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Event experience with data

Improving and expanding information flows between emergency services

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BACHELOR THESIS

Abstract

More data is being generated than ever before, some public, some private. This data can be used to gain insight into new developments in the fields of economical, social and medical sciences. This data can also be used to make festivals and sports events more fun, interesting and safe. EventCloud is a system that wants to accomplish just that by combining safety and fun. This paper will describe the process used to create the dashboard, from gathering the requirements to the design of the eventual dashboard.

Contents

Chapter 1

Introduction

Many events are organized every year in the Netherlands, ranging from small markets to national holidays like New Year's Eve. One of those events is the Volvo Ocean Race, which will take place in June 2018 in The Hague. This is a big event that will attract over one hundred thousand people towards the political center of the Netherlands. The bigger events usually have a lot of stakeholders. The first group of stakeholders consists of the visitors who come from all over the country and from abroad to enjoy the event. The second group consists of the local entrepreneurs who want to make their business part of the event. And last but not least there is the government who wants to make a good impression and wants to safeguard the security of the event. This paper will try to answer questions like: What information do security and other emergency services currently gather and process during events? How do security and other emergency services gather the data they use during events? And how do security and other emergency services use the information they gather? The main question of this paper is: "Is it possible for security and other emergency services to work more efficiently by giving them the right information in a specialized dashboard?".

To answer the main question of this paper I am part of a group of students that is helping to create a system called "EventCloud". The purpose of EventCloud is to help cities manage their events in such a way that all of the above stakeholders can get the most out of the event.

Thesis overview

The paper is organized as follows: Chapter 2 describes the elicitation methods used to gather the requirements. Chapter 3 shows the results from the elicitation process. Chapter 4 assigns features to the requirements found in chapter 3. Chapter 5 describes the design of the dashboard, keeping in mind the features in chapter 4. Chapter 6 evaluates the dashboard and provides the conclusions of the paper.

Chapter 2

Methods

This chapter describes in what way the requirements for the dashboard will be acquired and what these requirements will be used for. To gather these requirements some elicitation methods are used.[1] For this project the chosen elicitation methods are interviews and perspective-based reading.[2] These elicitation methods are detailed in the book "Mastering the Requirements Process Getting the Requirements Right" [1].

The research started off with a perspective-based reading. Perspective-based reading gives insight into presently existing requirements and sometimes into what information or functionality was missing at the time. One of the used documents is the report called "Twee werelden"("Two worlds") [2]. This report gives us a good insight into what happened during Project X-Haren, why it happened and how the police acted.

The other method that was used is interviewing stakeholders. First a decision had to be made what kind of interview had to be used. The three forms of interviews are:

Standardized interview An interview that has prepared questions that do not allow for any deviations. This means that there is little chance for the accidental discovery of requirements.

Exploratory interview An interview that has prepared questions, but that allows for deviation in hope of stumbling upon a requirement that was not thought of.

Unstructured interview A form of interview that does not have any prepared questions. This means that everything is improvised.

From the interview forms as mentioned above, the exploratory interview seemed the best fitted for the purpose of this paper. This form will both help to validate what was learned during the perspective-based reading and has the possibility of discovering previously unknown requirements.

The three main stakeholders for this project are interviewed. The first group of stakeholders consists of the people that started this project and organize events, referred to in this paper as "the organizers". The second

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[1]Elicitation is the process of acquiring requirements for a system or product from stakeholders.

[2]Perspective-based reading is a term used in this report for everything that has to do with eliciting requirements from reports, documents and other forms of written documentation.

group consists of the private security companies that are in charge of the security during an event. They can be viewed as a first line of defence against crime. The third and last group is the national police force.

The organizers will be involved during the entire project. On multiple occasions they will be asked about their thoughts on the current state of the project. This will happen during our meetings.

The private security companies will be interviewed as part of the elicitation process. Interviewing them will provide insight into securing and organizing events. They can make us understand what they require of the system to work with it. For example how they want the information to be presented and what information they need.

The police has a system that contains a lot of information that could be of interest to anyone organizing an event. They also have an incredible amount of experience with detecting, preventing and acting upon an incident. Talking to them will also be part of the elicitation process. This will also give us insight in the requirements of a security system in which multiple people from different disciplines cooperate.

After gathering the biggest part of the requirements a start will be made on the dashboard. As mentioned before there will be meetings with the organizers to keep them involved during the creation of the dashboard.

Chapter 3

Elicitation process

This Chapter will describe the results that were gathered with the methods described in the previous chapter. These methods were a study of related work, interviews with companies in the security sector and an interview with the national police.

Perspective-based reading

There are a fair amount of reports that contain a lot of information on the subject of police and events. One of those reports is the one describing Project X in Haren[1]. In the report "Twee werelden" [2] a commission led by Job Cohen describes what happened and what could have been done. Their findings were as follows:

- On page 14 they describe that the commander of the police did not know what was happening in Haren. The lack of information forced him to just send groups of police officers into Haren. This happened instead of sending them directly to a place where they were needed.

- On page 19 it is made clear that the police force in Haren also had no adequate plan to work with. All the scenarios were poorly made and it was not known when a realistic scenario would turn into a worst case scenario. This lead to poor communication in the chain of command.

- Page 25 of the report acknowledges the role of social media and the power it has to mobilize large groups of people. At this point it is known that Project X-Haren started with an open invitation on Facebook which was received by and shared with the wrong people.

- Page 25 also tells us that the police force had underestimated what was happening. This was mostly due to the fact that something like this had never happened before in the Netherlands, but it also points out

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[1]Project X-Haren was a party that got out of hand. It started when Merthe, a girl from Haren (near Groningen, The Netherlands), made a public Facebook invitation for her birthday party. Thousands of people would eventually come to the party, which resulted in large scale rioting.

that the national police force might not have had enough information to base their plans and assumptions on.

- Page 30 tells us that another reason communications might not have gone as well as it should is that the communication structure of GRIP² [3] hadn't been used before by most of those who were using it during Project X-Haren.

- Page 31 stresses the importance of monitoring social media, recommending to set up a system that looks for meaningful patterns.

- Page 36 stresses the importance of having a well thought out plan. This plan should describe what every party has to do in a given situation and should be known to every party.

Another interesting report is "Politie en evenementen: Feiten, ervaringen en goede werkwijzen" ("Police and events: Facts, experiences and good work methods") [4]. On pages 71–73 some points of interest are detailed.

- Page 71 clarifies that the police needs information during closed events.

- Page 72 mentions that close cooperation between police and private security companies is found to be beneficial for the event. This means sharing information and coordinating between both parties.

The interview with the organizers

Some previous work had been done by PROOOST³ before we, the students, were involved in this project. This was a small pilot to test something like EventCloud during "LIFE I LIVE" in The Hague. The system that was tested consisted of a small system with a heat map, some data on public transport, the location of all security personnel, the weather and a social media monitoring tool. They posted people with an app on their phone on different locations near the stages. By using this app, these people gave the information used to create heat map. The app had two sliders, one for how many people were near the stage, and one for the mood of the audience (are people having fun or are they discontent). The same was done on the train stations so they could take the people getting off the train into consideration. This gave them a good idea of the public density now and in the future.

This pilot was considered a success. Showing them the possible benefits of having all this information available. The system they used relied on personnel standing at the right place to communicate the public density. The organizers felt it would be possible to automate this process by using other data sources that do not require manpower. Furthermore they wanted to know what the current traffic situation is and wanted to improve the experience for the visitor by providing an app that could communicate with EventCloud. This app can for example show what bathrooms are not too crowded. The app could also function as a communication channel between the organizers and the visitors by allowing the organizers to send messages to the visitors phone.

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²"Gecoördineerde Regionale Incidentbestrijdings Procedure" (GRIP) is a nationwide emergency procedure in the Netherlands to facilitate coordination between different emergency and other government services. Among other things it offers a standardized communication structure. GRIP translates to "Coordinated Regional Incident Procedure"

³PROOOST is an organizer of events, specialized in culture and sport events.

The interview with the private security company

One of the stakeholders were the private security companies. Crowd Support was willing to answer some of my questions with regard to what functionality a system like EventCloud should have. They started by telling me their standard process. They start by looking into the profile of the visitors: are they young, old, students? Depending on this profile they make a plan. They gave me two examples. The first example is that if a popular band like One Direction is giving a concert, they have to take into account kiss and ride. This means that most of the young girls will be brought and picked up by their parents. This means that they will have to arrange a special place so the traffic won't become too congested. The second example they gave me was of a band that would attract people weeks in advance. These people would set up tents so they could be one of the first to enter the concert. In this example they either had to arrange facilities or personnel to ask them to leave. I also asked them how they would use a system like EventCloud. They told me they would mostly use the information it provides to manage the crowd and catch criminals, the last would only be possible if they could identify people via the app. In short, they wanted that a system that would support their current processes, provide an information source for crowd density, help them manage crowds and help them catch visitors with malicious intents.

The interview with the national police

The national police started by telling us how they normally work. They showed us what their control centre looks like and explained how it operates under normal circumstances. Basically this means that as soon as a call is made, it will be redirected to one of the phone operators. The phone operator would make an entry in their *C2000* system and determine what the next step would be and which people should be informed about the call. This could range from just a single police car to a heavier response.
Besides the main control centre there are also smaller rooms that could be used during events or other extraordinary occasions. These rooms contain equipment that could operate like a small control centre.
The main thing they were missing was information from the event organizer. They wanted an easy way to see what the organizer is up to and how well prepared they are to handle an emergency. The police may be able to share their information with the organizers in return.

Chapter 4

Requirements

This chapter will detail what can be learned and derived from the results found in the previous chapter, and what functionality EventCloud should have to support the organization, the security company and the police in their tasks during an event.

Social media monitoring

Social Media played, without any doubt, a big role in what happened during Project X-Haren. Social media had the power to mobilize a group larger than the authorities had expected. The report "Twee werelden" [2] stresses the importance of setting up systems to find meaningful patterns. Having a system that can do this successfully means being able to react better and more effectively to these worrying patterns.

Establish a log

Project X-Haren showed that the police force neither had the right information nor enough information to make a good plan. This could mean two things: it could mean that (1) the information did exist but was not given to the police or (2) the information didn't exist and could not be given. Due to the fact that Project X-Haren was the first of its kind, it will probably be the latter. This means that as much data as possible should be collected during events, so they will be able to use this data to make plans for future events. This is the first advantage of establishing a log.

The second advantage might be in the form of Big Data. In March 2017, the report "Enabling Big Data Applications for Security" [5] was presented by the Hague Security Delta. This report describes Big Data and its possibilities. If EventCloud has the ability to keep a log, it could be possible to use data mining tools to find new patterns. This would make it easier to send the right people to the right place at the right time.

Display information

In the report on "Twee werelden" [2] it is mentioned that the police did not have the information to work effectively. They did not know what was happening in and around Haren and at some point this resulted in just sending police officers into Haren to help where they could. A functional EventCloud should have been able to acquire and display information to those that need it. The first step to accomplish this will be the heat map. How this heat map is going to work can be found in the paper of my colleague Joost Miljoen [6]. Secondly, EventCloud should be able to display information given by third parties[1]. This can be done by integrating third party information in the heat map in the form of markers. These markers would show the location-based information. The system should also provide a part that can handle more general information, like a chat.

Communication

Communication is always an important task of every project in which multiple people work together. This was one of the limiting factors in Haren. There was a structure in which information could be shared, but no one was accustomed to the GRIP [3] structure. In the report "Politie en evenementen: Feiten , ervaringen en goede werkwijzen" [7] it is also made apparent that the police requires as much information as they can possibly get. EventCloud should be able to help with the communication between all parties that are involved during an event. Improved communication is possible by facilitating easy information sharing by integrating location-based information into the heat map in the form of markers, and more general information in a form of a chat.

Show the plan

During Project X-Haren the main thing that was missing was clarity what plan was being followed and when they would switch to the plan for a worst case scenario. Having a place in the dashboard where general information and communication is handled, should take away this problem. As stated before, the police would also like to see what the organization is working on at that moment. You could display the plan that is currently being followed by the involved parties. This plan could easily be changed and viewed by the other involved parties.

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[1] Third party information refers to information that is provided by users of the system, but not by the system itself. An example would be the location of a robbery.

Chapter 5

Dashboard

This chapter discusses the dashboard. The explanation of the dashboard is supported by screen shots. This dashboard consists of web pages showing all the information. The information used by the dashboard is saved to and loaded from a MySQL server. This server contains tables that are used to store the notifications, the data for the heat map, the different possible scenarios and tables that show the scenario that is presently used. These tables will be discussed more in depth along side the rest of the dashboard.
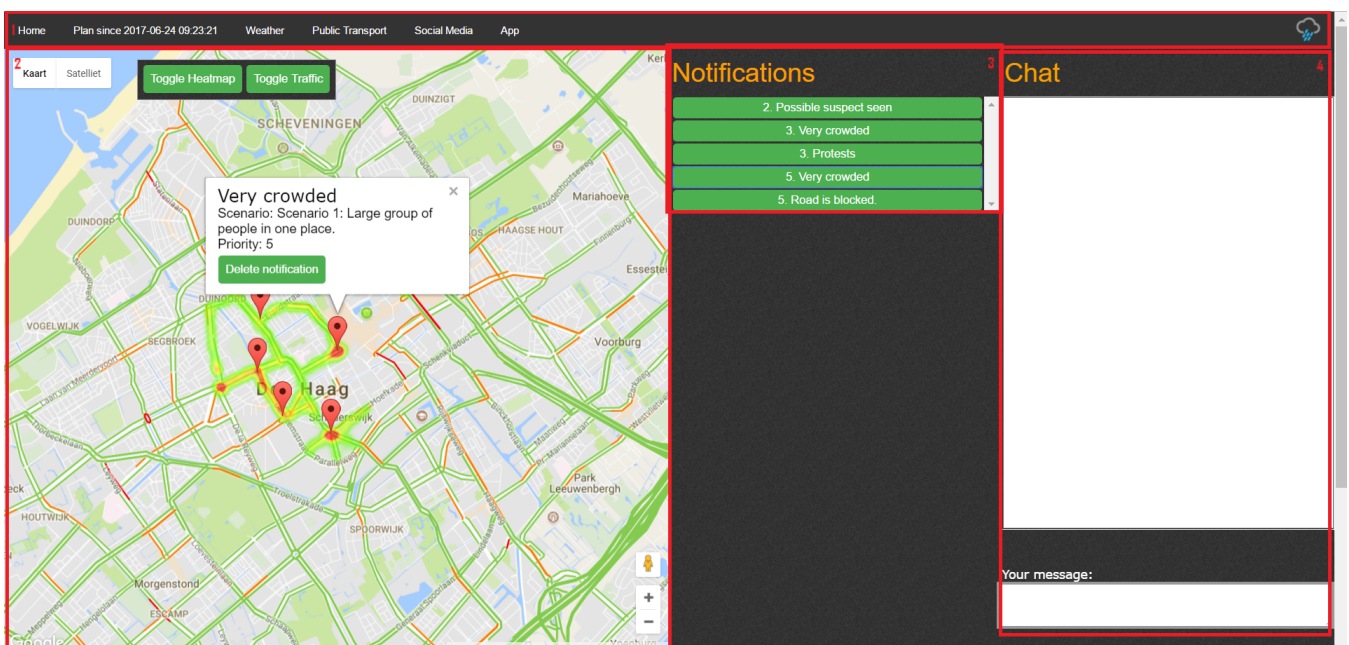
The home screen

Figure 5.1: The home screen. This consists of 4 parts as detailed in this chapter: 1. menu. 2. map. 3. notifications. 4. chat.

Most of the features of the dashboard are located in the home screen (see figure 5.1). The purpose of the home screen is to facilitate a quick exchange of information between different parties. The home page consists of 4

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Table 5.1: Columns in the heat map database.

HeatMapID	Latitude	Longitude

parts. The first part is the menu bar, the second part is the map, the third part consists of the notifications and the fourth and last part is the chat.

The first part of the home screen is the menu (see figure 5.1). The menu shows all the pages that are part of the web application. These pages are:

1. The "Home" page, which shows the dashboard.

2. The "Plan" page, which will be discussed later in this chapter.

3. The "Weather" page, which shows details about the current weather situation.

4. The "Public Transport" page, which contains information about the current situation of the public transport. An example would be information about how busy the trains are and what trains are due to arrive.

5. The "Social Media" page, which shows the results of a social media monitoring tool. Examples of these results would be the amount of people that enjoy the event and messages that contain important information for the organizers.

6. The "App" page, which shows information that people can see in the app and gives the organizers the ability to send messages to the mobile phones of the visitors.

There are two more interesting parts to the menu bar. The first is that after the name for the plan page a data and time is given. By showing the time the plan was lastly changed, the user is given the ability to determine whether or not they are aware of the last change in plans. If they think they are not, they can simply go to the page to check the latest plan. The second interesting part is the small weather icon in the right of the menu bar. This is a small widget available on `buienradar.nl` [8]. This widget shows the current weather. Hovering over it also shows the current temperature. This widget gives a limited insight into the weather. If there is need for more information concerning the weather it is possible to go to the weather page. The page will show a detailed summary of the weather. The design of this page will however not be a part of this project.

The next part is the map (see figure 5.1). The map as shown in the figure has 3 main features. The first feature is the heat map. The heat map shows the distribution of people over the event. This is shown by the distribution of green to red. Having this information at your disposal could help to determine among other things that alternative routes should be used for emergency vehicles. This map is generated by data stored in a database as shown in table 5.1. The heat map as shown in figure 5.1 is made with random data to show its functionality. Secondly a colored line is seen over each road in the map. These colored lines show how much traffic is present on that road. There is also a page with information on public transport. This page however is outside the scope of this project. Thirdly, there are the notifications. These notifications can easily be created by clicking on the map and filling in the form as shown in figure 5.2. An entry will be made in the database

Table 5.2: The table containing all the information used to create and manage the notifications. The "Done" column will be set to True when the notification is deleted using the "Delete marker" button in figure 5.1. This makes sure the notification is not displayed on the map anymore, but can be used in combination with the "Date" and other columns to go over the data at a later time.

NotsID	Latitude	Longitude	Description	Scenario	Priority	Date	Done

having the columns as shown in table 5.2. After a notification is created, it will be displayed on the map. This gives a good insight into where the incidents are happening. An information window will pop up when a notification is clicked on. This notification shows what is happening at its location, what scenario might be applicable, how high of a priority it has and a button to delete the notification when it is being taken care of. Upon pressing the "Delete notification" button, the "Done" column in the database will be set on true, signalling that the notification should not be displayed on the map anymore. It will still be in the database for data mining purposes. The map also has the traffic layer from Google to see how much traffic is on the road.

The third part is the list with notifications as seen in figure 5.1. This part of the dashboard has a list with all the notifications that are also present on the map. They are ordered by the priority they are given. This makes the notifications with the highest priority to be on top. After one of these buttons is pressed, the map will snap to the associated notification on the map and will open its info window.

Fourth and last in this dashboard is the chat. The name the user will have in the chat will be asked before the page is loaded. This will probably change when EventCloud will be fully released. Having a chat gives the user the opportunity to send general messages to everyone using the dashboard.
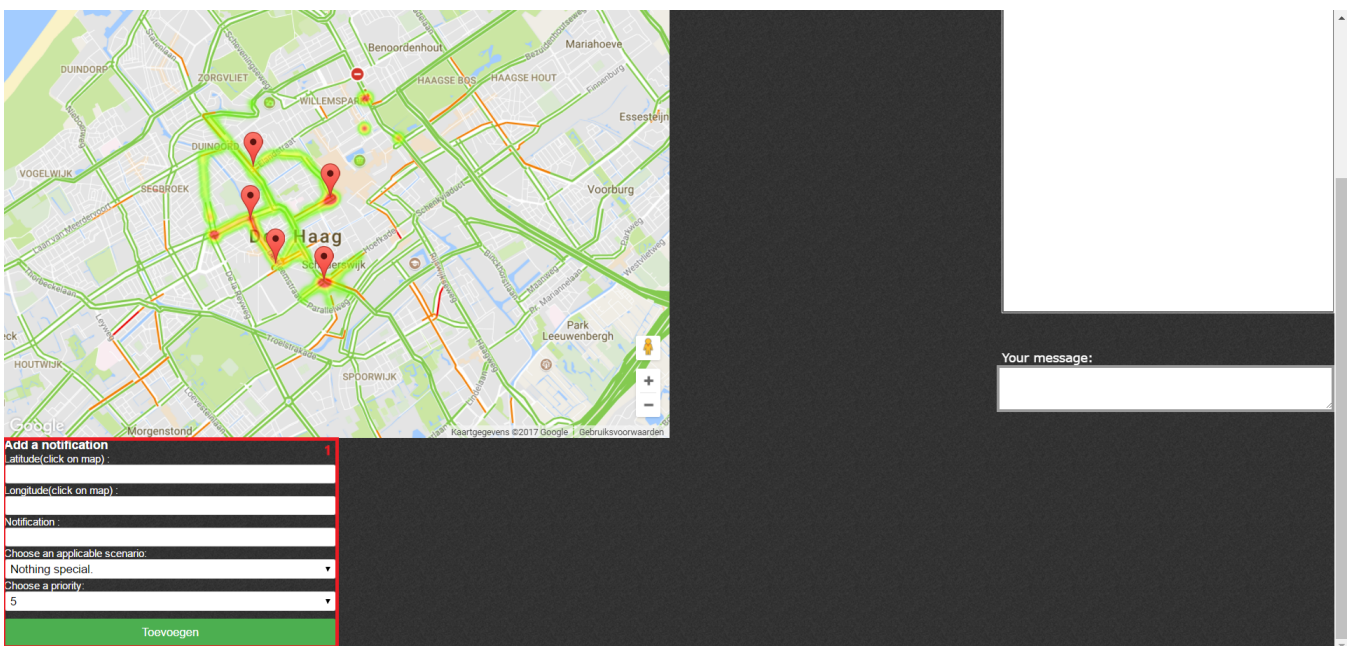
Adding a marker

Figure 5.2: This is the part below the dashboard. This part contains a form (1) that is used to add new notifications to the map.

Table 5.3: Table used to store the plans

ChangeID	Date	Scenario	ScenarioID	ExtraInfo

Figure5.2 shows the form to which the page snaps after the map is clicked. The boxes for Latitude and Longitude will automatically be set to where was clicked on the map. The "Notification" box will be where a description of the notification is given. After that an applicable, predefined scenario can be assigned and a priority, based on the importance, can be given to the notification. This data is stored in a table with the columns as in table 5.2.

The plan screen

The last important screen for this paper is the planning screen (see figure 5.3). This page is accessed through the menu bar by clicking on the second button from the left. All data on this page is stored in a table with columns shown as in table 5.3.
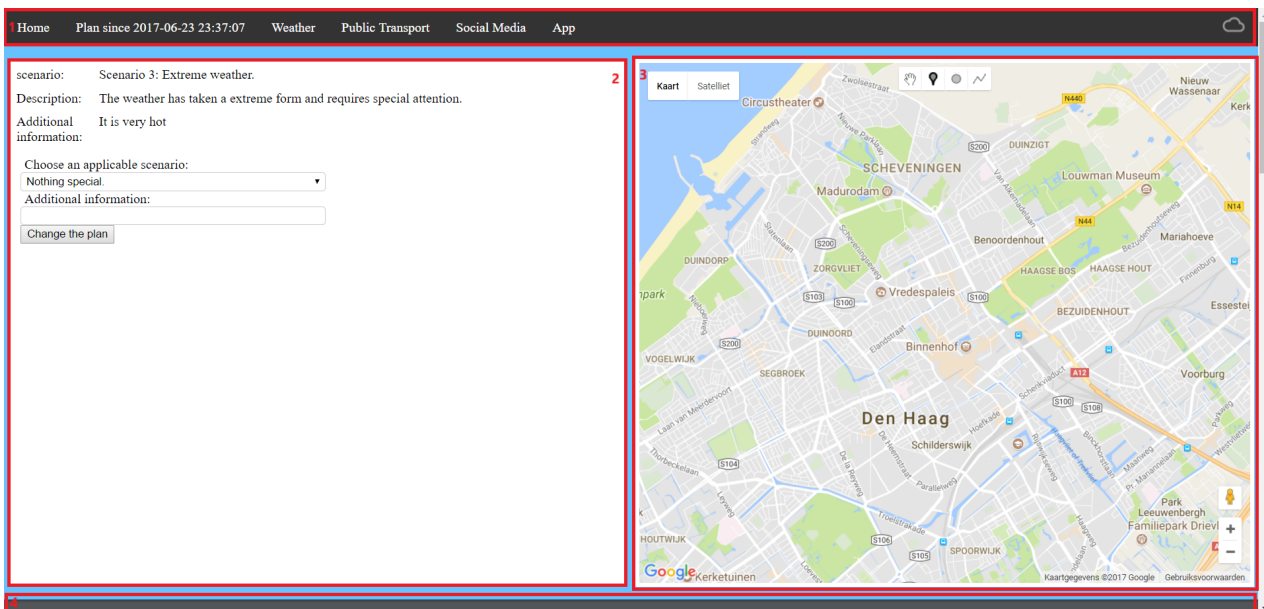

Figure 5.3: This is the part of the web application that shows the current plan for large scale disturbances. 1. Shows the menu. 2. The main planning part where the scenario can be chosen. 3. A map that can be drawn on. 4. (In the bottom) Room for the document detailing all the scenario's and how to react to them.

The plan page displays the same menu bar that is displayed on the home page. This menu bar was discussed earlier this chapter.

The next is the part where the current plan is described. It contains a small form where the plan can be changed. It will asks to give a scenario and to give additional information. A scenario can for example be set up for protests, but additional information is needed to know where the protest is held. After the "Change the plan" button is pressed the plan will change. The new plan will be displayed.

Next up is the map. This map can be used as a visual aid for the plan, for example showing which area to

clear for police operations

Lastly, on the bottom of the plan page there is room for the document describing all the scenarios and what else was planned for. This allows people to go over the papers once more if needed.

Chapter 6

Evaluation and conclusion

This chapter discusses and concludes the paper. First, it will be determined whether or not this dashboard would really help all parties communicate during an event. After that, the dashboard itself and what could have been done differently will be discussed.

The main question

The main question of this paper was the following: "Is it possible for security and other emergency services to work more efficiently by giving them the right information in a specialized dashboard?". Due to a lack of opportunity it was not possible to test this specific dashboard during a real event. But there is a strong case to be made for the dashboard as described in this paper.

More and more corporations and organizations use tailored dashboards to gain insight into their business and projects. These dashboards give insight into monthly costs and profits, success rates of projects, provide a communication platform for it's users and much more. A good example is the *C2000* system used by the Dutch police force. *C2000* made sharing information between emergency service easier than ever before.

The dashboard

The dashboard looks pretty good, but should only be used as a model for the eventual dashboard. It lacks a good log in page, a lot of design (it is made for functionality, not beauty) and it has no option to restrict users from accessing a functionality they should not (for example, everyone can change the plan page). Besides that, not all pages the menu bar were coded, because they are outside the scope of this paper.

The markers on the dashboard could also be improved. It is possible to make custom markers for every party involved in the organization of an event. Furthermore, some additional information could be given in the marker themselves. The priority could be displayed in the marker before the info window is opened.

The dashboard also lacks the functionality to make it usable in different cities. The map in this dashboard will always center on The Hague. In the final version, there has to be a functionality that can differentiate between different cities that are having events at the same time.

There is also a certain privacy and security risk that arises by using third party applications like Google maps. It is impossible to track the data after it is send to the Google services to make the heat map. The same could be said regarding the notifications. This should be addressed before a final version can be made.

The last thing the Dashboard lacks is a replay functionality. The only way to revisit the data is by opening the database itself and manually going through all the entries. Enabling replay of the dashboard with historic data could lead to new information about the event that was organized, the people it attracts and what patterns should be watched for.

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