HA EU WATCH

ITS in Europe – Identifying Opportunities for the HA

MESA Fact Sheet

Summary

MESA is an international partnership project created by ETSI (European Telecommunications Standard Institute) and TIA (Telecommunications Industry Association), which have agreed to co-operate to produce mobile broadband specifications aimed at the Public Safety markets.

In the UK with the adoption of the new TETRA radio system (the Airwave project, which now includes Police, Fire and Ambulance services, the HA and others), the level of communication will be limited to voice and very low-rate data, thereby preventing the use of high-resolution, real-time video and other essential diagnostic and disaster co-ordination data.

MESA aims to design a self-establishing, self-healing, ad-hoc broadband network, operating at specific 'hotspots' such as road accidents, chemical spills and natural disasters, at data rates in excess of 2Mbps.

The Highways Agency is carrying out an investigation into the use of a MESA-like system for the HA Traffic Officers through its research programme; the project started in 2005 and is being carried out by WSP, supported by Linear Communications.

Key Words

Communications; Emergency; Geographic Information; Incident; Project; Safety; Traffic centre; Traffic information; Traffic management.

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What is MESA?

Project MESA is aiming to specify a high-bandwidth communications system for use in emergency and disaster relief applications. Such a system is intended to augment the existing emergency services radio systems and provide a range of services including transmission of real-time video and high-resolution pictures and broadband internet access, for remote diagnosis of casualties and incident management. Project MESA is a joint initiative between ETSI (European Technical Standards Institute) and the TIA (Telecommunications Industry Association) of the USA and was ratified as an international partnership agreement in January 2001. It is aiming to design a self-establishing, self-healing broadband network, operating at specific 'hotspots' (e.g. road accidents, chemical spills, natural disasters such as floods etc.) at data rates in excess of 2Mbps.

The current membership of the MESA project includes fire services, police services, ambulance services and disaster relief/co-ordination organisations, in addition to potential equipment providers and systems designers from around the world.

PROJECT MESA ORIGINS

ETSI and TIA have agreed to work collaboratively by providing a forum in which the key players can contribute actively to the elaboration of MESA specifications. This is being done through a Partnership Project, originally known as the Public Safety Partnership Project (PSPP), which constitutes the legal and operational framework, ensuring a swift progress of results.

The original Partnership Project Agreement (PPA) was signed in Washington DC in May 2000. The current partnership agreement for Project MESA was ratified in January 2001 in the City of Mesa, Arizona. The PSPP was given the name "Project MESA" in recognition of the city where the partnership agreement was finalised.

MESA ORGANISATION

The MESA project is organised into three organisational areas: the MESA SSG SA, the MESA TSG SYS, which are overseen by the MESA Steering Committee. This is described in Figure 1.

Figure 1: MESA organisation

MESA Steering Committee

The Project MESA Steering Committee oversees the MESA SSG SA (MESA Service Specification Group – Services and Applications) and MESA TSG SYS (MESA Technical Specification Group – System) groups and is responsible for the general management as well as the following tasks:

- Allocation of human and financial resources provided by Organisational Partners;
- Allocation of voluntary human and financial resources provided by Public Safety Partners and Individual Members;
- Determination of the overall time frame and management of the overall work progress including technical coordination;
- Final adoption of new and stopped work items proposed by the TSG within the agreed MESA scope and objectives;
- Final adoption of Technical Specifications and Technical Reports prepared and approved by the TSG.

MESA SSG SA

This group prepares, approves and maintains the Project MESA users' Statement of Requirements (SoR) and related reports. The Highways Agency has had a significant influence on the content of the SoR document, through its representation within the MESA SSG. The group is additionally responsible for items including:

- Harmonisation of public safety requirements;
- Definition of services and feature requirements in public safety environments including:
  - user scenario descriptions;
  - quality of service;
  - availability;
  - service capabilities;
  - service architecture (e.g. fixed network aspects);
  - security and crypto matters;
  - lawful interception aspects (e.g. CALEA: Communications Assistance for Law Enforcement Act).
- High level service definitions used in the work performed in the TSG and monitoring progress;
- Preparation of a detailed time frame and managing detailed work progress;
- Proposal and approval of work items within the agreed scope and terms of reference of the SSG;
- Approval of the SoR and related reports before forwarding to the Steering Committee for adoption.

MESA TSG SYS

This group is responsible for the technical requirements of the project and specifically has the following responsibilities:

- Identification and derivation of the Technical Requirements from the SoR.
- Development of MESA system reference models and architectures.
- Consideration of the SSG SA reference user scenarios to evaluate proposed system models including environmental issues.
- Monitoring and informing other MESA entities of new and emerging activities falling within the scope of Project MESA.

EUROPEAN ACTIVITIES

A large number of EU-funded projects are currently examining aspects of a MESA-based system and are undertaking trials of the technology with public safety users. The CHORIST project (integrating Communications for enHanced envirOnmental RISk management and citizens safeTy), for example, is planning a major trial in Spain with all of the main emergency services taking part. The HA MESA project has formed strong links with the consortium behind the CHORIST project (and its predecessor, WIDENS - WIreless DEployable Network System) and will benefit from the results of this trial when it takes place. The HA witnessed the (small-scale) trial which formed a part of the WIDENS project.

The CHORIST project web site includes a summary of other projects in this field: http://www.chorist.eu/index.php?page=51&sel=51.

In parallel with MESA, a separate European initiative is co-ordinating a Europe-wide frequency allocation for MESA. A frequency band has been identified (around 5.8GHz) and this will become available towards the end of 2008; in the meantime a license-exempt band is available for trials and similar uses, adjacent to the proposed band.

A number of emergency services throughout Europe are beginning to adopt MESA-like technology within their operations, including some local fire, ambulance and police services in the UK. The technology is also being adopted by a large number of municipal authorities, both in the UK and elsewhere in Europe, for applications as diverse as real-time public transport information, traffic control and management and public broadband ('WiFi-hotspot') internet access. This has created both a competitive and competent supply base for the technology and a wealth of experience with its use.

BENEFITS OF MESA FOR THE UK

In the UK there is currently no standard communications and management infrastructure across the emergency services for use during major road incidents. Even with the adoption of the new TETRA radio system (which includes Police, Fire and Ambulance services, the HA and others), the level of communication is limited to voice and very low-rate data, thereby preventing the use of high-resolution, real-time video and other essential diagnostic and disaster co-ordination data.

The Highways Agency has launched its Traffic Officer (TO) Service patrolling the motorways in liveried vehicles, replacing the Police response to some incidents on the network. The Highways Agency must therefore be prepared for, and be equipped to be effective and efficient in, this new role. It is now possible for TO vehicles to be first on the scene at some incidents, ahead of other emergency services.

In the case of a motorway incident, the basic concept of MESA is that an HA response vehicle, for example, arriving at the incident, could instantly establish itself as the communications hub for a localised incident-area network, as illustrated in Figure 2 (overleaf). Other resources entering the area would then automatically form nodes in an IP (Internet Protocol) network, with this network re-configuring itself as other nodes (fire engines, ambulances, other HA response vehicles, police cars etc.) arrived at and left the area.

The primary aim of project MESA is to enable the emergency and incident response services to perform better, which, in the case of the UK roads network, could lead to:

- Improved effectiveness in the remote co-ordination of incidents. The coordinator and any associated 'experts' (e.g. medical, chemical, fire etc.) can get to work immediately, without having to wait to be on the scene.
- Faster diagnosis of casualties, leading to the faster removal of patients and the most appropriate use of resources (e.g. air ambulance services).
- Fewer road deaths (e.g. road casualties becoming fatalities) through the use of, for example, remote patient monitoring.

All of the above will lead to faster clearing of accidents, thereby returning the road to normal use in a more efficient and timely manner.

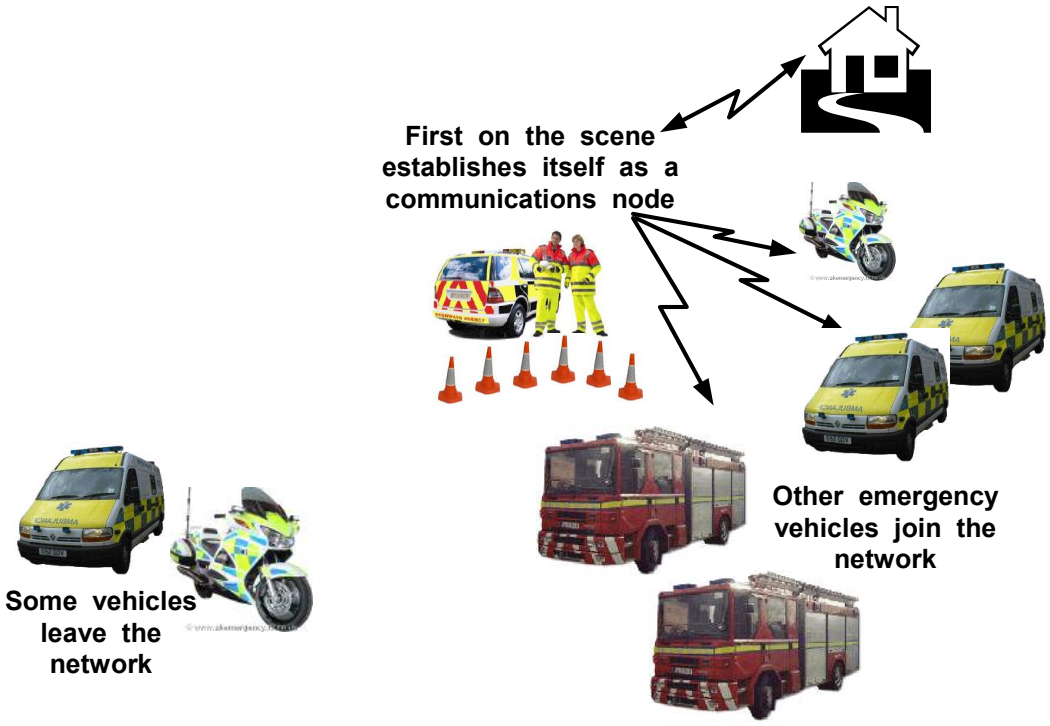

Diagram courtesy of WSP

Figure 2: Establishing an ad-hoc communications network based on MESA-like principles

One of the key benefits of this type of network is that it should require no fixed hardware to be installed. This platform would be shared by HA Traffic Officer vehicles, police, fire, ambulance, coastguard, civil defence etc. (in much the same way as the Airwave TETRA network is at present) so that all participants dealing with the incident could share information and facilities. In the case of the Highways Agency, this is clearly of interest for major road traffic accidents, road flooding, chemical spills etc. It is also relevant for coordinating incidents which take place adjacent to main highways, such as major fires, rail crashes etc. It should also be able to provide a direct access link to the incident management information network, which would then allow the progress in accident clearing to be monitored. This will assist in providing immediate information to travellers and enable more accurate predictions of journey time to be provided.

The technology being advocated by the MESA project has relevance in a wide variety of emergency and disaster communications scenarios, with one of its key application areas being major highways incidents. The proposed MESA technology provides the ability to quickly and easily deploy an ad-hoc, high-bandwidth communications network, locally to an incident, without tying up the existing communications infrastructure. It also provides virtually guaranteed communications between all types of emergency services attending the incident, whether or not good coverage is available from the fixed infrastructure network. Finally, it allows communication from any vehicle or person ('node') back to the control centre, so long as at least one node has good coverage from the fixed infrastructure backbone (utilising one or more 'hops' via other nodes, as necessary).

■ PROPOSED ARCHITECTURE

The network architecture proposed for the MESA system, shown in Figure 3, is deliberately similar to that of traditional wireless data networks. This enables existing technologies, standards and protocols to be re-used in the MESA system, facilitating the use of low-cost

commercial hardware and software. For much of the time, such as in 'normal' operational conditions or when dealing with minor incidents or breakdowns, communications will go through wireless base stations that are spread throughout the coverage area. These base stations are connected together to form a backbone network.

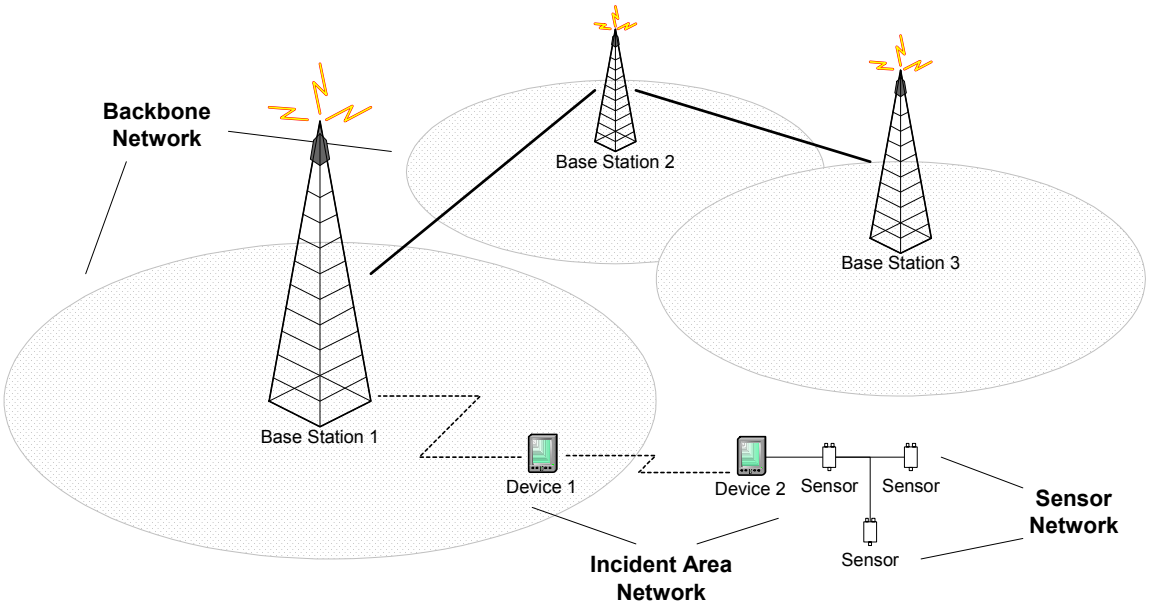

Diagram courtesy of WSP

Figure 3: Overview of MESA system concept

Devices (e.g. vehicle-mounted and handheld radios) use the backbone network to communicate with other devices that cannot be reached locally. All devices keep track of the other devices located nearby, thereby allowing a device to determine whether it should talk with another device directly or through the backbone network. Periodically, in order to communicate locally, an intermediate device may act as a relay by repeating traffic between two other devices. If traffic prioritisation dictates that the intermediate device is required for other (higher priority) purposes, communication is simply routed through another device or the backbone network instead.

This ability to be able to route traffic from other (local) devices effectively provides coverage enhancement for the basic communications system. This occurs because a MESA terminal which is not receiving coverage from the backbone network may well be able to communicate with another, nearby, MESA terminal which does have coverage from the backbone network. This second terminal can then act as a router/repeater for the voice or data traffic from the first terminal, thereby providing that terminal with core network coverage. This capability is one of the key benefits of MESA.

The MESA concept allows the establishment of 'incident area networks' which enable the various emergency services at a particular incident to communicate and share images, video etc. with each other, without the need to use the main 'backbone network' This would overcome (locally) the bandwidth/data rate restriction of, for example, the Airwave (TETRA-based) network.

MESA Statement of Requirements

The Statement of Requirements (SoR) is being developed by the MESA Service Specification Group – Services and Applications (SSG SA). The SoR details the major objectives and requirements of the project:

- Mission description and technology needs by public protection and disaster relief (PPDR) discipline. This describes how the various technologies are used to support the operational requirements of each PPDR discipline and documents the details of PPDR scenarios, describing the types of information that are routinely required to support PPDR activities.
- General technology requirements. This describes general Project MESA technology requirements and guidelines applicable to all PPDR disciplines.
- Project MESA general, functional, and operational requirements. This describes specific Project MESA technical requirements.
- Technology and applications. This discusses general guidelines for implementing specific technologies.
- Use of technologies and compatibility requirements. This discusses several practical aspects which should be considered when implementing various technologies for PPDR applications.

Work on MESA in the Highways Agency

A trial of MESA technology is planned to take place in the UK, in 2007/8. The aim of the initial, small-scale trials will be to assess the capabilities of the available technologies and how they can best be used by the Highways Agency in both 'disaster' situations and more day-to-day operational areas. In the latter case, some fixed roadside infrastructure could provide localised internet access, for example, enabling Traffic Officers to enter details of a breakdown or minor accident directly, thereby alerting the travelling public in the fastest and most direct manner possible. Non-disaster applications such as these will be evaluated alongside the more disaster-oriented communications scenarios outlined above.

Following on from these small-scale trials, the next step will be to deploy a system in a local region and assess its usefulness, reliability and cost-effectiveness in a real application. Such a trial would be likely to take place around 2008, but plans are not yet finalised.

Bibliography

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MESA project: http://www.projectmesa.org/

ETSI website: http://www.etsi.org/

TIA website: http://www.tiaonline.org/

CHORIST project: http://www.chorist.eu/

Glossary

CALEA	Communications Assistance for Law Enforcement Act (USA)
CHORIST project	integrating Communications for enHanced envirOnmental RISk management and citizens' safeTy – EU funded project under 6th Framework Programme which addresses Environmental Risk Management in relation to natural hazards and industrial accidents.
ETSI	European Telecommunications Standard Institute
TO	Highways Agency Traffic Officer
IP	Internet Protocol

MESA	Mobility for Emergency and Safety Applications
MESA SSG SA	MESA Service Specification Group – Services and Applications
MESA TSG SYS	MESA Technical Specification Group – System
PPA	Partnership Project Agreement
PPDR	Public Protection and Disaster Relief
PSPP	Public Safety Partnership Project
SoR	Statement of Requirements
TETRA	TErrestrial Trunked RAdio (realised in the Airwave Project in the UK)
TIA	Telecommunications Industry Association
WIDENS project	WIreless DEployable Network System – EU funded project under 6th Framework IST programme aiming to design, prototype and validate a high data-rate, rapidly deployable and scalable wireless ad-hoc communication system, based on 802.11 standard (WiFi), for future public safety, emergency and disaster applications.