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Spectrum

LS telcom Customer News Magazine

Special Edition

Special Edition Critical Communications

Edition 01|2014

LS telcom conducts Study on Broadband PPDR Networks in the United Arab Emirates

A report from LS telcom, commissioned by the Telecommunications Regulatory Authority (TRA) of the United Arab Emirates (UAE), has laid the foundations for the development of broadband PPDR (public protection and disaster relief) networks in the UAE.

The study aimed specifically at trying to address the major questions in the context of PPDR services in the UAE, and spectrum harmonisation for the Gulf region. LS telcom examined:

- Which bands could be harmonised across the Gulf region (through input from regulators and a consideration of issues such as equipment availability and interference).
- How much spectrum is necessary for PPDR users in the UAE.
- The possible extent of sharing of spectrum and networks between different PPDR users.
- Whether commercial networks could provide some, or all, of the necessary capacity.

The results show that whilst, using LTE technology together with the potential availability of higher power user equipment (see 3GPP TR 36.837), PPDR use could in theory be supported in as little as 2 x 5 MHz of spectrum, an allowance of 2 x 10 MHz would allow for reasonable future growth. However it is by no means certain that this has to be in the same band, and a mixture of lower frequencies (e.g. 700 MHz or 800 MHz) for wide area coverage together with higher frequencies (e.g. 2300 or 2600 MHz) for hot-spots of activity might provide a more balanced portfolio for PPDR users. It was also found that fully harmonised allocations are not always necessary, as long as the user equipment supports multiple bands, which most commercial off-the-shelf (COTS) devices already do. Ironically, if PPDR use is corralled into its own dedicated spectrum, which is not part of a commercial allocation, handsets would need to be bespoke and the advantages of multiple bands, and COTS procurement would be reduced.

LS telcom is a member of

- **TETRA & Critical Communications Association** representing more than 150 organisations from all continents of the world.
- **PMeV (Verband Professioneller Mobilfunk e. V.),** the German association for public mobile radio

SCADA Design for Berri Offshore Oil Field

LS telcom carried out the radio frequency planning for the SCADA communication system which gathers and processes data from the offshore oil producing platforms located in the Berri Field in the Northern Arabian Gulf (Kingdom of Saudi Arabia).

The system connects the SCADA host located onshore with several remote terminal units (RTU) on the oil producing platforms. LS telcom first determined how many onshore base stations were required to serve all offshore remote radios and then planned the technical configuration for the base stations and RMUs. Measurements were performed to guarantee the interference-free operation of the system.

Concept Study and Design of SCADA via TETRA System

A study on migrating the UHF SCADA remote terminal units (RTUs), installed at locations such as oil and water injection wellheads and cathodic protection stations along pipelines, into Aramco's existing TETRA mobile radio network was carried out by LS telcom.

LS telcom experts were asked to examine various parameters such as system reliability, system load and protocol performance of a SCADA system based on TETRA technology. The experts also carried out a market study of different solutions and technologies available for SCADA systems using TETRA.

Design of VSAT Terminals for SCADA Applications

LS telcom designs fully redundant narrow band Gateways and VSAT terminals for SCADA applications.

The final network covers several thousand remote terminal units (RTUs) communicating with each other via certain protocols. For the design of the VSAT based SCADA-system, parameters such as bandwidth and traffic load have been considered depending on the interrogation cycle of the RTUs, which could be between 5 minutes, hourly or daily. LS telcom carried out an inventory of existing infrastructure and defined what kind of new hardware is required. The experts analysed the market of VSAT system manufacturers and provided all necessary documents for the RFI (request for information) and tender.

**In VSAT (very small aperture terminal) systems the small terminals access satellite(s) in geosynchronous orbit to relay data from small remote earth stations (terminals) to other terminals.*

TETRA Planning for Sasol

LS telcom planned the TETRA network for several production sites of Johannesburg based energy and chemical company Sasol. The old analogue system was replaced by and extended with the new TETRA system.

Coastal Radio System for Denmark

LS telcom was chosen to prepare the tender for the design, delivery and implementation of a coastal radio system in Denmark that ensures safety at sea by enabling ship-to-shore and ship-to-ship communications using VHF and MF radio bands. The most prominent users of the system are the Danish Maritime Authority and the Danish Defence.

The radio system will support Denmark's fulfilment of its obligations as defined in the International Maritime Organisation's (IMO) treaty on supporting safety at sea and specifically in implementing the Global Maritime Distress and Safety System (GMDSS).

TETRA Network for leading Producer of Petroleum-Based Energy

LS telcom planned the TETRA network for Saudi Aramco, the Saudi Arabian national petroleum and natural gas company, in the Eastern Provinces of Saudi Arabia.

The old analogue network was replaced by a highly available and secure TETRA network. Continuous network coverage is now assured at operational sites, including refineries, administrative sites, on- and offshore oil-production sites and along pipelines.

The project included the planning, design, installation and launch of the new network, an extensive measurement campaign as well as the migration from the old analogue network to the newly-designed TETRA network.

More than 7.600 end-user terminals are now connected to the new TETRA network.

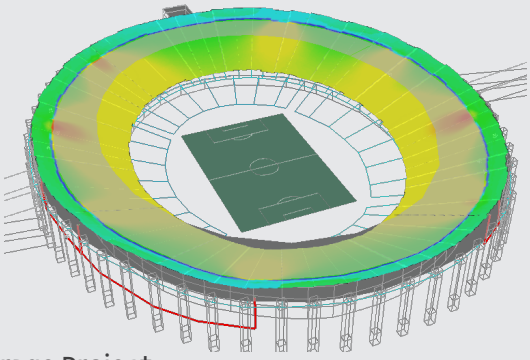
TETRA In-building Coverage Concepts for the Cities of Hamburg, Bremen & Stuttgart

LS telcom experts developed BOS-TETRA in-building radio coverage concepts for the cities of Hamburg, Bremen and Stuttgart.

Together with the authorities they first identified buildings and other locations, such as railway stations, airports and tunnels for which indoor coverage is essential. For each location an individual concept was then developed to show how all the required in-building systems and repeaters could be connected to the "outdoor" TETRA/BOS network. ←

Indoor Coverage - Communication Everywhere!

Mobile networks for security applications in particular, have to be available indoor as well as outdoor. The coordination of action forces, for instance, requires smooth communication in buildings, as well. Depending on the kind of building and the distance to the next base station a complete coverage 'from outside' is not possible. In this case, custom-tailored and optimised solutions are necessary for individual building types.



Vendor independent and experienced - LS telcom assists you in your Indoor Coverage Project

Indoor System Design
- Definition of coverage requirements
- Inventory of existing infrastructure
- Design of indoor coverage
- Development of redundancy concepts
- Initial radio design

Procurement
- Cost assignment and estimation
- Tender support
- Creation of tender documents
- Response to bidders
- Vendor evaluation

Indoor Radio Planning
- Creation of link budgets
- Dimensioning of the active radio components, passive feeder, DAS- (distributed antenna system) and supply units
- Detailed implementation planning

Implementation & Commissioning
- Site surveys
- Project management
- System integration and commissioning
- System acceptance
- Project documentation

Planning Tool for In-Building Network Design - Stay in control of your project

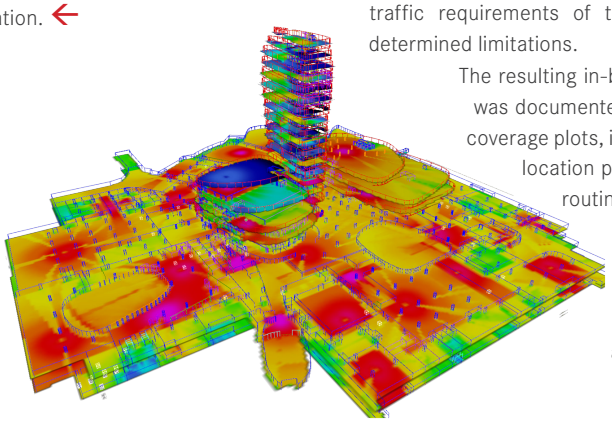
With ***iBwave Design***, RF engineers can automate in-building wireless network design and eliminate guesswork, to bring strong, reliable wireless communications indoors. ***iBwave Design*** takes you through network planning, design, costing, validation, documentation and reporting, delivering top performance, reducing capital expenditure and increasing your productivity. It provides the right mix of usability, control, and flexibility so that you can simulate real project situations, accurately predict coverage before deployment or quickly change how you have configured your design to see if there is a more cost-effective way to build it out. ←

Frankfurt Metro: Emergency Services will soon communicate via modern TETRA Network

LS telcom was asked by the Municipal Transport Services of Frankfurt (Verkehrsgesellschaft Frankfurt, VGF) to plan the indoor digital TETRA network for their underground railway.

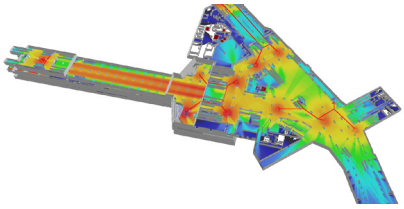
The Frankfurt Underground counts 27 underground stations and tunnel stretches of a total length of 48km. The project includes all planning stages, from the pre-planning and the preparation of approval reports for the regulator, to the creation of the tender documents and tender support and finally the preparation of as well as assistance during the tender awards.

The LS telcom experts have started to develop the technical concept for the TETRA technology, which comprises a redundancy, hand-over and security concept. Part of the first delivery will be the planning of the base station locations, the signal and cable routing plans, coverage and capacity planning, electromagnetic compatibility (EMC) certificates, positioning of network equipment, the preparation of the tender documents as well as a project management plan for the construction until commissioning. Next to the technical planning, there will also be a cost evaluation. ←



In-building TETRA Design for Metros in 3 German Cities

LS telcom engineers planned the digital TETRA indoor network coverage for the underground railway of the public transportation services in Hamburg, Hannover and Düsseldorf. The indoor radio network extends over all underground stations and tunnel stretches.



Coverage simulation for underground station with tunnel system

For all the three Metros, LS telcom engineers designed a detailed concept for the procurement process of the new digital radio infrastructure. The services included coverage simulations, link budget calculation and determination of network equipment as well as support in acceptance and system approval procedures. In Hamburg, the engineers paid particular attention to synergy effects using existing infrastructure and in Düsseldorf they also assisted in the bid evaluation and supported the quality and cost control of the network installation. ←

LS telcom engineers are also working on a design concept to equip the new "Wehrhahn-Line", currently under construction in Düsseldorf, with tunnel and indoor coverage.

TETRA In-Building Design for World Culture Centre

LS telcom designed the TETRA in-building system for the King Abdulaziz Centre for World Culture in Dharan, Saudi Arabia.

LS telcom experts specified the technical equipment and designed the TETRA indoor repeater system for the Centre, made up of five buildings located at the heart of the Saudi-Arabian Oil Fields. The engineers developed the overall design concept, examined the coverage and traffic requirements of the users and determined limitations.

The resulting in-building design was documented with various coverage plots, indoor antenna location plans and cable routing plans as well as link budget calculations, system specifications and equipment lists. ←

SPOT ON

Further projects LS telcom is involved in...

In-Building & Tunnel Coverage:

- inspection and verification of tunnel radio systems for motorway tunnels in the state of Hessen
- the design of the TETRA/BOS coverage of motorway tunnels in Thüringen
- the coverage design and RF-measurements for the stadium of Dynamo Dresden
- the coverage concepts for the Hemelinger Tunnel in Bremen

(in Germany)

Radio Frequency Studies

(including indoor and outdoor coverage studies, frequency planning, nterference/intermodulation analysis) performed for the:

- recently constructed Wasea bulk oil distribution plant
- SCADA system covering the Marjan and Zuluf off-shore platforms
- new TETRA BS in Hayil bulk plant
- AMT terminal in Yanbu (TETRA and marine VHF)
- Shoaiba bulk plant facilities (TETRA, marine VHF and AIS systems)
- preparation of the FEED (Front end engineering design) for the replacement of analog mobile radio systems in central and western region

(in Saudi Arabia)

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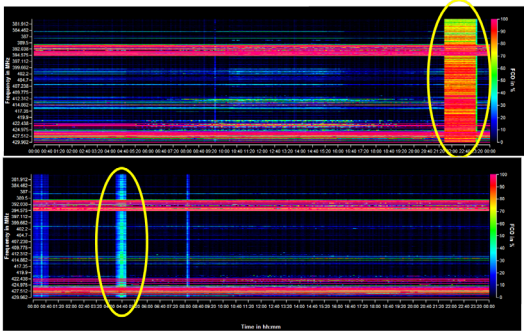
Long-Term Measurements and Drive-Tests in Critical Communication Networks



LS telcom offers network operators and regulators to check on temporary network outages and interferers.

LS telcom experts can carry out long-term measurements at places where network coverage is critical or where users complain about outages or insufficient network connection quality. They can also perform test drives to check whether the actual signal corresponds to the planned signal, to identify areas where coverage is insufficient or, on the contrary, too high, so that the network can be adjusted and optimised accordingly. The picture on the right shows an example of a measurement carried out over several weeks in a critical communication TETRA network. The frequency bands are shown on the vertical axis, whereas the time is shown on the horizontal axis. Two interference incidents are marked, one of them interfered the complete measured spectrum for about 15 minutes.

Performance Comparison of 2 GHz Satellite-Terrestrial Network and 700 MHz LTE Network for PPDR Services

LS telcom published a report comparing the use of 2 GHz and 700 MHz for public protection and disaster relief (PPDR) networks.

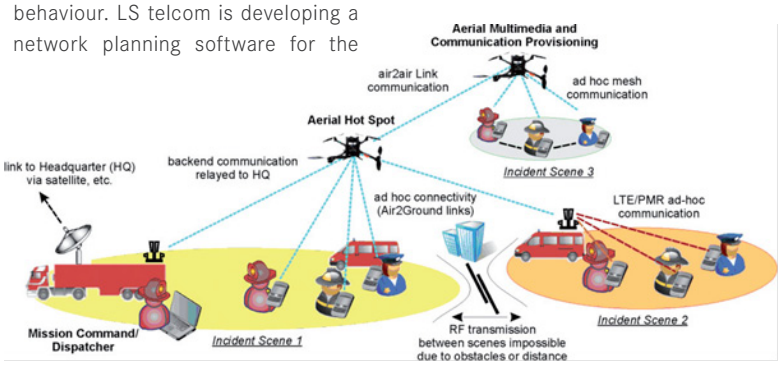
The study, conducted by experts from LS telcom's spectrum consulting team, was commissioned by Solaris Mobile, a mobile satellite services (MSS) operator with a 2 GHz spectrum licence across Europe. Solaris wished to examine whether the use of their spectrum for a complementary terrestrial ground component, to supplement existing satellite coverage, could be a cost-effective solution for the PPDR community. The study considered the design, dimensioning, coverage and economics for the use of 2 GHz and 700 MHz spectrum and used London as a worst-case area for assessing the likely performance and costs. LS telcom's planning engineers also considered practical factors, such as antenna performance and building penetration for the two frequencies bands.

UAV assisted ad-hoc Networks - LS telcom participates in Research Project

Rescue operators, industry and research institutes have joined forces in a Franco-German research project, called "ANCHORS", "UAV-assisted ad-hoc networks for crisis management and hostile environment sensing" for rescue forces to be able to better communicate in emergency and other crisis situations.

LS telcom together with the other project participants develops a flexible ad-hoc wireless communication infrastructure with broadband capacity which will include link support via unmanned aerial vehicles (UAV).

The project unites expertise and technology from several different disciplines, such as sensing technology, unmanned air and ground system design, communications technologies and cooperative swarm behaviour. LS telcom is developing a network planning software for the dynamic design and the deployment of the ad-hoc mobile relay antennas, such as aerial hotspots.



Picture: Ad hoc communication using UAV supported mesh and ad hoc cellular networks

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