The Trans-European Conventional Rail System

“TELEMATIC APPLICATIONS”
subsystem for Freight Services

FIGURES AND SEQUENCE DIAGRAMS
OF THE
TAF TSI MESSAGES

AEIF_TAF_FigSeq_V10_040622-EN.doc

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Intended Audience

This document is one of the references to be used by designers and engineers responsible for the proper implementation of the TAF TSI requirements regarding message exchange according chapter 4.2 of the CR TSI Telematic Applications for Freight Services.

Evolution of this Document

Distribution:

Any new version of the document incorporated in any new version of annex E of the TAF TSI approved by the EC in accordance of the procedure set out in Article 21(2) of the Directive 2001/16/EC shall be distributed to:

- AEIF
- EC
- DGTREN
- European Railway Agency
- AEIF SSG Telematic Applications
- Brussels
- Brussels
- As soon as it will be created
- Valenciennes

The document shall be distributed by e-mail in MS-Word format or in PDF Format and published on the AEIF Web-site www.aEIF.org.

Configuration Management:

Any change requests on the content of this document shall be reported to the TAF TSI responsible member at AEIF and at the European Railway Agency.
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0. Introduction

0.1. Purpose

This document is the collection of the figures and sequence diagrams to which the TAF TSI refers. It gives support for the right understanding of the verbal description in the TAF TSI

0.2. References

0.2.1. Standards and Guidelines

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0.2.2. Other References

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1. Figures

1.1. Example of the critical points in Freight Transport

The figure above shows the critical points (interfaces between the various partners involved) in freight transport on road compared with the critical points of freight transport on rail for a simplified scenario.

1.2. Example for train Path request and RU / IM Communication

With B, D and E as handover points between IMs and C and E as interchange points between RUs the situation is as follows:
RU1 has to request a train path A-B from IM1 and B-C from IM2;
RU2 has to request a train path C-D from IM2 and D-E from IM3;
RU3 has to request a train path E-F from IM4.

The communication during the train running between RU and IM must always be based on train and path number, whereby the IM communicates with the RU, who has booked the train path on his infrastructure. This means for the example above:

For the journey section A-B, IM1 communicates with RU1;
For the journey section B-C, IM2 communicates with RU1;
For the journey section C-D, IM2 communicates with RU2;
For the journey section D-E, IM3 communicates with RU2;
For the journey section E-F, IM4 communicates with RU3.

If an RU provides the complete journey A – F (Open Access by RU, no other RUs are involved), then each IM involved communicates directly with this RU only. This “open access” by the RU can be realised by booking the train path via “One Stop Shop” or in sections with each IM directly. The TSI takes account both cases.

1.3. Scenarios for path booking

- **Scenario A**: The RU contacts all involved IMs directly or via the OSS to organise the paths for the complete journey. In this case the RU has also to operate the train on the complete journey according to Article 13 of the Directive 2001/14/EC.

  a) Path booking via OSS by the RU for Transport Journey from A to F
b) Direct path booking by the RU for Transport Journey from A to F

- **Scenario** B: Each RU involved in the Transport Journey from A to F contacts the local IMs directly or via OSS to request a path for the journey section on which it operates the train.

In this example:
RU 1 is the LRU to co-ordinate the involved RUs

**Remark:** In the execution mode, the IM will always communicate with the RU which has booked the path. Therefore the “path ownership” is important for the message exchange during operation of the train.

**Figures and Sequence Diagrams**
Version 1.0 22.06.2004
### 1.4. Examples for ETI calculation

**Example 1** for calculation of an ETI for LRU 1 and LRU 2 based on TETA from IM2 for interchange point C:

**Example 2** for calculation ETI for LRU 1 and LRU 2 based on TETA from IM2 for interchange point C:
1.5. General Architecture Solution Overview

Solution Overview

- **Message Metadata**
  (format and change control)

- **Directory**
  (phone book)

- **Certification Authority**
  (Open CA PKI)

Overnight download or only when changes occur

Central repository operated by one agency (operational aspect required for interoperability)

Common Interface is specified for interoperability but can be built centrally or individually

Any TCP/IP network

Operational aspect required for interoperability

LRU existing Systems
Common Interface

IM existing Systems
Common Interface

RU existing Systems
Common Interface

Wagon and Intermodal Unit Operational Database
Common Interface

LRU existing Systems
Common Interface

IM existing Systems
Common Interface

RU existing Systems
Common Interface

RU existing Systems
Common Interface

LRU existing Systems
Common Interface
1.6. **Access method to the different types of Databases using the common interface**

Each instance of the Common Interface will have access to all the data required according the TSI within each RU, IM, etc, whether the relevant Databases are central or individual.

![Diagram showing access to different types of Databases via a common interface]

- **Central Database**
  - DB 1

- **Distributed Database**
  - DB 2a
    - 1
    - 2
  - DB 2b
    - 3
    - 4

- **Common Interface**
  (see 4.2.14.1)

- **Reference Files**
  - DB 3

- **Individual databases**
  - RUn
  - IM
    - IM1
    - IM2
2. Sequence Diagram: Path request

2.1. Sequence diagram path request

This Diagram is also valid for Open Access (RU is LRU) and OSS with IM 1 as OSS

![Sequence Diagram](image)

RU sends train path request to the relevant IMs.

The IMs send the receipt confirmation to the RU, if the required response cannot be made available in real-time.

Each IM sends to the requested RU the path details for its section.

RU confirms the Train Path Details to each relevant IM.

RU can refuse the path details from some IMs and sends a new path request to them.

2.2. Sequence diagram RU cancels a booked path

![Sequence Diagram](image)

RU cancels previously booked paths on the Infrastructure of various IMs.
2.3. **Sequence Diagram: Path Not Available**

This Diagram is also valid for Open Access (RU is LRU) and OSS with IM as OSS.

![Sequence Diagram]

- **RU**
  - Path Not Available
  - Path Details
  - Receipt Confirmation
  - Path Confirmed
  - Path Details Refused
  - Path Cancelled

- **IM**
  - The IM sends Path Not Available to the RU.
  - Together with the message Path Not Available or as soon as possible the IM sends a proposal for the booked path, which is not available. This is done with the Path Details message.
  - The RU sends the Receipt Confirmation to the IM, if the required response cannot be made available in real-time.
  - RU confirms the Train Path Details to the IM, if it agrees.
  - RU can refuse the path details from the IM and sends a new path request to them.
  - RU cancels the previously booked path with reference
3. Sequence Diagram: Train Preparation

This Diagram is also valid for Open Access (RU n is LRU) and OSS with IM 1 as OSS

**Remark:** During the train preparation also a Train Path Not Available message can occur, since this message can be send at any time between the moment the train path is contracted and the departure of the train. This is not included in this diagram.
4. Sequence diagram: Train running forecast, example A

- **Example A** according Path request scenario A(a) and A(b) (see chapter 1.3)
With: 3 = Train Running Forecast 4 = Train Running Information

Handling at Point A

After leaving A:
IM1 sends train running information to RU1
And
IM1 sends train running forecast ETH for B to IM2 and RU1.

Handling at Point B

When arriving at B
IM1 sends train running information to RU1
After leaving B:
IM2 sends train running information to RU1
And
IM2 sends train running information to RU1

Handling at Point C

Train preparation at Handling point C.

When arriving at C
IM2 sends train running information to RU1.

When leaving C:
IM2 sends train running information to RU1
And
IM2 sends train running forecast ETH for D to IM3 and RU1.
Handling at Point E:

When leaving E:
- IM3 sends train running information to RU1
- IM3 sends train running forecast ETH for E to IM4 and RU1.

When arriving at F:
- IM4 sends train running information to RU1

Train preparation at Handling Point E.

With:

3 = Train Running Forecast
4 = Train Running Information
Example B according Path request scenario B (see chapter 1.3)

In this example:
RU 1 is the LRU to co-ordinate the involved RUs.

Each RU must know its neighbour RU. This information must be given by the LRU

With: 3 = Train Running Forecast 4 = Train Running Information
At Interchange Point C

Train preparation at Interchange Point C done.

When leaving C:
- IM2 sends train running information to RU2
- IM2 sends train running forecast ETH for D to IM3 and RU2

When arriving at C:
- IM2 sends train running information to RU1

At Interchange / Handover Point D

When leaving D:
- IM2 sends train running information to RU2
- IM2 sends train running forecast ETH for E to IM4 and RU2

When arriving at D:
- IM3 sends train running information to RU2

At Handover Point E

Train preparation at Interchange Point E

When leaving E:
- IM4 sends train running information to RU3
- IM4 sends train running forecast TETA for F to RU3

When arriving at E:
- IM3 sends train running information to RU2

At Destination

When arriving at F:
- IM4 sends train running information to RU3

With:

3 = Train Running Forecast
4 = Train Running Information
5. Sequence Shipment ETI / ETA

This Sequence is based on the following example for the interchange point C.

Remark: ETA for the wagons 1&2 is the ETI at F plus the time for delivery at customer siding according to commitment.
ETA for the wagons 3,4,5 is the ETI at E plus the time for delivery at customer siding according to commitment.
6. Sequence Diagram: Wagon Movement/Interchange Reporting

The following Sequence diagram refers to figure 14 (Example 1, ETI Calculation) and considers the handling for the wagon Numbers 1 and 2.

- **LRU1**
  - LRU tells RU1 wagon is ready for pick up.
  - RU1 informs LRU, that wagon has been picked up
  - RU1 informs LRU: wagon arrived at the yard point A

- **RU 2**
  - After receipt of the train running information, the RU2 informs the LRU, that the wagon has left the yard point A.
  - After receipt of the train running information with train arrived at C, RU1 sends yard arrival to LRU and wagon interchange notice to RU2. RU2 accepts the wagon with wagon receipt notice.
  - After receipt of the train running information, the RU2 informs the LRU, that the wagon has left the yard point C.

- **IM 2**
  - After receipt of each train forecast message from IM 2, 3 and 4, RU 2 must recalculate the ETA for LRU1.

- **RU 1**
  - After receipt of the train running information, the RU1 informs the LRU, that the wagon has been picked up
  - RU1 informs LRU: wagon arrived at the yard point A

- **Wagon ETA for F**
  - Only as reminder!

- **Train Running Information**
  - Train running forecast for C
  - Wagon ETI for C
  - Wagon ETA for F

- **Wagon interchange Notice**

- **Yard arrival**

- **Release Notice**

- **Departure Notice**

- **Yard departure**

- **Wagon receive notice**

- **Possible Exception message**

- **Train running information**
  - Train running forecast for D
  - Only as reminder!
  - Train running forecast for E from IM 3
  - Train running forecast for F from IM 4

- **Train running forecast for F**

- **When arriving destination F:**
  - Wagon delivery notice
  - Wagon arrival notice
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