RAILROAD TRANSPORTATION IN THE ACCELERATED EUROPEANIZATION PROCESS THROUGH INTEROPERABILITY

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ABSTRACT: Following the revolutionary plan to make the European Union (EU) a unitary connected continent without roaming between EU countries it came the turn of physical infrastructure, the transportation to enter into the accelerated unification equation. Western Europe national railway systems experienced a significant change in the last 20 years, partly as a result of EU Regulation (EU) 440/1991, but also as a result of the railways revival by the return of increasing transport rail trend [1]. To ensure the interoperability and an efficient exchange of data and information, the EU states needs a general plan on the TSIs (**T**echnical **S**pecifications for **I**nteroperability) implementation. In order to be a significant strategic choice in Europe, railway transport should reduce their costs and deliver high quality services to customers. In all kinds of businesses, the management of information flows is an integral part of the offered services and in this case, railway transport is not an exception. The European Union is undergoing for adoption and implementation of the laws that will force interoperability along railways in Europe and along the railways in other non European. This paper describes those changes (harmonization) needed to solve the problem of interoperability, with particular emphasis on commercial tools of railway transport operators, infrastructure managers and the efficiency of traffic management as a result of modernization imposed by technical specifications for interoperability.

KEY WORDS: interoperability, technical specifications, common interfaces, traffic management, conventional transportation

1. INTRODUCTION

In October 2012, the new maps that show the nineth major lines of infrastructure supporting the EU unified market and upgrade est-westic connections were published. EU invests billions of euro in cofinancing trasport projects which follow to complete the missing links at transfrontarial level, to make the jams dissapear and to raise networks intelligence level.

European Comision (EC) has selected several projects to recive european money on the level of EU cofinancing includeed in the project regarding transeuropean transportation network (**T**rans-**E**uropean **T**ransport **N**etworks - **TEN-T**), to improve transport infrastructure of Europe. IT&C industries (**I**nformation **T**echnology **& C**ommunication) well develop several projects on EU level but also will face chalenges to finish comunitary transport network.

Transport if fundamental for economic efficiency of EU, even if in present time some vital links are missing and also major problems regarding between frontiers interoperability isues. The connection between est and west must be complete and transform the puzzle of connections that we have in present into a real coonection network (inter-conectated). Without it Europe will not grow and prosper.

New EU politics is focused on a central European network in transportation field, having as purpose concentration of the expenses on a smaller number of projects that can add real value at EU level. In this way, the 9 corridors will represent the fundament for central network infrastructure coordinate

development, covering at least 3 ways of transportation, 3 member states and 2 cross border sections. The 9 corridors organization will reunite member's states in cause, also the relevant interested parts.
This step starts from the premises of preliminary studies over new projects, also from complementary grand which have as purpose to support building initiative on going for all the transport modes. Trans European networks represent one of the best examples of the value that EU can bring to its member states.
A performing network is essential for the good function for the unique market and will stimulate to grow competition. Also, Europe will benefit from such projects through the transition hoards a more sustainable future and allowing same access regime on market for all its regions.

2. REDUSE TRANSFRONTARIAL INTEROPERABILITY

Without the help of a aquipped network and a smart ussage of it, no major change can be made in the transportation area. In assamble, the investments in transportation infra-structure help the economic growth also creating jobs and growing geografic accesability, comert and personal mobility. It has to be planned in such manner to maximise the positive impact on economy and minimize the negative impact on environment.
Now a days, European Unions transport infrastructure is well developed. Despite this, is still made from fragments, on geografic level and also between and in transportation facilities. TEN-Ts principal objective is to establish a complet and integrated trans-european transport network, able to cover the incorporate all the memmber states and regions and from which to start a balaced development of all the transport areas and also for optimal use of the advantages resulted from it, maximizeing in this way the value given to Europes Transportation network.
"Costs systems and capacity distribution should take into consideration growth saturation effects of infrastucture capacity " as showed in the rewied version of the First Railway Package.
Beside the need of investments in railways infrastructure and establising some cost systems for using the railway existing infrastructure, that can offer stimulents for administrators to made appropiate investments to make if fit for use, in this point interoperability is confrunted also with technical problems.
In order to diminish visibly this technical natured problems also First Package and the Fifth one are pointing at network interoperability as being one of the most significant elements of education is the Unic Railway Area on european level.
Also, the two legislative packages give idea of sign and control systems for the trains, ETCS, being, on their level, important for systematization interoperabilitaty for euro-pean networks. Just that is more easy to say then implement this solutions.
Suporting interoperability, European Comision has developed a solution to consolidate the certification and authorisation process for the traks and trains equped with ETCS. As we know, in present, through Europe are working over 20 sign systems, creating an incompability that leads to creat a problem for international trafic.
For example, instaling a new national safety system on one of the locomotives already autorhise in several countrys and obtaining and obtainingall over again all the safety system certification may cost over 2 millions euro and may take over 2 years. ETCS eliminates this costs.
At this moment, in Europa, over 4.000 km of tracks are equipped with ETCS. More, contracts are already aproved for equipting over 4.000 km extra, which indicates that the lengh in tracks equippted with ETCS will grow with 100 % in following 2-3 years.
As an extra reason to instal ETCS is represented by the legal context of the two packages mentioned above and according to them, the trains equippted with ETCS can pay a smaller fee for accessing the infrastructure.
On top, between 2011 – 2014, first priority included in TEN-T financial plan made refrence to testing campain in order to show

interoperability between lines equippted with ETCS 2.3.0d and bord machines from diffrent producer.
In this prime domain, tracks and trains which are schedual to be equippted with ETCS before becoming valid the Comision Decision 2008/386/EC may recive funds TEN-T for the upgrade, in order to insure compatibility to ETCS 2.3.0d standards.

3. EUROPEAN DIRECTIVES ON INTEROPERABILITY

To be a significant strategic choice in Europe rail to reduce costs and deliver high quality services to customers. In all types of businesses, management of information flows is an integral part of the services offered in this case, rail transport is no exception. The European Union is pending and law enforcement will force interoperability along railways in Europe and along the railways of other non European.
Why is it necessary interoperability of the European rail system? The answer to this question is simple. There railway system of the European Union a lot of technical barriers that prevents interoperability. The most important are:

- 5 different types of electrical systems;
- 21 different signaling systems;
- 5 types of different track gauges;
- 5 different classes of permissible axle loads;
- 6 different type distance between two adjacent lines;
- Different national rules for operation and/ or exploitation.

Commercial operations of trains, wagons and intermodal units on the European network require an efficient exchange of information between infrastructure managers, operators and other service providers [2, 3]. High levels of performance, enhanced quality of service and cost reduction will depend on the capacity of interoperability.
Interoperability series of measures known collectively as TSI is based on Directive 16/2001. TSI goal is to ensure effective exchange of information adapted to users' needs so that the transport process becomes viable economically. Rail must be more efficient to meet the challenges posed by other modes of transport, especially road.
Telematics applications subsystem is a functional rail system. This subsystem comprises two elements:

1. **TAP** - telematics applications for passenger services, including systems providing passengers with information before and during the journey, reservation and sale of tickets, luggage management, management of connections between trains and with other modes of transport links;
2. **TAF** - telematics applications for freight services, including information systems (real-time monitoring of freight and trains), systems selection and path allocation, reservation, payment and billing management systems for connections with other modes of transport (multimodal transport) and issuing electronic accompanying documents (bill of lading).

The following TSI are relevant to topics addressed in this paper:

- Operations and Traffic Management (OPE-TSI);
- Telematics Applications for Freight (CR TAF-TSI);
- Telematics Applications for Passengers (TAP-TSI).

4. OPERATIONS AND TRAFFIC MANAGEMENT (OPE-TSI)

Technical specifications for interoperability OPE (Operations and Traffic Management) was published in Decision 2012/757/EU and covers both conventional rail and high-speed track. Implementations will be detailed on the two types of rail competition are applied depending on the level of ERTMS implementation in each country [4]. Essential requirements of the OPE-TSI cover:

- Railway safety;
- Tread reliability and availability;
- Health staff;
- Environmental Protection;
- Technical compatibility.

OPE-TSI makes specific references to all the information, training and skills that are necessary to ensure future interoperability operations over infrastructure managers (**I**nfrastructure **M**anager - **IM**). Where this involves exchanges IT (**I**nformation **T**echnology - **IT**) tools, data, messages and basic features will be included in TAF and TAP specification.
Relevant, but particularly, are data train, train running clearance expeditions, signaling train, train schedule (timetable), books of timetable booklets (published including in electronic form), regulations (regulations published), access to infrastructure contracts, requests for personnel, etc.

5. CURRENT SYSTEM COMPATIBILITY WITH TSI REQUIREMENTS

This section assesses to what extent the current system used in the Romanian railway is compatible with CR TAF-TSI and the main actions, including projects, possibly through structural and cohesion to be achieved for interoperability.
TSI regulations, in addition to the basic requirements, the existence of IT components, also require specific functionality and its systems. These functionalities are required primarily to track new business philosophy of current and rail market actors.
The main concept of "market oriented" firms but also of "customer orientation" in particular, required for current business operations with low cost, high quality services, transparency, reliability, timeliness and flexibility for services. Main functionalities required are:

- Date of the bill of lading;
- Request path;
- Preparation train;
- Preview timetable;
- Information about service disruption (faults in the way);
- Train location;
- Estimated time for interchange (ETI)/ Estimated time of arrival (ETA);
- Topology / topography wagon;
- Reporting to interchange (transfer of rolling stock between transport operators);
- Data exchange to improve quality of service;
- Basic data reference;
- Various files (databases) with references.

If EU business by regulations TAP/TAF - TSI were taken the best practices of companies freight, passenger and beyond, as well as the most advanced IT systems. Companies seeking to have a better informed client and serviced.

5.1. Item 1. Common interface

Element "common interface" aimed at interfaces between internal systems and external partners. For international partners (external) interface replacement will be mandatory Hermes and easy at the same time, although in many respects it is closely connected to existing applications and uses the same communication standards.
Romanian domestic users who use IRIS computer system now, or will be in future IRIS users may continue to use the current interface, which provides the functions encountered in TSI message flows. This should be supported by the Ministry of Transport and AFER to ensure that work does not restrict the free market open.

5.2. Item 2. Reference files

Refers to reference files or files as known constants in the literature. This element contains the following files:

- File Locations - refers to the file encoding stations (stations with rail activity):
  - Romanian coding standard is SIRUES stations;
  - Station code is used by all applications running IRIS-CRONOS, IRIS-ARGUS, IRIS-CALIPSO, etc.;
  - Code and encoding station is under CFR control;
  - This requirement will be electronically interfaced to and from the central database.

- File of Companies - refers to a method of encoding activity railway companies include those involved in railway work:
  - It is an activity under the control of AFER;
  - The current method is to use a common code in all RIS systems and accounting subsystems;
  - For interoperability or change all current systems to use the new codes or messages ensures automatic translation TSI.
- Rolling stock file - this database is distributed, but requires links to the National Register of fleet cars and vehicles ERA virtual register:
  - National information systems are IRIS-SPEAR and IRIS-ARGUS. In IRIS-SPEAR are held only recorded details of Romanian wagons;
  - IRIS-ARGUS will have to continue registration of all wagons operating on CFR infrastructure to ensure safe operation;
  - This justifies the use IRIS-ARGUS by all rail operators, not only by CFR Freight;
  - AFER will have to create a national register of rolling stock for Romania - it can be Spear database, but in this case will require changes to align with European standards;
  - A real-time connection between IRIS and IRIS-Spear ARGUS will need to ensure that data exchange will be made immediately.

5.3. Item 3. Identification Restrictions on Network (IRN)

CFR should provide database access to infrastructure restrictions. It should be consulted by each operator Railway train before training to ensure that current and planned formations path compatible with temporary changes to the infrastructure. The database must be updated in real time.
Only parts of the necessary information are kept in real time - partly IRIS-IMA and IRIS-FOCUS partially. Preferred solution would be to provide two functions CFR:

1. Validation train training in accordance with the path to ensure that teams are not used unsafe and unfeasible path;
2. Provide query current restrictions in relation to existing trace accepted either by a proposed change in the short term.

5.4. Other items

Paths Request. Trace of movement is a basic element for railway activity. The system must meet the minimum functions.

- Call traffic path. Transport operators → Infrastructure manager
- Demand/supply details path. Infrastructure manager → transport operators
- Path confirmed. Operators transport → Infrastructure manager
- Path refused. Operators transport → Infrastructure operators
- Path Cancelled (transport operators).
- Path impossible (infrastructure manager).
- Receive path confirmed.

All of them are interactive messages between infrastructure manager and carriers. Rights of access to information should be checked.
Guidance trains (train training). The following information must be available in the preparatory train:

- Train composition;
- If the train is ready to go;
- If the train is accepted into service;
- If the train is in trouble;
- Train location;
- If the train is starting signal.

Circulation train (train trafic monitoring). Implies the transport of everything may occur during it. The main functions are:

- Alignment trains for a location;
- Train history;
- Searching train;
- Train location;
- Events in the way.

6. CONCLUSIONS

New technologies and concepts such as corridors "green" for freight are vital to achieving the strategies promoted by the European Union for decades. In this context, it focuses on the implementation of

interoperability standards and projects on intermodal platforms and nodes connecting modes of transport, particularly rail and river [4, 8].

To implement TAF-TSI, companies (infrastructure managers and railway undertakings) must make plans for the implementation of the main functions of TAF, and as a result achieve European Strategic Deployment Plan (SEDP) to reflect full implementation of the TAF -TSI. It will be completed by the end of 2014. Once the strategic plan is completed, all activities related to the implementation of TAF must be justified on the development plan.

Master Plan development objectives consist of two activities related to monitoring of SEDP activity performed with the European Commission and the authorities concerned, and the second activity focused on the development of a new Master Plan that was submitted to the Commission by May 2012. Necessary resources must be allocated both by the individual and those who gather indicative results of implementation and for effective results; this should be supported by rail and the European Commission. At this point the EC and ERA deals with developing a regulatory review due to the expansion project TSI purpose [9].

This objective should be to optimize the contribution that brings the concept of *"low carbon"* freight traffic by increasing efficiency improvement and intermodal transfer nodes capacity, by supporting the development of "green corridors" in accordance with the TEN-T.

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