

# Port of the Future

IoT and 5G to enhance Port Community System capabilities: the experience in Livorno

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**cnit**

*consorzio nazionale  
interuniversitario  
per le telecomunicazioni*



Porti di Livorno, Piombino,  
Capraia Isola, Portoferraio,  
Rio Marina, Cavo

# Short presentation of CNIT and Livorno joint lab

# CNIT: a snapshot

- 43 research units (37 universities+ 6 institutes of CNR)
- 5 National Laboratories + **Joint Lab with Port Network Authority of Northern Tyrrhenian Sea**
- 1300 people from partner universities
- 100 own employees
- Funding from private companies and competitive programs:
  - H2020: 41 projects, 10 of them coordinated by CNIT
  - Active projects 2018: 121



# Port of Livorno



- Mid-size historical port:
  - passengers and freight;
  - multipurpose (containers, break/dry/liquid bulk);
  - freight village, car stocking (25,000 cars capacity);
  - along TEN-T SCANMED corridor (core node);
  - door of Tuscany;
  - minor ports (Piombino, Elba) under the same organization.



View



# About us



July 2016

Most innovative Public Body



June 2017

Port and 5G



Swedish Ministry of Post & Telco 2018 ed 31 countries, 113 invited delegates

June 2018



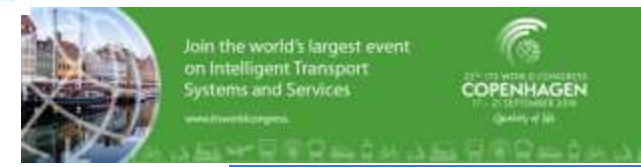
November 2016

EU Connected Vehicle



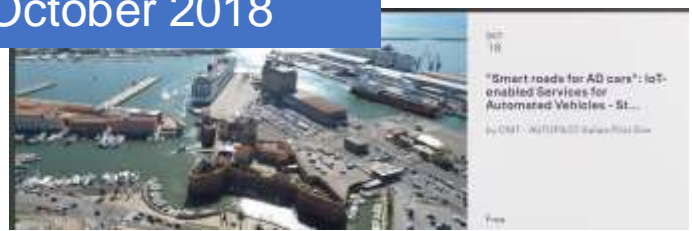
July 2017

Port of the Future



September 2018

October 2018



Autonomous Driving

March 2019



First C-ITS Port in EU

October 2019



October 2019



5G and IoT for the Port of the Future

# Main Objectives of CNIT & AdSP cooperation

- Started in 2013 aimed at:
  - Adopting a standardized cloud architecture for the ICT services offered to the port communities and assist the authority in the migration process of legacy systems, avoiding discontinuities;
  - Assisting the authority in the continuous process of gathering application-layer requirements from the final users guaranteeing the compliance with the standard architecture;
  - Integrating added-value services as ICT prototypes, exploiting the results obtained by EU projects, then assist the Authority in releasing the final user services by interacting with the industrial providers selected by tenders;
  - Extending the scope of the services provided by the Port Authority to the landside (i.e. Livorno city and the logistic corridor) and through the sea.

# 5G and IoT for Sea Ports

# Port Community Systems and 5G

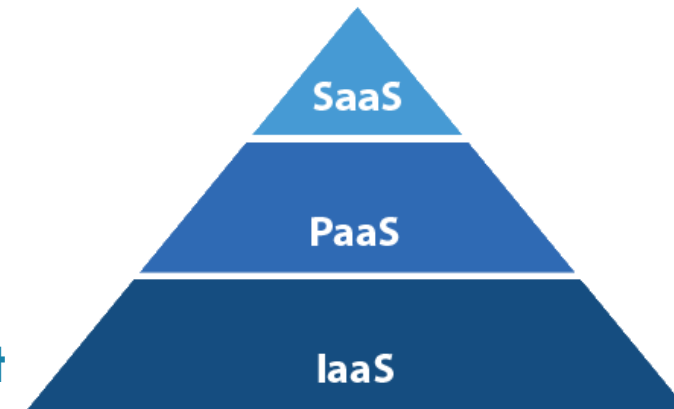


- The Port Authority of the Northern Tyrrhenian Sea in collaboration with CNIT is conducting a deep digital revolution that is already transforming port industrial activities;
- What kind of services is 5G enabling and how are they related to PCS?

Provide services

Provide platforms

Connects the port





# 5G requirements mapped to ports



Touristic crowds  
Assistance to people with disabilities  
Emergency procedures



Port (landside and sea) massive sensorization  
Vessel (and cargo) sensorization



RT Port View  
RT Vessel View (bathymetric data)  
RT Machinery status  
RT Assisted docking

- Actual 5G Targets: 1 M devices / km<sup>2</sup>, Peak data rates > 10 Gbps, 1 ms E2E latency, Ultra reliability 99.999%, 34 Billion connected devices by 2024, Battery life for low power devices – 10 years

# 5G: We are connecting everything

- Data collection, indexing and custodial for Machine-to-Machine (M2M) communications



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resourceType	4				
creationTime	2019-03-19 17:50:43+01:00				
resourceID	Syz2TRcAv4				
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Photonic radars



Bathymetric probe



Video streams



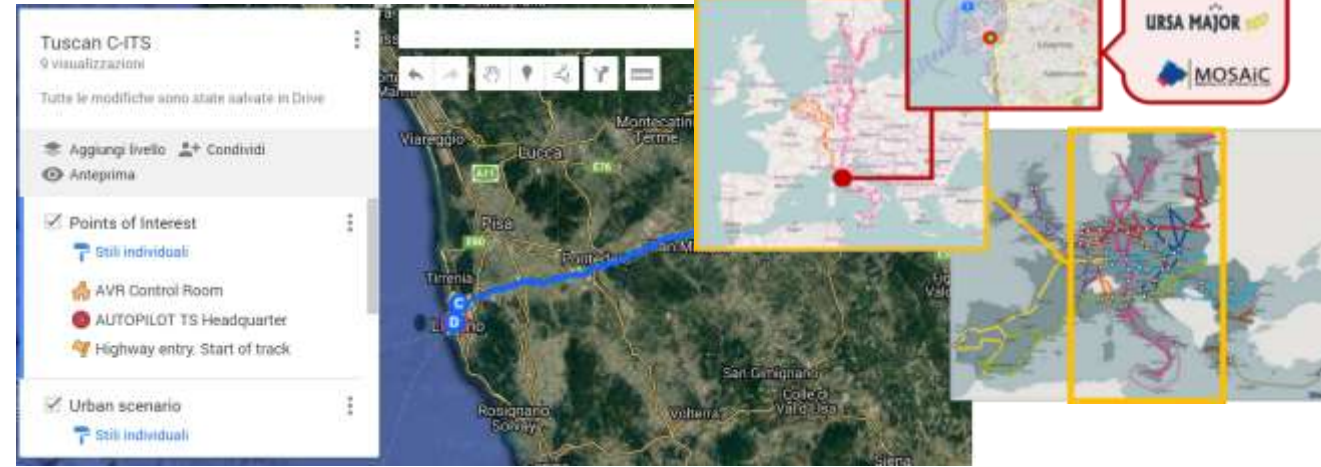
Meteo stations



Autonomous/connected vehicles

# 5G verticals: CAM

- What is it?
  - Port of Livorno, Livorno – Florence highway;
  - Outreaching the TEN-T.
- Running (prototype) services:
  - It implements some Day 1 and Day 1.5 C-ITS services;
  - It supports IoT assisted autonomous driving.



- When has it been set-up?
  - Starting from ETSI Plugtests 2016 experiments.
- Evolution:
  - towards 5G (CNIT prototype RSU/OBU);
  - logistics applications:
    - export of «Made in Italy»;
    - Truck Appointment System.

# 5G verticals: Freight Management

- Lack of a Break Bulk Management System is a common issue to many Freight Terminals;
- Cargo management for the unloading phase (from the truck) and the loading phase (on the ship);
- A management tool able to optimize all the operations that are currently carried out manually by:
  - Quay Operator
  - Docks Operator
  - Ship Captain
  - Forklift Driver



# 5G verticals: Connected Vessel

- Continuous update of bathymetric data, proper sea bed modeling accessed via GIS platform;
- Real-time support for navigation (especially for maneuvering);
- Integration of terrestrial and satellite components for container tracking and remote control in ports and in deep sea sailing;
- Valuable data sets: e.g. HD cameras, meteo stations, HR coherent radars.



# 5G impact for Livorno (Port-City ecosystem)

- FEEM, Ericsson, TIM, CNIT, Livorno Port Authority:
  - to evaluate 5G benefits against UN SDGs;
  - presented at Columbia University (Global Solutions Forum) in the context of the Climate Week 2019 (see [Press Release](#)) in NYC



- Impacted SDGs:

- #8: Competitiveness and more safety for workers;
- #11: Sustainable growth for the port-city;
- #12: Responsible business in logistics;
- #13: Estimated environmental 8,2% CO<sub>2</sub> saving per year (roughly equal to 150,000 kg of CO<sub>2</sub>), to be validated through field measurements

**8** DECENT WORK AND ECONOMIC GROWTH



**11** SUSTAINABLE CITIES AND COMMUNITIES



**12** RESPONSIBLE CONSUMPTION AND PRODUCTION



**13** CLIMATE ACTION



# Thank You!



Courtesy of:



Courtesy of:



Courtesy of:



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