BRIDGE Newsletter

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In this issue:

Editorial

Dear Reader!

I am proud to welcome you to the BRIDGE research project, which is a major effort in *interoperability*. The main goal of BRIDGE is to increase safety of European citizens by developing technical and organisational solutions that significantly improve crisis and emergency management.

To understand why BRIDGE is important, it suffice to consider the potential nightmare scenario caused by an accident or an assault on a chemical facility located close to the Franco-German border. This is a densely populated area with major communication infrastructure, so the potential impact can be severe. It will be an immense challenge for the first responders, i.e., the industrial safety brigade, the fire fighters, the police, and the ambulance personnel from both sides of the border. Furthermore, various government levels are involved with deciding and organising potential evacuation of the people living in the area, including hospitals, schools, kindergartens and retirement homes. The challenge is worsened by the fact that the first responders work with different equipment, operate under different procedures, speak different languages, and come from different cultures. Still, in a split second critical decisions about life and death must be made.

> ***"Research and development projects concerning emergency services are urgently needed, and the EU has met this challenge by financing BRIDGE (Bridging resources and agencies in large-scale emergency management)."***
>
> EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

In this first issue of the newsletter you will get a glimpse into the work we have done in the first eight months of the project. We will regularly issue newsletters like this over the four years of the project, and hope that by following our progress you will be able to better understand how complex emergency responses, like the one in the scenario above, can be handled in the future.

Geir Horn, SINTEF
Project Coordinator

BRIDGE Kick-off Meeting, Finse, Norway, 14-15 April 2011.

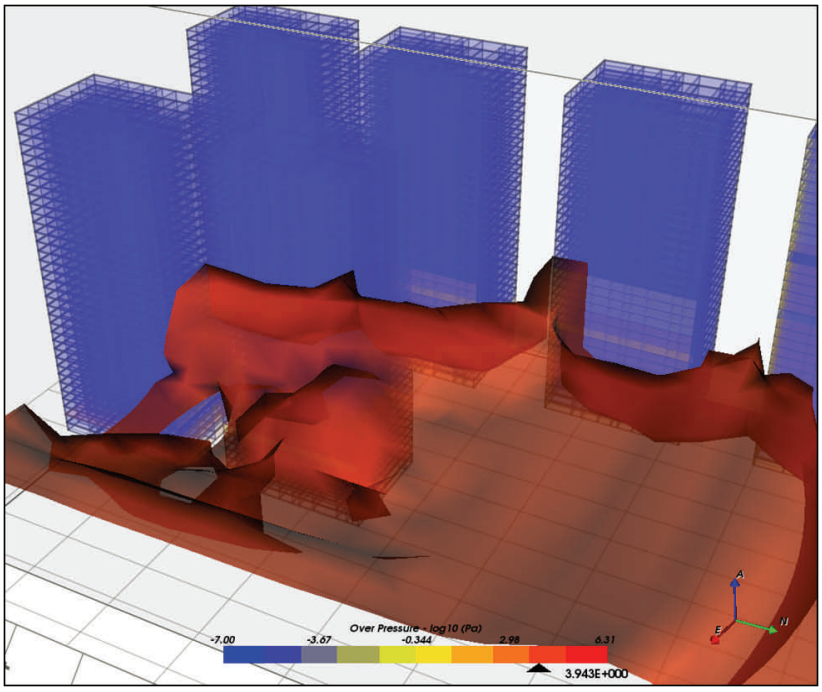
Reality-Based Modelling of Catastrophes

Our daily news show clearly that catastrophes can occur anywhere at any given time, be it an industrial accident, a natural disaster, or an intentional act of crime or terror. Any such high-consequence event exceeds, or threatens to exceed, the response capability of the local emergency services: (a) Number of victims is too high to be assisted in a timely manner; (b) Critical infrastructure is damaged to such an extent that emergency services can no longer provide sufficient protection of the system still functioning; (c) Societal infrastructure seizes to exist and results in wide spread social unrest and lawlessness.

BRIDGE Work Package 3 uses reality-based modelling to help first responders prepare for such catastrophes by developing:

- Tools for generation of a computer-based 3D graphics model, based on the available information about targeted critical infrastructure;
- Tools for generation of 3D simulations based on threat scenarios developed by BRIDGE, using models of critical infrastructure;
- Software components for running 3D simulations in real time during training and in case of an actual emergency;
- Software components for deploying 3D simulations to relevant parties using ad-hoc network and technology.

Different views of the virtual chemical facility CHEMCO.



Truck bomb attack in a hypothetical financial district resulting in the complete destruction of the tower above and hundreds of additional victims in the surrounding buildings and on the streets.

3D-modelling of *generic* critical infrastructure (CI) components is essential in crisis management, since the destruction or disruption of infrastructures providing key services could entail the loss of lives, the loss of property, and a collapse of public confidence and moral in the EU (figure left).

BRIDGE foresees: (a) Provision of *generic* 3D-model of a virtual chemical facility; (b) Development of a detailed threat scenario, assuming uncontrolled release of hazardous material (accidental and malicious); (c) Modelling of threat impact on selected reality -based CI facilities; (d) Modelling of the impact on staff and public for selected CI facilities; (e) Modelling of the catastrophic impact on environment for selected CI facilities. Subsequently, the results of the 3D-modelling are imported and rendered using COLLADA software. The figures above show an example of reality-based 3D-modelling of a virtual chemical facility.

BRIDGE System

The BRIDGE system consists of individual modular components, which are used to support coordinated multi-agency response efforts. The vision of the possible technical outcomes of the project is reflected in prototypes described below, which will be developed during the project implementation.

The BRIDGE system aims for practically applicable, optimal solutions for first responders beyond the state-of-the-art and is designed upon the following principles for effective response and recovery in emergency response: *Anticipation, Preparedness, Subsidiarity, Direction, Information, Integration, Cooperation, Continuity, Transparency, Flexibility, Correctness, Security, Traceability, Mixed Intelligence, Coherence, Graceful Augmentation* and *Degradation, Versatility and Scalability.*

The BRIDGE System has different components, arranged in categories according to their role: front ends or applications; back-office and configuration tools; and networking tools. This logical architecture, describing a service or unit of logical functionality of the system, identifies the elements of the system that have contact with the users and the elements of the system that support its functionality, such as information repositories and configuration tools. The logical structure is organized in components.

> *"BRIDGE will examine how we can obtain and use information as disasters develop, in order to give us a better joint understanding of the situation and thus enable us to make better decisions more rapidly."*
>
> EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

BRIDGE Tools

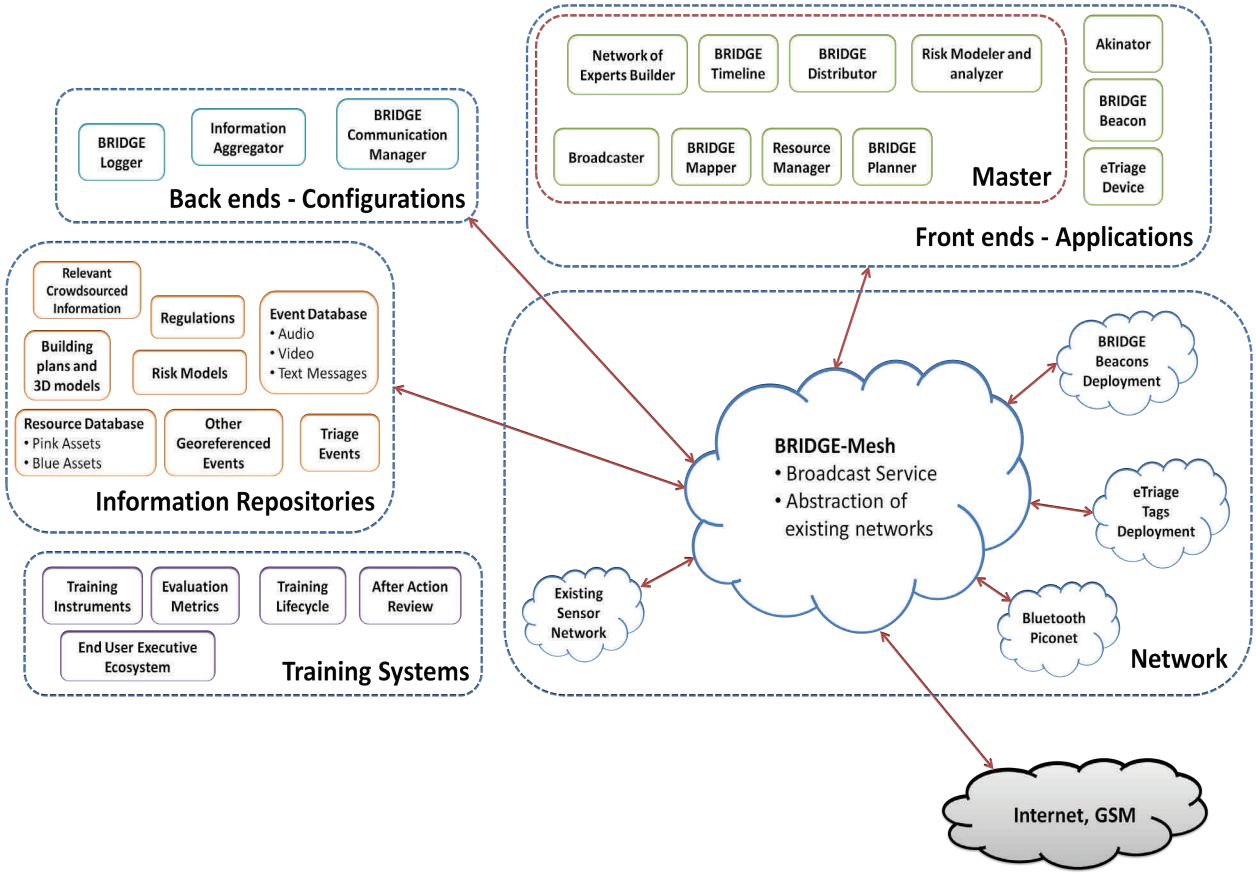
BRIDGE Mesh is a dynamically adaptable, mobile, interoperable network. It does not require the need of an infrastructure, i.e., users themselves may extend the area of coverage.

BRIDGE Master: is an application that allows the composition of several services or functionalities of the system, based on the role of the user. The following modules can be used as part of the Master System:

BRIDGE Mapper displays all data being logged and offering responders an interactive map of the incident site.

BRIDGE Resource Manager enables efficient, collaborative location and allocation of available assets in multi-agency emergency responses.

BRIDGE Planner is a command tool for planning and coordinating per-



BRIDGE System.

sonnel tasks and responsibilities within and between response agencies.

BRIDGE Broadcaster connects to any available output medium within a defined area and displays the message of the media officer.

BRIDGE Distributor lets command post personnel distribute relevant information to specified mobile units. It will not be a standalone tool, but rather will integrate with other modules, such as the Locator, Timeline, and Plan and Execute.

*BRIDGE Expert Network Buil*der enables the team members to dynamically establish networks of experts that are centered on specific topics and relevant to the management of the emergency situation.

BRIDGE Risk Modeller is a computerized tool that provides support for risk analysis concerning potential follow-on risks. It supports identification and anticipation of relevant risks, projection of their unfolding and cascading consequences, as well as assessment of risk levels in terms of likelihood and consequence.

BRIDGE Timeline helps users build and maintain the temporal aspects of their situation awareness. Just as interactive graphical map displays support spatial understanding of an unfolding situation, an interactive graphical timeline display will support temporal understanding.

BRIDGE foresees additional collaborating systems, such as: *BRIDGE Akinator* (mobile application to allow communication among command post, staff on site, victims and bystanders to provide information based on bandwidth; *BRIDGE eTriage System* (tagging victims and environmental features with RFID tags that store timestamps for direct use in the command post); *BRIDGE Beacons* (markers that emergency responders deploy in the environment during an intervention).

BRIDGE also addresses Back-Office and configuration, i.e., *BRIDGE Logger* (records every event registered along the whole the system); *BRIDGE Information Aggregator* (combines incoming text/audio/image/video situation reports from the field and prepares them to be displayed in the BRIDGE Mapper); *Bridge Communication Manager* (allows managing the network and supporting the construction of communication infrastructure).

> ***"The subject of the EU's BRIDGE project is transnational and interagency cooperation in the event of terror attacks, natural disasters and industrial accidents. ... Climate change and developments in society mean that we must be prepared for major disasters in Norway and elsewhere in the world. The recent terror attacks in Oslo and on the island of Utøya have shown that both individuals and society and a whole must be prepared for the unthinkable."***
>
> EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

Domain Analysis

The work in WP2—Domain Analysis—in the first phase of the project has focused on several aspects. One of these aspects is the establishing of the required collaboration infrastructure. This work will result in the production of several collaboration tools such as a multimedia server, a requirement management system and others, together with documentation containing methods, strategies and workflows to support collaborative design efforts in the whole project.

The second aspect in WP2 is fieldwork. In collaboration with WP12, several accounts of crisis management in action were collected and made available to the project. Interviews with relevant stakeholders in Norway and England were conducted. A video analysis workshop centered on a large emergency response exercise conducted in Norway was organized by WP2. All this work is oriented towards the production of a corpus of data that will inform the production of domain analysis deliverables.

Finally, an important aspect in the work of WP2 has been to catalyze the combination of empirical studies and technical design. The work package has collected technical visions from all the other WPs to create a unified vision of a BRIDGE system, accompanied with a scenario that provides a context to understand the system. This vision will help technical partners in defining the architecture of the different elements and the requirements of the platform along the whole duration of the project.

BRIDGE Domain Analysis experts at work.

BRIDGE Mesh Network

The network communication backbone of BRIDGE is developed by Work Package 5. The primary output of this work package is the BRIDGE Mesh, which lays the foundations for the technical work in the other work packages. Its purpose is to provide a stable network infrastructure and interoperability platform for various network nodes.

Due to the extreme conditions of crisis and catastrophe situations, the BRIDGE Mesh is supposed to operate in harsh, and highly dynamic unreliable scenarios. The breakdown of single network nodes and whole sub-networks cannot only not be precluded but is to be expected. One objective of this WP is to develop network infrastructures that can deal with these issues and adapt to dramatically changing environmental conditions. Furthermore, these conditions lead to the requirement of seamless integration of various heterogeneous devices. This is the second purpose the BRIDGE Mesh has to fulfill.

A typical scenario for the BRIDGE Mesh is: in a disaster site, a node (a trapped victim's cell phone device) could be able to discover via WiFi an access point equipped in a first responders' vehicle and transmit the whole data collected inside the BRIDE Mesh network. In turn, the first responder acts as a gateway to the outside world forwarding via 3G/GSM all the received data inside the overall BRIDGE system.

The BRIDGE Mesh is a dynamically adaptable, mobile network being interoperable. The Mesh network does not require the need of an infrastructure, i.e., users themselves may extend the area of coverage. The BRIDGE Mesh architecture is robust in the sense that it is able to deal with various technologies. Additionally, the mesh architecture is resilient to temporarily unavailable nodes by following alternate paths. Some of the nodes inside the mesh will act as gateway nodes that have additional, external network connections, e.g., to the Internet, or GSM network.

The BRIDGE Mesh will provide the infrastructure to broadcast information to any node or group of nodes inside of the network. The mesh will be able to handle several incidents simultaneously and will provide the ability to handle heterogeneous environments with minimum interdependencies.

> ***"BRIDGE aims to develop technology for improving communication and coordinated actions so that emergency leaders and agencies (police, fire and health services) will be better able to save lives and limit the extent of damage by means of the appropriate tools and equipment."***
>
> EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

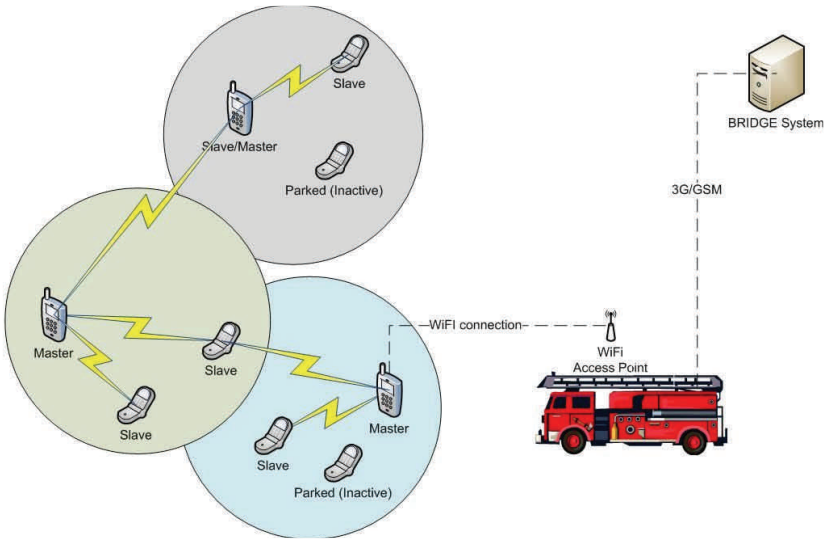
Several middlewares that different partners of the BRIDGE consortium bring into the project will be integrated to form the BRIDGE Mesh:

LinkSmart – the distinguished open source middleware for networking heterogeneous embedded devices that resulted from the Hydra EU project of the Sixth Framework Programme. It enables different kinds of devices to communicate over various networks.

AgentScape – a well-known Java-based open source middleware for agents, i.e., autonomous computer programs which observe and act upon an environment and direct their activity towards achieving goals. Aimed at providing low-level support for distributed agent applications, agents can move between physical and virtual locations.

CHAP – an agent development platform that provides a conceptual framework for multi-agent systems, based on the agent design pattern LiNeMeMo (Links - Nets – Memo – Motor). CHAP includes a software development kit for multi-agent systems, a library of for agent-based algorithms, and a middleware platform targeting various multi-agent problems.

WISE – a framework originating from the military domain that provides information-centric connectivity regardless of protocols, standards and architectures. It allows digital signing of drives to assure information security.



BRIDGE Mesh Network.

BRIDGE Social, Legal and Ethical Issues

BRIDGE pays particular attention to social, legal and ethical issues. This entails the analysis of fundamental aspects of the work of emergency response professionals, resulting in a "Manifesto" called *Towards a System Architecture Use Case*. Key insights from this manifesto are entered into an *architectural qualities* database and then, at least in part, folded into the *BRIDGE System* scenario. BRIDGE social, ethical and legal experts of WP12 also address *Privacy Protection and Legal Risk Analysis*. Furthermore, they analyse twitter communication associated with the urban riots (e.g., London 2011) and terror attacks (e.g., Oslo 2011) and organise collaborative design user workshops. This group of experts also collects and analyses international disaster reports, including over 50 publications that discuss privacy issues. Besides, they have created bibliographies on specific social, legal and ethical issues on Mendeley.

> ***"In addition to technological research and development, the project will examine European laws and regulations and how these affect cooperation and the management of major disasters across agencies and antional boundaries. Ethical and social aspects of the use of technology will also be central topics of the project."***
>
> EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

First End-User Advisory Board Meeting

Salzburg, Austria, 26-27 June 2011

In order to guarantee active end-user participation during the whole project, BRIDGE established an advisory board of end-users from national and regional emergency management organizations and industry representatives.

> **"EXTREME SITUATIONS REQUIRE INNOVATIVE SOLUTIONS, PAIRED WITH EXTENSIVE STANDARDIZED TRAINING ON THESE NEW METHODS."**
> **J. SCHADWASSER AUSTRIAN FEDERAL POLICE**

The first meeting of the End-User Advisory Board (EUAB), held in Salzburg, Austria, 26-27 June 2011, brought together several European experts from first responder and civil defence organizations: Barbara Campbell (UK), Sindre Mellesmo (Norway), Svein Arne Hapnes (Norway), Johann Schadwasser (Austria), Christian Van De Voorde (Belgium), Heiko Werner (Germany) and Thomas Larsson (Sweden). The members of the Advisory Board, representing both emergency services and industry, were introduced to BRIDGE goals, objectives, and methodology and briefed about their expected role in the project. They shared their personal expectations for the project and provided feedback with regard to the main BRIDGE scenario (technological disaster at a chemical facility).

EUAB Meetings are held every six months. The next meeting is scheduled to take place at VSH, Flums, Switzerland.

> ***"In order to ensure that appropriate solutions emerge from the project, the emergency services will be involved in the development and evaluation of the solutions."***
>
> EU finances BRIDGE project to tackle major disasters, *News Medical*, 26 August 2011

First BRIDGE User Workshop

Oslo, Norway, 28-30 September 2011

Complementary to the EUAB meetings, BRIDGE User Workshops provide opportunities for collaboration and co-design with practitioners. Professional specialists dealing with operational issues of crisis management at different levels are invited to explore and explain key aspects of their work with BRIDGE analysts and designers. They identify problems and opportunities and evaluate BRIDGE prototypes in the context of real world work experience. The first in a series of such BRIDGE User Workshops took place in Oslo, Norway, 28-30 September 2011. It focused on inter-agency collaboration, ongoing situation awareness and decision making practices, risk assessment and engagement of experts, media and members of the public.

BRIDGE Dissemination Activities

Conferences and Symposia

BRIDGE at ISCM 2011
9-10 June 2011

The first official presentation of BRIDGE to an international audience took place at the Intenational Symposium on Crisis Management (ISCM) 2011, which was held at Vouliagmeni of Athens, Greece, on 9-10 June 2011. The leader of the dissemination work package, Fritz Steinhäusler (University of Salzburg), presented the aims, methodology, and expected results of the BRIDGE project to a large group of European experts in crisis management. The meeting was organised by a multidisciplinary research consortium of EU FP-7 Project "Learning for Security - L4S".

BRIDGE at CBRNEmap
8 September 2011

Project Coordinator Geir Horn (SINTEF) presented BRIDGE at the CBRNEmap Final Conference on 8 September 2011 in Brussels, Belgium. The main purpose of the conference was to provide its audience with the overview on the work implemented within the framework of the EU-FP7 project CBRNEmap and its main contribution to the next step of the European Commission Security Research Programme.

BRIDGE at SRC 2011
19-21 September 2011

BRIDGE was one of the few projects selected for a poster presentation at the Security Research Conference (SRC) 2011 — the largest European conference on research for security, which was held on 19-21 September 2011 in Warsaw, Poland. The BRIDGE poster — displayed in the conference hall — raised a lot of attention among the conference participants.

BRIDGE at ECSCW 2011
24-28 September 2011

A one-day specialized workshop *Collective Intelligence in Crisis Situations* was conducted within the framework of the European Computer Supported Collaborative Work (ECSCW) Conference, which took place in Aarhus, Denmark, 24-28 September 2011. Organised by Monika Büscher (Lancaster University) and supported by BRIDGE, this workshop discussed how members of the public and professionals in emergency response currently use social media to collaborate in crises. The workshop participants took examples of collaborative work and collective intelligence in disasters and 'creeping' crises such as climate change to explore opportunities and challenges for innovation. Two BRIDGE-related contributions were made at this workshop by the project consortium partners.

Workshops

New Social Media and Crisis Workshop
27 April 2011

New Social Media and Crisis workshop, organised by Center for Interdisciplinary Research (ZiF, Bielefeld University, Germany) in April 2011, discussed how members of the public and professionals in emergency response currently use social media (Facebook, Twitter) in crises. This one day workshop focuses on one particular phenomenon of social media use in crises: 'collective intelligence'. The workshop was built on work undertaken in the BRIDGE project by Monika Büscher (Lancaster University), who was also a co-organiser of the event.

Exercises

Major Sea Disaster Exercise SkagEx11
6-8 September 2011

A large exercise — SkagEx11 — was conducted on 6-8 September 2011 in the Skagerrak basin, Norway. The main goal of the exercise was to test the ability of the neighbouring Norway, Sweden, Denmark and Finland to handle major disasters at sea. Morten Wenstad of Crisis Training (CTAS)— one

of the BRIDGE partners — observed the exercise to gain a better understanding on how the different organizations in the participating countries would collaborate in a major disaster and how they would organize their National Emergency Management.

Oil Spill Exercise BOILEX
27-29 September 2011

Two members of the BRIDGE consortium — Stiftelsen SINTEF and Crisis Training AS — were among the observers of another exercise, BOILEX, focusing on collaboration, coordination and communication mechanisms at the tactical level. This oil spill exercise conducted by the Swedish rescue services between 27 and 29 September 2011 in Nynäshamn, Sweden, was part of the EnSaCo project — Environmental and Safety Management on Shoreline Oil Spill Response.

BRIDGE in the Press

From the very start, BRIDGE has enjoyed a good press coverage in many of the participating countries. Many articles in English, German, Norwegian, Swedish, and Dutch can be found in the Press Room of the BRIDGE website .

BRIDGE at a Glance

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

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

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

The vision of the BRIDGE project is to:

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

CONSORTIUM

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

- Stiftelsen SINTEF (SINTEF), NO (**Project Coordinator**)
- Almende B.V. (ALMENDE), NL
- CNet Svenska AB (CNET), SE
- The Fraunhofer Institute for Applied Information Technology FIT (Fraunhofer FIT), DE (**Technical Coordinator**)
- Lancaster University (ULANCS), UK
- Crisis Training AS (CTAS), NO
- SAAB Training Systems (SAAB), SE
- Thales Nederland B.V. (THALES NL), NL
- Alpen-Adria University of Klagenfurt (UNIKLU), AT
- Paris-Lodron University of Salzburg (PLUS), AT
- VSH Hagerbach Test Gallery LTD (VSH), CH
- Technical University of Delft (TUDelft), NL
- Stockholm University (SU), SE
- Helse Stavanger HF (RAKOS), NO

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