



ELECTRONICS DIVISION



# NAVAL COMMUNICATIONS SYSTEM



## INTRODUCTIO

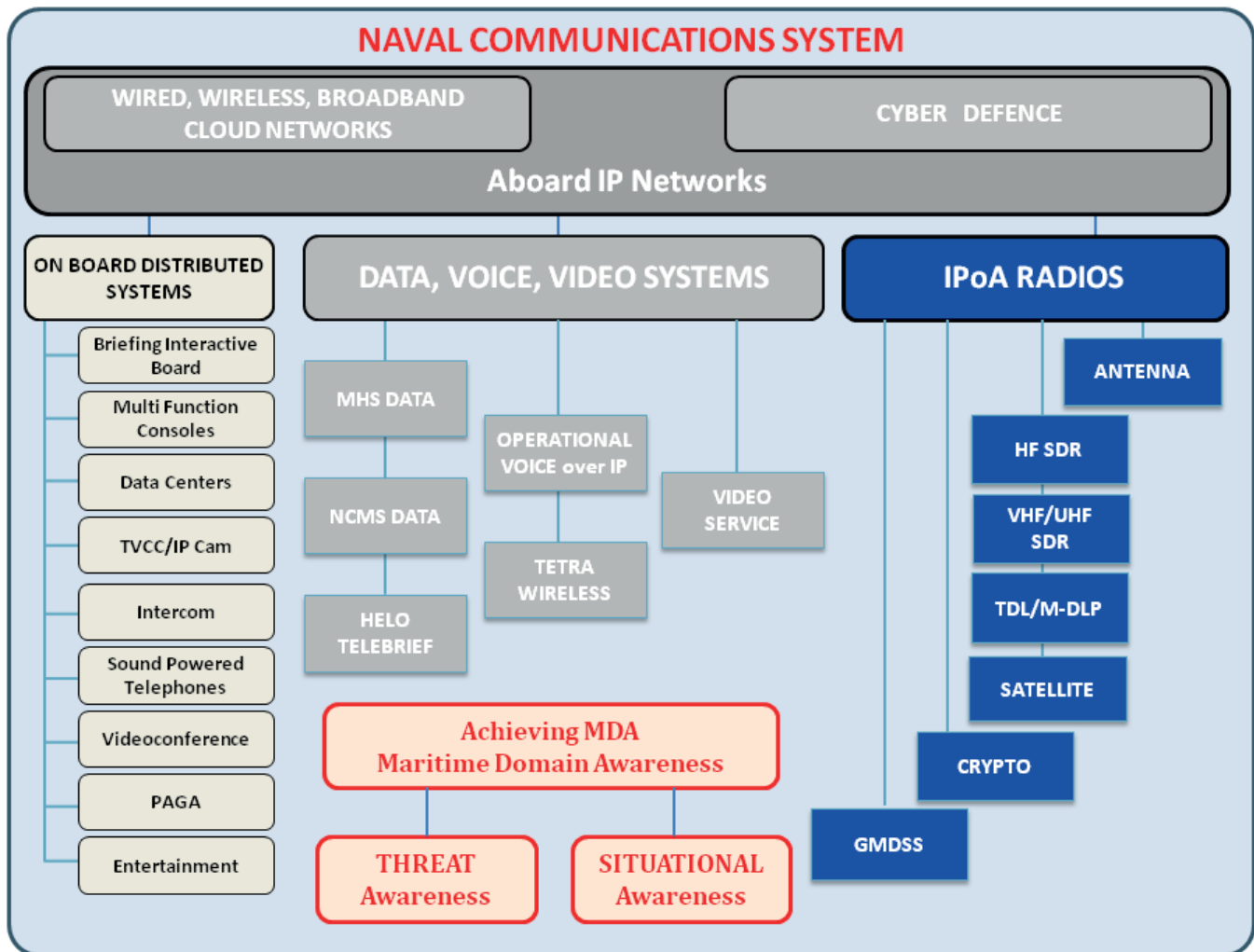
Navy missions nowadays encompass the full range of military operations. These missions necessitate operations in both blue-water and the littorals. Decision Making involves effective understanding of Maritime Domain Awareness (MDA) for what could impact the security, safety, economy or environment. MDA consists of Threat Awareness as well as Situational Awareness. It occurs when these two components are brought together to provide the command team with an amalgamation of operational, intelligence and environmental information.

Modern Naval Communications System (NCSs) need to cope with the emerging MDA aspects and, as such, are also more and more equipped with advanced command centres featuring complex facilities for coordinating military operations. They accomplish the highest point of convergence between the networks on board and the HF, VHF/UHF radio and satellite resources. Modern navies need to comply with evolving mission scenarios which include war fighting, peacekeeping operations, shipping lane patrolling, piracy deterrence, economic exclusive zones surveillance and oil platform protection, as well as search and rescue activities.

As Maritime Domain Awareness becomes increasingly important, there is a rising demand for standardised voice, video, data communications protocols and, as a consequence of this, of multiservice Mobile Ad Hoc Networks (MANET) with high data rates. This has been reflecting on a growing need of Software Defined Radios (SDR). The significance of video transmissions and video conferencing is also growing: live video are more and more conveyed to the Command Team via Ship-to-Shore communications and, in some specific scenarios as for instance counter-piracy missions, from small surface/combatant inflatable boats to the frigate. More generally, examples include chart updates, tactical data such as radar tracks, continuous reporting and even Microsoft documents.

Interoperability is vital being a prerequisite for joint operations and for Partnership for Peace (PfP) missions. Military messaging in particular is increasingly vital for mission success. Ship-Ship, Shore-Ship-Shore, Air-Ship-Air, and Sat-Ship-Sat multi-Domain communications are in the range of a ship of a naval fleet.





## KEY FEATURES

Commonly, Internal Communications provide networks within the ship and external communications provide the means of transmission between platforms. These communications systems shall ensure reliable, jam-resistant and encrypted information exchange, especially in case of a military action. External Communications needs to be a modular reconfigurable system utilising open interfaces and standards. They can be added, on both ships and submarines, as part of an upgrade or as the core of a new communications system.

The company can individually supply Naval Communications Systems as a Single Source and, normally, acts as a System Integrator of Naval Communications. We can provide our customers with either individual components or Integrated Communications Systems (ICS) to equip the entire ship. Leonardo ICS can incorporate subsystems from third parties, either as part of a new build or by integrating fielded equipment, thus preserving the life span of existing equipment and prior investments.

- Ubiquitous, Unique and Universal
- Synchronicity of Threats, Situations and Commands in active monitors of Flag Command Centre enables improved responsiveness
- IP on vessel aboard, on land naval base, in the air and in satellite domains
- Native IP over Air (IPoA) in our Swave SDR radios for all voice, data and video
- Swave UHF/VHF/HF Software Defined Radios in a Modular Design based on a Common Board
- Highly survivable secure communications by means of TRANSEC/Multi-Level COMSEC
- Integrated On-Deck MAST antenna
- "Thin Client"/"Server Based" Data Computing Architecture
- Scalability, Modularity and Flexibility, Large Reuse on different vessels
- Interoperability, implemented by Military (MIL STD/STANAGs) and Civilian (ITU-T) standards
- Single-Source System Delivery
- Ease of Operation : Centralized Setup, Configuration and Status Monitoring
- Intuitive Local and Remote HMI
- Compliance to security, safety and environmental constraints

- LONG RANGE COMMS
- SHORT RANGE COMMS
- INTERNAL COMMS & SERVICES

SATCOM WFs



Counter Piracy Missions



Boarding Team



VHF/UHF Comms System



MIL Land Services  
IMM/ICAO Civil Communications

Remote Shore Station



MH500 Radio Relay



HF Infrastructure



H7700 RSCU



HF Automation

ALE 3G

MARITIME MISSION BASE





LLF/MF/HF RADIOS



UHF/C/X/Ku/ Ka SATCOM



Tactical VOIP Terminal

Radio Gateway

SENTINEL

MNG & MH SYSTEMS



Cyber Security Room



**HF Waveform**  
 HF DATA MIL-STD-188-110B, LOS WF  
 HF ALE 2G MIL-STD 188-141B  
 HF ALE 3G STANAG 4538  
 HF STANAG 4285, 4529, 4538  
 STANAG 5066  
 WB HF MIL-STD-188-110C

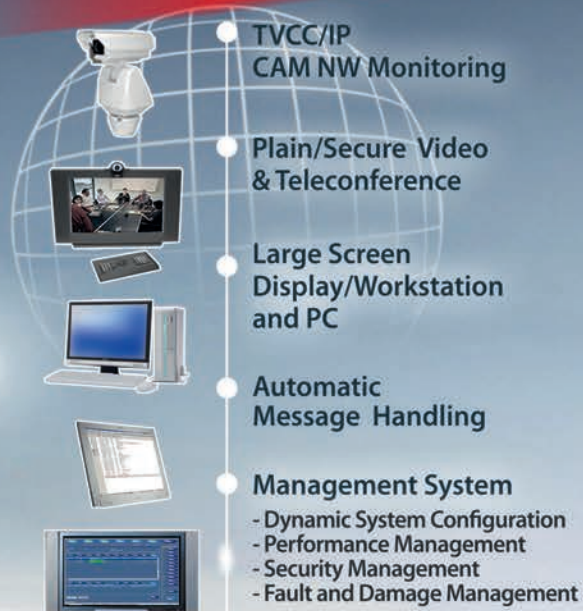
**VHF/UHF Waveforms**  
 Land: Singgars, LOS WF  
 New IP: SBW, HCDR, Essor HDR  
 GAG: Singgars, HQ, SATURN  
 SAT: SATCOM DAMA



Broadband Cloud

Secure SCIP Phones

## Applications/Services



## External Communications



VOICE / DATA / VIDEO

## LEONARDO CAPABILITIES

### WAVEFORMS DEVELOPMENT ON RECONFIGURABLE SWAVE SDR RADIOS

- HF DATA MIL-STD-188-110C
- HF ALE 2G MIL-STD-188-141B
- HF ALE 3G STANAG 4538
- HF STANAG 4285, 4529, 4538
- STANAG 5066
- Waveform "WB HF"
- VULOS STANAG 4204/05
- SelfNet SBW, HDR
- MIL 188-220 C
- HaveQuick I/II STANAG 4246
- SATURN STANAG 4372

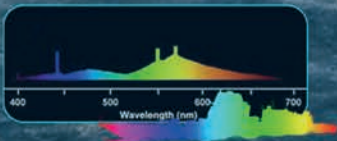
## Internal Communications



## COMMUNICATION SYSTEM



### EM STUDIES



### ANTENNA AND TOP SIDE DESIGN



## COMMUNICATIONS SYSTEM FEATURES

Main sub-systems of Leonardo NCS are figured out in the previous notional architectural diagram representing the application networks (grey boxes) of the Data, Voice and Video Systems and the Cutting Edge Communications Subsystem of the “IPoA Radios” (in blue) functional units.

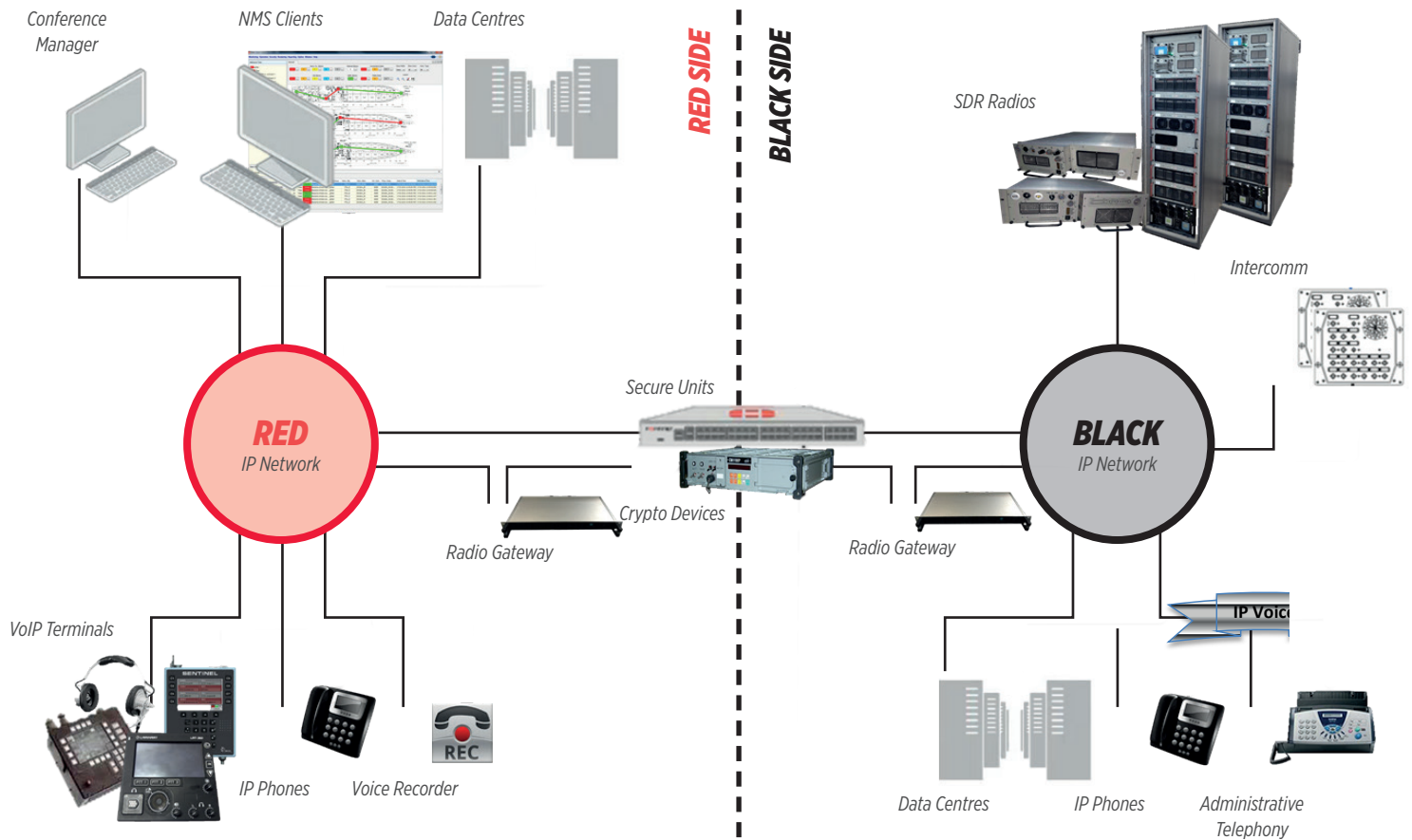
## ON-BOARD DISTRIBUTED SUBSYSTEMS

Through the overall set of the On-Board SubSystems, our new Interactive Table can show a Common Operational Picture on large LCD 4K 85 inches multi-touch displays for the benefit of Commander’ Briefing at the Flag Command Center.

The Interactive Table offers an essential summary point maximizing the contribution of our high responsiveness communications network to the mission execution.

Class	Subsystem	Description
Access and Management	Briefing Interactive Board/ Tactical Table	Shows common operational picture on large multi-touch displays/tablets, integrating data from external sources
	Consoles	All access points providing a user interface for exploiting naval communications services
Voice Services	Intercom	Provides voice services in specific local used for operational coordination activities
	Sound-Powered Telephones	Sound-powered phone terminals for IP/ analogue administrative and operative calls.
	PAGA	Public Announcement and General Alarm service for emergency, alarms and common messages
Data services	Data Centres	Server and storage platforms realising computing nodes in Business Continuity and Disaster Recovery configuration
Data & Video Services	TVCC/IPCAM	Enables remote and continuous monitoring of critical areas for damage and access control
	TeleConference & Video	User terminals realising plain and secure videocall for internal and external comms
	Entertainment	Distribution in common areas of SAT TV, Music AM.FM/DAB Radio, recording programs and video production functions





## APPLICATION NETWORKS

### Operational Voice over IP Subsystem

Operational Voice SubSystem (OVoiPS) is an high capability aboard VoIP Call System designed to provide internal and external secure voice communications services to naval forces. OVoiPs architecture ensures naval military requirements such as Red/Black full separation and security accreditation of the overall offered services. The core element is a secure unit that is a combination of encryption, firewall and specialised content filtering functions, enabling cross domain voice services through the embedded Call Manager. An alternative Red/Black voice separation can be provided on the Red network using accredited security functionality within the Sentinel TVT.

LRT-360 easy-to-use multifunction VOIP Terminal allows both classified/unclassified point-to-point calls and conferences from the same operator, performing all standard VoIP services required for internal communications, either secure or nonsecure, as the situation requires.

Inclusion of a Voice Recorder Functionality in OVoiPS Call Manager ensures better post-mission analysis and provides evidence if required. The SENTINEL Tactical Voice Terminal (TVT) is the Voice Terminal of the new naval Voice Distribution System (VDS), based on the company's proven Sentinel Soft Switch. TVT natively embeds suitable security functionalities and has been accredited environmentally and securely for ships and for submarines. Further, Improved reliability is assured by replication of Call Manager functions within the Data Server Room.

Reliability of service is provided by duplication of switching and management within the ship. QoS flows marking mechanisms are duly supported for establishing traffic priorities in crossing network infrastructures. The Leonardo distribution systems can be integrated with third party or legacy equipment to ensure continuity of equipment within the customers fleet. An effective Integration with non-IP legacy equipment is ensured by the Radio Gateway device, enlarging existing products lifespan and protecting customer investments.

### **Data Service Subsystem**

Data Service SS makes use of virtualization technology (VDI) hosting numerous desktop operating systems in centralized servers of the onboard data center. Majority, if not all, of the processing is done by servers rather than individual client computers. This architecture is usable, flexible, reduces total cost of ownership and smartly supports replication of data/IT systems as well as preparation of logistic plans to ensure continued business following an extended disruption.

On such a network framework, Leonardo Message Handling Systems and the Naval Communication Management cooperate in achieving secure network centric operations. Leonardo provides two options for high grade messaging to NATO standards, the message handling system (MHS) as used by the Italian Navy and MPS 2000 in service with the Royal Navy. They may be colocated, dependant by the operational needs, at the same Data Center/Group of Host or Terminals physical location. Leonardo MHS Data Service is a military message handling system complying with SMTP+ IETF RFC6477 and STANAG 4406 Annex E/ACP-127. It is a suite of applications targeted to convey military message services between organizations and individuals. This enables Internet-Based e-mail sending through satellite in high sea or via fiber at the dock. MHS also supports the most important military message formats. MPS 2000 is a military message handling systems also complying with SMTP+ IETF RFC6477 and STANAG 4406 AnnexE/ACP-127. MPS 2000 is delivered as suite of software applications, too.

Naval Communication Management Subsystem (NCMS) Data Service delivers distributed and comprehensive fault, configuration, performance and security management capabilities of onboard sub-systems and equipment. Composed of several applications, it features network planning, monitoring, local and remote control functionalities covering the complete equipment portfolio.

### **Video Service Subsystem**

The Video Service Subsystem (VSS) is comprised of a video conference subsystem that enables multiparty video conferencing either between personnel on board or with external authorities via suitable radio links. Consistency and interoperability of Video Services are guaranteed by on board systems using proven media-gateways centres that convert digital video to multiple file formats. Additionally, the on board Close Circuit TV (CCTV) can use the communication system infrastructure for distribution and display of information, enabling control of critical area's and extensive remote monitoring for damage control, access or other operational requirements.



### **Broadband Cloud Subsystem**

Leonardo LTE broadband subsystem places 4th generation private cellular networks (PCNs) within the tactical naval network in which high bandwidth/ throughput and voice emergency services are a daily occurrence. Features as low latency group calls, talker identification, device-to-device direct communications, emergency calling are supported in clear audio quality and high availability/ reliability. Near-Real Time/Real Time Video communications are also guaranteed. Reference international standard is the more recent 3GPP release. Of how many broadband cells and the resulting size/coverage of the overall LTE PCN infrastructure is solely bounded by the ownership of enough spectrum licences according to the national regulations/agreements.

### **TETRA WIRELESS SUBSYSTEM**

Beyond the other supported wireless communications solution, the handportable radio system compliant with ETSI TETRA V+D enables fast informational exchanges amongst on-board crew, providing reliable and secure TETRA communications for embarked personal. These systems are in use across multiple Navies including the Italian Navy and onboard the Royal Navy's Queen Elizabeth class carriers.

### **Helo Telebrief Subsystem**

The connection between the ship communication system and the helicopter on the flight bridge is accomplished through a specific audio/data cable using a dedicated connector on the helicopter.

To provide communications between the ship and the aircraft for voice and Datalinks, Leonardo provides a telebrief system that includes specialist tactical voice terminals for Flight Deck Officers. These are fully integrated into the onboard communication system and allows full mobility while maintaining communications with Command and the aircraft. Flight Deck Crew can be equipped with full duplex handsfree wireless communications that meet the stringent safety requirements for operating electronic systems near aircraft.

### **Cyber Defence**

The shipping industry recently entered the digitisation era. Computerised Systems are going to transform the naval operations with smarter and smarter autonomous automated vessels. They need to be Cyber-protected to prevent from unauthorized modification of ship status and creation of fake vessels.

A Cyber-Secure System is guaranteed by means of a comprehensive realtime network monitoring and control center, doing reporting, event logging and analysis, protecting against inbound attacks inclusive of advanced malware, outbound threats and data loss prevention.

The company has a long-term experience in Cyber-Protected systems and is tightly committed in delivering Secure, Vigilant and Resilient naval communication solutions.



## CUTTING EDGE COMMUNICATIONS SUBSYSTEMS

Leonardo holds a superior product portfolio providing Naval Unit with the external communication facilities required to operate in various mission scenarios, such as patrol or fleet operation, joint operation with helicopters and maritime patrol aircrafts and in combined missions in co-operation with national and international authorities or armed forces.

### Antennas

The high number of on-board radios and sensors generally makes antennas installation a critical task. The Required electromagnetic clearance and co-site mitigation often result in hard targets to be achieved.

The Company's strong background in improving the electromagnetic performance of naval platforms has enabled us to design an integrated mast that reduces antenna mutual interference and improves the overall stealth capability of the ship.

The integrated mast includes on the same mechanical structure several radiating elements such as Ku/Ka/X-band Satcom, ESM, UHF comms, IFF, 2D/3D Radar and Optical Sensors.

### Radio Subsystems

The SWave Naval Radio subsystem provides HF, VHF and UHF new-generation radio equipment designed to bring more operational flexibilities into maritime radios for service ashore or on board ship. All devices of Swave family deliver IP over Air (IPoA) voice/data/video on SCA Software-Defined-Radio core architecture.

The new SWave Family of Maritime Radio equipment includes the following products:

- 150W HF Maritime, Desktop and Rack-Mounted, Modular Radio Transceiver Unit
- 500 W and 1Kw HF Maritime Rack-Mounted Radio Transceiver Units
- HF Maritime High Rack-Mounted Multi-Channel Radio providing specific combinations of basic radio modules such as, for example, 2x1Kw radio
- 100W VHF/UHF Maritime, Desktop and Rack-Mounted, Modular Radio Transceiver Unit
- VHF/UHF Maritime Multi-Channel Radio
- 5/10kW HF Maritime High Power Transmitters

SWave Radios are designed around a highly modular concept, adopted both at system and module levels. It fully embodies the Common Core Radio (CCR) as the basic building block.

The CCR is a new generation, multi-band, multirole, multi-function HF/VHF/UHF single-channel low-power transceiver specifically designed to extend capabilities of SDR Swave family to Naval Communications Domain.

SWave HF carriers satisfy short, medium and long range ship-to-ship and ship-to-shore plain/secure voice/data communications. Automatic Link Establishment (ALE 3G) function is available to support operator for critical sky wave transmissions.





New V/UHF SDR carriers are used for line-of-sight plain/secure voice/data communications with military and civilian air, sea and ashore assets. Highrobustness EPM waveforms (Frequency Hopping) are available for immunity against intentional jammers.

All radios conform to the legislation in force in term of maximum emitted power, available in either vessel aboard or stationary land Installation.

#### **TDL/M-DLP Subsystem**

The Tactical Data Link/Multi-Data Link Processor (TDL/M-DLP) enhances the vessel's combat management capabilities enabling command and control integration in the network centric scenarios. Our solution integrates a number of different links (including Link 11-A/B, Link 16, Link 22, J-REAP, VMF) and provides the naval platforms with the ability to exchange with air and ground assets, in real time and via suitable Leonardo data link modem.

#### **Satcom Subsystem**

The Satellite Communications System provides UHF and VSAT-SHF Milsatcom and commercial INMARSAT connectivity. The UHF Satellite Terminal provides full hemispherical coverage for satellite access through stabilized phased array antennas. The terminal is JITS accredited for US/NATO interoperability, allowing fully-meshed, starred and hybrid connectivity with all terminals served by the network control centre for voice and data services.

The C/X/Ku/Ka satellite terminals provide two-way communications via military (X-Band and Ka-Band) and civilian (C band, Ku/Ka band) satellite systems.

The two antennas share a single modem, therefore only one airtime contract is required. The terminal provides multi-transponder, fully-meshed connectivity with all terminals served by the network control centre for voice, fax, high speed data services. Video services use an asymmetric link (DVB S2 RCS) to allow the use of small antennas.

#### **Crypto Subsystem**

The company supports navies with export version of the CM109, CM107 and CM2100IP encryption devices for voice, data and IP communications, through a double crypto logic able to host both NATO and national algorithms. Our compact crypto devices are designed to cope with the most demanding operating environments facilitating highly resilient secure communications at data rates up to 155Mb/s.

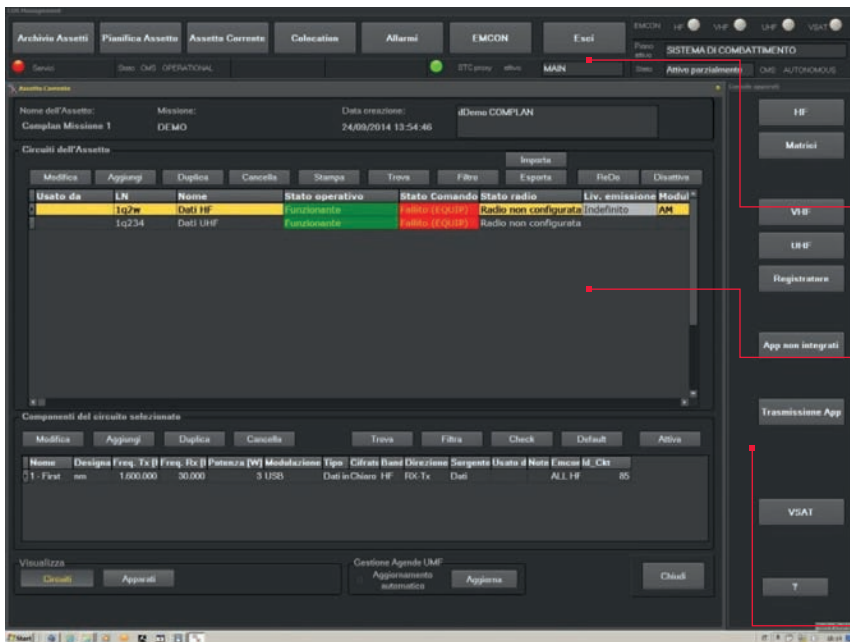
A Radio Gateway provides the legacy crypto equipments with the IP interfaces, in order to be integrated in the aboard IP networks and thus solving any interoperability' hindrance. The Crypto solution includes SETEL Secure Desktop and Mobile Phones, for increasing confidentiality of local and long-distance voice and data communications of governmental officers. SETEL Secure Phones rely on SCIP NATO standard and are available in three versions:

- Domestic/NATO restricted T2 desktop device
- Domestic/NATO restricted R2 mobile device
- Domestic/NATO Secret T6 desktop device

#### **GMDSS Subsystem**

As part of a fully integrated communications system Leonardo provides third party GMDSS equipment. This equipment can be fully environmentally prepared to meet the more stringent requirements for naval ship or submarine standards.

# USER EXPERIENCE



## Functional Menu Bar

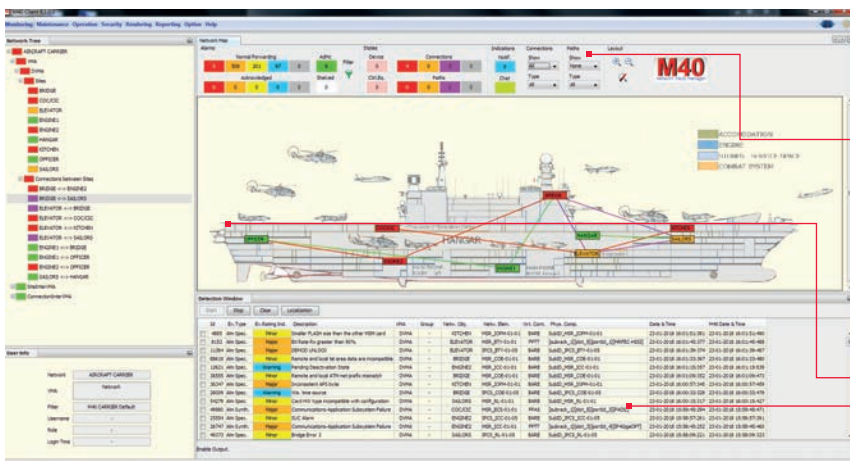
- Circuit Management
- Colocation Function
- Alarms & Faults
- EMCON Planning
- COMBAT Status Panel

## Working Panel

- Central workspace that displays the current working page

## Radio Control Menu

- HF, V/UHF Remote Radio Control
- Voice Recorder Services
- VSAT Links
- Matrix Management
- Modem Configuration



## Faults Panel

- Simple graphical display of network faults using colour coding to identify the fault severity

## Detail View Area

- Shows the graphical global view with sites and physical connections, using a standard color coding for a direct representation of active failures

## Detection Window

- Active monitoring of managed network elements, it collects all events/faults received from the network, showing a real time detailed view of communication failures



## Tool Bar Menu

- Home Menu
- Configuration
- Address Book
- Recording Service
- PTT Management

- Channel Detail Area
- Recording activation
- Mute function
- Headset configuration

## HARDWARE PLATFORMS

### SWave Naval Radios

Specifically designed for the maritime environment, the SWave Radio portfolio is the keystone of the Naval Communications System, offering solutions for different naval scenarios. An example is the stationary multichannel SWave installed in a 19" rack on Patrol vessels, fully interoperable with a 150HF/100VHF-UHF modular transceiver unit on small ships or on rigid inflatable boats.



### SWave SDR Radios

- 150W HF Modular Transceiver Radio
- 500W and 1Kw Standalone Radios
- HF Multi-Channel Radio
- 5,10 Kw High Power Transmitters
- 100W VHF/UHF ,Radio Unit
- VHF/UHF Multi-Channel Radio

### Operative Voice Subsystem

The Operative Voice Subsystem provides tactical voice and data services on two security levels, allowing the exchange of classified and unclassified operational information including administrative data.

All the external channels used for classified messages flow are associated with crypto devices interfacing RED and BLACK domains.



### Multifunctional VoIP Terminal

- Standard Telephony Functions
- Multiple form factor options
- Submarine specific capability
- ATEX rated versions
- External Encrypted/Plain Conferences
- Internal Conferences, also Mixed
- Voice Recording Functions
- Dual-Homing LAN Fibre Multi-Level Security
- NFC Authentication & Access Control
- Quick Magnetic Connection of Audio Ancillaries



The Company has a long time acknowledged experience in design and on board integration of turnkey Systems. We have delivered communications systems into naval programmes in Italy, the UK and over 40 countries including the USA, Canada, Australia and New Zealand, Malaysia, North Africa, Turkey and Middle East.

Over 250 naval platforms have been fitted with our equipment. Leonardo has recently completed for the Italian Navy the deliveries of NCSs for the new LSSs ('Unità di Supporto Logistico'), LHDs ('Unità Multiruolo d'Assalto Anfibio') and MPVs (Unità Pattugliatore Polivalente d'Altura).

## PLATFORMS EQUIPPED WITH LEONARDO COMMUNICATIONS SYSTEMS

### Aircraft/Helicopter Carriers



Cavour (IT)  
G. Garibaldi (IT)  
Viraat (India)  
Queen Elizabeth Class (UK)

### Landing Platform Dock (LPD) Landing Helicopter Dock (LHD)



San Giorgio Class (IT)  
WASP (USA)  
LHD (IT)

### Corvette



Minerva Class (IT)  
Wadi Class (Libya)  
Esmeraldas Class (Ecuador)  
Assad Class (Iraq)  
Laksamana Class (Malaysia)  
Djebel Chenoua Cl. (Algeria)

### Fast Patrol Boat



Dogan Class (Turkey)  
Minister Class (RSA)  
PPA (IT)

### Off-Shore Patrol Vessel (OPV)



Cigala Fulgosi Class (IT)  
Sirlo Class (IT)  
C.G. & Rescue Ships (Turkey) River Class (UK)

### Destroyer



Cacciatorpediniere lanciamissili  
Classe Orizzonte (IT)  
Andrea Doria (IT)



### Oceanographic (RV)



Magnaghi (IT)  
Alliance (NATO)  
Roebuck (UK)  
Scott (UK)

### Assault Ship



Ocean (UK)  
Albion Class (UK)  
UNPAV (IT)

### Hydrofoil



Classe Sparviero

### Logistic Support Ship (LSS)



Stromboll Class (IT)  
Etna (IT)  
Agnadeen (Iraq)  
BDSL (Algeria)  
Wave Class (UK)  
Fort Class (UK)  
Tide Class (UK)  
LSS (IT)

### Submarine



Sauro Class (IT)  
Walrus Class (Netherlands)  
Shishumar & Foxtrot Cl. (India)  
Gotland Class (Sweden)  
Victoria Class (Canada)  
Trafalgar Class (UK)  
Vanguard Class (UK)  
Astute Class (UK)

### Frigate



Anzac Class (Australia)  
FREMM Class (IT)  
Artigliere Class (IT)  
Maestrale Class (IT)  
Lupo Class (IT)  
Goziantep Class (Turkey)  
Type 22 Class (Romania, Brazil, Chile)  
Carvajal Class (Peru)  
Mariscal Sucre Cl.(Venezuela)  
Dat Assawari (Libya)  
Lekiu Class (Malaysia)  
Type 23 Class (UK)

### Minehunter



Lerici Class (IT)  
Gaeta Class (IT)  
CMT Class (Belgium)  
Hunt Class (UK)  
Sandown Class (UK)  
Minehunter (Algeria)



## TECHNICAL SPECIFICATIONS

### 150 W, 500 W, 1KW, Multi-Channel HF Reconfigurable Radio Systems

- Frequency range  
Tx: 1.5MHz to 30MHz  
Rx: 100kHz to 30MHz
- Operating modes  
J3E (USB/LSB), A3E (AM), A1A (CW), B7D (ISB), F1B/F2B (FSK)  
Ready for EPM STANAG 4444
- Voice service  
(WF dependant)  
Plain voice - STANAG 4203  
Secure voice (with external crypto) - STANAG 4197
- Data service  
(WF dependant)  
Plain/secure data (with ext. crypto) STANAG 4285, STANAG 4529,  
STANAG 4481, STANAG 4539 (up to 9.6kbps), STANAG 5065,  
MIL-STD-188-110 B (Appendix C);  
MIL-STD-188-141B  
Link 11/22 with external DTS  
Ready for MIL-STD-188-110 C/WB HF/ALE 4G
- Network interoper.  
ALE 2G, ALE 3G embedded

### 100W AND VHF/UHF MULTICHANNEL RECONFIGURABLE RADIO SYSTEM

- Frequency range  
V/UHF 30MHz to 512MHz
- Supported WFs:
  - NB VULOS V/UHF AM/FM  
(STANAG 4204 / 4205)
  - EPM/ECCM SINGARS, HQ I/II (STANAG 4246),  
SATURN (STANAG 4372)
  - SATCOM SAMA/DAMA (MIL-STD-181A,  
MIL-STD-182A, MIL-STD-183,  
MIL-STD-184)
  - WB ESSOR HDR, SelfNET SBW
  - Datalink Link 11/22 with external DTS  
High-Data Rate interface for external Sub Network Relay (SNR) modem

## OPERATIVE VOICE SUBSYSTEM

- Terminal Functions Night Mode, Integrated microphone and speaker, Audio ancillary magnetic connectors
- VoIP Protocol SIP/SDP, RTP Data streaming (EUROCAE ED137), RTCP for monitoring RTP QoS
- Security Plain/Crypto switch mode, RFID Authentication
- Mechanical Size (W x H x D): 205 x 205 x 80 mm  
Weight: < 3 kg
- Power Supply Operating Voltage: 21/48 VDC
- Power Consumption < 40 W
- Environmental MIL-STD-810G
- EMI CE marking (ref. IEC 60950-1, EN 55032, EN 55024)

## TACTICAL VOICE TERMINAL (TVT)

- Telephony H.323, H450
- Group Calls PMA, AMA, Open Line, Intercom
- Radio Circuit Operation >40 radio circuits; EMCOM mode; concurrent Secret & Unclassified circuits; Plain/cypher switching; Non-secure warning
- Audio G.711A voice encoding; split ear audio; up to 8 circuits concurrent monitoring; muting; VoX Operation
- Interfaces 100Base-TX Ethernet; Line in/linemout audio; Headset/handset; PoE 802.3af; SNMP V2c management; DHCP
- Physical Dimmable display; Sock, vibration, temp to DefStan 00-35 part 3; MIL-S-901D Grade A shock; Temp of -30°C to +55°C;
- Flight Deck Variant Telebrief interface; Flight Deck Officer's Keybox support for wireless comms, Helo Radio circuits, Intercom

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