the ecos-d dmr solutions

**ECOS·D**
Digital Extended COmmunications System

## ECOS-D CST

The new Selex ES Digital Mobile Radio (DMR) Simulcast solution. The future proof solution for Professional mobile radio users

Many organizations demand the deployment of a PMR system supplying additional and *improved features* compared with an analogue network, but in the meantime they need to manage a *slow migration* from analogue to digital networks, while continuing to use a limited number of frequencies over a wide area. These organisations need an *easy to set-up, easy to use, reliable* communications network with a wide range of services.

Selex ES **ECOS-D solution** meets these requirements, with its features including security and advanced digital services, making it the ideal solution for all of these organisations.

The complete ECOS-D DMR system is fully compliant with DMR, the new ETSI defined narrow-band digital protocol for Professional/Business Critical Organisations and provides users with the possibility of a *soft, easy and seamless migration* from a conventional analogue communication network to a digital network, offering a wide range of additional features due to the unique ECOS-D characteristic of a *data transmission at the maximum specified data rate*.

The unique ECOS-D feature of providing DMR using the Simulcast technique makes it easy to have a highly flexibile network deployment both for both medium and wide area coverage.

**Selex ES**

A Finmeccanica Company

## ECOS-D - SIMULCAST

The ECOS solution is a PMR mobile radio system based on the simulcast technique (SIMULtaneous broadCAST).

With its macrocell structure (simulcast RBS linked to each other), simulcast is the best solution for extended mobile radio networks to increase radio coverage, *reduce the use of radio frequencies, and increase the number of users.*

As all RBS broadcast the same frequency pair per channel. Simulcast systems reduce to two the number of frequencies needed, also reducing the Customer's costs and greatly simplifying the procedure to use this limited and strictly regulated resource.

ECOS special features including Voting, BS Synchronization and BS Equalization make the network work as a *single virtual repeater*, simplifying its usage and its management.

Professional/Business Critical Organizations can benefit from ECOS simulcast in terms of:

- radio coverage;
- automatic hand-over and roaming;
- fast call setup time;
- open channel communications with analogue or digital signalling;
- eavesdropping network protection (receive and/or transmit sides);
- digital voice protection;
- same-channel for voice and data communication;
- conventional dedicated channel network access.
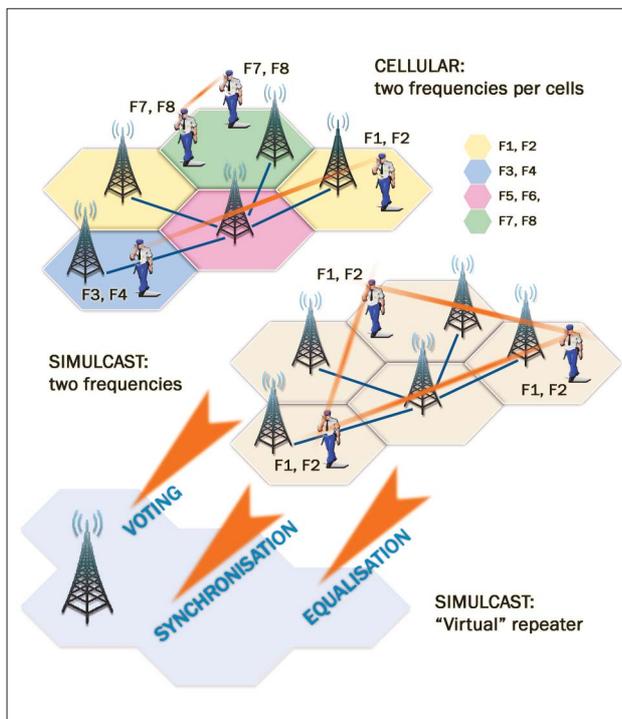


## ECOS-D - NETWORK FLEXIBILITY

As each RBS in the simulcast network broadcasts the same frequencies as the adjacent one, ECOS is an extremely flexible solution.

The ECOS system lets the customer easily choose the *best configuration* for their needs, selecting between:

- widening the coverage area with adjacent macrocells working on the same channel, to provide the best coverage for wide areas  or
- increasing the number of available radio channels, overlapping the macrocells to increase traffic capacity.

An ECOS Simulcast System can be deployed in *any network topology* configuration (star, tree, ring, linear, mixed), and its *nested* infrastructure logical levels allow the solution to easily widen its topology for any future use.
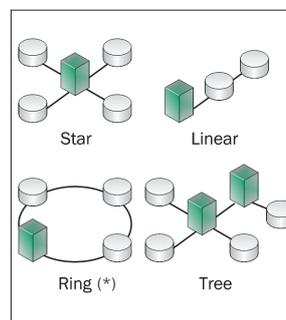


Network architecture available
(*) A$^2$T version only
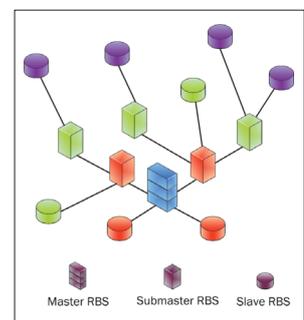
Nested infrastructure

## ECOS-D DMR - FUTURE PROOF

Selex ES *ETSI DMR* solution gives the customer the ability to increase the capacity of licensed channels', *widen the coverage area* and provide advanced features, using the ECOS-D infrastructure together with any vendors' terminals on the market.

### Dual Mode for analogue to digital migration

The ECOS-D family has the unique feature of allowing communication both in analogue and in DMR on the same channel, instantly switching between them in a *real time dual operating Mode.*

Using this feature a Customer gets to *softly migrate* from analogue to digital networks on a user group basis, without any service interruption.

This approach lets the Customer use the analogue terminal fleet for some user groups while gradually implementing the new digital services for dedicated groups of users, preserving the investment in term of sites and antennas and precluding any out of service problems(see scheme).

### Increasing spectral efficiency

The DMR protocol is based on a 2 TDMA timeslot, and its implementation on ECOS-D devices allows the Users to have 2 different logical channels in a single 12,5 kHz radio channel, hence *doubling the physical channel capacity.*

The choice of the ECOS-D DMR solution makes it quick and

easy to increase spectrum efficiency to make the best use of this limited resource compared with other similar protocols.
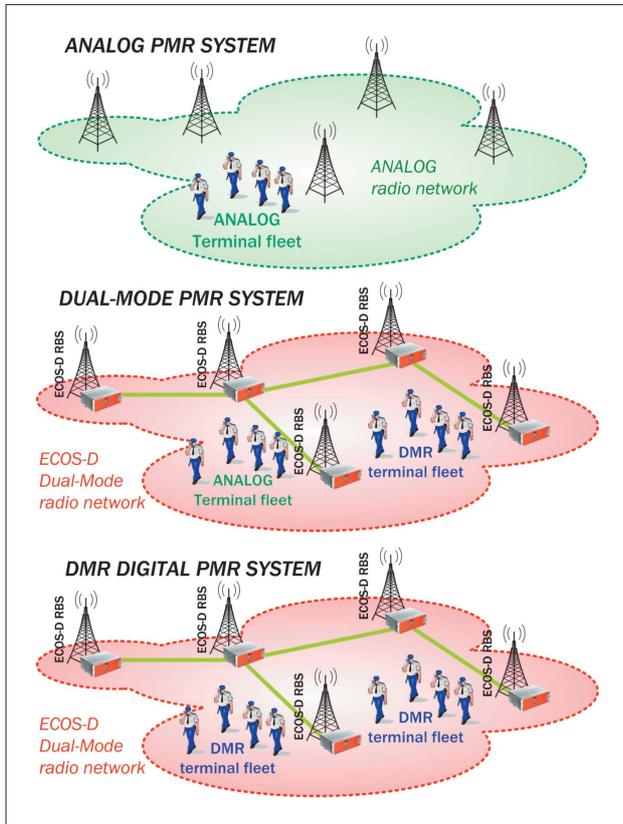


### Voice/Data communications

Due to the Selex ES implementation of the DMR protocol, the ECOS-D system supports, on the 2 TDMA slots of the same channel:

- two simultaneous voice communications (with reverse channel signalling) or,
- data and voice communications at the same time or
- the usage of the whole channel for data communication, *maximizing the throughput with dual slot data transmission* at the gross bit rate of *9.6 kbps*.
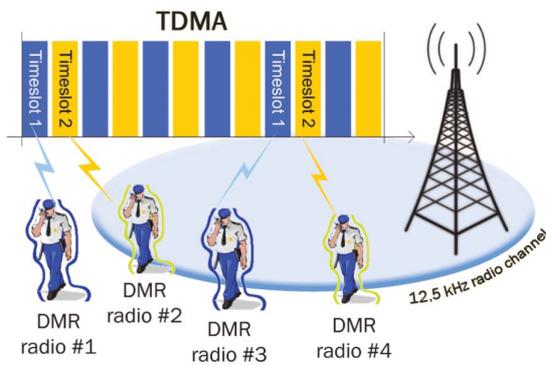


These possibilities give the customer greater *flexibility* of usage of the resources, sharing the same radio channel for different voice or data services in a completely transparent way for the users.

In this way ECOS-D can supply the resources for *value added applications* including Radio Traffic management, GPS locations, AVL (Automatic Vehicle Location), Telemetry (i.e. SCADA Applications) and short data services.

### Improved Audio Quality

ECOS-D DMR digital modulation uses built-in error-correction techniques, to obtain a high audio quality for voice communications over the whole coverage area.

### ECOS-D FAMILY

Selex ES ECOS-D family includes different *flexible, and innovative solutions* with a wide range of features and different types of links between repeaters.

The ECOS-D system maintains high performance and even in the most critical environment during operation, through the use of innovative techniques such as *network synchronization, auto equalization of link connections(*)* and real time voting.*

The system acts as a single "virtual repeater", regardless of the number of RBS (Radio Base Stations) in the network, giving the highest quality reception even in overlapping signal areas.

(*) A2T version only
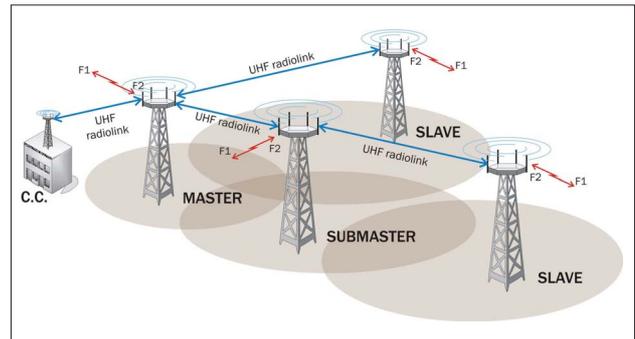


**ECOS-D CST (Coherent Simulcast Technology)** RBSs are interconnected via a single-channel VHF/UHF links integrated in the base stations so to use ECOS -D simulcast systems even if no E1 or copper links are present.

Synchronisation of all network RBSs, is directly derived from the UHF radio communication carrier itself.

This patented unique feature, together with the bi-directional signal equalisation, lets terminals perfectly receive, even in overlapping areas.

ECOS-D CST station

## TECHNICAL DATA

ECOS-D CST stations are completely modular and, in addition to transceiver modules, UHF link include:
- DSP units for signal processing (for voting, equalisation and synchronisation);
- power supply units;
- control management module.

### General specifications                                    *ECOS-D CST 25W*

| | |
|---|---|
| RF nominal output power: | Programmable from 1 W up to 25 W (0,1 dB step) |
| Frequency[1]: | 66-88 MHz / 136-174 MHz / 400-470 MHz |
| Modulation (automatic dual-mode): | FM/PM for analogue mode |
| | 4FSK for digital mode with I&Q mo/demodulator |
| Frequency generation: | Synthesised |
| Channel spacing: | 12.5 kHz / 20 kHz / 25 kHz [2] |
| Mode of operation: | Simplex / Half-Duplex / Duplex |
| Data gross bit rate: | 9600 bps with 4FSK digital modulation in 12.5 kHz channel |
| Temperature range: | -30° to +60°C (-22° to +140° F) |
| Power supply: | 12 Vdc |
| | 48 Vdc (35-75 Vdc - galvanically insulated) |
| | 220/110 Vac (2Q 2012) |
| Interconnection interface: | RF link |
| | Also mixed A2T/CST configuration is available (Radio link + 4W+E/M, E1, IP interfaces) |
| Number of interconnected RBSs: | Up to 15 RBSs [3] |
| RBS synchronisation: | Generated by Master RBS and transmitted over RF link |
| Configuration mode: | Stand-Alone / Simulcast Master / Simulcast Sub-Master / Simulcast Slave |

[1] RF Filters included in the same rack
[2] to meet FCC requirements on UHF band 20/25 kHz channel spacing is inhibited and on VHF band 25 kHz can be used until 31/12/2012
[3] depending on the RBS equipment - It can be expanded to manage more RBSs

ECOS-D CST is compliant with ETSI Standards (EN 300-086, EN 300-113 and ETSI TS 102 361 1/2/3)