



# Port of the Future

## Brief presentation of CNIT Laboratory @ Port of Livorno

Paolo Pagano

Head of «Technology Transfer» Research Sector  
Director of CNIT Laboratory @ Port of Livorno

**cnit** consorzio nazionale  
interuniversitario  
per le telecomunicazioni

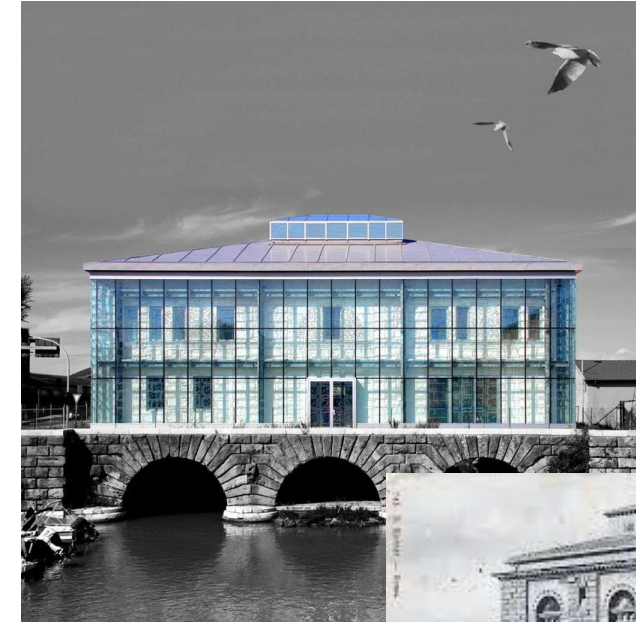
- Mid-size historical port:
  - industrial and institutional importance (Naval Academy);
  - passenger and freight hub (multipurpose), rail-road terminal, and car park;
  - core node of the TEN-T SCANMED corridor;
  - headquarters of the Maritime Directorate of Tuscany (ITCG) and the Northern Tyrrhenian Sea Port System Authority (AdSP);
  - research laboratory active for 13 years with structured collaborations with the ITCG and the AdSP.



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<https://commons.wikimedia.org/w/index.php?curid=93913824>

- An evocative venue: the «Glass Cube»
  - Original building by Arch. Carlo Reishammer (1840), destroyed in II WW (1943), Philological Restoration completed in 2015 (German Design Award 2018)
- CNIT Laboratory at the Port of Livorno:
  - Italian unique example of laboratory committed in the development of E2E ICT solutions at high TRL (> 6) tailored to Ports and Navigation
  - Pioneer of 5G in European ports according to Ericsson
- Founded in 2015:
  - Framework agreements w/ Livorno Port Authority (JLAB) and the Italian National Coast Guard;
  - Part of the National Laboratory of Photonic Networks and Technologies (PNT) in Pisa;
  - Part of CITEM – Livorno Center of Innovation and Technology for the Blue Economy.





- Leonardo Electronics Division (LED) and CNIT started in 2026 (see [here](#)):

- Advanced Center for the Development and Experimentation of Maritime Technologies (Maritime Technology PASS);
- to develop state-of-the-art technologies and systems for the Safety and Control of Maritime Traffic for the domestic and international markets.

## Cloud computing paradigm

### Computational Resources

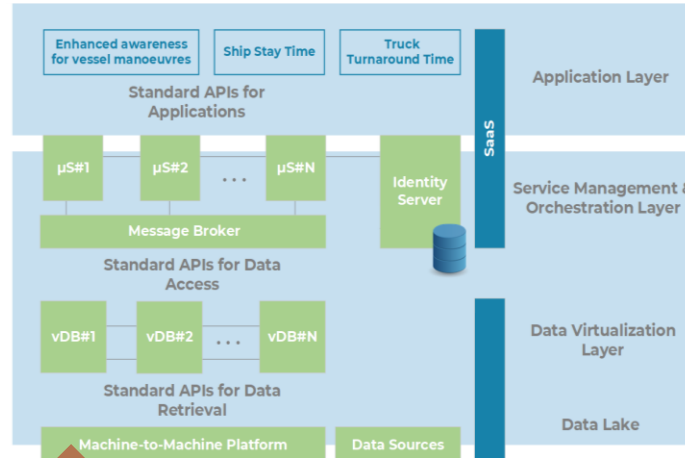
IaaS



### Connectivity Infrastructure

+ 3rd parties  
(AdSP, CGCP)

### Devices & On-Field Equipment



INTERNET



VPN and firewall for external access  
(authentication based on RSA keys).

SaaS

PaaS

### Software Resources

- VMware/Proxmox hypervisors,
- Set of distributed VMs, organized in cloud tenants
- Docker Swarm, Kubernetes (Docker containers orchestration),
- Full virtualization of the data plane,
- Blockchains,

### Wired Connectivity:

- Fiber Optics backbone (port, AdSP)
- TIM GBE (lab, CNIT)

### Wireless Connectivity:

- private 5G network (TIM/Ericsson),
- P2P 60 GHz, LoRA (indoor),

### IoT Devices:

- Bathymetric probes,
- meteorological stations,
- meteo-marine stations,
- acoustic sensors,
- photonic/electronics radars,
- C-ITS equipment,
- HD cameras, Lidars
- Vessel ECDIS / AIS,
- GPS trackers.

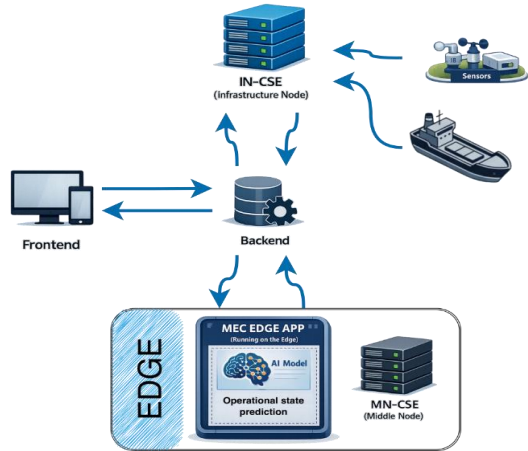
### Cybersecurity :

- Resilience and Business Continuity,
- Cyber-security processes (anomaly detection),
- SECOM framework

### IoT Connectivity:

- WiFi, C-V2X, G5, 5G,
- 4G/NB-IoT (TIM commercial), SAT-Com .





MEC and OneM2M



Coastal Surveillance



Autonomous Vessel



Freight tracking and monitoring



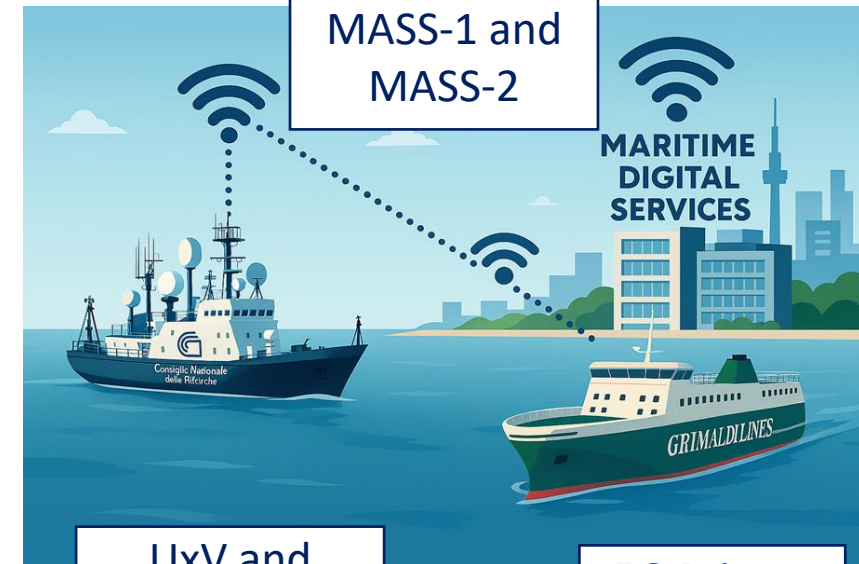
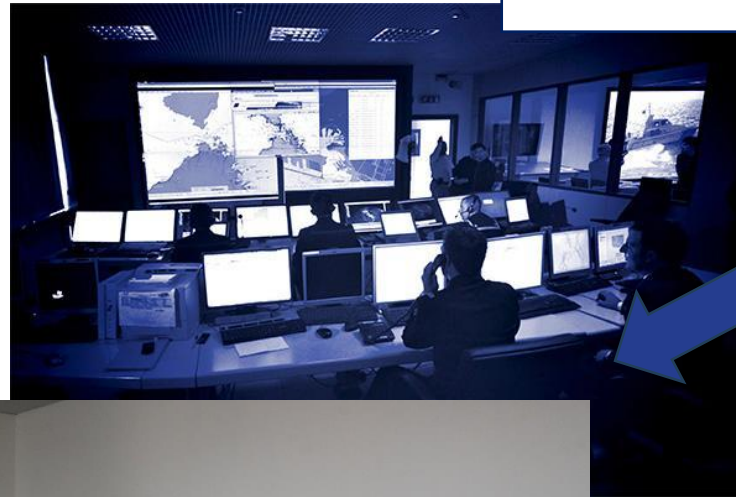
PCS and logistics

# cnit Italian MASS & e-Navigation testing platform (27/28)



drone and counter-drone  
enhanced radar system

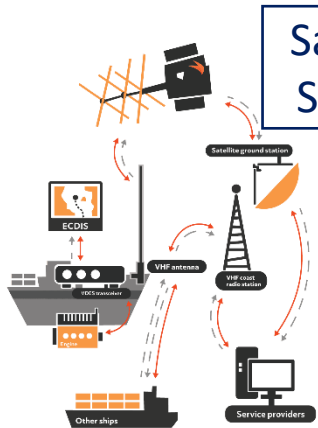
VTS



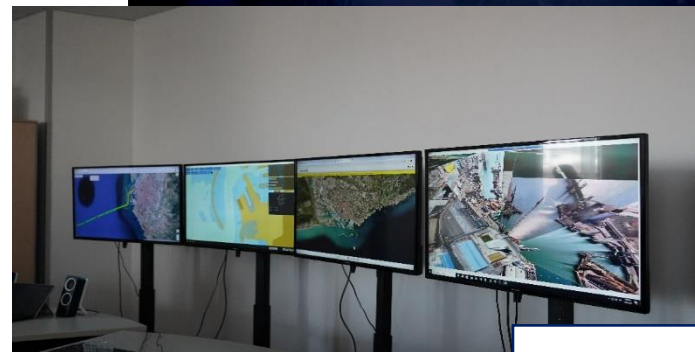
UxV and  
pilot/patrol  
boats

5G Private  
Network

SatCOM  
SatNAV

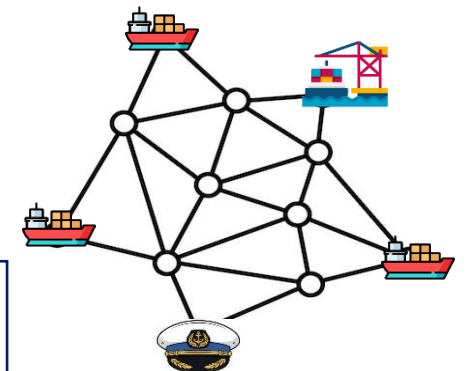


VDES



ROC

Cyber-secure digital  
infrastructure



- CNIT Laboratory @ Port of Livorno:
  - has enabled a digital infrastructure capable of validating innovative services targeted to port communities;
  - has an unquestionable recognition in the international domain;
  - has a solid background in the e-Navigation, e-Freight, Mobility and Sustainable Growth verticals;
  - is involved in high-valued R&D for Maritime Security of Critical Maritime Infrastructures, and Autonomous Vessels.



<https://www.youtube.com/watch?v=xkd94o6aR18>