# Session 6.3, Room Fez 2
## Stations / Capacity

Moderator : Mr. LIU Ziyuan
Associate Researcher, CARS, China

# Session 6.3
# Stations / Capacity
# Speaker Lists;

| 1 | 2 | 3 | 4 |
|---|---|---|---|
|  |  |  |  |
| Mr.Angel García De La Bandera | Mr.AHMET GEYIK | Mr.Ali Hassan Azizi | Mr.Lorenzo Vannacci |
| Spain | Turkey | Morocco | Italy |

UIC HIGHSPEED Morocco 2023

HIGH-SPEED RAIL : THE RIGHT SPEED FOR OUR PLANET

Under the High Patronage of his Majesty King Mohammed VI

11TH WORLD CONGRESS OF HIGH-SPEED RAIL

**Marrakech, 7-10 MARCH 2023**

# MANAGEMENT OF STATIONS IN OPEN MARKET CONTEXT

Angel GARCIA DE LA BANDERA
South Stations Deputy Director. ADIF. Spain
Session3-6.3 Stations / Capacity

ONCF UIC

## SPAIN RAILWAY AT PRESENT

Following the EU regulations, ADIF opened the network to comercial servicies competition in 2019 in a singular fremework agreements way.

Nowdays there are 3 RU competing.

renfe

iryo

ouigo

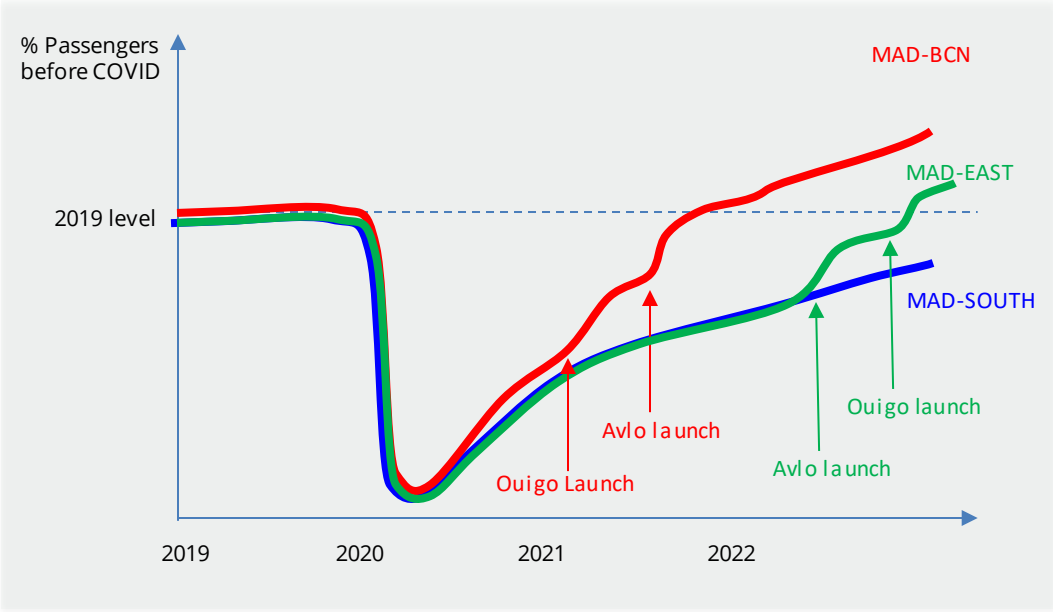
# CONSEQUENCES OF THE OPENING

## Acceleration of changes

- 3 RU, different products
- Falling ticket prices
- Lower canon prices

## Increse of rail use during next 10 years

- **60%** raise of **train capacity demand**
- **100%** raise of **passengers**





# OTHER CONSEQUENCES OF THE OPENING

## HS Stations, new bottlenecks

- Needs of infrastructure capacity
- Needs for passengers flows
- Needs for RU's servicies



## Transparency and equality requirements for RU's

- Capacity alocation
- Services provision models

# WHAT DO WE EXPECT FOR H.S. PASSENGER STATIONS?

## One place, three roles

- Mobility in open market
- Urban forum and service faclity center
- workplace

## Strategy

- Safe, sustenaible and connected mobility
- Fair play rules for RU's
- Maximum use of space
- Station, Gateway to the cities
- Stations, center of life

es.movilidad

# SERVICES TO RU's IN H.S. STATIONS

## Basic services

- Train stabling servicies on tracks with platform
- Access to buildings and platforms for passenger use
- Spaces for ticket sales and information
- Premises for workers
- "ADIF Acerca" PRM assitance

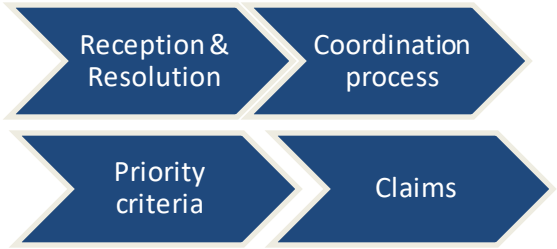
## Ancillary

- Space for attention services, last minute service point…
- Space for storing equipments
- Platform access control poin
- Premises to attend preferred clients
- Logistic to load and unload services on board
- "ADIF Acerca" PRM assistance to step on and off trains

## (OSF) Operator Service Facility

- Adif
- third parties (Enabled Companies)
- Self-provision, RU by their own

## Request to servicies



# PRACTICAL APLICATION 1: PRM ASSISTANCE

adif acerca

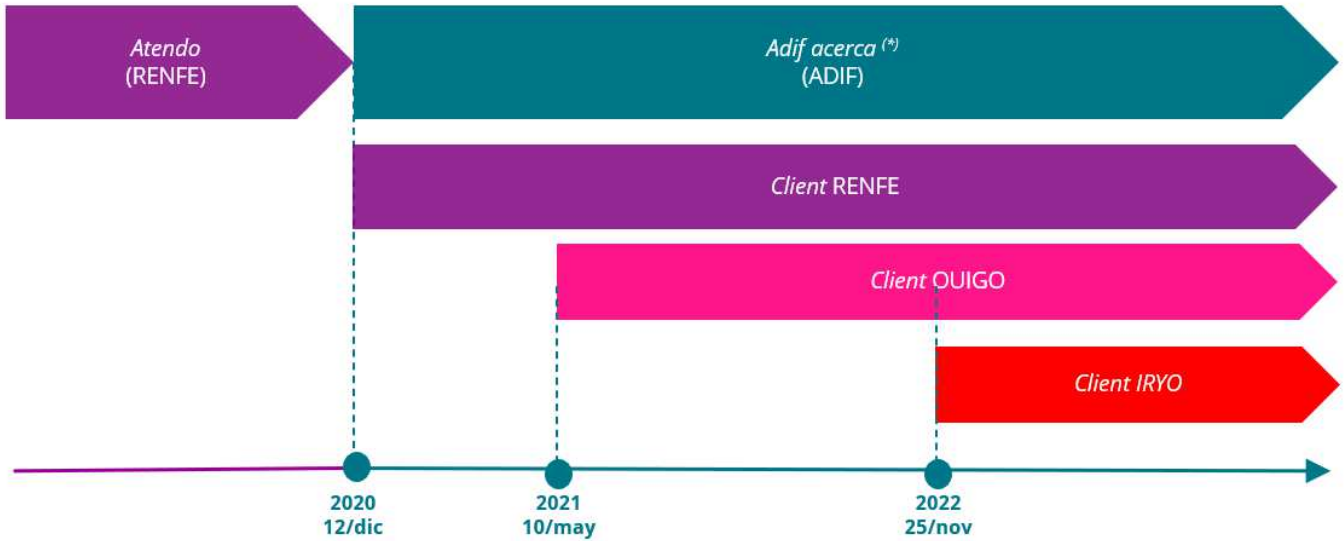
1. **Background**
   a. Service provided by the incumbent since 2011
   b. Service with a high-quality level and consolidated trademark
2. **Challenge**
   a. Guarantee universal accessibility in the stations
   b. Guarantee a non-discriminatory services in the station transit for all the companies
3. **Decisions**

**Change the service provision model in the station**

**Create a transparent framework for the service provision**

# PRACTICAL APLICATION 1: PRM ASSISTANCE EVOLUTION

renfe Atendo → adif acerca





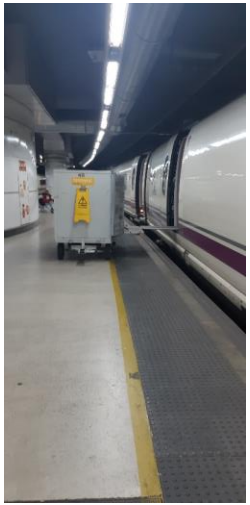

141 stations with *Adif acerca*

# PRACTICAL APLICATION 2: LOAD AND UNLOAD SERVICES LOGISTICS

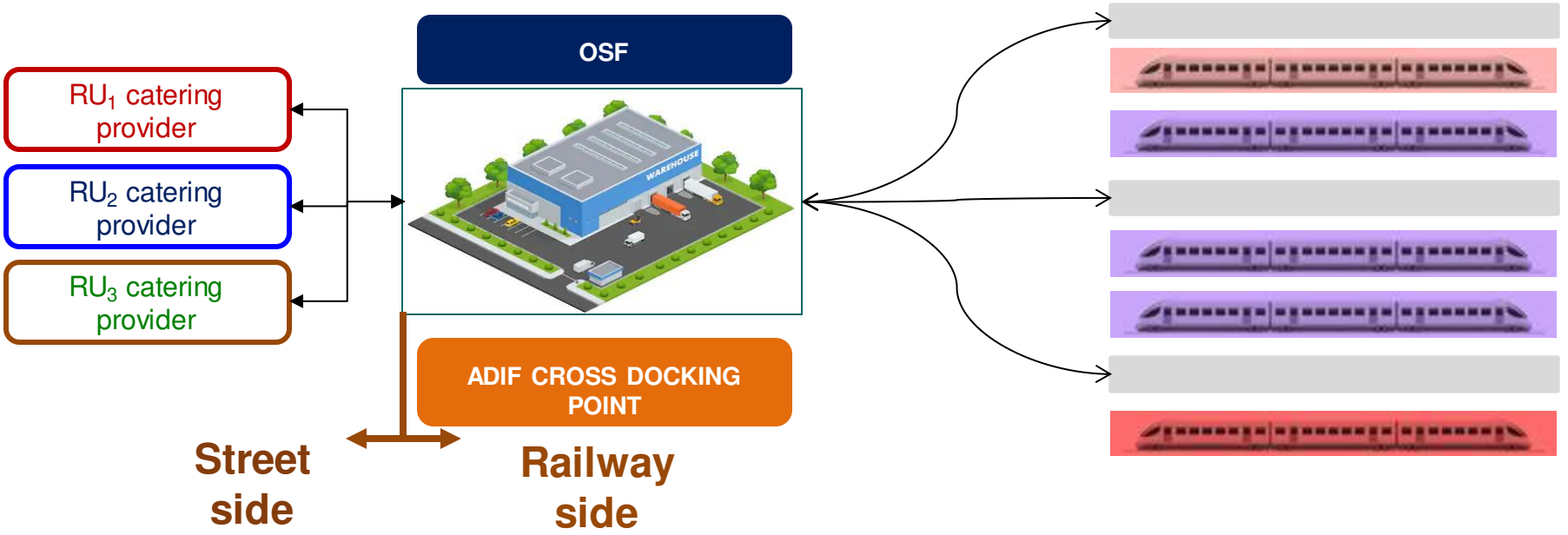
1. **Background**
   a. Lack of space in the stations to do cross docking operations
   b. High volumes of passengers in the platforms (security risk)
   c. Minimum time of rolling stocks rotation
2. **Challenge**
   a. Guarantee non-discriminatory access in the stations to all RU
   b. Select a specialized operator for the service
3. **Decisions**

   **Defined the service provision model in the station**

   **Create a transparent framework for the service provision**



# PRACTICAL APLICATION 2: LOAD AND UNLOAD SERVICES LOGISTICS FRAMEWORK



# HS STATIONS MANAGEMENT. CONCLUSIONS


## Opening of the HS market, an oportunity to increase train use

- More servicies, Cheapest prices
- More sustainability (environmental and economical)
- Stations are the link between people and mobility

## Beginings are not easy

- Infrastructure Bottelnecks
- General market rules without legal guideness for each case.
- Global instability creates uncertainty

## Learned lessons

- A.I. must be pro-active to stimulate changes in a successful way
- Cooperation between AI, RU's and OSF is needed
- Each challenge is an opportunity

# THANK YOU

**Angel García de la Bandera**
agarciadela@adif.es
www.adif.es

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# A MODEL FOR SIMULATING AND OPTIMIZING PASSENGER FLOWS IN RAIL STATIONS

AHMET GEYİK
Electrical-Electronics Engineer MSc,Turkish State Railways-TCDD, TÜRKİYE
Session3-6.3 Stations / Capacity

ONCF UIC

## OBJECTIVE AND OUTLINE

The objective of this presentation is to identify and develop a model to optimize passenger routes in stations.

- Introduction
- Simulation Models
- Virtual Coupling
- Network Design
- Case Study: Brignole Metro Station
- Conclusions

# INTRODUCTION

- The subway (or metro) is a railway type transport system for urban services characterized by a high frequency and the traffic is regulated by railway signaling systems.

- The number of people passing through a cross-section of a region in a particular period is known as pedestrian flows.

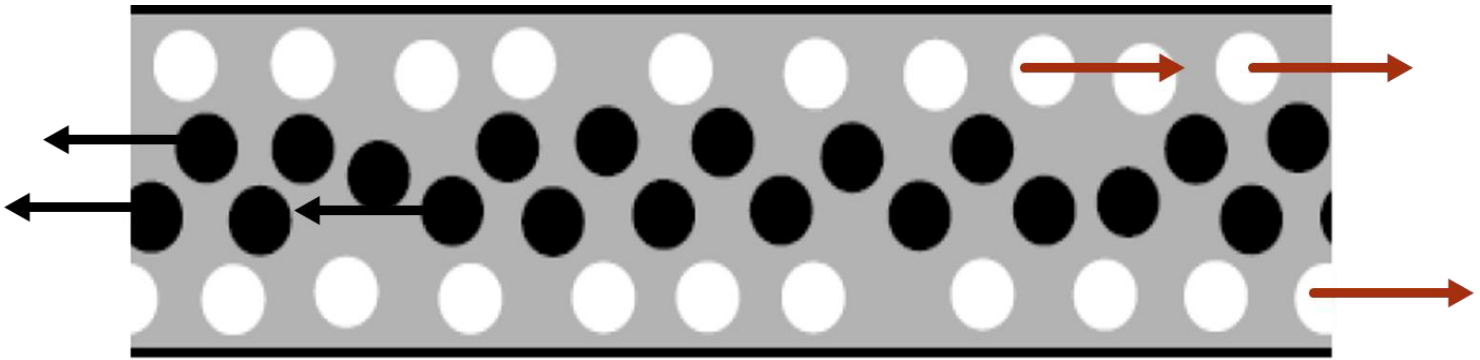
# INTRODUCTION

| Influence Factors | |
|---|---|
| **Platform** | Available area of platform<br>Traffic capacity of passage<br>Traffic capacity of stairs<br>Traffic capacity of escalators |
| **Train** | Train type<br>Train formation<br>Train departure interval<br>Train dwell time |
| **Passenger flow** | Temporal distribution of passenger flow<br>Spatial distribution of passenger flow |

Influence factors of passenger flow distribution

# SIMULATION MODELS

- Microscopic models: are based on people behavior, consider the movement and trajectory for every single person and the interactions with the surrounding environment.
- The flow representation is specific and precise in each time instant.



Simulation results for lanes formation in bidirectional pedestrian flows

# VIRTUAL COUPLING

- Virtual coupling is a train-centric control system and a new signaling paradigm
- The destination within the station changes depending on the virtual coupling timetable.
- VC is a novel railway operation control method
- Virtual coupling is based on the ERTMS

```
if (finaldest == 100)
{
{
if (time <= 600)
    dest_plat = 22;

if (time > 600 && time <= 1200)
    dest_plat = 27;

if (time > 1200 && time <= 1800)
    dest_plat = 24;

if (time > 1800 && time <= 2400)
    dest_plat = 26;

if (time > 2400 && time <= 3000)
    dest_plat = 22;

if (time > 3000)
    dest_plat = 26;
}

if (dest_plat == 24)  // 24 is the present node
    select = 0;
else
    select = 1;
```

Train at 8 am

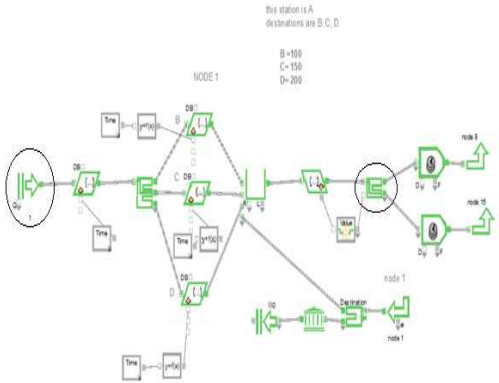
| Origin | Destination | |
|---|---|---|
| Station A | B | NODE 22 |
| | C | NODE 23 |
| | D | NODE 26 |

Train at 8:10 am

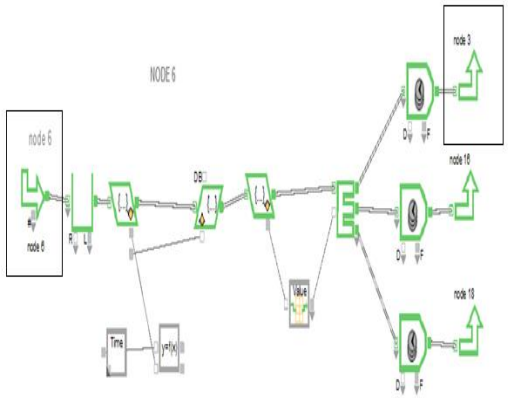
| Origin | Destination | |
|---|---|---|
| Station A | B | NODE 27 |
| | C | NODE 24 |
| | D | NODE 26 |

# NETWORK DESIGN

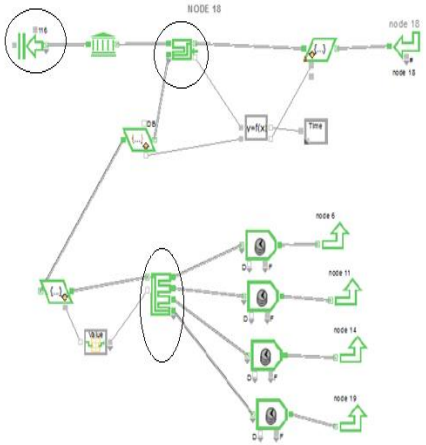
## The Pure Origin Node




## The Pure Middle Node




## The Destination Node

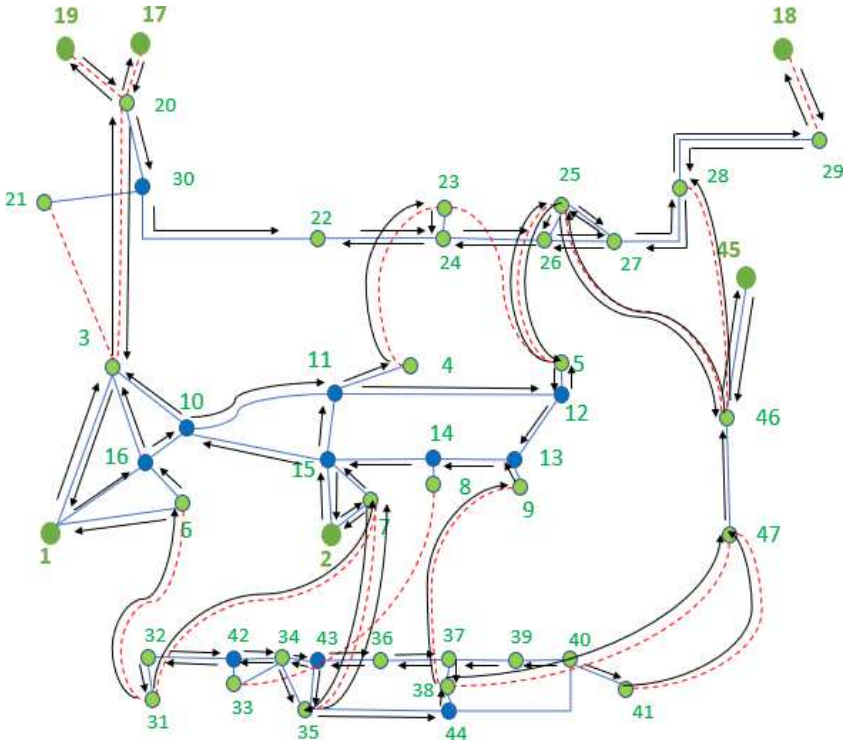


# CASE STUDY: BRIGNOLE METRO STATION

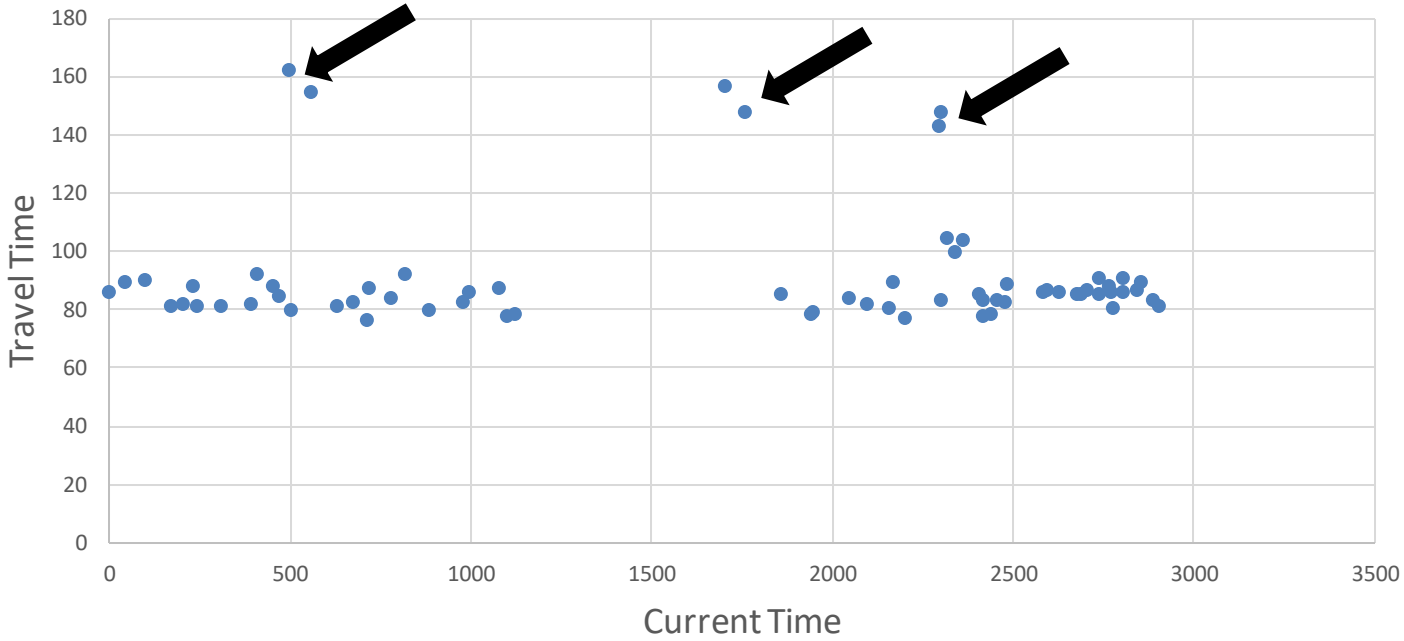
| NODE 1 | | |
|---|---|---|
| Destination | Best path | Average Travel Time |
| 22 | 3-20-30-22 | 88,56 |
| 24 | 16-10-11-4-23-24 | 85,16 |
| 26 | 16-10-11-4-23-24-26 | 101,08 |
| 27 | 16-10-11-12-5-25-27 | 108,46 |

| NODE 2 | | |
|---|---|---|
| Destination | Best path | Average Travel Time |
| 22 | 15-11-4-23-24-22 | 75,73 |
| 24 | 15-11-4-23-24 | 58,53 |
| 26 | 15-11-4-23-24-26 | 74,14 |
| 27 | 15-14-13-12-5-25-27 | 79,14 |

| NODE 36 | | |
|---|---|---|
| Destination | Best path | Average Travel Time |
| 22 | 37-38-9-13-12-5-23-24-22 | 97,82 |
| 24 | 37-38-9-13-12-5-23-24 | 80,31 |
| 26 | 37-38-47-46-25-26 | 76,49 |
| 27 | 37-38-47-46-25-27 | 80,14 |

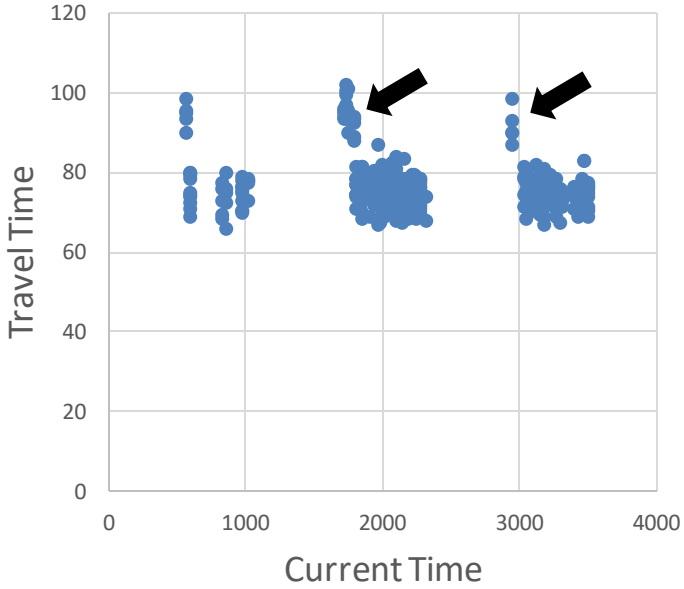


# CASE STUDY: BRIGNOLE METRO STATION

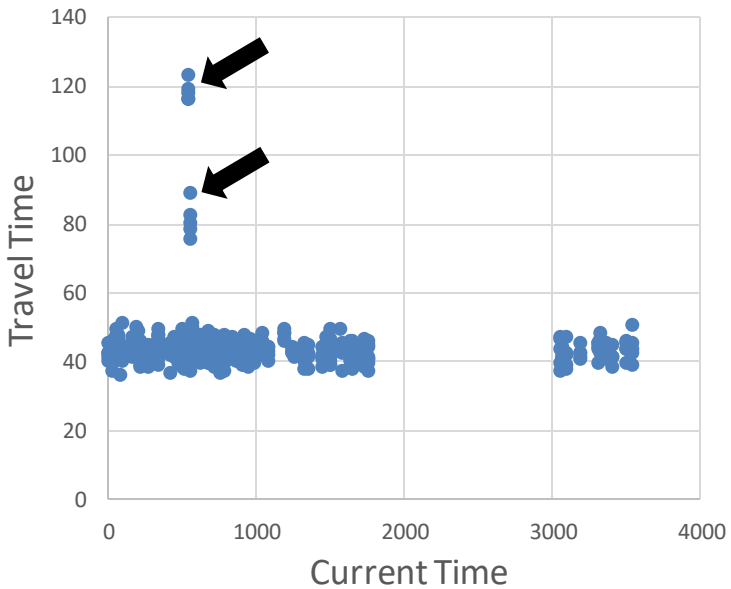



Passenger's travel time case study origin 1 destination 22

# CASE STUDY: BRIGNOLE METRO STATION




Passenger's travel time case study origin 36 destination 26




Passenger's travel time case study origin 45 destination 27

# CONCLUSIONS

- In VC scenario different wagons can have different destinations. The destination changes inside the station according to timetable of virtual coupling.
- VC is better use of resources only carriages which are necessary when they are necessary
- The questions of “How can we made users arrive at the right location of the platform in time with respect of train departure” is analyzed.
- Taking into consideration by VC how can be overcome problems:
  - By making users well informed
  - Make them know exactly where they must go
  - If they late, give them path of next train

# THANK YOU

ahmetgeyik21

ahmetgeyik21

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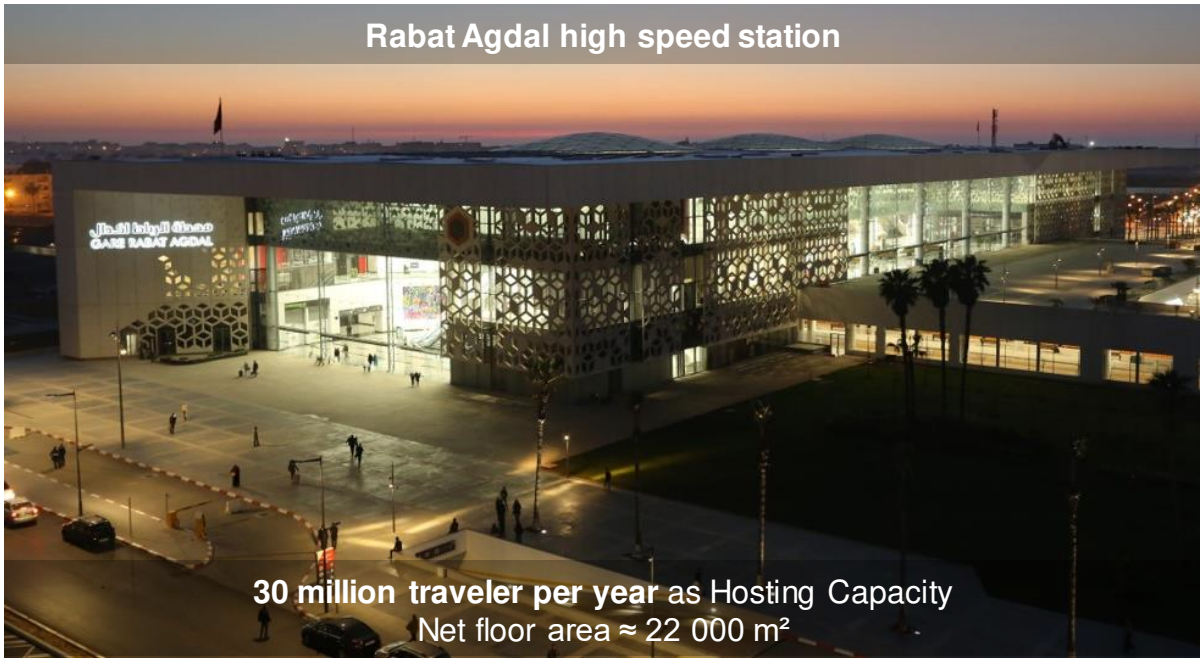
# HIGH SPEED STATIONS
## New vision in the era of challenging changes

Ali Hassan, AZIZI (Architecte D'ENA)
Head of the technical studies and construction department, ONCF, MOROCCO
Architectural design and placemaking
Session3-6.3 Stations / Capacity

ONCF UIC

# 1- Moroccan high speed stations

Railway stations transformation – Volumetry

# 1- Moroccan high speed stations

Railway stations transformation – Architecture & design

**Kenitra Old Station**


**Kenitra High speed station**

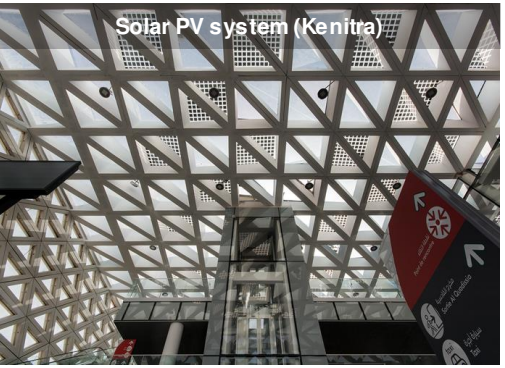
**20 million traveler per year** as Hosting Capacity
Net floor area ≈ 13 000 m²

# 1- Moroccan high speed stations

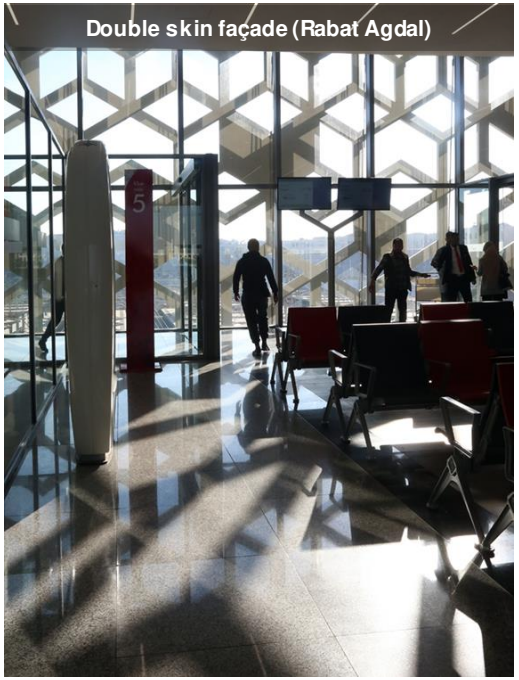
## Railway stations transformation – Sustainabilty

Solar PV system (Rabat agdal)

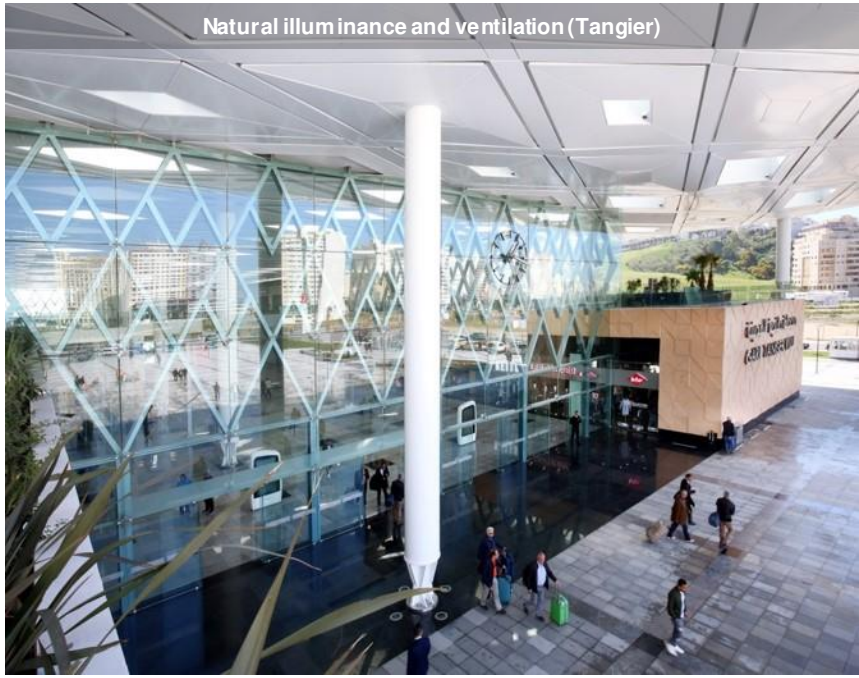
Solar PV system (Kenitra)



Double skin façade (Rabat Agdal)

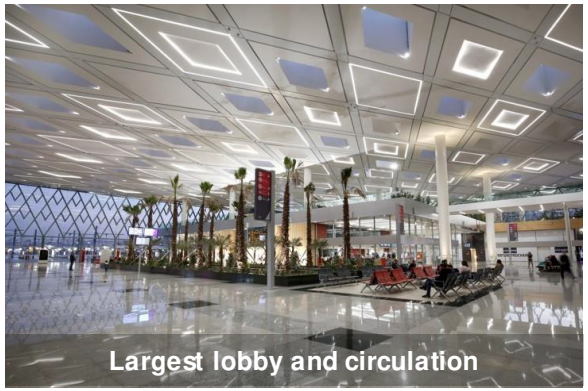


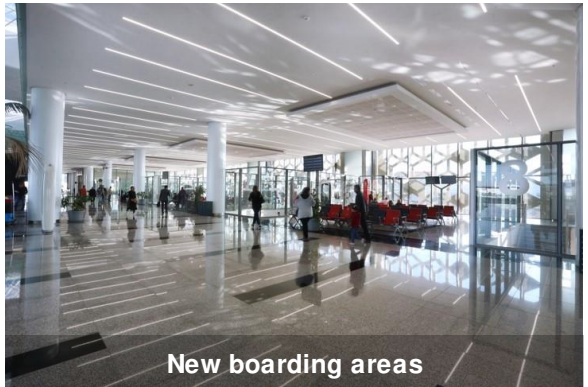
Natural illuminance and ventilation (Tangier)



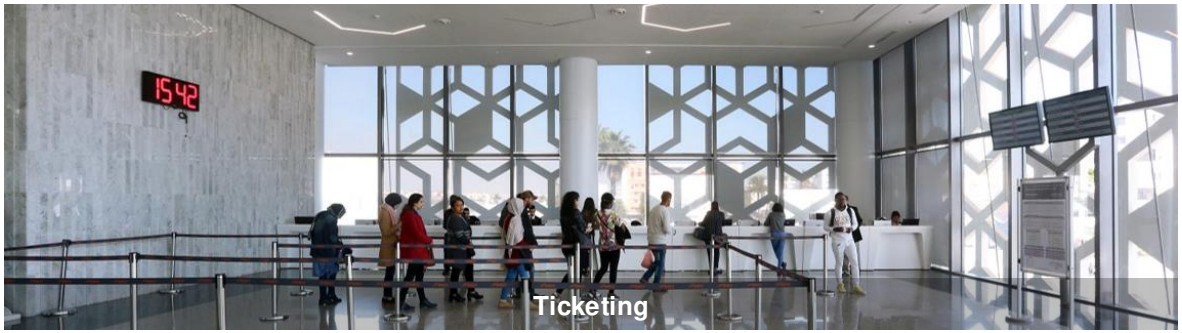
# 1- Moroccan high speed stations

## Interior spaces

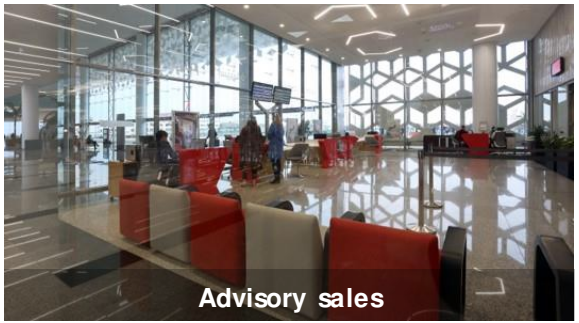

Largest lobby and circulation


New boarding areas

## Travelers services



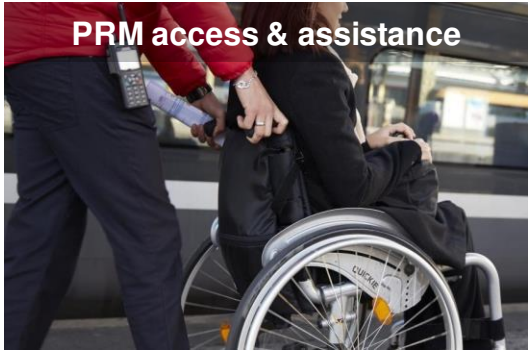
Ticketing


Advisory sales

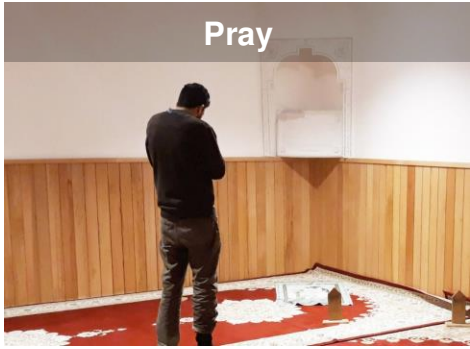

High speed lounge

# 1- Moroccan high speed stations

The new concept of stations as living spaces









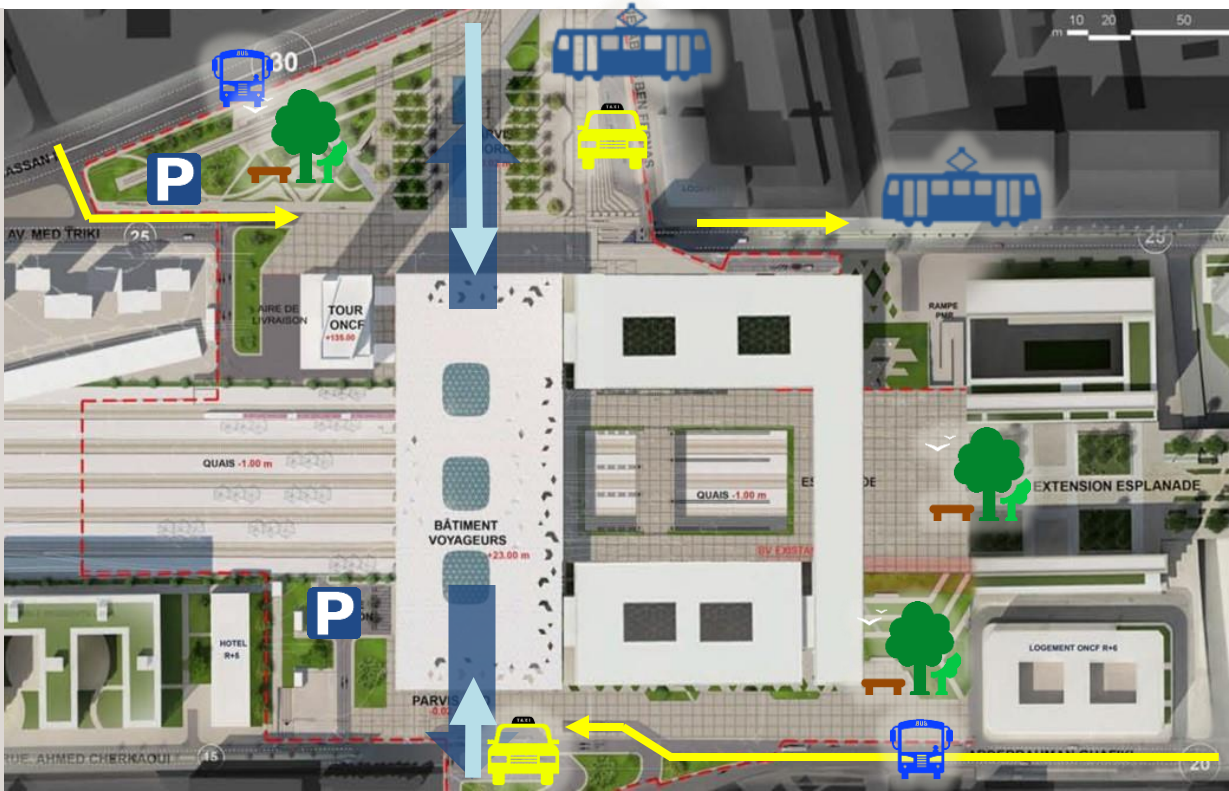
# 1- Moroccan high speed stations

## The New railway station Concept – Rabat Agdal High Speed Station example

**30 million traveler** per year as Hosting Capacity

Net floor area ≈ 22 000 m²

- Accessibilty
- Public spaces: **70 000 m²**
- **Intermodal Node (Train, bus, tramway, taxies…) ;** Underground parking capacity : **1000 places**
- **Urban connection via the station bridge**

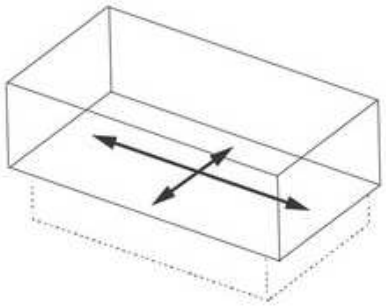


## 2- New vision in the era of challenging changes

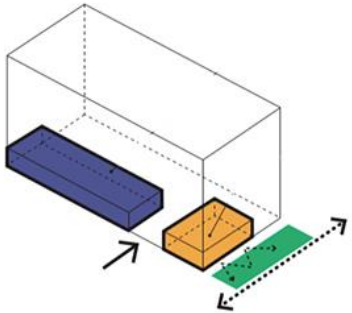
**D E S I G N**

Every great architect is - necessarily - a great poet. He must be a great original interpreter of his time, his day, his age. FRANK LLOYD WRIGHT - THE FUTURE OF ARCHITECTURE (1953)

FLEXIBLE AND ADAPTABLE SPACES



SCALABLE AND MULTIFUNCTIONAL SPACES



SUSTAINABLE RAILWAY STATION

## 2- New vision in the era of challenging changes

### S E R V I C E S

Technology has become a natural extension to people's lives. Passengers and other visitors will expect an efficient mobility service, with a well-connected, easy-to-use station at its heart that enables them to control and make best use of their time. Stations should also adapt to new consumer habits without forgetting a better enhancement of their spaces.

CONNECTED STATION

DIGITAL

ADAPTING TO NEW CONSUMER HABITS

SHOPPING

DELIVERY

TICKETING

COLLECTING POINTS

NEW WAYS OF ENHANCING SPACES

RECREATION

KOWORKING

ANIMATION

EXPOSITION

## 2- New vision in the era of challenging changes

**S E R V I C E S**

Adaptation to new modes of transport : Electrical vehicles (bikes, scooters, cars…), shared and/or autonomous vehicles, delivery drones

Business and innovation opportunities, connecting jobs with homes

Promote active travel such as cycling and walking as well as various sports activities

Better coping with crises

## Conclusion

RAILWAY STATION

respecting the value of people's time

as flexible and adaptable spaces

at the service of the community

as sustainable spaces

at the service of business and innovation

as recreation, shopping and culture place

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11TH WORLD CONGRESS OF HIGH-SPEED RAIL

**Marrakech, 7-10 MARCH 2023**

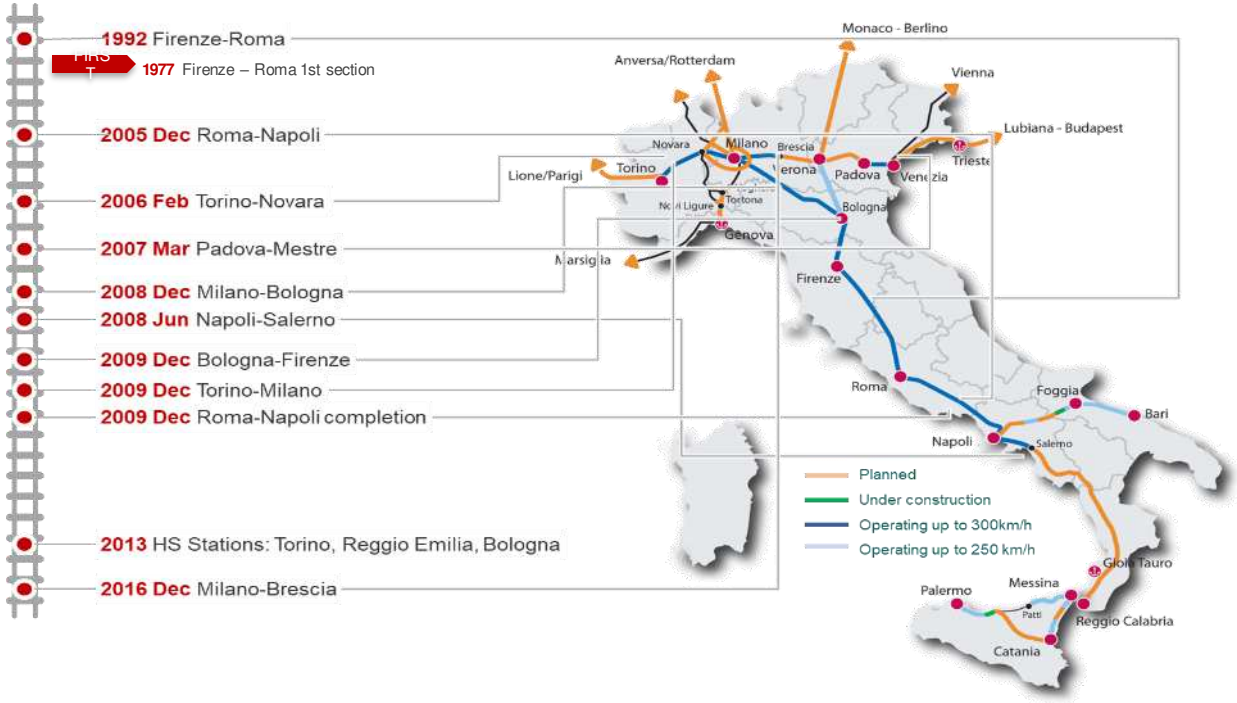
# Mobile data analytics in Italian HSR stations

Lorenzo Vannacci, Mario Tartaglia and Luigi Galieni
FS Research Centre, Ferrovie dello Stato Italiane, Italy
Session3-6.3 Stations / Capacity

# ITALIAN HIGH SPEED NETWORK EVOLUTION

- **First** Pendolino (tilting) train for public service between Rome and Ancona in 1976,
- **First** HSR section in Europe (1977)
- Europe **first** competitor on open access services from 2012
- **European** Brand

FRECCIAROSSA



# DATA ANALYSIS & MOBILITY



**RAILWAYS IS ALREADY THE GREENEST MODE OF TRANSPORT**

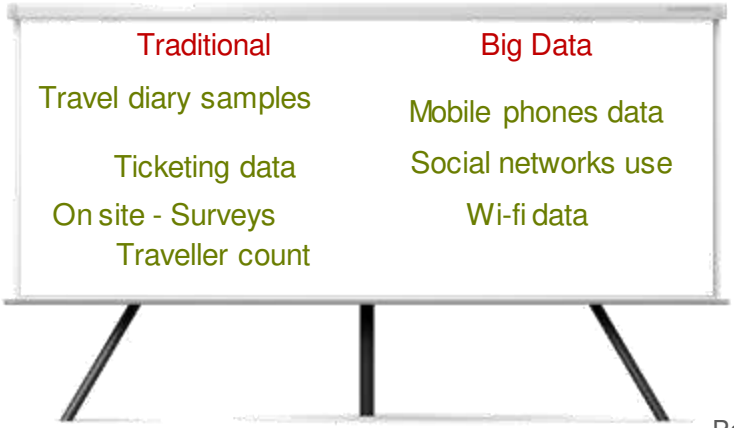
**INCREASE PASSENGER**

Strategy

"Continuos" Evaluation:

- Mobility demand mapping
- Commercial performance
- New services (smart working, business travels, holidays....)

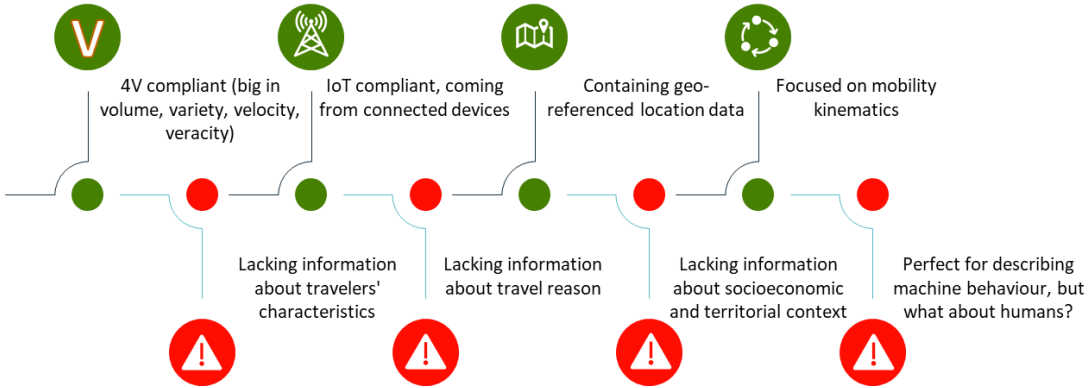
ESSENTIAL



# MOBILE NETWORK DATA

## Requirements

Developing a tool, not a single test




FIR ST

- Preliminary **desk research** on the state of the art (es: from CDR to MDN)
- **Call for tender** (national wide analysis area) for MNO
- Contract with Vodafone
- One year of calibration and investigation (mapping all Italy!)
- Focus on modal identification
- From 2022 “standard” tool for analysis and strategic decision LIVE DATA *
- Some limitation.....

* 20 days delay

# ITALIAN HRS MAIN STATIONS: OVERVIEW

- Focus on **main station**
- **Dedicated** mobile **network**
- **Behaviour** passenger and visitors
- **POI** identification
- Airport train
- Connections
- **Waiting times**

| Station performance | 2008 | 2019 |
|---|---|---|
| HS services calling at this station | 202 | 323 |
| Number of cities reachable within 4h* | 38 | 43 |

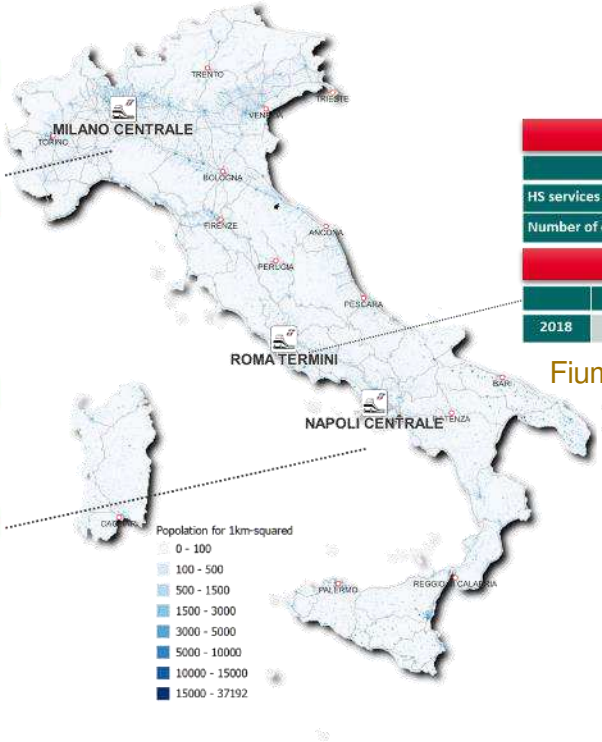
| Population of station user base** | By 15' walk | 30' by collective transport |
|---|---|---|
| 2018 | 48 008 | 1 809 388 |

Malpensa
Linate & Bergamo airports

| Station performance | 2008 | 2019 |
|---|---|---|
| HS services calling at this station | 49 | 170 |
| Number of cities reachable within 4h* | 7 | 17 |

| Population of station user base** | By 15' walk | 30' by collective transport |
|---|---|---|
| 2018 | 55 712 | 1 529 431 |

Naples' islands

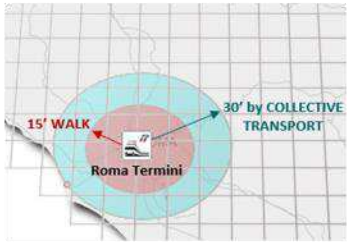



| Station performance | 2008 | 2019 |
|---|---|---|
| HS services calling at this station | 152 | 331 |
| Number of cities reachable within 4h* | 21 | 40 |

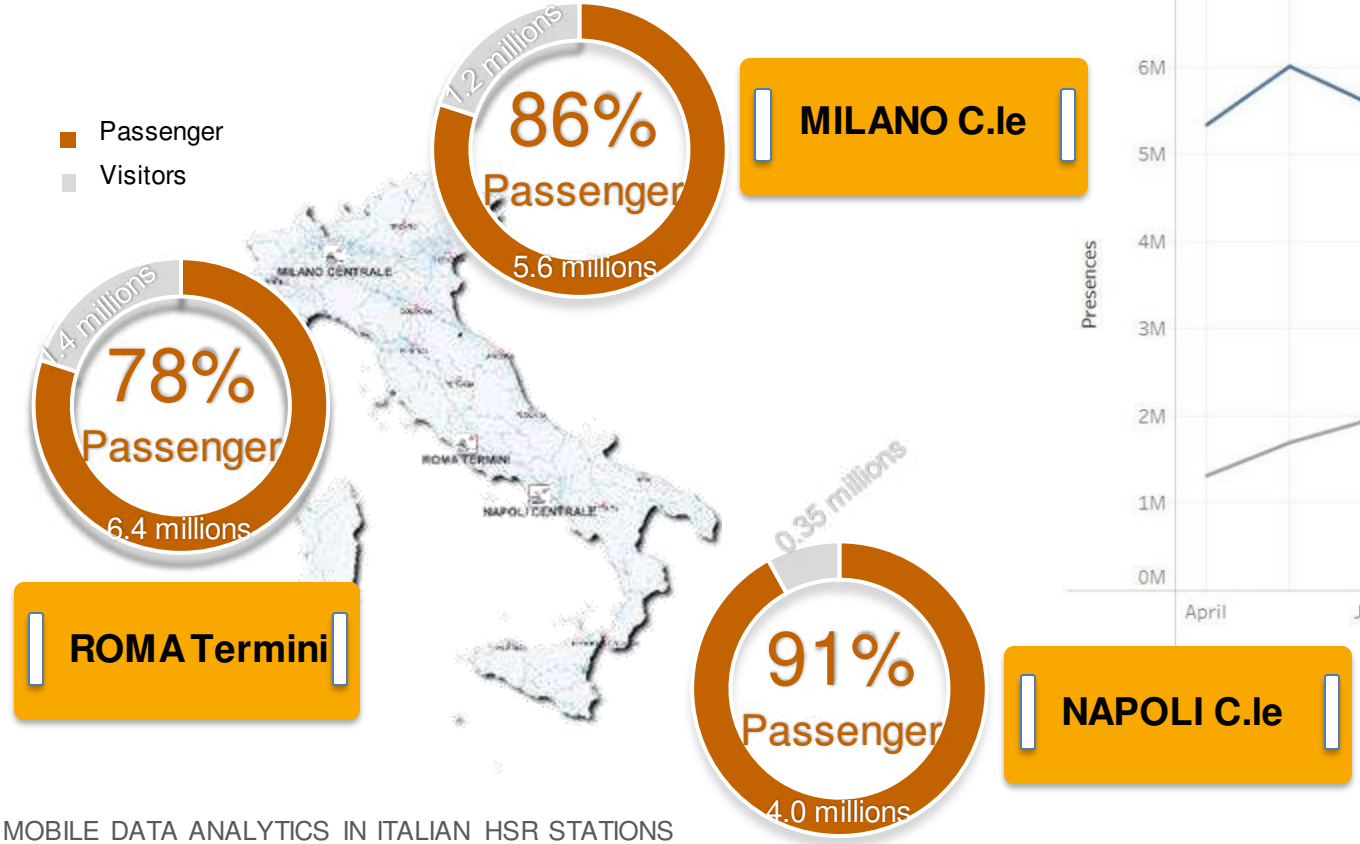
| Population of station user base** | By 15' walk | 30' by collective transport |
|---|---|---|
| 2018 | 26 370 | 1 965 355 |

Fiumicino

* Considering only travel time
** Based on Eurostat 1km and 2 km grid 2018

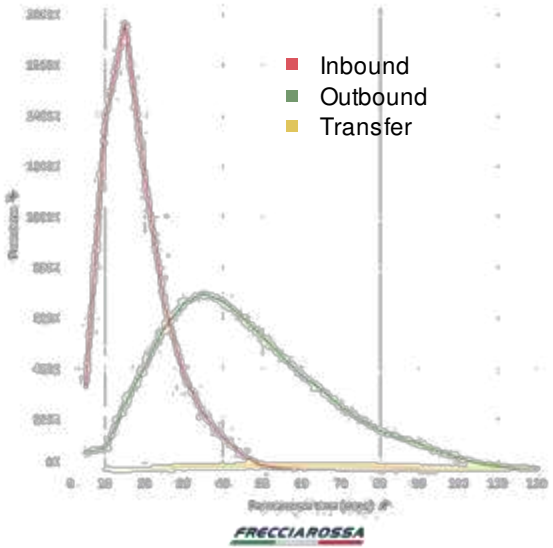


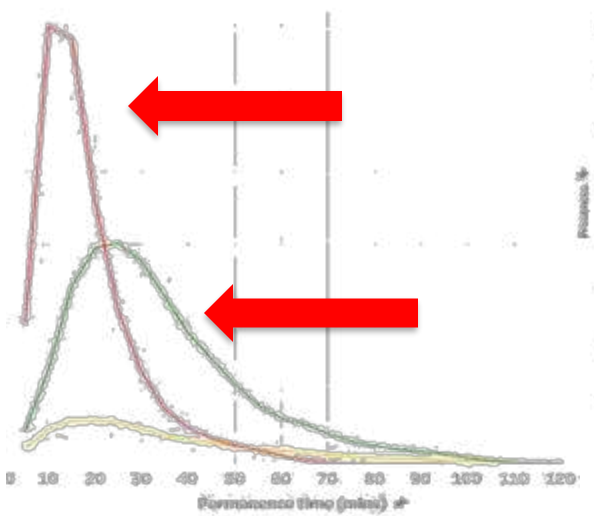
# PRESENCES IN THE 3 STATIONS



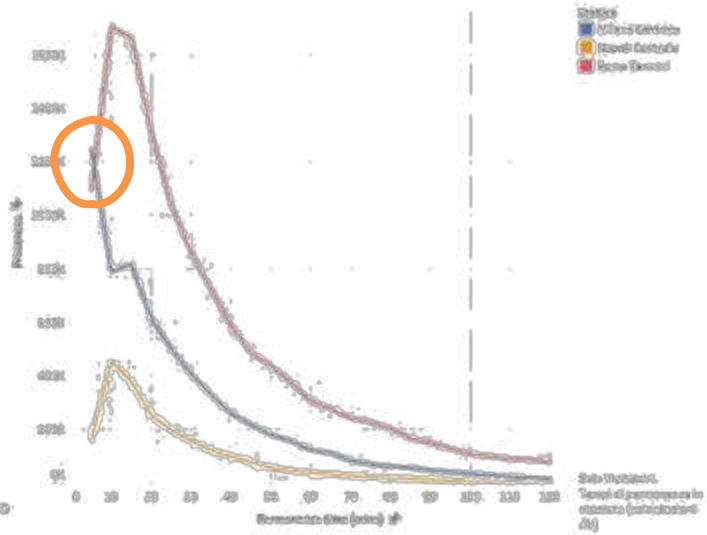

# DURATION OF STAY

## Passenger & Visitors ( April - November 2022)



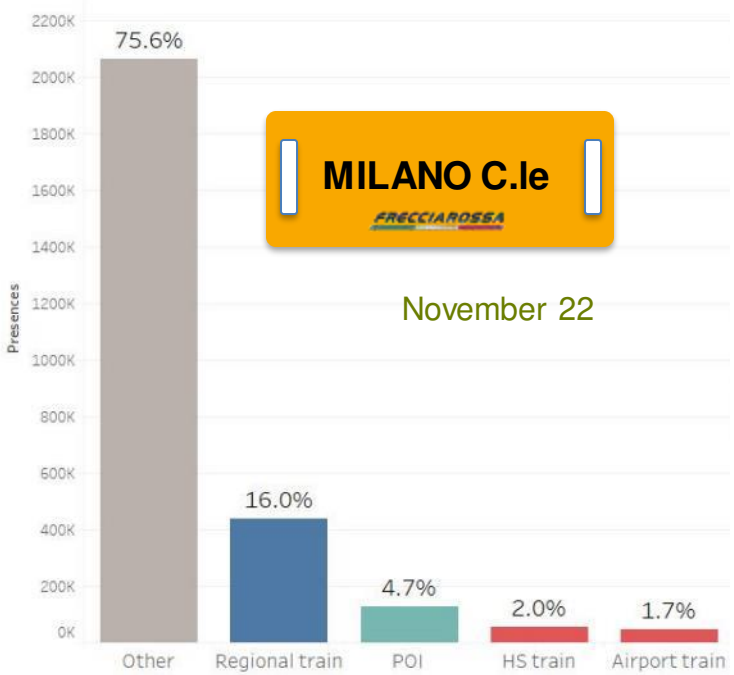
PASSENGER

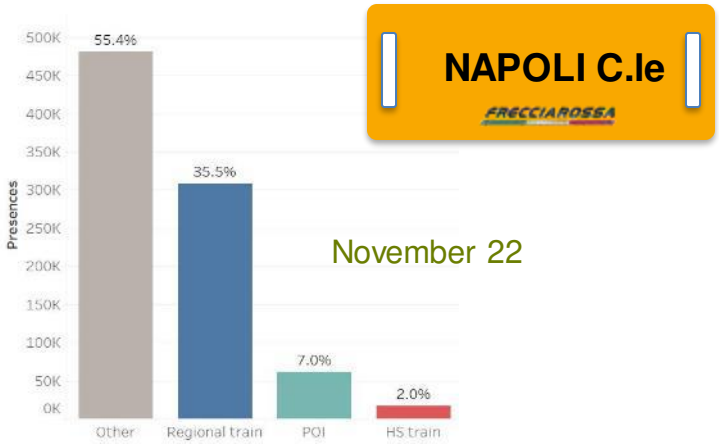


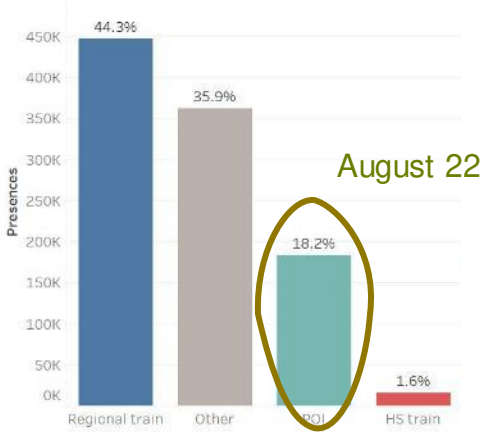
VISITORS

# POI ANALYSIS

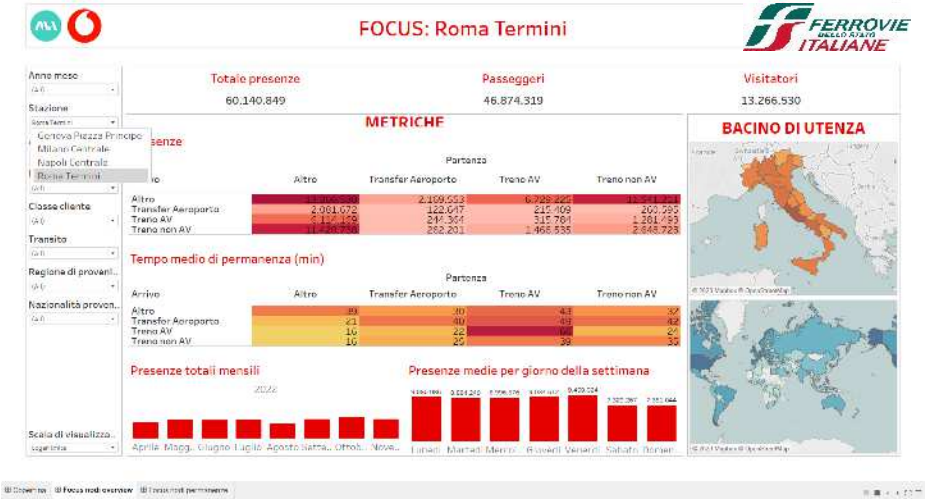
## HSR passenger & POI visits

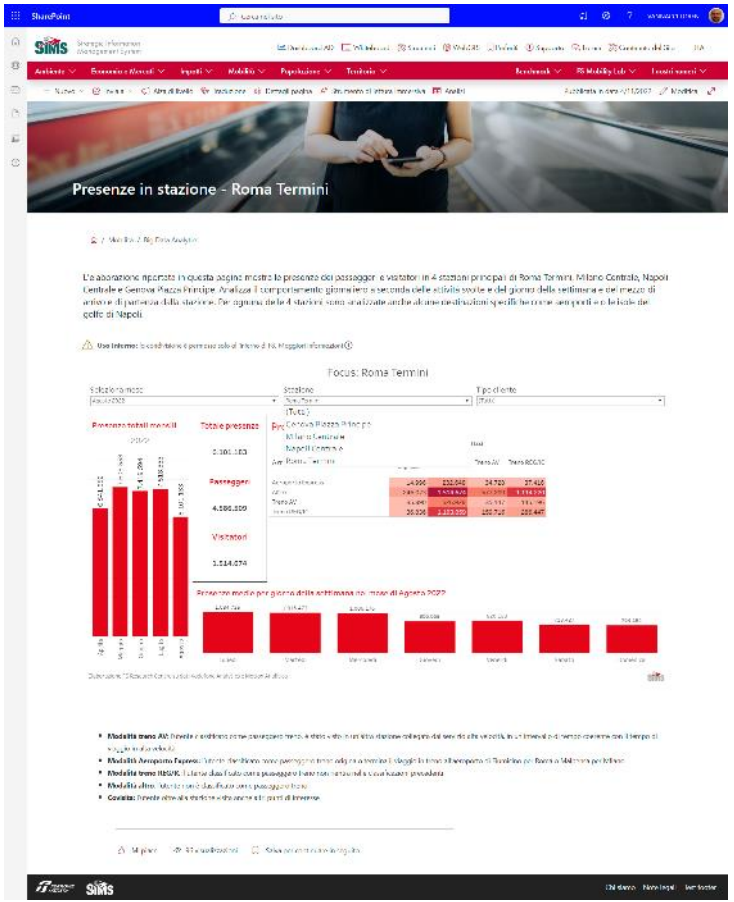


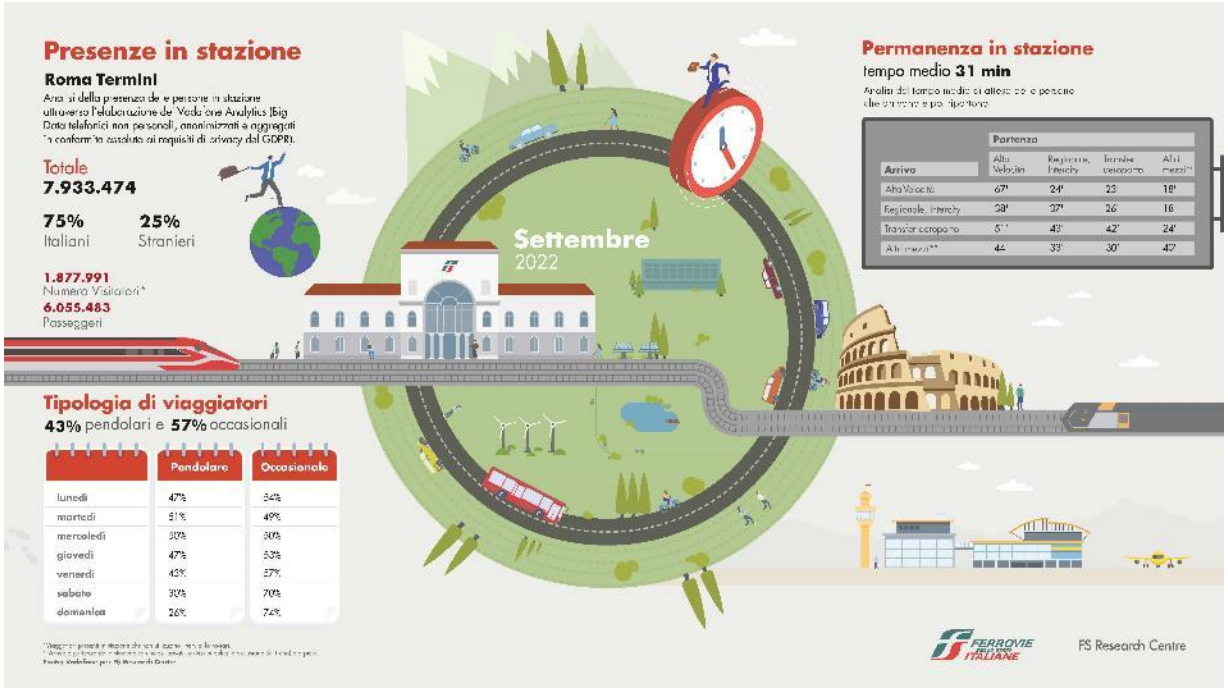
# INTERACTIVE DASHBOARDS



# MAIN CONCLUSIONS

- **Unique experience** from research to corporate tool
- **Extensive know how**
- **Updated** data (quite live.....)
- **Less expensive** than traditional surveys
- Customizable (also after data availability)
- **Limitation** in urban environment
- We are ready for Public Data dissemination



## NEXT STEPS

After 2 yars of intensive use:

- Better **modal identification** for station access and egress links
- Increase **dedicated networks in stations** (better analysis)
- Detailed study on **urban areas**: FS is starting a research with several Universities to overcome this limitation
- **Guide lines** (partnership Italian Statistic Institute)
- Work on 5/10 minutes time slots analysis in order to allow a **timetable improvement** in stations (connections)
- Definitely replace surveys when it is possible
- Develop the ability to work and plan with ***live data***

# THANK YOU

Eng. Lorenzo Vannacci
FS Research Centre
l.vannacci@fsitaliane.it