RNE Guidelines

Basic TIS requirements on data delivery for reporting purposes

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Contents

List of abbreviations

BLS Netz	*Swiss infrastructure operator based in Bern*
CIP	*Customer Information Platform*
CRD	*Central Reference Database*
DB Cargo	*Rail freight operator within Deutsche Bahn group*
EC	*European Commission*
ERA	*European Union Agency for Railways*
IM	*Infrastructure Manager*
KPI	*Key Performance Indicator*
MAV	*Magyar Államvasutak*
OTN	*Operational Train Number*
PDM	*Path Detail Message*
PKP-PLK	*PKP Polskie Linie Kolejowe S.A.*
RCA	*Rail Cargo Austria*
RFC	*Rail Freight Corridor*
RFI	*Rete Ferroviaria Italiana*
RINF	*Register of railway infrastructure*
RNE	*Rail Net Europe*
ROTN	*Reference Operational Train Number*
RU	*Railway Undertaking*
SBB Infra	*Infrastructure division within Swiss Federal Railways*
SNCF Fret	*Société nationale des chemins de fer français (SNCF) Rail Freight operator*
SNCF Reseau	*Société nationale des chemins de fer français (SNCF) Infrastructure Manager*
SQL	*Structured Query Language*
SŽCZ	*Správa železnic, státní organizace*
SZ-I	*Slovinské železnice Infrastrukture manager*
TAF	*Telematics Applications for Freight*
TAP	*Telematics Applications for Passenger*
TCM	*Train Composition Message*
TDCM	*Train Delay Cause Message*
TIS	*Train Information System developed by RNE*
TRIM	*Train Running Information message*
TSI	*Technical Specification for Interoperability*
UIC	*Union Internationale des Chemins de fer*
ZSR	*Železnice Slovenskej republiky*

1. Introduction

The Train Information System (TIS) is an European widely recognized tool for real time monitoring of international railway traffic. The coverage of the European network as well as the number of users are constantly increasing. Improvements of the system including data processing and user experience of the application are one of the main tasks, which can be confirmed in the earlier period.

TIS also becomes an important source of information for other, not so widely applicable functions. The need for the precise train performance reports and the precise Key Performance Indicators' (KPI) calculations, specifically on the Rail Freight Corridor (RFC) KPIs for operations, brings the higher requirements on the quality of the data. In May 2020 RNE (Rail Net Europe) General Assembly approved the Data Quality Strategy for Reporting Purposes and the follow-up projects to fulfil these requirements.

First project to contribute to the fulfilment of the approved data quality strategy is project "Basic Requirements on Data Sources for Reporting Purposes". The goal of this project was to define and agree on the standard TIS requirements on data delivery and processing to create a reliable, compatible, and complete data source and thus ensure the automatic generation of different, especially train performance management related, reports.

Based on the results of the above-mentioned project, these RNE Guidelines Basic TIS requirement on data delivery for reporting purposes (further referred to as the Guidelines) were created and approved by the RNE General Assembly. These Guidelines will serve as the basic reference to set-up the data quality monitoring process and will also be referred to in the TIS user agreements.

These Guidelines focus on the description of basic requirements related to 3 main areas:
» Basic requirements on messages and message elements
» Train linking procedures
» Information on border section areas

The aim of the document is to provide the description of the basic requirements within the existing technical and functional frame of TIS on data delivery and standard TIS procedures and processes regarding train linking, as international train monitoring and management still faces the problem of not being end to end transparent. To ensure the reliable monitoring of performance in border section areas, the Guidelines also contain the list of the crucial information that needs to be defined for each border section.

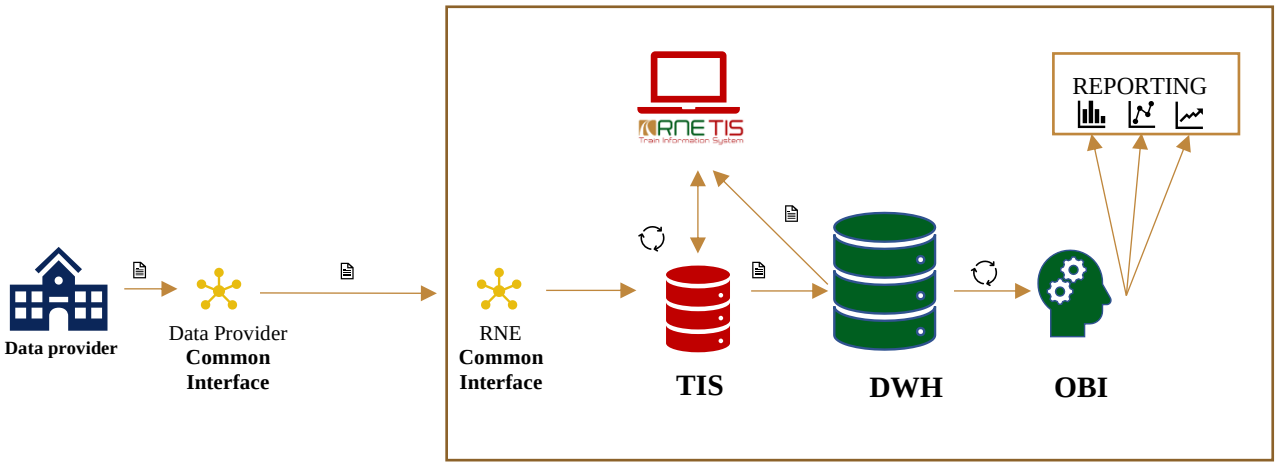
Data providers (IMs, RUs, Terminals, Logistical providers) should use this document as a reference, when establishing and maintaining the data delivery to TIS. Each data provider should aim to adapt their data delivery to TIS according to the requirements described in this handbook when relevant and possible.

The requirements and procedures described in these Guidelines will serve as the basis to establish the regular data quality monitoring process to determine the compliance of data providers with these requirements. In case the compliance is not possible to be reached based on the existing TIS functionalities, the additional TIS improvements can be suggested and discussed within TIS Change Control Board. When the new TIS developments related to the requirements covered by these Guidelines will be implemented, the Guidelines will be updated accordingly.

These Guidelines are defining the basic requirements avoiding the usage of specific technical terminology. The detailed technical documentation related to the messages and TIS procedures is not part of this handbook but can be requested via TIS support (support.tis@rne.eu).

2. Basic process of reports preparation

This chapter provides the simplified description of the main steps in the complex process of performance reports' preparation. The process from single messages delivered to TIS to the generation of the final performance report can be described in the following steps:



1. Provision of the single messages from data providers
   - TIS receives several different message types from the different data providers
   - The basic requirements, which message types for which trains and for which locations shall be delivered to TIS to ensure the reliable reports are described in detail in Chapter 3 of these Guidelines

2. Processing of messages by TIS to create the complete train run report
   - The main procedures influencing the final report's reliability are:
     - Identification of train type (More details in Chapter 3.5)
     - Identification of real origin and final destination (More details in Chapter 3.6)
     - Linking of messages (More details in Chapter 3.4)
     - Linking of train run sections (More details in Chapter 4)

3. Data-warehouse procedures
   - To enable the fast generation of several different reports and detailed figures, the specific procedures on the data warehouse level are implemented, e.g.:
     - Identification of trains crossing specific border section
     - Identification of train's direction
     - Identification of RFC trains
     - Identification of key locations in train run (e.g. RFC entry/ exit, specific measuring points)
   - The basic set of information required for the proper execution of data-warehouse procedures to create the reports about performance in border section areas are described in Chapter 5 of these Guidelines
   - The basic requirements for the RFC oriented reports are discussed within a separate project. Once the results from the project will be available, these Guidelines will be updated accordingly

4. SQL queries used for calculations of the performance figures
    - Based on the complex information stored in the data-warehouse, the SQL queries are modelled to calculate several different performance reports, such as e.g. punctuality, dwell time, running time, etc.
    - SQL Queries are not relevant from the data quality point of view and thus not covered by these Guidelines

5. Reports' development and execution in Oracle Business Intelligence
    - Development of the reports covers the basic mathematical formulas and/or displaying functions in the Oracle Business Intelligence used to design and execute the different performance reports
    - The standard reports are available and can be directly executed by authorised users via online user interface (https://reports.rne.eu)
    - The reliability of the reports is not influenced by these developments and thus is not covered by these Guidelines. Accuracy of calculated figures strongly depends on the quality of data delivered and processed by TIS system.

3. Requirements on the basic data set

The main source of information for TIS are the messages coming from the data providers. This chapter describes which messages for which trains and for which locations shall be delivered to TIS to ensure the reliable and compete data set needed for reporting purposes. The basic TIS procedures with the strong impact on the reliability of the reports are also explained within this chapter.

The more detailed information related to the content and processing of the messages can be found in Annex 1.

3.1. Messages to be delivered to TIS

TIS can receive and process several different message types. To ensure the reliable reporting, the bellow listed messages shall be delivered to TIS for all trains listed in chapter 3.2. and including all locations listed in chapter 3.3. These mandatory messages are:

» Path Details Message / UIC 2090 Contracted Timetable
» Path Section Notification Message / UIC 2003 Failure of train
» Train Running Information Message
» Train Delay Cause Message

In addition to the above-mentioned mandatory messages the following messages can be delivered:
» Train Running Interruption Message
» Train Running Forecast Message
» Train Composition Message

All messages delivered to TIS shall have a structure according to the TAF/TAP TSI requirements. As not all data providers are yet able to deliver the TAF/TAP TSI compliant messages, TIS is still able to process also few UIC messages, which were used before the TAF/TAP TSI were introduced.

3.2. Trains to be reported in messages

TIS will accept and process messages for all the trains, that are delivered to TIS. But as this could mean a huge message flow for some of the data providers, from reporting point of view, each IM should deliver all above-mentioned mandatory messages in minimum for the following trains:
» All freight trains (national and international)
» All international passenger trains

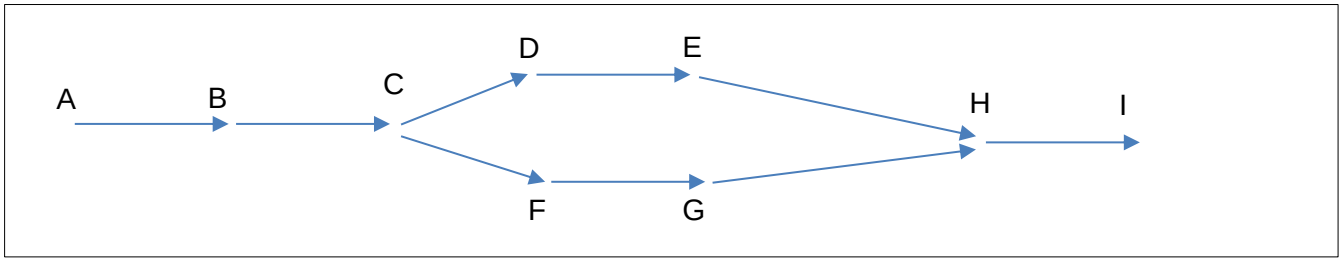
As international train should be considered every train, that is crossing the state border, independently if national or international train number is used.

3.3. Locations to be reported in messages

The above-mentioned messages can be delivered for all the locations that are defined in CRD. But as this could mean a huge message flow for some of the data providers, to ensure the proper and reliable reporting, in minimum the following locations should be included in the above-mentioned mandatory messages:

» Real Origin & Final Destination of the train run
» All border points included in the train run (as described in chapter 5.4)
» All intersection points in the train run – points connected to 3 or more sections
» At least 1 point between the intersection points included in the train run – to identify the precise routing of the train in case several alternative routings between intersection points are possible

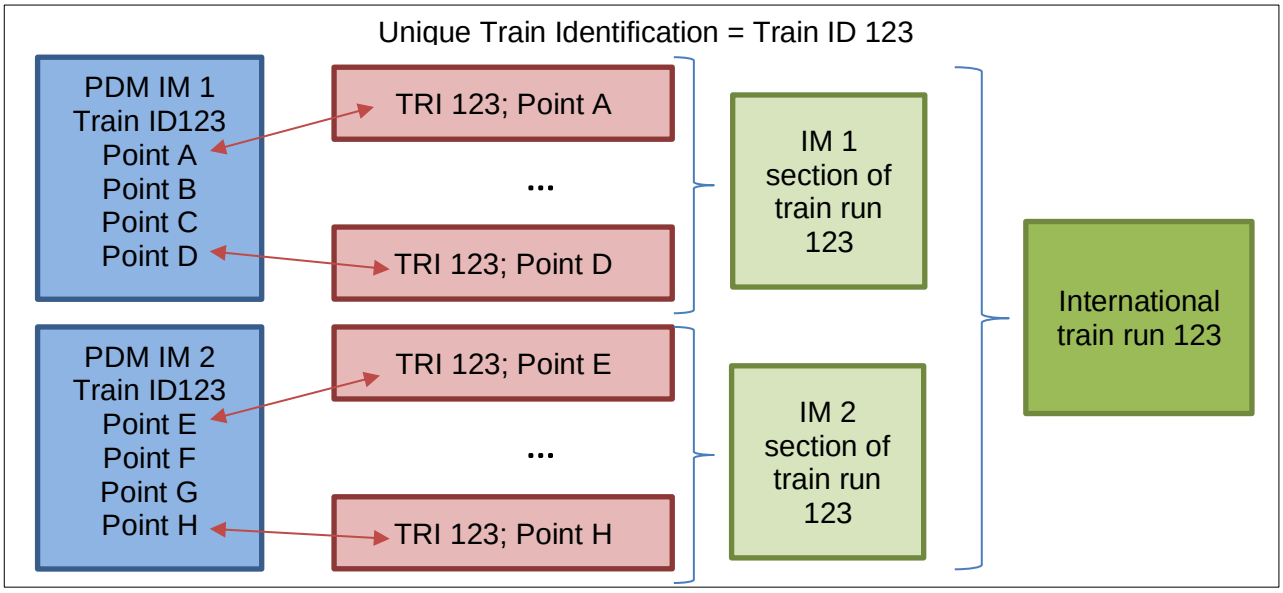
Based on the simplified schematical view bellow, for the train running from A to I via D and E, the following points should be reported to TIS, both in Path Detail Message and Train Running Information Message:
» A as origin
» C & H as intersection points
» D or E – as point between two intersection points
» I as destination



3.4. Processing of the messages by TIS

All messages delivered to the TIS are processed and linked together to create the complete (international) train run report. The link between the messages is based on the unique train identification. These linking rules are described in detail in Chapter 4.1.

Path Detail Message is considered as key message, to which all other messages are linked to. If Path Detail Message is deleted, also all other messages that are linked to it will be deleted.



TIS always keep recorded only one message if all key elements are identical. If multiple messages with the same key elements are delivered to TIS, the most recent one always replaces the previous.

Based on the key elements, all messages can be divided to 2 main groups, where each group has a specific set of key elements uniquely identifying the message:

Message group	Key elements	Messages
Section message	Train Identification	Path Detail Message
		Path Section Notification Message
	Sender	Train Composition Message
		UIC 2003 Failure of train
Location message	Train Identification	Train Running Information Message
	Sender	UIC 2090 Contracted Timetable
	Location	Train Running Interruption Message
	Location status	Train Running Forecast Message
	(Delay code)	(Train Delay Cause Message)

Based on the key elements, TIS keep recorded e.g.:
» Only one Path Detail Message per Train and Sending IM;
» Only one Train Running Information message per Train, Sending IM, Location and Location Status (arrival/departure).

The information how to correctly send the messages to TIS in case of needed update (e.g. in case of rerouting or cancellation of the train) can be found in Annex 1.

3.5. Identification of train type

Information about train type is delivered to TIS within Path Details Message. TIS recognises the following types of trains:

Train type	Meaning
Passenger train	commercial train with passenger coaches or trainsets Empty run of Train with passenger coaches or trainsets Including Crew train (for Train Crew Members)
Freight train	train with freight wagons
Light engine (locomotive train)	one or more engines without any carriages
Engineering train	train for measurement, maintenance, instructions, homologation, etc.
Other	train types that are not covered with the four codes given above can be codified as "other" in the messages Passenger with Freight - military trains, the Overnight Express; Royalty, Head of States

Each IM shall report the train type in line with the meaning described above. If IMs involved in the same train run deliver the different train types in their PDM messages, TIS records both these types. However, when reports are created and focused on the specific train type, this might cause a significant problem.

E.g. one IM reports the train as Light engine; other IM reports it as Freight. If report about the freight trains is needed, this train (although in reality maybe a Light engine) will be considered as well.

3.6. Identification of real origin and destination

The correct identification of the origin and destination of the train is crucial for the reporting purposes. This identification can be made based on:
» Location type delivered in Path Detail Message
» Train location status delivered in Train Running Information message

3.6.1. Origin and destination reported in Path Detail Message

Each location reported within the Path Detail Message shall have a location type specified. The following statuses are recognised by TIS:

Location type	Meaning
Origin	point is origin of the train run
Intermediate	point is intermediate point within the train run and it is not State border (code 07)
Destination	point is destination of the train run
State Border	point is state border

For the reporting purposes, it is crucial to have the origin and destination related to the complete international train run. Each train shall have only one origin and one destination.

Therefore, if in IM domestic system the entry border point is defined nationally as Origin (but train is not originating there) or exit border point is defined nationally as Destination (but train is not destinating there), in international concept this information is not correct and to TIS both points shall be reported as State border point.

3.6.2. Origin and destination reported in Train Running Information Message

Information about the real origin and destination can also be reported in Train Running Information message via correct specification of train location status. TIS recognise the following train location statuses:

Train location status	Remarks
Arrival at destination	shall be utilized only in the location that is actual destination of the whole (international) train run
Departure at origin	shall be utilized only in location that is actual origin of the whole (international) train run
Intermediate arrival	
Intermediate departure	
Run through	

The time, when train enters / exits the IM network in border stations should be delivered to TIS either as intermediate arrival / departure or as run-through. Status Departure at origin / Arrival at destination should be used only for the real origin and final destination of the whole international train run.

3.7. Identification of delay

The information about the delay of a train is reported within Train Running Information Message. If delay is not delivered, it can also be calculated by TIS, comparing the planned time delivered in Path Detail Message and real time delivered in Train Running Information message.

TIS recognise 2 types of the planned time:
» Booked time - related to the case when timetable has been modified due to operational purposes
» Referenced time – time from the original (internationally agreed) timetable

Consequently, also delay reported to TIS can be calculated either against booked or against rescheduled time.

In standard situations, when no re-scheduling is done, both times are identical. In cases when train is re-scheduled nationally, e.g. shifting the timetable due to high delays, as soon as train crosses the border to other IM, the planned times might not fit together and/or the significant additional undocumented delay will be identified.

The impact of the inconsistent planned time is described in more detail in chapter 4.2.2.

The more details how to send the planned times and delays to TIS can be found in Annex 1.

3.8. Identification of delay causes

In order to receive the information about the reason for the delay to TIS the TAF/TAP TSI Train Delay Cause Message (TDCM) should be send to TIS. For all delays, occurring during the train run, the Train Delay Cause message shall be send to TIS, independent from where the delay occurs.

IMs shall report to TIS reasons only for those delays which happened on their own network and using the delay codes as defined in UIC Leaflet 450-2.

If location specified in Train Delay Cause Message is known in TIS, although not delivered in Path Detail Message, the exact location is recorded by TIS and can be displayed in reports.

For one train, one location and train status (arrival/departure):
» several different delay causes can be delivered
» but for each delay cause only one delay value is kept – the latest one overwrites the previous one.

The Train Delay Cause messages shall be sent to TIS as soon as possible but latest 45 days after the train run. Train Delay Cause messages send to TIS more than 45 days after the train run, are not processed by TIS.

3.8.1. Handling of delay causes in border areas

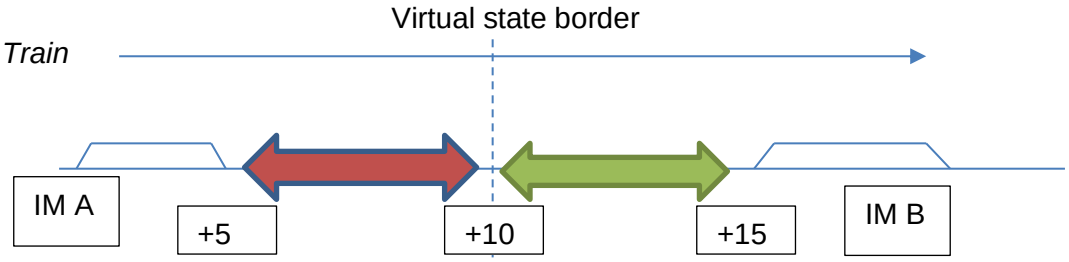
For 2 specific delay reasons, if reported within a border section area, the treatment in the national systems is not the same as in the international context.

» 41 Delay caused by previous IM
  - Delays occurring on the network of IM B caused by an incident which is attributed to IM A.
  - E.g.: *construction work on IM A network cause the rerouting of train through other border and leading to delay on IM B network*
  - E*.g. Delay verified on arrival to a location of IM B that was caused by an event located in the network of IM A before entering the network of IM B.*

» 71 Delay caused by previous RU
  - Delays occurring while a train is operated by RU B but were caused by an incident which is attributed to RU A.
  - *E.g.: Train is delayed on arrival to IM B network due to missing or faulty train composition provided by RU A*
  - *E.g.: Delay verified on departure from Origin of a Path operated by RU B, caused by RU A delay in handover.*

To avoid the duplicate coding of the same delay (by current and previous IM) in border section area:
» if code 41 or 71 is used to identify delays taken over at the border station from the previous network
» or if IM is not able to clearly distinguish the taken over delay from additional new delay in border section area and code these delays together with code 41 or 71,
such codes shall not be delivered to TIS because the real causes for such delays are already coded by the previous IM.

Example:



IM A – is not able to identify and code the delay in red zone
IM B – will identify on arrival to point B the delay +15 minutes
» 5 minutes taken over delay – already coded by IM A
» 5 minutes (green) – delay caused on IM B network
» 5 minutes (red) – delay caused on IM A network

If IM B is able to clearly identify the delay in red zone (5 minutes) and delay in green zone (5 minutes), and one or both of them shall be coded by the code 41, these codes shall be sent to TIS.

If IM B is not able to identify the delay in red and green zone and is coding the +15 minutes by delay code 41, this code shall not be sent to TIS as the 5 minutes delay identified on departure from point A will be coded twice.

4. TIS train linking procedures

Single messages send to TIS are processed and linked by TIS together based on unique train identification to create the complete train run report.

The IM national processes or IM national systems are not always enabling the IM to provide the data in line with the standard processes, as defined in TAF/TAP TSI Sector Handbook. Therefore, during the recent years, several alternative train linking procedures were developed in TIS and their brief description can be found in Chapter 0. As these procedures are just a work-around solutions they should be used as temporary solutions until the future standard TAF/TAP TSI Train ID procedure will be fully implemented.

The most recent technical documentation related to the TIS linking procedures is not part of this handbook and can be requested via TIS support (support.tis@rne.eu).

4.1. Importance of TIS linking procedures

The target of TIS linking procedures is to have fully transparent international train runs from origin to destination. This target is currently not yet achieved as very often international trains are requested by RUs as national trains and as IMs do not sufficiently coordinate the requested train paths with their neighbours.

Hence, the linking procedures are necessary to put together the different national train runs into one complete international train run, from its real origin to the final destination.

Correctly linked trains enable the proper identification of all partners involved in the international train run, which is especially crucial:

- To share the real time information between all involved partners
- To share the information about estimated time of arrival between all involved partners
- To identify and inform all partners affected by interruption
- To enables the proper post-hoc analysis of train performance along the complete train journey
- To enable the proper quality management as you can only steer what you measure
- With delivery of Train Composition message, the following additional benefits can occur:
  - Possibility to monitor the single wagon movements
  - Ensuring the logistical links between different transports – follow the load
  - Monitoring the commercial and operational interdependencies (e.g.to see the consequences of delaying one train)

4.1.1. Importance of harmonisation

Correct linking of trains and monitoring of the complete transport chain is strongly depending on the correctness and completeness of the RUs' process of harmonisation of their path requests and IMs' process of coordination of paths elaboration.

Especially in ad-hoc business, but also often in the yearly timetable, RUs are not placing harmonised path requests from origin to destination, but several partially harmonised path requests from border to border. This behaviour, apart from the problems with non-coordinated timetables, cause also the problem to link the trains together in TIS. IMs usually respond to such partially harmonised path requests individually and allocating the train number based on the national or bilateral rules. As a consequence, it is impossible to monitor such train run internationally via IT-

tools like TIS without specially defined and implemented workarounds causing additional costs to all stakeholders (e.g. extra IT development and/or increased manual human work).

To eliminate those problems, it is strongly recommended to RUs to place the harmonised path requests for the whole planned train journey so they can be fulfilled with coordinated paths containing agreed identifier of the train valid for the whole train journey, which is used for automatic linking of national timetable sections provided by IMs to TIS. If the RU is not able to provide the Train ID in line with TAF TSI requirements, or if he is not placing the harmonised path request, he shall at least provide the information about the consequent paths/trains to ensure the linking of these trains/paths within TIS. The RNE members should commit to communicate these requirements towards the RUs in the most appropriate way.

TIS is able to process 2 types of unique train identifiers:
» Reference Operational Train Number (ROTN) - legacy identifier based on UIC data exchange standards which is nowadays still used as identification of national timetable sections in TIS
» Train ID - identifier based on TAF / TAP TSI data exchange standards which shall be used (when implemented by all stakeholders) as identification of national timetable sections in TIS

In both cases, either ROTN or Train ID, usage of the agreed common identifier in delivered national timetable sections to TIS automatically enables the proper linking of trains in TIS (if other conditions are fulfilled) and thus partners involved in such train can enjoy all additional important benefits, as mentioned in the previous chapter.

The main differences between identification of trains by ROTN and by Train ID are:
» ROTN is not supported in data exchange based on TAF / TAP TSI standards and thus not supported in future by stakeholders
» ROTN is defined by the IM(s) without any common rules or guidelines how to define it
» Train ID (as unique identification of the train) is defined by RUs during harmonisation phase of path request process – the Train ID concept is in detail described in TAF / TAP TSI technical documentation that is available for all stakeholders
» TAF / TAP TSI processes ensures (if correctly implemented and followed) unique and unchangeable train identification (Train ID) during various situation, e.g. train re-routing, change of train number, etc. – in such situations identification of the train based on ROTN fails

Identification of train by Train ID will solve or prevent many issues leading to failings in automatic train linking in TIS, however even with the new Train ID concept the RUs still need to harmonise their path requests between themselves and use the same Train ID when placing the individual path requests. If they don’t do so, IMs will face unharmonized path requests with different Train IDs that cannot be coordinated and thus would not be linked together automatically.

Taking into account the current different states of play of the IMs and RUs it can be assumed that a full implementation of the TAF / TAP TSI Train ID concept will not be finished in the next 5 years. Until that time identification of train and thus linking of trains based on ROTN shall be used.

4.2. Train linking based on Reference Operational Train Number

Successful automatic linking of national timetable sections delivered to TIS in PathDetailsMessage(s) from involved IMs is subject of fulfilment of 3 equivalent conditions:

1. Reference Operational Train Number (ROTN) in all PDMs belonging to the international train run are identical, e.g. ROTN in PDM of IM A and PDM of IM B is identical
2. The locations in which 2 PDMs shall be merged together are pre-defined as Linking region, e.g. to link PDM of IM A with PDM of IM B, the last location in PDM of IM A and the first location in PDM of IM B has to be defined as Linking region.
3. Difference between planned timings in locations described in previous condition are within time gap defined for particular Linking region, e.g. planned timings in the last location of IM A and the first location of IM B is within the defined time gap of 1 hour for the Linking region

The chapters below describe the different reasons, why one or more of the above-mentioned conditions are not fulfilled. For each reason few examples are provided and alternative solutions how to overcome this problem are recommended (including pros and cons).

4.2.1. Linking Challenge: ROTN not identical

The most frequent issue in automatic linking of trains is non-identical ROTNs in PDMs containing national timetable sections of international train delivered to TIS by individual IMs. This can be caused by several reasons, e.g.:

» Not harmonised international ad-hoc path requests for whole train journey – for ad-hoc trains the OTN allocation as consequence of not harmonized path requests is done from border to border and there is no possibility to have one common ROTN
» RU responsibility is changing during the train run which leads in some cases to OTN change
» Trains are re-routed and/or OTN is due to various reasons changed and original ROTN is not kept by the IMs

4.2.2. Linking Challenge: Time gap exceeded

The second most frequent issue in automatic linking of train is caused by inconsistency of timings in locations defined in Linking region – if the inconsistency exceeds the threshold defined for particular Linking region even timetables delivered in PDMs with identical ROTN are not automatically linked. This can be caused by several reasons, e.g.:

» Timetable is re-planned (for example as consequence of re-routing) and this re-planning is not coordinated and processed on the next/previous network
» RUs utilize for particular train run paths from different day (as consequence train is running in network of one IM advanced and in the network of another IM delayed) and dates are not fitting at border

4.2.3. Linking Challenge: Incorrect Linking region definition

Not very frequent issue in automatic linking of train is caused also by incorrect Linking region definition. This can be caused by following reasons:

» Locations defined in Linking region are not fitting with locations provided by IMs (as the first/last location on cross border section) within their PDMs (e.g. original definition of Linking region is not updated when needed)
» Time gap definition is not fitting to actual situation (e.g. time gap is too short)

4.3. Recommended alternative interim solutions

In order to improve the train linking in case of the above-mentioned linking challenges, the bellow listed solutions can be evaluated and implemented if feasible. It is possible to implement one or more solutions in the same time for the same linking region.

Solution 1 – Linking based on Service OTN

» Description: In addition to ROTN provided within PDM and valid for the complete section reported in PDM, IM can additionally provide the information about OTN for each single location in PDM – such OTN is in TIS glossary known as Service OTN. In several cases, especially in case of ad-hoc requests, the IMs are not able to agree on one single ROTN valid for the complete journey. Usually, they just agree on the service OTN, that will be used when train crosses the border. If these service OTNs are reported in PMDs and the service OTN in last location of first IM is identical to service OTN in first location of other IM and these locations are defined in linking region, particular national timetable sections are linked in TIS automatically to the single international train run.
» Solution for Linking Challenge(s): ROTN not identical
» Applicable: only for some IMs
» Early adopters: SŽCZ, PKP-PLK, ZSR, MAV
» Pros: automatic solution, no risk of mistakes, no manual effort
» Cons: works only for some IMs

Solution 2 – Linking based on ROTN Groups

» Description: for every single Linking region the group of ROTNs can be defined for specified validity period. If the non-identical ROTNs are provided by IMs in PDMs for the train, but these ROTNs are defined within the above-mentioned group of ROTNs, particular national timetable sections are in TIS automatically linked together.
» Solution for Linking Challenge(s): ROTN not identical
» Applicable: appropriate solution in case when ROTN change is planned in advance and valid for longer period and also for example in case of re-routings during longer construction works. Applied not only in border section, but also within the single IM network
» Early adopters: SNCF Fret, DB Cargo, RCA, SBB Infra, BLS Netz
» Pros: semi-automatic solution
» Cons: Linking region specific solution, risk of human mistake (correct ROTN group has to be defined manually in TIS), manual effort

Solution 3 – Linking based on Adjacent ROTNs

» Description: if train regularly changes ROTN from even to odd in Linking region and this solution is applied for such Linking region, particular national timetable sections are in TIS automatically linked together.
» Solution for Linking Challenge(s): ROTN not identical
» Applicable: for trains that are changing ROTN regularly from even to odd and back (e.g. because of direction change).
» Early adopters: SNCF Reseau with all neighbouring IMs, RFI / SZ-I borders
» Pros: semi-automatic solution
» Cons: Linking region specific solution, (low) risk of human mistake (if applied incorrectly for Linking region), (low level of) manual effort

Solution 4 – Linking based on train characteristics

» Description: if the train characteristics (length & weight) provided in Train Composition Message(s) (TCM) for locations in Linking region are identical or within defined threshold, particular national timetable sections are in TIS automatically linked together.
» Solution for Linking Challenge(s): ROTN not identical

» Applicable: solution so far in test phase (not yet fully finalised); main precondition is either TAF/TAP TSI TCM or UIC HERMES 30 v 2.0 message is delivered to TIS. Basically, train characteristics shall be sent by RU to TIS. Optionally, IM can also forward the TCM received from RU to TIS, if possible.
» Early adopters: DB Cargo, ECR, BLS Cargo, RCA
» Pros: automatic solution
» Cons: (low) risk of mistakes

Solution 5 – Linking based on reporting of previous/next ROTN
» Description: RUs can report in TCMs ROTN used on the previous/next network. This information is then used to link particular national timetable sections in TIS together.
» Solution for Linking Challenge(s): ROTN not identical
» Applicable: only in cases when RU is able to provide TCMs to TIS and knows the next/previous ROTN
» Early adopters: RCA
» Pros: automatic solution
» Cons: risk of mistakes

Solution 6 – Manual linking
» Description: based on defined rules TIS detects linking candidates (trains that should be linked, but they are not), user can then in TIS web application search/filter such trains and via manual linking feature according to her/his knowledge link them to together.
» Solution for Linking Challenge(s): ROTN not identical, Time gap
» Applicable: only on trains that are flagged as linking candidates in TIS
» Early adopters: used by RCA, SZCZ, BLS Cargo, ZSR, MAV but in some cases already replaced by implementation of one of the above-mentioned solutions
» Pros: only solution for Linking Challenge Time Gap
» Cons: (high level of) manual effort, risk of mistakes

4.3.1. Implementation of alternative solution

Each data provider shall establish either the standard procedures according to TAF/TAP TSI or one or more alternative solutions, if appropriate.

In case data provides would like to evaluate or implement one or more of the above-mentioned alternative solutions, first his TIS company admin and/or data IT expert shall get in contact with RNE TIS Manager to discuss the technical requirements and details of implementation. Furthermore, the Early adopter companies can be approached in order to exchange experiences.

5. Border section information

During the recent years the importance of precise performance monitoring within the border sections areas is constantly increasing. IMs, RFCs but also external parties, like ERA or EC, are focusing on the detailed analysis of the dwell time related to the border section crossing procedures.

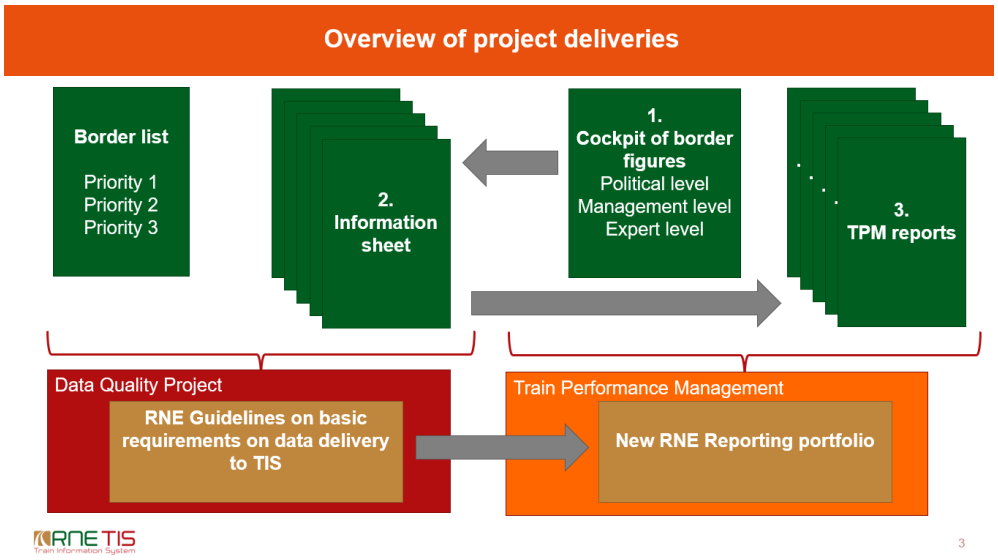
To ensure the reliable performance monitoring and automatic reports generation within the border section areas, the quality of the data has to be ensured and several information needs to be collected for each border section.

In the following chapters, the basic requirements needed for the reliable monitoring of performance in border section areas are listed.

Chapter 5.1 provides the basic information, how these requirements were identified.

5.1. Background information

In order to define the basic requirements on information to be provided for each border section, the specific task force, deeply involving the TPM experts, was created. The goal of the group was to analyse the currently known and potential new requirements on the figures to be provided for each border section and create a complete list of border sections, that might be relevant for reporting purposes.



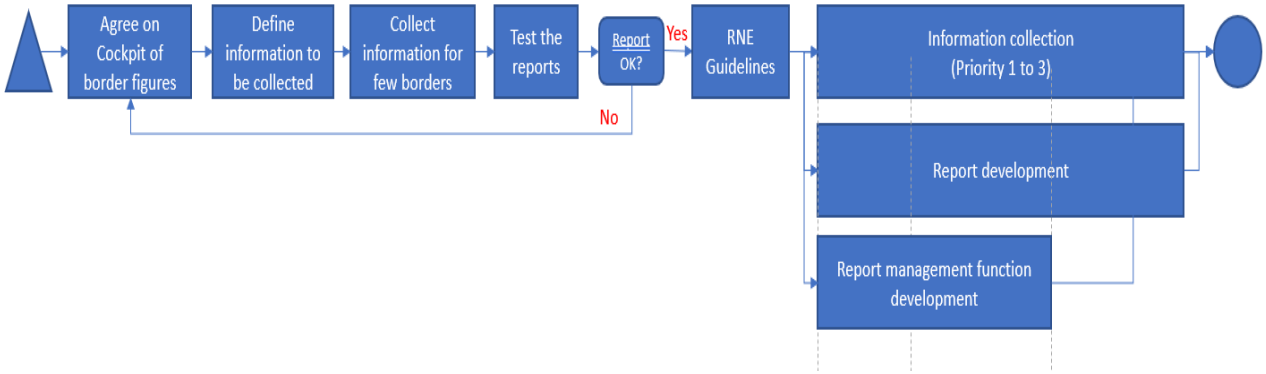
To identify all information needed for reporting, the so called “Cockpit of border figures” was prepared. TPM experts defined and agreed on the main list of the different figures, that should be calculated to monitor the performance and data quality in border sections. As the figures could vary depending on the target group that would analyze them, 3 levels were defined:

» Political level
» Management level
» Expert level

Cockpit of border figures provides the information about the basic figures and rough indication how they will be calculated. The detailed calculation methodology would be further developed and RNE

reporting portfolio will be updated accordingly, but these activities are out of scope of this handbook.

Based on the cockpit of border figures, group has identified the basic information, that needs to be collected for each border and develop the template for their collection. To verify, that all needed information to produce the reliable reports are included within the template, information was collected for several borders and test reports were created and checked. Based on the results, the template was updated accordingly. More details related to template are provided in chapter xx.



5.2. List of border sections

Until now there was no complete and standardized list of border sections agreed on RNE level. In CRD and Big Data, no specific list of borders is yet defined. In TIS, there are linking regions defined, but sometimes they are also including the regions not related to border stations. The full comprehensive list was found on the EC website, but sections are not always defined in way as usually used on the operational level. In CIP, the border points can be found, identified usually as single point of state border, but only covering the RFCs borders.

In the Annex 2 the complete list of border sections, relevant for RNE / IM / RFC reporting purposes, can be found. The priority focus is on the state borders, but IM-IM borders are covered as well, if relevant.

This list consists of all the operational border sections in which RNE members are involved, including:
» All operational and regularly used border sections
» Museum lines and lines with weekend operation
» Lines with low traffic volume or currently closed due to reconstruction
» So called "peage" lines (line operated by one IM but running on territory of other IM)

The border sections, that are not operational yet or are not operational any longer (with no tracks) are excluded from the list. The borders, involving only non-RNE members are also excluded from the list.

Each border is identified by the unique Border ID and Border Name. This identification will serve as the main reference for all the reports that might be related to the border sections. The goal is also to link this list with all other existing lists related to the borders, such as e.g.:
» RINF borders
» CIP borders
» TIS Linking regions

As performance analysis and reports can be oriented only on the specific border sections, the priority status and RFC relevance are stated for each border section.

Priority status is defined based on the following criteria:
» 1 - HIGH (important RFC border)
  - RFC border with high traffic volume/importance
» 2 - MEDIUM (internationally relevant border)
  - RFC border with low traffic volume/importance
  - Non-RFC border with international traffic
» 3 - LOW (other borders - not internationally relevant), e.g.;
  - Only national traffic (Peage line)
  - Border with tracks but limited traffic (Museum trains, etc.)

For the borders belonging to the specific RFC, or the borders which are in the specific interest of the RFC (e.g. if used as a rerouting option) the indication of the RFC is also provided.

5.3. Basic information about border section

For each border listed in the Annex 2, the set of information must be collected to ensure the reliable report's generation. If the information is different for freight and passenger transport, the set of information shall be provided separately for freight and passenger transport.

5.3.1. Identification of trains crossing the border

The basic precondition for all possible figures and reports related to the specific border section is the correct identification of trains, which are crossing this border. All and only these trains should be considered for calculation of any figure related to this border section.

Each train, that runs through the last reporting point on one side of the border and the first reporting point on the other side of the border shall be considered as the train crossing the border. This methodology is considered as the main method to identify the trains crossing the border and thus first/last reporting point on each side of the border shall be defined for each border section. As the first/last reporting points should be considered those points, for which the timetable and running information are available in IM domestic system.

The main pre-condition for a successful identification of trains crossing the border based on the main methodology is the proper linking of trains (details described in Chapter 4).

As an intermediate solution, until the train linking problems will be fully eliminated, an alternative pair of points can be defined to identify the trains crossing the border. It is recommended to use such pairs of points, that are within single IM network but still guarantee, that if train runs through these 2 points, it also definitely crossed the border. As a typical example the pair can be defined as Last reporting point – Second last reporting point.

5.3.2. Information needed for reports on expert level

Target group:
» RFC TPM working groups
» Bilateral IM working groups
» Quality circles

Basic figures:
» Detailed figures per measuring points
  - Train statistics – e.g. Number of Run-through trains, Train starting/ending
  - Dwell time – e.g. planned dwell, exceeded dwell, etc.
  - Punctuality – e.g. arrival / departure punctuality, delay at arrival/departure
  - Delay causes – e.g. Delay minutes, Delay causes
  - Data quality statistics – e.g. missing timetables, missing running information

To support all ongoing and future activities focusing on the detailed performance monitoring in the border sections areas (e.g. Data quality circle initiative focusing on the reduction of dwell times in border section), the precise identification of the measuring points is crucial.

The detailed analysis are especially focusing on the precise dwell time monitoring. Therefore, all points where train crossing the border undergoes the border crossing related treatment (e.g. loco change, driver change, paper-work, etc.) shall be defined for each border section.

The performance measurement can be done either in the single reporting point (defined by PLC and Country code) or can also be done for the so called “master station”. The detailed information about Master station concept can be found in Annex 3.

5.3.3. Information needed for reports on management level

Target group:
» IM management
» RFC management
» RNE management

Basic figures:
» Aggregated figures from expert level
  - Train statistics – e.g. Run-through trains, Train starting/ending
  - Dwell time – e.g. planned dwell, exceeded dwell, etc.
  - Punctuality – e.g. arrival / departure punctuality/ delay
  - Delay causes – e.g. Delay minutes, Delay events
» Detailed figures from political level
  - Section Punctuality (Entry/Exit)
  - Section Running time
  - Section Speed

As the reports for management level are using the aggregated figures from the expert level and more detailed information about sections defined for political level, no additional information needs to be collected for the management level.

5.3.4. Information needed for reports on political level

Target group:
» External parties, e.g. ERA, EC

Basic figures:
» Number of trains crossing the border
» Border Section Punctuality (Entry/Exit)
» Border Section Running time
» Border Section Speed
» Dwell time in border section (same as for management level)

To fulfil the requirements of the external parties and to provide the consistent and if possible comparable figures for each border section, the simple and same monitoring and calculation methodology should be applied for each border section.

Therefore, for each border the measuring intermediate border section shall be defined by pair of points, following the criteria:
» the section should represent the intermediate border section area, covering the main points where the “border dwell” usually occurs
» to ensure the consistency between different border sections, the length of the defined section should be approximately 20 km
» the beginning of the measuring section would be the first point before a “border dwell” occurs on one side of the border
» the end of the measuring section would be the last point after a possible (additional) dwell on the other side of a border

Multiple sections can be defined if a single precise section covering all possible routings that train can run before/after crossing the border, cannot be defined.

5.4. Summary of mandatory information to be defined for each border section:

Based on the requirements described in the previous chapter, the complete set of the following mandatory information shall be collected for each border section:

» First/last reporting point on each side of the border (details in Chapter 5.3.1)
  - To be used as main method to identify the trains crossing the border
» Alternative pair of reporting point (s) (details in Chapter 5.3.1)
  - To be used as an alternative method to identify the trains crossing the border if main method is not providing the reliable result
» Intermediate border section defined by pair of points on each side of border (details in chapter 5.3.4)
  - To be used for section measurement for political and management level
» List of all measuring points/master-stations, where border crossing related procedures can take place (details in chapter 5.3.2)
  - To be used for detailed analyses on expert level and aggregated figures for management and political level

5.4.1. Additional information

Apart from the mandatory information described in the previous chapter, the additional information can also be provided to fulfil the additional reporting needs, e.g.

» Indication of measuring points to be considered for management level (as subtract from the points defined for expert level)
» Additional sections to be monitored on management and/or expert level

5.5. Collection of information

RNE provides the specific user interface (available to authorized users at: https://report-management.rne.eu), where all the information listed in the previous chapters can be recorded and updated for each border section. Information recorded via this user interface will be directly transferred to data-warehouse and can be automatically used for the report's generation. The detailed instructions, how this interface should be used, are described in Annex 4.

6. List of Annexes

» Annex 1: Messages and data delivery scenarios
» Annex 2: List of Border sections
» Annex 3: Master station concept on reporting level
» Annex 4: Border Section Information Interface

Annex 1: Messages and data delivery scenarios

1. Basic description of TIS messages and their processing

The chapters bellow provide the basic description of the message delivered and processed by TIS and highlighting the specificities important to consider when setting-up or updating the data delivery to TIS to ensure the highest possible level of data quality.

1.1. Path Details Message / Contracted Timetable Message

In order to receive the timetable information to TIS (information about planned time of train in specific location) the TAF/TAP TSI Path Details Message (PDM) should be send to TIS.

For one train and one data provider (Sending IM), only one PDM message is kept by TIS. If the new PDM with status 1 Creation or status 2 Modification for the same train is send by the same IM, TIS automatically replace the old PDM message with new PDM. If new PDM with status 3 Deletion for the same train is send by the same IM, TIS delete the original PDM message, and all other messages connected to this train.

PDM message is the key and mandatory message to be delivered for each train, and providing the following information:

» On train level – information valid for complete PDM:
  - Responsible IM
  - Unique Train Identification
  - Information about type of train (passenger, freight, light engine, engineering, other)

» On location level – for each location included in PDM:
  - Location type (Origin, Intermediate, Destination, State Border)
  - Timetable time and type of time (Arrival, Departure)
  - Information about responsible RU
  - Information about Operational train number

1.1.1. Train type code

TIS recognises the following types of trains:

Code	Name	Meaning
1	Passenger train	commercial train with passenger coaches or trainsets Empty run of Train with passenger coaches or trainsets Including Crew train (for Train Crew Members)
2	Freight train	train with freight wagons
3	Light engine (locomotive train)	one or more engines without any carriages
4	Engineering train	train for measurement, maintenance, instructions, homologation, etc.
0	Other	train types that are not covered with the four codes given above can be codified as "other" in the messages Passenger with Freight - military trains, the Overnight Express; Royalty, Head of States

Each IM should report the train type in line with the meaning described above. If IMs involved in the same train run deliver the different train types in their PDM messages, TIS records both these types. However, when reports are created and focused on the specific type, this might cause a significant problem. E.g. one IM report the train as Light engine; other IM report it as Freight. If report about the freight trains is needed, this train might be considered as well.

1.1.2. Location type code

Each location reported within PDM shall have a location type specified:

Code	Location type	Meaning
01	Origin	point is origin of the train run
02	Intermediate	point is intermediate point within the train run and it is not State border (code 07)
03	Destination	point is destination of the train run
07	State Border	point is state border

Train can also have a real origin and final destination in the border point. But if in IM domestic system the entry border point is be defined nationally as Origin and exit border point nationally as Destination, in international concept this information is not correct and to TIS both points shall be reported as State border point.

1.1.3. Contracted Timetable Wizard (CTT Wizard)

To maintain backward compatibility and support Infrastructure Managers that are not yet TAF TSI compliant, TIS uses CTT Wizard tool to convert multiple Contracted Timetable Messages (CTT) into single Path Details Message. This solution is only a temporary work-around solution and will be removed as soon as all IMs will be providing PathDetailsMessage.

PDM message is created for the first time 10 minutes after the first CTT is delivered. Every additionally delivered CTT (after this 10 minutes timeframe) leads to the update of the existing PDM:

» If new CTT is sent, this is added to existing PDM.
» If updated CTT is sent, this is replacing the info in existing PDM.
» If deletion of CTT is sent, this information is deleted from existing PDM.

To delete the complete PDM, the deletion of all already sent CTT must be sent.

1.2. Path Section Notification Message

In order to receive the information about cancelled train run section (complete or partial) to TIS the TAF/TAP TSI Path Section Notification Message (PSNM) should be send to TIS.

For one train for one data provider (Sending IM), only one PSNM message is kept by TIS. If new PSNM for the same train is send by the same IM, TIS automatically replace the old PSNM message with new PSNM.

The PSNM shall be used to provide the information that planned path will not be used by train either completely or partially and thus the timetable previously send to TIS in PDM shall be cancelled for whole or part of the train run section.

In this case, the section for which PSNM is sent is indicated in TIS as cancelled, but the information about the section, including the planned times, is kept.

Some of the IMs are still using the UIC Train Failure Message instead of PSNM. If this message is sent to TIS it is converted on the Common interface to PSNM and thus is processed by TIS in a same way as PSNM. In case the point defining the section in Train Failure Message is not recognized by TIS, TIS searches for the relevant section based on the scheduled time and cancels the section based on the nearest point (before or after the scheduled time).

1.3. Train Running Information Message

In order to receive the real time information to TIS (information about real time of train in specific location) the TAF/TAP TSI Train Running Information Message (TRInfM) should be send to TIS.

For one train, one location and running status only one TRInfM message is kept by TIS. Every new TRInfM (creation or modification) is replacing the old one. TRInfM with status deletion will delete the recorded TRInfM.

If TRInfM is sent and there is no corresponding PDM in TIS, TIS creates PDM based on the information included in TRInfM. If later TRInfM is sent with status deletion, related PDM created by TIS will remain in the system.

TRInfM message is the key and mandatory message to be delivered for each train and location as specified in chapter 4.1 and 4.2 and providing the following information:

» Unique Train Identification
» Location
» Location time
» Location status (Arrival at destination, Departure at origin, Intermediate arrival, Intermediate departure, Run through)
» Timetable time (Booked / Referenced)
» Delay at location (against Booked / Against Referenced)

1.3.1. Train Location Status

TIS accepts the following statuses:

Code	Train location status	Remarks
01	Arrival at destination	shall be utilized only in the location that is actual destination of the whole (international) train run
02	Departure at origin	shall be utilized only in location that is actual origin of the whole (international) train run
03	Intermediate arrival	
04	Intermediate departure	
05	Run through	

Entry/Exit time in border stations should be delivered to TIS with status 03, 04 or 05. Status 01 and 02 should be used only for the real origin and final destination of the whole international train run. If statuses 01 and 02 are used on the national level to indicate the first/last information

within IM network (e.g. entry/exit in border station) these should be replaced by codes 03,04 or 05 when sending the message to TIS.

To clearly distinguish whether the location type is arrival at destination or intermediate arrival or departure of origin or intermediate departure, the information delivered by RU in the Path request message shall be used.

1.3.2. Timetable time

Within TRInfM, also the information about planned time can be provided. 2 different planned times are recognised and can be delivered:

» BookedLocationDateTime
  - The value shall be identical with timings in the location from the last timetable for the train provided by particular IM to TIS (this time is related to the case when timetable has been modified due to operational purposes).

» ReferencedLocationDateTime
  - The value shall be identical with timings in the location from the original timetable for the train provided by particular IM to TIS.

In standard situation, when no rescheduling is done, both times are identical. In case of operational re-scheduling within one IM network, e.g. shifting the timetable due to high delays, Booked time refers to the new timetable and Reference time relates to the original timetable.

From international point of view, in case when rescheduling is done only on the national level and not coordinated in border section area, the Referenced time should be delivered to TIS to avoid the inconsistency in border section.

1.3.3. Delay at location

Within TRInfM, 2 different delay values are recognised and can be delivered to TIS:

» Against Booked
  - Delay compared to the Booked location time (see explanation in previous chapter)

» Against Referenced
  - Delay compared to the Referenced location time (see explanation in previous chapter)

At least one of the above-mentioned information shall be delivered to TIS.

In standard situation, when no rescheduling is done Against Booked and Against Referenced are the same. From international point of view, in case when rescheduling is done only on the national level and not coordinated in border section area, for reporting purposes the delay Against Referenced time is to be considered if provided.

1.4. Train Running Forecast Message

Mandatory message but its detailed usage is handled without a specific project. Once the final results will be available, the guidelines will be updated accordingly.

1.5. Train Delay Cause Message

In order to receive the information about the reason for the delay to TIS the TAF/TAP TSI Train Delay Cause Message (TDCM) should be send to TIS.

Message shall be delivered for all locations included in the train run. If location in TDCM is known in TIS but not delivered in PDM, in TIS online application on train info page it is allocated to the next location (based on the time when delay occurred). However, on train statistics page and also in the data warehouse, the exact location reported in TDCM is recorded.

If two TDCMs are sent for the same train with the same delay reason, for the same location and same running status, the most recent one will overwrite the previous one. For one train, one location and running status several delay reasons can be provided, but for each reason only one delay value is kept.

TDCM with status Modification should not be sent to TIS as it is not possible to precisely identify the change (whether the delay code or delay value is updated). If already send TDCM needs to be updated, first the deletion of previously sent TDCM shall be send followed by the new TDCM with status creation.

IMs must send TDCM to TIS only for delays that happened on their network and using the delay codes as defined in UIC Leaflet 450-2.

1.6. Train Running Interruption Message

The detailed usage of this optional message is currently discussed within the specific project. When the final results will be available, these guidelines will be updated.

1.7. Train Composition Message

The detailed usage of this optional message is currently discussed within the specific project. When the results will be available, these guidelines will be updated.

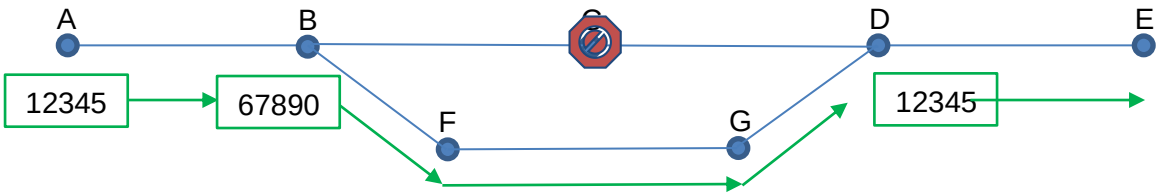
2. Data delivery scenarios

The following chapters provide the basic explanation, how the updated information shall be sent to TIS in the specific operational scenarios, based on the existing TIS processing rules.

2.1. Scenario 1: Operational change of train number / train re-routing

This scenario describes the process, how to correctly update the information in TIS in case of:
» Operational change of train number (e.g. due to delay, or after train interruption, etc.)
» Rerouting of train (with or without change of train number) in Origin, Destination or intermediate section

Example case:
Train with number 12345 has planned path from location A to location E via location B, C and D. Due to operational reason train is re-routed via different points and with different train number.



Original PDM was sent to TIS is for Train ID/Reference OTN 12345 with Service OTN 12345 in points A,B,C,D,E.

TIS processing:
When rerouting/change of train number occurs, the new PDM (status creation or modification) for Train ID/Reference OTN 12345 shall be send to TIS for:
» Point A(dep) and point B(arr) with Service OTN 12345
» Point B(dep), point F, point G and point D(arr) with Service OTN 67890
» Point D(dep) and point E(arr) with Service OTN 12345

TRInfM shall be sent to TIS for:
» Point A(dep) and point B(arr) with Service OTN 12345
» Point B(dep), point F, point G and point D(arr) with Service OTN 67890
» Point D
» (dep) and point E(arr) with Service OTN 12345

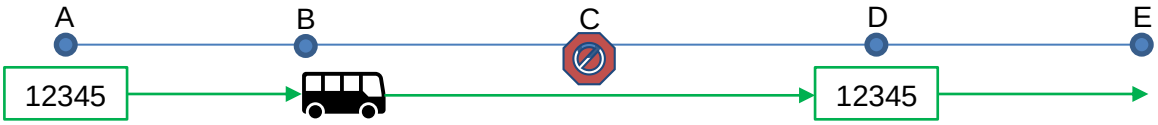
Important note:
The PDM with status deletion shall not be sent to TIS, even if followed by new PDM, because by PDM deletion also all already received TRInfM will get deleted.

However, if PDM deletion is sent and followed by new PDM, it is recommended to send these 2 messages with a time gap of at least 1 minute (if possible), so they are processed by TIS in correct order, e.g. if deletion and new PDM are sent in the same moment (only few milliseconds difference) it can happen that new PDM is processed before the PDM deletion and thus PDM deletion will be considered by TIS as the most recent message and leads to the deletion of the new PDM.

2.2. Scenario 2: Part of train run replaced by Bus service

Example case:
Train with number 12345 has planned path from location A to location E via location B, C and D.

Due to interruption in location C, train 12345 is replaced by bus service between locations B and D. From location D train 12345 continue to location E.



TIS processing:
PDM shall be sent for train number 12345 and locations A, B, D and E.
TRInfM shall be sent for train number 12345 and locations A, B, D and E.

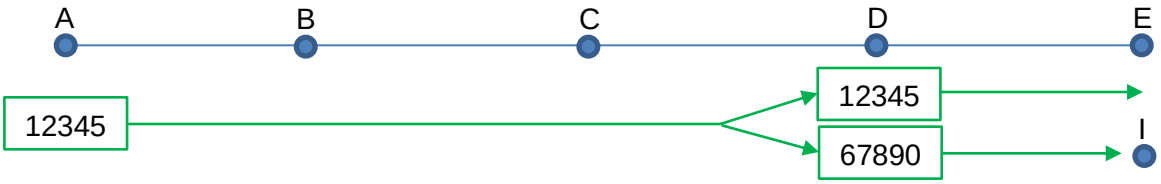
PSNM for intermediate section (B(dep) to D(arr)) is not fully supported by TIS because information about the bus service cannot be visualized in TIS application. However, if PSNM for B(dep) to D(arr) is sent to TIS, this information is stored on database level and can be considered for reporting purposes.

Important note:

Sending 2 separate PDMs, (one for section A-B and one for section D-E) shall not be done because the later one will automatically replace the previous one. TIS is not able to handle 2 PDMs, with same Train ID but different Path IDs.

2.3. Scenario 3: Train split

Example:
Train with number 12345 has is planned until point D where it is split to 2 trains:
» train 12345 from location D to location E
» train 67890 from location D to location I



TIS processing:

TIS is not able to maintain the link between train run from A to B and both split trains. In TIS, the 2 separate trains will be recorder: Train 12345 from location A to location E and Train 67890 from location D to location I.

Annex 2: List of Border sections

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
1	Figueres Vilafant - Perpignan	ADIF	SNCF Réseau	1	RFC 6	
2	Irun - Hendaye	ADIF	SNCF Réseau	1	RFC 4	
3	Port-Bou - Cerbère	ADIF	SNCF Réseau	1	RFC 6	
4	Puigcerdà - La Tour de Carol-Enveitg	ADIF	SNCF Réseau	2		
5	Helsingør - Helsingborg	Banedanmark	TRV Sweden	2		
6	Peberholm	Banedanmark	TRV Sweden	1	RFC 3	
7	Laarwald - Coevorden	Bentheimer Eisenbahn	ProRail	3		
8	Brig - Domo II	BLS	RFI	1	RFC 1	
9	Brig - Domodossola	BLS	RFI	1	RFC 1	
10	Carei - Tiborszállás	CFR Romania	MAV	3		
11	Curtici - Lökösháza	CFR Romania	MAV	1	RFC 7, RFC 9	
12	Episcopia Bihor - Biharkeresztes	CFR Romania	MAV	2	RFC 7, RFC 9	
13	Salonta - Kötegyán	CFR Romania	MAV	2		
14	Valea lui Mihai - Nyírábrány	CFR Romania	MAV	2		
15	Giurgiu Nord - Ruse	CFR Romania	NRIC	2	RFC 7	
16	Golenți - Vidin	CFR Romania	NRIC	1	RFC 7	
17	Negru Vodă - Kardam	CFR Romania	NRIC	3		
18	Flensburg - Padborg	DB Netz	Banedanmark	1	RFC 3	
19	Süderlügum - Tønder	DB Netz	Banedanmark	2		
20	Igel - Wasserbillig	DB Netz	CFL INFRA	3		
21	Aachen-Süd - Hammerbrücke	DB Netz	Infrabel	3		
22	Aachen-West - Montzen	DB Netz	Infrabel	1	RFC 1; RFC 8	RFC 8
23	Freilassing - Salzburg Liefering	DB Netz	OBB	2	RFC 9	RFC10
24	Griesen - Ehrwald Zugspitzbahn	DB Netz	OBB	3		

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
25	Kiefersfelden - Kufstein	DB Netz	OBB	1	RFC 3	
26	Lindau - Lochau-Hörbranz	DB Netz	OBB	3		
27	Mittenwald - Scharnitz	DB Netz	OBB	3		
28	Passau HBF - Schärding	DB Netz	OBB	1	RFC 9	
29	Pfronten-Steinach - Vils	DB Netz	OBB	3		
30	Simbach - Braunau/Inn	DB Netz	OBB	2		
31	Klingenthal - Kraslice	DB Netz	PDV Railway a.s.	3		
32	Ahlbeck Grenze - Świnoujście Centrum	DB Netz	PKP PLK	2		
33	Forst - Zasieki	DB Netz	PKP PLK	3		
34	Frankfurt (Oder) - Rzepin	DB Netz	PKP PLK	1	RFC 8	RFC5
35	Görlitz - Zgorzelec	DB Netz	PKP PLK	3		
36	Grambow - Szczecin-Gumieńce	DB Netz	PKP PLK	2		
37	Guben - Gubin	DB Netz	PKP PLK	2		
38	Hagenwerder - Krzewina Zgorzelecka	DB Netz	PKP PLK	3		
39	Horka Gbf - Węgliniec	DB Netz	PKP PLK	2	RFC8	
40	Küstrin-Kietz - Kostrzyn	DB Netz	PKP PLK	3		
41	Neu Rüdnitz - Siekierki	DB Netz	PKP PLK	3		
42	Tantow - Szczecin-Gumieńce	DB Netz	PKP PLK	2		
43	Zittau Hp - Sienawka	DB Netz	PKP PLK	3		
44	Aachen-Vetschau - Bocholtz	DB Netz	ProRail	3		
45	Bad Bentheim - Oldenzaal	DB Netz	ProRail	1	RFC 8	
46	Emmerich - Zevenaar Oost	DB Netz	ProRail	1	RFC8; RFC 1	
47	Gronau - Enschede	DB Netz	ProRail	2		
48	Herzogenrath - Landgraaf	DB Netz	ProRail	2		
49	Irhove - Bad Nieuweschans	DB Netz	ProRail	2		
50	Kaldenkirchen - Venlo	DB Netz	ProRail	1	RFC1	RFC8

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
51	Basel Badischer Bf. - Basel SBB PB/RB	DB Netz	SBB	1	RFC 1	RFC 2
52	Bietingen - Thayngen	DB Netz	SBB	2		
53	Erzingen - Trasadingen	DB Netz	SBB	3		
54	Grenzach - Basel Badischer Bahnhof	DB Netz	SBB	3		
55	Jestetten - Neuhausen Rheinfall	DB Netz	SBB	2		
56	Konstanz - Kreuzlingen	DB Netz	SBB	2		
57	Konstanz - Kreuzlinger Hafen	DB Netz	SBB	2		
58	Lörrach-Stetten - Riehen	DB Netz	SBB	3		
59	Lottstetten - Rafz	DB Netz	SBB	2		
60	Rielasingen - Ramsen	DB Netz	SBB	3		
61	Waldshut - Koblenz	DB Netz	SBB	3		
62	Hanweiler-Bad Rilchingen - Sarreguemines	DB Netz	SNCF Réseau	3		
63	Hemmersdorf - Bouzonville	DB Netz	SNCF Réseau	3		
64	Kehl - Strasbourg-Neudorf	DB Netz	SNCF Réseau	2	RFC 9	RFC4, RFC1, RFC2
65	Neuenburg - Bantzenheim	DB Netz	SNCF Réseau	3		
66	Perl - Apach	DB Netz	SNCF Réseau	2		
67	Saarbrücken - Forbach	DB Netz	SNCF Réseau	1	RFC 4	
68	Winden - Wissembourg	DB Netz	SNCF Réseau	3		
69	Wörth - Lauterbourg	DB Netz	SNCF Réseau	3		
70	Bad Brambach - Vojtanov	DB Netz	SZCZ	3		
71	Bad Schandau - Děčín	DB Netz	SZCZ	1	RFC7; RFC8	
72	Bärenstein - Vejprty	DB Netz	SZCZ	3		
73	Bayerisch Eisenstein - Železná Ruda-Alžbětín	DB Netz	SZCZ	3		
74	Ebersbach - Rumburk	DB Netz	SZCZ	3		
75	Furth im Wald - Česká Kubice	DB Netz	SZCZ	2	RFC 9	
76	Großschönau - Varnsdorf	DB Netz	SZCZ	2		

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
77	Johanngeorgenstadt - Potůčky	DB Netz	SZCZ	3		
78	Schirnding - Cheb	DB Netz	SZCZ	2	RFC 9	
79	Sebnitz - Dolní Poustevna	DB Netz	SZCZ	3		
80	Seifhennersdorf - Varnsdorf	DB Netz	SZCZ	3		
81	Selb-Plößberg - Aš	DB Netz	SZCZ	2		
82	Zittau - Hrádek nad Nisou	DB Netz	SZCZ	3		
83	Valga - Lugazi	EVR	Latvijas	1	RFC 8	
84	Baumgarten - Sopron	GYSEV / ROeEE	GYSEV / ROeEE	2	RFC 7, RFC 9	
85	Pamhagen - Fertőszentmiklós	GYSEV / ROeEE	GYSEV / ROeEE	2		
86	Beli Manastir - Magyarbóly	HZI	MAV	2		
87	Koprivnica - Gyékényes	HZI	MAV	1	RFC 6	
88	Kotoriba - Murakeresztúr	HZI	MAV	2		
89	Ličko Dugo Polje razdjelna točka - Martin Brod	HZI	ZFBH	3		
90	Metković - Čapljina	HZI	ZFBH	2		
91	Volinja - Dobrljin	HZI	ZRS	2		
92	Drenovci - Brčko	HZI	ZRS	2		
93	Slavonski Šamac - Bosanski Šamac	HZI	ZRS	2		
94	Erdut - Bogojevo	HZI	ZS Serbia	2		RFC 10
95	Tovarnik - Šid	HZI	ZS Serbia	1	RFC 10	
96	Arlon - Kleinbettingen	Infrabel	CFL INFRA	1	RFC 2	
97	Athus - Pétange	Infrabel	CFL INFRA	1	RFC 2	
98	Autelbas - Clemency	Infrabel	CFL INFRA	3	RFC 2	
99	Benonchamps - Schimpach-Wampach	Infrabel	CFL INFRA	3	RFC 2	
100	Gouvy - Bellain	Infrabel	CFL INFRA	2	RFC 2	
101	Lengeler - Wilwerdingen	Infrabel	CFL INFRA	3	RFC 2	
102	Y Aubange - Pétange	Infrabel	CFL INFRA	1	RFC 2	

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
103	Essen - Roosendaal	Infrabel	ProRail	1	RFC 8;RFC2	
104	Hamont - Weert	Infrabel	ProRail	2		
105	Lanaken - Maastricht	Infrabel	ProRail	2		
106	Noorderkempen - Breda (grens)	Infrabel	ProRail	1	RFC 8	
107	Visé - Eijsden	Infrabel	ProRail	2		
108	Zelzate - Sas van Gent	Infrabel	ProRail	2		
109	Elvas - Badajoz	IP	ADIF	1	RFC 4	
110	Valenca do Minho - Tui	IP	ADIF	2		
111	Vilar Formoso - Fuentes de Onoro	IP	ADIF	1	RFC 4	
112	Indra - Polocka	Latvijas	BZ Belarus	3		
113	Eglaine - Obeliai	Latvijas	LTG INFRA	2		
114	Kurcums - Turmantas	Latvijas	LTG INFRA	2		
115	Meitene - Joniškis	Latvijas	LTG INFRA	1	RFC 8	
116	Reņģe - Mažeikiai	Latvijas	LTG INFRA	2		
117	Riga - Vilnius	Latvijas	LTG INFRA	1	RFC 8	
118	Mockava - Trakiszki	LTG INFRA	PKP PLK	1	RFC 8	
119	Eperjeske - Батьово	MAV	UZ Ukraine	2		
120	Záhony - Чоп	MAV	UZ Ukraine	2	RFC 6	
121	Kelebia - Суботица / Subotica	MAV	ZS Serbia	2	RFC 11	
122	Röszke - Хоргош / Horgoš	MAV	ZS Serbia	2		
123	Kulata - Promachon	NRIC Bulgaria	OSE Greece	1	RFC 7	
124	Svilengrad - Dikea	NRIC Bulgaria	OSE Greece	2	RFC 7	
125	Svilengrad - Kapikule	NRIC Bulgaria	TCDD Turkey	3	RFC 10	
126	Kalotina Zapad - Dimitrovgrad	NRIC Bulgaria	ZS Serbia	3	RFC 10	
127	Deutschkreutz - Harka	OBB	GYSEV / ROeEE	2		
128	Jennersdorf - Szentgotthárd	OBB	GYSEV / ROeEE	2		

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
129	Loipersbach-Schattendorf - Sopron	OBB	GYSEV / ROeEE	2	RFC 7	
130	Nickelsdorf - Hegyeshalom	OBB	MAV	1	RFC 7, RFC 9	
131	Nendeln - Tosters	OBB	OBB	3		
132	Brennero	OBB	RFI	1	RFC 3	
133	Innsbruck - Fortezza	OBB	RFI	1	RFC 3	
134	Silian - San Candido	OBB	RFI	2		
135	Thörl-Maglern - Tarvisio Boscoverde	OBB	RFI	1	RFC 5	
136	Bernhardsthal - Břeclav os.n.	OBB	SZCZ	1	RFC 5; RFC 7	
137	Gmünd NÖ - České Velenice	OBB	SZCZ	2		
138	Retz - Šatov	OBB	SZCZ	2		
139	Summerau - Horní Dvořiště	OBB	SZCZ	2		
140	Bleiburg - Prevalje	OBB	SZI	2		
141	Rosenbach - Jesenice	OBB	SZI	2	RFC 10	
142	Spielfeld-Straß - Šentilj	OBB	SZI	1	RFC 5, RFC 10	
143	Kittsee - Bratislava-Petržalka	OBB	ZSR	1	RFC 5, RFC 7; RFC 9	
144	Marchegg - Devínska Nová Ves	OBB	ZSR	1	RFC 5; RFC 7	
145	Idomeni - Gevgelija	OSE Greece	MZ Macedonia	2		
146	Neos Kafkasos - Kremenitsa	OSE Greece	MZ Macedonia	2		
147	Pythion - UzunKopru	OSE Greece	TCDD Turkey	2		
148	Czeremcha - Wysokie	PKP PLK	BZ Belarus	2		
149	Kuźnica Białostocka - Grodno	PKP PLK	BZ Belarus	2		
150	Siemianówka - Świsłocz	PKP PLK	BZ Belarus	2		
151	Terespol - Brześć	PKP PLK	BZ Belarus	2		
152	Chałupki - Bohumín os.n.	PKP PLK	SZCZ	1	RFC 5	
153	Chałupki - Bohumín-Vrbice	PKP PLK	SZCZ	1	RFC 5	
154	Cieszyn Marklowice - Český Těšín	PKP PLK	SZCZ	2		

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
155	Głuchołazy - Jindřichov ve Slezsku	PKP PLK	SZCZ	2		
156	Głuchołazy - Mikulovice	PKP PLK	SZCZ	2		
157	Lubawka - Královec	PKP PLK	SZCZ	2		
158	Międzylesie - Lichkov	PKP PLK	SZCZ	1	RFC 5	
159	Mieroszów - Meziměstí	PKP PLK	SZCZ	2		
160	Szklarska Poręba - Harrachov	PKP PLK	SZCZ	2		
161	Zawidów - Frýdlant v Čechách	PKP PLK	SZCZ	2		
162	Zebrzydowice - Petrovice u Karviné	PKP PLK	SZCZ	1	RFC 5	
163	Dorohusk - Jahodyn	PKP PLK	UZ Ukraine	2		
164	Hrebenne - Rawa Ruska	PKP PLK	UZ Ukraine	2		
165	Hrubieszów LHS - Izov	PKP PLK	UZ Ukraine	2		
166	Hrubieszów Miasto - Izov	PKP PLK	UZ Ukraine	2		
167	Medyka - Mościska	PKP PLK	UZ Ukraine	2		
168	Werchrata - Rawa Ruska	PKP PLK	UZ Ukraine	2		
169	Łupków - Medzilaborce	PKP PLK	ZSR	2		
170	Muszyna - Plaveč	PKP PLK	ZSR	2	RFC 11	
171	Zwardoń - Skalité	PKP PLK	ZSR	1	RFC 5, RFC 11	
172	Bardonecchia - Modane	RFI	SNCF Réseau	1	RFC 6	
173	Limone - Vievola	RFI	SNCF Réseau	2		
174	Olivetta-S. Michele - Breil-sur-Roya	RFI	SNCF Réseau	2		
175	Ventimiglia - Menton Garavan	RFI	SNCF Réseau	2		
176	Gorizia Centrale - Vrtojba	RFI	SZI	2		
177	Villa Opicina - Sežana	RFI	SZI	1	RFC 5, 6	
178	Helsinki - Tallinn	RHK Finland	EVR	2		
179	Buchs SG - Nendeln	SBB	OBB	2		
180	St. Margrethen - Lustenau	SBB	OBB	2		

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
181	Chiasso - Como S. Giovanni	SBB	RFI	1	RFC 1	
182	Chiasso SM - Bivio PC Rosales	SBB	RFI	1	RFC 1	
183	Ranzo - S. Abbondio - Luino	SBB	RFI	1	RFC 1	
184	Stabio - PM Bevera	SBB	RFI	2		
185	Basel St. Johann - St Louis Haut Rhin	SBB	SNCF Réseau	1	RFC 2	
186	Boncourt - Delle	SBB	SNCF Réseau	2		
187	Chêne-Bourg - Annemasse	SBB	SNCF Réseau	2		
188	La Plaine - Pougny-Chancy	SBB	SNCF Réseau	1	RFC 2	
189	Le Châtelard-Frontière - Vallorcine	SBB	SNCF Réseau	2		
190	Le Locle-Col-des-Roches - Morteau	SBB	SNCF Réseau	2		
191	Travers - Portarlier	SBB	SNCF Réseau	2		
192	Vallorbe - Frasne	SBB	SNCF Réseau	2		
193	Audun-le-Tiche - Esch-sur-Alzette	SNCF Réseau	CFL INFRA	2		
194	Longwy - Rodange	SNCF Réseau	CFL INFRA	2		
195	Thionville - Bettembourg	SNCF Réseau	CFL INFRA	1	RFC 2	
196	Volmerange-les-Mines - Dudelange-Usines	SNCF Réseau	CFL INFRA	2		
197	Calais-Fréthun - Ashford International	SNCF Réseau	Eurotunnel	1	RFC 2	
198	Baisieux - Y Froyennes	SNCF Réseau	Infrabel	1	RFC2	
199	Feignies - Quévy	SNCF Réseau	Infrabel	1	RFC2	
200	Jeumont - Erquelinnes	SNCF Réseau	Infrabel	1	RFC2	
201	Mont-Saint-Martin - Y Aubange	SNCF Réseau	Infrabel	1	RFC 2	
202	Tourcoing - Moeskroen	SNCF Réseau	Infrabel	1	RFC 2	
203	Wannehain - Y Antoing	SNCF Réseau	Infrabel	1	RFC 2	
204	Hodonín - Holíč nad Moravou	SZCZ	ZSR	2		
205	Horní Lideč - Lúky pod Makytou	SZCZ	ZSR	1	RFC 9	
206	Lanžhot - Kúty	SZCZ	ZSR	1	RFC 7	

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
207	Mosty u Jablunkova - Čadca	SZCZ	ZSR	1	RFC 5, RFC 9	
208	Sudoměřice nad Moravou - Skalica na Slovensku	SZCZ	ZSR	2		
209	Velká nad Veličkou - Vrbovce	SZCZ	ZSR	2		
210	Vlárský průsmyk - Horné Srnie	SZCZ	ZSR	2		
211	Dobova - Savski Marof	SZI	HZI	1	RFC 6, RFC 10	
212	Ilirska Bistrica - Šapjane	SZI	HZI	2		
213	Imeno - Kumrovec	SZI	HZI	3		
214	Lendava - Mursko Središće	SZI	HZI	2		
215	Rakitovec - Buzet	SZI	HZI	2		
216	Rogatec - Đurmanec	SZI	HZI	2		RFC 10
217	Rosalnice - Bubnjarci	SZI	HZI	2		
218	Središče - Čakovec	SZI	HZI	2		
219	Hodoš - Őriszentpéter	SZI	MAV	1	RFC 6, RFC 11	
220	Charlottenberg	TRV Sweden	Bane NOR SF	2		
221	Kornsjø	TRV Sweden	Bane NOR SF	1	RFC 3	
222	Riksgränsen - Bjørnfell	TRV Sweden	Bane NOR SF	2		
223	Storlien - Kopperå	TRV Sweden	Bane NOR SF	2		
224	Haparanda - Tornio	TRV Sweden	RHK Finland	2		
225	Ballyshannon - Belleek	UK	IR	3		
226	Bridgend - Gallagh Road	UK	IR	3		
227	Carrigans - Londonderry Foyle Road	UK	IR	3		
228	Clady - Strabane	UK	IR	3		
229	Clones - Newtonbutler	UK	IR	3		
230	Creighanroe - Carnagh	UK	IR	3		
231	Dundalk - Newry	UK	IR	2		
232	Glaslough - Tynan	UK	IR	3		

RNE Border ID	RNE Border section name	IM A	IM B	Priority status:	RFC	Other relevant RFC
233	Glenfarne - Belcoo	UK	IR	3		
234	Lifford - Strabane	UK	IR	3		
235	Omeath - Newry Bridge Street	UK	IR	3		
236	Pettigo - Castlecaldwell	UK	IR	3		
237	Pettigo - Kesh	UK	IR	3		
238	Porthall - Strabane	UK	IR	3		
239	Rusovce - Rajka	ZSR	GYSEV / ROeEE	1	RFC 7, RFC 9, RFC 11	
240	Čaňa - Hidasnémeti	ZSR	MAV	2	RFC 11	
241	Fiľakovo - Somoskőújfalu	ZSR	MAV	2		
242	Komárno - Komárom	ZSR	MAV	2	RFC 7, RFC 11	
243	Lenartovce - Bánréve	ZSR	MAV	2		
244	Lučenec - Ipolytarnóc	ZSR	MAV	3		
245	Malé Straciny - Nógrádszakál	ZSR	MAV	3		
246	Slovenské Nové Mesto - Sátoraljaújhely	ZSR	MAV	2	RFC 11	
247	Štúrovo - Szob	ZSR	MAV	2	RFC 7, RFC 11	
248	Čierna nad Tisou - Chop	ZSR	UZ Ukraine	2		
249	Čierna nad Tisou ŠRT - Chop ŠRT	ZSR	UZ Ukraine	2		
250	Maťovce ŠRT - Uzhorod ŠRT	ZSR	UZ Ukraine	2		

Annex 3: Master station concept on reporting level

As the topological situation might not always be simple, the so called “master station” concept was developed on the reporting level. A master-station represent a specific geographical area defined by several measuring points, further referred to as substations.

If the real train run passes one or more substations, the final train run assembled on reporting level only consists of one master-station (instead of one or more substations).

This concept can usually be applied for the areas with a lot of alternative routings, where timetable information were provided for one route while the real run was through another route (e.g. big shunting yards, etc.). The other usage can be for the cases, when timetable is provided for the specific point, but the real information is provided from the balise, which is not on the same place as timetable relevant point. In such cases, there would be 2 different points in TIS, one with the timetable information (and missing running advice) and second with running advice (and no timetable information).

If such master station is defined, the following principles applies:

- Master station is defined as virtual point together with the list of substations belonging to this point/area; e.g. virtual point “Köln area” including all Köln related substations
- The times for the area (arrival and departure) will be considered as:
    - the entry time to area (arrival) – first/lowest/oldest time provided from all subpoints
    - the exit time from area (departure) – last/latest/highest time provided for all subpoints
    - if the Arrival terminal / Departure origin is the last / first time, in that case this time would be considered as the time for master station
    - To ensure the consistency between running information and timetable information, only that running information will be considered, for which also timetable information is available (either delivered from IM or calculated from TIS

Table below shows the example, how the times for Master station will be defined:

Point	Timetable Arrival	Timetable Departure	Running Arrival	Running Departure
A	delivered	delivered		
B	calculated	calculated	delivered	delivered
C	delivered	delivered	delivered	delivered
D	delivered		delivered	
E		delivered		delivered
F	delivered	delivered	delivered	
G		delivered	delivered	delivered

	Timetable Arrival	Timetable Departure	Running Arrival	Running Departure
Master station	minimum time from blue fields	maximum time from blue fields	minimum time from green fields	maximum time from green fields

This master station concept is used only for the reporting purposes. All original information for all the substations are kept as they are and are also available for reporting purposes. Only in addition to them the master station data can be calculated in Data warehouse and thus are possible to use in the reports.

Annex 4: Border Section Information Interface

User interface to record and update all relevant information for each border section is currently under development. Once the development will be finalized, the Annex will be updated accordingly.

Until that time, for providing the information about border section, the separate excel file template (as shown below) shall be filled in and delivered to RNE Joint Office (reports@rne.eu).

Basic information about border section		
Border ID		Information to be given from the list of borders
Border name A - B		
IM A		
IM B		

Border section reporting points							
IM	Point type	Traffic type	PLC	Country	Name	Timetable status	Running status
IM A	**FIRST/LAST point with Timetable and Running information**	☐ Freight ☐ Passenger ☐ Freight ☐ Passenger					
	FIRST/LAST point with Timetable information	☐ Freight ☐ Passenger ☐ Freight ☐ Passenger					
	FIRST/LAST point with Running information	☐ Freight ☐ Passenger ☐ Freight ☐ Passenger					
IM B	**FIRST/LAST point with Timetable and Running information**	☐ Freight ☐ Passenger ☐ Freight ☐ Passenger					
	FIRST/LAST point with Timetable information	☐ Freight ☐ Passenger ☐ Freight ☐ Passenger					