INTEROPERABILITY UNIT

TAF TSI - ANNEX D.2: APPENDIX B - WAGON AND INTERMODAL UNIT
OPERATING DATABASE (WIMO)

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AMENDMENT RECORD

Version	Date	Section number	Modification/description
1.0	25.01.2011	All	Initial version
1.1	15.05.2012	1.4.1 and 1.4.2	Update of regulatory references and other references.
1.1	15.05.2012	2.1.2	Removal of references and text of legislation not in force.
1.1	15.05.2012	4	Inclusion of a new internal reference to chapter 6.
1.1	15.05.2012	6	Creation of chapter 6, including the list of xml elements to be used during the implementation phase. Due to this modification Annex 1 to this document is abolished.
2.0	08.08.2013	All	All the chapters were revised due to the TAF TSI Revision Process and the TAF TSI CCM WP cycle 2012 – 2013.
2.0	17.10.2013	All	Validated by the ERA TAF CCB on 11.09.2013.
2.1	18.03.2018	2.8	To define a new mechanism to exchange data between WIMO and RSRD. Endorsed by the ERA TAF CCB on 10.02.2015; Published on 18.03.2019

Important note

The present document belongs to the set of Technical Documents described in Appendix I 'List of technical documents' of the Commission Regulation (EU) No 1305/2014.

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1.1 Purpose

The Purpose of this document is to further specify and clarify the specifications described in the TAF-TSI (Technical Specification for Interoperability "Telematic Applications for Freight Services" Sub-System) concerning the Wagon and Intermodal Unit Operational Database (WIMO).

The Functional Requirements Specification will be the basis for the detailed specifications and various design documents related to the WIMO.

This document is limited to functional and technical aspects and does not cover organisational issues or the database design. Thus, the description in this document supposes WIMO as an "instance" (see chapter 1.5) and the architecture, especially the question how many instances will be installed, is an implementation issue and will be clarified during the design phase.

This document is part of List of technical documents listed in Appendix I of the TAF TSI regulation [4].

1.2 Intended Audience

This document is one of the references to be used by designers and engineers responsible for the deployment of the TAF TSI requirements.

1.3 Evolution of the Functional Requirements Specification

1.3.1 Distribution

The FRS will be distributed to the Representative Bodies from the Railway Sector acting on a European level as defined in Article 3 (2) of Regulation (EC) No 881/2004 and made available to the stakeholders of the European Rail Freight Industry.

The FRS will be delivered by electronic means in MS-Word format or in PDF Format and published on the ERA Web-site: era.europa.eu.

New versions will be accessible electronically.

1.3.2 Configuration Management

A new version of the document will be created if new changes are considered because of

the Change Control Management Process led by ERA:

- if there is a change in the requirements which influences the implementation

- if information is added to or deleted from the FRS, eg.

adding test cases to the field checking in messages or databases.

The changes will be included in the FRS. They must be marked in the new document for better realizing them.

1.4   References

1.4.1   Regulatory References

Id	Title	Doc ID, Edition	Date	Author
1	Directive 2012/34/EU of The European Parliament and of The Council establishing a single European railway area.	Directive 2012/34/EU	21/11/2012	EC
2	On the interoperability of the rail system within the Community (Recast)	Directive 2008/57/EC	17/06/2008	EC
3	TSI OPE (repealed with effect from 01.01.2012) - Decision 2006/920/EC (as amended by 2009/107/EC and 2010/640/EU)	Decision 2011/314/EU (in force from 01.01.2012 on)	12/05/2011	EC
4	TAF TSI Regulation No 1305/2014	Commission Regulation (EU) No 1305/2014 of 11 December 2014 on the technical specification for interoperability relating to the telematics applications for freight subsystem of the rail system in the European Union and repealing the Regulation (EC) No 62/2006	11/12/2014	EU
4.1	ERA-TD-100: TAF TSI - ANNEX A.5: Figures and Sequence Diagrams of the TAF TSI Messages	Version 2-1	10/02/2015	ERA
4.2	ERA-TD-101: TAF TSI – ANNEX D.2 : APPENDIX A – (WAGON/ILU TRIP PLANNING)	Version 2-0	23/03/2013	ERA
4.3	ERA-TD-103 : TAF TSI – ANNEX D.2 : APPENDIX C – REFERENCE FILES	Version 2-1	13/05/2012	EC
4.4	TA ERA-TD-104: F TSI — ANNEX D.2: APPENDIX E — COMMON INTERFACE	Version 2-0	23/03/2013	ERA

4.5	ERA-TD-105: TAF TSI APPENDIX F — Data and Message Model)	Version 2.1	10/02/2015	ERA

1.4.2   Other References

Id	Title	Doc ID, Edition	Date	Author
5	CEN Working Agreement for Coding For Railway Undertakings, Infrastructure Managers And Other Companies Involved In The Rail Transport Chain.		2006	CEN
6	Codes for the Representation of Names of Countries and their Subdivisions - Part 1: Country Codes Definitions and Abbreviations.	ISO 3166-1	1997	ISO
7	TAF TSI Master Plan	V.4.0	17/01/2013	Rail Sector

1.5   Definitions and Acronyms

For all definitions and acronyms see [4]: Appendix II Glossary. Only one important specific definition is explicitly given here:

Instance: An individual object of the class "WIMO database", which means   a single copy of a class in the moulding of "WMO database".

With this definition in mind, it is usual to use the class name for the instance. This is also the case in this document.

1.6   Responsibilities

This FRS was written under the responsibility of the SEDP project team with support of nominated experts from European IMs, RUs and others. It is a deliverable of the SEDP project for the implementation of the TAF TSI. Since 2012 this document has been hand over to the European Railway Agency and it belongs to the ERA Technical Document set for TAF TSI. Therefore, any update of this document shall be brought to

the TAF TSI Change Control Management Working Party under the aegis of the European Railway Agency.

2. FUNCTIONAL REQUIREMENTS SPECIFICATIONS

2.1 Initial requirements

The Functional requirements are derived from the requirements expressed in the Technical specifications for interoperability:

- Telematic Applications for freight services (TAF-TSI)
- Operation and traffic management (OPE-TSI)

They are restricted to the mandatory requirements of the TAF TSI.

They support the EC goal to enlarge rail freight business by offering better quality of transportation services and reduced costs. Every single Functional Requirement Specification has to take into account the

- improvement of transport quality to attract more business and
- reduction of costs on the medium and long run.

2.1.1 Existing and used applications

Existing and used applications should be taken into consideration. E. g. the status reporting of the individual RUs could be used to populate / update the WIMO. This guarantees the reuse of existing investments of the individual RUs in their own systems and processes.

2.1.2 Requirements according to TAF TSI

The TAF TSI (*Commission Regulation (EU) No 1305/2014 of 11 December 2014 on the technical specification for interoperability relating to the telematics applications for freight subsystem of the rail system in the European Union and repealing the Regulation (EC) No 62/2006)* obliges to install a Wagon and Intermodal Unit Movement Data Base (WIMO) for the freight services in the complete freight rail network of the member States of the European Union. The shown chapter numbers refer to that document.

Chapter 2.3.2
The RUs / LRUs must in general have, at minimum, the capability of,

- DEFINING services in terms of price and transit times, wagon supply (where applicable), wagon / Intermodal unit information (location, status and the wagon / Intermodal unit related estimated time of arrival "ETA"), where shipments can be loaded on empty wagons, containers etc.;
- DELIVERING the service that has been defined in a reliable, seamless manner through the use of common business processes and linked systems. There must be a capability for RUs, IMs and other service providers and stakeholders such as customs to exchange information electronically;
- MEASURING the quality of the service delivered compared to what was defined. i.e. billing accuracy against price quoted, actual transit times against commitments,

wagon ordered against supplied, ETAs against actual arrival times;
- OPERATING in a productive manner in terms of utilisation: train, infrastructure and fleet capacity through the use of business processes, systems and data exchange required to support wagon / Intermodal unit and train scheduling.

Chapter 2.3.3
This database contains the operational status data of the rolling stock, the weight and dangerous goods information, information related to Intermodal Units and the location information.

Chapter 4.2.3.1, 4.2.3.2
For the preparation of the train, the RU must have access to the information on dangerous goods and to the current, updated information status on the wagons (The Wagon and Intermodal Unit Operational Database). This applies to all wagons on the train.

Chapter 4.2.5.1
When the RU learns about a service disruption during the train running operation for which it is responsible, it must immediately inform the IM concerned (this may be done orally by the RU). If necessary the RU updates the Wagon and Intermodal Unit Operational Database.

Chapter 4.2.6.1
It is the task of the RU receiving the TETA information to identify and process that information, store it as a wagon movement in the Wagon and Intermodal Unit Operational Database and communicate it to the LRU, if the train is not running in Open Access mode.

Chapter 4.2.7.1
The following events must be stored in the Wagon and Intermodal Unit Operational Database
      4.2.7.2. Wagon Release Notice message
      4.2.7.3. Wagon Departure Notice message
      4.2.7.4. Wagon Yard Arrival message
      4.2.7.5. Wagon Yard Departure message

The information of the following messages must be stored in the Wagon and Intermodal Unit Operational Database.
      4.2.7.6. Wagon Exception message
      4.2.7.7. Wagon Arrival Notice message
      4.2.7.8. Wagon Delivery Notice message
      4.2.8.2. Wagon Interchange Notice message,
      4.2.8.3. Wagon Interchange Notice/Sub message,
      4.2.8.4. Wagon Received At Interchange message,
      4.2.8.5. Wagon Refused At Interchange message.

Derived from the running information of the train at a reporting point, the wagon or Intermodal Unit related information — regarding location and date/time of arrival and departure — must be processed and stored in the Wagon and Intermodal Unit Operational Database.

Chapter 4.2.10.1
The Infrastructure Data (the Network Statements and the infrastructure restriction notices) and Rolling Stock Data (in the Rolling Stock Reference Databases and in the Wagon and Intermodal Unit Operational Database) are the most important data for the operation of freight trains on the European network. Both types of data together allow an assessment of the compatibility of the rolling stock with the infrastructure, help to avoid multiple data input, which increase

especially the data quality, and they give a clear picture on all available installations and equipment at any time for fast decisions during the operation.

Chapter 4.2.10.3
The operational rolling stock data is a part of the European-wide Wagon and Intermodal Unit Operational Database.

Chapter 4.2.11.2.
To allow for the tracking of train and wagon movements, the following databases, updated at each relevant event in real time, must be installed. Authorised entities such as keepers and fleet managers must have access to the data relevant to fulfil their functions, according to bilateral agreements.

— Wagon and Intermodal Unit Operational Database,
— Wagon Trip plan Databases.

These databases must be accessible via the common interface.

The communication between the Lead RU and RUs in the cooperation mode is based on wagon and/or Intermodal unit numbers. Therefore an RU, which communicates with the IMs at train level, must break down this information into wagon and Intermodal unit related one. This wagon and Intermodal unit related information must be stored in the Wagon and Intermodal Unit Operational Database. The information on train movement leads to new entries/updates in the Wagon and Intermodal Unit Operational Database for customer information.

The movement part for a wagon or Intermodal unit in the database is set up at the latest when receiving the release time for the wagons or Intermodal unit from the customer. This release time is the first movement entry for a wagon into the Wagon and Intermodal Unit Operational Database related to an actual transport journey.

The Wagon and Intermodal Unit Operational Database is the most important one for the tracking of wagons and therefore for the communication between the RUs involved and the Lead RU. This database shows the movement of a wagon and of an Intermodal unit from departure through to final delivery at customer sidings with ETIs and actual times at different locations until the final delivery time ETA. The database also shows the different status of the rolling stock such as:

— Status: loading of the rolling stock

This status is required for the information exchange between the RU and the IMs and to other railway undertakings involved in the transport journey.

— Status: loaded wagon on journey

This status is required for the information exchange between the IM and the RU, with other infrastructure managers and with other railway undertakings involved in the transport journey.

— Status: empty wagon on journey

This status is required for the information exchange between the IM and the RU, with other infrastructure managers and railway undertakings involved in the transport journey.

— Status: unloading of rolling stock

This status is required for the information exchange between the RU at destination and the Lead RU for the transport.

— Status: empty wagon under fleet management control

This status is required to get the information about availability of a vehicle of defined characteristics.

More requirements about the implementation phases of the system will be found on chapter 7 of [4].

2.2 Overview of the WIMO

2.2.1 General objective

The purpose of the WIMO is the storage and provision of the data elements needed for operational purposes and for the tracking of wagons / Intermodal units within the geographical scope of the TAF TSI.

The TAF TSI covers single wagon traffic as well as train load or groups of wagons for the traffic within one RU as well as for interoperable traffic.

The Common interface (see [4] chapter 4.2.12.6 and [4.5]) will handle the communications.

2.2.2 Functional objectives

To allow the tracking of wagon and ILU movements, the Wagon and Intermodal unit operational database (WIMO), updated at each relevant event in real time, must be installed. Authorised entities such as LRU, keepers, fleet managers, etc must have access to the data relevant to fulfil their business functions, according to contractual conditions.

With reference to chapter 4.2.11.2 of the TAF TSI regarding to the tracking of trains see chapter 2.4.2 of this document.

2.2.3 Data storage

The Wagon and Intermodal Unit Operational Database consist mainly of two parts:
- The Rolling Stock Operational Data and
- The Movement part of the WIMO

Wagon and Intermodal Unit Operational Data	
The Rolling Stock Operational	**Wagon / ILU Movement Data**

TAF TSI Requirements:
 	
Data shall include temporary data such as:
  1. **Restrictions**
  2. **Current and projected maintenance actions**
  3. **Km and fault counters**
  4. **Load weight, dangerous goods**
  5. **Extract from consignment data**
 	
AND ALL DATA AS
 	
"STATUS" SUCH AS
 	
  6. **Temporary speed restriction**
  7. **Brake isolated**
  8. **Needs for repair and fault**
	TAF TSI Requirements:
	
	Movement Reporting:
	1. **Release**
	2. **Departure**
	3. **Yard Arrival**
	4. **Yard Departure**
	5. **Wagon Exception**
	6. **Received at Interchange**
	7. **Accepted at Interchange**
	8. **Refused at Interchange**
	9. **Arrival Notice**
	10. **Delivery message**
	
	STATUS SUCH AS Loading of the rolling

Figure 1: Wagon and Intermodal Unit Operational Data

2.2.3.1   The Rolling Stock Operational Data ([4], chapter 4.2.10.3, 4.2.11.2)

Beside the transport relevant (static) reference data for rolling stock stored in the individual keeper databases, the data representing the actual status of the rolling stock is the most important data for operational purposes.

This data helps to avoid multiple data input, which increase especially the data quality, and they give a clear picture on all available installations and equipment at any time for fast decisions during the operation.

Actual technical status of each wagon:

This data shall include temporary data, such as restrictions, current and projected maintenance actions, km and fault counters, etc.; and all data that could be considered as "status" (temporary speed restrictions, brake isolated, needs for repair and fault description, etc.) ([4] chapter 4.2.10.3).

Actual load status of each wagon:

- Dangerous goods information
- Loading information e.g. weight of the load

2.2.3.2   The Movement Data ([4], chapter 4.2.11.2)

The movement part of the WIMO is the most important database for the tracking of wagons / Intermodal units. This database contains data about the movement of a wagon and of an Intermodal unit from departure to final delivery at customer sidings with ETIs and actual times at different locations until the final delivery time ETA and the different status of the rolling stock such as loaded/empty wagon on journey.

Special Intermodal Units update messages are not foreseen in TAF TSI. But according [4] chapter 4.2.11.2 the movement of Intermodal Units must be stored in the WIMO for tracking and tracing. This is done based on the wagon information within the WIMO itself.

The communication between the LRU and RUs in the co-operation mode is based on wagon and/or Intermodal unit numbers. Therefore an RU that communicates with the IMs at train level must break down these train reporting messages into wagon and Intermodal unit related one.

The wagon and Intermodal unit related movement information must be stored in the Wagon and Intermodal Unit Operational Database. Thus, the reporting on train movement leads to new entries / updates in the Wagon and Intermodal Unit Operational Database.

The train movement reporting itself is not stored in the WIMO data base. It is up to the IMs to store such information and make it available.

Movement reporting ([4], chapter 4.2.7 and 4.2.8)
For the reporting of the movement of a wagon and the Intermodal units on it, the data of the following messages must be stored and electronically accessible. In addition they must also be sent on contractual bases to authorised parties. The detailed formats are defined in [4.5].

- Wagon release notice
- Wagon departure notice
- Wagon yard arrival

- Wagon yard departure
- Wagon exceptions message
- Wagon interchange delivered
- Wagon received at interchange

_____

- Wagon arrival notice
- Wagon delivery notice

Status Information

The database also shows the different status of the rolling stock such as:

- Loading of the rolling stock
- Loaded wagon on journey
- Empty wagon on journey
- Unloading of rolling stock
- Temporary wagon speed restrictions

2.3 Benefits

2.3.1 Benefits of the Rolling Stock Operational Data

Prerequisites to generate benefits are next to the implementation of the WIMO the implementation of processes at individual RU / IM level that allows a high level of data quality, reported to the WIMO.

The Rolling Stock Operational Data will allow easy access to the relevant information to improve transit time reliability, prepare and operate trains and to manage the wagon fleets.

Benefits are expected in the areas train preparation and train operation

- reduced costs
- no need to collect information, stencilled on the wagon sides
  (all wagon related information needed e.g. for the wagon list and the brake sheet)
- support in case of interchange
- support for train splitting e.g. in case of infrastructure restrictions on short notice, if shunting terminal is available.
- In case of unplanned changes of RUs as Service Providers on short notice all information is easily available to the "new" RU
- improved data quality
- transparent responsibility for every data element

Other benefits are expected in the area of Fleet management:

- Knowledge about he technical conditions of every single wagon
- Knowledge of availability for use

2.3.2 Benefits of the Movement Part of the WIMO

Benefits are expected by

- Improved Customer Service
- European wide tracing of individual wagons, IM units, and shipments
- Actual shipment status is available to the customers via the LRU

- Support for maintenance decisions based on km counter
- Improved Fleet productivity
  - Tracing supports the fleet managers in better managing their fleet
  - Single source of information for all wagons in "local" and "interline" traffic

2.4 General Assumptions and Remarks

2.4.1 Wagon Numbering

In the scope of Railway Undertaking's operational activity in principle the wagon number is the relevant reference or entity to trace the wagon.

Vehicle numbering is also a basic parameter of the OPE TSI for all types of vehicles including wagons, coaches and traction units. This numbering is defined in Appendix P of the OPE TSI (from 1st January 2014, the requirements to have EVN will be in OPE TSI, appendix P, but the coding will be defined on NVR Decision 2007/756/EC, Appendix 6.

The wagon number is used in the train composition message and in all wagon related messages and even in the consignment note (ConsignmentOrderMessage according to TAF TSI data set [4.5]) e.g. for wagon load. This number is the key element for the access to the rolling stock database. Therefore it must be a unique number and it must also allow the access to the historical data of a wagon.

The coding of the wagon number is harmonised with the UIC Leaflet 438-2 (Identification marking for freight rolling stock) and UIC Leaflet 438-3 (Uniform numerical marking of Freight Wagons) as it is the standard not only for the EC countries but also for the OTIF, UIC and OECD members; see also [3]. For the conversion from SMGS wagon numbering to UIC coding the UIC/OSJD leaflet 402 shall be used.

Nevertheless, the coded information within the wagon number should never been used as such, but must be explicitly available in defined data field outside the wagon number field, e.g. type of the wagon or number of axles.

Due to the coding of the wagon number, the number may be changed several times during the lifecycle of the wagon. To have access to the history of a wagon, it is therefore important to have a mechanism, which allows this access.

2.4.2 Integrating and maintaining different consignment notes and wagons in WIMO

Wagon number can be changed during the transportation. Due to different track gauges, as the case is e.g. on the Sweden - Finland or Spain - France border, the goods must be reloaded from one wagon to another. In reloading phase the goods from one wagon can be reloaded into two wagons. WIMO system must integrate the different wagon numbers. Wagons are linked together with previous wagon number and information must be sent before departure from the reloading place.

The departure RU may enquire "Where is my consignment" and the system must give answer even if the goods are reloaded to another wagon. One wagon can also

contain several consignments. That is a usual case in intermodal carriage.

During the transportation leg several different Consignment Note types can be used. E.g. transportation from Italy to Moscow has 4 different types of transport documents. First one is the CIM Consignment Note, second one is the Vessel Manifest, third one is the Finnish Domestic Waybill and the last one is the Joint Finnish-Russian Waybill. WIMO system must combine these transport documents as the system receives different types of Consignment Notes. Consignment Note information (through ConsignmentOrderMessage according to TAF TSI data set [4.X]) is updated with transport document information as the goods are being transported. Consignment Notes are linked to the consignment with wagon numbers or with the previous waybill number.

Information about Consignment Notes as well as relations between various Consignment Notes must be stored in WIMO. Furthermore the WIMO database must handle relations between transport units and wagons.

2.4.3 Train number

The train identification is a key element for IMs, RUs and other companies esp. in the international railway business. As proposed by the CEN-CWA (see [8]) the identifier shall be unique at any given point at one time as there shall not be two trains running simultaneously with the same identifier.

The train identification shall not be changed during the whole train run and is a primary key for all partners involved. Even if the train service number for operational purposes changes due to e.g. the direction of the train, the train identification has to stay the same.

The *Train-Ident* shall be used by the IMs and RUs in each message where the train identification is required.

Train-Service-Number is the operational train number which identifies the train for traffic management purposes and is usually inherited from the Path Number. The OPE-TSI terms this as a 'Train Identifier', a 'Train Number' and a 'Train Running Number'.

A *Train-Service-Number* may be different from one IM to another and may also change during the run of the train. This identifier is used for operational purposes by the Dispatcher, GSMR Services, etc.

Remark: The train number is stored in the WIMO only with the Wagon ETI / ETA messages and the Wagon Interchange Notice messages ([4] chapter 4.2.6.3 and 4.2.8.2), if the wagon is within a train. Therefore enquiries with the train number as a "search criteria" may deliver only uncompleted reports.

2.4.4 General Remarks

For each function the general purpose, more specific requirements, input, output, processing and further explanation is provided.

The Input for the WIMO database is mainly based on the messages from the various users. These messages may be sent directly from an user to the WIMO or via a client as a middleware within the system architecture. The descriptions of the functional requirements in this document assume the direct sending of the messages to make clear the responsibility for the delivery of the information.

Beside the described data also additional calculated data, status data and administrative fields may be needed, but are not reported in this document as they depend on the database layout and will be then defined therefore in the database design document.

Next to the verbal description of the Functional Requirements in this document the overview of the FRS in chapter 5 should be taken into account.
This Overview of the FRS informs about:

- Data and Message Input with reference to the TAF TSI
- Classifying the information
- Plausibility checks and reaction on failures
- Required data quality, timeliness and data sensitivity
- WIMO availability and Fall back procedure
- Accessible data based on the role of the user
- Examples of benefits
- Examples of specific reports supported by WIMO

The kernel of the WIMO is a permanent record of each wagon that could be interchanged between RUs in the EU. This could include also wagons from outside the EU. A permanent record for the ILUs is not foreseen.

2.5 Data supply

The WIMO may be populated preferred automatically via messages. The data sent to WIMO via messages is normally available from the domestic systems. There is no intention to require from the Railway Undertaking or Infrastructure Managers to input large amounts of data manually for the system's purposes.

However some manual input may be necessary when automatic systems are not available or partially operating. (Ref: [4]). For this data supply the users have to install their own HCI interface according their own demands. The data sent from this HCI interface to the WIMO via messages, have also to use the common interface ([4.5]). Thus the WIMO will get in any case data in transparent way.

The WIMO database monitors in particular the progress of Wagons and Intermodal units by receiving reports in form of Wagon reporting messages from the systems of the various Railway Undertakings.

Before starting an opening cycle for monitoring in particular the movement of a wagons and Intermodal unit the WIMO database must be pre populated with certain wagon data, especially with the wagon number. This function is described in chapter 4.1.

Thus, a wagon in operation must be contained in the Wagon and Intermodal Unit Database (WIMO). Wagons, not contained in the WIMO database, but made known by any wagon reporting message are handled as new entries into the WIMO and are to

be reported as such to the sender of the message, who will be stored in the WIMO as keeper, marked as "provisional" entry.

2.6 Wagon and ILU Movement data

In this chapter 2.6 the functions will be described for the

- Population of WIMO with Wagon Release notice message data
- Population of WIMO with Wagon Departure notice message data
- Population of WIMO with Wagon Yard Arrival message data
- Population of WIMO with Wagon Yard Departure message data
- Population of WIMO with Wagon Arrival notice message data
- Population of WIMO with Wagon Delivery notice message data
- Population of WIMO with Wagon Exception message data
- Population of WIMO with Wagon Exception, New Wagon ETI / ETA message data
- Population of WIMO with Wagon ETI / ETA message data
- Population of WIMO with Wagon Interchange Notice message data
- Population of WIMO with Wagon Received at Interchange message data
- Population of WIMO with Wagon Refused at Interchange message data
- Population of WIMO with Wagon Interchange Sub Notice message data
- Update of the Km Counter
- Update of the Fault Counter
- Update of a wagon status

2.6.1 Function: "Wagon Release , ([4], chapter 4.2.7.2)

Purpose:

To store the information from the LRU to the ORU, that the wagon is ready for pull at the customer sidings.

Requirements:

The LRU must inform the ORU, that the wagon is ready for pull at the customer sidings. This event must be stored in the WIMO. Main data elements are:
- Wagon number
- Place, date and time of release

The following data must be easy accessible to RU and LRU as stored data in databases, e.g.:
- Total weight
- Dangerous goods indication

Input:

Wagon Release Notice message sent by the various LRU. This is also valid if the LRU is also the ORU.

Required data content is defined on Annex II, Annex A, ,TAF TSI —
ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II,
Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message
Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store data in the database
- Set the actual wagon status
  (e.g. to "loading of the rolling stock", if the code to indicate to which
  extent the equipment is loaded indicates that the wagon is not
  empty, else the status is "empty wagon").

Output:

These stored data must be accessible to ORU and LRU as stored in
the database.

The Wagon number and the location must also be accessible by the
keeper of the wagon.

Explanation:

The Lead RU is not necessarily the first RU in the transport chain. In
this case the LRU must tell the RU in charge that the wagon is ready for
pull at the customer sidings (Place of departure according to the LRU
commitment) at the given release time (date and time of departure). If
the LRU is also the ORU, than this message must only be sent to the
WIMO.

If the load is an ILU, the WIMO module generates automatically the
corresponding entries into the database regarding the involved ILUs.

Use case:

Figure 2: Use Case Wagon Release Notice

2.6.2 Function: "Wagon Departure" , ([4], chapter 4.2.7.3)

Purpose:

To store the information from the RU to the LRU of the actual date and time, that the wagon has been pulled from the place of departure.

Requirements:

The RU must inform the LRU of the actual date and time, that the wagon has been pulled from the place of departure. This event must be stored in the WIMO. Main data elements are:

- Wagon number
- Place, date and time of departure

The following data must be easy accessible to RU and LRU as stored data in databases, e.g.:
- Total weight
- Dangerous goods indication

Input:

Wagon Departure Notice message sent by the RU.

Required data content is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

-

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store data in the database
- Set the actual wagon status
  (e.g. to "loaded wagon" if the code to indicate to which extent the equipment is loaded indicates that the wagon is not empty, else the status is "empty wagon").

Output:

These stored data must be accessible to the sending RU and LRU as stored in the database.

The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

In the case of Open Access the wagon movement is an RU (LRU) internal process. Nevertheless all calculations and data storage must be effected by it as the LRU having a contract with and a commitment to the customer. Therefore the RU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs.
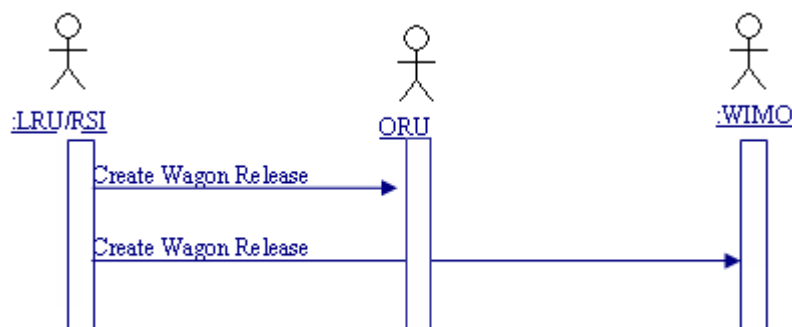
Use case:

Figure 3: Use Case Wagon Departure Notice

2.6.3 Function: "Wagon Yard Arrival", ([4], chapter 4.2.7.4)

Purpose:

To store/update the information from the RU to the LRU, that the wagon has arrived at its yard.

Requirements:

The RU must inform the LRU, that the wagon has arrived at its yard. This event must be stored in the WIMO. Main data elements are:
- Wagon number
- Place, date and time of arrival at the yard

Input:

Wagon Yard Arrival message sent by the RU.

Required data content is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:
- Receive the message via the common interface

- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Start Function "Km Counter"

Output:

These stored data must be accessible to the sending RU and responsible LRU as stored in the database.

The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

The RU must inform the LRU, that the wagon has arrived at its yard. This message can be based on a "Train running information" message received from the Infrastructure manager.

In the case of Open Access the wagon movement is an RU (LRU) internal process. Nevertheless all calculations and data storage must be effected by it as the LRU having a contract with and a commitment to the customer. Therefore the RU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs.

Use case:
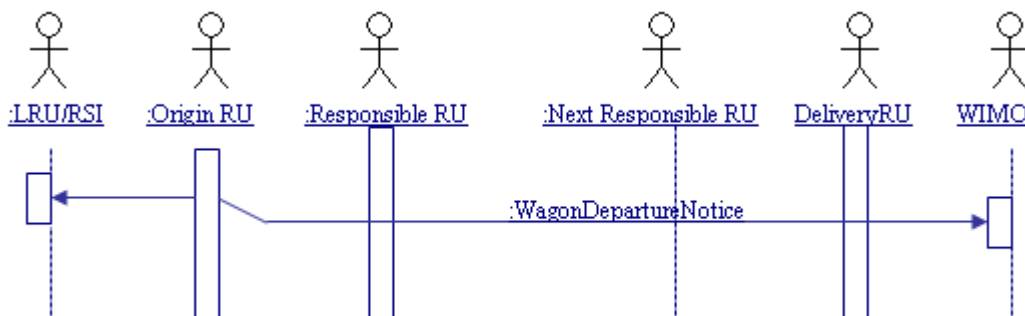

Figure 4: Use Case Wagon Yard Arrival

2.6.4 Function: "Wagon Yard Departure", ([4], chapter 4.2.7.5)

Purpose:

To store/update the information from the RU to the LRU, that the wagon has departed from its yard.

Requirements:

The RU must inform the LRU, that the wagon has left its yard. This event must be stored in the WIMO. Main data elements are:

- Wagon number
- Place, date and time of arrival at the yard

Input:

Wagon Yard Departure message sent by the RU.

Required data content is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Set the actual wagon status
  (e.g. to "loaded wagon on journey" if the actual status is "loaded wagon", else set the status to "empty wagon on journey").

Output:

These stored data must be accessible to the sending RU and responsible LRU as stored in the database.

The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

The RU must inform the LRU, that the wagon has left its yard. This message can be based on a "Train running information" message received from the Infrastructure Manager.

In the case of Open Access the wagon movement is an RU (LRU) internal process. Nevertheless all calculations and data storage must be effected by it as the LRU having a contract with and a commitment to the customer. Therefore the RU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the

corresponding entries into the database regarding the involved ILUs.

Use case:
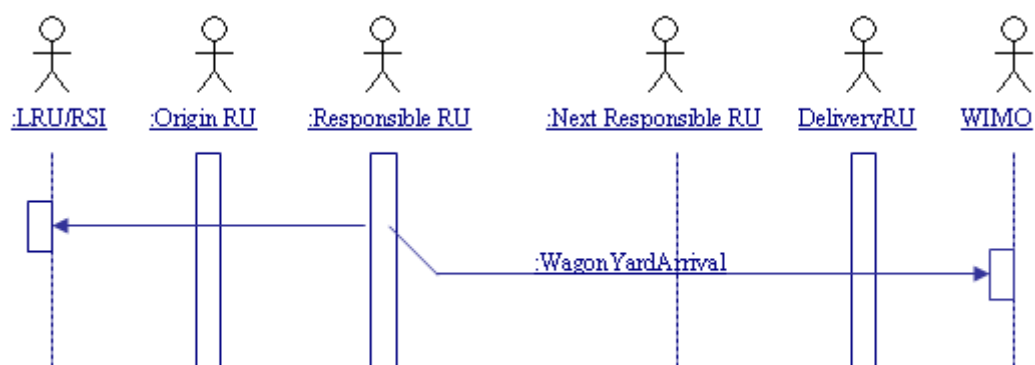

Figure 5: Use Case Wagon Yard departure

2.6.5 Function: "Wagon Arrival Notice", ([4], chapter 4.2.7.7)

Purpose:

To store/update the information from the last RU to the LRU, that the wagon has arrived at its yard at the destination.

Requirements:

The last RU must inform the LRU, that the wagon has arrived at its yard. This event must be stored in the WIMO. Main data elements are:
- Wagon number
- Place, date and time of arrival at the yard

Input:

Wagon Arrival Notice message sent by the RU.

Required data content is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:
- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Set the actual wagon status
  (e.g. to "loaded wagon" if the actual status is "loaded wagon on journey". If the actual status is "empty wagon on journey, set the

status to "empty wagon").
- Start Function "Km Counter"

Output:

These stored data must be accessible to the sending RU and responsible LRU as stored in the database.

The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

The RU must inform the LRU, that the wagon has arrived at its yard. This message can be based on a "Train running information" message received from the Infrastructure Manager.

In the case of Open Access the wagon movement is an RU (LRU) internal process. Nevertheless all calculations and data storage must be effected by it as the LRU having a contract with and a commitment to the customer. Therefore the RU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs.
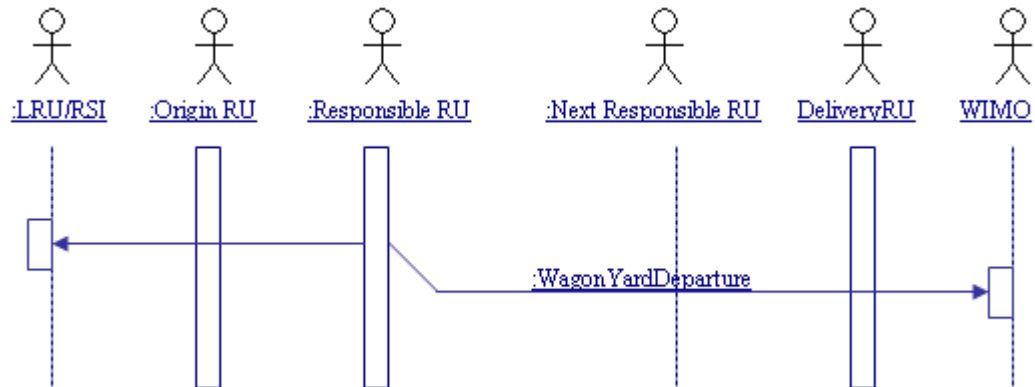
Use case:

Figure 6: Use Case Wagon Arrival Notice

2.6.6   Function "Wagon Delivery notice", ([4], chapter 4.2.7.8)

Purpose:

To store/update the information from the RU to the LRU, that the

wagon has been placed at the consignee's sidings.

Requirements:

The last RU in a wagon transport chain must inform the LRU, that the wagon
has been placed at the consignee's sidings. This event must be stored in the
WIMO. Main data elements are:

- Wagon number
- Identification of placement (location, zone, track, spot),
- date and time of placement

Input:

Wagon Delivery Notice message sent by the RU.

Required data content is defined on Annex II, Annex A, ,TAF TSI —

ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II,

Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message

Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Start Function "Km Counter".
- Set the actual wagon status
    (e.g. to "unloading of rolling stock" if the actual status is
    "loaded wagon". If the status is "empty wagon" the actual
    status is set to "loading of rolling stock").

Output:

These stored data must be accessible to the sending RU and responsible
LRU as stored in the database.

The Wagon number and the location must also be accessible by the
keeper of the wagon.

Explanation:

In the case of Open Access the wagon movement is an RU (LRU) internal
process. Nevertheless all calculations and data storage must be effected
by it as the LRU having a contract with and a commitment to the
customer. Therefore the RU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the
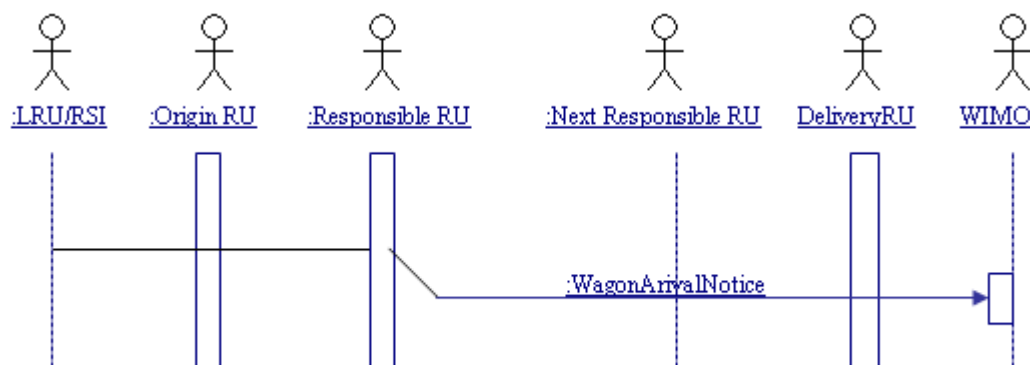corresponding entries into the database regarding the involved ILUs. It
must be noticed, that for an RU the delivery point is always a

customer, who can be also an Intermodal terminal operator in the case of ILUs.

Use case:

Figure 7: Use Case Wagon Delivery Notice

2.6.7 Function "Wagon Exception", ([4], chapters 4.2.7.6)

Purpose:

To store/update the information from the RU to the LRU, that something unexpected occurs to the wagon, which might have an impact for the ETI / ETA, or requires any additional action.

Requirements:

The RU must inform the LRU, if something unexpected occurs to the wagon, which might have an impact for the ETI / ETA, or requires any additional action. This information must be stored in the WIMO. Main data elements are:

- Wagon number
- Place, date and time of disruption
- Reason / disruption code

Input:

Wagon Exception Message sent by the RU.

Required data content is defined on Annex II, Annex A, ,TAF TSI —
ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Start function "Fault counter".
- Start Function "Km Counter", if relevant

Output:

These stored data must be accessible to the sending RU and responsible LRU as stored in the database.

The Wagon number, the location and the exception reason must also be accessible by the keeper of the wagon.

Explanation:

In the case of Open Access the wagon movement is an RU (LRU) internal process. Nevertheless all calculations and data storage must be effected by it as the LRU having a contract with and a commitment to the customer. Therefore the RU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs.
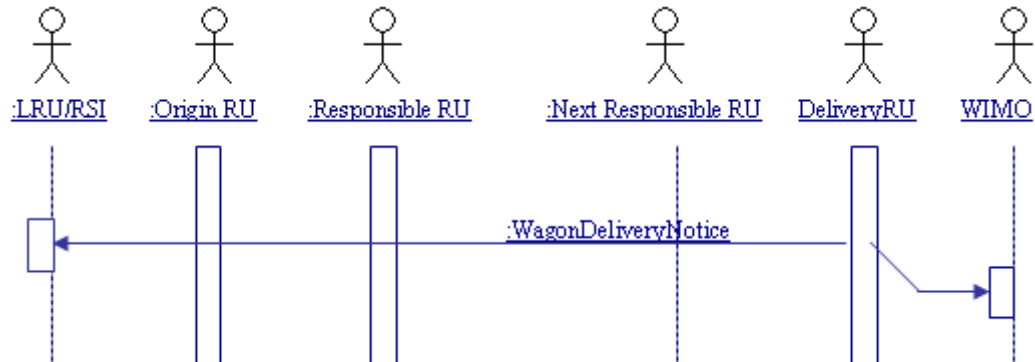
Use case:

Figure 8: Use Case Wagon Exception

2.6.8 Function "Wagon Exception Reason", ([4], chapters 4.2.7.6)

Purpose:

To store/update the information from the LRU to the involved RU, that something unexpected occurs to the wagon and new ETI / ETA

calculation may be requested.

Requirements:

The LRU informs the RU, that something unexpected occurred to the wagon and a new ETI / ETA calculation may be needed. This information must be stored in the WIMO. Main data elements are:

- Wagon number
- Place, date and time of disruption
- Reason / disruption code

Input:

Wagon Exceptions Reason Message sent by the LRU.

Required data content is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

-

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database

Output:

These stored data must be accessible to the sending LRU and the involved RU.

The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

In the case of Open Access the wagon movement is an RU (LRU) internal process. Nevertheless all calculations and data storage must be effected by it as the LRU having a contract with and a commitment to the customer. Therefore the LRU must send this message only to the WIMO.

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs.
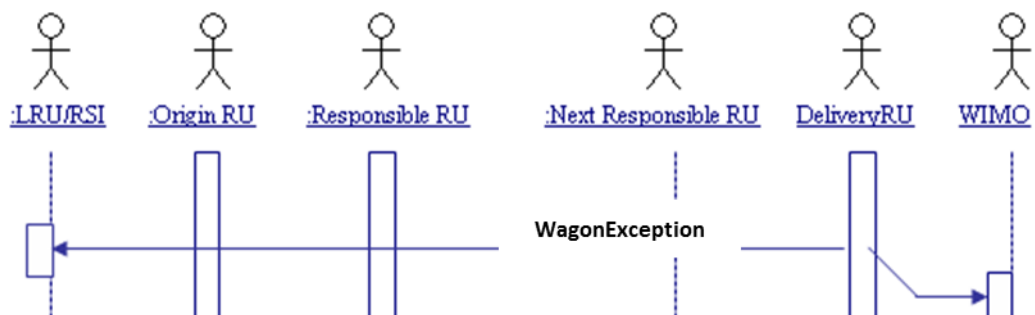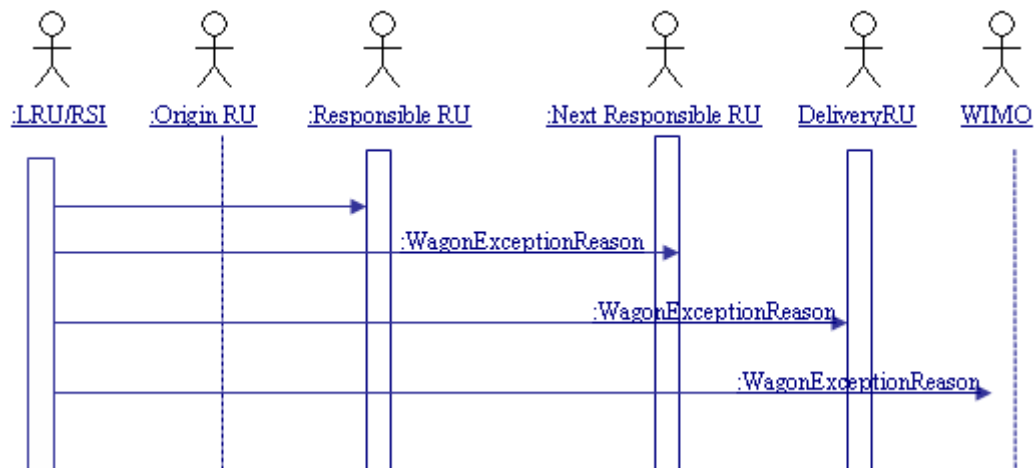
Use case:

Figure 9: Use Case Wagon Exception Reason

2.6.9 Function "Wagon ETI / ETA", ([4], chapter 4.2.6.3)

Purpose:

To store the new or updated ETI / ETA calculation result from the RUs involved in the transport chain of the wagon.

Requirements:

With the ETI / ETA message the ETI or updated ETI from one RU to the next in the transport chain is sent. The last RU in the transport chain of the wagons sends the ETA or updated ETA to the LRU. Each message must be sent in parallel to the WIMO.

Input:

Wagon ETI / ETA messages sent from the involved RUs in the transport chain of a wagon with the calculated ETI respectively ETA. Required data is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database

Output:

These stored data must be accessible to the sending RU, the following RUs in the transport chain (if any) and responsible LRU as stored in the database.

The Wagon number must also be accessible by the keeper of the wagon.

The ETI / ETA values are especially needed for the "Wagon deviation report" (see 2.9.1, Ref. [4], chapter 4.2.6.4).

Explanation:

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs. But for the Intermodal units on a wagon, the wagon ETIs are also ETIs for the Intermodal units. Regarding the ETAs for Intermodal units it should be noticed, that the RU is not in the position to calculate such an ETA beyond the rail transportation part. Therefore the RU can only deliver ETIs related to the Intermodal terminal.

Use case:
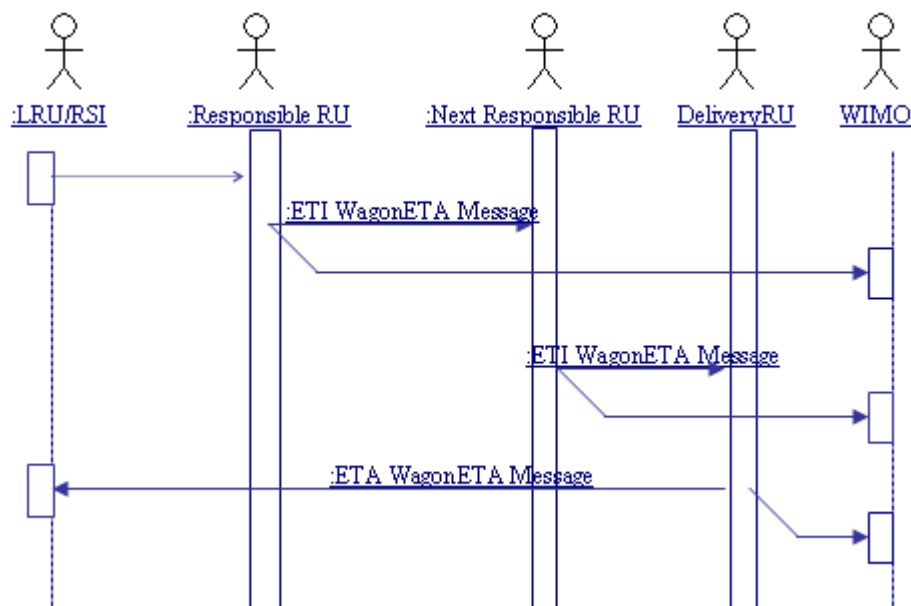
Figure 10: Use Case wagon ETI / ETA

2.6.10 Function "Wagon Interchange Notice", ([4], chapter 4.2.8.2/3)

Purpose:

To store/update the information sent from the RU1 to the next RU2 in the transport chain asking whether it accepts the responsibility for a wagon.

Requirements:

The RU1 must asks the next RU2 in the transport chain whether it accepts the responsibility for a wagon. The information data of this message must be stored in the WIMO. Main data elements are:

- Wagon number,
- Train-Ident (if the wagon is in a train),
- Place, date and time of interchange.

Input:

Wagon Interchange Notice Message sent by the RU1.

Required data is defined on Annex II, Annex A, ,TAF TSI — ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database

Output:

These stored data must be accessible to the sending RU1, to RU2 and responsible LRU as stored in the database. The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

The interchange reporting ([4] chapter 4.2.8) describes the messages attached to the transfer of responsibility for a wagon between 2 RUs, which occurs at interchange points. It also commands the new RU to make an ETI calculation

The following messages must be exchanged (e.g.):

- Wagon interchange notice, with this message RU1 asks the next RU 2 in the transport chain whether it accepts the responsibility for a wagon.

    - Wagon received at interchange, with this message the RU 2 informs RU 1 that it accepts the responsibility for the wagon.

      OR

    - Wagon refused at interchange, with this message the neighbouring RU2 informs RU1 that it refused the responsibility for the wagon.

- Wagon interchange Sub-notice, with this message the RU2 informs its IM, that it has taken over the responsibility of the wagon.

The wagon interchange notices and the wagon interchange notices / sub

as well as the wagon received messages may be transferred as a list for various wagons, especially if these wagons are all within one train. In this case all the wagons may be listed within one message transfer.

In the case of Open Access there are no interchange points. At a handling point the responsibility for the wagons does not change. Therefore there is no special message exchange regarding interchange reporting needed between RUs. But all the other wagon movement reporting messages and ETI ETA messages must be sent by the RU to the WIMO, even in OPEN ACCESS mode.

If the load is an ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs.

Use case:

Figure 11: Use Case Wagon Interchange Notice, Sub Notice, Received, Refused

2.6.11 Function "Wagon Received at Interchange", ([4], chapter 4.2.8.4)

Purpose:

To store/update the information from the RU2 to the RU1, that it accepts the responsibility for the wagon.

Requirements:

The RU2 informs the RU1, that it accepts the responsibility for the wagon. The information data of this message must be stored the WIMO. Main data elements are:

- Wagon number
- Location, date and time of interchange

Input:

Wagon Interchange Received Message sent by the RU2.

Required data content is defined on Annex II, Annex A, ,TAF TSI —

ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II, Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Start Function "Km Counter"

Output:

These stored data must be accessible to the sending RU2, RU1 and responsible LRU as stored in the database.

The Wagon number and the location must also be accessible by the keeper of the wagon.

Explanation:

If the load is a ILU, the WIMO module generates automatically the corresponding entries into the database regarding the involved ILUs. See also explanation for Function "Wagon Interchange Notice".

2.6.12 Function "Wagon Refused at Interchange", ([4], chapter 4.2.8.5)

Purpose:

To store/update the information from the RU2 to the RU1, that it refused to take over the responsibility for the wagon.

Requirements:

The RU2 informs the RU1, that it refused the responsibility for the wagon.

The information data of this message must be stored the WIMO. Main data elements are:

- Wagon number
- Location, date and time of interchange
- Cause of the refuse

Input:

Wagon Interchange Refused Message sent by the RU2.

Required data content is defined on Annex II, Annex A, ,TAF TSI —
ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II,
Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message
Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database
- Start Function "Km Counter"

Output:

These stored data must be accessible to the sending RU2, RU1 and
responsible LRU as stored in the database.

The Wagon number and the location must also be accessible by the
keeper of the wagon.

Explanation:

If the load is an ILU, the WIMO module generates automatically the
corresponding entries into the database regarding the involved ILUs. See
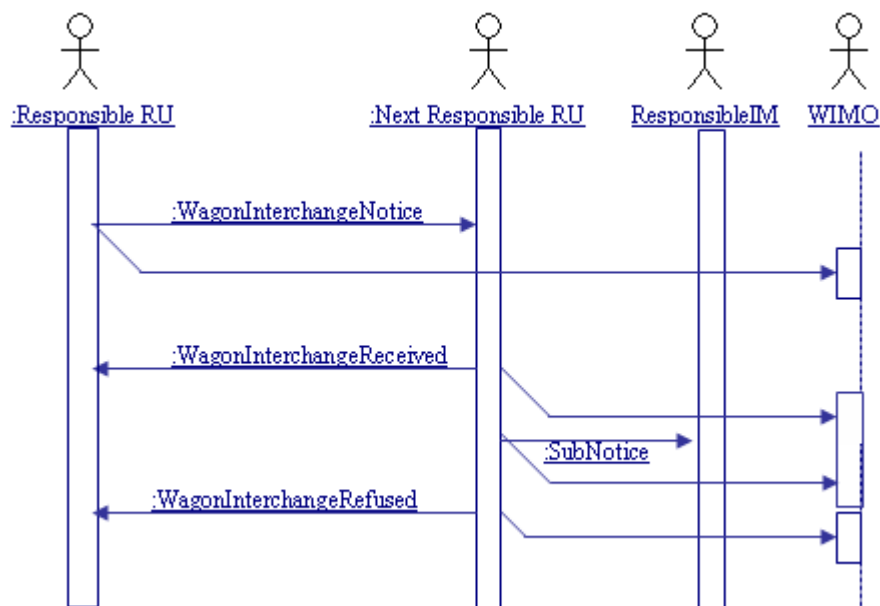also explanation for Function "Wagon Interchange Notice".

2.6.13 Function "Wagon Interchange Sub Notice", ([4], chapter 4.2.8.3)

Purpose:

To store/update the information from the RU2 to the responsible IM,
that it accepts the responsibility for the wagon.

Requirements:

The RU2 informs the its IM, that it accepts the responsibility for the wagon
received from RU1. The information data of this message must be stored
the WIMO. Main data elements are:

- Wagon number
- Location, date and time of interchange
- Train-Ident (only if the wagon is in a train)
- Dangerous goods details, identification

Input:

Wagon Interchange Sub Notice sent by the RU2.

Required data content is defined on Annex II, Annex A, ,TAF TSI —
ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II,
Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message
Model [4].

Processing:

- Receive the message via the common interface
- Evaluate the message regarding wagon and ILU, if relevant
- Store/update data in the database

Output:

These stored data must be accessible to the sending RU2, receiving
IM and responsible LRU as stored in the database.

The Wagon number and the location must also be accessible by the
keeper of the wagon.

Explanation:

If the load is a ILU, the WIMO module generates automatically the
corresponding entries into the database regarding the involved ILUs. See
also explanation for Function "Wagon Interchange Notice".

2.6.14 Function "Km Counter", ([4], chapter 4.2.10.3)

Purpose:

To accumulate and store/update the km for each wagon accessing the
distance table. These counters are calculated data in the database.

Requirements:

Distance table according trip legs

Processed Wagon movement

message.

Input:

Route description defined with Trip legs (from A to B) by the LRU.

Processing:

Based on the trip legs enquire the distance table, accumulate the km per train trip leg and store/update this value.

Output:

"Workload" of every single wagon is available.

These stored data must be accessible to the keeper, fleet manager of the wagon and for the responsible entity for maintenance as stored in the database.

Explanation:

To support the keeper and / or the responsible entity to manage the maintenance actions for every individual wagon based on the usage instead only time based, the km run per wagon is necessary and shall be administrate.

The database procedure has to accumulate km counters and the accessing to the distance table.

To describe the structure, the pre population and the update of the distance table is outside this FRS.

When the wagon has performed the maintenance, the km counter must be reset.

2.6.15 Function "Fault Counter", ([4], chapter 4.2.10.3)

Purpose:

To accumulate and store/update the fault counters based on the Wagon Exception message. These counters are calculated data in the database.

Requirements:

Processed Wagon Exception message.

Input:

Wagon exception

message Fault Counter

Processing:

Fault Counter = Fault Counter + number of faults according the Wagon Exception message.

Output:

Actualised Fault Counter. These stored data must be accessible to the keeper, fleet manager of the wagon and for the responsible entity for maintenance as stored in the database.

Explanation:

To support the keeper and / or the responsible entity to manage the maintenance actions for every individual wagon based on the usage instead only time based, the Fault Counter per wagon is necessary and shall be administrate.

The database procedure has to accumulate the Fault Counters.

When the wagon has performed the maintenance, the Fault Counter shall be reset to zero, if all faults are repaired, otherwise to the number of still remaining faults.

2.6.16 Function "Status Creation / Update", ([4], chapter 4.2.11.2)

Requirements:

The database must also shows the different status of the rolling stock such as:

- Status: loading of the rolling stock

  This status is required for the information exchange between the RU and the IMs and to other railway undertakings involved in the transport journey. The setting of this status is considered in chapter 2.6.

- Status: loaded wagon on journey

  This status is required for the information exchange between the IM and the RU, with other infrastructure managers and with other railway undertakings involved in the transport journey. The setting of this status is considered in chapter 2.6.

- Status: empty wagon on journey

  This status is required for the information exchange between the IM and the RU, with other infrastructure managers and railway undertakings involved in the transport journey. The setting of this status is considered in chapter 2.6.

- Status: unloading of rolling stock

  This status is required for the information exchange between the RU at destination and the Lead RU for the transport. The setting of this status is considered in chapter 2.6.

  The default status is "empty wagon.

  The status "loaded wagon" is derived from the code in the wagon release notice message and in the wagon departure notice message, which indicates to which extent the wagon is loaded. (see chapter 2.6).

Processing:

In this document only examples for the setting of wagon status are given. It will not be fixed, how the status information will be given and stored in the database, as this is also a question of the data base design. A status can also be derived from the content of certain data base elements during the preparing process of the answer to an enquiry and a special status element may not be needed.

2.7 Consignment note data – transport opening cycle

The consignment note data are required to open a transport cycle within the system. The information will be taken from the Consignment Note Data and the Wagon Orders and is used to populate the records related to the wagon number. The information is given by the Lead RU.

2.7.1 Function "Consignment Data", ([4], chapter 4.2.1 and 4.2.11.2)

Purpose:

To store/update the information from the LRU regarding the shipment.

Requirements:

Consignment note data finalised

Input:

Consignment orders sent by the responsible LRU.

Required data content is defined on Annex II, Annex A, ,TAF TSI —
ANNEX D.2: APPENDIX A (WAGON/ILU TRIP PLANNING and Annex II,
Annex A, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message
Model [4].

Processing:

Store/Update the consignment information linked to the wagon

Evaluate the wagon load data and store/update ILU data if load is an ILU

Output:

These stored data must be accessible for the sending LRU. The access to the data for the Origin RU, Transit RU Delivery RU are specific of the role of the RU.

Explanation:

The LRU gets the data mainly from the Consignment Notefrom the customer. In case of subcontracting RUs, the LRU sends specific message to them, where the data are specific on the role of the subcontracting RU (Origin RU, Transit RU Delivery RU). For the data access by the various RUs, the WIMO must take this into account.

Use case:
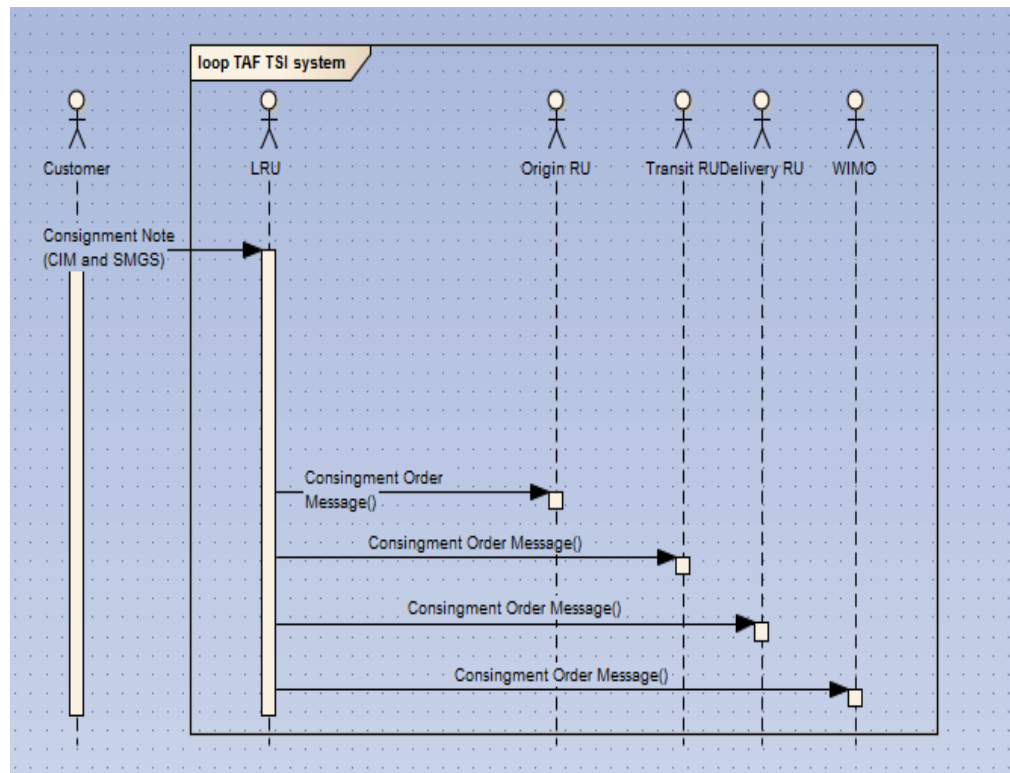
Figure 12: Use Case Consignment Order

2.8 Keepers Wagon data ([4] 4.2.10.3)

The WIMO database shall be populated and maintained with data provided by the keepers from their Rolling Stock Reference database.

The processes regarding the creation, modification and deletion of data contained in the Rolling Stock Reference Database as well as the use of the RollingStockDataQueryMessage for enquiry purposes are not part of this document but are described in the Technical Document TAF TSI - ANNEX D.2 : APPENDIX C - REFERENCE FILES [4.3].

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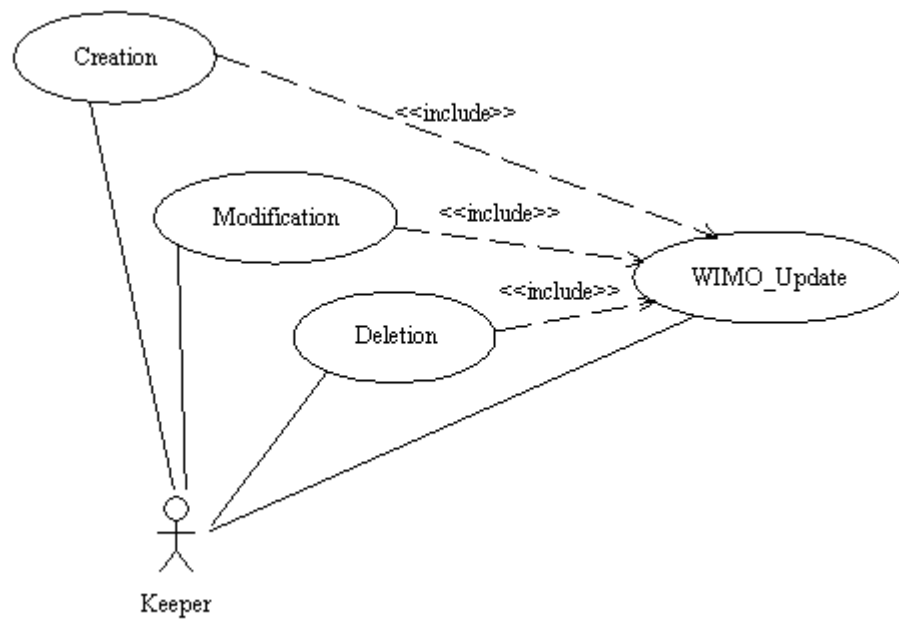
Figure 13: Creation, Modification and Deletion Use Case

Figure 14: WIMO - RSRD Query Mechanism
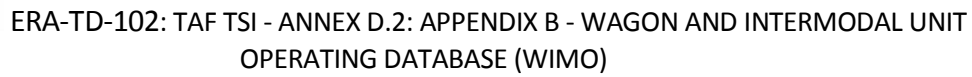
2.9   Enquiries and Reports ([4], chapter 4.2.11.2)

Users must have the possibility to submit queries via the common interface. Responses to queries are returned by the WIMO module. The model below addresses the various query types. The subchapters describe the input parameters for the report generation and the response information from the WIMO module.

When the required response on an enquiry cannot be made available within the time frame of 10 minutes, the message "Receipt Confirmation" must be sent out according the TAF TSI chapter 4.2.2.8 to indicate, that the enquiry was received and the answer is given as soon as possible. But nevertheless, the response time for enquiries must be meeting the requirements quoted in TAF TSI chapter 4.4 Timeliness. This message must have an identifier to which it refers.

Queries about consignments can be made by using query factors:

- Consignment number, if provided by the LRU (see also chapter 2.4.2)

- wagon number (see also chapter 2.4.2)
- transport unit number, if available
- consignment reference, if provided by the Lead RU
- location
- country of departure

Users are given a user profile depending on their role and access rights to information. Such roles may be Consignee, Consignor, Wagon keeper, Railway Undertaking, Infrastructure manager or any other. User's query rights are limited by user profile information that is connected to user ID and described in chapter 4.2.1.

The WIMO system must provide at least the following queries (not exhausted):

- Consignment query – 'Where is a consignment, which consignment number/container number/order number/wagon number is it?

- Location of customers consignments – 'Where are all consignments related to customer Y?'

- Incoming wagons and consignment they carry – 'Which consignments/wagons are due to arrive to place Y?'

- All incoming wagons and consignments to a certain location - 'Which consignments/wagons are due to arrive to place Y?'

- Location of wagons – 'Where is wagon number Z or where are group of wagons?'

- Wagons in a certain location – 'Which wagons are at place Y?'
- All wagons and consignments in certain location – 'Which wagons and consignments they carry are at place Y?'
- Delayed consignments and wagons – 'Which wagons/consignments are delayed?'
- ETA of wagon to a location – 'What is the ETA for wagon Z to place Y?'
- Transportation unit query – 'Where are all my wagons or Transport units?'

Recognised authorities

Recognised authorities i.e. Customs can have an own interface to WIMO system. In that case the WIMO system should provide at least the following queries:

- Customs Departure – 'Updating consignments, which are duty-paid and in free movement'
- Customs transit control – 'Which wagons are not in free movement, the customs clearance is missing?'
- Customs destination – 'Which consignments/wagons which are not duty-paid are due to arrive to customs centre Y?'

Simultaneous Consignment note number

In case there is more than one simultaneous consignment with exactly the same consignment number and query is made with on that basis, the user must enter additional criteria for the query, such as the country and place of departure or the country and place of delivery.

In the following chapters, some queries are more detailed described. Further enquiries will be defined in the design phase of the WIMO. AS an future oriented system, also during the operational phase the retrieval of information based on new defined enquiries shall be possible.

2.9.1 Enquiry about wagon deviation", ([4] chapter 4.2.6.3)

Purpose: LRU to enquire on the deviations to a specific wagon.

Key in Parameters	Response Data
WagonNumberFreight	WagonNumberFreight
LRU (*Identification*)	For each reporting point:
	Reporting location,

	Wagon reporting point status (departure, yard arrival, yard departure, interchange arrival, arrival at destination yard).
	Responsible RU at reporting location and according wagon reporting point status,
	Re-scheduled time (against current schedule if multiple reschedules),
	ETI, if Reporting point is an interchange point,
	Actual time at reporting point,
	For each deviation at that reporting point…
	Reason code and delay time for this reason.

2.9.2 All incoming wagons at a location

Purpose: LRU to enquire on all incoming wagons at a specific location within a specified time interval.

Key in Parameters	Response Data
LRU (*Identification*)	WagonNumberFreight
Date/Time (to/from)	Last recorded location
Location	Date/time at last recorded location
Country	Place of destination
	Empty/Load Status
	ETA

2.9.3 All wagons in a certain location

Purpose: LRU to enquire on all wagons at a specific location.

Key in Parameters	Response Data
LRU (*Identification*)	WagonNumberFreight
Location	Last recorded location
Country	Date/time at last recorded location
	Place of destination
	Empty/Load Status
	ETA

2.9.4 Delayed wagons

Purpose: LRU to enquire on the deviations of all wagons at a specific location within a specified time interval of departure from a given location.

Key in Parameters	Response Data
LRU (*Identification*)	WagonNumberFreight
Date of Departure (from/to)	Last recorded location
Location	Date/time at last recorded location
Country	Place of destination
	Empty/Load Status
	ETA

2.9.5 ETA of Trains/wagons to a location

Purpose: LRU to enquire on the ETI/ETA of wagons depart within a specified time interval from a given location.

Key in Parameters	Response Data
LRU (*Identification)*	WagonNumberFreight
Date of Departure (from/to)	TrainNumber (if available)
Location	Place of Destination
Country	ETA
WagonNumberFreight	

2.9.6 Incoming wagons depart from a certain location

Purpose: LRU or RU to enquire on the incoming wagons which are depart within a specified time interval from a given location.

Key in Parameters	Response Data
LRU or RU Identification	WagonNumberFreight
Date of Departure	Last recorded location

Location (of departure)	Date/time at last recorded location
Country (of departure)	Place of destination
Location (incoming)	Empty/Load Status
	ETA

2.9.7 Location of all Wagons with load for a specified Customer

Purpose: LRU to enquire on the locations of all wagons for a specified customer, where the wagon is depart within a specified time interval.

Key in Parameters	Response Data
LRU (*Identification)*	WagonNumberFreight
Date of Departure	Customer Reference
Customer Name	Last recorded location
	Date/time at last recorded location
	Place of destination
	Empty/Load Status
	ETA

2.9.8 Location of a specific Wagon

Purpose: To enquire on the location of a specific wagon.

Key in Parameters	Response Data
Keeper, LRU or RU	WagonNumberFreight
WagonNumberFreight	Train-Ident (if the Train-Ident is available)
	Last recorded location
	Date/time at last recorded location
	Place of destination
	Empty/Load Status
	ETA

2.9.9 Train/Wagons at a certain location

Purpose: To enquire on all wagons together with the Train-Ident (if the train- Ident is available) at a specified location.

Key in Parameters	Response Data
Keeper, LRU or RU	WagonNumberFreight
Location	Train-Ident (if the Train-Ident is available)
Country	Date/Time
	Place of destination
	ETA

2.9.10   Wagons of a train

Purpose: To enquire on all wagons of a specific train depart at a specified location within a specified time interval.

Key in Parameters	Response Data
LRU or RU	WagonNumberFreight
Date of Departure	Place of Destination
Location	ETA
TrainNumber	

See remark in chapter 2.4.2

3. TECHNICAL REQUIREMENTS

The design of the WIMO should allow easy access, high performance and response time and low transaction costs.

In addition the WIMO design must be able to carry the workload of all parts and users, described in this document, even if the implementation will be released in steps.

3.1 WIMO Users ([4], chapter 2.3.1)

The users of the system can be classified as:

A) users working at the domestic operational centres (i.e. directly involved in operations management). These are the parties responsible for rolling stock during transport operation:
- Railway Undertaking as Duty holder during its transport control,
- Keeper of rolling stock and
- User (Hirer) of rolling stock.

For all three different parties the operational rolling stock data must be accessible by the authorised user, down to his predefined authorised level, using the single key given by the wagon ID (wagon number).

B) users responsible of the management information systems at each RU an LRU (i.e. who can have more technical responsibilities about the system management, password authorization, configuration and integration with other systems).

C) users working at Infrastructure managers and other Organizations (according to the authorization provided).

D) Intended Customers according to general provisions quoted on TAF TSI legal text [4&5] section 2.3.2.

3.2 Access right ([4], chapter 4.2.11.3)

Access rights that protect the vital interests of the various entities are required to use the WIMO. Some aspects of the access rights are also described in the FRS "Common Interface" ([4.5]) and in the FRS "Rolling Stock Reference Data base for Wagon Keepers" ([4.7]).

Access to the WIMO system through an Internet user interface or in any other way requires a valid user ID and a password. The User ID is linked with profile information defining the scope of user and query authorities.

The system operator of the WIMO system is responsible for the maintenance of WIMO user profiles. Each information provider maintains their own users' information and forwards the information to the operative party

responsible for user information updates.

3.2.1 Access Rights for Specific Data

The user rights will be based on specific profiles for each type of user. The confidential information is on the data level so each field must be identified with specific read and update rights for each user. The basic user rights are outlined in the table below.

Profile ID	Actor	Accessible Information	Rights
P1	IM	Participant in the itinerary - Departures, Transit, Interchanges and Arrivals (movement data)	Read all in own territory
P2	Lead RU	Responsible on overall transportation	Read All
P3	O-,T- or D-RU	Participant in the itinerary – Departures, Transit, Interchanges and Arrivals	Read All, for which it is the Duty holder
		Consignment Data	
P3.1 P3.2 P3.3	Origin, Transit or Delivery RU		Read, All, according the role Origin, Transit, Delivery
P4	Customer	Transport order data. Must be identified as Consignor or Consignee in the Consignment. The access rights are linked with P2 as the Lead RU must explicitly allow the access for a customer according to TAF TSI legal text [4&5] section 2.3.2.	Read, All
P5	Freight Payer	Transport order data Must be identified in the Consignment	Read, All
P6	Third Party	Transport order data Must be identified in the Consignment	Read, All

Profile ID	Actor	Accessible Information	Rights
P7	Keeper	Must be identified as owner of the wagon in the Keepers data part of the WIMO	Read / Update only Status, counters; Read position information
P8	Authorities	Must be a recognised authority (i.e. Customs) from a country identified in the itinerary	Read, to be specified in details in design documents,
P9	Maintenance responsible entity, Fleet manager.	Must be identified as such in the keeper data	Read, All

3.2.2 Authorisation concept

Definition of user rights: users grouped by any means, i.e. do all users have access to all information, i.e. alerts. Users can only make queries about their own consignments, wagons etc. Users have different roles, which affect the available queries and the results of queries:

System Operator - as an system operator, you see information on all consignments.

Infrastructure Manager - as an IM, you see information on trains in which you are involved either as an Origin, Departure or Transit IM.

Lead Railway Undertaking – as a LRU, you see information on consignments in which you are involved as LRU.

Origin, Departure or Transit Railway Undertaking – as a ORU, DRU or TRU you see information on consignments in which you are involved either as a Origin, Departure or Transit RU.

Customer - as a customer, you see information on consignments in which you are involved either as a consignor or a consignee. You can also authorise another customer to see information on your consignments. The access rights for a customer are linked with the Lead RU as the Lead RU must explicitly allow the access for a customer to meet the requirements quoted in TAF TSI

legal text [4&5] section 2.3.2 .

Keeper - as a keeper, you see the same information as with Customer's rights, plus information on your own wagons.

Third party - third parties see information on the consignments for which they have been given the authorisation.

Authority- as an Authority, e.g. Customs, who can have rights to make queries to certain stations only.

Maintenance responsible entity- as stated in the keepers data e.g. an RU, which has the obligation during the use of the wagon to take care on all maintenance issues.

Fleet manager- as stated in the keepers data e.g. an RU.

3.3 System Integrity and Security ([4], chapter 4.2.11.3)

Under the following points are listed the requirements which must be supported by the WIMO databases according [4] chapter 4.2.11.3. These are:

Authentication
The database must support the authentication of users of the systems before they can gain access to the database.

Security
The database must support the security aspects in the meaning of controlling access to the database. The possible encryption of the database contents itself is not required.

Consistency
The database selected shall support the ACID principle (**A**tomicity, **C**onsistency, **I**solation, **D**urability).

Access Control
It must be ensured that only authorised users may gain access to WIMO and that they can only gain access to the relevant parts and information of the system The access control shall be supported down to a single attribute of a data record. The database shall support configurable, role based access control for insertion, update or deletion of data records.

Tracing
The database must support logging all actions applied to the database to allow for tracing the detail of the data entry (Who, What, When did the contents change).

Lock strategy
The database must implement a locking strategy which allows access to the data even when other users are currently editing records.

Multiple Access

The database must support that data can be accessed simultaneously by several users and systems.

Reliability

The reliability of the database must support the required availability.

Availability

The database must have an availability on demand of at least 99,9 % based on percentage of 24 x 7 operations, which means outage minutes per year of max. 500.

Maintainability

A maintainability of the database must support the required availability.

Safety

The database itself is not safety related. Hence safety aspects are not relevant. This is not to be confused with the fact that the data - e.g. wrong or not actual data - may have impact on the safety operation of a train.

Compatibility

The database must support a data manipulation language that is widely accepted, such as SQL or XQL.

Import facility

The database shall provide a facility that allows the import of formatted data that can be used to fill the database instead of manual input.

Export facility

The database shall provide a facility that allows to export the contents of the complete database or its part as formatted data.

Mandatory Fields

The database must support mandatory fields that are required to be filled before the relevant record is accepted as input to the database.

Plausibility Checks

The database must support configurable plausibility checks before accepting the insertion, update or deletion of data records.

Response times

The database must have response times that allows users to insert, update or delete data records in a timely manner.

Performance aspects

The database shall support the queries necessary to allow the effective run of about 60.000 train runs per 24 hours. About 50% of these train runs are deemed to take place within two hours.

The number and kind of queries or updates per train are dependent on the overall process for planning and running a train.

Capacity aspects

The database shall support the storage of the relevant data for all freight wagons respectively the network. It shall be possible to extend the capacity by simple means (i.e. by adding more storage capacity and computers). The extension of the capacity shall not require replacement of the subsystem.

Historical data

The database shall support the management of historical data in the meaning of making of data available that has been already transferred into an archive. The system shall keep on-line historical data for at least 13 months.

Historical data from an archive shall be accessible in a manner, that is safe from damage and allows accurate retrieval of information for at least 7 years or the maximum statute of limitations in any one Member State of the EU.

Backup strategy

A backup strategy shall be in place to ensure that the complete database contents for up to a 24 hour period can be recovered.

The above requirements shall be handled by a standard Database Management System (DBMS).

The usage of the database is embedded into various work flows. The general workflow is a request / response mechanism, where an interested party requests information from the database through the Common Interface (Ref. [4] chapter 4.2.12.1 and 4.2.12.6). The DBMS responds to this request either by providing the requested data or by responding that no data can be made available (no such data exists or access is refused due to access control). If the response cannot be made available within the time meeting the requirements quoted in TAF TSI chapter 4.4 Timeliness a message "Receipt Confirmation" must be sent from the WIMO module to the sender of the request.

3.4 Data Quality ([4], chapter 4.4.1)

Chapter 4.4.1 of the Telematic Applications for Freight Services Sub System (TAF TSI) documents the essential requirements for Data Quality. This is a prerequisite for effective data exchange and comprises the following elements:

Completen
ess
Accuracy
Consistenc
y
Timeliness

The sender of each message will be responsible for the correctness of the data sent and must verify that it is in compliance with the guidelines stipulated for that message. This means that the data must not only be complete and conform to the metadata requirements (syntax-level), but must also be accurate, timely and consistent for the receiving application to effectively import the message. This requires various distinct levels of validation, which are described in other Functional Requirement Specifications of the subsystem Telematic Applications for freight.

3.5 Data lifecycle

Regarding the data lifecycle in the WIMO databases, the following data types must be considered:

Keepers data and other reference data in the WIMO

This data remain over the whole system life in the WIMO database. Regarding the update see chapter 2.8.

Counters

After the maintenance of the wagon the accumulated counters shall be reset after the storage of the whole wagon record in the history storage.

Status data

The status data of a wagon are updated based on the wagon messages.

Consignment Data and Movement Data

The lifecycle of the consignment data and the movement data normally ends after the wagon has been delivered at the customer sidings and the WIMO has received the delivery message. After that time the data related to the wagon inclusive of the wagon status information shall be stored together with the linking in the history storage and the movement data as well as the consignment data, but not the wagon status information, shall be deleted in the active part of the WIMO.

In the case, that no delivery message was received, but a message related to a new transportation use of the wagon is sent to the WIMO all the actual consignment data and movement data inclusive of the wagon status information related to the wagon must be stored together with the linking in the history storage and deleted – besides the wagon status information - in the active part of the WIMO, before the new transportation cycle can start.

The history part of the WIMO must be on-line accessible for at least 13 months (see [4] chapter 4.2).

After the 13 months, the data are archived and accessible as described in chapter 3.3 "Historical data".

3.6   Error messages

It must be distinguished between technical errors and application errors. For both errors the codes needs to be defined in the further design documents together with the receiver of such error messages. For error messages on the application level, the receiver is normally the sender of requests or update messages for the WIMO.

Technical error codes needs to be defined and harmonised within the whole community.

The structure of the error messages and the codes must be central administrated in the repository and distributed. These technical error messages are mainly handled in the common interface (see [4.5]).

3.7   Manual Input

Manual data input is needed

- To provide essential data supply in case of unavailability of the domestic systems

- To allow users of the system to access the WIMO and query for specific data, subject to particular authorizations.

See chapter 2.5 "Data Supply".

4. DATA LISTS

The complete WIMO data are shown in chapter 6. But all these data in this document as well as in the chapter 6 are to be used as a baseline and are subject to change during the implementation phase. In the following tables the cardinality defining the number of occurrence of entries is defined as:

(0,1): entry is optional and has a maximum occurrence of 1

(0,*): entry is optional and has an unlimited maximum

occurrence (1,1): entry is obligatory and has a maximum

occurrence of 1

(1,*): entry is obligatory and has an unlimited maximum

occurrence (2,1): entry is conditional and has a maximum

occurrence of 1

(2,*): entry is conditional and has an unlimited maximum occurrence

The data description of the following subchapters is a functional definition to understand the information exchanged, but the implementation shall use the elements defined in chapter 6.

4.1 Data Exchange between WIMO and RSRD ([4.6])

For detailed data description see "RollingStockDataSetQueryMessage" and "RollingStockDatasetMessage" as described in in Appendix I, ERA-TD-105, TAF TSI — Annex D.2: Appendix F — TAF TSI Data and Message Model.

4.2 Consignment Data - Opening the Cycle ([4])

For detailed data description see TAF TSI — ANNEX D.2: APPENDIX E — COMMON INTERFACE [4.4].

This document doesn't describe the database design, which gives more clearly the picture on the organisation of how the data are stored. Therefore the following list shows only, which data are available. The data shall be stored in an "efficient" manner. The data must be based on the consignment order messages. The definition of the data structure is quoted ERA_Technical_Document_TAF_D_2_Appendix_F, including the specification of the data, the provider, user rights and timing.

4.3 Movement Data ([5])

For detailed data and message description see TAF TSI — ANNEX D.2: APPENDIX E — COMMON INTERFACE [4.4] and ERA_Technical_Document_TAF_D_2_Appendix_F [4.5].

The movement data are based on the event reporting for wagons from the responsible Railway Undertaking. Events must be reported by all of the Railway Undertakings and the Infrastructure Managers in the pre-defined route of the shipment. The reporting shall take place within one hour of the Event being reported. The Infrastructure Managers will be reporting on the train level to the Railway Undertakings, while the Railway Undertakings will be reporting on the Wagon / ILU level to the WIMO, mainly based on the train reporting messages. The WIMO system will match the reporting, it checks the consistency of the data contents with the contents of the same already existing ones, updates specific information and stores additional one. This document doesn't describe the database design, which gives more clearly the picture on the organisation of how the data are stored.

The data shall be stored in an "efficient" manner. All reports and answers on queries based on this data shall show the logical transport chain of a wagon / shipment without redundant data.

5.   DATA REQUIREMENTS

The complete definition of all the elements to be used for the operation of WIMO are located at TAF TSI [4] [5] [6] Annex II, Annex A, Appendix F (ERA/TD/2012- 04/INT: Appendix F - TAF TSI Data and Message Model), which encloses the whole xml catalogue for the implementation of TAF TSI after every Change Control Management cycle. Within this document is specified all the different elements, complex types and simplex types of the so called TAF TSI catalogue, among them the elements and messages used to implement the functionality described on this Appendix B for WIMO database. Consequently the corresponding xml elements from this document have been deleted.

E N D O F D O C U M E N T

Warning