

# Looking at the 2016 ITS Plugtests in Livorno from the "impact" perspective

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# Outline

- CNIT organization, mission of the Research Unit at the Livorno Port Authority;
- The Port of the Future:
  - sensing and telecommunications;
  - digital platforms;
  - applications and services for the port communities.
- The Plugtest initiative:
  - the industrial alliance of local organizers;
  - testbed description and network infrastructure;
  - added-value service prototypes;
  - impact for the territory.

# About CNIT

# cnit organization



## Figures about CNIT:

**37 universities**

**1400 faculties**

**50+ employees**

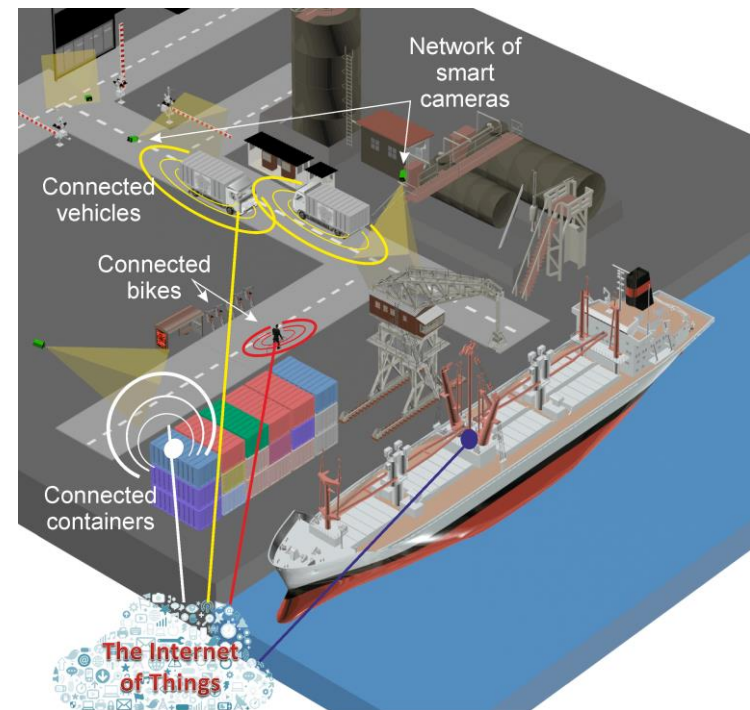
**100+ temp staff**

**3 Nat'l Labs**

**owns satellite network**

# A special lab is...

- “Joint Laboratory of Advanced Sensing Networks & Communication in Sea Ports”, a.k.a. **"Innovation Service Center"**
  - to provide a continuous and effective presence of CNIT researchers at the Port in order to support the design and implementation of the ICT technical agenda;
  - to provide an accessible and ready testing and experimentation ambient to Italian and European partners:
    - either industries...
    - either the academia.
  - guarantee an outstanding level of education and training for the (forthcoming) port operators;
- ... considering IoT and ITS for large scale infrastructures;
- technological transfer in the maritime and logistics domains;
- located in a sea port of Livorno in the North Tyrrhenian.





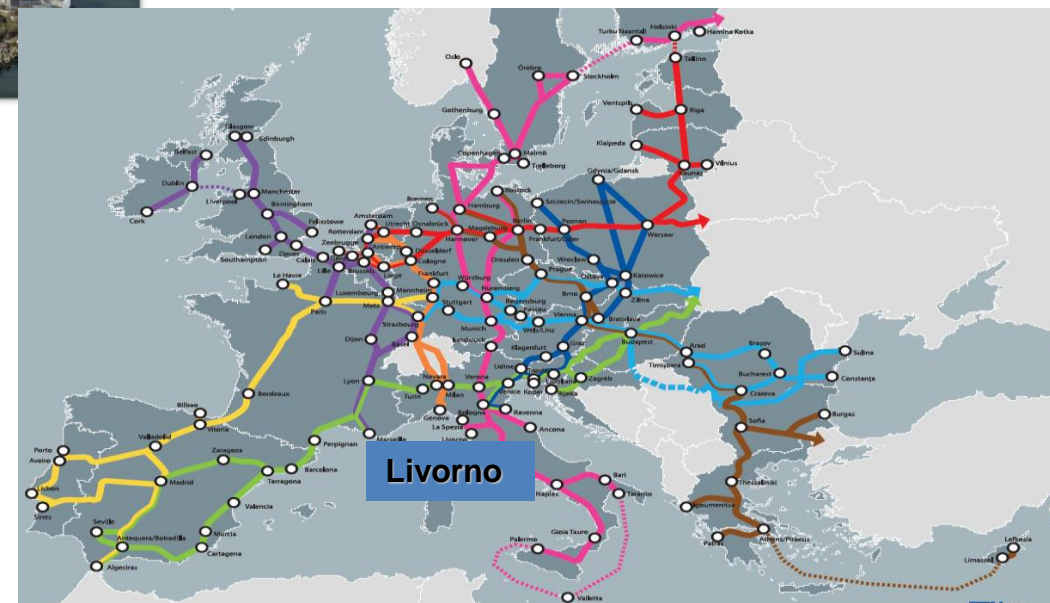
# Sea Ports in the ICT innovation framework



- Sea ports are genuine intermodal points located at the edge of Trans-European corridors;
- Sea ports are smart spaces, natural testbeds, IoT playgrounds, focal point of several industrial and institutional communities.



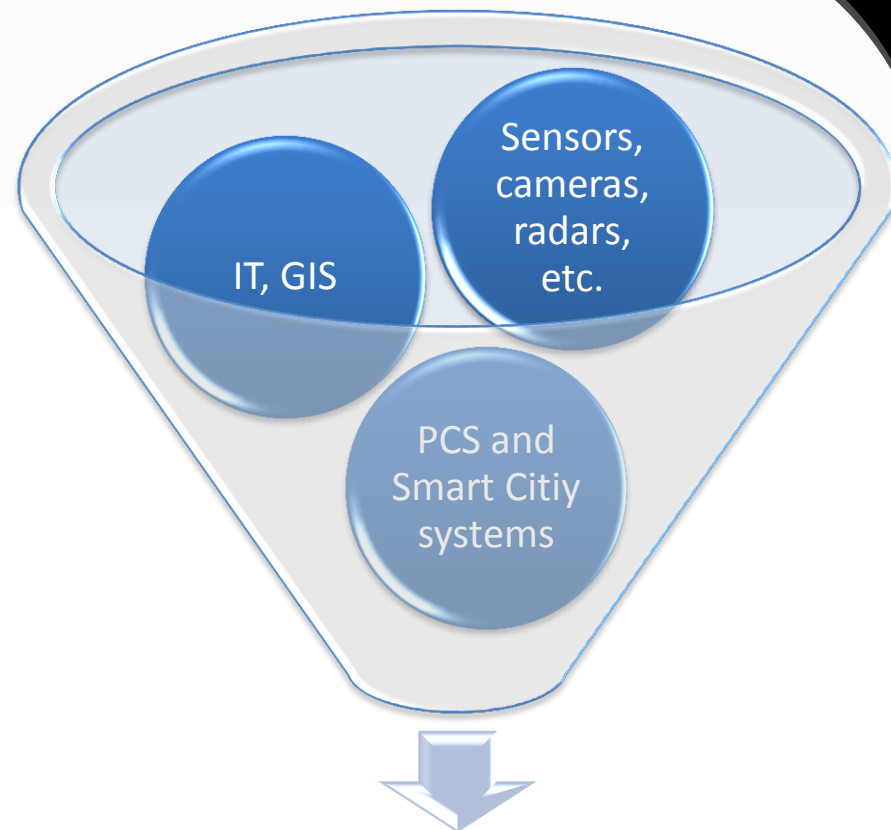
Livorno Port Authority



# Digital sea ports

# A digital Sea Port is...

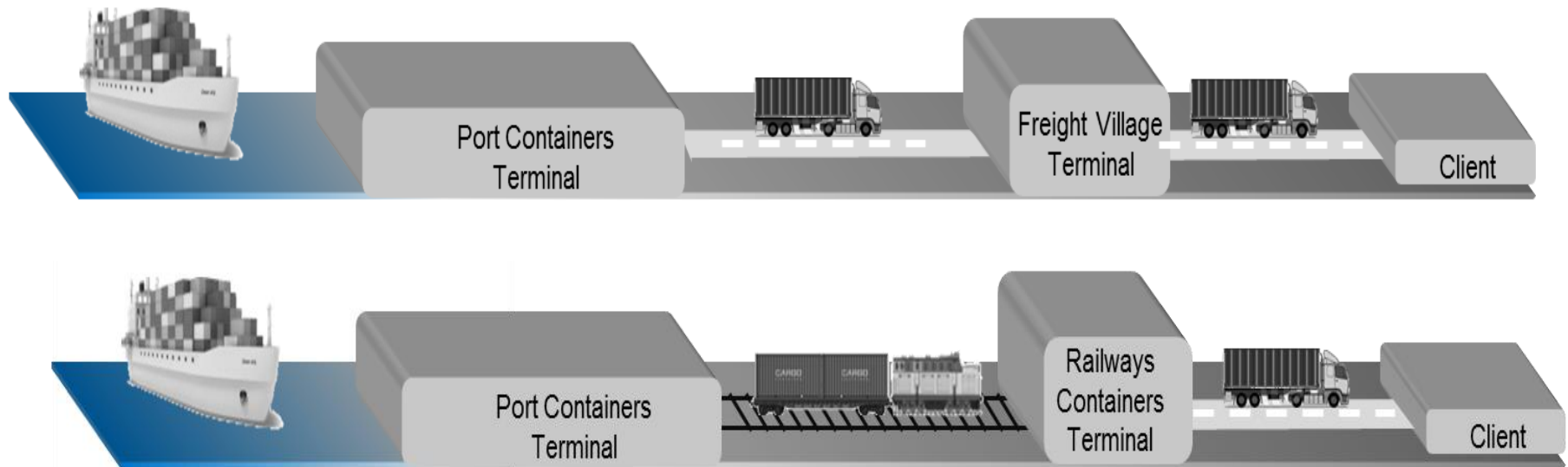
- Fully connected in itself:
  - relying on a broadband backbone.
- Pervasively monitored:
  - considering a suited set of monitoring devices.
- Centrally controlled:
  - featuring a Service and Control Room (H2M and M2M enabled).
- Fully Intermodal:
  - integrated in a geographically distributed (intermodal) Logistic & Transport network (at national and trans-national levels).





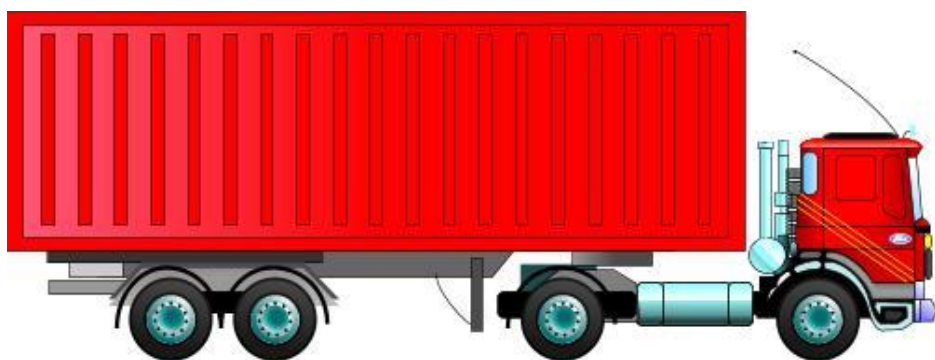
# Efficiency in docks operations

- Handling containers and/or route heavy trucks disembarking from ships:
  - are the key process that must be optimized at the docks.
- Via an effective integration of processes in the dedicated information systems:
  - we will reduce the «Transit Time» of goods and persons in the seaport enhancing the effectiveness and competitiveness in the supply chain.



# Safety in the working areas

- Vehicles in ports (trucks, reach stackers, cranes, etc.):
  - carry (dangerous) freight;
  - move containers.
- Share the same space with workers (and sometimes visitors, passengers);
- We will implement secure message exchange among devices:
  - in containers, vehicles, and personal equipment
- To allow for safety-aware processes in docks and terminals.



# Centralized Control

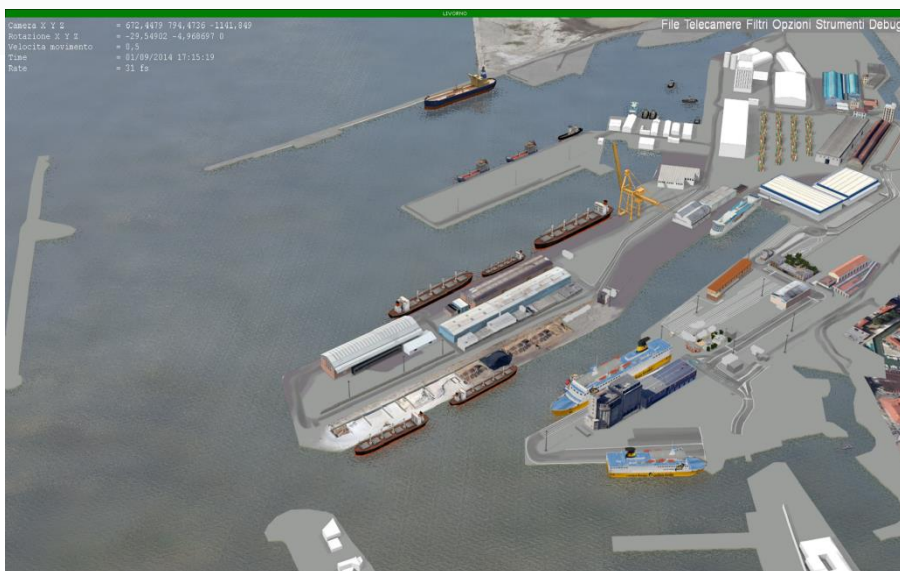
- Monitoring of sensing, operations, and events:
  - in real-time
  - allowing for On-Line Analytical Processing
  - allowing for off-line studies and knowledge extraction (data mining)
- Assessing the risk level:
  - per zone, per vehicle, per worker



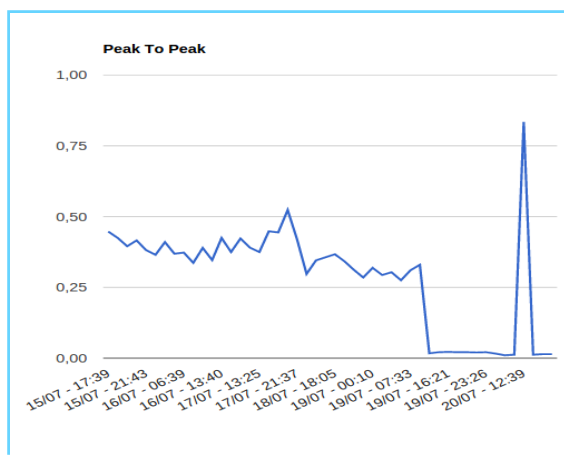
- Improving on efficiency:
  - getting rid of impediments generating congestion;
  - avoiding deadlocks, starvation in the workflow.



# Services atop digital platforms



- Pervasive monitoring and control:
  - in real-time and off-line
- I/E Processes
  - workflow management
  - event generation
  - open to communities
- Presented in:
  - [Intelligent Transport System: from good practices to standards, edited by Paolo Pagano, CRC Press, 2016](#)



# We think that...

- In large scale infrastructures digital services rely on the interaction among field equipment (sensors), networks and information appliances (servers and repositories).
- Although proprietary (vertical) systems can effectively respond to the requirements set by the community:
  - they will rapidly get old;
  - they need dedicated maintenance;
  - they are not interoperable with other systems.
- Therefore open and standard technologies can boost innovation:
  - adoption of standards are beneficial in the long term for the industrial sector.



# The ITS initiatives



# ITS Plugtest 2016

- This Plugtest is a lighthouse project which allows for more follow-up projects:
  - First outdoor ITS Plugtest (Nov 7 - 17)
  - Port and Tuscan motorways / highways
  - Institutions and Industries collaborating together
  - IoT in ITS showcase
  - Port Innovation Conference 2016

ERTICO ITS EUROPE

ETSI

AVR

Plugtests Headquarter

TIM

工業技術研究院 Industrial Technology Research Institute

LEGHORN.ORG

REGIONE TOSCANA

Autorità Portuale di Livorno

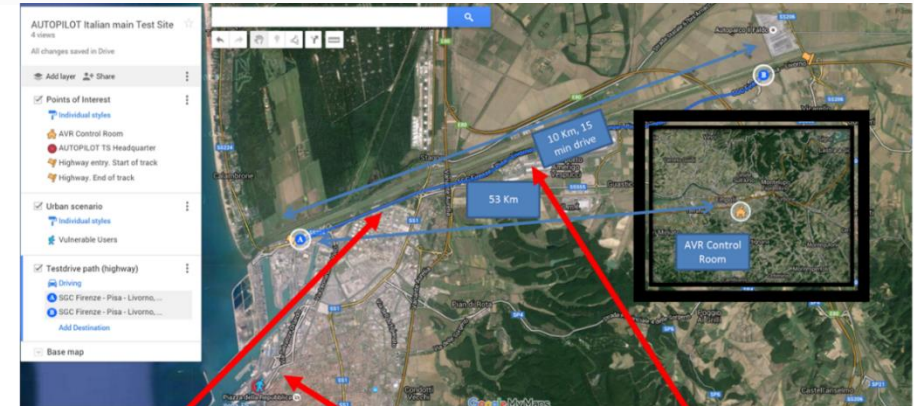
DATA CH TECHNOLOGIES

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# H2020 LSPs



- ERTICO project on Autonomous Driving (GA preparation)
  - 39 partners
  - 25 MEuros total costs
  - 6 Italian partners, P.P. Italian Test Site Coordinator
- The highway segment (100 km with 2 lanes in each direction) will feature:
  - ETSI ITS-G5 compliant in-vehicle system with information from road infrastructure
  - Cellular 3G/4G and LTE-V2X
  - A pervasive IoT sensing network
  - Traffic management centre (AVR control room)



Hazard Warning



Vulnerable Users



TCC Assisted AD



# Press Releases



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Take a look at the #ITSWC16 Programme [bit.ly/2c2loXu](http://bit.ly/2c2loXu) #realITS @ITS\_AUSTRALIA

### ITS Europe

## PRESS RELEASE: The first European live trial for Intelligent Transport Systems

September 21, 2016 • Add Comment

*Testing event in Livorno to show convergence between IoT and ITS*

<http://erticonetwork.com/press-release-first-european-live-trial-intelligent-transport-systems/>



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di Maurizio Bogni



Lo leggo dopo 20 settembre 2016



Se un pedone cammina pericolosamente a bordo superstrada, i sensori lo comunicano all'auto che rallenta automaticamente. Se la vettura

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21 September 2016



## ETSI launches first European live trial for intelligent transport systems

First published on [www.ITSInternational.com](http://www.ITSInternational.com)

# Setting the testbed up



# Plugtests from another perspective

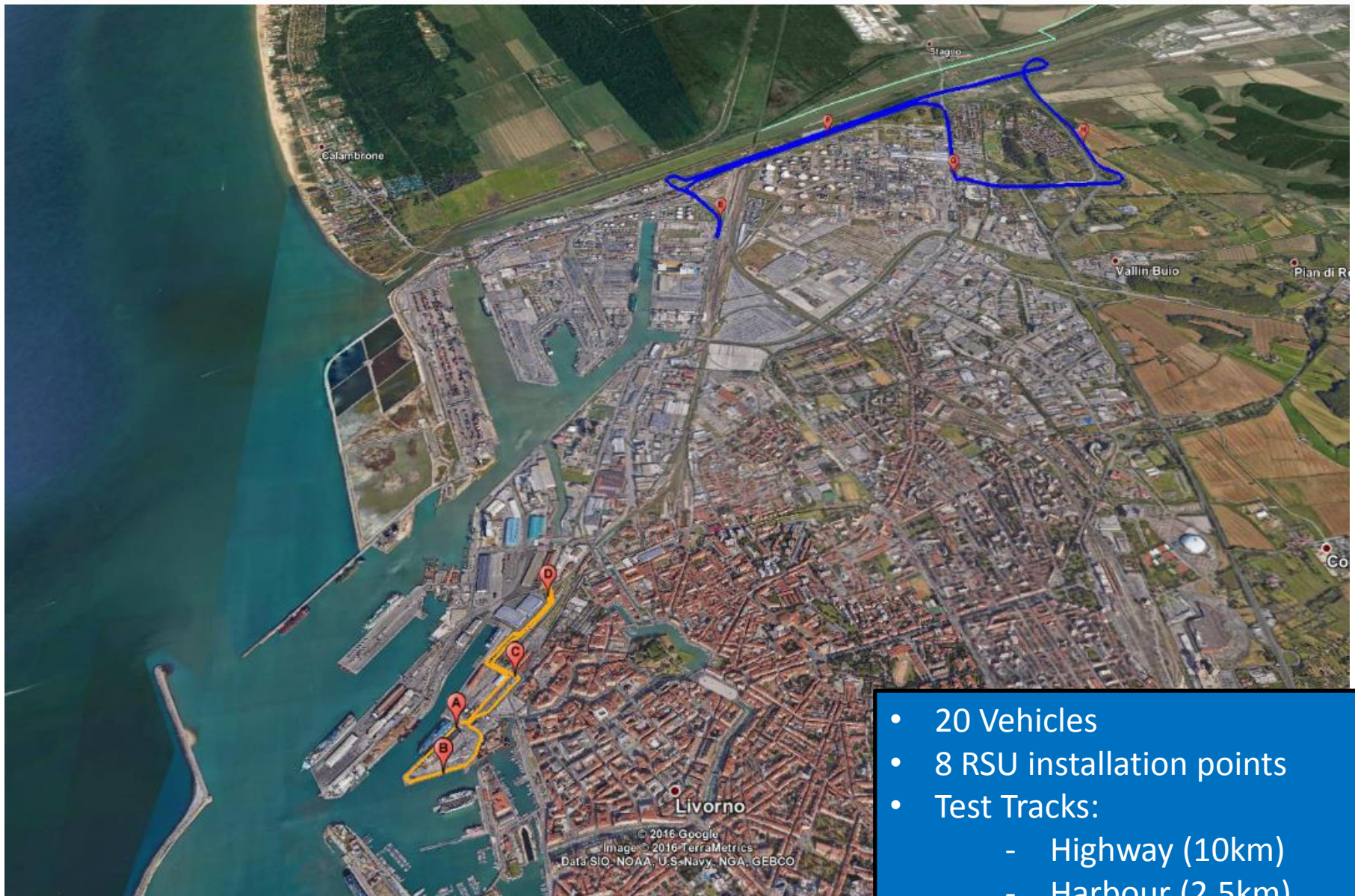
organizers

system integrators

The central map displays a route with several key locations marked: 'Freight Village', 'Tolling station', 'AVR Control Room', '6 Km, 10 min drive', and '53 Km, 35 min drive'. The map interface includes a search bar, navigation controls, and a list of 'Points of Interest' such as 'AVR Control Room', 'Plugtests Headquarter', 'Freight Villages', 'Tolling Stations', and 'Plugtests Radio Conformer...'. The map is surrounded by logos of various organizations categorized into four groups:

- organizers:** ERTICO ITS EUROPE, ETSI
- system integrators:** DATA CH TECHNOLOGIES, OBA LAB
- transport sector companies:** autostrade//Tech
- telco & services:** TIM
- tech. providers:** CNIT lab, LEGHORN .ORG, cmùt (consorzio nazionale interuniversitario per le telecomunicazioni)
- hosts:** REGIONE TOSCANA, Autorità Portuale di Livorno

# Testbed at a glance



- 20 Vehicles
- 8 RSU installation points
- Test Tracks:
  - Highway (10km)
  - Harbour (2.5km)



# Harbour Test Track



- TDMA / SDMA schedule
  - per Use Case
  - per user



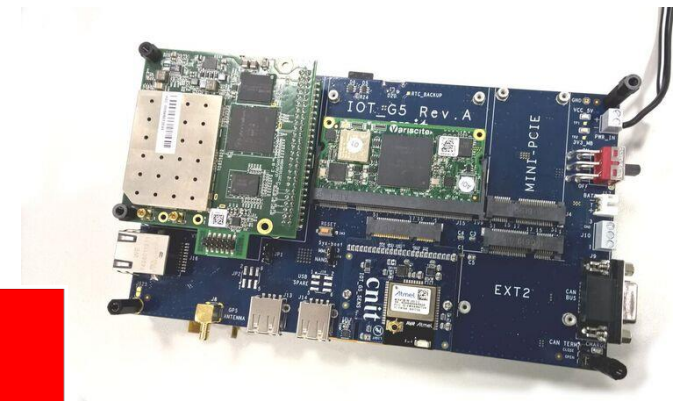
# Highway Test Track



- Connecting
  - roadside
  - traffic control center in Empoli (50 Km away)
  - information service control room in Florence (100 Km away)

# Using the testbed

- CNIT itself is a plugtester;
- CNIT publishes data on the port platform (MoniCA) in real-time;
- A new board (IoT/G5) comes from a joint venture between CNIT and the Industrial Technology Research Institute in Taiwan (ITRI).



**MONI.C.A.**  
seaport sensitive playground

[www.monicapmslivorno.eu](http://www.monicapmslivorno.eu)

# Impact for the territory / industries and institutions

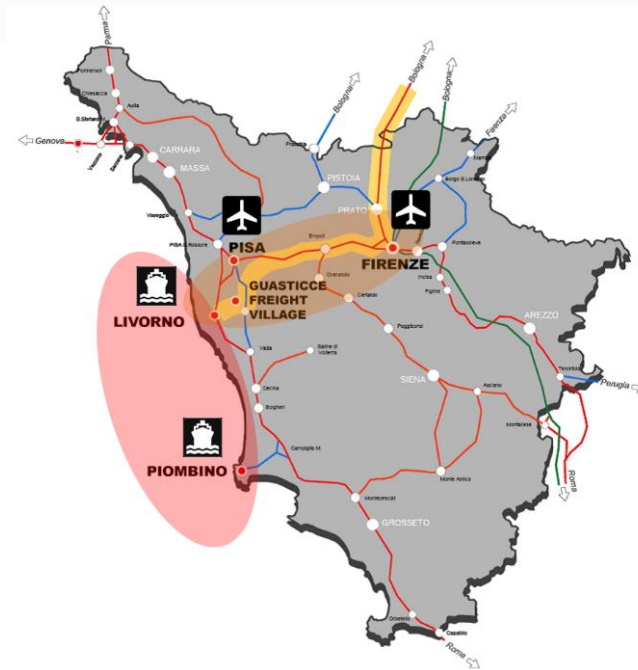
# Outcome of the Plugtests

- A large wireless (backhaul) network serving as an asset for the port communities (terminal operators, line operators, logistics operators, coast guard, customs, fiscal police, workers, general public);
- A virtual private network connecting port, highway, and motorway eligible to enable a set of comodal transportation services;
- A set of new way-side devices (like the IoT-G5 boards) connecting field components (i.e. RSUs, OBUs, IoT sensors) with digital platforms through the backhaul.
- A deep understanding of where the frontier is in digital technologies and (new) processes.



# The Tuscan platform for transport

- An effective integration of transport modes:
  - to improve on competitiveness along the logistics chain;
  - within the regional strategic process of combining the two main ports (Livorno and Piombino) and the two regional airports (Pisa and Firenze) under single corporations.



- Adopting a "system perspective" to connect Points of Interest:
  - use of international standards and best practices available at the EU scope:
    - for technologies, architectures, processes



# Impact for the territory

- Synchro-modality:
  - ability for a shipper to choose between a range of transport modes at any given time, a choice made on the basis of cost and environmental efficiency;
  - the shippers will select the best choice upon a set of competing carriers and competing logistics providers.
- The adoption of a synchro-modal model:
  - need of a “corridor-wide” integrated approach;
  - need of a “real-time” snapshot about where the goods are, what do they need for being loaded/discharged/routed, what resources are available at the time.



- The Tuscan transport platform is a powerful enabler:
  - of synchro-modal logistic services
- Opening a new market:
  - for innovative companies
  - and paving the ground for "Transport Industry 4.0"

# Impact for CNIT, ETSI, and ERTICO

- CNIT relies on a permanent testbed for IoT and ITS experimentation;
- ETSI relies on a realistic testbed to validate the communication protocols released for the ITS and IoT domains (following the mandate got from the EC);
- ERTICO considers this testbed at the same extent as the others (France, Netherlands, Spain, Finland).



# Conclusions

- The 2016 ITS Plugtests in Livorno are:
  - an offer of excellence from Tuscany for Europe;
  - an industrial event of international relevance;
  - a focal point for prominent industrial technologies in Europe;
  - an experiment of industrial cooperation, open to Europe;
  - a powerful driver for ICT innovation in the territory (port and highway);
  - a possible way for discussion about technological innovation in integrated transportation (Sea Port Innovation Conference 2016).