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Swiss Federal Institute of Technology Zurich

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OpenTrack
Projects in the Balkan Region

Presentation at nextRAIL´17
2017-09-08

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OpenTrack Railway Technology Ltd.

Agenda

- Projects in Austria
- Projects in Croatia
- Projects in Serbia
- EU founded projects
- Questions and answers

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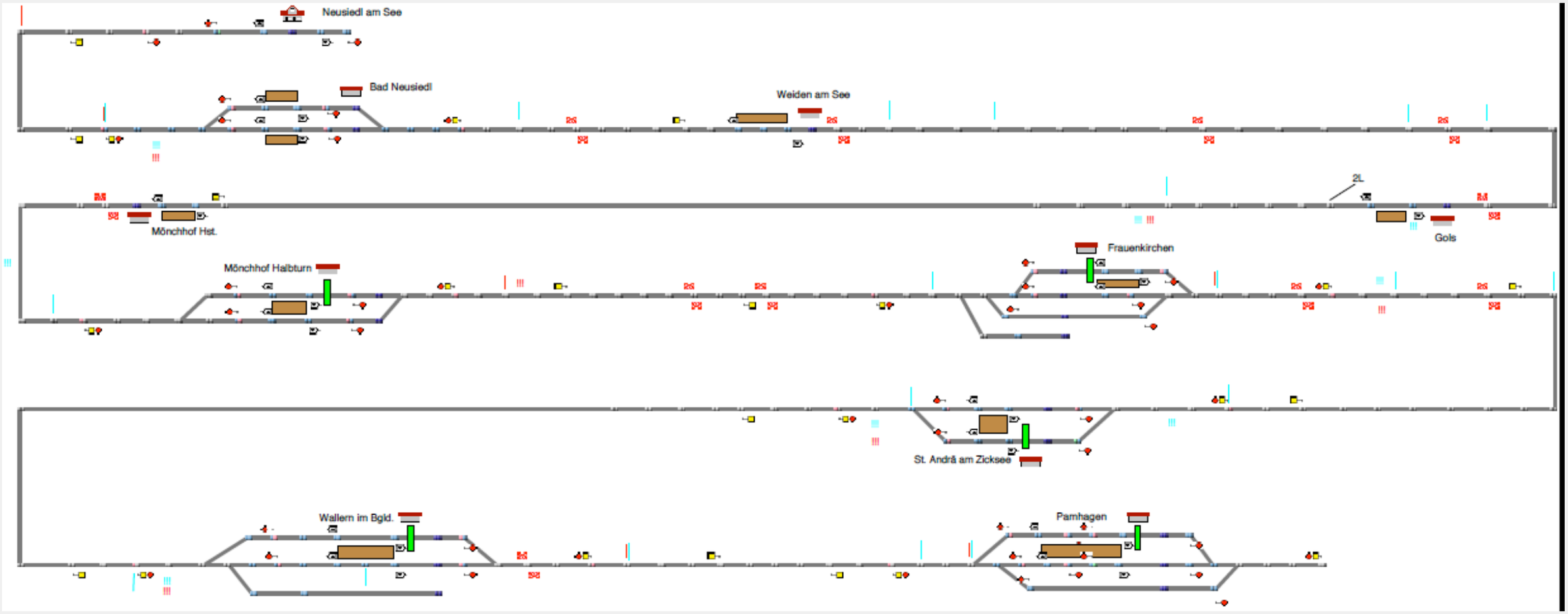
Neusiedler See Bahn (NSB)

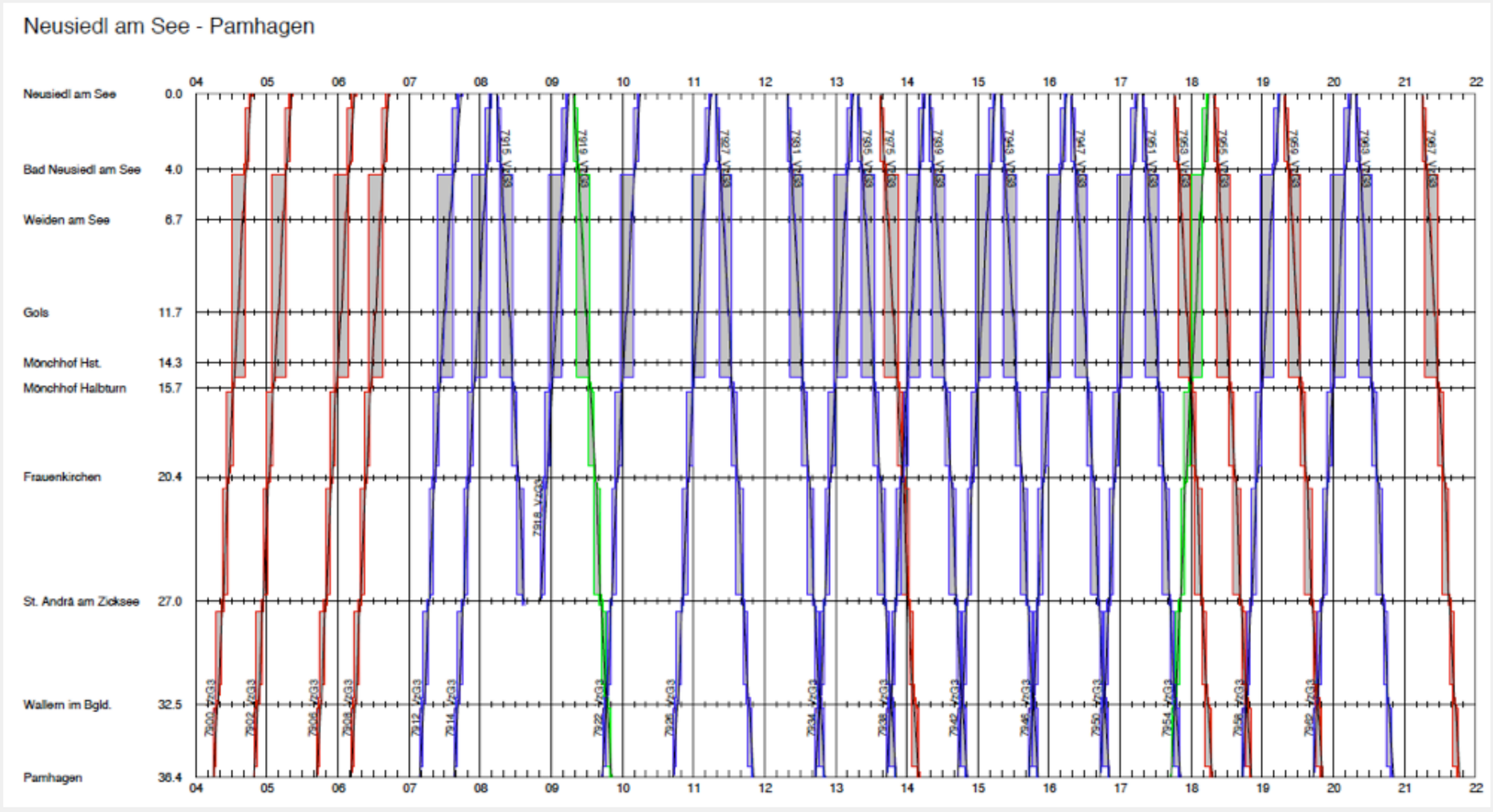
- Electrified 36 km Single Track Line
- Commuter Services for Vienna
- Touristic Region
- OT used for Calculation of Running Times when improving Infrastructure

Neusiedler See Bahn: Topology



- IVT Format used for Topology Import - Snake Layout

Neusiedler See Bahn: Timetable

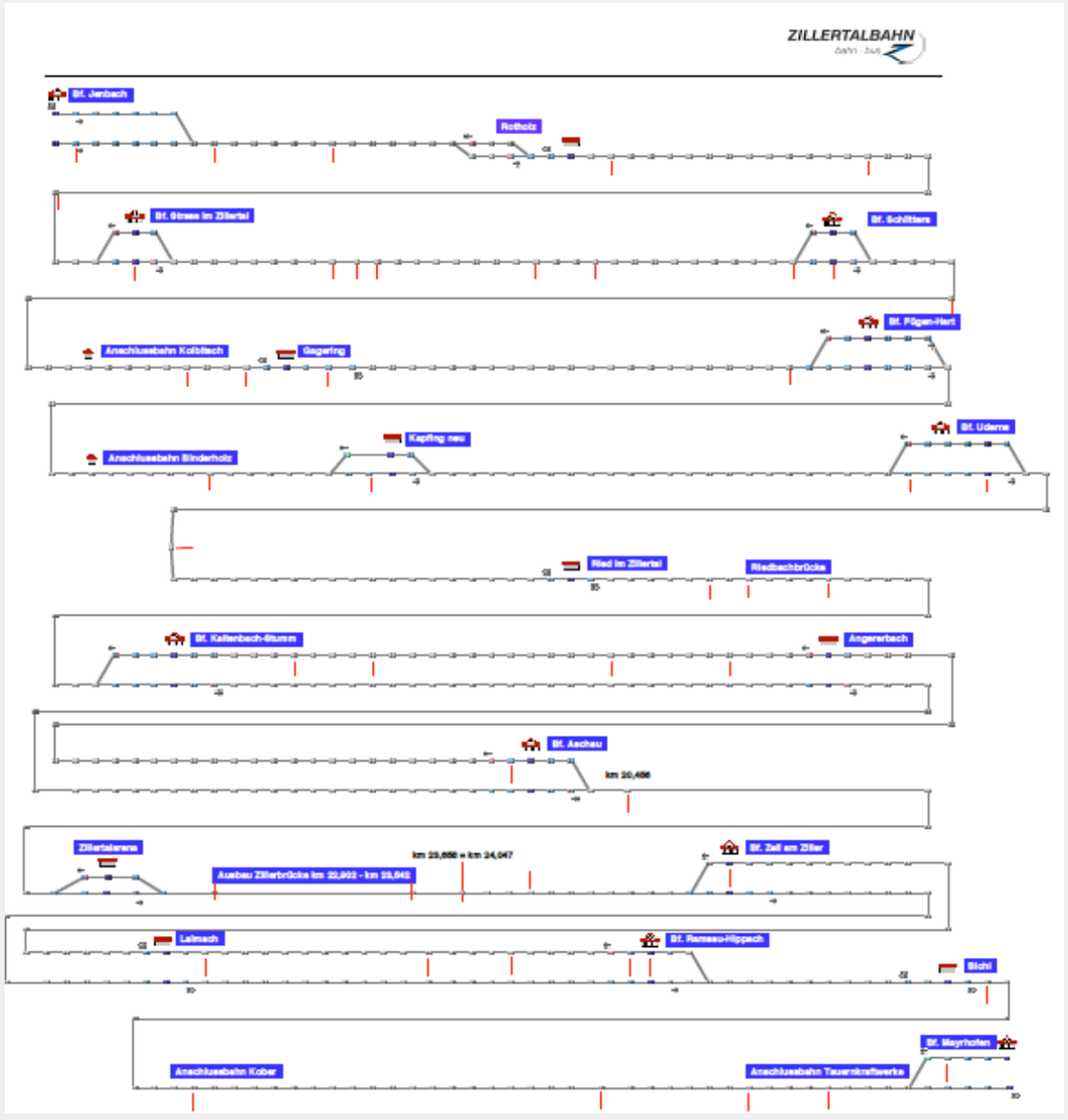


- OpenTrack Format used for Timetable Import

Zillertalbahn (ZTB)

- Non Electrified 32 km Single Track Line with two Double Track Sections
- Commuter Services for Jenbach
- Touristic Region
- OT used for Calculation of Running Times when Line will be electrified

Zillertalbahn: Topology



- Non Electrified 32 km Single Track Line with two Double Track Sections
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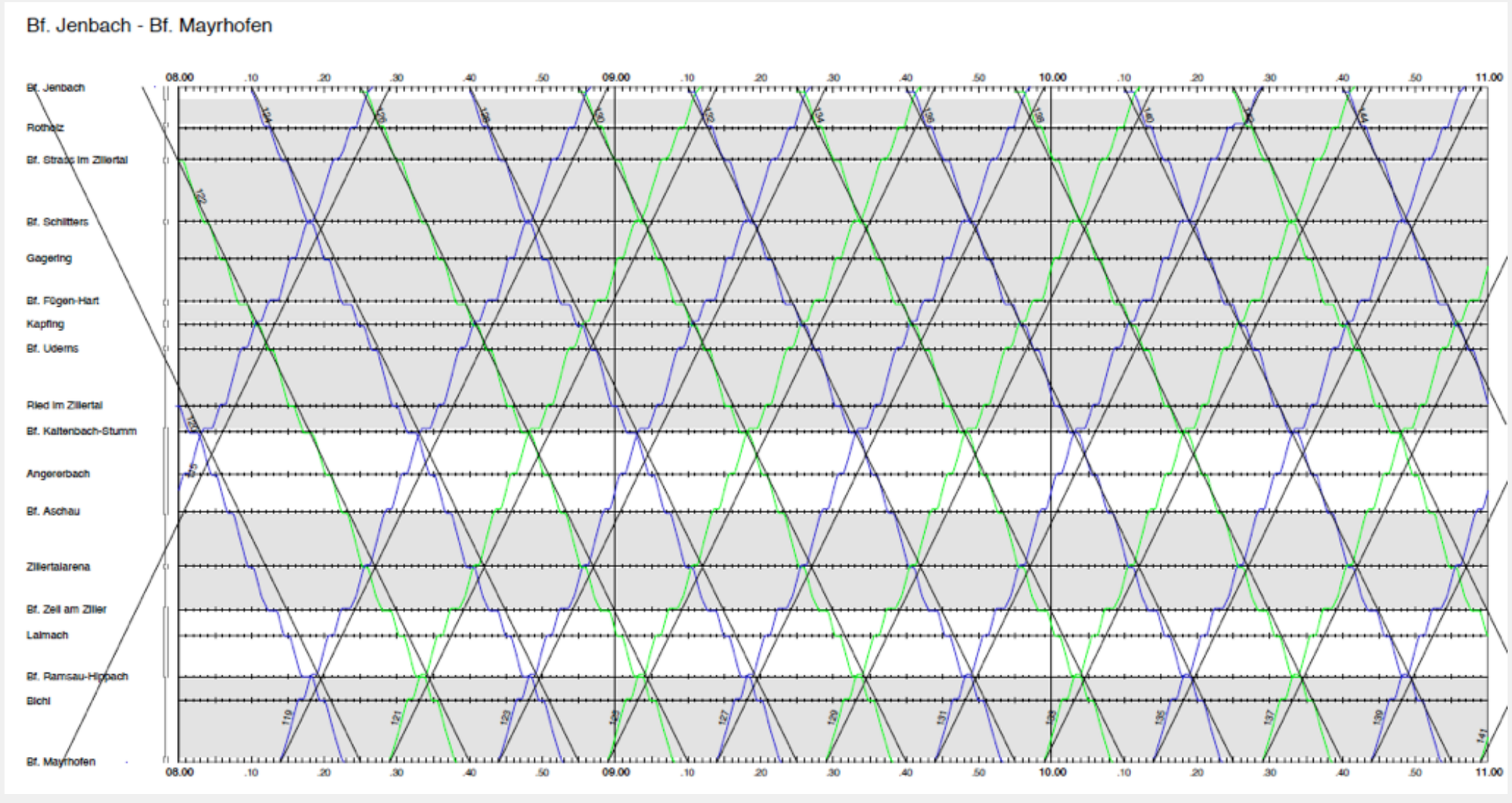
Zillertalbahn: Timetable



- Timetable created in OpenTrack by Interval Function

Fakultet Prometnih Znanosti, Zagreb

- OT in use since 2012
- Network of HZ Infrastruktura (Infra-Manager in Croatia) covered by student´s work
- Very detailed Model of Topology
- OT is used in Several Lectures and for Diploma Thesis and commercial for ERTMS Implementation in Croatia

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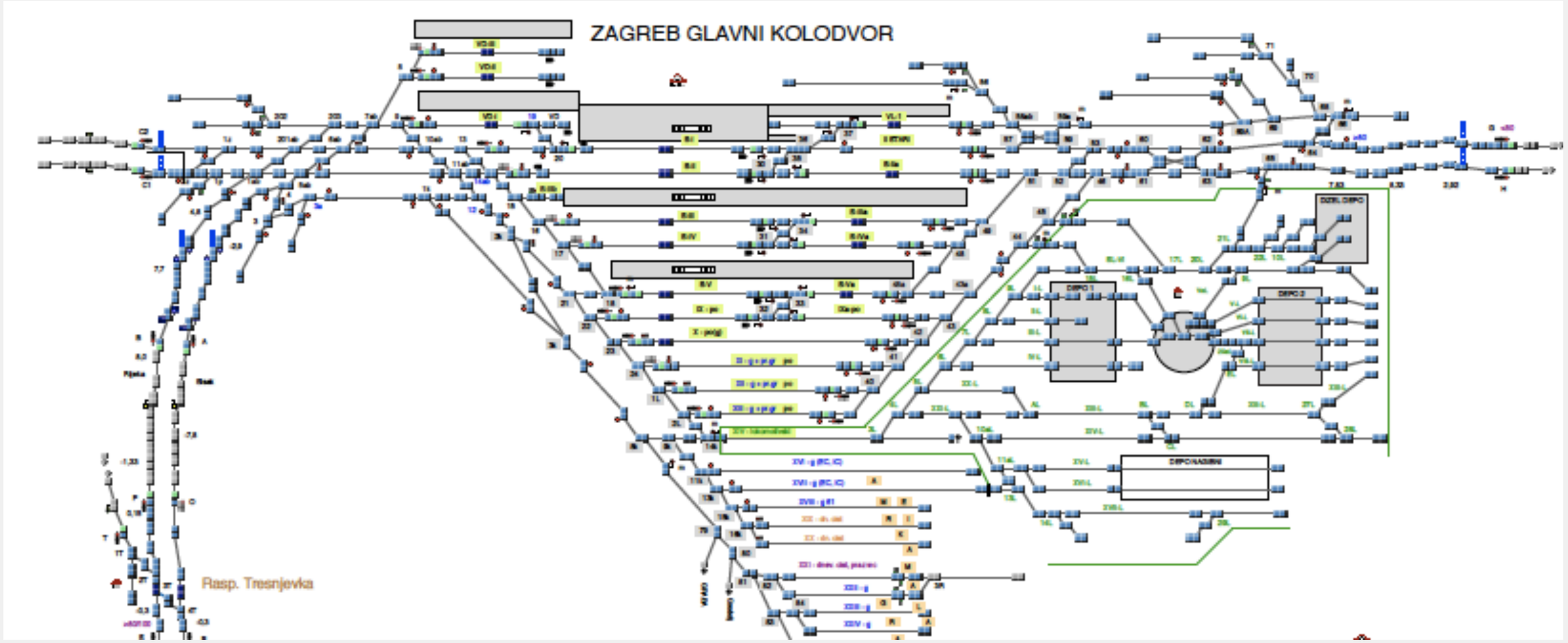
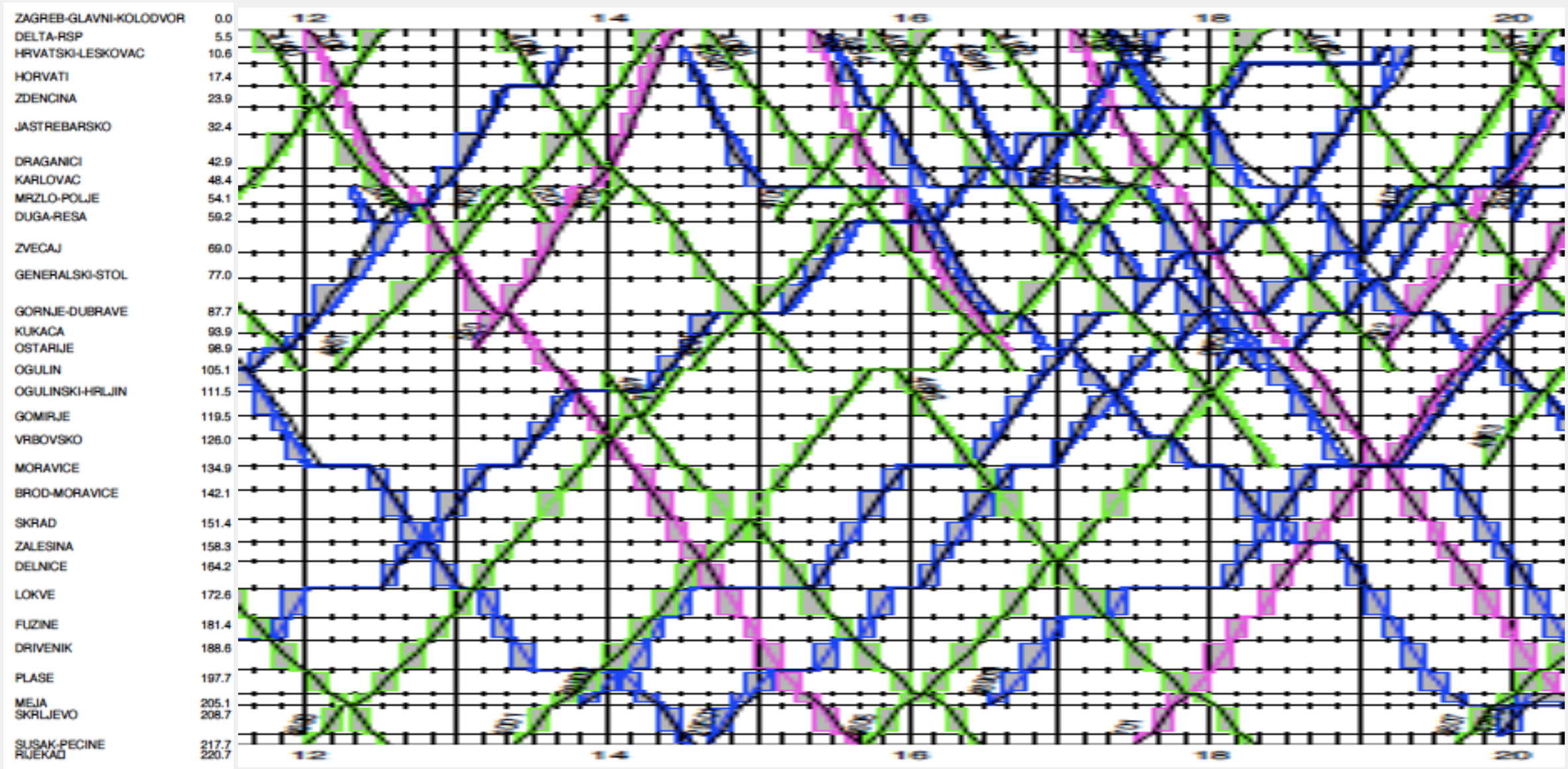
Topology of Zagreb Glavni Kolodvor



Timetable on Zagreb GK - Rijeka



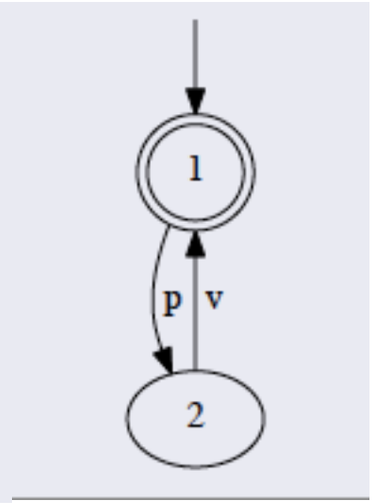
Saobraćajni Institut CIP, Beograd

- OT in use since 2009
- Capacity Analysis on Open Line and in Stations
- Design of Railway Hubs
- Organisation of Railway Traffic during Maintenance Work

Kronecker Algebra for Railway Operation

- Consists out of Kronecker Product & Kronecker Sum
- Trains L_k correspond to threads
- Track sections T_i are modelled by semaphores

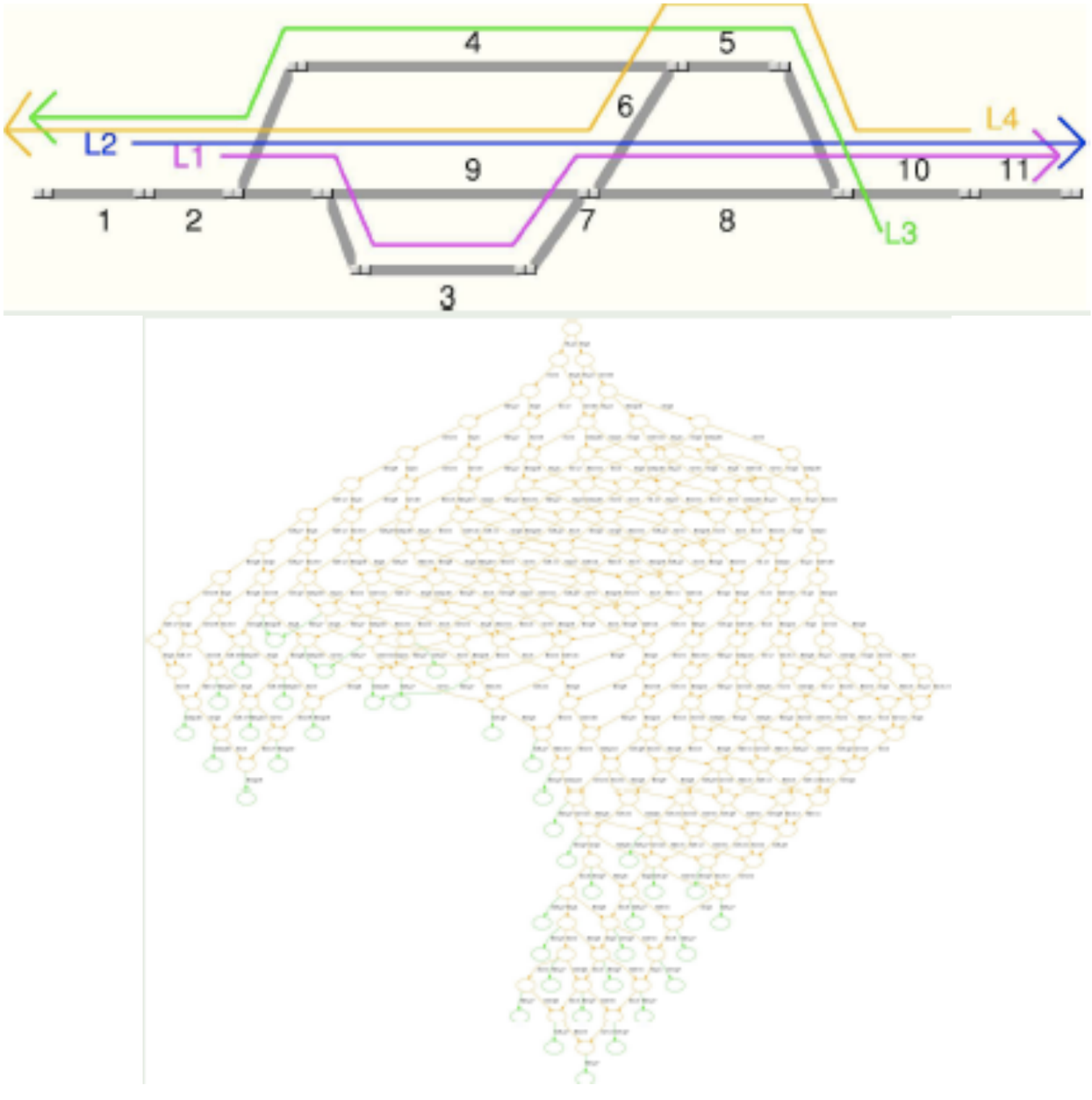
$$S = \begin{pmatrix} 0 & p \\ v & 0 \end{pmatrix}$$



- Routes R_j are modelled by sequences of semaphore operations
- Overall system:

$$S = \left(\bigoplus_{j=1}^{t} R_j \right) \otimes \left(\bigoplus_{i=1}^{r} T_i \right)$$

A Simple Example: Station „Nendeln“



- 11 sections, 4 trains
- lazy implementation: only ryg graph is computed
- matrix operations can be parallelized
- matrix size: 298,721.280
- ryg-graph size: 2583
- yg-graph size 206

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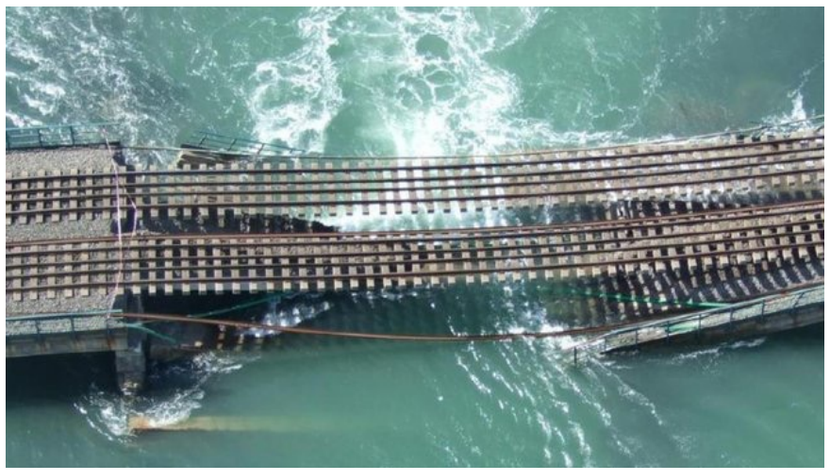
H2020 Project DESTinationRAIL



- Irish Railway Network used for Demonstration
- Kronecker Algebra used for Calculation of an Driving Strategy for all involved Trains
- Minimum of Delays and/or Traction Energy Consumption

EUROPEAN COMMISSION
Innovation and Networks Executive Agency
Director

DESTination RAIL
Decision Support Tool for Rail Infrastructure
EU Project No. 636285

HORIZON 2020

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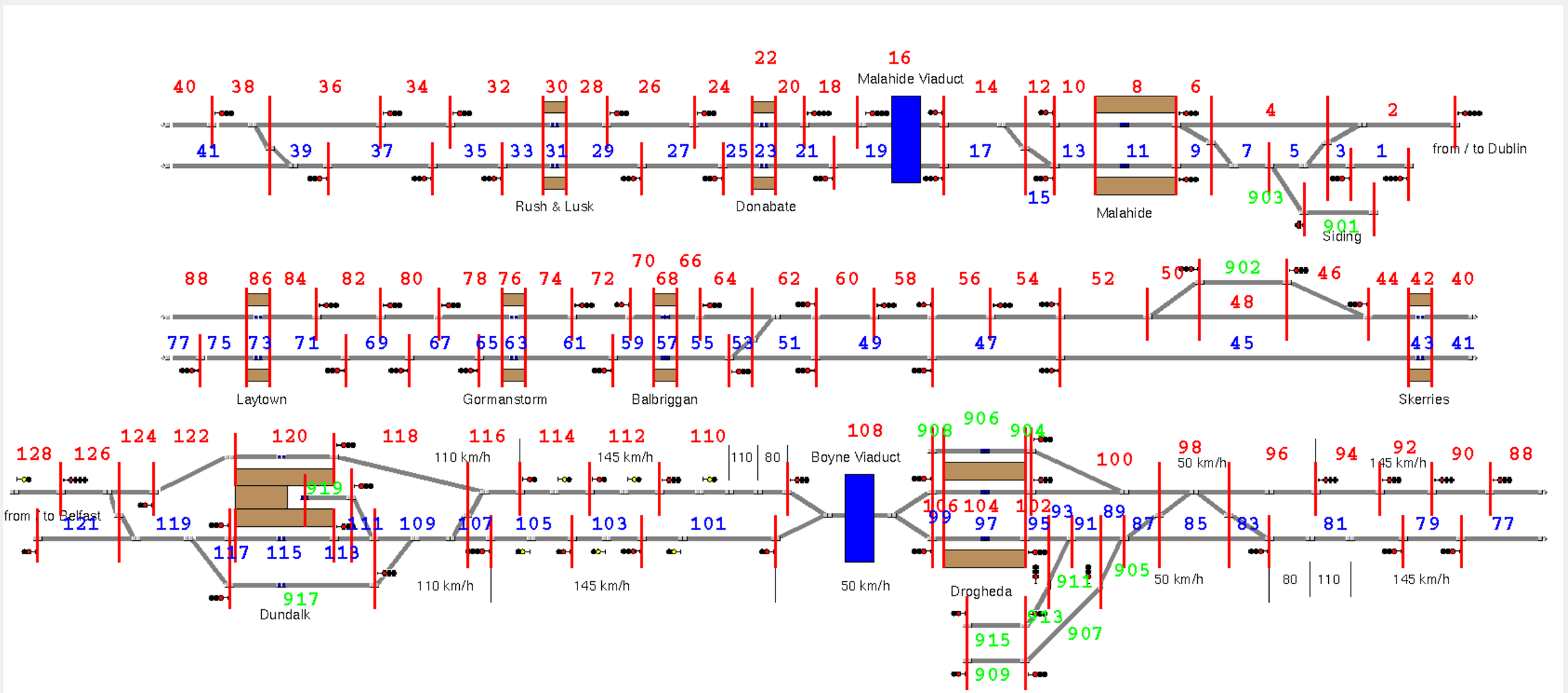
Irish Rail: Topology Malahide - Dundalk



- OT used for Visualisation of Segmentation in Kronecker Algebra

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Questions ?