ELECTRONIC INFORMATION EXCHANGE SYSTEMS IN RAIL FREIGHT TRANSPORT
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## ABBREVIATIONS AND ACRONYMS

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CER</td>
<td>Community of European Railway and Infrastructure Companies</td>
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<tr>
<td>CIM</td>
<td>Uniform Rules Concerning the Contract of International Carriage of Goods by Rail (Appendix B to the Convention concerning International Carriage by Rail)</td>
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<tr>
<td>CIS</td>
<td>Commonwealth of Independent States</td>
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<tr>
<td>CIT</td>
<td>The International Rail Transport Committee</td>
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<tr>
<td>COTIF</td>
<td>Convention concerning International Carriage by Rail</td>
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<tr>
<td>CRT</td>
<td>Council for Railway Transport</td>
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<tr>
<td>CUV</td>
<td>Uniform Rules concerning Contracts of Use of Vehicles in International Rail Traffic (Appendix D to the Convention concerning International Carriage by Rail)</td>
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<tr>
<td>ERA</td>
<td>European Union Agency for Railways</td>
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<td>EU</td>
<td>European Union</td>
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<td>EUROSTAT</td>
<td>Statistical Office of the European Union</td>
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<td>OSJD</td>
<td>Organization for Cooperation of Railways</td>
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<td>RNE</td>
<td>Rail Net Europe</td>
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<tr>
<td>SMGS</td>
<td>The Agreement on International Goods Transport by Rail</td>
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<tr>
<td>TAF</td>
<td>Telematic applications for freight subsystem of the rail system in the European Union</td>
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<tr>
<td>TEU</td>
<td>The twenty-foot equivalent unit</td>
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<tr>
<td>TSI</td>
<td>Technical specifications for Interoperability</td>
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<tr>
<td>TTP</td>
<td>Trusted Third Party</td>
</tr>
<tr>
<td>UIC</td>
<td>International Union of Railways</td>
</tr>
<tr>
<td>UNESCAP</td>
<td>United Nations Economic and Social Commission for Asia and the Pacific</td>
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<td>WG</td>
<td>Working Group</td>
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Executive Summary

Given that the flow of information has a crucial impact on the efficiency of the railway border crossing processes, electronic exchange of information among railways could enormously increase the efficiency at the railway border crossings.

When the information required is exchanged electronically the organization of the processes at railway border crossings could be significantly streamlined. In this background this study details the existing electronic railway information systems for facilitation of international railway transport.

The main objective of the study is to enhance the understanding of the railway officials of the region on options for sharing electronic information for efficient international railway transport.

The chapter on existing electronic information systems explains various systems in use globally for international railway transport. It provides working of the the Telematic Applications for Freight-Technical Specification for Interoperability (TAF-TSI) a system used among members of the European Union. Under TAF-TSI information is exchanged on the consignment note, path request, train preparation, train running information, wagon movement and post trip details. In addition, various information technology tools to implement TAF-TSI are indicated.

Next, the electronic information system among CIS countries developed under Council for Rail Transport (CIS CRT) is detailed. Following that, OSJD solutions for electronic interchange of communication are explicated. The status of electronic CIM/SMGS consignment note has also been elaborated.

The following chapter explains the challenges to seamless flow of information along the international railway corridors. Different legal regimes for international railway transport due to which the consignment note data gets disrupted is identified as the main challenge. The common consignment note could be way forward to serve as a bridge between the two systems.

Similarly, for information exchange between railways and customs due to different legal requirements of the customs authorities along the corridors the flow of information gets disrupted.

Based on the review of existing electronic railway information systems, the next chapter identifies the key message exchanges required for smooth international railway transport. These include messages related to (a) consignment note data; (b) train handover sheet or train information; (c) rolling stock movement. It also provides information on existing international standards on those message exchanges.

The study concludes by reiterating that electronic data exchange within the railway community faces technical, organizational and legal issues and these are closely linked to the historical divergence between 1435 mm and 1520 mm gauges. It is apparent that the process of developing solutions for possible integration of different systems is on-going such as the CIM/SMGS initiative, integration of TAF system into COTIF legislation.

It also observed that the integration of railway information exchange on the regional level is far more advanced comparing to the interregional one. The study identifies technically and legally mature systems of electronic data exchange, namely (i) TAF TSI in European Union and (ii) the system implemented in the 1520 mm railway network (including all the solutions developed by OSJD and CIS CRT).
The study concludes that the most issues on the way to globalization of the electronic data exchange for railway transport arise at the level of interface between different systems (also taking into consideration the systems developed by the customs authorities), which are already at their advanced stage of maturity.

Keeping in mind that the currently functioning electronic data exchange systems are based on intergovernmental agreements (EU legislation on TAF TSI, COTIF CIM, OSJD SMGS, decisions of the CIS CRT), one of the efficient ways for information exchange could be an intraregional intergovernmental arrangement on electronic data exchange (presumably, in the context of ESCAP) with the potential scope incorporating data exchange between railways, between railways and public authorities, and possibly the data exchange between different transport modes (multimodal dimension).

Adoption of such intergovernmental decision would demonstrate the strong commitment of the parties and would provide an impetus for the future international cooperation on this subject.

The study also emphasizes that the future activities on development of an electronic data exchange systems should involve tight cooperation between railways and customs authorities, as any diversity in implementation of various practical aspects of the system might lead to unwanted complexity.
I. Background

The adoption of the United Nations 2030 Agenda for Sustainable Development has provided renewed emphasis on sustainable transport solutions to achieve the Sustainable Development Goals. One of ways to materialize sustainable transport is to enable integrated intermodal transport systems that use modes of transport according to their strength. Such systems encourage mode complementary instead of competition. To move toward such a system at regional level there is a need for proactive policy initiatives to encourage energy efficient and environmental friendly modes of transport such as railways. This would gain even more importance in coming years as the overland transport is expected to increase rapidly.

To support rising land transport, countries in the ESCAP region are implementing numerous national as well regional initiatives to ramp up the transport infrastructure that would further strengthen transport linkages among the countries. Some of the important initiatives in this direction include: The Belt and Road Initiative, launched by China in 2013, aims to promote the connectivity and support development of transport connectivity networks. The Silk Road Economic Belt, a land component of the initiative, focuses on several regional road and railway corridors that will: connect China, Central Asia, Russia and Europe; link China with the Persian Gulf and the Mediterranean Sea through Central Asia and West Asia; and connect China with Southeast Asia, South Asia and the Indian Ocean. The projects under Belt and Road initiatives include transport infrastructure investments and cooperation in transport facilitation.

The Kazakhstan’s economic policy Nurly Zhol - the Path to the Future announced in 2014 address development and modernization of transport and logistics infrastructure, as well as other areas such as industry, energy, housing and support of small and medium businesses.

Railway Transport Development strategy of Russian Federation for 2030, first elaborated in 2008 and revised in 2013, defines strategic goals such as integrated transport space in the Russian Federation and integration into the international transport system.

As a result of these initiatives huge funds are expected to flow to improve transport connectivity among the ESCAP countries and most of it would flow to further improve international railway transport.

Moreover, last few years have also seen rapid growth in information and communication technologies due to exponential spread of internet that can now be harnessed for commercial purposes. Efficient completion of railway border crossing formalities hinges crucially on the availability of information on various aspects of freight train that is required by regulatory authorities to complete the formalities. Given that the flow of information has a crucial impact on the efficiency of the railway border crossing processes, electronic exchange of information among railways and control authorities could enormously increase the efficiency at the railway border crossings including transit formalities.
Figure 1: Drivers of changes, industries overall. Share of respondent rating drivers as top trend (%)

TECHNOLOGICAL
- Mobile internet, cloud technology: 34%
- Processing power, Big Data: 26%
- New energy supplies and technologies: 22%
- Internet of Things: 14%
- Sharing economy, crowdsourcing: 12%
- Robotics, autonomous transport: 9%
- Artificial intelligence: 7%
- Adv. manufacturing, 3D printing: 6%
- Adv. materials, biotechnology: 6%

Source: Future of Jobs Survey, World Economic Forum. Note: Names of drivers have been abbreviated to ensure legibility.

Considering the above mentioned, it might be concluded that digitalization of railways would enhance the efficiency of International railway transport and also make possible for railways to integrate with other modes of transport seamlessly in providing sustainable transport solutions.

The Regional Cooperation Framework for the Facilitation of International Railway Transport acknowledges the crucial importance of the railway transport in the context of regional connectivity and promotion of sustainable and inclusive economic and social development. Considering, on one hand, the growing mobility, the great distances between the points of departure and arrival of passengers and freight as well as, on the other hand, safety, carrying capacity, better speed over long distances, low environmental impact of the railway transport combined with the variety of more and more affordable digital solutions, it becomes evident that digitalization of the railway transport is critical to further enhance efficiency of this transport mode.

The Regional Cooperation Framework for the Facilitation of International Railway Transport makes it very clear that one of the most important measures to facilitate the intraregional and Eurasian international railway transport is to remove non-physical barriers between railway networks. This statement is very important evidence of the intergovernmental recognition of the need to promote coordinated digitalization of the railway transport, to ensure and foster cross-border electronic data exchange between railways as well as between railways and control authorities.

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2 Resolution 71/7 adopted by the United Nations Economic and Social Commission for Asia and the Pacific
Further sections of the study will provide a description of the electronic exchange solutions implemented (or on the way to implementation) in Eurasia together with the high-level analysis of their merits and limitations.

II. Existing situation of the electronic information exchange between railways and with control authorities

Insufficient development of standardized electronic information exchange about consignment notes, the tracking of trains and wagons adversely impacts efficiency of railway transport. Indeed, the bilateral railway border crossing operations can possibly be the subject of technical arrangements between railways. However, the facilitation of interregional traffic, especially the one which includes long transit routes with multiple border crossings immediately calls for intergovernmental decisions on coordinated harmonized technical solutions, including the electronic information exchange.

From the point of view of the electronic information exchange, today’s Eurasian railway area contains at least three “electronic information exchange areas”:

- The single European railway area governed by the legislation of the European Union;
- The railway area covered by the members of Organisation for Co-operation of Railways (OSJD);
- The railway area formed by the members of the Council for Railway Transport of the Commonwealth of Independent States (CIS CRT).

The essential properties of the mentioned systems followed by the review of the interfaces between them should provide an understanding of the currently existing situation in the domain of the electronic information exchange. The challenges, related to this complexity will be additionally addressed in the following sections of the study.

A. European Union

In early stages of development of the Technical Specifications for Interoperability for Telematic Applications for Freight Services (TAF TSI) it has been acknowledged that in the freight transport sector, railways need to improve service and efficiency to increase revenues and market share, and to play their part in delivering sustainable transport. The critical attributes of a successful freight service are the ability to keep track of consignments, determine when deliveries to customers will be made and to maximize the productivity of the transport chain. These primary objectives can be achieved cost-effectively by the use of business processes and supporting
information systems, for transport chains in either the open access or railway companies’ network co-operation business models.\(^6\)

To increase the share of rail freight transport in Europe, which has been consistent around 18 per cent in last several years, some legislative measures have been introduced by the EU. In this respect, the most important legal acts were the following:

- Directive (EU) 2016/797 on the interoperability of the rail system within the European Union (aiming at fostering interoperability within the rail freight network)
- Commission Regulation (EU) No 1305/2014 on the technical specification for interoperability relating to the telematics applications for freight subsystem of the rail system in the European Union (aiming at fostering interoperability for the electronic information exchange within rail freight network).

**Figure 2: Share of rail freight transport in the EU**

![Share of rail freight transport in the EU](source)

*Source: EUROSTAT\(^7\)*

What are the expected benefits for railways implementing and operating the TAF TSI:

- Single communication system for all business cases an operator can find
- Improved communication and process coordination between railway operators and infrastructure managers (in terms of quality and speed)
- Single standardized way of working, providing cost savings through better management quality system; establishment of homogeneous procedures; reduction in system maintenance costs
- Standardized and interoperable communication interfaces

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\(^7\) See: http://ec.europa.eu/eurostat/statistics-explained
• Participants possess a strong and committed TAF Users’ Community

Consequently, the following benefits emerge regarding the value chain passengers / freight customers:

• Access to more transparent railway products, meaning more efficient and thus competitive products
• Monitoring becomes more transparent
• Quicker and better information delivery to freight customers and business partners

At a glance, the TAF TSI’s functions can be summarized in a snapshot as follows:

**Figure 3: Overview of TAF TSI functions**

![Diagram of TAF TSI functions]

*Source: 6th TAF TSI Regional Workshop, 12-13 September, 2017*

The functions shown in the TAF TSI are described in the legal text in dedicated chapters as a set of procedures (who sends to whom what type of electronic message and when) and of corresponding technical interfaces to above messages (XML definitions in so-called Technical Documents). The TAF TSI describes business-to-business processes between the railway operators, railway infrastructure managers and wagon keepers with a clear link for the freight customers how they can get transport related electronic messages from the contracted railway operator.

It is important to emphasize for the sake of transparent implementation and operation that the TAF TSI itself, containing the description of procedures, is in the public domain and can be
accessed at the EU Official Journal\(^8\). Aforementioned Technical Documents are equally in the public domain but at the European Union Agency of Railways' website\(^9\).

Same functions from Figure 3 can be also represented as parts of the rail freight transport process:

**Figure 4: TAF TSI functions as part of the transport process**

![Diagram of TAF TSI functions as part of the transport process]

*Source: 6th TAF TSI Regional Workshop, 12-13 September, 2017*

The major functions and main elements of the TAF TSI are summarized below.

Currently, the TAF TSI is at advanced stage of implementation within the European Union. It is leading to harmonization of electronic information exchange in Europe and has attracted a huge and committed users’ community (railway companies, control authorities, infrastructure managers, wagon keepers and customers) covering 85 percent of the EU rail freight market. The TAF TSI implementation has also triggered positive effect on the harmonization of rail operation processes.

In the EU, a dedicated TAF implementation and operating governance entity has been set up. This entity - backed by experts coming from the EU member states, railway operators, infrastructure managers and wagon keepers - has achieved considerable progress in TAF implementation and operation. Large scale trusted IT implementation companies have also joined the TAF community. This all-together leads to large figures as regards the running of the TAF business:

- Number of companies with own company codes: 328

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• Number of rail locations with own code: 60,000
• Number of consignment note messages exchanged: 2,500,000 per year
• There are 2600 train path dossiers per year resulting in 1,600,000 trains per year running on the network.
• Number of train running messages exchanged: 163,000,000 per year
• Number of train wagon event messages exchanged: 144,000,000 messages per year

Above figures indicate the amount of XML messages which are all exchanged according to TAF TSI format.

1. Consignment Note

The CIM compliant consignment note has to be sent (electronically or by other means) by the customer to the lead railway operator, who creates an electronic consignment order message. It must show all the information needed to carry a consignment from the consignor to the consignee according to "Uniform Rules Concerning the Contract of International Carriage of Goods by Rail (CIM)" , "Uniform Rules concerning Contracts of Use of Vehicles in International Rail Traffic (CUV)" and valid national rules.

The consignment order is primarily a subset of the consignment note information. It must be electronically forwarded to the other operators involved in the transport chain by the lead operator. The content of the consignment order must show the relevant information which is needed for an operator to effect transportation during its responsibility until handover to next operator. Therefore, the content is dependent on the role to be performed by the railway operator: origin-, transit- or delivery operator.

Even though the goal of the TAF Consignment order is not primarily the support of customs procedures - as TAF supports rather open market approach within the EU without customs at borders - this message set has the elements (sender, recipient, dossier number, carrier, goods in consignment, customs data such as customs organisation, customs rail location point, declaration codes etc.), which can be exploited and processed in order to support customs messages (such as the UN CUSCAR (Customs cargo report message)).

2. Path Request

The path defines the requested, accepted and actual data to be stored concerning the path and the characteristics of the train for each segment of that path. Paths are used to compose the total transport leg. The operator and the infrastructure manager exchange a set of path request messages in order to agree on the path between two points where a train (with given length, mass etc.) can run on the infrastructure with given characteristics (clearance gauge, axle load etc.).
3. Train Preparation

Train preparation includes compatibility check between the train and the route. This check is done by the operator on basis of information provided by concerned infrastructure managers on infrastructure description and infrastructure restrictions.

During train preparation the operator must send the train composition to the next operators. According to contractual agreements, this message must also be sent from the operator to infrastructure manager(s) with whom the operator has contracted a path section.

At a later stage the operator shall send a train ready message to the infrastructure manager every time a train is ready to start after train preparation.

4. Train Running

The train running forecast message is used to provide information about the estimated time at contractually agreed forecast points. This message shall be sent from the infrastructure manager to the operator and the neighboring infrastructure managers involved in the run. The train running forecast message must give the forecast time for agreed forecast point.

On top of that, the train running information message must be issued by the infrastructure manager to the operator running the train upon:

- Departure from departure point, arrival at destination,
- Arrival and departure at handover points, interchange points and at agreed reporting points based on contract (e.g. handling points).

If the cause for the delay (first assumptions) is provided it must be sent in a separate train delay cause message.

When the operator learns about a service disruption during the train running operation for which it is responsible, it must immediately inform the infrastructure manager concerned. If train running is interrupted, the infrastructure manager shall send a train running interrupted message to the contracted operator and the next neighboring infrastructure manager involved in the train run.

5. Wagon Movement

The purpose of this message is to send the estimated time of interchange (ETI) or updated ETI of the wagon from one operator to the next in the transport chain. The last operator in the transport chain of the wagons sends the estimated time of arrival (ETA) or updated ETA to the lead operator.

In addition, the lead operator has to exchange following electronic messages with the other operators and the customer:

- Wagon Release notice
to inform adequately about the status and location of the customers’ wagon.

6. Post trip assessment for quality improvement

A measurement process is an essential post trip process to support quality improvements. In addition to measuring the service quality delivered to the customer, Lead operator, operators and infrastructure managers must measure the quality of the service components that in total make up the product delivered to the customer.

The process involves the infrastructure managers and operators (especially if they are lead operators) selecting an individual quality parameter, a route or location and a measurement period in which actual results are to be measured against predetermined criteria and which normally have been set out in a contract. The results of the measurement process must clearly show the achievement level against the target which has been agreed upon between the contracting parties.

Today such assessments can be performed in Europe with the help of huge rail IT data systems storing the information from above sections II.A.1.- II.A.5 in a TAF TSI compliant format.

7. Reference data

It is mandatory to have for all operators, infrastructure managers and wagon keepers some standardized reference codes (such as company or location codes) in order to be able to join the TAF users’ community and to exchange electronic messages. Without the existence of such reference codes it is not possible to exchange any electronic message within the TAF TSI framework.

B. IT Tools for implementation of TAF TSI functions:

The implementation and operation of the TAF TSI functions in the form of the IT tools mentioned in this section are successful because they

• have been developed on a voluntary and commercially oriented basis by the European rail sector since years and
- have been (co)funded by the European Union in the form of Connecting Europe Facility (CEF) calls\textsuperscript{10}

In Europe for the implementation and operation of TAF TSI the aforementioned IT Tools:

- Common Components System (CCS),
- ORFEUS\textsuperscript{11},
- Path Coordination System (PCS) and HEROES\textsuperscript{12},
- Train Information System (TIS) and Improved Service Reliability (ISR)

Above IT tools (together with additional tools from the UNIFE\textsuperscript{13} and from the European rolling stock wagon keepers) correspond to the TAF TSI functions mentioned in sections II.A.1. - II.A.7.:

**Figure 5: Integration of products into TAF TSI**

![Integration of products into TAF TSI](image)

Source: 6th TAF TSI Regional Workshop, 12-13 September 2017

A description of the solutions integrated into TAF TSI system is being provided in the sections below.

\textsuperscript{10} See: https://ec.europa.eu/inea/connecting-europe-facility/cef-transport
\textsuperscript{11} http://www.raildata.coop/orfeus
\textsuperscript{12} https://www.hitrail.com/h30-train-predvice-app
\textsuperscript{13} Union of European Railway Industries (UNIFE)
1. ORFEUS

ORFEUS is an information system developed and operated by RAILDATA, an international organisation of freight railway operators for development and production of central information and data exchange systems for European rail freight transport.

ORFEUS system provides exchange of CIM consignment notes and CUV wagon notes data between railway operators using a Central Data System (CDS).

The data are sent in parallel to the paper CIM consignment note (or CUV wagon notes data for empty wagons). In 2006 the ORFEUS was migrated to the XML-CTD message system, in particular to fulfil the requirements related to the coming into force of the new international rail transport law CIM. In 2009, the system was extended with the ECN (electronic consignment note) message format and new message flows.

ORFEUS Components:

- Central part CDS (Central Data-management System). It acts as a message broker for collection and distribution of information, including specific logic and verifications. This software was designed by LUSIS, French IT supplier using their TANGO platform.
- National Information Systems (NISes) of connected railway operators. NIS is the common name for the information system of a freight railway company, which covers both commercial and production functions.

![Figure 6: Data exchange in the ORFEUS system](http://www.raildata.coop/orfeus-overview)

Source: Components of ORFEUS

The ORFEUS technology is used by railway companies in Czech Republic, Luxembourg, Sweden, Croatia, Austria, Germany, Denmark, Netherlands, Spain, Switzerland, Belgium, France, Italy.

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14 [http://www.raildata.coop/orfeus-overview](http://www.raildata.coop/orfeus-overview)
2. International Service Reliability (ISR)

ISR offers exchange of movement information for wagons in international traffic through a central platform.

ISR Components:

Information systems of connected railway operators to monitor wagons in their own trains and send movement information to the central ISR message broker. In opposite direction they may receive and process movement information from other ISR members, forwarded by the central message broker.

Central message broker (CDS) ensures reception of messages, their validation, storage as well as format conversion and distribution.

All data like the wagon movement events and the transport descriptions are stored in the central ISR database for the transport duration.

A subset of the consignment note data is taken over from ORFEUS to match the events to a Transport Description (TD).

The ISR web site allows to search in the stored data and to display different views on them.

Due to strict filtering rules, operators can access the ISR database, depending on their role.

**Figure 7: Data exchange in the International Service Reliability (ISR)**

(Source: Basic components of the ISR system\(^\text{15}\))

\(^\text{15}\) http://www.raildata.coop/isr-overview
3. The Path Coordination System (PCS)

The Path Coordination System (PCS) is an international path request coordination system for path applicants, e.g. railway operators, infrastructure managers, railway capacity allocation bodies and rail freight corridors. The internet-based application optimizes international path coordination by ensuring that path requests and offers are harmonized by all involved parties. Input for international path requests needs to be placed only once into one system - either into the domestic application or directly into PCS.

PCS provides a single workflow that enables operators and capacity allocation bodies to use a standard dossier for all types of path requests. According to the submission date of the request and the requested timetable period, PCS will automatically define whether the request is an ad-hoc path request for the running timetable, a path request placed in time for the next annual timetable, or a request to be treated as a late path request for the next annual timetable.16

4. The Common Components System (CCS)

The Common Components System17 provided by the railway sector business association Rail Net Europe (RNE)18 consists of three different components:

- The Common Interface (CI)
- The Central Reference File Database (CRD)
- The Certification Authority (CA)

**Common Interface (CI)** functionalities enable the exchange of messages between existing or future legacy (company) applications used by rail operators. These legacy applications can connect with the CI through one of the standard protocols (such as FTP, WMQ/JMS, JMS, File, Web service, Email and IP Socket) and use different message formats (such as Text, CSV, XML or UIC 407-1). Messages can be translated from one format into another in the CI. The CI provides a graphical mapping layer that can be used easily both by IT and non-IT personnel. Message exchange between railway companies has been standardized: it is based on common message formats or shared message formats agreed by two or more railway operators.

**Central Reference File Database (CRD)**

The CRD consists of:

- the codes for companies and locations
- a common repository of metadata for the messages to be exchanged within TAF.

The reference file database for companies is maintained through certain process and can be downloaded. The Central Location Identification Reference File consists of the primary location code and the subsidiary location code. The national location entities (mostly infrastructure

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16 http://pcs.rne.eu/what_is_pcs
17 http://ccs.rne.eu/
18 http://www.rne.eu/
managers) are responsible for the allocation of the primary location code to railway locations. This is a prerequisite for the allocation of the subsidiary location code by railway operators.

RNE acts as a Certificate Authority (CA) and provides X.509 certificates to support secure communication between partners, along with message-based encryption and signature.

**Figure 8: Functional structure of the RNE CCS Common Interface**

Source: The Common Interface. Rail Net Europe

5. Train Information System (TIS)

The Train Information System (TIS, formerly EUROPTIRAILS) is a web-based application (provided by RNE) that supports international train management by delivering real-time train data concerning international passenger and freight trains. The relevant data is obtained directly from the infrastructure managers’ systems.

**TIS Real-Time Information:**
- Real-time rail traffic data – e.g., contracted timetable, forecast, running advice, delays

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19 http://ccs.me.eu/common-interface/
20 http://tis.me.eu/index.php/what_is_tis.html
− Real-time information is visualized in the TIS graphical interface
− Accessible though standard web browsers

TIS Reporting:
− Predefined reports and graphs (punctuality, delay causes, etc.)
− Customizable reports and graphs
− Information source for international Train Performance Management (TPM)

TIS Data Exchange:
− Raw data exchange based on TAF/TAP TSI messages
− Filtering function to select the required information
− TAF TSI reference system for testing and implementation

6. HEROS

In rail freight traffic, each railway operator that moves a train needs to have detailed information in advance about the train composition. If a train runs in collaboration between several operators, each operator has to send the train composition information to the next one. This information includes the engine(s), wagons, consignments and where present the containers.

Most of the large operators have implemented an H30 application for this purpose, but many smaller operators simply collect the details manually on the yard, send them by e-mail in plain text, and then the next RU has to capture the data anew. This is an inefficient process and is prone to errors.

HIT Rail has developed on HEROS an H30 web application. This tool allows the staff of RUs to log in and enter composition data directly in a web form on their computer or tablet, directly on the yard. Additionally, the tool is able to receive train composition data from “previous” RUs and allows for this data to be reused for templates, or for sending to the next operator.

Advantages of the H30 application offers many:
− It validates messages in real time reducing the errors. Various code lists are offered.
− Data for past trains that is to be repeated (where trains and wagon sets run regularly) can be stored and reused.
− Standard H30 UIC train composition messages can be sent to the partner RU (or to Raildata ISR system).
− It receives H30 messages from other RUs for display and reuse.
− The train data can be exported to excel for the printout of train documents and reports to the infrastructure manager.

21 http://tis.me.eu/what-is-tis/
The H30 application connects small or new operators with large operators using H30. It also allows for the automated collaboration between smaller or new operators.

C. TAF TSI integration into COTIF framework

In 2015, Organization for International Rail Transport (OTIF) has issued a study about the potential use of the TAF TSI for those OTIF members that are not part of the EU\textsuperscript{22}. In Chapter 2.9 of the OTIF study, an inventory of possible ways of how to proceed for OTIF with TAF TSI is elaborated with the recommendation to make a partial transposition into OTIF TAF regulation (Uniform Technical Prescription(UTP)): partial transposition could also be considered as a possible solution.

This in fact means that the core requirements of the TAF TSI would be transposed into COTIF legislation, which would refer to the technical details (appendices to TAF TSI) published centrally on the website of the European Union Agency for Railways.

As a result, OTIF’s Committee of Technical Experts (CTE) in its 10th meeting adopted the “UTP TAF”, which has its equivalence with the TAF TSI. The UTP TAF entered into force on 1 December 2017\textsuperscript{23}.

In accordance with UTP TAF (Chapter 0. 0. Equivalence and Transitional Provisions), the implementation of this UTP TAF is voluntary. This means that there is no deadline after which this UTP or parts thereof must be implemented. However, the purpose of the UTP TAF is to ensure that if IT investments and developments in the scope of the UTP TAF are made, they are done in a harmonized and compatible way, so as to facilitate international rail traffic.

The application of the UTP TAF is therefore mandatory in case of development of processes or technology, or purchase of equipment of telematic applications that fall within the scope of this UTP TAF. This means that new processes, technology or equipment of this kind shall comply with this UTP TAF.

D. CIS CRT and OSJD railway areas

Comparing to the TAF TSI system described in the sections above, the railway areas of the states cooperating in the context of the Organization for Cooperation of Railways (OSJD) and the Council for Railway Transport of the Commonwealth of Independent States (CIS CRT) have implemented their own data exchange systems to support international railway traffic.

\textsuperscript{22} https://otif.org/fileadmin/user_upload/otif_verlinkte_files/07_veroeff/Studien/CTE8_6_1_e_TAF_TSI_study.pdf
1. Council for Railway Transport (CIS CRT)

Established in 1992 by governments of the Commonwealth of Independent States (CIS), the Council for Railway Transport is currently consisting of 11 railway administrations from the CIS (full members), 6 associate and other members, and 2 observers.²⁴

In general, CIS CRT is a railway sector organization with a strong expert capacity and wide geographic scope of application, providing legal and technical regulation for a major part of the 1520 mm railway area.

(a) MESPLAN

Automated system (AS) MESPLAN is used to develop the monthly consolidated freight loading plan at international level, elaborate the international freight transportation plan based on applications submitted by the participating railways. Currently MESPLAN is being managed by the IT center of the CIS CRT (co-financed by the members of the CIS CRT). The data exchange includes all the members of the CIS CRT.

The consignor intending to submit the goods for international carriage by rail shall submit a monthly application for freight carriage, or ad hoc amendments of the previously submitted application. The approval of the application is being done by all the involved international railways using electronic data exchange within the system.

The consignor’s application is submitted to the MESPLAN central server via electronic template and agreed communication channels. The system automatically disseminates the application to all railways indicated in the application, then wait for approval. The possible results of the approval procedure are the following:

- Approved
- Rejected
- Approved with modifications

The results of the approval procedure are being submitted to the MESPLAN central server, aggregated and forwarded to the initial party. If the application is approved by all the railways of the transportation chain, the carriage is considered approved.

It is worth mentioning that the majority of MESPLAN using networks have introduced internal control mechanisms blocking production of the SMGS consignment note if the application for carriage is not approved. Due to the fact that the approving decision guarantees the acceptance of goods by the subsequent operator, such approval process allowed to abandon paper information exchange and facilitated the border crossing procedures. Furthermore, this allowed to reduce the freight wagons’ detention time in the border stations and simplified management of railway traffic flows, which is very important in order to avoid “bottlenecks” in main Eurasian rail freight transport corridors.

²⁴ Members of CIS CRT: http://sovetgt.org/index.php?link=2
Components of the MESPLAN system are aimed at:

- Estimation of the consolidated network-wide freight loading and transportation plan based on single estimation algorithms and on an international single applications database
- Creation of an international database of lead indicators and technical requirements for analytical reporting to analyze operation of the international railway network
- Automatic admission of lead indicators submitted by the participating railways
- Distinction of international and national data flows
- Integration of other national and international systems.

Estimated benefits of the MESPLAN system:

- avoidance of application of other means of transfer of the loading plan data
- avoidance of manual entry of the consolidated data
- creation of international database for lead indicators and technical requirements
- ensure the exchange of estimated technical requirements for operation between participating railways

(b) Electronic exchange of the train handover sheet

Train handover sheet is a combined document aggregating the following data:

- data on a full set of documents for carriage (for loaded wagons) or a forwarding consignment (for empty wagons),
- general form note for wagons, containers, goods, seals and carriage equipment.

In the present time railway operators of the CIS and the neighboring railways exchange train handover sheets in 2 alternative ways:

- ASOUP message 4770, and /or
- UN/EDIFACT message IFCSUM

In both cases, initial data are being communicated 2-3 hours before the actual crossing of the border.

(c) Vehicle tracking system in the CIS CRT railway area

The railway network of CIS countries does not apply any single web-based application for vehicle tracking. This, however, is being partly compensated by the mutually exchanged specific messages and information which allows the sufficient tracking of wagons and goods in the whole network. The exchange process is being coordinated by the single IT center of the CIS CRT.

The recommended set of electronic messages defined by the CIS CRT is divided into the following groups:
- Messages in information exchange between national information systems of railways in the processes of admission and handing-over of trains at interstate border-crossing points.
- Messages in information exchange between national information systems of railways and CIS CRT single IT center.

It has to be also noted that railways operating in the CIS CRT area may agree on the set of messages to be used in electronic exchange, for example:

- message on the composition of the train, containers, shipments and conveyances handed over from the territory of one state to another
- Regarding acceptance / handing-over of containers in interstate communication
- About the departure of a train towards the interstate division point with information about locomotives
- Request for information about the composition of trains and operations with them on the adjacent railway

Provisional list of messages bilaterally used by railways in cross-border exchange of freight trains is provided in the Annex 2.

The structure of messages complies with requirements adopted by the working bodies of the Council for Railway Transport.

2. Organization for Cooperation of Railways (OSJD)

(a) Electronic Data Interchange (EDI)

The legal background for the electronic carriage documents is being provided by the Articles 6(10) and 7(14) of the Agreement on International Freight Transportation by Rail (SMGS)\(^{25}\).

According to the agreements on application of the EDI system, the information support starts from the moment of acceptance of the freight for carriage and followed by the transfer of the advanced notification information to the relevant border stations for advance notification and document processing. The communication process employs the internet network as well as data transfer systems “Infoset-21”\(^{26}\) and HERMES\(^{27}\). The data transfer is being done using the international standard UN/EDIFACT.

Electronic signature is being applied to ensure the integrity and legal relevance of electronic documents.

The principal tasks for successful implementation of the legally relevant EDI:

- Elaboration of mutual recognition of the electronic signature and certificates issued under different legal regimes;

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\(^{25}\) http://osjd.org/doco/public/ru?STRUCTURE_ID=5038&layer_id=4581&refererLayerId=4621&id=1023&print=0

\(^{26}\) “Infoset-21” (or “Infonet-21”) – an electronic system being developed from 1999 to exchange railway-related information between railway administrations of the CIS CRT.

\(^{27}\) For more information see https://www.hitrail.com/hermes-network
Development of specific programming and computer-aided means (as the parties participating in information exchange process may belong to the different legislative regimes which may preclude acceptance of cryptographic algorithms used by the parties)

Elaboration of technical conditions for transfer, handling and verification of electronically signed documents

OSJD succeeded to develop an efficient instrument to ensure application of legally relevant documents for international freight carriage, by means of the Trusted Third Party (TTP) services. TTP services are described in the Recommendation X.842 adopted by the International Telecommunication Union. The main functions of the TTP are (i) verification of the electronic signature generated under different legal regime and using foreign cryptographic standards, and (ii) acknowledgement of its legitimacy in accordance with the legislation of the receiving party.

With regard to outcomes of the work done by OSJD in the field of EDI, there is already a number of projects implementing this IT solution:

- in 2016 almost, 100 percent of the freight turnover between Russia and Belarus became paperless (including dangerous goods from September 2017);
- in 2016, the flow of empty freight wagons transported between Russia (Kaliningrad area) – Lithuania – Belarus – Russia (mainland) and vice-versa using SMGS electronic consignment note became paperless.

The latter case is in fact the first transit “electronic” route in the history of railway transportation in the 1520 mm track gauge network.

Members of OSJD currently applying EDI: Belarus, Estonia, Kazakhstan, China, Latvia, Lithuania, Poland, Russia, Ukraine

(b) Electronic CIM/SMGS common consignment note

CIM/SMGS common consignment note has been created as a solution to avoid consignment note exchange. The main advantage of this joint product is that it covers two major international railway frameworks: COTIF law which is dedicated mainly to the 1435 mm railway system and SMGS framework targeting 1520 mm railway area. Application of the common CIM/SMGS consignment note allows uninterrupted passage through the majority of Western and Central European borders, starting freight transportation under COTIF rules and delivering the goods to a destination in the SMGS jurisdiction (and vice versa). The paper version of the CIM/SMGS consignment note has been created as a solution to avoid consignment note exchange. The main advantage of this joint product is that it covers two major international railway frameworks: COTIF law which is dedicated mainly to the 1435 mm railway system and SMGS framework targeting 1520 mm railway area. Application of the common CIM/SMGS consignment note allows uninterrupted passage through the majority of Western and Central European borders, starting freight transportation under COTIF rules and delivering the goods to a destination in the SMGS jurisdiction (and vice versa). The paper version of the CIM/SMGS

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28 OSJD leaflet P 941-4 “Typical technical specifications of cross-border cooperation between public key infrastructures used by railways operated by member countries of the OSJD”
30 Minutes of the Expert Meeting, Permanent Working Group for Coding and Informatics (04-05.09.2017, Warsaw)
The consignment note has been successfully implemented and the geographic scope of its application is constantly growing.

The initial specifications of the CIM/SMGS consignment note, were created in 2009, however practical application of this high-potential solution is still pending for a number of reasons.

The first obstacle is incompatibility of data standards (information system must be able to accept and process the rules and classificatory information from both COTIF and SMGS legal frameworks. To address this issue, a Temporary Expert Group comprising members of CIT, OSJD and Raildata focused at updating of the technical specifications of the CIM/SMGS had been created in 2012. The work on the update has been finished in 2017 by development of the following deliverables:

a) CIM/SMGS technical specification updated;
b) data directory and message structure developed;
c) message branching diagram for FTMIN created;
d) message scheme IFTMIN (CIS) < > XML (EU) developed.

The work on technical specifications of the new electronic CIM/SMGS consignment note will be continued by OSJD and CIT in 2018.31

The second reason of the pending full implementation of the electronic CIM/SMGS consignment note is that even though the CIM/SMGS is being accepted by the customs as a valid railway document, there is insufficient practice of its implementation due to the fact that the customs procedures on both sides of the 1435 mm – 1520 mm railway border still call for the paper version of the CIM/SMGS consignment note.

There are however indications of a possible breakthrough in application of the electronic CIM/SMGS note. It is suggested that the adherence of the Chinese Railway Corporation to the project as of 1st of May 2017 will provide a strong impetus to the progress of practical implementation of this promising electronic solution. Other initiatives and pilot projects are expected to additionally contribute to shaping of a good practice in this domain.

III. Challenges in implementing electronic information exchange between railways and with control authorities

The previous sections of the study have revealed the complexity of the electronic exchange system in the Eurasian railway transport. Significant variety of electronic exchange solutions are being historically determined by the variety of applicable legal requirements and principles of functioning of 1435 and 1520 mm railway sectors and their business demands.

The non-physical obstacles related to the insufficient coordination in the domain of electronic data exchange have less influence on the intraregional level or in the areas where the density of freight flow still allows to implement “legacy” solutions for data exchange. However, at corridors with intense freight, passenger or mixed international traffic, the smooth and expedite border-crossing

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31 Minutes of the meeting of the OSJD Permanent Working Group for Coding and Informatics, 14-16 November 2017.
is a critical aspect. The same could probably be said with regard to development of long-distance trans-Eurasian corridors, which should contribute to the modal shift from other modes of transport to environmentally benign and less time-consuming railway carriages.

A. Challenges related to electronic information exchange between railways

1. Consignment note exchange

In East-West freight transportation, the open market-oriented TAF TSI system ceases to apply on the external EU border. In the Scheme 1, the practical example of a freight train departing from the European Union (e.g. Netherlands) to Asia (e.g. China) will illustrate the existing electronic data exchange situation (the color code indicates the area that is potentially problematic from the electronic data exchange point of view):

Scheme 1: Data exchange in the West - East freight transportation

1. In Netherlands, the consignor fills in a CIM consignment note using ORFEUS system.
2. After the departure, the consignor monitors the journey of the train using ISR or TIS systems (see points II.B.2 and II.B.5)
3. At the border station within the EU (e.g. German station at the German/Netherlands border), the railway operator only fills in data concerning the passage of the border.
4. After arrival to the next border crossing station within the EU (e.g. Polish station at the Polish/German border) the following options are possible:
   a) In case Polish operator applies ORFEUS – data concerning the CIM consignment note is digitally transferred, or
   b) in case Polish operator does not apply ORFEUS – train message H30 is being transferred together with the printed version of the CIM consignment note.
5. After crossing the Polish – Lithuanian border electronic data stops being received. Paper version of the CIM consignment note is being transferred to Lithuanian operator.
6. Goods are being reloaded from the 1435 mm gauge to the 1520 mm gauge.
7. SMGS consignment note is being filled in. Data concerning the SMGS consignment note is being transferred to railway operators outside the EU (e.g. Belarus and Russian operators) via EDI system by message IFTMIN.
8. INVOICE message is being issued in accordance with the obligation to provide advance notification to the customs authorities of the EACU.
9. At the border between EU and CIS (e.g. Lithuanian/Belarus) border the train handover sheet (message 4770 in the ASOUP system) is being issued. SMGS consignment note data is being amended (IFTMIN message in the EDI system).
10. At the border station within the Eurasian Customs Union (e.g. Belarus/Russian border), the train handover sheet (message 4770 in the ASOUP system) is being issued. SMGS consignment note data is being amended (IFTMIN message in the EDI system).
11. At the next border within the Customs Union (e.g. Russian/Kazakhstan border) the train handover sheet (message 4770 in the ASOUP system) is being issued. SMGS consignment note data is being amended (IFTMIN message in the EDI system).
12. At the Kazakhstan/China border SMGS consignment note data is being transferred (IFTMIN message in the EDI system).

The Scheme provides for conclusion that the freight transportation process goes smoothly until the train arrives at the “digital frontier” between areas implementing CIM and SMGS consignment notes. After crossing this border, the transportation becomes sustainable again. Therefore, efficiently functioning (and unanimously applicable) interface between two systems, for example, electronic CIM-SMGS consignment note is indispensable.

2. Incompatibility of classification codes (nomenclature)

In substantial Eurasian regions (EU, CIS etc.) the most important market players (international organizations, biggest railways, customs authorities) often apply different requirements and standards for owned information systems. Furthermore, there is a variety of data classification codes applied for the same data, for example, the product code.

Even a simple research reveals the existence of a number of different product code systems:

- NHM (Nomenclature Harmonisée des Marchandises) applied in COTIF area
- GNG (Harmonised nomenclature of goods) applied by the SMGS consignment note system
- ETSNG (Single tariff-statistical nomenclature of goods) applied by the members of CIS Council for Railway Transport

Another sample of incompatibility of classification codes is railway station codes. Members of COTIF apply DIUM codes maintained by UIC; in the meantime, SMGS Station code developed and maintained by OSJD exists and is possibly applicable by the same entity depending on the destination of goods. In addition, instead of railway station codes, customs authorities apply the customs control office of destination.

Same countries and railways might be represented in several railway legal frameworks (for example to be members of the EU, COTIF and OSJD), therefore applying several coding systems which produces an obvious overlap and another non-physical barrier.
3. Incompatibility of data exchange flows

The Eurasian railway market contains a wide variety of digital solutions. In addition, it is worth mentioning that countries and companies can develop their own IT systems in accordance with local standards and/or agreements. It is rather obvious that data exchange goes in a more coordinated way in the areas where countries apply the same rules. For instance, countries of Western Europe apply CIM consignment note and ORFEUS system, therefore are enabled to exchange consignment note data in effortless way. However, when the train’s destination is a country whose operator does not participate in ORFEUS-based exchange, the paper CIM consignment note immediately emerges. At the border between countries with different legal regime, CIM consignment note often needs to be replaced by the SMGS consignment note for the same goods. Even more, the whole set of electronic data is re-entered due to the fact that data from the country of consignor is not received.

Similar situation exists in the customs domain. The European Union applies the Union Customs Code and the goods pass internal EU borders without any delays caused by the customs procedures. However, when the same goods reach the border with the Eurasian Customs Union (EACU), it is mandatory to re-issue the customs transit declaration applicable in the jurisdiction of the EACU.

This demonstrates, that for the same goods one might need to re-issue both consignment note and the customs declaration which puts a double burden on the railway operator, in terms of work, time and costs, creates time-delays and negatively affect the quality and competitiveness of railway transport.

B. Challenges related to electronic information exchange between railways and customs authorities

Non-physical obstacles to the seamless railway border-crossing operation exist not only in railway-to-railway communication, but also in the domain of customs procedures, which sometimes present additional challenges to international railway carriers.

In accordance with the Article 183(1) of the European Commission Implementing Regulation (EU) 2015/2447\(^\text{32}\) railways provide the customs authorities with advance information (entry summary declaration) regarding the goods about to be delivered to the EU (this allows the customs authorities to perform the risk analysis and plan own activities with regard to customs checks).

Following this legal requirement, the operator carrying goods into the territory of the EU shall submit the Entry Summary Declaration (ENS) to the customs authorities 1 hour in advance. The

set of data of ENS contains information about the means of transport, i.e. the number of the train, which is not contained in the SMGS consignment note.

This is the reason why for instance the SMGS consignment note alone is not a sufficient source of information in terms of customs procedures. And as a result, additional submission of information on train number requires extraction of data from the train list or the train handover documents.

As the data should be provided to the customs one hour before actual arrival of the train (while the train is managed by the foreign railway operator and the train number is yet unknown), this particular aspect may create an obstacle for the smoothness of customs procedures.

Similarly, in accordance with the Decision No. 169 of the College of the Eurasian Economic Commission\textsuperscript{33}, railway operators carrying inbound goods to the territory of the Eurasian Customs Union (EACU)\textsuperscript{34} are obliged to provide advance information regarding the goods not later than two hours before crossing the border of the EACU. As in the case of entering the EU, the data set to be provided to the customs authorities does not comply with the data set of the SMGS consignment note. The EACU requirements provide for the submission of additional document in the format readable by the system.

One important aspect of the customs procedures in both cases is that the customs documents in question may not be directly presented by foreign railway operators (non-residents of the given customs area) which stipulates the appearance of an intermediate actors and presumably brings more complexity into the interface between railway operators and customs authorities.

Fulfillment of the abovementioned customs procedures puts an additional burden on railway business and it is visible that the electronic railway-to-railway exchange is not yet the sufficient measure in case of crossing the borders between two customs areas.

This non-physical barrier can be however overcome by extended implementation of fine-tuned solutions developed in bilateral cooperation with customs authorities to facilitate the railway border-crossing procedures. As an example of the cross-border railway cooperation on provision of data for the ENS, the information exchange between railways in Belarus and Lithuania is being performed in the following steps:

1. Neighboring railway operator sends the IFTMIN message regarding the SMGS consignment note in accordance with EDI
2. After the train arrives to the neighboring border station, the message 4770 regarding the composition of the train (train handover sheet) is sent
3. The data is automatically aggregated using IT systems and the ENS message addressed to the entry customs authority is being sent

\textsuperscript{33} http://www.eurasiancommission.org/ru/Lists/EECDocs/635151118000847728.pdf
\textsuperscript{34} The Eurasian Customs Union (EACU) is a customs union which consists of all the Member states of the Eurasian Economic Union
4. Based on system-to-system communication, the confirmation or refusal of the message is generated. The ENS is considered to be submitted

5. After physical arrival of the train to the border station in the EU territory the message about the entry of goods is sent to the local customs authority’s IT system

6. After processing the information in the customs IT system, the customs authority communicates a decision to authorize the further carriage of goods or about the detailed customs check to be conducted

7. The ENS procedure is complete.

Another challenge related to the customs procedures has its origin in the incompatibility of codification of goods. In addition to the challenges in railway-to-railway communication due to incompatible rail freight codification (as described in the section III.A.2.) the operators are currently obliged to respect the requirements of two more codification systems:

- TNVED (Commodity Nomenclature of Foreign Economic Activity) applied the customs authorities of the EACU
- CN (Combined Nomenclature) applied by the customs authorities of the EU

Such diversity obviously creates additional expenditures and to a certain extent hinders the cross-border rail freight traffic. Therefore, harmonization of the applied codification systems would significantly contribute to operational efficiency of rail freight transit.

For legal framework governing customs activities, insufficient dialogue between the legislator and railway sector might create challenges for the latter. As an example, in the recent years the European Union has been working on a new rail dedicated transit procedure, complying with the Article 233(4e) of the European Union Customs Code. From the perspective of legislators, this new procedure offers a range of benefits for customs and operators: saving costs, no new IT-Systems for operators or customs administrations, rail dedicated data management, if desired transports under customs supervision within one country, application of the procedure is independent from the way of cooperation between railway operators.

Notwithstanding the abovementioned benefits, according to the opinion of CER (one of the biggest EU railway sector organizations) the New Computerized Transit System (NCTS) promoted by the European Commission, cannot be considered as a viable option for railways.

The EU railway sector made clear at many occasions that the NCTS, even with some rail-dedicated improvements, means numerous disadvantages such as:

1. NCTS has many different types of codes, which are different from the regular codes applied by the rail sector, e.g. identification number for railway operators or railway customers

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36 The Community of European Railway and Infrastructure Companies (CER)
(Economic Operators Registration and Identification Number (EORI)\textsuperscript{38} vs. UIC-Code/customer code for consignor or consignee).

2. A NCTS declaration contains many more information boxes to be filled in. The data concerned is not available in the systems of operators.

3. Significant amount of manual (meaning, time consuming / labor intensive) entering of data even though part of the data processing can be computerized, and/or could be entered by default.

4. Longer stops at external borders with countries that are not part of the Common Transit Convention\textsuperscript{39}. Office hours / availability of customs offices have to be taken into account.

5. In case of application of NCTS with Union goods in connection to export procedures or in case of intra-community transports via third countries, inevitable stops and presentations of the goods for opening and closing NCTS. Again, office hours / availability of customs offices has to be taken into account.

The final solution is not yet defined; however, it is presumable that the railway consignment notes will not obtain the status of a customs declaration. In practice this means that railway personnel shall be obliged to issue a transit declaration for each transit carriage, which is a time-consuming process (see the NCTS disadvantages above).

At present, European railway sector organizations continue the dialogue with the European Commission regarding the NCTS reduced data set, seeking to make the NCTS declarations more adapted to the needs of railway transport and for the data set of CIM, SMGS and CIM/SMGS consignment notes would be sufficient for the NCTS declaration.

IV. Key messages to be exchanged between railways and with control authorities

A. Key messages (functions) in CIS CRT and OSJD systems

Before listing the key messages in the context of the CIS CRT and OSJD electronic information exchange, it is important to take account of the fact that the geographic scope of the both systems coincide to the great extent. Therefore, it is presumable that speaking about one of the biggest Eurasian railway systems – the 1520 mm track gauge system – CIS CRT and OSJD systems complement each other and their application in the organization of the international traffic the 1520 track gauge market is indispensable.

The key messages for the combination of systems in question are the following:

\textsuperscript{38} https://ec.europa.eu/taxation_customs/business/customs-procedures/general-overview/economic-operators-registration-identification-number-eori_en
\textsuperscript{39} Convention on a Common transit procedure of 20 May 1987
• Consignment note messages

As it has been already acknowledged in several parts of the study, the exchange of the consignment note data is of exceptional importance for international freight traffic. The consignment note serves as a legally binding contract for carriage applicable to relations between the customers (consignor and consignee) and one or more railways in the transport chain.

Even though the electronic exchange of the consignment note is not mandatory under SMGS framework. (the parties to the contract for carriage “may” apply electronic consignment note) Exchange of such data allows the parties to receive timely information about the conditions of carriage and allows them to duly perform their contractual obligations, which provides more certainty and hence efficiency and attractiveness of international railway carriage.

Another indication of the importance of the exchange of information on the consignment notes is the joint effort of 1435 mm and 1520 mm systems to implement the common CIM/SMGS consignment note. The development and implementation of CIM/SMGS consignment note due to strong business needs to eliminate the legal uncertainty and increase the efficiency of rail transportation.

• Messages regarding the Train handover sheet

The train handover sheet is an important document participating in handover of goods in international traffic, therefore electronic exchange of the train handover sheet significantly contributes to the efficiency of the freight transportation technology, specifically to the border-crossing processes allowing to reduce the time of handover of goods which significantly contributes to the quality of rail services.

Another benefit coming from the electronic exchange of train information is reduced amounts of paperwork which after its full implementation will enable not only to overcome the non-physical barrier, but at the same time will trigger reduction of costs.

The last but not least factor of importance of exchange the train handover information is that this information currently used for customs procedures. Therefore, electronic exchange of such information becomes critical not only in railway-to-railway exchange, but also in communication with control authorities.

• Messages of the vehicle tracking system

Traditionally, one of the main specificities of freight transportation in the 1520 mm network is the existence of the common fleet of freight wagons consisting of freight wagons which belong to railways of the CIS CRT (in total more than 1.49 M vehicles). The wagons of

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40 See §4 of the Article 15 of the SMGS
41 According to the latest inventory count done by the members of the CIS CRT (see Agenda Item 4 of the 67th meeting of the CIS CRT)
the pool are being operated and maintained in accordance with harmonized rules, providing significant level of legal certainty for the keepers of shared wagons. In this case, vehicle tracking system enables the keepers to monitor the movement of wagons to estimate and ensure own economic interests.

Second important aspect of the shared use of wagons is the remuneration the railways (or other keepers) receive for use of their wagons by other operators. The system of remuneration is based on several criteria, one of them being the time the wagon physically spends in one or another network of the CIS CRT members. As a result, accurate and timely information on dislocation of wagons becomes crucial element of reciprocal settlements for the use of wagons between railways.

It is also important to mention that vehicle tracking systems are important for the 1520 mm track gauge railway community because of its gradual opening to the new actors, such as private operators, private vehicle keepers, independent maintenance shops. Therefore, vehicle-tracking messages in the CIS CRT area have the same importance as the for the TAF TSI system.

B. Key messages (functions) of the TAF TSI SYSTEM

The set of electronic messages developed in the context of the TAF TSI system is intended not only to facilitate the shared use of infrastructure and eliminate non-physical barriers for multiple operators, but also for railways to improve the traceability of own activities, upgrade the quality of transportation increasing customer satisfaction level. As all of the abovementioned values are definitely applicable to any railway market regardless of its composition, it is possible to conclude that one of the biggest advantages of the telematic applications for freight – technical specification for interoperability (TAF TSI) system is its functionality that can support both the traditional railway sectors consisting of limited number of operators and infrastructure managers as well as the co-existence of multiple railway operators with multiple infrastructure managers which is the case for the opened railway markets.

Based on the description of the TAF functions (see sections II.A.1 - II.A.7) it is possible to distinguish the TAF messages which are essential to ensure smooth freight transportation:

- **Consignment note data:**

  Being the starting point for a potential customer to enter into agreement with an operator for the transportation of goods, consignment note data is useful to inform other operators and infrastructure managers in the transport chain. Additionally, the customer can also get from an IT system the status and the location of its goods. Finally, the electronic consignment note is an important prerequisite for the efficient handling of goods during customs procedures.
• **Train running:**

The importance of this set of messages for the infrastructure managers to inform the operator about the running of the train and about detected deviations from plan. Based on above information the operator can inform the customer or the consignee about the calculated arrival of goods.

• **Wagon movement:**

The subset of messages on wagon movement has a key importance as the operator can inform the other operators, wagon keepers and customers about the status and location of their wagons. Wagon exceptions and mileage can also be reported and calculated, which is essential for efficiency in wagon planning, operation and maintenance.

C. Summarized assumptions

Analysis of the existing situation in the Eurasian railway electronic information domain allows elaborating a number of conclusion regarding the key messages to be exchanged between international railway operators and between them and control authorities.

One of the most important subjects of the electronic data exchange is the harmonized exchange of the consignment note data. This element exists in all of the previously described Eurasian data exchange systems, thus it is presumed to be essential for international freight transportation by rail irrespectively of the geographical scope of application.

Considering the issues mentioned above when describing railway operator’ communication with customs authorities (see section III.B), it is possible to additionally conclude that the harmonized approach of both railways and customs authorities to the consignment note as a customs document and to data exchange process would significantly facilitate the border-crossing procedures in terms of its time hence would visibly contribute to the efficiency of the international railway traffic.

Another important set of messages in the data exchange process is messages regarding train information. Despite alternative approach to the subject in CIS CRT and TAF TSI, both those data exchange systems prescribe exchange of the train information data. With regard to the interface with customs authorities, harmonization of requirements for this specific dataset would accelerate the border-crossing procedures and would reduce the administrative costs of railway operators, allowing to globally reduce transportation costs and transit time.

Finally, the key message existing in both TAF TSI and CIS CRT systems is the message regarding movement of wagons. The aspect of traceability of wagon is critical for wagon keepers and railways for planning their economic activities (especially in the context of the shared use of vehicles). Therefore, wagons traceability provides sound contribution to the efficiency of the railway business. Moreover, in the context of the growing digitalization of any economic activity traceability becomes more and more important factor influencing railway customer
satisfaction. Traceability contributes to confidence and reliability of services, increasing attractiveness of the railway transport on the market of international transportations.

V. International standards/guidelines for the identified messages

A. UN/EDIFACT standard (OSJD framework)

The main document describing electronic messages in the OSJD railway area is the OSJD Leaflet O+R 943 “Catalogue of standardized electronic messages in UN/EDIFACT standard for international freight carriage in accordance with SMGS” which contains provisions of both mandatory and voluntary application.

The Leaflet O+R 943 applies to any international exchange of information by messages in the structure of the UN/EDIFACT standard.

The messages presented in the Leaflet are intended for use in the exchange of information between railways and railway enterprises that are part of OSJD under the conditions of the SMGS agreement, as well as between railway networks with a gauge of 1520 mm. It is assumed that the exchange is carried out between the information systems of railway enterprises for international freight traffic, and that the participants in the information interaction have concluded the relevant Exchange Agreement.

The messages contained in this Leaflet can also be used for exchange between railway customers and railways, if agreed by the partners in the contract, which describes the conditions for using the messages.

According to the Leaflet O+R 943, development and maintenance of the UN/EDIFACT standard is carried out under the control of the following organizations:

The United Nations Economic Commission for Europe (UNECE), at which a special Working Party on the Facilitation of International Trade Procedures (WP.4) was established. In 1997, the UNECE WP.4 was reformed and a new body was established with the same powers - Center for Facilitation of Practices and Procedures for Administration, Commerce and Transport (CEFACT).

The International Organization for Standardization (ISO), which operates a special Technical Committee dealing with documents and data elements for the administration and production of "Documents and data elements in administration, commerce and industry" (TC 154).

Coordination of the process of development and implementation of European standards, including in the field of standards for EDI is carried out by the European Committee for Standardization (CEN), thus, for the practical implementation of UN/EDIFACT, original documents should be used: ISO / TC 154, UNECE WP.4 (CEFACT) and CEN. In addition to them, it is necessary to bear in mind such normative and methodological documents as the UNECE WG4 Recommendations in the context of the application of the UN/EDIFACT standard.

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42 The version as of 21/04/2017 available at the official OSJD web page
43 UNECE Working Group on Water and Health
To develop electronic message support in the structure of the UN/EDIFACT standard for railway transport, the UICE Central Steering Committee established the Edifer Central Office (short for "Electronic Data Interchange in Railway Transport").

More information regarding the messages in accordance with the OSJD Leaflet O+R 943 is provided in the Annex 1 to this study.

B. Guidelines for functional and legal specifications for the Electronic CIM/SMGS Consignment Note

Guidelines for functional and legal specifications for the electronic CIM/SMGS consignment note are described in the dedicated joint CIT/OSJD working document.44

Implementation of the fully applicable electronic CIM/SMGS consignment note is defined in the third stage of the 3-staged approach:

- Application of electronic data as a supplement to the paper by the electronic CIM/SMGS consignment note where consignment note data is to be sent forward electronically in advance, which will allow all the participants in the EDI messaging system to make use of the data early on and will allow customs authorities’ security requirements to be satisfied.
- Second stage is considered to be a transitional, with application of the “mixed system”, the need of which will be studied when the results of studies of the desirability of the “mixed system” for the electronic CIM consignment note are available. However, following a recommendation of the 12th Steering Group Meeting (Bern, 2009-07-08) it was decided not to proceed with drawing up a specification for the second stage at the present time.
- Application of the electronic CIM/SMGS consignment note.

According to the joint CIT/OSJD working document, the purpose of the electronic CIM/SMGS consignment note will ensure solely electronic exchange of documentation. Exceptionally, printouts will only be produced if necessary and only at the location at which they are required.

For relationships between customers and carriers, between customs authorities and carriers and between carriers themselves, the exchange of electronic documentation must provide the same level of legal certainty as the exchange of paper documentation. That includes:

- retaining all the functionality of the paper CIM/SMGS consignment note as well as the comprehensiveness, quality and reliability of the data it contains,
- archiving the data in accordance with the provisions of the CIM Uniform Rules and of the SMGS on limitation of action, the provisions of national law and the terms of the EDI contract,
- keeping the data secure and protecting it,
- authenticating the electronic documents,
- recognizing electronic documents as having equivalent evidential value,
- having options to transform these electronic documents into legible written symbols,
- recording amendments and additions to an electronic consignment note and retaining earlier data,
− recording data exchange between the participants in the EDI,
− ensuring that the data is available.

Appendix 3 to the joint CIT(OSJD) document indicates the EDI messages to be sent in the context of the electronic CIM/SMGS data exchange are described together with the cases of their application and the parties involved, including special messages to and from customs authorities.

It should be noted that the technical specification of the electronic CIM/SMGS consignment note is not yet publicly available.

C. Legal framework for CIS CRT electronic exchange

Working documents of the CIS CRT provide for the following legal framework of the electronic exchange for the dedicated railway area. The following documents provide regulation for general subjects of electronic data exchange or individual messages:

i. Procedure for handover of wagons and containers at interstate railway border-crossing points of members of the CIS (Annex 5 to the Agreement on particularities of application of SMGS) approved by the CIS CRT;
ii. Guidelines for drawing-up of train sheet for passenger train, approved by the CIS CRT;
iii. Guidelines for drawing-up of train handover sheet and of the message “Information on vehicles and goods in train composition”, approved by the CIS CRT;
iv. Rules on operation, number-specific accounting and settling concerning the use of freight wagons of the foreign ownership, approved by the CIS CRT;
v. Algorithm of the “Number-specific based automated system of accounting and settling for use of freight wagons of the foreign ownership in international traffic”, approved by the CIS CRT;
vi. Sample book for interstate-level messages;
vii. Rules on operation, number-specific accounting and settling concerning the use of general purpose containers of railway ownership, approved by the CIS CRT;
viii. Guidelines for accounting of handing-over of freight trains, shared freight wagons and containers at interstate border-crossing points, approved by the working party of the CIS CRT;
ix. Guidelines for accounting of handing-over of passenger trains at interstate border-crossing points, approved by the CIS CRT;
x. Rules on use of passenger carriages in international traffic (PPPV), approved by the CIS CRT.

The detailed technical specifications and standards for the electronic messages to be exchanged in the context of the CIS CRT are reserved to the members of CIS CRT.
D. TAF TSI XML message standards

The scope applies to any international exchange of information by messages in the structure of the TAF TSI XML standard.

The TAF XML messages presented in this document are mandatory for railway operators, infrastructure managers and wagon keepers in Europe as they fall under the scope of the rail legislation TAF TSI.

Same messages are applicable on a voluntary basis for non-EN members of OTIF as TAF TSI has been transposed into OTIF UTP. OTIF has direct access to the Technical Documents stored on the public website of the European Union Agency of Railways (ERA) and to the Change Control Management.

Development and maintenance of the TAF TSI XML message standards has been carried out since the mid of 2000’s under the control of the International Union of Railways (UIC) in Paris. The aim of this TAF TSI XML message data catalogue (XSD) was to create object oriented elements end messages for data exchange in the European rail freight business.

In 2012 TAF data catalogue has been handed over from UIC to ERA. Since this time, the TAF data catalogue is a part of the European rail legislation TAF TSI as a so-called Technical Document which is publicly available at the European Union Agency for Railways’ website.

The ERA holds the TAF data catalogue under its sole control and manages it in a dedicated TAF Change Control Management Working Party. This Working Party releases every second year a new baseline for above data catalogue as to ensure that changes / amendments can be easily pushed towards the TAF users’ community. The Working Party is attended by representatives of the European rail industry (railway operators, infrastructure managers and wagon keepers), National Safety Authorities, IT implementers and the European Commission.

The data catalogue has its current baseline version 2.2. This means that all messages quoted in the next chapter are released with the same version. A baseline version release is compatible with the previous baseline version release.

The data catalogue defines elements and messages needed for the TAF data exchange in Europe: data cardinality, data type, code lists and all kind of data restrictions. It is object oriented which means that every element, complex type is defined only once, used however across all TAF messages. This fact makes change control management concise and the TAF implementation much easier as IT developers can start system deployments directly from this catalogue.

Moreover, the data catalogue (XSD) is the source of the derived TAF XML messages which are exchanged among the members of the TAF users’ community. The fact that every XML message is set against the data catalogue (XSD) has the advantage that valid message formatting and parsing becomes an easy task.

Annex 3 to this study should be consulted for more information concerning the messages in accordance with TAF TSI framework.

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VI. Approach towards the issues. Conclusions and recommendations

As it can be seen from the section III of the study, electronic data exchange within the Eurasian railway community faces a number of technical, organizational and legal issues to be addressed. One of the possible reasons for the most of those issues and challenges are closely linked to the historical divergence between main European track gauge railway systems, specifically – 1435 mm and 1520 mm gauges. Another significant aspect is the interface between railways and public authorities (first of all – customs).

From the previous examples it is apparent that the process of developing solutions for possible integration of different systems is on-going (for example, CIM/SMGS initiative, integration of TAF system into COTIF legislation), the implementation of measures covering all possible interests of the players is not complete.

However, it would not be reasonable to omit the fact that the integration on the regional level is far more advanced comparing to the interregional one. Analysis of the information provided in section II of the study identifies technically and legally mature systems of electronic data exchange, namely (i) TAF TSI (including the solutions developed by the railway sector) and (ii) the system implemented in the 1520 mm railway network (including all the solutions developed by OSJD and CIS CRT). Therefore, it is possible to conclude that the most significant issues on the way to globalization of the electronic data exchange for railway transport arise on the level of interface between different systems (also taking into consideration the systems developed by the customs authorities), which are already at their advanced stage of maturity.

A. Intraregional domain

Regarding possible electronic railway data exchange solutions for the region of the Asia and the Pacific, it is first of all believed that the advantages and shortcomings of the already developed systems should be taken into account. Assessment of the European experience provide for a number of considerations which might aid to avoid potential difficulties already faced by the other railway areas.

1. Uniform sustainable intraregional electronic data exchange concept

Because the development of (and later amendments to) an intraregional electronic data exchange system demands significant investments of various resources, it is recommended that the Asian – Pacific region elaborates a single unanimously supported concept and a uniform legal framework. It is believed that the intergovernmental decision followed by the consistent monitoring by the dedicated internationally established working bodies will ensure sufficient sustainability of elaboration of the elements of the data exchange system at both national and international levels.

Keeping in mind that the currently functioning European electronic data exchange systems are in principle based on intergovernmental agreements (EU legislation on TAF TSI, COTIF CIM, OSJD SMGS, decisions of the CIS CRT), one of the efficient ways towards the high-level international...
decisions would be the conclusion of an intraregional intergovernmental agreement on electronic data exchange (presumably, in the context of UNESCAP) with the potential scope incorporating data exchange between railways, between railways and public authorities, and possibly the data exchange between different transport modes (multimodal dimension). Adoption of such intergovernmental decision would demonstrate the strong commitment of the parties and would provide an impetus for the future international cooperation on this subject.

Depending on the outcomes of relevant feasibility studies, the concept of the electronic data exchange system might possibly take a “corridor-based” approach or the scope of its application can cover the intraregional railway traffic in its integrity.

It is recommended that the concept (or the intergovernmental agreement itself) includes provisions on key elements of the system. Assessment of the currently existing European systems identifies a set of principal data to be exchanged between railways and with customs authorities. In addition, the intergovernmental decision should provide for international cooperation developing relevant functional and technical specifications.

What should be once again emphasized is that to reach the ultimate goals of the electronic data exchange (especially the legal validity of the data) the future activities on development of an electronic data exchange system should involve tight cooperation between railways and customs authorities, as any diversity in implementation of various practical aspects of the system might lead to unwanted complexity precluding efficient operation of the railway transport as described in the section III.B of the study.

2. Good practice of implementation: TAF system

As suggested above, international legislation is the key step towards successful implementation and operation of the international electronic information exchanges. In addition to this and regardless of the adopted fundamental approach to the railway market (be it liberalized model comprising of multiple national operators and other players or the maintaining integrated railway companies), there are some other elements which should be evaluated and considered for the electronic information exchanges to be successfully implemented.

The following sample of a good practice refers to the approach implemented for the TAF TSI-based system:

(a) Governance
An efficient governing structure should be set up to oversight above implementation and operation. This governance should be ideally composed of:

- the body which is responsible for the legal act (lead, acting as project sponsor)
- representatives of participating member states
- representatives of international rail transport organizations or institutions
- group of railway experts from IT, traffic operation and customs departments of railway operators, infrastructure managers, wagon keepers or authorities
- group of rail experts from customers

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46 See Chapter 4 of the study.
group of trusted IT implementation companies

There should be a general assembly responsible for the decision-making and project steering and a given set of subordinated working groups where experts develop dedicated and more detailed items. The working groups would typically deal with subjects related to different data exchange protocols, operational rules, customs rules etc.

For the implementation and operation phases, the project sponsor should have a dedicated bureau with permanently employed railway experts.

(b) Masterplan
Aforementioned governing structure should be mandated to draft a master plan for the implementation of the functions covering the electronic information exchanges. Railway operators, wagon keepers and infrastructure managers of the dedicated geographic area should contribute to that master plan by reporting the deadlines for local implementation of the abovementioned functions. Once all contributions received, the project sponsor would merge them into a consolidated master plan which should later become the basis for implementation. When the consolidated master plan is approved by the general assembly, this will be the starting point for the implementation of the project.

(c) Monitoring of implementation
It should be the task of the project sponsor to monitor as accountable body the implementation of the functions covering the electronic information exchanges against the master plan and to take corrective measures (together with the general assembly) if deviation from plan is detected.

Figure 9: Suggested governance structure

(d) Dissemination of knowledge
It is advisable that the project sponsor should disseminate (with the help of the representatives from member states) the content of electronic information exchanges to smaller railway operators, infrastructure managers or wagon keepers which cannot be represented in above governance so that they would be informed of their obligations in terms of implementation of the system.
(e) Funding
To guarantee a smooth and successful implementation and operational running of above functions, funding mechanisms should be available for those smaller railway operators, infrastructure managers or wagon keepers which cannot profit directly from state subventions to develop their IT systems. The funding should be done by an international organization and should be at reasonable interest rates/entering barriers as to ensure that also smaller companies can profit from it.

To ensure coherency and efficiency in funding and spending, the project sponsor should be empowered to make a decision on funding allocation.

(f) Trusted IT implementation companies
The European experience has demonstrated that without the support of neutral and trusted large-scale IT companies the implementation of above functions would be very complicated. For this reason, such IT companies should be founded by the railway operators, infrastructure managers to ensure that functions covering consignment note, path request, train running reporting and wagon reporting are implemented and operated in a robust and transparent manner. Presence of such IT companies would attract smaller and larger companies involved in Eurasian rail transport for better data sharing to the customers. The result would be that smaller railway operators would be able to join the implementation and operation of such a system thank to the ability to share same communication interface and IT system with the larger railways. They would also be able to make value proposal for the larger operators in the transport chain. On the other hand, the larger railways often rely on the “first/last mile services” provided by smaller operators. Again, in this case, same communication interface and IT system could be shared.

This would definitely lead to higher acceptance level of railway transport and to increased share of railway transportation on the market.

(g) Standard setting and maintenance
Given the heterogeneity and the large number of potentially involved stakeholders it is of critical importance to set and efficiently maintain standards for the implementation and operation of functions covering the electronic information exchanges. As the operation of above functions will happen in an IT environment where product lifecycles are rather short (3-5 years), it seems to be crucial to have a central body which will be responsible for the efficient release maintenance of the electronic information exchange standards: the central body should be ideally the project sponsor supported by dedicated subgroups specified in the section IV.A.2.(a)

Within the standard setting and maintenance activities the interface between existing large scale electronic information exchange systems (such as in CIS, EU etc.) should be addressed and their interoperability (in terms of processes and protocols) should be elaborated.

Finally, the standard setting and maintenance activities should also encompass the allocation and maintenance of reference data for company code and location codes of all the companies.
B. Eurasian (interregional) domain

Considering accelerating development of freight transport corridors, which originate in Asian and Pacific regions, transiting the 1520 mm railway network of the CIS CRT members with the final destination in Western Europe, it would be logical to estimate that in order to facilitate the interregional freight traffic, the Asian-Pacific data exchange system should be linked to other Eurasian systems.

The steps towards closer cooperation between Eurasian railways include; China’s readiness to apply CIM/SMGS for all container carriages to and from Europe as of 1 May 2017\(^\text{47}\). This could give additional impulse to further development and practical implementation of the electronic CIM/SMGS consignment note. Given the fact that a number of Member States of the ESCAP are also active members of OSJD and COTIF, ESCAP might consider options to consult, share experience and cooperate with the abovementioned organizations possibly starting from the subject of the electronic exchange of the consignment note data.

In addition, steps towards the exchange of the complete set of key messages referred to in the section IV of this study should be taken in collaboration with other international organizations and institutions (in particular with CIT, ERA, CIS CRT). The scope of the collaboration should include:

- as a first step, the mapping of the various messages between TAF TSI, the CIS CRT and OSJD systems.
- second step, the mapping of railway freight transportation processes between aforementioned systems should be done.

The mapping of messages and processes should lead to better understanding of what actions are needed to reach harmonization between the systems (by safeguarding investments already done) and pave the way for the future smooth data exchange along the Eurasian rail freight corridors.

Annex 1. Library of electronic messages in accordance with OSJD Leaflet O+R 943 “Catalogue of standardized electronic messages in UN/EDIFACT standard for international freight carriage in accordance with SMGS”

A. Components of the UN/EDIFACT

OSJD leaflet O+R 943 provides the description of the UN/EDIFACT three main components:

1) The data elements contained in the dictionary (or in another way, the directory) are, as it were, the words of the language with which the data is transmitted;

2) The syntax of the language that plays the role of the grammar and is a set of rules, according to which the structure of messages is formed;

3) A dictionary (library, reference book) of standard messages serving as a reference for selecting specific commercial (transport) documents built according to the rules of syntax.

A data element is a data unit for which methods of identification, description, and representation of a value are defined. The Element Directory is specified by the UNECE WP.4 (hereinafter referred to as CEFACT) and includes identifiers (qualifiers) and a description of the elements in accordance with the division into the following groups:

Group 0 - Service Data Elements
Group 1 - Documentation, references
Group 2 - Date, time, time periods
Group 3 - Parties, addresses, points, countries
Group 4 - Articles, circumstances, conditions, instructions
Group 5 - Amount of expenditure, interest
Group 6 - Indicators of measures, quantities (other than money)
Group 7 - Products and products: descriptions and notations
Group 8 - Types and means of transport, containers
Group 9 - All other data elements (customs and state formalities, etc.)

A segment is a predefined set of functionally interrelated data elements identified by their sequential positions in the set (for example: partner, address and place, date, period and their format, document with its requisites, currency with its characteristic, etc.). Each segment has a structure defined and described in the UN/EDIFACT segments directory. One message should distinguish between two types of segments - service and application. Service segments always begin with the letters UN (United Nations) and refer to the syntax. Application segments contain
real data required by application programs. Their name TAG is an abbreviation of the full name in English (DOC for the document, NAD for the partner and address, LOC for the location, etc.).

Segmented groups. In one message, the segments can be grouped together to describe not only the essence, but also its characteristics. For example: a segment group that in the chapter contains the NAD segment (partner name) and is complemented by the DOC segments (documents and LOC (location)), defines not only the partner, but also his documents and location.

Element in the segment. Two types of elements should be distinguished in the segment: a single element (for example: country code, code for the name of the sender or recipient partner, etc.) and a composite element, which consists of different or identical elements (for example: a date consisting of the day of the month and year, an address composed of several lines - a house, a street, a city, etc.).

Standard messages. An exchange message is understood as an "ordered data set intended for the transmission of information". The message in the structure of the UN/EDIFACT standard is a set of segments located in the sequence specified in the message directory. The set begins with the message header (UNH segment) and ends with the end of the message (UNT segment).

An exchange is the transfer of a message from the computer of one partner to the computer of another (from one information system to another), in which a combination of data elements constructed in a certain way is transmitted as a set of segments.

B. Directories and catalogues

The UN/EDIFACT standard contains directories and catalogues, which are updated at least once a year.

Directory of Elements of Foreign Trade Data - UNTDED. Standard data elements can be used for any method of data exchange, whether on paper or electronic data transfer. In addition to the data elements, a section with references to codes and international classifiers of general purpose is included in the directory, which can be used to represent data in coded form.

Directory on the electronic exchange of trade (transport) data - UNSID.

The directory contains general semantic and syntactic rules for performing the functions for transferring standard data. The directory includes, in particular, syntactic rules ISO 9735 (GOST 6.20.1.90). Directories include message libraries (EDMD), segments (EDSD) and feature codes (UNCL).

The data segment catalogue (EDSD) includes segment assignments, segment names (TAGs) and their codes, segment specifications (codes, names, statuses, field lengths).

Catalogue of composite data elements (EDCD) for use in various segments for reflection in trade and transport information segments.

The message catalogue includes standard messages that have received the appropriate status and are recommended for use by UNECE and the European Union (CEN).
The standard electronic message in the Leaflet O+P 943 is presented in the form of a Message-Guidelines description and contains the data:

- about the branch diagram (Message Branching Diagram);
- description of the segments;
- a list of codes or names of codifiers (classifiers).

A branching diagram is a pattern in which segments and groups of segments included in a message are arranged in a certain order among themselves and by levels. In the text of the description, the location of the segment on the chart is determined by the symbols: m. mm. AAA, where:

m is the level at which this segment is located;
mm - the number of the segment group to which the segment belongs;
AAA is the segment name (TAG) in accordance with the Segment Catalog.

For example: 1.03.LOC means that the LOC segment is at the first level and enters the third segment group.

It should be kept in mind that segments of the same name (having one TAG) can be present in different branching coordinates. In doing so, they perform a different semantic function, being identical in structure.

For example: LOC segment "location", depending on its location on the diagram and belonging to the group, can locate the departure, arrival or transit stations, as well as the location of the customs office, the consignor, the forwarder, etc.

The service part of the segment description indicates the number of allowed repetitions at the specified location and the status of the segment:

M - mandatory;
C - conditional, optional, which is given under certain circumstances.

The description of the segments contains the detailed (element-wise) content of the segment and the order of the input of the variable data in relation to its location. In this case, the description of the same segment (having the same name - TAG) will differ depending on its location or repetition (s) of use.

Elements of data or a group of elements - a composition - in a segment are given in exact accordance with its structure. For elements or a group of elements at their particular place, as well as for segments, their status is indicated:

M - mandatory;
C - conditionally required.

For each element, the presentation of data values is indicated:

a - alphabetic signs;
n - numeric characters;
an - alphanumeric characters;
a3 - 3 alphabetic characters of constant length;
n3 - 3 digital signs of constant length;
an3 - 3 alphanumeric characters of constant length;
a ... 3 - up to 3 alphabetic signs;
n ... 3 - up to 3 numeric characters;
an ... 3 - up to 3 alphanumeric characters.

In the notes to a group of segments, segments, individual elements and groups of elements, the source and procedure for obtaining data, codes or other (textual) information is given. Here are the columns of source documents, codes, code lists, classifiers, and also the lines and requisites of the corresponding electronic messages of national information systems.

It should be borne in mind that the description of messages provides the possibility of using, along with standard international codes, national and local codes, while respecting the structure of EDIFACT and the opportunities that are provided to them.

For each message: "Guidelines to working with a description of the message."

**Description of segments.** The description of the message is reduced to describing the data, reduced to standard segments or segment groups. In the description of segments, data elements and groups of data elements - compositions are presented. Data elements specify codes that qualify the specification of the corresponding data element. The sequence of data elements within a single segment is an immutable hierarchical structure.

The description specifies the index, field, status and name of the element (group of elements), as well as the meaning and guidance for use. In addition, for meaningful elements, the SMGS consignment note graph to which this data refers is indicated.

In the description of the message, in addition to the standard EDIFACT Data Element Library, lists of codes adopted jointly by OSJD and UIC (see the relevant Leaflets) are used and not provided for by these documents. At the same time, OSJD (code 288) is indicated as the responsible organization. In all cases, when the codes necessary for use do not belong to the EDIFACT data element library, the description is followed by a link via e-d.1131-the name of the code list and e.g. 3055-the organization responsible for the code list.

**Information about the status and application indicators.** The status represents part of the EDIFACT standard and indicates the minimum required to fulfill the requirements for the structure of the message. For segments, segment groups, data elements, and groups of items, a status pointer is used in the message description:

M = Mandatory;
C = Conditional.

The M status indicator specifies the presence of the message.

The status indicator C in a particular application can be represented through an application pointer (user) with the values R, D, O or X. The status indicator C is used by agreement between the parties for exchange.
Segments without including at least one data item should not be used.

<table>
<thead>
<tr>
<th>EDIFACT</th>
<th>Application</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>M       = Mandatory</td>
<td>M = Mandatory</td>
<td>Indicates that the data element is mandatory in the message</td>
</tr>
<tr>
<td>C       = Conditional</td>
<td>R = Required</td>
<td>Indicates that the data element must be transmitted according to the conditions of this application</td>
</tr>
<tr>
<td>C       = Conditional</td>
<td>D = Depending</td>
<td>Indicates that the use of the data item depends on certain conditions. The conditions should be specified in the relevant application manual.</td>
</tr>
<tr>
<td>C       = Conditional</td>
<td>O = Optional</td>
<td>Indicates that the data item is sent at the discretion of the sender</td>
</tr>
<tr>
<td>C       = Conditional</td>
<td>X</td>
<td>Specifies that the data item is not used in this application</td>
</tr>
</tbody>
</table>

C. Message library

The message library is a list of agreed messages and their full description in accordance with paragraph 7. The contents of the library are open for expansion as new messages are developed and adopted by the relevant body.

The of messages currently listed in the OSJD Leaflet O+R are provided in the Annex 1 to this study.

D. Structure of information about the message

Information about the message contains the following headings:

Message title - the full name of the message

**Message index:**
- **Version:** The version code starts with one and increments by 1 for each change
- **Basic version:** the version of the basic UNSM in the UNECE catalog is indicated.
- **Function:** The application function of the message is specified
- **Source:** Indicates the initial source of information for the formation of a message
- **Original document:** Specifies the document on the basis of which a message is generated
- **Developer:**
- **Date of adoption:**
- **Changes:**

E. Information about messages

1. **Name of the message:** Report on the shipment of the goods (formation of the transport dossier for transportation) for the SMGS consignment note or CIM / SMGS consignment note; for the packing list.
**Message index:** IFTMIN

**Version:** 1 revision 1

**Basic version:** D.97A 9

**Function:** Transfer the contents of the contract of carriage (consignment note). Form in electronic form a transport dossier.

**Source:** The consignor, freight forwarder, departure station

**Original document:** Consignment SMGS or CIM / SMGS.

**Developer:**

**Date of adoption:** 17.05.2001.

**Changes:**

2. **Name of the message:** Message for correction of the transport dossier (SMGS consignment note) on the way and on arrival.

**Message index:** IFTMCS

**Version:** 1 revision 1

**Basic version:** D.97A 9

**Function:** Change in the contract of carriage and electronic dossier in connection with technology, conditions, events and orders on the way and on arrival.

**Source:** Stations of the operation

**Original document:** SMGS consignment note

**Developer:**

**Date of adoption:** 12.09.2001

**Changes:**

3. **Name of the message:** Message - notification of the crossing of the border, the arrival at the destination (delivery of cargo).

**Message index:** IFTMAN

**Version:** 1 revision 1

**Basic version:** D.97A

**Function:** Notice of crossing the border, of arrival at the destination (delivery of cargo)

**Source:** Railway station

**Original document:** Universal transport document, forwarding instruction

**Developer:**
Date of adoption: 06.11.2002

Changes:

4. **Name of the message**: A message confirming / refusing to receive the message.
   
   **Message index**: CONTRL
   
   **Version**: 1 revision 1
   
   **Basic version**: 89.2
   
   **Function**: It is intended to notify railway enterprises of the receipt of messages and the presence of syntactic errors in them.
   
   **Source**: EDI server
   
   **Original document**: EDI message
   
   **Developer**: 
   
   **Date of adoption**: 
   
   **Changes**: 

5. **Name of the message**: Report on the train composition for railways with a gauge of 1520 mm in the SMGS conditions.
   
   **Message index**: IFCSUM
   
   **Version**: 1 revision 1
   
   **Basic version**: D.99B 10
   
   **Function**: It is intended for preliminary transmission of data on the composition of a freight train in international traffic between railways belonging to the OSJD according to the SMGS rules and with a gauge of 1520 mm.
   
   **Source**: Railway station
   
   **Original document**: Transportation dossier
   
   **Developer**: 
   
   **Date of adoption**: 23.05.2002
   
   **Changes**: 

6. **Name of the message**: Message about transfer list
   
   **Message index**: IFCSUM
   
   **Version**: 1 revision 1
   
   **Basic version**: D.99B
**Function:** It is intended for transferring the transfer list data to the transmitted cargo shipments from the railway of one country to the railway of another country in international traffic between the railways belonging to the OSJD according to the SMGS rules and for roads with a track gauge of 1520 mm.

**Source:** Border railway station

**Original document:** Transportation dossier

**Developer:**

**Date of adoption:** 19.05.2005

**Changes:**

7. **Name of the message:** Report on the customs declaration

**Message index:** CUSDEC

**Version:** 1 revision 1

**Basic version:** D.97A

**Function:** Provides preliminary information on goods and vehicles prior to crossing the customs border, necessary for use in customs authorities for the purpose of processing the arrival of goods and vehicles.

**Source:** Railway station

**Original document:** Delivery control document

**Developer:**

**Date of adoption:**

**Changes:**

8. **Name of the message:** Invoice message

**Message index:** INVOIC

**Version:** 1 revision 1

**Basic version:** D.97A

**Function:** Provides preliminary information on the data of the invoice, intended for use by railway organizations with a view to registering the arrival of goods and vehicles.

**Source:** Railway station

**Original document:** Invoice

**Developer:**

**Date of adoption:**

**Changes:**
9. **Name of the message**: Receive acknowledgment message and application error message  
**Message index**: APERAK  
**Version**: 1 revision 1.11  
**Basic version**: D.97A  
**Function**: Informing the sender of the original message that the addressee received it by the application, the failure due to the presence of errors detected during the processing of the message by the application.  
**Source**: EDI server  
**Original document**: EDI message  
**Developer**:  
**Date of adoption**:  
**Changes**:  

10. **Name of the message**: Report on the train composition for railways with a gauge of 1520 mm in the SMGS conditions.  
**Message index**: IFCSUM  
**Version**: 1 revision 1  
**Basic version**: D.97A  
**Function**: It is intended for preliminary transmission of data on the composition of a freight train in international traffic between railways belonging to the OSJD according to the SMGS rules and with a gauge of 1520 mm.  
**Source**: Railway station  
**Original document**: Transportation dossier  
**Developer**:  
**Date of adoption**:  
**Changes**:  

11. **Name of the message**: Report on the commercial act of the CIM / SMGS, the general form of the SMGS act in transit or on arrival.  
**Message index**: IFTMCS  
**Version**: 1 revision 1  
**Basic version**: D.97A
**Function:** It is intended for the transmission of data on the commercial act of the CIM / SMGS, the general form of the SMGS act drawn up on the route or on arrival.

**Source:** Act drawing station

**Original document:** Commercial act or act of general form

**Developer:**

**Date of adoption:**

**Changes:**
Annex 2. Provisional list of messages to be bilaterally used by railways in cross-border exchange of freight trains within the framework of the CIS CRT

<table>
<thead>
<tr>
<th>Message title:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Telegram – complete train sheet, including wagon check order mark</td>
</tr>
<tr>
<td>2.</td>
<td>Message on the composition of the train, containers, shipments and conveyances handed over from the territory of one state to another</td>
</tr>
<tr>
<td>3.</td>
<td>Message on the adjustment of the train composition, containers, shipments and conveyances accepted by the state from the transferring state</td>
</tr>
<tr>
<td>4.</td>
<td>On the “additional handover” of wagons which were not previously accepted in accordance with the agreed train handover sheet</td>
</tr>
<tr>
<td>5.</td>
<td>Receipt of admission</td>
</tr>
<tr>
<td>6.</td>
<td>Agreed data on the adjustment of the uniform wagon list transmitted via the interstate border-crossing point, and also in the case of lack of coordination on the train</td>
</tr>
<tr>
<td>7.</td>
<td>Regarding acceptance / handing-over of containers in interstate communication</td>
</tr>
<tr>
<td>8.</td>
<td>Harmonized data on the adjustment of the numbered list of containers transmitted by the IHR</td>
</tr>
<tr>
<td>9.</td>
<td>About the handing-over of a train to the adjacent railway with information about locomotives</td>
</tr>
<tr>
<td>10.</td>
<td>About the acceptance of a train to the adjacent railway with information about locomotives</td>
</tr>
<tr>
<td>11.</td>
<td>About the departure of a train towards the interstate division point with information about locomotives</td>
</tr>
<tr>
<td>12.</td>
<td>On the change of the index of the train</td>
</tr>
<tr>
<td>13.</td>
<td>On temporary leave of the train without traction</td>
</tr>
<tr>
<td>14.</td>
<td>On cancellation of a previously transmitted message</td>
</tr>
<tr>
<td>15.</td>
<td>Correction of the wagon information model of the road (WIMR) regarding the size of the loaded and empty run of the wagons</td>
</tr>
<tr>
<td>16.</td>
<td>Information on the presence of faulty cars in the train</td>
</tr>
<tr>
<td>17.</td>
<td>Request for inquiries with general information about the operation of objects of a adjacent road</td>
</tr>
<tr>
<td></td>
<td>Request for information about the composition of trains and operations with them on the adjacent railway</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>18.</td>
<td>Request for information:</td>
</tr>
<tr>
<td></td>
<td>on operations with the wagons;</td>
</tr>
<tr>
<td></td>
<td>on the current state of the wagon;</td>
</tr>
<tr>
<td></td>
<td>on the duration of presence of the wagon in the network;</td>
</tr>
<tr>
<td></td>
<td>on the mileage of the wagon;</td>
</tr>
<tr>
<td></td>
<td>on information about operations with the container.</td>
</tr>
<tr>
<td>19.</td>
<td>Request for a report from the archive about operations with the wagon within the adjacent railway (according to the agreed list of users)</td>
</tr>
<tr>
<td>20.</td>
<td>Request to receive the registrar of received and sent messages from information systems</td>
</tr>
<tr>
<td>21.</td>
<td>Request message to search wagons and their location</td>
</tr>
<tr>
<td>22.</td>
<td>Response message about the location of wagons found</td>
</tr>
</tbody>
</table>
Annex 3. Structure of TAF TSI messages

A. General structure

The TAF TSI messages consist always of a so-called message header and a message body (or payload). All TAF TSI messages (as they are object oriented) have the same message header:

*Figure 10. TAF message header as XSD*
B. Structure of individual TAF TSI XML messages

The individual TAF TSI XML messages have the following structures (message headers are the same but message bodies are different):

1. Consignment Order Message

```xml
<xs:element name="ConsignmentOrderMessage">
    <xs:complexType>
        <xs:annotation>
            <xs:documentation>Used for all messages</xs:documentation>
        </xs:annotation>
        <xs:sequence>
            <xs:element ref="MessageReference"/>
            <xs:element ref="MessageRoutingID" minOccurs="0"/>
            <xs:element ref="SenderReference" minOccurs="0"/>
            <xs:element ref="Sender"/>
            <xs:element ref="Recipient"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
```

element ConsignmentOrderMessage
element ├── MessageHeader
element │   ├── COMS
element │   │   └── COM_Header
element │   │       └── SendingRU (CompanyCode)
element │   │       └── ReceivingRU (CompanyCode)
element │   │       ├── MessageReferenceNumber (restriction of xs:string)
element │   │       └── ShipmentType (restriction of xs:token)
element │   │       └── ConsignmentOrderType (restriction of xs:token)
element │   │       └── DossierNumber (restriction of xs:string)
element │   │       └── VersionNumber (restriction of xs:int)
element │   │       └── ChangeLog
element │   │       └── AcceptancePoint
element │   │       └── Station (extension of LocationIdent)
element │   │       └── ProductionStation
element │   │       └── PreviousResponsibleRU (CompanyCode)
element │   │       └── AcceptanceDate (restriction of xs:dateTime)
element │   │       └── ResponsibleRU (CompanyCode)
element │   │       └── COM_ConsignmentNumber (restriction of xs:string)
<table>
<thead>
<tr>
<th>Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>ForwardingTrainNumber</td>
</tr>
<tr>
<td>LoadingFacility</td>
</tr>
<tr>
<td>DeliveryPoint</td>
</tr>
<tr>
<td>Station</td>
</tr>
<tr>
<td>ProductionStation</td>
</tr>
<tr>
<td>NextResponsibleRU</td>
</tr>
<tr>
<td>LoadingFacility</td>
</tr>
<tr>
<td>Customers</td>
</tr>
<tr>
<td>ConsignorDeclarations</td>
</tr>
<tr>
<td>WagonGroupInfo</td>
</tr>
<tr>
<td>AttachedDocuments</td>
</tr>
<tr>
<td>DocumentType</td>
</tr>
<tr>
<td>DocumentInformation</td>
</tr>
<tr>
<td>Quantity</td>
</tr>
<tr>
<td>DocumentTypeDescription</td>
</tr>
<tr>
<td>Code</td>
</tr>
<tr>
<td>CommercialSpecifications</td>
</tr>
<tr>
<td>PrincipalRU</td>
</tr>
<tr>
<td>Location</td>
</tr>
<tr>
<td>CustomsData</td>
</tr>
<tr>
<td>SimplifiedTransportProcedure</td>
</tr>
<tr>
<td>PrincipalRU</td>
</tr>
<tr>
<td>CustomsSurveillance</td>
</tr>
<tr>
<td>CustomsEndorsements</td>
</tr>
<tr>
<td>RU_Declarations</td>
</tr>
<tr>
<td>RU_Declaration</td>
</tr>
<tr>
<td>DeclaringRU</td>
</tr>
<tr>
<td>RU_DeclarationCode</td>
</tr>
<tr>
<td>DeclarationText</td>
</tr>
<tr>
<td>DifferentAcceptance</td>
</tr>
<tr>
<td>DifferentAcceptancePoint</td>
</tr>
<tr>
<td>DifferentAcceptanceDate</td>
</tr>
<tr>
<td>Wagons</td>
</tr>
<tr>
<td>WagonPreviousNumberFreight</td>
</tr>
<tr>
<td>ReferenceOriginalCN</td>
</tr>
<tr>
<td>AgreedTimeOfDelivery</td>
</tr>
</tbody>
</table>

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2. Path Request

element **PathRequestMessage**
  element |---MessageHeader
  element |---AdministrativeContactInformation
  element |---Identifiers
  element |---MessageStatus ( restriction of xs:token )
  element |---TypeOfRUHarmonization ( TypeOfRUHarmonizationCode )
  element |---TypeOfIMHarmonization ( TypeOfIMHarmonizationCode )
  element |---CoordinatingIM ( CompanyCode )
  element |---LeadRU ( CompanyCode )
  element |---TypeOfRequest ( TypeOfRequestCode )
  element |---TypeOfInformation ( TypeOfInformationCode )
  element |---TrainInformation
  element |---PathInformation
  element |---NetworkSpecificParameter
  element |---FreeTextField ( FreeText )

element **PathCanceledMessage**
  element |---MessageHeader
  element |---AdministrativeContactInformation
  element |---Identifiers
  element |---MessageStatus ( restriction of xs:token )
  element |---TypeOfRequest ( TypeOfRequestCode )
  element |---TypeOfInformation ( TypeOfInformationCode )
  element |---CoordinatingIM ( CompanyCode )
  element |---LeadRU ( CompanyCode )
  element |---AffectedSection
  element |---FreeTextField ( FreeText )

element **PathConfirmedMessage**
  element |---MessageHeader
  element |---AdministrativeContactInformation
  element |---Identifiers
  element |---MessageStatus ( restriction of xs:token )
  element |---TypeOfRequest ( TypeOfRequestCode )
  element |---TypeOfInformation ( TypeOfInformationCode )
  element |---CoordinatingIM ( CompanyCode )
  element |---LeadRU ( CompanyCode )
  element |---AffectedSection

element **PathDetailsMessage**
  element |---MessageHeader
  element |---AdministrativeContactInformation
  element |---Identifiers
  element |---MessageStatus ( restriction of xs:token )
3. Train Preparation
element |--- TransportOperationalIdentifiers ( extension of CompositIdentifierOperationalType )
element |--- OperationalTrainNumberIdentifier
element |--- OperationalTrainNumber ( String1-8 )
element |--- ReferenceOTN
element |--- TransferPoint ( LocationIdent )
element |--- TransfereeIM ( CompanyCode )
element |--- TrainCompositionJourneySection

element TrainReadyMessage
element |--- MessageHeader
element |--- MessageStatus ( restriction of xs:token )
element |--- TransportOperationalIdentifiers ( extension of CompositIdentifierOperationalType )
element |--- OperationalTrainNumberIdentifier
element |--- ReferenceOTN
element |--- ResponsibleRU ( CompanyCode )
element |--- TrainContactDetails ( CommunicationRefID )
element |--- TrainLocation ( LocationIdent )
element |--- CountryCodeISO ( extension of CountryIdentISO )
element |--- LocationPrimaryCode ( Numeric1-5 )
element |--- PrimaryLocationName ( FreeText )
element |--- LocationSubsidiaryIdentification
element |--- TrainReadyStatus
element |--- TrainReady ( restriction of xs:integer )
element |--- TrainDelay
element |--- DelayCause ( DelayCode )
element |--- TransferPoint ( LocationIdent )
element |--- TransfereeIM ( CompanyCode )
element |--- TrainStartTime ( xs:dateTime )
element |--- TrainReadyTime ( xs:dateTime )

4. Train Running

element TrainRunningForecastMessage
element |--- MessageHeader
element |--- MessageStatus ( restriction of xs:token )
element |--- TrainOperationalIdentification
element |--- OperationalTrainNumberIdentifier
element |--- ReferenceOTN
element |--- ResponsibleRU ( CompanyCode )
element |--- TrainLocationReport
element |--- TransferPoint ( LocationIdent )
element |--- TransfereeIM ( CompanyCode )

element TrainRunningInformationMessage
element |--- MessageHeader
5. Wagon Movement

- **WagonDeliveryNoticeMessage**
- **WagonDepartureNoticeMessage**
- **WagonDeviationMessage**
- **WagonExceptionMessage**
- **WagonInterchangeNoticeMessage**
6. Reference data

element Location (LocationIdent)
  element |---CountryCodeISO (extension of CountryIdentISO)
  element |---LocationPrimaryCode (Numeric1-5)
  element |---PrimaryLocationName (FreeText)
  element |---LocationSubsidiaryIdentification