

Annex – Roadmap – All phases

Phase 1 - already started or immediately starting high priority activities

Asset Management / IoT			
Type	Measure	Impacts	CT stakeholders
<i>CT Wagons</i>	Installation of sensorics (GPS localisation, status) Standardization of asset data (e.g. wagon data elements)	<ul style="list-style-type: none"> • Safety • Maintenance • Operations 	Wagon manufacturers, leasing companies and keepers
<i>Intermodal Loading Units</i>			ILU producers (new loading units) and owners
<i>Transshipment equipment (e.g. portal cranes)</i>			Terminal Operators / Crane producers
<i>Terminal facilities</i>	Installation of OCR-gates	<ul style="list-style-type: none"> • Automate status change 	Terminal Operators
Master Data (Services)			
Type	Measure	Impact	CT stakeholders
<i>ILU technical specifications</i>	Elaboration of an ILU technical database for swap-bodies and semi-trailers as a service to the CT sector (similar to the Boxtech developed by BIC)	<ul style="list-style-type: none"> • Train and wagon optimisation • Control and exception management improvement 	Associations (UIRR) ILU owners Codifying entities
<i>Wagon technical specifications</i>	Establish a standard for CT wagon specification (with loading scheme functionality) for a unique virtual wagon DB or standardized API	<ul style="list-style-type: none"> • Wagon optimisation • Process efficiency 	EU (TAF TSI Regulation and RSRD catalogue) Wagon keepers
<i>Network nodes services</i>	European portal of all service facilities (static data) enriched with dynamic data (www.railfreightlocations.eu)	<ul style="list-style-type: none"> • Data availability • System transparency and visibility 	EU + Associations (governance structure) Service Facilities (data provider) Other CT actors (potential users)
<i>Railway Location Codes</i>	Facilitate the access to RNE location codes application	<ul style="list-style-type: none"> • Reduction of data mapping and error corrections 	Framework agreement among the industry associations (e.g. UIRR and RNE)
<i>CT line codification</i>	Promote RINF as operational database for the CT ecosystem, definition of interface and data quality mechanisms – RINF revisions	<ul style="list-style-type: none"> • Planning • Route / gauge visibility • Route compatibility 	EC / ERA (quality assurance) IMs (data providers) All other CT stakeholders (potential users)
Transaction Document Standardization			
Type	Measure	Impacts	CT stakeholders
<i>Customer order / booking</i>	Apply and enhance the currently used EDIGES standard Propose a governance mechanism to enhance EDIGES in a coordinated way	<ul style="list-style-type: none"> • Reduced manual work • Higher booking from LSPs/ shippers 	Association (UIRR) Other stakeholders (potential users)
<i>Consignment note (customer)</i>	TAF TSI update for harmonized customer consignment note (e.g. EDIGES format)	<ul style="list-style-type: none"> • Cost reduction • Facilitation of data exchange 	EC/ERA (intermodal task force) All other CT stakeholders (potential users)
<i>Single Digital Transport document</i>	Establish a common agreement among sector for relevant documents (similar to NCTS for customs)	<ul style="list-style-type: none"> • Higher efficiency • Less IT maintenance costs • Improve CT attractivity 	EC legislator Associations Supply chain stakeholders
<i>Advanced notification</i>	Define data elements and access to advanced shipment information where available.	<ul style="list-style-type: none"> • Higher ability to react • Reduced delays 	Shippers and LSPs CT Operators
<i>Status message harmonization</i>	Validate and enhance EDIGES standard towards a sector wide applicable minimal and extensible status standard including exception and error codes	<ul style="list-style-type: none"> • Reduce costs • Increase clarity • Increase speed of resolution 	Operators and terminals RUs

Information Sharing (Services)

Type	Measure	Impacts	CT stakeholders
<i>KPIs + ETA</i>	Establish common collection and computation of critical KPIs including ETA/ETI/ETD (e.g. Webservice calls when passing gates for security information)	<ul style="list-style-type: none"> • Improve transparency • Monitoring • Quality assurance 	RNE TIS system Freight corridor KPIs (as a basis)
<i>Document Exchange Platform</i>	Central document hub for the SC for digitalized documents (instead of e-mails). Digital solutions to exchange dangerous goods, waste declarations, customs documents etc	<ul style="list-style-type: none"> • Improve transparency • Monitoring • Quality assurance 	RUs CT + Terminal Operators LSPs
<i>Order booking</i>	Facilitate the booking order for end-user (common template/platform) – EDIGES as format	<ul style="list-style-type: none"> • Facilitate CT access • Improve interoperability among operators 	Association (UIRR) CT operators LSPs, Shippers
<i>Tracking and tracing</i>	Stakeholders should be connected to the RNE TIS System	<ul style="list-style-type: none"> • European transparency • Facilitate ETA calculations 	RNE (as the platform owner) CT + Terminal Operators End-users (LSPs)

Shared Processes Support

Type	Measure	Impacts	CT stakeholders
<i>Timetabling / routings</i>	Alignment with RUs towards a standardized communication to avoid international interruptions and keep availability of railways for CT high	<ul style="list-style-type: none"> • Improved planability • Better resource utilization • Higher profits potential 	RUs Infrastructure providers CT + Terminal Operators
<i>Order booking</i>	Order booking is of high interest and solutions for intercompany order transfer require deeper analysis to avoid point-to-point solutions / establish interface standards (as part of EDIGES)	<ul style="list-style-type: none"> • Increase efficiency for customer and supplier • Less mistakes • Faster issue identification 	CT + Terminal Operators LDLs, Shippers
<i>Order equipment</i>	Establish standards and services to order equipment electronically	<ul style="list-style-type: none"> • Transparency • Improved operational efficiency 	CT Operators, Wagon Holders
<i>Booking of road pre- and on carriage</i>	Align process for booking of pre-and on-carriage of shipments and equipment	<ul style="list-style-type: none"> • Transparency • Improved operational efficiency 	LDLs CT Operators
<i>Railway consignment note</i>	UIRR and members analyse implementation options of previously defined standard	<ul style="list-style-type: none"> • Interoperability • Improved operational efficiency 	RUs CT Operators
<i>Advanced notification</i>	Messages supporting the pre-information to support the likely arrival of goods to be expected prior to the physical arrival at the respective step (derivative of the ASN between shipper and his customer).	<ul style="list-style-type: none"> • Better use of resources • Higher efficiency • Better ability to cope with disruptions 	RUs, LDLs, Operators, Terminals
<i>Wagon information exchange</i>	Establish a unique virtual wagon database or a standardized API Create the WIMO database as planned in the TAF TSI	<ul style="list-style-type: none"> • Improve operations (technical control) • Improve wagon visibility 	EC / ERA Wagon keepers / leasing companies
<i>Exchange of dynamic terminal service</i>	Promote an EU portal for dynamic data exchange for data elements such as capacity status or disruptions (EU portal/platform)	<ul style="list-style-type: none"> • Transparency • Improved operations 	EC / Associations (governance) All stakeholders (potential data providers and users)
<i>ILU operation data exchange service</i>	Enhance the ILU database towards an active service on damages, status and characteristics	<ul style="list-style-type: none"> • Transparency • Improve operations (controls, optimisation) 	Association (UIRR) All stakeholders (potential users and data providers)

Business Intelligence

Type	Measure	Impacts	CT stakeholders
<i>Predictive maintenance (assets)</i>	Installation of sensorics (wagons, cranes, locomotives, loading units) as prerequisite Early pilots towards standardized data collection	<ul style="list-style-type: none"> • Knowledge management • Asset management • Real-time positioning 	All asset owners / lessor / lessee / manufacturer
<i>Capacity utilisation</i>	Stock taking on existing inter-organizational reservation and booking processes and IT systems	<ul style="list-style-type: none"> • Higher ability to plan • Better customer satisfaction • Increased efficiency 	Associations (UIRR), CT operators, LSPs, shippers
<i>Demand forecasting</i>	Explore demand forecasting procedures & standards Analyse existing services (e.g. cargo stream)	<ul style="list-style-type: none"> • Higher ability to plan • Increased efficiency 	Associations (UIRR), CT operators and shippers
<i>Exception management</i>	Exception coding stock taking Assessment of standardization cost benefit	<ul style="list-style-type: none"> • Efficiency from and degree of automation 	All asset owners and CT operators

Phase 2 – Visibility and efficiency improvements

Asset Management / IoT			
Type	Measure	Impacts	CT stakeholders
<i>CT Wagons</i>	1) Alignment of man-to-machine cloud applications 2) Development of machine-to-machine protocols and formats (e.g. wagon status connected to loading unit)	<ul style="list-style-type: none"> • Safety • Maintenance • Operations 	Wagon manufacturers, leasing companies and keepers
<i>Intermodal Loading Units</i>			ILU producers (new loading units) and owners
<i>Transshipment equipment (e.g. portal cranes)</i>			Terminal Operators / Crane producers
<i>Terminal facilities</i>	Data exchange with existing operational registers (e.g. intermodal loading unit register)	<ul style="list-style-type: none"> • Automate status change • Process efficiency • Safety (damage management) 	Terminal Operators

Master Data (Services)			
Type	Measure	Impact	CT stakeholders
<i>ILU technical specifications</i>	Operational register available for all stakeholders – interaction with other third-party applications	<ul style="list-style-type: none"> • Train and wagon optimisation • Control and exception management improvement 	Associations (UIRR) ILU owners Codifying entities
<i>Wagon technical specifications</i>	1) Development of API services and/or virtual interface for all CT wagons in Europe (including exact loading schemes) 2) Development of common algorithms for wagon optimisation	<ul style="list-style-type: none"> • Wagon optimisation • Process efficiency 	EU (TAF TSI Regulation and RSRD catalogue) Wagon keepers
<i>Network nodes services</i>	Full functioning European portal of all service facilities (static and dynamic data) enriched with timetables (rail, inland waterway)	<ul style="list-style-type: none"> • Data availability • System transparency and visibility 	EU + Associations (governance structure) Service Facilities (data provider) Other CT actors (potential users)
<i>Railway Location Codes</i>	Interfacing and API services developed – all facilities codified (primary and secondary codes)	<ul style="list-style-type: none"> • Reduction of data mapping and error corrections 	Framework agreement among the industry associations (e.g. UIRR and RNE)
<i>CT line codification</i>	1) Full implementation of the revised RINF regulatory framework 2) Development of specific queries for CT (re-routing capabilities) 3) Mapping RINF with the rail freight corridors	<ul style="list-style-type: none"> • Planning • Route / gauge visibility • Route compatibility 	EC / ERA (quality assurance) IMs (data providers) All other CT stakeholders (potential users)

Transaction Document Standardization			
Type	Measure	Impacts	CT stakeholders
<i>Customer order / booking</i>	1) Full implementation of the EDIGES format 2) Revision of the TAF TSI Regulation 3) Technical specifications for a common booking platform	<ul style="list-style-type: none"> • Reduced manual work • Higher booking from LSPs/ shippers 	Association (UIRR) Other stakeholders (potential users)
<i>Consignment note (customer)</i>	Monitoring of the TAF TSI implementation (customer consignment note) (e.g. EDIGES)	<ul style="list-style-type: none"> • Cost reduction • Facilitation of data exchange 	EC/ERA All other CT stakeholders (potential users)
<i>Single Digital transport document</i>	Agreement on the single transport document concept for combined transport operations (e.g. dangerous goods, invoice)	<ul style="list-style-type: none"> • Higher efficiency • Less IT maintenance costs • Improve CT attractiveness 	EC legislator Associations
<i>Advanced notification</i>	Pilot phase for data set exchange between stakeholders	<ul style="list-style-type: none"> • Higher ability to react • Reduced delays 	Shippers and LSPs CT Operators
<i>Status message harmonization</i>	Full implementation of the EDIGES format among the CT ecosystem (incl. error codes) + establish governance mechanism	<ul style="list-style-type: none"> • Reduce costs • Increase clarity • Increase speed of resolution 	Operators and terminals RUs

Information Sharing (Services)

Type	Measure	Impacts	CT stakeholders
<i>KPIs + ETA</i>	ETA/ETI/ETD ecosystem defined and ready to be implemented	<ul style="list-style-type: none"> Improve transparency Monitoring Quality assurance 	RNE TIS system Freight corridor KPIs (as a basis)
<i>Document Exchange Platform</i>	<ol style="list-style-type: none"> Development of a prototype for a central document repository Defining and establishing governance structure 	<ul style="list-style-type: none"> Improve transparency Monitoring Quality assurance 	RUs CT + Terminal Operators LSPs
<i>Order booking</i>	Development of common booking platform and related services (to be linked with existing registers)	<ul style="list-style-type: none"> Facilitate CT access Improve interoperability among operators 	Association (UIRR) CT operators LSPs, Shippers
<i>Tracking and tracing</i>	All agreements signed Development of interfaces and services	<ul style="list-style-type: none"> European transparency Facilitate ETA calculations 	RNE (as the platform owner) CT + Terminal Operators End-users (LSPs)

Shared Processes Support

Type	Measure	Impacts	CT stakeholders
<i>Timetabling / routings</i>	Test pilots of the commonly agreed communication processes on selected routes	<ul style="list-style-type: none"> Improved plannability Better resource utilization Higher profit potential 	RUs Infrastructure providers CT + Terminal Operators
<i>Order booking</i>	Development of specific modules for shared booking capabilities (such as for air tickets)	<ul style="list-style-type: none"> Increase efficiency for customer and supplier Less mistakes Faster issue identification 	CT + Terminal Operators LDLs, Shippers
<i>Order equipment</i>	Development of a prototype for order equipment	<ul style="list-style-type: none"> Transparency Improved operational efficiency 	CT Operators, Wagon Holders
<i>Booking of road pre- and on carriage</i>	Development of platform for last mile operations on road (freight market exchange) aligned with the current CT services	<ul style="list-style-type: none"> Transparency Improved operational efficiency 	LDLs CT Operators
<i>Railway consignment note</i>	Test pilots on specific relations / routes / rail freight corridors	<ul style="list-style-type: none"> Interoperability Improved operational efficiency 	RUs CT Operators
<i>Advanced notification</i>	Integration of the advanced notification messages into existing standards (TAF TSI, EDIGES)	<ul style="list-style-type: none"> Better use of resources Higher efficiency Better ability to cope with disruptions 	RUs, LDLs, Operators, Terminals
<i>Wagon information exchange</i>	Relevant stakeholders connected to the virtual wagon platform	<ul style="list-style-type: none"> Improve operations (technical control) Improve wagon visibility 	EC / ERA Wagon keepers / leasing companies
<i>Exchange of dynamic terminal service</i>	Dynamic data integrated in a full functioning platform	<ul style="list-style-type: none"> Transparency Improved operations 	EC / Associations (governance) All stakeholders (potential data providers and users)
<i>ILU operation data exchange service</i>	Development of specific web and/or API services	<ul style="list-style-type: none"> Transparency Improve operations (controls, optimisation) Improve data 	Association (UIRR) All stakeholders (potential users and data providers)

Business Intelligence

Type	Measure	Impacts	CT stakeholders
<i>Predictive maintenance (assets)</i>	Installation of sensorics (wagons, cranes, locomotives, loading units)	<ul style="list-style-type: none"> Knowledge management Asset management Real-time positioning 	All asset owners / lessor / lessee / manufacturer
<i>Capacity utilisation</i>	Initiate developments to extend reservation and booking time frames (e.g. no show and booking cancellation management)	<ul style="list-style-type: none"> Higher ability to plan Better customer satisfaction Increased efficiency 	CT operators, LSPs, shippers
<i>Demand forecasting</i>	Initiation of demand forecasting standards Analyse existing services (e.g. cargo stream)	<ul style="list-style-type: none"> Higher ability to plan Increased efficiency 	Associations (UIRR), CT operators and shippers
<i>Exception management</i>	Define common exception management handling procedures based on disruption coding	<ul style="list-style-type: none"> Efficiency from higher degree of automation 	All asset owners and CT operators

Phase 3: Establish predictive capabilities and higher adaptability to customer needs

Asset Management / IoT			
Type	Measure	Impacts	CT stakeholders
<i>CT Wagons</i>	1) Installation of gates to control (via RFID) based on interoperable standard	<ul style="list-style-type: none"> • Safety • Efficiency • Reliability • Maintenance • Operations 	Wagon manufacturers, leasing companies and keepers
<i>Intermodal Loading Units</i>	2) Application of automated train operations to CT		ILU producers (new loading units) and owners
<i>Transshipment equipment (e.g. portal cranes)</i>	3) Service for IOT data exchange and aggregation		Terminal Operators / Crane producers
<i>Terminal facilities</i>	Upgrade of OCR-gates to control trains and trucks (via RFID) based on interoperable standard	<ul style="list-style-type: none"> • Automate status change 	Terminal Operators

Master Data (Services)			
Type	Measure	Impact	CT stakeholders
<i>ILU technical specifications</i>	Improvement of ILU services (automated data exchange and integration)	<ul style="list-style-type: none"> • Train and wagon optimisation • Control and exception management improvement 	Associations (UIRR) ILU owners Codifying entities
<i>Wagon technical specifications</i>	Improvement of wagon data master standards	<ul style="list-style-type: none"> • Wagon optimisation • Process efficiency 	EU (TAF TSI Regulation and RSRD catalogue) Wagon keepers
<i>Network nodes services</i>	Improvement of network node services (services, connectivity, ownership, pricing)	<ul style="list-style-type: none"> • Data availability • System transparency and visibility 	EU + Associations (governance structure) Service Facilities (data provider) Other CT actors (potential users)
<i>Railway Location Codes</i>	Enhance railway location codes (optional)	<ul style="list-style-type: none"> • Reduction of data mapping and error corrections 	Framework agreement among the industry associations (e.g. UIRR and RNE)
<i>CT line codification</i>	Enhance CT queries (optional)	<ul style="list-style-type: none"> • Planning • Route / gauge visibility • Route compatibility 	EC / ERA (quality assurance) IMs (data providers) All other CT stakeholders (potential users)

Transaction Document Standardization			
Type	Measure	Impacts	CT stakeholders
<i>Customer order / booking</i>	Enhance operations and documents towards synchromodality capabilities (late change of transportation mode - detailed process flow)	<ul style="list-style-type: none"> • Reduced manual work • Higher booking from LSPs/ shippers • Responsiveness increases 	Association (UIRR) Other stakeholders (potential users)
<i>Consignment note (customer)</i>	Enhance operations and documents towards synchromodality capabilities (late change of transportation mode - detailed process flow)	<ul style="list-style-type: none"> • Cost reduction • Facilitation of data exchange 	EC/ERA All other CT stakeholders (potential users)
<i>Single digital transport document</i>	Adapt existing and add missing transport or commercial documents	<ul style="list-style-type: none"> • Higher efficiency • Less IT maintenance costs • Improve CT attractiveness 	EC legislator Associations
<i>Advanced notification</i>	Roll-out of advanced notification standard	<ul style="list-style-type: none"> • Higher ability to react • Reduced delays 	Shippers and LSPs CT Operators
<i>Status message harmonization</i>	Improve and enhance status messages according to learnings	<ul style="list-style-type: none"> • Reduce costs • Increase clarity • Increase speed of resolution 	Operators and terminals RUs

Information Sharing (Services)

Type	Measure	Impacts	CT stakeholders
<i>KPIs + ETA</i>	Further enhancement of ETA/ETI/ETD services Exchange of agreed KPIs through services	<ul style="list-style-type: none"> • Improve transparency • Monitoring • Quality assurance 	RNE TIS system Freight corridor KPIs (as a basis)
<i>Document Exchange Platform</i>	Use of (logical) document exchange platform by all CT stakeholders	<ul style="list-style-type: none"> • Improve transparency • Monitoring • Quality assurance 	RUs CT + Terminal Operators LSPs
<i>Order booking</i>	Enhance common booking platform	<ul style="list-style-type: none"> • Facilitate CT access • Improve interoperability among operators 	Association (UIRR) CT operators LSPs, Shippers
<i>Tracking and tracing</i>	Use of (logical) track and trace service platform by all CT stakeholders	<ul style="list-style-type: none"> • European transparency • Reliable basis for ETA calculations 	RNE (as the platform owner) CT + Terminal Operators End-users (LSPs)

Shared Processes Support

Type	Measure	Impacts	CT stakeholders
<i>Timetabling / routings</i>	Expand timetabling to all corridors/routes/relations	<ul style="list-style-type: none"> • Improved plannability • Better resource utilization • Higher profit potential 	RUs Infrastructure providers CT + Terminal Operators
<i>Order booking</i>	Increase order booking (speed, flexibility) towards synchromodal readiness	<ul style="list-style-type: none"> • Increase efficiency for customer and supplier • Less mistakes • Faster issue identification 	CT + Terminal Operators LDLs, Shippers
<i>Order equipment</i>	Establish acceptance and wide use of ordering equipment electronically (e.g. intermodal loading units, wagons)	<ul style="list-style-type: none"> • Transparency • Improved operational efficiency 	CT Operators, Wagon Holders
<i>Booking of road pre- and on carriage</i>	Enhance pre- and on carriage booking capabilities	<ul style="list-style-type: none"> • Transparency • Improved operational efficiency 	LDLs CT Operators
<i>Exception management service</i>	<ol style="list-style-type: none"> 1) Evaluate potential for harmonized exception management (as extension to ELETA) 2) Establish harmonized data exchange 	<ul style="list-style-type: none"> • Efficiency increase • Increase quality of service 	LDLs CT Operators RUs + Infrastructure providers
<i>Common slot management support</i>	Elaborate slot management standardization Establish services / interfaces for slot management	<ul style="list-style-type: none"> • Efficiency 	CT + Terminal Operators LDLs, Associations (UIRR)
<i>Railway consignment note</i>	Establish measures for wide use of commonly agreed railway consignment note	<ul style="list-style-type: none"> • Interoperability • Improved operational efficiency 	RUs CT Operators Terminal Operators
<i>Advanced notification</i>	Establish advanced notification processes and services within the CT supply chain	<ul style="list-style-type: none"> • Better use of resources • Higher efficiency • Better ability to cope with disruptions 	RUs, LDLs, Operators, Terminals
<i>Wagon information exchange</i>	Enhance virtual wagon platform	<ul style="list-style-type: none"> • Improve operations (technical control) • Improve wagon visibility 	EC / ERA Wagon keepers / leasing companies
<i>Exchange of dynamic terminal service</i>	Enhance platform towards near real-time information accuracy	<ul style="list-style-type: none"> • Transparency • Improved operations 	EC / Associations (governance) All stakeholders (potential data providers and users)
<i>ILU operation data exchange service</i>	Enhance ILU exchange services towards synchromodality requirements	<ul style="list-style-type: none"> • Transparency • Improve operations (controls, optimisation) • Improve data 	Association (UIRR) All stakeholders (potential users and data providers)

Business Intelligence

Type	Measure	Impacts	CT stakeholders
<i>Predictive maintenance (assets)</i>	Analyse data sources to improve maintenance schedules (wagons, trains, terminal assets) Establish common services	<ul style="list-style-type: none"> • Knowledge management • Asset management • Real-time positioning 	All asset owners / lessor / lessee / manufacturer
<i>Capacity utilisation</i>	Establish standard for capacity reservation and booking	<ul style="list-style-type: none"> • Higher ability to plan • Better customer satisfaction • Increased efficiency 	CT operators, LSPs, shippers
<i>Demand forecasting</i>	Enhance demand forecasting processes	<ul style="list-style-type: none"> • Higher ability to plan • Increased efficiency 	Associations (UIRR), CT operators and shippers
<i>Exception management</i>	Enhance disruption management capabilities	<ul style="list-style-type: none"> • Efficiency from higher degree of automation 	All asset owners and CT operators