

# Sahana Victim Registries: Effectively Track Disaster Victims

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## ABSTRACT

“Disaster management” a key topic these days due to the enormous amount of disasters occurring all over the world tends to focus mainly on the individuals victimized as human lives and living conditions are in jeopardy. During such a disaster scenario there are many different volunteer organizations and volunteers willing to support victims but due to the lack of robust and reliable human computer systems developed for responding and managing disaster aftermaths the efficiency tends to suffer thus crushing down the volunteer efforts drastically. So developing an effective disaster management solution is vital and a computerized registry that captures and handles information on disaster victims can be called the heart of the system due to the significant bearing it has on human lives. Thus one could say that disaster victim registries have a higher significance in a disaster management context. Due to this reason, three such registries have been developed and integrated into the Sahana Disaster Management System namely the Disaster Victim Registry, Missing Person Registry and the Children Registry.

## KEYWORDS

Disaster Management, Missing Persons, Children, Victims, Sahana

## PROBLEM DEFINITION AND REQUIREMENTS

After a disaster occurs the individuals that were affected in one way or another due to the disaster are known as disaster victims. They can be categorized into several groups based upon different factors such as age, victimized status etc... Grouping by age is done to categorize individuals as children and adults etc... due to the fact that information to be captured should be varied accordingly. For example... capturing health, educational and behavioral information is vital with regard to children. But for adults that may be unnecessary. Grouping by the victimized status is another categorization of victims that one may use. Victims with one or several statuses from namely missing, found, dead, deceased, injured etc... may be encountered during the aftermath of a disaster and thus they are categorized depending on one or more of the above victimized statuses. For example... a missing person may be recovered but he may also be injured or deceased. In such a situation his victimized status would be found and deceased or something similar. But all this may lead one to wonder why there are such categorizations with regard to disaster victims. The main reason for this is even though a common set of information may be shared among different categories the important and unique information differs from one category to another.

In a large scale disaster aftermath nearly two thirds of the individuals victimized are displaced or missing. Thus, capturing information on all the displaced and missing people is a mandatory task. And even though everyone affected during that disaster are considered disaster victims, specific information on the current status of each and every victim that was present when that disaster occurred needs to be recorded. Thus the need to record information on disaster victims with a group categorization such as families, tourists, passengers, pedestrians etc... arises due to the reason that then that they can be easily identified as a whole. Common information for all the individuals of a group may be captured with the use of one wizard. Furthermore if an NGO is specifically functioning to help a specific group or an entity such as a group of tourists or a large family they can easily extract information of that specific group for their use. Group categorization is also useful to assist agencies to identify their target set of victims. Individual information should be recorded under each group and this should be done one by one. For each and every individual a photograph and fingerprint scan will be very useful considering that it adheres to the

governing rules if there are any. In most situations these rules will depend on the deployment environment and the country. For example... Some countries will not allow finger prints of their residents to be exposed outside due to privacy and/or security measures. These rules may also apply with regard to photographs. Displaced location and current location details of the victim is another vital factor that needs to be recorded by the system as that helps for the successful completion of other activities. Items required such as food, clothes and water etc... should also be captured and victims should be identified uniquely by their full name and/or a card number such as an identity card or a passport number. Searching, editing and deleting facilities should also be provided for convenience and efficiency. Report generation too should be an option due to the fact that it helps the relief coordinating body among many others to effectively operate.

Reports generated based by groups, incidents, shelters etc... can be regarded as the most important with regard to report generation as it provides an effective summary based upon the given criteria of all the victims thus jumpstarting the relief effort. There also tends to be a major requirement arising around missing people. Once one has a good understanding of relief efforts he tends to realize that not only should the ideal system capture information about missing people and found people but it should also capture information of the person seeking them due to the fact that it adds to the chances of people finding each other. For example... if two members of a family are looking for the head of the family, the data maybe used even to connect those two family members with each other.

Multiple disaster management should be another capability due to the fact that this enables an individual to search for information from one or more of the disasters as he prefers. Thus with if the system is equipped with multiple disaster management capabilities the same instance of the system may be used for different disasters. For example... a user may get information on disaster victims of a flood or a fire or both simultaneously from the system by selecting the disaster type or types if the system is equipped with the ability to store data on both single and multiple disasters. The reporting individual should be able to specify which disaster he would like to report information on through the terminal he accesses and an individual that is searching for maybe a missing person should be able to specify which disaster he wishes to search thereby limiting the possibilities and reducing the delay time. It also may be a useful feature for the relief organization capturing data due to the fact that sometimes they may need to generate reports on one or more than one disasters using the same instance of the disaster management system.

Another important feature that one may add is the use of several graphical representations of the data thereby adding visual appeal and providing a better impression on the disaster situation and its severity and up to what extent the volunteer coordination process has been a success. For example... charts depicting the proportion of factors such as missing and found people and the distribution of aid and other relief efforts tend to stick in the onlookers mind rather than just seeing a list of numerical data. Another vital fact to remember is that during a disaster aftermath the victimized status and reporting and finding missing people is a major functional requirement and should be deployable independently. The other major concern with regard to effective coordination of disaster victims is the age factor. When considering age children play a prominent role when compared to adults as they have special needs. Thus the need to capture important and unique information on each and every child arises. For example... child educational details and child behavioral details should be captured. But these are just two of the many different types of data that need to be specifically captured with regard to children. Using this information the coordinating body can determine if a particular child needs a special follow up or not. And even for this the customized report generation mentioned earlier will be really useful tool.

## NONFUNCTIONAL REQUIREMENTS

The core requirement of a disaster management system is capturing right and sufficient information of disaster victims. So designing proper victim registries should emphasize on both functional and nonfunctional requirements alike. In terms of non functional requirements it is really important to reduce the data capturing time since during an actual disaster scenario the data entry operators that capture the data of the victims have to be able to finish it both quickly and efficiently and capture as much data as possible in order for other disaster relief functions to effectively operate. Thus the designers of an ideal system have to give more priority on simplicity of forms and ease of data entry rather than great elaborateness so that it's easily deployable during a disaster aftermath. For example... after the Indian Ocean tsunami in 2004 they needed a system that had to collect data on around 30000 victims. In a situation like this due to large amount of information needed to be captured and the limited amount of volunteers

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reducing the data capturing time and focusing on the other non functional requirements as well should be a main concern.

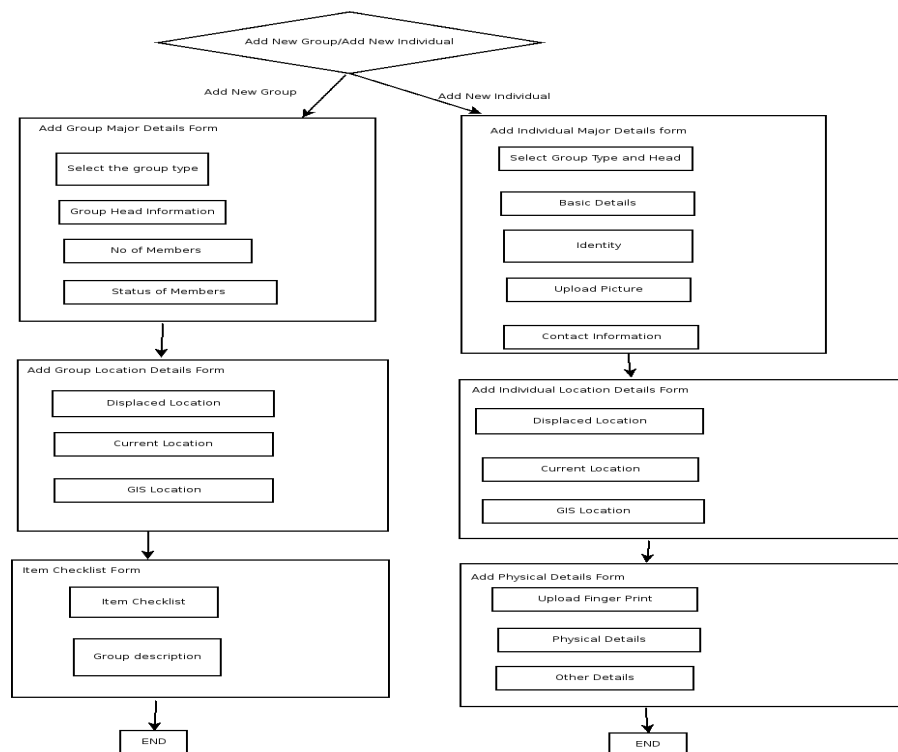
Forms should be easily navigable and only the most required information should be captured to reduce the data capturing time since it plays a major role during an actual disaster aftermath. It would also be wise to make all the meta data fields such as blood type, marital status, religion, age etc... configurable by the administrator so that he can customize it as and when he pleases according to the need. Capturing redundant information should be eliminated as much as possible. Furthermore auditing and logging of the transactions handled by the system may be useful for recovery purposes and tracing and thus this too can and may be implemented. The security of the data captured should also be ensured. Only authorized parties should be allowed to access the data captured or/and access the system to collect data. Information security should also be given a serious consideration in this context. Thus in these kinds of victim registries in addition to the functional requirements implementation of nonfunctional requirements too is a vital factor.

## **INTRODUCTION TO THE SAHANA FRAMEWORK AND IT'S VICTIM REGISTRY IMPLEMENTATIONS**

Sahana is a Free and Open Source Disaster Management system. It is a web based collaboration tool that addresses the common coordination problems during a disaster from finding missing people, tracking victims, managing aid, managing volunteers, tracking camps effectively between Government groups, the civil society (NGO's) and the victims themselves. Currently there are three modules in the Sahana system to effectively track disaster victims. These are namely the Disaster Victim Registry, the Missing Person Registry and the Child Protection System. All three modules can be deployed independently or together depending on the need of the targeted disaster scenario and are they are designed to have a tight integration when deployed simultaneously.

### **Disaster Victim Registry**

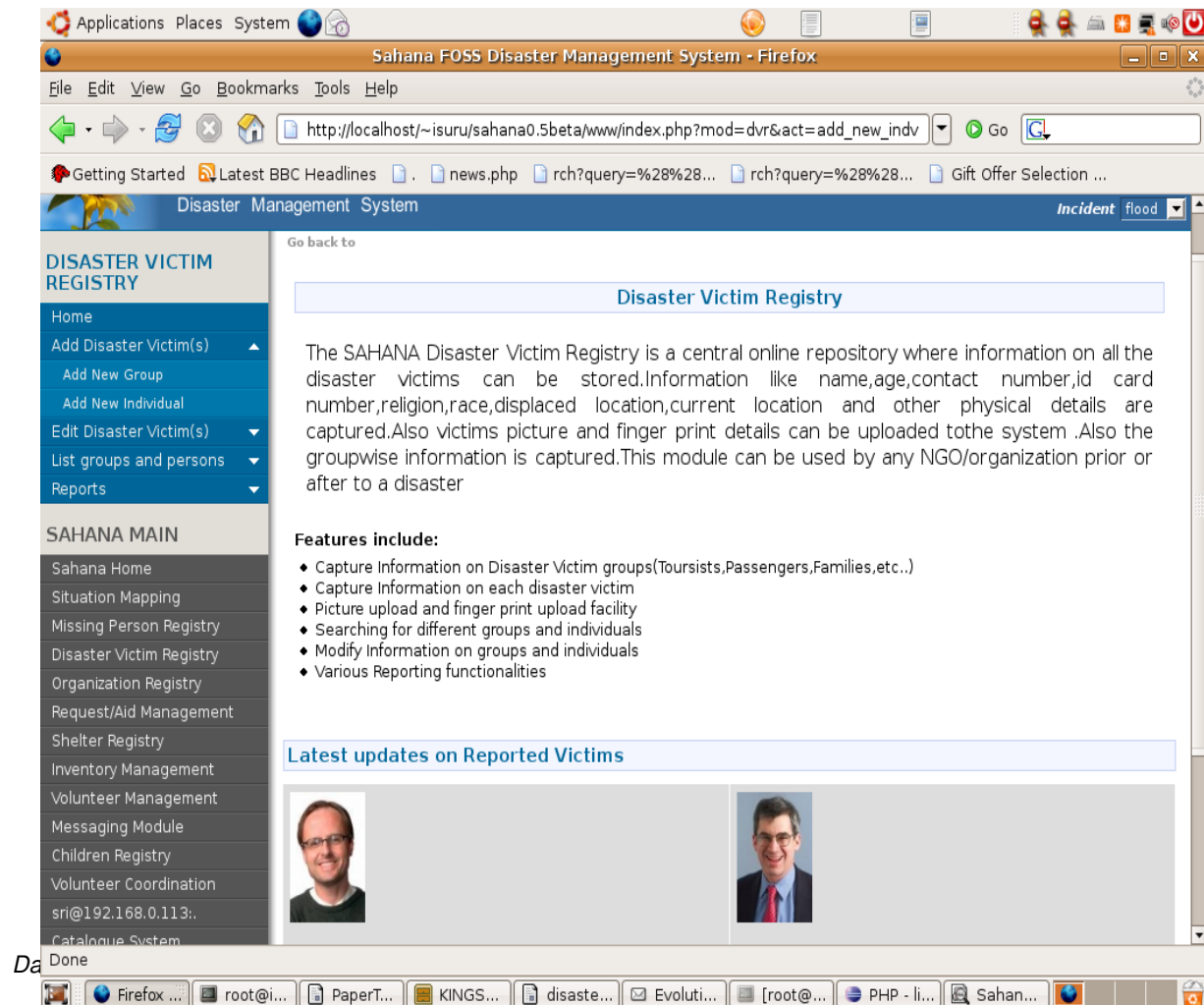
The Sahana Disaster Victim Registry is a central online repository where information on all the disaster victims can be stored. This module is acting as the heart of the Sahana framework providing support by enabling abilities such as adding a new group of individuals to the Sahana system, adding a new victim to the Sahana system, searching and editing groups, searching and editing disaster victims, listing all groups and generating reports such as drill down by group, drill down by shelter, drill down by incident etc...



**Figure 1. Flow And Content Of Forms When Adding A Group And An Individual**

### *Disaster Victim Registry Home Page*

The Disaster Victim Registry Home Page gives a basic description of the Disaster Victim Registry what it's features are. This is mainly done to provide the users with a summarized view of what they may expect from the Disaster Victim Registry and how it maybe used to track disaster victims. The Home Page also increases the overall visual appeal and provides a list of the latest updates on disaster victims.



Each individual that was victimized during the relevant disaster is added to a particular group. The group information is captured prior to the individuals. Groups are generally identified as passengers, families, tourists, etc... and can be customized at the administration menu as one prefers. Each group is identified by their relevant head of group. In the first form of the add new group wizard the group type, group head information, number of members including the count of male, female and children as well as the missing, injured and found are captured. In the second form displaced location of the group, the current location and the GIS map location is captured. In the final form of the wizard checklist items such as water, sanitation, food, clothes, etc... required by group are captured. Only the full name of the group head set as a required field so that end user can easily skip form elements and navigate through the wizard easily thus preventing redundancy and making it more efficient.

The screenshot shows a web browser window titled "Sahana FOSS Disaster Management System - Firefox". The address bar shows the URL: `http://localhost/~isuru/sahana0.5beta/www/index.php?mod=dvr&act=add_new_grp`. The page header includes the Sahana logo and the text "SAHANA Disaster Management System". A sidebar on the left contains a "DISASTER VICTIM REGISTRY" menu with options like "Home", "Add Disaster Victim(s)", "Add New Group", "Add New Individual", "Edit Disaster Victim(s)", "Search and Edit Group", "Search and Edit Individual", "List groups and persons", "List All groups", "List All persons", "Reports", "Drill Down By Group", "Drill Down By Shelter", and "Drill Down By Incident". Below this is a "SAHANA MAIN" menu with options like "Sahana Home", "Situation Mapping", "Missing Person Registry", "Disaster Victim Registry", "Organization Registry", and "Done". The main content area is titled "Add New Group" and includes a key: **\*req** - Fields tagged with this have to be filled to submit the form successfully. The form has two sections: "Select Group Type" with a dropdown menu set to "family" (marked with **\*req** and a help icon) and "Head Of Group" with fields for "Full Name" (marked with **\*req** and a help icon), "Family Name", "Local Name", "NIC No", "Upload Photograph" (with a "Browse..." button), "Mobile", "Telephone", and "Email". Each field in the "Head Of Group" section has a help icon. The bottom of the browser window shows a taskbar with various application icons.

**Figure 3. Adding A Disaster Victim Group**

#### *Customization of the Check List Through the Administration Menu*

The item checklist which appears when adding a new group is customizable through the administrative interface. The administrator is shown the available services and will be prompted for new checklist items which are dynamically added to the form interface at the runtime.

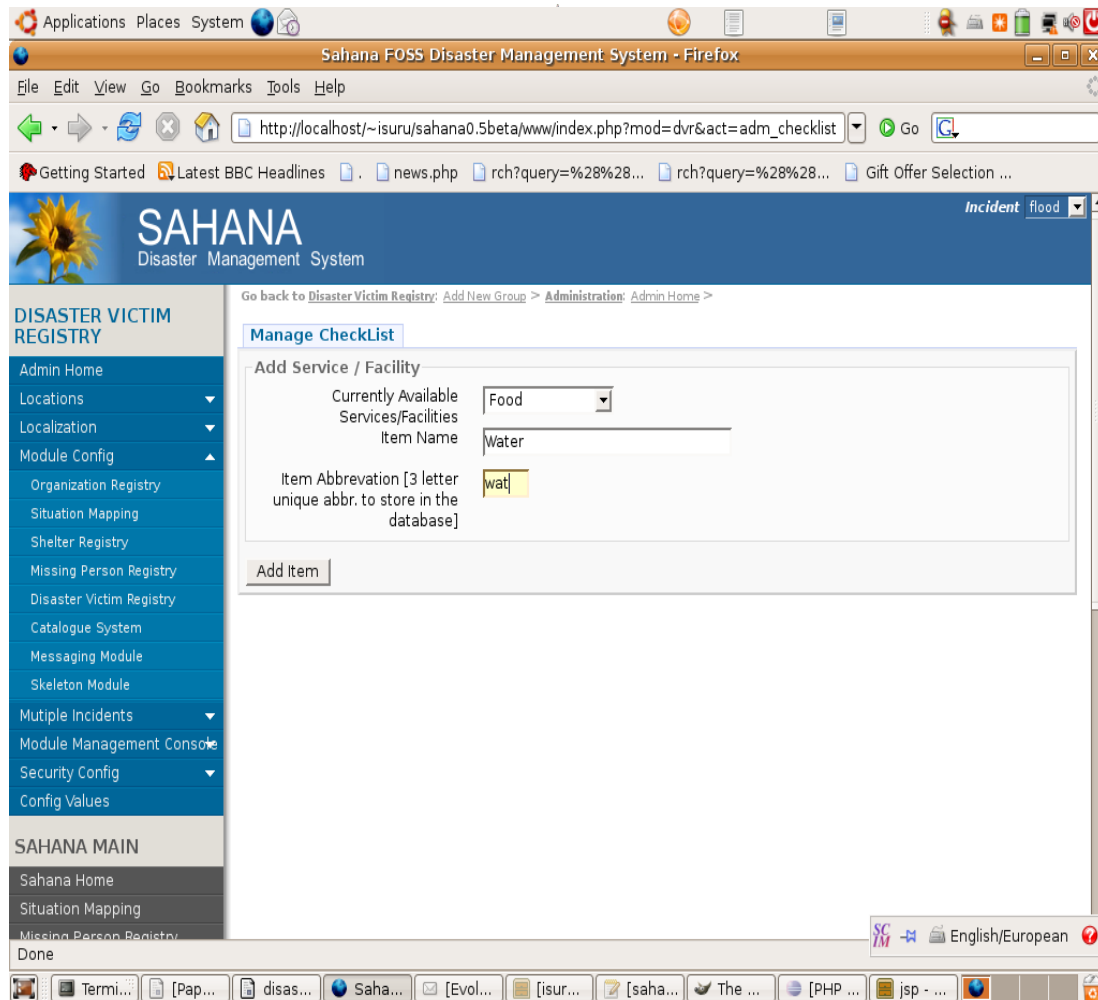


Figure 4. Customizing Victim Group

#### *Adding An Individual Victim*

The data entry operator has to identify the group type in which the victim belongs to and once he selects the group type all the heads related to that group will be populated in a drop down menu dynamically. Then the data entry operator has to select the corresponding group head and continue filling his basic details such as the full name, family name, marital status, religion etc... identification information such as an identity card number, a driving

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license number etc.. he may also upload a photograph of the victim and fill in contact details such as the victimized individuals address, phone number and mobile number etc... In the next form of the wizard the location details of the individual victim is captured. The data entry operator may enter his displaced location, current location etc... and even map his location on a GIS map. In the final form of the wizard finger print and physical information is captured. To make the data capturing easier and to prevent redundant data being entered only the full name is marked as required in the disaster victim basic details form. The Disaster Victim Registry is mainly used during the aftermath of a disaster to capture information on disaster victims.

The screenshot shows the Sahana FOSS Disaster Management System interface in a Firefox browser. The address bar shows the URL: `http://localhost/~isuru/sahana0.5beta/www/index.php?mod=dvr&act=add_new_indv`. The page title is "SAHANA Disaster Management System". The left sidebar contains a "DISASTER VICTIM REGISTRY" menu with options like Home, Add Disaster Victim(s), Add New Group, Add New Individual, Edit Disaster Victim(s), List groups and persons, and Reports. Below this is the "SAHANA MAIN" menu with various system modules. The main content area is titled "Add New Individual" and includes a key: "\*req - Fields tagged with this have to be filled to submit the form successfully". The form has two main sections: "Select Group Type" and "Basic Details".

**Select Group Type**

Please select a Group that describes you well

Type of Group:  \*req ? HELP

Select the group head:  \*req ? HELP

**Basic Details**

Full Name:  \*req ? HELP

Family Name:  ? HELP

Local Name:  ? HELP

Date of Birth (YYYY-MM-DD):  ? HELP

Age Group:  ? HELP

Gender:  ? HELP

Marital Status:  ? HELP

Figure 5. Adding A Disaster Victim

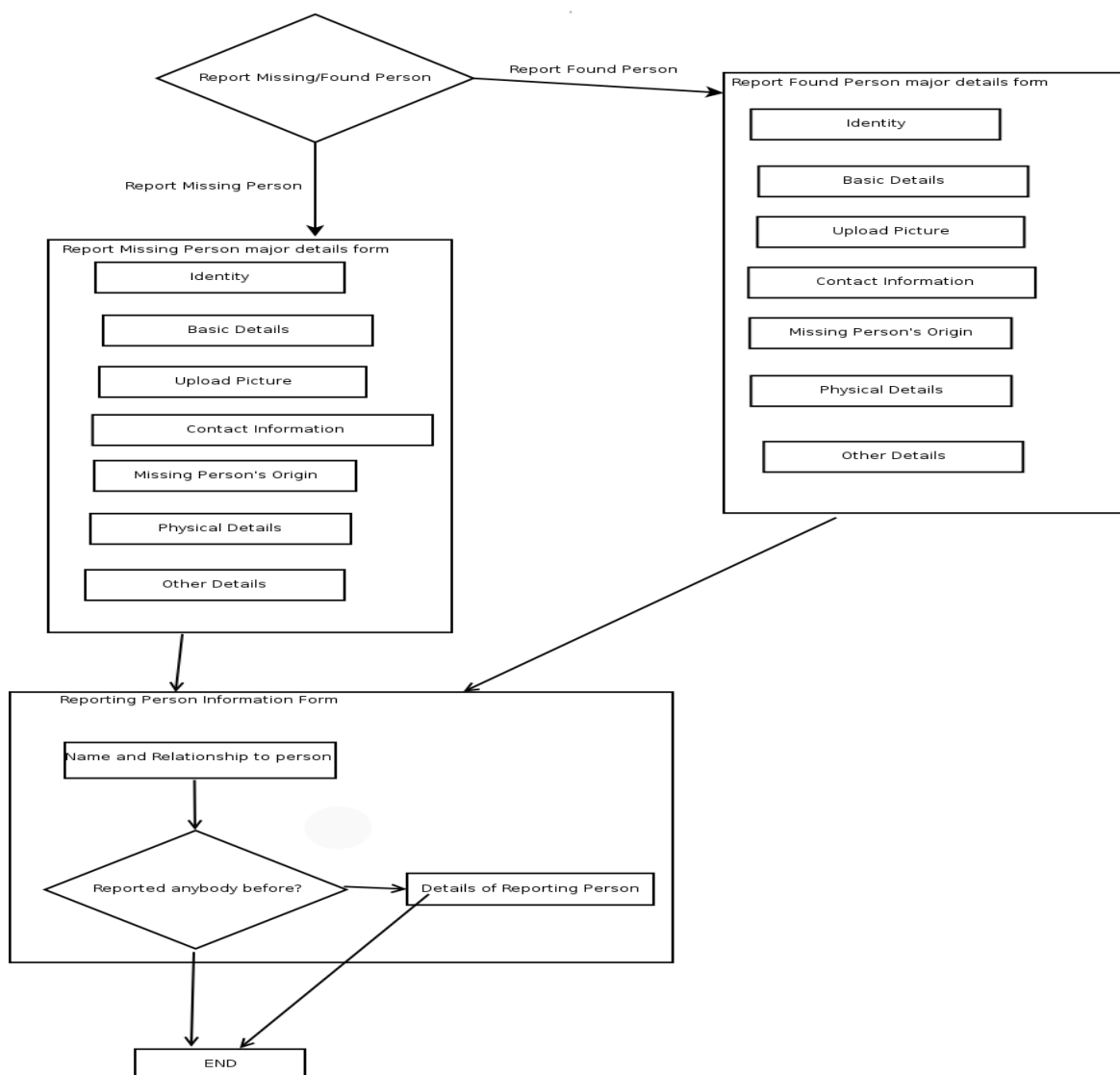
## Missing Person Registry

The Missing Person Registry is an online bulletin board of both missing and found people. Typically in a disaster scenario a missing person refers to an individual who has been victimized by the disaster and cannot be located or found. The relief coordinating body operating the Sahana Missing Person Registry may define the status of victims

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as missing or found. Not only does the Missing Person Registry capture information about people missing and found, the information of the person seeking them is also captured for efficiency. For example... if two members of a family are looking for the head of the family, by tracking the information mentioned above we may use this data to connect those two family members to each other. Among others the major features in the Missing Person Registry it has the ability to add meta data of the victimized individuals such as their identification numbers, visual appearance, last seen location, missing or found status etc... and a “sounds-like name search” which implements metafore and soundex algorithms thus proving useful when the searching algorithm simply does not match the text. In such a case it matches the sound of the word and improves the performance of the search functionality. It is also equipped with picture uploading capabilities providing the user with the ability to add a picture of the missing person.



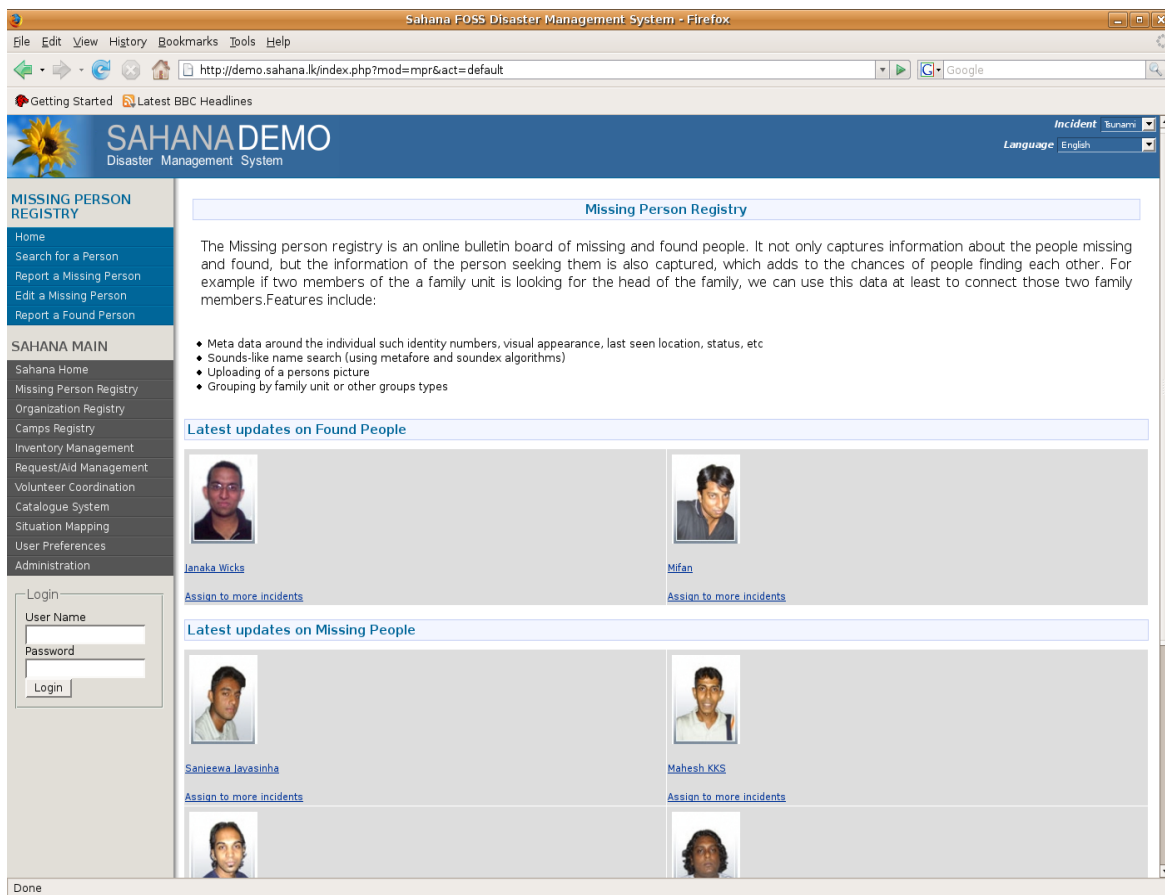
**Figure 6. Flow And Content Of Forms When Reporting A Found And Missing Person**

#### *Missing Person Registry Home Page*

The Missing Person Registry Home Page gives a basic description of what it is and it's usefulness in a disaster situation. This is mainly done to provide the users with a summarized view of what they may accomplish with the

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use of the Missing Person Registry. The Home Page also increases the overall visual appeal and provides a list of the latest updates on missing and found people.



**Figure 7. Missing Person Registry Home Page**

### *Reporting A Missing Person*

A missing person is identified by a card type or full name. Along with the full name the family name, local name, age group, gender, marital status etc... may be provided. Information such as an identity card number, passport number, driving license number etc... and an optional photograph uploading functionality may also be provided.

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Contact information such as the address, phone and mobile numbers and physical details such as the eye color, skin color and other information such as the blood type may also be captured. Another feature of the Missing Person Registry is that other than just tracking the missing individuals it also tracks the reporting individual and the relationship between reporters and the missing people are added thus smoothening the process. The name, relationship to person being added and the contact details of the reporting person are captured.

Before reporting a missing person one is strongly encouraged to do a search and see whether the person is already in the database prior to adding him. Only the full name of the missing person is marked as required to prevent redundancy when entering information.

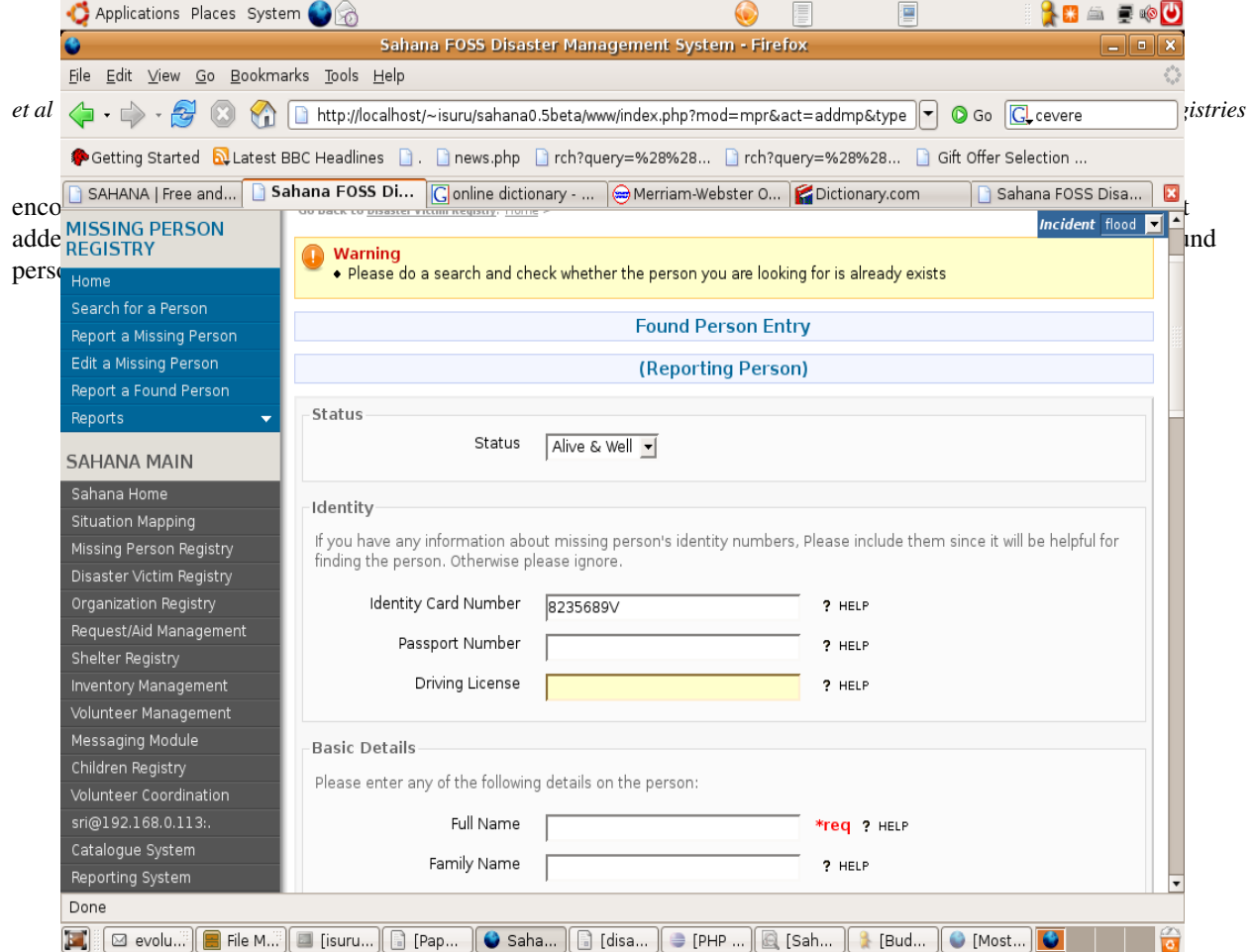
The screenshot shows the Sahana FOSS Disaster Management System interface in a Firefox browser. The address bar shows the URL: `http://localhost/~isuru/sahana0.5beta/www/index.php?mod=mpr&act=addmp&type`. The page title is "Sahana FOSS Disaster Management System". The left sidebar contains a "MISSING PERSON REGISTRY" menu with options: Home, Search for a Person, Report a Missing Person, Edit a Missing Person, Report a Found Person, and Reports. Below this is the "SAHANA MAIN" menu with various system modules. The main content area has a "Warning" message: "Please do a search and check whether the person you are looking for is already exists". Below the warning is the "Missing Person Entry" form, which is titled "(Reporting Person)". The form has two sections: "Identity" and "Basic Details". The "Identity" section includes fields for "Identity Card Number", "Passport Number", and "Driving License", each with a "? HELP" link. The "Basic Details" section includes fields for "Full Name", "Family Name", and "Local Name", each with a "? HELP" link. The "Full Name" field is marked as required with a red asterisk and the text "\*req".

**Figure 8. Reporting A Missing Person**

### *Reporting A Found Person*

A found person may be searched by his name, what it sounds like or any card number that he may have entered. Then his status may be changeable accordingly. User specific statuses are configurable by the administrator and the general states are alive and well, missing, injured or deceased. Before reporting a found person one is strongly

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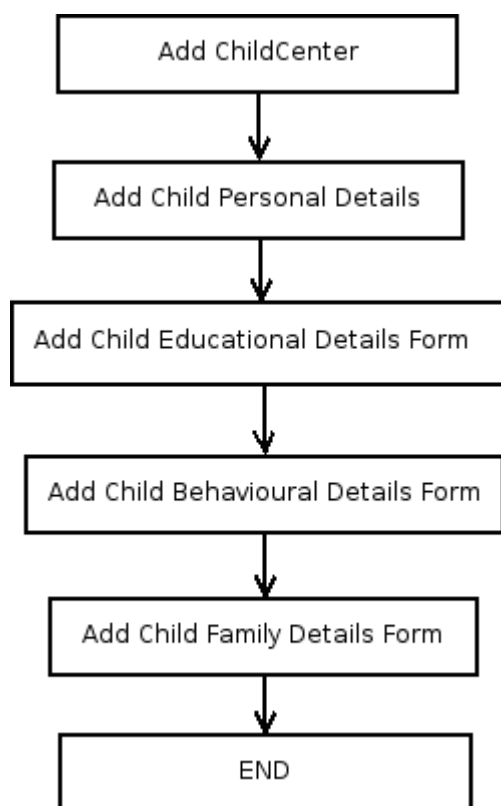
**Figure 8. Reporting A Found Person**

## Children Registry

Children Registry is the central repository to manage children affected during a disaster and helps to coordinate individual child activities in an efficient manner. Major functions provided by the system include the abilities to track, edit and modify child personal details, health details, education details, behavioral details and details of the

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relations of that child in separate forms and to generate reports based on the selected criteria. In the Add Child Center form information related to the center tracking the child such as the center name and center code are captured. In the child personal information form information such as the full name, family name, religion etc.. are captured. In child educational details form information such as the school name, extra classes he may attend, any school friend's names etc... are captured. The user may also add information on the child's behavior and his family and/or relative's details using the respective forms.



**Figure 9. Flow Of Forms When Adding A Child**

#### *Children Registry Home Page*

The Children Registry Home Page is linked directly with the Basic Details page thus allowing the user to view what may be added into the Sahana Children Registry in a tabbed format. This is mainly done to provide the users with a summarized view of what aspects of a child they may need to capture when storing data of a child. The Home Page

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also increases the overall visual appeal of the Children Registry.

The screenshot displays the Sahana FOSS Disaster Management System interface in a Firefox browser. The page is titled 'SAHANA Disaster Management System' and is specifically for the 'CHILDREN REGISTRY'. The left sidebar contains navigation options such as 'Add New', 'Search, Edit Or Delete', and 'SAHANA MAIN'. The main content area is titled 'Child Personal Data' and features several tabs: 'Basic Details', 'Health Details', 'Educational Details', 'Behavior Details', 'Family Details', and 'A Relatives Details'. A key note indicates that fields marked with '\*req' are required for successful form submission. The form fields include 'Child Code', 'Center Name', 'First Name', 'Last Name', 'Family Name', 'Date of Birth (YYYY-MM-DD)', 'Place of Birth', 'Current Address', and 'Coming From'. Fields marked with '\*req' are Child Code, Last Name, and Date of Birth.

**Figure 10. Children Registry Home Page**

### Special Feature

Query view is used to manipulate and select user specific criteria that needs to be added into the reports. These are then used to provide various report generation capabilities thus enabling relief organizations effectively coordinate the relief process. The generated report can be transformed to various formats such as excel, pdf and word etc...

The screenshot shows the Sahana FOSS Disaster Management System interface in a Firefox browser. The address bar shows the URL: `http://localhost/~isuru/sahana0.5beta/www/index.php?mod=cps&act=queryview`. The sidebar menu on the left includes options like 'Add New', 'Add A New Child', 'Add A New Child Care Center', 'Add A New Child Reporter', 'Search, Edit Or Delete', 'Child', 'Child Care Center', 'Child Reporter', 'Backup/Restore Database', 'Query View', and 'GoToQueryView'. The main content area displays the 'Query View' form for the 'Children Registry'. The form includes fields for 'Gender' (set to 'Male'), 'Age Group' (set to 'Unknown'), 'Date registered' (with 'Year' and 'Month' dropdowns), 'Child Center', 'Description' (with 'Name of the child' and 'Name of the Family' text boxes), and several checkboxes for 'Child have birth Certificate', 'Child Registered in School', 'Child Attending school before tsunami', 'Child Attending school after tsunami', 'Child lost his parents', 'Child with disability', and 'Afraid of another tsunami'. A key message at the top states: 'Key: \*req - Fields tagged with this have to be filled to submit the form successfully'.

Figure 11 Children Registry Query View

## CURRENT DEPLOYMENTS

Sahana has currently been deployed successfully for the following:

1. **Tsunami** - Sri Lanka 2004 - Officially deployed in the CNO for the Government of Sri Lanka

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Sahana is a disaster management system that grew out of the 2004 Asian Tsunami disaster that devastated many of the countries in Asia bordering the Indian Ocean. In Sri Lanka, one of the countries hardest hit by the tsunami, information and communications technology (ICT) volunteers put together the Sahana Disaster Management System to help track families and coordinate work among relief organizations during and after the tsunami disaster.

2. **AsianQuake - Pakistan 2005** - Officially deployed within with NADRA for the Government of Pakistan

Sahana was deployed in Pakistan together with the support of NADRA (National Database and Registration Authority of Pakistan and IBM Pakistan. NADRA had a comprehensive people database as they built and maintained the central system that maintains the registration of people (identity card, passport, etc) in Pakistan, however the system is not web based and under tight security controls. Thus Sahana fills the gap of making the data accessible to the other organizations involved in the relief effort such as the NGOs.

3. **Southern Leyte Mudslide Disaster - Philippines 2006** - Officially deployed with the NDCC and ODC for the Government of Philippines

Sahana was deployed last 3 March 2006 at St. Bernard, Southern Leyte, by the National Disaster Coordinating Council (NDCC) with the technical support of the Advanced Science and Technology Institute (ASTI) of the Department of Science and Technology (DOST). It has been deployed in the country to help in the rehabilitation and rebuilding phase for the hapless victims of the mudslide in St. Bernard, Southern Leyte.

4. **Typhoon - Bicol Philippines 2006** - Deployed for the Typhoon that occurred in Bicol Philippines

When a typhoon hit the Philippine province of Bicol in early December 2006 A Stockholm Challenge Finalist of HotCity Wireless wanted to help, but, while he knew how to deploy wireless networks to replace the damaged telecommunications infrastructure, he needed tools to connect donors, volunteers and victims to solve the many problems that had arisen. But he happened to remember another finalist, a disaster response project from the Health category that had an application for exactly that purpose. A quick search of the Challenge database gave him the answer he needed, a project called Sahana. Within three hours after contacting the Sahana team jay had his co-ordination tool website up and was registering volunteers and donations even before the Philippines had been able to give permissions for HotCity Wireless to deploy its local networks.

5. **Terre des Hommes - Sri Lanka 2006** - Deployed with new Child Protection Module

Terre des Hommes is a NGO operating in Sri Lanka to help children affected from tsunami in eastern Sri Lanka. The customized version of SAHANA was deployed to capture information on children related to their education, behavior and health .The system was able to analyze the data and generate reports in excel, pdf etc... formats. The system was fully deployed on a windows environment and a user familiarization session was conducted to ease the usage.

6. **Yogjarkata Earthquake - Indonesia 2006** - Deployed by ACS, urRemote and Indonesian whitewater association and Indonesian Rescue Source

In early 2006 concerns that the Mount Merapi volcano might erupt led the Australian Computer Society to ask UrRemote to prepare a report on the feasibility of deploying Sahana to assist relief coordination. The report was completed just as the Yogya earthquake occurred; the Indonesian Whitewater Association and Indonesian Rescue Source deployed Sahana with technical support from UrRemote, and assistance by ACS and the Sahana core team.



## CONCLUSION

The Sahana victim registries namely the Disaster Victim Registry, the Missing Person Registry and the Children Registry are very well suited and have been successfully deployed for large scale disasters. All three modules can be deployed independently or together depending on the need of the targeted disaster scenario and are they are designed to have a tight integration when deployed simultaneously.

## ACKNOWLEDGMENT

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