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Cost Benefit Analysis for OTI – Methodology and Results

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Agenda

- Introduction/Aim
- Methodology & Results
  - Life cycle cost analysis
  - Capacity analysis
- Conclusion/Outlook

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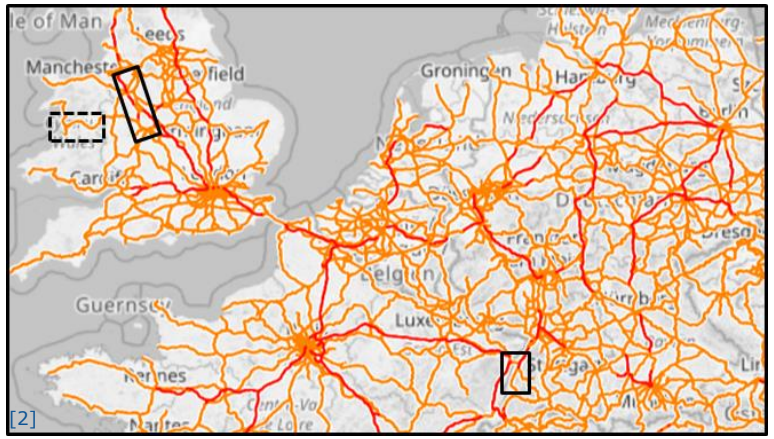
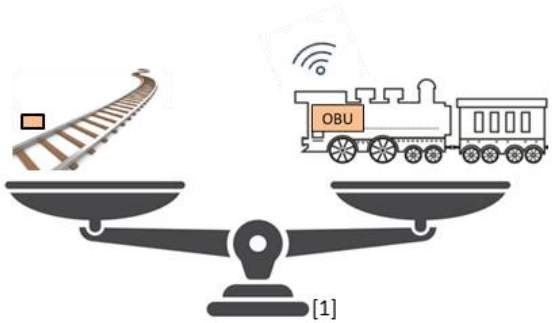
Introduction/Aim

- Studies have been performed on Network Rail and Deutsche Bahn real scenarios for regional and high capacity lines
- Aim of the study:
  - Cost analysis
    - expected cost of OTI
    - saving potential through the elimination of infrastructure elements
  - Capacity analyis
    - line capacity analysis,
    - the effects of applying moving block in nodes and stations



--- Regional — High capacity



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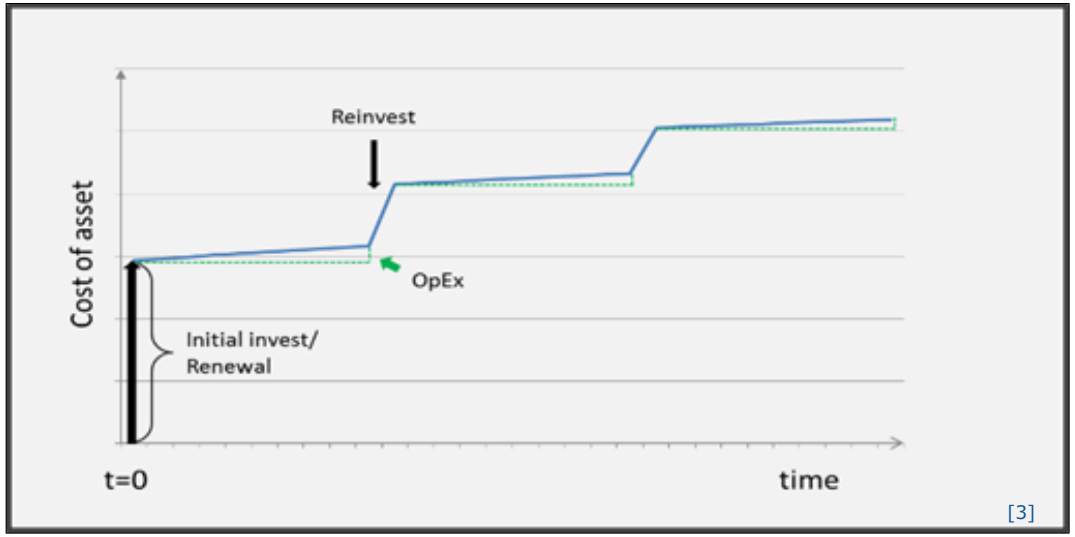
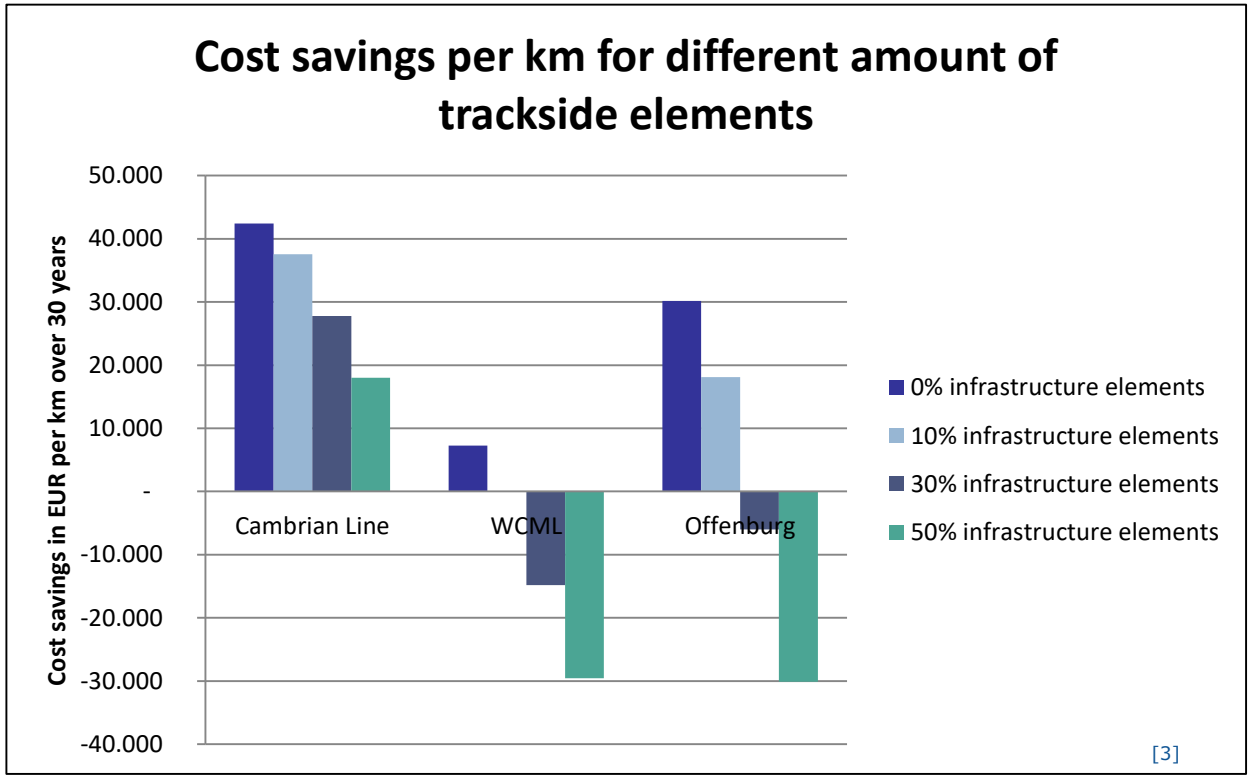
Cost analysis - Methodology

- Net present value approach for life cycle cost analysis
  - assessing technological implementations with a long service life
  - lifespan, discount rate, asset quantities, cost values
- Asset determination for OTI equipment has been presented at SmartRacon2020
  - fixed assets
  - rolling stock



Cost analysis - Results

- Highest cost savings per kilometer on Cambrian Line
  - No freight trains running
  - Few passenger trains
  - ➢ Not many trains to equipped with OTI
- On high density mixed lines cost savings are possible when less trackside elements remains



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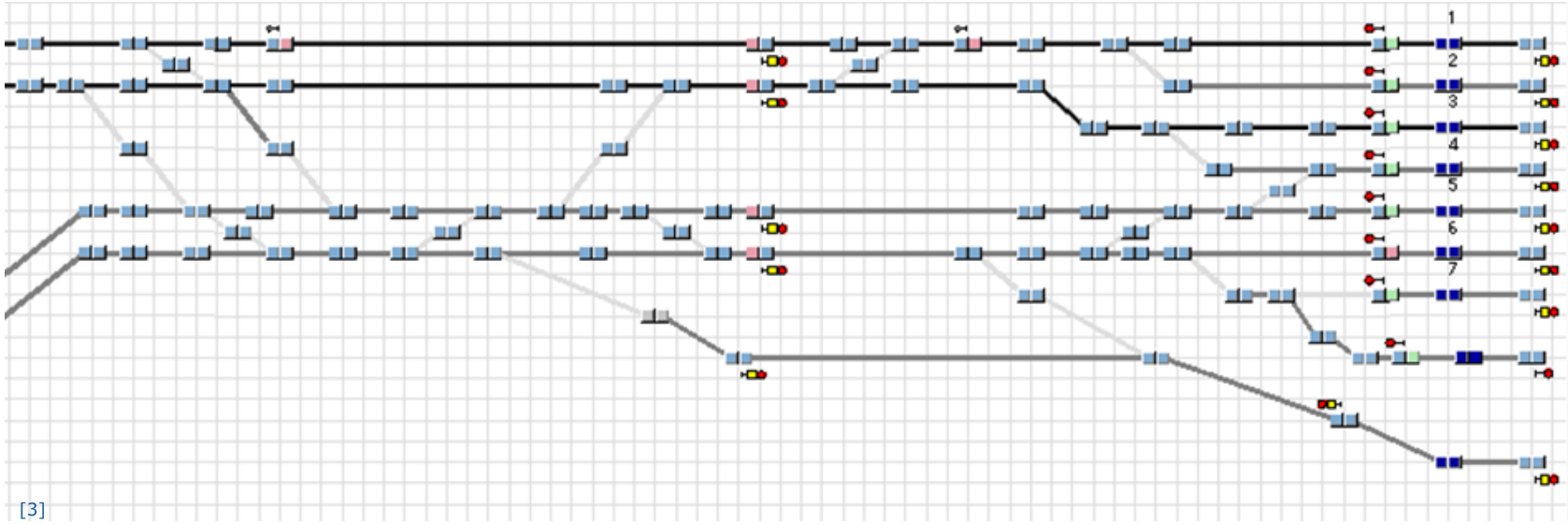
Capacity analysis - Methodology

- Microscopic simulation done with Open Track on two lines and in one node
  - detailed models of trains as well as the infrastructure possible e.g. exact position of switches, signals, axle counter, track circuits
  - possibility to apply moving block operation



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Open Track infrastructure

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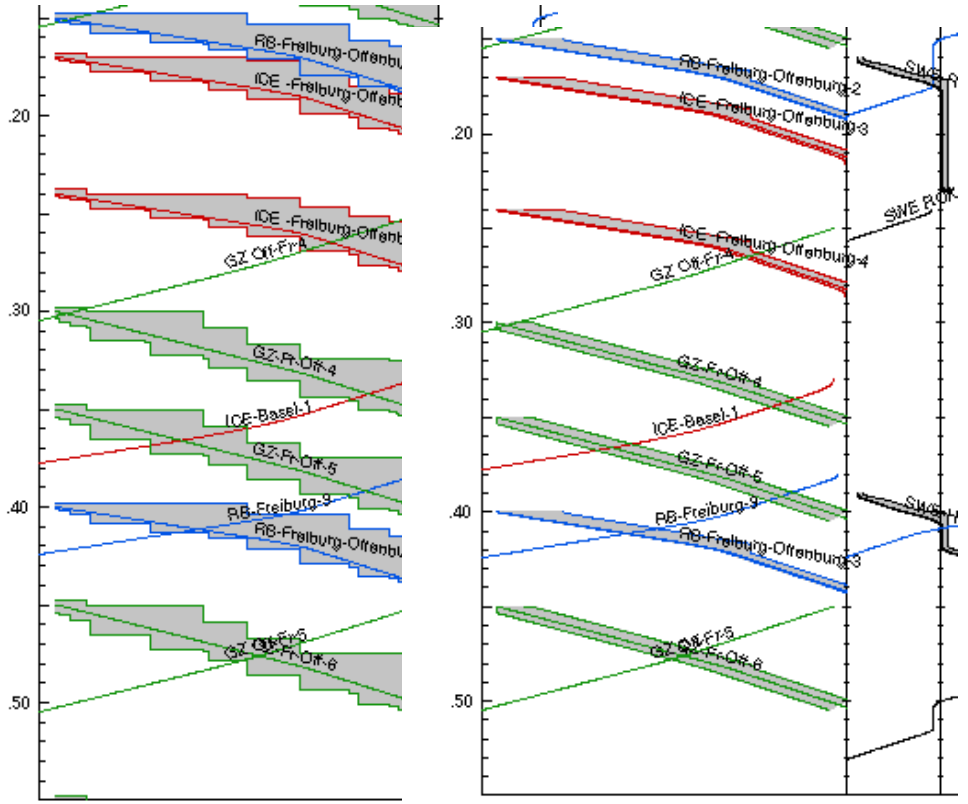
Capacity analysis – Results main line

- Capacity consumption according to UIC Code 406 on the line
- Reduction of capacity consumption visualised by a train diagram
  - Y axis: time
  - X axis: distance
- Colored lines represent different train types
- Grey shaded areas visualise the time that a track section is blocked by one train

➢ Capacity consumption in simulated scenario could be reduced from ~80% to ~55%



[2]

Reduction of capacity consumption visualised by a train diagram for a fixed block (left) and moving block (right) on a section of the network Offenburg-Freiburg

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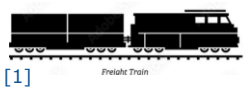
Capacity analysis – Results node

- Capacity consumption in the node in the simulated scenario could be reduced
  - Green line represents a reserved train path with blocked track sections
  - Reduction of the occupation rate of critical switches to 50%-33%



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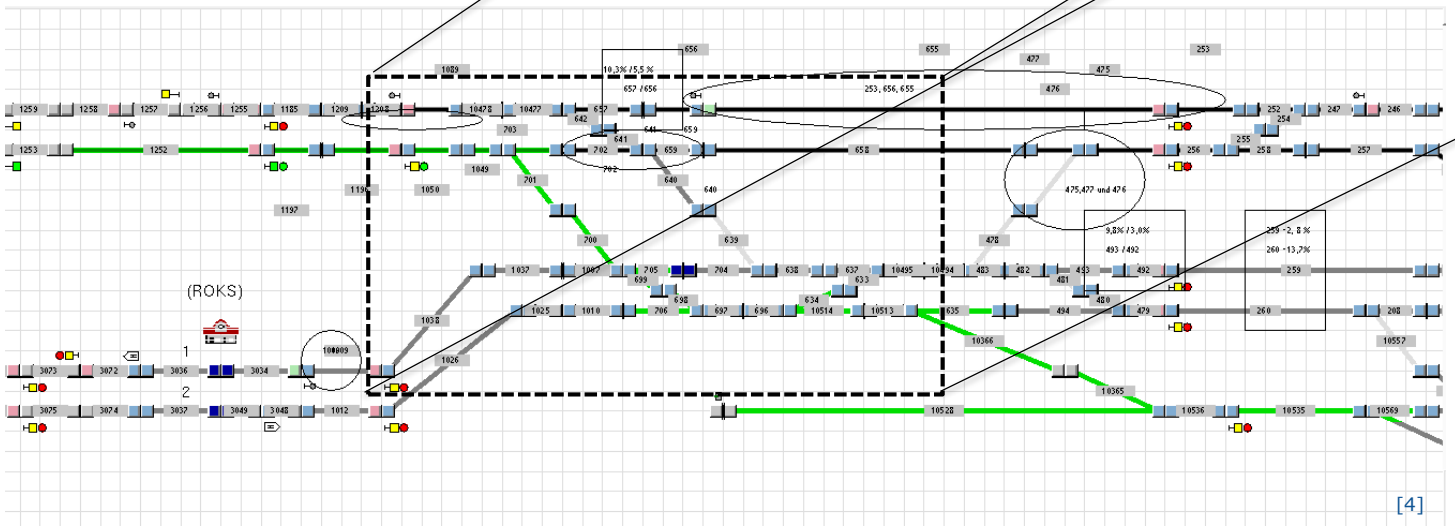

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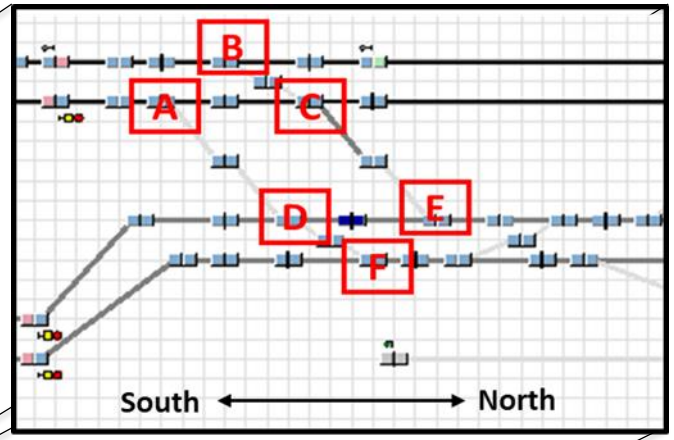

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Conclusion / Outlook

Conclusion

- Highest cost effects for low density lines due to the limited number of trains that need to be equipped and the high costs for the infrastructure elements
- The break-even point between both technologies depends on the share of remaining trackside elements
- Under the analysed assumptions the break even point for high density mixed traffic was between 10-25% of remaining trackside elements
- Increase in line capacity (from 80% to 55%) as well as the capacity in the analysed station (50%-67%) is possible

Outlook

- Migration analysis is performed in X2Rail-4
- Aim is to consider timeline of retrofitting trains/removing trackside equipment and thus better knowledge on impacts on stakeholder

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Thank you for your attention!

Feel free to ask questions

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References

D4.5 Cost benefit analysis - X2Rail-2 – February 2020

D6.2 Cost benefit analysis – X2Rail-4 – December 2020

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UIC, „UIC Leaflet 406 - IV Operating,“ Paris, 2013

Pictures/Figures

[1] https://stock.adobe.com/

[2] https://www.openrailwaymap.org/

[3] D4.5 Cost benefit analysis - X2Rail-2 – February 2020

[4] D6.2 Cost benefit analysis – X2Rail-4 – December 2020