2024

TEG REFERENCE FILES CORE GROUP 6
USE CASE FOR MESOSCOPIC INFRASTRUCTURE DATA IN TTR IT LANDSCAPE

Austria Campus 3
Jakov-Lind-Straße 5
AT-1020 Vienna

Phone: +43 1 907 62 72 00
E-Mail: mailbox@rne.eu

www.rne.eu

1 History of document versions

Version	Date	Author	Reason for change / comment
0.1	2020-11-18	Máté Bak	Initial version

2 Contents

3 Introduction

On 29th September 2020, the TEG Reference Files approved the proposal to JSG for establishing new Core Group 6 – Segments to define how segments can be included in CRD.

Core group members:

- Máté Bak (chairman)
- Mario Toma
- Josef Stahl
- Vojkan Stefanovic
- Will Deakin

The CG6 analysed the original requirement, including segments in CRD, and also the requirements from the TTR IT Landscape. According to that, it won't be sufficient to store only the segments, because that would mean still only macroscopic level of infrastructure data.

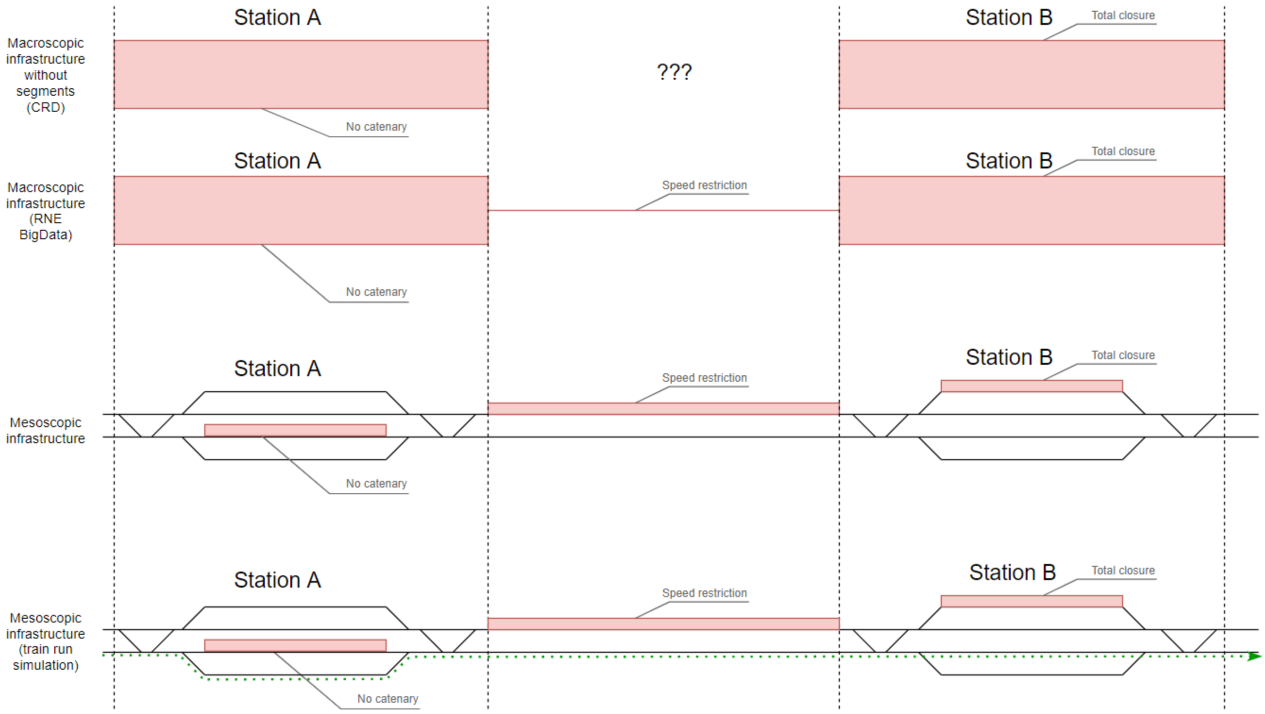
The aim of this document to show why mesoscopic infrastructure data is necessary as a baseline for the TTR IT Landscape. Please note that the TTR IT Landscape is built on the TAF/TAP TSI framework that is why it's relevant that the needed infrastructure data is available in CRD.

4 Use case with Temporary Capacity Restrictions

Capacity Strategy, Capacity Model and Capacity Supply are essential in TTR, and Temporary Capacity Restrictions (later: TCRs) play a key role there too. The following picture demonstrates the need, why mesoscopic infrastructure data is relevant for TCRs.

There are three TCRs:

- There is no catenary on one track at Station A
- There is a speed restriction on the left track between Station A and Station B
- There is a total closure on one track at Station B



1. Picture: TCRs on mesoscopic and on macroscopic infrastructure

On the mesoscopic infrastructure it's clearly visible where the TCRs are located. In case there is a train run via Station A and Station B, it can be seen that the train can pass the two stations almost without any impact (it has to use an alternative track on Station A), assuming that the train is running with an electric loco. Please check the train run indication with the green dotted line on the picture.

However, if the information is either communicated or stored on macroscopic level, this additional information is lost, and it would like as the top half of the image. The TCR is valid on the whole station, as there is no further detail apart from the node, and the same goes to the segment. Not to mention that without the segment information, it won't be even possible to communicate/store the TCR on the line.

5 Requirements to infrastructure data

Considering also the above presented use case with the TCR, in this chapter, please find the general requirements to the necessary infrastructure data from TTR's point of view.

5.1 Segment

It is necessary to store the segment information. Segment represents the connection of the two neighbouring primary locations. For each segment at least the following attributes are necessary:

- Identification
- Distance
- Validity
- Line

5.1.1 Identification

If we accept the above written definition of a segment, then it would be enough to identify the segment with the PLCs of the connected nodes with their country codes.

5.1.2 Distance

Distance information shall be provided by the IMs. Reasons for storing distance information on a segment:

- Presentation purposes for the capacity model, capacity supply
- Priority rule calculation on conflicting requests. Please note that Rail Freight Corridors calculate today the priority rule, based on IM provided distances between certain stations

Please note that currently, RNE's BigData stores the following distance information for a segment:

- *IM distance*
- *Polyline distance*
- *Linear distance (air distance)*

5.1.3 Validity

As for any object, the validity period is essential. The validity period of a segment must be in line, therefore can be originated from the validity period of the connected nodes (Primary Locations).

5.1.4 Line

IMs can link the segments to line. One segment can belong to one line. The relation between lines and segments is 1:n.

5.2 Track

Based on the use case, track information is necessary either for nodes (stations) or for edges (segments) of a network. Storing only the number of tracks as an attribute of the node or edge won't be enough. Indeed, there are further attributes that might be necessary from the business point of view to be stored for each track.

Track attributes

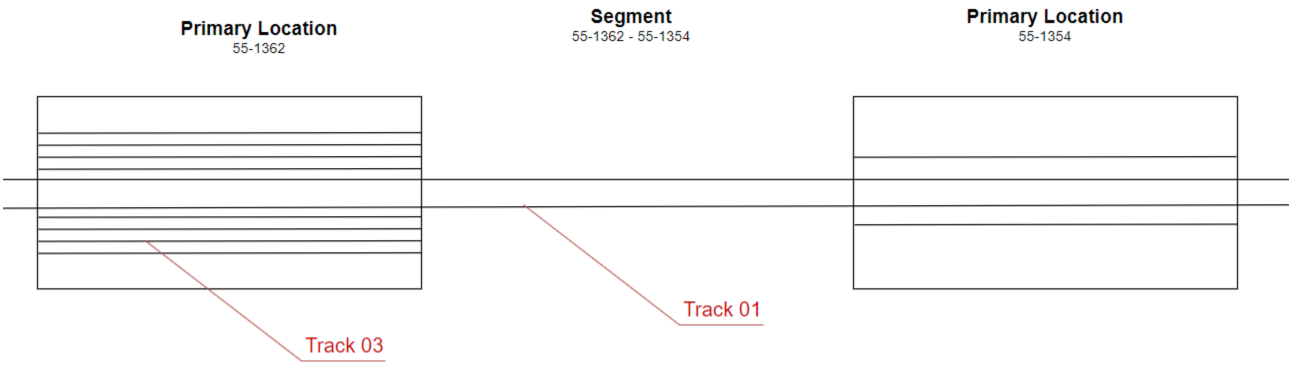
- Identifier
- Validity
- Speed
- Electric system
- Train control system
- Max. axle load
- Gauge
- Length

5.2.1 Identifier

Each track is linked either to a node or to an edge. It means, it's enough to have a local identification among those tracks that are linked to the same parent element. It's not necessary to create a global identifier of a track. Based on that, it might be enough to store the number of the track.

The proposal is to have an alphanumeric field for this purpose. Proper length to be defined based on further analysis.

For example, please check the following picture and the track identifiers below.



- For a station: 55 – 1362 – 03
- For a segment: 55 – 1362 – 55 – 1354 – 01

5.2.2 Validity

As for any object, the validity period is essential. The validity period of a segment must be in line with the reference object's validity (node or edge). The general rule is that the validity period of a track must be a subset of the validity period of the reference object.

5.2.3 Speed

Speed information can differ from one track to another, that is why it's necessary to store it on the track level. Speed information is necessary due to the following reasons:

- The tool can support proper route finding
- The tool can apply plausibility checks between the received path requests, published capacity and the available master data

5.2.4 Electric system

Electric system information can differ from one track to another, that is why it's necessary to store it on the track level. Electric system information is necessary due to the following reasons:

- The tool can support proper route finding
- The tool can apply plausibility checks between the received path requests, published capacity and the available master data
- The tool can estimate the impact of TCR on the planned capacity, e.g. take the TCR example from the use case, where there are tracks left with working catenary

5.2.5 Train control system (only for segments)

Train control system information can differ from one track to another, that is why it's necessary to store it on the track level. Train control system information is necessary due to the following reasons:

- The information of the train control system, or at least the type of the system has an input to the calculation of the capacity model

5.2.6 Max. axle load

Axle load information can differ from one track to another, that is why it's necessary to store it on the track level. Axle load information is necessary due to the following reasons:

- The tool can support proper route finding
- The tool can apply plausibility checks between the received path requests, published capacity and the available master data

5.2.7 Gauge

Gauge information can differ from one track to another, that is why it's necessary to store it on the track level. Gauge information is necessary due to the following reasons:

- The tool can support proper route finding

5.2.8 Length (only for stations)

Length information can differ from one track to another, that is why it's necessary to store it on the track level. Length information is necessary due to the following reasons:

- The tool can support proper route finding
- The tool can apply plausibility checks between the received path requests, published capacity and the available master data. It's especially important on stations, where the track lengths can be cross-checked with the received path requests or published capacity objects.

6 RINF analysis

The European Union Agency for Railways keeps its register, called RINF (https://rinf.era.europa.eu/RINF/), for infrastructure data. The TEG Reference Files established a Core Group (CG1) for the integration of RINF to CRD. In this analysis, we checked whether the formerly mentioned requirements could be fulfilled by RINF.

6.1 Operational points and tracks on operational points in RINF

Please find here a summary of the formerly written requirements and their availability already in CRD, or their match in RINF, if exists.

<table>
<tr><td colspan="2">Requirement</td><td>CRD</td><td>RINF</td></tr>
<tr><td colspan="2">Name of the location</td><td>OK</td><td>OK – Name of the operational point</td></tr>
<tr><td colspan="2">PLC of the location</td><td>OK</td><td>OK – OP TAF TAP primary code</td></tr>
<tr><td colspan="2">Validity period of the location</td><td>OK</td><td></td></tr>
<tr><td rowspan="6">Tracks</td><td>Number</td><td></td><td>OK – Identification of track</td></tr>
<tr><td>Speed</td><td></td><td></td></tr>
<tr><td>Electricity</td><td></td><td></td></tr>
<tr><td>Max. axle load</td><td></td><td></td></tr>
<tr><td>Gauge</td><td></td><td>OK – Nominal track gauge</td></tr>
<tr><td>Length</td><td></td><td></td></tr>
</table>

6.2 Segments and tracks of segments in RINF

Requirement	CRD	RINF
PLC of the location	OK	OK – Name of the operational point

Validity period of the location		OK	
Tracks	Number		OK – Identification of track
	Speed		OK – Maximum permitted speed
	Electricity		OK – Energy supply system
	Train control system		OK – ETCS level and train protection legacy system
	Max. axle load		OK – Load capability
	Gauge		OK – Nominal track gauge

7 Conclusion

Looking at the comparison of the requirements and the available data in RINF, it's clear that the integration to RINF would be necessary. However, the information stored in RINF is not enough as some relevant data is missing for the station tracks. For example, without knowing the electric system information over a track, it won't be possible to check the real impact of a TCR as it's described in the use case.

8 Next steps

It shall be checked whether the missing information is available somewhere and it's possible to get it.

According to the use case, the TCR related messages shall be updated so that they can have the track information inside.