# Table of Contents

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Preface ........................................................................................................................................................... vi

Keynote Speaker
Challenges in Content Management for B2B Electronic Commerce ................................................................. 2  
*Dieter Fensel*

Visualization and Knowledge Discovery for High Dimensional Data ................................................................ 5  
*A. Inselberg*

Information Retrieval Techniques
An Object-Oriented Multi-Mediator Browser ...................................................................................................... 26  
*K. Cassel and T. Risch*

Up-Scaling a Semantic Navigation of an Evidence-Based Medical Information Service on the Internet to Data Intensive Extranets ......................................................................................... 36  
*R. Grütter, C. Eikemeier, and J. Steurer*

A Semantics Based Interactive Query Formulation Technique ............................................................................. 43  
*D. Baer, P. Groenewoud, E. Kapetanios, and S. Keuser*

Search Result Visualisation with xFIND ........................................................................................................... 50  
*K. Andrews, C. Güçl, J. Moser, V. Sabol, and W. Lackner*

Interactive Systems Design
A UML-Based Design Environment for Interactive Applications ......................................................................... 60  
*P. da Silva and N. Paton*

Specifying Conceptual Interface Patterns in an Object-Oriented Method with Automatic Code Generation .......................................................... 72  
*P. Molina, O. Pastor, S. Marti, J. Fons, and E. Insfran*

Considering Possible Outcomes and the User's Environment in Designing User Interfaces for Data Intensive Systems ................................................................................................................................. 80  
*K. Renaud and R. Cooper*

Using XML to Semi-Automatically Derive User Interfaces ................................................................................... 91  
*A. Mueller, T. Mundt, and W. Lindner*

Secure Interface for Risk Management Services ................................................................................................ 96  
*Y. Mountzidis, S. Sirmakessis, and G. Tzimas*

Information Visualization
On-Line Analytical Processing while Immersed in a Cave ......................................................................................... 102  
*O. Zaïane and A. Ammoura*

Virtual Library: Paths to Knowledge .................................................................................................................. 116  
*M. Bugajska and A. Vande Moere*

Interactive Visual Tools to Support Spatial Multicriteria Decision Making ....................................................... 127  
*G. Andrienko and N. Andrienko*

Author Index ......................................................................................................................................................... 132
Secure Interface for Risk Management Services

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Abstract
In this paper we present the architecture and functionality of the secure interface of RIMS. RIMS (Risk Management Services) is a secure intranet environment that supports the operational services in critical situations in four civil protection organisations in Europe. It contributes to the information exchange and collaboration between experts for the prevention, alert and crisis management in hazard management situations.

1. Introduction
During 1998 the natural catastrophes caused the death of about 50,000 people throughout the world (13,000 in 1997). Economic losses exceeded US$ 90bn; the Kobe earthquake damages have been estimated at 180bn US$ (Figure 1).

![Figure 1. Source: Munich Re ([3])](image)

Only floods represent across Europe ([6]):
- 23% of the loss events
- 26% of the number of deaths due to natural catastrophes
- 47% for the economic losses.

In addition to the natural catastrophes, industrial and energy plants, public transportation, big commercial centres, etc. are other sources of public risk.

Today the public opinion and the political forces in each country would no longer understand that in case of risk management, Public Administrations and Private Organisations are unable to have access to modern techniques and thus are unable to minimise the losses in human lives or materials.

Having these in mind we established through RIMS a trans-European network of experts in natural disaster prevention and rehabilitation, connected through a secure intranet application. The scope of RIMS is therefore naturally in the area of services for the Risk Management sector and covers the five steps of Major Hazards Management:
- knowledge,
- prevention,
- alert,
- crisis management
- post-crisis rehabilitation.

One of the most evident socio-economic effects is that all organisations will benefit of a much higher efficiency of their staff of specialists. Both public and private potential targets are studied:
- the public target is represented mainly by the Civil Protection Organisations; Ministère De L'intérieur-Direction De La Défense Et De La Sécurité Civiles (France), Ministry of Interior-General Secretariat For Civil Protection (Greece), Serviço Nacional De Proteção Civil (Portugal) and Dirección General De Protección Civil (Spain)
- the private target is represented by insurance and re-insurance companies, energy suppliers, big shopping centres, oil companies, etc.

RIMS contributes also to a larger initiative called the EDRIM Programme ([2]).

EDRIM (Electronic Discussion groups for Risk Management) is one of the programmes decided by the Ministerial Conferences of the EUR-OPA Major Hazards Agreement as a mean to reach the following objectives:
- Reinforce and promote co-operation between member States in a multi-disciplinary context to ensure better prevention of major hazards, protection of life and belongings and organisation of relief in the event of major natural or technological disasters by calling upon present day resources and knowledge to
ensure an efficient and interdependent management of major disasters;

- Use the Agreement as a suitable platform for co-operation between Eastern Europe, the South of the Mediterranean and Western Europe in the field of major natural and technological disasters.

The RIMS secure interface is used to support the communication and information exchange of experts in Civil Protection Organisation. The interface is the front end of the whole system presented graphically in Figure 2. In this paper we present the basic topological and architectural issues of the system (section 2). Section 3 describes the interaction components and the functionality provided.

Data distribution from Cannes centre (Alcatel premises where the satellite link ends) to end-users uses point-to-multipoint links,
- End-users equipment are based on PC, using groupware software, file transfer facility and videoconference software,
- Quality expected for digital transmission is 10-6 B.E.R (Bit Error Rate),
- Antenna size at end-users sites is 1.20 m,
- Use of Ku-band for space DVB links.

Each civil protection organization is equipped with a hybrid terminal. The terminal, based on SPACETOUCH MM receiver DVB system, is defined as an end-to-end system solution with a dedicated digital receiver PC board designed to fit into a multimedia PC. The combination of a local fast microprocessor, together with a high performance PCI bridge, allows high-speed data transfer to the host system. The ALCATEL SPACETOUCH MM (Figure 3) is designed:
- to receive satellite videoconferencing via a satellite antenna and a satellite receiver board on Processing Centres and End-users sites,
- to send/receive requests or E-mail via a modem or ISDN board to/from the terrestrial network (PSTN/ISDN) on all the sites,
- to communicate via an Ethernet board directly to a PC or a LAN machine.

![Figure 2: Risk Management Service](image)

**2. Topology of the RIMS network**

To support RIMS services, the telecommunication network is based on space communications broadcast techniques, using the DVB standard and SCPC transmission mode \([1]\)). The founding hypotheses retained in the definition of the present architecture of the communications sub-system are:

- Two way videoconference has to be supported by the network,
- Bandwidth permits the transfer of large data files,
- All users of the system must be able to exchange electronic mail through two-ways communications terrestrial lines. Delay of transmission should be near real-time and use ISDN connection,
- Satellite coverage for experimentation phase encompasses at least France, Greece, Portugal and Spain,
- Main end users sites involved in this project utilizing the space links connections are the DGPC (Spain), the SNPC (Portugal), the GSCP (Greece), the DDSC and the CoE (France).
A DVB up-link has been implemented in the RIMS Network. It is located at Alcatel Space Industries (ASPI) Cannes; Five DVB receive stations have been implemented in Spain (RIMS-03), Portugal (RIMS-04), Greece (RIMS-05), France (RIMS-01) and at the CoE (RIMS-02). In addition, all the communications sites are connected to Cannes site through two-ways communication switched terrestrial ISDN lines.

3. Secure Interface

The General Secretariats of Civil Protection will be supplied with low cost software applications. The operating system selected for RIMS station telecommunication part is FreeBSD Release 3.4, as it is a robust multitask operating system with free licence software GPL (GNU General Public License) and powerful IP tools. Several low cost applications have been integrated in the system.

The UCB/LBNL video tool ([7]), VIC (Video-Conferencing), is a real-time, multimedia application for video conferencing over the Internet. VIC was designed with a flexible and extensible architecture to support heterogeneous environments and configurations. For example, in high bandwidth settings, multi-megabit full-motion JPEG streams can be sourced using hardware assisted compression, while in low bandwidth environments like the Internet, aggressive low bit-rate coding can be carried out in software. VIC is based on the Draft Internet Standard Real-time Transport Protocol (RTP) developed by the IETF Audio/Video Transport working group. RTP is an application-level protocol implemented entirely within VIC. Although VIC can be run point-to-point using standard unicast IP addresses, it is primarily intended as a multiparty conferencing application. To make use of the conferencing capabilities, your system must support IP Multicast, and ideally, your network should be connected to the IP Multicast Backbone (MBone). VIC also runs over RTIP, the experimental real-time networking protocols from U.C. Berkeley’s Tenet group and over ATM using Fore’s SPANS API.

The Robust Audio Tool (RAT) [5], is an open-source audio conferencing and streaming application that allows users to participate in audio conferences over the Internet. These can be between two participants directly, or between groups of participants on a common multicast group. RAT requires no special features for point-to-point communication, just a network connection and a soundcard. For multiparty conferencing RAT uses IP multicast and therefore all participants must reside on a multicast capable network. RAT is based on IETF standards, using RTP above UDP/IP as its transport protocol, and conforming to the RTP profile for audio and video conference with minimal control. RAT features a range of different rate and quality codecs, receiver based loss concealment to mask packet losses, and sender based channel coding in the form of redundant audio transmission. It offers better sound quality relative to the network conditions than most audio tools available. It also features encryption so you can keep your conversations private. RAT runs on a range of platforms: FreeBSD, HP-UX, IRIX, Linux, NetBSD, Solaris, SunOS, and Windows 95/NT.

During a crisis situation experts are called to assist in the management. They are called on the civil protection premises and they operate through the RIMS system. Different applications are stored into two different workstations. One is used for the support of videoconferencing and the other for any office work. As soon as the alert has been acknowledged, the RIMS interface is securing the connection interface. The main purpose of the generic interface is to launch applications used in the RIMS project for collaboration and communication between the Civil Protections. The main characteristics of this application should be:

- Support for both platforms used in the RIMS project (Windows 2000 and FreeBSD). To accommodate this feature, platform independent technologies like Java and HTML have been used for the development of the interface.
- User friendly. The user chooses the application just by clicking on the corresponding icon located on the application bar, which is always visible on top of the users screen.
- Robust. In collaboration with the application intergrading the applications used in the RIMS project does not allow the user to close, move or resize by mistake the applications launched.
- Expandable. Easy way to add, modify or remove applications located on the application bar by editing the HTML file and reloading the page into the browser.
- Customisable. Editing the HTML file allows the user to place the application bar to a different location on the screen, change the look and feel of the buttons (using different image files), and change the background of the application.

The interface does not specify or enforce the default location of the applications launched. This information should be input to the application intergrading all applications used to the specified platform (Windows 2000 and FreeBSD).

An instance of the RIMS secure interface can be viewed below. The user can not move any window from the interface. Every application is launched in a pre-specified position, which has been determined from the user requirements phase.
During the crisis, the interface guarantees that an expert can not accidentally close any application or lose any window by moving its frame. Although it seems that this reduces usability ([4]), it significantly increases rational security. During September 2000, the robustness of the secure interface has been tested in the following forest fire crisis scenario:

- A forest fire starts in the area of Marvao in Portugal and expands to the Caceres area in Spain. The Portuguese meteorological services send risk maps to the regional civil protection services.
- Portuguese Firemen civil forces such as firemen, cars, trucks, water loaded hydroplanes can be moved from neighbouring areas.
  - also forest forces, forestry police, firemen and staff of the natural park.
  - pilots from neighbouring airports,
  - and even police and military forces to dissuade criminal fire starters.
- Meanwhile civil forces and Means are sent close to the fires to evaluate them, with various levels according to the procedures in local / regional / national emergency plans from a single patrol car to a complete set of firemen, cars, trucks.
- In the framework of the operational co-ordination at national level, Portuguese Civil Protection uses a software called 'Management of occurrences' to find on a GIS Map water points which are the closest to a fire, as well as other infra-structures and fire attacking means.
- A decision maker at the Portuguese Civil Protection wants to know what would be the potential effects of a fire starting in the area of Marvao and what can be done to minimise the risks and effects of such natural hazard. An expert from the Centre of Forest Fire Studies shows a 3D animation with the fire propagation according to specified wind conditions.
- A co-operation is requested by Portuguese Civil Protection to other civil protections for experts and aerial means. The request is also propagated to the French and Greek civil protections.
data, it seems that the end users can use the system efficiently.

4. Conclusion

Although the first trial was a successful procedure, we should have in mind that during a natural disaster, terrestrial networks do not usually operate! For this reason, we are now planning a second crisis scenario using only satellite mode of communication. During this second trial, the RIMS should try to support expert at a floods situation in the German territory.

Figure 6. 3D Fire propagation

- Portuguese and others receive a high resolution aerial / satellite view picture of the fire zone (Figure 7).

Figure 7. Satellite view of the fire zone

- Fighting this hazard requires a combined action of Spanish and Portuguese Firemen. Decision makers suggest the use of aerial means.
- The Portuguese Civil Protection will share its GIS with other civil protections to show that there are no available heliports in the concerned district.
- Aerial means are sent from Spain to Portugal while the forest fire crosses the Portuguese / Spanish border. French and Greek civil protections are kept informed about the operations which take place between Portugal and Spain.
- A question about the water supplies arises for these operational means.
- Portuguese could share its Geographic Information System with Spanish Civil Protection, in particular the specialised software which find automatically the nearest water points to the forest fire (figure 8).
- Field forces are fighting against the forest fire on both sides of the border. Spanish and Portuguese want to visualise on a shared GIS map the positions of each other’s firemen trucks / ambulances in order to co-ordinate fire fighting / evacuate injured people to an hospital in Portugal. These positions are defined manually on the GIS by each civil protection.
- The forest fire has been stopped and the post crisis analysis on the RIMS network allows a quick report of the crisis management and damages.

During this test, the application was well functioning. Although, we used terrestrial mode for the transmission of

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