TETRA

Terrestrial Trunked Radio

The TETRA (TErrestrial Trunked RAdio) standard is implemented in Europe and is spreading to other parts of the world.

TETRA was specifically designed to meet the needs of Public Mobile Radio (PMR), "Walkie-Talkie". It has a large number of features designed for Safety and emergency use.

Radio spectrum for TETRA

Frequencies have been allocated based on agreement between the EU and NATO. As a result, European Public Safety and Security forces are using the radio frequency band 380-385//390-395 MHz for operation of their TETRA networks.

Within this emergency service TETRA spectrum allocation most of the radio frequencies are reserved for Trunked Mode Operation (TMO). The Direct Mode Operation (DMO) frequencies are typically allocated at the lower end of the radio frequency band (from 380 MHz upwards) and specific frequencies for Air-Ground-Air (AGA) operation are allocated at the upper end of the band (from 385//395 MHz downwards) to allow international compatibility.

For the European non-emergency services, TETRA frequencies are mainly allocated in the 410 to 430 MHz band with some countries allocating frequencies in the 450 to 470 MHz band. Countries that are not members of NATO can sometimes allocate radio frequencies in the 385-390//395-399.9 MHz band for non-public safety TETRA users.

Radio spectrum for TETRA elsewhere
In Asia Pacific and South America the so-called 800 MHz band, i.e. frequencies 806-824//851-869 MHz are available for Digital PMR systems like TETRA.

Communication architecture
The technology is based on a four slot TDMA system with 25 KHz bandwidth that can use multiple carrier frequencies to increase capacity.
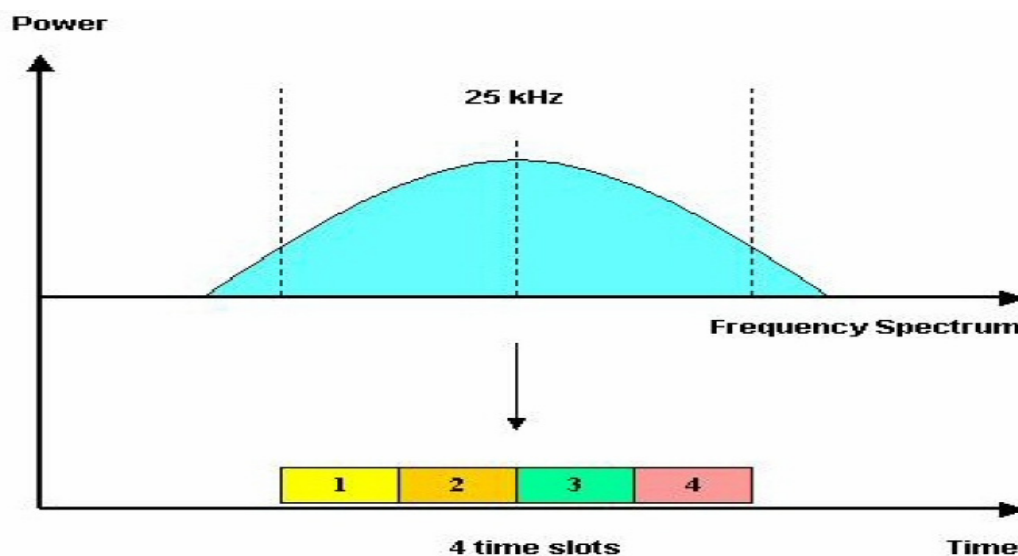

Several timeslots can be combined for data transmission

As with a traditional PMR, TETRA is not a *one-to-one* communication system, although a very limited number of "telephone calls "can be made. The fundamental mode of communication is *one-to-many.*

TETRA has some unique features:

- Direct *push-to-talk (PPT)*, to groups and with priority setting

- Centralized call control, for priority and queuing

- Direct mode, portable to portable without central radio coverage (DMO)

- Relay mode, one portable can use another mobile device to link to the central radio

- Use of one or several timeslots for (low speed) dData

- Voice encryption, different algorithms available
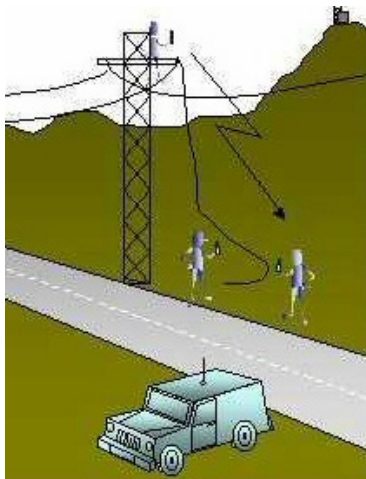
DMO
Direct communication
between units
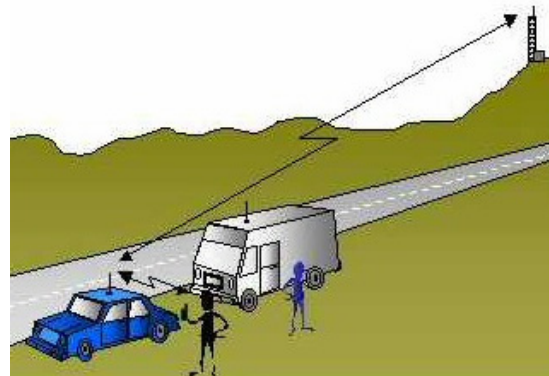
Relay Mode
A mobile device can use another mobile
device to get connected to the radio network

Since first implementation in 1997, a number of companies have come and gone. One example is Nokia who invested heavily in both networks and handhelds from the start. In 2006, they sold their complete TETRA division to EADS, the European Defence & Space giant. This enabled EADS to nearly equal in size with Motorola who has been (and still is) the market leader.

The implementation of nation-wide TETRA systems has not gone as smoothly as anticipated. Interoperability issues and in some cases cost levels has slowed down the deployment

The TETRA market can be divided in (at least) three main segments

- The "blue light" Mission critical communication

- Transportation and utilities

- Companies with a large geographic footprint

It's clear that the "Blue light" market is choosing TETRA but some GSM/3G vendors are developing "PMR like" functionality in their networks to target other traditional user groups of PMR. It will be a fight

in the coming years between the TETRA suppliers and the GSM/3G industry over the non "Blue light" users in areas with good 3G/GSM coverage.

Devices

Voice communication is the most common communication way. New products are coming with enhanced functionality like built-in GPS, full wide-band encryption support, personal alarm buttons, etc. Intrinsically safe versions are also available. Handsets are carried around and mobile devices are for fitting in vehicles, on motorcycles, etc, are available. A range of accessories, such as chargers, headsets, etc is also available.

Handset prices were about €750 in 2003 & about €600 in 2006. Predictions in the industry indicates a continuous price pressure towards the 300-400€ level.

Relevance for Ascom Wireless Solutions

The area where TETRA could be of interest for the traditional Ascom customers is for large geographical sites. Power plants and refineries are typical examples. The coverage areas are similar to high power paging installations, some square kilometres. As explained earlier TETRA is not a telephony system and is not a replacement of, for example a DECT installation. A customer with a need for large area coverage that cannot be served with a paging system most probably need to combine a TETRA infrastructure with a wireless telephony solution (DECT/WiFi/GSM) that covers the areas where telephony is needed.

The philosophy from Ascom is to connect to TETRA phones over VoIP and Unite messaging combined with IP DECT or WiFi.