



TETRA Smooths SL's Modernisation Programme for Efficient Public Transportation System



Stockholm, Sweden.

Centrally situated in Northern Europe, the city of Stockholm is built on 14 islands, where the lake Mälaren opens up into the Baltic Sea. With some 782,000 city inhabitants and a regional population of 1.9 million, Stockholm aims to be one of the world's most accessible capitals. Approximately 70 percent of the city's citizens use its public transportation system daily, which comprises a network of buses, commuter and local trains, ferries, and Metro and tram systems. On land, public transport is run by 'Storstockholms Lokaltrafik' (SL), a limited company that is owned by the County of Stockholm. Governed politically, SL makes all major transport service decisions, including how the company is structured, bus-route coverage, and whether new train stations are to be built. At sea, the ferries are managed by Waxholmsbolaget. Both authorities strive to provide an efficient public transportation system and cooperate with different private contractors, who operate the fleets independently.



The challenge: to introduce a real-time traffic system and modern two-way radio network to support SL's modernisation programme.

More than 600,000 people travel with SL each day. With just over 500 employees, it is a relatively small organisation, but must oversee a workforce of 14,000, and a fleet of 2,000 buses, which are provisioned by a number of sub-contractors. It also has responsibility for developing new approaches to public transport, procuring services and ensuring that contractors deliver according to service level agreements.

Some five years ago, SL took the decision to modernise its infrastructure with a real-time traffic information system that could harness Global Positioning System (GPS) data and Professional Mobile Radio (PMR) to enhance service operation control, supervision and monitoring, across a complex bus fleet comprising different users, depots and dispatchers. In addition, the system would be used to deliver information to passengers via the Web, and direct to passenger information displays located inside each bus, over the PMR network.

It soon became clear however, that a new two-way radio system would be required to consolidate communications between the various fleet operations. There were three legacy Land Mobile Radio (LMR) systems in use for voice, some of which were 20-years old and based on MPT1327. In addition, a separate analogue radio system operating in much the same way as the old poc-sag paging networks, was being used to send information to bus-stop signs in down-town Stockholm, informing passengers of when the next bus was due to arrive.

Motorola IP Dimetra (Motorola's TETRA solution) network solution and MTM700 mobile terminals support GPS and real-time traffic information system

In order to meet its modernisation objectives, SL issued an open tender for the supply of a digital PMR solution – to be called 'BussKom' – in 2002. Having evaluated a number of options, the company chose Motorola and its local distributor, CELAB, to deliver a PMR network based on Tetra, which would be owned and operated by SL. Just a year later, the core Tetra system was commissioned.

The contract awarded to Motorola-CELAB comprised two sections:

- Delivery of a turnkey Tetra network based on Motorola's Dimetra IP infrastructure – including switches, base stations, dispatch consoles, installation and commissioning (with SL responsible for site acquisition and backhaul/transmission facilities)
- Supply of 2,200 Motorola Tetra terminals (MTM700s)

"As well as providing a single radio communication system across the fleet, we required a solution that could be integrated with a real-time traffic information system comprising a number of elements provided by different suppliers," says Tomas Sjöblom, Technical Project Leader, SL. "The strength of the Tetra solutions provided by Motorola, and their ability to facilitate integration with third-party products and software, were decisive

Company name

Storstockholms Lokaltrafik (SL)

Partner name

CELAB

Industry name

Transportation

Product

- Motorola Dimetra IP infrastructure
- Motorola MTM700 mobile terminals

Solution Features

- Dimetra enhanced IP technology
- High performance & quality of service
- Fast, reliable call set-up
- MTM700 offers durability & robustness

Benefits

- Single radio communication system
- Short and packet data connectivity
- Interfaces with external sub-systems
- Centralised monitoring & control

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Technical Project Leader, SL.

Dimetra IP delivers greater control and efficiency

Using Motorola's Dimetra IP, SL has delivered a common radio system supporting voice and data, and scalable in terms of both network capacity and functionality. As an IP-based solution, Dimetra has enabled SL to integrate BusKom with a number of other complex sub-systems to support its real-time traffic and passenger information systems. This gives SL greater control over its public transport services, enabling efficient management of its sub-contractors, and improving service delivery.

factors in our selection, as well as meeting our stringent budget requirements.”

SL's Tetra network now comprises 33 MBTS Mobile Base Station (MBTS) sites, with more planned to extend coverage and provide greater network resilience. BusKom is based on Motorola's IP Dimetra infrastructure, which features enhanced IP technology to ensure high performance, quality of service and fast, reliable call set up over a very wide area. Motorola's Elite dispatcher consoles were deployed at SL's network operations centre, as well as at the depots of the independent sub-contractors operating the bus fleets. These consoles are soon to be upgraded to Motorola's latest Vortex dispatcher solution. SL also signed a 24/7 service & maintenance contract with Motorola.

Each bus has been fitted with a Motorola MTM700 Tetra mobile, integrated with specially-developed 'CoPilot' control heads. Supplied by Germany-based INIT (Innovations in Transportation, Inc), the CoPilot is an onboard computer running on Microsoft XP and features a touch-sensitive, TFT colour display and software that simulates the functions of a traditional PMR control head (e.g. talk group access, volume, etc.). It also enables the driver to make announcements via the on-board PA system, and transmit passenger information to the on-board displays.

Tetra serves the CoPilot terminals when buses are out in the field, with the units then synchronised with SL's central back-office system via wireless LAN when the buses arrive at their depot. The central back-office system incorporates a real-time Dynamic Traffic Information (DTI) solution based on the 'Pubtrans' product from Sweden-based Hogia, and allows SL to update the CoPilot terminals with the latest bus route information and train times.

A Message Gateway (MGW) supplied by Sweden's Contactor Data also interfaces with the Tetra network, dispatch consoles and CoPilot terminals, to facilitate automated messaging, private and group-based voice and data communications between SL, its sub-contractors' depots, and the fleet. The MGW handles the GPS data sent over the Tetra network via Dimetra's SD (Short Data) service, and routes it via the DTI to the separate dispatcher systems at each depot – enabling operators to monitor the location of each bus. However, in future, it is likely that this information will be transmitted using Dimetra's packet data facility.

Having been in operation for five years, SL's Tetra network is now serving Stockholm's ferry service, and there are plans to migrate the train network's analogue PMR users over to the BusKom Tetra network. Most recently, SL has purchased a repeater and 'leaky-feeder' system supporting both analogue and digital RF signals, so that radio coverage can be extended throughout the Metro underground network.

Flexible and future-proof Tetra network serves complex communications requirements of SL

Using Motorola's Dimetra IP Tetra solution, SL has created a single PMR system that has the capability to serve its entire operations, which embrace the management of six sub-contractors operating the buses, commuter trains, ferries, Metro (underground), suburban railroads and tramway lines.

“A major challenge was to develop and integrate multiple applications meeting the special requirements of our planned system, and co-ordinate the four-way relationship between SL, Motorola, Init and Contactor Data,” continues Sjöblom. “Although we faced a number of other challenges in the beginning, we have built a system that comprises complex technical components and performs very well.”

As well as the bus and ferry fleets, the BusKom Tetra network is supporting some 200 hand-portable radios used by station personnel – such as security guards and night watchmen, mobile traffic supervisors and ticket office controllers. These hand-portables support GPS, allowing dispatchers to view the location of personnel and ensure their safety by interfacing with SL's integrated Audio, Video and Alarm Management platform (supplied by Canada-based Visual Defence).

Driver security has also been addressed using the covert functionality afforded by Motorola's MTM 700s. A hidden emergency button can activate the radio's atmospheric monitoring facility, enabling dispatchers at the depot to hear what is happening on the bus, as well as being able to identify their location using GPS data.

For more information please contact your local Motorola Authorised Dealer or Distributor



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