Integrated Border Control Security Solution

09 November 2016

LEONARDO

Topics

- Leonardo – a new beginning
- Leonardo Integrated Border Control Security Solution
- Focus on Video Analysis capabilities and technologies
- References

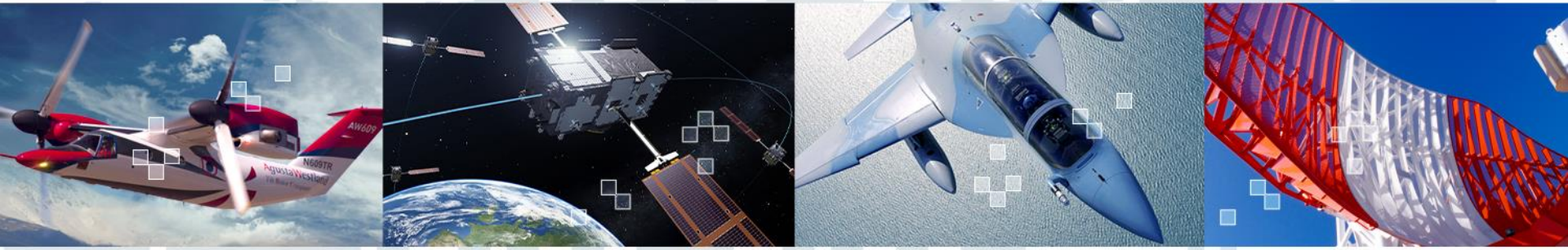
2016: A new beginning

One Company, Stronger Together

1 January 2016: the **One Company is born** through merger operations for the incorporation of OTO Melara and WASS into Finmeccanica and the absorption of the activities carried out by AgustaWestland, Alenia Aermacchi and Selex ES. The industrial entity maintains Parent Company and Corporate Centre functions for **DRS Technologies, MBDA, Telespazio, Thales Alenia Space,** and **ATR.**

Finmeccanica is now Leonardo

28 April 2016: our name changes to Leonardo, inspired by Leonardo da Vinci, a universally recognised symbol of **creativity and innovation. Leonardo** represents the **ideal bridge** between historical legacy and our future in the high-tech industrial sectors.



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Our Business

Leonardo is a global high-tech company and one of the key actors in Aerospace, Defence and Security worldwide.

DIVISIONS

- **Helicopters**
- **Aircraft**
- **Aerostructures**
- **Airborne & Space Systems**
- **Land & Naval Defence Electronics**
- **Defence Systems**
- **Security & Information Systems**

SUBSIDIARIES AND JOINT VENTURES

- **DRS Technologies** (100% Leonardo)
- **Telespazio** (67% Leonardo and 33% Thales)
- **Thales Alenia Space** (67% Thales and 33% Leonardo)
- **MBDA** (37.5% BAE Systems, 37.5% Airbus Group, 25% Leonardo)
- **ATR** (50% Leonardo and 50% Airbus Group)

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SECURITY AND RESILIENCE CAPABILITIES

PHYSICAL

- SECURE PROFESSIONAL COMMUNICATIONS
- MAJOR EVENTS
- AIR AND VESSEL TRAFFIC CONTROL SYSTEMS
- BORDER CONTROL
- CRITICAL INFRASTRUCTURE PROTECTION

LOGICAL

- INTELLIGENCE AND ANALYTICS
- INFO ASSURANCE
- EXTENSIVE KNOW-HOW IN CYBER SECURITY SERVICES

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LAND CAPABILITIES

INTEGRATED SYSTEMS

DISMOUNTED SOLDIER	SITE PROTECTION	BATTLESPACE MANAGEMENT	C4I SYSTEMS	AIR DEFENCE	FIGHTING VEHICLES	UNMANNED GROUND VEHICLES

SENSORS & EQUIPMENT

GUIDED AMMUNITION	TURRETS	RADAR, OPTRONICS AND FIRE CONTROL SYSTEMS	COMMUNICATION NETWORKS AND EQUIPMENT	COUNTER IED (IMPROVISED EXPLOSIVE DEVICE)	OPERATIONS SUPPORT

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MARITIME CAPABILITIES

INTEGRATED SYSTEMS

INTEGRATED NAVAL SYSTEMS
Combat System Integration
Combat Management System

MARITIME AND COASTAL SURVEILLANCE AND SECURITY

POWER AND PROPULSION (DRS)
Environmental Systems
Motors and Generators
Conversion and Distribution
Propulsion System Integration

UNMANNED SYSTEMS
USV / UUV / RUAV

NAVAL HELICOPTERS

SENSORS & EQUIPMENT

NAVAL SENSORS, SURVEILLANCE AND FIRE CONTROL SYSTEMS
Radar
Electro-Optics

NAVAL COMMUNICATIONS

UNDERWATER SYSTEMS
Torpedoes
Torpedo Carrier System
Countermeasures
Sonars

NAVAL DEFENCE SYSTEMS
Guns
Launchers
Ordnance & Ammunitions

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Leonardo - Competitive Edge

System Integrator

We design, develop and implement solutions partnering with public and private organizations to harness the latest technology and so deliver fully automated, yet highly robust, sustainable solutions for security in critical infrastructures, transportation, communications, and public services. Our approach, driven by a focus on risk management, combines robust process, smart technology – both proprietary and third party – and optimized organization

Devices Manufacturer

We design and develop in-house advanced sensors (Radars, EOs, Sonar, UGS) secure communications and C4ISR systems uniquely positioned to address the rapidly changing high technology needs of defense, security, civil resilience, air and maritime route management..

Military, Dual use and Civil technology vendor

Taking advance from expertise and capabilities in Military domain, we are able to design and deliver Dual Use solutions suitable for border and homeland security.

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Border Security Scenario

Provide front-line staff with the best solution to effectively detect, identify, classify and react to threats in border security scenarios

- Assure borderline security (Drug, Human and Goods Trafficking)
- Contrast illegal immigration and smuggling.
- Fight traffic of weapons, explosives and terrorist activities
- Detect and track mobile targets within the geographical Area Of Interest.
- Evaluate threat level of the targets.

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The Leonardo offer

Integrated Border Control Solution

Border Surveillance and Detection

Surveillance, reconnaissance and detection equipment for the green and blue border security in order to deal with illegal border crossing, drug trafficking, smuggling and other criminal activities..

Border Infrastructure and Protection

Physical barriers along green and blue borders, protecting also maritime infrastructures like ports, offshore oil and gas.

Border Management (Smart Borders)

- **Automated border check points and crossing points** for the identification of transit people/vehicles
- **ICT infrastructures** to manage the interactions between border check points and C2 centers.
- **intelligence and risk analysis** to prevent possible threats.

An Integrated Solution for Maritime, Land and Air Surveillance

EXTERNAL CENTRES

- Vessel Traffic Control
- Air Traffic Control
- Armed Forces
- Joint HQ
- Coast Guard, Border Guard

LOCAL SURVEILLANCE CENTRES

- Command & Control of assigned resources
- Local Operational Picture

NATIONAL SURVEILLANCE CENTER

- Operational Control of assigned forces
- Decision Rooms
- Information Fusion
- Validated Picture
- Information Sharing
- Interoperability with External Agencies

SURVEILLANCE PLATFORMS, PATROLLING AND INTERCEPTING ASSETS

- Radars (including OTH and ISAR capabilities)
- Long Range Thermal Imaging Cameras
- Earth Observation from Satellites

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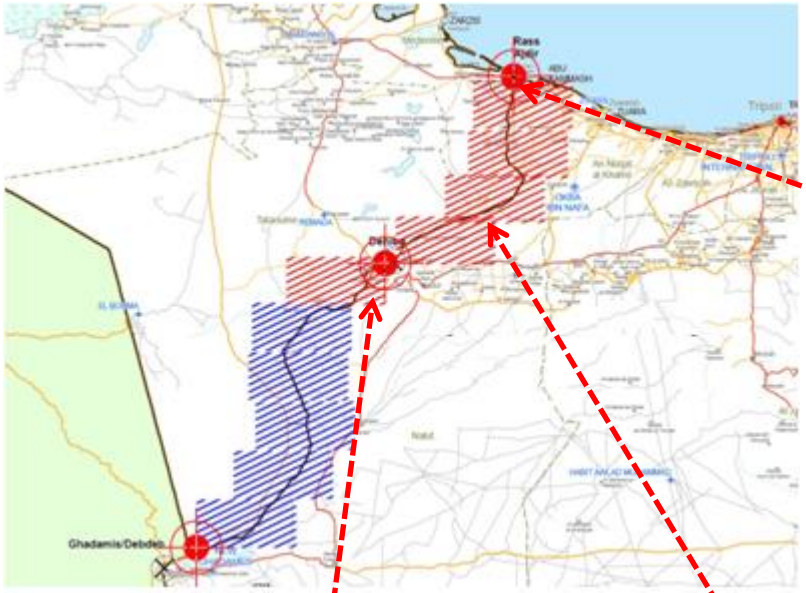
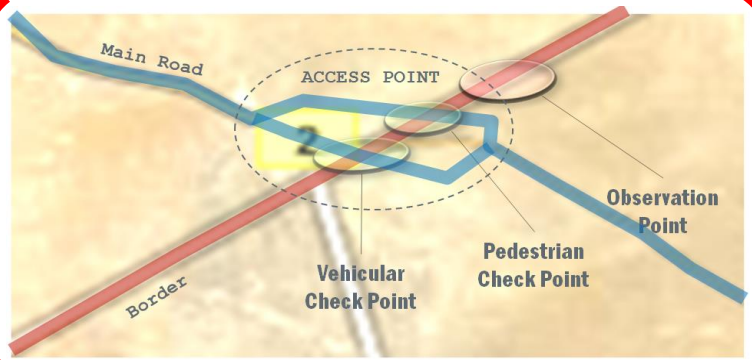
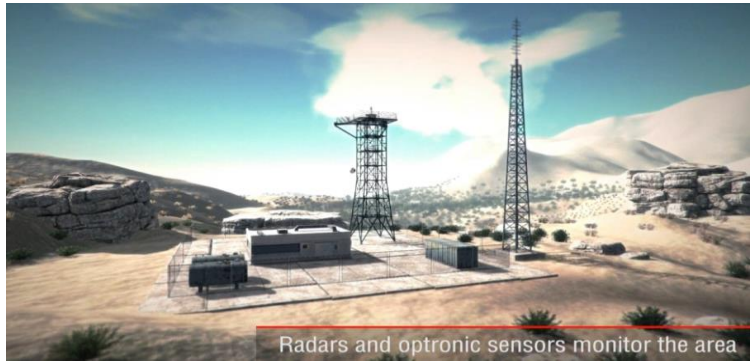
Ground Surveillance: Fixed Solution



Maritime Sites



Border Access Point



Land Sites

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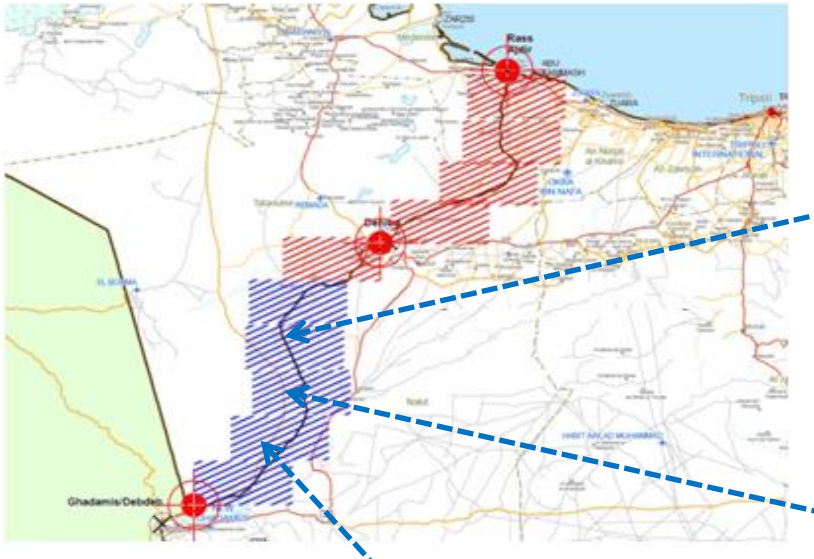
Ground Surveillance: Deployable Solution



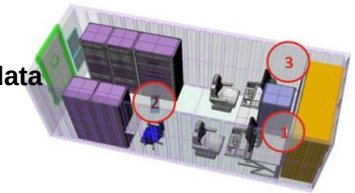
- ❖Surveillance
- ❖Recognition
- ❖Identification
- ❖Interdiction

Mobile Integrated Border Control System (MIBCS)

- ❖Local situational understanding
- ❖Resources Management
- ❖Intervention coordination
- ❖Surveillance
- ❖Recognition/Identification
- ❖Interdiction

Transportable Integrated Border Control System (TIBCS)

- ❖Persistent surveillance
- ❖Treat detection
- ❖Real-time tactical data
- ❖Multi-spectral images/streaming



Unmanned Aircraft System (UAS)

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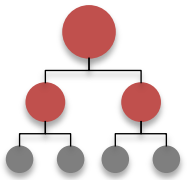
High Level Architecture

Information Layer



National & Regional Center

People Blacklist Update

Vehicle Blacklist Update

Illegal Crossing Areas Update

Videoanalitics on video feeds (plates, faces)

Big Data Analyitics

Behavioural Analysis (Vehicles, People)

OSINT

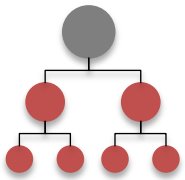
Intelligence and Special Forces DB Access

Open Data Web Unstructured Content

Structured Data (Fingerprints, Passports)

EU Ext. Systems (EUROSUR, etc.)

Sensors Data Layer



Local & Regional Center

Surveillance Radars (land and airborne)

E/O (land, airborne and maritime)

Communication Devices and Networks

UAVs and Mission control

Border Patrol Vehicles,

Command and Control, Multi Sensor Data Fusion, Mission Planning, Search and Rescue

Mobile Integrated Border Control System (MIBCS)

Unattended Ground Sensors

Satellite observation, comms and AIS

Border Surveillance and Detection

Surveillance Radars (land and airborne)

E/O (land and airborne)

Communication Equipments and Networks

UAVs and Mission control

Border Patrol Vehicles

Aircrafts, Rotorcrafts, Helicopters

Perimiter Fence

Command and Control, Mission Planning

Data & Video Analytics

Border infrastructure and protection

ABC Gates

Identity Access , Portable Identity Access

People screening, Goods check, Vehicle gates

Biometrics, Smart cards, RFID

Licence Plate Reader

Central command and control

Big Data analytics

Facial recognition

Border Management (Smart Border)

Secure ICT Infrastructure

Leonardo design, build and deploy state of the art professional telecommunications and digital platforms to support management of security of Critical Infrastructures in normal and emergency conditions.

ICT & Networking	Cyber security	Encrypted communications
Leonardo acting as a system integrator develops and supplies secure, integrated and interoperable turnkey communication solutions to provide multi-technology network solutions to professional customers **Leonardo provides:** ▪ Consulting services. ▪ Network design. ▪ Wired and Wireless infrastructures. Employing best of breed third party equipment	Leonardo can support logical security with a complete portfolio that cover the whole solution lifecycle . **Critical Infrastructure protection Cyber security services:** ▪ Assessment design and review. ▪ Data & network security program. ▪ Industry security program (to address specific industry systems and applications). ▪ Security management support	Leonardo can provide security and privacy in voice communications both on fixed and mobile lines as well as secure data communications **Leonardo provides**: ▪ Secure voice and data encrypted communications using Identity based public key cryptography (**sentinel Mobile**) ▪ Secure VPN for application communications

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Leonardo's C2 for Integrated Border Control

Leonardo's solution for Integrated Border Control is based on the use of different sensors integrated in the Command & Control**.**

Our command and control is designed to support the operational personnel in the conduct of several activities from surveillance up to localization, assessment, classification and tracking of the possible threats. It performs video and data analysis, data fusion and correlation, and compiles the Common Operational Picture for the achievement of the Situational Awareness and can integrate different systems:

Integrated Sensors and Subsystems

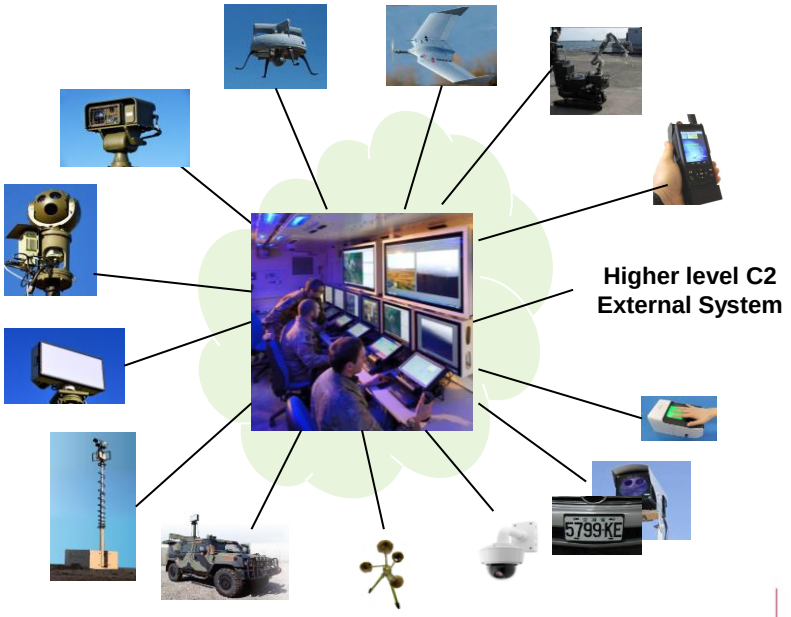
- Radar & Electro-optical surveillance sensors
- Satellite Surveillance
- Perimeter Intrusion Detection, Access Controls, CCTV
- Reaction systems (Intercept, Non lethal weapons, etc.)
- E-gates, Portable Biometric Scanners
- External Police and EU Systems

Main Functions

- COP
- Secure Communications
- Decision support system
- Video, Data, Voice Recording
- Post event and forensic analysis
- Trend Analysis and Blacklist management
- Video Analysis

Platforms

- Fully equipped platforms (Patrol Boats, Airplanes, Helicopters, UAV)
- Mobile Surveillance Units
- Intercept vehicles



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Data Collection, Analytics and information mining

DATA COLLECT AND ANALYSE

Collect
- Gather and retain data from heterogeneous sources

Analyse & Visualise
- Search, analyse & visualise this data

Intelligence
- Improve situational awareness, generate actionable intelligence

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Video Analysis

Automatic Video Tracking

The operator can be replaced by an electronic system which processed the video image in real time to ascertain the position of a designated object with respect to the sensor boresight. This measure is then used to control the platform such that it follows accurately the target. Automatic Tracking can be configured to use three different algorithms:

Centroid: is used for tracking bounded objects such as a UAV, which can be fully contained within the track window.

Edge: can be used for tracking many types of object but is most effective when tracking objects that have one or more defined edges with the remaining edges unbounded.

Correlation: can be used for tracking many types of object but is most effective when tracking unbounded targets that have low dynamics.

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Video Analysis

360° IR Panoramic Picture

Through dedicated HW and SW Anteo is able to command an EO to rotate continuously and during rotation frames of IR sensor are grabbed and sent over the network to the visualization units. Images are aligned and displayed on the monitor to create a 360° picture that is updated in real time.

As IR sensors detect heat sources, the video displaying module can also highlight points whose temperature is higher than the background, which may reveal the presence of humans or vehicles.

Information can be used for the generation of 1D tracks (with the only azimuth component) to obtain a more accurate tactical picture through appropriate data fusion.

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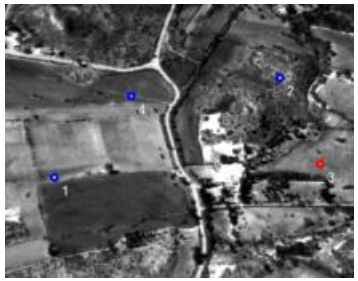
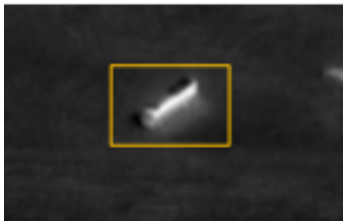
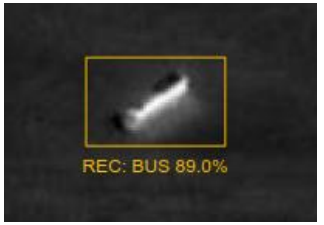
Video Analysis

Automated IR Target Search & Recognition

IR Stream & Nav Data → Detection Extraction → False Alarm Reduction → Target Tracking, location & priority → Target Recognition



Detection & Extraction

- Moving & Static target detection
- Matching different types of background and targets

False Alarm Reduction

- Neural Networks based algorithms: detected object has a target like shape
- Residual non uniformity: Pruning false detection generated by sensor fixed pattern noise
- Segmentation & Selection: Detected object dimensions compatible with the searched classes

Tracking, Location & Prioritization

- Target location saved for later recognition
- Prioritization based on detection and tracking features

Recognition

- Recognition by correlation against models database and select most likely target and pose set

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Video Analysis

TV and IR Image Fusion

Electronic stabilization, de-noise, de-haze, etc.	Different resolutions, capture rates and FOV, parallax errors.	Fusion algorithms adapted to image characteristics	Sharpening, contrast, etc.

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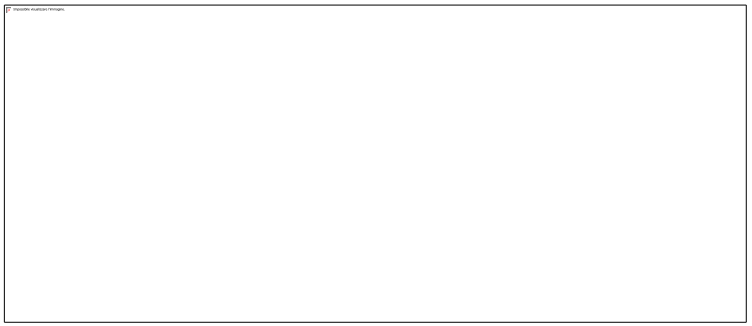
Video analysis for short range

Technologies

- Feature extraction
- Feature matching
- Object detection,
- Object classification
- Object tracking
- Virtual Fence
- Motion detection
- Tracking & Re-identification



Use cases

- Recognition 1:1 e 1:many
- Activity Monitoring
- People counting
- Vehicle Counting
- Face identification and emotion recognition;
- People recognition in supervised zones
- Proactive alerting e “watch list” via live video
- E-Gates
- Plate reading

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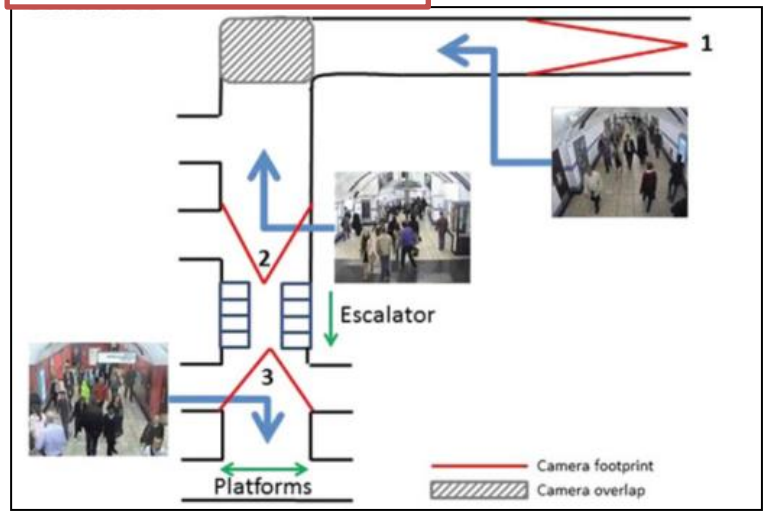
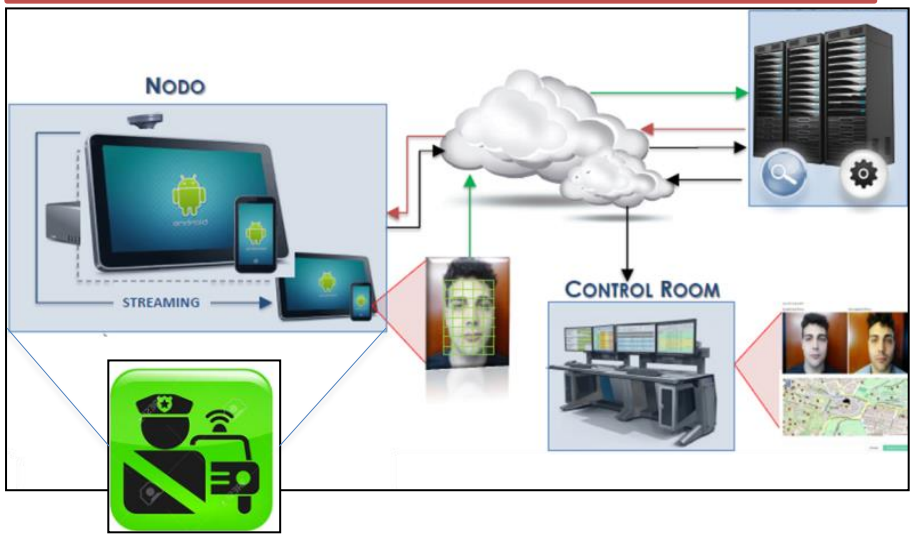
Face Recognition - Scenarios

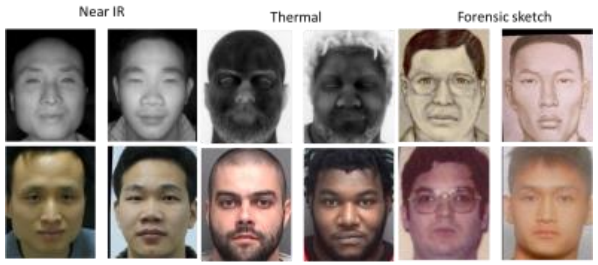
Non collaborative



Face recognition in the wild with central processing

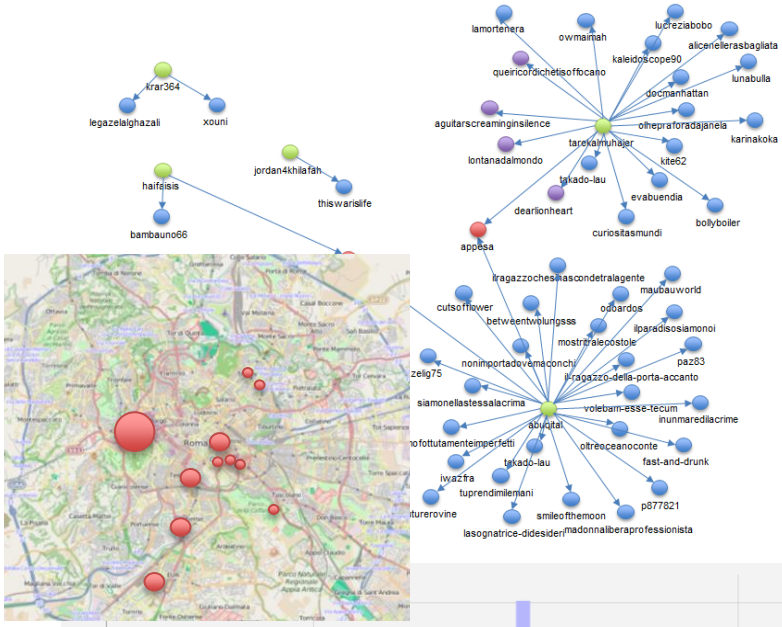


Collaborative

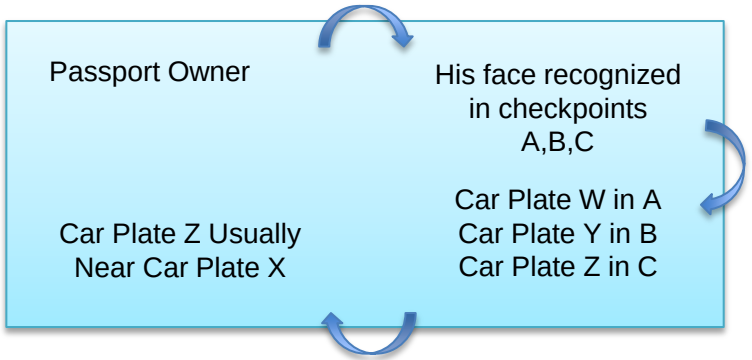


Analytics

The Analytics engine allows trends, patterns e relations among the gathered onfield data (e.g.Vehicle plates, Biometric data, Faces)



- Geographic relations
- Time based relations
- Relations among different objects (Vehicles>Owner>Face)
- Geographic Anomalies
- Time Anomalies



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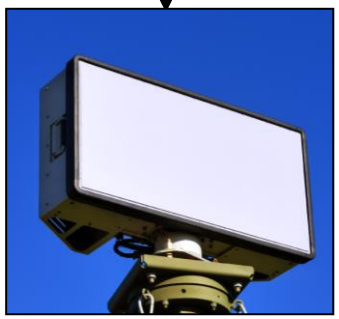
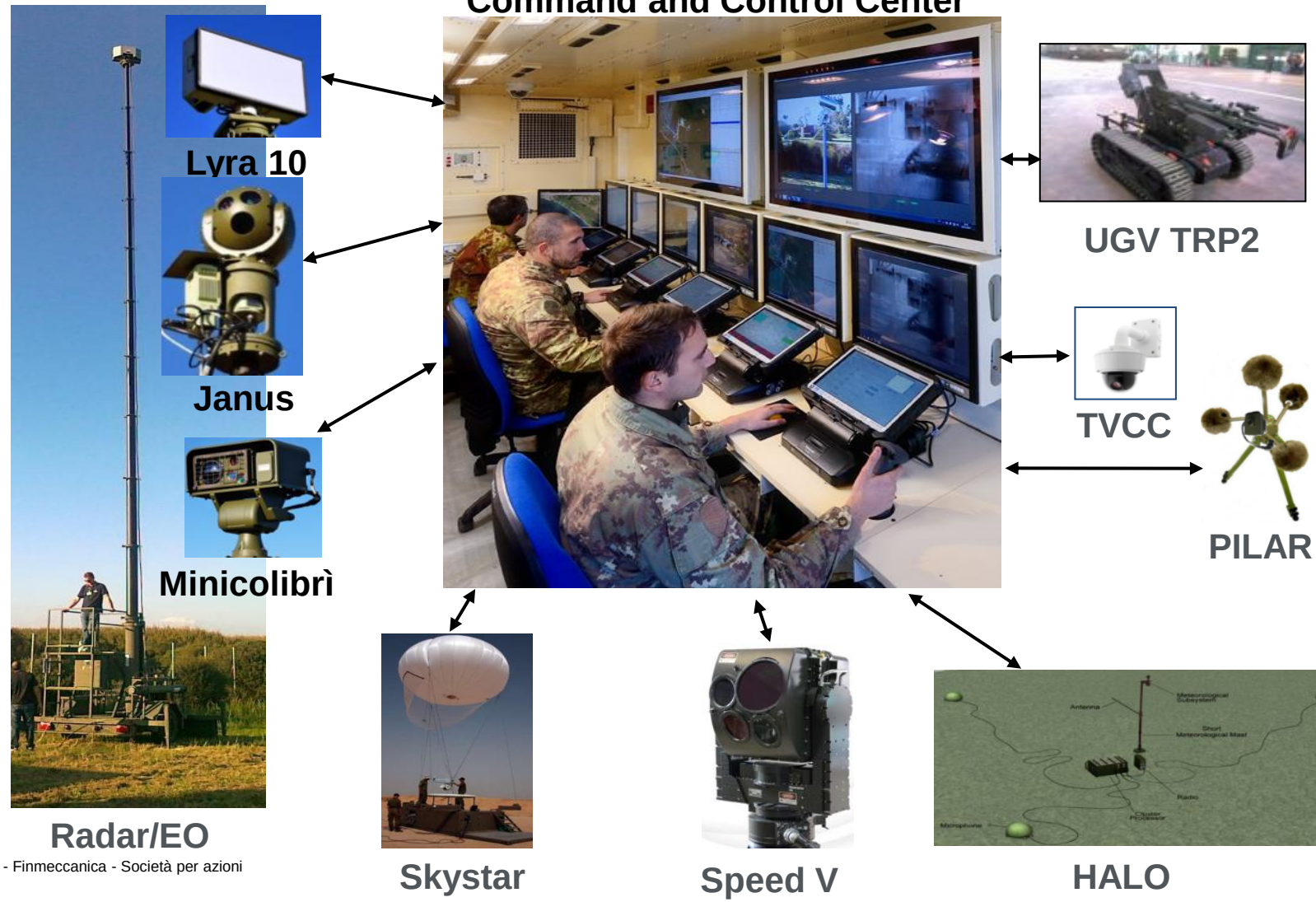
Archimede Harbour Protection System
HARPEX 2010



Remote C2 available in Granatiere Naval Unit

FOB/FSB Force Protection
Proven and actually used on field



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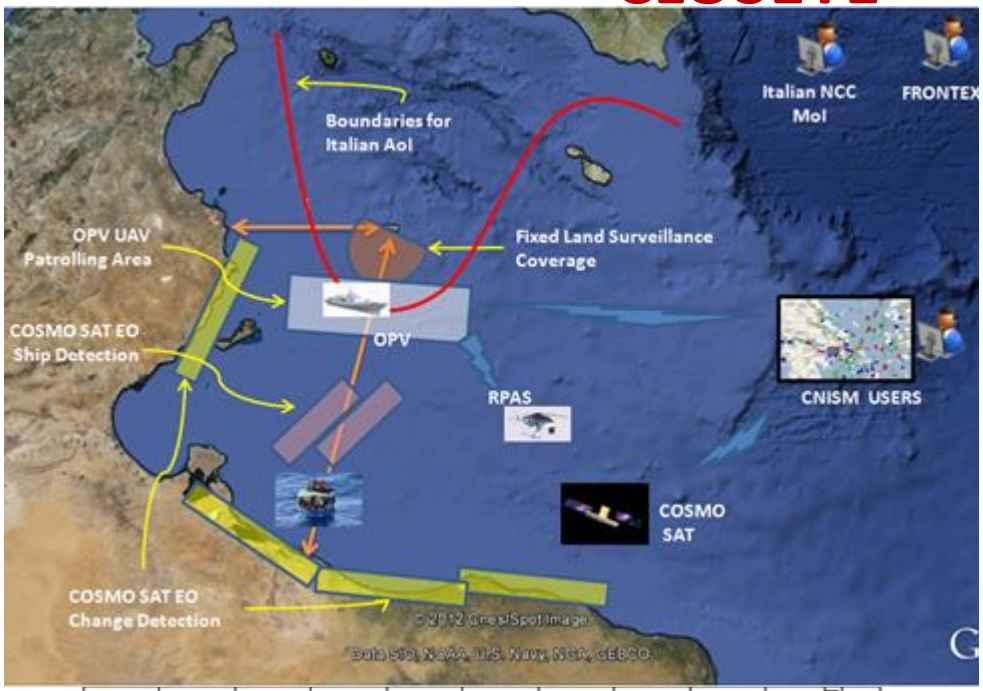
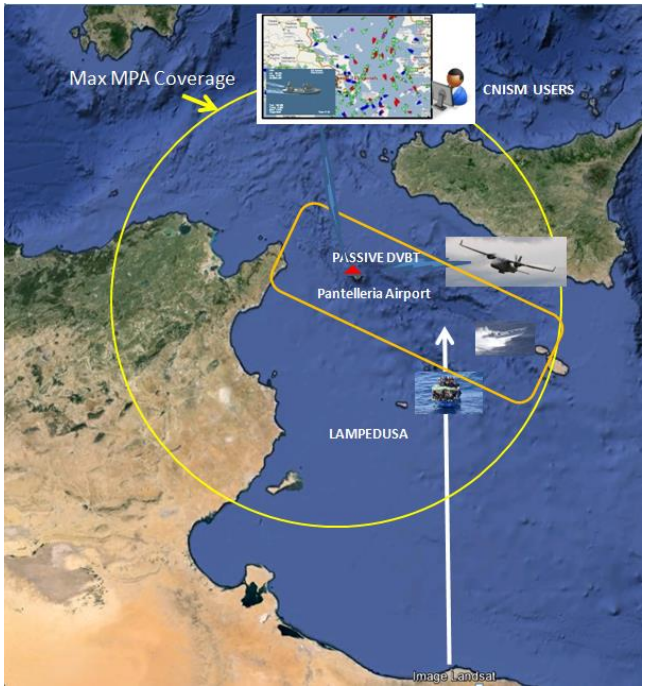
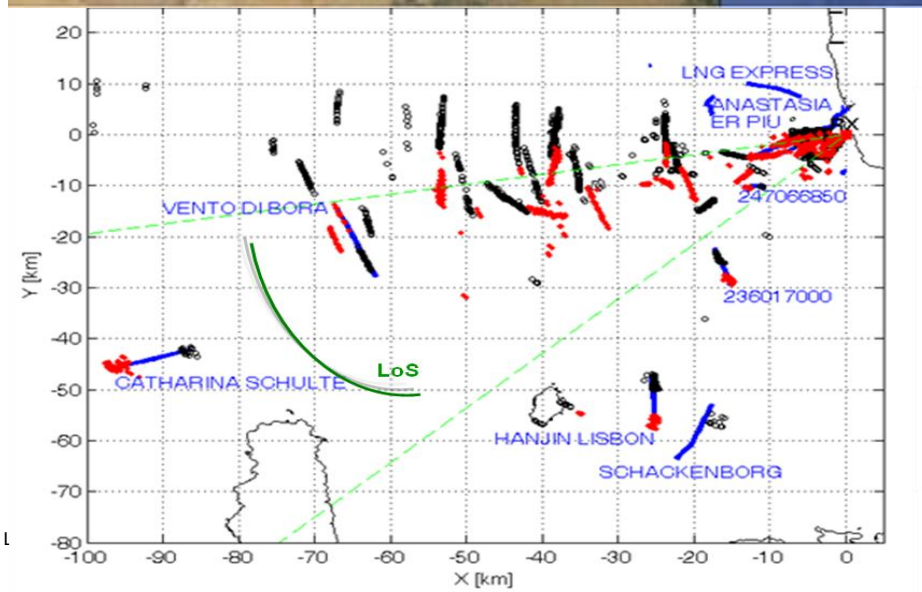
CLOSEYE







Test with target outside the line of sight

(Livorno) – SEABILLA CAMPAINS

Targets of opportunity: (a) Catharina Schulte; (b) Hanjin Lisbon; (c) Schackerborg; (d) Vento di Bora.

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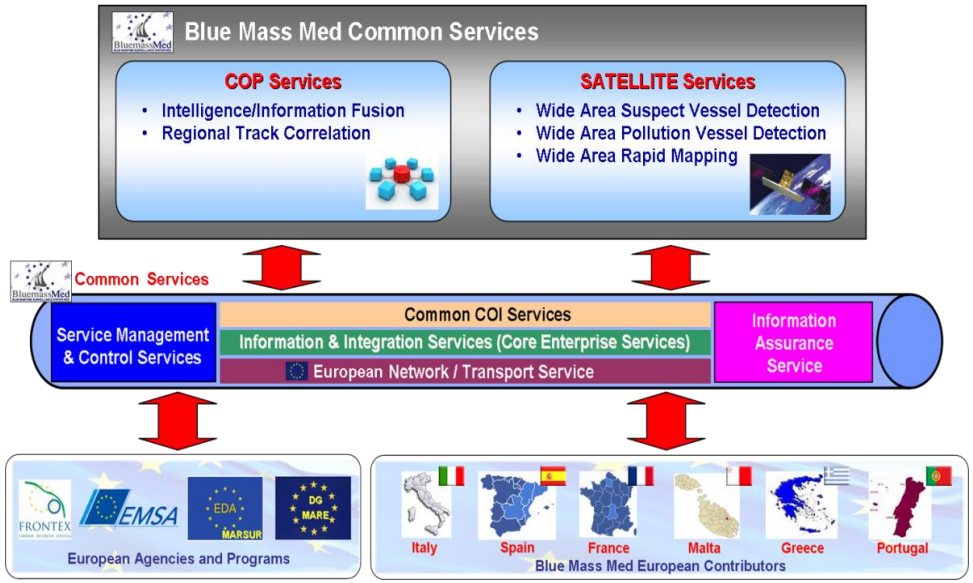
BluemassMed

The Blue Mass Med (BMM) Project is a Pilot Project for the definition of the architecture of the future European wide Maritime Surveillance Network

BMM aim is to define a model for the integration of the existing BMM partners' maritime surveillance systems (MSS) and other available commercial products (such as AIS, VMS, LRIT), with the main goal of contributing to the building up of a shared "Common Maritime Picture"

- 37 State partners from 6 Member States bordering the Mediterranean Sea and Atlantic approaches actively participate by:
  - sharing the maritime information they collect and operate
  - building the proper conditions for an enhanced exchange
- BMM can be considered the first step to supports the process of creating an EU Common Information Sharing Environment (CISE)



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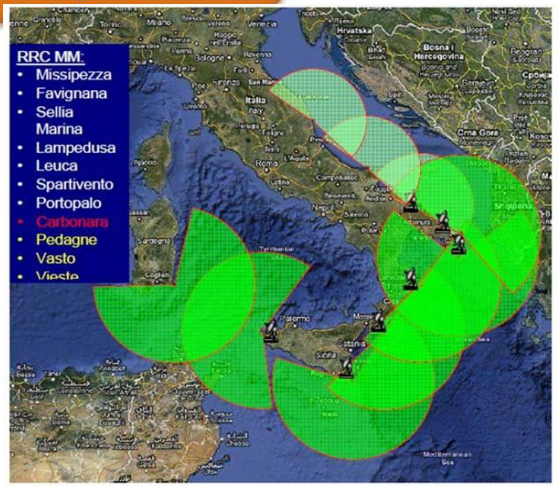
Italian Coastal Surveillance System

Shared Situation awareness (SSA) enabled by network access to shared services and collaborative capabilities built into C2 Systems.

Shared services :
- SSA Data management;
- SSA Correlation/tracking;
- Weather data reduction;
- Sensors Management;
- Other

Net Centric Data Distribution



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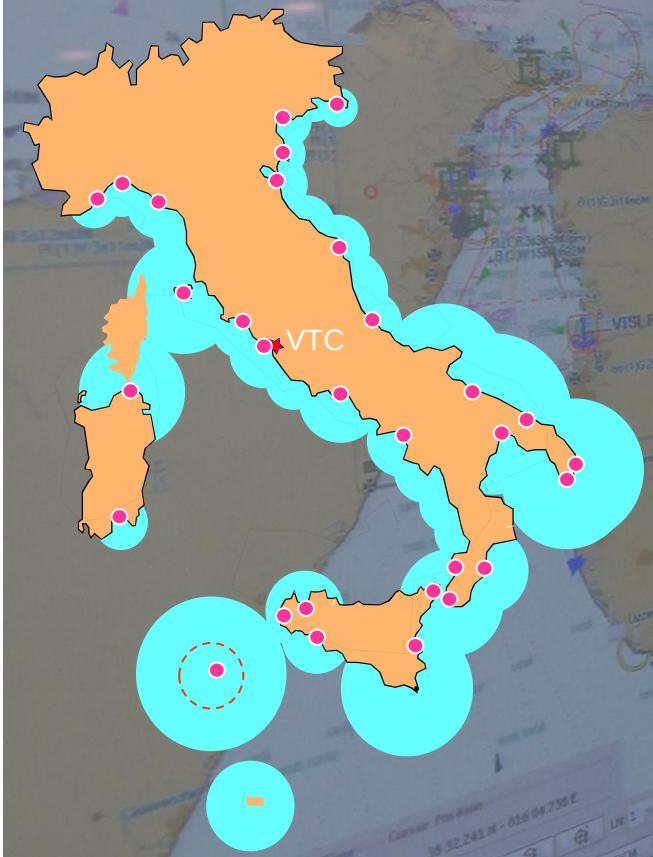
Leonardo for National Italian VTMS system



Proud to be the first company to develop the world largest Vessel Traffic System, which covers over large areas of sea under surveillance

- One of the largest vessel traffic management systems (VTMS) throughout the world.
- Example of deep integration of information technology, telecommunications and network infrastructure.
- It is also an example of network integration of maritime services operating protection and security.
- It provides full real-time coverage of thousands of kilometres of Italian coastline, thanks to a National Centre which operates within the general command of the Coast Guard placed in Rome.
- 14 regional centers located in seven maritime directions receive information from 39 local centers, connected to 80 sensors sites and three mobile units.

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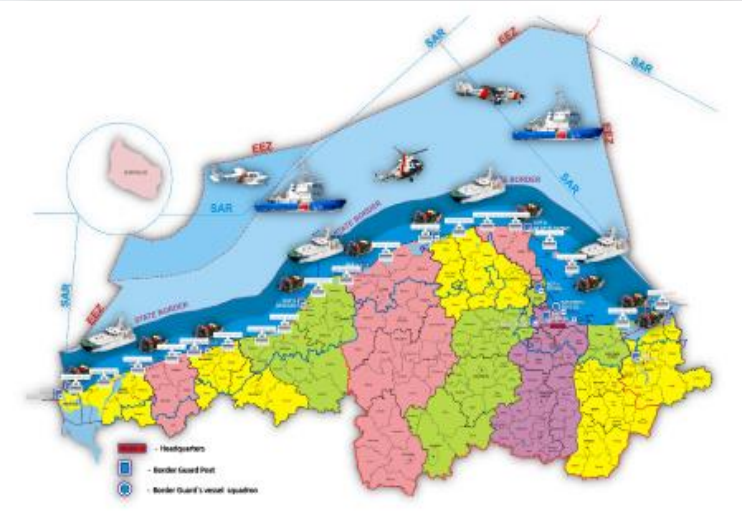
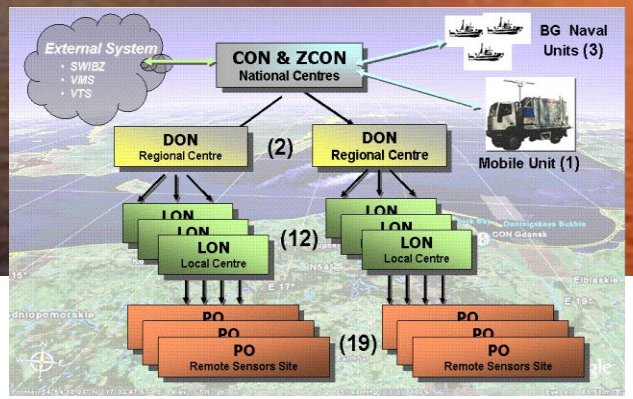
Leonardo for Polish ZSRN





- 19 remote sensor sites (radar + E/O)
- 1 Mobile Unit
- 1 Pilot System
- 12 Local Operation Centres
- 2 Regional Operation Centres
- 1+1 National Operation Centre

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Critical Infrastructure Protection

Leonardo is being awarded a contract for the protection of a off-shore Exploration and Production area managed by an important oil& gas company.

System requirements includes:

- Radar system
- Automatic Identification system (AIS)
- Electro-Optical and Infra Red Sensors
- Tele-communications systems for live video streaming to remote command and control centers and other law enforcement centers
- Integrated control console
- Digital recording facility

And were open to additional technology solutions that could improve security in protected area

Leonardo Solution Characteristics

- **Small vessels** (RHIBs) and **larger vessels** can be **detected** at distances of some tens of kilometres
- Potential **threats** are **recognised** at distances of some tens of kilometres
- Aggressors **intentions** can be clearly **identified** very early in order to be properly managed
- A **local defence** is implemented to **neutralize** the attack or at least to **delay** the attackers so that **intervening forces can reach** the location.

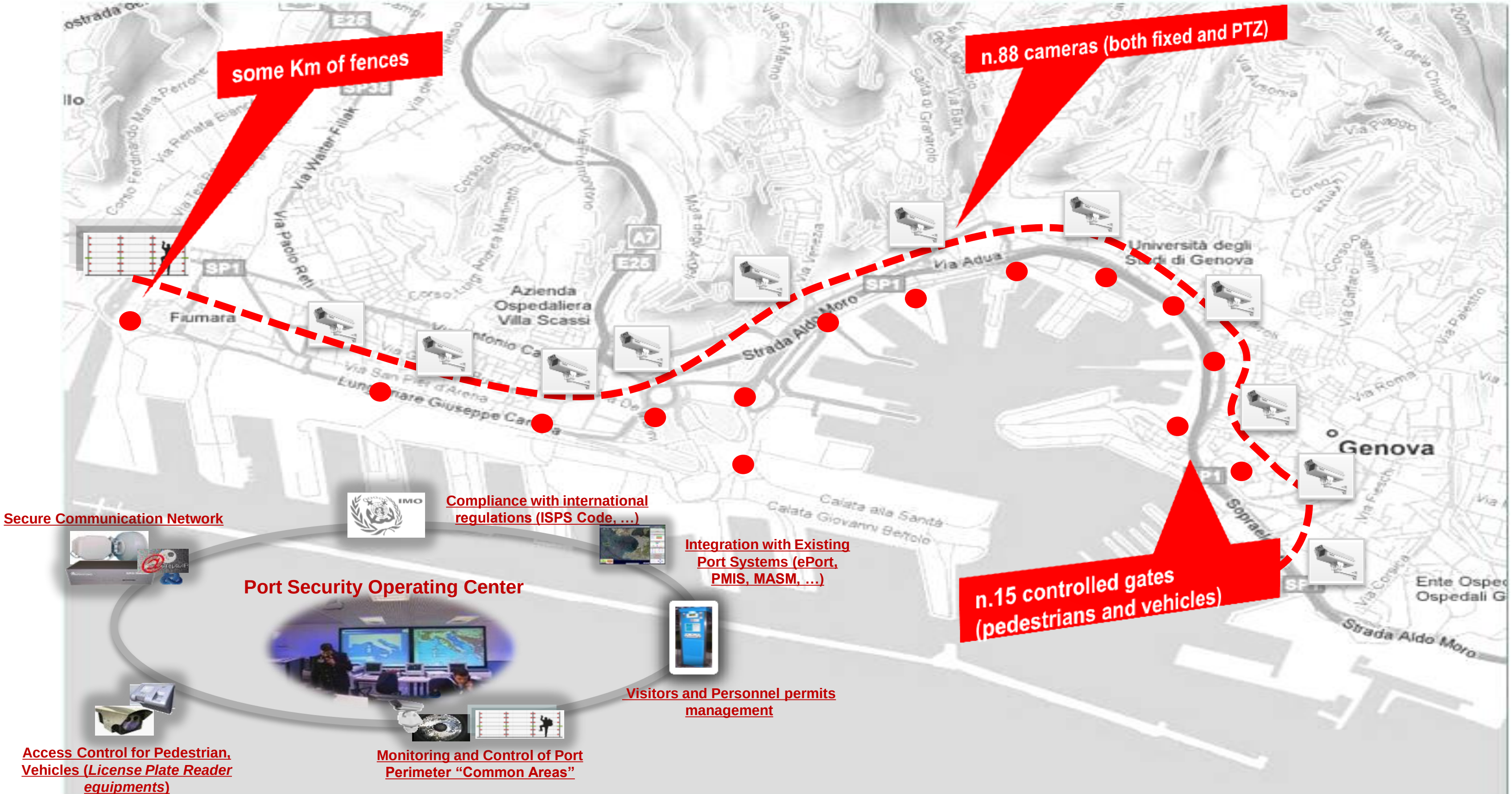
Leonardo for Turkey

- 24 surveillance radars
- 3 Area Control Centres
- 1 National Command & Control Centre (Ankara)
- 1 Training & Recovery Centre (Izmir)

CNI Protection

Port of Genoa

The port of Genoa, one of the main European ports, is significantly exposed to risks, leads all other Italian ports in volume of passengers and freight traffic, hosts International Events



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THANK **YOU** FOR YOUR ATTENTION

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