CASE STUDY:

Airwave: one network, one technology, one truly open standard

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The UK's Airwave network is one of the largest and most complex TErrestrial Trunked RAdio (TETRA) systems of its kind in the world.

Owned and operated by O_2 Airwave, it currently serves approximately 200,000 public safety users. Each public safety service operates independently with its own control rooms and, in the event of a major incident, the Airwave service is capable of allowing all users to communicate on a single, shared system. This most important feature was effectively demonstrated in 2005 at the celebratory Trafalgar 200 event and later at the G8 Summit at Gleneagles, the largest planned police event in the UK. Based on Motorola's Dimetra IP TETRA network solution, O_2 Airwave is a leader in implementing highly secure, resilient, reliable and scaleable radio coverage and capacity – a model now followed worldwide by numerous public safety communications networks.

TETRA is the modern digital Private Mobile Radio (PMR) and Public Access Mobile Radio (PAMR) technology for the emergency services and other professional radio communication users. When the UK Government commissioned the building of the Airwave network in 2000, the chosen technology was TETRA. To meet the operational requirements of the users, O_2 Airwave specified a set of requirements for a mission-critical communications system that set new levels of excellence for public safety networks worldwide. In addition to compliance with the ETSI TETRA standard to ensure interoperability with other vendor's product, O_2 Airwave also demanded highly-efficient switching and fast call set-up for local, regional and national calls, air-interface encryption, high levels of system redundancy, efficient integration with third-party Control Room equipment, and migration to an IP solution within the contract period.

Motorola endorsed these exacting requirements, implementing its advanced Dimetra TETRA solution and supported O_2 Airwave in delivering the Airwave service"… on time and within budget", as announced in June 2005, by Pete Richardson, O_2 Airwave's CEO at the time. Now fully operational, the Airwave core network is based on Motorola's TETRA over IP platform. The network covers 230,000m^2, has over 3,000 antenna sites, plus a series of seven-zone cluster switches, to provide a single, nation-wide digital infrastructure without operational black-spots. So far, more than 100,000 Motorola radios have been shipped to users on the Airwave network.

A joined-up communications network

Airwave is dedicated for use by the emergency and public safety services throughout England, Scotland and Wales. Currently, users include all 51 regional police forces and British Transport Police, with contracts in place for the nation's Fire and Rescue services, and Ambulances services across England and Scotland. Already, there are other key 'Category 2 responders' on the network, including the Immigration Service; CCTV monitoring teams; Emergency Planning Agencies; the HM Prison service; and street wardens. Category 2 responders are classified under the terms of the recent Civil Contingencies Act, which stipulates co-operation with the main emergency services (or 'Category 1 responders'), with an elevated responsibility to share relevant information at times of crisis.

Access by, and between appropriate user groups is controlled at Government level and a list which references the emergency services and public safety agencies that are eligible to access the Airwave service, is administered by the UK communications regulator Ofcom. In April 2006, the Local Authority Airwave User Group (LAAUG) was established to represent local government organisations that either use or are considering using the Airwave service. "The Airwave objective is to provide a highly resilient service that can be relied upon to enable true interoperability between all organisations involved in public protection and health and safety should they need to work together in day-to-day operations or at the scene of major or minor incidents," comments Airwave's Pete Richardson.

Unparalleled system features

In the deployment of the Airwave network, Motorola has led the world in the development and implementation of highly secure and feature-rich networks. Already supporting up to 200,000 public-safety users, air-to-ground communications and direct access to the PSTN network, coverage includes all major and minor roads in Britain. Enhanced, hand-portable coverage also ensures operation in urban or remote areas, as well as within the confined spaces of buildings and tunnels, where radio coverage has often failed in the past. With Dimetra IP, highly-efficient switching of local, regional and national calls is complemented by advanced packet data

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capabilities. Motorola's expertise as a supplier of end-to-end solutions has also proved paramount to the successful integration of third-party Computer Aided Dispatch (CAD) equipment, Geographic Information Systems (GIS), mapping and Automatic Vehicle Location (AVL) applications, as well as radios, into the Airwave network.

From the onset, the Airwave service was designed to achieve the highest levels of system redundancy and resilience. While the original blueprint for the network called for the use of a 'dark site' – a securely located stand-by switch cluster that could be deployed within a few hours – Motorola is now working with Airwave to implement a new nationwide solution delivering a new service to meet an enhanced set of requirements for the Police Information Technology Organisation (PITO). This will deliver significantly improved switch resilience to cater for catastrophic failure of one or more of the primary cluster sites. "The role of police communications has changed dramatically in the ten years since the initial Airwave network was conceived," explains Iain Clarke, Director of Sales at Motorola. "The provision of this enhancement will make the Airwave network even more resilient and more suited to today's policing needs."

The new national solution will be based on Motorola's Cluster Hot Standby (CHS) technology, whereby a fallback cluster will be preconfigured to mirror each primary cluster and maintain full service provision for all users. Service restoration times will be in the order of minutes, making it an unparalleled feature for the delivery of public safety communications anywhere in the world.

Practical data applications for public safety

The Airwave network delivers fully-integrated voice and mobile data communications, with short data service (SDS) and packet data supporting status and text messages, plus database enquiries of the Police National Computer (PNC), Electoral Roll and local intelligence databases. Users of these services will in the future have an added benefit with the introduction of multi-slot packet data capability, increasing the data throughput by up to a factor of 4. Such practical applications have proved of particular importance to police users, given that the majority of officers currently have to return to the station to access such databases, file reports and assign tasks. Statistics from research conducted recently by the Home Office and PA Consulting (Diary of a Police Officer) estimates that such tasks keep officers off the street for 30% or more of their time on duty. Not surprisingly, many now believe that mobile data via TETRA is the best solution for delivering increased visibility, effectiveness and efficiency, while also enabling more accurate resource management. The Lancashire Police for example, is using mobile data to access the Police National Computer for vehicle checks, while advanced applications such as image transfer, GIS using AVL and integrated Global Positioning via Satellite (GPS) are already being utilised by Suffolk Police. Fire & Rescue services in Lancashire and Shropshire also use TETRA's data capabilities for mobilisation, status messaging and AVL, while the Hereford & Worcester Ambulance Trust is using AVL, as well as the transmission of patient's vital signs directly to A&E departments.

As early pioneers of TETRA, Motorola continues to push forward the boundaries of this technology. The introduction in 2004 of the MTH800 radio with WAP (Wireless Access Protocol) browser and colour display brought significant improvements in ability to access the PNC, and the launch of the industry's first TETRA PDA at the end of 2006 will continue to drive the

adoption of mobile data on Airwave. The MTH800's colour display provides a more user-friendly interface and makes it easier to display graphics and images such as 'mugshots'. It is also easier for users to enter information and view subsequent search results via improved query forms. With SDS, queries are limited to 140 characters, whereas WAP uses packet data and can handle much more content. Furthermore, because the actual application is hosted on a central WAP server, users only have to make changes on the server to provide all terminals with near-instant access to new services, without having to recall radios for reprogramming.

A number of Police forces have also been piloting off-the-shelf personal digital assistants (PDAs) using commercial bearers such as GPRS, but concerns have been raised over security and availability of the bearer (cellular networks can crumble under heavy traffic loads). Motorola's TETRA PDA – the MTC 100 – overcomes these issues by utilising the highly secure Airwave network. Trials with a number of forces are already underway. The MTC 100 incorporates the latest Windows 2005 Mobile Edition™ with security and messaging enhancements, large 3.52" TFT touch screen, integrated camera and flash, plus TETRA wide area radio (WAN) with optional encryption and authentication. Additional options will include integrated GPS, for example, to deliver a solution that will help fulfil aims outlined in ACPO's 2002 UK National Strategy for Mobile Information. A typical example of the benefits offered by the MTC 100 is where officers will be able to capture information on their PDAs, communicate with IT systems via TETRA, and have a crime number issued automatically – a much more efficient use of resources that will free-up more officers to patrol the streets.

Leading security and standards

The Airwave service is owned and operated by O_2 Airwave under contract to the UK Home Office – who required a network accredited by government security agencies to "Restricted" level to ensure privacy and protection of sensitive information. Airwave features TETRA Encryption – with the first phase delivered in Lancashire with Class 2 encryption using TEA2 algorithm as far back as 2001 (TEA2 is reserved only for use by EU/Schengen Police forces). Today, the whole network covers the UK with Class 3 encryption, the most secure level of air interface protection available in TETRA. For users that require an even higher level of security, end-to-end encryption, which provides an additional overlay of protection, is supported. In addition, Motorola has been awarded the contract from PITO to supply a nation-wide Crypto Key Management solution for all such users of end-to-end encryption.

Charged with delivering the most complex, mission-critical and demanding communications system requirements in the world, Motorola has ensured that the O_2 Airwave TETRA network has met and exceeded public safety user requirements. During the terrorist attacks in London, a well-rehearsed emergency response plan was instigated within 35 minutes of the bombs going off in the London Underground. O_2 Airwave was quickly able to deploy a network to provide radio communications in the tunnels at Russell Square and Kings Cross Tube stations, ensuring that police officers and supporting London Underground staff had communications in vital areas.

Simultaneously, Airwave provided secure radio communications at the G8 Summit at Gleneagles. "July 7 has brought home more than ever the need for trusted, resilient and reliable emergency communications ... one technology, one open standard," concludes Airwave's Pete Richardson.

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Motorola Ltd., Viables Industrial Estate, Jays Close, RG22 4PD, Basingstoke, UK

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