



Synchronous collaboration: audio/visual communication

A tabletop display can be installed in a command centre to allow direct interaction with visual displays such as maps and timelines

★ Responding effectively to terrorist incidents is a complex challenge, and demands effective communication between tactical and operational personnel. **Dr Mark Ashdown** of the Marie Curie ESCRITOIRE 2 project, explains how research into synchronous collaboration will allow for verbal and visual communication

The threat from terrorism and environmental disasters is on the rise. London, New York and Madrid have all been attacked since 2001, while earthquakes, floods and hurricanes have wrought havoc across the world over the same time period. Responding effectively to such incidents presents a complex challenge; not only do they require clear, remotely-located strategic direction based on a comprehensive overview of the situation, but the rapidly evolving circumstances on the ground must also

be taken into account, a context in which effective communication between tactical and operational personnel takes on real importance. Voice communication is already relatively well catered for, yet the nature and scale of modern-day terrorist incidents and environmental disasters increasingly demands visual means too, an area which forms the primary research focus of the ESCRITOIRE 2 project. "We aim to provide visual information to complement existing voice channels. As part of my PhD I produced a large

horizontal tabletop display called ESCRITOIRE. Meanwhile, at the other end of the size scale smaller devices like the iPhone are already widely used. We have decided to link these two together," explains Dr Mark Ashdown, the project's Marie Curie fellow, before outlining the relevance of this work in terms of emergency response. "Command centres can accommodate large tabletop displays – while field operatives are restricted to something a lot smaller, like an iPhone," continues Ashdown. "When wireless

networks have developed to a point where synchronous collaboration between the two is possible then you'll be able to communicate not just with the voice channel – as people do already in the fire service for example – but also with visual information, including things like maps and schedules."

With everyday applications like the fire service, police, and even taxi dispatch all requiring effective, efficient communication between desktops and handheld devices, there are a wide range of potential applications for this research. While this has not escaped the notice of those within the project, for a concrete usage scenario ESCRITOIRE 2 has focused

one is completely dedicated to using this information technology, whereas the other is doing a physical task where the technology is not integral to his role?"

Command hierarchy

This is work which has clear implications for the traditional command hierarchy. There has long been a clear division between command and control functions in emergency response, with tactical personnel typically based in a mobile command unit – effectively a truck holding several computers – and communicating instructions via radios to operational personnel out in the field. Allowing both groups access to the same

hierarchy has up to seven subordinates. This allows the organisation to scale up for large emergencies, while remaining manageable. Teams out in the field usually have a team leader, and also a command support officer who deals with the radio and the clipboards and maintains a map of the area – it's this officer that would be using our handheld device. He's a little detached from the physical work of searching and rescuing, so he can use the extra device to improve the flow of information up to the incident commander, and down to his local team members. Transferring information through the hierarchy is always a challenge in these kinds of organisations – it's often difficult for people at the top to work out what's happening in the field. Today, operational personnel can come back with maps and feed information back to tactical personnel, but it would be more efficient if you could get it back from the field in real time."

This is a technically demanding goal, and although focused on developing innovative concepts, the project's approach nevertheless makes full use of existing structures. The ESCRITOIRE 2 system is designed to enhance the current command hierarchy, by extending the use of advanced communication technology to the edge of the organisation. "Members of the organisation in fixed locations like offices can use more conventional remote collaboration methods, but the fixed locations can currently only talk to their teams out in the field using two-way radios. Our system focuses on synchronous collaboration that augments those voice channels in the existing command structure with much richer collaboration.

In network-centric

Our system focuses on synchronous collaboration, with the overall goal of augmenting existing command structures and the voice channels that teams of people use to talk to each other

its efforts on urban search and rescue, and having recently observed search and rescue teams from the UK and other countries in a training exercise, Ashdown says he has identified some significant shortcomings in existing systems. "In a typical scenario today, somebody out in the field will draw a map of a building that they're searching on squared paper and then call back and describe it square by square, so that it can be recreated back at the base," he explains, describing laborious processes ill-suited to the fast-moving circumstances of terrorist incidents. With the backing of Thales Research and Technology (UK), the sponsor of his PhD, this is the kind of issue that Ashdown and the ESCRITOIRE 2 project are working to address. "You really want the person out in the field to be able to draw on some mobile device that shares data in real time with the person back at the base, allowing tactical and operational personnel to point, gesture and engage in a two-way conversation about that visual information," he argues. "The question is; how do you enable remote collaboration in this very asymmetric way, where one side has a very big display and the other has a small one, where one is in an office and the other is out in the field, and where

visual information will fundamentally alter these roles, and although enabling dialogue between the various actors brings significant benefits in terms of their responsiveness, it is also necessary to maintain a clear strategic direction in emergency response, an issue of which Ashdown is well aware. "I don't think traditional hierarchies would dissolve with the provision of the same visual information to all personnel. A clear command hierarchy is still necessary," he says. "Emergency response organisations are arranged so that each person in the command



At a glance

Full Project Title
ESCRITOIRE 2

European Host Organisation
Thales Research and Technology, UK

US Host Organisation
Massachusetts Institute
of Technology

Project Objective
Design, implement and test methods
for sharing visual data in real-time
between team members in a command
centre and those in the field

Project Funding
Marie Curie Outgoing
International Fellowship

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Dr Mark Ashdown



Marie Curie Fellow

Mark Ashdown gained a BA in Computer Science from the University of Cambridge in 1999, and a PhD in 2004. He worked at the University of Tokyo, Japan, from 2004 to 2006. He spent the outgoing phase of his Marie Curie fellowship at the Massachusetts Institute of Technology, USA, from 2006 to 2008, and is now spending the incoming phase at Thales Research and Technology UK.



THALES



Photos taken last year by Mark Ashdown as he attended an urban search and rescue exercise. This is a good example of the scene and the type of application the ESCRITOIRE 2 project is trying to target with technology

operations the aim is to have everybody linked to everybody else. You could think of our system as the 'last mile' of the network-centric operation, which links the field personnel into the network," explains Ashdown, before describing the design of the displays that the ESCRITOIRE 2 system presents to its users. "We've arranged visual sharing around a number of shared workspaces," he continues. "There's a map, there's a timeline showing the tasks, and there are reports that need to be filled in. The various collaborators all share access to this information, but of course it is shown on devices of very different sizes, meaning those with access to the tabletop display see all of the relevant information at the same time whereas with the handheld you can see only a relatively small part. However, as we are aiming for synchronous collaboration, our goal is to provide access to the same information on the various displays, regardless of their dimensions."

Untapped potential

While these attributes are clearly enormously relevant in terms of emergency response, the project has not

neglected the wider potential of its work, which reaches beyond public service functions and into the wider commercial arena. Mobile devices of all kinds have grown increasingly ubiquitous over recent years, and with a large proportion of the population owning a mobile phone, Ashdown believes there is great untapped potential for synchronous collaboration, particularly using visual workspaces. "Almost everybody has a mobile phone, so they can perform synchronous voice communications in a mobile setting, but you rarely see anyone using something as simple as a shared whiteboard on a handheld device," he says. "This is a function with enormous potential; sometimes it's extremely useful to just draw a picture of what you're talking about rather than describing it with words. Tabletop displays and touchscreen mobile devices allow users to directly affect displays, which is very exciting in terms of enabling remote collaboration. Touch displays, and synchronous collaboration in visual workspaces, are set to become very popular in the future. They can be used for all sorts of other applications, reinforcing the importance of further research in this area." ★