SINTEF REPORT

SINTEF

SINTEF ICT

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ABSTRACT

In this report we look into tasks for the local leader in the police at the TYR exercise, and describe both the tasks and the information involved when performing them. The identification of tasks and the further analysis is based on observations during the TYR exercise conducted by the police in October 2009.

After a short introduction and a description of the research method used in the research presented in this report, we describe the identified tasks, roughly structured according to type of and/or common characteristic of groups of tasks (categories), i.e. handling locations, handling information about incident, handling the incident, handling resources, communication, and handling the rest of the world. Then we present the type of information needed to perform the identified tasks, structured in views focusing on the most important concepts involved. These views are incident, plans and actions, resources, and allocations. Each concept in the models is also presented in some detail. Furthermore, we outline the information (i.e. subset of the model views) that is needed when doing selected tasks, thus identifying which information that may be included in ICT support for the various tasks. Finally, we draw some conclusions, and outline further work on the models presented in this report, which will include complementing the models where the task and information models are connected, and making sketches/paper prototypes of possible ICT support for some of the identified tasks with connected information.

KEYWORDS	ENGLISH	NORWEGIAN
GROUP 1	ICT	IKT
GROUP 2	HCI	Menneske-maskin-interaksjon
SELECTED BY AUTHOR	Decision support for emergency response	Beslutningsstøtte for redningsaksjoner
	Task analysis	Oppgaveanalyse
	Information modelling	Informasjonsmodellering

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1 Introduction

In the EMERGENCY project, the partners are developing technology for decision support for operational leaders in emergency response. The technological solutions aim at addressing the high level of uncertainty in acute emergency situations, by supporting cooperation between actors, as well as providing easy and immediate access to critical information.

The research being conducted in the project is grounded in a number of practical field trials where the partners investigate needs and requirements, and evaluate the technology developed in the project in a realistic context. So far, most of the field trials have been carried out in connection with training exercises within different areas of emergency response.

The work presented in this report is based on findings from participation in the TYR training exercise conducted by the police in October 2009 (The Norwegian Police University College, 2010), involving a number of emergency agencies. In this field trial, observations were conducted at the tactical level (The National Police Directorate in Norway, 2007), both of work performed in the central staff, and of work taking place at or close to the scene of the incident. This report addresses findings from the latter (observation of work close to the scene of incident).

The remainder of this report is structured into five sections. In Section 2 we present the research method used. The findings from the observations and analyses performed on these findings are presented in Sections 3-5. In Section 3, we describe the identified tasks, roughly structured according to type of and/or common characteristic of groups of tasks (categories). In section 4, we present concept models of the type of information needed to perform the identified tasks, structured in views focusing on the most important concepts involved. Each concept in the models is also presented in some detail. In section 5, we couple the contents in section 3 and 4, by outlining the information (i.e. subset of the model views) that is needed when doing selected tasks, thus identifying which information that may be included in ICT support for the various tasks. Finally, in Section 6 we summarize our conclusions and outline how the results in this report have been and will be used in future research in the project.

2 Research method

The findings reported in this document are based on observations of the work performed by the local leaders from the police during the TYR exercise, organized by the National Police Directorate in Norway October 28, 2009. The observation work was done by the author of this report. The case used in the exercise was a gas leak/fire in a boat loaded with ammine while it was about to be unloaded at the quay at Herøya close to Porsgrunn. Access to do observations was granted by the Police Directorate, while practical arrangements for conducting observations were handled by The Norwegian Police University College.

The methods used when doing the observations were a combination of passive observations and shadowing (Crang & Cook, 2007 (ch. 3 & 4), Blomberg et al, 1993, Myers & Avison, 2002, Walsham, 2006). The subjects for the shadowing were two field commanders [operasjonsledere] at Telemark Police District's office in Skien. These two field commanders shared the role of being the local leader of the police activities at the scene of the incident. During the observations, both the leaders were shadowed when inside their car or when they were co-located outside the car. When they were not co-located, one of them was shadowed, which one was chosen depending on practical issues, mainly decided by the field commanders. The shadowing was occasionally supplemented by short questions to the subject or other observers to clarify issues.

The subjects for the passive observations were the other participants in the exercise. These observations were conducted partly indirectly as the subjects for the shadowing interacted with

them, and partly in parallel with the shadowing in periods where the subjects being shadowed had idle periods.

During the combined shadowing and observation activities, extensive notes and photographs were taken (Crang & Cook, 2007 (ch. 7), Harper, 2005). The notes and photos were the main input for analyzing the findings. This analysis resulted in the task and information models described in this report. During the analysis, coding (Crang & Cook, 2007 (ch. 8), Stake, 2005, Walsham, 2006). was extensively used. The analysis also leans heavily on our knowledge and experience in design and design patterns for user interfaces on mobile devices (Nilsson, 2009).

3   Tasks at local CP at the TYR exercise

Based on the observations and analyses described in the previous section, we have identified a set of relevant tasks during an operation like the one that was trained in the TYR exercise. In the description and analysis of the tasks (Kirwan & Ainsworth, 1992), we have grouped the tasks into a set of categories, which may be viewed as generalized/composed tasks (types), i.e.

- Handling locations
- Handling information about incident
- Handling the incident
- Handling resources
- Communication
- Handling the rest of the world

In the following, we present these categories, with focus on the individual tasks within each category. For each category the tasks are presented in a table and individually. In the table, appropriate UI style(s) for IT support for the task is/are suggested, and some indication of what kind of interaction the user (typically a local leader in the police) will utilize on a ICT-based application supporting the task. UI styles are classifications of different visual presentation forms that may be used for the user interfaces on a mobile device, the main ones identified in the analysis being:

- Map based – a user interface where the main means of presenting information and doing interaction is through a graphical map presentation.
- Forms based – a user interface where information is presented, manipulated and entered using forms consisting of text fields, check boxes, combo boxes, list boxes, radio button groups, etc. Such fields usually stems from the same or a set of closely related classes in an underlying information model. Forms-based UIs are often transaction oriented, usually connected to a data base.
- Document based – a user interface where information is presented using text (possibly augmented with various illustrations). A typical document based UI is mainly used for presenting output to the user. A web-based UI is an example of this UI style.
- List based – a user interface where the information is presented i lists containing one or more columns.
- Media based - a user interface where information is primarily presented using images, sound and/or video. It is mainly used for presenting output to the user, and will usually be combined with other UI styles, either combined in the same UI or in situations where a media based UI is used for restricted periods of time in a UI complying to a different style.
- Graphics based – a user interface where different type of illustrations are used for presenting information, usually combined with direct manipulation for user interaction. It may be viewed as both a generalization of a map based UI, but may also be an augmentation of this (i.e. a map-based UI is enhanced with other type of graphics).

Note that most applications/services usually exploit a combination of these UI styles. The same may be the case for individual dialogs/windows, although in this case, one of the UI styles is usually predominant.

User interaction described as part of the task descriptions focuses on whether a UI supporting the task is used as a means for obtaining information or/and is used to enter information (for later use by the user and/or other people involved in the operation).

3.1 Handling locations

This category includes tasks connected to how the police (and other emergency response organizations) handle their command posts and various local bases during the operation.

Task	Appropriate UI style(s)	User interaction
Decide or change location of bases	Map based, maybe augmented with check lists	Primarily study, maybe some sketching
Establish or move bases	*Primarily manual task[1]*	
Document location of bases	Map based, maybe augmented with check lists	Draw on map

3.1.1   Decide or change location of bases

This is the task of making the decision of where to (re)locate local CP, other local bases ([samleplasser]), check points, etc. The task involves considerations wrt. distance to the location of the incident (close enough to know what is happening and be able to do something useful, but far enough to remain safe and avoid being part of the actual rescuing operation), weather conditions, available roads, etc. The decision making is a manual task, but it is useful to use a map as support when performing it. As there are a number of local bases that should or could be established, a check list may be helpful[2].

3.1.2   Establish or move bases

This task involves the actual establishment of the bases, primarily of informing different people that have a positions or tasks at the bases where the bases are and what their positions/tasks are.

3.1.3   Document location of bases

This task is closely related to the two previous, but in this task the actual location is documented, possibly including allocation of positions and tasks at the bases (cf. the tasks connected to handling resources).

3.2 Handling information about incident

During an operation, the local leaders need to have access to and possibly maintain information about the incident (where it is, what and who are involved (directly and indirectly), events that have occurred, etc.).

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[1] Some of the tasks are expected to be performed as manual task even if ICT support is introduced. For the tasks where this is fairly obvious, UI style and User interaction is not applicable.
[2] Cf. "Politidirektoratets prinsippskisse for innsatsområde"

Task	Appropriate UI style(s)	User interaction
Maintain information about location of incident	Map based, maybe augmented with check lists	Automatically from central or plot/draw on map
Maintain information about objects involved in the incident	Forms/document based	Automatically from db or central, or entered manually – use db of dangerous goods
Maintain information about people that are indirectly involved in the incident	Forms/list based	Automatically from owners db or central
Maintain information about people that are directly involved in the incident	Forms/document based	Automatically from central or enter manually
Keep log of events/incidents	List/forms based	Combination of select and enter, based on templates
Obtain information from "external" sources	Vary, depending on source	Configure/bring up service + capture where appropriate

3.2.1   Maintain information about location of incident

This task primarily involves handling information about the location of the incident (where), but it also included handling risk assessment issues like deciding secure distance to the location, and physical means of keeping people not involved in the rescuing operation away from the incident using e.g. cordons. This is a task where much of the information ideally should be handled by the central, or where the central should obtain some of the background information like facts about dangerous goods.

3.2.2   Maintain information about objects involved in the incident

This task primarily involves handling information about the object(s) involved in the incident (what), including both the object(s) themselves, possible cargo that will possess special challenges, as well as information about owner etc. The latter is needed both as a source of information and for giving information back.

This is a task where much of the information ideally should be handled by the central, or where the central should obtain some of the background information, e.g. from databases handled by owner(s).

3.2.3   Maintain information about people that are indirectly involved in the incident

This task primarily involves handling information about the people connected with the incident (who) without necessarily being victims, including possible responsible persons (like the captain in the TYR exercise), number of crew members, etc.

This is a task where much of the information ideally should be handled by the central, or where the central should obtain some of the background information, e.g. from databases handled by owner(s).

3.2.4   Maintain information about people that are directly involved in the incident

This task primarily involves handling information about the people that are victims in the incident (who), including both number of injured and dead, as well as their names. This is a task where the information stems from a variety of sources (including the local leaders), but should be coordinated by the central.

3.2.5   Keep log of events/incidents

This task is primarily about keeping track of things that have happened during the operation, including time stamps. Keeping such logs is important both for handling the incidents during the operation, but also as documentation of what happened, and when it happened. The latter is important from a legal point of view, as well as when assessing the incident later. The task is closely connected to the task "Decide and carry out actions and plans" presented below. To make the log keeping efficient and effective, use of templates and selection rather than typing should be exploited in the user interaction.

3.2.6   Obtain information from "external" sources

Depending on the incident, the operation and available resources, external sources may be used for obtaining more information about the incident, e.g. link from helicopter or satellite images. In addition to requisition of such services, the task is primarily about bringing the services up/configuring them, but may also include capturing images, etc.

3.3 Handling the incident

While the previous category was about handing information about the incident, this category is about actually handling the incident, including how to approach the location, how to keep people in the vicinity safe, as well as maintaining an operation picture and planning and carrying out the actual rescuing actions.

Task	Appropriate UI style(s)	User interaction
Collect information about weather	Map/graphics/document/list based	Browse/select info from external service(s)
Collect information about types of gas involved	Document/forms based	Automatically from owner or central – use db of gases
Decide which roads to close and issue road blocks	Map/document/list based	Study and draw on map
Establish and maintain operational picture	Map based, maybe augmented with check lists	Draw on map, incl. selection of predefined objects and templates
Decide and carry out actions & plans	*Primarily manual task? Cf. handling resources*	Feedback from info collected and processed in central?

The first two tasks are concerned with deciding a safe route to approach the incident, but the information connected is also useful during the rest of the operation.

3.3.1   Collect information about weather

Collecting information about weather (in a risk assessment context) is primarily a relevant task when the incident involves possible gas leakage. This includes both information about the current weather (focus on wind), how the weather will evolve, as well as how a given gas will spread under the given weather conditions. Performing such a task involves using one or more external services, preferably just obtaining the results of using these from the central.

3.3.2   Collect information about types of gas involved

This task is partly a support task for the previous one, and partly useful in itself. The information includes how dangerous the gas is, how it generally spreads, etc. This is a task where much of the information ideally should be handled by the central, or where the central should obtain some of the background information, e.g. from databases handled by owner(s).

3.3.3 Decide which roads to close and issue road blocks

This task is a special case of decide and carry out actions and plans (see below), but is mentioned explicit as it is usually carried out early in an operation, possibly before the local bases are established, before an operational picture exists, and before any concrete plans are made. The task also includes allocating resources to perform the road blocks.

3.3.4 Establish and maintain operational picture

This is a central task for local leaders, both to keep an overview for him/herself, and to communicate this to other people involved both at the central and locally. To a large extent, many of the other tasks described here may be viewed as parts of or supporting tasks for this task. An operational picture ([situasjonskart]) will typically be drawn on a map. To handle the operational picture efficient and effective, use of predefined object(s) (types), templates and selection rather than typing should be exploited in the user interaction.

3.3.5 Decide and carry out actions & plans

This is also a central task for local leaders, and one to which some of the other tasks describe here may be viewed as specialization of. The actual decision and performance of the tasks are primarily manual tasks. Also, to the extent that plans really exist locally, they are probably seldom documented. The task is though closely connected to the tasks on handling resources described below, and it should be mentioned that the consequences wrt. utilizing resource for carrying out the actions are indeed documented as part of these tasks.

3.4 Handling resources

This category is closely related to the previous one, but instead of focusing on handing the incident, this category focuses on handling the resources needed for handling the incident, including both human resources and various types of equipment.

Task	Appropriate UI style(s)	User interaction
Allocate, reallocate & keep track of resources	List/forms/map based	• Info on resources available from services • Status automatically from central or enter • Select allocation/priority • Location automatically from services, tracking or enter
Exchange information about resources	List/document/forms/map based	Share or send
Requisition of new resources	List/document/forms/map based	Select from info available from services

3.4.1 Allocate, reallocate & keep track of resources

This is the central task in this category, consisting on finding out which resources are available, and continuously (re)allocating resources to the tasks being performed. This is typically a task that is performed in close cooperation with the central, and where services keeping information about resources are important. When performing this task, the user needs to know about issues like status and owner of resources. The priority of allocations is important when scarce resources are to be (re)allocated. Also, there is a difference between how human resources (personnel) and equipment are handled. Furthermore, resources may be categorized in at least three groups wrt. availability, i.e.

1. Resources that are known, but not available (need to be mobilized or requested)
2. Resources that are available, but not allocated
3. Resources that are available and allocated

3.4.2 Exchange information about resources

In this task, local leaders exchange information about resources with (local) leaders in other rescuing services (health, fire department, ...). A main choice when exchanging this type of information is whether the information should be sent explicitly by the rescuing service having the resources to the other rescuing services, or the information should be shared (following a given set of access rights).

3.4.3 Requisition of new resources

This task is a special case of the allocate etc. task above, focusing on getting hold of resources in that are known, but not available (group 1 in 3.4.1 above).

3.5 Communication

This category describes tasks related to communication between a local leader and various other players involved more less directly in the rescuing operation.

Task	Appropriate UI style(s)	User interaction
Find local leaders from other rescuing services	Map/list based	Identification and location automatically from service, other rescuing services or central
Get in contact with local leaders from other rescuing services	*Primarily manual task?* Document/map based possible	IM type service + shared map
Exchange information with local leaders from other rescuing services	List/document/forms/map based	Share or send
Share information & plans with command centrals	*Primarily manual task?* List/forms/map based for resource allocation info	Share or send
Receive orders & plans from command centrals	List/forms/map based	Automatically from central
Communicate with own personnel	*Primarily manual task?* Document/map based possible	IM type service
Obtain information of how to communicate with local leaders from remote rescuing services	List/map based	Details and location automatically from other rescuing services or central
Communicate with local leaders and operational units from remote rescuing services	*Primarily manual task?* Document based possible	IM type service

3.5.1 Find local leaders from other rescuing services

This is the task of finding information about leaders in other rescuing services in order to get in contact with them. This includes who they are, where they are and how they may be contacted. Preferably, all necessary information for handling the task should be provided from a ICT-based service, alternatively from the central.

3.5.2 Get in contact with local leaders from other rescuing services

Once the other local leaders are identified and localized, and contact details are available, the task of contacting them is primarily a manual task (i.e. done through radio, phone or somebody meeting them personally). It could though be imagined a messenger type application for getting in contact and possibly decide if/where to meet. Using a shared map could also be valuable in this setting.

3.5.3 Exchange information with local leaders from other rescuing services

This task is very diverse, and will vary a lot depending on whether the local leaders are co-located or not. This is a generalization of the task described above on exchanging information about resources, and as with that task it is a main choice whether the information should be sent explicitly or shared (following a given set of access rights).

3.5.4 Share information & plans with command centrals

How this task is performed is highly dependent on whether plans and actions are handled in an application or as a manual task. In the former case, exchanging the information with the central is again a choice between sending or sharing the information. In the latter case, information exchange will be aural (radio and/or phone).

3.5.5 Receive orders & plans from command centrals

This is the "reverse" task of the previous, and possesses some of the same characteristics, although it is more likely to have ICT support.

3.5.6 Communicate with own personnel

If the task is not manual (using radio/phone), using messenger type interaction and having shared maps may be helpful.

3.5.7 Obtain information of how to communicate with local leaders from remote rescuing services

By remote rescuing services we mean services like the Coast Guard and Industrial CP. This (and the next) task are related to the tasks of finding and communicating with other local leaders described above, with the distinction that it is not a goal to meet personally, and that the importance of the location of the remove services vary. Preferably, all necessary information for handling the task should be provided from a ICT-based service, alternatively from the central.

3.5.8 Communicate with local leaders and operational units from remote rescuing services

This is primarily a manual task (i.e. done through phone or radio). It could though be imagined a messenger type application for getting in contact and possibly decide if/where to meet.

3.6 Handling the rest of the world

While the other categories focus on the incident and the persons involved in it or in handling it, this category focuses on persons and objects not directly involved - either to make sure that they are not threatened by the consequences of the incident, or/and to inform them.

Task	Appropriate UI style(s)	User interaction
Get overview of critical concentration of people	Map/list/document based	Browse information from external services
Communicate with media	*Primarily manual task?*	Use IM/mail/social media
Obtain information from public	Map/list/document based	Use social media
Decide on and carry out warnings [type of action]	*Primarily manual task?* Cf. handling actions and resources	Feedback from info collected and processed in central?
Decide on and carry out evacuation [type of action]	*Primarily manual task?* Cf. handling actions and resources	Feedback from info collected and processed in central?

3.6.1 Get overview of critical concentration of people

In incidents involving e.g. gas or fire, it is important to protect people not directly involved in the incident from suffering harm from the incident. In this setting, locations with high concentration of people, like schools, kindergartens, shopping centers, and companies with many employees are especially important. This task involves identifying these critical concentrations to be prepared for special actions if they are threatened. Solving the task requires good information services combined with knowledge of the local conditions.

3.6.2 Communicate with media

In most incidents, media will be interested in obtaining information about the current situation. Media is mainly an information consumer, but may also be an information provider - both as people knowing something may contact media instead of the police, and because media may do their own investigations. Aural communication is common for this task, but there is a clear potential of exploiting social media, email, messaging services, etc.

3.6.3 Obtain information from public

Just like media may be a source for information about an incident, the general public may also be so directly to the police or other rescuing services. In addition to direct contact (typically witnesses), social media may have a big potential for obtaining information, both special such ICT services provided by the rescuing services or others, and general social media services like Facebook and Twitter.

3.6.4 Decide on and carry out warnings [type of action]

If people indirectly involved in an incident are threatened, warnings may be necessary. Warnings may be on different levels, issued using different methods. Deciding and carrying out this is to a large extent a manual task, but ICT solutions like SMS and automatic calling services may be used to warn people.

3.6.5 Decide on and carry out evacuation [type of action]

If people indirectly involved in an incident are threatened, evacuation may be necessary. Deciding and carrying out this is to a large extent a manual task, but ICT solutions like SMS and automatic calling services may be used to give information about evacuation.

4 Information involved when solving the tasks at local CP at the TYR exercise

Based on the tasks identified in the previous section, we have identified information that is needed or helpful when solving these tasks. In the description of the information involved, we have grouped the information in different (overlapping) models focusing on different aspects of an incident and a connected rescuing mission, i.e.

- Incident
- Plans and actions
- Resources
- Allocations

In the following, we present these models, both the individual concepts and the structure in which they are connected. The models are presented as UML class diagrams (Pilone, 2005), focusing on connections, but also indicating possible properties (attributes) for the different concepts, in tables, and individually. In the tables, we focus on who or what is the source of the information, and what kind of generic operations the user (local leader) is expected to perform on the information. These operations are presented using the standard transactional concepts CRUD, i.e. Create, Read, Update, Delete (Kilov, 1990). The presence of a letter indicate that the user often performs the operation, while a letter in parentheses indicate that the user only occasionally performs the operation.

4.1 Incident

In this model we focus on information connected to the incident, its location, the involved objects, the organization of the operational area [innsatsområde], and people that not directly involved, but may be threatened by the incident.
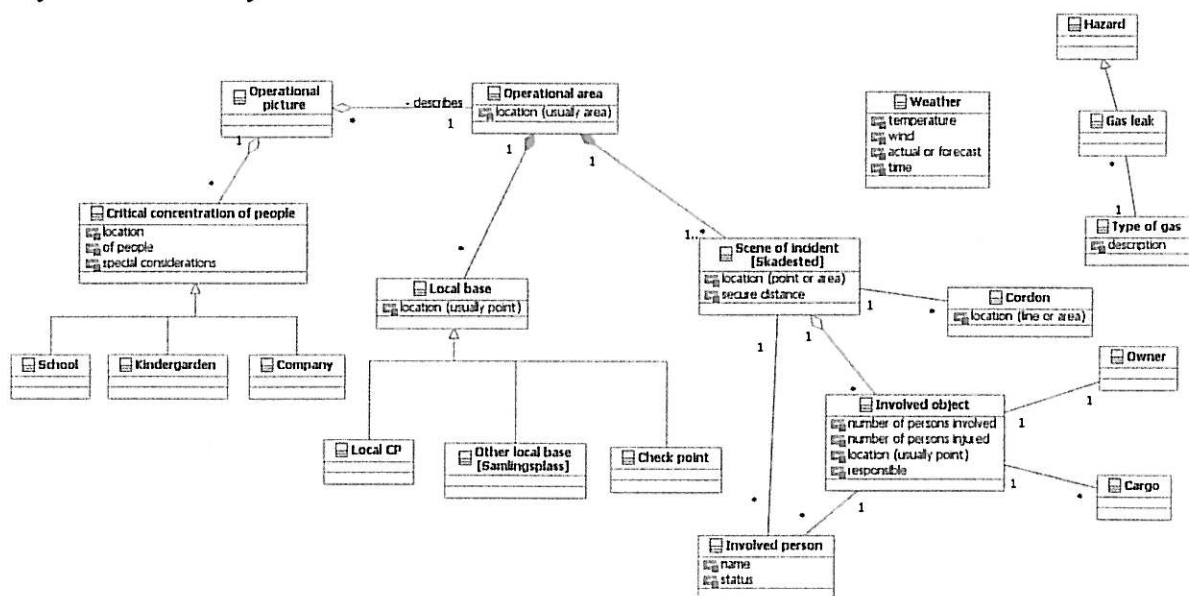
The main concepts in the model are:

Concept	Source	CRUD
Operational area [Innsatsområde]	User	CRU
Local base [KO og samlingsplass]	User (types predefined)	CRU
Scene of incident [Skadested]	User or central	CRU
Involved object	Central, owner or user	(C)RU
Involved person	Central, owner or user	(C)RU
Owner	Central or user	(C)RU
Cargo	Central, owner or user DB for dangerous goods	(C)RU R
Cordon [Sperring/sperrebånd]	User	CRUD
Operational picture [Situasjonskart]	User (types and templates exist)	CRUD
Critical concentration of people	Central or external service	R

4.1.1 Operational area [innsatsområde]

This is a defined area where the rescuing operation takes place. It includes the location of the incident and the local bases. The size and shape will vary in different incidents, and may also change during a specific incident.

4.1.2 Local base [KO og samlingsplass]

These are the different locations the police set up when organizing the rescuing operation, including the local CP, various local based, and check points. The organization of these should ideally follow the principle sketch in (Mjølhus, 2008 (slide 23)).

4.1.3 Scene of incident [skadested]

This is the location where the incident has happened. The size and shape will vary in different incidents, and may also change during a specific incident.

4.1.4 Involved object

This includes information about objects directly involved in the incident, i.e. vehicles that have crashed, building that are burning, etc.

4.1.5 Involved person

This includes information about persons directly involved in the incident, both victims and other persons at or close to the scene of the incident during the incident.

4.1.6 Owner

This is information closely related to the information about involved objects. Owner may both be a source of information, and influence decision making.

4.1.7 Cargo

This is information closely related to the information about involved objects. Information about cargo is essential when assessing risks both for the rescuing personnel and people indirectly involved in the incident.

4.1.8 Cordon [sperring/sperrebånd]

Cordons are important both to for the safety of the public and to ensure that the rescuing services are not disturbed, as well as to ensure that the police's investigation is not influenced badly.

4.1.9 Operational picture [situasjonskart]

This is central information for the local leaders at the police to maintain an overview of what has happened and how it is handled.

4.1.10 Critical concentration of people

Information about critical concentrations of people like schools, kindergartens, shopping centers, and companies is important to be able to protect people not directly involved in the incident from suffering harm from the incident.

4.2 Plans and actions

In this model we focus on information connected to handling the incident, i.e. the plans and actions, as well as how these are connected to information about the incident, the log of the operation and the information in the previous model (Incident).
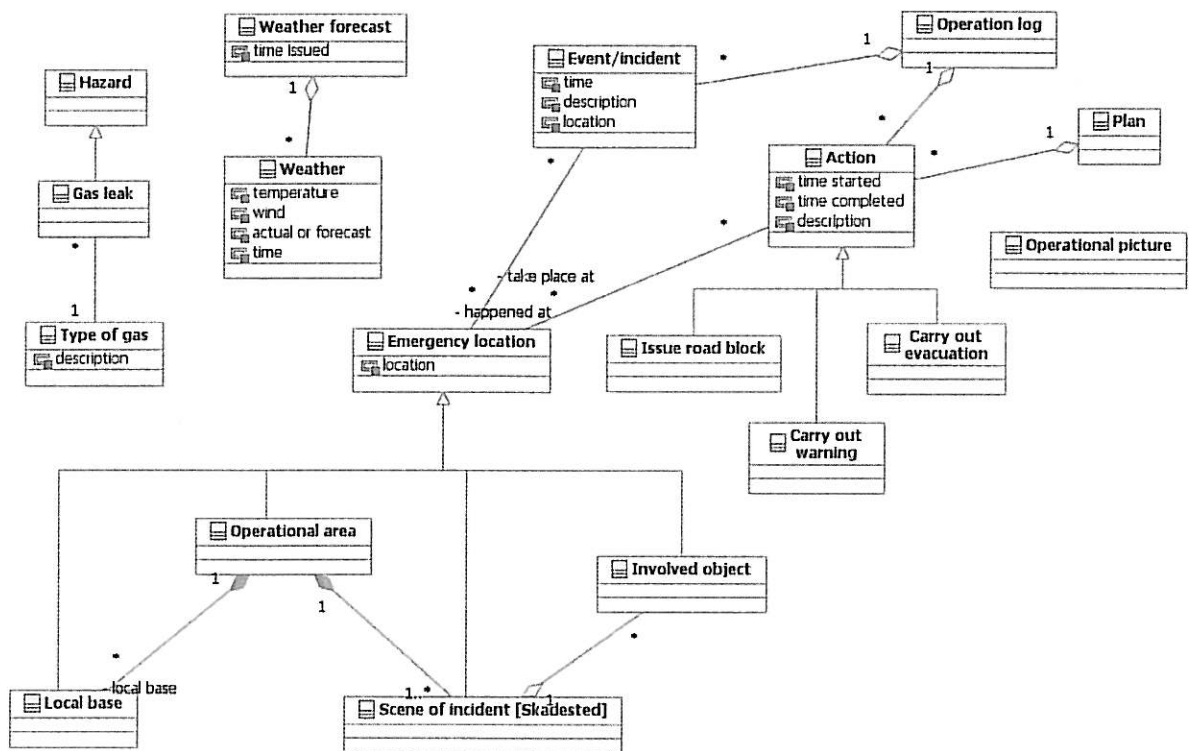
The main concepts in the model are (concepts included in the previous model are not repeated):

Concept	Source	CRUD
Operation log [Hendelseslogg]	User	CRU
Event/Incident	User (types and templates exist)	CRU
Plan	Central or user (templates exist)	CRUD
Action (including example subtypes)	Central or user (types and templates exist)	CRUD
Weather forecast	External service or central	R
Weather	External service, central or user	(C)R(U)
Type of gas	External service, owner or central DB for dangerous goods	R R

4.2.1   Operation log [hendelseslogg]

This is the log that is maintained at the local CP, at least of the various events and incidents that take place during an incident. It may also include information about plans and actions taken as part of the rescuing operation. Such a log is important both as an aid during the operation, and as documentation for assessment etc. after the operation.

4.2.2   Event/Incident

This is the various individual events and incidents that take place as part of a larger incident. The main incident (accident, fire, explosion, earthquake) starting the incident is of course central, but also later events and incidents that are more or less direct consequences of the initial incident or actions connected to handling it are important to keep track of and document.

4.2.3   Plan

A plan is a set of actions to obtain some goal in relation to solving issues connected to the incident. In most operations, plans may only exist in the head of the local leaders.

4.2.4   Action

A restricted operation to obtain a sub goal in relation to solving issues connected to the incident. The subtypes included in the diagram are example of more concrete actions that are described in the task models above. As they are described in the task models and are included in the information models, we do not describe them further here.

4.2.5   Weather forecast

Expected weather conditions at one or more locations or areas connected to the incident in one or more periods of time.

4.2.6   Weather

Actual or expected weather conditions at a location or area connected to the incident in a period of time.

4.2.7 Type of gas

In incidents involving gas, it is important to have information about type of gas, how dangerous it is, how it spreads, how inflammable it is, etc.
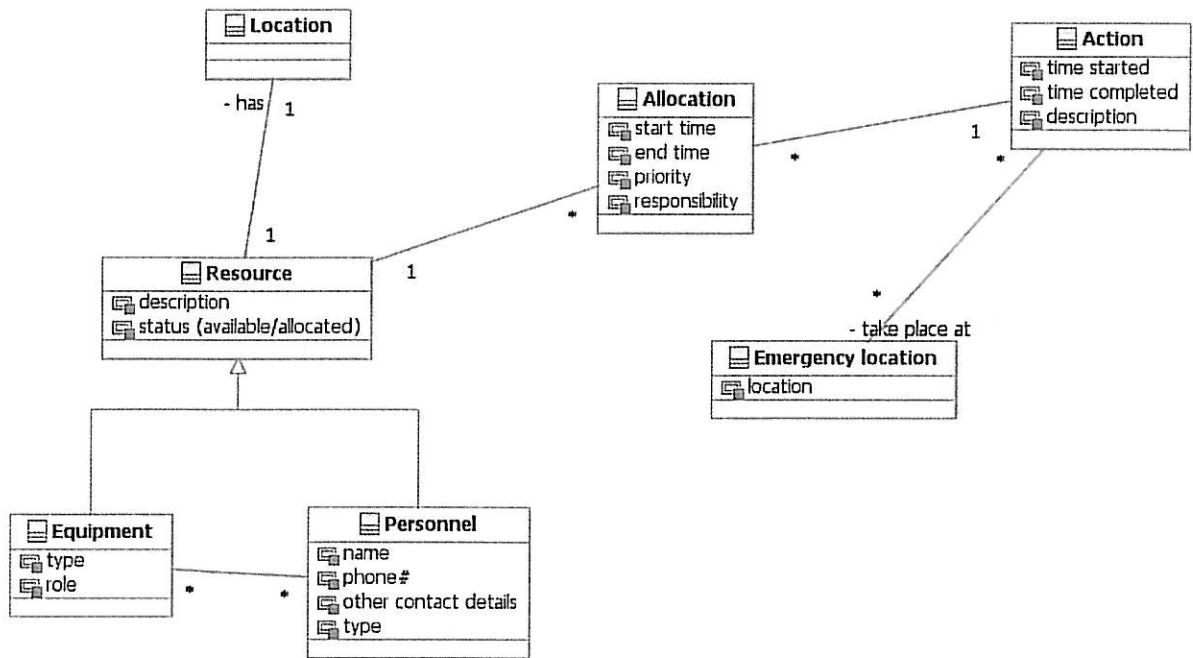
4.3 Resources

In this model we focus on information connected to the resources available/needed to handle the incident, including location, owner, etc. Resources are divided into personnel and equipment.
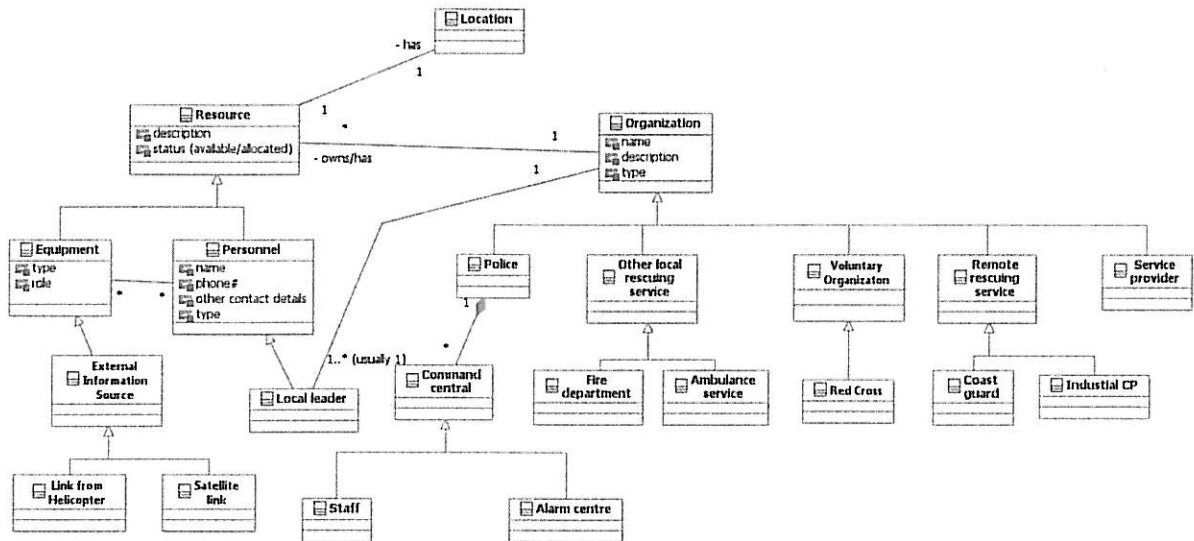
The main concepts in the model are presented together with the model on allocation in the next section.

4.4 Allocations

In this model we focus on information connected to how the resources available/needed to handle the incident are actually allocated. Thus, the model connects the model focusing on plans and action with the model focusing on resources.

The main concepts in the models of resources and allocations are (concepts included in the first two models are not repeated):

Concept	Source	CRUD
Resource	Central, service, sensors or user	CRU
Organization	Central or service	R
Local leader	Central or (external) service	R
Allocation	User or central (coupling data)	CRUD

4.4.1 Resource

Resources are equipment and personnel that are available, allocated or may be mobilized for taking part in the operation. Most resources are connected to some rescuing organization, but equipment may also be rented from companies or private persons.

4.4.2 Organization

In this context organizations are primarily different rescuing services like the police, health services, fire brigade and volunteer organizations like The Red Cross.

4.4.3 Local leader

The person(s) in charge of the operation or a sub function of it for a specific rescuing operation at the scene of the incident. There will usually be one local leader per organization, but it may be more.

4.4.4 Allocation

One resource committed to one action during a restricted period of time. When doing allocation, a local leader may allocate a number of resources at the same time, i.e. create a number of allocations in one operation.

5 Information needed for the tasks at local CP

In this section, we outline which information (i.e. subset of the model views presented in the previous section) is needed when performing selected tasks, thus identifying which information that may be included in ICT support for these tasks.

In the description of the information needed for each task, we have used the same categories as used when presenting the tasks above, i.e.

- Handling locations
- Handling information about incident
- Handling the incident
- Handling resources
- Communication
- Handling the rest of the world

The drawing outlining the most relevant information for the different tasks refer back to the information models from the previous section. For some tasks, the outlines are partly dashed. The information inside a dashed outline is either available only part of the time the task is conducted, or it is of secondary importance for performing the task. For some of the tasks we have also included a comment explaining or discussing the task/information connection.

5.1 Handling locations

5.1.1 Decide, change and document location of bases (tasks described in 3.1.1 and 3.1.3)
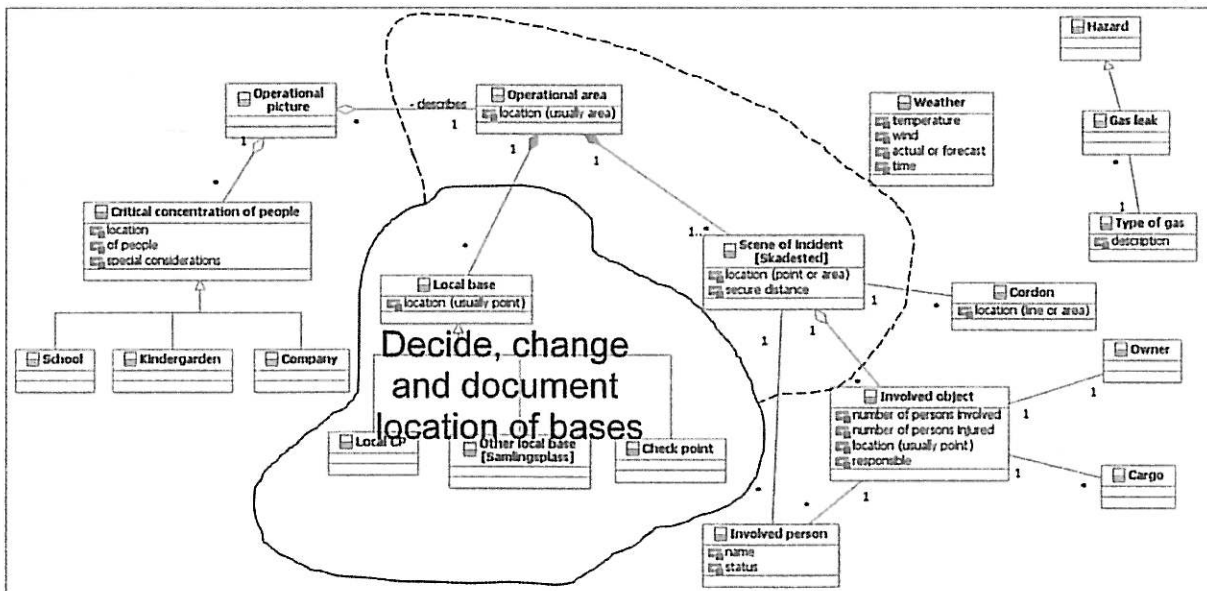
When deciding and documenting the location of different bases, the central information is connected to these bases. Both the operational area (to the extent that it is identified when the local bases are established) and the scene of the incident are relevant, but mainly as background information.

5.2 Handling information about incident

5.2.1 Maintain information about location of incident (task described in 3.2.1)
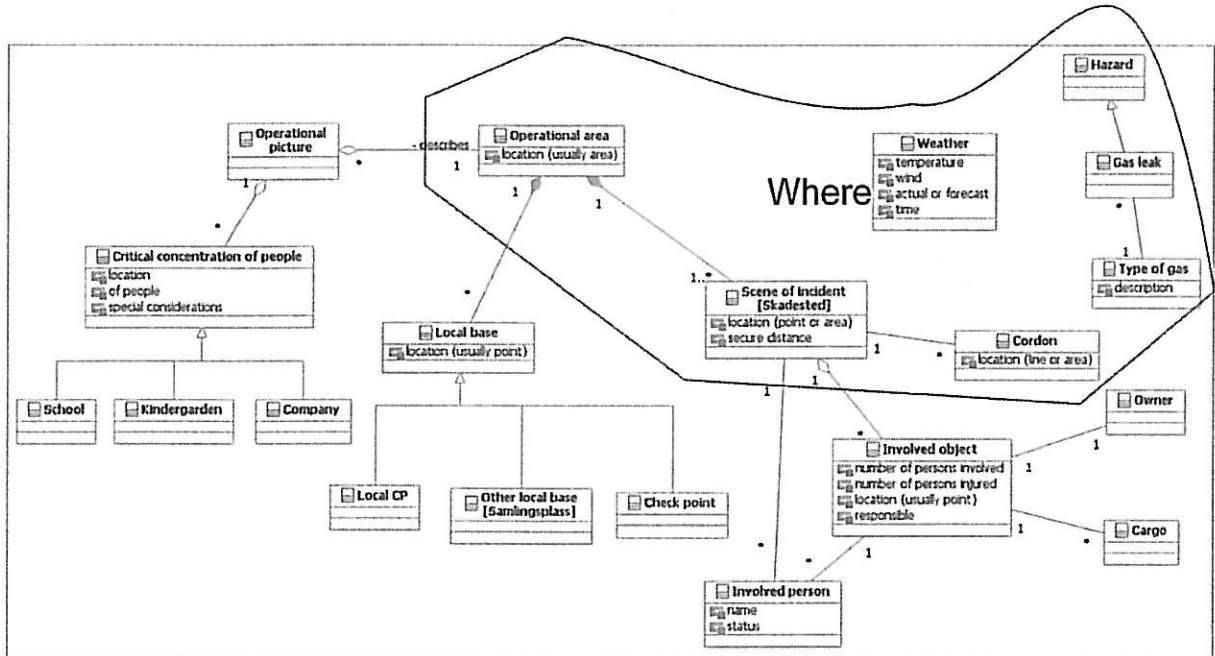
5.2.2 Maintain information about objects involved in the incident (task described in 3.2.2)
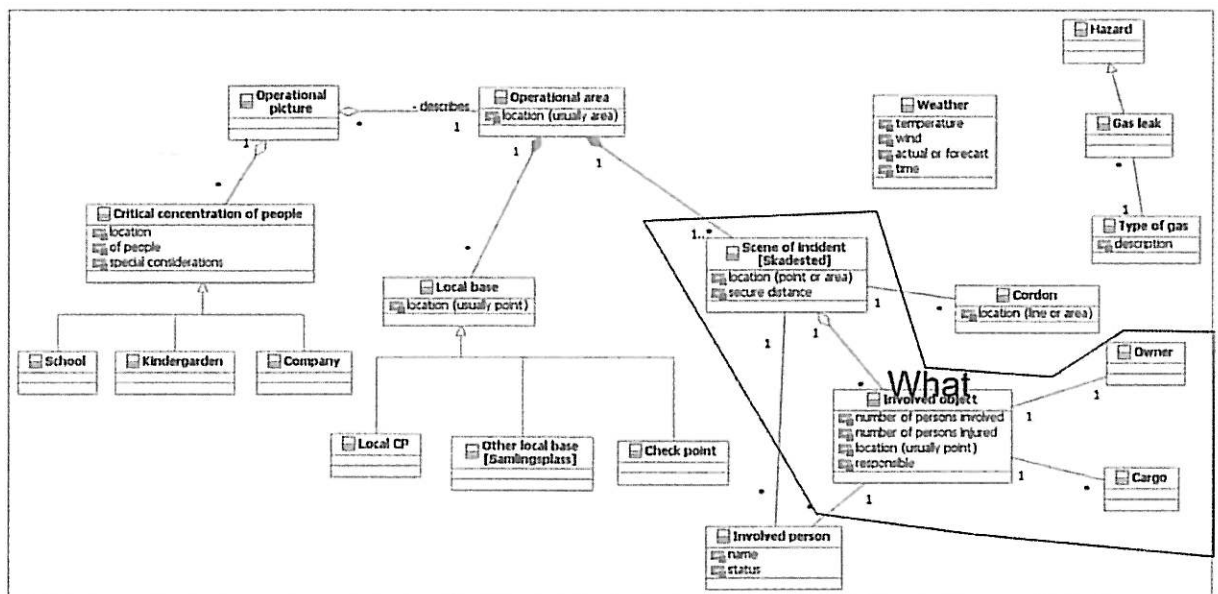
5.2.3 Maintain information about people that are indirectly or directly involved in the incident (tasks described in 3.2.3 and 3.2.4)
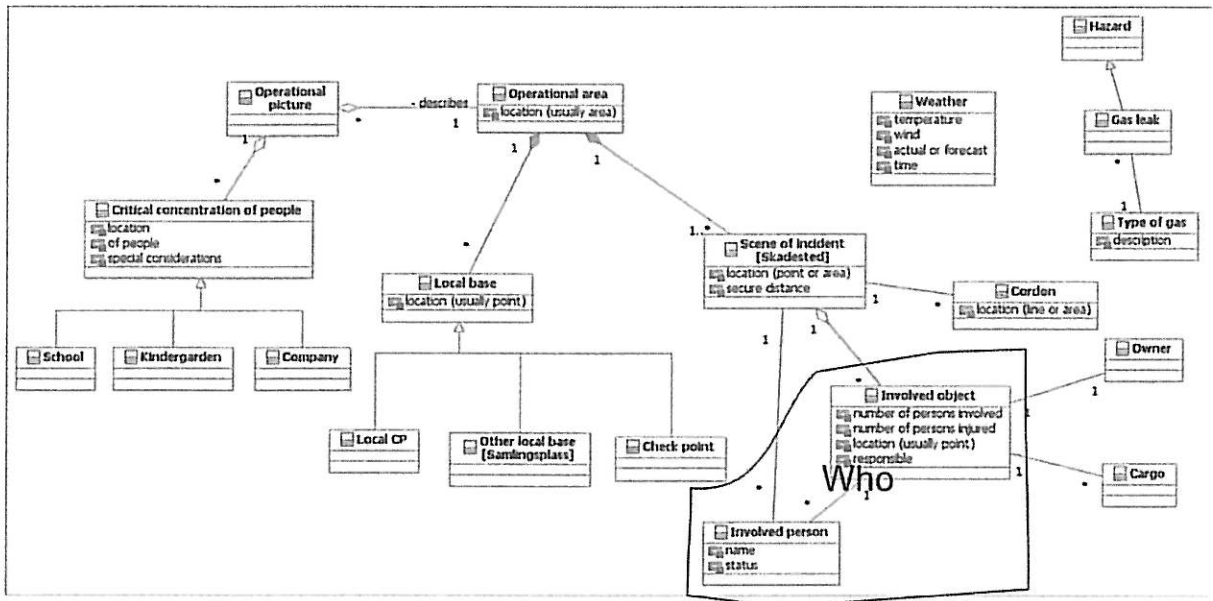
5.2.4 Keep log of events/incidents (task described in 3.2.5)
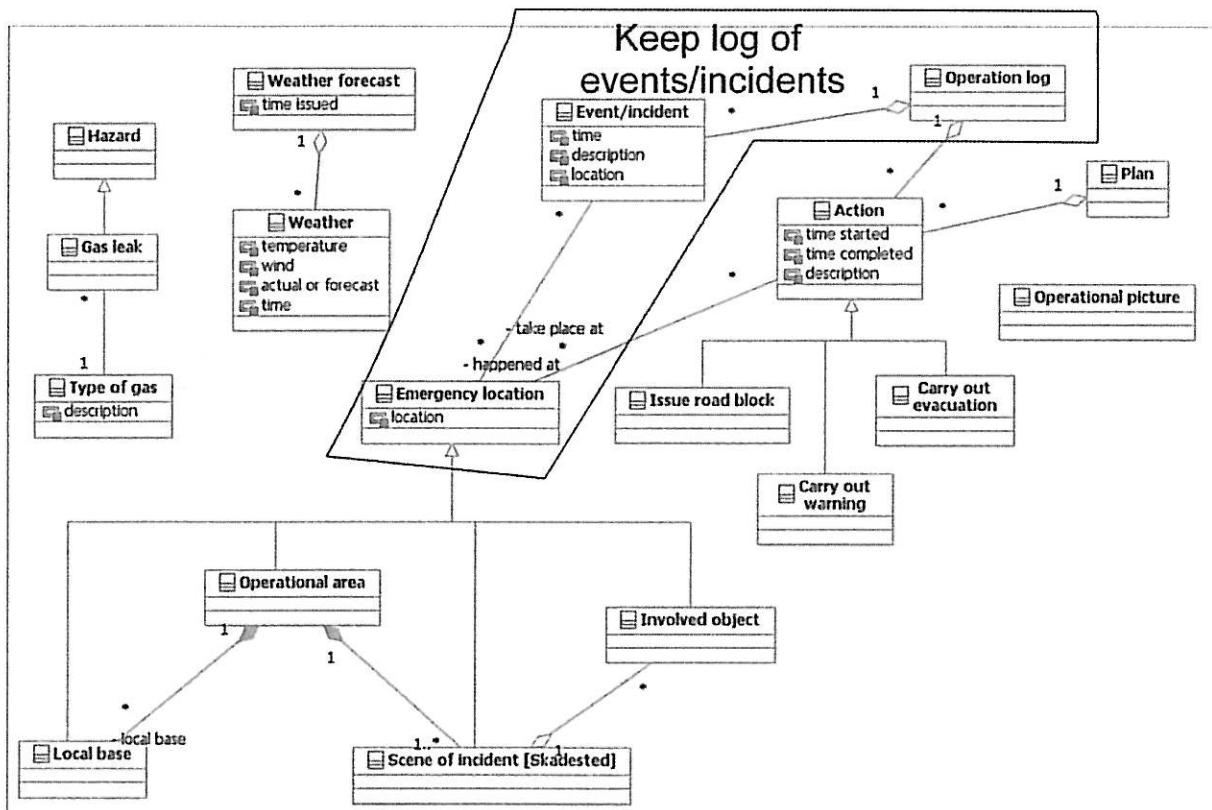
5.2.5 Obtain information from "external" sources (task described in 3.2.6)
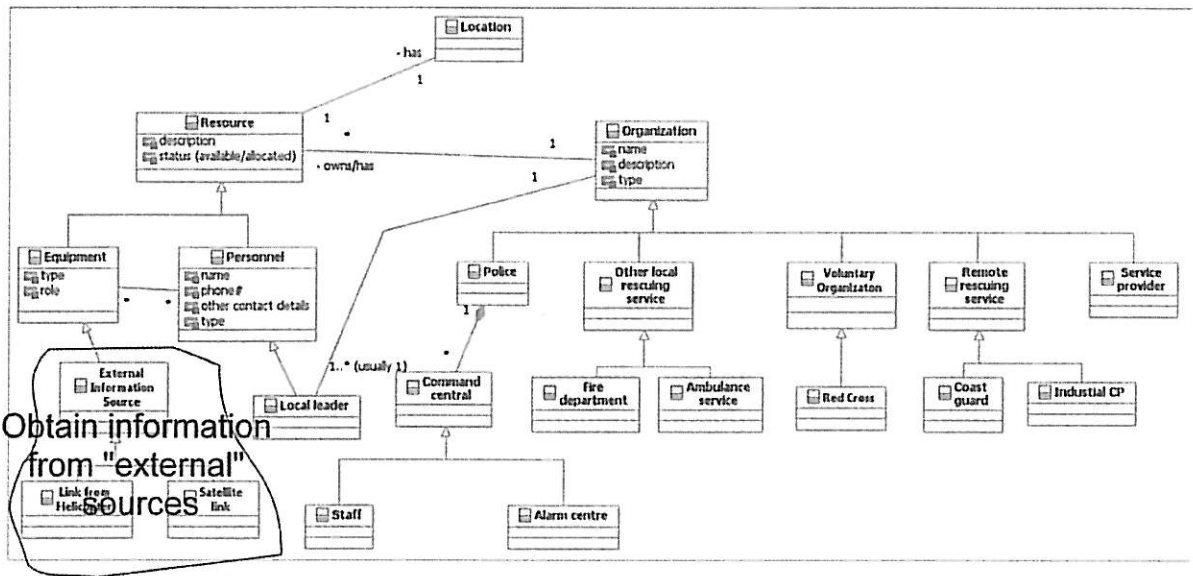
5.3 Handling the incident

5.3.1 Collect information about weather (task described in 3.3.1)
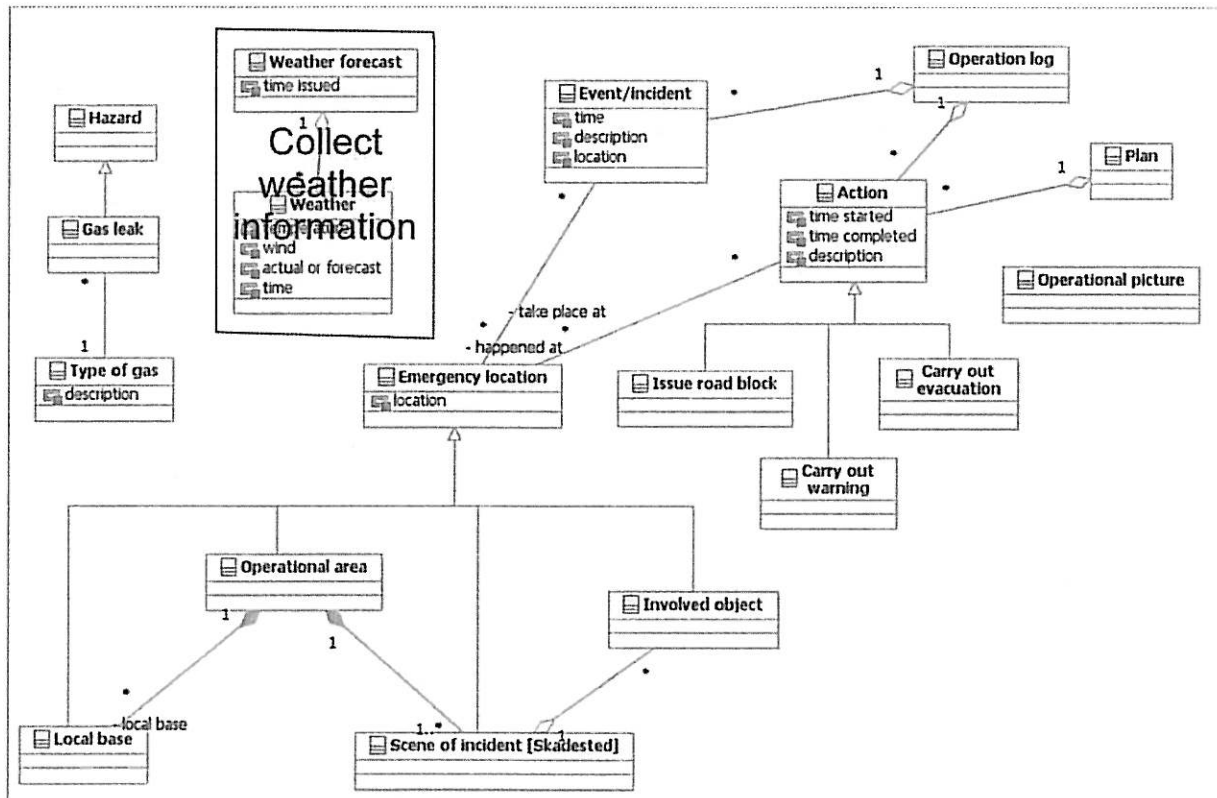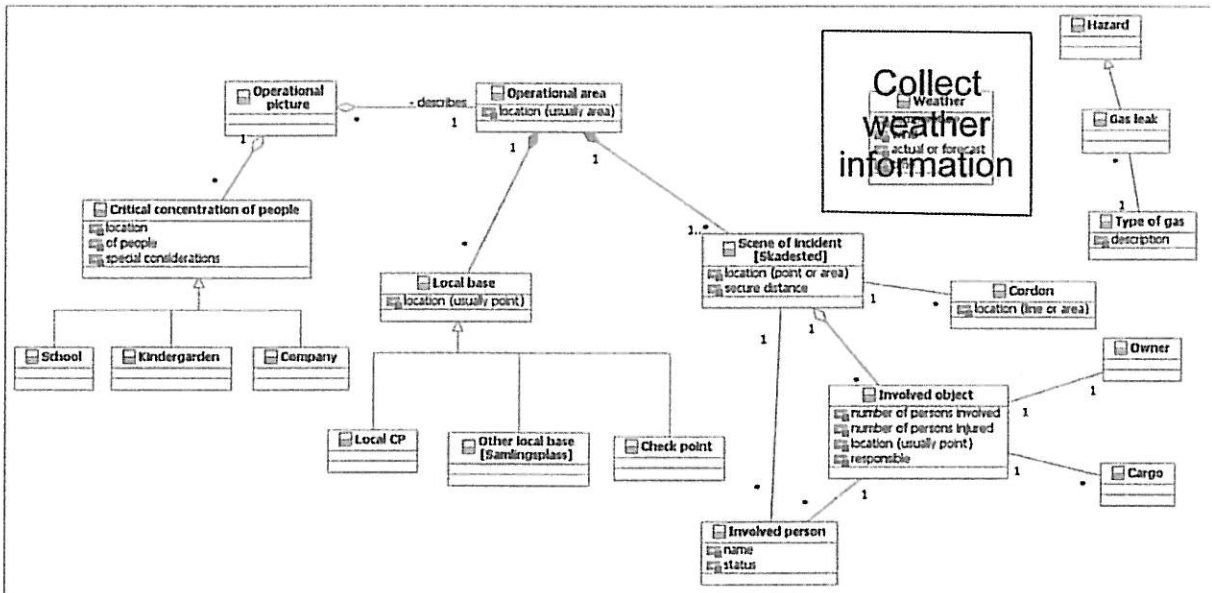
5.3.2 Collect information about types of gas involved (task described in 3.3.2)
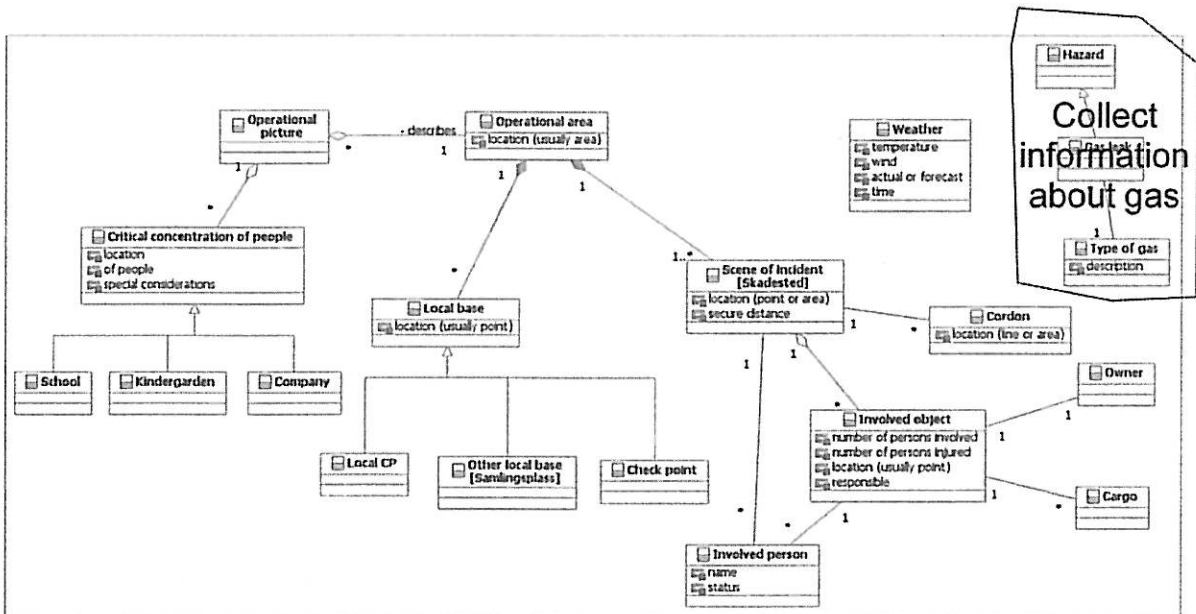
5.3.3 Decide which roads to close and issue road blocks (task described in 3.3.3)
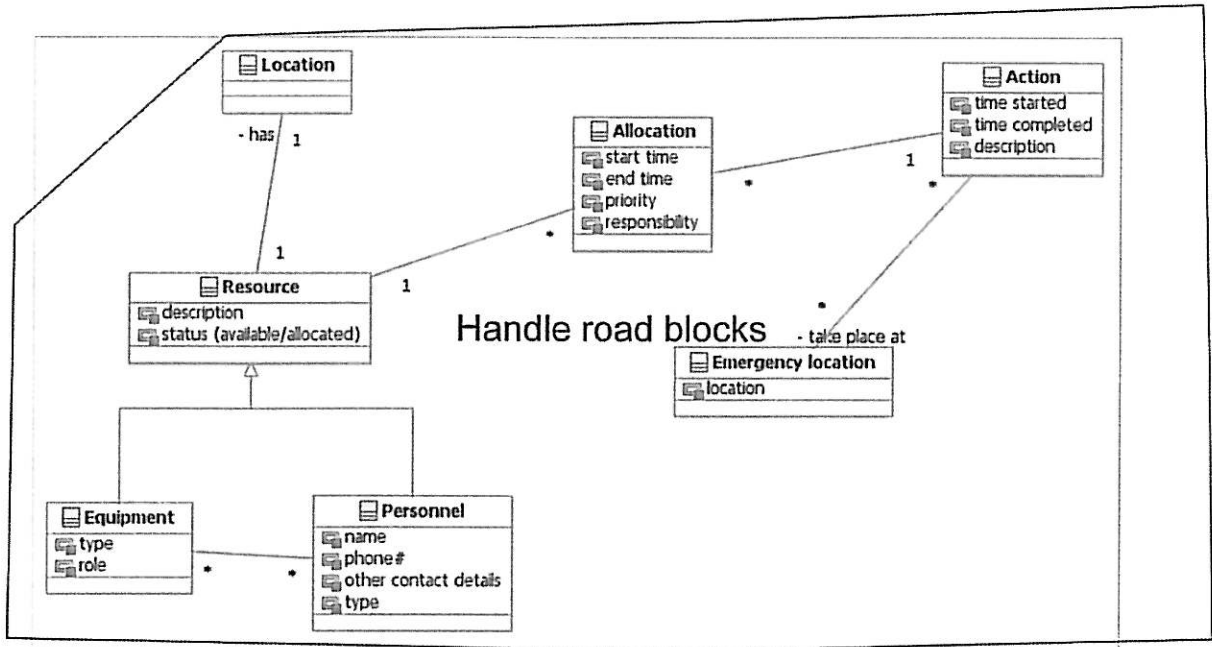
For this task, there will probably be more than one dialog (this is also the case for many other)

5.3.4 Establish and maintain operational picture (task described in 3.3.4)
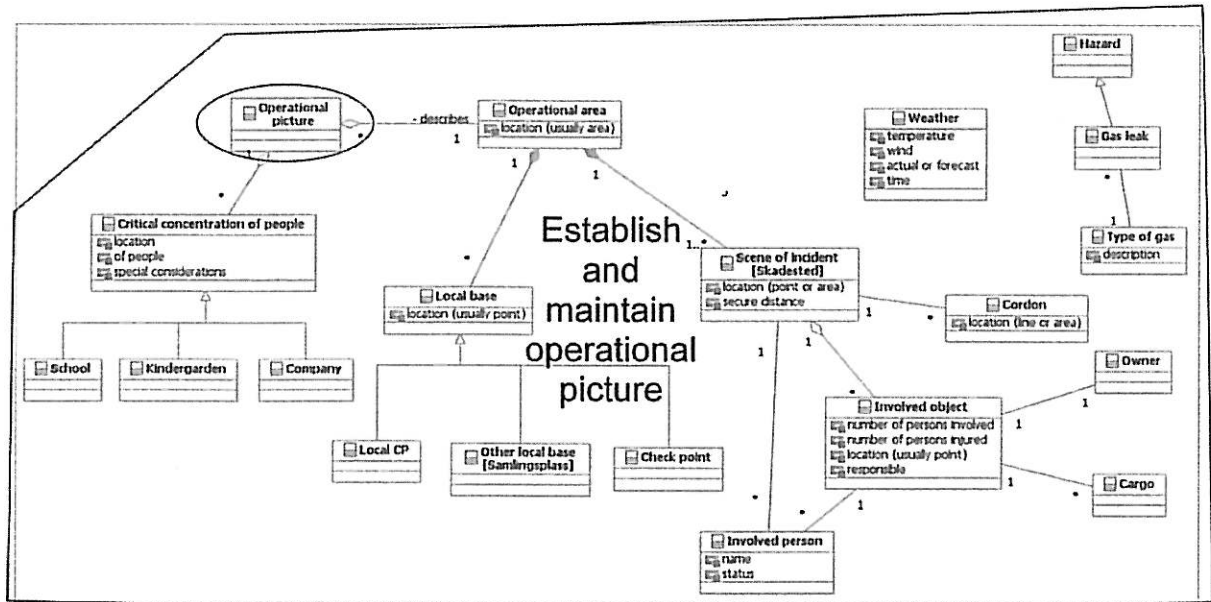
This is typically a task where very many types of information may be needed. For this task, there will probably be more than one dialog (this is also the case for many other)

5.3.5 Decide and carry out actions & plans (task described in 3.3.5 and specialized in 3.6.4 and 3.6.5)
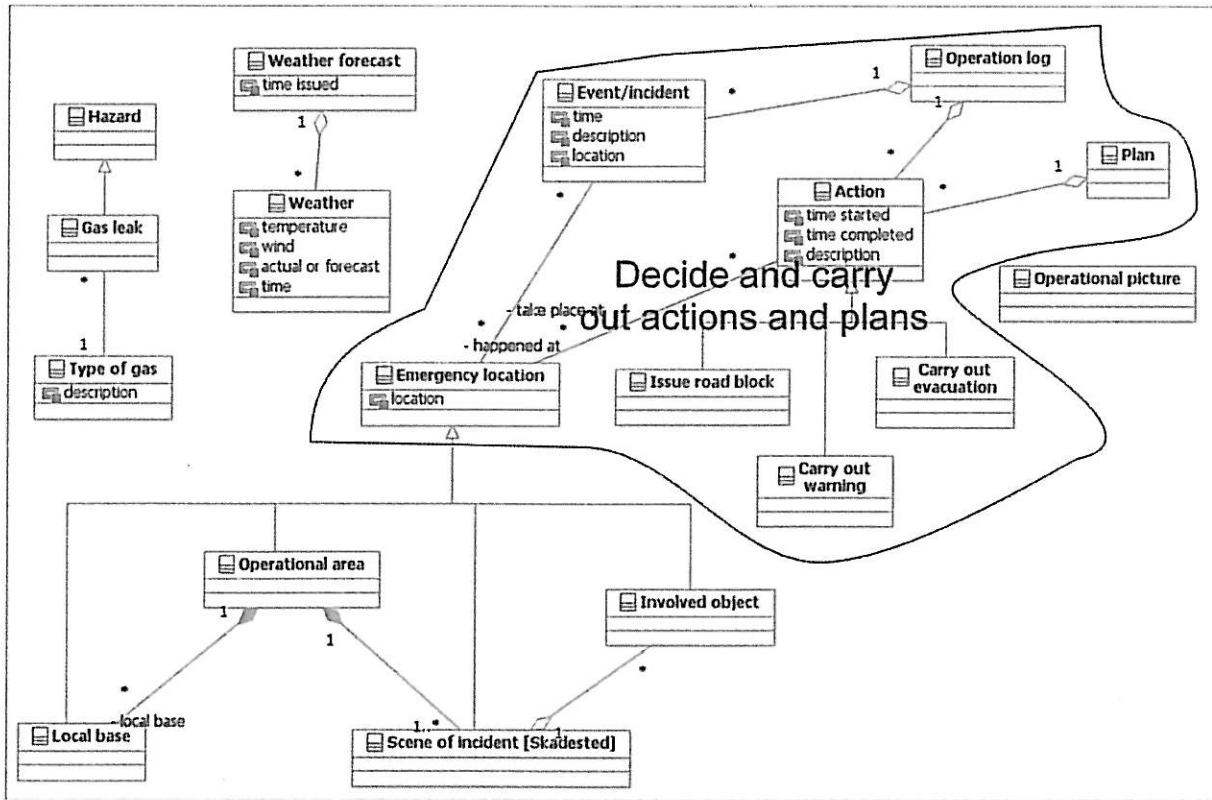
5.4 Handling resources

### 5.4.1 Allocate, reallocate & keep track of resources (tasks described in 3.4.1 and 3.4.3)

For this task, we have included two figures, one showing the information needed from the Resources model, and one showing the same for the Allocations model (the information in these two models overlap, but there are information needed that are only present in the individual models).
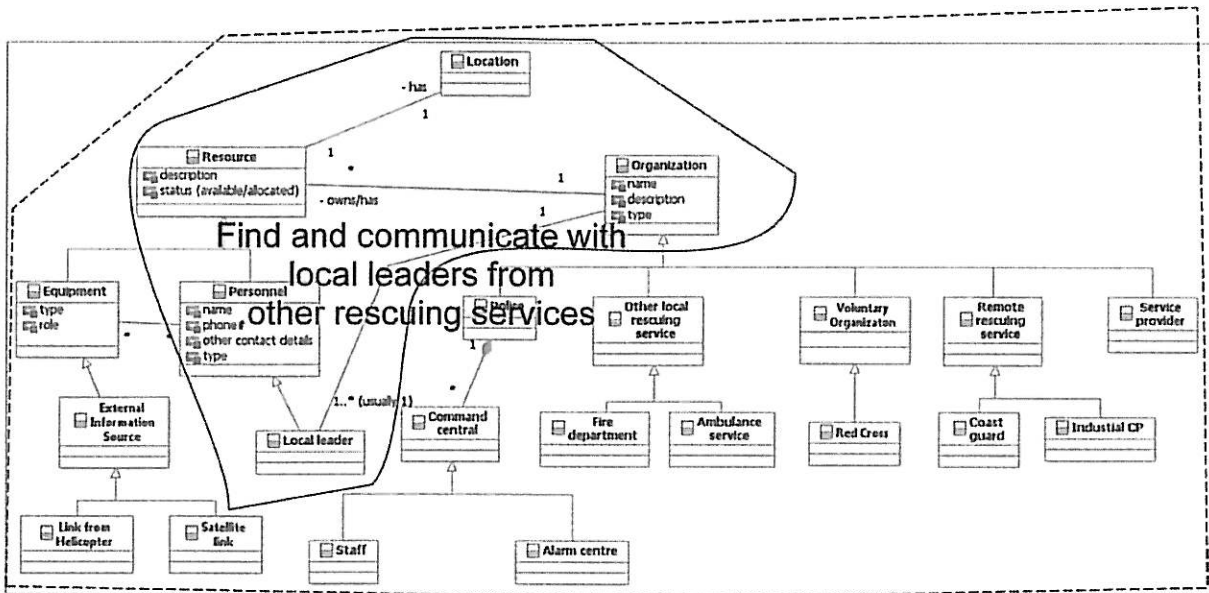
(Re)allocate and keep track of resources
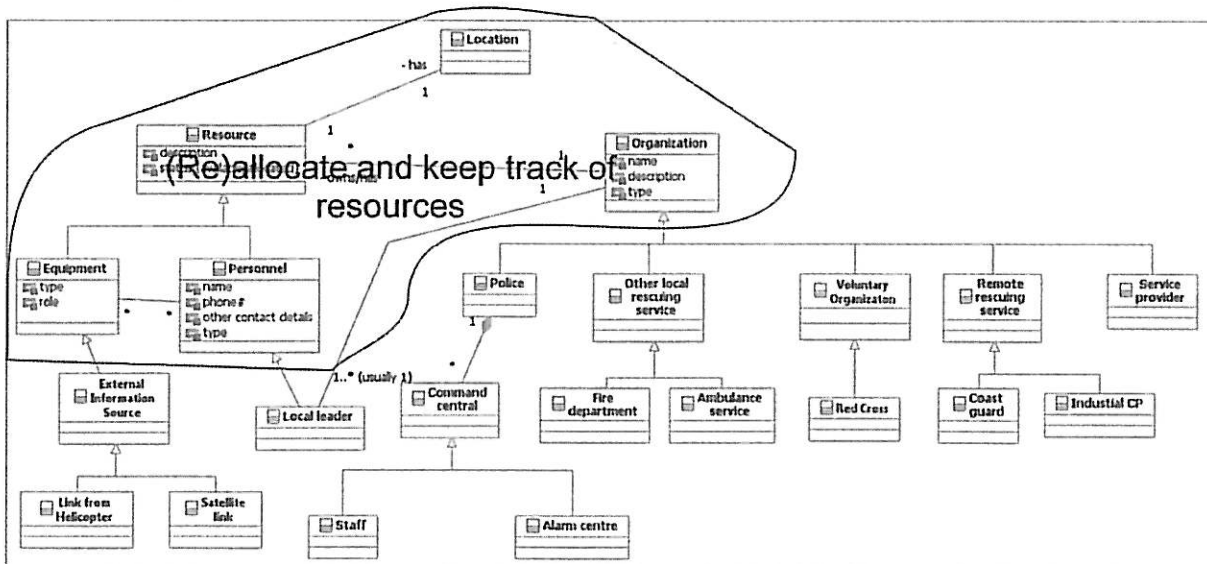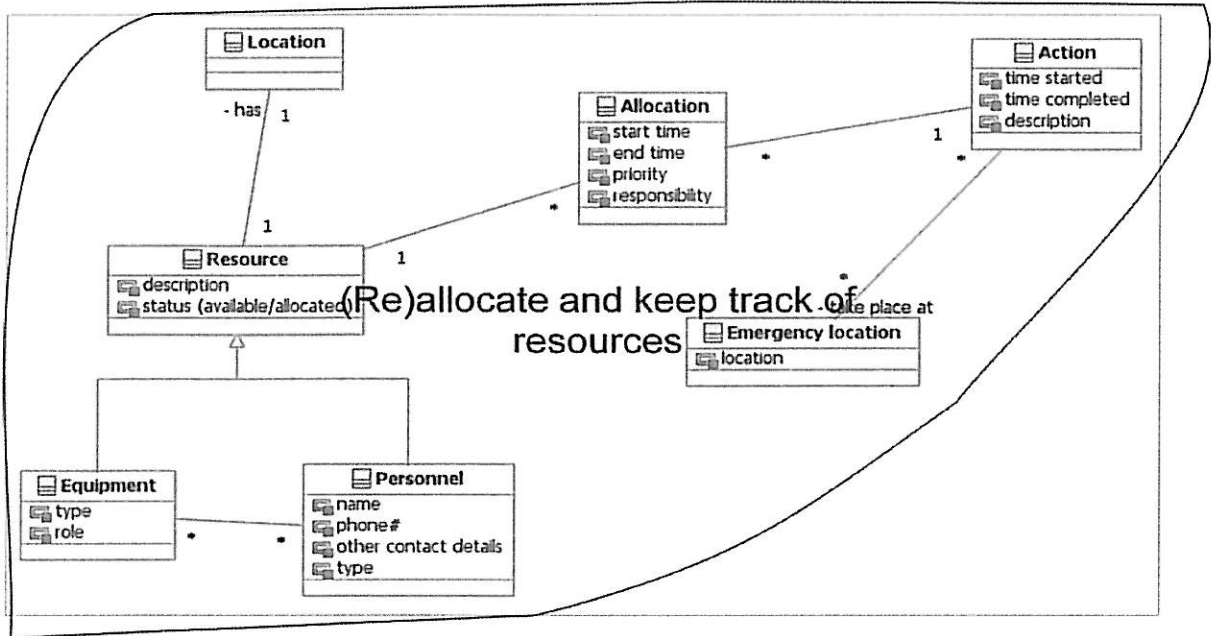
5.4.2 Exchange information about resources (task described in 3.4.2)
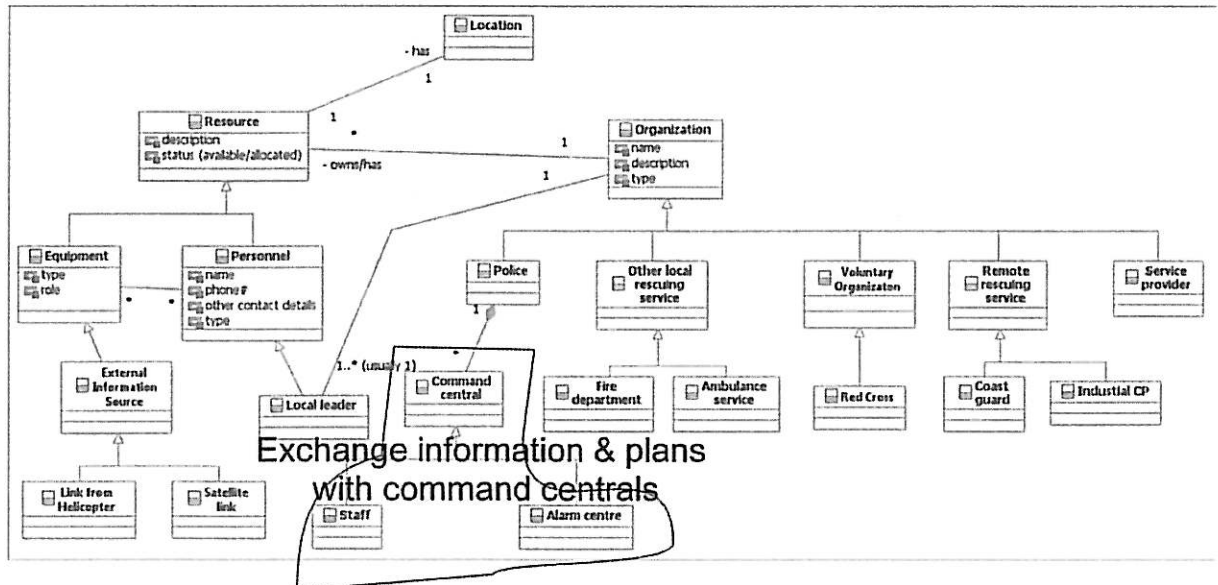

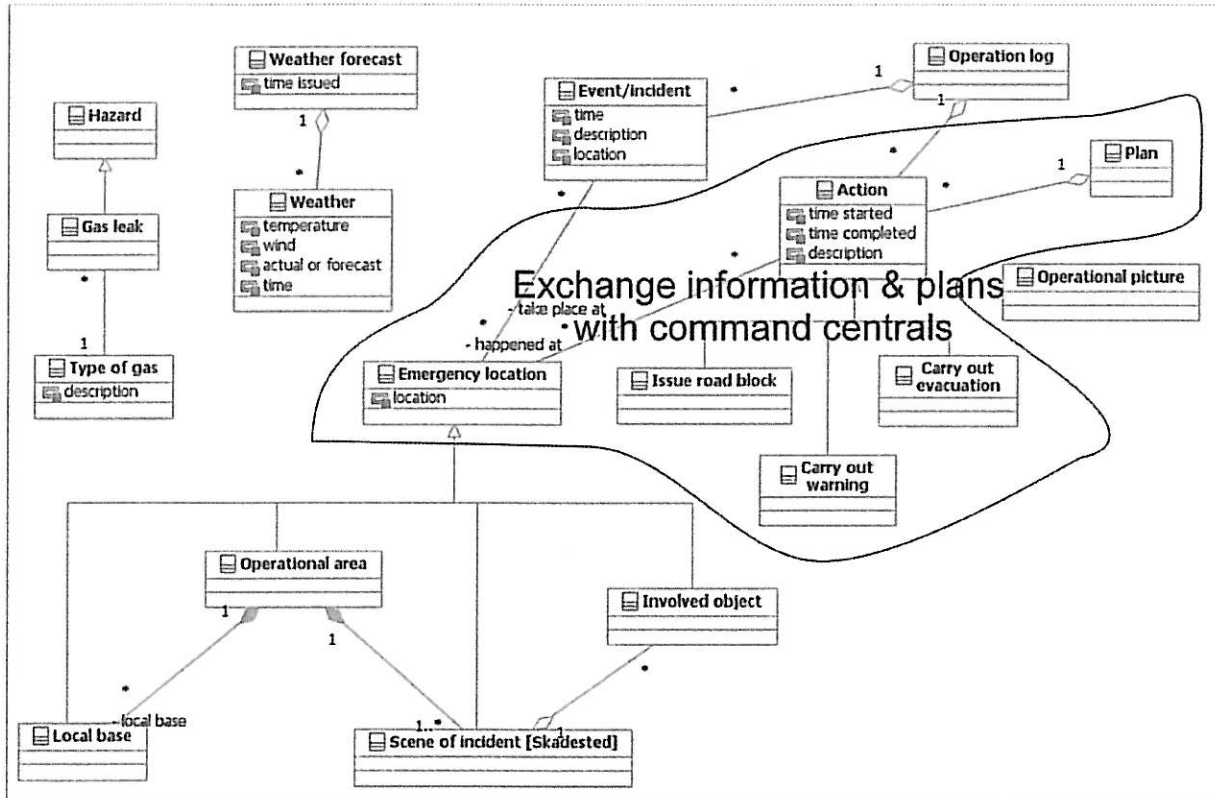
Exchange information about resources
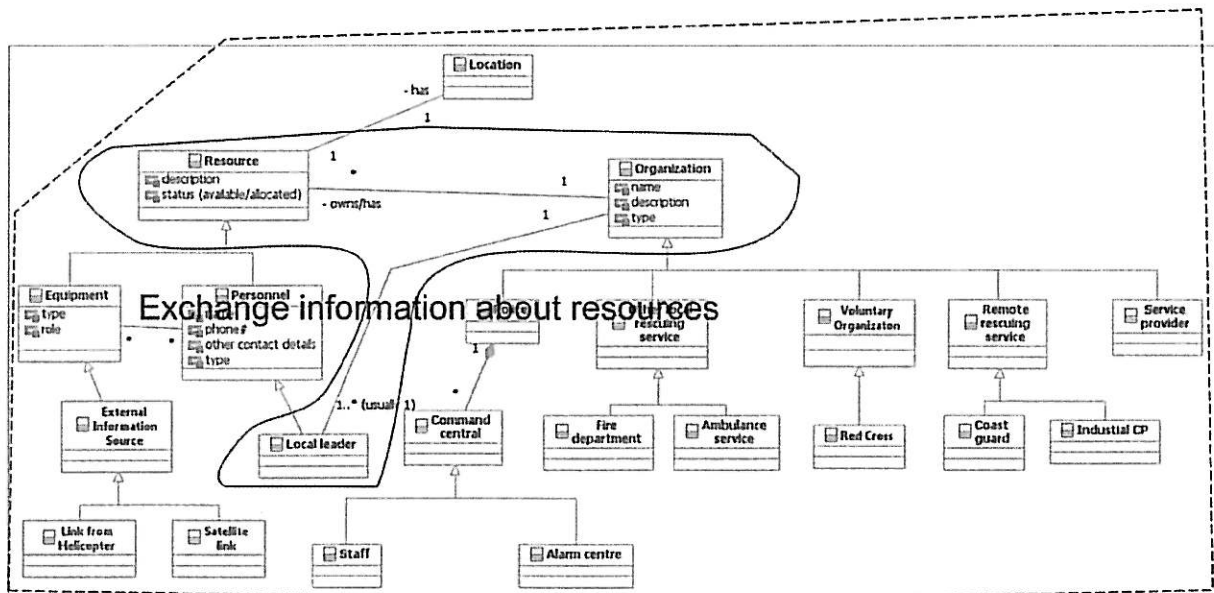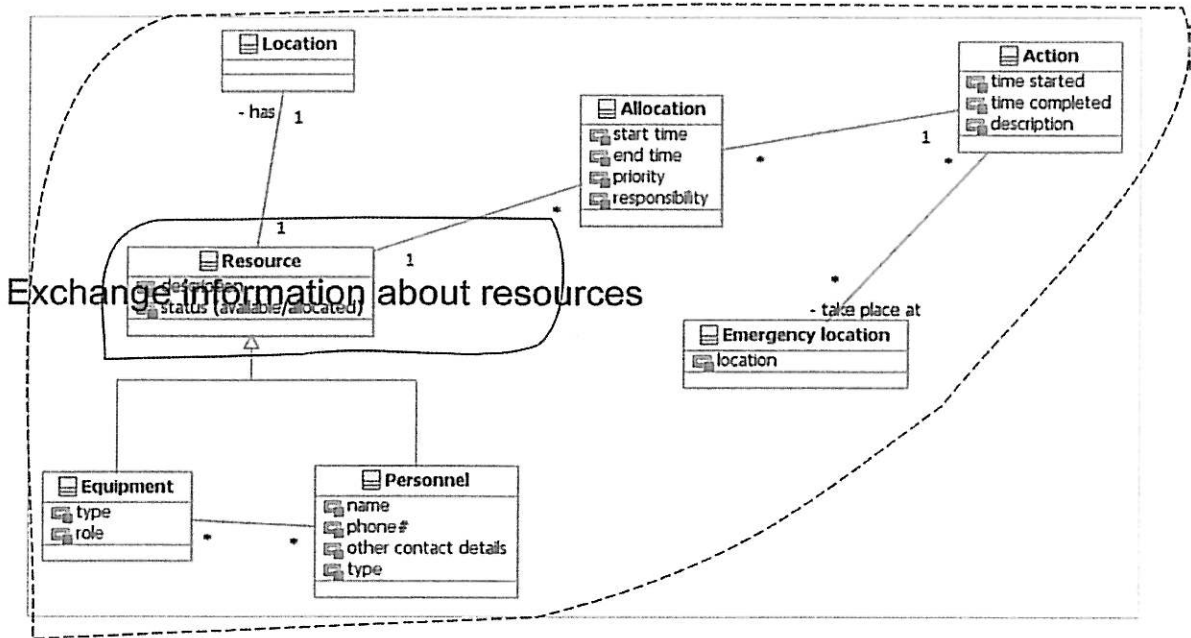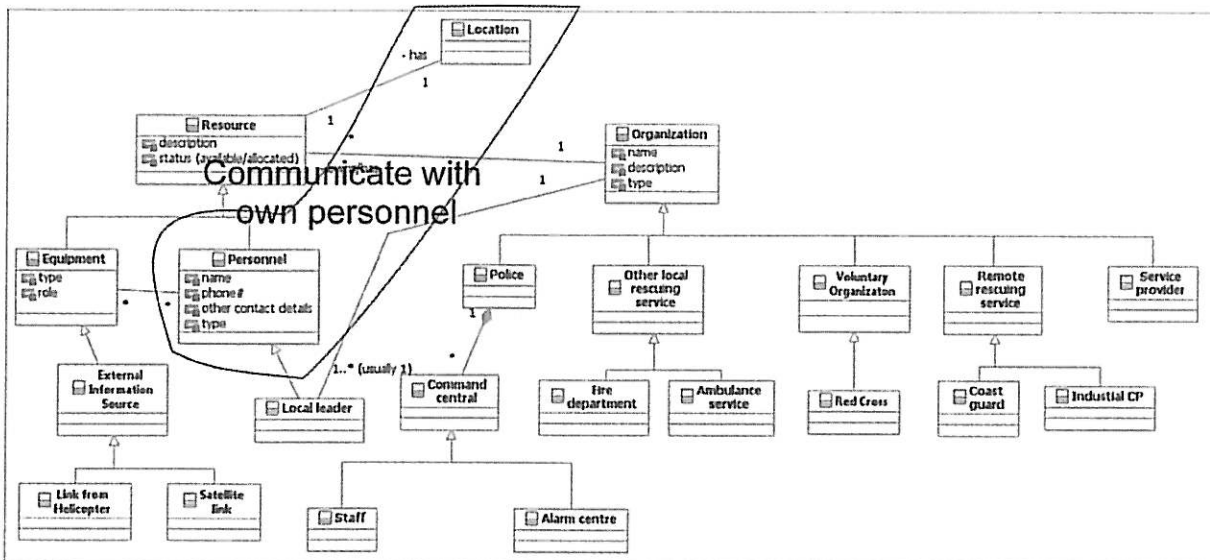
5.5 Communication

5.5.1 Find, get in contact with and exchange information with local leaders from other rescuing services (tasks described in 3.5.1, 3.5.2 and 3.5.3)
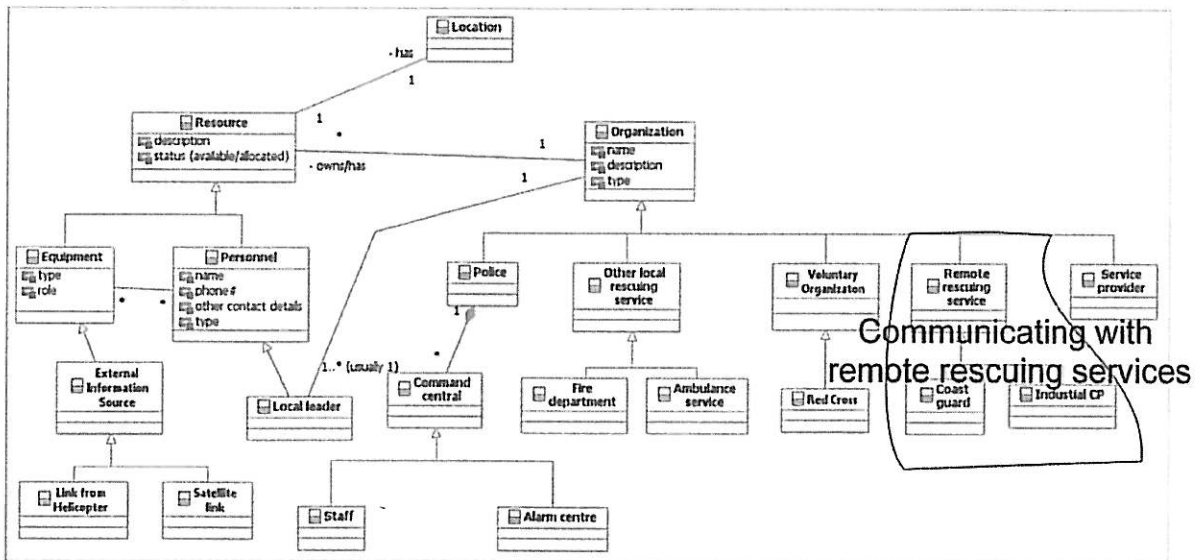

5.5.2 Exchange information & plans with command centrals (tasks described in 3.5.4 and 3.5.5)

5.5.3   Communicate with own personnel (task described in 3.5.6)
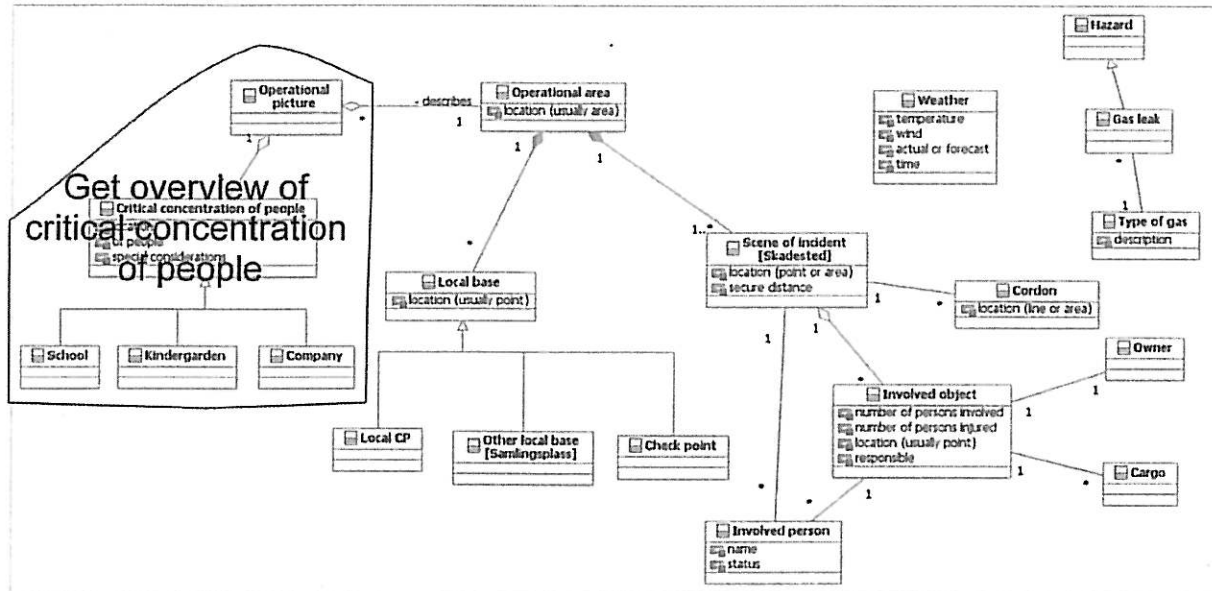
5.5.4 Obtain information of how to communicate with and communicate with local leaders and operational units from remote rescuing services (tasks described in 3.5.7 and 3.5.8)

5.6 Handling the rest of the world

5.6.1 Get overview of critical concentration of people (task described in 3.6.1)

6 Conclusions and future research

Based on the observations at the TYR training exercise and analyses performed on these observations, we have identified a set of relevant tasks, information that is needed when solving these tasks, as well as which information that is needed for solving selected individual tasks.

We have grouped the tasks into the following categories:

- Handling locations
- Handling information about incident
- Handling the incident
- Handling resources
- Communication
- Handling the rest of the world

When presenting the individual tasks within each category, we have characterized the tasks with regards to suggested appropriate UI style(s) for IT support for the task, as well as an indication of what kind of interaction the user will utilize on a ICT-based application supporting the task. The UI styles that are used when characterizing the tasks are:

- Map based
- Forms based
- Document based
- List based
- Media based
- Graphics based

Descriptions of user interaction focus on whether a UI supporting the task is used as a means for obtaining information or/and is used to enter information (for later use by the user and/or other people involved in the operation).

Based on the described tasks, we have identified information that is needed or helpful when solving these tasks. This information is modelled using UML class diagrams, grouped in different (overlapping) models focusing on different aspects of an incident and a connected rescuing mission, i.e.

- Incident
- Plans and actions
- Resources
- Allocations

When presenting these models, we focus on who or what is the source of the information, and what kind of generic operations the user (local leader) is expected to perform on the information. In (Nilsson & Stølen, 2010), we summarized the sources for the information in these models (assuming ICT support) to be:

- The field commanders themselves, i.e. information that the users need to enter themselves, like the extent of the operational area, location of various bases, and log of events and actions.
- The central, i.e. information that is available in the operations centers, either because it is entered by personnel situated there, or because it resides in information systems controlled from the operations centers. This includes information like critical concentration of people, dangerous substances involved in the incident, and available resources (equipment and personnel) including their location and allocation.
- Other actors, i.e. information that must be collected from actors like the owner of a building or an other object involved in an incident. This information includes information about which people that may be involved and dangerous substances involved.
- Services, i.e. internal or external ICT based solutions that contain information that is relevant for local leaders. This includes information about weather (forecast) and details about dangerous substances.
- Sensors, i.e. various fixed or mobile devices collecting information, usually in the vicinity of the incident. Such sensors may already be available before an incident (like surveillance cameras, and temperature and pressure sensors), or they may be put out as part of the rescuing operation (like location sensors on personnel).

In future work in the EMERGECY project on the findings presented in this report, we will complement the models where the task and information models are connected, and we will make sketches/paper prototypes of possible ICT support for some of the identified tasks with connected information. This work has already started for tasks connected to resource management for field commanders in the police, and field work for ambulance personnel in two master student projects. Similar work focusing on using aural user interfaces supporting search for missing persons by personnel in The Red Cross is planned to start in January 2011. Developing prototypes of possible support tools is central in all these projects. Furthermore, we have also looked into the more general modelling structures involved in the connections between task and information models, in work on languages for modelling flexible user interfaces supporting emergency response. This work will continue, with a focus on domain specific modelling concepts.

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