CYBER & SECURITY SOLUTIONS

CRITICAL COMMUNICATIONS

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LEONARDO

CUTTING-EDGE CRITICAL COMMUNICATIONS SOLUTIONS

Leonardo is a world leader in the development of critical communications solutions that protect communities and infrastructures.

With over 100 years of experience, we develop integrated and interoperable communications technologies for military, civil and institutional customers.

Leonardo's advanced communications technologies and system integration capabilities provide turnkey mission-critical infrastructure solutions that help keep communities safer.

Our in-house technologies include analog, DMR, P25, TETRA, and broadband applications and network-integration infrastructures with enhanced security and reliability provided by our secure-by-design approach.

- Over 50 countries rely on our integrated mobile communications.
- We support public safety and emergency services, civil protection agencies, transportation bodies, utilities, military and homeland security authorities.
- We provide secure, integrated, reliable, and interoperable multi-technology communications solutions.

DIGITAL MOBILE RADIO (DMR)

DMR is the ETSI standard for digital radio communications. It introduces a 2-slot TDMA channel access feature, doubling the communications capability and making simultaneous voice and data applications possible.

Leonardo's "dual-mode" ECOS-E (digital conventional Tier II) networks work in analog and digital modes, allowing the use of existing analog terminals with the possibility of gradually migrating them with new digital terminals, as required.

DMR solutions encompass both Tier II conventional Simulcast and Tier III trunking networks. They operate on VHF, UHF and 700/800 MHz frequencies, feature a full-IP system architecture, and are IOP-certified for DMR terminals. DMR solutions can be used to support SCADA applications as well as operational communications over large areas, using the same physical channel, due to the 2-slot TDMA air interface structure.

DMR solution includes:

- Repeaters for standalone, conventional, Simulcast and Multicast mode (ECOS-E DTA7000, which is fully backward compatible with Leonardo's current ECOS-D system)
- Dispatchers and control room terminals
- Network management applications

SIMULCAST

Leonardo designs and manufactures DMR Tier II and Tier III Simulcast solutions used by public safety and critical infrastructure organizations in both the public and private sectors. Simulcast networks are ideal for professional mobile radio applications requiring the coverage of large territories with low-medium traffic density and only a small number of frequencies available.

In a Simulcast network, repeaters are installed over the territory to establish a virtual repeater covering the served area and offering a transparent communications handover. The main challenge when designing a Simulcast DMR system is to manage the delay spread that characterizes overlapping areas. Leonardo has vast experience in designing networks using radio coverage and delay spread analysis which is critical to optimizing system performance.

TRUNKING

Tier II solutions are complemented by DMR Tier III "trunking" solutions designed to manage higher traffic volume given the ability to manage multiple frequency pairs and routing user terminals for automatic roaming over the service territory.

Trunking solutions include:

- Single site, stand alone system
- Simulcast multi-site system (number of frequencies and channels is the same in each site)
- Multicast (cellular like) system

The value of Leonardo's DMR solutions:

- All-in-one base station including all supported configurations
- Powerful DSP based design for Simulcast
- Efficient Simulcast over IP (SoIP) protocol ensuring high signal quality
- Switchless architecture (DMR Tier III) with embedded controller in base stations supporting multi system/ multiprotocol centralized or distributed configurations
- Versatility in radio base station configuration
- Auto adaptive/multiple link technology (A2T) for bi-directional equalization

P25

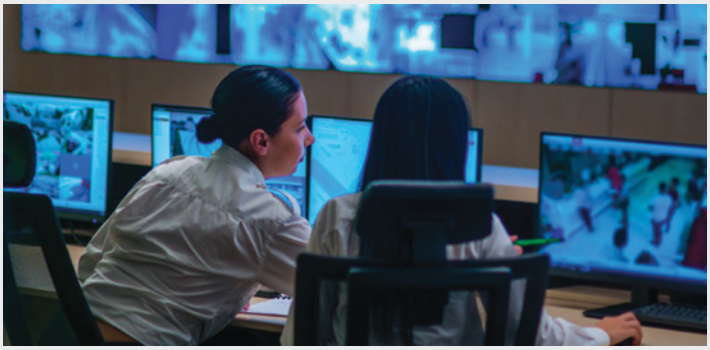
Leonardo's ECOS-E solution combines two very popular open standards in one innovative base station. Our Multi-Mode ECOS-E (P25 or DMR) network uniquely works in analog and digital modes, allowing the use of existing analog terminals—P25 or DMR—and to gradually migrate to new digital terminals as required.

P25 features:

- Unaddressed voice call
- Routine group call
- Emergency call
- All call (system-wide call)
- Initiate system-wide call to collection of talk groups
- Unit-to-unit voice call
- Encryption
- Emergency alarm to dispatch monitoring console
- Call alert
- Radio check
- Radio unit inhibit
- Radio unit uninhibit
- Message update
- Status update
- Status query
- Radio unit monitor

MISSION CRITICAL CONTROL ROOM

Leonardo's Mission Critical Control Room (MCCR) is an advanced dispatcher solution for today's fast-paced control room environment. MCCR enhances decision-making and response times by simplifying operations, optimizing workflows, and improving situational awareness, for greater efficiency and security.



The value of Leonardo's MCCR solution:

- Full virtualized architecture deployable both on premises or on Cloud
- Scalable dimensionally and technologically to meet the specific needs of each agency
- Able to integrate and connect resources that use different technologies (TETRA, DMR, Analog, PSTN, Broadband)
- Accessible from any device through a web-based interface
- The MCCR Human Machine Interface (HMI) supplies real situation awareness with a cartographic view and a complete set of communication features
- Innovative, multi-language, user-friendly interface, with high operational immediacy, flexibility and customizability
- Cyber secure-by-design and compliant to CIS (Center for Internet Security).

BROADBAND (LTE AND 5G)

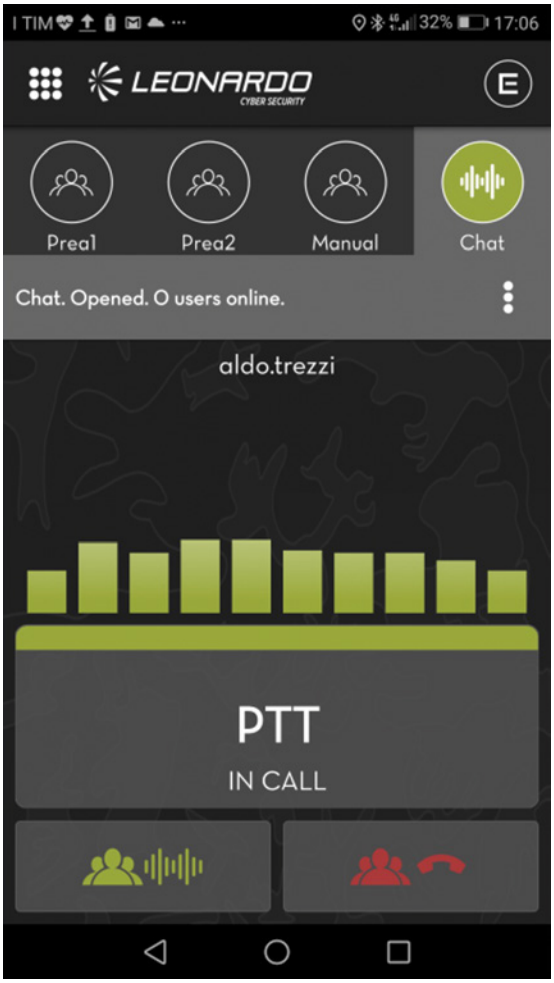
Broadband has become increasingly important in both mission-critical and business-critical markets due to the communication of rich data and multimedia. Leonardo focuses on developing service core networks and applications for professional broadband services and integration with narrowband infrastructure, while relying on third-party equipment for access and core networks.

Our award winning CSP-MCX is a complete solution compliant with 3GPP Standard MCX. It includes features from MC PTT, MC Video and MC Data providing users with the next generation platform for professional communications over 4G/5G networks. Based on a microservices architecture, CSP-MCX is a cloud native solution ready to be deployed on networks and 5G slices. Our solution features an embedded SIP core for small deployments while capable of interacting with existing IMS systems that sometimes exist in commercial networks.

Leonardo's broadband offers:

Tactical systems

Use of third-party systems for deployable installations providing communications in under-served areas, or integration with existing networks.



MCX mobile user interface

Network infrastructures

A wide range of solutions ranging from Private Mobile Networks covering a site such as a factory or a plant, to large scale networks in cooperation with Public Telecom Operators according to the MVNO model.

Push-To-Talk Over Cellular solutions

3GPP standard (CSP-MCX) solutions that can be deployed in an Over-the-top (OTT) fashion over commercial networks or fully integrated in private infrastructures, taking full advantage of mission-critical functionalities.

Leonardo broadband solutions value:

- System integration approach
- Partnership with primary LTE/5G vendors
- Scalability in business approach (from tactical system to Secure MVNO)
- Narrowband integration solutions
- Professional ecosystem including control room and applications
- Cyber security services (secure-by-design, MSS)

HYBRID NETWORKS

Most narrowband evolution projects include narrowband and broadband coexistence, making interoperability the key to a smooth solution.

Leonardo's Mosaic™ solution uses a multi-technology heterogeneous radio network framework for broadband transition. Mosaic allows us to provide a convergent approach to narrowband and broadband integration for future-proof infrastructures that leverage existing technologies and allow the seamless, phased introduction of new capabilities.

Mosaic is an integrated multi-technology network that provides unified services to professional users. Its network model foresees heterogeneous access networks coordinated by an integrated core network that provides technology independent access to control room and applications.

Mosaic Access Layer is composed by Leonardo narrowband infrastructures (DMR, P25, and TETRA) and third-party broadband networks.

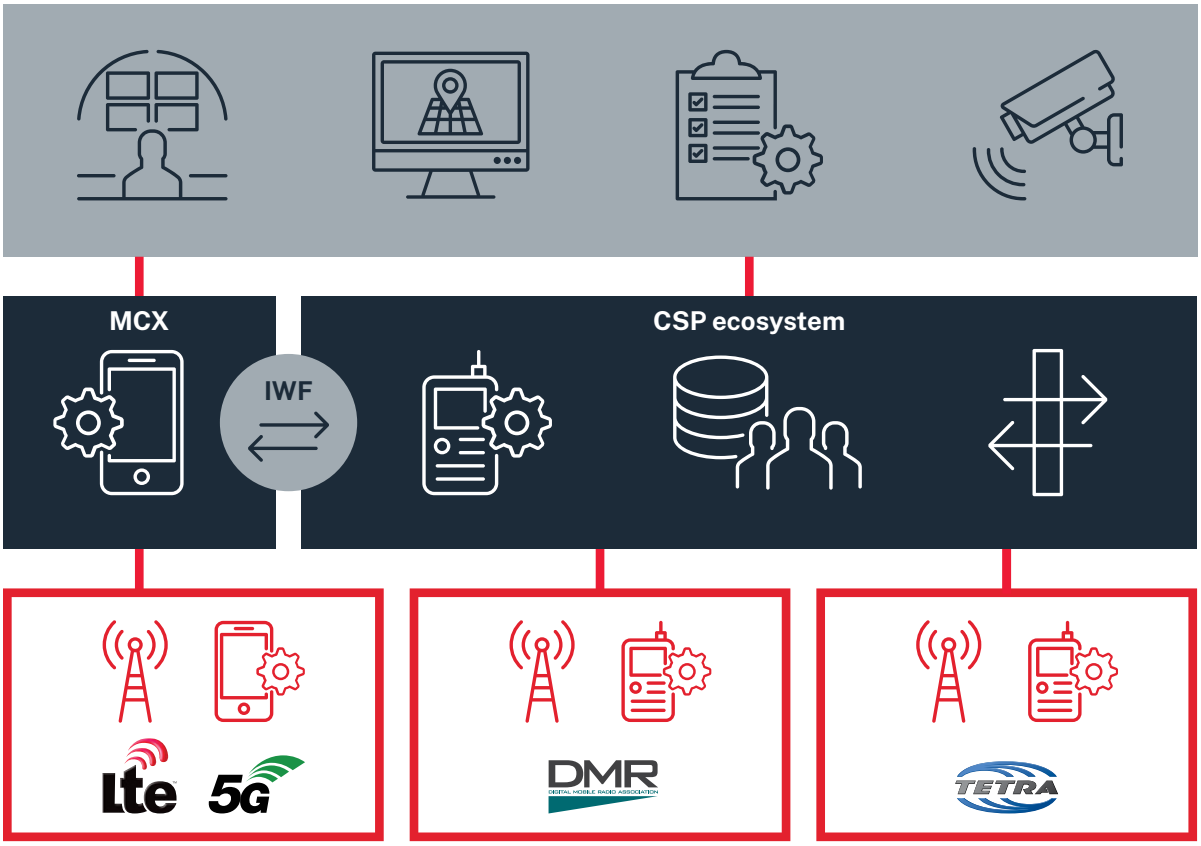
Mosaic is built upon Leonardo CSP ecosystem to provide:

- Coordination and control functions for the integrated network
- Core network services for DMR, P25, and TETRA
- Standard MCX components and standard LMR-IWF for narrowband/broadband integration

Mosaic Application Layer contains multi-technology control room where LMR dispatching functions are extended to multi-technology environment and can be enriched with multi-media and video services.

The value of Leonardo's Mosaic solution:

- Convergent approach for narrowband/broadband integration
- Unified user management and provisioning
- Unified multi-technology enabled control room providing voice messaging and location-based services
- Standard-based and legacy solutions coexistence
- Enhanced availability and reliability
- Enhanced security



MCCR Mission Critical Control Room

Mosaic **Core Network**

Mosaic **Access Network**

CORE NETWORK	CSP-CM Communication Manager	Voice/data services for integrated networks
	CSP-SMN Service Management Node	Subscriber management
	CSP-GW Gateway	Interface with other networks (specialized according to type)
CONTROL ROOM	MCCR Mission Critical Control Room	Enhanced technology agnostic dispatching and command/control
	CSP-REC Recorder	Server/client multi-protocol recorder
	CSP-CRIS Control Room Interface Server	Application server for third-party control rooms
MNGT	CSP-NMS Network Management System	Network management application and functions

CSP ECOSYSTEM

Leonardo's Communication Service Platform (CSP) ecosystem is an implementation of the Next Generation Network designed for the professional sector. It provides PMR/Mil multimedia services independently of the technology access and allows integration of legacy networks with new generation access networks such as 4G/ LTE and 5G.

The CSP integrates not only infrastructures, but also subscribers to obtain a single, unified and homogeneous physical and logical network.

- API/serviced layer provides unified network model to applications that can be written in a network-agnostic mode.
- Communication Manager delivers unified voice, video, messaging, data pipe, and file transfer communication services.
- Adaptation layer translates individual payload and signaling into a common format.

TERRESTRIAL TRUNKED RADIO (TETRA)

TETRA is the communications standard of choice for organizations that require immediate access to reliable, secure communications. Engineered for emergency services, its versatility makes TETRA an ideal solution for public safety, industrial, and transportation markets.

Leonardo's TETRA product portfolio is based on Adaptanet®, a full-IP solution with the capability to support our previous TETRA TDM version, ElettraSuite, for mixed technology infrastructures.

The complete line of TETRA services includes:

- Individual communications
- Group communications
- Broadcast communications
- Mobile data communications, including Short Data Services (SDS) file transfer and internet access
- Mobile data services taking advantage of multi-slot packet data for narrowband communications
- Integration with broadband data-intensive communications

Leonardo's TETRA offering is composed of:

- Radio base stations (BS Node series and DTA node series) for TETRA coverage and deployment
- TETRA Switching and Management Infrastructure (SwMi) composed of CSP ecosystem intrinsically ready for multi-technology integration
- Control room equipment, including recorders and dispatchers
- Gateways for interconnection with external networks (PSTN, ISDN, and packet data)
- Peripheral terminals such as handhelds, mobile and fixed stations
- Applications including location services, encryption, and network management systems

The value of Leonardo's TETRA solution:

- Full-IP distributed or centralized architectures
- Scalable from single site to nationwide
- Fast, deployable, and easy to install
- Resilient, reliable, and secure
- Native broadband integration
- Standard hardware and protocols open to virtualization and cloud

DTA BASE STATIONS

DTA is Leonardo's new family of convergent modular multi-technology radio base stations, leveraging powerful hardware modules, increased security, and a high degree of flexibility. Designed in TETRA and DMR/P25 versions, DTA base stations share the same architectural approach to facilitate complex network design through a basic building block called DTA carrier, for a complete transceiver with impressive computational power, synchronization capabilities, radio and terrestrial interfaces, to which filters and branching units are added, as needed.

Our DTA base stations, DTA-Node TETRA and DTA7000 DMR/P25, maintain full backwards compatibility with existing BS-Node and RBS4000 models and can be employed in mixed configuration infrastructures.

DTA node base station (2 carrier version)

VS4000 ECOSYSTEM SOLUTIONS

The VS4000 ecosystem solution combines the powerful performance of the TETRA radio unit (VS4000) with the flexibility and user-friendliness of the FPG3 Plus front panel.

Optional features such as CAN bus interface and Wi-Fi access point extend connectivity options. VS4000 is also the core upon which TETRA fixed radio station (FC4000) and radio dispatcher unit (RDS4000) are built.

VS4000 supports TETRA Direct Mode Operations (DMO) thus allowing communication services even in the absence of a conventional infrastructure. With the Wi-Fi within a FPG3 front panel inside the vehicle, it is possible for smartphones and tablets to become a secure entry point into the professional network.

VS4000 ecosystem, mobile unit configuration

For more information:
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SCHEDULE A CALL >

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