BRIDGE Newsletter

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Editorial

Dear Reader!

Thank you for showing interest in the BRIDGE research project by reading this newsletter. In the previous edition we proudly introduced the project and our overall technical vision. Hopefully, we managed to give you the understanding that interoperability in emergency operations is a life-saving necessity, albeit achieving this in practice is rather complex and not straightforward. Interoperability requires that individual systems can communicate and exchange information with other systems, and make good use of the received information. Furthermore, innovative technical solutions should be compatible with the operational procedures, or be good arguments for improving the procedures.

This newsletter presents a first set of concepts developed in BRIDGE. Some of these deal with support for the incident command, ranging from new ways to visualise the information to have a common operational picture of the crisis scene and an overview of the available resources and the risks involved with various decisions. Making the right choices requires the right information from the right people, and is it is a challenge to extract the important data while suppressing the noise, especially in potentially voluminous multimedia sources.

At the individual level we propose two concepts: One application tries to involve the victims and to have them provide important on-scene information about what has happened and where; the other aims to inform the incident commander and the rescue workers about where victims have been found and the severity of their conditions. This may help assuring conscious victims that help is coming, and facilitate the evacuation of the casualties in the right order.

All of these concepts are example of applications and systems that need a network to communicate, and therefore may not work if the existing infrastructure has been severely damaged by the event or if there is no pre-existing communication infrastructure, as is unfortunately often the case in remote areas or tunnels. BRIDGE is therefore researching into how the infrastructure can be provided on-demand.

The above concepts are not the products of the project team's imagination, but responding to real needs of real emergency workers whose input we have obtained in a series of co-design workshops. We hope that you may understand this research methodology better through the few glimpses we provide in this newsletter.

In September we will demonstrate the presented concepts in a live demonstration focused on fire in a tunnel. I do hope this will confirm that we are on the right track, and I hope that you will pick up our next newsletter to read more about how that exercise went!

Geir Horn, SINTEF
Project Coordinator

In this issue:

BRIDGE will demonstrate its concepts in a tunnel fire exercise in September 2012.

BRIDGE Master

Supporting Coordinated Response to Large-Scale Emergencies

For emergency managers responding to large-scale incidents it is a big challenge to take the most appropriate and coordinated actions necessary to save lives and assets. The BRIDGE system will provide the incident commanders and their teams with the tools, which will help them to make coordinated assessments of the situations, coordinated planning, coordinated decision making and coordinated information gathering and sharing. The main component, which enables this coordinated view for the different leaders, is the *BRIDGE Master*. The BRIDGE Master is a component that provides basic functionality for visualization and management of all collected information and available resources during an incident and assists the leaders in making appropriate decisions using the BRIDGE system.

One of the main functions of the BRIDGE Master is an interactive map of the incident site. It is likely to be predominantly used on-site and in incident command centres, but also local leaders with mobile devices like a tablet will be provided with the map functionality. The map has several layers of geo-referenced information, such as:

- Location of severely injured or persons buried in the rubble;
- Location of fire hydrants;
- Location of vehicles;
- Location and status of first responders;
- Current weather forecast;
- Toxic plume.

Mockup of the common operational view.

By making decisions visible in the movement of resources, the BRIDGE Master supports – amongst other things – the principle that decisions should be taken at the lowest appropriate level, while co-ordination should be facilitated from the highest necessary level.

Normally, in large emergency response efforts, tracking and allocation of resources must occur in close cooperation with a central staff responsible for managing the logistics of the response. The BRIDGE Master will improve on that by making use of sensors and other geo-localised devices that are integrated into the BRIDGE system to visually track these resources. For each resource, the users of BRIDGE Master will be able to determine its (current) owner/commander, its status (availability, scarcity), whether others request it.

The BRIDGE Master will be developed to support cross-organisational teams both co-located and separated. The system will also provide tailoring based on roles, so it will also support an adapted but common view on different levels from tactical to strategic.

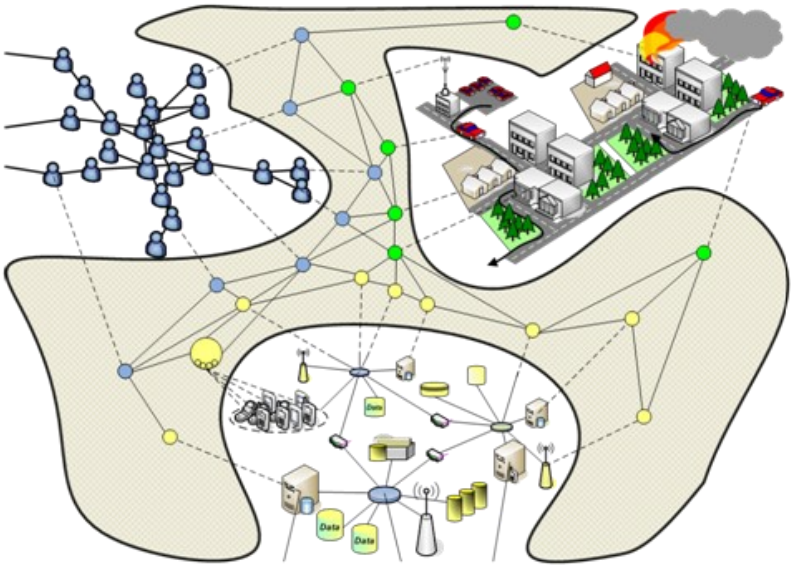
To enable this flexibility, the BRIDGE Master will be developed to support different end-user equipment from Android based tablets to larger Windows based tables or screens.

Microsoft Surface table supporting team work.

BRIDGE Resource Manager

Improved Support for Resource Management During Emergency Response

The objective of the *Resource Manager* is to provide drastically improved support for resource management during emergency response operations. It enables its users to identify and announce resources, to view information about resources from different agencies in real-time, and to allocate resources to specific tasks and locations.



Resources as clickable items on an interactive map.

The Resource Manager is an agent-based distributed system running on mobile devices (smartphones, laptops, tablets, MDTs) in combination with cloud-based services. Via these latter services, a tight integration with the *Master* concept is to be expected: resources and their status will be visible as clickable icons on an interactive map. Also, the assignment of resources to tasks and usage of the related decision support system can be done directly from the interactive map.

Various different communication media and protocols can be used by the Resource Manager in order to provide a robust and fully functional application even in circumstances with limited connectivity. For example, the Resource Manager will be able to make use of the *BRIDGE MESH* concept for communication between end user devices and with the cloud services, but will also be able to exploit HTTP connections over Wifi/GPRS/UMTS, if available.

Intended Users

The discovery and notification functionality is to be used by everybody involved in a crisis situation, both institutionalized first responders and citizens providing opportunistic support.

The allocation functionality of the Resource Manager is also intended to be used by personnel working at centralized command centers (e.g., operative centrals, call centers), and by command personnel working at incident control posts.

Intended users - emergency response personnel.

The real-time information visualization functionality is intended to be used by all actors from the agencies involved in the emergency response effort, including not only commanders, but also field workers and others.

Functionality

The Resource Manager typically provides the following functionality:

- Register / identify resources;
- Register / identify tasks;
- Assign tasks to resources either centrally or locally;
- Provide both local and centralized decision support for resource allocation;
- Monitor the location, state, availability and capabilities of resources;
- Propagate local decisions to upper echelons;
- Low-level (sub)task planning (typically local);
- Distributed analysis of data about earlier events and training-relevant events;
- Distributed prediction and forecasting functionality of resource location and status .

Technology

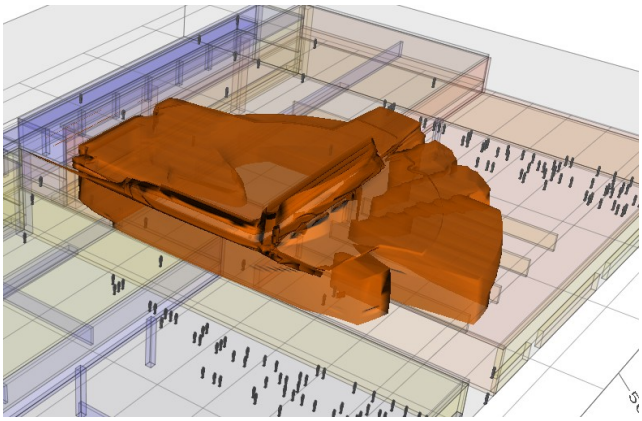
The Resource Manager is directly linked to resources by means of devices such as smartphones and MDTs. It uses an offline local data store, which can be synchronized periodically with other devices and/or with a data store in the cloud.

The Resource Manager will most likely make use of the Emergency Data Exchange Language (EDXL) to facilitate sharing of resource information and allocation requests. EDXL is a XML-based messaging standard for emergency-related organizations. Furthermore, compatibility with lightweight data exchange and integration protocols (e.g., JSON, RPC), architectural styles (e.g., REST), and open standards for data persistence (JDO, JPA, JTA) is envisaged.

BRIDGE Risk Analyzer

Supporting Emergency Risk Analysis and Communication

When an emergency or crisis occurs, big decisions need to be made on the basis of risk analysis, such as: Is it safe enough for rescue workers to enter the area? Do we need to evacuate the public from the surrounding area? Making the right decisions depends on a good understanding of the current risk picture:



3d model of a blast wave from a suitcase bomb at an airport departure hall blocked by a massive side wall.

- What are the assets, i.e., the things we need to protect, and what potential incidents may cause harm? Assets typically include the health and safety of the public and the responders, the environment, buildings and infrastructure, and so on.
- How likely are the incidents to occur, and what will be the consequence (impact) with respect to the identified assets?
- What are the available options to reduce the likelihood or consequence?

The nature of emergency and crisis situations makes these tasks very challenging. As the situation may quickly change, there is little time to collect and process the information needed to perform the analysis. Moreover, the analysis often requires participation from a number of different people, including external experts on specific domains, who may not be located together on the incident site.

The purpose of the *BRIDGE Risk Analyzer* is to support risk analysis during emergency and crisis situations where the decision time frame is longer than a few minutes.

The BRIDGE Risk Analyzer can be deployed on interactive multi-user tables aimed at incident command and command central, as well as on smaller tablet computers carried by selected individuals. It is based on graphical risk models represented in a slightly simplified version of the CORAS risk modeling language. For foreseen types of emergency scenarios, a library of predefined risk models will provide starting points for the analysis, to be filled in and tailored to the specific scenario when it occurs.

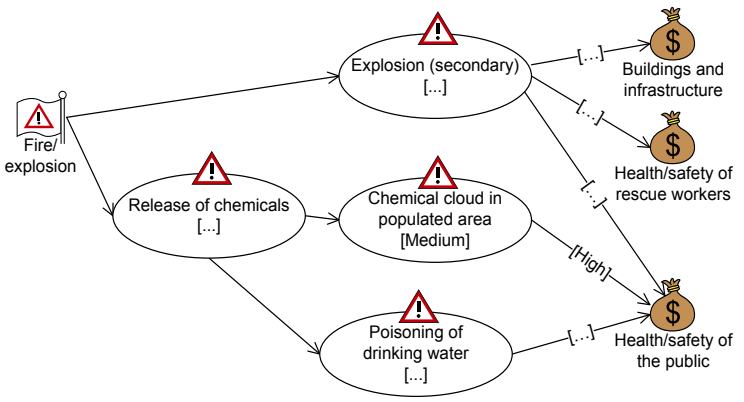
The graphical modeling language is very simple in order to ensure that the models can be intuitively understood by involved actors with different background and training, such as police, fire fighters, medical personnel, NGO representatives and external domain experts. By pointing to an unwanted incident (illustrated by a warning triangle), a new menu will appear that allows the user to:

- View a checklist of issues and information that should typically be considered when assessing this type of risk;
- Insert new entries and information to this checklist as it becomes available;
- Obtain support from external experts through dedicated collaboration tools (Dynamic Expertise Integration Network, Scenario-Based Multi-Criteria Decision Analysis);
- View 3d models, object plans or other visual information related to the incident;
- Locate the risk on a map;
- View mitigation options.

Likelihood and consequence assessments can be inserted in the brackets on an incident and the relation from an incident to an asset, respectively. If the combination of the likelihood and the consequence represents a high risk, a warning is trigged. This may result in a message to relevant actors based on roles or location.

The risk model can be viewed and edited from different devices located at different places, thereby supporting information sharing and distributed analysis, and contributing towards a common operational picture.

After developing the Risk Analyzer as a paper prototype and obtaining feedback from end users, work has now started on the technical development of the tool.



A simple risk model. Note that this model is only meant to illustrate the approach, and is not the result of a realistic analysis.

BRIDGE Information Aggregator

Facilitating Aggregation of Data Collected During an Emergency

The *Information Aggregator* – a specific BRIDGE component developed at Klagenfurt University – facilitates the aggregation of data collected during an emergency. Currently, we focus on the aggregation and analysis of social media data (e.g., from Flickr or YouTube) to support emergency management. Studies show that social media data is an important instrument during a disaster, due to the fact that people report and describe any kind of situation they are involved in. Hence, the increasing usage of social media platforms delivers valuable insight into crisis-related issues.

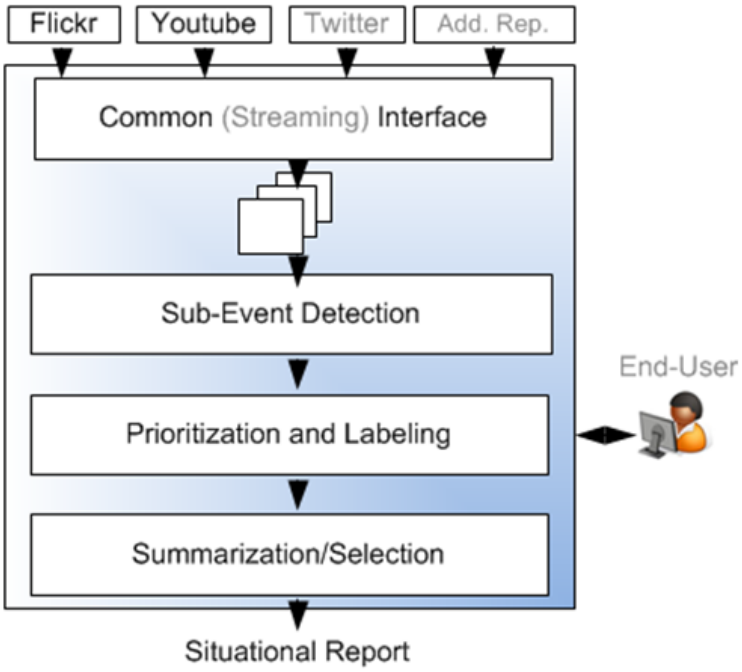
In case of large-scale emergencies, it is obvious that a huge amount of data is gathered and shared. Manual browsing through this amount of data in stressful situations is a time-consuming and cumbersome task. Therefore, the Information Aggregator can be seen as a Media Exploration Framework that relieves the user from this manual activity.

The framework supports an after-the-fact analysis of data related to a crisis. At the moment, it facilitates the identification of sub-events (specific hotspots of a crisis). Sub-events describe dominant threats in a crisis that need immediate emergency response to stabilize the situation.

Tsunami crisis in Japan, March 2011.

Events are often seen as a whole not recognizing the different facets, namely the sub-events. For example, also a soccer game, seen as a famous sport event, contains sub-events. Hence, goals recognized as specific sub-events have particular influence on the game. This is also true for crises, where specific hotspots (e.g., collapse of buildings, impact of an earthquake or tsunami on critical infrastructure) have an influence on the situation at hand.

We studied clustering techniques as an unsupervised learning approach to identify such sub-events based on crisis-related data from Flickr and YouTube. Each identified cluster represents a specific sub-event. To detect sub-events, the Information Aggregator performs several processing steps. First, a keyword-based query (e.g., "UK riots 2011") is set up that delivers the most important images and videos related to the keywords, from Flickr and YouTube. The resulting metadata fields of each item (image or video) are used to create a representation suitable as input to the clustering algorithm. Especially, we used metadata fields like title, description and tags associated with each item. Through natural language processing, a so called word vector (word-value pairs) for each item is created. This representation acts as input to the clustering-based sub-event detection.



Information Aggregator as media exploration framework.

We studied two clustering techniques: self-organizing maps and agglomerative clustering, which show suitable characteristics for the identification of sub-events. Based on the identified clusters, a prioritization/labeling mechanism is performed, which ranks the clusters based on their importance and creates for each cluster composite labels. This results in a suitable, user-readable overview of the extracted information.

In future work, we want to extend this framework to stream processing analysis that identifies sub-events in real-time. We also plan to further refine the static analyses (especially for an after-the-fact crisis analysis). Another future direction is the inclusion of additional sources (e.g., data collected directly in the BRIDGE project, Twitter or news media). We also intend to develop a user-friendly representation of the cluster results.

BRIDGE MESH

Supporting Communication Over Different Exploitable Channels

In an emergency situation the first network to become unavailable are cellular networks. Although emergency forces have priority to use this form of communication, the access may still be limited and victims at the emergency area have no possibility to send their help requests. *BRIDGE MESH* will provide the possibility to communicate with devices in an emergency area over different exploitable channels.

Network Triangle

When talking about exploitable channels we have to distinguish between different kinds of network:

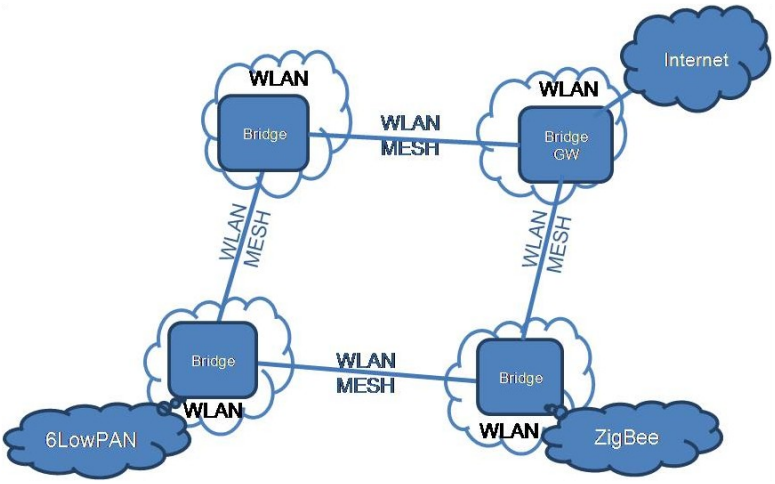
- There are networks, which are pre-installed for an area. We call this kind of networks *infrastructure*. It obviously includes the cellular network but also there are networks installed for special environments.
- At a disaster site arriving forces may deploy *ad-hoc* devices. These devices are designed to adapt to the dynamic nature of the network and to support emergency forces and victims. Example of such systems is a WiFi access points installed on top of fire trucks.
- In today's digital world devices with wireless interfaces are found everywhere. These resources can be used *opportunistically* to extend the services of the network. For example smart phones can be used as repeaters of packets or building control systems' sensors can be queried for context information.

BRIDGE MESH Architecture

MESH is an ad-hoc network, which will be based on deployed MESH Bridges, which have multiple network interfaces beside a 802.11s interface. As first responders arrive at the incident site and explore the region they carry the MESH Bridges with them and place them at given distances. The MESH Bridges create an ad-hoc WiFi network, where data is forwarded over multiple hops. Through this deployment the area gains network coverage.

Hardware

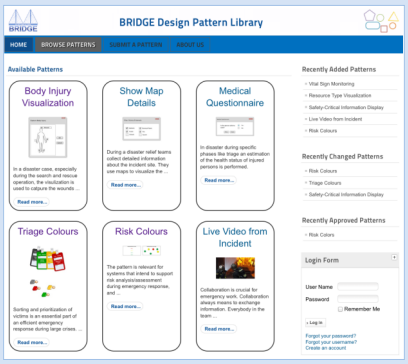
The hardware used as MESH Bridges are Libelium's Meshliums. These waterproof housed routers provide interfaces for 802.11g, ZigBee, 802.15.4, GPRS and GPS location information. They run full functional Linux Debian distributions and provide an easy to use web configuration page. They implement OLSR routing protocol for mesh construction and provide common access point functionality in their proximity.



BRIDGE MESH Architecture.

This network can from now on be used by different emergency forces, as a shared medium, over which communication or other data can flow. Additionally MESH Bridges accept local networks to attach to them (like ZigBee networks, Bluetooth piconets, etc.). These local systems can from now on be reached over the Bridge MESH and data can be forwarded between them and the Incident Command Centre.

This hardware is a very good starting point for all the development planned for Bridge MESH. The provided tools make a quick learning cycle possible and the powerful platform makes us able to run all the foreseen applications. The integration of "landmark" and eTriage has been initiated and we are collecting experience for developing applications on Bridge MESH.



BRIDGE Design Pattern Library

The BRIDGE Design Pattern Library (DPL) accompanies the engineering efforts undertaken within interface and prototype design and domain analysis by incorporating findings and early concepts right from the beginning of the exploratory research work. All stakeholders that are involved in the design, analysis and validation process contribute to the library from the very first minute. An evolutionary community process is applied to contribute, comment and refine the design pattern library. The more research is performed on a certain topic, the more mature a pattern idea becomes. From ideas to patterns - the concept of the BRIDGE DPL (pattern-library.sec-bridge.eu).

BRIDGE RescueMe App

Supporting Victim Notification in Case of Emergency

Public participation is one of the most underutilized resources during crisis response. Due to the increasing ubiquity of smartphones (and further portable devices as tablets) members of the public have the possibility to access the Internet over various forms of network technologies as 3G or Wi-Fi. Driven by the strong emergence of social media services citizens can express their status or needs when being at various locations and times, in daily life and in crisis situations.

Though, in crisis incidents public participation is often blocked due to infrastructural damage, e.g., parts of the cellphone network have been destroyed or are jammed due to usage over its capacity. At this, the *BRIDGE RescueMe* concept aims at the design and development of viable solutions that facilitate members of the public to still communicate their emergency needs in crisis situations in spite of critical infrastructure disruptions. In the following, we outline one design sketch that aims at supporting victims who are stuck due to a disaster as an earthquake or crisis incident as a gun rampage.

RescueMe App

The main goal of the application is to provide victims with the means to inform rescue agencies about being in emergency and receive the confirmation that their notification was registered at the dispatch center. To do this, when starting the application the user needs to indicate if he or she is facing an emergency, upon which an emergency beacon is sent to the dispatch center. Then, the victim briefly answers four W-questions (Who? What? When? Where?) resulting in an emergency ticket that is also sent to the dispatch center. As soon as the received information is registered in the BRIDGE system the victim receives a confirmation message that personnel at command center are aware of his or her critical status.

RescueMe App.

For the very first designs we investigated findings from past incidents and organized brainstorming sessions with members of the public. In participatory design workshops with crisis response practitioners and past victims we continuously evaluated our design ideas and gained inspirations for new ideas. For this we utilized paper prototypes and high-fidelity software prototypes.

The application is intended to scale from being used in a small emergency (e.g., car accident) to a large-scale crisis (e..g., heavy earthquake). Hence, depending on the aftermath of the disaster on the network infrastructure features as calling the local dispatch center, sending multimedia files, receiving status updates on the progress of the response operation or how to get to collection point where medical assistant is provided, might or might not be possible. In case of critical infrastructure disruptions the relaying of data is accomplished through *BRIDGE Mesh*.

Hardware

Currently, development takes place primarily on the Android operating system. However, porting the design sketches to Windows Phone or iOS devices is also possible.

BRIDGE Participatory Design Workshop.

BRIDGE eTriage

Unobtrusive Augmentation of Triage Process

Triage professionals told us that, by putting a variety of sensors on the victims and having them report live to the command post, the commanders' situation awareness would be improved and the incident better managed. GPS, heart rate, breathing rate, and blood pressure were the crucial values to measure and report. However, development should not come at the price of complicating the triage process.

Fraunhofer FIT's key observation was that not all patients need all sensors. Those with minor wounds may need only a GPS sensor, while the critically injured may need many others. We designed a triage concept—*eTriage*—that combines presently-available technologies in new ways to unobtrusively augment the triage process.

The triage concept from Fraunhofer FIT puts a "triage bracelet" at its center. The bracelet connects to the MESH network and serves as network access point for all other sensors on the victim. The sensors are tagged by RFID and the RFID reader in the bracelet is used to "pair" the sensor and the bracelet by touching them for a split second. In countries where ID cards have an RFID/NFC chip, the triager can simply touch the victim's ID to the bracelet to identify the victim.

The GPS sensor in the bracelet detects position. All sensor measurements are logged to flash. The bracelet's color can be changed electronically for retriage. The bracelet is barcoded and its back has peelable barcodes or RFID tags for tagging personal belongings, to interoperate with current hospital procedures. The flex sensor detects when the bracelet is opened or closed, i.e. when a victim attempts to exchange the bracelet for a higher priority one. To minimize network traffic, sensor values are reported only when they change.

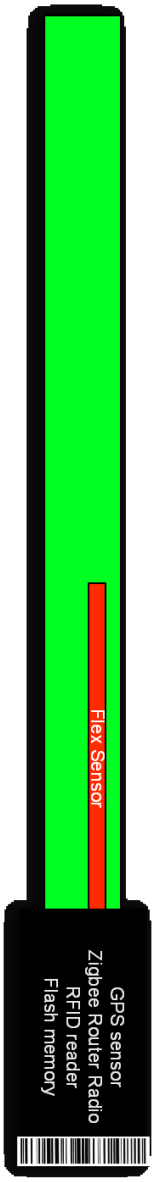
Data provided by the bracelets is visualized for incident commanders or ambulance staff via an app on the Triage Tablet device (a smartphone). The app shows live vital parameters and an overview of the emergency site.

In the *Map View*, the app shows the location and severity of triaged patients on a map relative to the medic's own location. The map rotates automatically to align to the medic's line of sight. It is available in satellite view, which helps orientation by landmarks, and in map view, which shows only streets and prevents distracting detail.

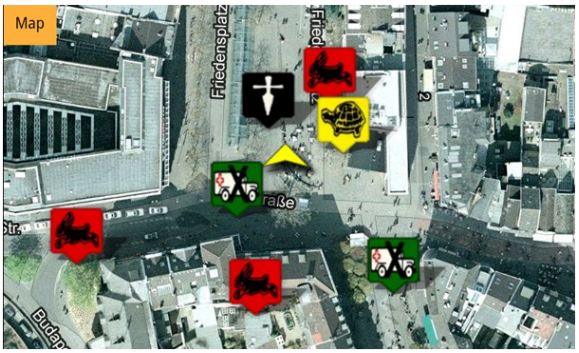
The *Augmented Reality* view allows the medic to "see through barriers" the location and category of the triaged patient, as an overlay over the device's camera image. In all views a tap on the screen brings up the ID and vital parameters of the victim, allowing a medic to remotely get a quick overview of the patient data.

When a victim is first triaged, the bracelet's GPS and clock are automatically initialized with values from the Triage Tablet GPS and clock. This shortens the initialization time of the bracelet's own GPS and allows the bracelet to timestamp events correctly from the beginning.

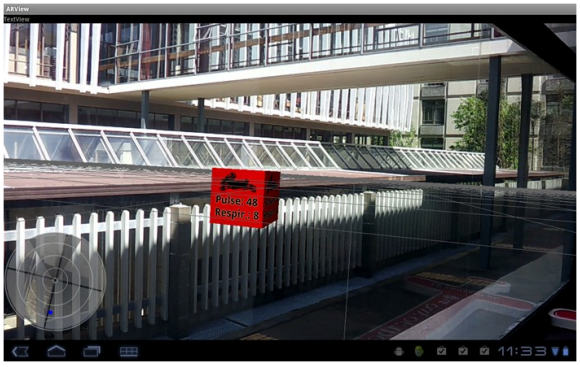
The current prototype reports the victim's ID number and triage category, GPS coordinates, and pulse values. It can detect removal of pulse sensor and opening/closing of bracelet (to detect exchanges of bracelets by victims themselves).



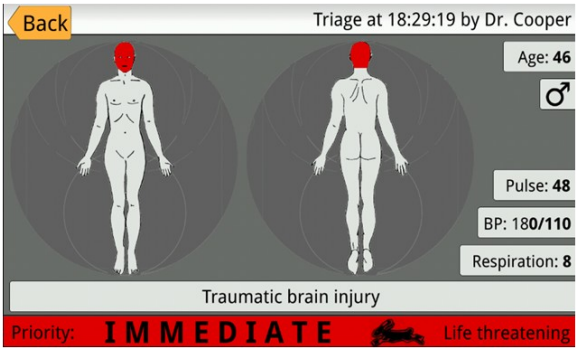
Triage Bracelet.



Map View.



Augmented Reality View.



Patient Data.

BRIDGE Co-Design User Workshops

The goal of the human-centred design approach is to ensure that the development, acquisition, and operation of an interactive system take the needs of the user into account. Complementary to the End-User Advisory Board, workshops with first responders provide a bottom-up perspective and practitioner's view to the BRIDGE project, in which their needs, desires, and current challenges are given extensive attention during the design process.

The overall goal of WP2 is to develop, facilitate, and document a user-driven innovation approach that folds ongoing domain analysis into the design and innovation process across the project. The workshops with domain experts are thus central in BRIDGE both for acquiring a deep understanding of the emergency response domain, and for involving those experts directly in the design process.

First Co-Design Workshop Oslo, Norway

The first in a series of three such workshops took place in SINTEF's premises

in Oslo, Norway, on the 29th of September 2011. The main focus was to explore and understand the complex practices of intra- and interagency collaboration during large-scale emergency response. Headed by Jan Håvard Skjetne, SINTEF, the workshop was planned and organized by participants from WP02 (domain analysis) and WP06 (interaction design), gathering 10 practitioners from Norwegian emergency response organizations: Fire and Rescue Services (Oslo and Bergen), Oslo Police district, Norwegian Police University College, the Western Norway Regional Health Authority, Stavanger University Hospital, Oslo University Hospital, Trondheim University Hospital, and Trondheim Municipality. The workshop covered several topics, including interagency collaboration, distributed situation awareness and decision making practices, risk assessment and engagement of experts, and media and the public.

Group work was the default method of information gathering. The experts were divided into three groups, each of which included representatives from each agency. Each group also had a facilitator, whose main responsibility was to assign the exercises, clarify any methodological issue, and keep track of time. Audio and video recordings were done by a technician, and a secretary supported the data collection process by taking notes and pictures.

Each group then participated in three consecutive workshop sessions (described in more detail below): (1) a domain analysis session focusing on current intra- and interagency work practices and challenges during large-scale emergencies; (2) a bluesky session in which the end users imagined and described future tools for tackling today's challenges – which, through comparison with those imagined tools, would also provide a test of the perceived usefulness of the BRIDGE concepts and prototypes; (3) a co-design session involving end users in an early phase of BRIDGE design, carried out using paper prototypes and basic artefacts. Short plenary sessions introduced and summarized each session.

Domain Analysis Session

This session was conducted by posing trigger questions about current work practices during large-scale emergencies. Of the list of questions that was generated before the workshop, the most important ones were posed to all of the groups, while the rest were distributed among them. The goal was to gather a broad range of information in a limited time, but still delve in depth into the main issues.

Four trigger questions were considered to be of major importance, and so they were the first questions posed to each of the three groups:

- How do you set up the emergency organisations on-site?
- Which roles and responsibilities can be identified?
- How do you obtain an understanding of the unfolding emergency situation?
- How do you maintain such an understanding?

The remaining questions on the list were distributed among the groups. They addressed communication issues, the decision making process, resource management, risk analysis, and interaction with bystanders, media, and experts.

Bluesky Session

This session was used to elicit thoughts and ideas about future tools. In our experience, experts sometimes constrain themselves during brainstorming, limiting their imagined solutions to what they consider to be realistic in today's world. For example, they tend to consider future solutions only in terms of their current workflow, and when asked to describe what they need and what could help them in their work, they tend to think only in terms of what is technologically familiar or currently possible, or within a given budget. So, a plenary warm-up session was held to get people "in the mood", encouraging them to think beyond current practices, technological constraints, and budgets – e.g., "Imagine that anything is possible. What would be useful in your work?"

Thinking beyond current practices: "Imagine that anything is possible!"

Co-Design Session

Getting proper input and feedback from domain experts during a design process is challenging. In BRIDGE, several ideas, concepts, and early prototypes were available at the time the user workshop was arranged. The following subset of early prototypes was chosen for the co-design session:

Master – a map-based tool for the incident command post, providing a detailed map and support for indicating scene of incident, overview of resources, etc;

RescueMe – a mobile phone app for victims trapped during an emergency, utilizing ad-hoc network connectivity to communicate with first responders during rescue;

Resource Manager – functionality embedded in the Master to manage resources and tasks during incident command;

Information Aggregator – a filtered view of rich material (pictures, video, etc.) collected from bystanders, including social media that could contribute to situation awareness needed in the incident command post or the command central;

eTriage – a tool for paramedics to support the triage process (sorting and prioritization of victims according to their injuries);

Risk Analyzer – functionality embedded in the Master for supporting risk analysis during incident command.

Paper-based prototypes are advantageous in a co-design session because they are quick to make, they show UI structure without distracting details, and most importantly – they invite *change*. In other words, they support exploration rather than demonstration, helping experts to make their unarticulated knowledge explicit.

From Domain Knowledge to System Design

A key task running parallel to the end user workshops is the translation of the information gathered into design and relevant requirements and specifications for BRIDGE. Work is in progress to analyse and categorise domain data, and to disseminate the results from the user workshops.

Second Co-Design Workshop Delft, The Netherlands

The workshop in Delft, held on December 6, 2011, replicated the structure of the Oslo workshop, working intensively with experts from RESPOND BV (leading provider of incident information management solutions in The Netherlands) and RIVM (RijksInstituut voor Volksgezondheid en Milieu, National Insititute for Health).

Themes and questions that were discussed included the current innovations in the emergency management domain and how they come (or do not come) to markets, networks and processes of collaboration, social and economic barriers to innovation, emergency planning and the processes of writing these plans, information flows, communication errors, information overload, practices of filtering information, the complexity of crises.

As in the Oslo workshop, discussions resonated with and challenged BRIDGE visions and prototypes. On citizen participation, for example, one of the participants expressed his support of Public Initiative and noted with regret that in western countries too much is left to specialists, whereas in some other parts of the world people help each other more.

> "IN WESTERN COUNTRIES CITIZENS LEAVE TOO MUCH TO THE SPECIALISTS. I WOULD LIKE TO SUPPORT PUBLIC INIITIATIVE. IN OTHER COUNTRIES PEOPLE HELP EACH OTHER."
>
> JAN OTTEN, RESPOND BV

This was followed by detailed discussions focused around the BRIDGE system components – *Master*, *Risk Analyzer*, *e-Triage*, *RescueMe App*, and *Resource Manager*. Given the background of the workshop participants, particularly useful insights were gained into competing, complementary and related technologies.

Third Co-Design Workshop Lancaster, UK

The third BRIDGE co-design user workshop was held in Lancaster University's *Imagination Lab* on April 16, 2012. Organized by Lisa Wood (Lancaster University) together with WP02, WP12 and the concept case owners, the workshop attracted 13 professionals from UK emergency response organisations, including Hertfordshire Police, Cumbria Police, Lancaster City Council, Cumbria Fire and Rescue Service, Lancashire Fire and Rescue Service, Cork City Fire Brigade, North West Ambulance Service, Langdale and Ambleside Mountain Rescue, and Emergency Planning College.

The workshop was split into two parts, starting with a 'sandbox' exercise where professionals described their role in past incident response efforts such as a Nuclear Power Plant incident exercise (Heysham Reactors), the Greyrigg train crash (Cumbria), a rapid river rescue during heavy flooding, the threat of a burst damn, and a factory fire. During the second half of the day, the professionals enacted and discussed multi-agency response work using prototypes of the BRIDGE *Master, Risk Analyzer, Resource Manager, RescueMe App, 3D Modelling, the Training Concept Case*, in collaboration with BRIDGE designers and domain analysts. A plenary session concluded the workshop, although discussions are continued in the BRIDGE Social Media Network. A host of insights were gained, which will be reflected in the future work of the project consortium.

BRIDGE Scientific Results

Security Management and Society
16-17 May 2012

Friedrich Steinhäusler (University of Salzburg) presented a paper at the Security Management and Society Conference held in Brno, Czech Republic. Talking about modern crisis management tools, he described several EU and US concepts, including those under development in the BRIDGE project.

4th iNTeg-Risk Conference
6-8 May 2012

Maximilian Wietek (VSH Hagerbach Test Gallery) presented BRIDGE at the 4th iNTeg-Risk Conference, which took place in Stuttgart, Germany. In his presentation, Max described the preliminary results of the first underground car test explosions conducted in the VSH tunnel complex and their corroboration with the 3D computer simulations by the University of Salzburg.

ISCRAM 2012
22-25 April 2012

Monika Büscher (Lancaster University) and Amro Al-Akkad (Fraunhofer FIT) attended the 9th International Conference on Information Systems for Crisis Response and Management (ISCRAM) in Vancouver, Canada. Monika presented a paper on microblogging during the 2011 terror attacks in Norway, starting a discussion around the design concept of *agile response*. Amro presented a short paper regarding a survey towards ICT-supported public participation in crisis situations. He also participated in the PhD colloquium and presented a poster describing the design process behind the RescueMe concept

SWDM 2012
17 April 2012

Daniela Pohl (Klagenfurt University) presented a paper at the First International Workshop on Social Web for Disaster Management (SWDM), which was held in Lyon, France, within the annual international World Wide Web Conference (WWW 2012). Daniela's paper investigated the application of multimedia metadata in identifying the set of sub-events related to an emergency situation.

ISCM 2012
29 March 2012

Friedrich Steinhäusler (University of Salzburg) presented the BRIDGE project and its developments at the 2nd International Symposium on Crisis Management (ISCM) held in London, UK. Organised by the University of Greenwich, the symposium was linked to the final review of the EU FP7 Pandora project.

ISTSS 2012
14-16 March 2012

Maximilian Wietek (VSH Hagerbach Test Gallery) discussed the validation aspect of the BRIDGE project at the 5th International Symposium on Tunnel Safety and Security (ISTSS), which was held in New York, USA. In his presentation, Max talked about the power of simulation and the need for experimental validation.

Dealing with the Disasters of Others
26-28 January 2012

The Center for Interdisciplinary Research (ZiF) at Bielefeld University, Germany, organized a closing conference *Dealing with the Disasters of Others*. Within the context of this conference, BRIDGErs Monika Büscher, Lisa Wood and Sung-Yueh Perng (Lancaster University) presented a paper entitled *Altruistic, Augmented, Agile: Public Crisis Response*. The paper discussed how those in the periphery of a disaster – watching it unfold via social and traditional media – can help mobilise resources, using the example of the bombing and shooting in Norway on 22 July 2011.

18th ACM Conference
17-21 October 2011

Atle Refsdal (SINTEF) attended the 18th ACM Conference on Computer and Communications Security in Chicago, USA, and gave a three-hour tutorial on risk analysis. One hour was dedicated to presenting the BRIDGE project and the emergency risk analysis support envisioned for BRIDGE.

Informatik 2011
4-7 October 2011

René Reiners (Fraunhofer FIT) presented a paper at Informatik 2011 — Workshop on Enterprise Services Computing and Communities, held in Berlin, Germany. The paper described new pattern language concepts for designing UbiComp applications connecting to cloud services.

PATTERNS 2011
25-30 September 2011

René Reiners (Fraunhofer FIT), presented a paper on new pattern language concepts in Rome, Italy, at PATTERNS 2011 — the Third International Conference on Pervasive Patterns and Applications. The full title of the paper, co-authored with Irina Astrova and Alfred Zimmermann, is *Introducing New Pattern Language Concepts and an Extended Pattern Structure for Ubiquitous Computing Application Design Support*.

Save the date!

BRIDGE is co-organizing AMI for Crisis Management workshop, which will be held in conjunction with the International Joint Conference on Ambient Intelligence (AMI2012) in Pisa, Italy, on 13 November 2012. The workshop will bring together researchers and practitioners working on the application of AmI for crisis management.

You can find more on these project results at: http://www.bridgeproject.eu/en/bridge-results/publications.

BRIDGE at a Glance

BRIDGE will build a system to support interoperability — both technical and social — in large-scale emergency management. The system will serve as a bridge between multiple First Responder organisations in Europe, contributing to an effective and efficient response to natural catastrophes, technological disasters, and large-scale terrorist attacks.

"The project will look in particular at how cooperation among different agencies and organisations can be made more efficient at national and transnational level."

EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

The vision of the BRIDGE project is to:

- Facilitate cross-border and cross-agency collaboration
- Allow the creation of a common, comprehensive, and reliable operational picture of the incident site
- Enable integration of resources and technologies into workflow management
- Enable active ad-hoc participation of third parties

CONSORTIUM

The BRIDGE consortium consists of a well-balanced mix of cross-disciplinary academics, technology developers, domain experts and end-user representatives:

- Stiftelsen SINTEF, Norway
- Almende B.V., The Netherlands
- CNet Svenska AB, Sweden
- The Fraunhofer Institute for Applied Information Technology FIT, Germany
- Lancaster University, UK
- Crisis Training AS, Norway
- SAAB Training Systems, Sweden
- Thales Nederland B.V., The Netherlands
- Alpen-Adria University of Klagenfurt, Austria
- Paris-Lodron University of Salzburg, Austria
- VSH Hagerbach Test Gallery LTD, Switzerland
- Technical University of Delft, The Netherlands
- Stockholm University, Sweden
- Helse Stavanger HF, Norway

CONTACT

Project Coordinator:
Geir Horn, SINTEF ICT
Forskningsveien 1, Oslo
Norway

Telephone: +47 93 05 93 35
E-Mail: Geir.Horn@sintef.no

Please visit the project website for more information: http://www.bridgeproject.eu.

Newsletter designed by Lyudmila Zaitseva