MERIDIAN

Multimodal activities workshop

"Status of the pilot implementation in the port of Ravenna: the trucks monitoring system"

Munich - 04th June 2025

Port of Ravenna

Total Area: 21 sq. km

Port canals length: 14,0 km

Current max depth: -11,5 mt

Forecast max depth: -14,5 mt *(Ravenna Port Hub infrastr. works– Ph. II)*

Operational quays : 14,5 km

KEY FIGURES

Private port terminals: n. 27

Yards: 1,414,348 sq.m

Warehouses: 845,542 sq.m

Silos 313,600 cum

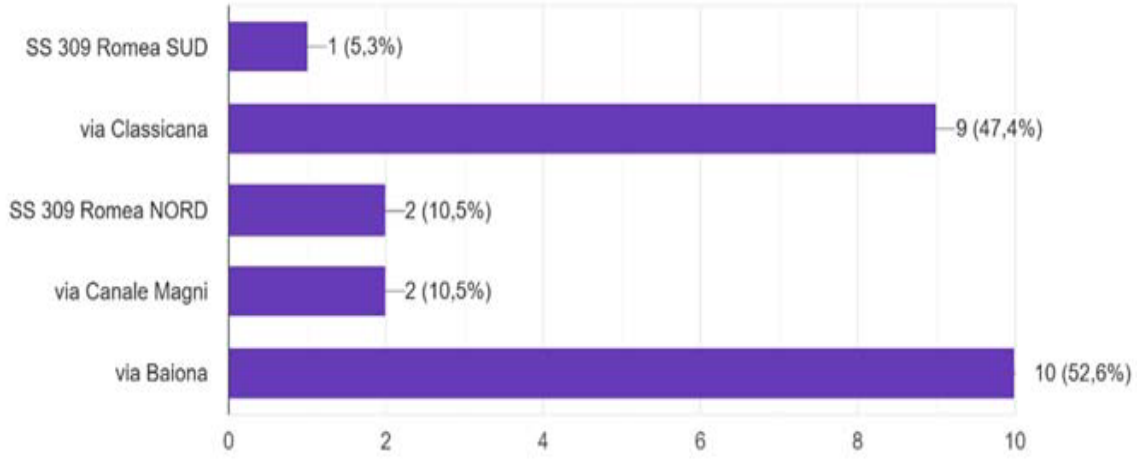
Storage tanks: n. 372 - 1,017,960 cum

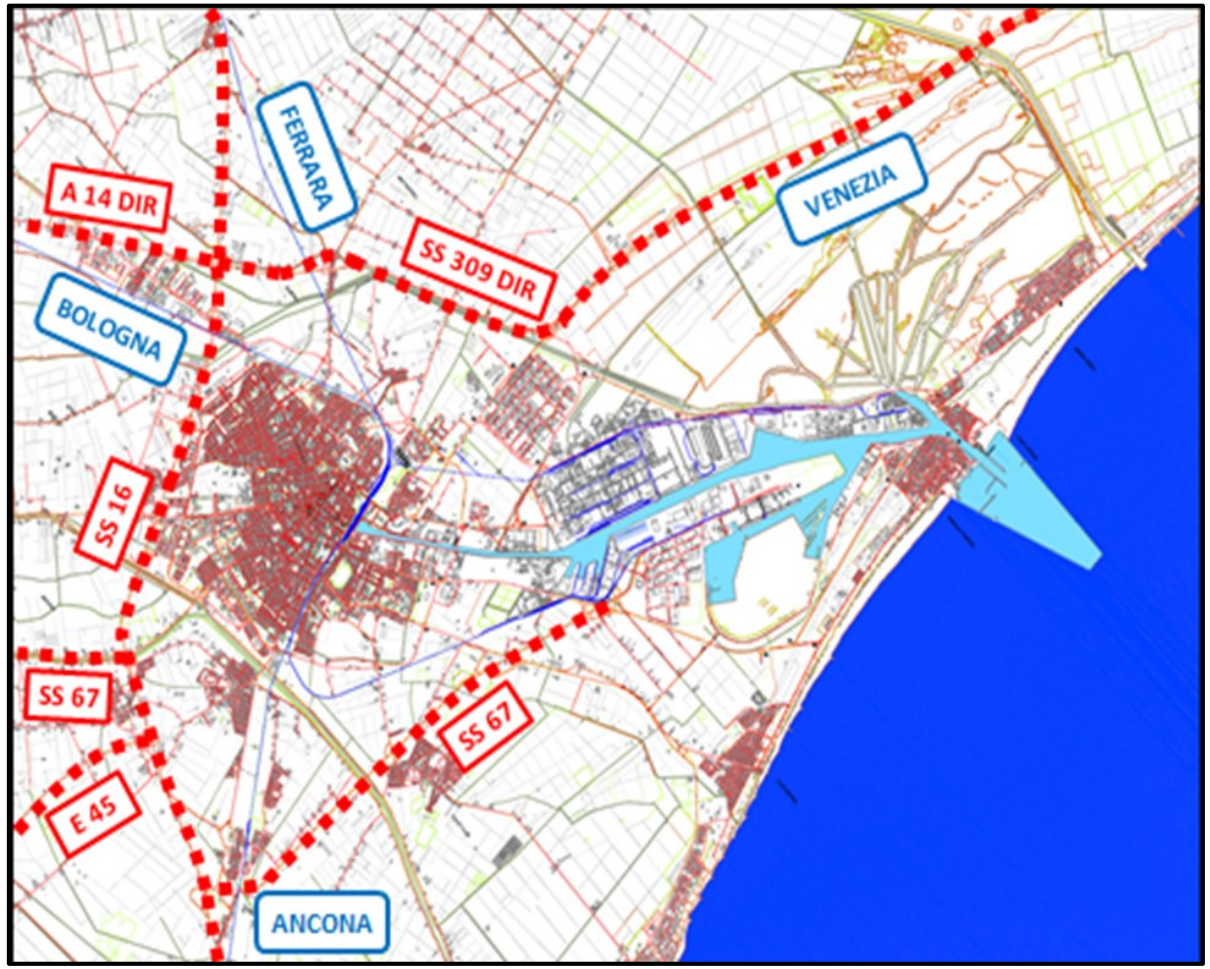
KEY FIGURES

- The only port in the **Emilia-Romagna Region**
- **multipurpose port** and an **intermodal platform**
- **leading** for its trade with **Northern Italy** and **Central Europe**, **Eastern Mediterranean and Black Sea, Middle and Far East**
- "**Core Ports**" of the **TEN-T Networks**, and part of both the ***Baltic-Adriatic Corridor*** and the ***Mediterranean Corridor***
- total handling in 2024 of ***25.6 million tonnes (50,5 Bln Euros)***
- ***201.766 TEUs***
- ***70.458 trailers***
- ***7.750 trains (3,5 Mln tons – 13,9% of total traffic)***
- ***2,544 port calls***

MAIN ROAD CONNECTIONS

Total truck trips (2024 estimation): 1.742.690
Emissions: 2.036 CO2 tons





GENERAL OBJECTIVES

- Anticipate/concentrate some security, customs and logistics checks with respect to the terminal operators' gates.
- Standardize the procedures for the delivery/collection of goods by making relations with the road haulage companies, terminals, administrations.
- Monitor vehicular traffic in the port area in order to manage any situations of congestion or emergency.
- To have useful information to support the decision-making processes of the Port Network Authority, the Administration and individual operators.

PORT VIRTUAL GATES PROJECT

Creation of virtual port gates for the acquisition of data relating to vehicular traffic in the port area and the activation of vehicle booking system and traffic monitoring systems.

In perspective, the virtual gates will be able to use the traffic data to calculate the selected KPIs, periodically, when needed.

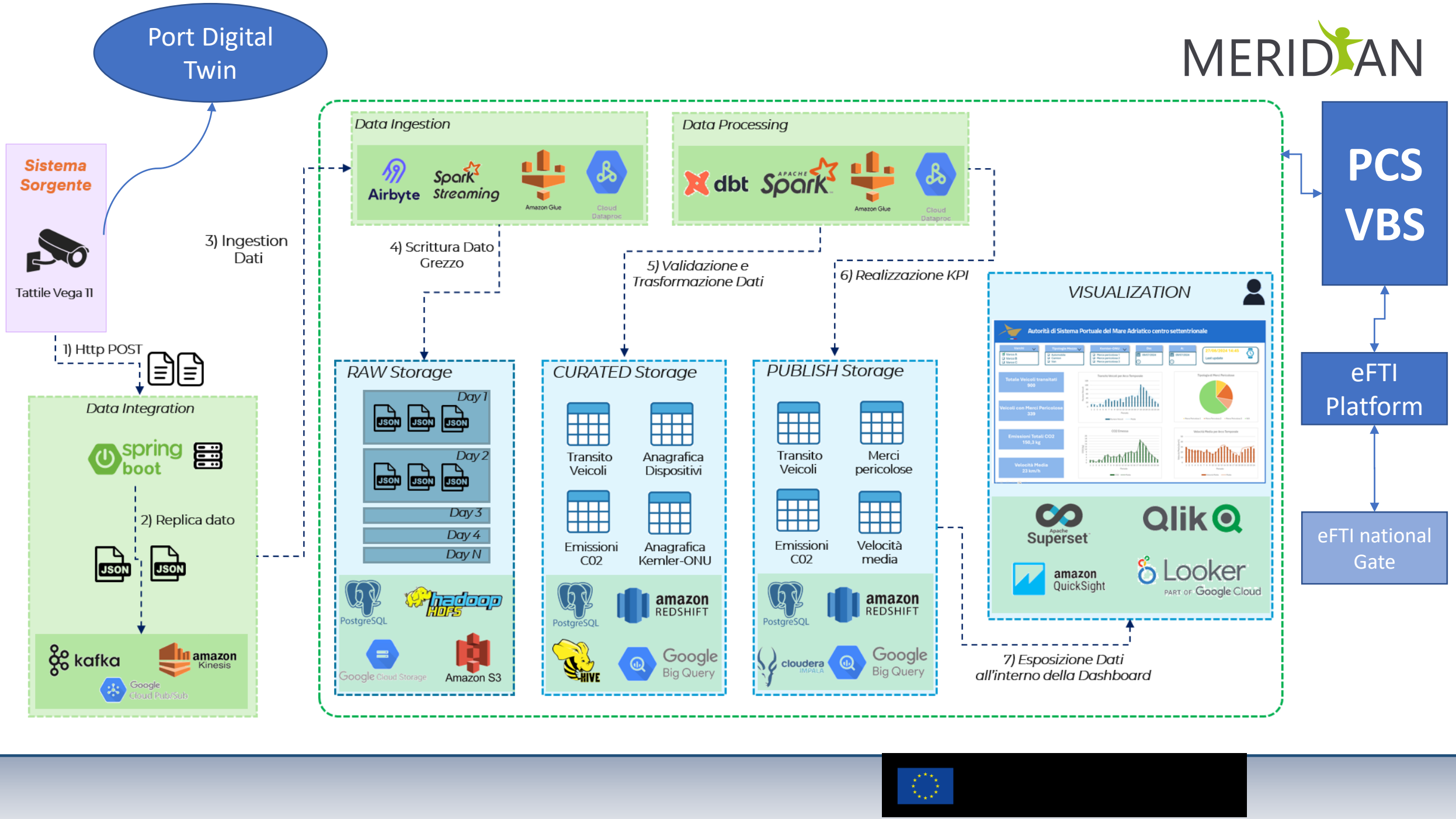
7 virtual gates (9 couples of cameras)
Connected by 5G Mobile Network
Powered by photovoltaic panel with storage battery
Functionalities: identification, classification and tracking of vehicles

PORT VIRTUAL GATES PROJECT

The gates will be connected through the Port Data Platform to the Vehicles Booking System under development in MILEPORT Project and to the Port Community System.

The data will be shared with the Municipality for the traffic magement and road maintenance.

Future connection to the eFTI National Gate through an ad-hoc eFTI platform


Port Digital Twin
MERIDIAN
Sistema Sorgente
Tattile Vega 11
1) Http POST
3) Ingestion Dati
Data Integration
spring boot
2) Replica dato
JSON
JSON
kafka
amazon Kinesis
Google Cloud Pub/Sub
Data Ingestion
Airbyte
Spark Streaming
Amazon Glue
Cloud Dataproc
4) Scrittura Dato Grezzo
Data Processing
dbt
APACHE Spark
Amazon Glue
Cloud Dataproc
5) Validazione e Trasformazione Dati
6) Realizzazione KPI
RAW Storage
Day 1
Day 2
Day 3
Day 4
Day N
PostgreSQL
hadoop HDFS
Google Cloud Storage
Amazon S3
CURATED Storage
Transito Veicoli
Anagrafica Dispositivi
Emissioni C02
Anagrafica Kemler-ONU
PostgreSQL
amazon REDSHIFT
HIVE
Google Big Query
PUBLISH Storage
Transito Veicoli
Merci pericolose
Emissioni C02
Velocità media
PostgreSQL
amazon REDSHIFT
cloudera IMPALA
Google Big Query
VISUALIZATION
Autorità di Sistema Portuale del Mare Adriatico centro settentrionale
Apache Superset
Qlik
amazon QuickSight
Looker PART OF Google Cloud
7) Esposizione Dati all'interno della Dashboard
PCS VBS
eFTI Platform
eFTI national Gate

ENABLING TECHNOLOGIES

- **Video Analysis and Complex Event Detection integrated into the Physical Security system/capability**
- **Digital Identity and OCR (Optical Character Recognition) cameras for license plate recognition allow you to**:
  - Recognize the type of vehicles and the license plates at the Port Gate In
  - Recognize dangerous goods through Kemler codes
  - Track Vehicles That Gate Out
- **Data Platform** for the collection and historicization of events
- **Workflow Management** enables the possible execution of automatic tasks to manage the Import/Export process
- Hazard events/alarms shared in real time with third-party systems through **Integration** and **Messaging & Streaming** or to specific users through the **Notification System**
- Sending Gate In/Gate Out information to **PCS** and receiving that information from TOSs (**REST API** or **event based**)
- **Unique Control Tower** allows you to monitor arrivals and authorized and unauthorized vehicles

Identified KPI list

1. ITS Coverage
2. Traffic Flow Variance
3. Average Journey Time
4. Average Bottleneck Congestion
5. Maximum emission of polluting gases (CO_2) ver. A
6. Maximum emission of polluting gases (CO_2) ver. B

1. ITS coverage

Objective

This KPI is used to define the degree of implementation of the ITS system. Useful if used together with other KPIs to verify what is the correlation between the benefits and the adoption of the ITS system for a greater number of access roads to the port.

Description

Percentage of port access routes crossed by heavy vehicles covered by systems that provide predictive and real-time information on:

- Traffic flow;
- planned events: maintenance work, parking availability, road closures for scheduled events;
- unexpected events: road accidents, malfunctions at virtual gates, health emergencies, sudden congestion, weather conditions, obstacles on the road;

2. Traffic Flow Variance

Objective

The system should suggest arrival times that distribute the incoming truck traffic evenly throughout the day, thus avoiding bottlenecks and traffic jams.

This KPI aims to measure the reduction in traffic peaks following the introduction of ITS.

Description

Variation in the distribution of the truck traffic flow at the virtual gates in a specific time slot.

3. Average Journey Time

Objective

With the reduction in traffic, trucks will no longer have to wait in line for their turn to enter the terminals. Consequently, trucks will take less time to reach their destination.

Description

Average truck travel time from the virtual gates to the terminal in a specific time slot.

4. Average Bottleneck Congestion

Objective

In uncontrolled traffic conditions, during the day, there may be trucks that take a short time to reach their destination, while there will be others that find themselves immersed in traffic. By redistributing traffic evenly, the difference in time taken to reach their destination between one truck and another should be reduced.

Description

Variation in actual time taken by trucks to go from the virtual gates to the terminal compared to the ideal time in optimal traffic conditions, in a specific time slot.

5. Maximum emission of polluting gases (CO_2) ver. A
6. Maximum emission of polluting gases (CO_2) ver. B

Objective

By reducing traffic peaks, the number of trucks in the port area at the same time should be reduced.

This should lead to a reduction in the maximum concentration of polluting gases in the air.

Description

Maximum hourly emission of the polluting gases (CO_2) in the air calculated at times of traffic peaks.

6. Maximum emission of polluting gases (CO_2) ver. B

Objective

By reducing traffic peaks, the number of trucks in the port area at the same time should be reduced.

This should lead to a reduction in the maximum concentration of polluting gases in the air.

Description

Maximum hourly emission of the polluting gases (CO_2) in the air.

Thanks!

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Smart port & Security Dept.

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