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**SAFIR**

Work Package 1

**DELIVERABLE D.1.2.2:  
Special User Requirements Environmental  
Health and Safety (EHS):  
Fire Brigades and related users**

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Abstract: Content of this document are the findings of the requirements search/market research for EHS. Focuses are the special users fire brigade and other EHS related special users. The results of this evaluation will be the basis for the WP4 pilot Information Center EHS.

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## 1 Abstract

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The document on hand summarizes the basic requirements to fulfill the special users needs, like fire brigades or other emergency response forces using SAFIR-enabled technology, in particular the requirements for SAFIR WP4 pilot Information Center EHS (ICE). After a detailed description of the methodologies and techniques used, an overview about the regarding market is given, describing the related user domain and the involved market actors inclusive the use cases in detail. The research results and analysis covers the whole spectrum from the process, the requirements, and the system limitations up to an overview about innovative scenarios. After the validation of the results, you find the conclusion, which summarizes the main outcomes of the concerning market study.

## 2 Introduction to Special User Requirements Report

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This document was created within Work Package 1 of the European Union's project SAFIR (Speech Automated Friendly Interface Research). The focus lies on analyzing and identifying particular eGovernment applications which citizens find advantageous to execute using speech activation, which plays a core role in the SAFIR project.

SAFIR will principally address three different types of user groups:

- Generic users: citizen users accessing e-Government services at home
- Selected users: governmental service providers (Walloon Region: sports facility queries)
- Special users: governmental employees (like police, fire brigades or other emergency response forces)

To get familiar with the e-Government topic, existing e-Government systems were examined. Based on a profound research, an overview about the special user requirements is given. Another topic is a general survey about the basic functions an application has to fulfill in the concerned/targeted e-Government environment. In order to experience the special user requirements, interviews have been carried out. The interview's methodology and results are incorporated in this document. The document closes with a summary about the gained experience and a recommendation on how e-Government applications could potentially be realized with the use of speech activation.


## 3 Methodology for Work Package 1

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As mentioned in the SAFIR project three different kinds of users are differentiated: generic users, selected users and special users. Before developing the SAFIR SDK and the regarding pilots, the different requirements for the different pilots have to be identified.

Comprehensive examinations of the concerning special-user needs in the specific domains help to identify the regarding processes. This is also a precondition for implementing the concerning WP4 special user pilots for the police or fire brigades. SAFIR users in the Public Order & Safety will get reliable, immediate, complete and easy available sets of data. To assess the exact demands of our eGov target customers, different ways of examinations are carried out, like interviews, panel discussions and shadowing.

Interviews and panels are accurate market research tools to get an overview and solid feedback about focus groups needs and the praxis relevance of our planned processes respectively. This is especially the case for situations that cannot be replicated or simulated easily or at all, which is often the case for

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special user fire brigade. Anyway a shadowing may be useful and possible in case of large scale multidisciplinary emergency rehearsals as regularly organized by authorities.

For more repeatable daily activities, the requirements can be monitored being where they appear. The regarding qualitative research method is called shadowing. The market researcher follows the user (with permission of course) in his daily work and records every concerning activity. The regarding user groups can also be "shadowed" more general, e.g. when checking corresponding news groups or chat rooms.

For additional information concerning the general methodology for Work Package1 please also check the SAFIR WP1 - Market analysis – Methodology document published in Quickplace:

SAFIR\_WP1\_D.1.x.x\_Chapter\_Methodology\_v01.doc.

## 4 Methods and Techniques to Determine ICE User Requirements

### 4.1 Introduction

This document concentrates on the requirements of the eGov WP4 special-user fire brigades and related special users (see below).

To identify the concerning praxis relevant demands, the following tools were used: one-on-one interviews, panel discussions, shadowing, Internet investigation and checking the corresponding chat rooms.

### 4.2 Inquiry into ICE user requirements for e-Gov VQL domains

Managing of risks and hazards dictates the most important day-to-day tasks of people handling hazardous substances. Every day they need a firm basis for decision-making, thus they need immediate, reliable and easy access to up-to-date, relevant information.

In hazardous situations for action forces like the fire brigade to get a quick and reliable overview is first step in their missions. So when assessing hazardous situations, WP4 special user fire brigades needs easy accessible information regarding involved hazardous substances.

The ideal system should serve whatsoever EHS info demands whenever and wherever needed, and this simultaneously for different users through easy and fully voice activated data access.


This would facilitate EHS users (as defined hereunder) to have direct remote access to an EHS database, independently of an operator in the control station. The user would be enabled to use his voice instead of manual input for his database enquiries, and if required in a later project step, a portable unit (like a cellular phone or a PDA) will provide a readable and doubt free output.

The main goal of the SAFIR voice activated pilot "**Information Center EHS (ICE)**" is to give action forces the correct answer at any moment to any EHS related question, coming from the special user, on any product (pure chemical or mixture) and in any language. However, the system must be secure to avoid misinterpretations, respect the privacy etc.

The description of WPT 1.2.2 "Special user (fire brigade) requirements" mentions that some kind of shadowing takes place. However, emergency situations are the most important obstacle to shadowing of course. On site visiting, short time shadowing and intensive interviews give also a good impression of the daily routine and involved requirements.

These focus groups also help to find out new functionalities. Deeper analyses with more elaborate questionnaires are used to describe the requirements of daily activities. In addition, a prototype developed by JPass with the Voice SDK of Voice Insight illustrates to potential users of SAFIR software the type of approach to be developed with the SAFIR project in an EHS environment. This prototype is based on a SDS database (800 SDS in an average of 11 languages i.e. more than 8000 documents and may be ported to other SDS databases running with the JPass software Pollux<sup>1</sup>. Pollux supports both Western and Eastern European languages and the different users of Pollux (within EU) have edited more than 150000 SDS. This prototype is running in English and with telephone interfaces, the answers being voice and/or SMS messages. We plan to use the prototype only to illustrate the Vocal Technology to

<sup>1</sup> Pollux is **not** planned to be used in the SAFIR project as a prototype. This is a program equivalent, out of the SAP world, to the SDS component of SAP EHS.

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Emergency Response teams, to generate ideas, and to illustrate concepts with potential users. In the same idea, we are able to illustrate our ideas using a combination of the existing JPass' prototype / P-Info system / envimax SAP EHS solution to demonstrate the potential to the special user.

**Remark:** The special users and the team leaders in charge of that kind of industrial risks are generally skilled and trained (often at University level). They have, therefore, more chance to apprehend complex concepts as SAFIR without a long demonstration or deep explanations.

#### 4.3 Used Methodology for Collecting Special User Requirements

As already mentioned different marketing research methods were applied within the here discussed market study. This includes intensive user interviews, using the questionnaires below, shadowing, literature and Internet research. The different methods used are described in more details below.


##### 4.3.1 Questionnaire

The focus groups need to provide information regarding the following issues:

- Environment, health and safety related information:
  - Which information do they need (until now and in future)?
  - Are they satisfied with the data quality?
- Way of communication:
  - How do they get the EHS data so far?
  - Which communication channels do they prefer/wish in future (via voice/via GUI/combination of both)?
- Location:
  - Where do they need EHS info today (e.g. in the fire brigade control station, on the way in the truck, on site)?
  - Where would it suit best, to get EHS info (without considering technical restraints)?
- Authentication and authorization:
  - What about voice based authentication (access is provided based on the recognition of the user's voice)?
  - What about voice supported authentication (the user is prompted by voice to enter password etc.)?
  - What about unaccepted authentication (wrong password, unstable communication quality...)?
- What should the ideal EHS info system consider?

##### 4.3.1.1 General questions regarding voice commands and voice output

- What are the circumstances in which voice commands and/or voice output are most useful and what would be the level of background noise in these cases?
- Is the voice output suitable with complex chemical names and with the type of risks varying dramatically with two products having very close chemical names and very different risks class?
- How much training is acceptable to start operational use of voice commands?
- What dangerous chemicals should be considered: solids, liquid, gas, medications, cosmetics, and food additives? Where are the limits? How to inform the user about a "missing" chemical and a "out of scope" chemical like?

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#### 4.3.1.2 Integrated search in SDS databases

In the current JPass prototype, the user can search SDS databases for products, specifications and risks, by respectively entering the product name or part of it, the product reference or part of it, the components, the risk sentences or part of it, and the danger symbol.

The envimax SAP EHS includes a sophisticated database with 360 different properties including altogether 2.000 characteristics to describe a hazardous substance. This complexity makes it evident to define appropriate search strategies. These strategies also have to consider the concerning environmental parameter under which this special user group is acting. The regarding evaluation includes questions as the following listed ones.

- What about voice input for UN Numbers searches?
- What about voice input for complex queries?
- What about voice output, reading out the results with close names?
- What about voice input (output) in a noisy environment by emergency teams wearing masks?
- What about voice input in a multilingual country (i.e. Belgium, Finland...)
- What about voice input in trans-national transport of dangerous goods?
- What about geographical queries linked with voice input in case of an emergency: air crash, marine pollution, Chernobyl like incident, border incident.

Background information: 65 % of EU chemical industry is situated within a circle with radius of 300 Km around Brussels. Antwerp is the second largest chemical complex of the world and the biome Antwerp-Rotterdam the first largest chemical storage and transportation area of the world. In addition, at BASF site Ludwigshafen - the world's biggest Chemical location – GIS data could be evident.

- What about radio labeling of goods related with this voice query activated application?  
Background: Some labels are now radio labeled and the package may be identified by a radio signal: Frequencies have to be checked about (to avoid noises), and possibilities to store more information on those labels.

In some cases, the result will be a hit list, allowing the user to get information that is more detailed.

- What about voice input to select one of the results?
- What about voice output, reading out the detailed information?
- What about voice interaction on still more detailed queries?


#### 4.3.1.3 Specialized search in complex EHS databases

In complex EHS databases, more detailed information can be requested, e.g. all the interactions between a specific product (frequently a mixture of different chemicals) and a person involved.

- What about complex queries in such EHS databases based on voice input?
- What about voice output for results from complex EHS databases? Instead of reading out all potential risks, first aid measures, risk for environment etc., certain obvious sets of data could be predefined for example.
- If there are regulatory information available, but not in the required language, should the system inform the user and ask if the output should be given in the regarding language (mostly English)?
- Information stored in the envimax database could be confidential, like the exact composition for example. Such data have to be predefined and excluded from future inquiries. On the other hand, should they be kept for company fire brigade investigations?

#### 4.3.1.4 Spatial search and GIS

Additionally to the further core pilot ICE functions in a later project step, spatial search and geo-functions might also be useful. To complete the requirements specification research, we tried already to evaluate if there is a related need for such functions (also see chapters 4.3.1.5 and 4.3.1.6).

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- What kind of location-based data are you mostly interested in? Is information, like chemical inventories (what hazardous substance is stored or produced at the place of the accident) relevant for the practice? Other object-related information could be for example, where is the key for the object stored (the so called “fire brigade key” stored in a “fire brigade safe”) or the facilities for fire water retention, the fire-extinguishing system or similar.
- The fact to use spatial query may require access to other, non-EHS information like: quantity in stock, products stored in the vicinity. What about reasonable output in term of performance, accuracy and complexity?
- Spatial searches are also generating potential problems in case of different chemical sites close one to the other one. What about inventories in a radius of, let say, 500 meters if a large part of that radius is in another site where the current emergency person has no access.

**Remark:** Access to inventories would generate legal limitations: does the fire brigade of site 1 have the right to have, by any way, access to the inventory of the closest competitive site 2? The problem is occurred some years ago in Basel, but other may be discovered later.

#### 4.3.1.5 Mapping and portrayal

Different kinds of information can be displayed on a map. Normally you need to interpret this information.

- What about having a spatial analysis performed, presented by voice?

For example: ‘Your destination is an isolated plant, no recent incidents reported, within an industrial zone and close to a high pressure gas Pipe Line’. Alternatively: ‘Your destination appears to be a truck, please give us the UN Number and the current size of the Truck’. Or: ‘Around the place the fire is active, you have 2 tanks one with 250.000 Liters of fuel and another with an undermined quantity of highly polluting substance. No information is available about the exact composition nor extinguish media’.

#### 4.3.1.6 Alert and notification

The dangers and risks information will be provided by voice, eventually supported by additional graphical output. Today the information is coming among others e.g. from CEFIC (ERICards) or the product supplier (e.g. BASF, Atofina or smaller companies)<sup>2</sup>.


Do the response time of the current system seem suitable to the users?

- What are the related standard operating procedures? What are the different kinds of scenarios encountered (or to be considered)?
- How to avoid misinterpretations: e.g. suitable extinguish media and unsuitable extinguish media, high risk of chemical pneumonia if the victim is not hydrated within the 10 first minutes, what about responsibility of the emergency team in case of misunderstanding of the answer coming from a computer and, therefore, checkable later?
- What about integrating alert and notification functionalities into the system, using voice?
- What about the readability of a PDA in an emergency? Are PDA already used in emergency events (and if yes, for what purposes)?

#### 4.3.2 One-to-One Interviews

Individual interviews with key figures are used as accurate market research tools to get a solid feedback about the focus groups needs. The user describes his daily activities and the related data demands. The one-to-one contacts make it possible to demonstrate existing prototypes and illustrate the included potentials. The user gives us a first feedback about the praxis relevance of our planned applications and processes for special user fire brigade respectively. The above-described questionnaires are used as base for these interviews.

<sup>2</sup> 96% of the chemical companies in Europe have less than 250 persons. Most of them are unable to offer a 24/24 emergency response service.

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### 4.3.3 Shadowing

In the shadowing part of the research, the main aim is to provide knowledge to be used in the spatial analysis of locations and the spatial inventory of areas, in combination with relevant recent incident information. Information to answer the following questions needs to be collected:

- Which features are important to define the needs when using voice?
- Which categories of incidents should be distinguished worthy of reporting using voice?
- Which data level is required in praxis and at what time? Where are deficits today? What could be solved better with the new technology?

This information can be partly gathered by studying existing documentation, regarding the aggregation of types of incidents for reporting purposes and tested in the field. The selection of relevant features can be better investigated in the field, as this selection needs to be relevant to fieldworkers in the first place. However, emergencies are a big hindrance for shadowing of course. Because on site visiting, short time shadowing and intensive interviews give also a quite good impression of the daily routine and involved requirements we focus on this tools for collecting the requirements.

### 4.3.4 Internet Research

We use the Internet as a market research tool to top off the elaborated special user requirements on a more global basis. This also gives an insight into the latest research status concerning this matter. Professional applicable chat rooms are an additional direct contact possibility. Following the related discussions show further professional needs.

## 5 Market Overview

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The state of the art in this user domain is described below, to get a better insight into the system/business context. This includes the description, how the actors do there job today, with a clear focus on the professional players in this market. The foreseen differences when using SAFIR technology are then highlighted.

### 5.1 User Domain “Emergency Response Forces”


The current situation concerning emergency response forces handling hazardous substances like fire brigades is the content of this chapter. This document details the market description from WP1 document ‘Existing Systems’ (D.1.3.1; chapter 5.3.1). When appropriate, the processes are described also with the help of UML-models. In the special user fire fighter situation, the EHS supported processes are the focus and are described in more detail.

### 5.2 Involved actors:

Any human community has different special users who play an active role in case of industrial accidents. In most cases this are whether municipal or company fire brigades.  
Any places where men are active are potential candidates for chemical incidents.  
Any human activity is generating directly or indirectly EHS risks.  
Any human organization needs to plan a procedure to reduce the risks and to limit the consequences of the incidents.

#### 5.2.1 Current events with EHS data demand

Among many others here are some examples of accidents involving hazardous substances: gas explosion of a pipeline at Ghislenghien in Belgium (8/2004), crash of 2 Tupolev in Russia (9/2004), Pipe Line terrorists attacks in Iraq (9/2004), Explosion in a plant in North Carolina (late 2003), sinking of Erika in North Sea (late 2001), road accident in the Netherlands (1 truck with sulfuric acid and 6 cars).

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### 5.2.2 Market actors

Many emergency oriented teams have a demand for ES related information.

Attached you will find a list of different dangerous occurrences with the corresponding market actors:

- Gas explosion of a Pipeline: Local Fire Brigade, Civil Protection Fire Brigade, Gas operator, Industrial Zone management, Medical unit, Hospitals (in that case 6 in 3 countries speaking 3 languages), Police (both local and regional), Environment Agency, Ministry of Health, Local Emergency Medical Unit ...
- Airplane Crash: Local Fire Brigade, Army, Local Police, Airplane Authority, Air Carrier, and Ministry of Transport...
- Pipe Line Terrorism: US Army, Iraqi Army, Fire emergency team, Police, Pipe Line authority...
- Plant Explosion: Fire brigade, Environment Authority, Police, Hospital, Local Emergency Medical Unit, Company emergency team, public utilities...
- Ship Sinking: Client, Supplier, Navigation Authority, Fishing companies, Boat giving first assistance, Environment Authority, Sea Side communities...
- Road Accident: Highway Police Patrol, Fire Brigade, Fluvial Police, Hospital and Local Emergency Medical Unit...

### 5.2.3 Typical business process with EHS data demand


To manufacture the LCD screen of your laptop you are using to have at least nine different industrial actions. Any contains a potential risk:

- **Extraction** of the raw material from ground using dangerous goods and persons.
- **Storage** of the raw material within the mine area where persons and dangerous goods are present.
- **Manipulation** of the raw material before transportation with men and engines using fuels, lubricants etc...
- **Transporting** the raw material from extracting area to transforming plant using one or more of the following vectors: road, rail, boat, air always with men and crossing over manned area.
- **Transforming** the raw material into a semi finished material into a plant using chemicals, energy, heat, cold, and operated by men and women.
- **Transporting** the semi finished good from extracting area to transforming plant using one or more of the following vectors: road, rail, boat, air always with men and crossing over manned area.
- **Repeating** the operations 5 and 6, one or more times.
- **Manufacturing** the screen into a high tech plant, with clean air area, very well protected persons to protect the product against external polluting agents.

At any of those steps, there is place for incidents or accidents, with high risk of actions to be taken with a very short response time without any idea about the risks.

Therefore, the potential users are everywhere and with different questions and different response times:

Type of User	Description	Skills	Information Required	Current Answer
Company Fire Brigade	Inside the industrial site	Good of their products	On local products	Private data base generally suitable
Local Fire Brigade	At the city or village level	Variable according to the status: volunteer or professional	Any emergency measures on any product	CEFIC ERICards, Information provided by the producer (SDS) or transporter (TREMcards), Orange Book of the

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Type of User	Description	Skills	Information Required	Current Answer
		with limited regular training.		"Pompiers de Genève" Other information from various origin
Large City Fire Brigade	At the city level	Generally good	Any emergency measures on any product	Same as here above
Civil Protection	At the region or country level	Generally good	Any emergency measures on any product	Same as here above
Emergency Physician	At the level of the incident	Variable	Medical first aid on any product	Nothing or SDS or TREMCards
Emergency Team in First level hospital	The closest hospital	Variable	Long term risks for the victims	Nothing
Medical Authority and experts	Back office preventive team	High	Long term effects to the population and	Almost nothing or information gathered by good will
Local Police	Close to incident area	Extremely variable	Potential risk area, Effects on population	Good will from other active players
Regional or National Police	Global view	Low required	What to do to limit the extension	Contact with Fire Brigade actors on site
Anti Poison Center	Skilled team	High	Anything linked to health on any product	Limited information
Environment authority	Skilled team	High	Anything linked with environment effects on any product	Excellent data bases in most EU countries but for common products almost nothing on new products
Transportation Authority	Skilled team	High	Anything linked to health or with environment effects on any product	Excellent databases for common products in EU countries, but almost nothing on new products

The best knowledge of a specific product is usually at the producer level. He knows not only what but also how many, where, how to evacuate, how to reduce secondary risks. This is the kind of information handled by the clients of envimax and JPass.

The more frequently used information by special user fire brigade is the ERICard from CEFIC. The ERICards are distributed free by CEFIC to Fire Brigades. Unfortunately, ERICards are mainly available for generic products, and the information is only suitable for the first level of fire brigade missions. Therefore further information sources are used, mostly in written, paper-based form, for often encyclopedia like Römpp or Hommel or the regarding safety data sheets, if available.


### 5.3 Market Actor Fire Brigade

#### 5.3.1 *Introduction*

In Belgium, chemical accidents are handled by an organization called **Belintra**, a "joint venture" of BASF and Solvay and active in any chemical accident on request of the local fire brigade or authorities. The Belintra teams are also trained to remove chemicals for disposal or future usage in case of leakage.

In Germany, at BASF Ludwigshafen, an internal emergency fire brigade is in charge of the largest chemical production unit. Their control unit is also the center of the German and Austrian network for fire brigade related information and active help: TUIS (Transport-, Unfall-, Informations- und Hilfeleistungssystem). This network of 150 chemical companies, just in Germany helps municipal fire brigades whenever hazardous substances are involved. Help is provided at different levels: support via telephone, on site or active assistance with corresponding action force instruments.

In conjunction with those "private/industrial" teams, the public service of municipal fire brigades also exists. We are in contact with both types of fire brigades: company as well as municipal fire brigades. We have also discovered similar needs for other actors of the emergency user domain.

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### 5.3.2 Description of actors

In most developed countries, different types of fire brigade are working, mainly independently, but in some dramatic circumstances, together. Therefore, there is a place for communication and for high quality information available immediately with simple and cheap devices in a very simple and structured way.

**Small entities:** Fire brigades composed of volunteers. In the best case, they have the same basic training than professional fire brigades but they have less permanent training and less expertise. The political game may generate dramatic changes in the management team because volunteers can be more easily dismissed than employees.

**Medium entities:** Fire brigades composed of volunteers but managed by professional firemen. They have the same constraints regarding training than in smaller entities. Better stability at the management level.

**Large entities:** Fire brigades composed of professional personnel, with generally good basic and permanent training. A dedicated medical unit is often integrated within the Brigade.

**Regional or National Level:** Civil protection composed of professional, generally called in a second level either in case of very large incident or of very long incident.

In some countries, some of the Fire Brigades are members of the Army and in any country the army as different fire brigades. In other countries, the fire brigades are depending, directly or not, from the Ministry of Interior.

Other active actors:

**Medical:** local physician, emergency medical team, general hospital emergency team, specialized hospital emergency team (i.e. burned people departments), public health experts and medical unit. Except the last team, all the others are working in emergency directly with the victims. The last team is working at the public health level taking decisions to reduce the number of victims.

**Environment:** local and centralized (sometimes with intermediate echelons) teams. The local team has to take action to reduce immediate direct pollution and consequences of pollution; the central team needs to take decisions, to order actions, to reduce long range and long-term pollution.

**Police:** local and road police. Both have to avoid new additional victims, to avoid secondary risks (to prepare or organize evacuation of a dangerous area), to avoid vandalism and to facilitate the movement of the different emergency teams.

### 5.3.3 Typical organization of a public fire brigade

After this brief overview of the different actors in the emergency response domain, you find below a typical organization of a municipal fire brigade in Germany. This type of organization is similar to the one in other EU states.

Representative municipal fire brigade organization in Germany:

**Troop:** Smallest entity (2 man: troop leader, troop member, in German: "Truppe")


**Echelon:** 2 troops (in German: "Staffel"): 1 water/1 attack troop; 1 troop leader, 1 machinist (always the driver)

**Group:** 3 troops: water troop, attack troop, hose troop and 1 group leader, 1 machinist

**Enhanced group:** Group + annunciator (Coordinating the different entities)

**Platoon:** (in German: "Zug") one entity in the case of fire, in cities in mostly: 1 extinguish-/ 1 ladder vehicle


→ Several of these echelon or group entities have 1 **platoon conductor** in total

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Large scale operation e.g. with several platoons:

Additional 1 **operation controller** (e.g. chief of the fire brigade)

**Typical use case:** at least 1 vehicle is on the field, the person in charge sounds out the situation and gives the appropriate operation orders. He is responsible for identifying the main risks involved (e.g. risks caused by hazardous substances), communicating them and deciding the adequate measures. A system as the proposed ICE could be used to support the decision of correct and adequate data and their distribution.

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### 5.3.4 General Fire Brigade Use Cases

As above already mentioned, different doers are involved in standard special user fire brigade missions. In the diagram below different typical use cases with the actors involved are described.

A citizen notifies the fire brigades about an incident happened using whether telephone or an alarm annunciator. Depending on the nature of the incident, different fire brigade units eliminate the risks that have arisen, e.g. an attack troop gives technical assistance. Fire fighter equipments are used, as well as the analog mobile phone system for fire brigade internal communication.

First of all, the platoon leader checks the situation including risks involved and prioritizes the needed actions during existing crisis conditions (triage). He uses paper-based information for his risks assessments or lets the control station doing this. For coordination he and the control station use the mobile phone system again. Additionally on the administrative level the operations have to be documented by the management.

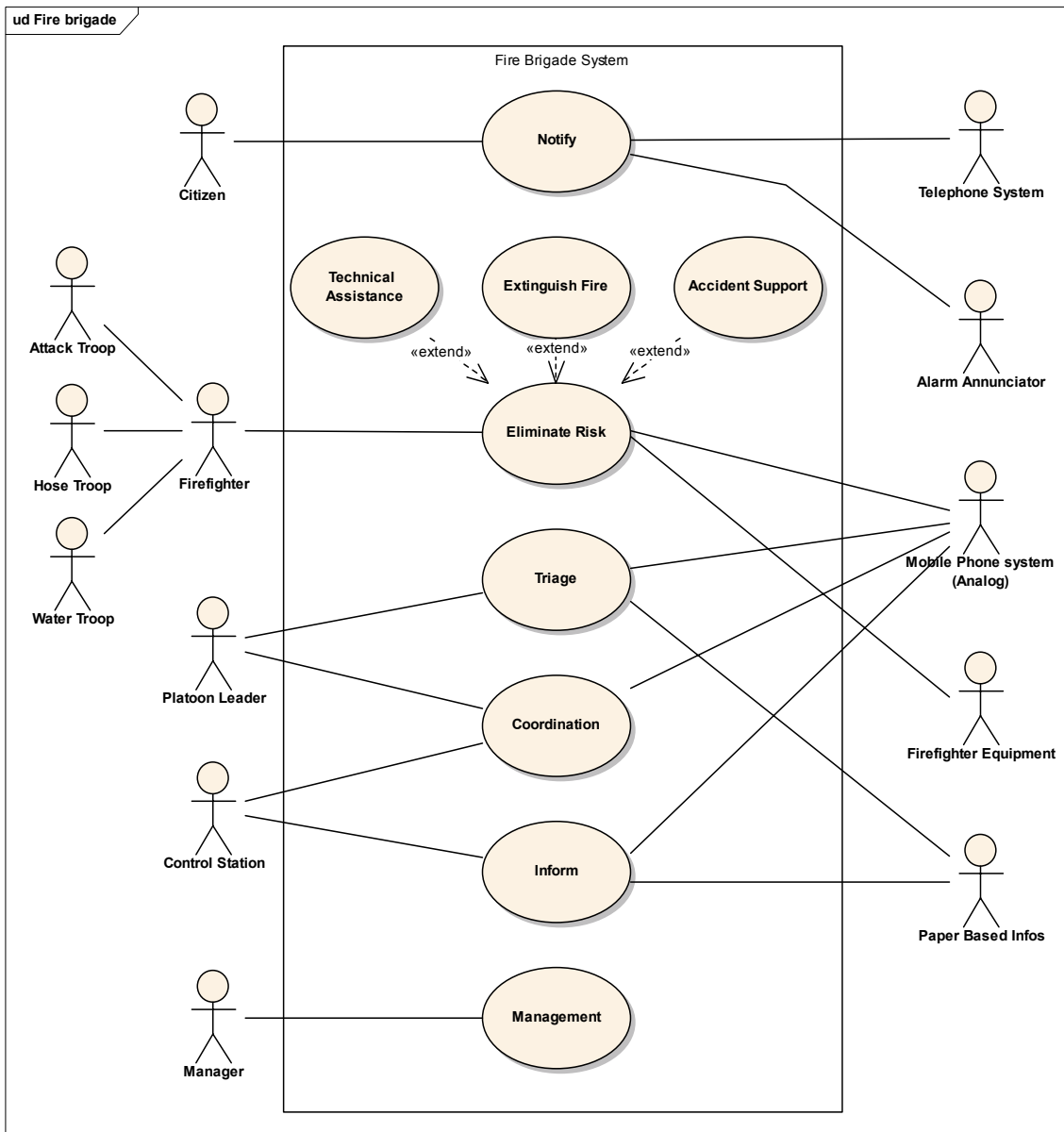



Figure 1 Use Case Diagram: General Fire Brigade Mission

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### 5.3.5 General Fire Brigade Activities

The main activity flow within such a typical fire brigade mission is now described.

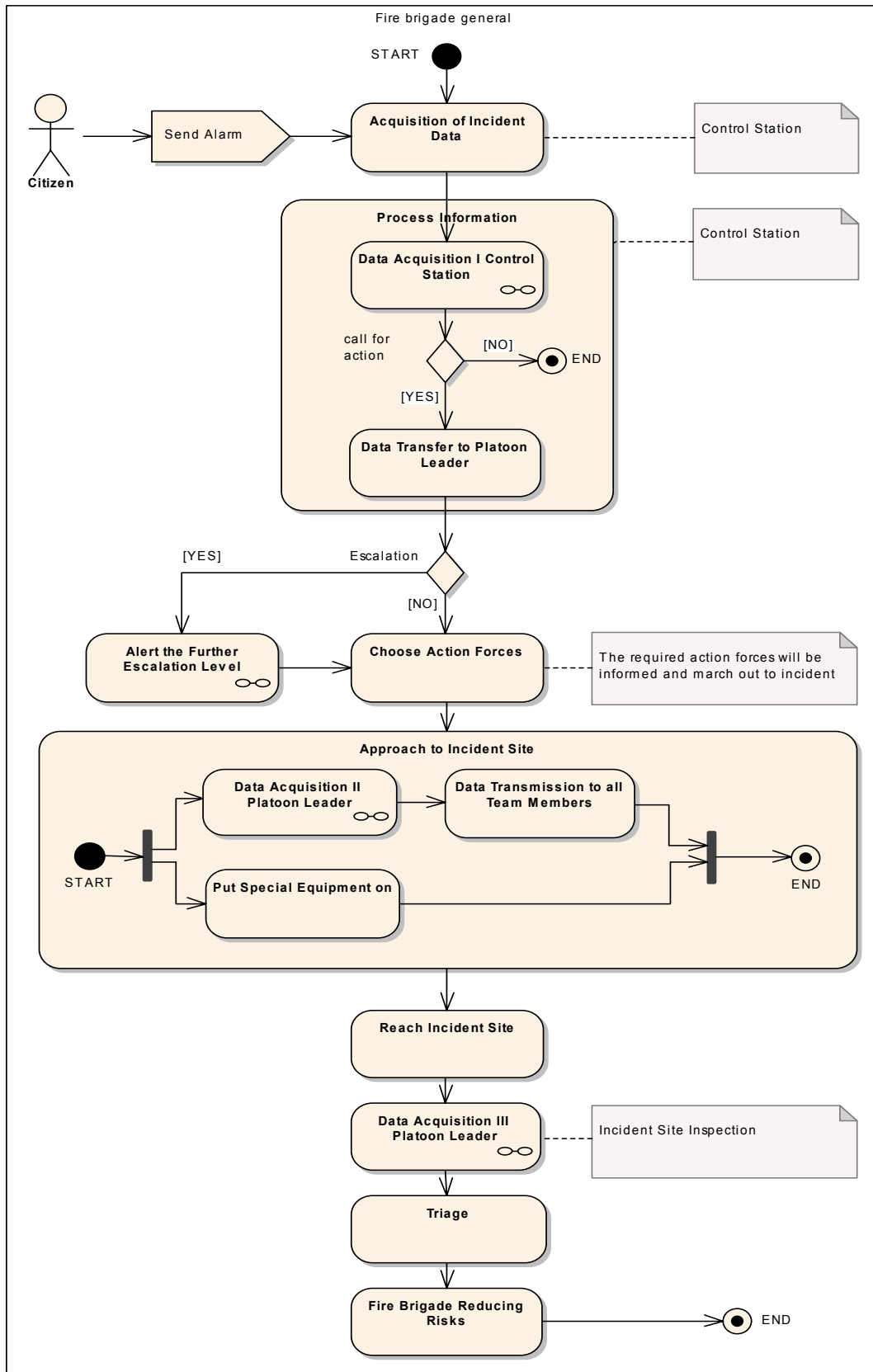
First of all, someone has to alarm the fire brigade. This is the start signal for the general fire brigade business process. Beside this standard trigger, further use cases are possible, like a standard/regular on-site inspection/site visit to evaluate the potential risk of a new company warehouse for example.


First of all, the control station determines what happened (acquisition of incident data). Here is the first acquisition step for hazardous data. The result determines, if there is a need for further action (call for action). If yes, the appropriate action forces are chosen, march out to the incident site and the collected data transferred to the platoon leader. Depending on the incident level a possible further escalation level is alerted. So police, ambulance services and on demand additional fire brigade forces will be involved. During the time, the team puts their special equipment on the approach to the incident site, the platoon leader rounds up his information level. In this second acquisition step, he checks hazardous data in paper based data collections when needed. This could be the ERICards of the CEFIC (European chemical industry council), Safety Data Sheets, he gets faxed or books like the Hommel, Römpp, or others. He transmits the relevant information to the team.

Once they reached the place of the event, the platoon leader checks the location and circumstances in which they have to operate. Within this site inspection, he has the third time an (potential) information demand for hazardous substance data (among other things). After completed data acquisition within the so-called "triage" he prioritizes the needed actions during the existing crisis conditions. The described process shows a distinct demand for hazardous substance data at different activity points, before the action forces really can start to reduce the risks, like extinguishing a fire. In chapter 6.2 the different data acquisition levels are highlighted, especially describing the different data sources more detailed using the related activity flows.



ad Fire brigade general



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**Figure 2 Activity Diagram: General Fire Brigade Mission**

#### 5.4 Market Actor Medical Central Teams

The information demand of fire brigades and medical central teams are complementary and often comparable. Both entities have a distinctive need for hazardous substance related data, like risks involved and correct measures to be taken in case of an accidental contact. Organizational both units are often organized close to another. In Germany, for example fire brigades provide also often ambulance services.

In Belgium, the Central Medical Team is attached to the Ministry of Health and Environment. The main goal is to provide effective answers to political deciders who need to organize public health actions and to avoid side effects of the incident. Based on their current knowledge of the field information: location, quality of the involved products, quantity of products, risks to population and environment... they will recommend and justify decisions like: evacuation of a populated area, closing of a road, shutting down of a nuclear plant and so on. They need extremely accurate information, in a delay of about 15 minutes to 1 hour, and in a form simple enough to be dispatched to remote experts located anywhere: at work, in train in car, eating, sleeping etc.

The required information is far more complex than SDS or ERICards; the information is from various origins but has to be extremely accurate. If you decide to evacuate 10.000 persons based on inaccurate information, this will result in increased costs, and increased risk for people: for example when traveling by road and exposed to more agents than at home, to vandalism, anxiety or panic situations.

## 6 Research Results and Analysis

After a first insight into the system/business context inclusive the state of the art in this user domain, this chapter describes how the actors do there job today, with a clear focus on the foreseen differences when using the SAFIR technology.

### 6.1 Introduction

The market research study on hand was prepared by two companies with competence in the environment, health and safety user domain and specialized on the EHS IT market:


- envimax in Germany
- JPass in Belgium

Additionally to the special user fire brigade, the following requirements have been identified:

- Emergency services in general:
  - Fire brigades
  - Ambulance services
- Police
- Environmental agencies

The aims of the pilot ICE are:

- To provide easy and rapid access to reliable information on hazardous substances
- To assist with information in case of accidents involving hazardous substances
- To verify the handling and transportation of environmentally hazardous substances
- To indicate possible risks of hazardous substances

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- To make fire brigade info assessment and concerning decision making easier

How these aims can be fulfilled is the subject of the next chapters.

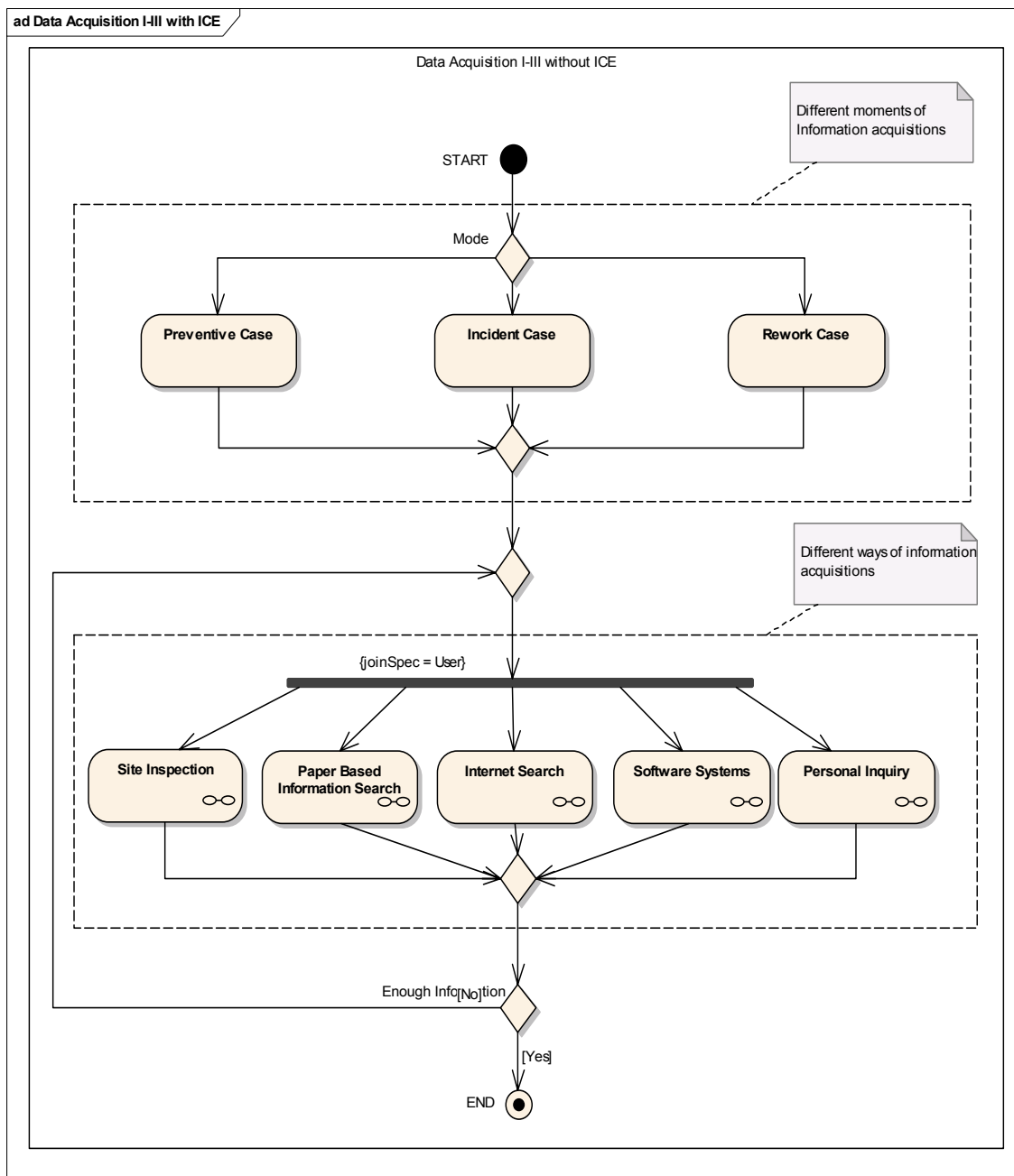
## 6.2 Processes with EHS Data Demand for Fire Brigades

In the chapters 5.3.4 and 5.3.5 were already the most common use cases and the related activity flow itemized, containing the corresponding diagrams.

Below the different data acquisition levels are highlighted, especially describing the different data sources with more details. Having the described current situation in mind, the advantage of using an advanced EHS info source like ICE becomes more evident.

First of all, there are three different operating modes when searching for EHS data: the incident cases itself, a preventive site inspection and the review after a hazardous event. For the information acquisition principally five different data resources can be defined: site inspection, personal inquiry, paper based information search and the use of relating software systems.

The search cycle has to be repeated (with modified criteria) if the retrieved information is not satisfactory.




**Figure 3 Activity Diagram: Data Acquisition I – III without ICE**

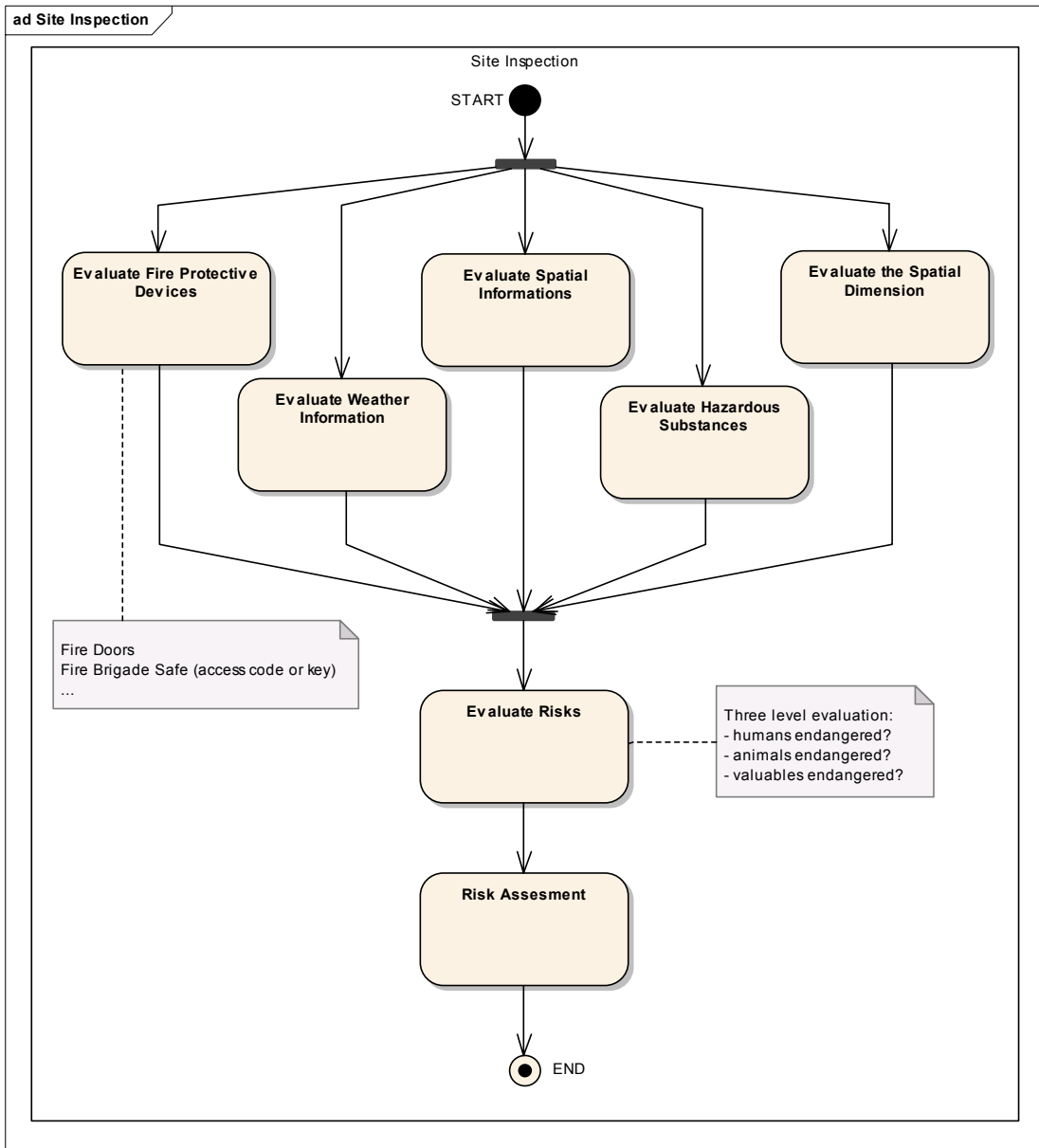
Figure 2 Activity Diagram: General Fire Brigade Mission describes the overall process fire brigades go through in their typical mission. At three steps hazardous substance data could be required.

Figure 3 Activity Diagram: Data Acquisition I – III without ICE shows the related different information sources.

The five following diagrams describe the different data sources in detail. Again, having the above-described current situation in mind, the advantage of using an advanced EHS info source like ICE becomes more evident.

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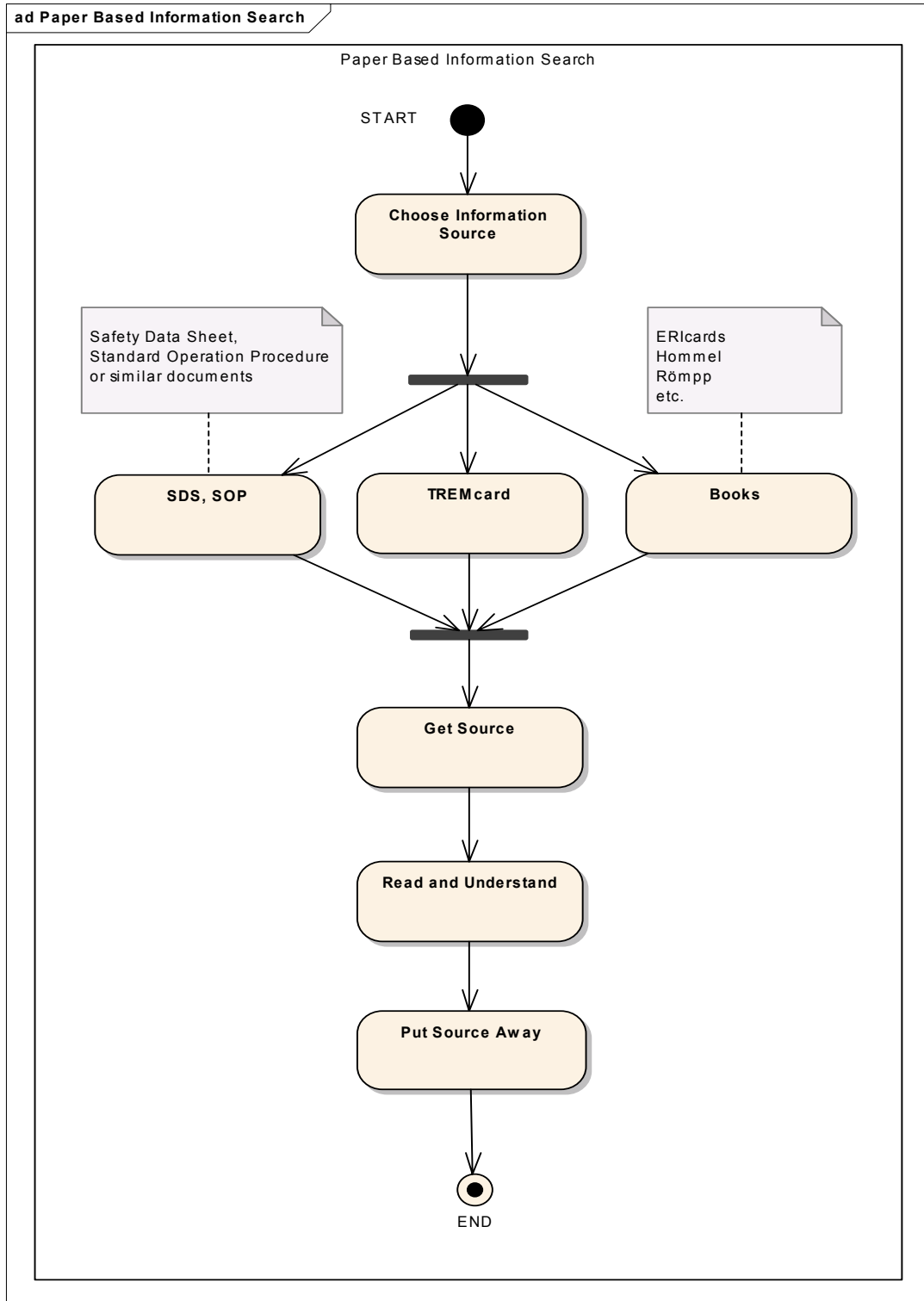
The below shown site inspection could be done in all three modes: at the incident case itself, at a preventive site inspection or at the review/post-processing after a hazardous event. Beside the presence of hazardous substances different kind of information are evaluated. A quick and easy feedback on hazardous substance would enable the platoon leader to have a faster overview about the exposure for each location. The overall search cycle has to be repeated with another data source (paper based, software or other, see next diagrams) if the retrieved date is considered to be insufficient.




**Figure 4 Activity Diagram: Site Inspection**

The diagram below details the data sources used for the paper-based information search mentioned in Figure 3 Activity Diagram: Data Acquisition I – III without ICE. The advantages of using the SAFIR application ICE become clearly visible. All the mentioned data sources can be cut down as they get redundant, using an adequate maintained enhanced EHS database (covering 2.000 characteristics to describe a substance from an EHS perspective). Furthermore the ability

of using voice for data in- and output offers more features particularly suitable for emergency action forces.

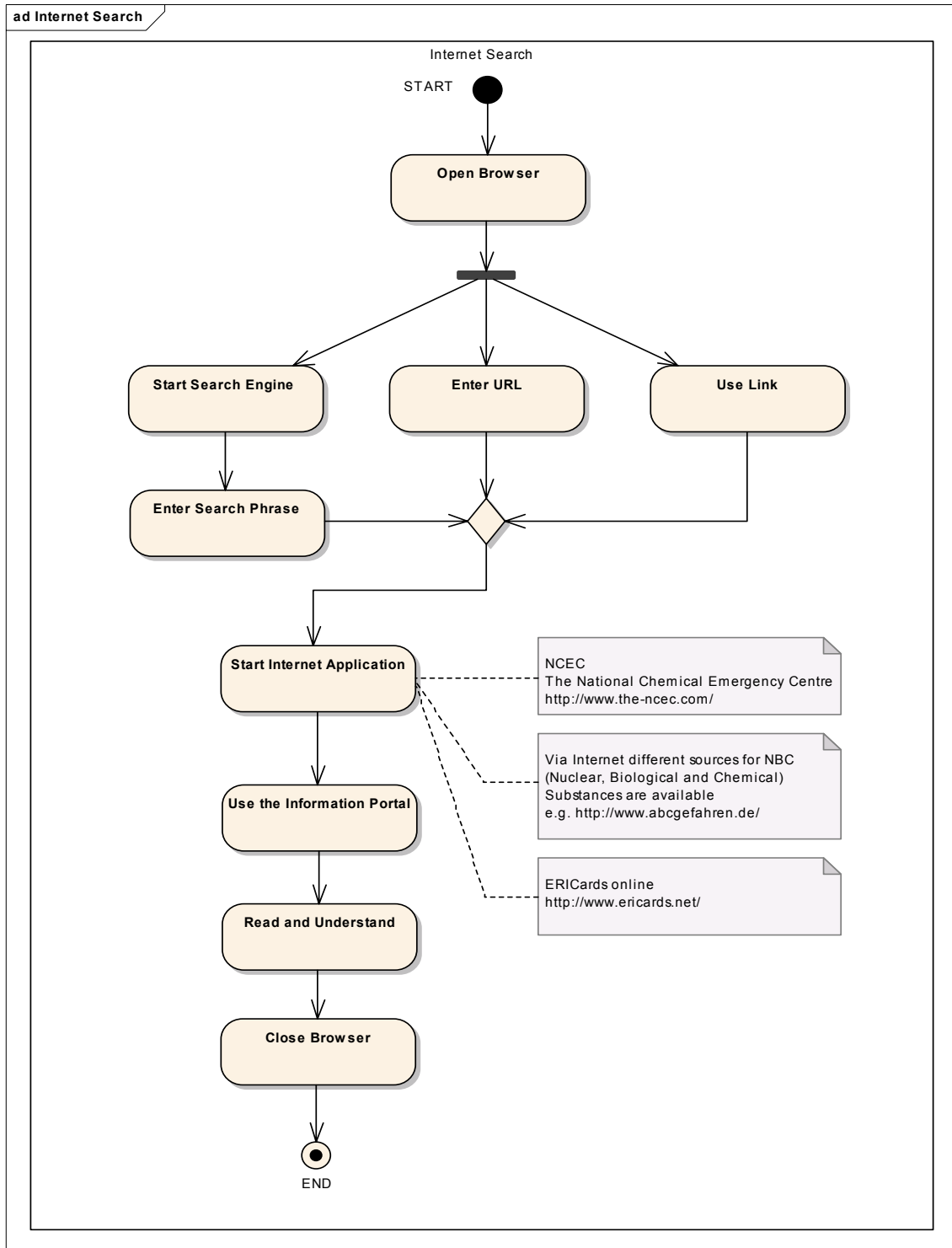


**Figure 5 Activity Diagram: Information Search Using Paper Based Data Sources**

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The Internet is a further origin for EHS related information. These Internet applications cover various sets of data within the EHS domain, like Safety Data Sheets or fire brigade first level information (e.g. ERICards). All required information suitable for and required by emergency response forces are already included within the SAP EHS database.


The diagram below details typical data sources available via Internet and mentioned in Figure 3 Activity Diagram: Data Acquisition I – III without ICE.



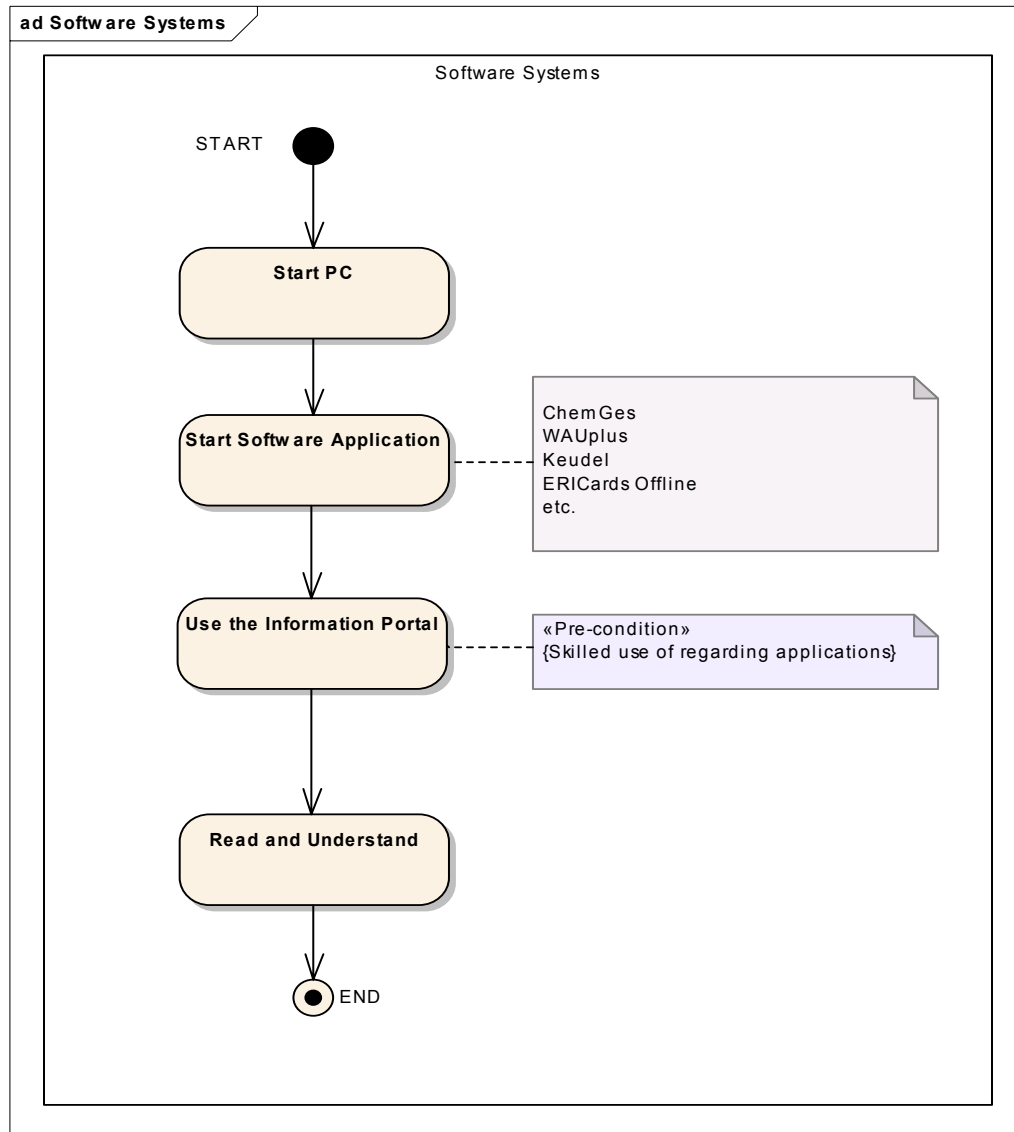
**Figure 6 Activity Diagram: Internet Search**

Different software systems could be used as further data source as mentioned already in Figure 3 Activity Diagram: Data Acquisition I – III without ICE.


Deliverable D1.3.1 “Existing Systems” summarizes a representative overview. SAP EHS, used as Service Provider within the WP4 pilot ICE is one of them. As already mentioned, it is not only full integrated the

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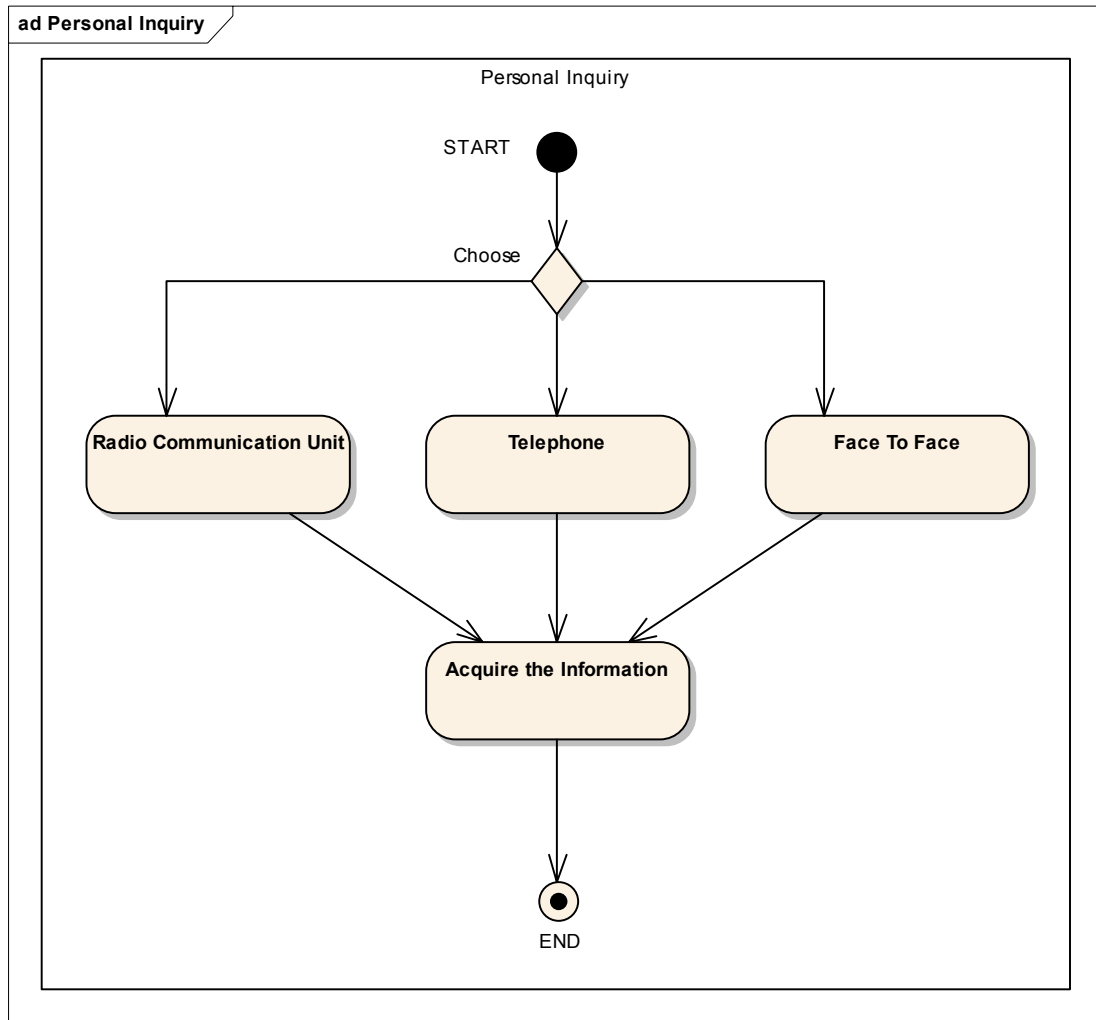
overall SAP R/3 system landscape. This opens a further great potential for fire fighters responsible for industrial objects and also offers a wide spectrum of further enhancements. Additionally it covers the biggest variety of characteristics to describe a hazardous substance from an EHS point of view. Using ICE application , no further external software handling EHS data is furthermore required.



**Figure 7 Activity Diagram: Software Systems**

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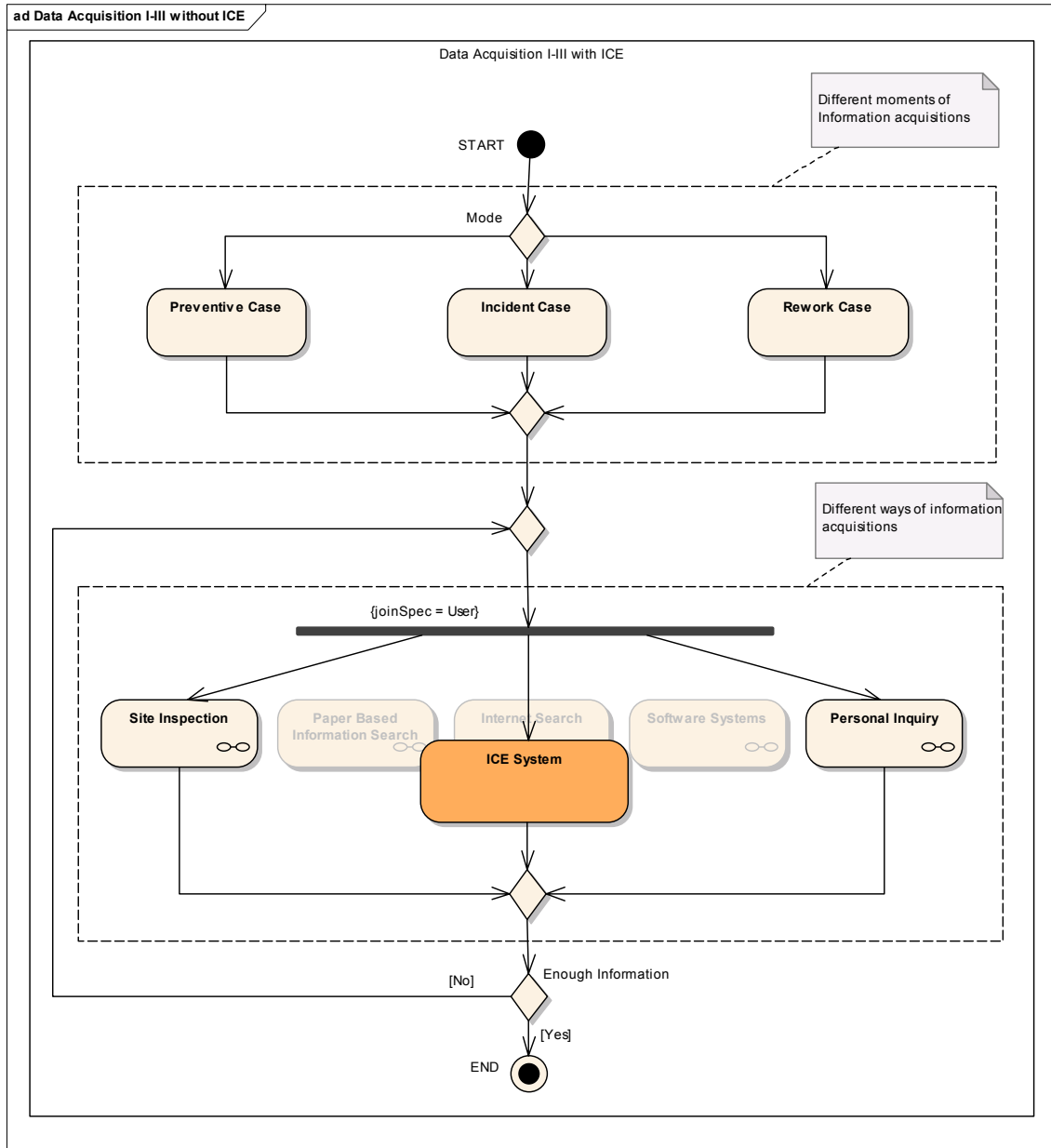
First hand information is of course best available consulting responsible personal on the incident location site, especially when the incident takes place within a company. This could be facilitated using radio communication, telephone or -of course best of all- a face-to-face dialog. Personal inquiries could also ideally be supplemented using outreaching data systems, like SAFIR application ICE as shown in Figure 3 Activity Diagram: Data Acquisition I – III without ICE.




**Figure 8 Activity Diagram: Personal Inquiry**

As already elaborated above, the data acquisitions phases within an emergency response mission can be facilitated at different steps using SAFIR WP4 pilot ICE. A well maintained ICE system does not only substitute other software systems and paper based data sources, it also replaces the need for additional evaluations for example via Internet and enhances site inspections and personal inquiries by having an extensive set of hazardous data easy available just by using the actor's voice.

The diagram below shows the regarding facilitations compared to Figure 3 Activity Diagram: Data Acquisition I – III without ICE.



**Figure 9 Activity Diagram: Data Acquisition I – III using SAFIR WP4 Pilot ICE**

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### 6.2.1 Responsibilities

Professional data providers will provide the content of the ICE underlying database. The responsibility for the data and the related quality assurance processes are the subject of the WP4 deliverables D4.3.7 and D4.3.10.

Basically the content is originally generated and updated by the industry (as we have seen before the producer is the best person to have information on a product). However, for example medical information is frequently missing. The reason is that in general there are no physicians within the EHS teams; toxicity studies are very limited for delay, costs and animal friend organizations.

However, the hazardous substances data situation will improve in the next years, once the European Community pushed REACH system will be implemented (REACH: EC regulation for Registration, Evaluation and Authorization of Chemicals).

### 6.2.2 Competence

The ICE team does not require only competence in EHS but skills in technology and skills in access control also: according to the person calling, the data available will vary. A fireman as defined at the smallest level will work with information like ERICards, a platoon leader would perform more complex queries, a physician in an emergency ambulance on site will query on first aid measure, and the same in the emergency room of the hospital or on the way to the hospital will ask for more long term effects and/or methods.


For the prototype, we need to work with a very limited set of information required by everybody: an SDS database is a perfect candidate but firemen prefer ERICards. Using ERICards will require fixing a copyright problem with the CEFIC and the NCEC. SDS are generally company dependent and some organization avoid providing "on line" free access to any SDS. In both cases the data have to be in different languages: German, French, Dutch, Bulgarian and may be Chinese. CEFIC has not published ERICards in Chinese, nor in Bulgarian. However, Bulgarian TREMCards have been published by the CEFIC. envimax and JPass have databases of SDS, to avoid any copyright problem, and to avoid redundancy we recommend to use those data.

## 6.3 Description of business use cases

### 6.3.1 Functional requirements

Functional requirements for the ICE application are:

- The system has to be **available at any time**: days and nights, weekdays and weekends. The availability of 100% is difficult to achieve because it is impacted by different operators:
  - **Server:**
    - Hardware: 100% availability means mirroring, multiprocessors...
    - Software: 100% availability limits the choices to some suppliers...
    - Operation: 100% availability limits the operator to some providers...
  - **Communication:**
    - Hardware: 100% availability means special techniques and material and therefore suppliers. Multiplication of channels on both sides (server and client).
    - Software: 100% availability limits the choices to some suppliers ...
    - Operation: 100% availability force, may be, to use simultaneously different providers,...In some extreme situations the vectors (antenna's, intervention vehicle...) could be destroyed as a consequence of the current incident, and some other situations, the most complex in fact, the cooperation between different emergency teams (different fire brigades,

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police and ambulance, Canadair, helicopters...) may require to develop common interfaces, frequency's, protocols...


- **Data content and consistency:**
  - Back-up operation: 100% availability implies to select RDBMS offering on line back up.
  - Data update: data consistency means to develop an interface where the data are “frozen” during an intervention. The same question needs the same answer during any specific operation. If, for any reason, this is not the case, the system has to inform the FO's having requested information to inform him about the modified answer.
- The system must have a fast and reliable **response time**, similar or faster than the current one. The current system is composed of a dialogue between “back office operators” (BOO) and the “field operator” (FO). To any question from the field, the back office provides an immediate answer: “OK, “I’ll check”, “wait a minute”... and is calling the expert or looking into his own set of information (paper or electronic). As soon as an answer is provided the field may ask for “more details”, “repeat”, “I do not understand”, “something else?” This is a pure dialogue with nothing written but based on the total confidence between the two partners. Any interviewed users have hard to believe SAFIR will be able to provide so fast answer. Use of the current prototypes has been key success factors in those situations.
- The **learning time** has to be fast: The current users of the technology, mainly prototype users, hire highly skilled people (3 years university grade minimum) with a minimum IT background (at least use of IT). The learning time they needed to apprehend the system, never in a stressed environment, was extremely short. Generalizing in an emergency environment such a technology will require developing a training module able to warranty a very short learning time. One idea, from a potential FO, is to develop also a “help card” of the size of a credit card, to be “printed” on the cloth of the FO where any situation is clearly explained with a font size suitable with the operational conditions: a challenge.
- **Flexibility:** Any team uses The FO-BOO dialogue procedure, but the operational approach differs frequently. It has to be described, how to work with a voice accessed database. This is not a technical but a “methodological” way of working: ask then wait, if you do not get the right answer repeat the question, do not ask a new question before a specific event... Conventions and vectors may vary from one site to another site, from one organization to another organization. The system must be flexible enough to be adaptable in different organization and operational environment but also to be the base of a future common platform.
- The **delivered information** has to be accurate, exhaustive and up to date. This requirement is evident and trivial but not so easy to achieve. The following question marks have been addressed:
  - Type of data provided:
    - ERICards<sup>3</sup> for firemen, but also “Guide Orange des Pompiers de Genève<sup>4</sup>”, Chemdata<sup>5</sup> in the UK and many others
    - Tremcards for Police, the official CEFIC Tremcards<sup>6</sup>, the “Written Instructions” as required by ADR for other organization (including envimax, JPass...)
    - Medical Safety Data Sheets<sup>7</sup> for physicians

<sup>3</sup> Published by CEFIC, operated by NCEC (UK) and available for free to firemen, copyrighted CEFIC

<sup>4</sup> Published by the Fire Brigade of Genève (Switzerland) some years ago, out of stock, out of date, but frequently used due to his quality.

<sup>5</sup> Published by NCEC (UK) but used only in the UK, Australia and South-Africa


<sup>6</sup> Published by NCEC (UK), developed by CEFIC, copyrighted CEFIC, available from NCEC and approved agents both on paper or electronically.

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- Safety Data Sheets for emergency operators
- Regulatory information
- Environmental information
- Exposure risks and exposure data
- Origin of those data:
  - Producer measured and tested values
  - Producer estimated or recommended (without tests but by extrapolation) values
  - Industry organization data (CEFIC, EIGA, CONCAWE...)
  - Regulatory bodies data (Countries, EU, ADR, UN, WHO, FDA...)
  - Scientific publications
  - Commercial data provider, like Atrion International Inc. (Canada and NL) etc.
- Links from one data type to another, related data...
  - Some information are frequently used on different data supports: i.e. UN Number, CAS Number, EINECS number, IUPAC naming conventions, R phrases, ... they permit to navigate from one environment (data base) to another. However "good sense" is sometimes required e.g. HCl Chloride Acid exists on gaseous and liquid (diluted) forms: both forms have the same name and the same CAS number, risks are very different, way of handle accidents also...
  - Some similar data provide different answers: for many reasons (commercial, expertise, regulatory team...) the same product (e.g. Benzene) produced by different companies may have different descriptions and ways to handle similar incidents according to the supplier. In other way, the same product, coming from the same unit (e.g. operated by a joint venture of 2 companies) may be distributed under two different commercial names (not a key problem) but also two different UN numbers (therefore different Tremcards) and as consequence different ways to handle incident.
- Frequency of the data update:
  - For trivial reasons the frequency of updating are totally randomized:
    - EU publishes enhancements when ready
    - Countries propagate those changes when ready
    - Firms publish related changes to MSDS at different times, related to the workload and internal priorities
    - ADR has another schedule than EU and the changes of the ADR regulations imply changes in the same documents (SDS) and thus the DB has permanently to be changeable.
    - Research reports and articles are published according to various planning...
  - Final documents (TREMcards, ERICards, SDS...) are updated some times online, some times by batch, some times on quarterly published CD's...

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<sup>7</sup> Containing medical information, actual composition, long range effects, public health effects and risks...

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Data Accuracy: the here above-mentioned information shows that it is practically very difficult to have totally accurate and up to date data. The frequent usage of the “Livre orange des Pompiers de Genève” proves that this point is relatively important. Accidents often occur or get worse when information is inaccurate or unavailable: one tendency is to access and process several sources in order to benefit from different updating processes and complementary information. SAFIR would positively improve the data accuracy compared to the current situation.

- Exhaustive Data: the given information shows that it is today practically impossible to have exhaustive data at a specific time. Everybody recognized that SAFIR would improve this factor.


### 6.3.2 Non-functional requirements

The most frequents “non-functional requirements” cited are:


- **Confidence from the users**
  - The current radio based dialogue system is well perceived and has an “a priori” high confidence rate.
  - It seems always available (in fact only during any intervention) and it is virtually true due to the simple peer-to-peer radio dialogue using simple standard multi purpose walkie-talkie sets.
  - How to provide similar confidence with a machine based system? The questions are: “How to be sure to have what I need when I need it?” “Why should I rely on the system?” This could also be a cultural issue as mentioned below.
  - How to go from the era of the voice to the era of the multimedia without true transition?
  - The requirement is: to develop a conceptual training module to handle that extremely difficult change in the work process.
- **Handling of the stress environment**
  - Noise
  - Moving and changing environment
  - New situations at any time
  - Frequent unplanned situations
  - Frequent extremely “emotive” situation
  - **The requirement is:** to develop **simulation seminars** to discover and highlight the consequences of this environment by neither non-IT nor university graduated persons in a non-familiar environment to the system designers and developers. Usage of the psychological teams in charge of handling the post incident stress of OP had to be evaluated.
- **Avoid resistance to changes**
  - Resistance to change always breaks the start-up of any new IT application. We may anticipate the same situation, but a little bit more accentuated
  - Due to the organization of those teams: volunteers and professionals, industry highly trained and local less trained, western Europe IT minded and Eastern Europe of Chinese less IT minded people, the way to handle that will vary.
  - **The requirement is:** to develop a set of **motivation seminars** adapted to the identified type of teams with the assistance of specialists in human communication.
- **Communication with other organizations.**

In any major incident, there are interactions between different types of special users:

  - **Fire brigades**

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- Local
  - Public (municipal) or company fire brigade brigades (e.g. BASF team in Ludwigshafen, Antwerp)
  - Professionals or volunteers
- Area
  - Land, department, province, region...
- National
  - Civil protection
  - Nuclear trained people
  - Chemical incident team (e.g. Belintra in Belgium)
- International
  - Large incident (forest fires in France, Portugal...)
  - Country borders (Fire works plant in Enschede (NL))
- Specific
  - Specific to the type of incident (gas, train, air crash, forest...)
  - Specific to the technique used (e.g. Canadair: hydro airplanes, Trackers, Helicopters, Boats, anti-pollution units, nuclear incidents...)
- **Medical emergency units**
  - Local
    - Private or public (e.g. BASF team in Ludwigshafen, Antwerp)
    - Professionals or volunteers
  - Area
    - Land, department, province, region...
  - National
    - Civil protection
    - Nuclear trained people
    - Chemical incident team (e.g. Belintra in Belgium)
  - International
    - Large incident (forest fires in France, Portugal...)
    - Country borders (Fire works plant in Enschede (NL))
    - Burned specialized teams are limited in any country,
  - Specific
    - Specific to the type of incident (gas, train, air crash, forest...)
- Similar for the **police** and the **public health units**.
- **The requirement is: to develop a set of interfaced procedures** where cooperation between teams with different culture and training and skills may share information with different origin and, certainly in the first phases, different level of automation.
- In any situation, **an additional requirement is: to develop a debriefing methodology** to gather information about any incident, information structured in such a way that the

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development of the tool will benefit of the weakness and of the goodies highlighted thanks to those debriefings seminars, or sessions.

- As a fast system response is also an essential user requirement, the system performance can be enhanced with an intelligent strategy to optimize the database enquiries. To achieve this, the last in- and outputs saved in the cache can be reused. This means that the data keep available until the regarding VQL command (like "GiveMeUNnumber") is used in another context again. This avoids redundant database inquiries.

### 6.3.3 Actor benefit

The benefits are not always clear to the current selected special users:


- The more enthusiasts persons are dreaming about immediate benefits may be too optimistic, certainly after the initial phases,
- The more reluctant persons do not see any benefit and some only problems.

According to the gathered information, we may list the following benefits, without any realistic ranking. To avoid any tentative of ranking, we have sorted the benefits alphabetically.

- Answer to those questions that are today never answered, or too late.
- Better and more documented information to the public (including the press) in a shorter period of time after the incident and therefore reduced risk of panic, wrong interpretation...
- Better communication between the different teams operating on the field,
- Better communication between the various field operators and the various back office teams,
- Better image of the industry who is able to set-up that methodology,
- Better security for the FO's
- Better security for the persons and the goods,
- Cares to the victims selected on a more accurate mode and therefore less long term consequences of the incident,
- Faster and more documented decision for public health crews,
- Immediate access to up to date information,
- Information in the language of the FO or the BOO,
- Information transmitted directly to the FO or the BOO who need the information,
- More FO available and less BOO, thus better efficiency,
- Most efficient use of the budgets by an increasing the number of FO's, redefining the training methods...
- Parallel queries would be possible,
- The questions will be answered without any intermediaries.

Some anxieties have already been highlighted:

- "What are the costs"?
- "Who will take care of the maintenance? "
- "You come with very nice ideas but the politicians will never give a budget to realize those ideas."

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## 6.4 System limitations

### 6.4.1 *Requirements to the interface*

- The interface has to be **multilingual** :
  - Voice commands : the set of commands has to be available in any language
  - Outputs
  - Vocal outputs, answers have to be available in any language
  - Written outputs, answers have to be available in any language
  - User's assistance
  - Queries
  - Answers
  - Vocal Help
  - Short user card (size of credit card), see also leaning time supra.
  - Data content
  - Handle national "linguistic", "legal" or "cultural" differences, e.g.
  - Native French vs. Belgian French, e.g. the current GPS used in cars do not provide that function and this is generating errors and selection of the wrong directions.
  - Federal country vs. Centralized country
  - Police vs. Firemen
  - Local fire brigade vs. Industry specialized Fire brigade
- The interface must be adapted to persons acting in a **stressed environment**
  - Stress is coming from the unknown aspects of the situation: what is behind that wall, what is the content of that truck, what is the quantity of gas in that tank, how many people are working there....
  - Stress is coming by the changing situation: fumes may hide something, an explosion may generate new risks, and a Canadair removing water may change the way to attack the fire...
  - Stress is coming from the gravity of the situation, 1 wounded person is relatively easy to handle, 100 heavily burned persons generate a lot of potential problems and difficulties,
  - Stress is coming from the partners: working only with your daily colleague is relatively simple, but working in a multi brigade, multi reporting or multi national or multi lingual team is more difficult. In addition, work with a computer, as "pal" is not always well perceived. The user is not accustomed to talk to a machine. He cannot estimate its reliability . This is especially a problem when working in stressful situations.

In any of those, non exhaustive, situations the operator has to have the warranty that the system will provide the same high quality answer, to handle his/her wording or spelling or accent or reduce the effect of the current, but changing, noisy environment .

- The interface **must fit to the current situation and response time**:
  - The "operator" (FO) (fireman, policeman, physician...) calls, by radio, his "back office operator" (BOO) to have information. The FO's know the BOO, they work both daily together. Sometimes they are exchanging job during the time.

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Therefore the FO has the warranty that the BOO will understand him and in case of doubt will ask him to repeat or to precise. The BOO is in the same way of working. They operate in a close confident relationship.

- The BOO gets the required information, he has papers, books, cards, computer database...and expertise to find the information. He had had the time to prepare some material during the travel time of the FO's.
- The BOO transmits the answer to the FO in a clear, concise and well-trained way. Here also dialogues are frequent.
- When the FO has the information he needs, he closes the transaction, but the BOO has the memory of the request and is able, during the same incident, to extremely fast retrieve or start from the previously delivered situation.
- The teams and crews are organized to improve this way of working and both sides are very confident about his effectiveness.
- Any of the queried persons have had some "doubts" about the ability of SAFIR to provide the same high level and high quality of efficiency.

#### 6.4.2 Requirements for performance (other than use case non-functional requirements)

The main criteria for performance are that the developed system should be at least as fast as the current FO-BOO dialogues. When we ask, "what is that response time", the answer is something like: "the fastest as possible". And according to the fact that the BOO is using ERICards on Internet with ADSL, ERICards on Internet with a modem, ERICards on Internet in a command car, ERICards on CD, Livre Orange des Pompiers de Genève on paper, Chemdata etc. the currently fastest possible response time vary between seconds and minutes.


We should be aware that you could provide a system based on man-machine dialogue with faster response time than the currently used system, and experience rejection from the end-user. This can be due to the fact that if the current system is not based on dialog, the end-user will be tolerant and will accept the corresponding response time, but in the contrary when using a dialogue-based system he will compare it to human interaction and he could be more demanding...

Some measurable requirements:

- Fire brigades: seconds on a simple information set (ERICard)
- Emergency medical team: seconds on a more complex information set (SDS)
- Hospital emergency team: time of transportation from the site of the incident up to the emergency operating area.
- Police: (site protection) time to evaluate the area to protect (minutes)
- Police: (road intervention) seconds (UN Number => Risks and First actions.
- Public Health units, experts active 15 to 30 minutes after first warning but requiring response time in seconds, on a predefined subset of information.

#### 6.4.3 Requirements for safety, security, reliability, scalability, maintainability (all ...utilities)

- Access control has to be extremely strict and related to the type of user. The access control procedures have to take into account the information required by any type of user, the type of usage, the current situation of a user e.g. FO or BOO but also FO in operation, on the way to an operation, back from an operation, operating a routine inspection... The system must correctly handle the "bad" access control and the "refused" access, in order to avoid the system to be rejected by the user.
- Security, Reliability: the servers have to be managed in a secure environment to guarantee 100% availability **at any time** and in any circumstances but also **from any place**.

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- **Scalability:** the system must be designed to operate in a multi incident, multi-users type, from different sites, connected with different methods simultaneously. First prototype has to be limited however, the here above listed requirements have to be included into the first prototype.

#### 6.4.4 Legal requirements

The different regulations discovered are sorted alphabetically:

- **Antiterrorism regulation** (new and emerging), EU and non EU based
- **Copyrights** exist on most of the information used
- **Dangerous goods** regulation including GHS, Reach, ...
- Data Encryption regulations
- Most of the **environmental** regulations,
- IATA, ADR, EU, IMDG, National, Regional, Local laws and other **transportation** regulation...
- International trade regulations
- Medical secret regulations
- **Privacy** regulations
- Trade secret regulations
- Use of **language regulations**. French is required by law in France

#### 6.5 Innovative Scenarios


Looking into the future, we find a lot of interesting features mentioned by the interviewed partners that could technically be fulfilled using and merging the complementary know-how of the different WP4 partners. So ICE could ideally be supplemented using the **GIS** know how of a corresponding Geodan application for example or further applications available within the SAFIR environment.

Additionally the **hardware resource management** knows how of Thales would complement the application. This includes not only advanced wireless remote functions, but also hardware expertise to optimize the used front-end. This is also an outcome of another and complementary EC project: "Wearable IT @ Work", in which SAFIR partner Thales is involved. So advanced technology, as special I/O devices like head up display or other equipment to use ICE, as a hands free solution could be available.

The hazardous substance information system ICE will already include important **object related information** to answer the question: What risks do I have to expect on the accident site?

Possible **additional innovative scenarios**, supplementing the ICE system:

- More object related information including link to official data sources, like entries in the land register, floor plans, plan of site
- Link to GIS applications, which help the driver for example to choose the fastest way to the incident location or help locating the action forces
- Weather forecast services, specially accurate area forecasts
- Automatic translation services, so involved (foreign) person just speak in and the firefighter gets the correct translated voice output in his language
- Link to important authorities, e.g. for water pollution control or in case of an evacuation required or other information of the public
- Availability of data like a stock-list or similar
- Possibility to print information

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- Download of a selected basic set of data, in case the remote access to the backend server would break down. So further data inquiries would still be possible.
- Sophisticated I/O devices to ease the use of ICE, fitting to the practical needs of action forces like firefighters.

Of course the features of the preliminary month 18 ICE pilot will be improved in the ensuing 36 months.

Beside additional features, this will be:

Performance optimizing functionalities (as buffering of data or similar)

A previous "interim" download of a basic data set will already consider emergency situations.

- In cases where the fire fighter has no remote access to the underlying backend server an "ICE light" functionality will supply the most important basic data in a "stand-alone" application.

Further going innovative scenarios are already under way and will be subject of the second part of the project.

## 7 Validation of Results

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Our concepts, available and planned applications were first validated within our market research. Feedback of our interviewed partners, answers to our questionnaires, discussions within our team (company internal, within WP4, with other SAFIR work packages and first contacts with other EC projects) etc., and not to forget the two first reviews gave us a first validation of results.

In the project we are subject to an ongoing validation process. Additional Controlling bodies as the EC, external auditors, the user advisory board and the steering committee guarantee the sufficient consideration of the external view.

Additionally especially for the WP4 pilot ICE, two special deliverables are planned to further detail the quality assurance process:

- D4.3.5 Database Safety Concept
- D4.3.7 Draft for quality assurance procedures

There you will find more detailed related information.

## 8 Conclusion


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### 8.1 Introduction


Comprehensive, proven and up to date information on the environmental properties of chemical substances are of immense importance for all areas of environmental and civil protection and for improving general safety. Vision of the SAFIR WP4 pilot ICE is to implement a database of chemical substances to collect and maintain crucial information for the special user fire brigade and other potential EHS users and make them available on the easiest possible way: via voice commands. A market research proved the praxis relevance of the underlying concepts. Next part summarizes the main deductions.

### 8.2 Conclusions

The main requirements that were determined during this study are summarized below including the arising conclusions and demands.

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- Elaborate an advanced role concept. Store the emerging authorizations on the SAP R/3 backend server, to control who may give which commands, who receives which data and in what detail level and so on. The front-end client retrieves the related user information once ICE is initialized.
- Keep ICE configurable (e.g. the used graphical data output).
  - Data output is also required in a graphical form (minimum a four times twenty display or eventually the display of the regarding Safety Data Sheet)
  - Nice feature, but not essential: additional output in hardcopy form, selectable by language
  - The data level for in- and output should be kept variable.
  - The user have very different demands on the type of data that have to be evaluated (like physical chemical data versus measures for example)
  - Command hierarchy must not be permeated (this has to be considered in the role concept): the possibility for broadcasting is therefore very limited
- Prove the validity of the voice activated commands and query by users
  - Stressed by an emergency situation
  - In a noisy environment
  - Continuously variable environment
- Prove the response time against the current system, also voice driven, but with a man on both sides of the line.
- Guaranty the access to the data:
  - Remote access from, sometimes, not totally radio covered area,
  - Data access with all the related topics i.e.
    - Safe and secure access
    - 24/24 availability
    - Respect of privacy law
    - Respect of medical secret
    - Supersede of trade secrets (product current composition)
  - Suitable and stable response time
  - Multilingual access
  - Natural or Intuitive command words with different type of users with different level of training
    - Extremely short learning time
  - Avoid any copyright conflict
- Guaranty the content of the data therefore publish the data required by the user or the data the user is familiar:
  - **Fireman:** ERICards from CEFIC (or **exactly** same content)
  - **Police:** Tremcards from CEFIC or other suppliers (or similar content)
  - **First Aid teams:** SDS from producer or importer (as a minimum) published in different sites
  - **Hospitals:** Medical sheets with short term effects and detailed potential, recommended or to be avoided cares (frequently non existing or too weak)

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- **Authorities:** Medical sheets with long term effect and public health impact (not available on line on extra company sites)
- Supplementary wishes to additional information that would be useful:
  - Access route dependent on weather conditions
  - Object related data (like the safe for the Fire brigade Key)

## 9 References and Bibliography

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### 9.1 Data Provider

(In an alphabetical order without any prioritization.)


- **Atrion International Inc.** (Canada and Netherlands): Private company providing hazardous substance related information and rules, covering regulation areas worldwide. See : <http://www.atrionintl.com>
- **Canadian Center for Occupational Health and Safety** <http://www.ccohs.ca/> deliver excellent data but also many related information.
- **CEFIC** <http://www.CEFIC.be/> stands for European Chemical Industry Council and is representing the chemical industry at the EU level. The CEFIC has developed [Tremcards](#) and [ERICards](#).
- **Chemical accidents** [http://www.ehw.org/Links/LINK\\_Chem\\_Accident1.htm](http://www.ehw.org/Links/LINK_Chem_Accident1.htm) proposes a large set of links to related sites to assist the user in case of an accident.
- **GSBL** Joint Federal and State Substance Data Base (Gemeinsamer Stoffdatenpool Bund/Länder): <http://www.gsbl.de/>; <http://www.umweltbundesamt.de/uba-info-daten-e/daten-e/gsbl.htm>.
- **NCEC:** National Chemical Emergency Center (UK) <http://www.the-ncec.com/> proposes also the ERICards <http://www.ERICards.net/> jointly with the CEFIC.
- **Quick SDS,** French data provider delivering millions of up to date SDS in different languages directly posted by the producers of chemicals./<http://www.quickds.com/>
- **US Chemical Safety and Hazard Investigation Board** a US governmental agency , does not provide data directly but an excellent overview of incidents with an analysis of many. [http://www.ehw.org/Links/LINK\\_Chem\\_Accident1.htm](http://www.ehw.org/Links/LINK_Chem_Accident1.htm)
- Many other organizations and data providers are available.

### 9.2 University Publications

- A thesis developed at University of Brussels on the world market of SDS and related services: "Une P.M.E. au service de la sécurité mondiale?," by Pierre Slegers, ULB, Ecole de Commerce Solvay, 12/2001. Prof. Elie Liberman.

### 9.3 Abbreviations

Belintra:	Belgian Intervention System for Transport Accidents
CAS:	Chemical Abstract Service
CEFIC:	European Chemical Industry Council, includes 40.000 chemical companies
DG:	Dangerous Goods Management

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eGov:	Procedures in the governmental domain processed via electronic applications
EHS:	Environment, Health & Safety
EINECS:	European Inventory of Existing Commercial Chemical Substances
ERICards:	Emergency Response Intervention Cards, developed by CEFIC with fire brigade and EU
ERP:	Enterprise Resource Planning
GIS:	Geographical Information System
I/O:	Input/Output (Device, like headset)
IAC:	Internet Application Component
ICE:	SAFIR voice activated WP4 special user pilot "Information Center EHS"
IHS:	Industrial Hygiene and Safety
MS:	Microsoft
NA:	Non applicable
NCEC:	National Chemical Emergency Center in the UK
PHS Info:	WP4 pilot "Police, Health and Safety Information System"
QA:	Quality Assurance
SAP EHS:	Module of the ERP system of SAP for the area of Environment, Health & Safety (synonym: SAP EH&S)
SAP R/3:	R/3 is the SAP client-server solution. It has proved hugely popular in many countries. R stands for "Real-time", "3" for third generation.
SAP:	Systeme, Anwendungen, Produkte in der Datenverarbeitung (Software, Applications, Products in data processing, for more details: <a href="http://help.sap.com/">http://help.sap.com/</a> )
SDK:	Software Development Kit
SDS:	Safety Data Sheet
SP:	Service Provider
SP:	Service Provider
TBD:	To be Defined
TSCA:	Toxic Substances Control Act
TUIS:	"Transport, Unfall Informations System": Transport information system of the chemical industry (in German speaking countries) for accidents with dangerous goods involved
VQL:	Voice Query Language
WWI:	Windows Word processor Integration (document creation within SAP R/3 EHS)