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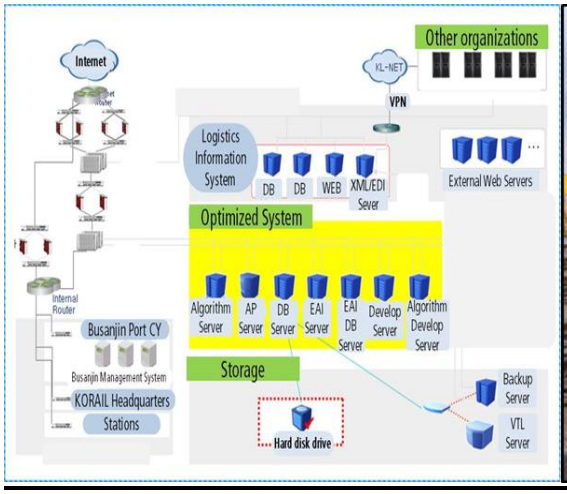
Economic and Social Commission for Asia and the Pacific

KCTTI CCTT

Report on Information Technology for Seamless Rail-Based Intermodal Transport Services in Northeast and Central Asia



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1. Introduction

Liberalization and integration of international trade, increasingly growing cross-border cooperation speed up economic development of the countries of Asia and the Pacific.

Time and cost of goods transit are among the critical components shaping international trade. Therefore, container transportation by various modes of transport lays a significant role on the main international trade routes on the Eurasian continent. The long-distance railway transport connecting Asia and Europe is the main alternative to deep-sea shipping operations through the Suez Canal. Countries of Northeast and Central Asia largely rely on railway links, including the Trans-Siberian Railway, for their international trade with Europe.

At present, regular container block trains operate to transport goods between China and Europe in both directions[1].

The Trans-Siberian Route is also used for the transportation of goods to Central Asia, other countries of the Commonwealth of Independent States (CIS) and Europe from Japan and the Republic of Korea (see Figure 1).

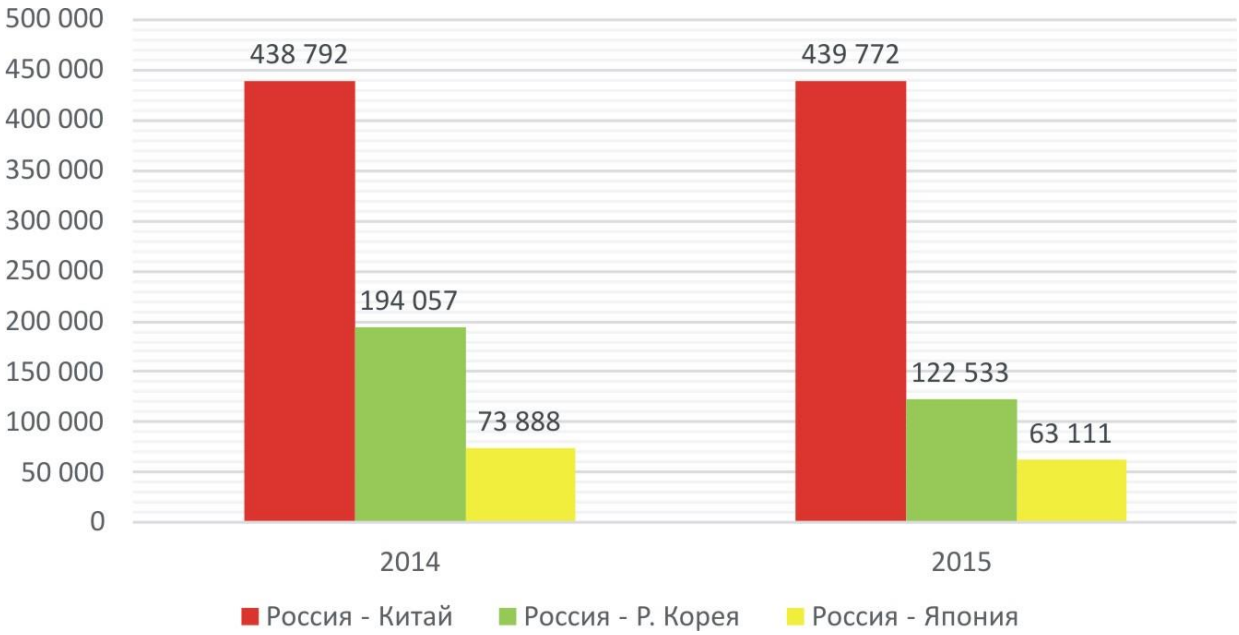

Figure1. Container freight transportation between the Russian Federation and Asia-Pacific countries, 2014 – 2015, TEU

At present, China is the main generator of container flow in Euro-Asian trade with estimated 60% of total container traffic. The main volume of containers is currently transported by sea.

[1]Europe – China routes: Duisburg - Chongqing; Hamburg - Wuhan; Brest, Dobra - Zabaikalsk; Hamburg - Zhengzhou; Madrid - Yiwu; Duisburg - Korla; Lodz - Chensen; Hamburg - Lanzhou;
China - Europe routes: Zhengzhou - Hamburg; Suzhou - Warsaw; Changsha - Duisburg; Changsha - Warsaw; Nakhodka - Dobra, Brest; Wuhan – Dostyk - Pardubice; Kuitun - Tbilisi; Chengdu - Dostyk - Lodz; Chongqing - Dostyk - Duisburg; Yiwu – Madrid; Wuhan - Hamburg; Hefei - Hamburg; Chengdu - Nurnberg.

The container flows by rail in trade with China are primarily directed to the central parts of the country, to a lesser extent to its southern parts to the factories of South China, and to ports for further transit to other countries of Asia and the Pacific.

Given that overall directions of economic development of China are aimed achieving balanced economic development and growth in the western areas of the country, international container flows operated on the Trans-Siberian and other railways are expected to grow in the long run.

Despite this fact, freight traffic is being slowed on the routes passing through the national borders with tough customs control and regulations implying a large number of bureaucratic and technological procedures. According to estimates of the Coordinating Council for Trans-Siberian Transportation (CCTT), Customs clearance and documentation-related formalities account for nearly 39 % of transit time.

Given the global coverage of the existing logistics systems, cross-border facilitation procedures are playing crucial role in international trade, the effect of border-crossing facilitation is more as the effect of customs tariff reduction.

Taking this into account, enhancing efficiency of international railway cargo transport should be recognized as a priority for railway transport development. Establishing of a seamless transportation system in Eurasia, introduction of paperless technologies with the use of electronic consignment and accompanying documentations are essential yet challenging. Unification of requirements would allow achieving significant progress in the development of international rail-based cargo transport between Europe and Asia.

Further development of rail transport between Northeast and Central Asia and Europe also requires development of seamless multimodal transport services with railway, maritime and road components.

In this connection, UNESCAP initiated the project entitled ‘Development of Seamless Rail-Based Intermodal Transport Services in Northeast and Central Asia for Enhancing Euro-Asian Transport Linkages’ to explore and recommend the ways of improving interconnections between different modes of transport involved into multimodal operations in the above-mentioned subregions.

This study was conducted jointly by UNESCAP and the Coordinating Council for Trans-Siberian Transportation in the framework of this project to review the practices in application of modern information technologies in rail transport, including their use in the region of Northeast and Central Asia, and the application of technologies for the facilitation of border-crossing procedures. It aims to identify ways for enhancing efficiency of information technologies in railway and other modes of transport.

Based on the analysis of: international practices in simplification and harmonization of documents and formalities for multimodal cargo transport by rail through the sea ports and land border crossings, it aims at developing recommendations on:

- harmonization of electronic systems applied for railway and multimodal transport in different countries;
- increasing coordination among various modes of transport through the use of information systems;
- application of information technologies to streamline and facilitate border-crossing procedures in rail transport.

The recommendations could further serve as a reference tool for relevant government authorities of the countries concerned in developing and implementing policies for increasing efficiency of railway-centred multimodal transport.

2. Overview of existing electronic information systems used by the railways of Kazakhstan, Mongolia, the Republic of Korea and the Russian Federation

Electronic document flow in railway transport is a new type of technology designed for processing electronic documents in freight transport, for delivery and issuance of these documents by tenancy to the parties involved.

Electronic document flow allows:

- improving the quality of railway transport services provided to the users through registering shipping documents at client's convenience;
- speeding up the delivery of cargo through reducing time in terminal stations;
- reducing the costs for participants of transport operations associated with preparation, sending and keeping of documents;
- processing cargo documentation using a unified information system;
- reducing time between preparation of main transport-related documents and collecting charges for freight transportation, accomplished work and services;
- increasing freight safety by regulation of access to cargo information, preventing document forgery en route, tracking operations with cargo in transit.

Electronic document flow in cargo transport usually relates to the following types of activities:

- Commercial activities (interactions between the railway carrier and consignors, consignees, carriers of other transport types and transport organizations (ports, railways carriers, forwarders, operators, government control authorities, etc.).
- Freight operation (loading and unloading operations in common areas of cargo railway stations).
- Transport management in freight transportation.

- Financial activities (interaction with participants of a carriage operation regarding fees, collecting penalties from consignors and consignees, payment of fines and interest in case of liability of the railway carrier).

- Railway infrastructure activities (terminal loading and unloading operations, performing of a freight transport operation itself).

This following chapters describe information technologies deployed to ensure seamless railway freight transport in Kazakhstan, Mongolia, the Republic of Korea and the Russian Federation. The description is based on the data provided by railway companies of the respective countries.

2.1 Automation and computerization of transport operations by Kazakhstan Temir Zholy (Kazakhstan)

The information technology formerly used by the Kazakhstan railways (Kazakhstan Temir Zholy, KTZ) has a number of disadvantages: high level of manual data input (80%), requirement for client's presence at the station for the arrangement of shipment documents, client's dependence on station officer, non-transparent business processes for clients and KTZ, fraud and thievery risks, mismatch of data on the start of transportation with data on the end of transportation.

Therefore, in order to ensure a higher level of the international freight transportation service on the Kazakhstan railways a new automated information management system for transport (ASU-DKR) is being actively deployed.

Computerized business processes under ASU DKR include 5 major groups:

- Transport operation planning;
- Transport documentation processing;
- Payments related to freight transportation;
- Cross-border data exchange between information systems;
- Advance electronic notification.

Processes of collecting, approving and confirming shipping requests of the applicable consignment note form are implemented and brought in place and fully deployed on the entire territory of Kazakhstan.

Introduction of ASU DKR in the railways of Kazakhstan resulted in a number of achievements:

- Development of the client-oriented remote access for client's work (web service) eliminated the need for client's personal presence at the railway office to order transport services.

- Automation of approval process of the local transportation under the freight transportation rules and transportation planning procedure resulted in reduction of required time for approval of transport service orders. In addition, it allowed avoiding human mistakes in consideration and approval of orders.

- Clients got the opportunity to promptly track service order approval process, thus transparency of the planning process was ensured and related human mistakes in processing of transport orders were excluded.

- Reliability of information was improved through the use of unified reference books and classifiers of the reference data.

- Effective planning system for railway of station resources and wagon groups for train composition was established.

- Unified tariff calculation and prompt rating were established.

- Automation of business operations for the planning allows making available extra 410,000 man-hour per year (equal to labor of 22 staff).

The system is currently implemented in the pilot mode at Ekibastuz-Uzel railway station, and the results of the pilot application are satisfactory and received positive feedback from the clients. A paperless technology of shipping document processing is also being implemented in the inter-regional and international services at Ekibastuz-Uzel.

ASU DKR implementation steps for the short-term:

- Introduction of the system at Pavlodar railway section.

- Implementation of the system at country-to-country division points.

- Implementation of cross-border [electronic technological document flow] | electronic data exchange.

- Advance notification of customs authorities.

- Complete realization of the ASU DKR and AS CRGP systems in 2016.

ASU DKR further perspectives:

- Implementation of the system for railway services to China, countries of Central and South Asia.

- Launch of a multilingual interface.

- Highly informative content of the system and high-quality service will reduce the cost of document processing and bring new clients.

- Automation of transport-related procedures (e.g. freight insurance).

The initiation of cross-border information exchange leads to reduction of idle hours under Customs formalities, ensures support of the risk management sub-

systems in customs information systems, eliminates errors in customs entry bills, allows provision of information on brokerage services.

It is also worth noting that electronic digital signature made in another country is valid in Kazakhstan.

The expected results of the introduction of advanced electronic notification system are:

- customer-oriented approach, provision of information on tariffs, regulatory documents, routes to forwarders, launch of a multilingual interface and establishment of a single-window system;
- exchange of data with external information systems of other railways and clients;
- possibility of uploading data from advance electronic declaration instead of re-inputting data manually;
- enhancing of railway handling capacity; and
- timely receipt of data.

The expected financial benefits include the following:

- decommissioning of old-generation information systems resulting in reducing costs of technical support and development;
- professional retraining of 40% of the staff;
- avoiding costs for to printing, filling in and signing paper consignment notes;
- increasing profit from freight transportation;
- increasing total sales related to freight transportation;
- increasing profitability of freight transportation.

Conclusion:

The implementation of the project on automated management system of contracting and commercial activities (ASU DKR) of Kazakhstan Temir Zholy (KTZ) is currently still under way.

The level of automation of ASU DKR doesn't allow electronic exchange of official documents between consignors and the railways, despite the fact that the KTZ Certification Centre has already been formally established and is running test operation.

2.2 Automation and computerization of transport operations by Ulaanbaatar Railway (Mongolia)

More than 75 software products are used at 800 automated workstations of Ulaanbaatar Railway **(**UBZD) on 800 automated work stations with over] by more than 1,300 users. Information is exchanged with East-Siberian Railways (VSJD), affiliate of RZD, at Taishet railway station). (see Figures 2 and 3). Starting from 2005, data exchange on cargo transfer has been initiated between JSC UBZD and the Irkutsk Data Processing Centre, affiliate of JSC Russian Railways.

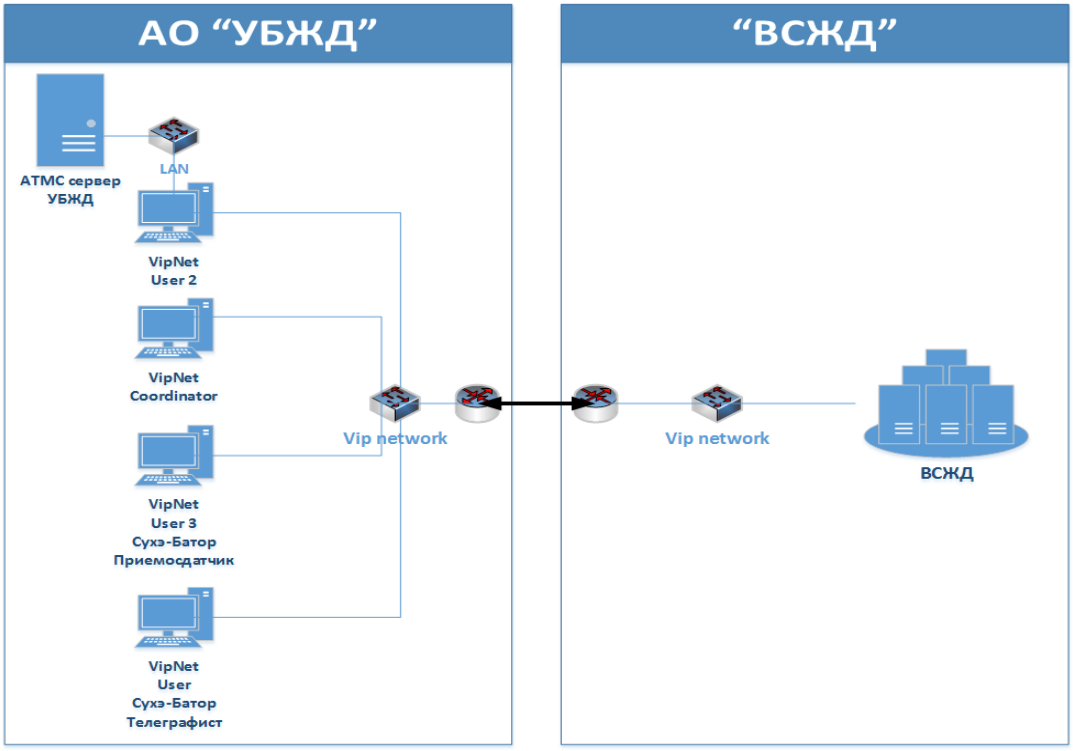

Figure.2. Scheme of information exchange between VSZD and UBZD via VIPNet system

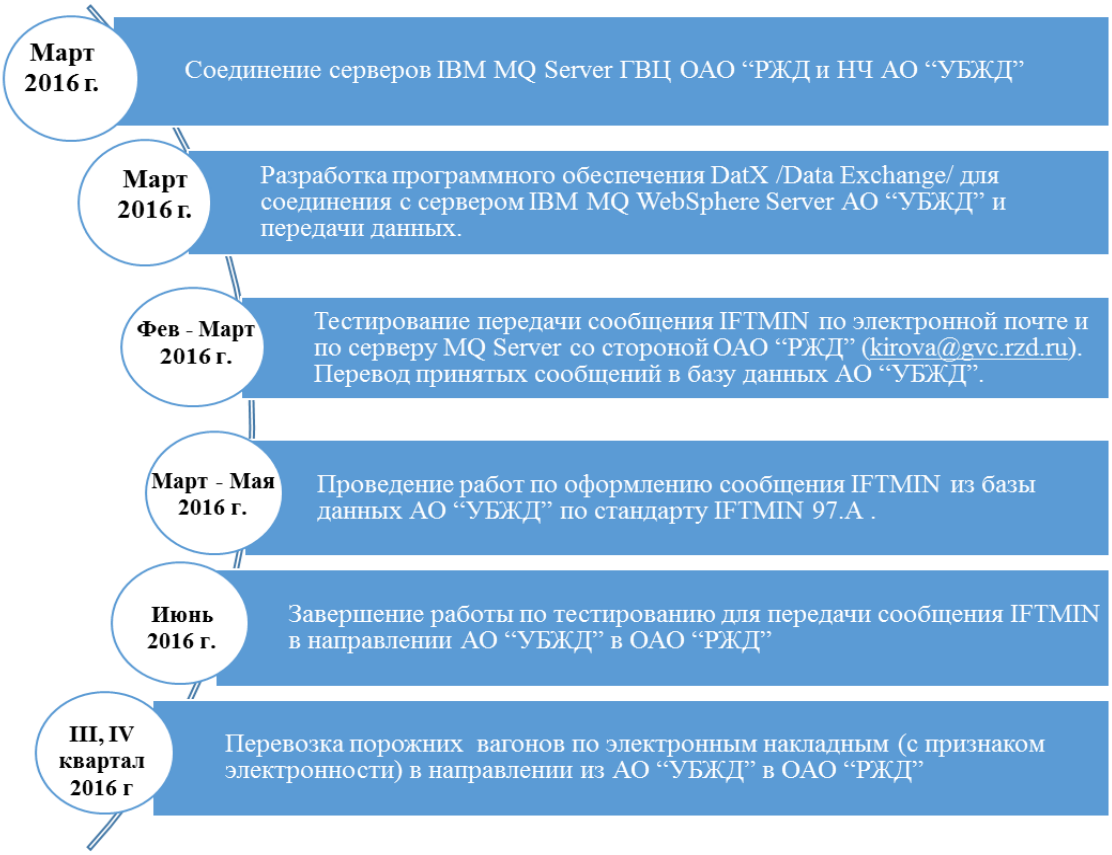

Figure 3. Stages of implementation of information exchange system between VSZD, and UBZD via VIPNet

UBZD also uses software for managing the queue of freight reloaded from trucks on to cargo wagons to facilitate and improve quality of intermodal railway operations. The UBZD software also uses data on freight transported across the border by trucks from the customs information system, the trucks are classified by the customs check date.

Conclusion

The main issue related to cross-border electronic document exchange in UBZD cargo transport relates to unsettled legal status of electronic signature. Solution can be found by bringing into force of Mongolian legislation on electronic signature. Starting from 1 June 2016, Mongolia introduces the use of the electronic signature at the level of governmental authorities. The implementation of the electronic signature for UBZD is at the research stage.

In addition, information exchange with KZD has not been yet established.

2.3 Automation and computerization of transportation process by KORAIL (Republic of Korea)

In 2010, Korea Railroad Corporation (KORAIL) and KL-Net Corporation developed its own Logistics Information System, which is dedicated to freight transportation service, in 2010. The system provides a freight transportation process based on EDI (Electronic Data Interchange), real-time location and operation information, and client's transport performance information. It ultimately aims to enhance customers' satisfaction and the efficiency of internal work processes. It is not only web-based but also client / Server-based through XML, JAVA, and JSP mechanical languages. The logistics system is compatibly linked to KORAIL's Extended Railroad Operating Information System (XROIS), monitoring trains' operations and managing an integrated transportation process. Notably, this advanced system exchanges critical container information and electronic document with CY (Container Yard) system in Busan Port, the number one port-rail container terminal (Area: 64,020m^2) in the Republic of Korea.

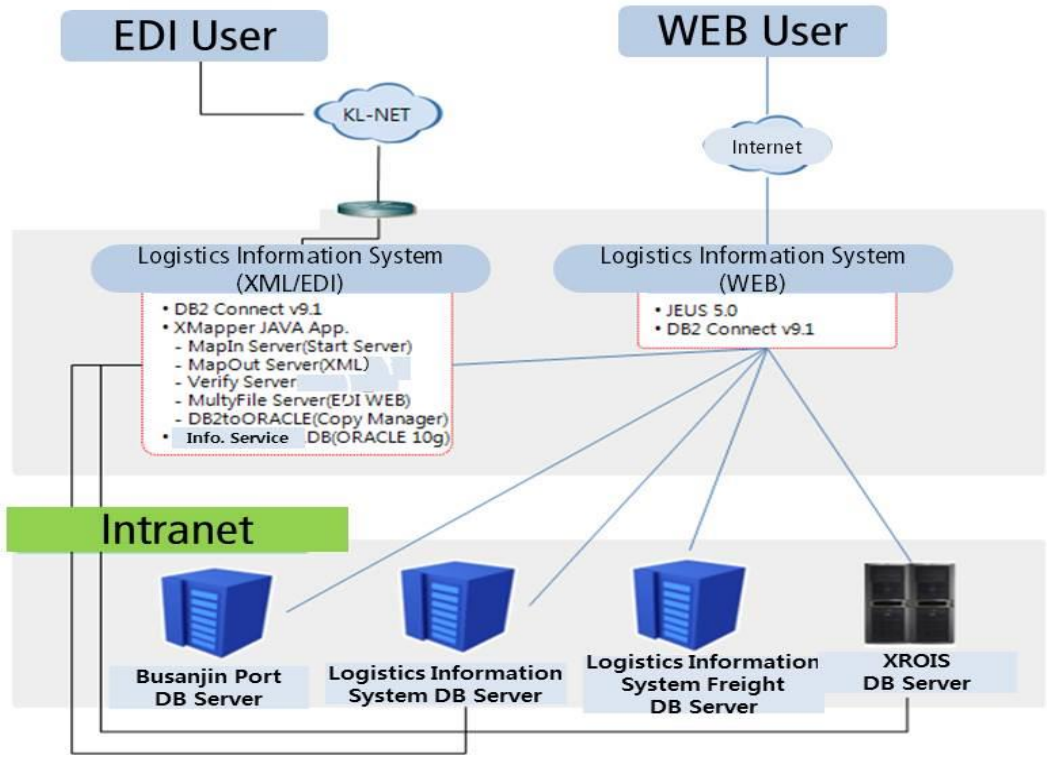

Figure 4. KORAIL Logistics Information System Configuration

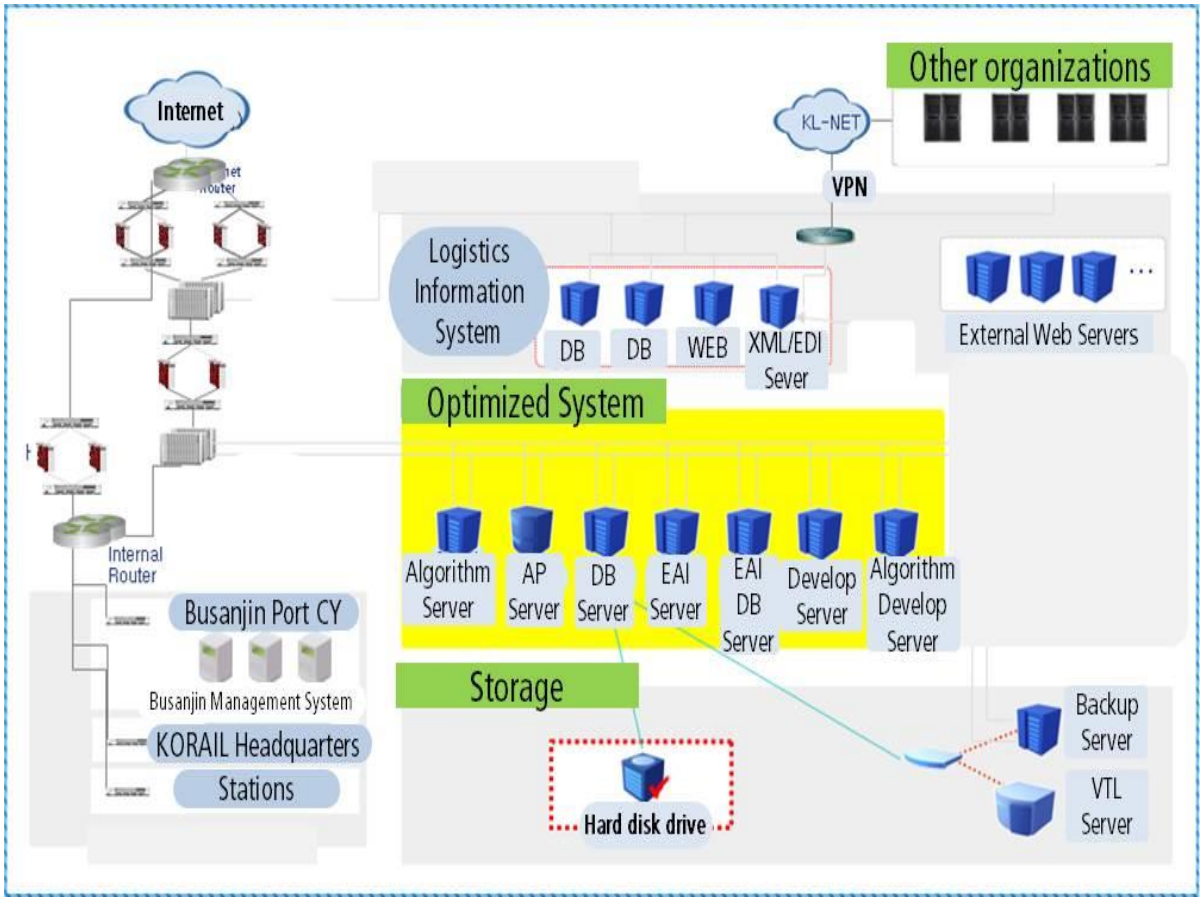

Figure 5. KORAIL Logistics Information System Flow

The EDI service is indispensable for the error-zero implementation of the Logistics Information System. It is subject to all types of freight transportation such as containers, general cargos and so on. KORAIL and clients easily exchange relevant documents regarding freight transportation and have wide access to real-time trains' operation information.

Conclusion

Due to the continuous political factors, KORAIL is physically infeasible to offer international freight service. However, the Logistics Information System and Extended Railroad Operating Information System (XROIS) prove that this rail operator has the capacity for exchanging data and documents with other international rail companies.

2.4. Automation and computerization of transport operations by Russian Railways JSC (Russian Federation)

The Transport Strategy of the Russian Federation until 2025 envisages the establishment of a common information space to achieve close interaction of the government bodies in transport sector with clients of the transport services market; seeks to set up a system of logistics centers for provision of information support throughout international transport corridors, establish the State Transport Information

Database of the Russian Federation and a system for collection and processing transport statistics.

At present issues related to the lack of legal base for electronic document exchange have been resolved. Ways of interaction of customers with the railways have been simplified. Today the railways carry out activities for connecting a larger number of stations to the data network.

Freight transportation management includes 17 basic functions: daily shift planning, current planning, dispatch management of train operation, freight operation and commercial activities management, operations with freight shipping documents, information support for clients, locomotive and rolling stock fleet management.

Three-level centralized management structure based on a new operating model has been set up for efficient management of freight and cargo railway transport. The structure includes RZD Operating Control Centre, Traffic Control Centres (DCU), and Local Work Control Center (CUMR).

Russian Railways JSC (RZD) has developed a computer system that includes a number of information systems for technological and financial monitoring.

The complete real-time model for national railway transport is running based on the deployed advanced information technologies with proven efficiency. More specifically:

a. Automated Traffic Control System (ASOUP). ASOUP includes about 6,000 programs. ASOUP ensures that operating staff at the stations and railway administrations of the complex are issued with technical documents for each of the trains. It laid the ground for setting up new automated systems and determining complex objectives for transport management. For example, ASOUP includes the 'Freight Express' system developed for the management of export cargo loading sent to ports and border ports, as well as information exchange between the automated systems of the regions of port and border-crossing stations and industrial agglomerations.

b. ETRAN (electronic consignment note) is an automated system for centralized preparation and processing of shipping documents. It is the first system to include client (consignor, consignee, forwarder) into the technological cycle of receiving requests and processing shipments making it possible for clients to submit requests for shipments, prepare the electronic consignment note, receive final documents, get the results of carriage charge calculation and monitor the cargo transportation progress from a client's office. Besides, the client can receive information on all cargo dispatched.

Initially designed as an application, after 7 years in operation ETRAN switched to a comprehensive system for the management of cargo transportation business processes. At the moment ETRAN covers 100% of the railway freight transportation in the Russian Federation.

The system was transforming through several configurations: from accounting services to a large number of management solutions, from internal to cross-border data exchange.

As a result of the project on cross-border data exchange, ETRAN was launched beyond the Russian Federation. In particular, bilateral electronic exchange of bills of lading for empty wagons between Russia and Finland has been initiated. Latvia also dispatches wagons with electronic consignment notes. Starting from early

2012, activities on electronic document exchange with Belarus have been under way, as well as the preparation process for electronic exchange of bills of lading in transportation to the Baltic countries, China, Kazakhstan, Kyrgyzstan and Mongolia.

The system is based on paperless technology of loading sheets from consignors who put electronic digital signatures (EDS) on respective electronic sheets. The approved loading tables for the forthcoming month are also provided to consignors by ETRAN in an electronic form. In addition, ETRAN envisages management of loading tables by means of legally valid exchange of documents.

c. Automated information system for paperless cargo transport with the use of electronic consignment note

RZD has developed multi-purpose information technology solutions to facilitate commercial and operational procedures in railway cargo transport through the electronic processing of the bill of lading and documents accompanying the transportation contract with the use of the electronic exchange of data (EED). This technology complex is known as the Automated Information System of Paperless Organization of Freight Transportation with the Use of Electronic Consignment Note (AIS EDV).

The main objective for establishing this system is to facilitate transport commercial and operational (technological) procedures through introduction of electronic document flow and data exchange between the transportation participants when preparing a transportation contract and operation en route, including re-consigning, reloading, border crossing, forwarding. Computerization of these procedures and operations will help expand provision of information to the clients during transportation and support the introduction of modern technologies in railway transport.

Other objectives include improvement of the database through the use of electronic documents for transportation (transport profile) to develop and implement applicable projects and tasks for maintaining and controlling the transportation process, including planning and backing up the transportation, monitoring the fulfillment of the transportation conditions and freight delivery time, calculating transportation costs and distributing income between the participants.

Moreover, provision of information services to participants in the carriage, forwarders, freight owners, exporters and importers has to be substantially expanded.

The system allows the following:

- introduction of electronic transportation contract (electronic consignment note), recording and documentation of operations and events with transmission en route, issuance of consignment notes and completion of information procedure of freight arrival and delivery;

- information exchange on cargo transport between Russian railways in the process of carriage;

- information exchange between the railways of CIS and the Baltic states in inter-state transportation;

- exchange of data with the European railways in inter-state transportation based on international data exchange standards (UN/EDIFACT);

- information support for Customs and border crossing operations;

- exchange of information between the systems and for achieving practical objectives in station processes, rail transport management, transport payments and income distribution;

- archiving and storage of data for the needs of the dispute resolution service;

- possibility of printing out hard copies of electronic documents;

- ensuring safety and security of information as well as authorized access to the data.

The AIS EDV was developed on the basis of the UNECE WP-4 (Expert Group on Trade Facilitation and Transport Management) recommendations with due consideration of possibilities for applying international rules for electronic data interchange UN/EDIFACT.

Conclusion

Information technologies operated by Russian Railways network fully respond to existing challenges and are able to support document interchange both in domestic and international freight transport.

3. Practical experience in implementation of electronic document management in international goods transport by rail

3.1. Application of of information technology based on electronic documents with electronic digital signature (EDS)

This scheme is an advanced one with more potential as it seeks to ensure not only uninterrupted, but also fast cargo traffic. The advantages of paperless technologies are well known. Legal, software and telecommunication bases for the implementation of the electronic legal document management has been set up in nearly all countries involved in international railway transport. Still, security standards for creation and use of electronic documents, including the electronic digital signatures (EDS), differ in these countries. Therefore, in order to implement the cross-border exchange of electronic documents, the matter of mutual recognition by all participants in the carriage of the legal power of electronic documents with the electronic digital signatures of different jurisdictions, has to be resolved.

In order to deal with this matter, the Organization for Cooperation between Railways (OSJD) established a permanent Working Group on Coordination and Information Technologies in collaboration with CCTT. The Working Group has

developed relevant Guidelines. The Guidelines provide the regulatory and technological basis for concluding the Agreements on Electronic Data Exchange between the actors of international transportation process subject to mechanisms of mutual recognition of EDS of different jurisdiction by the parties. The main Guideline for this purpose is R 941-3 ‘Recommendations on the use of the technology of the Third Trusted Party (DTS) for providing legal power of electronic documents in the cross-border service’ and R 941-4 ‘Description of typical technical specifications of the cross-border interaction ‘Instructor of ‘public keys’ for the railways of OSJD member states’.

RZD has carried out a large amount of work to organize electronic document management system for processing of shipping documents. All RZD stations open for freight operations are connected to the EDS infrastructure. Over 7,100 external enterprises with 53,000 users work in the ETRAN system in the EDS mode. The number of RZD agents processing documents in the EDS mode is to more than 6,000 people.

RZD has concluded agreements on electronic document exchange with the railway administrations of all bordering countries, which provide for receiving information on all freight crossing the border. This information facilitates and speeds up the document flow process, thus, eventually reduces the time for handling trains at border stations and brings more traffic in transit (see Figures 6 and 7).

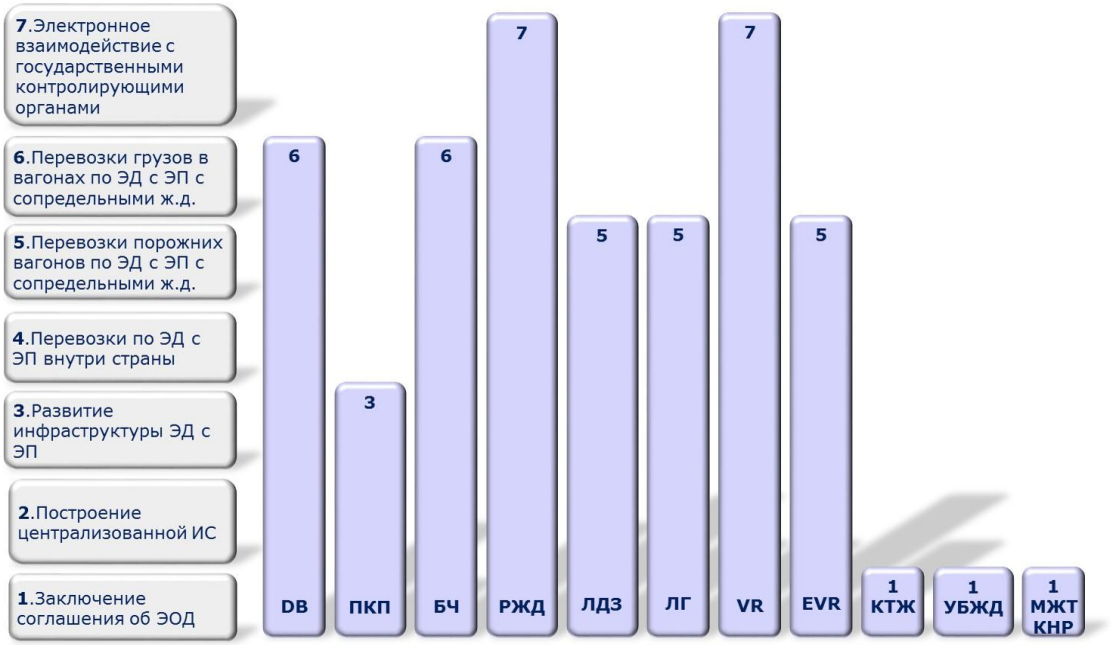

Figure 6. Level of EDS document development with bordering railway administrations

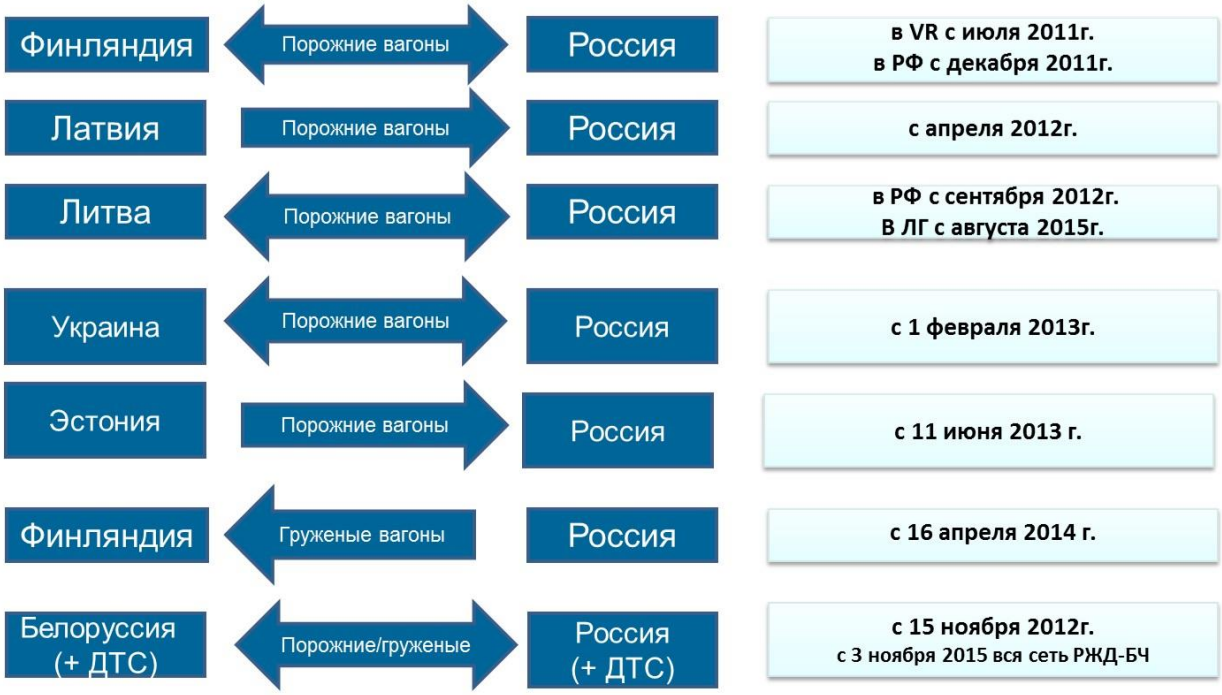

Figure 7. International paperless freight and wagon transport based on electronic documentation

RZD carries out joint activities with several railways on the introduction of paperless technologies in international transport on the basis of above-mentioned agreements. These agreements envision the use of standard electronic signature technology in transport carried out by RZD and railway operators of Finland, Latvia, Lithuania and Estonia. The volume of “paperless transportation” equals 90 % of total volume of rail total cargo traffic for Finland, 80% for Latvia, 86% for Lithuania and 81% for Estonia (see Figure. 8).

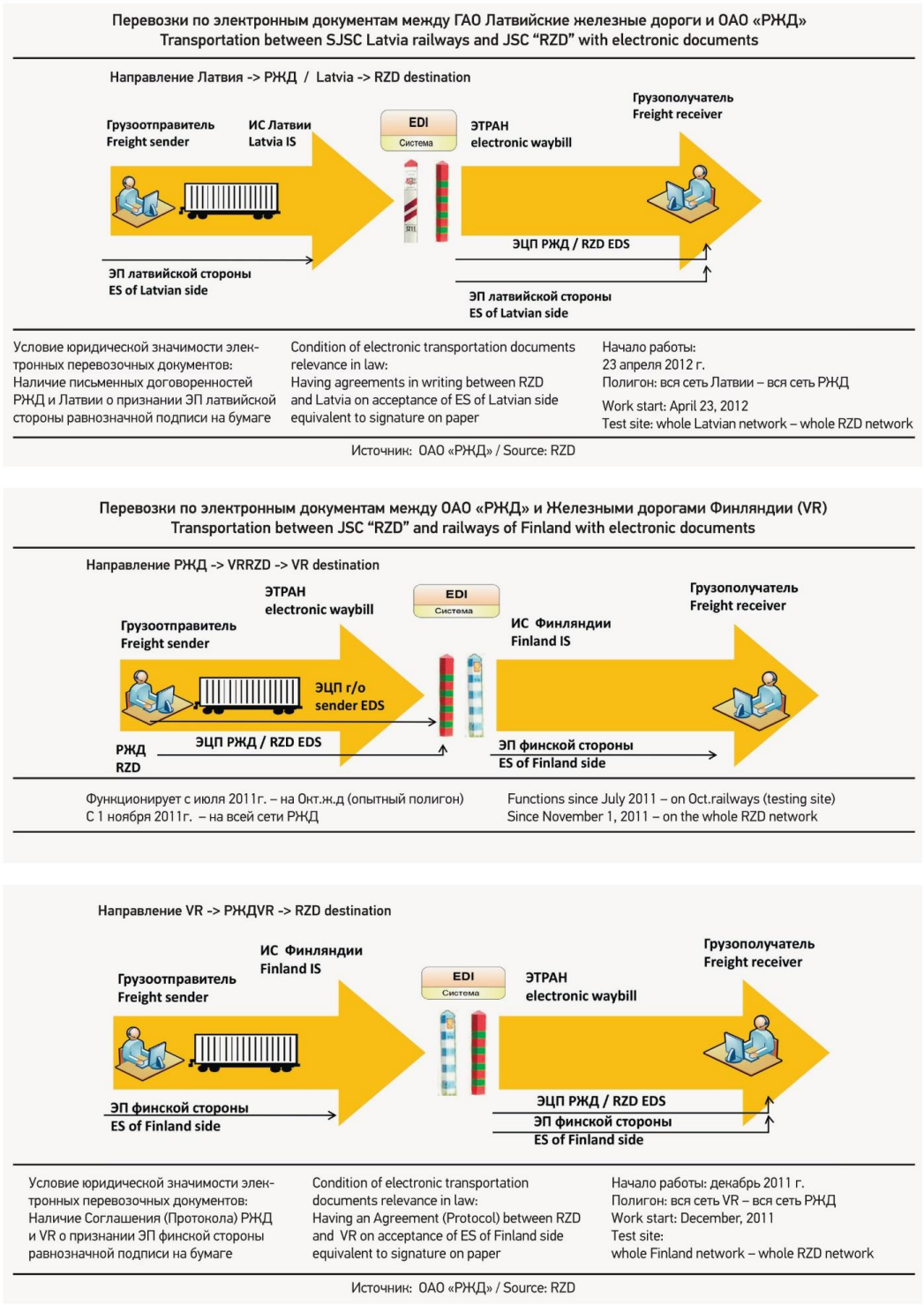

Figure 8. Transportation based on electronic consignment notes

Paperless transport between Russian Railways and the Railways of Belarus is based on the DTS (Trusted Third Party) technology. The volume of this type of transportation amounts to 44% of the total transportation volume. This type of transportation makes 44% of the total.

Paperless transport between the Russian Railways and the railways of Ukraine is based on the technology of trusted certification centres through encryption providers. This technology has been applied to 66 % of cargo transport in 2014.

Activities planned for 2016 should provide for switching to paperless technology of the document flow in transportation between Russian Railways and the railways of Kazakhstan and Poland.

Joint activities carried out by the Belorussian Railways and the Association of the International Electronic Document Management Railway Operators related to the organization of the cross-border electronic document exchange, with the mutual recognition of the EDS of the Republic of Belarus and the European Union, within the framework of the project, showed positive results.

3.2. Application of information technology based on electronic copies of paper documents

Implementation of the first technological scheme in cargo transport is based on traditional shipping and accompanying documents in hard copies. The information from these documents feeds into the IT systems of forwarders or other participants in carriage, and is transferred to the border stations on the routes of the international freight shipments as the advance information reaching the border stations several days ahead of the freight. This time should be sufficient for identifying possible data discrepancies that may impede transportation, before the freight arrives at the border station. Thus, advance information facilitates the seamless transfer of import and transit of freight at border stations.

This IT scheme has been tested on the ‘East Wind’, Chengdu-Lodz-Chengdu, ‘Baltic Transit’, Chungking-Duisburg, Suzhou-Warsaw international container trains. This scheme is used to develop technology of advance notification of the customs authorities of the Customs Union (EEU). Nevertheless, the expected speedup of the document flow at border stations cannot be achieved as the hard copies of documents accompanying the train have to be checked for matching with the advance information provided earlier. Labor intensity of this technological scheme is increasing as the information is double processed at border stations: initially, the advance information and subsequently the original hardcopy of the document upon arrival of the freight at border stations.

Due to this the expected level of efficiency in provision of advance notification to customs authorities on import and transit freight can not be achieved. This takes place when the advance information feeds into the system from the graphical copies of the documents scanned at the border station. In this case there is no time for eliminating data discrepancies before the arrival of the freight to the station. Due to this freight shipments with data entry errors identified in documentation are delayed at entry border stations, same as prior to the introduction of advance notification.

3.3 Application of IT-solutions for streamlining intermodal transport operations, facilitation of border-crossing procedures and transshipment at seaports

3.3.1. Practice of the PJSC TransContainer

One of the key components of the cross-border document management is a unified platform for compilation, processing and keeping the data on transportation as well as legal shipping and forwarding documents. The platform ensures interaction of all participants in carriage by provision of access to the system and by establishment of integrated links to information systems of all participants involved in document management. (see Figure 9).

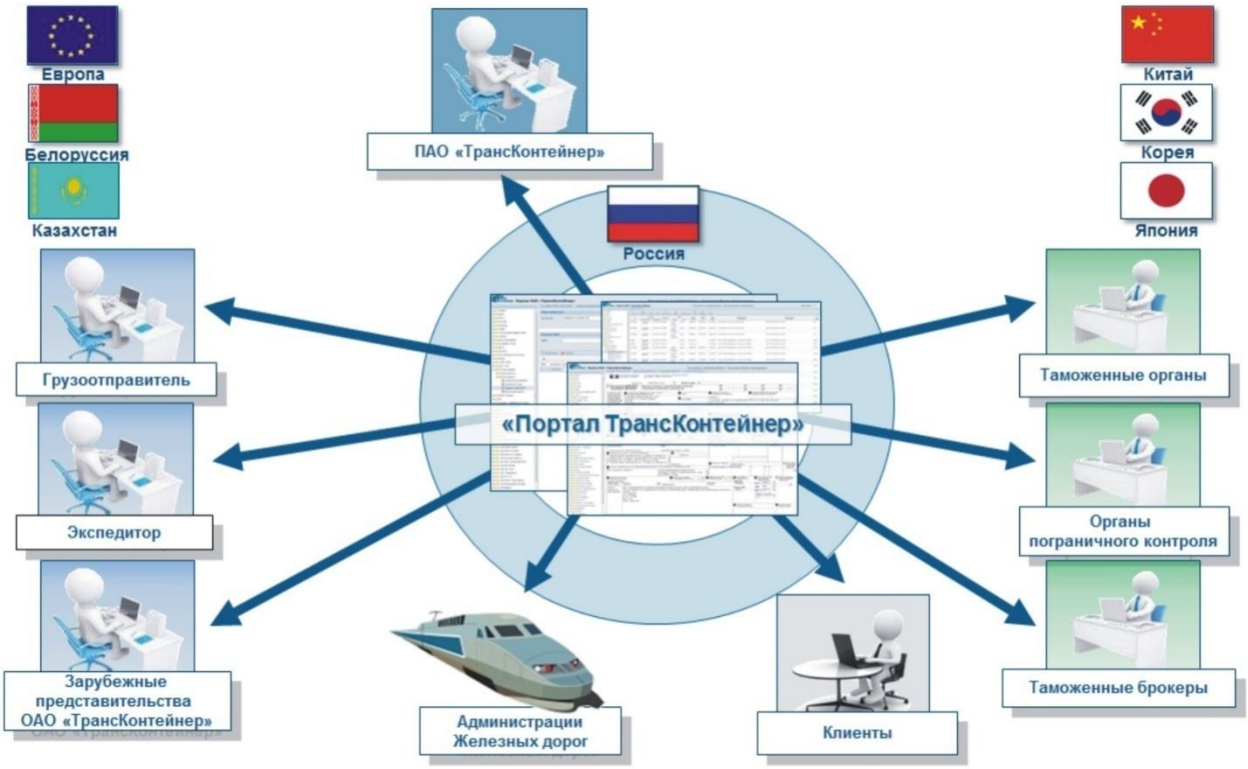

Figure 9. Customs clearance of goods

Under the pilot project on trans-border document management to facilitate the handling of project container trains at the Brest (BCh) - Terespol (PKP) border checkpoint, PJSC TransContainer and Belarussian Railways signed in 2009 an agreement on information exchange providing for advance notification of the customs authorities of the Republic of Belarus. (see Figure 10).

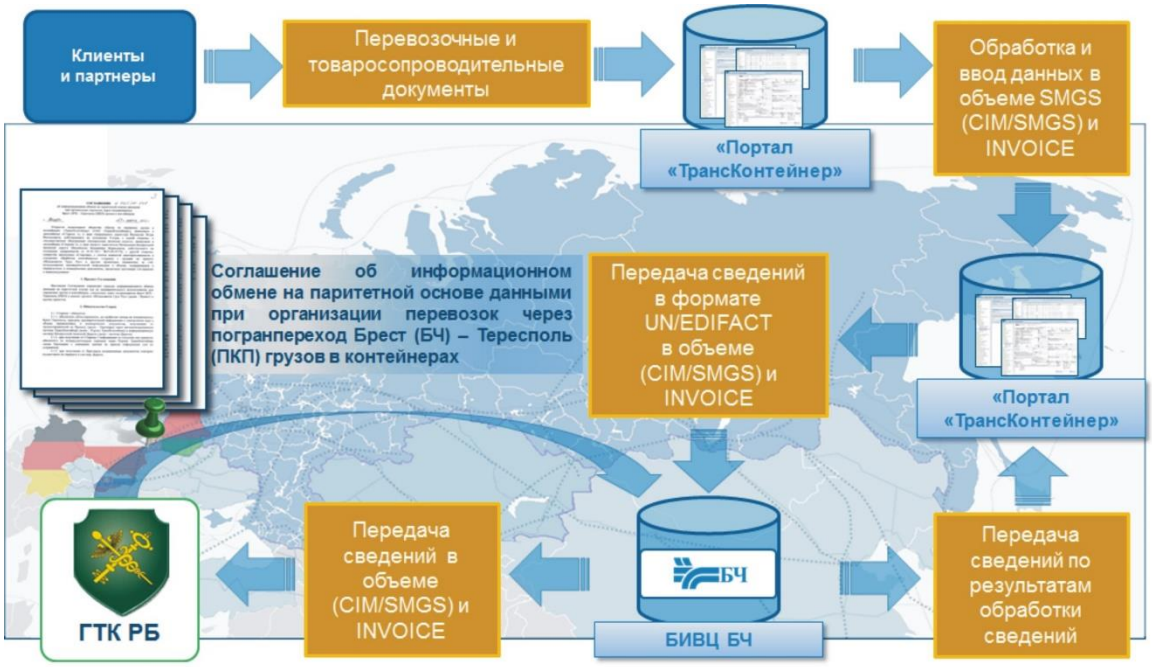

Figure 10. Electronic document flow

Upon arrival of shipping and forwarding documents to the Malaszewicze station transport information is being processed and electronic documents are issued for the advance notification of the Belorussian Railways and the customs authorities of Belarus (see Figure 11).

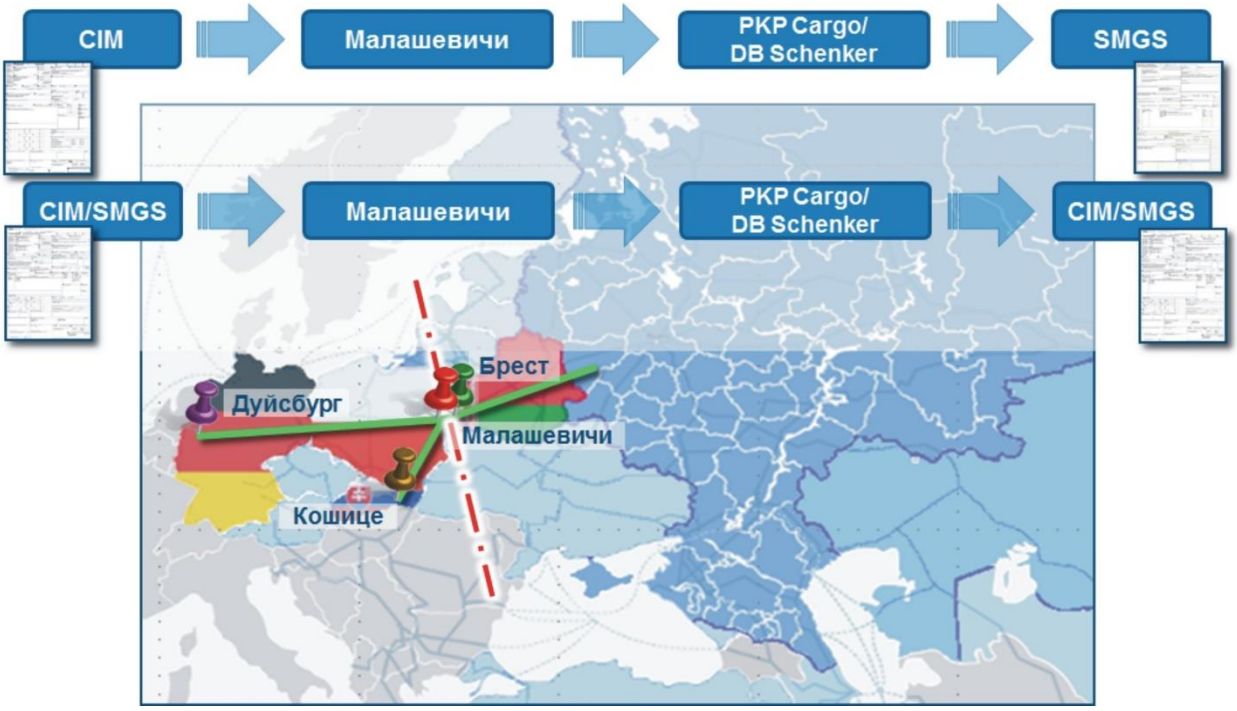

Figure 11. Processing of shipping documents

Cross-border document management covers implementation of the project on Electronic Container Transportation. The primary objective of this project is to obtain soft copies of legal shipping and forwarding documents at the moment of issuance (electronic document signed with the electronic signature) for further use during the entire process of carriage (see Figure 12).

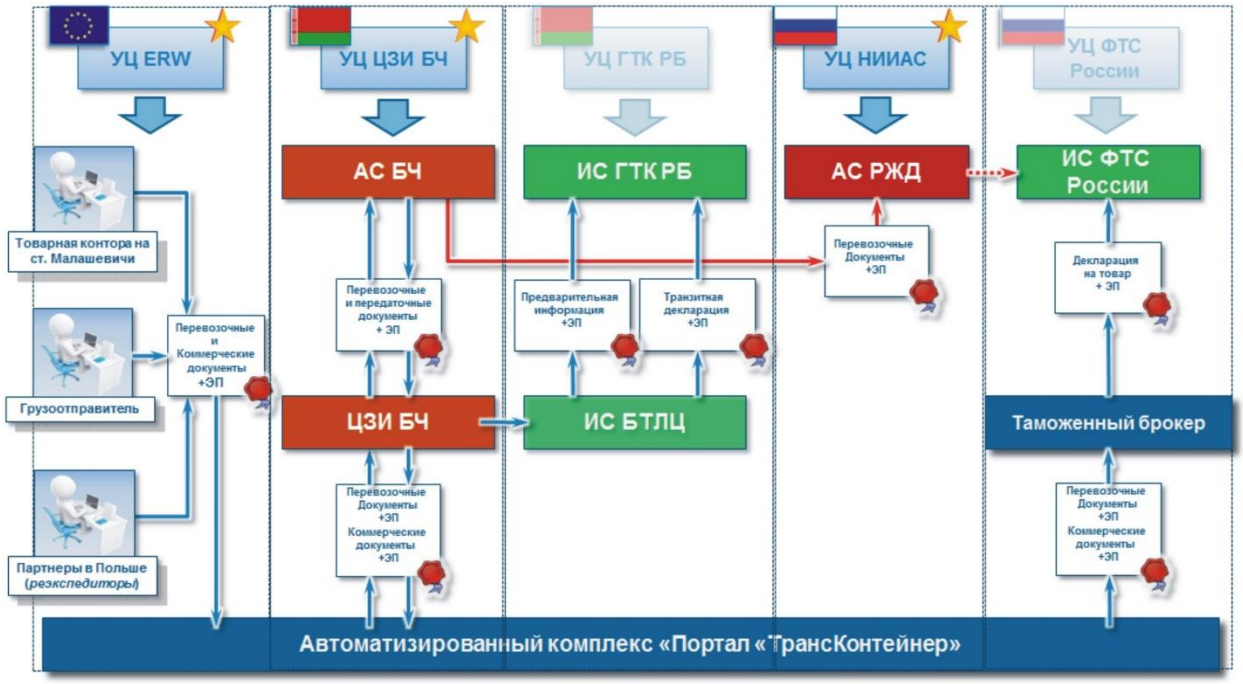

Fig.12. EDS document processing technology

As a pilot initiative to the project on Electronic Container Transport, TransContainer together with DB Schenker, DB Schenker Rail Polska S.A, the Belarusian Railways and RZD uses electronic shipping documents (along with paper documents) for dispatching the container train from Germany to Russia via the Duisburg – Perspektivnaya route and applies the CIM/SMGS consignment note.

It is essential to establish regulatory frameworks and develop legislation providing legal ground for cross-border document flow - this component is indispensable for cross-border document management. (see Figure 13).

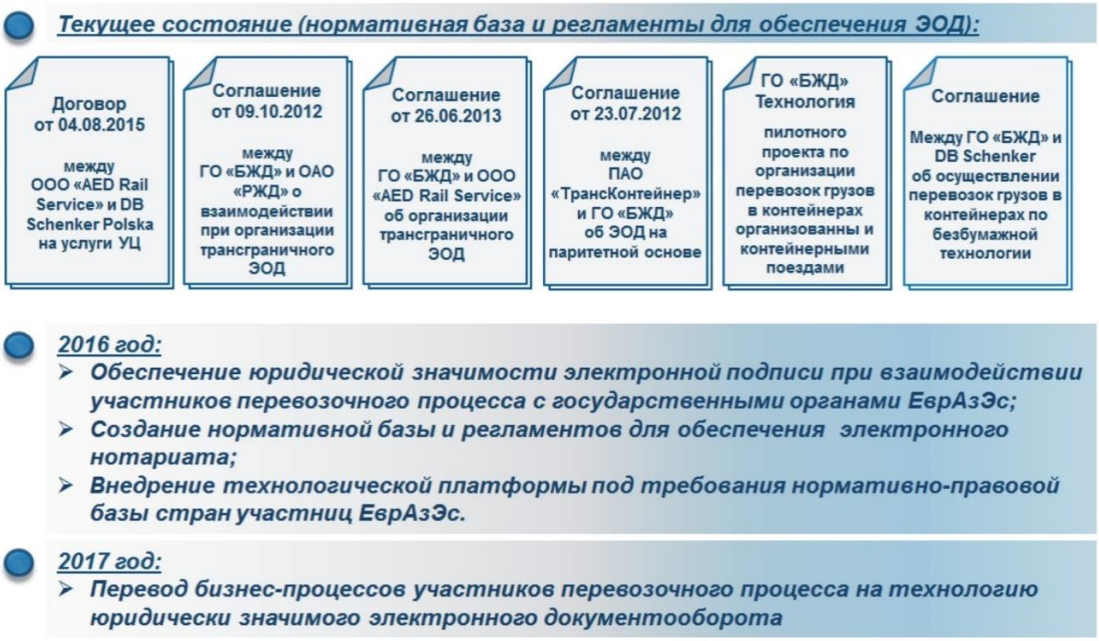

Figure 13. Implementation of the Electronic Container Train project

3.3.2. Interagency project ‘Sea Port’ implemented by the Federal Customs Service of the Russian Federation (FCS). Provided by STM LLC (Russian Federation)

The majority of freight transport from Northeast and Central Asia to the Russian Federation as well as transit traffic from the Russian Federation to the countries of the European Union is undertaken by sea vessels through Russian ports and further by container rail transport (see Figure 14).

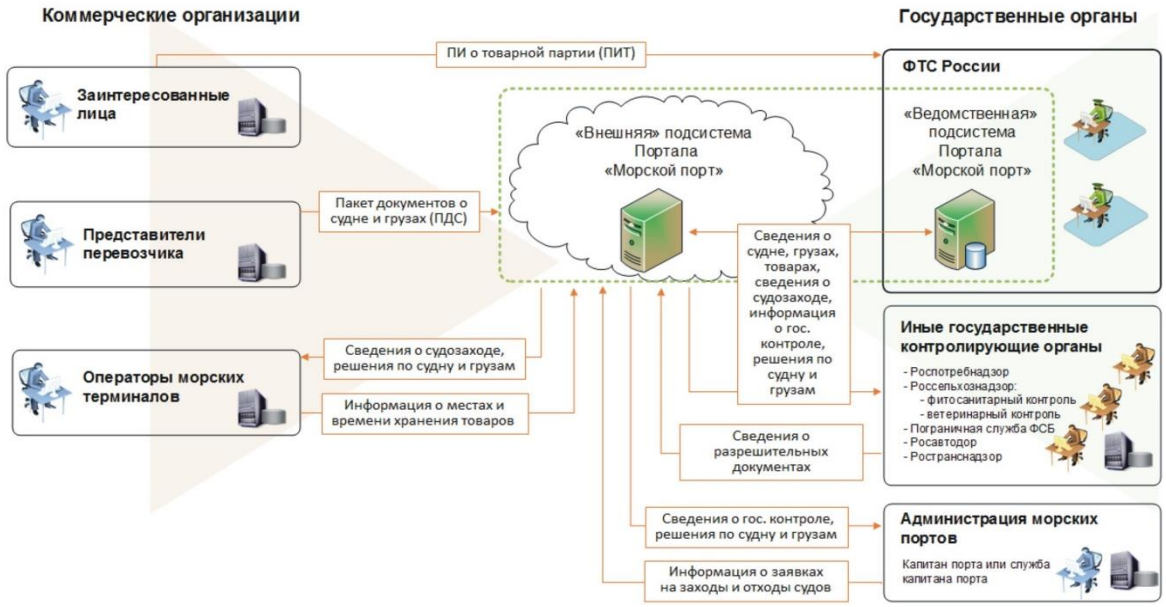

Figure.14. Single window at the Russian Federation’s seaports

When performing operations at sea ports in reloading containers from vessels onto the railway platforms the following stages of cargo document processing may be identified as the cargo is brought to the customs territory of the Eurasian Economic Union:

- providing stakeholders (cargo owners and their representatives, forwarders) with advance notifications on goods arrival at the sea point of access submitted to the Electronic Information Submission information subsystem of the FCS;

- provision of a set of documents for a vessel and freight by the carrier representatives (vessel captains, vessel agents) to the customs and other governmental regulatory authorities located at the sea point of entry;
- approval by customs and other governmental regulatory authorities located at the sea point of entry for unloading goods off the vessel to the customs control areas;

- submission of Customs declarations by shippers’ agents or discharging of a Customs procedure for transit of goods through the Customs territory of the Eurasian Union;

- processing of forwarding documents by shippers' agents for loading and transporting the goods by the rail or road transport.

To ensure the integration of various information systems of the above participants and support joint work with the sets of electronic documents, STM LLC has developed the Fill-Bill Information System (see Figure 15).

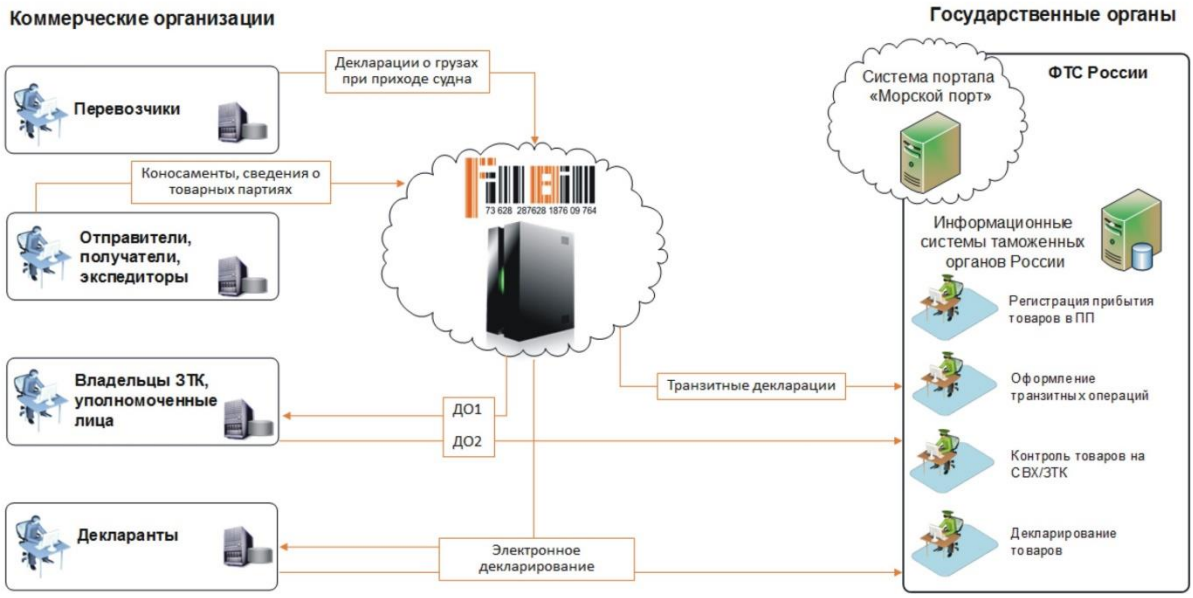

Figure 15. Overall layout of Fill-Bill Information System

The Fill-Bill Information System allows the participants of information exchange to perform the following operations:

a. Upload electronic documents with set formatting of original data systems to the Fill-Bill system and develop databases on vessels and goods carried by vessels.

b. Based on data entries, develop sets of electronic documents in the formats suitable for submission to the government regulatory authorities (including the formats conforming to the requirements of the Eurasian Economic Union), as well as preparation of the forwarding documents for the railway carriers.

c. Provide sets of electronic documents at different stages of processing formalities for transported goods, to the relevant information systems of the governmental regulatory authorities or railway services in accordance with the technology and specifications of the data exchange of those systems.

d. Receive feedback from the information systems of the government authorities or railway services, including decisions of the Customs authorities on goods transported.

Below are several practical examples of simplification of e-document processing and other procedures to improve the quality of intermodal operations and facilitate their implementation.

a. Preparation and provision to Customs authorities of notification on goods delivery to the seaport checkpoint (based data of the consignor, freight forwarder and consignee).

b. Preparation of a single set of documents on vessels and goods by several representatives of carriers in case different consignments are carried out by one vessel and submission of a single set of electronic documents to FCS.

c. Preparation based on the consignment data of the electronic transit declaration and remote registration of Customs transit from seaport to destination.

d. Preparation of railway consignment notes and their submission ETRAN system for registration of loading and transportation of goods from the seaport.

3.4. Experience of 'electronic seal' application

The application of 'electronic seals' supported by the use of legal transport and accompanying documents that will be processed through the IT-systems of participants in carriage (consignors, freight forwarders, Customs authorities) has a considerable potential. At the same time in 'Electronic seals' only key details which unambiguously identify cargo sending which is sealed up by this electronic seal will be registered.

Regulatory frameworks for the development of 'Electronic seals' have already been established. Among priorities for ensuring cargo safety and security is the system of radio-frequency identification (RFID) being presently actively introduced. The radio frequency identification technology in a supply chain complies with the international standard ISO/CD 10891 'Containers – automatic identification'. The standard has been developed to improve transport safety, including technical components, such as electronic seals. The ISO 18185 standard 'Cargo containers. Seals electronic' sets the concept of development and use of electronic seals. The electronic seal is a balanced combination of a reliable mechanical seal with electronic means of information support, identification and record of opening. The electronic seal registers an installation date and openings and can once be used. Information exchange with an electronic seal is made by means of service electronic blocks of "programmer" and "reader" (reader).

Similar standards have been developed in the Russian Federation, more specifically, GOST 52259-2004 'Sealing Electronic Devices. General Technical

Requirements'. To ensure uniformity of technical requirements for sealing devices in the countries of the CIS, the CIS Technical Committee 246 'Containers' has developed four international standards approved by the interstate standardization bodies of the CIS, endorsed and registered by the Inter-state Committee (Minsk).

Evidence indicates that in transit transport a number of geolocation hardware devices has been installed to wagons and containers by consignors of high value goods for monitoring traffic and as a means of protection signaling. With rare exception, these means are not certified in the countries of the Eurasian Economic Community (EEA). Normally information is missing on installation and technical characteristics in transport and accompanying documents. It prevents the efficient use of these means for ensuring transit safety, for customs control and transport management, also poses transport security threats, including terrorist attacks.

In response to these issues, a technical regulation has to be developed for setting obligatory requirements for the above-mentioned technical means. Besides technical issues mentioned above, other objectives include: ensuring road safety, radiation safety, biological safety, explosion safety, mechanical safety, fire safety, industrial safety, chemical safety, electric safety, electromagnetic compatibility with respect to safe operation of devices and equipment, uniformity of measurements and other dimensions of freight transport safety.

4. Challenges and opportunities of transboundary electronic document exchange in international railway transport of goods

Among main impediments for transboundary electronic document exchange in international freight transport is uneven development of railway IT systems.

The IT systems of JSC Russian Railways are the most advanced ones of all reviewed in the report. These systems can provide the ground for the development and introduction of cross-cutting transcontinental information technologies for seamless international transport services within international supply chains.

Cross-cutting information technologies are based on legally valid electronic document management. Legal and technical frameworks have already been established in all countries, for all railways to support the deployment of these technologies. Regulatory and technical basis (United Nations Recommendations and OSJD Guidelines) to support transboundary exchange of documents of various jurisdiction (including shipping and commercial documents) have been set. With conclusion of relevant agreements, it can provide the ground for information exchange between the stakeholders.

To promote the electronic document exchange in export-import transit operations, JSC Russian Railways has signed relevant agreements with railway administrations of nearly all neighboring countries, including JCS Ulanbataar Railways (UBZD). It is worth mentioning that rapid development of the IT system of UBZD allows the exchange of electronic legal documents, including the exchange with RZD.

Legal issues concerning the use of electronic signature in international exchange of data – the ones that UBZD is confronting - are related to transboundary electronic document exchange in international cargo transport. The implementation of Mongolian law on electronic signature provides solution to the issue. Starting from

1 April 2016 Mongolia is initially introducing the use of the electronic signature by government authorities. UBZD is carrying out a research on the introduction of an electronic signature.

The data exchange agreement between the JCS Russian Railways and JSC Kazakhstan Temir Zholy is not yet signed. The IT systems JSC KTZ are not supporting electronic documents exchange with the IT systems of JSC Russian Railways, thus cross-cutting technology for container trains on the route China-Europe-China can not be applied.

The main issues pertaining to cross-border electronic document exchange at border and port railway stations include the following[2]:

a. There is no integrated intermodal IT system at border points and sea ports designed mainly for rail transport, including the elements of maritime and road transport. The international system for maritime and air transport is not suitable for railways.

b. Insufficient compatibility of the software used by the Customs authorities (including Customs authorities of the Eurasian Economic Union) at border crossings and at the offices of arrival / departure. For example, any adjustment made to the customs document by the Customs at border point does not allow the customs to see the adjustment at the Customs office of arrival, which results in requests for hard copies.

c. Frequent loss of documents in container transfer between participating countries (certificates / invoices / packing) due to lack of electronic exchange, thus hard copies of all documents have to be dispatched with a container.

d. Lack of transparent procedure for advance transit declaration of shipments from Uzbekistan through Kazakhstan. All accompanying documents are currently being sent via e-mail to a declarant. This may not duly consider setting out of cars in case accompanying documents reveal data entry discrepancies at border crossings.

e. No unified technical regulation has been introduced for the installation of mobile navigation and monitoring equipment (devices with GPS) for secured vehicles at entry points and its removal at exit stations. Additional time and resources are required due to this fact.

Potential solutions to identified issues:

a. Strengthen linkages and ensure accessibility availability of IT systems of relevant administrations: Customs – maritime line – railway operator – client through the development and implementation of a unified intermodal IT system.

[2] According to FESCO, Changchun International Land Port Co., Ltd, InterRail Holding

b. Avoid the use of hard copies in completion of customs formalities and processing transport and commercial documents through deployment of advanced information technologies.

c. Improve regulatory frameworks for the transportation of import, export and transit cargo by actors of carriage chain (e.g., railways of two neighboring countries).

5. Recommendations for ensuring efficient interaction between corporate IT systems of carriers involved in multimodal transport operations

The summary and analysis made in previous chapters on IT systems of international carriers show that these systems provide the ground for developing international transport and logistics systems complying with the concept of the Fourth Industrial Revolution (Industry 4.0).

In general, these requirements target maintaining control of the technical systems in 'real-time' mode.

The following objectives should be completed to fulfill the above requirements:

a. All transport participants (through corporate IT systems) being parts of a unified logistics system should use common means of communication ensuring reliable real-time cooperation (within a common information space).

Achieving of this objective requires improvement of the systems of cross-border exchange of electronic legal documents of various jurisdictions. Simultaneously it is necessary to consider different levels of IT systems of transport participants. Not all the stakeholders are currently ready for transition to paperless technology. It makes the chain of electronic document management lag. To remove barriers participants with advanced technologies are confronting, combined e-document management has to be organized. It is not obligatory to use strictly electronic documents. Using of soft (scanned) copies of original paper documents with EDS is sufficient, as it still allows carrying out preliminary technological operations prior to the arrival of cargo shipments to the points of processing, and the data thereby will not be double-processed. Disadvantages include impossibility of automatic computerized processing of soft copies of documents.

b. All the components of transportation process (transport vehicles, freight packages and shipments, technical staff, etc.) should be automatically identified in real-time mode by computerized management systems ('Internet of Things' (IoT)).

Achieving this objective requires equipping the transported vehicles, freight packages and shipments with automatic distance identification (recognizing by unique features) devices (ADID) and devices of indication (determining current

condition by setup criteria, including dislocation at specific moments of time). 'Electronic seals' are examples of such devices.

At the same time, the critical issue for the use of 'electronic seals' is lack of precise requirements to mobile devices, to the systems for ensuring their safe operation. Cases of unauthorized installation on mobile units (trucks and containers) of multi-purpose devices which include receivers of radio navigational signals of the global satellite positioning systems. Such devices can provide the basis for potential geolocation technologies in transport ensuring efficiency of transport management, safety of cargo and Customs control monitored in 'real-time' mode. However for this purposes these devices have to conform to a number of mandatory requirements, especially on ensuring cargo safety.
Technical regulations have to be developed and enforced to ensure safety of cargo transport and unify the use technical means.
The exchange of information between carriers operating vehicles with installed ADID should also be ensured.

c. Switch has to be made from the management of specific technical operations to coordinated management of results-oriented processes.

For achievement of this objective, taking into account the need for including the international railway routes into international supply chains, it is necessary to ensure the integration of the IT systems of the carriers. Methods of supply chain management (SCM) have to be set as a priority for the integrated system. [The SCM systems manage whole goods supply chain, including: purchasing raw materials, delivering these materials to the points of processing, manufacturing certain products, delivering the products to the places of consuming, sales or preliminary distribution, storage, etc. The established integrating system shall provide information modes of the above processes. The system has to ensure consistency of all processes, including train schedules based on actual forecast for cargo freights.

Mathematical methods of logistics supply chains (LSC) re-engineering have to be applied for the development of computerized tools for market forecasting. These methods involve upgrading existing LSC or developing new ones, including the strategic planning of the supply chain situation analysis, quality evaluation of proposed services and assessment of possible risks.

Given that global supply chains are formed by independent market agents carrying out planning and management of the transport and logistics resources within supply chain technological processes, the integration system cannot be considered in terms of management and can not be used for establishing such system. CCTT can only coordinate the operation of supply chains. Controlling can be considered an appropriate methodology for developing the system and achieving the objectives set for logistics supply chains. Controlling stands for an instrument of market economy that does not impose direct centralized regulation of all chain links. Under this concept, coordinator is expected to maintain the balance and ensure consistency in plans of all logistics chain links. The goal of the coordinator is maintaining the balanced and synchronized plans of all these logistics chain links. At the same time, all these plans have to be directed towards achievement of the final objective and synergistic effect.

In the interim, result of this system's operation should be the forecast streamlines of cargo flows (car flows) from the places of origin to the places of redemption, as well as the reverse flows the displacing of which is planned within relevant Transport and Logistics Supply Chains. Based on this information it is possible to plan establishment of dispatching and step-by-step routes with firm-time slots distinguished. In this regard the information should be transferred to the IT systems of respective carriers and infrastructure owners, as well as operators involved and owners of the rolling stock.

Thus, the development, implementation and ensuring consistency and integrity of modern information systems of various participants in carriage is an efficient way to facilitate official procedures along the entire transport route.

Today, businesses are interested in the establishment of an intergrated intermodal information system that, through the use of electronic seals, allows to:

- ensure inter-agency exchange of information of various types between all participants in carriage (Customs authorities, railways, forwarders, etc.);
- track cargo location and status along the entire route;
- remove administrative barriers and facilitate border crossing formalities;
- harmonize information flows, prevent duplication of data, ensure data transmission to common data bases which can be utilized by different government control authorities.