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**Mechanisms for Group Target Follow-up Interaction 1**

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PP	Restricted to other program participants (including Commission Services)	
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## **Executive Summary**

### **Mechanisms for Group-Target Follow-up Interaction 1**

This document presents Deliverable D2.3.1 (Mechanisms for Group-Target Follow-up Interaction 1) of the project FP7-614154 | CNPq-490084/2013-3 (RESCUER), a Collaborative Project supported by the European Commission and MCTI/CNPq (Brazil). Full information on this project is available online at <http://www.rescuer-project.org>.

Deliverable D2.3.1 provides the results of the first iteration of Task 2.3 (Group-Target Follow-up Interaction). In this task, we investigate how the command centre, after receiving initial information about an emergency situation, can demand further information from people at the place of the emergency (eyewitnesses or formal responders) in order to clarify a piece of information or check its reliability. The task focuses on the prototype of suitable mechanisms for group-targeted follow-up interaction with the Mobile Crowdsourcing Solution and for providing progress information as long as necessary.

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## **1. Introduction**

### **1.1. Purpose**

The RESCUER project aims at developing a smart and interoperable computer-based solution for supporting emergency and crisis management, with a special focus on incidents in industrial areas and at large-scale events. The RESCUER solution will be composed of four main components, namely the Mobile Crowdsourcing Solution, the Data Analysis Solution, the Emergency Response Toolkit and the Communication Infrastructure. This deliverable provides the specification for the development of the Mobile Crowdsourcing Solution (also called RESCUER app), especially related to the follow-up interaction. The main goal is to (1) identify the need for follow-up interaction and for structuring the information demanded as well as the representation of this information to the user and (2) prototypical suitable mechanisms for (target-group) follow-up interaction.

### **1.2. Partners' Roles and Contributions**

Fraunhofer was responsible for the conception and prototyping of the follow-up interaction mechanisms with the crowd during an emergency.

### **1.3. Document Overview**

The remainder of this document is structured as follows:

- Chapter 2 introduces the mechanisms for supporting follow-up interaction, the current question catalogues and preliminary strategies for target-group-based follow-up interaction.
- Chapter 3 presents the specification of the RESCUER app.
- Chapter 4 presents the conclusions and next steps in Task 2.3 Group-Targeted Follow-up Interaction.

## 2. Mechanisms for Supporting Follow-up Interaction

This chapter introduces the conception of mechanisms for follow-up interaction with the crowd involved in an incident through the RESCUER app. The RESCUER app enables people involved in an incident to contribute to the workforces by using their smartphones on a voluntary basis as well as receive some information requests from the command centre. In particular, we present approaches and interaction concepts for doing follow-up interaction with people in the crowd and for motivating people to continuously interact with the RESCUER app.

For this purpose, a series of workshops were performed together with the workforces and supporting forces in order to identify the need for communication with people in the crowd and the information demand of the command centre in the different contexts (i.e., large event and industrial incident). A detailed description of the workshops can be found in Deliverable D2.1.2 Conceptual Model of Mobile User Interaction in Emergencies 2.

From the point of view of the command centre, the main goals for follow-up interaction are:

1. **Acquiring missing information**
2. **Clarifying contradictory information**
3. **Investigating potential problems**
4. **Continuously evolving information**

Considering the dynamics of a command centre in an emergency situation, the workforces agreed that the interaction with the people in the crowd should occur in a more structured way, e.g. with the help of a question catalogue, in order to save time for the workforces in the command centre and also to allow more controlled communication with the crowd. Based on that, we identified typical information requests that could potentially be sent to the people in the crowd in the context of the scenarios of the RESCUER project. In addition to a set of fixed questions, the command centre can also send questions ad-hoc because it is not possible to foresee every detail and every issue in an emergency situation.

The next section presents the questions catalogue together with the information requests from the command centre to the people in the crowd (Section 2.1), a preliminary general approach for target-group follow-up interaction (Section 2.2), and general interaction cases that support the presentation of the questions to the people in the crowd (Section 3).

### 2.1. Follow-up Catalogue

The current question catalogue, called Follow-up Catalogue, comprises 35 questions. Some of them are contained in the current standard reports (presented in Deliverable D2.2.2 Information Gathering 1) and others are exclusive for follow-up interaction. Table 1 shows the consolidated Follow-up Catalogue. In this table, we present the question itself, the answer type that is associated with this question, the profile that could potentially answer this question, and information about whether this question is already part of a standard report or not.

There are three types of answers:

- Multiple-choice: questions with predefined answers with no possibility of free-text communication.
- Photo/video: request for taking a photo or video with predefined quantity and size.
- Free text: chat-like open questions from the command centre.

**Table 1: Follow-up Catalogue**

Questions	Answer type	Who provides this information	Part of a standard report
1. How many injured people are there?	multiple choice	(1) workforces (2) supporting forces	yes
2. Are you feeling some kind of irritation?	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
3. Is there a coloured cloud?	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
4. Is there some damage to the physical structure?	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
5. Explosion Reaction	multiple choice	(1) workforces (2) supporting forces	yes
6. Fire Severity	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
7. Smoke Direction	multiple choice	(1) workforces (2) supporting forces	yes
8. Smoke Colour	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
9. Are people, plants, or animals in danger?	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
10. Substance in the water or on the floor?	multiple choice	(1) workforces (2) supporting forces (3) civilians	yes
11. Do you smell anything?	multiple choice	(1) workforces	yes
12. Do you see flames escaping through openings of the building?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
13. What is the product that caused the incident?	free text	(1) workforces	no
14. Is there a possibility that the external neighbourhood could be affected?	multiple choice	(1) workforces	no
15. How many dead people are there?	free text	(1) workforces	no
16. Was there an explosion?	multiple choice	(1) workforces	no
17. Does the incident have an environmental impact?	multiple choice	(1) workforces	no
18. Are you observing tumult/panic?	multiple choice	(2) supporting forces	no
19. Are you injured?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no

20. Are you trapped?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
21. Do you need support?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
22. Is the situation under control?	multiple choice	(1) workforces (2) supporting forces	no
23. Which support do you need?	free text	(1) workforces (2) supporting forces (3) civilians	no
24. Could you take a photo/video?	photo/video request	(1) workforces (2) supporting forces (3) civilians	no
25. Are there people who have difficulty moving?	free text	(1) workforces (2) supporting forces	no
26. Incident in enclosed area?	multiple choice	(1) workforces (2) supporting forces	no
27. Water leakage?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
28. Is there a need for evacuation?	multiple choice	(1) workforces	no
29. Do you need medical support?	multiple choice	(1) workforces (2) supporting forces	no
30. Problems finding the exit?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
31. Is there need for reinforcement?	multiple choice	(1) workforces (2) supporting forces	no
32. Are you being helped?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
33. Are you alone?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
34. Can you see electrical wires?	multiple choice	(1) workforces (2) supporting forces (3) civilians	no
35. Free Question	free text	(1) workforces (2) supporting forces (3) civilians	no

## 2.2. Target-Group Based Follow-up Interaction

Although *target-group* follow-up interaction is just part of the second version of the current deliverable, a preliminary orientation was achieved in the workshops mentioned above. In this section, we present some requirements to be considered when interacting with the crowd.

Target-group follow-up interaction can be performed considering aspects such as profile, position, movement, previous interaction and affiliation. Table 2 shows the interplay between user profiles and other aspects for target-group interaction. The combination of these aspects helps to derive concrete requirements for target-group-based follow-up interaction. The command and control centre can send information requests to:

- Civilians under defined conditions (previous interaction with RESCUER, position in the safety areas); requests regarding the personal status are only enabled when the people are stationary;
- Supporting forces on site, to obtain missing information or investigate potential problems;
- Workforces on site, to increase information reliability, obtain missing information, clarify contradictory information or investigate potential problems.

**Table 2: Aspects to consider for target-group-based follow-up interaction**

Profile	Position	Movement	Previous Interaction	Affiliation	Main Goal
<b>(1) Civilians</b>	Safety Areas	Stationary	Already interacted	-	<ul style="list-style-type: none"> <li>▪ Know personal status</li> </ul>
<b>(2) Supporting Forces</b>	On-site	-	-	-	<ul style="list-style-type: none"> <li>▪ Obtain missing information</li> <li>▪ Investigate potential problems</li> </ul>
<b>(3) Workforces</b>	On-site	-	-	-	<ul style="list-style-type: none"> <li>▪ Obtain missing information</li> <li>▪ Clarify contradictory information</li> <li>▪ Investigate potential problems</li> </ul>

### 3. Follow-up Interaction: Interaction Cases

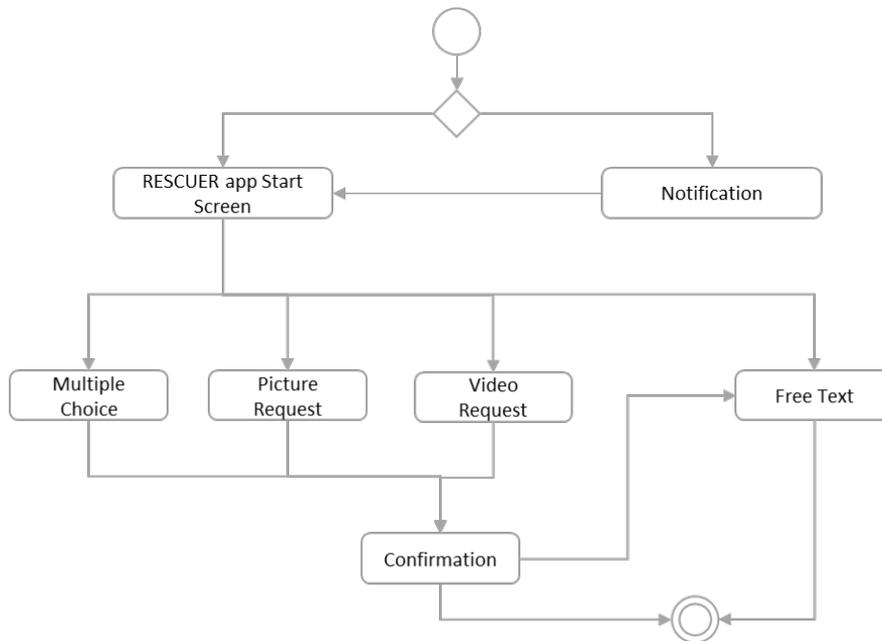
In order to present the questions of the Follow-Up Catalogue (see Table 1), a bundle of generic interaction cases was designed. The use of each of these interaction cases was defined through rules that can be applied to the answer types presented. This means that when the dispatcher selects a question from the question catalogue and sends it to the crowd, the representation of this question to the people will follow the rules described in Table 3.

**Table 3: Representation rules for questions of the follow-up interaction**

Answer Type	Representation	Representation Rules
<b>Multiple-Choice Request</b>		<ul style="list-style-type: none"> <li>▪ <b>Up to three questions:</b> one to three questions at the same time</li> <li>▪ <b>Related question:</b> When more than one question, send only correlated questions, e.g., only questions about fire description and not questions about fire descriptions AND about injured people.</li> <li>▪ <b>Randomized question distribution:</b> Sending different questions to different users instead of sending all questions to all users.</li> </ul>
<b>Picture Request</b>		<ul style="list-style-type: none"> <li>▪ <b>Three photos maximum:</b> People can be asked to take a maximum of three photos each time.</li> <li>▪ <b>Randomized request distribution:</b> Sending different requests to different users instead of sending all requests to all users.</li> </ul>

<p><b>Video Request</b></p>		<ul style="list-style-type: none"> <li>▪ <b>One video maximum:</b> People can be asked to take a maximum of one video each time.</li> <li>▪ <b>Randomized request distribution:</b> Sending different requests to different users instead of sending all requests to all users.</li> </ul>
<p><b>Free-Text Request</b></p>		<ul style="list-style-type: none"> <li>▪ <b>Free questions or dialogue:</b> People can be asked questions in the chat function. Dispatcher can use this function to chat with people in the crowd until issues are clarified.</li> <li>▪ <b>Randomized question distribution:</b> Sending different questions to different users instead of sending all questions to all users.</li> </ul>

People in the crowd will receive the questions through the RESCUER app. Figure 1 shows the possible flows for the people in the crowd if they receive an information request from the command and control centre. People whose RESCUER app is closed are notified about the information request. When they click on this notification, they are directed to the app, where they can navigate to the information request itself. If the RESCUER app is open, they receive the notification and it is loaded on the main screen as an icon. Through the notification icon, they can navigate to the request itself.



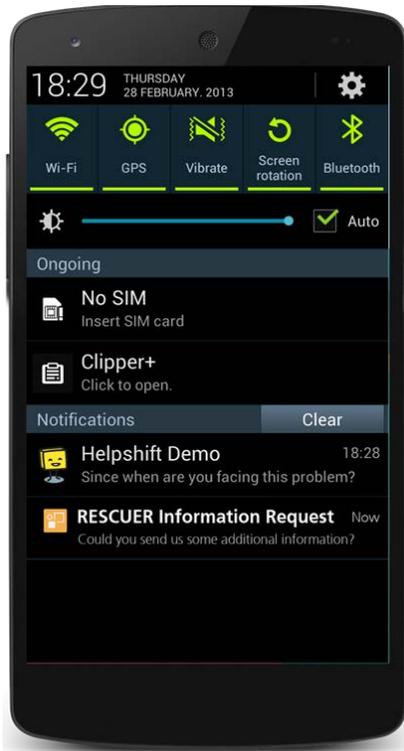
**Figure 1: Interaction Cases Follow-up Interaction**

### 3.1. Follow-up Interaction Notification

The system informs the people whose RESCUER app is closed via a notification. This notification remains stored in the smartphone’s notification queue. With the help of the notification modal dialogue or through the notification in the queue, the user can navigate to the RESCUER app and answer the information request sent from the command and control centre. Figure 2 shows an example of the notification queue with a RESCUER notification.

### 3.2. RESCUER App Start Screen

Icons that indicate information requests from the command and control centre are shown on the start screen of the RESCUER app, see Figure 3. By touching the icons, people navigate to the information request itself.



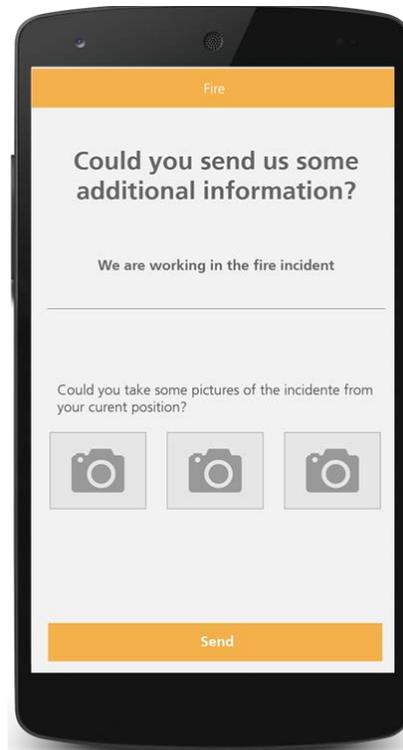
**Figure 2: Follow-up Interaction Notification**



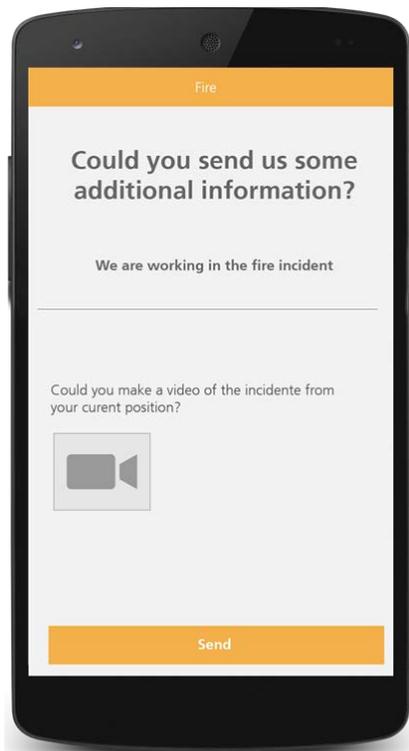
**Figure 3: RESCUER App Start Screen**



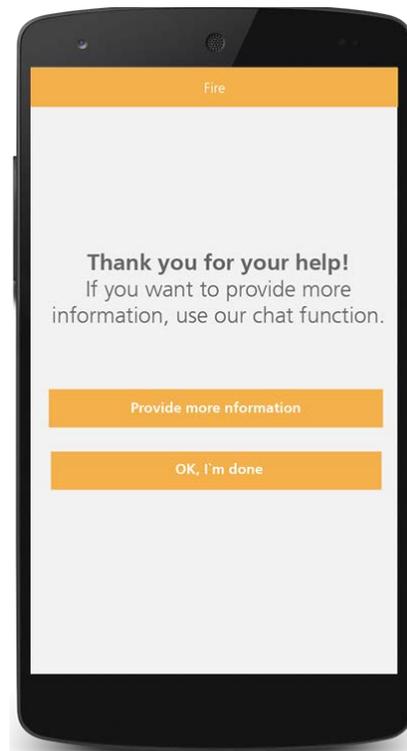
**Figure 4: Multiple Choice Request**



**Figure 5: Picture Request**



**Figure 6: Video Request**



**Figure 7: Confirmation Screen**

### 3.3. Multiple-Choice Request

A maximum of three questions can be sent to people at the same time. These questions should also be strongly related to each other in order to demand less cognitive capability from the user. Ideally, the command and control centre should randomly send the questions to the crowd to enable people to answer just one question each time.

### 3.4. Photo Request

As in the standard report, the photo request should demand three photos from the user (see Figure 5) in order to guide people during the use of the RESCUER app. These pictures are uploaded in the background when the user touches the “send” field or after 10 seconds without user interaction with the app. The photos are compressed in the app before being uploaded. The compression requirements are:

- Minimum resolution: VGA - 640x480, SD - 720x480 (depending on the mobile device specifications)

### 3.5. Video Request

Video requests comprise the demand for taking only one video each time. Figure 6 shows the screen design for video requests. Videos are compressed through the RESCUER app before they are sent to the RESCUER system. The requirements for video compression are:

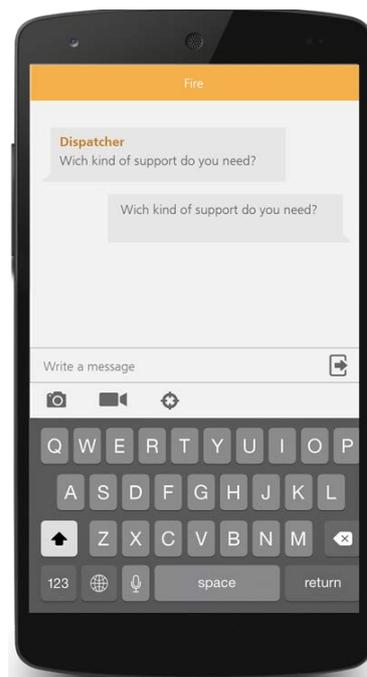
- Maximum duration: 25 seconds
- Minimum duration: 5 seconds
- Minimum resolution: VGA - 640x480, SD - 720x480 (depending on the mobile device specifications)
- Minimum framerate: 15 fps

### 3.6. Confirmation

After sending the report, the RESCUER app shows a confirmation that the requested information was sent. Figure 7 shows the confirmation screen. After sending the report, the user can leave the screen or navigate to the free report to give more information to the command and control centre.

### 3.7. Free-Text Request

Figure 8 shows the screen for free-text requests. As in the free report, this screen behaves like a chat. The dispatcher can write free questions and the user can also report using free text, including pictures and videos for describing the current situation.



**Figure 8: Free Text Request**

## 4. Data Model: Extension for Follow-Up Interaction

The data model presented in Figure 9 describes the objects represented in the RESCUER app for the new information that was elicited exclusively for the follow-up interaction. The green component in Figure 9 is the extension of the data model and represents the additional bundle of information added through the follow-up interaction.

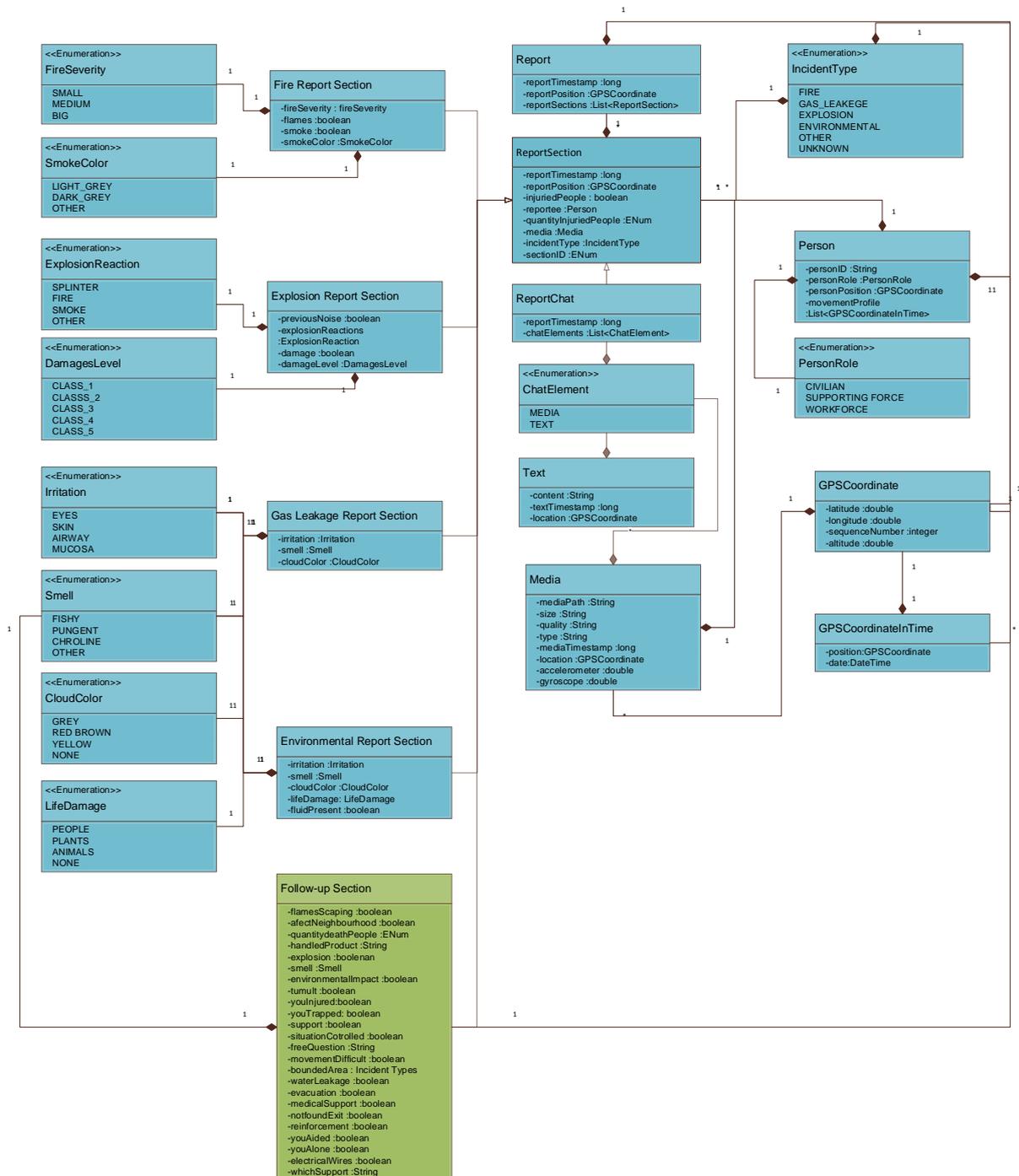


Figure 9: Data Model: Extension for Follow-Up Interaction

## 5. Conclusion and Next Steps

In this deliverable, we presented concrete requirements for the implementation of the mechanisms for follow-up interaction with people in the crowd through the RESCUER app. Chapter 2 presented the underlying way for the follow-up interaction using the Follow-up Catalogue, which supports the command and control centre in communicating with the people in the crowd in a fast and structured way. Additionally, a preliminary set of requirements for target-group-based interaction was introduced, which is the basis for further work in Task 2.3 *Mechanisms for Group-Target Follow-up Interaction*, which aims at developing advanced rules for interacting with the crowd.

Chapter 3 presented the concrete requirements for the implementation of the RESCUER mobile app. The requirements are built in a generic way, allowing easy extension of the RESCUER app. These new concepts have to be evaluated in the project from the perspective of the RESCUER app user as well as from the point of view of the command and control centre.

Additionally, efforts regarding the development of features that motivate people in the crowd to maintain the interaction with the RESCUER app will be considered later and will be reported in the next version of the current deliverable. The work on motivating features comprises the use of methods that lead to idea generation as well as to the conception and evaluation of such interaction mechanisms.

## Glossary

**Command and Control Centre** Group of people assigned to evaluate risks and make decisions in an emergency and/or crisis in an industrial area or at a large-scale event.

**Emergency** Critical situations caused by incidents, natural or man-made, that require measures to be taken immediately to reduce their adverse consequences to life and property.

**Emergency Response Toolkit** Component of the RESCUER platform whose goals are to: 1) get contextual information about the emergency, 2) ask eyewitnesses and formal responders for relevant missing information, 3) give instructions to eyewitnesses, formal responders and potentially affected people or companies, and 4) communicate the emergency to the press, public authorities and the general public in a context-aware way.

**Incident** It can bring damages to life and property and seriously affect the image of the business and/or of the country. The concept of incident as defined here includes the concept of accident.

**Mobile Crowdsourcing Solution** Component of the RESCUER platform whose goal is to support eyewitnesses and formal responders in providing the command and control centre with information about an emergency situation, taking into account the different smartphones that might be used and how people interact with smartphones under stress.

## Abbreviations

**RESCUER** Reliable and Smart Crowdsourcing Solution for Emergency and Crisis Management

**UI** User Interface