



LEONARDO CYBER & SECURITY SOLUTIONS

ECOS EPS CORE NETWORK



In the age of 5G LMR still play an important role for many organizations both in Public Safety and industrial sector worldwide. During the years since the beginning of radio communications, technological evolution has always tried to support users with increased performance ensuring clear communications, enhanced coverage increased number of users with optimized spectrum use. Among different techniques and standards that have been progressively developed, DMR is providing effectiveness and flexibility characteristics that make it an optimal choice for professional infrastructures.

DMR can support a complete range of scenarios starting from a single repeater operating in conventional mode, to large trunked cellular infrastructures with simulcast possibilities passing through a number of intermediated configurations also characterized by interconnection with external networks such as analogue, telephony or broadband. Being the internal network infrastructure (core network, repeaters interconnection, subscriber management...) not addressed by the standard, the choice of a solution able to support in an effective way the addressed scenario and the possibility to make changes evolutions and add-on in a not disruptive way may be a key factor for building effective and long lasting networks.

Leonardo is a primary player in professional communications sector actively contributing to DMR evolution and developing interoperable communication systems supporting public safety and industrial sector in their missions.

ECOS EPS CORE NETWORK

A COMPLETE SOLUTION

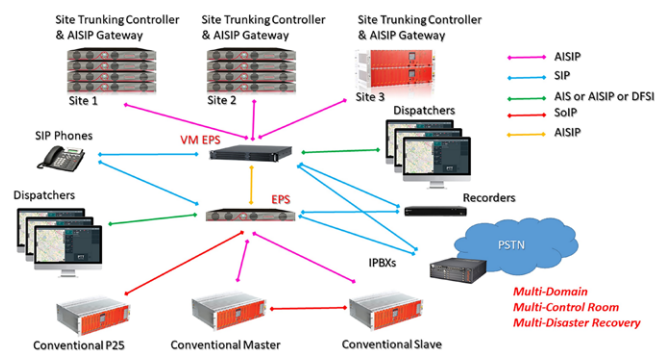
Leonardo ECOS networks are characterized by a great flexibility that allows the implementation of solutions that can mix Tier II (conventional and simulcast) with Tier III single and multisite in simulcast or cellular configuration in the same network that can be interfaced with external networks as well.

This degree of flexibility is possible thanks to the combination of different factors.

- Suitable hardware platforms designed to address in an efficient and effective way Simulcast issues
- Intelligent protocols taking care on one side, of all issues connected to the use of a conceptually shared and not deterministic network in a system requiring string synchronization and quality of diffused signal incorporating mechanisms to handle jitter and packet loss and, on another side, to manage complex multi system interactions and external systems interoperability
- Reliable core network architecture able to support multi configuration, multi-site, multi option users and communications management

A complex configuration composed by several trunked sites, different conventional channels and even external networks, may be thought as a set of inter communicating domains: each domain is homogeneous in terms of characteristics, functions and management (i.e. a simulcast configuration, a trunked site, a conventional radio channel) and is communicating with other domains by means of a Leonardo protocol called AISIP.

AISIP protocol supports PTT conversations, PTTs, data transfers and signaling and ensures the correct flow of communications among domains making a complex heterogeneous configuration to behave as a single uniform entity. AISIP protocol runs on a server/gateway architecture where gateway and server functionality are allocated on domain network elements according to the needed configuration.



EMBEDDED CORE NETWORK

AISIP server gateways and server implement ECOS EPS core network

Registration	Registration and authentication services. Subscription information are transferred among domains implementing a distributed subscribers database
Mobility management	Which macro cell is currently serving terminals – handling information updated by radio terminals on a regular base
Call management and forward	Among different macro cells also taking into account permissions, privileges for actions requested by radio terminals dispatchers and Internal or external phones
Groups control and management	Dealing with status, priority, terminal-group association
Embedded SIP Server	That can manage connected SIP phones in order to provide communication toward Radio subscribers and vice versa
Active Recorder interface	Provide an SIP interface towards Active external recorders

Control room interaction can also be managed via DMRA standard AIS protocol (in addition to AISIP protocol) and DFSI standard P25 protocol. EPS core network in addition takes charge of vendor specific format translation for non DMR standard defined functions (as required for instance for correct text message handling). This makes possible the successful delivery and reception of proprietary text message among different vendors' terminals even in case of control room unavailability.

FLEXIBLE DEPLOYMENT

AISIP Gateways and Server are logical roles that can be implemented in physical servers as virtual machines or embedded in ECOS radio base stations. This allows the deployment of flexible configuration ranging from centralized core network to fully distributed approach.

The choice to deliver EPS functionality as a virtual machine or as an embedded software component in ECOS radio base stations, depends on the communications traffic to be supported that is linked to the number of simultaneous communications streams to be managed. An EPS implemented as a virtual machine on a server is able to deliver more traffic than the one embedded in the radio base station.

In case of a server deployment option a suggested configuration is as follows

VM	File format	.ova
	Virtual hardware version	11
RAM	Minimum	4GB
	Recommended	6GB
DISK	space	40 Gbyte
CPU	Minimum	4 vCORE
	Recommended	6 vCORE
Networking	One Ethernet connection vNIC	
	Static IP address	

Where the server may also be used to host additional element in ECOS system such as E-Connect network management.

RESILIENCE AND RELIABILITY

EPS functionality can be intrinsically redounded in an ECOS network. An EPS domain contains one EPS main element and one or more backup element. A suitable control protocol is used to exchange information among EPS elements and elect a new main in case of failure.

Intelligent placement of EPS elements among sites that compose a domain further increase the resiliency characteristics. For instance, placing main and backup elements in different sites protects against connectivity faults as well.

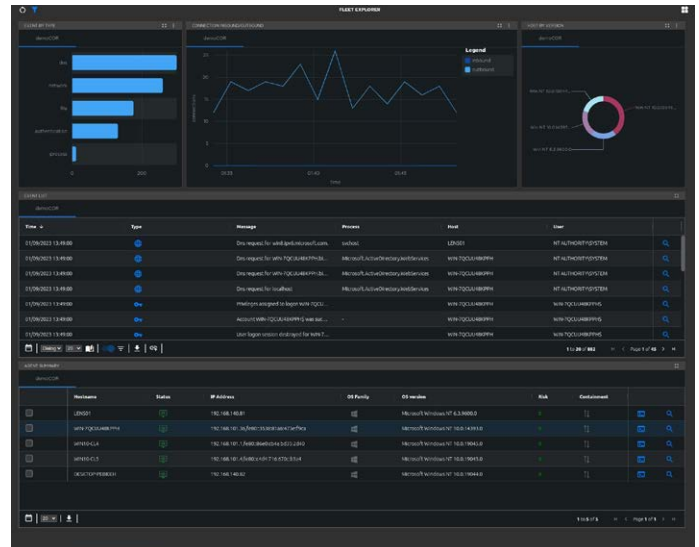
The distributed architecture, due to a mesh full interconnection among domains, allows remaining EPS Domains to properly operate and manage both intra-Domain and inter-Domains calls in case of failure or unreachability of one EPS Domain.

CYBER SECURITY

EPS Servers feature an embedded firewall and can be equipped (future release) Leonardo cyber security LENS (Leonardo End point Security) agent. LENS is part of Leonardo Cyber Information Superiority (CIS) suite which applies the Information Superiority paradigm to cyber domain and is composed by a set of integrable modules enabling the collection, processing and dissemination of data in order to counter adversaries' cyber activities.

LENS is the Leonardo flexible and innovative Endpoint Detection & Response (EDR) tool allowing to collect telemetry and interact with deployed agents. It is designed to continuously monitor end-user devices' behavior identifying suspicious patterns in order to detect the most complex cyber threats.

Additionally, it provides contextual information through a web based visual environment that allows security experts to evaluate the most appropriate mitigation activities for the detected malicious event and to determine the recovery path for the systems involved in the incident.



EPS ADVANTAGES

Decentralized and distributed EPS Servers provide:

- High Reliability without any external device avoiding any single point of failure in the system.
- High Availability based on intrinsic and native redundant management, robust in any situations.
- Centralized user management data with synchronized DB
- Multiple points of interfaces for all external applications
- Optimized use of IP WAN bandwidth of backbone
- Optimized use of the server hardware for dispatching (cost / performance).
- Scalability, from few to many sites.
- Cyber security: real-time monitoring and alerting capabilities for security events and threats provided for a scalable Leonardo Cyber Information Superiority (CIS) suite.

For more information:
cyberandsecurity@leonardo.com

Leonardo Cyber & Security Solutions Division
Via R. Pieragostini, 80 - Genova 16151- Italy

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