

EXECUTIVE SUMMARY

Purpose of the document

This executive paper is a short version of the salient arguments expressed in the 'UIRR Roadmap for an effective digital transformation to advance Road-Rail Combined Transport in Europe'. The UIRR's Roadmap builds on a concerted effective digital transformation of all key stakeholders' capabilities. The approach aims for fostering self-enforcing momentum within the UIRR member companies, shippers, logistics service providers and initiatives of the EU commission towards one digital Combined Transport market. Through more and better use of information supported by coordinated standardization components, the targeted results are to achieve improved competitiveness of Road-Rail Combined Transport with feasible investments into capabilities required to meet end-customers' future needs and requirements.

This concise version sketches the approach by highlighting the following aspects:

- (1) the real benefits of the digital transformation
- (2) the key drivers and stakeholders' needs influencing the Combined Transport ecosystem
- (3) the enhanced envisaged digital vision for Combined Transport and
- (4) the proposed roadmap covering now up to 2025.

Importance of Combined Transport

Road-Rail Combined Transport (CT) joins together the advantages of these two land transport modes to offer a reliable and economical (inter)continental service. The cargo is packed into an Intermodal Loading Unit (ILU), which may be a maritime container, continental swap body/non-ISO container or (craneable) semi-trailer. The ILU is transferred from one mode to another at specialised transshipment facilities (CT terminals), well-equipped for the efficient facilitation of this exchange between road and rail. European Road-Rail CT is a continuously evolving market with an average yearly growth of 7% since the nineties.

The total volume of Road-Rail CT in the EU amounted to more than 17.2 million TEU (about 34 million UIRR consignments) in 2011; the gross tonnes lifted achieved nearly 185.8 million, while traffic performance expressed in tonne-kilometres is estimated at around 115bn. UIRR and its member companies, the CT operators and the terminal operators, represent today about 50% of the total transported and shifted volume.

1. The real benefits of digitalisation for Road-Rail Combined Transport

In the light of supporting the goals of reducing oil-dependency, increasing safety, flexibility and environmental friendliness, Combined Transport must be considered as an integral part of the European logistic chains. Stakeholder's horizontal and vertical collaboration are required to achieve an efficient, flexible, resilient and sustainable transport mix towards the notion of 'Logistics 4.0' and 'Physical Internet'. In accordance with ALICE, Combined Transport aims to synchronize freight services of all transport modes with shippers' expectations and orders, aligning connected assets and services on corridors and hubs with the aim to integrate these into digital Physical Internet networks.

The last past and recent successful achievements in the CT sector such as tracking and tracing applications (CESAR), development of common standard format (UIRR data message, EDIGES), centralised master data (UIRR codes), systematic business-to-business interfacing and improved real-time information through digitalisation of assets (terminal OCR gates and wagon GPS data) have largely demonstrated the key beneficial role of a digitalised CT environment.

Through further increased digitalisation¹, Road-Rail Combined Transport will continuously optimize the integration of CT flow of goods. Digitalization uses information as a so called 'digital twin'² of the physical flow of goods to be able to visualize the planned or current status and optimize flows towards becoming a perfect synchromodal partner for shippers. The sharing of relevant information within the supply chain should ideally start in the early planning phases of a shipment and covers the planning, booking, and execution. The areas for improvement and the envisaged benefits are multiple: (1) better service quality and reliability to the end-users with a common understanding of estimated time of arrival or consistent inter-company tracking and tracing systems, (2) improved alignment on standards and processes, (3) higher flexibility and, simultaneously and (4) higher robustness and resilience towards embracing a synchromodal transport system in 2030. A concerted approach requires more coordination in the beginning but the result will be far more beneficial for sector stakeholders than only small, local, isolated and uncoordinated improvements.

2. The CT ecosystem: key drivers and stakeholders' needs

Today's CT business ecosystem is composed by interdependent elements that are significantly impacted by developments of: (1) physical assets (infrastructure, wagons, terminals, loading units, cargo), (2) stakeholders (infrastructure managers, railway undertakings, CT operators, terminal Managers, trucking companies, logistics companies, shippers), (3) authorities (policy-makers, customs authorities, regulators) and (4) information processing capabilities and data flows.

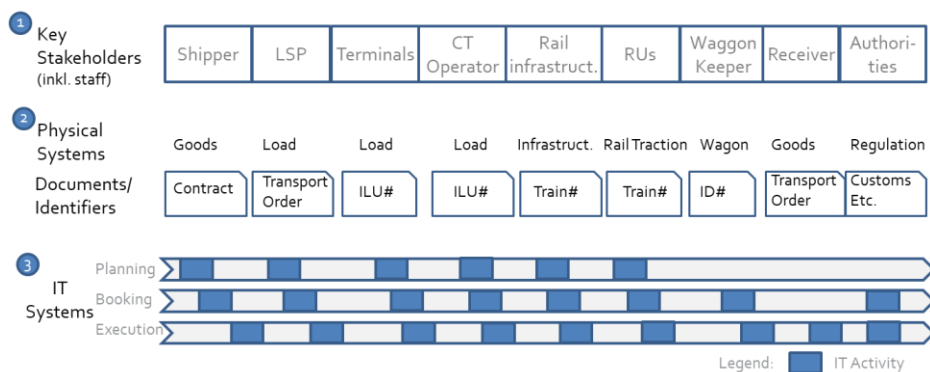


Figure 1 - The key components of the CT ecosystem

The CT ecosystem (see figure 1) is continuously in motion and must be adjusted to the ongoing business developments, operational, and production changes. The following elements can be considered as key drivers for change and adaption of the CT business environment:

¹ The concepts of 'digitisation' and 'digitalisation' are currently often (mis)used and misunderstood. Whereas 'digitisation' is the process of converting information into a digital computer-readable format, digitalisation means the use of digital technologies to change processes and provide new revenues and value-producing opportunities through enhanced products and services. With the notion of 'effective digitalisation', UIRR aims to avoid the pitfalls of too narrow borders or viewing this topic only through an IT lens.

² A digital twin can be defined, fundamentally, as an evolving digital profile of the historical and current behavior of a physical object or process that helps optimize business performance.

- (1) Competition of other transport modes (in particular the road) pushing the CT sector to continuously enhance their logistic capabilities and market responsiveness
- (2) Pressure of European and national legislators for more coordinated digital measures in the transport sector
- (3) The logistic requirements of the end-users such shippers/logistics companies: they require seamless integration, end-to-end supply chain visibility, rich exchange of near to real-time information on the digital flow independently of transportation mode with a transparent provision of the expected time of arrival (ETA) for picking up loading units in case of irregularities.
- (4) The continuous development of new technologies (Internet of Things, 5G bandwidth, artificial intelligence, 'software as a service', blockchain concept, autonomous driving; new collaborative data hubs or platforms) as a support for the digital transformation.

All these drivers will lead to a "perfect storm" of changes on the CT ecosystem in the future with 'data' as 'the new oil'³ for the future CT ecosystem. This will generate major (mental) shifts for the industry, logistics and regulatory environment.

3. An enhanced digital vision for Road-Rail Combined Transport

In comparison with other modes of transport and to respond to the constantly evolving CT ecosystem, CT must initiate a digital process maturity change. This situation demands faster advancement to avoid falling behind. **The CT sector's vision is to transform itself from a 'road-rail freight transport' service provider to an 'integrated collaborative transport' service provider for the logistics supply chain.** The figure 2 shows the vision of improved collaboration that increases the efficiency and meets current and future customer demands. Thereby, the improved coordination enabled through the envisioned service platform would lead to a higher competitiveness of the combined transport sector⁴.

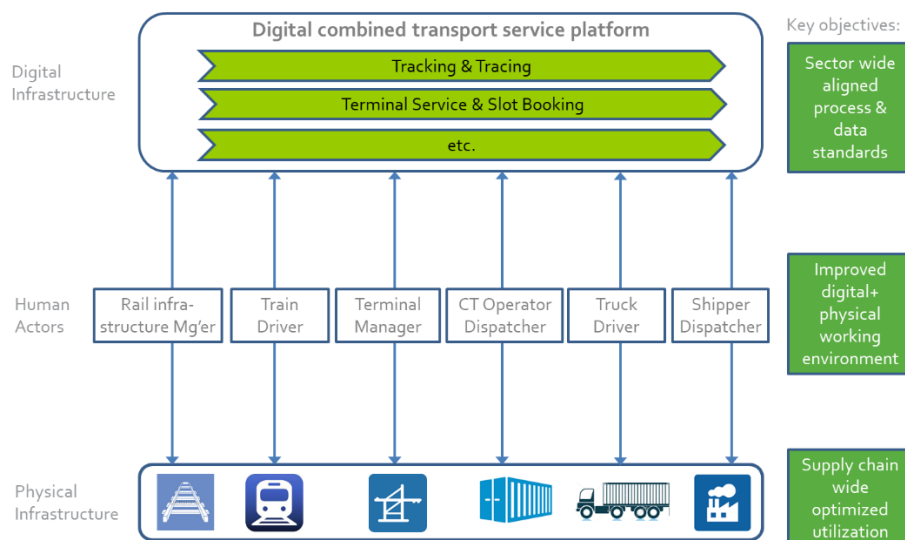


Figure 2: Envisioned future state end-to-end effective collaboration between CT sector stakeholders

The path towards this vision is facilitated via an effective implementation of a sector wide coordinated digital transformation. It requires however several prerequisites for the stakeholders of the CT ecosystem: (1) Design and set up a CT Digital Forum with all relevant stakeholders driven by the end-users' future needs, (2) Increase trust in commitment of all relevant parties through an active participation and progress monitoring to reduce uncertainty and costs, (3) Establish a requisite level of willingness to exchange information, (4) Collaborate to the definition of accepted set of shared standards for the total supply chain, (5) Loose coupling of services, companies and IT infrastructures and (5) Define and establish stable services to exchange data. **The CT sector will position itself to become more competitive by reaping the potentials of digitalisation in an effective and synchronised manner.** The vision can be achieved by improved collaboration and interoperability within the sector, with shippers and other stakeholders of the logistics chain including authorities and regulators.

³ See Economist article 6th of May 2017 (www.economist.com/news/leaders/21721656-data-economy-demands-new-approach-antitrust-rules-worlds-most-valuable-resource)

⁴ The form of deployment will be decided later in the process. It can have one of the following forms: (1) no recommendation, (2) only defining standards to be used, (3) defining standards and selecting a proprietary service or platform, or (4) defining standards and requirements to customize existing platform service as a shared service, (5) phased evolution of a combination of the four. The minimum achievement is a more efficient exchange of information between different stakeholders to be able to win additional customers.

4. Roadmap for the CT sector transformation

The digital transformation path follows a logical sequence shared by similar initiatives⁵. The proposed model for the roadmap follows exactly this path applied to the CT sector and the emerging Internet of Services in a phased approach which allows enough time to learn, adapt and improve. UIRR proposes to roll out the entire CT digital transformation in three distinctive phases (see annexes for full roadmap): (1) Phase 1 (2020 to 2022) focuses on lay the groundworks for the future digital transformation, (2) Phase 2 (2022 – 2024) will define the implementation of services to improve collaboration within the combined transport sector, (3) Phase 3 (2024 – 2025) will focus on platform or data hub-based supply chain spanning open data exchange and the adoption of inter-organisational service platforms where beneficial. From 2025 to 2030, the full impacts and envisioned benefits of the changes will be visible.

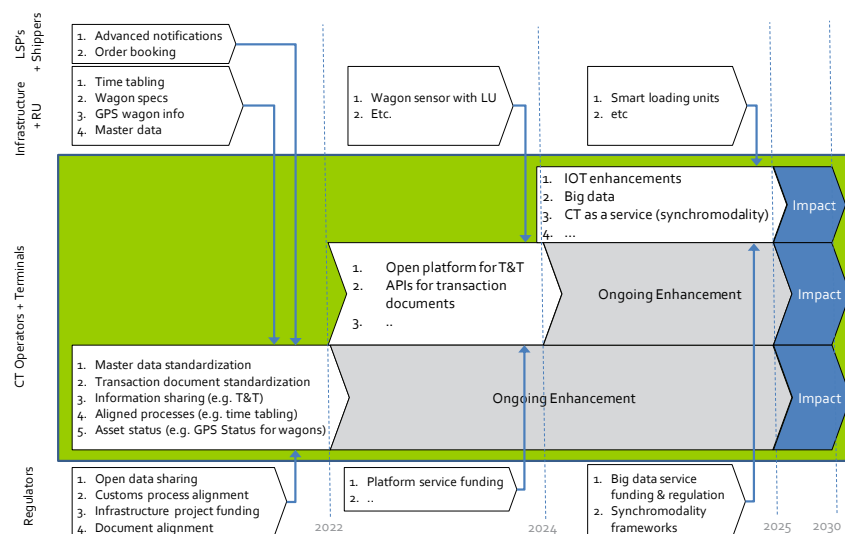


Figure 3 – CT Digital Roadmap and stakeholder interaction based on a three-phased approach

For the three phases, all measures have been grouped in categories to be able to group and sequence the required activities. The categories follow a bottom-up logic⁶ starting with the bottom first: (1) Asset Management / IoT, (2) Master Data, (3) Transaction Document Standardization, (4) Information Sharing, (5) Shared Processes Support and (6) Business Intelligence. All the workstreams of detailed topics and recommendations for all phases are included in the roadmap document.

5. Conclusions and recommendations

Road-Rail Combined Transport, promoted by UIRR and its member companies, is recognised as the most economic railway technique to ensure a sustainable modal shift for goods from pure unimodal road chains to integrated door-to-door supply chains with railway journey(s). Today's CT business ecosystem is essentially composed by interdependent elements such as physical assets, stakeholders, regulators, information systems and data. To guarantee the further development of this ecosystem in the coming years, the traditional vertical collaboration and partial integration must be transformed towards a more integrated and interconnected CT ecosystem. The final aim of this metamorphosis is to create a system in which CT will play a fundamental new role in building synchronodal solutions towards a fully flexible European CT network. Our vision, supported by digitalisation, is the creation of a European initiative on the digital transformation of CT with all interested parties with the aim to accompany and coordinate the entire roadmap on a commonly agreed detailed implementation programme. The success of the CT digital transformation will result in a smart and cooperative integration of all stakeholders into one commonly defined CT ecosystem supported by new commonly agreed concepts, processes, shared data hubs/platforms and digital solutions (assets, transport documents, data messages, registers). Thus, the involvement of all stakeholders is required to achieve a highly interoperable, efficient and effective digital transformation. Otherwise, an uncoordinated digital approach will be counterproductive and will undermine the expected benefits of the CT digital transformation.

⁵ See a similar approach by the Industry 4.0 maturity development path defined by FIR e.V. at RWTH Aachen University

⁶ For reasons of a simpler flow of the argument some levels are aggregated and the transaction document standardization activity is defined as a logical level.

The following table summarises the UIRR priorities per stakeholder for an effective digital transformation in Combined Transport. UIRR is (currently) taking the lead but is open for future support by others.

Stakeholders	Main priorities
Associations (UIRR...)	<ul style="list-style-type: none"> ➤ Definition of governance models/structures (ensuring neutrality and openness of the CT digital forum) ➤ Development of common standard messages (contacts with the Regulators/Authorities) ➤ Promotion of activities that facilitate the path towards Physical Internet, IoT and Logistics 4.0 ➤ Set-up of a CT Digital Programme with all relevant stakeholders (UIRR initiative) for defining the common approach on data standards, protocols, APIs and services ➤ Linking with associations of other modes to coordinate towards streamlined global standards ➤ Initiate discussion on future enhancements and measures for the sector towards mobility services ➤ Signature of framework contract on behalf of members following the 'shared costs' principle ➤ Analyse the impacts of any regulations related to data use and sharing (eFTI and GDPR) ➤ Active participation in the ERA TAF TSI activities
Combined Transport Operators	<ul style="list-style-type: none"> ➤ Contribute actively to the CT Digital Programme ➤ Active participation in the common CT approach ➤ Adopt and promote 'open data model' approach (tracking and tracing purposes) ➤ Dedication of resources to develop standards for collaboration and alignment of proposed roadmap and own internal projects ➤ Adopt the data format exchange EDIGES (as standard for the electronic data exchange) ➤ Provision of an accurate ETA (pick-up time) and alert messages for the end-users
Terminal Operators	<ul style="list-style-type: none"> ➤ Participation in the CT Digital Programme ➤ Adopt the data format exchange EDIGES ➤ Improve terminal visibility and transparency ➤ Adopt and promote 'open data model' approach (tracking and tracing purposes) ➤ Join the RNE TIS platform for enhanced data exchange with RUs and IMs ➤ Dedication of resources to develop standards for collaboration and alignment of time-lines and own internal projects
Wagon owner/keeper	<ul style="list-style-type: none"> ➤ Transform all wagons in smart IoT assets at an affordable economical price ➤ Develop smart solutions for improved safety and train load optimisation ➤ Alignment of cloud applications and standards (e.g. IoT data exchange standards)
Railway Undertakings	<ul style="list-style-type: none"> ➤ Contribute actively to the CT Digital Programme ➤ Participation in the common approach towards developing a collaborative set of standards and services to foster vertical collaboration between supply chain stakeholders (e.g. ease of access to traffic status information) ➤ Provision of an accurate ETA for train and detailed reasons of delays (TAF TSI implementation) ➤ Implement fully the TAF TSI Regulation (e.g. train identification ID for tracking and tracing purposes) ➤ Adopt the data format exchange EDIGES (as format for the electronic exchange of consignment note)
Infrastructure Managers	<ul style="list-style-type: none"> ➤ Participation in the common approach towards developing a collaborative set of standards and services to foster vertical collaboration between supply chain stakeholders (e.g. access to infrastructure status information) ➤ Promote transparency in CT infrastructure rules and provision of all infrastructure-related information to all CT stakeholders through existing European (IT) tools (e.g. RNE TIS & PCS) ➤ Implement fully the TAF TSI Regulation (e.g. unique train identification ID)
End-Users (logistics providers or shippers)	<ul style="list-style-type: none"> ➤ Participate in explorative activities to openly share common requirements with CT industry associations ➤ Initiate pilot projects to advance CT's integration into the end users supply chain planning and execution processes ➤ Develop platforms for freight demand bundling ➤ Adopt the data format exchange EDIGES
Regulators	<ul style="list-style-type: none"> ➤ Provide an open and fair environment enabling CT stakeholders and their services to develop towards a synchromodal system ➤ Foster pilots and standard development to facilitate a faster agreement within CT and the between the other modes of transport ➤ Promote IT integration with all transport modes through innovative subsidy schemes to boost digital transformation