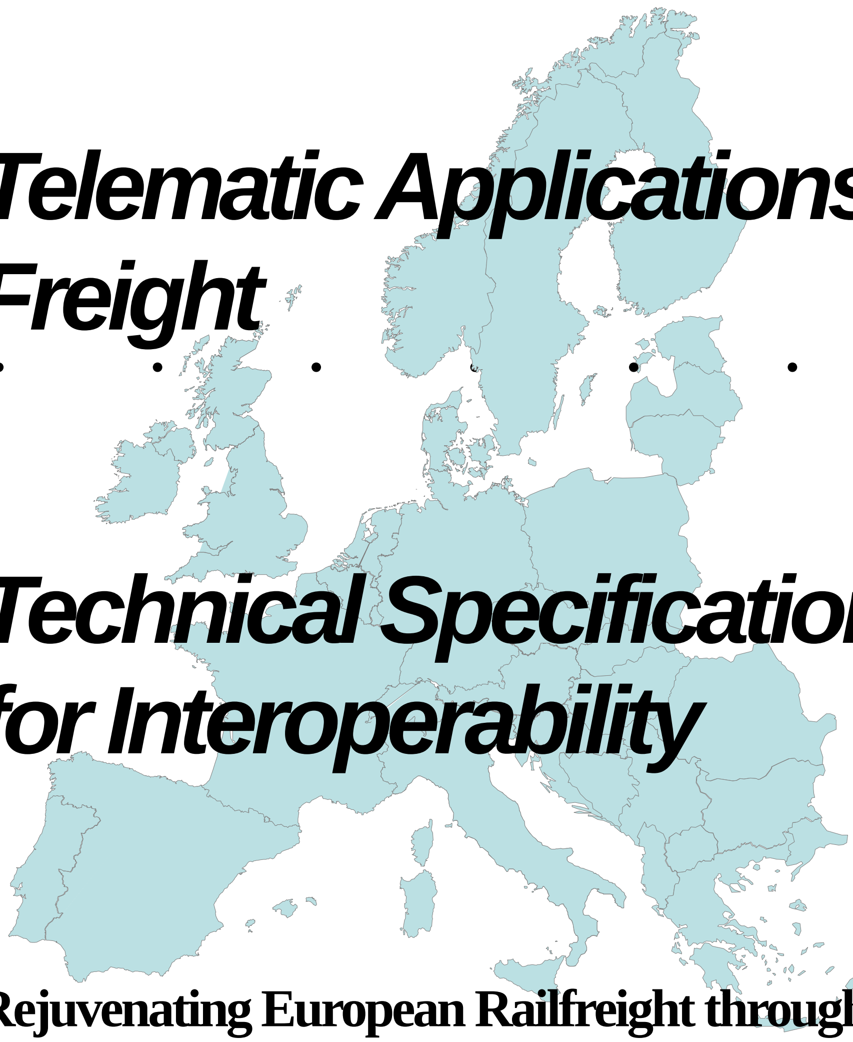
Framework Plan



Telematic Applications Freight

Technical Specification for Interoperability

Rejuvenating European Railfreight through efficient interchange of information

Strategic European Deployment Plan Team, May 2005

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1 Foreward

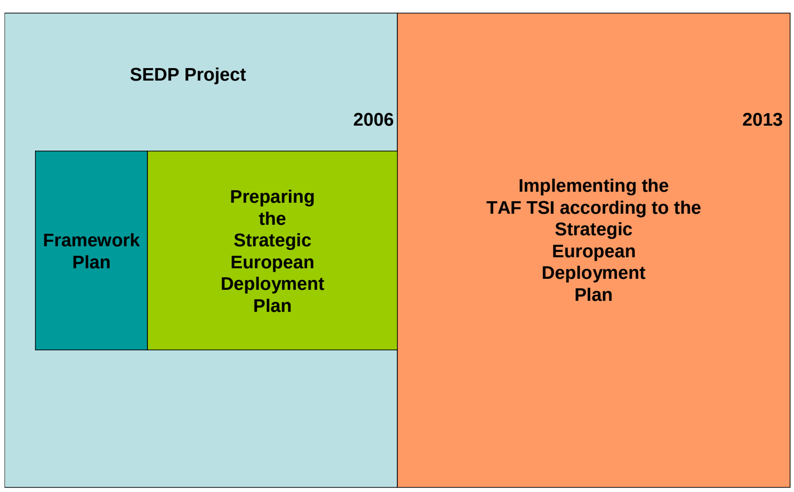
Welcome to the Framework Plan for the largest rail integration project in Europe today. This Framework Plan is the guide to be used by rail freight stakeholders during the Strategic European Deployment Plan project to prepare for the implementation of the Telematics Application for Freight TSI.

1.1 Objectives

The mobility that is necessary for the economic future of Europe is growing in a more and more unsustainable way. In the freight transport sector, railways need to improve service and efficiency in order to increase revenues and market share and to play their part in delivering sustainable transport. The critical attributes of a successful freight service are the ability to keep track of consignments, determine when deliveries to customers will be made and to maximise the productivity of the transport chain. These primary objectives can be achieved cost-effectively by the use of business processes and supporting information systems, for transport chains in either the open access or RU network co-operation business models.

1.2 Methodology : The Strategic European Deployment Plan

The European Commission, through Directive 2001/16 is mandating the implementation of the Telematics Application for Freight, TSI (TAF TSI) as one element of its plan to rejuvenate the European rail freight industry by



enabling interoperable information systems across Europe. Preparing this pan-European change process itself is a complex task which is being delivered as a Strategic European Deployment Plan (SEDP), managed by a small Project Team mandated by the Rail industry working together through UIC, CER & EIM.

There are three steps to this project : Framework Plan ; Consultation with RUs, IMs and Stakeholders ; Strategic European Deployment Plan. Project completion is planned for June 2006 and the Framework Plan is the first deliverable.

Using the Framework Plan and TAF TSI documentation, in the second step of the Strategic European Deployment Plan project, the Team will work with each stakeholder to complete the components of the Strategic European Deployment Plan. In 2006 a CEO-level signature will be required by the Commission from each organisation to confirm commitment to the final version of the SEDP. The Framework Plan will not be amended during this process as it is only for initial guidance. The steps and governance of the SEDP project have already been agreed.

1.3 Framework Plan

Each European Railway Undertaking (RU) and Infrastructure Manager (IM) is obliged by law to implement the TAF TSI Regulation and identify how and when it will be compliant with the requirements. The purpose of the Framework Plan is to guide this geographically-wide process into a co-ordinated European approach (the SEDP).

It is important to note that the Framework Plan represents what the Project Team proposes as the most effective approach for implementation of the requirements and benefits of the TAF TSI in terms of time, cost and risk. The team has also taken into account equivalent successful and unsuccessful projects worldwide. **The Framework Plan is not mandated**, it is simply a guide for each stakeholder's internal team to construct plans for compliance through updating computer systems over the following 8 years. It is these plans that will constitute the content of the Strategic European Deployment Plan. Whether each organisation will have a full-time or a virtual team will depend on current TAF TSI compliance and overall scope of business.

The Framework Plan also does not require any specific computer systems to be included by individual RUs/IMs in their plans – only the core messaging interface and central reference data for TAF TSI will be mandated to stakeholders. The systems selected for each organisation are the responsibility of each organisation, subject to their own procurement processes and/or internal development plans. The Project Team have taken into account the existing European rail computer system initiatives and projects. Comments regarding their potential contribution to the TAF TSI are included in this Framework Plan which will assist with responding to the Project Team using the questionnaire spreadsheets that will be provided in step 2 of the SEDP project. Additional material will be available from the organisations delivering these existing initiatives/projects and there are also other suppliers of systems if stakeholders are not building or modifying their own.

1.4 Process Change

As the Framework Plan and TAF TSI demonstrates, technology is required to improve rail freight operations and increase volumes across Europe, but successful outcomes to this type of project also requires investment in organisational change and new processes. The TAF TSI, Strategic European Deployment Plan, the SEDP Project Team and this Framework Plan are not intended to address internal process change – this is for each organisation to manage directly. In order to deliver the benefits of interoperability, your TAF TSI internal team should focus on processes as well as systems.

1.5 Post-implementation Objectives

Once the Process changes and supporting technology have been implemented, the European Rail Freight Industry will have the potential for dramatic improvements in financial results.

- Transit time reliability for wagons and IM Units can be in the 90% range. Customers will be able to track their shipments and obtain ETAs electronically – on a European wide basis. If a delay occurs proactive notification and corrective action will be possible.

- Productivity improvements will be possible in terms of better wagon fleet utilisation. This will benefit both RUs and Customers who own/lease their wagons. The dynamic trip plan capability represents a short term production management system at the wagon and train level.

The dynamic trip plan capability will allow train loads to be increased while still improving transit time reliability. Increasing tons-per-train improves infrastructure productivity as well.

Significant increases in yield have been seen where on-time performance has risen to the 90% level and above as a result of implementing dynamic trip planning. These performance improvements, implemented through standards, process and systems change, have also enabled market share rises of 5% in Bulk Traffic and over 10% in Merchandise, with additional traffic from modal shift.

TAF TSI, implemented through the Strategic European Deployment Plan, can enable similar results in Europe by meeting the number one need of Freight Customers, ie transit time reliability. These capabilities will enable Railways to increase revenues through modal shift and increased competition because of their higher quality services.

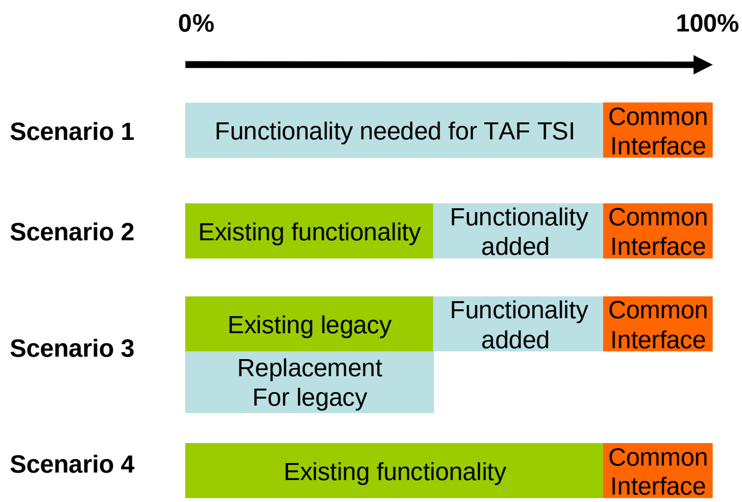
Jeremy Acklam
Project Director

2 Framework Plan

2.1 Introduction

The deployment of TAF TSI is primarily about halting and reversing the loss in rail freight market share in Europe (as measured by ton-km), which has declined from 21% in 1970 to the current level of below 8%. In the same period, the road market share has grown from 31% to 45%. This has occurred as the inter city freight market has expanded at approximately 3% per year.

The impact of this market shift is enormous in that 1% market share loss by the Railways results in 6.4 million additional lorry trips per annum and an annual revenue loss to the European Railway of approximately 1.1 billion Euros. The total social cost increase in terms of congestion, additional highway construction, loss of usable land, reduced safety and reduction in air quality is difficult to overstate. The EU states that road congestion alone is costing the Union almost 1% of its Gross Domestic Product (GDP).



Scenario 1 – No TAF TSI functionality at RUs/IMs – Framework Plan scenario
Scenarios 2 – 4 Some or all of the functionality exists at RUs/IMs and plans are in place to complete the remaining work – these will be incorporated into the SEDP

The primary reason for this loss in market share is the inability of the European Railway Industry to individually and collectively meet the needs of Customers, primarily in the areas of transit time reliability and shipment information.

Implementing TAF TSI is about enabling messaging, local systems and reference files to communicate data between rail freight industry stakeholders to improve transit time reliability and shipment information allowing process change to achieve results.

The Framework Plan describes the detail functionalities required by TAF TSI in a scenario where no functionality exists at present. It is focussed on the early delivery of data that can be used to benefit transit time reliability.

2.2 Phasing Rationale

TAF TSI Functionality Benefits Matrix driving SEDP implementation phases

(H-high, M-Med, L-low)

Implementation Phases →	1	2			3		4
TAF TSI Functionality →	Trace	ETA From History	Service Quality Measure	Data Quality	ETA From Pre Determined Trip plans	Dialogues (inc Train ETAs)	ETA From Dynamic Trip plans
TAF TSI Benefits							
Customer Service		M	H	M	H/L	L	M
Reliability		L	H	H	H/L	L	H+
	50%	- - - -	- - - -	→ 70%	- - - -	→ 80%	→ 90%
Fleet Productivity		H	H	M	M/L	L	H
Infrastructure Productivity		L	M	M	L	M	H+
Risk	LOW				MED		HIGH

Figure 1 - Phasing Matrix

The key factors driving the framework plan rationale are :

- The TAF TSI is required by the EU Directive 2001/16 which was created as part of an effort to revitalize the European Freight Railways in terms of Customer Service Delivery and Productivity. European Commission documents state that "improvements in the Quality and Efficiency of Europe's (rail) transportation networks will create conditions for a Modal Shift to alleviate road use and the problems it causes, namely congestion and pollution."

- The Cost Benefit Analysis of the completed TAF TSI has confirmed that it will provide a cost effective means of improving IM/RU efficiency (productivity) and contribute to modal shift through improved Customer Service Delivery. The efficiency improvements are primarily in the areas of rolling stock and infrastructure. Improvement in Customer Service Delivery is primarily in the area of transit time reliability which is the leading criteria used by shippers in making modal choices.

- The planned implementation of the TAF TSI represents an unprecedented effort by the European Rail Freight Industry which is a NETWORK business. It is unprecedented in scope (one Billion Euros over 8 to 10 years for the full project) although initial investments will provide early benefits. A high degree of co-operation is required between the interdependent Service Providers (Individual RUs, IMs, their Associations and others)

- The provisions of the TAF TSI are also MANDATORY as opposed to the voluntary environment which has existed to date.

- In addition, the implementation will take place as the Industry evolves from large Nationally focused, vertically integrated Railways into a mixture of large and small RUs & IMs operating across Europe in an Open Access mode.

- The TAF TSI must also be implemented at a time when Railways from new Member States are adjusting to the EU environment. They are making the transition from business processes and supporting systems based upon command economies to market driven environments where customers are free to choose the mode of transport that they feel best meets their, (and their customers') needs.

The factors outlined above, when taken together, result in a challenging situation with significant risks which must be addressed with great care to avoid failure. A failure and "re-start" would be very expensive but more importantly it would take several years. This represents time that the European Rail Freight Industry may not have since market share is dropping and now stands at less than 8% in the EU 15.

The core rational behind the Phasing Plan is the maximization of benefits of the TAF TSI for the lowest implementation risk and costs in the earliest time scales. This rational particularly applies to the implementation of dynamic trip plans which are difficult and risky but provide major benefits. For these reasons, the capabilities of ETAs from history and Predetermined Trip Plans are proposed for Phases 2 and 3 respectively while Dynamic Trip Plans are proposed for Phase 4.

Dialogues, (Short Term Path requests, Train preparation & Train running information) are desirable however they are proposed for Phase 3 because they involve new and potentially difficult functionality for all IMs and RUs.

Functionality, Benefits, Costs and Risks for each Phase now described in more detail :

2.3 Phasing

2.3.1 Phase 1

In phase 1, the Common Interface, Key Reference Files (e.g. ENEE) and the Wagon & Intermodal Unit Operational Database (WIMO) are implemented. These are Central System Components with moderate costs and low risks since there are similar successful applications in operation around the world. The WIMO Database contains, in part, Operational data extracted from the Consignment note. It does not contain Commercial data.

The most difficult portion of this Phase is at the RU level where they must modify their systems to provide Wagon Event information, create messages and send them to the WIMO database via the Common Interface and Reference File systems. Note that this information is for ALL traffic - Local & Interline. (Local means intra RU and Interline means inter RU.)

Work done to date (e.g. ISR) indicates that the provision of these events could be a slow process. Also there are some indications that some RU systems currently do not (or can not) capture some of the wagon events specified in the TAF TSI. Five initiatives to be explored during Step 2 of the SEDP development that could reduce the time required are as follows:

- Determine if RUs can report wagon arrival & departure at yards using existing train running advise according to (UIC 407) or other ad hoc processes based on train yard arrival and departure info from IMs. To reduce time & expense in Phase 1, the full implementation of the capability described in TAF TSI 4.2.4 is best left to Phase 3.

- Evaluate the potential for Common Development of new RU Operating & Consignment Note/Wagon/IM UnitOrder Systems which could be used by two or more RUs. This approach would also reduce risks in other Phases especially in the Dialogue capability in Phase 3 and Dynamic Trip Plans in Phase 4.

- Allow incomplete and even inaccurate data (with a flag) to populate the WIMO Database. The availability of a central European Wide source of information for all wagons and IM Units in Europe is a major leap forward and initially any information however incomplete, would be useful.

- Learn from the experience of ISR. Railion, SNCF Fret and Trenitaila are currently in the process of providing wagon events to the central ISR database where they are merged with Consignment Note data from ORFEUS.

- Allow RUs to report Consignment Note and Event information at various levels of completeness, timeliness and accuracy. It is not necessary to have all RUs at the same reporting level in order to get started.

It is recommended that during Step 2 of the SEDP development, an assessment be made to determine if it is feasible to capture selected Intermodal Consignment Note/Order information plus In Gate, Ramped, Deramped and Out Gate Events directly from Intermodal Terminals or via Systems such as CESAR in Phase 1. Costs, Benefits and Risks would be part of this assessment. The reporting of other Intermodal events such as Release, Pick Up Times, Delivery Appointments could be left to later Phases however the WIMO Database should be designed to handle them. As in point 5 above, varying levels of Intermodal reporting could be accepted in Phase 1.

Tracing defined as a response to a query which provides the status and location of Wagons/IM Units is the major functional capability provided during Phase 1. Tracing can also provide recent event(s). With the Inputs described above (Wagon order, Status and Event Information) the primary outputs are a wide range of tracing reports based on parameters such as: Wagon Number(s), Wagon Pool I.D., Destination, Shipment Numbers, and I.M. Unit Numbers. Contrary to popular belief, single Wagon/IM unit tracing is not the primary method used by Rail Freight Stakeholders. Most Rail Freight customers and fleet managers are interested in multiple Wagons/IM units at any one time and want the information in a single report from a single inquiry for Local & Interline traffic across Europe. Clearly, Internet access to the WIMO Database will be required however other methods of access may also be necessary.

Even with less than perfect information in the WIMO Database, significant Customer Service and Fleet Management Benefits can be achieved. The ability to obtain current status and location of ALL (Local & Interline) Wagons/IM Units of interest to a Qualified Rail Freight Stakeholder from a single source is a major leap forward. Strict access rules will be put in place to prevent the unauthorized use of WIMO Data. Benefits will improve as reporting quality improves and users will continue to create pressure for improvements.

2.3.2 Phase 2

In phase 2 the focus shifts from setting up the common interfaces, establishing the reference files, and reporting events to the WIMO Database, to improve Data Quality, Service Quality and generating wagon ETAs from history. These three functional capabilities can be supported by Central Systems.

The key capability in this phase is the ability of the WIMO Database to arrange the Wagon/IM Unit order and event data into TRIPS. Normally a wagon (L or E) trip starts with the consignment note and a customer release or departure (pull). Normally a trip ends with the delivery (placement) of the wagon to customer’s or destination siding.

In the case of Intermodal (as recommended above), the trip would start with the Wagon/IM Unit order and an ingate event. It would end with an outgate reporting. Provision should be made to eventually start an Intermodal trip with a Pick Up appointment and end with a delivery event reporting at a consignee’s dock.

Once a Wagon/IM Unit has completed its trip, the complete trip record with the selected Consignment note and all event data would be moved to the Completed Trip section of the WIMO Database.

Given that the WIMO Database and Common Interface/Ref File capability from Phase 1; the addition of this Trip functionality within the WIMO can be provided relatively quickly at low cost and with low risk since there are Systems in operation which have this capability.

Before focusing on Service Quality and ETAs from History, considerable effort must be expended in the area of Data Quality.

- Data accuracy can be measured primarily through the use of edits based upon Reference Files.
- Data completeness can be measured by logic such as; a wagon departure from a customer must be preceded by a consignment note/wagon order; a yard departure must be preceded by a yard arrival; an interchange received must be preceded by an interchange delivered etc. At a more basic level all incoming messages should be checked to ensure all mandatory fields are populated.
- In order to measure Data Timeliness, each event message must contain; the date and time the event actually occurred, the date and time that the event was reported and the date and time that the message was sent.

A robust set of Business Processes supported by a flexible, user friendly Data Quality measurement system (where responsible service providers are identified) are ESSENTIAL. Data Quality measurement systems must have the capability of highlighting problem areas and, over time, measuring progress in resolving the issues. The costs and risks involved in establishing these processes and systems are low but there is some risk that service providers will not expend the required efforts to improve data quality. This is low profile grunt work that will require major efforts on an ongoing basis. The ISR experience could be useful here.

Once data quality has reached a “moderate” level, (e.g. wagon/IM order data, trip start, trip end and some level of intermediate events) Service Quality measurements supported by the Completed Trips section of the WIMO Database can begin. Business Processes involving customers Service Integrators/LRUs, RUs, IMs and Intermodal Terminal Operators can establish transit time and reliability targets. The measurement of Trip Start to Trip End Service Quality will be relatively easy however the identification of Delay Reasons and Locations will only improve as the reporting of intermediate events (especially exception events such as wagon damaged) improves. Root cause analysis is a powerful tool that should be used to improve Service Quality.

Assuming acceptable data quality, the delivery of a Service Quality Measurement System is low cost and low risk. The risk of the Service Providers not using the systems capability to actually improve the levels of transit time reliability is Moderate to Low assuming that the Lead RU/Service Integrator concept becomes an accepted Business Process.

The benefits of Service Quality Measures (assuming that they are acted upon) are high. This is the number one (ahead of price) service parameter valued by Freight Shippers in Europe.

Again assuming a “moderate” level of Data Quality, the key function of ETAs from History can be delivered. This Central System can be based on an Algorithm which uses the data (Wagon IM Unit Order and Event data as previously described, i.e. no new reportings are required) from the Active and Trip Completed portion of the WIMO Database to automatically generate an ETA based on the history of previous wagon trips. An ETA is therefore available for all Wagons/IM Units (Loads or Empties) moving between O-D pairs that have had sufficient previous trips to enable a statistically sound ETA to be generated.

As a Wagon/IM Unit moves through its trip, a sophisticated Algorithm can update the ETA based upon its progress. Note that no trip plan is developed in creating ETAs from History, as opposed to the ETAs developed from Predetermined and Dynamic Trip Plans. In theory, ETIs could also be generated from a history driven Algorithm however experience has shown that increased fragmentation of Wagon/IM Unit trips decreases Algorithm output accuracy.

This ETA from History approach represents an effective step forward in delivering quality customer service and fleet productivity. As the reporting quality improves ETA accuracy will also improve. The ETAs generated by this functionality will update the WIMO Database and tracing inquiries can then include this data element. This capability enables another parameter to be added to the Tracing Functionality such as listing Wagons/IM Units moving to a common destination, sorted by ETA. ETAs from History are effective for Fleet Management and the Management of flows of large volumes of wagons such as grain to ports or coal and iron ore to a steel mill. ETAs from History are less effective in managing the trips of individual service sensitive wagons such as auto parts to an assembly plant.

The benefits of adding this Functionality are high, (in the areas described above) the risks are low and the costs are moderate to low depending on the sophistication of the Algorithm specified.

2.3.3 Phase 3

Phase 3 involves the implementation of Dialogues between IMs and RUs and using this capability to enable accurate Wagon ETAs and ETIs to be generated from predetermined trip plans. The lessons learned from using this and the ETA from History functionality are a prerequisite for the successful implementation of Dynamic Trip Plans in Phase 4.

Dialogues are used for; Path Requests and Confirmation, Train Preparation and the Exchange of Train Running Information which includes the important Train ETA and Train ETH messages. (ETH - Estimated Time of Handover from one I.M. to another.)

The Dialogue Functionality is supported by local or corridor systems at the IM and RU levels and the Common Interface/Reference File system which was outlined in the description of Phase 1. The Benefits of Dialogues includes the ability of IMs and RUs to co-ordinate their activities in a manner which will improve on time train performance and facilitate the operation of extra trains when required to handle the traffic offered. Both of these benefits also contribute to improved Wagon/IM Unit transit time reliability.

The productive use of Infrastructure is also improved by the effective IM/RU communications specified in the TAF TSI. Infrastructure Managers will be able to plan the handling of trains in the short term with the availability of information concerning train ready times for prearranged train paths.

Costs and risks for this Dialogue package are moderate to high since the separation of RUs and IMs into new entities is still under development. The operating systems of all RUs and IMs would need modifications to the required interfaces. Here again the Common Development of an Operating system for RUs and perhaps, IMs could reduce risks, time and costs.

Assuming that data quality has continued to improve during Phase 2 and into Phase 3 and that accurate Train ETAs are available, the Predetermined Trip Plan Functionality can be implemented. This is an O-D pair based concept applicable to loads and empties therefore Data Quality and Train ETA accuracy do not have to be uniformly high across all of Europe. Predetermined Trip Plans can, therefore, be selectively implemented. In fact the manual efforts required to create and *update* Predetermined Trip Plans preclude them from being implemented to cover all traffic. They are, however, very useful in improving transit time reliability and shipment information for especially service sensitive Wagonload and Intermodal traffic (Loads or Empties) such as auto parts.

Prior to Trip Start, a Trip Plan which identifies all wagon and train events (and elapsed time between them) from the origin siding to the destination siding are determined. This Trip Plan can involve a single or multiple RUs and IMs. A robust set of inter Service Integrator/LRU/RU/IM Business Processes are required to create and *maintain* Predetermined Trip Plans.

The Predetermined Trip Plan is stored in a Planned Trip Repository. When a Wagon/IM order and the Release or Departure Event are received, the appropriate Trip Plan is activated and the elapsed times between events are converted to dates, times, event types and Train I.D.s. ETIs and ETAs are also part of the Trip Plan.

As a result of the Business Processes described above, the initial ETA for the wagon should correspond to the transit time commitment made to the Customer by the LRU or Service Integrator.

Actual event reports (Including Train ETAs) are then compared to the events in the Predetermined Trip Plan and an alert is generated if the events and times do not correspond. A non event alert capability is also required. These alerts (e-mails) can be sent to Customers and “Traffic Managers” at the LRU or Service Integrator

The Traffic Manager at the LRU or Service Integrator can take corrective action and manually enter a revised Trip Plan including a new ETI and ETA. Entry of Delay Reason Codes by Traffic Managers can also assist the Post Trip Processes such as root cause analysis.

The original and revised ETIs/ETAs can be used to update the WIMO Database. All ETAs (From History or Predetermined) are captured in the WIMO Database with clear indications of which is which.

A similar Predetermined Trip Plan approach to that described above, can be used for Intermodal Units where Ingates, Ramped, Deramped and Outgates can be identified in addition to events for wagons which are carrying containers.

The benefits of this Predetermined Trip Plan capability are significant in that Transit Time Reliability and Shipment Information for *selected* Customers can be dramatically improved. Post Trip analysis lead by the LRU or Service Integrator including the use of Delay Reason Codes can result in excellent transit time reliability and other aspects of Customer Service. The experience gained in using Predetermined Trip Plans can also provide a stepping stone for implementation of Dynamic Trip Plans in Phase 4.

A Common System approach with individual RU implementation could be used for Predetermined Trip Plans however, time, costs and risks would be minimized by using a Central System drawing on the WIMO Database, with a web based delivery to LRUs and/or Service Integrators.

2.3.4 Phase 4

The implementation of ETAs/ETIs from Dynamic Trip Plans in phase 4 represents the most challenging and risky portion of the TAF TSI. The Benefits are also very significant in terms of Transit time reliability, Wagon Fleet and Infrastructure productivity.

Dynamic Trip Plans should apply to all wagons in transit, loaded or empty. When a Wagon Order and a Release/Departure (Pull) are received, a Trip Plan is automatically generated, not from Predetermined Trip Plans but from Files and Tables which represent the up to the minute operating situation of all the RUs in the route of the wagon. For example, extra and cancelled trains and the traffic that they were to (or will) handle are reflected in the system. The system also generates Trip Plans for wagons received or to be received in interchange, as indicated by ETIs. In addition to Train Specifications, the system requires current train to train wagon connection standards for yards.

A system of this type also automatically generates “re trips” (a revised Trip Plan) when a wagon misses a connection or appears likely to miss a connection in a yard because of a Train ETA from an IM which is past a predetermined cut off time. For Interline traffic, wagon ETIs are generated and sent to the next RU in the wagon route. The “downstream” RU uses the ETI and the Wagon/IM Unit order to generate a wagon ETA at the destination siding or another ETI for the next RU in the wagon route.

The ETAs are sent to the LRU or Service Integrator who compares the ETA with what was promised to the customer. LRU/SI systems trigger alerts as required for corrective action and Customer liaison by the “Traffic Managers”.

A similar functional approach can be used for Intermodal Units. In Intermodal Terminals time standards would be required for Ingate to Ramping and wagon delivery at an Intermodal Terminal to Deramping. Also Deramping to Outgate.

In addition to the obvious transit time reliability and customer shipment information benefits, this Dynamic Trip Plan Functionality provides RUs with a wagon and train based short term production management system. Several hours notice of trains with insufficient capacity to handle the traffic scheduled to them as well as underutilized trains can be provided. Forecasts of switching workload and class track utilization in yards can also be generated. The trainload forecasting capability allows trainloads to be increased while still meeting the transit time reliability needs of Customers. Increasing trainloads represents a major productivity benefit for both IMs and RUs. For example a Freight Train carrying 400 net tons and a train handling 500 net tons use approximately the same amount of Infrastructure capacity! Also the train crewing costs for a 400 and a 500-ton train are the same.

It is difficult to overstate the difficulty involved in implementing this type of system. (It took CSX three tries). First and foremost it represents a major cultural shift for RU operating people – from running trains to managing the flow of wagons to meet customer commitments. Secondly, the task of keeping files and tables up to date to reflect the current operating situation of an RU is daunting. Also local and Regional operating people will no longer have the freedom to change switching assignments, or train specifications (e.g. traffic handled, time of departure, days of week etc), run extras or cancel trains. Any change must be assessed on the basis of the impact on the NETWORK and Customer Commitments not just at the local level. This represents another major cultural change which many local operating people often find difficult to accept.

Given the above, the risks and costs (e.g. Training) of implementing a Dynamic Trip Planning System are high (especially for large RUs) but so are the benefits. Currently siding to siding reliability for wagons in Europe is approximately 50%. To be competitive with trucking, reliability levels above 90% are required. It is estimated that Phases 1&2 could increase reliability to 70%. Phase 3 could increase overall reliability to a maximum level of 80% assuming intensive use of Predetermined Trip Plans. Higher levels could be achieved for selective traffic. Overall transit time reliability levels of 90% and above are not achievable without Dynamic Trip Plans.

In theory the Dynamic Trip Plan functionality described above could be delivered by a central system however this would increase the risks considerably. A Common System development option for medium and small RUs could reduce risks and costs to some extent.

2.4 Timeline, Definitions & Functions

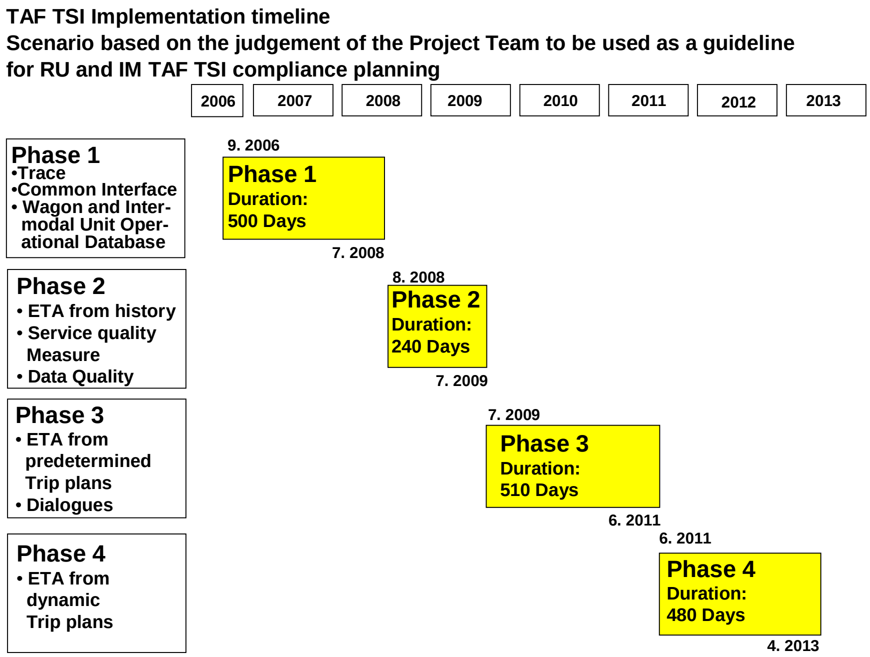


Figure 2 - Timeline

2.4.1 Phase 1:

2.4.1.1 Trace:

Explanation of functionality:

- Tracing is based on the event, location and status reporting of trains and wagons and Intermodal Units.
- Train arrival and departure reporting from the IMs to the RUs are converted into individual wagon events and send to the WIMO database.
- Wagon reported events by the RUs are pull (wagon departure notice), yard arrival, yard departure, interchange reporting, placement at customer location, wagon release notice, wagon exceptions messages
- Intermodal events, reported by the IM-Terminals are Ingate, Ramp, Deramp and Outgate

- Train arrival and departure reporting from the IMs to the RUs are converted into individual wagon events and send to the WIMO database
- Parameter tracing (e.g. which shipments are actually on the way to my company) and individual wagon tracing is supported

Benefits:

Customer Service
- Tracing European wide of individual wagons, IM Units, shipments as well fleet tracing is an instrument to improve customer service by delivering reliable location and status information
- Actual shipment status is available for customers

Fleet productivity
- Tracing supports the fleet managers in better managing their fleet
- Single source of information for all wagons in "local" and interline traffic

2.4.1.2 Messaging system:

Explanation:
- The Common Interface is mandatory for each actor in order to join the rail interoperability community.
- Supports the exchange of various types of messages
- The Common Interface has to be able to handle:
  - message formatting of outgoing messages according to the metadata,
  - conformity checks of incoming messages according to metadata,
  - handling the single common access to various databases.
  - Each instance of the Common Interface will have access to all the data required according the TSI within each RU, IM, etc, whether the relevant Databases are central or individual
- The common interface uses the information in the central repository in order to manage the above tasks.
- An actor may implement a local “mirror” of the central repository to shorten response times.

Benefits:

A common interface reduces the adaptation costs per RU/IM

2.4.1.3 Wagon and Intermodal Unit Operational Database (WIMO):

Explanation of functionality:
- The WIMO-Database is the "Heart" of TAF TSI
- It is of high importance for the tracking of wagons and intermodal units as a data repository accessible to all qualified stakeholders.

- This database stores on a trip bases the movement of all wagons and of all Intermodal units from departure through to final delivery at customer locations for "local" and "interline" traffic.
- The database must be accessible via the Common Interface
- Authorised entities such as keepers and fleet managers must have access to the data relevant to fulfil their functions
- The database also shows the different status of the rolling stock such as:
  - loading of the rolling stock
  - loaded wagon on journey
  - empty wagon on journey
  - empty wagon under fleet management control
  - operational rolling stock data

Benefits:

- WIMO database supports Tracing, Fleet management, ETAs from history, Predetermined Trip Plans, Data and Service Quality measures. Also many statistical measures such as wagon mileage, Traffic flow studies etc.

2.4.2 Phase 2:

2.4.2.1 ETA from History

Explanation

- The TAF TSI specifies that RUs must have the capability of generating accurate and current ETIs and ETAs for all individual wagons and Intermodal Units (loaded and empty). The TAF TSI is silent on the method to be used to generate them.
- A first and easy to implement step in this direction are ETAs from history.
- ETA from history is based on statistical information from previous shipments. These previous shipments between a specific origin destination pair (station to station or siding to siding) are accessed from the WIMO database.
- Overtime all origin destination pairs will have sufficient statistical information to generate an ETA.
- With the help of an algorithm an ETA from history can be calculated for an individual shipment on the origin destination pair.

Benefits:

Customer Service

- Even if the ETA from history is not based on a Trip plan, the ETA values can be continuously updated as more and more actual shipment experience is gained

Reliability:

- This statistical approach is adequate for flows of large volumes of similar shipments such as grain to ports, coal to steel mills or empty wagons. It is not generally sufficiently accurate for individual shipment monitoring between origin/destination pairs

Fleet productivity:

- Fleet manager can use the statistical information for fleet management decisions

Remark:

- A big limitation of ETA from history is that when operating plans on the specific route are changed, the statistical projections immediately become obsolete. The learning process within the algorithm will start again.

2.4.2.2 Service Quality Measure

Explanation:

- To be competitive the European Railway Industry must deliver higher service quality to its customers.
- Transit time reliability is the leading service quality element.
- In addition to measuring the service quality delivered to the customer, LRUs, RUs and IMs must measure the quality of the service components that in total make up the product delivered to the customer.
- The process involves the IMs and the RUs (especially if they are Lead RUs) selecting an individual quality parameter, a route or location and a measurement period in which actual results are to be measured against predetermined criteria and which normally have been set out in a contract.

- The results of the measurement process must clearly show the achievement level against the target which has been agreed upon between the contracting parties.
- Root cause analysis must then be carried out on repetitive, quality failures, so that corrective action can be determined by the contracting parties.
- It is the obligation of an IM and a RU to provide data, participate in root cause analysis, also with third parties, and to implement any corrective action which has been agreed to.
- The most relevant messages for this measurement of quality are:
  - Release Notice,
  - Departure Notice,
  - Yard Arrival,
  - Yard Departure,
  - Arrival Notice,
  - Wagon Interchange Delivery,
  - Wagon Interchange Receipt,

- Wagon Interchange Refused.
- Train Running Forecast,
- Train Running Information,
- Enquiry / Response about train delay / performance.
- In Gate, Ramped, Deramped, Outgate.

Benefits:

Customer Service

- Customer will immediately benefit from quality improvements and from a more reliable service

Reliability

- Service Quality Measures based on post trip analysis is a key success factor in to improvement of reliability and quality

Fleet productivity

- Quality measure is a key for Fleet productivity improvements
- Reliable transit time of empty equipment allows the reduction of buffer- or safety stocks at demand points

Infrastructure productivity

- IMs will benefit from better train performance in terms of utilising contracted slots

2.4.3 Phase 3:

2.4.3.1 ETA from predetermined trip plans

Explanation:

- Predetermined Trip Plan System(s) can provide more accurate ETAs however it would be impracticable to apply this approach to any more than a subset of all the wagons and Intermodal Units in Europe.
- This is primarily a tool for Lead RUs and Rail Service Integrators.
- Operational plans of Railways and Intermodal Service Providers are examined and trip plans for selected origin-destination pairs are developed and stored in a database.
- Waybills/Consignment Notes coupled with release or pull times for actual shipments are then used to select the appropriate trip plan and generate an ETA. Shipment movement events are then used to monitor shipment progress against this predetermined trip plan.
- This actual ETA based on a predetermined Trip Plan can also represent the Transit Time Commitment to the Customer.

- Alerts are generated when unplanned events or no events are reported on a timely basis.

Benefits:
- This type of ETA has the capability of providing significant benefits at modest system cost relatively early in the TAF TSI implementation.
- This approach also provides a stepping stone towards ETAs/ETIs from dynamic trip plans.

Customer Service
- Customer can be informed proactively in case of a deviation
- While ETAs are valued by Railway Customers, they are even more valued when they are generated in conjunction with a Transit Time Commitment provided to the Customer by the LRU/SI prior to actual shipment movement.
- An alert can also be used by the Lead RU to initiate corrective actions.

Reliability
- The stored trip plan technique is useful in managing relatively small volumes of service sensitive traffic over selected corridors
- It allows a more accurate ETA calculation and the monitoring of the shipment along the route, based on reported events

Fleet productivity
- Lead RU benefit from the improved transparency of there wagon flow
- Fleet managers can use this capability to manage pools of high value wagons in both loaded and empty modes.

Infrastructure productivity

Remarks
- This technique is relatively labour intensive as re- trip and new ETAs must be generated manually.
- It requires timely reporting, skilled users and clearly defined business processes to provide reliable arrival forecasting
- More sophisticated algorithms can also provide a probability factor to the ETA.
- A simplified subset of this stored trip plan approach involves the use of a Predetermined From/To table to generate ETAs & ETIs with no trip plan. For small RUs this could be a very cost-effective approach.

2.4.3.2 Dialogues

Benefits:

Customer Service

- There is no direct benefit for customer service but the enquiries Train Location and Wagon deviation are the fallback position for the customer service information

Reliability:

- With the enquiries Train Location and Wagon deviation the WIMO data reliability can be checked and increased.
- Dialogues help to improve train performance which leads to improved wagon and IM Unit reliability

Fleet productivity:

- There is no direct benefit for fleet productivity, but the enquiries Train Location and Wagon deviation are the fall back position for the fleet information.

Infrastructure productivity:

- transparent and commonly used dialogues between RUs and IMs support the increase of infrastructure productivity
- Dialogues help to improve train performance which leads to improved infrastructure productivity

2.4.4 Phase 4:

2.4.4.1 ETA from dynamic trip plans

Explanation:

- The dynamically generated Trip Plans are based upon access to RUs and/or Intermodal Service Providers' current operations plans.
- Trip Plans and associated ETIs/ETAs, are automatically generated from wagon order/release/pull information and are based upon the current status of operations, including extra and cancelled trains etc.
- If shipments miss connections, or are on late trains etc, new trip plans are automatically generated with a new ETA/ETI.
- With this approach ETAs/ETIs are always current.
- The original and revised ETAs are sent to the LRU/SI where they are compared with the Transit Time Commitment made to the Customer. Alerts are generated and managed by the LRU/SI.
- Its disadvantage is that it requires large sophisticated systems and consistent business processes across service providers.
- It also requires rigorous maintenance of tables for train specifications, yard connection standards and industrial switcher schedules which is a major workload on a Railway of any size.

- With a re-trip capability it provides the most current and accurate ETAs and once set up it is far less labour intensive than stored trip plans.

Benefits:
Customer Service
- Customer Service is strongly supported by the accurate ETAs for all traffic

Reliability
- Dynamic trip plans are essential to achieve transit time reliability of (90%) and above

Fleet productivity
- Fleet Management is enhanced with reliable ETAs

Infrastructure productivity
- Detailed, updated and in advance information on transport aspects allows a better usage of the limited infrastructure capacity

Remark
- Dynamic Trip Planning Systems and Processes must become the long term goal of the TAF TSI implementation plan. Only with dynamic Trip Planning the TAF TSI requirements to generate accurate and current ETIs and ETAs for all in-transit individual wagons and Intermodal Units (loaded and empty) can be fulfilled.
- Dynamically generated trip plans for all traffic (loaded and empty) also provide the capability of Railway workload planning.

2.5 Overview for TAF TSI Components

TSI Ref		Comments	sender	receiver	Impact	SEDP Phasing
N°	Name					
4.2.4.3	TrainRunning Information	This message is issued upon – Arrival, departure or run-through in agreed reporting points and/or – Attainment of the agreed initial running time and/or – A new divergence between nominal and actual being achieved in excess of the agreed threshold value	IM	IM/RU	IM/RU	1
4.2.8.2	WagonReleaseNotice	This message is used by the Lead RU – for the case, that the LRU is not the first RU in the Transport chain - to inform the RU in charge, that the wagon is ready to be pulled.	LRU	RU	RU	1
4.2.8.3	WagonDeparture Notice	This message is used by the RU in charge to inform the LRU, that the wagon has been picked-up (pulled) and	RU	LRU	RU	1

		has reach the RU's Yard of departure. This message is the response to the "WagonReleaseNotice".				
4.2.9.2	WagonInterchange Notice	This message is used by the RU/Service Provider to ask the neighbouring RU/Service Provider the acceptance of the responsibility for a wagon.	RU	RU	RU	1
4.2.8.4	WagonYardArrival	This message is used by the RU to inform the LRU, that the wagon has arrived at its yard	RU	LRU	RU	1
4.2.9.3	WagonInterchange SubNotice	This message is used by the RU/Service Provider to inform the IM, that the responsibility is handled over to the next RU/Service provider.	RU	IM	RU/IM	1
4.2.12.1	Numerical Coding for RUs, IMs and Transport Companies	Centrally stored reference file for identification of transport partners in the transport chain	IM/RU	IM/RU	IM/RU	1
4.2.8.5	WagonYardDeparture	This message is used by the RU/Service Provider to inform the Lead RU that the wagon has left the yard	RU	LRU	RU	1
4.2.9.4	WagonReceived_At Interchange	This message is used by the neighbouring RU/Service Provider as answer to the message "WagonInterchangeNotice" to confirm the acceptance of the responsibility for the wagon.	RU	RU	RU	1
4.2.11.2	Infrastructure Restriction Notice databases	These databases contain the description of existing restrictions on the European rail infrastructure. Each IM manages their own database.	IM	RU	IM/RU	1
4.2.11.3	Rolling Stock Reference databases	The keeper of a rolling stock is responsible for the storage of the rolling stock data within a Rolling Stock Reference Database. Databases must be accessible to all service providers based on access rights.	RU	RU	RU	1
4.2.12.2	Wagon and Intermodal Unit Operational Database	This database shows the movement of a wagon and of an Intermodal unit from departure through to final delivery at customer sidings with ETIs and actual times at different locations until the final delivery time ETA. The database also shows the different status of the rolling stock.	RU	RU	RU	1
4.2.8.6	WagonException	This message is used by the RU/Service Provider to inform the Lead RU about deviations e.g. bad order, hold.	RU	LRU	RU	1
4.2.9.5	WagonRefusedAt Interchange	This message is used by the neighbouring RU/Service Provider as answer to the message "WagonInterchangeNotice" to inform the sender of the WagonInterchangeNotice the responsibility for the wagon is refused.	RU	RU	RU	1
4.2.8.7	WagonException Reason	Specified as the Wagon Exception message New ETI/ETA Request. This message is used by the Lead RU to inform the other RU/Service providers	LRU	RU	RU	1

		about deviations and to request a new ETI / ETA.				
4.2.8.8	WagonArrivalNotice	This message is used by the last RU/Service Provider in the transport chain to inform the Lead RU that the wagon has arrived at its yard	RU	LRU	RU	1
4.2.8.9	WagonDeliveryNotice	This message is used by the last RU/Service Provider in the transport chain to inform the Lead RU that the wagon has been placed at the consignee's siding.	RU	LRU	RU	1
4.2.14.6	Metadata	Structure data defining message contents	IM/RU	IM/RU	IM/RU	1
4.2.14.6	PKI	Public Key Infrastructre	IM/RU	IM/RU	IM/RU	1
4.2.14.6	Certificate Authority	Certification authority for PKI	IM/RU	IM/RU	IM/RU	1
4.2.14.6	Repository	Contains necessary information for identifying those participating in the data exchange.	IM/RU	IM/RU	IM/RU	1
4.2.14.7	Common Interface	Common interfaces mandatory for each actor and must handle messaging, encryption, authentication, etc.	IM/RU	IM/RU	IM/RU	1
4.2.12.1	Coding for Rail Locations	Centrally stored reference file for coded rail locations including Primary, Secondary and Zone, Track, Spot (ZTS) . This database exists as ENEE. ZTS not needed till Phase 4	IM	IM/RU	IM/RU	2
4.2.12.1	Emergency Services	Centrally stored reference file of the emergency services, correlated to type of hazardous goods	RU	IM/RU	IM/RU	2
4.2.12.1	European accredited operators	Reference File of all European licensed operators including respective list of national safety certificates granted	IM/RU	IM/RU	IM/RU	2
4.2.12.1	Numerical Coding of Transport Customers	Centrally stored reference file for the Identification of transport customers	RU	RU	RU	2
4.2.12.1	Numerical Coding of Customer Locations	Centrally stored reference file of coded customer locations	RU	RU	RU	2
4.2.12.1	Dangerous Goods, UN and RID Codes	Centrally stored reference file of UN/NA and RID codes for Dangerous Goods	RU	IM/RU	IM/RU	2
4.2.12.1	Identification of Goods	Centrally stored reference file of codes CN and HS codes for the identification of goods	RU	RU	IM/RU	2
4.2.12.1	European maintenance Workshops	Centrally stored reference file of all European maintenance workshops	RU	RU	RU	2
4.2.12.1	European Audit Organisations	Reference File of all European audit bodies	IM/RU	IM/RU	IM/RU	2
4.2.1.2	WagonOrderToORU	Customer sends to Lead RU all information which is needed to carry on the whole transportation from origin to delivery. The Lead RU gives the Origin RU/Service Provider the relevant information which is needed to start the transportation until the interchange to the next RU/Service Provider.	LRU	RU	RU	3

4.2.1.2	WagonOrderToDRU	Customer sends to Lead RU all information which is needed to carry on the whole transportation from origin to delivery. The Lead RU gives the Delivery RU/Service Provider the relevant information which is needed to carry on the transportation during his responsibility until the handover to consignee.	LRU	RU	RU	3
4.2.1.2	WagonOrderToTRU	Customer sends to lead RU all information which is needed to carry on the whole transportation from origin to delivery. The LRU (Service Integrator) gives the Transit RU/Service Provider the relevant information which is needed to carry on the transportation during his responsibility until the interchange to the next RU/Service Provider.	LRU	RU	RU	3
4.2.2.2	PathRequest	This message serves to request a train path. The message is sent from the RU to each IM involved.	RU	IM	IM/RU	3
4.2.3.2	TrainComposition	This message is sent from an RU to an IM defining the composition of the proposed train	RU	IM	IM/RU	3
4.2.2.3	PathDetails	This message is used by the IM to the RU confirming details of the path in response to RU request.	IM	RU	IM/RU	3
4.2.2.4	PathConfirmed	This message is used by the RU to confirm the proposed path of the IM (message “PathDetails”) in response to RUs original request.	RU	IM	IM/RU	3
4.2.3.3	TrainAccepted (Optional)	This message is sent from the IM back to the RU indicating, that the train composition is acceptable for the booked path. This message is optional unless agreed to IM/RU.	IM	RU	IM/RU	3
4.2.4.2	TrainRunningForecast	This message is issued from the IM to the neighbouring IM upon departure from or movement past agreed points or prior to reaching the first reporting point if, owing to a delay, the train has not reached the bilaterally agreed initial running time. This message is also issued from the IM to the RU when, at the next stopping or handling station, out-of-schedule running is anticipated that exceeds the threshold agreed with the RU responsible for the train. This message is also issued in any cases for handover points, interchange points, for the destination point and for each other reporting point predefined by contract	IM	IM/RU	IM/RU	3
4.2.5.2	TrainRunning Interruption	This message is issued from the IM to the neighbouring IM and to the path contracted RU, if the train is cancelled due to a train related service disruption.	IM	IM/RU	IM/RU	3
4.2.2.5	PathDetailsRefused	This message is used by the RU to inform the IM, that the Path Details (with changed values to the request or to earlier booked path) are not acceptable.	RU	IM	IM/RU	3

4.2.3.4	TrainNnotSuitable (Optional)	This message is sent from the IM back to the RU indicating, that the train composition provided is not suitable for the previously agreed path. This message is optional unless agreed to IM/RU.	IM	RU	IM/RU	3
4.2.2.6	PathCancelled	This message is used as a request to cancel a previous booked train path. The message is sent from the RU to the IM, where the train path was requested.	RU	IM	IM/RU	3
4.2.3.5	TrainReady	This message is sent from an RU to IM indicating that the train is ready for access to the network.	RU	IM	IM/RU	3
4.2.6.2	EnquiryTrainRunning Information	This message serves to enquire on the current status of a specified train.	RU	IM	IM/RU	3
4.2.6.2	ResponseTrain RunningInformation	This message is issued following receipt of an enquiry about the train running. It delivers all information for the specified train about the current status of the train.	IM	RU	IM/RU	3
4.2.2.7	¨PathNotAvailable	This message is sent from an IM to an RU indicating, that the booked path is not available (path cancelled by IM).	IM	RU	IM/RU	3
4.2.3.6	TrainPosition (Optional)	This message is sent from IM to RU defining exactly when and where the train should present itself upon the network. This message is optional unless agreed to IM/RU.	IM	RU	IM/RU	3
4.2.6.3	EnquiryTrainDelay Performance	Permits the RU to enquire about all delays of a specific train from a particular IM	RU	IM	IM/RU	3
4.2.6.3	ResponseTrainDelay Performance	This message is issued following receipt of an enquiry about the train delay / performance. It delivers a report of all the delays to a specified train at all reporting points with a particular IM.	IM	RU	IM/RU	3
4.2.7.3	WagonETA/ETI Message	This message is sent by the RU to the next RU in the transport chain to give him the calculation of its ETI. The last RU sends this message with ETA to the Lead RU, which may inform its customer. Following the handover information from the IM, the RU sends with this message also the updated ETI to the next RU and the last RU sends the updated ETA to the LRU.	RU	RU	RU	3
4.2.2.8	ReceiptConfirmation	This message is sent from the recipient of a message to the original sender of the message, when the required response cannot be made available in “real-time”.	IM/RU	IM/RU	IM/RU	3
4.2.3.7	TrainAtStart (Optional)	This message is sent from the RU (train responsibility) to IM (control responsibility) to indicate, that the train has started its journey. This message is optional unless agreed to IM/RU.	RU	IM	IM/RU	3
4.2.6.4	EnquiryTrainIdentifier	This message serves to enquire upon the current specified train ID and its previous train ID’s. Any of the train ID’s can be used for the enquiry.	RU	IM	IM/RU	3

4.2.6.4	ResponseTrain Identifiers	This message is issued following receipt of an enquiry about train identifiers. It gives a report of the current and all previous train ID's of a specified train.	IM	RU	IM/RU	3
4.2.7.4	AlertMessage	Following the comparison between the actual ETA and the commitment to the customer, the Lead RU sends this Alert Message to the actual RU in charge and to all following RUs, involved in the transport chain.	RU	RU	RU	3
4.2.6.5	EnquiryTrainRunning Forecast	This message serves to enquire on the forecast time for a specified train at a particular reporting location or by missing out the reporting location to enquire on the forecast time at the handover point from the IM.	RU	IM	IM/RU	3
4.2.6.5	ResponseTrain Running Forecast	This message is issued following receipt of an enquiry about train forecast. It gives the forecasted time of a specified train at a specified location. If the location is not specified the forecast time at the handover point will be sent.	IM	RU	IM/RU	3
4.2.6.6	EnquiryTrainsAt ReportingLocations	This message serves to enquire on all trains of an RU at a particular reporting location or by missing out the reporting location to enquire on the trains at the handover point from the IM.	RU	IM	IM/RU	3
4.2.6.6	ResponseTrainsAt Reporting Location	This message is issued following receipt of an enquiry about trains at a particular reporting location. It gives a report of the forecasted time for all trains of the enquirer at a specified location. If the location was not specified by the enquirer, the forecast time at the handover points for the different trains will be sent.	IM	RU	IM/RU	3
4.2.7.5	EnquiryWagon Deviation	This message serves to enquire on the current status of a specified wagon.	LRU	RU	RU	3
4.2.7.5	ResponseWagon Deviation	This message is issued following receipt of an enquiry about the wagon deviation. It delivers a report of all deviations of a specified wagon at all reporting points.	RU	LRU	RU	3
4.2.12.1	Existing Train Control Systems	Centrally stored reference file of command and control systems used	IM/RU	IM/RU	IM/RU	3
4.2.12.1	Locomotive Types	Centrally stored reference file of coded Locomotive types	RU	IM/RU	IM/RU	3
4.2.12.2	Trip plan for wagon / Intermodal unit	The Wagon Trip Plans must be stored by each LRU in a database. These databases must be accessible via the Common Interface Predetermined Trip Plans	RU	RU	RU	3
4.2.12.2	Wagon Trip Plan Databases	Wagon Trip Plans must be stored by each LRU in a database. These databases must be accessible via the Common Interace.	RU	RU	RU	3

3 Central & Reference Files

3.1 Reference Files:

In Chapter 4.2.12.1 of the TAF TSI the Reference files are classified in two ways:

Locally stored and administered (e.g. Reference File of the emergency services, correlated to type of hazardous goods)

Centrally stored and administered (e.g. Reference File of the Coding for all IMs, RUs, Service provider companies, or Reference File of the Coding for Transport Customers, etc.)

For the centrally stored and administrated Reference files it is clear that an important point is to keep these files consistent at all times. They must be accessible by each RU and IM and updated in the most cost efficiency way as these files are not restricted to local or country related use.

3.2 WIMO database:

The Wagon and Intermodal Unit Operational Database (WIMO) is the key database for the tracking of wagons / Intermodal units and therefore for the communication between the RUs involved and the Lead RU / Service Integrator. This database shows the movement of a wagon and of an Intermodal unit from departure through to final delivery at customer sidings with ETIs and actual times at different locations until the final delivery time ETA.

In addition, the Rolling Stock operational Data (TAF TSI chapter 4.2.11.4) represent the actual status of the individual rolling stock for operational purposes. This data shall include temporary data, such as restrictions, current and projected maintenance actions, km, fault counters, etc.; and all data that could be considered as "status" (temporary speed restrictions, brake isolated, needs for repair and fault description, etc.).

The operational rolling stock data is part of the European-wide WIMO database as described in TAF TSI chapter 4.2.12.2. To allow for the tracking of train and wagon movements, the WIMO database, updated at each relevant event in real time, is required. The WIMO database will be accessible via the Common Interface.

The use of this database allows :

- Transport operation under the Open Access business model
- Transport operation under the network Co-operation business model
- Improvement in Wagon Fleet utilisation
    - for RU owned wagons and
    - for private wagons (keeper owned wagons)
- Straightforward empty wagon administration for both business models
- Selected information for maintenance (for Keepers and Workshops)
- Selected information for the LRU / Service integrator and for all RUs involved in the transport to serve the customer requirements (of the consignee and consignor).

During the development of the TAF TSI it was recognised that a central database represents the best approach when risk, time and costs are considered against the benefits. It is planned that the definitive architecture and interfaces of the WIMO database has to be specified during the Step 2 of the SEDP development in discussion with Rail Industry Representatives.

4 Current Projects and Initiatives

Sections of TAF TSI where experience and knowledge of the existing projects is valuable for the SEDP process.

Main Processes and related functions per Project :
(based on Presentations made to the Project Team)

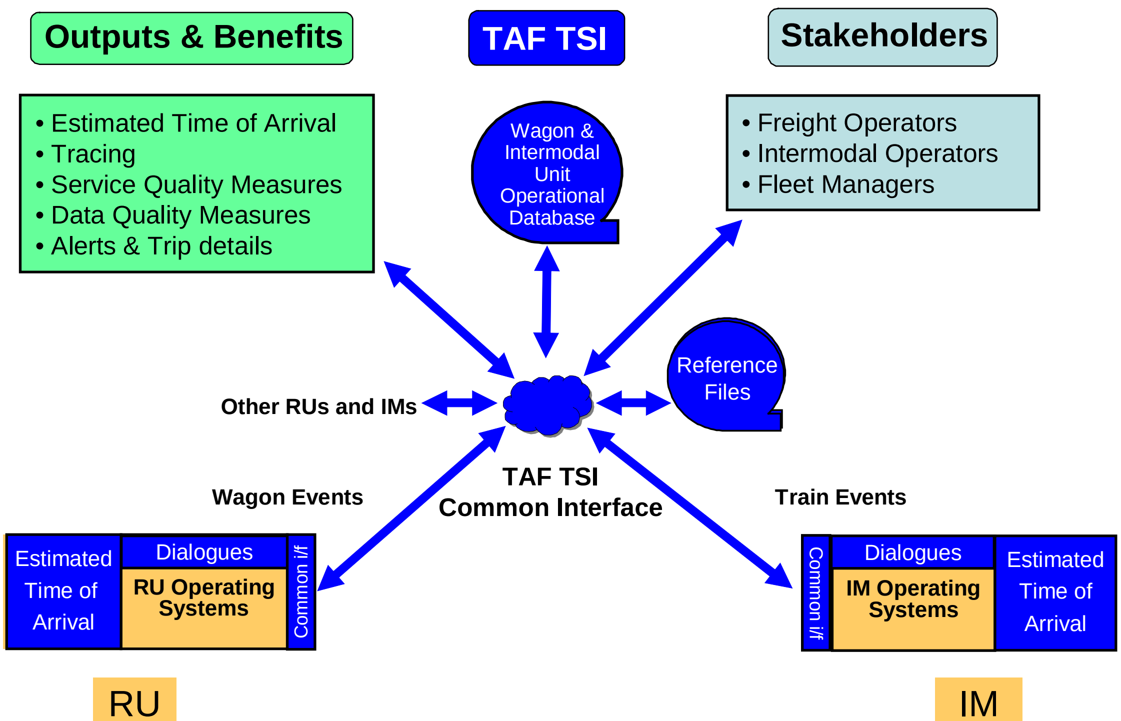
Project:	Sections of TAF TSI, were experience and knowledge is valuable in the SEDP development process:
Crobit	- Wagon order management during complete transport chain - Repository for predetermined trip plans - ETA calculation for selected traffic based on predetermined trip plans, tracking and tracing - Exception notification - Tracking and Tracing related queries, responses - Service quality measures
Europtirails:	- Supply of information on trains and operations on predefined corridors in real time between IMs (Train running forecast) - Quality analysis (punctuality, reasons of delays...)
ISR:	- Status and location (tracking and tracing) information of wagons - Integration of commercial information via consignment note data - Using reference files

Orfeus:	-	Sending of international consignment note from RU to the other RUs involved in the transport chain
	-	Updated version handling capability
Partner:	-	Interface to current domestic Timetable Design Systems
	-	Co-operative planning procedures for international corridor paths
	-	Advanced scheduling algorithms (optimisation)
Pathfinder:	-	co-ordination of tailor made paths for annual time table and upon request thru the year
	-	shop window for catalogue paths
	-	workflow solution for co-ordination
Railtrace:	-	Consignment note management during the complete transport chain
	-	Repository for predetermined trip plans
	-	ETA calculation, exception reporting
	-	Tracking and Tracing related queries, responses and reports
	-	Service quality measures

5 TAF TSI Summary

5.1 TAF TSI Architecture

The diagram summarises the TAF TSI architecture. TAF TSI requires minimal central provision – internet-delivered messaging, key reference files and easily-accessible data for ETA calculations. Because of the need to interface with many local systems, a common interface will be made available to manage messaging and to allow only high quality data (defined by business rules) to be passed between TAF TSI-compliant systems at RUs and IMs.



Each TAF TSI compliant system will use the common interface to communicate in a network architecture with the other stakeholders' systems and central files utilising the internet and/or existing company networks. The common interface acts as the gatekeeper for data quality, security, message delivery and change control. Changes to the common interface itself will be managed centrally.

An information system is only as good as the reliability of the data within it. Therefore the data that plays a decisive role in the forwarding of a consignment, a wagon or a container must be accurate and captured economically - which means that the data should be entered into the system only once.

Based on this, the applications and messages of this TSI avoid the multiple manual data input by access to already stored data

5.2 Geographical Scope

The geographical scope of the TSI is the Trans-European conventional rail system as described in Annex I to the Directive 2001/16/EC. But this TSI may also be applied to the complete freight transport rail network of the member States of the EU, with the restriction that the requirements of this TSI are not mandatory for freight transport arriving from or going to a non-EU country.

5.3 Functions within the scope of the TSI

The subsystem Telematic Applications for Freight is defined by Annex II of the Directive 2001/16/EEC, section 2.5 (b) and includes in particular:

- Applications for freight services, including information systems (real-time monitoring of freight and trains),
- Train Composition in the context of marshalling and allocation systems,
- Train path reservation systems,
- Management of connections with other modes of transport and production of electronic accompanying documents.

5.4 Functions outside the scope of the TSI

Payment and invoicing systems for customers are not within the scope of the TSI, nor are such systems for payment and invoicing between various service providers such as railway undertakings or infrastructure managers. The system design behind the data exchange, however, provides the information needed as a basis for payment resulting from the transport services. Also the long term planning of the timetables is out of scope.

5.5 Service Providers

The TSI takes into account the present service providers and the various possible service providers of the future involved in rail freight transport covering :

- Wagons
- Locomotives
- Drivers
- Switching and Hump shunting
- Slot selling
- Shipment management
- Train composition
- Train Operation
- Train monitoring
- Train controlling
- Shipment monitoring
- Inspections & Repair of Wagon and / or Locomotive
- Customs clearance
- Operating Intermodal Terminals
- Haulage management

When taking into account the needs of a customer, one of the key services is to organise and manage the transport according to the requirements of the customer. This service is provided by the Lead Railway Undertaking (Lead RU or LRU). The LRU is the single point of contact for the customer. If more than one railway undertaking is involved in the transport chain, the LRU is also responsible for the co-ordination with the other railway undertakings. This LRU service can also be undertaken by a forwarder or by any other entity.

The network approach of the TAF TSI is primarily that all the RUs, IMs and other Service Providers (as listed above) in the conventional rail transport chain must work together, through process co-operation and efficient interchange of information to deliver seamless, high quality commercial services to the customers. The TAF TSI is also applicable to the single RU 'Open Access' business model.

6 Conclusion

This Framework Plan provides the basis for planning compliance with TAF TSI for organisations in the European rail transport chain. Organisations that have not already set up an internal team and allocated responsibility for TAF TSI compliance planning should do so as soon as possible. It is also recommended that attention of all senior RU and IM staff is drawn to this either through internal publications or directly.

In the first phase of the implementation of TAF TSI, the Messaging System, Key Reference Files and the Wagon & Intermodal Unit Operational Database (WIMO) are implemented. Where train running advice is already available from IMs, it is feasible to use this to achieve early benefits. European wide Tracing capability for Wagons and Intermodal Units will provide the significant benefits from Phase 1.

In phase 2 the focus shifts to improving Data Quality, Service Quality and generate wagon/IM unit estimated time of arrivals (ETAs) from history.

The majority of the message exchange (dialogues) supporting short term path requests, train preparation and train running advice between IMs and RUs is planned to occur in the 3rd implementation phase of TAF TSI. This capability is used to enable accurate ETAs and Estimated Time of Interchange (ETIs) to be generated from predetermined trip plans.

The implementation of ETAs/ETIs from Dynamic Trip Plans in phase 4 represents the most challenging portion of the TAF TSI. The Benefits are the most significant in terms of Transit time reliability, Wagon Fleet and Infrastructure productivity.

The SEDP Project Team is working on behalf of all the railways of Europe in delivering the Strategic European Deployment Plan to the European Commission. TAF TSI implementation represents an exciting opportunity but it will not succeed without the full participation of all organisations. The SEDP Project Team will work with all organisations implicated by the TAF TSI to enable the industry to publish the Strategic European Deployment Plan in 2006.

Project Team
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