString,'012345']]],[[]]]], 
27msrNav([X],[is,[],[Result])].
28X = [dtPassword,[],[[dtString,[[value,[ptString,'012345']]],[[]]]], 
29Result = [ptBoolean,true] ?
30yes
31
32| ?- X = [dtPassword,[],[[dtString,[[value,[ptString,'01234']]],[[]]]], 
33msrNav([X],[is,[],[Result])].
34X = [dtPassword,[],[[dtString,[[value,[ptString,'01234']]],[[]]]], 
35Result = [ptBoolean,false] ?
36yes
37*/

```

Listing D.37: Prolog file PrimaryTypesDatatypes-dtPassword-is.pl.

### D.38 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesDatatypes-dtPhoneNumber-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% dtPhoneNumber
7
8% msd01
9msrop(dtPhoneNumber,is,[AdtValue],Result):- 
10msrVar(ptBoolean,TheResult),
11(
12 ( msrNav([AdtValue],
13   [value,length,[],gt,[[ptInteger,4]]], 
14   [[ptBoolean,true]]),
15   msrNav([AdtValue],
16   [value,length,[],leq,[[ptInteger,30]]], 
17   [[ptBoolean,true]])
18 )
19
20 -> TheResult = [ptBoolean,true]
21 ; TheResult = [ptBoolean,false]
22),
23 Result = TheResult
24.
25/*
26| ?- X = [dtPhoneNumber,[],[[dtString,[[value,[ptString,'(+352) 46 66 44 60 00')]],[[]]]], 
27msrNav([X],[is,[],[Result])].
28X = [dtPhoneNumber,[],[[dtString,[[value,[ptString,'(+352) 46 66 44 60 00']]],[[]]]], 
29Result = [ptBoolean,true] ?
30
31yes
32
33yes
34*/

```

Listing D.38: Prolog file PrimaryTypesDatatypes-dtPhoneNumber-is.pl.

### D.39 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClassAlertStatus-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% etAlertStatus

```

```

7
8% msd01
9msrop(etAlertStatus,is,[AdtValue],Result) :-
10msrVar(ptBoolean,TheResult),
11(
12  (
13    member(AdtValue,[pending, valid, invalid])
14  )
15 -> TheResult = [ptBoolean,true]
16 ; TheResult = [ptBoolean,false]
17),
18 Result = TheResult
19.

```

Listing D.39: Prolog file PrimaryTypesDatatypes-etAlertStatus-is.pl.

## D.40 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses etCrisisStatus-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% etCrisisStatus
7
8% msd01
9msrop(etCrisisStatus,is,[AdtValue],Result) :-
10msrVar(ptBoolean,TheResult),
11(
12  (
13    member(AdtValue,[pending, handled, solved, closed])
14  )
15 -> TheResult = [ptBoolean,true]
16 ; TheResult = [ptBoolean,false]
17),
18 Result = TheResult
19.

```

Listing D.40: Prolog file PrimaryTypesDatatypes-etCrisisStatus-is.pl.

## D.41 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClasses etCrisisType-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% etCrisisType
7
8% msd01
9msrop(etCrisisType,is,[AdtValue],Result) :-
10msrVar(ptBoolean,TheResult),
11(
12  (
13    member(AdtValue,[small, medium, huge])
14  )
15 -> TheResult = [ptBoolean,true]
16 ; TheResult = [ptBoolean,false]
17),
18 Result = TheResult
19.

```

Listing D.41: Prolog file PrimaryTypesDatatypes-etCrisisType-is.pl.

## D.42 File ./src-gen/prolog-ref-spec/Operations/Concepts/PrimaryTypesClass-etHumanKind-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5
6%% etHumanKind
7
8% msd01
9msrop(etHumanKind,is,[AdtValue],Result):-
10msrVar(ptBoolean,TheResult),
11(
12(
13    member(AdtValue,[witness,victim,anonymous])
14)
15 -> TheResult = [ptBoolean,true]
16 ; TheResult = [ptBoolean,false]
17),
18 Result = TheResult
19.
```

Listing D.42: Prolog file PrimaryTypesDatatypes-etHumanKind-is.pl.

## D.43 File ./src-gen/prolog-ref-spec/Operations/Concepts/SecondaryTypesDatatypes-dtSMS-is.pl

```

1%%%%%%%%%%%%%
2/* DISCONTIGUOUS PREDICATES */
3:- multifile msrop/4.
4%%%%%%%%%%%%%
5%% dtComment
6
7%msd01
8msrop(dtSMS,is,[AdtValue],Result):-
9 msrVar(ptBoolean,TheResult),
10 msrVar(ptInteger,MaxLength),
11(
12(
13(
14    MaxLength = [ptInteger,160],
15    msrNav([AdtValue],
16        [value,length,[],leq,[MaxLength]],
17        [[ptBoolean,true]]))
18)
19 -> TheResult = [ptBoolean,true]
20 ; TheResult = [ptBoolean,false]
21)
22),
23 Result = TheResult
24.
```

Listing D.43: Prolog file SecondaryTypesDatatypes-dtSMS-is.pl.

# Glossary

<b><i>abstract actor</i></b> an actor that is not . . . . .	22
<b><i>actor</i></b> An actor is a person, organization, or external system that plays a role in one or more interactions with the system . . . . .	18
<b><i>direct actor</i></b> an actor that interacts directly with the system. It thus belongs to the environment.	22
<b><i>indirect actor</i></b> an actor that interacts indirectly with the system through a direct actor. It thus belongs the domain but not to the environment. . . . .	22
<b><i>system operation</i></b> a functionality of the system that can be triggered by a message sent by an actor belonging to the environment. . . . .	18



