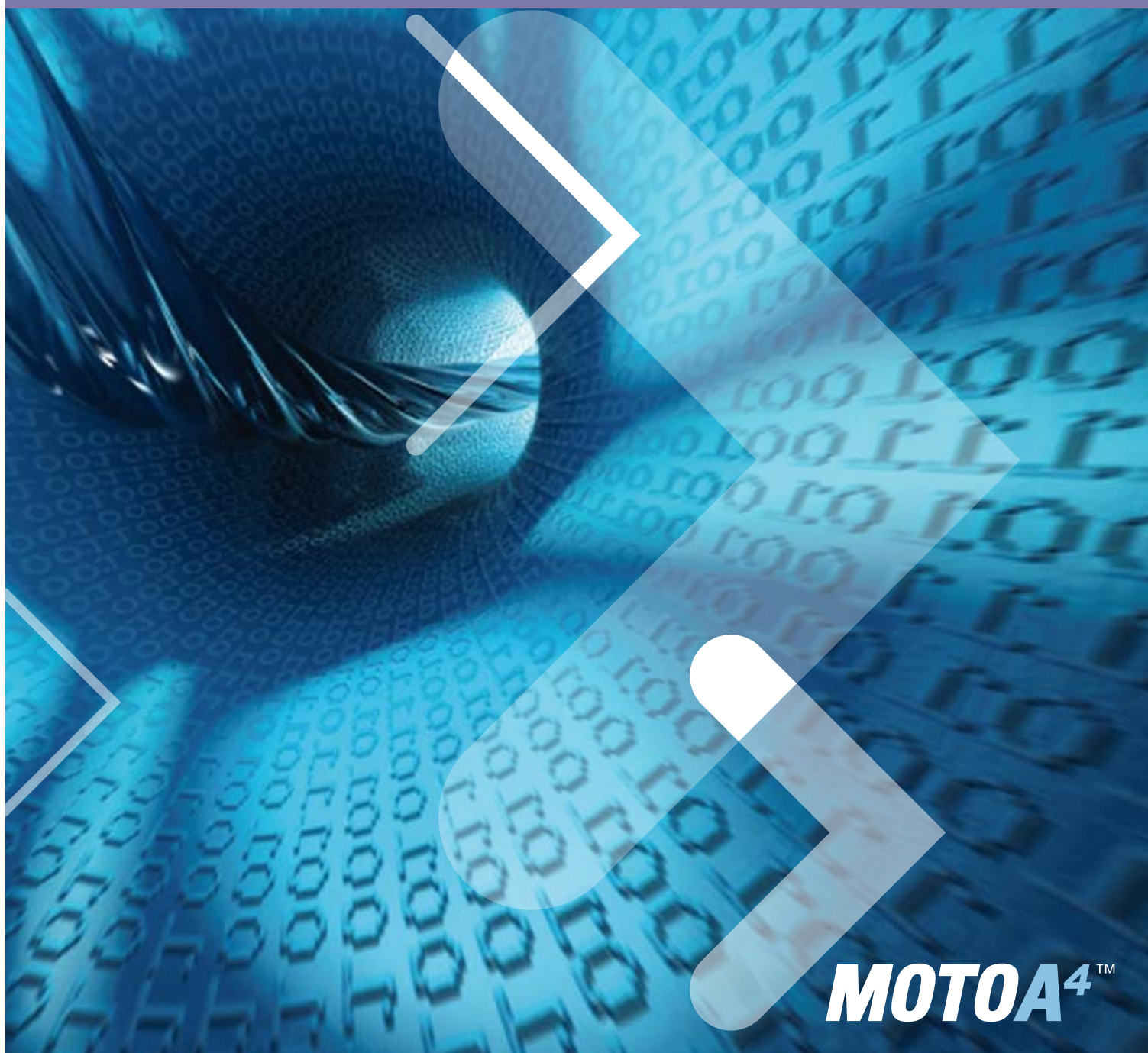




# ***MOTOROLA'S TEDS SOLUTION***

ENHANCING PERFORMANCE THROUGH DATA



**MOTOA<sup>4</sup>**™

**MOTOA4™: Your Evolution to the Future**

TEDS is a key part of Motorola's overall MOTOA4™ portfolio. MOTOA4™ is Motorola's Mission Critical portfolio, designed to meet an organization's needs as it evolves into the future:

**Assured Mission Critical Communications**

Motorola's Dimetra TETRA solutions provide interoperable, secure and resilient voice and data communications. They provide the foundation for the evolution of mission critical communications.

**Advanced Applications & Services**

Harnessing the power of Mission Critical networks, applications such as vehicle and user location, text messaging and mobile office solutions, as well as our full range of supporting services, enhance operational effectiveness.

**Assured Wideband Data**

Enhancing the capability of our core networks, the introduction of TETRA Enhanced Data Services (TEDS) delivers resilient, secure wideband wireless data across a wide geographic area to support enhanced web access, graphic images, and richer data applications.

**Advanced Broadband Data**

Today, our IP based mission critical solutions enable true integration with complementary high-speed data networks to support video and multimedia applications in targeted local areas.

As we look to the future, Motorola's rich heritage and proven innovation make us the ideal partner to define the next generation mission critical networks.



### ***Beyond Voice – The Need for Mobile Data***

From day-to-day operations to crisis situations, TETRA's voice services are recognised as providing no compromise, ultra-reliable communications. Increasingly however, mission critical agencies are also assessing how they can leverage the inherent data capabilities of TETRA to better support their operations.

### ***TETRA – Enhancing Performance Through Data***

Across the world TETRA is supporting an extensive array of field services. Examples include: police officers filing paperwork on-the-go and accessing databases to check suspects; fire fighters viewing building blueprints while on the way to a blaze and the remote monitoring of pipelines in the oil and gas industry. Such services transform the ability of users to anticipate problems, make informed judgments under pressure, improve productivity and efficiently coordinate emergency response. As TETRA evolves, developers are further expanding the array of services available. Together with new devices (such as Motorola's TETRA PDA ) that are making services more accessible and convenient, the trend for mission critical workers to take advantage of TETRA's wide area, trusted and secure data coverage is accelerating.

### ***Extending Mission Critical Data***

With data being increasingly adopted by mission critical organisations, attention is turning to how data services can be enhanced going forward. Complementary wireless broadband technologies can be deployed, particularly where broadband data speeds are required to support specific events or locations. Motorola is acknowledged as having the most comprehensive collection of wireless broadband technologies including WIMAX, Fixed Broadband, Mesh and Powerline systems. However, where highly secure, wide-area data and voice communications are concerned, TETRA remains the foundation for secure communications. TETRA Enhanced Data Services (TEDS) then enhances TETRA's data capability to meet the need for trusted and secure wide area high speed data.

### ***IMAGIN: A Complete Portfolio of Images in the Field***

Scotland's Northern Constabulary provides all its officers with on-the-street access to a wide range of images. For example, images taken from CCTV footage. The pioneering new scheme, which is attracting huge interest from other policing organisations, delivers images across the Airwave network to Motorola's WAP-browser equipped MTH800 radio. The handset's clear, large coloured screen provides excellent detail of the range of images available to officers under the IMAGIN (Images Made Available to Groups or Individuals over Networks) concept, developed by the Force. Officers can view images of missing persons, suspects on CCTV and call up maps while on patrol. They can also access the voters' roll for the Highlands and Islands region to verify names and addresses (freeing up Force Operations Centre staff), and the DVLA driver database to check drivers' identities. Taking advantage of TETRA's data capabilities, the scheme returns a range of benefits: officers will be able to spend more time on the streets (information on persons can be distributed without the need to return to the station); their safety is enhanced as they approach incidents armed with information about individuals, and missing persons can be traced more quickly which has the potential to save lives.



## ***Introduction to TEDS (TETRA Enhanced Data Services)***

### **So What is TEDS?**

TEDS is part of TETRA standards Release 2, an evolution of TETRA release 1 to which it is backwards compatible. It will provide a step change in the data rates available over TETRA, thereby meeting the need for higher speed data services. Key aspects of TEDS include:

- It shares the same government approved high-strength security mechanisms that make TETRA1 so secure
- It can be introduced into an existing TETRA1 network as an upgrade; greatly simplifying the operations and maintenance task for the network operator and so avoiding the operational risks associated with having to deploy a separate mission-critical high speed data network
- Its spectral efficiency means that TEDS can be slotted into available space within the existing TETRA frequency band, or even replacing existing carriers dedicated for data and providing substantially more capacity. This avoids a costly and time-consuming process of finding new spectrum for a separate high speed data network

### **Balancing Coverage and Throughput Requirements**

The relationship between data throughput, coverage, spectrum and channel bandwidth (the amount of spectrum used by each data channel) needs to be considered to determine the optimal solution. Higher channel bandwidths enable faster data rates but require more spectrum and result in smaller coverage areas. As a result the industry is moving towards 25KHz and 50KHz bandwidths which give broadly equivalent coverage areas to TETRA1 voice. A network operator can decide on a site-by-site basis which channel bandwidth to provision for each site.

### **Adaptive Modulation to Maximize Data Throughput**

The modulation scheme defines how data is conveyed between the device and the base station. Adaptive modulation automatically changes the modulation scheme used depending on the strength of the signal – a higher throughput scheme when the signal is good, a slower, more robust scheme, when the signal is poor. Motorola's TEDS implementation uses full adaptive modulation and supports all the QAM modulation schemes (4 QAM, 16 QAM and 64 QAM – the highest available). As the modulation schemes are also used by technologies such as WiMax, Motorola has proven expertise of implementing these advanced techniques in the field in both our infrastructure and our devices.

### **What Data Throughput Will TEDS Provide?**

Based on a 50KHz channel bandwidth and a 64 QAM modulation scheme (the maximum allowable) it is theoretically possible to achieve a net IP data rate of 157kb/s, but this gives low protection from errors on the air interface. Instead, a high protection mechanism is typically used to ensure the resilience of the data transmission, giving an effective data rate of up to 80kbps, available to applications, once overheads are considered.

### **What Applications Will be Enabled?**

Implementing TEDS will provide sufficient bandwidth to support the majority of applications that mission critical users require including richer database enquiries, higher resolution images and video streaming. It also provides more capacity for concurrent data usage by multiple users sharing the same data channels and intelligent mechanisms for managing data fairly between users.



## Why Motorola

Motorola are uniquely positioned to deliver TEDS. We have all the key competences needed to be successful:

- Technology leaders. Motorola are leaders in the key underlying technologies required for TEDS. For example, Motorola has already commercially deployed both devices and infrastructure that utilise the underlying technologies used by TEDS, such as QAM adaptive modulation and multi-carrier transmission as part of its WiMax solution.
- Leadership in data devices. This is shown by being the first to deliver a TETRA PDA. Motorola also has a long track record in delivering devices capable of supporting high speed data for both cellular and WiMax networks.
- Leadership in critical communications. Motorola understands the unique requirements of the critical communications market. We are the leader in both TETRA and APCO 25 and are therefore ideally placed to deliver the key capabilities required.
- Leadership in TETRA data. The underlying features key to an efficient TETRA data solution such as shared packet data channels, SDS transfer over packet data channels, multi-slot packet data and packet data prioritisation will also be key to an efficient implementation of TEDS. Uniquely, Motorola has all these key capabilities proven and operational NOW.
- A fully integrated solution. Motorola can provide a fully integrated voice and high speed data solution including TETRA, TEDS as well as our complementary wireless broadband solutions.
- Motorola is committed to developing a complete TEDS solution including infrastructure, devices, services and supporting applications. In 2007, Motorola was awarded the first ever contract with commitment to deliver TETRA High Speed Data (TEDS) for Nodnett (the Norwegian nationwide public safety system).



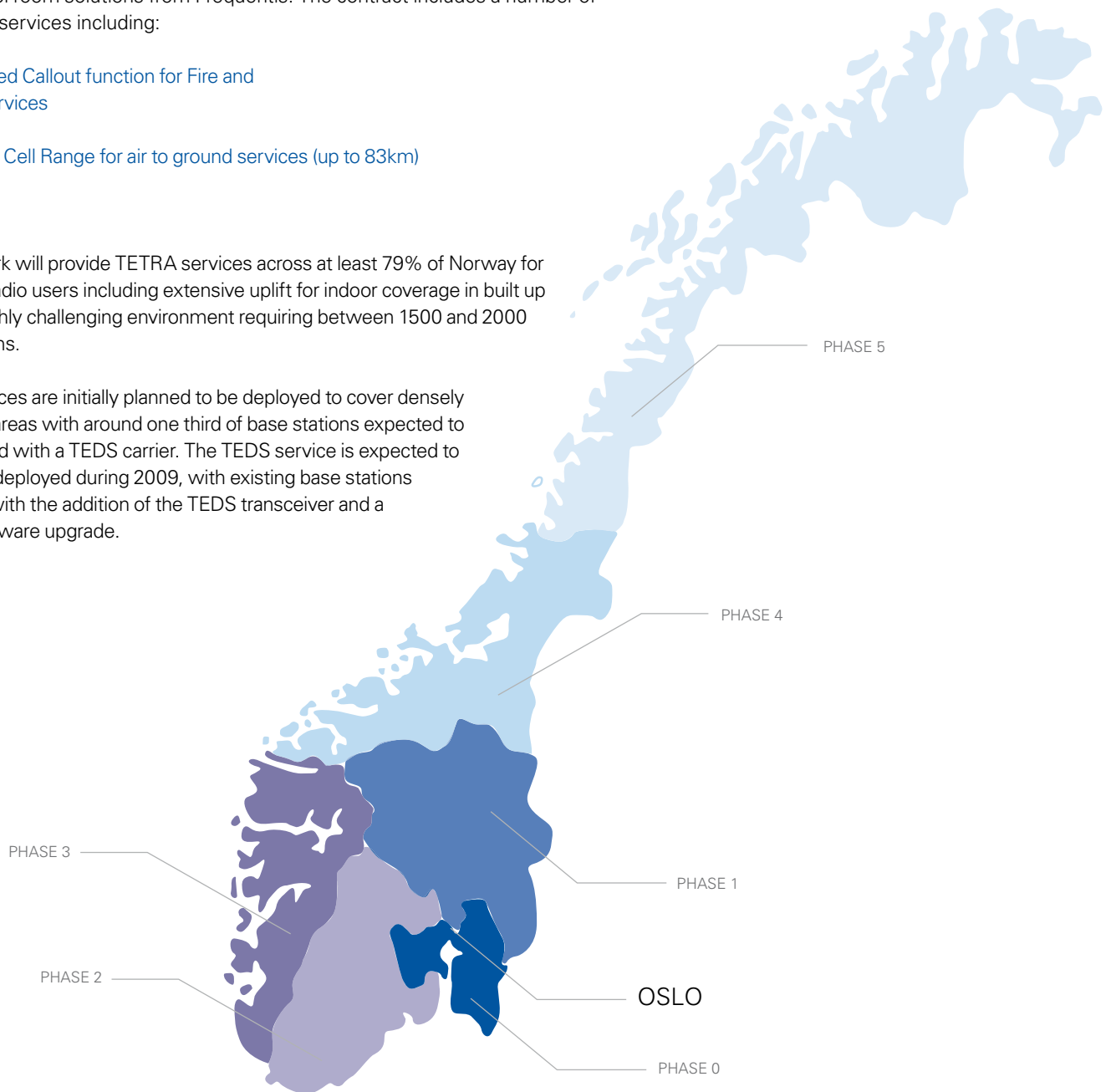
## Nodnett Rollout Plan

When the Norwegian Ministry of Justice announced the award of the contract to build the Nodnett nationwide public safety network, it became the first organisation to commit to deploying high speed data services based on TEDS. The Nodnett network is a common network for all Norwegian emergency services, with approximately 40,000 users and will be delivered in phases by Nokia-Siemens Networks, based on a Motorola Dimetra IP TETRA network and with control room solutions from Frequentis. The contract includes a number of innovative services including:

- A dedicated Callout function for Fire and Health services
- Extended Cell Range for air to ground services (up to 83km)
- TEDS

The network will provide TETRA services across at least 79% of Norway for handheld radio users including extensive uplift for indoor coverage in built up areas, a highly challenging environment requiring between 1500 and 2000 base stations.

TEDS services are initially planned to be deployed to cover densely populated areas with around one third of base stations expected to be equipped with a TEDS carrier. The TEDS service is expected to start to be deployed during 2009, with existing base stations upgraded with the addition of the TEDS transceiver and a simple software upgrade.



### Why MSPD (Multi-Slot Packet Data) is Still Important

In the future, processes will have evolved to maximise the benefits from enhanced data offerings and users' expectations and requirements will have risen accordingly. However, some users may not have TEDS enabled devices or may need to use their devices outside the TEDS coverage area. For these users, the speeds offered by MSPD will provide the critical data lifeline that mission critical users can rely on. MSPD is available today on all Motorola's base stations and terminals.

## *Introducing TEDS is Straightforward with Motorola's Complete Solution*

### Base Station

Motorola's latest generation of base stations are TEDS ready. TEDS can be installed simply by loading the appropriate software and configuring each carrier as required, i.e. either for TEDS (TETRA2) or TETRA1. Furthermore, during major events or disaster situations, the network can change its operation such that TEDS carriers are temporarily made available for voice, or vice versa, optimising the use of the system resources to best serve its end users.

### Core

Motorola's integrated all IP core network is fully scalable to support increases in data going forward. Therefore TEDS along with voice and existing TETRA data services can all be supported on one integrated network. This will greatly reduce both OPEX and CAPEX, as all speech and data will be carried on the same infrastructure links and managed on the same network management and security systems. Additionally, Motorola is able to integrate complementary broadband solutions such as MESH and WiMax together with the TETRA network as part of a multi-bearer solution.

### Transmission

Motorola's IP capability provides efficient packet-based backhaul today as it easily adapts to loads that change throughout the day and provides significant trunking efficiencies compared to a separate 'pipe' (or circuit) for each service. As data traffic grows, an efficient packet based backhaul capability will become even more important in ensuring a cost effective system.

### Devices

Motorola's leadership in data enabled TETRA devices is well established including MSPD (Multi-Slot Packet Data), WAP and GPS being supported across our entire range. Motorola also offer the innovative MTC100 (TETRA PDA) and a range of robust mobile computing platforms. Motorola is leveraging this leadership along with our experience in developing high speed data devices from other technologies to offer a range of TEDS devices that include the latest technology whilst still being easy to use. Motorola's first TEDS offering will be a Mobile Radio based on the MTM800E for in-vehicle communications followed by Modems, PDA's and other new devices to meet market demand.

### Applications

Motorola offer a range of applications today, such as MotoLocator which is a complete location solution. Motorola also enables the development of tailored applications to meet a variety of market requirements, through its ecosystem of application partners as well as customer specific application providers. Key enablers offered range from open application programming interfaces, through WAP and WWW enabled devices to providing full integration support.

### Services

Motorola offers a comprehensive and flexible portfolio of services to support the introduction of TEDS from the initial system planning and design to the implementation and integration. Once installed, Motorola also offer a full range of supporting services to ensure peak performance and smooth operations.



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