

Copenhagen Metro

TETRA Metro Communication and Traffic Information System



BACKGROUND

In 1997, Motorola was awarded a contract to supply The Copenhagen Mini Metro with a communications network for the metro opening in 2002.

The metro is a 24-hour automated people mover with driver-less trains. All equipment is remotely controlled by the Control Center, allowing operational staff to concentrate on assisting passengers in order to ensure a friendly and secure atmosphere and to discourage vandalism. Therefore operational staff (stewards) can move freely on the trains and in the stations, answering passenger queries, checking tickets, and assisting in emergencies.

Security is further enhanced by communications through which passengers and stewards can ask for assistance, be informed and be seen from the Control Center while on a train or at a station.

The system covers the first stage of the new metro (Ørestadsbanen), which has a total length of 11 kilometers, five of which are underground.

CUSTOMOER NEEDS

- For safety reasons, a redundant system is required.
- Easy interfacing with other systems needed to operate the Metro.
- Efficient and dependable instant communication across the entire network.
- Integrated data capability to support data applications, such as Passenger Information System.

The trains run on a fully automated system based on ATC (Automatic Train Control), which constantly monitors where every single train is positioned. This gives the metro a high degree of safety. Furthermore, the monitoring of the system ensures that at least 98% of the trains will be running on time.



MOTOROLA SOLUTION

Motorola equipment provided for the transit system includes a 2-sites Dimetra system, which is a fully TETRA compliant system working in the 380-400 MHz frequency band. One base station is placed at either end of the tunnels.

A series of Alcatel 'active repeaters' amplify the RF signals at various points through the tunnels. The Mini Metro system is predominantly for data transmission throughout the Metro system, with 'leaky feeder' aerial technology in the Metro's underground network with certain sections situated above ground.

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The Control Center in Ørestaden is the "brain" of the metro. The entire metro is run from there, and 24 hours a day the Control Center is staffed with 4-5 operators, who supervise the automated operation. They manage communication with the passengers and the metro stewards, and monitor the cameras installed at the stations and in the trains.

This means that the Control Center can spot the smallest irregularities and quickly re-establish normal operation.

The system is primarily a non-voice system, providing facilities to the operator such as passenger information on train arrival times, train location, security systems as well as radio patched through to emergency services.

The 2-site *Dimetra* system includes fault-tolerant group controller, telephone interconnect, console server with four local dispatchers, system management via two terminals, 100 portables, 38 mobiles, three fixed mobiles for emergency

dispatch and three fixed mobiles for connected data.

The speech services available will encompass; individual call, group call group call, broadcast and telephone interconnect. Using the comprehensive data services, the Mini Metro system can benefit from SMS (Short Message Service) via data transfer between the Dispatch Centre and Train for the purpose of control and information.

As the Copenhagen Mini Metro is an automated system running without drivers, great use will be made of the system's video surveillance mode to assist the smooth running of the trains running with headways of 100 seconds during peak times.

Video transmission plays an important role in monitoring train and passenger flow. Connected Oriented Data (COD) provides video sent from train to dispatch.

Benefits of the system include:

- Effective communication in case of emergencies.
 - Fault-tolerant configuration providing a high degree of reliability and availability, not only for the Metro radio system itself, but also in supporting radio communication facilities for police and fire brigade authorities.
 - The system ensures that at least 98 per cent of the trains will be running on time.
 - Robust infrastructure and subscriber devices
 - High MTBF (Mean Time Between Failure).
 - Possibilities for Customer Application Developments
 - Short Data and Packet Data Capability
- Availability:
- The system must be available 24 hours/365 days.
 - Built-in redundancy. High degree of system redundancy to ensure up-time.
 - Emergency Call Capability. Part of the Metro safety system.



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