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Bridging Resources and Agencies in Large-Scale Emergency Management

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BRIDGE Demonstration III: Collaboration Technologies

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Abstract / Executive summary:

This report documents the BRIDGE effort on Collaboration Technologies as demonstrated in Risavika and Stavanger on September 24, 25 and 26, 2013. It documents the context and purpose of the demonstration and puts the demonstration in the perspective of the first two BRIDGE demonstrations. It also reports on the preparation of for the third BRIDGE demonstration and risks and opportunities identified during the preparation phase. It describes the demonstration scenario in detail, summarizes the BRIDGE technology involved in the demonstration and reports on the execution of the demonstration and the surrounding events.
The final chapter looks back at the third BRIDGE demonstrator from the perspective of successes and failures, lessons learned, and draws some conclusions regarding the demonstration, leading to recommendations for the final BRIDGE demonstrator and BRIDGE Dissemination and Validation.

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Contributing partners

Almende B.V.
Westerstraat 50
3016 DJ Rotterdam
The Netherlands

Andries Stam
andries@almende.org
Ludo Stellingwerff
ludo@almende.org

Alpen-Adria-Universität Klagenfurt
Universitätsstraße 65-67
9020 Klagenfurt
Austria

Christian Raffelsberger
christian.raffelsberger@uni-klu.ac.at

Daniela Pohl
daniela.pohl@aau.at

CNET Svenska AB
Svärdvägen 3B
SE-182 33 Danderyd
Sweden

Peeter Kool
peeter.kool@cnet.se

Crisis Training AS
Storgata 20
Post 142
2402 Elverum
Norway

Morten Wenstad
morten@crisistraining.no

Fraunhofer-Institut für Angewandte Informationstechnik FIT
Schloss Birlinghoven
53754 Sankt Augustin,
Germany

Amro Al-Akkad
amro.al-akkadfit.fraunhofer.de

Erion Elmasllari
erion.elmasllari@fit.fraunhofer.de

SINTEF
Strindveien 4
7034 Trondheim
Norway

Jan Håvard Skjetne
jan.h.skjetne@sintef.no

Thales R&T Nederland
Delftechpark 24
2628 XH Delft
The Netherlands

Paul Burghardt
paul.burghardt@d-cis.nl
Bernard van Veelen
bernard.vanveelen@d-cis.nl

PLUS
Hellbrunnerstr. 34
5020 Salzburg
Austria

Friedrich Steinhäusler
Friedrich.Steinhaeusler@sbg.ac.at

Lyudmila Zaitseva
Lyudmila.zaitseva@sbg.ac.at

VersuchsStollen Hagerbach AG
Polistrasse 1
CH-8893 Flums
Hochwiese
Switzerland

Maximilian Wietek
mwietek@hagerbach.ch

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1 The BRIDGE demonstration on Collaboration Technologies

1.1 Introduction

The goal of the BRIDGE project is to increase safety of citizens by developing technical and organisational solutions that significantly improve crisis and emergency management. The key to this is to ensure interoperability, harmonization and cooperation among stakeholders on the technical and organisational level. Therefor, BRIDGE delivers:

- Resilient ad-hoc network infrastructures, focussing on the requirements evolving from emergency scenarios
- Generic, extensible middleware to support integration of data sources, networks, and systems
- Context management system to foster interoperability of data, providing meaningful, reliable information

Technical interoperability is crucial for improving multi-agency collaboration and continuous training, but its full potential can only unfold if technology can be integrated and sustained into agency workflows and communication processes. On the level of organisational harmonisation, BRIDGE will provide:

- Methods and tools that support run-time intra- and inter-agency collaboration
- Model-based automated support system combined with scenario-based training
- Agent-based dynamic workflow composition and communication support system

The deliverables and results of the BRIDGE projects are disseminated on the public BRIDGE website: http://www.bridgeproject.eu/en.
In the program of the BRIDGE project a number of demonstrations have been defined to show the progress of the technologies being developed in BRIDGE and how the results achieved can contribute to improve the practice of first responders in crisis response situations.

This deliverable has been produced in part before and in part after the third BRIDGE demonstration. This is reflected in the deliverable text by refereeing to the Risavika exercise and the BRIDGE demonstration in future tense for the chapters written beforehand (Chapters 2, 3 and 4) and past tense (Chapters 5 and 6).

1.2 Purpose of the demonstration

The purpose of the third BRIDGE demonstration is to expose the progress and results achieved in the BRIDGE project, with a focus on Collaboration Technologies, including inter-agency and cross-border collaboration. However, the third BRIDGE demonstration was not an independent, stand-alone event. It was the result of earlier demonstrations and what we had learned from these. One can truly say the BRIDGE project has evolved towards this third demonstration.

1.3 Document Overview

In this deliverable we will first document the scenario being played at Risavika, in chapter 2. In chapter 3 we will discuss the BRIDGE technologies demonstrated during the exercise, grouped into Concept Cases and BRIDGE Assets.
Chapter 4 will report on the execution of the demonstration and the Risavika exercise. Chapter 5 will formulate some lessons learned and recommendations for the final BRIDGE demonstration.

1.4 Acknowledgement to authors

The contents of this deliverable have been contributed by almost all BRIDGE project members, although the editor was not able trace back all snippets and contributions to the individual authors. The list of authors at the beginning of this deliverable only lists the project members responsible for producing the larger pieces of content, but in this place we acknowledge the fact that contributions have actually been produced by many more hard-working researchers and developers in the BRIDGE project.

The report on the events during the third BRIDGE demonstration includes many photographs contributed by Lyudmila Zaitseva, Maximilian Wietek and Ludo Stellingwerff.

2 The third BRIDGE demonstration

2.1 Looking back on BRIDGE demonstration I

The first BRIDGE demonstration was held in Flums, Switzerland, on September 20th 2012, using a real firefighting exercise in the VSH tunnels as the integrating story. The focus of the first demonstration was interoperability, showing how the various technical BRIDGE components were able to find each other using the BRIDGE middleware and exchange information. Also, we gave an initial demonstration of all these technological concepts, some of which have now matured into BRIDGE assets.

The technological concepts we demonstrated in Flums were:

- Master System, a multi-touch table for interaction with the BRIDGE system and visualization of results
- BRIDGE MESH, a deployable network technology composed of so-called meshliums
- BRIDGE eTriage, a system of sensor-bracelets and a mobile ad-hoc network infrastructure
- RescueMe, consisting of two smartphone-app based components: the "helpBeacon" and the "local Cloud",
- Risk analysis tool, integrating a mechanism for risk assessment with technology for external expert integration (DEIN) and external Simulation-as-a-Service
- Resource manager, a technology to keep track of and coordinate human teams of resources in the field,
- Training concept, a system concept aimed at facilitating training for crisis responders

More information and details of the first BRIDGE demonstration can be found in [1]. What we learned from the first demonstration, among other things, is that in order to demonstrate the merit of BRIDGE as a System of Systems paradigm for large scale emergency response, we had to focus on concept cases that feature 'cross-cutting aspects' of the technologies and concepts that were developed in the technical work packages. Apart from all the good work done in these various technical work packages, we needed to demonstrate how all this technology can improve first responders' work, by supporting collaboration and integration of the technology. As a result, we defined a number of concept cases that integrated a number of the BRIDGE technologies and concepts.

2.2 Looking back on BRIDGE demonstration II

On a technical coordination meeting in Klagenfurt, Austria, we defined a set of Concept Cases, that we, as the BRIDGE project, felt should be able to clearly demonstrate the benefits of the BRIDGE philosophy on Systems of Systems technology to first responders. Also, on another technical coordination meeting, we decided to piggy-back the next BRIDGE demonstrations on a real life exercise in Norway. This provided us with an opportunity to not only demonstrate BRIDGE technology under realistic conditions, but also to expose the BRIDGE concepts to a large audience.

On April 24th, 2013, we demonstrated the BRIDGE Concept Cases to members of the organisation committee for the "Risavika exercise", at the Stavanger University Hospital, with a specific focus on visualization and interaction.

The demonstration took the form of a so-called table-top exercise. During this demonstration, we presented the nine BRIDGE concept cases:

- Adaptive Logistics (AL), on using artificial intelligence and workflow technologies to establish effective and efficient collaborations between (members of) participating agencies and available technological resources,
- Advanced Situation Awareness (ASA), a constellation of an unmanned airborne vehicle (UAV) with a flexible sensor suite payload and an artificial simulation and prediction expert system,
- Dynamic Tagging of the Environment (DT), containing technology such as eTriage Bracelets, Mobile ad-hoc networking and mechanisms exploiting physical transmitters and Augmented Reality to help navigate an incident scene,
- Federated Control Rooms (FCR), a concept to facilitate collaboration between incident control rooms,
- First Responder Integrated Training System (FRITS), a technological solution to facilitate high-tech training for first responders,
- Information Intelligence (II), containing mechanisms to exploit information from social media in the command and control room,
- MASTER, a composition of physical multi-touch table, novel interaction mechanisms and dedicated applications, such as the Risk Analyser Modeller to advance situation awareness and display tactical relevant information on a central unit,
- Robust and Resilient Communication (RC), featuring technology to help bridging 'islands of connectivity' and improving communication,
- Situation aWAre Resource Management (SWARM), combining technology for resource management and situation awareness.

The BRIDGE Concept Cases are discussed in detail in chapter 3; an extensive report on the second BRIDGE demonstration can be found in [2].

At the demonstration in Stavanger the audience was divided into three groups. The benefit of this division was that we could show a lot of the Concept Cases, the drawback was that not all the Concept Cases were demonstrated to all the members of the audience. This allowed us to show clusters of concept cases in detail to the members of the audience without confusing them with too much information. The overall system was then discussed in a plenary session with all groups. Overall, we received a lot of feedback from the end-users present and learned a lot about the possible weak spots in our concepts.

2.3 Towards BRIDGE Demo III: Collaboration Technologies

There was only little time between the second and third demonstration, just 5 months (including the summer's holidays), so the BRIDGE project team had to work hard to mature, improve and further integrate the BRIDGE technology and prepare for the life-test in September 2013.

The focus of the third BRIDGE demonstration is Collaboration Technologies. There is a profound difference between interoperability (focus of demonstration I) and collaboration (focus of demonstration III). While interoperability is concerned with the technical aspects of information and data-exchange, i.e. the agreement on (and implementation of) standards for data formats and data exchange protocols, collaboration technology focuses on the semantics of 'doing things together'. Collaboration technologies are indeed enabled by interoperability, but aim to move beyond interoperability by developing mechanisms that enable effective and efficient working together. In the BRIDGE project we have identified a number of services and mechanisms that facilitate, or even enable, collaboration and grouped these technologies in what we call "Orchestration Services". The collaboration technologies require knowledge regarding

resources, capabilities and status, but also about Quality of Service (QoS) provided; it also requires mechanisms that are capable of processing this knowledge.

2.4 Venue of the third BRIDGE demonstration

The venue for the third BRIDGE demonstration will be the Stavanger University hospital and the Risavika harbour near Stavanger and possibly other locations where the Risavika exercise takes place.

In combination with the demonstration, the BRIDGE project will take the opportunity to invite the BRIDGE review commission and the End-User Advisory Board (EUAB). The concept cases will be presented to the EUAB separately to obtain their feedback and suggestions on the development of the concept cases.

Co-located with the demonstration will be the Nordic Conference on Disaster Mitigation [3], organized by some BRIDGE partners SINTEF and Stavanger University Hospital and hosted at the Stavanger University Hospital. Members from the BRIDGE project will be allowed to present their work to the conference audience and the papers they submitted will be included in the proceedings of the conference.

2.5 Risavika exercise

The Risavika exercise scenario will revolve around a simulated terrorist attack on Risavika harbour. Four terrorists will arrive by speedboat, and attack the local Skangass LNG plant, the ferry terminal and a ferry waiting for departure next to the terminal. After arrival, the terrorists will split up in three groups. At the Skangass LNG plant the first group will try to blow up a part of the factory, deploying a suicide bomber.
The second group will enter the ferry terminal, and kill as many people as possible, employees and travellers alike. The third group will force entry into the waiting ferry and start shooting passengers and personnel on the ferry. There will be many casualties and victims. Victims will not only be triaged on the spot, but also actually taken to a hospital for further treatment.

As soon as the emergency services are notified of the on-going events at Risavika harbour, they will deploy full-scale, to:

1. Neutralize the terrorists
2. Triage and evacuate the victims
3. Extinguish fires and clear up debris caused by the terrorist attacks

The exercise will involve many agencies, and coordination will have to take place on various locations:

4. Local coordination on the incident site will be provided from a shelter on the parking lot
5. Police forces coming to the area will be coordinated from the Police Command and Control centre
6. The ambulances driving between the incident scene and the participating hospitals will be coordinated from the Stavanger University Hospital.

2.6 Opportunities provided by the third BRIDGE demonstration

2.6.1 BRIDGE Demonstration

First and foremost, the focus of the BRIDGE project for the events taking place in Stavanger is to demonstrate BRIDGE technology and concepts. The Risavika exercise allows us to

demonstrate the BRIDGE technology to end-users as they exercise their daily practice. The Risavika scenario is extensive enough to allow us to demonstrate this technology not just in isolation, but in coherence, pointing out how the collaboration of technologies and human professionals can increase situation awareness and operations, in turn increasing the effectiveness and efficiency of the efforts.

At the same time, the elaborate program and events taking place on the demonstration days present us with a number of other opportunities.

2.6.2 BRIDGE Validation

The demonstration in Stavanger opens opportunities for validation as well. The BRIDGE Validation work package (BRIDGE WP 10) has two main aspects to investigate:

1 Will the technology work as intended? The Risavika exercise allows us to validate whether the technology developed in the BRIDGE projects is able to cope with the strain of a realistic scenario.
2 Will the end-users accept the BRIDGE technology as good technology that improves their current practice? The exposure of BRIDGE technology to a large group of end-users allows us to investigate what they think of the usability of the technology and whether they are able to use it to improve their practice.

Also the presence of the EUAB, who will examine the BRIDGE Concept Cases carefully, gives us the opportunity to ask their feedback on the feasibility of deploying the concepts in their daily operations.

2.6.3 BRIDGE Dissemination

The third BRIDGE demonstration presents us also with a number of dissemination opportunities. The Risavika exercise exposes the BRIDGE technology to a large group of end-users (in the exercise) and a large group of (inter-) national observers. These two groups constitute our core target audience. They will be able to sample the BRIDGE concepts and be made aware of what the BRIDGE project is going to deliver in the future.

The Nordic Conference on Disaster Mitigation provides us with the opportunity to disseminate BRIDGE results and concepts to an audience of scientists and practitioners. Papers that the BRIDGE members are going to submit for the conference will be peer reviewed, and the presentations in the conference track allow us to explain the technology in detail to this audience.

An exercise on the scale of the Risavika exercise will attract national and maybe even international press attention. Broadcast, written and social media will report on the exercise, which provides us with the opportunity to reach out to parties (end-users and industry) we have not been able to reach yet.

2.6.4 Risks and Opportunities

The ambitions for the third BRIDGE demonstration are high. It is important to point out a few significant differences with the earlier BRIDGE demonstrations, annotated with risks and opportunities:

1. The demonstration is for a large part out of our control. The main event for the demonstration day is the exercise of the first responders, who want to train their skills in collaboration and communication, based on a large-scale realistic scenario. For them, the first responders, the BRIDGE technology is not the main attraction of the day.

This constitutes a risk, since the first responders (who are the intended end-users) might deem our technology too unfamiliar or too immature and choose to ignore it.
On the other hand, the exercise presents us this with an opportunity to expose our technology to a large cross-section of our target audience.

2. Unlike the first two demonstrations, this demonstration has a distributed set-up. The exercise takes place in multiple locations, including the Risavika harbour, the Stavanger University Hospital and Stavanger Police Command and Control centre. Hence, we have to distribute the demonstration as well and find the most suitable location for each Concept Case.
   This constitutes a risk, since we might not get access to the right places or be allowed to demonstrate our concepts at the right times.
3. As a consequence of the importance of the Risavika exercise itself, the event will be attended by a large and diverse audience. Not only the first responders and employees of the companies involved in the incident scenario will be joining the exercise, but a large host of role-players, international observers and press will be present. To prevent the first responders from being hampered in their efforts, the exercise board will regulate access to the training scene. This will effectively limit the freedom of movement (and operations) for the BRIDGE project members and other non-first responders, including the BRIDGE review commission and the BRIDGE End-User Advisory Board.
4. In this demonstration, we will deploy BRIDGE technology on a large scale and under realistic circumstances. This implies there will be a severe emphasis on the reliability of the BRIDGE middleware, since the BRIDGE middleware is the set of mechanisms that 'tie everything together'.
   This also constitutes a risk, as we have not developed certified software products but rather developed technology concepts and mechanisms that could very well collapse under the strain of reality.
   However, when we are successful, that is a major step towards validation of the BRIDGE concepts.
5. Not all technologies and concepts will be mature enough to be deployed and demonstrated during the actual exercise. To compensate, we will extend to demonstration to a second day, where each BRIDGE Concept Case will be presented and demonstrated separately.
6. We have co-located the third demonstration with a number of other events. Not only the Risavika exercise, but also a preliminary BRIDGE review and the Nordic Conference on Disaster mitigation [3].
   This provides us with the opportunity to disseminate the BRIDGE concepts to a very large audience, including the first responders in the exercise, the Norwegian national press and a host of international practitioners observing the exercise and joining the conference on the next day. The Nordic conference on Disaster Mitigation has the same venue as the BRIDGE review, is organized by SINTEF and the Stavanger University Hospital and supported by BRIDGE and, indeed, the EU 7th Framework Programme.

3 The Risavika Exercise Scenario

3.1 Introduction

This section describes the overall scenario for the execution of demonstration D09.3 in BRIDGE. D09.3 will be aligned with a real exercise organized and managed by the Stavanger Region Emergency Exercise Organising Committee. The exercise will be managed and led by crisis response professionals and has the main objective to train emergency personnel on various levels of operation. BRIDGE must align its demonstration in accordance with these conditions.

Members from the BRIDGE project (from BRIDGE WP9: Morten Wenstad and Åge Vølstad) participate in the Exercise Organising Committee that is responsible for the planning and execution of the Risavika exercise. Their job is to assure a good coordination between the Exercise Organising Committee and the BRIDGE project.

In this chapter we will first sketch the context of the Risavika exercise, after which we will give a detailed scenario description.

3.2 Context of the Risavika exercise

3.2.1 Participating organizations

The organisations participating in the exercise are:

- Rogaland Police District
- South Rogaland Fire Department
- Stavanger University Hospital including ambulance services
- Joint Rescue Coordination Centre – South
- Rogaland Civil Defence District
- Rogaland Home Guard
- Risavika Harbour
- LNG Factory (Skangass)
- Potentially other industrial actors in the Risavika Harbour

3.2.2 Description of the RISAVIKA site and its surroundings

Risavika Harbour is a modern and harbour near Stavanger, providing wide range of harbour services for regional, national and international players, including a ferry terminal, an LNG plant and various facilities for cargo transport and fishing industry. The harbour facilitates regular arrivals and departures from and to international harbours, and as a hub for cargos being transported to other locations in Norway. A description of the Risavika Harbour can be found at [4].

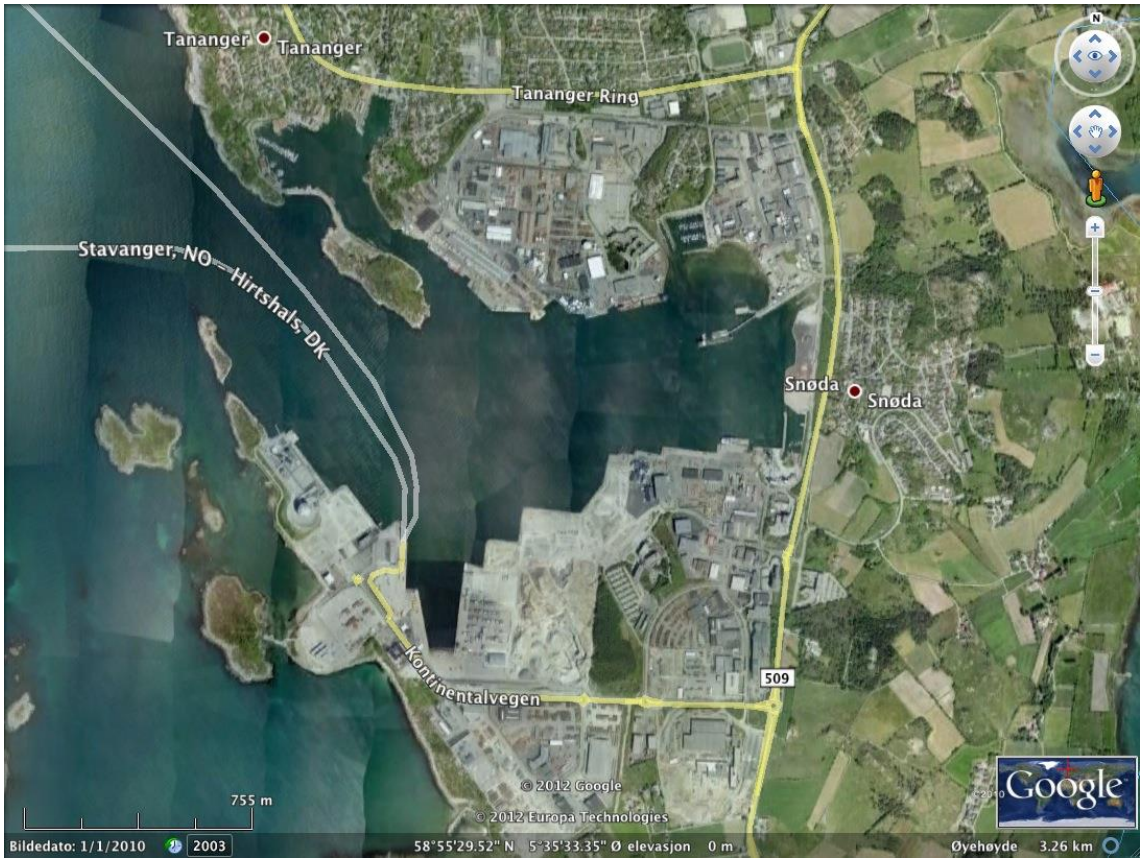


Figure 1: Satellite photo of the Risavika Area

A number of populated residential areas are close to the Risavika harbour as can be seen in Figure 1. Detailed information and photos of the Risavika Harbour and its surroundings are provided by [5].

Figure 2: Skangass Plant at Risavika

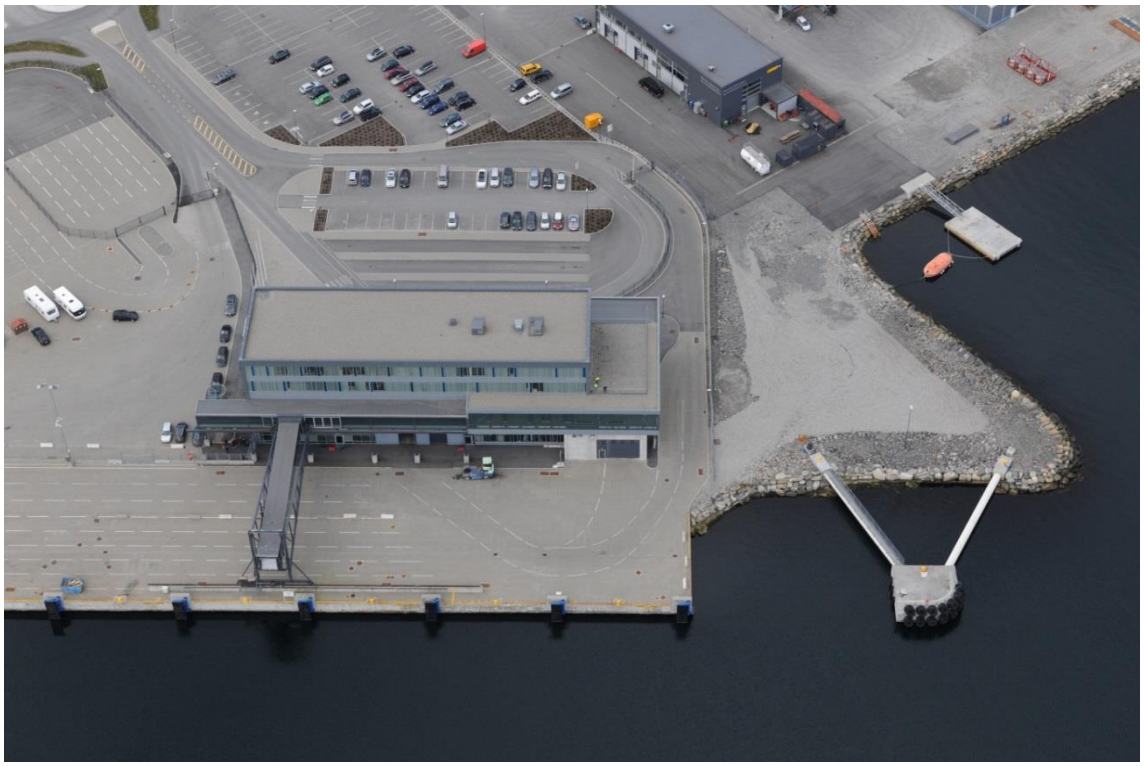


Figure 3: Passenger terminal and ResQ Facilities at Risavika

The Skangass Plant (Figure 2), the Passenger Terminal (ferry terminal) and the ResQ Training Centre depicted in Figure 3 play an important role in the Risvika exercise scenario. The ferry terminal and the ResQ centre are the designated deployment areas for the BRIDGE System of Systems during the BRIDGE demonstration.

3.3 Risavika Exercise Scenario description

This scenario description in this section is based on the latest information from our dialogue with the Stavanger Region Exercise Organizing Committee and our own suggestions, to assure the best interaction possible between the exercise and the suggested approach from the BRIDGE Concept Cases. The scenario description was continuously improved in close collaboration with the Exercise Organizing committee. It focuses on demonstrating the potential of the BRIDGE concept cases for optimizing the management of an incident by first response agencies.

The scenario description is divided into phases; each phase describes a number of events or pieces of information becoming available to the incident management team.

Phase 0: 23rd September 14:00

Police Security Service (PSS) presents an updated threat assessment to the Chief of Staff and the Operations Manager at the local precinct. The threat assessment is classified as RESTRICTED and cannot be presented in detail here.

The threat assessment is related to a terrorist threat against harbour terminals and supply bases received in June 2013. The background is that "Al Muntaqim" (AM) tried a similar terrorist attack in the Netherlands. Their target was the supply base at Hoek van Holland located at the seaward approach to Rotterdam. The conclusion is that AM probably has the capacity to strike against Norwegian interests in the near future. On this basis PSS has described recommended measures.

The threat assessment is part of the exercise, although the people involved may not know this, and intended to raise the alertness of the Police Security Service.

Phase 1: 25. September 09.06 - 09:25

The Dispatch Centres of police, fire fighting and medical services receive multiple phonecalls about on-going shooting and explosions at the ferry terminal and Skangass plant at Risavika Harbour. They receive the following information:

7. 4 persons arrived in a rib/speedboat. They started shooting with automatic weapons, which were followed by 2 suicide bomb explosions.
8. Two of the attackers armed with rifles and machine guns are about to leave the premises in the same boat as they arrived in.
9. Many people are killed, and there are also a lot of severely injured people in the area.
10. A truck is set on fire, parked just a few meters from the fence at Skangass.

Phase 2: 25. September 09:25 - 10:15:

- First units from the emergency agencies are arriving at Risavika.
- Several reliable witnesses state:
  - 4 heavy armed persons arrived in a speed boat.
  - 2 of them blasted themselves.
  - 2 remaining persons have recently left the premises in a white speed boat after shooting numerous people in the harbour area.
- The scene is chaotic, many injured in all degrees, and unharmed people are strongly affected by the incident.

- The fire in the truck has been extinguished by personnel from Skangass.
- The school vessel "Gann" is on fire – and there are many shot victims and severe damages caused by one of the suicide bombers.
- The police forces establish a secured area for the paramedics and the fire fighters. The Risavika area in total is not secured at this moment.
- There are many killed and injured on the ground nearby a bus at the ResQ training centre, and in the area of the international ferry terminal.

Phase 3: 25. September 10:15 - 11:00

- The fire in the truck and the fire on Gann have been extinguished.
- There are a large number of dead and injured in 3 different sectors in Risavika Harbour:
    - International ferry terminal
    - School vessel "Gann"
    - Training centre ResQ
- In addition there are 1 dead and 3 injured near the truck. (2 of them with severe burn wounds)
- The overview of dead, injured, minor injured and evacuees are as follows:
    - ResQ and Truck – 10 dead, 15 injured, 3 minor injured and 12 evacuees.
    - Ferry terminal - 21 dead, 5 injured, 3 minor injured and 18 evacuees.
    - Vessel "Gann" - 25 dead, 15 injured, 2 minor injured and 21 evacuees. Several of the injured have life-threatening injuries. Among the dead and injured there are youngsters from different schools from the municipalities Stavanger – Sandnes – Klepp.
- Resources arrive continuously, also from the reinforcement units.
- Injured patients are transported to Stavanger University which is under pressure regarding capacity.
- There is a large number of incoming calls from anxious relatives.
- There is a large number of evacuated people (minor or none injuries) who are strongly affected by the incident.
- National and local media are broadcasting "live" from the site and at the hospital

Phase 4: 25. September 11:00 - 12:30

- Critically wounded patients are given emergency medical assistance, and are being transported to the University hospital. Some critical injuries will be transported to Bergen and Oslo by plane or helicopter.
- Helse Stavanger HF asks the municipalities to implement measures to relieve the hospital capacity.
- Next of kin centre is established at Sola Airport Hotel, but there are a lot of inquiries regarding the incident at the hospital as well.
- Among the killed and wounded there are also foreign citizens (it has been confirmed Danish, German, and Polish citizens among the dead).
- The media escalates, and are approaching with a critical view and points out comparisons to the Utøya incident.
- The dead persons are still at the various locations/crime scenes.

Phase 5: 25. September 12:30 - 16:00

- A total of 38 injured patients have been placed at 3 different hospitals.
    - 6 of the injured inflicted with severe burn wounds. In addition 4 of them have suffered from shot wounds.
    - 12 victims with minor injuries are transported to different local hospitals.

- A total of 51 persons is evacuated to the next of kin centre. Among these there are a number of teachers and students associated to Stavanger, Sandnes, and Klepp municipalities.
- Several countries have established contact with Norwegian Authorities to offer support and assistance.
- Superior authorities are demanding status reports and measures being implemented.
- Emergency response personnel are exhausted and heavily affected by the incident.

Phase 6: 25. September 16:00 - 23:59

- All the victims are taken care of at the hospitals
- The evacuation centre and next-of-kin centre still hold many victims.
- The schools involved are requesting assistance.
- There are 56 casualties due to the incident at Risavika – 52 were killed on site, and 4 died in the hospitals. There are several critically injured, so the number of casualties may increase.

Remarks

- SKANGASS will be under normal production during the exercise. Due to safety regulations we are not allowed to use devices that have a valid certification for use in environments with explosion hazard (EX-safe) inside SKANGASS in this time frame. This will still give us the possibility of simulating and modelling the effects of the explosions at Skangass but the "roll out" of the BRIDGE system will mainly be done in the area between Skangass and the ferry terminal.
- One of the main training objectives will be the handling of mass casualties from the incident area and to different appointed hospitals as well as other evacuation centres. This also includes coordination of international support handling for major burning injuries.

4 Demonstration III Technologies

4.1 Chapter overview

In BRIDGE we have defined nine Concept Cases, which combine relevant BRIDGE technologies into sensible emergency response capabilities. The nine BRIDGE concept cases are:

1 Adaptive Logistics
2 Advanced Situation Awareness
3 Dynamic Tagging of the Environment
4 Federated Control Rooms
5 First Responder Integrated Training System
6 Information Intelligence
7 MASTER,
8 Robust and Resilient Communication
9 Situation aWAre Resource Management

Besides the Concept Cases we have a number of BRIDGE Assets, which are featured or referred to in the third BRIDGE demonstration[1]. The BRIDGE Assets differ from the Concept Cases in the sense that the Assets are (more generic) pieces of enabling technology, whereas Concept Cases are compositions of technology, providing specific capabilities in emergency response scenarios. The BRIDGE Assets in this demonstration are:

11. Distributed Expertise Integration Network (DEIN)
12. eTriage
13. BRIDGE Middleware (BMW)

In this chapter we describe the BRIDGE Concept Cases and BRIDGE Assets. The descriptions are produced before the exercise, and are only intended to describe technology in rough details. The technology has been developed in the various technical work packages; the deliverables of these work packages contain more technical details and references.

4.2 Concept Case Adaptive Logistics

4.2.1 Overall Goal

In the BRIDGE concept case Adaptive Logistics we characterize large-scale emergency management operations as complex dynamic multi-agency distributed systems. In this concept case we explore how we can coordinate the efforts deployed by all the systems' human participants and artificial components. The aim of these coordination efforts is that the BRIDGE system-of-systems as a whole displays coherent, goal-directed behaviour, realizing its goals effectively and efficiently.

4.2.2 Main Functionality

To organize a dynamic multi-agency collaboration we use workflows (or more specific: a 'WorkFlow Generation and Management (WFGM) sub-system'). To organize this collaboration

[1] The BRIDGE Concept Cases themselves can be considered compositions of BRIDGE Assets.

the WFGM sub-system requires system awareness and specific capabilities to plan, instantiate, monitor and adjust activities. Advanced Logistics establishes a collaboration between various BRIDGE system components, including DEIN, Situation aWAre Resource Management (SWARM), the Risk Analyser Modeller and Advanced Situation Awareness - Prediction Modelling.

4.2.3 System Awareness

The purpose of system awareness information is to make explicit what the capabilities of the emergency management responders and their technical systems are: what roles, causes and effects exist in the operation domain and what does the overall emergency management operation currently tries to achieve. The component does this by:

- Gathering knowledge regarding the capabilities and constraints of participating entities and their own characteristic approaches to resource deployment
- Exchanging information regarding plans and intentions
- Searching for collaboration opportunities
- Dynamically keeping track of the current goals of the system

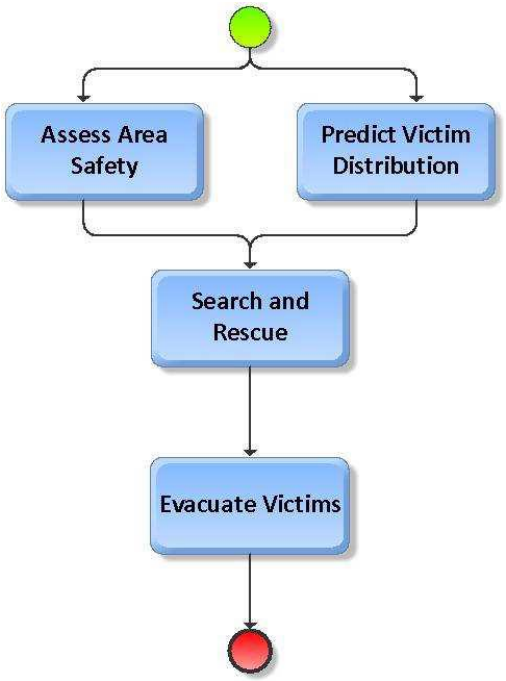


Figure 4: A simple workflow

4.2.4 Collaborative Planning

Mechanisms

In BRIDGE we explore the deployment of three WFGM mechanisms that collaboratively compute workflows to coordinate the BRIDGE efforts:

- COMPASS/SMDS deploys a classic reasoning algorithm, iteratively constructing workflows that achieve a given system goal. From the generated workflows, the one that best matches the system's current requirements is selected. This approach will yield

good results for non-standard complex goals that can not be pre-planned, or for goals that involve the collaboration of multiple agencies.

- CoWS uses templates describing relevant domain information to construct workflows. The templates contain gaps that need to be filled in with other templates or services. This approach will show good results in environments where certain complex tasks occur frequently and can be specified at design time.
- ATOM uses an opportunistic approach to planning and execution: based on a survey of the current situation and rough notion of how to achieve a goal, only the first (or, alternatively, next) step(s) are planned and executed. The planning of later steps is delayed, based on the idea that the situation may change. In BRIDGE we will use ATOM to coordinate the deployment of resources.

The WFGM mechanisms interact using the BRIDGE Annotated Workflow Language (BRAWL), an information representation and exchange language which has been developed in BRIDGE work package 7.

Workflow Processes

- Instantiation: Once a workflow has been selected for execution, the WFGM system needs to configure the resources in the BRIDGE system of systems to execute that workflow.
- Monitoring: Monitoring helps ensure the system accomplishes what it actually needs to accomplish and to detect failure to accomplish or deviation from agreed-upon qualities.
- Adjustment: In case the monitoring mechanisms detect an (immanent) failure, the WFGM system has a number of options, depending on the nature and severity of the failure: Ignore, Reconfigure, Regenerate, Escalate, Reject.

4.2.5 Features visible in BRIDGE Demo III

During the BRIDGE demo in Stavanger we will demonstrate, using an operational workflow, how we can establish collaboration between various BRIDGE system components. For simplicity, some of these services may be simulated as their interoperability was already demonstrated in BRIDGE Review/Demo I in Flums.

4.3 Concept Case Advanced Situation Awareness

4.3.1 Overall Goal

BRIDGE Advanced Situation Awareness (ASA) assists first responders on scene in increasing situational awareness by supplying real-time visual and other information on the extent of the disaster and its consequences.

4.3.2 Main Functionality

BRIDGE ASA consists of the following three components: Hexacopter, Expert System, and Modelling Module. The *Hexacopter* is an unmanned aerial vehicle (UAV) system, which consists of

- Flying platform with six motors;
- Global Positioning System (GPS) and radar;
- Video and infrared cameras;
- On-board computer;

- Environmental sensors; and
- Ground control station.

The Hexacopter provides a live video from a bird's-eye-view perspective, a parallel infrared video, and real-time environmental sampling data, which help assess the magnitude of destruction, fires and health hazards to first responders and affected population. The UAV can be controlled manually or put into a pre-programmed automatic flight modus.

Figure 5: Unmanned Aerial Vehicle

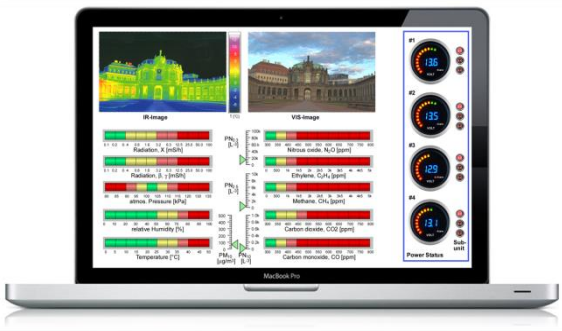


Figure 6: Ground Control Station

The *Expert System* is a software to automatically analyse the incoming environmental measurements data supplied by the Hexacopter to the Ground Station. The data is compared against national and international standards, and combined with expert recommendations. The aim of the Expert System is to help the incident commander interpret the obtained environmental data and ease the decision-making in a complex emergency.

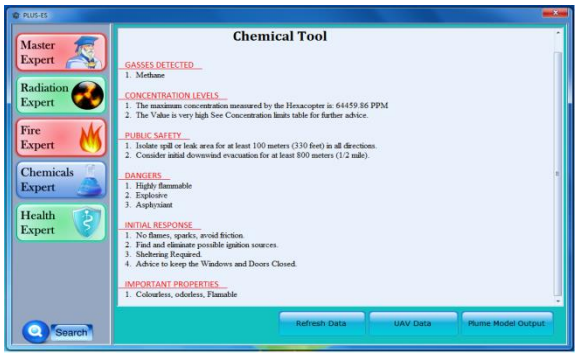


Figure 7: Expert System

The *Modelling Module* is used to create computer models of the incident site and of plumes in case of an uncontrolled release. It can draw on the pre-programmed generic models of reality-based structures contained in the BRIDGE Critical Infrastructure Library, a library developed in BRIDGE work package 3. This module enables the user to assess the physical damage to buildings, estimate the number of victims, and predict the dispersion of hazardous plumes based on metrological data.

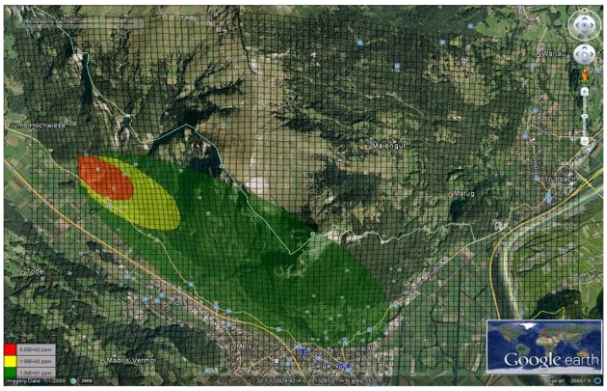


Figure 8: Plume Dispersion Model

4.3.3 Integration with other Concept Cases

The different components of BRIDGE ASA assist in providing an accurate, real-time update on the incident, strengthening the capabilities of BRIDGE Risk Analyser (featured in BRIDGE demonstration I and II, but not featured in BRIDGE demonstration III)and BRIDGE SWARM (See section 4.10) concept cases.

4.3.4 Features visible in BRIDGE Demo III

The following components of the BRIDGE ASA will be demonstrated:

- Hexacopter: Recorded video demonstration of the flying UAV with live digital and infrared video transmission; UAV;
- Expert System: Safety recommendations applicable to first responders;
- Modelling Module: Estimates of plume dispersion and damages due to explosives.

4.4 Concept Case Dynamic Tagging of the Environment

4.4.1 Overall Goal

BRIDGE Dynamic Tagging System assists first responders in marking and monitoring significant locations of the disaster site and in creating real-time situation awareness. It aims to ease the annotation of the field with digital information targeting at an improved spatial reference system and shared mental model for fire fighters. Such an annotated disaster site enriches the process of spatial sense making performed by first responders in the field.

4.4.2 Main Functionality

The tagging process works as follows:

1. In their exploration process of the incident site, first responders mark specific points in space either
    a. physically through the deployment of a sensor tag or
    b. virtually through some type of digital information such as a specific symbol, a voice recording, a text, etc.
2. The Master receives the sensor values or the digital information associated with a GPS position and visualizes them on the map.

3. Other first responder teams in the field use a mobile device with a map view or an augmented reality view to discover the information deposited by the former first responder team in the field.

Figure 9: Tagging the environment using symbolic icons

The Tagging Device

The Tagging Device forms the main point of access for the dynamic tagging system and serves two purposes: First, the creation and deployment of dynamic tags in the form of digital information, and second, the exploration of already deployed dynamic tags.

Tagging the Environment

The Tagging Device already offers a range of pre-built icons that the user can possibly exploit as tags. Each icon visually represents one possible situation that the user might like to report back to his team members and the command post through the dynamic tagging system. If the user selects one of these icons, the dynamic tagging system associates the current position to the respective icon and stores it in the database. At the same time, this icon appears on the map of the Master (see section 4.8). In a second optional step, the user might also want to bind a personal note with the selected and positioned icon. Such a personal note can consist in a voice recording, an image, written text or a drawing.

Visualizing tags in the Environment

The Tagging Device also visualizes the dynamic tags placed in the environment. Two different visualization modes are available: The map mode (Figure 10) and the augmented reality mode (Figure 11). In the map mode, icons representing each dynamic tag are displayed on a map. For outdoor environments, a Google Map is used and the user's position is acquired by GPS. For indoors, the model of the building and roughly estimated positions are used.

The augmented reality mode presents the stream of the built-in camera with an overlay of abovementioned icons representing a dynamic tag. The user operates the Tagging Device as a "lens", scanning the environment by turning around and acquiring the digital information associated with a dynamic tag in his current view. Touching on one of the icons with the finger in either visualization mode, the user receives the digital information, either sensor data or human-made information (e.g. voice recording), on the screen or through the loudspeakers of the tagging device.

Figure 10: Tagging the environment using symbolic icons

Figure 11: Looking "through" the tagging device using the augmented reality mode

The Sensor Tags

Sensor tags continuously measure environmental parameters such as air temperature, CO2 contamination, etc. (see Figure 12). First responders can deploy these tags in the environment through clipping them to the relevant location or through throwing them towards a desired direction. Once activated, the tags acquire the exact GPS position and start to send a stream of sensor values to the command post.

Figure 12: Example Sensor Tag

4.4.3 Features visible in BRIDGE Demo III

The Dynamic Tagging system will demonstrate one aspect of tagging the environment, namely e-triage (i.e. tagging of victims). Since the eTriage system represents a specialization of the Dynamic Tagging system, the map view and an augmented reality view for the exploration of the tagged environment will be demonstrated.

4.5 Concept Case Federated Control Room Support

4.5.1 Overall Goal

BRIDGE Federated Control Room Support (FCRS) makes it easier for multiple agencies to work together in complex emergency management operations. FCRS can be used to overcome the lack of interoperability between the actual (legacy) systems with which many organizations at many locations must actually work.

4.5.2 Main Functionality

BRIDGE FCRS provides support for three basic tasks:

- **Team formation.** The formation of cross-agency and cross-border teams that will work together on specific processes such as air-support for fire fighting, evacuation, search and rescue, or the transportation of wounded to hospitals.

- **Team process monitoring.** FCRS allows teams and commanders to monitor the activities of simple and more complex joint processes, involving multiple agencies, roles, tasks and systems.
- **Team communication.** FCRS allows participants in teams to easily communicate within a team via multiple modes of communication as they become available by means of the infrastructure: chat, messaging, telephone, and videoconference.

BRIDGE FCRS takes a novel approach to the establishment of interoperability in ad-hoc teams across agencies and across borders. By taking a *capability-driven approach* that does *not* require joint standards and a common terminology right from the start, FCRS makes it possible to achieve:

- **Emergent standard procedures** by evolving cross-agency operating procedures via practical emergence from the actually available capabilities that agencies have to offer.
- **Emergent standard terminology.** Evolve cross-agency understanding of the capabilities to provide information and to conduct work by means of emergence from actual interactions involving the request and provision of services.

The *Team Formation Module consists of* software that makes it easy for commanders to assemble a team that is capable of handling all specific tasks that are required to get the main job done. The key mechanism that makes this possible relies on principles of *professional self-organization*, where each participant in the team takes responsibility for acquiring all the specific support he or she needs to complete the tasks by means of smartly structured requests and responses.

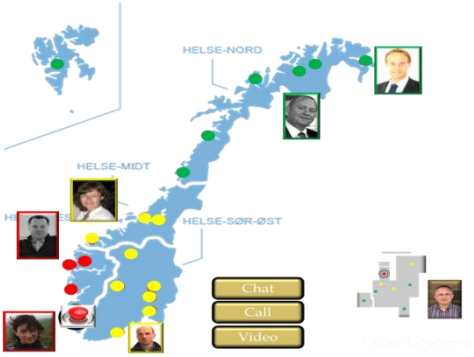


Figure 13: Geographical View of Burn Wound Team

The *Team Monitoring Module* makes it possible for any team member to see what other team members are doing and what progress they are making. This is done by visualizing the flow of the smart requests and responses at different levels of detail. This allows teams to improve or reconfigure themselves when critical services run into difficulties.

The *Team Communication Module* provides easy access to available modes of communication within a specific team and process.

Figure 14: Process View of Evacuation Decision Team

4.5.3 Integration with other Concept Cases

The FCRS concept consists of two main parts: the FCRS graphical user interface (GUI) and an advanced FCRS engine. The engine provides the advanced business logic to configure and monitor teams. The GUI makes it easy for end users to easily make use of this powerful logic. Via the BRIDGE middleware FCRS can make use of all other concept cases to conduct operations, depending on the scenario.

4.5.4 Features visible in BRIDGE Demo III

The FCRS concept emerged in response to the need for overall interoperability of all developing concepts, at the level of business logic and human interaction. The concept will be validated during demo III and fully presented at the final demonstration. The FCRS concept is now in fact an innovative *exploitation activity* of Thales due to multiple commercial interests in follow-up to the R&D in BRIDGE.

4.6 Concept Case First Responder Integrated Training System (FRITS)

4.6.1 Overall Goal

The main objective for FRITS is to establish an optimal learning and training methodology, supported by an integrated portfolio of sub-systems that will improve the quality of emergency response and crisis management in intra-agency and inter-agency operations.

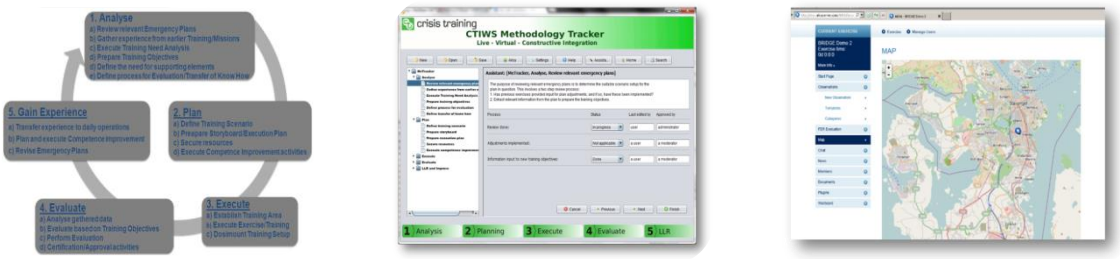


Figure 15: The training methodology transferred into FRITS tools for exercise analysis, planning,

4.6.2 Main Functionality

FRITS will use BRIDGE developed methods and tools together with COTS (commercial off-the-shelf) technology to ensure flexibility and to provide scalability for different end-user needs.

The concept is divided into modules, focusing on training, exercises and proper evaluation for improvements:

- Training methodology tools
- Evaluation tools
- Simulated training; live, virtual and constructive systems (commercial off-the-shelf (COTS)-technology)
- ITE – Integrated Training Environment

By combining two or more of these modules, FRITS will help prepare all levels of responders (operational, tactical, and strategic) to improve their training and exercise activities. Also, by focusing more on using various virtual and constructive tools in addition to live exercises, a quantified cost effective end-result is possible to achieve over a relatively short time-frame, ranging from base theory to large-scale multi-agency exercises.

4.6.3 Features visible in BRIDGE Demo III

For Demo III, FRITS focus will be on the evaluation and use of AKKA in a large scale live multi-agency exercise. In addition, the methodology has been used extensively for BRIDGE demonstration III, and will also be used for the Lessons Learned Repository in the methodology tracker, called "MeTracker", collecting results of the execution of the training methodology .

Figure 16: Overview of the FRITS concept; various tools on the left hand side and

The main training audience will utilize the concept for training outcome, by the help of observers and evaluators using predefined templates and sets of evaluation criteria. Last, but not least, there is a communication module, that might be standard operational equipment and/or software based solutions in order to train communication between the actors. This may also be used to support the communication between exercise control center and observers during the exercise.

The idea behind FRITS is that tailoring any of these tools creates a scalability and flexibility in order to achieve quality assured training and exercise objectives and be able to extract and utilize the outcome in a lesson learned repository. This is crucial for the competence progress for both individuals and teams, and makes all parties better prepared for the real incidents.

4.7 Concept Case Information Intelligence

4.7.1 Overall Goal

In all emergency management phases information about the current situation is vital. People document any situation they are confronted with in social media. Hence, our aim with BRIDGE Information Intelligence (II) is to introduce a tool that allows the automatic analysis of such media data in addition with live data from in-the-field and aggregates it in a sort of situational report.

4.7.2 Main Functionality

The BRIDGE II comprises several components:

1. *Aggregation Component:* It performs the aggregation based on sub-events (i.e. specific hotspots of a crisis) and shows the results to the user (see figures below).
2. *Data Simulation Component:* It allows the simulation of data during a running exercise. This tool can also be used for training purpose.
3. *Data Collection Component:* It is implemented as an Android-App and allows the collection of live data (from within the field).

The *Aggregation Component* performs the aggregation based on online clustering algorithms. It aggregates the data based on their textual and location content. The aggregation can be performed on social media data (e.g., Twitter) and on live data coming from within the field.

The results are shown to the user via a web-based implementation reachable from any browser (e.g., Mozilla, Google Chrome etc.). The GUI contains a map-representation and a detail view for sub-events (see Figure 17 and Figure 18). In addition, it allows filtering the results based on geo-location and/or keywords.

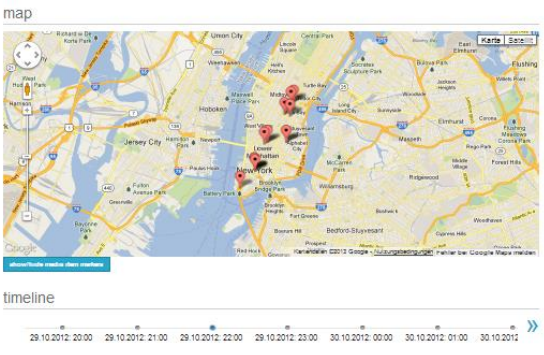


Figure 17: Aggregation Component GUI

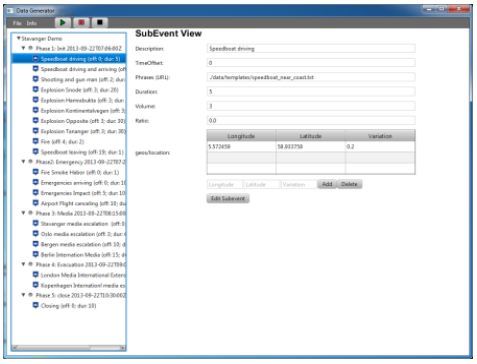


Figure 18: Data Simulation Component

The Data Simulation Component allows the creation of data based on a given scenario description (XML). The description can be also administered by the tool (see Figure 18). The

creation of the dataset follows this scenario description. It comprises short text messages (i.e., simulated tweets), which are based on the effect the incident might have. For the generation process different sub-event attributes are needed (see figure right-hand-side), e.g., start of the sub-event (offset) during the exercise, description, some textual phrases for the generation mechanism etc. The data simulation tool can be used, e.g., for training to integrate (simulated) "social media" into a running exercise.

The *Data Collection Component* allows the introduction of live data into the aggregation process. The Smartphone App was created in collaboration with Fraunhofer FIT and the Alpen-Adria University at Klagenfurt (based on the "Local Cloud" concept developed at Fraunhofer FIT). It allows directly the integration of text messages and pictures from persons in the field into the aggregation mechanism. The idea is to enrich the aggregation process with this live data

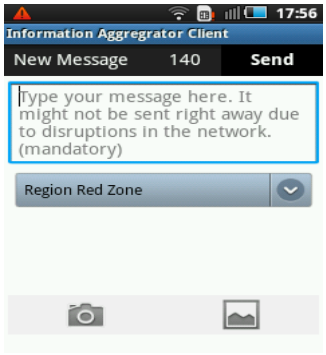


Figure 19: Data Collection Component

4.7.3 Integration with other Concept Cases

The information aggregated by BRIDGE II can be passed to the Master Table (see section 4.8). This is performed by selecting a specific sub-event which is of importance for the emergency agencies. In addition, it makes use of the general ideas of the "Local Cloud" concept developed at Fraunhofer FIT.

4.7.4 Features visible in BRIDGE Demo III

The following components of the BRIDGE II will be shown during the Demo:

- *Aggregation Component:* The aggregation component to aggregate and visualize the information
- *Data Simulation Component*: This component is used to create sufficient amount of data to aggregate. The simulation is based on a description following the Risavika exercise scenario.
- *Data Collection Component*: Students will collect pictures and send text messages during the Risavika exercise.

4.8 Concept Case MASTER

4.8.1 Overall Goal

MASTER assists in keeping a common operational picture among central actors during an incident.

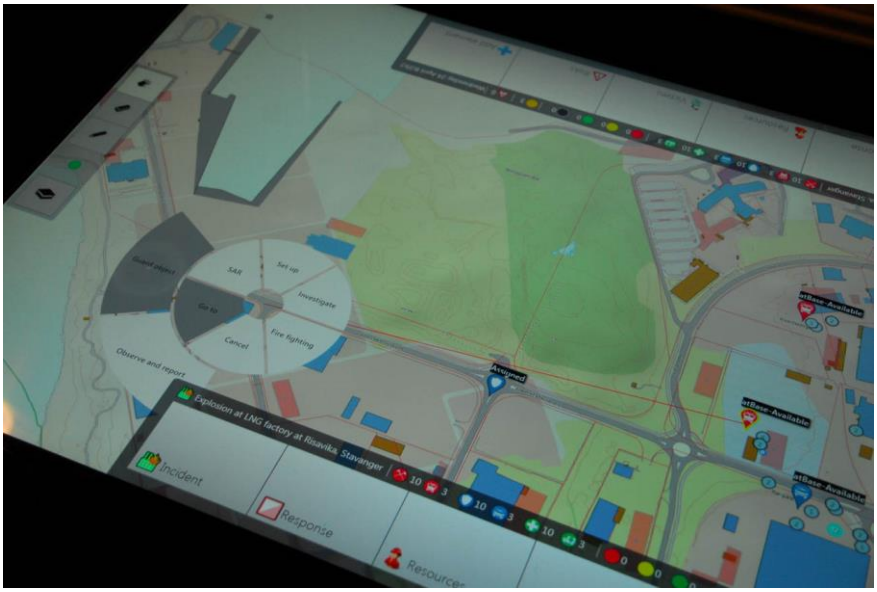


Figure 20: Overview of the Mater table

4.8.2 Main Functionality

The Master provides functionality to present and act on three types of information, which are accessible through the BRIDGE system:

- *Information about the incident*,
  e.g., incident location and number and triage status of victims;
- *Information about the response*,
  e.g., number and position of police, fire and health vehicles;
- Information from external services, e.g., weather.

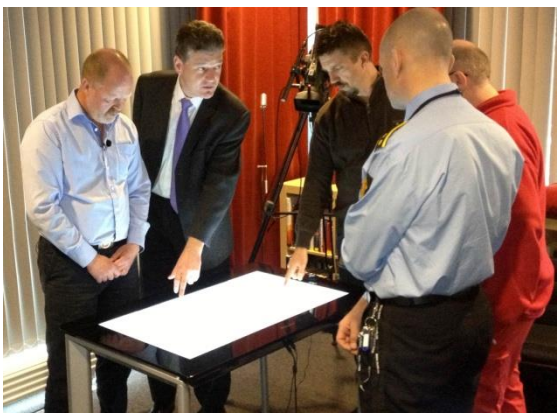


Figure 21: Discussion and explanation at the Master Table

4.8.3 Features visible in BRIDGE Demo III

During the 3rd Demonstration in Stavanger, the MASTER will display information from the following BRIDGE parts:

- Incident information added by incident response teams using MASTER system
- Triage and status of patients
- Resources Managing
- Input from external sources:
    - Weather
    - Information Intelligence - Flickr, YouTube, media
- 3D models

The BRIDGE system will be available on three different devices:

- Tablet for use by individual leaders
- Touch sensitive table for use by the incident command team
- Ordinary PC for use by operational centers

Figure 22: Projector presentation

Figure 23: Tablet version

4.9 Concept Case Robust and Resilient Networking

4.9.1 Overall Goal

The main goal is to create an ad-hoc networking infrastructure that provides networking services on an incident site. The so called BRIDGE Mesh network allows other systems to exchange data locally or send them to other networks such as the Internet. The HelpBeacons application allows people to use their smartphones to advertise their need for help.

4.9.2 Main Functionality

Robust and Resilient Communication comprises several components:

1. Wireless Mesh routers that form an ad-hoc network (called the BRIDGE Mesh) to provide a networking infrastructure for other systems on the scene (e.g., eTriage (see section 4.4))
2. The HelpBeacons application that allows people to call for help using an Android smart phone

3. The HelpBeacons Seeker application that is used by first responders to collect SOS messages

The wireless mesh routers form an ad-hoc networking infrastructure that can be used by other concept cases to exchange data. All routers provide wireless access points to allow other devices (such as smartphones, notebooks or the eTriage bracelets) to join the network. Some routers provide gateways to other networks such as the Internet and bridge different wireless technologies.

The HelpBeacons System provides a way for people to call for help using their Android smartphones. The HelpBeacons system uses the Wi-Fi wireless technology to advertise short help messages. First responders that use a HelpBeacons Seeker application can collect beacons in their vicinity and locate victims.

Figure 24: The HelpBeacons app

Technically, the idea is implemented by encoding short messages inside the name of the Wi-Fi access point created by the victim's smartphone. Any device in range can see these messages using its Wi-Fi interface.

The HelpBeacons Seeker application has been designed in a way that is does not need any user intervention to collect HelpBeacons and send them to the BRIDGE Mesh. This allows the first responder to fully focus on his/her tasks. Optionally, the first responder can be notified via acoustic signals or vibration when a new HelpBeacon has been found.

Figure 25: Front officer with HelpBeacons Seeker device

Collected HelpBeacons are sent by the seeker device to the BRIDGE mesh that provides connection to other BRIDGE systems such as the BRIDGE Master. Thus, the Master can visualize information about HelpBeacons, such as the help message itself or the time the help message was received by the seeker. If the GPS position of the victim and/or the seeker is available, the Master can visualize the location of HelpBeacons on a map.

4.9.3 Integration with other Concept Cases

The information that is collected by the HelpBeacons Seeker application is sent to the BRIDGE Mesh network where a dedicated service first stores the received data locally. The data is then transferred via the BRIDGE middleware to other interested parties. Thus, the BRIDGE Master can access and visualize the help beacons.

4.9.4 Features visible in BRIDGE Demo III

The following will be shown during the Demo:

- BRIDGE Mesh: Wireless mesh routers application will be deployed that provide the networking infrastructure for the eTriage bracelets and the HelpBeacons.
- Several smart phones will run the HelpBeacons application to simulate the dynamics of having injured that call for help in different positions.
- One smart phone running the HelpBeacons Seeker application will collect the help messages and forward them via the BRIDGE Mesh
- Collected HelpBeacons will be visualized on the BRIDGE Master.

4.10 Concept Case Situation aWAre Resource Management (SWARM)

4.10.1 Overall Goal

BRIDGE SWARM (Situation aWAre Resource Management) combines resource management (resource identification, involvement, task assignment, status reporting) with technology for achieving situation awareness, in order to:

1 Provide first responders with a continuous overview of the resources in their immediate surroundings (including human resources);
2 Communicate the state and context of human resources (e.g. their condition and health, environmental conditions like temperature, background noise, etc.);

3 Provide better context-aware predictions of activities of resources, e.g. estimated times of arrival for moving resources.

4.10.2 Main Functionality

The SWARM concept case provides functionality to the end-users on a smartphone and on the Master Table. Smartphone Functionalities:

Get insight into:

14. Location of the incident;
15. Location of command/control posts;
16. Location and status of surrounding resources;
17. Location, assigner and status of my current task.

Inform others about:

18. My task status;
19. My personal status.

Direct (emergency) voice contact with:

20. (Assistant) Incident Commander;
21. Any other person (configurable).

Figure 26: SWARM Smartphone application

Master functionalities:

Get insight into:

22. Location and status of resources;
23. ETA for moving resources;
24. Current tasks and their status.

Inform others about:

25. New task assignments;
26. Dynamic team formation.

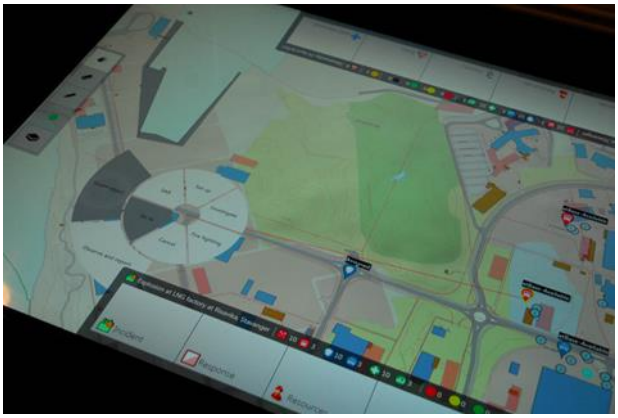


Figure 27: SWARM resources shown on the Master Table

4.10.3 Integration with Concept Cases and BRIDGE Middleware

The SWARM Concept Case integrates the Master Table with a general purpose smartphone application through a secure publish/subscribe service provided by the BRIDGE Middleware.

4.10.4 Feature visible in BRIDGE Demo III

During the 3rd demonstration in Stavanger, SWARM will be used by the incident commander + assistants and a number of team leaders in the field for four major purposes:

27. Get insight into the current location and status of resources on the Master;
28. Assign tasks and keep track of task statuses on the Master;
29. View task information and the location of tasks and teams on the smartphone;
30. Modify personal status and the status of assigned tasks on the smartphone.

4.11 Asset DEIN

The DEIN technology aims to involve external experts in an emergency situation by providing web-based interfaces that allow first responders and on-line experts to exchange information. The expertise of the off-site experts can be used to help in the assessment of (aspects of) the incident scene, to obtain advice on an intended course of action or in any other matter that external experts can provide useful assistance.

4.11.1 DEIN Technology

Capability capturing and information exchange

In order to become part of a network of experts, the expert needs to go through a registration process, where (s)he documents the capabilities that (s)he can provide. The capabilities are described using natural language and keywords. Based on the keywords the registration mechanism will try to find equivalent capabilities already documented in the system, to keep the set of capabilities coherent and unambiguous. The expert also defines the interface that (s)he needs to execute the capability that is being described. In DEIN information exchange takes place with so-called Request and Response Forms.

The capability of an expert is invoked using a Request Form that contains all the necessary information to describe the problem. The response produced by the expert is formulated using a Response Form. Both forms are defined by the expert, using a dedicated GUI.
In order to successfully execute the invoked capability, the expert may need to invoke capabilities from other experts, observers or sensors. The information exchange between the expert and the capabilities provided by others is also based on Request and Response Forms.

After completion of the registration process, defining all the Request and Response Forms for all capabilities provided, the expert can now participate in the expertise network. A software agent representing the expert is created (automatically) that collects the request and response form that are relevant for the expert and displays these forms in an interface.

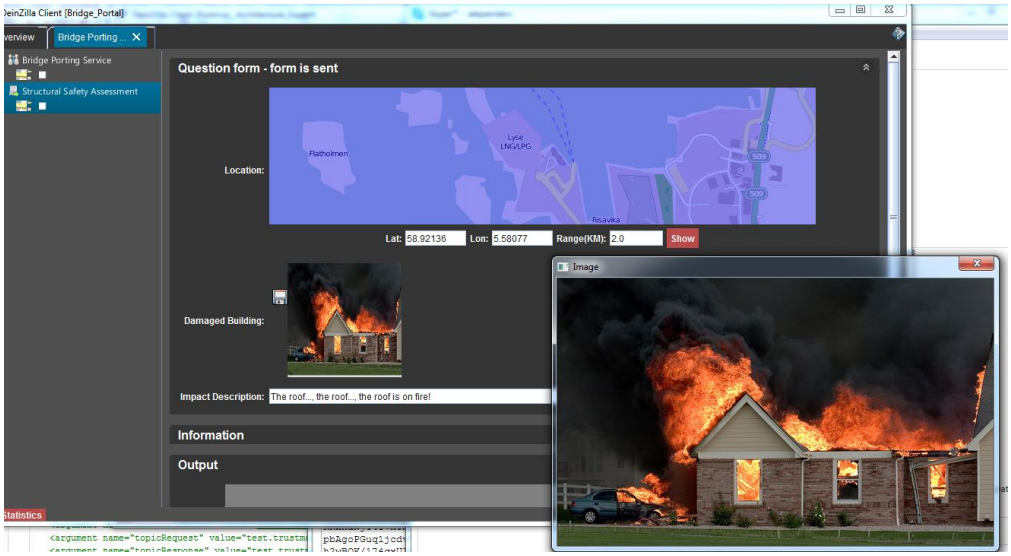


Figure 28: Example of DEIN graphical user interface

DEIN Agents and Matchmaking Technology

DEIN makes use of the Dynamic Process Integration Framework (DPIF) wrapper technology which

31. makes very heterogeneous services composable,
32. supports reliable service composition through service discovery and
33. keeps track of information flow in complex collaborative systems.

In DEIN each local process (human or machine-based) is encapsulated by a module which is implemented through a software agent (a DEIN agent). The agents provide a uniform interface between different local processes involved in collaborative information processing workflows.

A key feature of the DEIN agents is asynchronous, data-driven processing in complex workflows. This is achieved through a combination of weakly coupled processes. Each module consists of at least two basic processes implemented through asynchronous threads communicating via a local blackboard (see Figure 29).

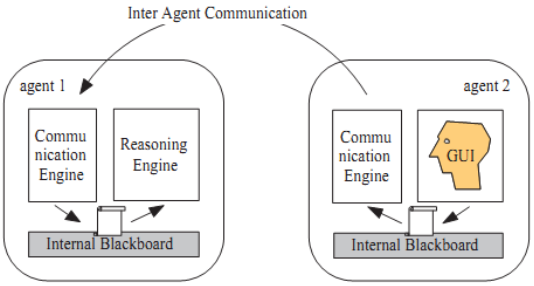


Figure 29 Interaction between agents providing heterogeneous processing services

Both agents use identical communication engine. However, agent 1 encapsulates automated processing while agent 2 integrates human-based processing.

DEIN agents can autonomously form workflows in which heterogeneous processes support collaborative analysis (see example in Figure 30). The DPIF implements advanced negotiation mechanisms, which support automated creation of connections between experts and automated processes by using multiple criteria and advanced protocols.

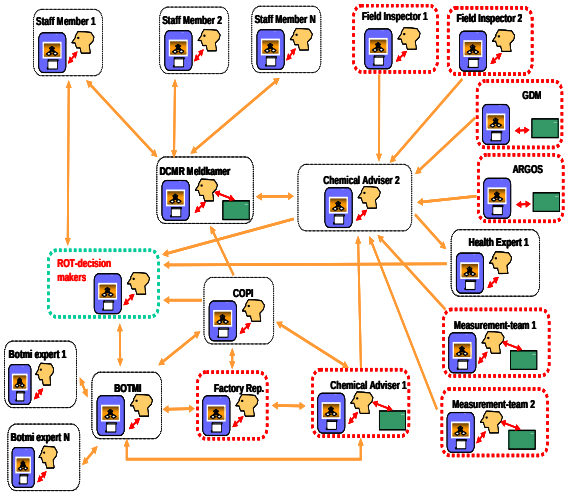


Figure 30 A simplified example from Crisis Management

This simplified Crisis Management example illustrates the information flow between different collaborating experts and automated tools that are integrated via DEIN agents (blue rectangles).

4.12 Asset eTriage

4.12.1 eTriage System

BRIDGE eTriage assists in marking and monitoring victims and in creating real-time situation awareness. It aims to ease the triager's task and bridge the process from triage to hospital admission. The eTriage system is made up of several components that work together, but independently, to mark and monitor victims.

4.12.2 Triage Bracelet

A colored, reflective plastic bracelet, just like the ones being used currently for triage in a number of countries, is snapped on a patient's arm. This plastic bracelet is augmented with

microelectronic components and various sensors that do not need contact with the victim's body (e.g., air temperature, infrared, etc.).

Figure 31: The eTriage bracelet prototype

4.12.3 Triage Relay

The Triage Beacon is a small device that is intended to clip on a normal trouser belt like a beeper. It needs no interaction from the triager; its role is to gather data from the disaster field and transmit them to the command center in case the MESH has a problem.

4.12.4 Clip-on Sensors

Clip-on sensors are those that need contact with the victim's body, e.g., heart rate, breathing rate, blood pressure, etc. They allow monitoring the victim instead of simply marking him or her. The sensors are intended to be used either by the triagers or by the medical personnel at the assembly point, as needed.

4.12.5 Triage Tablet

The main purpose of the triage tablet is to visualize the triage data. It is intended to be used by either triagers, or by the medical personnel at the gathering place. Two different visualization modes are available: The map mode (figure left) and the augmented reality mode (figure right). In the map mode, icons representing each patient are displayed on a map. Each icon contains the most important triage data category, pulse and respiration rate. For outdoors, a Google Map is used and the users own plus patient’s positions are acquired by GPS. For indoors, floor plans and roughly estimated positions are used.

The augmented reality mode presents a camera stream on which again category, pulse and respiration rate are overlayed as icons. The medic uses the tablet as “lens”, scanning the environment by turning and acquiring triage data about his current view.

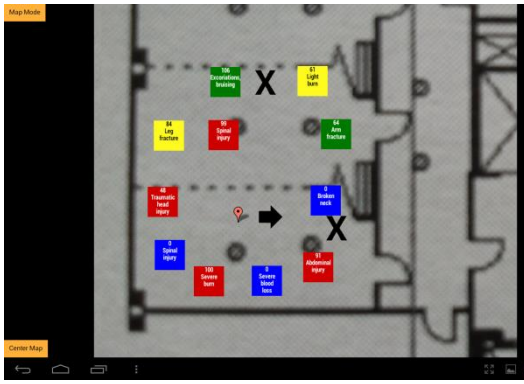


Figure 32: Triage Tablet

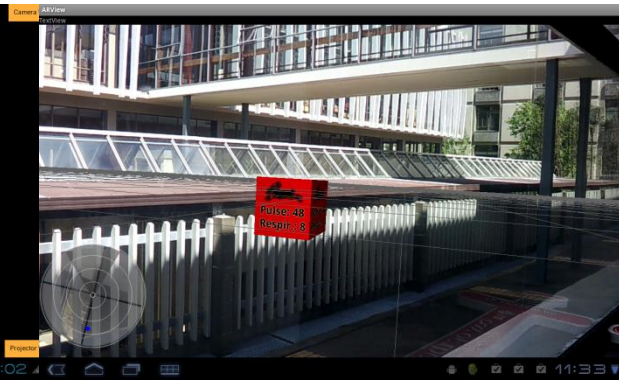


Figure 33: Augmented Reality mode

In both modes, a click on an icon reveals all data about a patient. As alternative, the triage tablet comprehends an RFID reader which allows for scanning a patient's bracelet in order to call up the detailed patient information on the screen. The triage tablet can, additionally, function just like a triage relay.

4.12.6 Availability in BRIDGE Demo III

At the moment, we have five Triage Bracelets available, and we plan to build at least five more. We have one Triage Tablet and we can build a second one. We also plan to build two or three Triage Beacons. At the moment, we have no usable clip-on sensors and we do not foresee being able to build some until the Demo. We can nevertheless provide some plastic prototypes for demonstration, whereas the visualized sensor values shall be computer-generated, for illustration purposes only.

4.13 Asset BRIDGE Middleware

4.13.1 Overall Goal

BRIDGE middleware supports the flexible assembly of emergency response systems into a 'system of systems' for agile emergency response. Such systems include BRIDGE concept cases, but also independent systems such as healthcare or vehicle registration records, building sensors or CCTV camera systems.

4.13.2 Main Functionality

To the producers of emergency response systems, BRIDGE middleware offers a consolidated set of software services organised in three layers that facilitate the orchestration of systems, the communication between such systems, and the management of data produced by such systems during an incident's life-cycle.

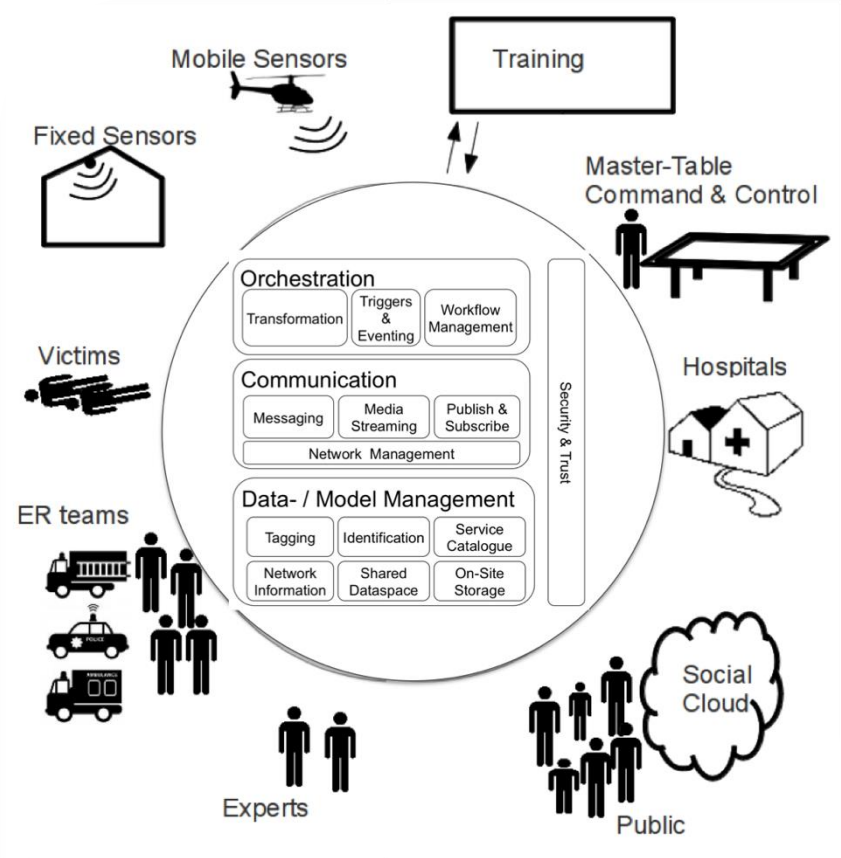
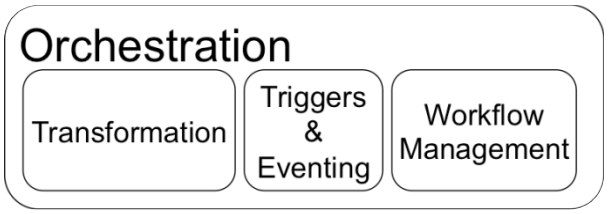
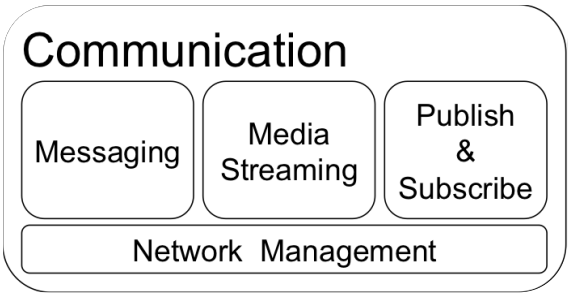


Figure 34: The functional coverage and delimitation of the MW in terms of three broad categories of functions.

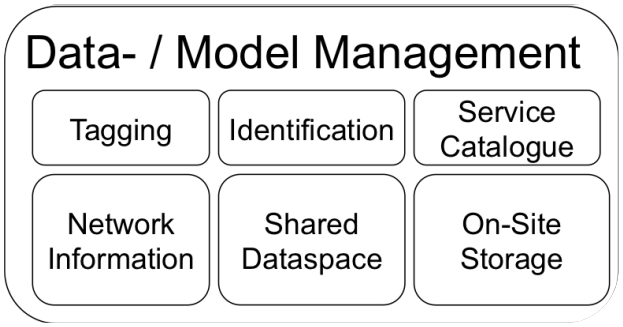
Orchestration provides support for the composition of services and workflows.



Communication provides services enabling distribution of data as well as invocations of services.



Data Management supports the acquisition, storage and exchange of data, services and models emerging from diverse sources (colleagues, sensors, experts, public, etc.) on the fly.



Security is provided by a combination of guidelines, models and supporting technologies including standards.

4.13.3 Integration with BRIDGE Concept Cases

The BRIDGE middleware forms the basis of all BRIDGE Concept Cases and underpins interoperability between different BRIDGE and external systems.

4.13.4 Availability in BRIDGE Demo III

The following services of the BRIDGE middleware will be demonstrated:

- Messaging Service
- Publish/Subscribe Service
- Network Management
- Triggering and Eventing
- Workflow Management
- Service Catalogue
- Identification Service
- On-Site Storage
- Shared Data Store

5 Execution of the third BRIDGE Demonstration

5.1 Chapter overview

This chapter reports on the events that actually took place during the third BRIDGE demonstration and the events that surrounded it from September 25th through September 27th, 2013. The photos included in this chapter are courtesy of (and copyright by) Lyudmila Zaitseva, Maximilian Wietek and Ludo Stellingwerff.

The order of events on the actual BRIDGE demonstration days differs slightly from the order in which they are presented in this chapter. On the days before the Risavika exercise, in combination with the final preparation and set up of the BRIDGE Concept Cases, we organized an End User Advisory Board meeting (September 24 and 25), where all the Concept Cases were presented to the EUAB members. The EUAB members were also invited to observe the Risavika exercise. The Risavika exercise took place on September 25th, observed by the BRIDGE review commission. After the Risavika exercise, on September 26, we have organized a separate demonstration session for the review commission, while at the same time the Nordic Conference on Disaster Mitigation took place (September 26 and 27).

This chapter briefly reports on the events of the exercise in section 5.2, followed by a brief impression of the End-User Advisory Board Meeting (section 5.3) , the review meeting (section 5.4) and the conference (section 5.5).

5.2 Risavika exercise

Although the Risavika exercise was meticulously planned, in the days before the exercise the Skangass company received some ‘bad press’ what made the management of Skangass decide to withdraw from the exercise. The scenario was adapted to exclude the Skangass LNG plant in Risavika from the storyline, and include a burning LNG truck; the exercise was further executed as planned.

The number of people involved in the Risavika exercise on September 25th was large. An informed estimate:

150 first responders (including the responders in the emergency control centres in Stavanger)
200 role-players (mostly school children, playing wounded victims)
50 training coordinators, coordinating the exercise from the 3rd floor of the ferry terminal
50 members of the BRIDGE project
120 observers of various origins
2 TV-reporting teams and several members of the written press
Unknown number of crew, facilitating various aspects of the exercise (make-up artists, catering, drivers, etcetera)

The BRIDGE team was provided with a separate wing of offices in the ferry-terminal, to set-up equipment in preparation for the exercise. The BRIDGE-wing was declared off-limits for the exercise. In this BRIDGE-wing, behind the scenes, a number of BRIDGE members were busy keeping the BRIDGE middleware up and running, and supporting the various Concept Cases during the exercise.
A number of BRIDGE project members were ‘deployed in the field’, to assist in interacting with the BRIDGE technology.

Yet another group of BRIDGE members, equipped with video and photo cameras, documented the activities during the exercise, to help us learn as much as possible from this exercise.

BRIDGE also contributed a large number of devices and technologies to the Risavika exercise: we handed out over 30 smart-phones and tablets running BRIDGE software, we set up a MASTER table in the incident command shelter and MASTER beamer at the Stavanger University hospital; we handed out prototype eTriage bracelets, glasses with video-cameras, network components and other hardware. We also helped role-players and first responders install BRIDGE software on their smart-phones.
In addition, the displays of software supporting the BRIDGE Training Concept Case was beamed during the entire exercise in the exercise control room at the ferry terminal.

The agenda for the BRIDGE Demonstration is included in Appendix I.

5.2.1 BRIDGE Technology demonstrated during the Risavika exercise

At the Risavika exercise a number of BRIDGE Concept Cases and Assets were demonstrated, but not all Concept Cases were deemed mature enough to participate in the exercise. The Concept Cases included in the exercise are:

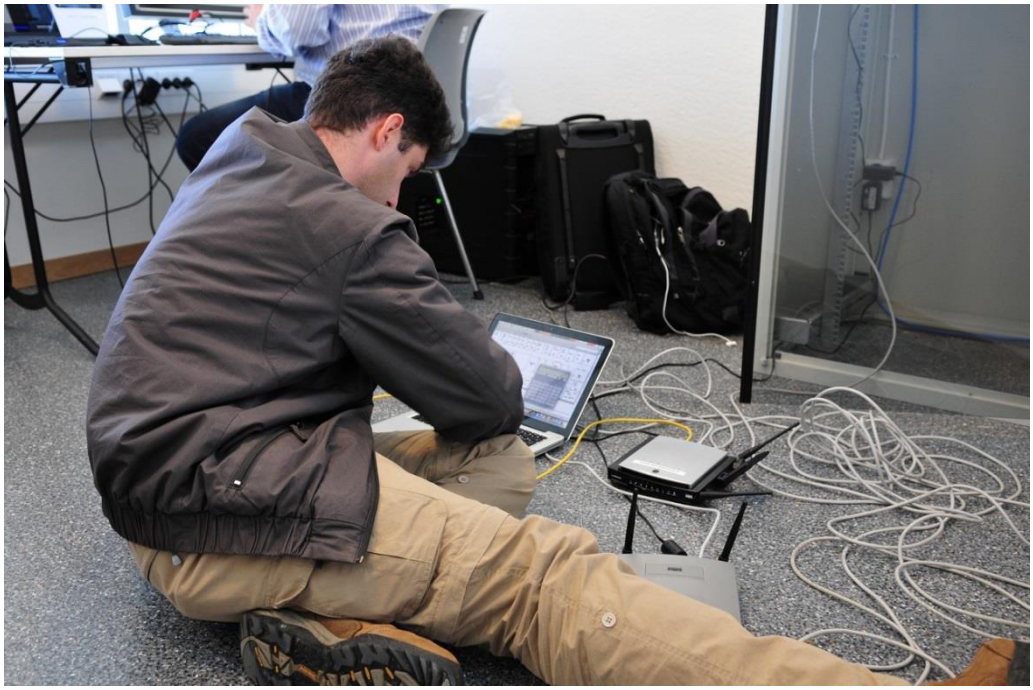
1. CC Dynamic Tagging of the Environment
2. CC First Responder Integrated Training System (FRITS)
3. CC MASTER
4. CC Robust and Resilient Networking
5. CC Situation aWAre Resource management (SWARM)

The BRIDGE Assets included in the Risavika exercise are:

1. eTriage
2. BRIDGE Middleware

5.2.2 A photographic impression of the exercise

Preparations of the BRIDGE Team…



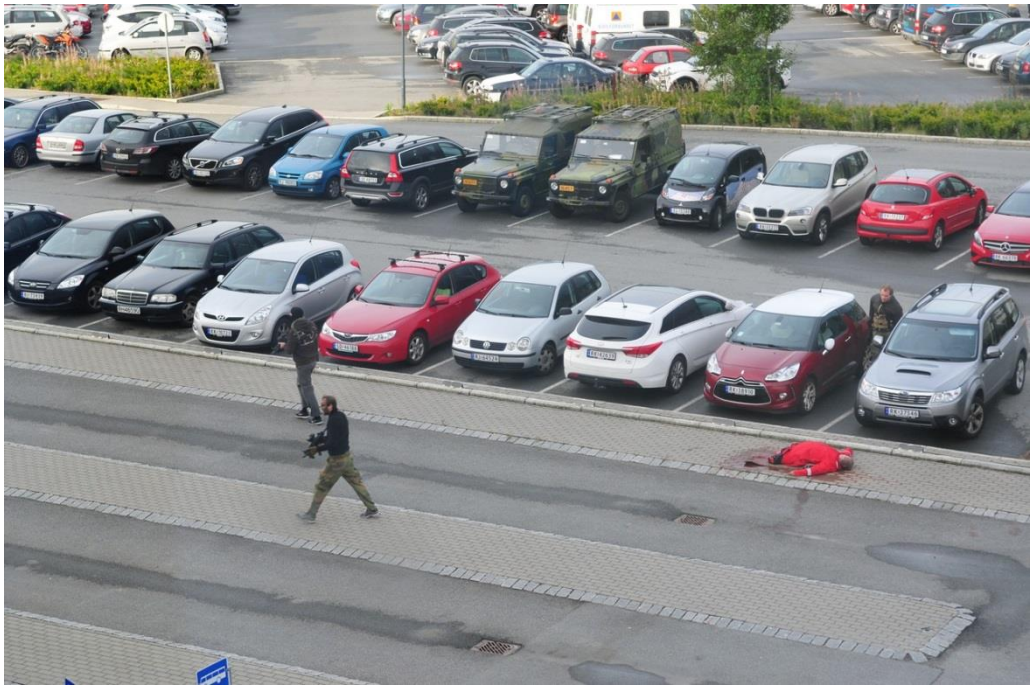
Preparation of the infrastructure and middleware…

…discussions on urgent issues and last minute adjustments…

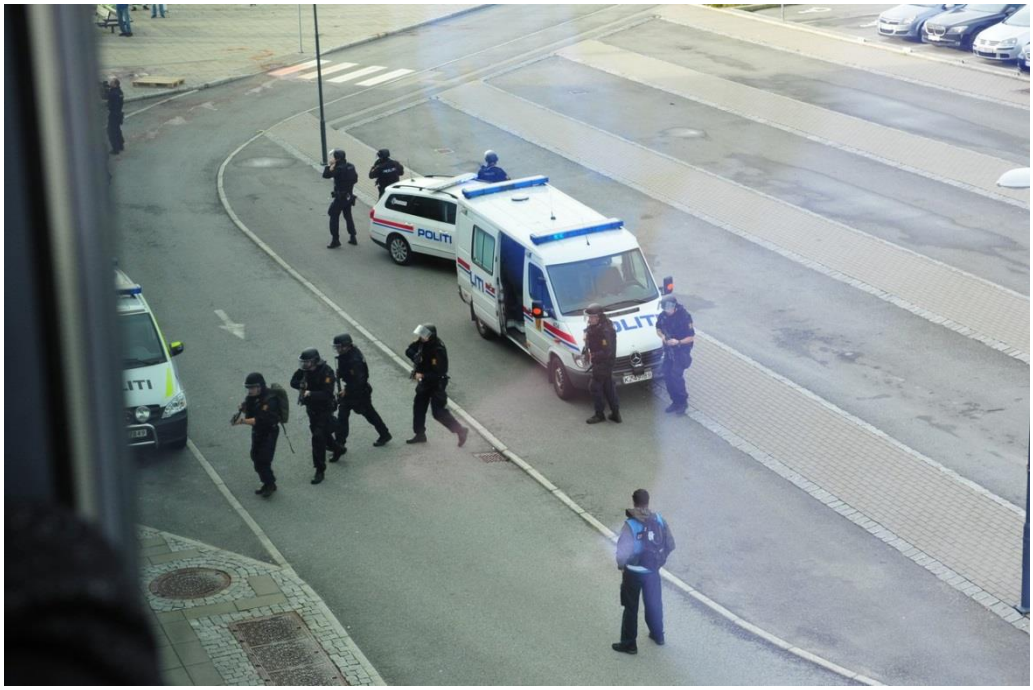
…and preparation of the Master Table.

… and preparation of the exercise role-players

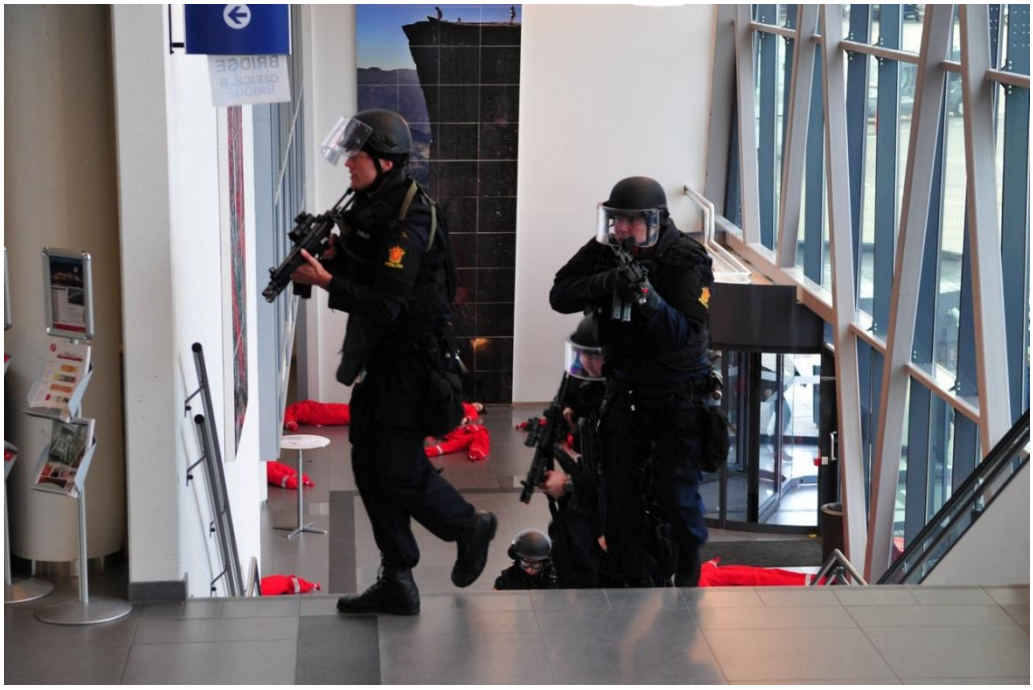
Arrival of the terrorists



Causing mayhem



Arrival of the SWAT Teams



SWAT teams securing the ferry terminal

Deployment of the fire-fighting and medical emergency services. The fire engine has the same color as the ambulances…

BRIDGE eTriage in action

'Wounded victims' were actually taken to the hospital. A coordination centre was set up at Stavanger University hospital.

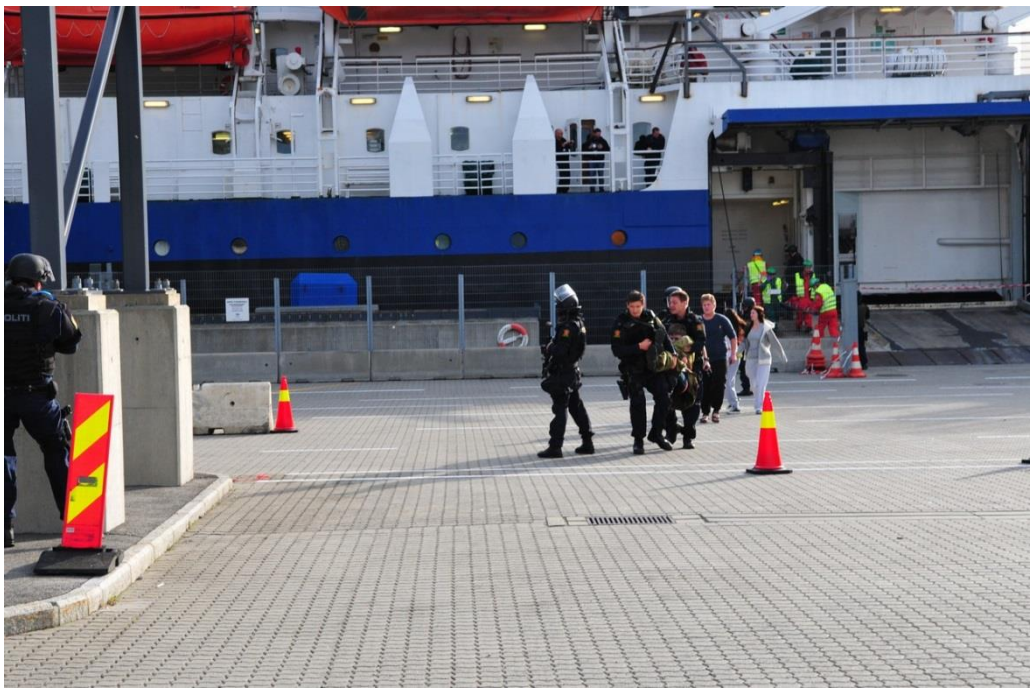
Triage and evacuation on the parkinglot.

Deployment of rescue helicopters

The Norwegian training ship GANN, acting as ferry during the exercise, just before the start of events.

Emergency personnel rushing to the ferry…

…to find casualties and wounded in an area just secured by the SWAT teams. An interesting detail: two of the victims would have been overlooked bythe first responders if it were not for the BRIDGE RescueMe app, which proved its usefulness in that instant.



The (body of) the last terrorist taken from the scene.

Many observers (identifyable by the blue vests) during the exercise were allowed to walk around in relative freedom over the exercise area.

The debriefing of the Risavika exercise in the exercise coordination rooms.

5.2.3 Press coverage

The Norwegian press was invited and present at the exercise. Several interviews were conducted and the efforts of the first responders were filmed and photographed.

BRIDGE EUAB-member Heiko Werner interviewed by the NRK reporters

The Norwegian national television station NRK covered the Risavika exercise and the BRIDGE Demonstration in a 7 minute segment as the main topic of the evening news. The news broadcast can (still) be found online [6].

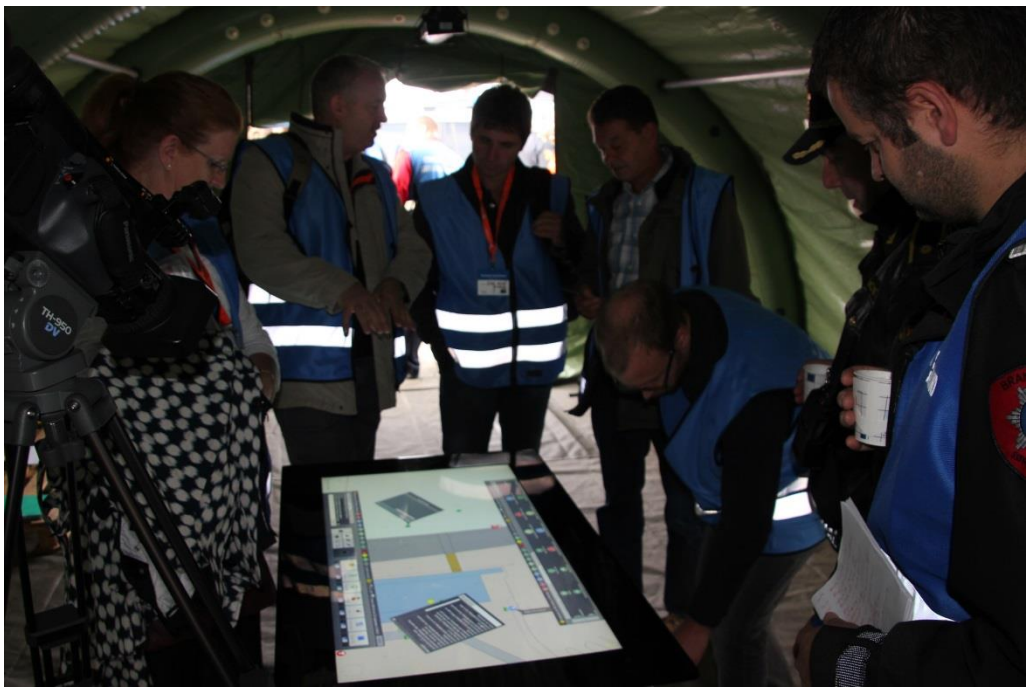
5.3 BRIDGE End User Advisory Board

The concept cases were presented to the End-User Advisory Board the day before the Risavika Exercise. BRIDGE members recorded audio and video of these presentations; the recordings serve as input and aide memoire to the BRIDGE concept case teams.

The EUAB witnessed the Risavika exercise as observers. They interacted with the BRIDGE technology, the first responders in the exercise and the assembled press.
Most of the EUAB members took advantage of the opportunity to attend the Nordic Conference on Disaster Mitigation.

The EUAB listening and giving feedback to…

…presentations of all the BRIDGE Concept Cases



The EUAB inspecting the Master Table, which was set up in a separate room in the incident command shelter. The incident commander tried once to look at the Master table, but was apparently deterred by the amount of observers trying to get a look…

The agenda for the End-User Advisory board meeting is included as Appendix II.

5.4 BRIDGE Review Commission

The BRIDGE review commission was present at the Risavika exercise as observers. On the second day of the BRIDGE Demonstration they were given presentations and demonstrations of the individual BRIDGE concept cases.

The BRIDGE review commision observing the Risavika exercise and the BRIDGE Concept Cases in action

Separate presentation and demonstration of the BRIDGE Concept Cases to the review commision on the second day.

5.5 Nordic Conference on Disaster Mitigation

On 26 and 27 September 2013 the Nordic Conference on Disaster Mitigation was held on the premises of the Stavanger University Hospital.

The conference featured two tracks and 7 members of the BRIDGE project as well as 3 members of the BRIDGE End-User Advisory Board were given the opportunity to present their work and vision.

A photo-impression of the conference:

The program of the Nordic Conference on Disaster Mitigation is included as Appendix III.

All presenters at the conference are invited to contribute to an anthology which we are going to publish through Elsevier, Inc. We are currently in contact with the publisher and the plan is to have the anthology ready at the end of the project which will give a broad academic overview of some of the core research done in BRIDGE.

6 Looking back and forward

6.1 Chapter overview

In this chapter we will look back on the BRIDGE demonstration in Stavanger and the Risavika exercise, and identify some successes and failures. We will also look forward to the fourth BRIDGE demonstration and provide some recommendations.

6.2 Looking back

6.2.1 Demonstration Preparation

The BRIDGE project team has been preparing for this demonstration roughly for one-and-a-half years. From the decision to join the Risavika exercise (early 2012) until its execution in September 2013, we organized various meetings and events to prepare as good as possible.

We believe the idea of Concept Cases that provide a cross-section of technologies, instead of isolated stand-alone technological developments in the work packages, is a good one. The Concept Cases enable us to present groups of various technological concepts as well-defined coherent capabilities to the emergency response domain. This greatly helps us in talking to the target audience, who is not as such interested in technology, but in usable functionality.

However the coherence of the Concept Cases themselves (how the Concept Cases in collaboration improve the current state of the art in emergency response technology) has not always been pointed out as clear as is could have been. There are two main reasons for this:

3. The BRIDGE Middleware has been interpreted as a given by many of the concept cases instead of as a noteworthy enabling technological advancement. It has been unclear to some BRIDGE members what the use and availability of the very meticulously crafted services in the BRIDGE middleware is, and how it would serve as a binding factor. Various workshops and meetings have not completely resolved this problem.
4. The maturity level of the orchestration services was at the time of the demonstration insufficient to showcase how technological assets and human resources contributed by multiple agencies can be brought together in a dynamic collaboration.

On the route to the Risavika exercise, a number of technical integration meetings and BRIDGE workshops were organized. This helped tremendously in the formation of tightly knit BRIDGE teams that were able to make great progress in the implementation of the BRIDGE Concept Cases. These events also kept the teams in check with each other, and ensured we could develop a vision of how one Concept Case was related to other Concept Cases.

The second BRIDGE demonstration and EUAB meeting in April 2013 can be regarded a stepping stone, where we could check the feasibility of the BRIDGE developments for end-users. We obtained a lot of useful feedback from this event.

Another good thing in the preparation phase was the presence of BRIDGE member in the organisation committee of the exercise. This kept us well informed of the developments and implicitly helped us validate out training concept case. It was also an important help for us to let the organizing committee keep an open mind to new technology.

In retrospect, we can conclude the BRIDGE project had a thorough preparation for this demonstration, and maintained intensive contact with the right people, both contact between project members and with external agencies.

6.2.2 *Demonstration Execution*

For the participating emergency services, the Risavika exercise itself was a huge success. In addition, the presence of BRIDGE and BRIDGE technology was well acknowledged. However, major parts of the events were beyond the control of BRIDGE, since the primary focus of the exercise was the training of practice of the emergency response teams.

The unfamiliarity of the first responders with the BRIDGE technology made them to some extent ignore the devices we provided to them. As an example, we distributed 30 smart-phones for the SWARM Concept Case, which disappeared inside the pockets of the responders not to be used during the exercise[2]. However, it did enable us to track the whereabouts of the first responders with a smart-phone, so we can claim a partial success here. This is also an acknowledged and well-known problem of developing technologies for emergency response. As Murray Turoff wrote in his article in Communications of the ACM in 2002: "An emergency system not used on a regular basis before an emergency will never be of use in an actual emergency." Hence, we see it as a success in itself that many parts of our system came to use during the exercise, even though most of the responders were hardly familiar with it before the exercise.

Illustrative is also another drawback of the pressure and scale of the exercise: at one point the Incident Commander, located in the shelter on the parking lot, came to look at the Master table we had set up in that same shelter. At that time the room was rather populated with observers and the table was inaccessible to the commander. Instead of sending the observers out (as he could and maybe should have done) he chose to fall back on familiar technology (2 phones) and ignored the table for the remainder of the exercise. As we learned later, this was also related to the fact that parts of the radio system had broken down during the exercise and made it necessary to resort to mobile phones for the communication between and inside the first responder organizations. Using unfamiliar technologies, in this regard, was perceived as too risky in this situation due to the enormous pressure for the incident commander and assisting commanders of the police, the fire fighters, and the paramedics to come to a positive result with the exercise.

There are also unambiguous successes to report. Two of the victims on board of the training ship GANN used the BRIDGE RescueMe app from their hiding places to notify the responders of her presence. The search and rescue team overlooked them executing the conventional procedures, but the team came back and found them after the team-leader noticed the distress messages they had sent.

As another example, the Master presentation set up at the Stavanger University hospital was well used and kept the medical coordination centre informed during the exercise.
In the debriefing right after the Risavika exercise had ended, we were also able to extract some first results from the training software. Since the training was on multi-agency collaboration and communication, we could graphically display the amount of communication between first-responders during the exercise, and give some samples of the feed-back and observations collected by the training observers.

6.2.3 *Feed-back on Concept Cases*

During the demonstration days we received a lot of feed-back on our technology from the End-User Advisory Board, the Review commission, the end-users and observers. Also the Nordic Conference on Disaster Mitigation provided useful input.

[2] At the end of the exercise all phones were returned, so none went missing.

Now the feed-back needs to be processed by the Concept Case teams and turned into (plans for) improvement of the technology. Organizing and preparing for all these smaller and larger (sub-) events put a lot of stress on the BRIDGE project team. However, from the perspective of exposing technology to various audiences and asking feed-back, the demonstration was a huge success for the BRIDGE project.

6.2.4 Dissemination

All in all we can be very satisfied with the amount of exposure we achieved with the third BRIDGE demonstration. The presence of end-users, observers and press at the Risavika exercise, as well as the subsequent conference in Stavanger, helped us disseminate the BRIDGE concepts successfully on a large scale.

6.3 Looking forward

6.3.1 Preliminary conclusions

The way we have set up the third BRIDGE demonstration has some advantages as well as some drawbacks. On the positive side we can conclude

- We had a thorough preparation and stayed in touch with each other and the end-users. This allowed us to choose a proper focus, adjust concepts and prioritize implementation issues. Maintaining contact by all means necessary has had a positive effect on the developments in the project.
- The Risavika exercise allowed us to get in contact with a large community of ‘real’ first responders and international observers; that gave us the opportunity to obtain some preliminary evaluations and ample feedback of end-users who had some hands-on experience with our technology. This allows us to greatly improve our technology and adjust our concepts to their daily practice.
- Co-locating a conference with the demonstration exposed the BRIDGE concepts and technology to an audience of scientific and industrial peers. That constitutes a great way to disseminate the BRIDGE results.
- The Risavika exercise allowed us also to have a peek in the kitchen of emergency response operations. We have gained a much deeper insight in the severe conditions the end-results of the BRIDGE project will need to cope with.
- We also learned about the maturity and feasibility of the technological concepts in BRIDGE. As to be expected, some of the technology failed during the demonstration, allowing us to pinpoint what aspects need improvement. Some pieces of technology succeeded in proving their usability in real-life conditions. Exposing technology to real-life conditions really helps the development process.

On the negative side, we must conclude:

- We did not have control over the demonstration scenario and dates, the time-schedule, and indeed the execution of the demonstration at opportune moments in the exercise. This was a risk we identified beforehand.
- There is a substantial variation in the maturity level of the BRIDGE technology assets. Some are ready for production, others are still at the research and development level. That is to be expected for a project with the ambition and size of BRIDGE. However, this variance in maturity level prohibited us from demonstrating the BRIDGE

system as a whole, and may have ended up with a demonstration of a collection of rather fragmented concepts and technology.
This risk was also identified beforehand and mitigated by having separate demonstration sessions around the Risavika exercise.

6.3.2 Recommendations for the BRIDGE final demonstration

Evaluating the lessons learned, we can formulate a number of recommendations for the final BRIDGE demonstration.

1 Make sure we have full control of the demonstration scenario. It is of paramount importance that the final BRIDGE demonstration revolves around the BRIDGE technology that has been developed. Piggy-backing on a real exercise of first responders, even though it has provided us a number of advantages for this demonstration, may not be a good idea for the final demonstration.
2 For the final demonstration it may be a good thing to put more focus on the BRIDGE system vision and the performance of the BRIDGE collaborative system as a whole. This implies we recommend to focus on further integration of the BRIDGE Concept Cases and to showcase how in collaboration the BRIDGE concepts can truly improve the emergency response operations by supporting gaining situational awareness and operational deployment.
3 As a consequence, we need to further mature the collaboration technologies, such as the Orchestration Services, and have more integrated concepts. The BRIDGE Concept Cases should take note of the ongoing developments and try to adhere to the guidelines for orchestration in a BRIDGE System of Systems
4 The large amount of effort that has gone into the design and implementation of the BRIDGE middleware warrants a larger emphasis on BRIDGE middleware as a concept, and we recommend the BRIDGE middleware should become one of the focal points of the final demonstration.
5 In addition to the previous recommendations, we recommend the final BRIDGE Demonstration pays attention to the issues that complicate large-scale emergency response operations. This has indeed implications for the BRIDGE middleware, since it has to demonstrate it can handle "a lot of everything", but also for the individual Concept Cases; in a large scale multi-agency deployment there will be *many* e-Triage bracelets, hexa-copters, Information Officers and Master tables (as well as a lot of items to display on each Master table). This implies in turn that measures will have to be taken to handle the absence of the 'guarantee of uniqueness' and to enable the BRIDGE mechanisms to interoperate with equivalent but different mechanisms.
To implement a demonstration on the large-scale aspects of the BRIDGE System of Systems philosophy, simulation might provide viable solutions.

6.3.3 Dissemination and validation

Also on the aspects of Dissemination and Validation we have learned a lot from the Risavika exercise and the third BRIDGE demonstration. A shortlist of recommendations from the third demonstration:

1 For dissemination and validation of the BRIDGE results, a combination of exposure on conferences, EUAB meetings and workshops with end-users is a good idea; we have

gained a lot from the events surrounding the demonstration.
However, it is maybe not such a good idea to concentrate all these possibilities on one cluster of events. Maybe more focussed sessions on details of the BRIDGE project will provide better results.

2 Stay in touch with the end-user communities as well as scientific and industrial peers. It has proven a good thing to always ask their comments and suggestions during the development and preparation processes, both for validation and dissemination purposes.

3 We recommend validating capabilities by further exposure of concept cases to end-users, and validate technical implementations in dedicated sessions of tests and simulation.

References

1 BRIDGE Deliverable D09.1, "*D09.1: Demonstrator 1*", Thomas Kulbe and Morten Wenstad, September 2012, available for download on http://www.bridgeproject.eu/en/bridge-results/deliverables

2 BRIDGE Deliverable D09.2, "*D09.2: Demonstration of Visualization and Interaction*", Jan Håvard Skjetne and Morten Wenstad, September 2013, currently available for download on on https://project.sintef.no/eRoom/ikt2/BRIDGE/0_33476

3 See http://nordic-conference-on-disaster-mitigation.origo.no/?ref=checkpoint

4 Description of Risavika harbour, part of the exercise environment: http://risavika.no/modules/module_123/proxy.asp?D=2&C=58&I=152&mid=133.

5 Detailed information and photos of the Risavika Harbour and its surroundings: https://project.sintef.no/eRoom/ikt2/BRIDGE/0_2bc18.

6 NRK news coverage of Risavika exercise and BRIDGE Demonstration (in Norwegian): http://tv.nrk.no/serie/distriktsnyheter-rogaland/dkro99092513/25-09-2013

Appendices

Appendix I: Program for the demonstration and review

Bridging Resources and Agencies in Large-Scale Emergency Management

Seventh Framework Programme (FP7-SEC-2010-1) SEC-2010.4.2-1

Interoperability of data, systems, tools and equipment

Grant Agreement No.: 261817

www.bridgeproject.eu

Agenda

Second review

25-26 September 2013

Stavanger, Norway

Wednesday 25 September, Risavika

07:15	Departure from hotel St. Svithun		
08:00	Assembly at gathering point in Risavika		
	Welcome and introduction to BRIDGE Demo III	Dag Ausen	SINTEF
	Instructions to participants	Morten Wenstad	Crisis Training
		Eivind Rake	RAKOS
09:00	On-site location for the exercise		
09:15	Exercise RISAVIKA starts Walk around demonstration (guided)		
14:30	Exercise RISAVIKA ends		
15:00	Wrap-up meeting together with the EUAB	Eivind Rake	RAKOS
	(terminal building)	CC-owners	
15:30	Reviewer's pre-meeting (Meeting room in terminal building)		
16:00	Review meeting – part 1 (Meeting room in terminal building)		
	Welcome and introduction	Dag Ausen	SINTEF
		Andreas Zimmermann	Fraunhofer
16:15	BRIDGE Demo II & III and outlook to IV	Volker Wetzig	Hagerbach

		Morten Wenstas	Crisis Training
16:45	Validation of Interoperability (D10.1/D10.2)	Maximilian Wietek	Hagerbach
17:15	Exploitation plans (D11.1)	Paul Burghardt	Thales
17:45	Dissemination activities	Fritz Steinhäusler	University of Salzburg
18:15	Departure for the hotel		
19:30	Project dinner		

Thursday 26 September, St. Svithun hotel/ Stavanger University Hospital

08:00	Welcome and agenda for the day	Dag Ausen	SINTEF
		Francesco Lorubbio	EC/REA
08:15	Technical overview and next steps	Andreas Zimmermann	Fraunhofer
09:00	Concept Case Café		
	Presentations of Concept cases		
	Concept case 1: Master table	Jan H Skjetne	SINTEF
	Concept case 2: Advanced Situation Awareness	Fritz Steinhäusler	University of Salzburg
	Concept case 3: Dynamic Tagging of the Environment	Erion Elmasllari	Fraunhofer
	Concept case 9: First Responder Integrated Training System	Morten Wenstad	Crisis Training
10:00	Coffee break		
10:15	Concept case 4: Information Intelligence	Daniela Pohl	University of Klagenfurt
	Concept case 5: Situation-Aware Resource Management	Andries Stam	Almende
	Concept case 6: Robust and Resilient Communication	Christian Raffelsberger	University of Klagenfurt
	Concept case 7: Adaptive Logistics	Bernard van Veelen	Thales
	Concept case 8: Federation of Control Rooms and Call Centers	Paul Burghardt	Thales
11:00	Architecture/middleware/integration	Peeter Kool	CNET
		Matts Ahlsèn	
11:45	Management issues	Dag Ausen	SINTEF
12:00	Reviewers meeting		
12:15	Feedback from reviewers and remaining steps to close the 2nd period	Francesco Lorubbio	EC/REA
12:30	Closing of meeting		
12:30 -	Lunch / Departure from hotel St. Svithun to the airport		

Appendix II: Agenda of the End-User Advisory Board Meeting

Bridging Resources and Agencies in Large-Scale Emergency Management
Seventh Framework Programme (FP7-SEC-2010-1) SEC-2010.4.2-1
Interoperability of data, systems, tools and equipment
Grant Agreement No.: 261817
www.bridgeproject.eu

Agenda EUAB-meeting

24-25 September 2013
Fifth review

Stavanger, Norway

Tuesday 24 September, Risavika

07:30	*Departure from hotel St. Svithun*		
08:30	*Opening of meeting, Agenda,*	*Eivind L Rake* *Ove Njå*	*RAKOS* *RAKOS/UiS*
	Expected outcome of the sessions	*Max Wietek*	*VSH*
08:35	*Introduction into the BRIDGE System of Systems*	*Andreas Zimmermann*	*FIT*
08:45	*Federated control room*		
09:30	*Robust & Resilient Communication*		
10:15	*Coffee break*		
10:30	*FRITS, First Responder Integrated Training System*		
11:15	*Dynamic tagging of the environment*		
12:00	*Lunch*		
12:30	*Walking through the exercise area*		
13:00	*SWARM*		
13:45	*Information Intelligence*		
14:30	*Advanced Situation Awareness*		
15:15	*Coffee break*		
15:30	*Adaptive Logistics*		
16:15	*Master*		
17:00	*Close and Transportation back to hotel*		

19:00 *Transportation to City center and "guided" tour for EUAB members*

20:00 *Dinner EUAB members*

Wednesday 25 September, Risavika

07:15	*Departure from hotel St. Svithun*		
08:00	Assembly at gathering point in Risavika		
	Welcome and introduction to BRIDGE Demo III	Eivind L Rake	RAKOS
	Instructions to participants	Ove Njå	RAKOS/ UiS
		Morten Wenstad	Crisis training
09:00	On-site location for the exercise		
09:15	Exercise RISAVIKA starts Walk around demonstration (guided)		
14:30	Exercise RISAVIKA ends		
15:00	Wrap-up meeting together with the EU-reviewers and CC-owners (terminal building)	Eivind L Rake Ove Njå CC-owners	RAKOS RAKOS/ UiS
15:30	Wrap-up meeting continue together with the CC-owners		
16:00	End of meeting		
16:30	Departure for the hotel		
19:30	Project dinner at St.Svithun		

Appendix III: Program of the Nordic Conference on Disaster Mitigation

Nordic conference on disaster mitigation

Version 1


Source: RAKOS Helse Vest

When
26-27 September, 2013

Where
Stavanger University Hospital, Stavanger, Norway

Practitioners and researchers are invited to a two day conference to discuss how technology can be used as tools for first responders to mitigate disasters.

Progress is needed for improved tools, infrastructures, procedures and organisational frameworks to respond and recover more efficiently and effectively both during, and after an incident. The uses of ICT systems vary across agencies and countries, which to a large degree influence the performance of holistic emergency response.

This conference will give the participants insight into current practice from experienced practitioners and state of the art from leading scientists. Participants are also invited to take part in panel discussions about progress in exercises and implementation of learnings. The conference is also arranged head to head with an exercise with focus on collaboration between first responders and will demonstrate use of tools developed in the EC SECURITY project BRIDGE. Participants are invited to be observers in that exercise.

Registration and accommodation
Attendees register by paying the appropriate registration fees through the conference site.

The conference has a special deal with St. Svithun hotel. Visit the web site for more information and other options for accommodation.

The conference web site
http://nordic-conference-on-disaster-mitigation.origo.no

Supported by:

Thursday 26 September 2013

Time	Room A	Room B
09:00	Opening	
09:15	Keynote: Why is it so hard to improve disaster risk reduction? - Prof. Kurt Petersen, Department of Fire Safety Engineering and Systems Safety, Lund University, Sweden	
09:45	Security research from an end-users perspective - Heiko Werner, Federal Agency for Technical Relief (THW), Germany	
	Exercises	
10:15	A review of the exercise in Stavanger - Managing Director Morten Wenstad, Crisis Training AS, Norway	
10:35	Coffee	
10:50	EU exercises: What are the potentials in exercises driven by high level global entities? - Ralf Beerens, Netherlands Institute for Safety NIFV and Lund University, Sweden	
11:10	Learning from large scale exercises: What has scientifically been explored and how does it comply with concrete experiences? - Kirsti Russel Vastveit, University of Stavanger, Norway	
11:30	Could a large scale exercise contribute as a learning tool and simultaneously be a validation tool? - Eivind Rake, RAKOS/University of Stavanger, Norway	
11:50	Plenary session - How to improve exercises? - Moderator Ove Njå	
12:30	Lunch	
	Crisis Management	Securing life and assets
13:30	Long term crisis management – the case from the chemical train crash event from Belgium. - Christian van DeVoorde, Fire Brigade Ghent, Belgium	From Computational Fluid Dynamics to 3D Risk Management – Possibilities and Limitations - Trygve Skjold, Gexcon AS, Norway
14:00	How could technical concept cases have improved crisis management and communications in the Buncefield disaster? - Inspector Barbra Campbell, Hertfordshire Constabulary, United Kingdom	Computational crisis response for improved situational awareness - PhD Jonas Landgren, Interaction Design, Chalmers & Gothenburg University, Sweden
14:30	Coffee	Coffee
14:45	Agile Response: Designing for emergent interoperability - Dr Monica Büscher, Mobilities.Lab, Lancaster University, UK	Confronting complexity and uncertainty - ICT-based decision support for emergency preparedness and management - Dr. Tina Comes, Centre for Integrated Emergency Management (CIEM),

Supported by:

Thursday 26 September 2013

Time	Room A	Room B
15:15	UICDS as crisis management tool - PhD James W. Morentz, Homeland Security Technology Consultant, US	How can we facilitate a proactive and cooperative risk approach during emergencies? - Senior researcher Atle Refsdal, SINTEF, Norway
15:45	*Panel discussion:* Why is implementation of disaster risk reducing measures so damned difficult? Or is it? Which trends could be seen with regards to measure characteristics, media pressure, and emergency response organisations' reactions. Moderator: Bjørn Ivar Kruke, University of Stavanger, Norway	
16:20	Coffee	
16:30	Keynote: Challenges in disaster risk reduction, a comparative perspective from developing countries versus industrialized countries. - Jan Egeland, General secretary Norwegian Refugee Council, former Vice general secretary of the UN	
17:30	End of day	
19:00	Conference dinner	

Friday 27 September 2013

Time	Room A	Room B
09:00	Opening	
	Saving lives	Cooperation
09:05	What did we learn from 22/7: - Triaging: A new procedure - Emergency medical dispatch centre: How to increase the capacity by using modern technology - Jan Erik Nilsen, The National Center for Prehospital Emergency Medicine and Olav Eielsen, Regional Centre for Emergency Medical Research and Development, Stavanger University Hospital, Norway.	Common Situation awareness? - Research Manager Jan Håvard Skjetne, SINTEF, Norway
09:35	The Reconfiguration of Triage by Introduction of Technology - UbiComp Researcher Erion Elmasllari, Fraunhofer FIT Institute, Germany	Experience of major incidents in a changing environment - Chief Fire Officer John Ryan, Cork City Fire Brigade, Ireland
10:05	Coffee	Coffee

Supported by:

Friday 27 September 2013

Time	Room A	Room B
10:20	Leadership ideals as barriers for effective collaboration during emergencies and crises - PhD Christian Uhr, Swedish Civil Contingencies Agency and Lund University, Sweden	
10:50	Decision-making – yet another obstacle for survival - Conrad Bjørshol, SAFER - Stavanger Acute medicine Foundation for Education and Research, Norway	
11:20	*Panel and plenary discussion:* Potential for improving disaster management with technology?	
12:30	End of conference	

Organisers

SINTEF

HELSE STAVANGER
Stavanger University Hospital
The Regional Centre for Emergency Medical Research and Development (RAKOS)

University of Stavanger