NET ENGINEERING

presentation to OpenTrack user meeting

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Vito Velardi

Zurich, January 24th 2008

An application of OpenTrack in the design of Veneto Regional Metropolitan Railway System

- foreword
- Veneto Region
- project features

NET Engineering S.p.A.

NET Engineering S.p.A. *is a dynamic Company which produces and supplies* ***technical and management services*** *in the field of* ***civil engineering*** *for customers in Italy and abroad.*

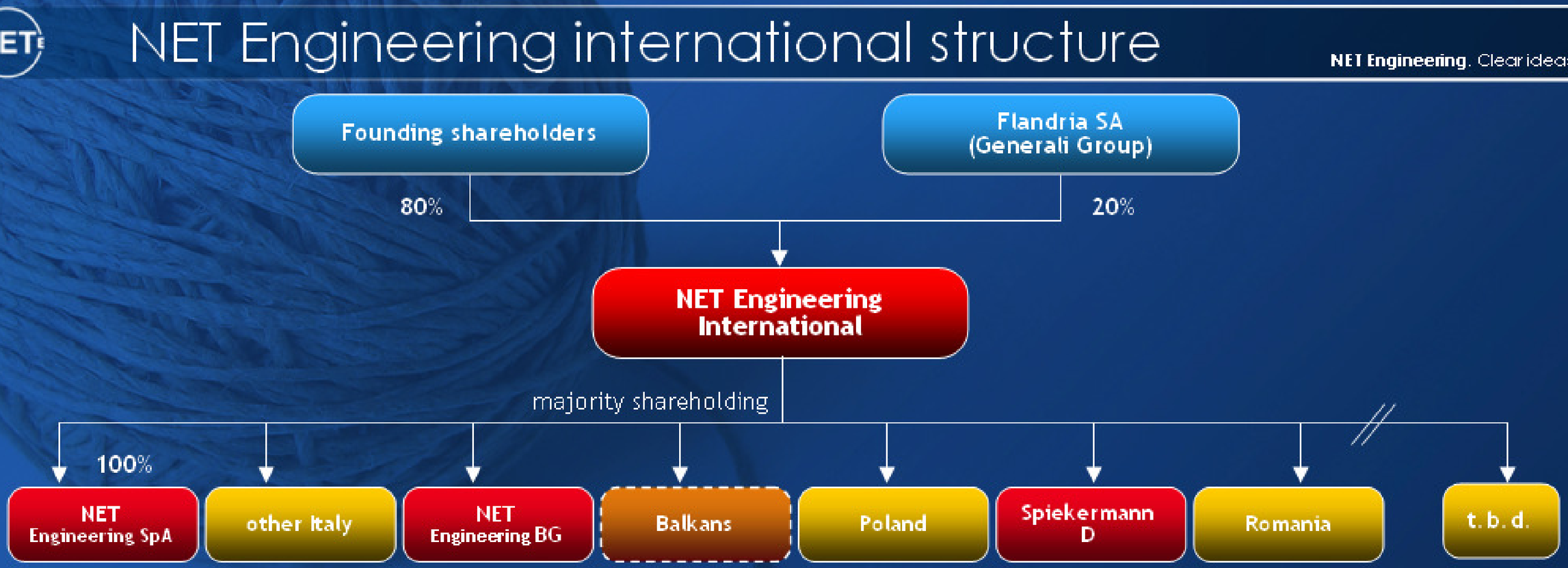
NET Engineering *today is a joint stock company which employs about* ***160*** *people, with offices in Monselice (30 minutes from Venezia), Roma, Mestre-Venezia, Napoli.*

fields of expertise

Our Company's mission is to provide optimal integration of competencies to respond to customers' needs, studying, planning, designing and implementing projects in the following sectors :

- *Land Use, Environment, City Planning*
- *Transportation*
- *Architecture and Real Estate Development*
- *Hydraulics and Water Cycle*
- *Consulting*

NET Engineering international structure



NET International *aims at the markets of Central and Eastern Europe, where a big portion of the EU investments for infrastructures will be dedicated to the Countries of recent or forthcoming entrance into the European Union*

In July 2007 ***NET International*** *acquired the majority of Spiekermann, a German civil engineering group based in Dusseldorf, with about* ***250 FTE's*** *and a* ***23 M€*** *turnover*

The combined size of ***NET Engineering International*** *is now of about* ***400 FTE's*** *and* ***45 M€*** *turnover.*

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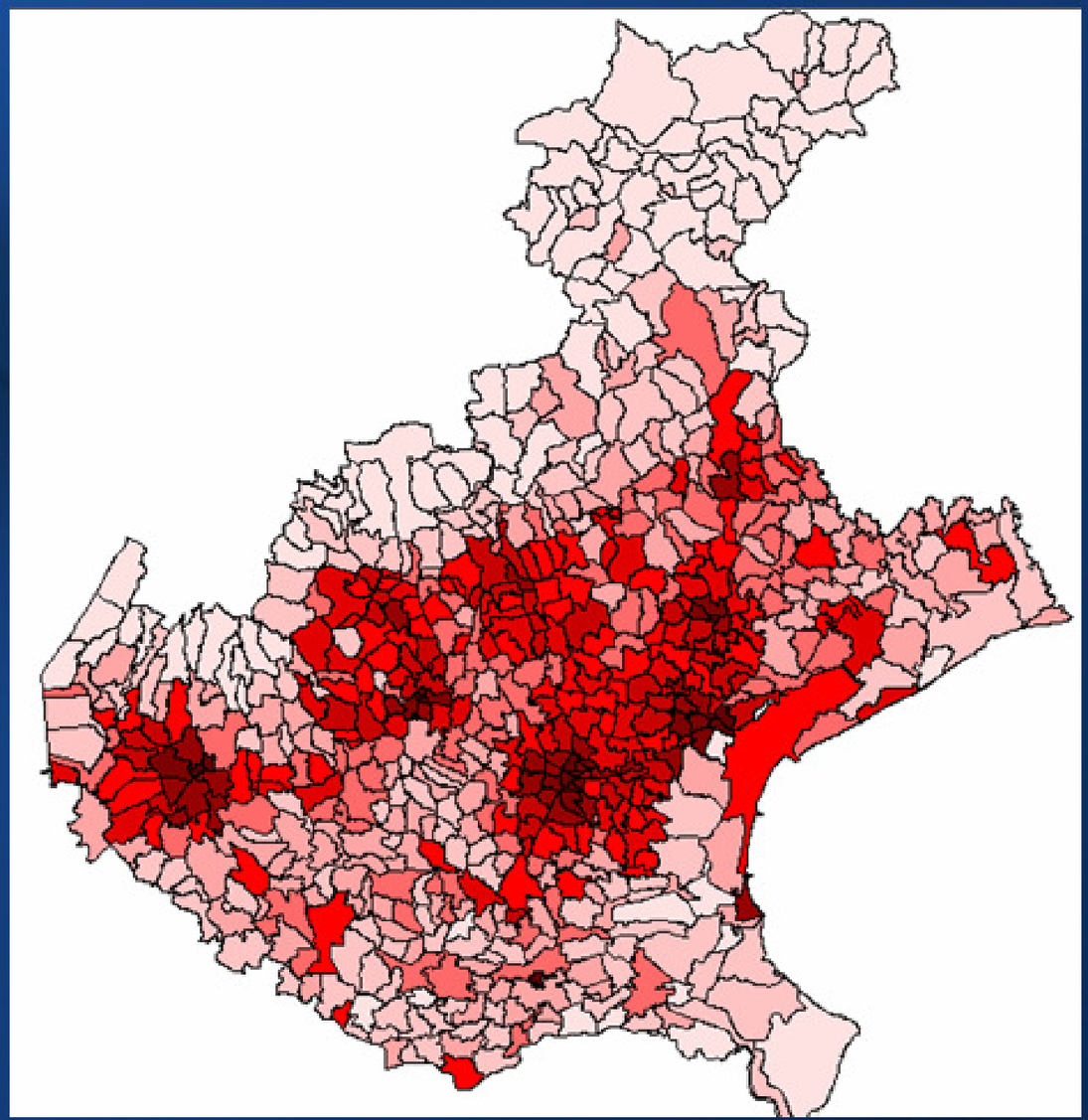
Veneto Region: an overview

- 18.391 sq km
- 4.500.000 people
- population density:
  245 people per sq km

A widespread urbanization



300 people/sq km

6000 people/sq km

Railways in Veneto

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1500 km of railway lines in the region

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system design approach

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SOCIO-ECONOMIC BACKGROUND

TARGET AND CONSTRAINT

Study area
Traffic zone

Transport demand
Analysis and Estimation

Present Supply Analysis :
- Train line
- Bus line

Present traffic flow
Critical point

PROJECT OF AN INTEGRATED OPERATIONAL MODEL
- Operational model
- Interval train timetable
- Bus line timetable
- General system check

MATHEMATICAL MODEL FOR THE SIMULATION
- Supply Component
- Demand Component
- Interaction Demand/Supply
- Impact Evaluation

INTEGRATED FARE

INFORMATION FOR USERS

Check of:
- Level of Service
- Capacity

SERVICE CHOICE

NEEDS

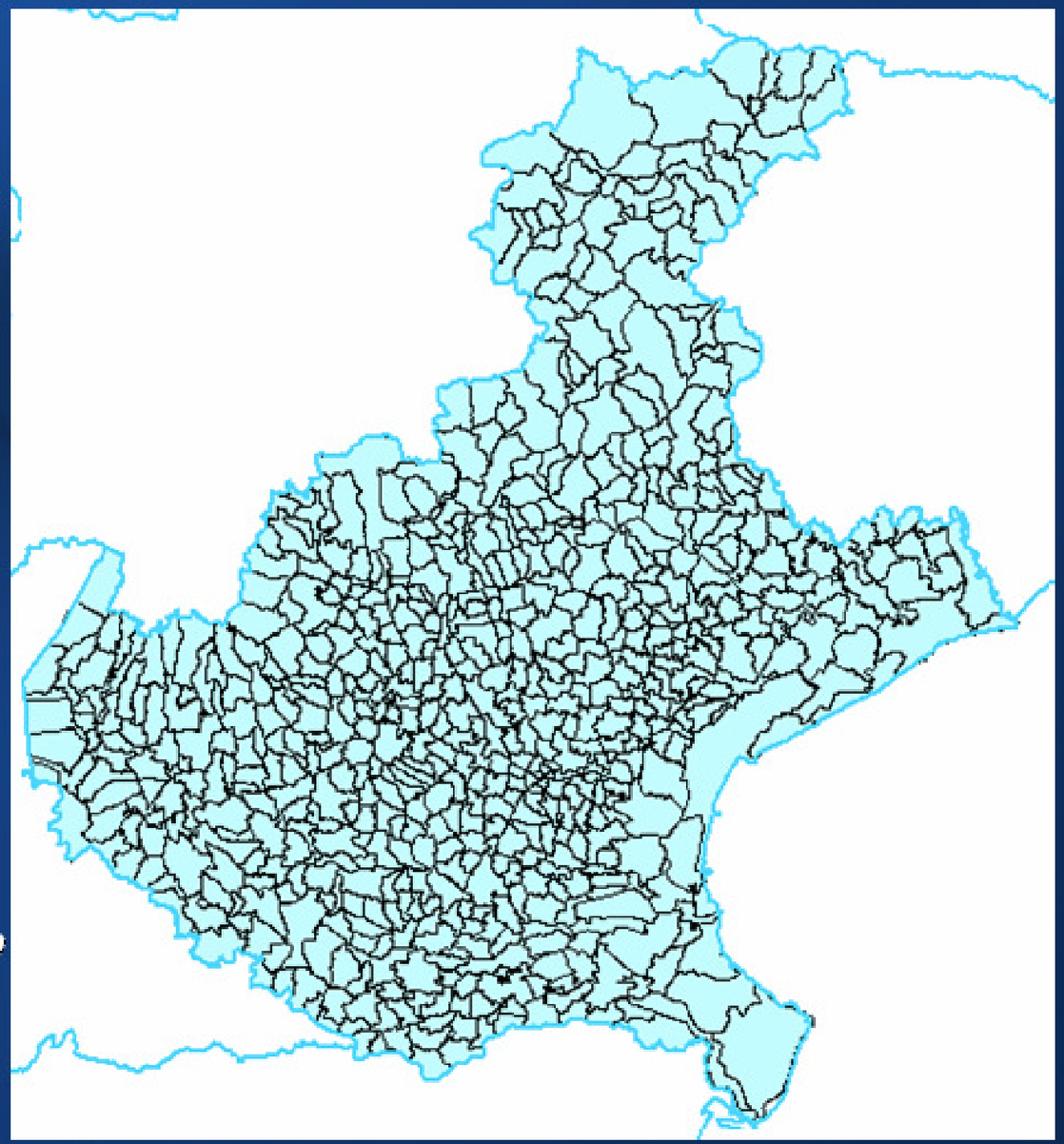
Train, Train*km, Station, Infrastructure, Bus, Bus*km, Interchange Parking, Technology

travel demand estimation: socioeconomic data

1. Study area

2. Zoning

3. Socio-economic data: population, students, workers, working places, schools, ...



travel demand estimations: surveys

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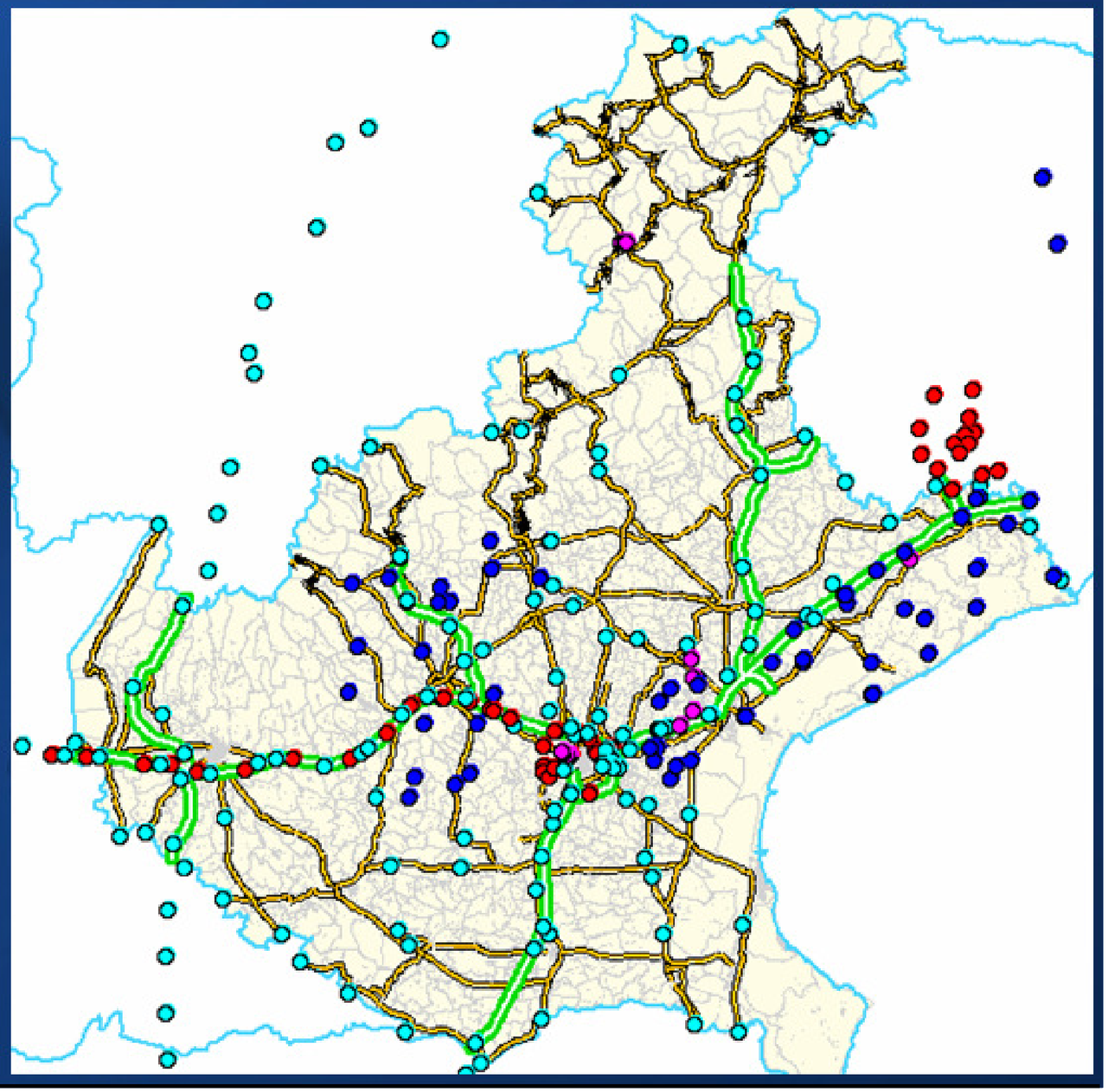
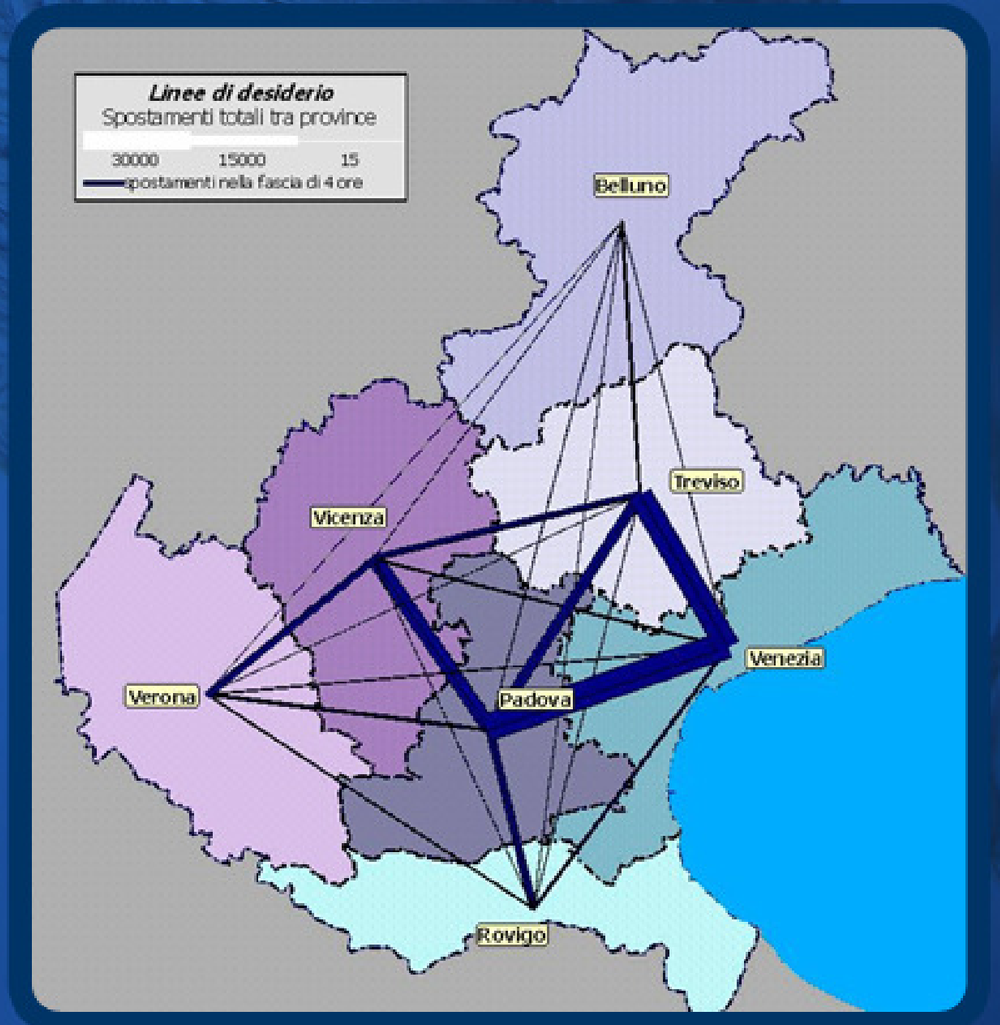
168 traffic counts inside and outside the region, with **4.400** interviews to drivers

12.500 telephone interviews to people living in the region, concerning trips and transport modes

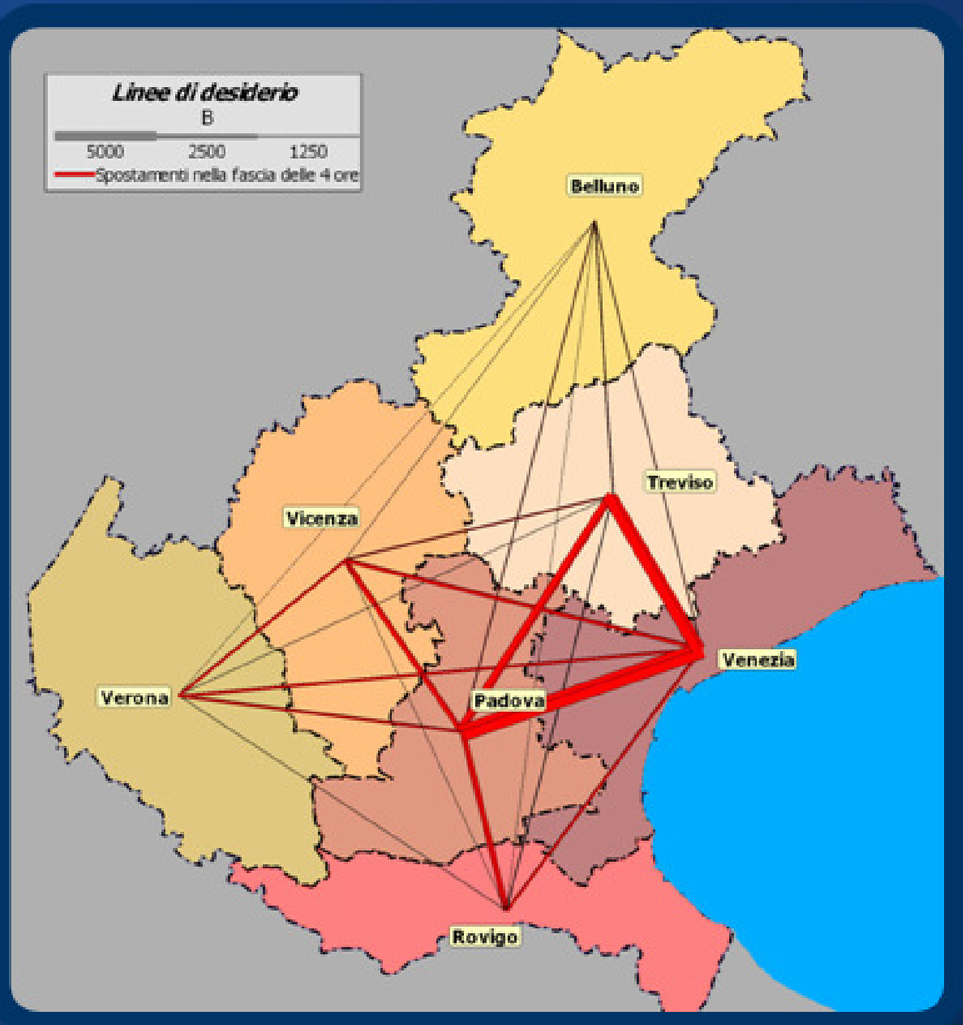
3.700 interviews to train passengers



travel demand



Deplacements between provinces



Railway trips between provinces

travel demand

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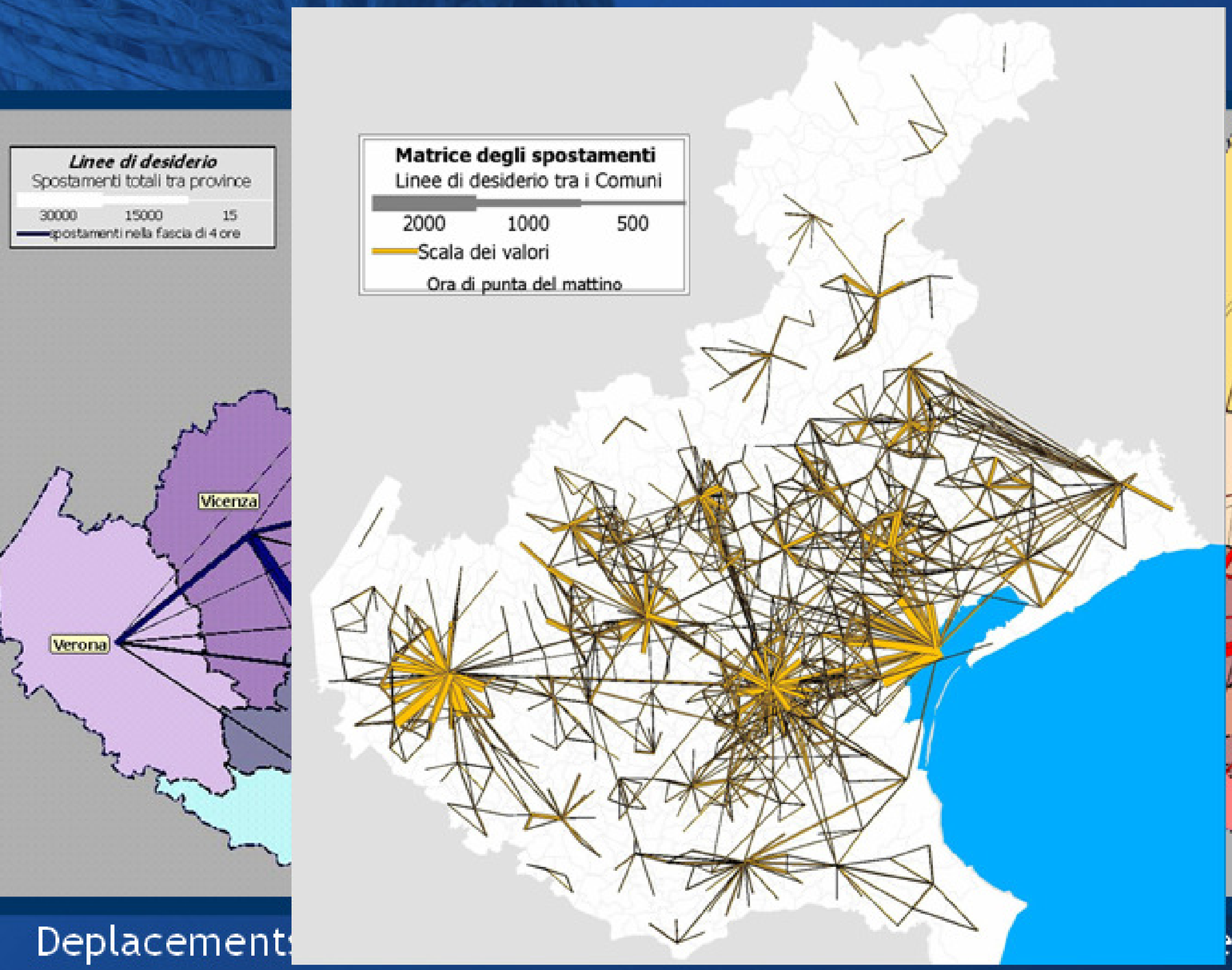
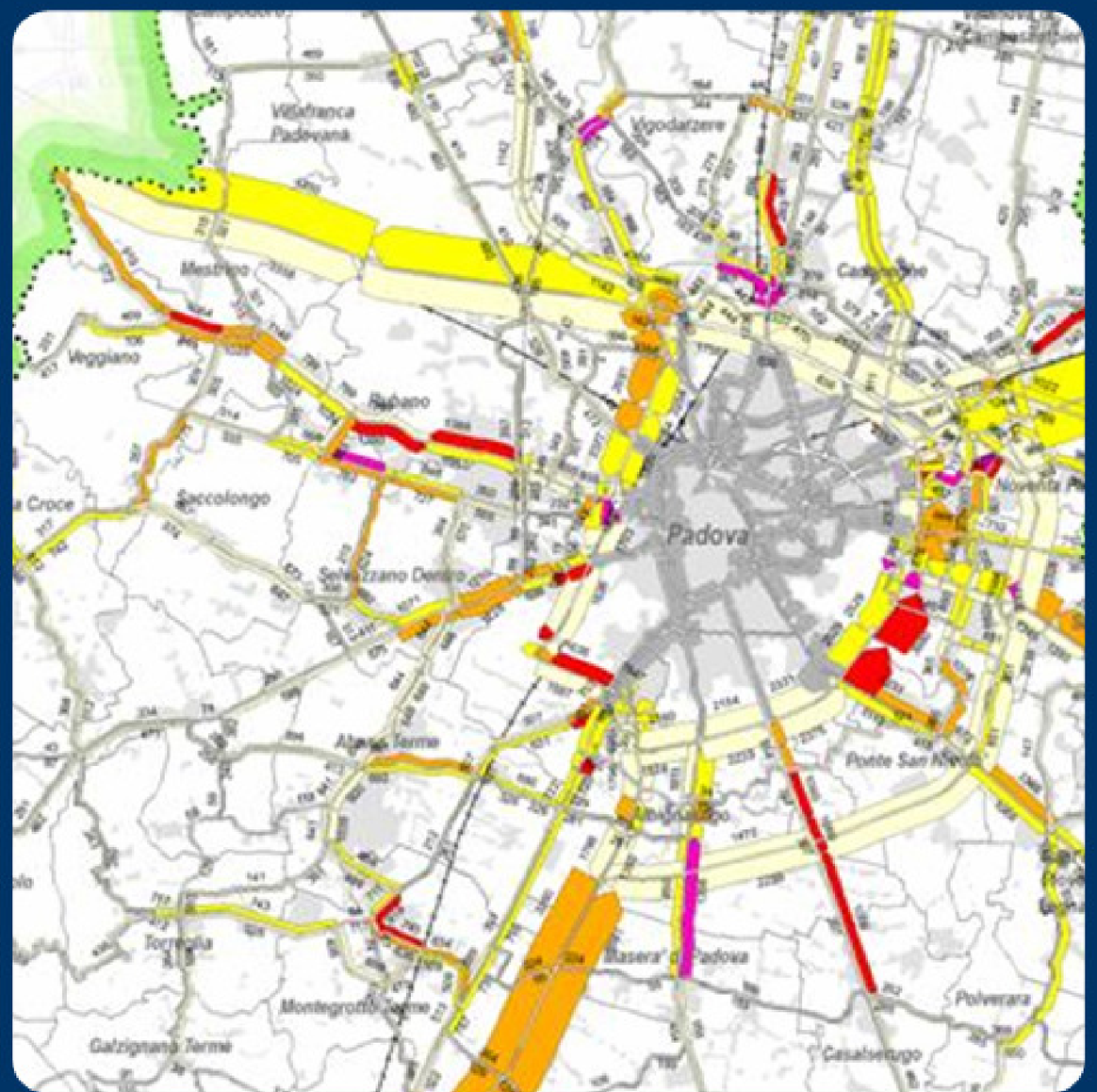
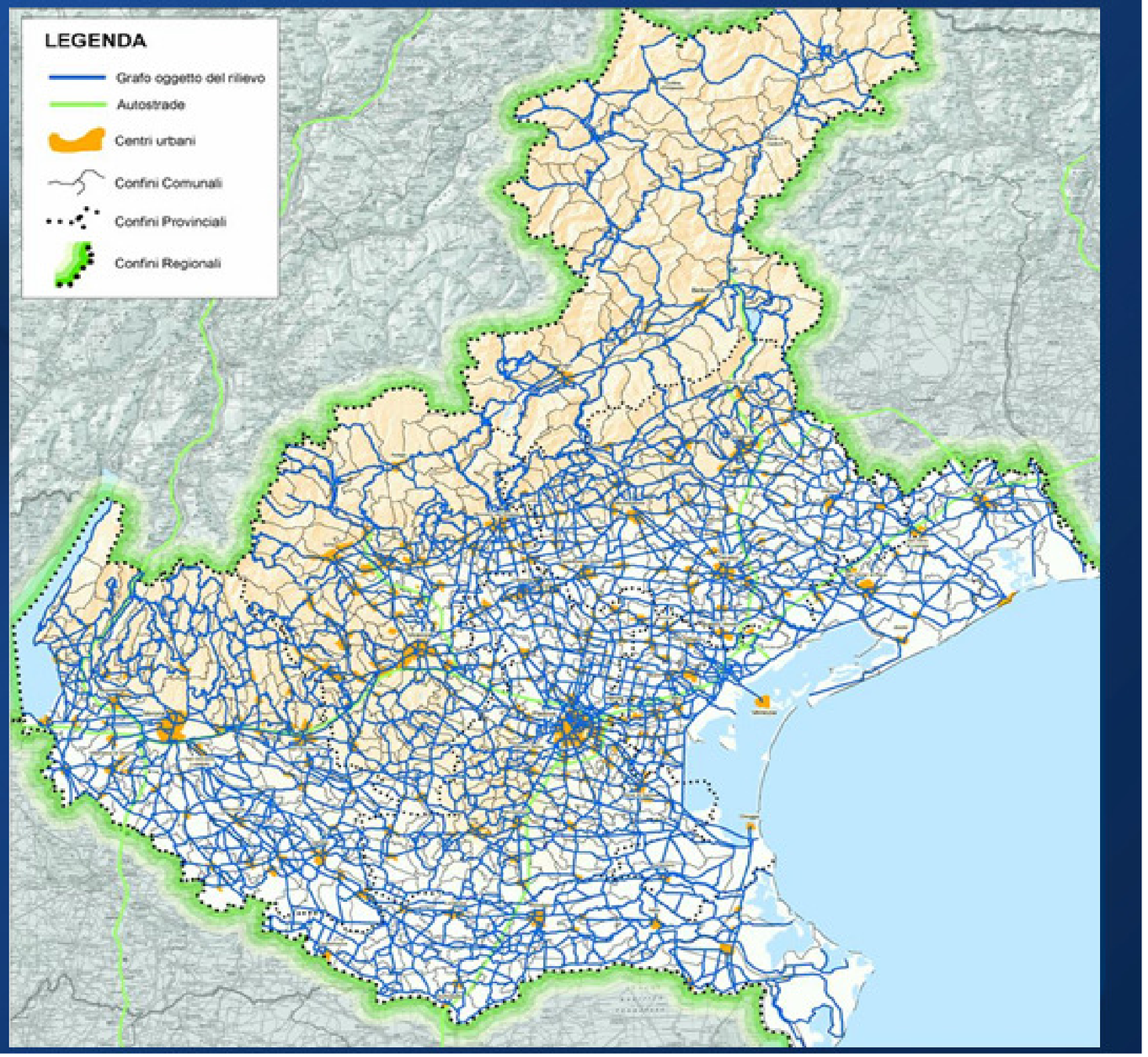


Deplacements ... een provinces

Traffic assignment to private network



Traffic assignment to private network



system planning approach

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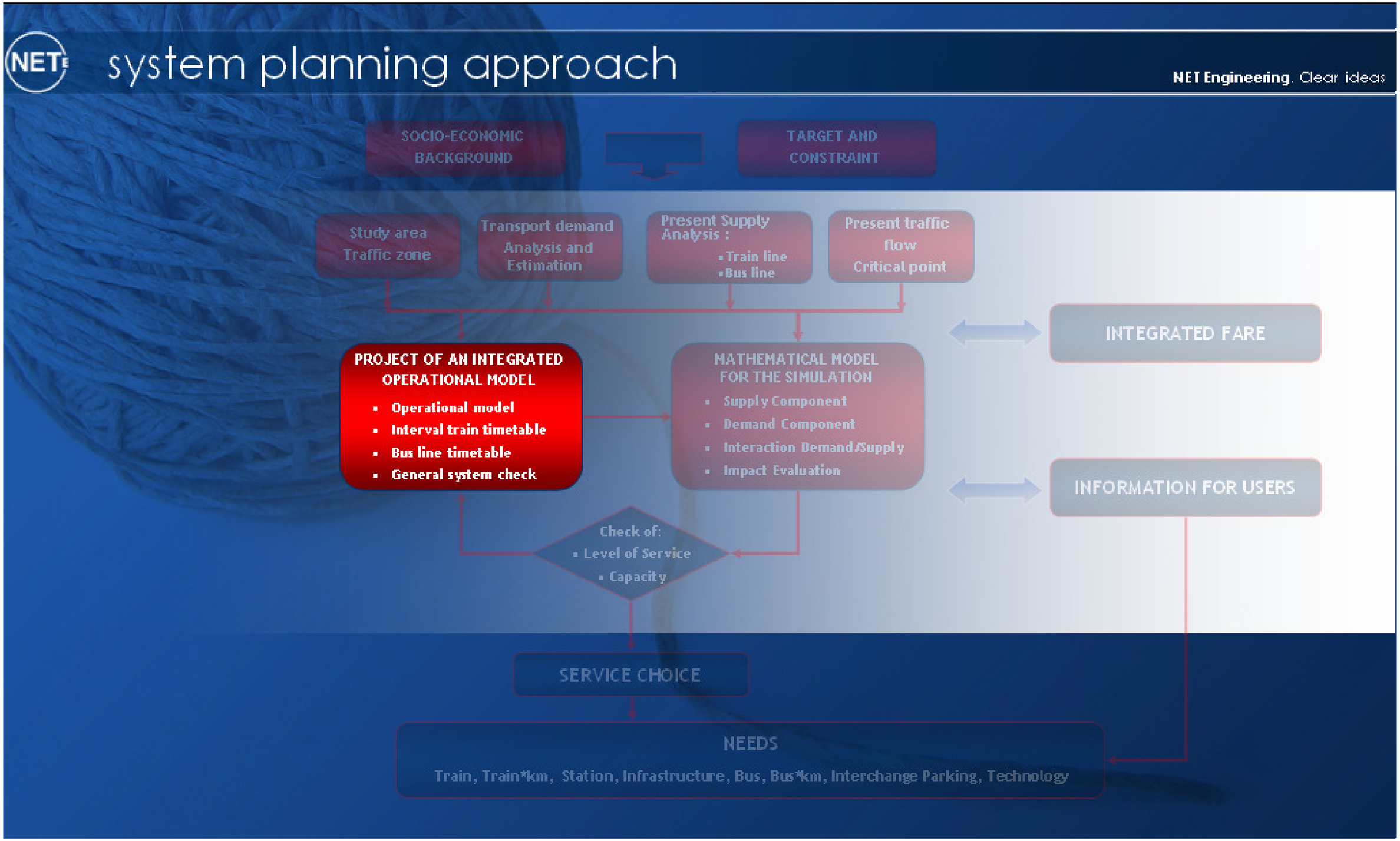
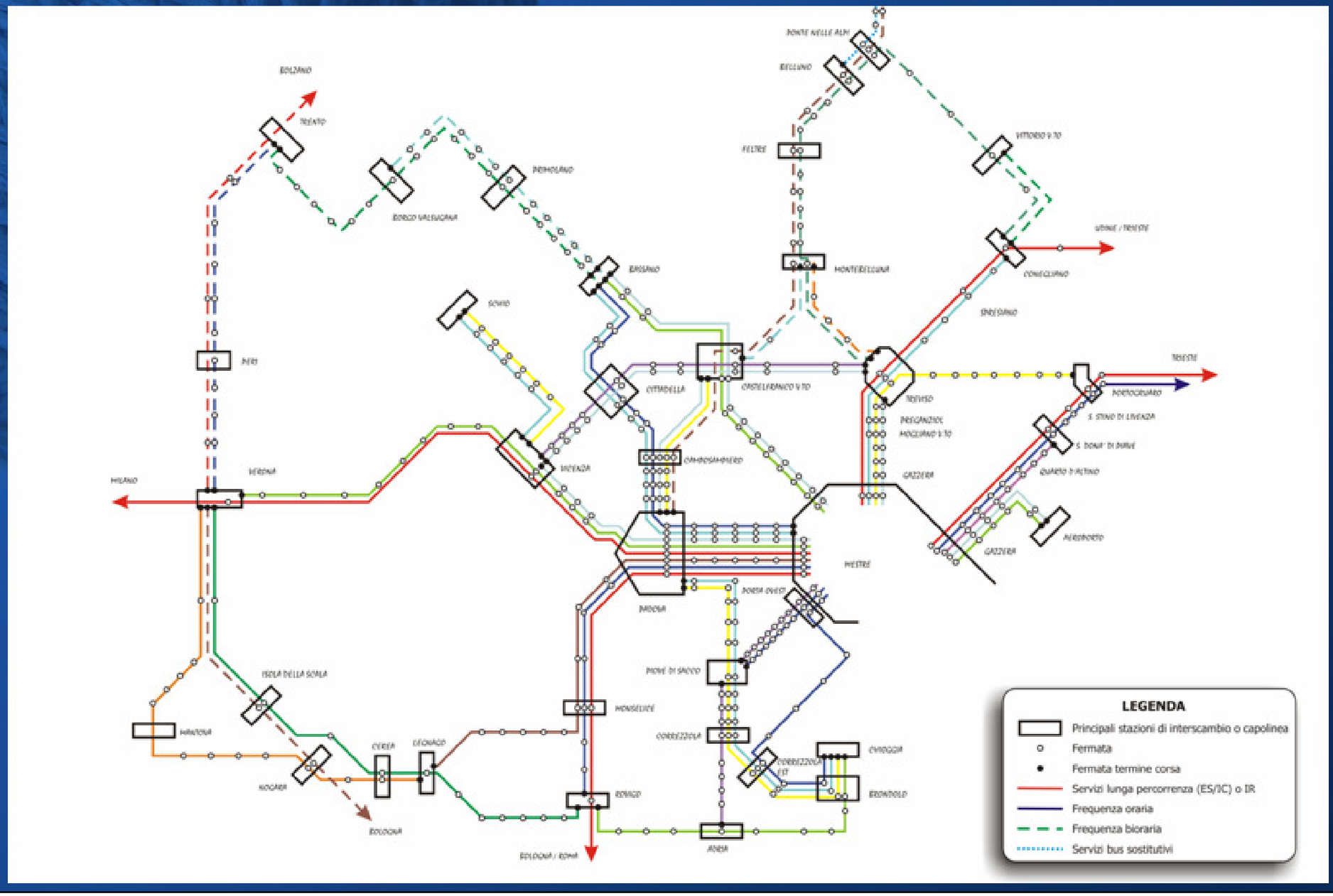
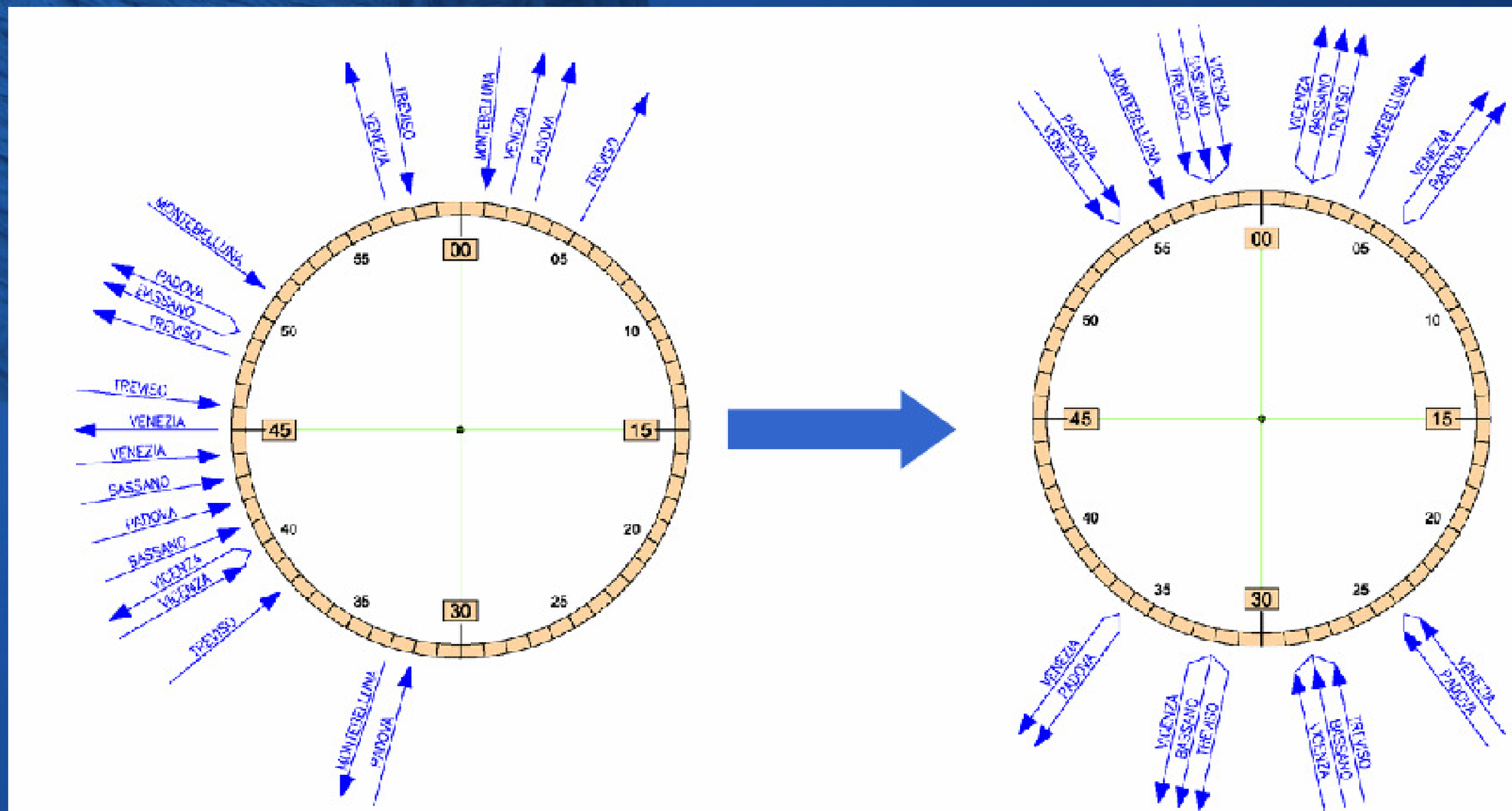


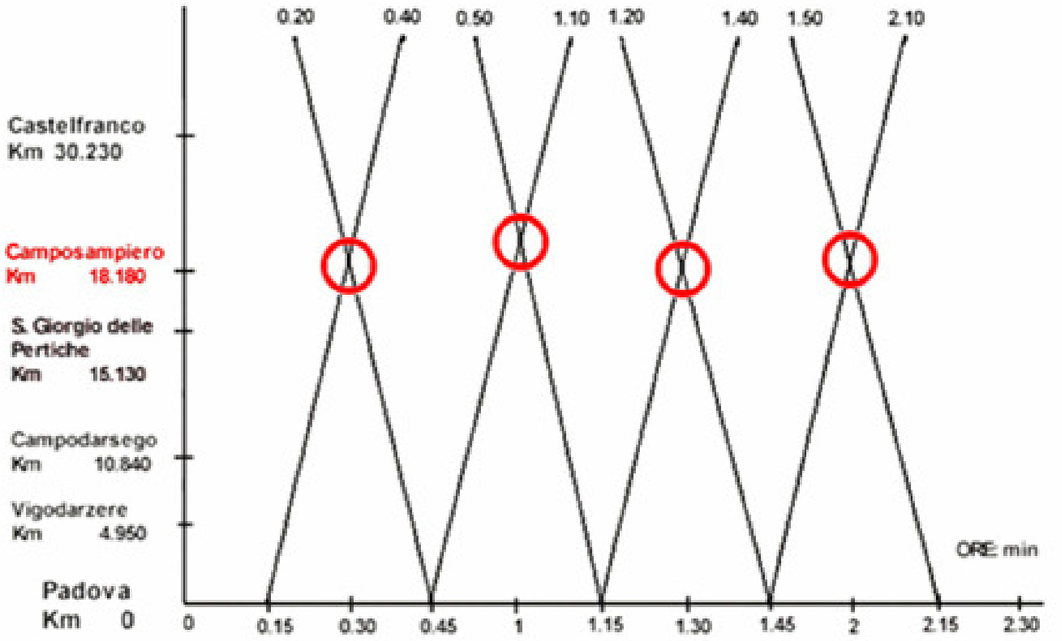
service features: high frequency all day long

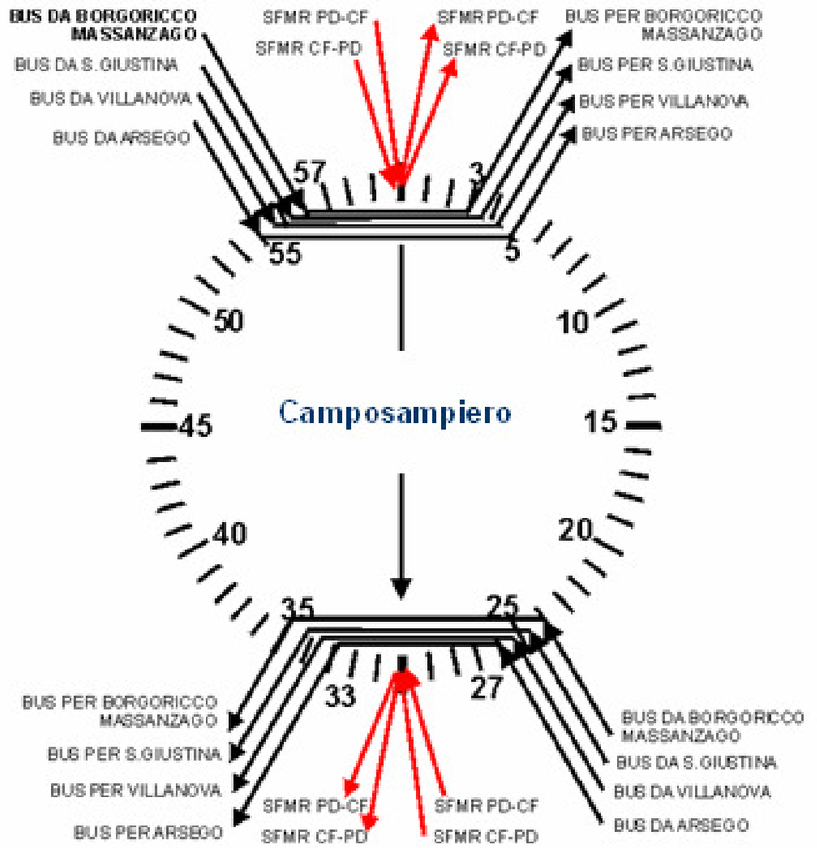


service features: rational connections

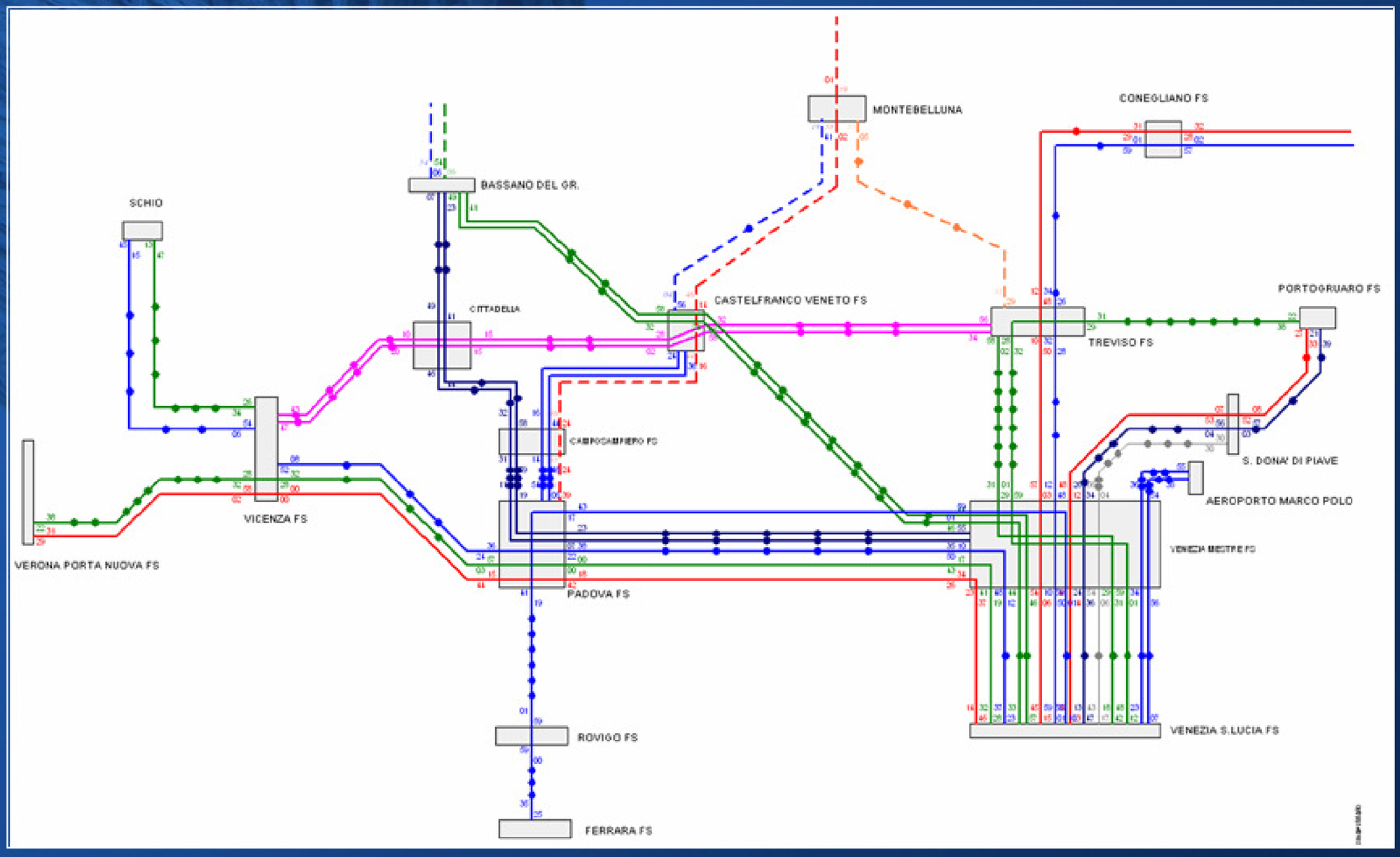


service features: coordination with bus services





The design tool: VIRIATO



system design approach

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interaction demand-supply: NEMO

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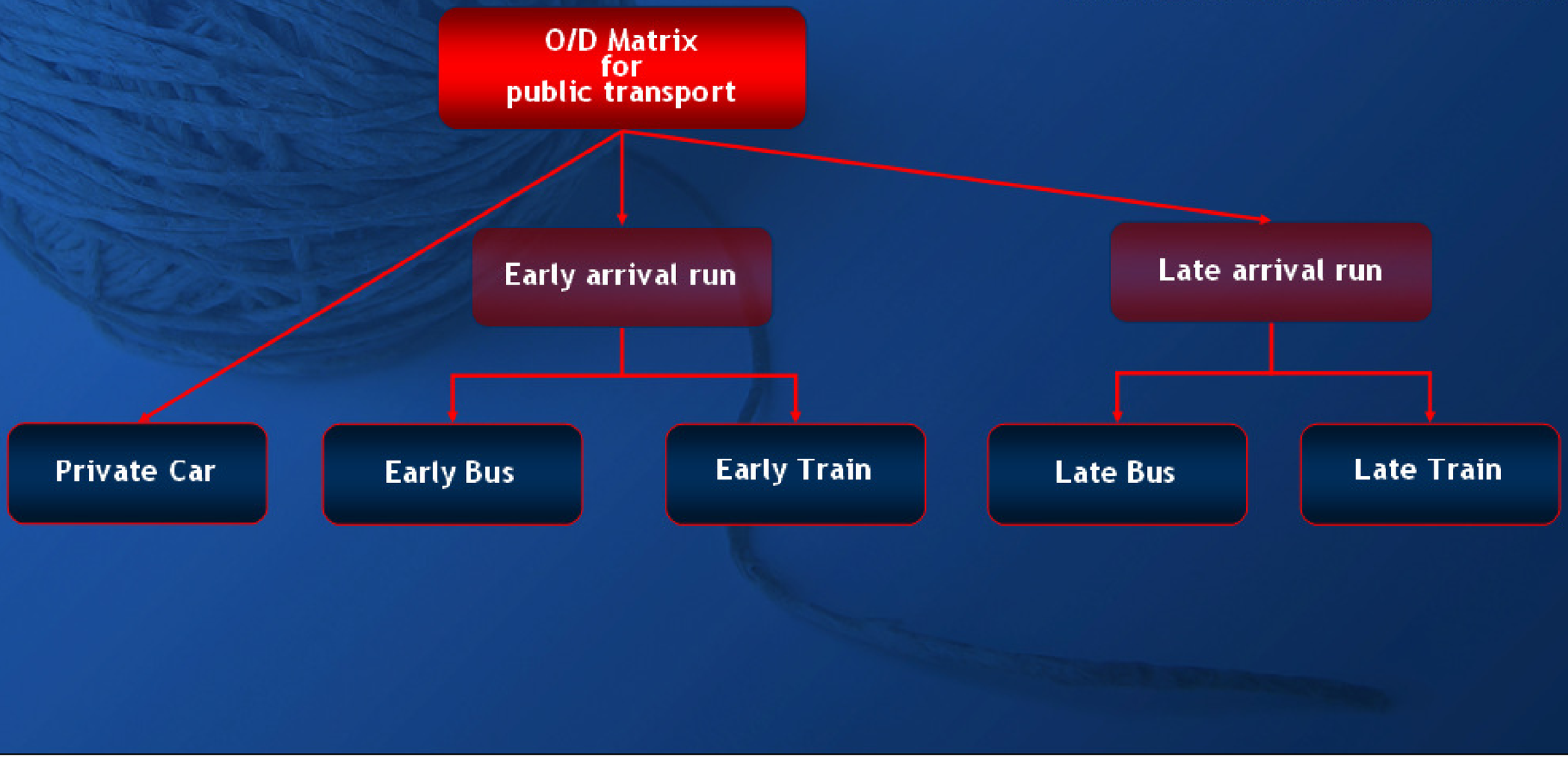
MODE/SERVICE CHOICE:
timetable diachronic model



passenger load for each single bus or train run

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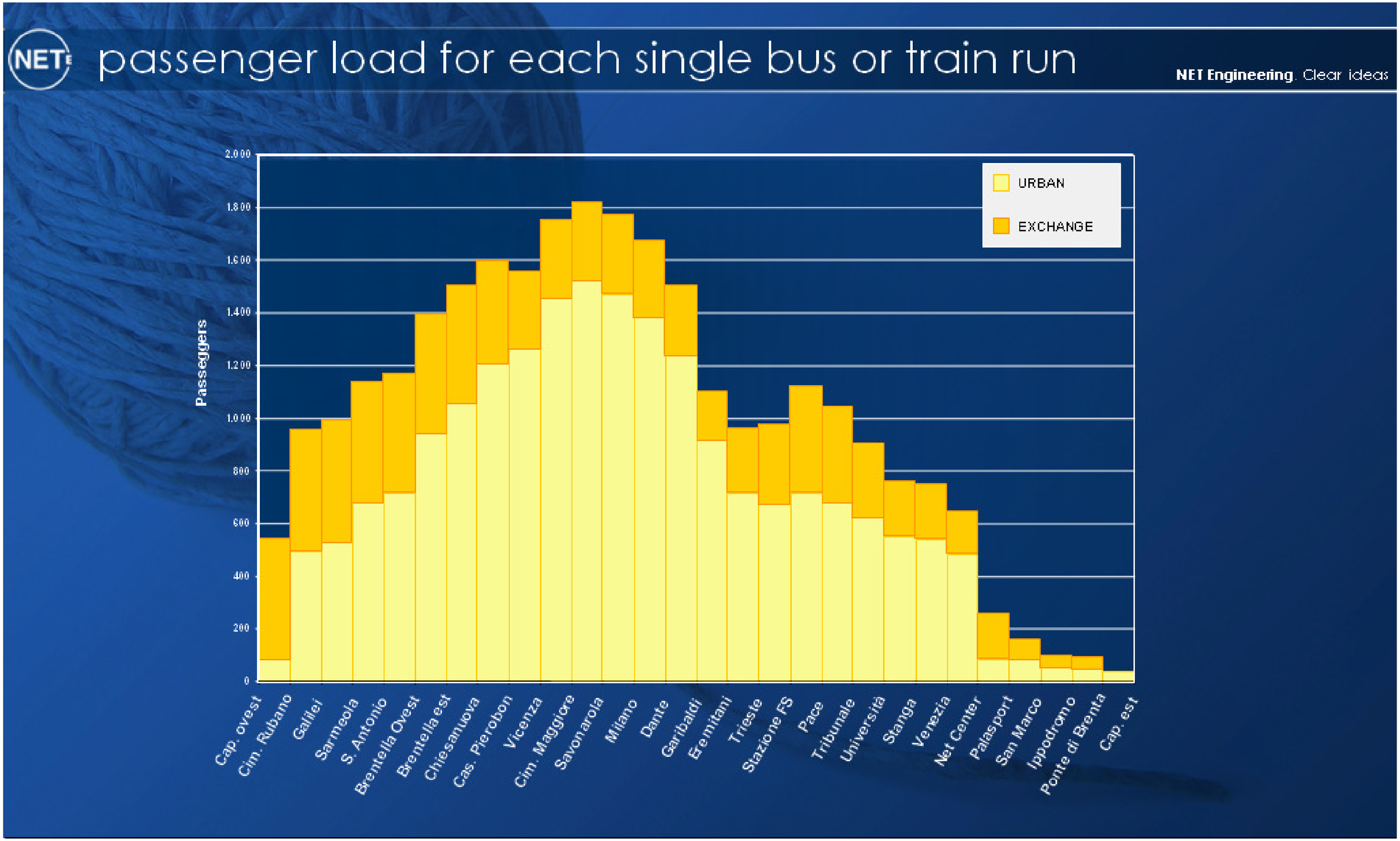

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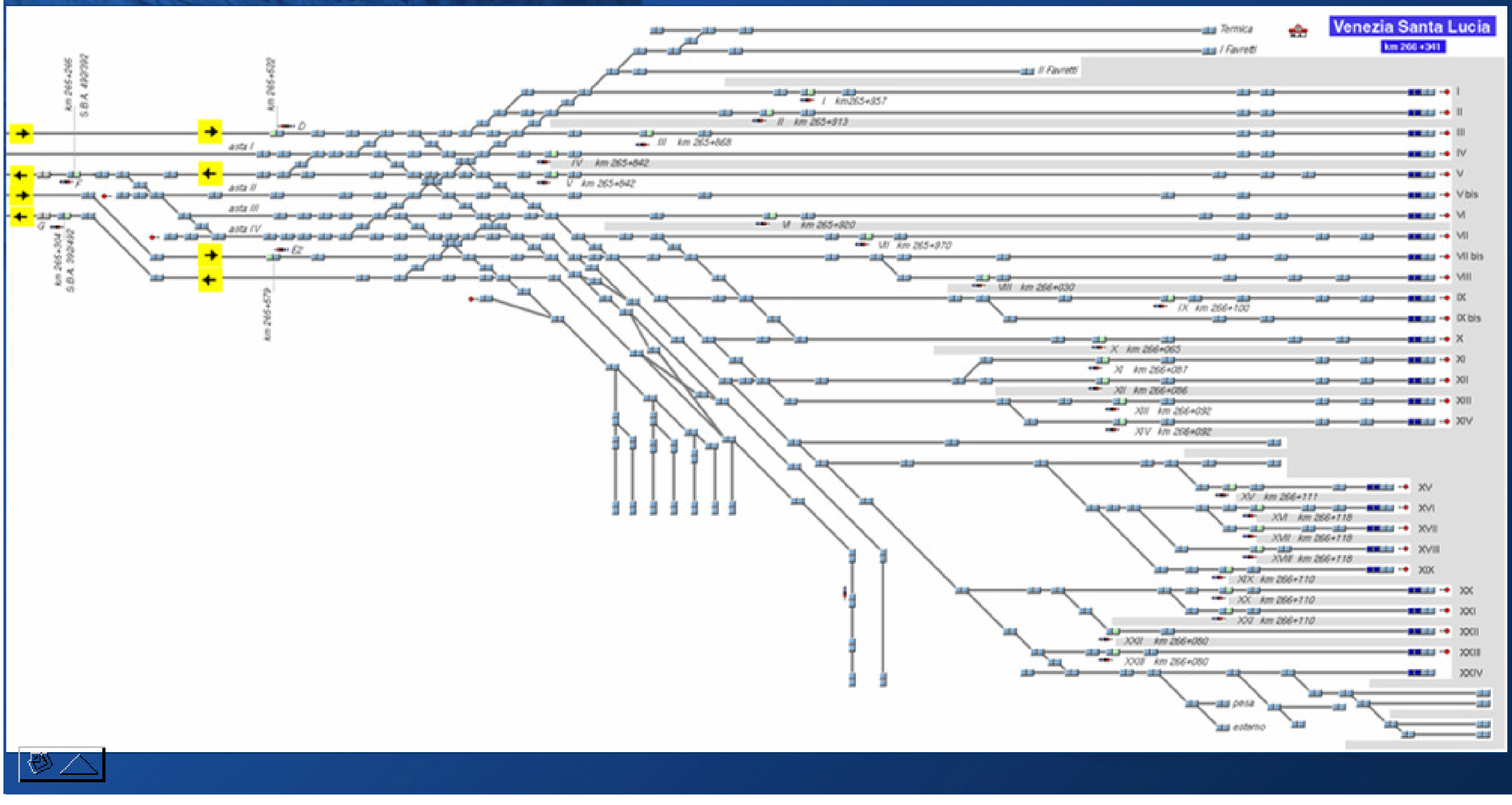
detailed analysis: OPENTRACK

We used OpenTrack to evaluate:

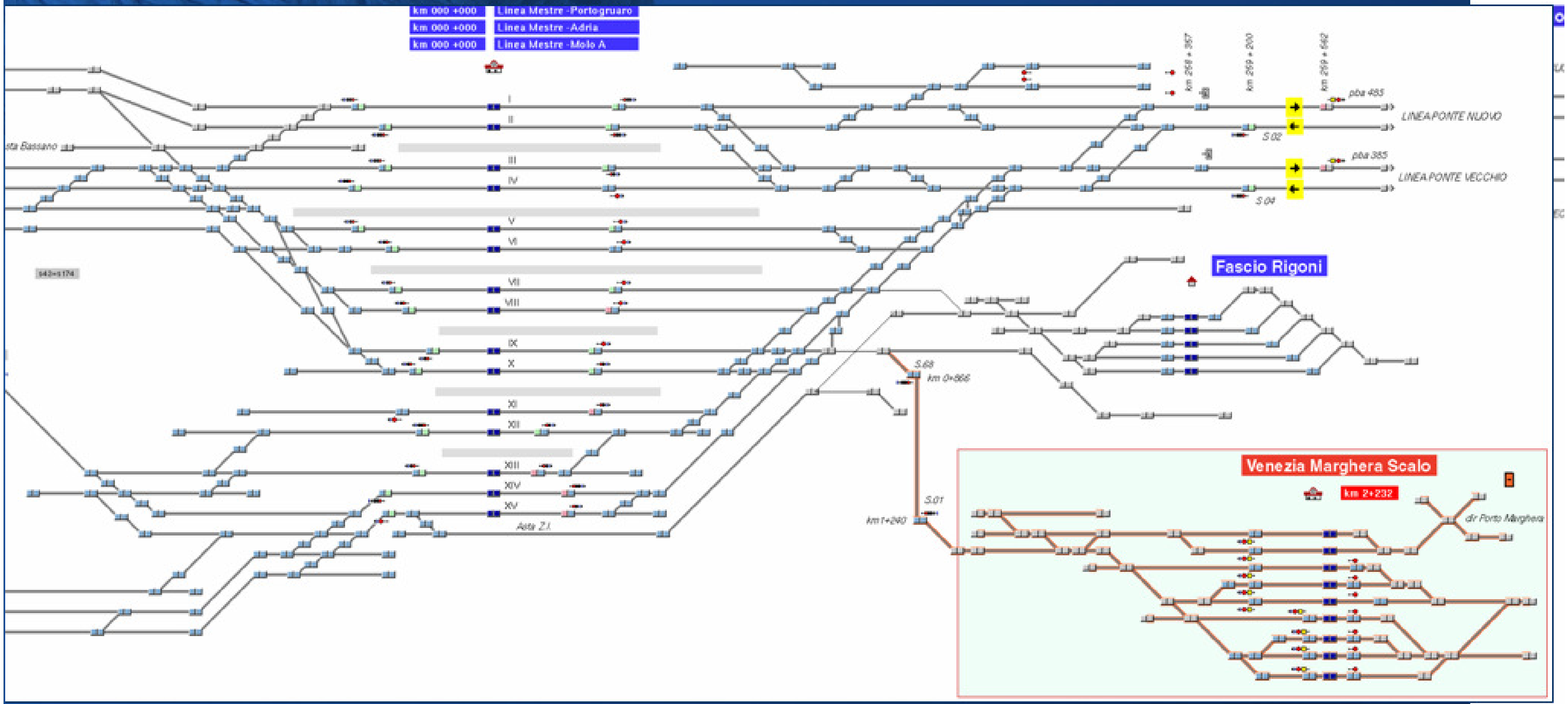
- ✓ the feasibility of a new local train timetable and its interaction with other trains (long distance, freight) in:
  - the principal nodes of the network (Venice, Mestre, Padova, Verona, …)
  - the new high speed / high capacity line between Mestre and Padova
  - the new lines and the new stations layouts under construction in the Region
  - …

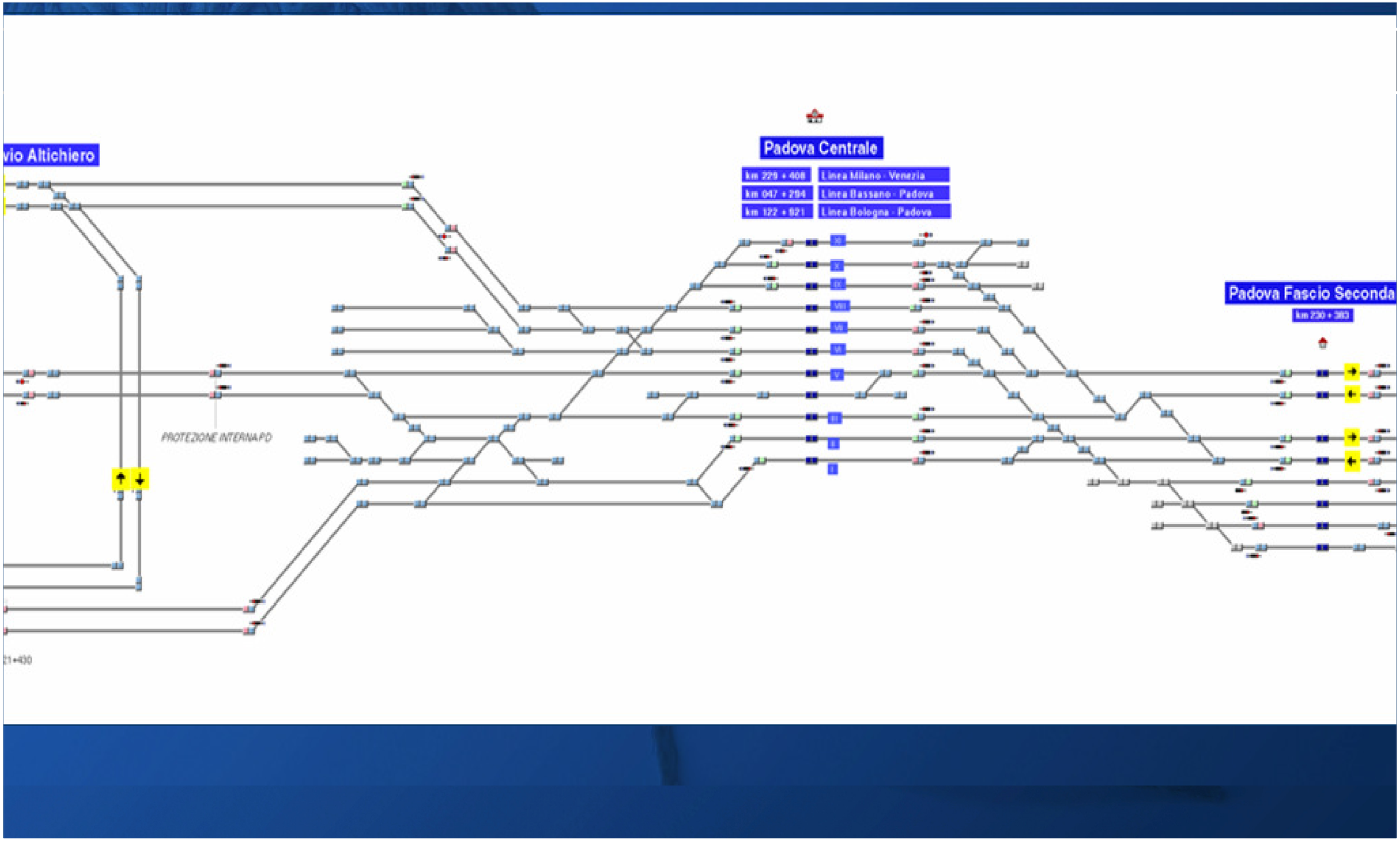
an example: Venezia – Verona line

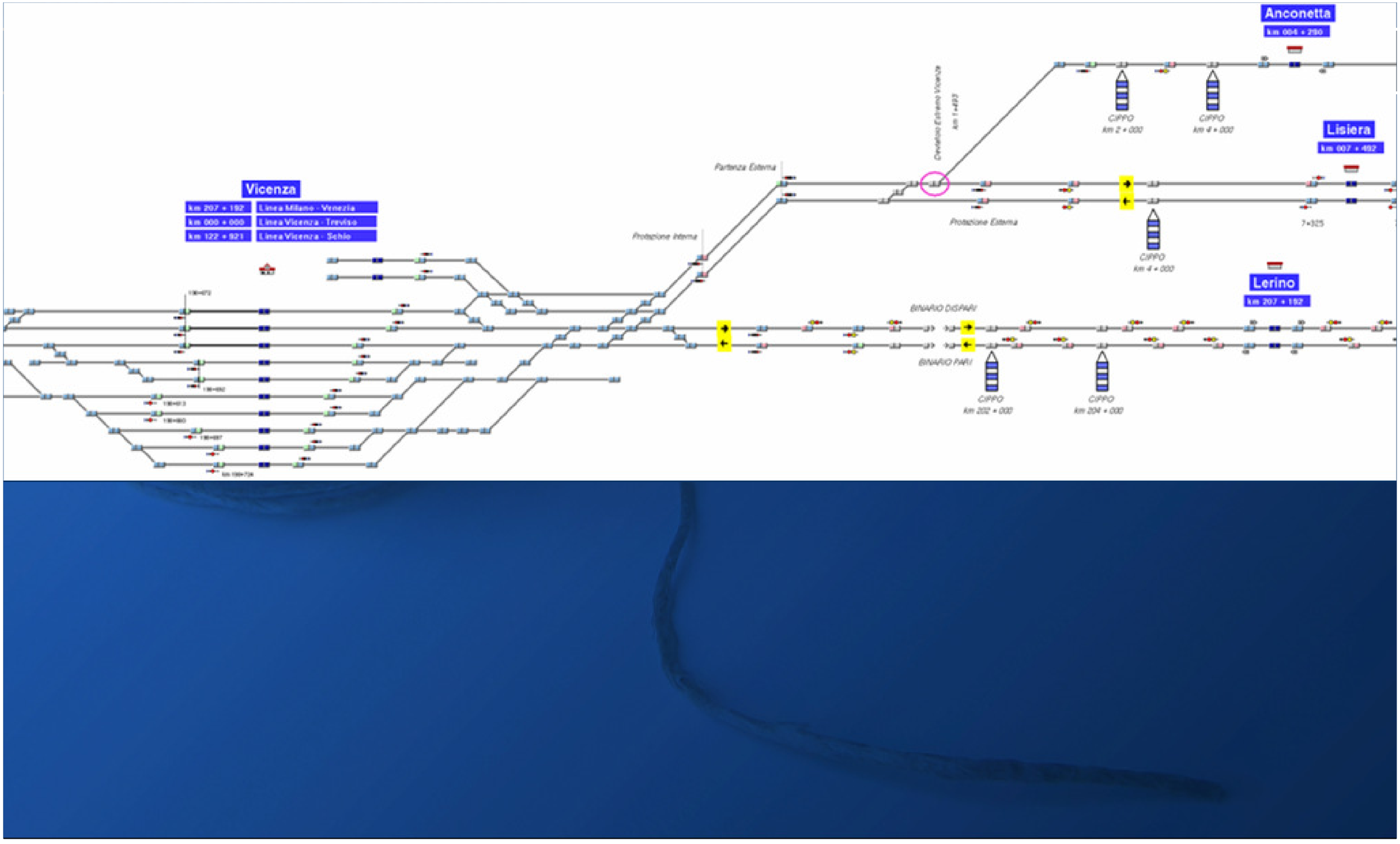
An example: the Venezia – Verona line



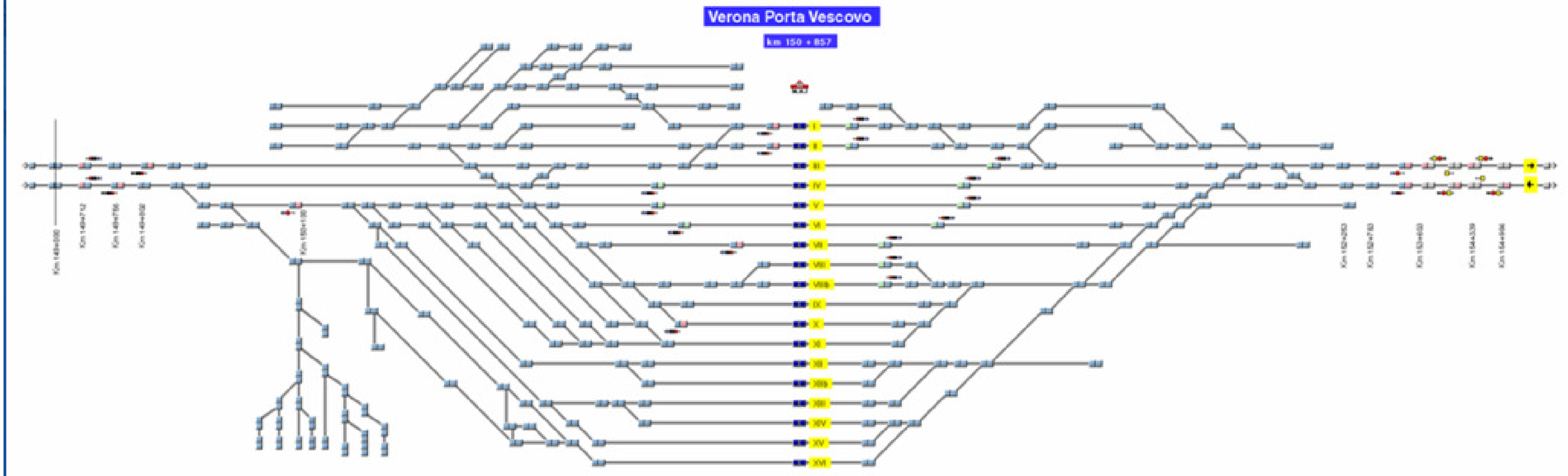
An example: the Venezia – Verona line




vio Altichiero
Padova Centrale
km 229 + 408
Linea Milano - Venezia
km 047 + 294
Linea Bassano - Padova
km 122 + 921
Linea Bologna - Padova
Padova Fascio Seconda
km 230 + 383
PROTEZIONE INTERNA PD
21+400


Anconetta
km 004 + 250
Lisiera
km 007 + 492
Lerino
km 207 + 192
Vicenza
km 207 + 192 Linea Milano - Venezia
km 000 + 000 Linea Vicenza - Treviso
km 122 + 921 Linea Vicenza - Schio
Partenza Esterna
Protezione Interna
Protezione Esterna
Deviatoio Estremo Vicenza
km 1+491
BINARIO DISPARI
BINARIO PARI
CIPPO
km 2 + 000
CIPPO
km 4 + 000
CIPPO
km 4 + 000
CIPPO
km 202 + 000
CIPPO
km 204 + 000
7+325

An example: the Venezia – Verona line



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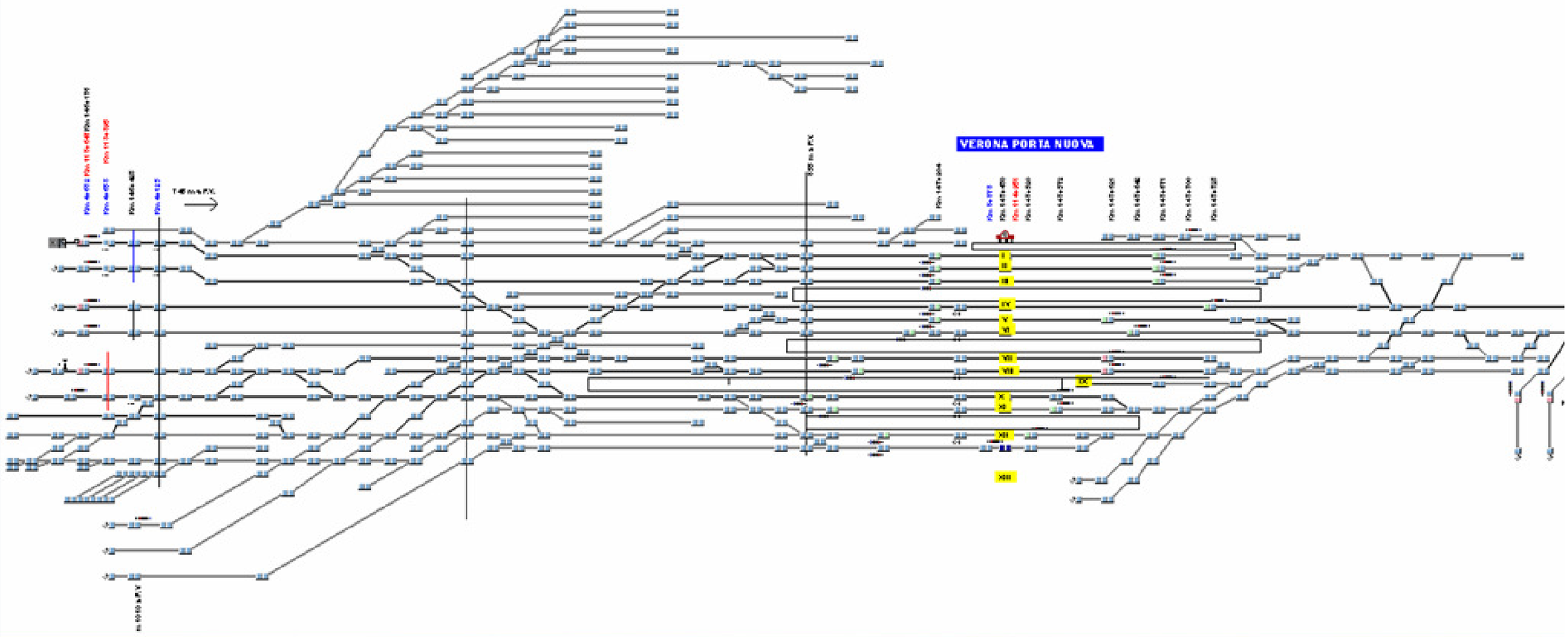

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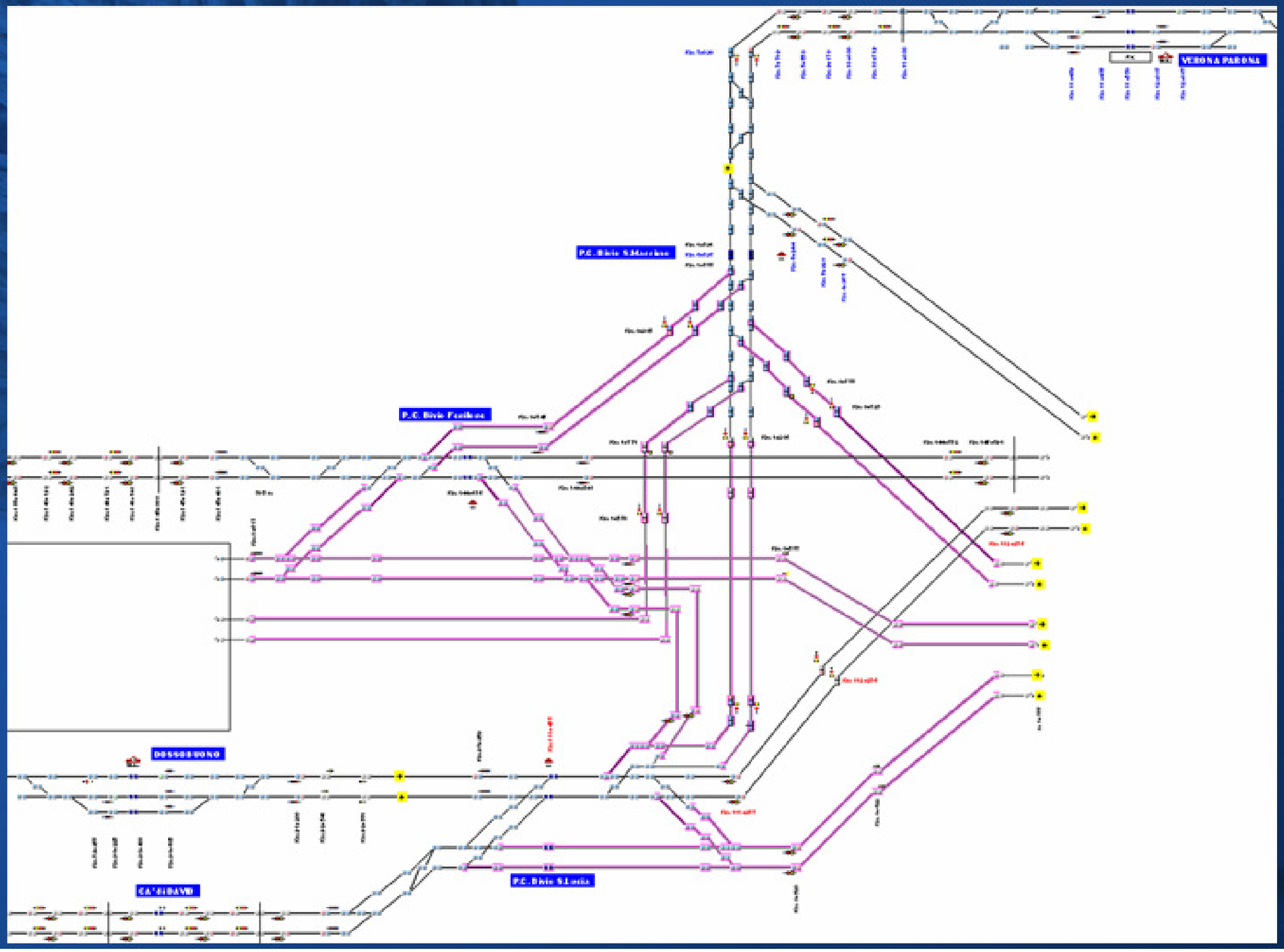

Some numbers about the network

281 stations

8471 edges, **15812** vertexes, **3342** signals

268 lines, **162** pictures, **246** rectangles, **268** lines, **2027** texts