General Functional Description Twin Hub Order Booking system

FINAL

Twin Hub project

Ab Ovo Nederland B.V.

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Version 1.0

Jaap Nagtegaal
Ab Ovo Nederland B.V.
Barbizonlaan 75
2908 ME Capelle aan den IJssel

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2 Management Summary

The goal of the Twin Hub network is to make intermodal rail freight transport in, from and to Northwest (NW) Europe more attractive and increase its competitiveness in order to shift flows from road to rail transport, making transport more sustainable, regional accessibility more robust, regions more competitive, and increasing territorial and economic cohesion within Europe.

A Twin Hub network is a hub-and-spoke network bundling the flows of different seaports, e.g. Rotterdam and Antwerp. The network consists of several rail service connections between a begin-terminal and an end-terminal. The trains on their journey visit a hub. The trains of a hub-and-spoke network visit the same hub in order to mutually exchange load units. Such operation provides scale economies also to small(er) flows. Scale economies in terms of larger trainloads, higher service frequencies, a higher network connectivity and a more efficient use of tracks. These benefits only emerge if the trains cooperate well, meaning that the exchange of load units functions well. A load unit should easily reach its destination, on its way being transported by one train (for the total rail distance) or two trains (one up to the hub, the other one after the hub).

The trains in a Twin hub network are likely to be run by different intermodal rail operators. In other situations they are competitors, in the Twin hub network they cooperate. A precondition for such operations to be effective and efficient is the availability of appropriate information. The customer (shipper, forwarder) wants to know if what the performance of a Twin hub service is, what for alternative transport options there are, and what their performances are, all on a door-to-door basis, and also per network segment (e.g. train up to the hub and afterwards). The booking system is providing such information and the conditions of transport (= functionality 1).

Should the customer decide to take a Twin hub service, the firm will want to know, whether there is sufficient capacity on the train, tomorrow or later, or what the probability is of sufficient capacity then. The booking system is now matching demand and supply (= functionality 2). Should the customer decide to book a Twin Hub train service, the booking system has to confirm the request. A rail operator may want to have comparable information as the shipper or forwarder in order to take appropriate planning decisions. The booking system in its ultimate form provides more information and in one step only than a customer can achieve if he/she separately demands transport and booking information from each rail operator. Of course there is also a cost related to the booking system, as this needs to be developed or as existing systems need to be adopted or coordinated with other existing ones.

Summarising, the development of an Information system within the Twin Hub project can be beneficial to the different operators in a Twin Hub network and to the customers from different countries. This can be achieved by objectively matching transport demand and train capacity which enables the operators to exchange volume, optimize their planning and develop a commercially interesting product which can compete with truck and barge.

Together with the rail operators in the project the various possibilities for a booking system for the short term and long term were discussed. All the operators in the project were clear in their view that only when the project proves to be successful a “new” system, meaning to evolve to a substantial scale, a new booking system should be added to their current information systems. The development of a new booking system interfacing or working alongside and/or interfacing with the rail operating system from the rail operators in the project is totally unnecessary during the project phase. Main reasons for not wanting an extra booking system:

- Additional cost (business case) for interfacing or developing a system is not clear and can't be compensated by the additional quality and convenience of the booking system.
- Only if at least 5 rail operator or more will use the Twin Hub set-up than a new system will be viable.

The ultimate goal is that the booking system supports the Twin Hub network and connected operators by objectively matching transport demand and train capacity. Four scenarios/options are applied in the Twin Hub project, scenario 1 being the simplest one and scenario 3 the most ambitious one:

1. Customer A (Shipper or Forwarder) or Customer B (= supplier 1/ rail operator 1) and supplier 2 (= rail operator 2) calls/e-mails Customer Service Centre (use of template) of Rail operator.
2. Customer books through web enabled booking template.
3. Customer books at a dedicated Twin Hub Customer Service Centre. (This is the most ambitious scenario where the Twin Hub network uses existing processes, capacity and systems to book and plan the order)

Scenario/option 1 comes down to developing nothing and using the booking systems already existing. Depending on the success of the pilots and the success of future implementation of the Twin Hub concept, scenario/option 1 is very simple and easy to implement without extra costs and of all the scenarios is the preferred one too follow during the pilot phase of the project.

Scenario/option 2 is a step too far for the current status of the Twin Hub pilot but should be investigated further if the pilots prove to be successful. There are companies that can provide cheap but efficient development and support for creating a Twin Hub web interface.

Scenario/option 3 is only interesting if the project and pilots proof to be successful and all the deliverables from the project are implemented. Scanning the field has led to the conclusion, that Twin Hub network is not the first framework in need of the information functionalities described above. First of all, numerous information/route systems have been launched already. Most of them have no matching functionality. An information and booking system (functionality 1 and 2) has been developed under the name Freight Arranger. This is a booking system on the level of scenario 3. The conclusion of explorations is that, even if Twin Hub would evolve to a network of substantial scale, justifying the introduction of a booking system on the level of scenario 3, the network (project) should not develop such a system an its own, but get connected with an existing innovative system. The British Freight Arranger is a very promising option in this regard.

For the current status of the project and pilot it is advised to follow scenario 1. The hesitation of rail operators in the pilot to develop a new booking system does not in any way indicate that there is no need for or value added by such system. It only shows that the benefits **in the concrete context** do not prevail above the costs and other efforts to implement and run it.

3 Introduction

3.1 Booking system in the Twin Hub project

The Twin Hub network is defined by some clear goals and targets. The goal of the Twin Hub project is to make intermodal rail freight transport in, from and to Northwest (NW) Europe more attractive and increase its competitiveness in order shift flows from road to rail transport, making transport more sustainable, regional accessibility more robust, regions more competitive, and increasing territorial and economic cohesion within Europe.

In this project the central configuration to achieve the goal is the Intermodal rail freight Twin hub Network Northwest Europe (= ITN-NWE or Twin hub network). Its implementation and the achievement of related performance improvements is the **main objective** of the project. The envisaged performance improvements are larger trainloads, higher service frequencies, higher network connectivity and – derived from larger trainloads – a better utilisation of the rail infrastructure. The objective refers

1) To promising networks, which could be implemented on the short to long term
2) To a specific network that the project intends to implement on the short term by means of a pilot.
    a. The pilot consists of train services and rail-rail exchange between these trains at a hub
    b. Supported by an information system to be used by the rail operators. The information system matches trainloads and train capacity.

The core idea of the Twin hub network is to transport **Rotterdam** containers etc. in Antwerp trains, wherever these (potentially) have a strong position in the market. The other way around, let **Antwerp** containers etc. lift along in Rotterdam trains, wherever these are (potentially) well represented in the market. The **smaller maritime ports** can benefit by getting their train services attached to those of the large ports. The **inland terminals** transport their load units from/to Belgian and Dutch ports in common trains instead of separate ones.

The trains in a Twin hub network are likely to be run by different intermodal rail operators. In other situations they are competitors, in the Twin hub network they cooperate. A precondition for such operations to be effective and efficient is the availability of appropriate information. The customer (shipper, forwarder) wants to know if what the performance of a Twin hub service is, what for alternative transport options there are, and what their performances are, all on a door-to-door basis, and also per network segment (e.g. train up to the hub and afterwards). The booking system is providing such information and the conditions of transport (= functionality 1).

Should the customer decide to take a Twin hub service, the firm will want to know, whether there is sufficient capacity on the train, tomorrow or later, or what the probability is of sufficient capacity then. The booking system is now matching demand and supply (= functionality 2). Should the customer decide to book a Twin Hub train service, the booking system has to confirm the request. A rail operator may want to have comparable information as the shipper or forwarder in order to take appropriate planning decisions. The booking system in its ultimate form provides more information and in one step only than a customer can achieve if he/she separately demands transport and booking information from each rail operator. Of course there is also a cost related to the booking system, as this needs to be developed or as existing systems need to be adopted or coordinated with other existing ones.

Summarising, the development of an Information system within the Twin Hub project can be beneficial to the different operators in a Twin Hub network and to the customers from different countries. This can be achieved by objectively matching transport demand and train capacity which enables the operators to exchange volume, optimize their planning and develop a commercially interesting product which can compete with truck and barge.

The development of an Information system (in the long term) within the Twin Hub project and in long term can benefit the operators from different countries by objectively matching transport demand and train capacity which enables the operators to exchange volume, optimize their planning and develop a commercially interesting product which can compete with truck and barge. Together with the rail operators in the project the various possibilities for a booking system for the short term and long term were discussed. All the operators in the project were clear in their view that only when the project proves to be successful a “new” system should be added to their current processes.

One of the discussions concerned the willingness of the rail operators to book orders directly in the booking order systems of each other? Furthermore an agreement of sharing or not sharing of certain (neutral) data elements needs to be done by the operators BEFORE development of the first prototype for the booking system. The question was uniformly answered negatively by all the rail operators, but the rail operators also gave notice that the development of a new booking system interfacing or working besides their own rail operating system is totally unnecessary during the project phase. Main reasons for not wanting an extra booking system:

- Additional cost (business case) for interfacing or developing a system is not clear and can’t be compensated by the additional quality and convenience of the booking system.
- Only if at least 5 rail operator or more will use the Twin Hub set-up than a new system will be viable.

The definitive choice of the Twin Hub (Rotterdam or Antwerp) is constantly being delayed and delivery and agreement on the business plan and the current set up of the pilot has been delayed. As it currently stands it doesn’t require a new system because no volume is exchanged or need for interaction with other train operators is necessary. The Twin Hub pilots (see picture above) are planned for October 2014. Further agreement on paths, regions and providers need to be made and agreed on within the project and written down in the business plan and pilot plan. For the moment the pilot are two pilot flows of individual Twin Hub operators that won’t need to interact or exchange information about the Twin Hub trains. A Booking system is therefore in the short term not needed. Again if the pilots are successful and the Twin Hub project is successfully implemented than the business case for an independent booking system is interesting. In the long term the implemented Twin Hub concept can benefit from an innovative booking information system but only if there is enough volume, capacity and connected rail operators. In the next chapter we will take a closer look at the various scenarios/options to follow.

3.2 Goal of the Booking system

The goal of the work package WP2A6 is, if functional and reasonable, to develop an innovative booking information system which enables the involved rail operators to interactively book train capacity on a train of another rail operator (in the pilot), matching transport demand and train capacity of the three rail operators. The system facilitates the identification of available loads and train capacity that could be exchanged in the Twin hub network. Otherwise to deliver a general Functional Description Twin Hub Order Booking System. This describes in general the functions of an order booking system and various options/scenarios if the output of Twin Hub project will be operational.

In both cases, the temporal focus of the booking system is:

- Project pilot, hence the short term,
- The long term, should the Twin hub concept evolve to a substantial scale. The booking system was not defined to be a prerequisite of the project pilot. In other words, the pilot is intended to take place anyhow, with or without an implemented innovative booking system.

During the course of the project, the focus of WP2A6 shifted towards the second goal. The major reasons for the shift in were that:

- The current two Rail operators (Russell & IMS) do not want an additional booking system besides their own booking system.
- On the short term, additional cost (business case) for interfacing or developing a system can impossibly be compensated by the additional quality and convenience of the booking system.
- Only if the Twin Hub project proves to be successful, the deliverables will be operational and at least 5 rail operator or more will use the Twin Hub set-up than a new system will be viable.
- The rather frequent changing of rail operators in the project has made it quite difficult to prepare and implement an innovative booking system responding to the first goal.
- In the most recent version of the pilot network there is a lot of interaction between the operators being project partners and project external operators.

3.3 Activities work package WP2A6

The work package has been carried out in London at the Russell office (various discussions, interviews and explanation of the Russell operation) as well as in the Netherlands at the Ab Ovo office (preparations and reporting) and at Modal-Link office (various discussions, interviews and explanation of the IMS operation). Modal Link handles operations for IMS Swiss and one of their operations managers served as a contact for the project. Interviews with the Rail operators have been held from end 2012 to the summer of 2013 on various occasions. Also discussions and interviews were planned, prepared but eventually delayed or cancelled with members of the IFB and HUSA organizations.

Together with Ab Ovo Senior Rail Consultants brainstorm session have been held and looked at other options for a booking system in the current market, for instance Xrail, The Transparent Quality Network, which is currently being interfaced for customers of the Rail Cargo System (RCS) and at Freight Arranger, an Intermodal Freight Broker that finds best connections PLUS matches demand and supply (market place). For the business case, additional and further market research is needed at the various rail business solutions for booking systems.

Although the goal of the work package has changed during the Twin Hub project, various activities were undertaken.

- Analysis of documents
- Various interviews of key-users from the rail operators
- Analyses of information flows, current booking systems, ICT, Data and bottle necks from the rail operators
- Feedback Twin Hub project manager(s)
- Presentation, discussion and feedback within the Twin Hub project during meetings and sessions
- Brainstorm session with Ab Ovo Senior Rail Business Consultants

4 General functionality of the Twin Hub booking system

A hub-and-spoke network has an intermediate node, the hub, where load units are exchanged between trains. Up to the hub a train may have load units to all end-terminals of the network. The exchange cumulates in the resorting the load units in terms of directions. All trains leaving the hub are single-destiny loaded, meaning that they carry load units for only one end terminal. With such operations the hub-and-spoke network connects the same number of begin-and-end terminals al the direct service network, but with less train routes (in the example of Figure 3 with three train routes instead of nine). This makes it easier to:

- Organise full trainloads and use the link infrastructure more efficiently and/or
- Organise high service frequencies and/or
- Provide connections to many end terminals, also for small(er) flows.

The full trainloads lead to low transport costs (prices) per load unit a higher track capacity, the high service frequencies to low other transport costs for the shipper, the high rail network connectivity to lower door-to-door transport costs (prices) due to shorter pre- and post-haulage by road.

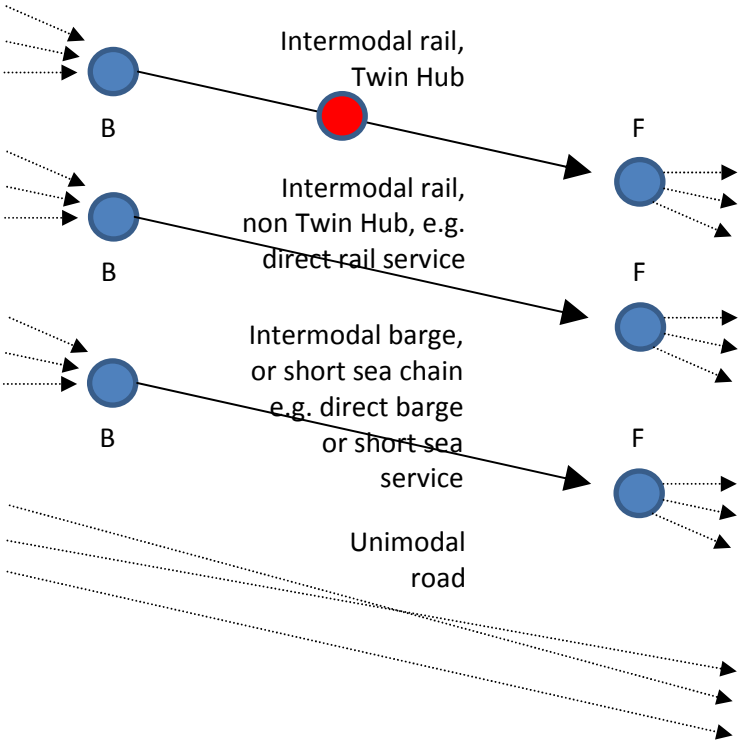
The ultimate goal is that the booking system supports the network and it's connected operators by objectively matching transport demand and train capacity. An independent booking system has various functionalities.

1) Offering the best connection option for a customer (Shipper or forwarder)
    a. Offer options for the best optimized connection to deliver the goods to the customer
2) Matching capacity
    a. Offer and match capacity demand and supply from all operator to deliver the best option to deliver the goods to the customer based on Services, costs, delivery time

A (shipper or forwarder) booking information:

- **Which is the best connection with the best performance?**
- **What are the alternatives?**

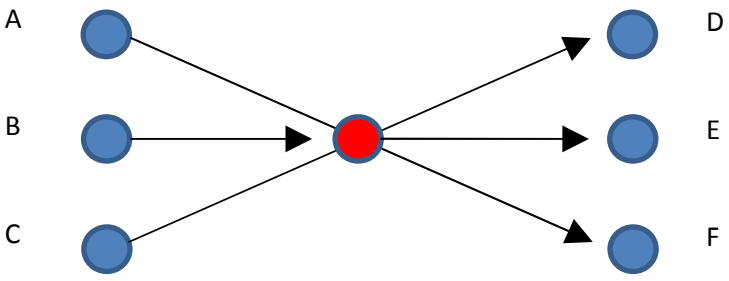
Main functionality 1 Information Best Connection



Booking information between customer (shipper, forwarder, other rail operator) and supplier (rail operator)

- **Do required performances (quantities, quality, costs) of demand and supply match? Following service? Services thereafter: is it likely that supplier will have sufficient capacity?**
- **Should I book?**

Main functionality 2 Matching supply and demand



There are also various products/business solutions like the FreightArranger solution (see appendix B for more information) which allows Rail Freight Operating Companies to make visible to other participants, train capacity which they want to sell or share. Also the Xrail Alliance has been set up and implemented and integrated with operations from various European Railway companies. Xrail is a production alliance aiming to increase the competitiveness of Wagonload traffic in Europe, protecting the environment by offering a more sustainable alternative to road. Xrail has developed new cross-border production standards, supporting IT tools and different quality improvement measures for international wagonload traffic, and all Alliance partners are committed to maintaining the high standards of quality and service for the customers. The Alliance is not targeting block train transport or combined transport. Hence the difference with the Twin Hub project.

In November 2013 a workshop was planned in Frankfurt am Main during which various developments and projects were presented for Innovative tools for more efficient tools and more efficient freight transport in Europe. Developments will continue over the next couple of years and the Twin Hub project is a good addition to the various initiatives.

5 Scenario's/options for Twin Hub Booking system

In the next chapters we will take a closer look at the pros and cons of various scenarios of (not) using and interactive booking system. Options that can be used in the Twin Hub project are:

1. Customer A (Shipper or Forwarder) or Customer B (= supplier 1/ rail operator 1) and supplier 2 (= rail operator 2) calls/e-mails Customer Service Centre (use of template) of Rail operator.
2. Customer books through web enabled booking template.
3. Booking between Customer Service Centre (CSC) (use of template) of the Rail operators.
4. Customer books at a dedicated Twin Hub Customer Service Centre. (This is the most ambitious scenario where the Twin Hub network uses existing processes, capacity and systems to book and plan the order)

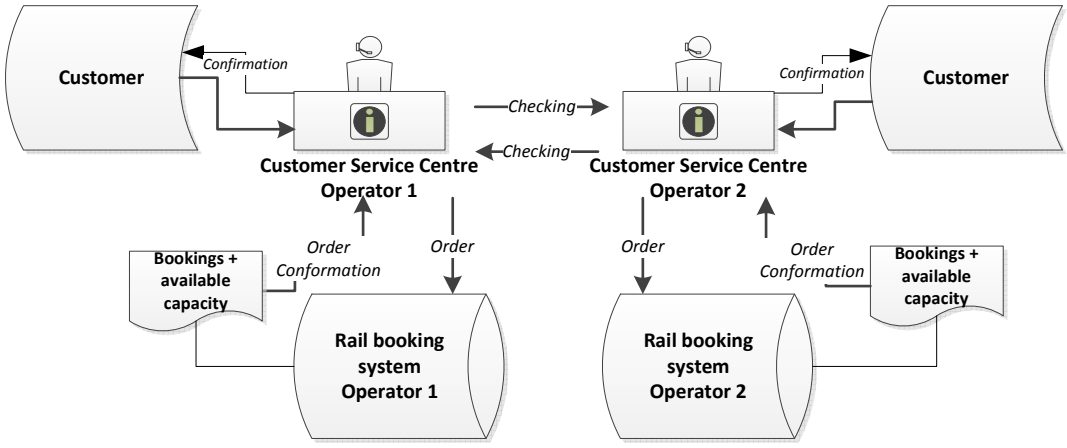
Restrictions:

- Twin Hub CSC is connected (manually or EDI) with current booking system / CSC operators
- Twin Hub CSC checks availability and books the order at the CSC operators
- Excel sheet with capacity, availability is communicated
- Communication channels
- CSC single point of Contact
- Booking system, interfaced with booking system of rail operators (optional)

Customer can be:

- Customer A (Shipper or Forwarder)
- Customer B (= supplier 1 = rail operator 1) and supplier 2 (= rail operator 2)
- Customer Service Centre (CSC) of the rail operator

5.1 Scenario/Option 1: Customer calls/e-mails Customer Service Centre (use of template) Rail operator.



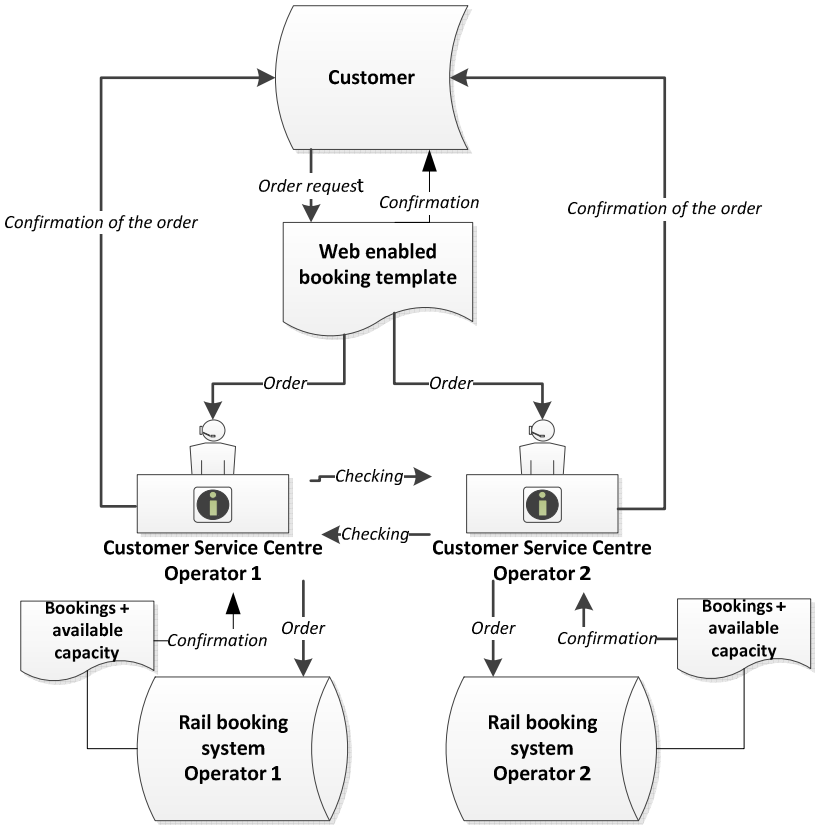
The first scenario is a very basic scenario. All the current processes stay the same. A Customer places an order using the normal order booking processes of the Rail operator. Only if the order calls for extra information or interaction with other Twin Hub operators is needed, than the CSC operator 1 contacts the CSC of operator 2. The CSC is the central point of contact where all communication is centred who take and process the order and handles the communication to the customer.

It is advisable to make an excel output list of the planning of the Twin Hub train and exchange it on a daily base (depending on the schedule of the Twin Hub train) and exchange the latest info between the CSC and the sales division of the operators. The use of a Twin Hub order template is not necessary but advisable.

PROS	CONS (actions needed)
• Usage of existing infrastructure Rail operators • No extra software needed • Hardly any implementation time • Cost effective • CSC checks with other operators if needed • CSC handles the order in booking system	• Lack of inventiveness, adds nothing to the Twin Hub project • Twin Hub order template optional • Agreement on timely output (excel) of order status (capacity and availability) of Twin Hub trains • Work instructions for CSC, planning and sales department • Current booking system of Rail operators need to make small adjustments (Twin Hub field) to make an Twin Hub order visible • More (administrative) handling time • Status update manually • Tracking of orders less efficient

Although this scenario adds nothing new to the current processes of the Rail operators in the Twin Hub project, for the current status of the pilots this scenario is very simple and easy to implement without extra costs.

5.2 Scenario/Option 2: Customer books through web enabled booking template



Note: conformation of the order can also be done directly from the website when using the web enabled booking template. Contact by CSC is optional. This will require web integration of systems. The picture above shows the situation that confirmation is send through the CSC.

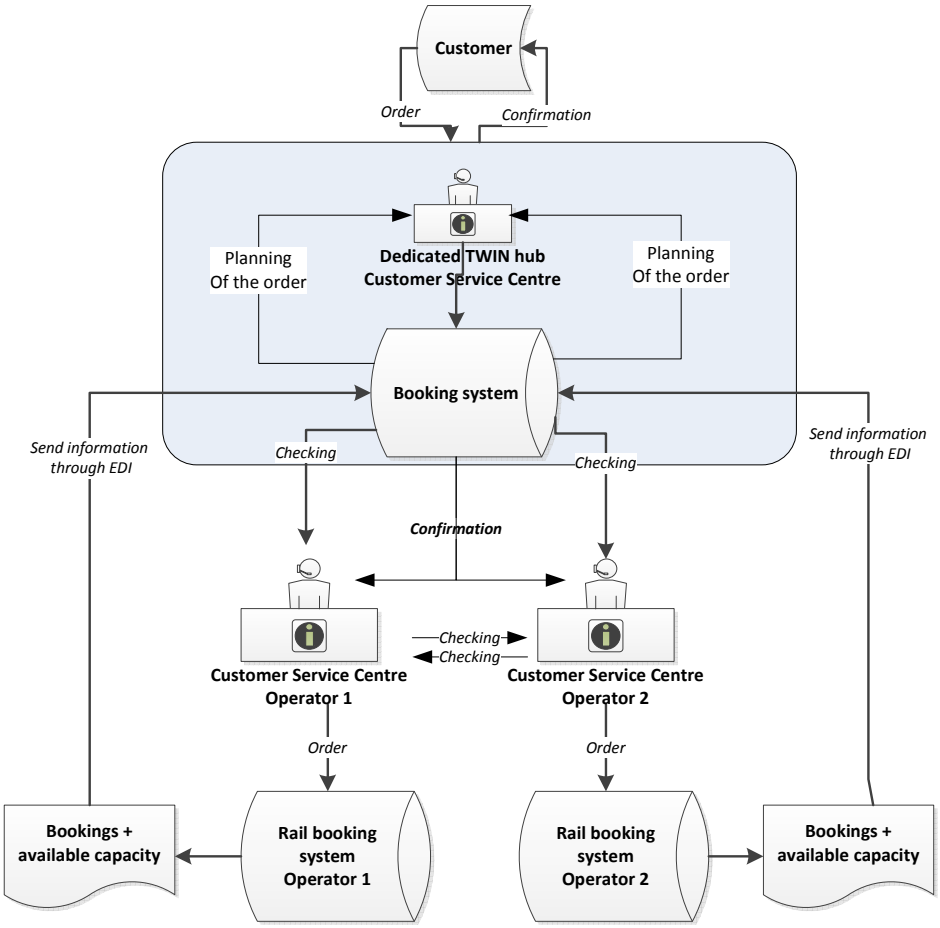
The second scenario adds a web enabled feature to scenario one. All the current processes stay the same, except that the customer goes to a web interface where information of the Twin Hub trains is available. A web enabled order booking template is available to fill in. If all the required fields are filled in the order request will be send to the CSC of the depending Rail operator (or directly in the booking systems of the operators if integrated). The order request will be handled by normal order processes and the customer will get a confirmation of the order by email. It is also possible to send the confirmation directly through the web interface. In that case the CSC will have no direct contact with the customer but will be monitoring the order bookings in the background. After confirmation the order will be handled by normal procedures of the Rail operators.

Only if the order calls for extra information or interaction with other Twin Hub operators is needed, than the CSC operator 1 contacts the CSC of operator 2. It is advisable to make an excel output list of the planning of the Twin Hub train and exchange it on a daily base (depending on the schedule of the Twin Hub train) and exchange the latest info between the CSC and the sales division of the operators. This information should also be available for the customer on the web interface. The use of a Twin Hub order template is required.

PROS	CONS (actions needed)
• Usage of existing infrastructure Rail operators • CSC checks with other operators if needed • CSC handles the order in booking system • Direct booking • Automatic handling • Use existing infrastructure rail operators • Web interface adds to the visibility of the Twin Hub concept • Effective exchange of Twin Hub information between operators	• Software / Web based template is needed • Interfaces (two way) between systems are needed • Extra system besides existing systems • Time consuming (Number of participants) • Authorization rules • Matching in own rail booking system • Information about Twin Hub train is not real time but should be available • Agreement on timely output (excel) of order status (capacity and availability) of Twin Hub trains • Work instructions for CSC, planning and sales department • Current booking system of Rail operators need to make adjustments (Twin Hub field) to make an Twin Hub order visible + web order needs to be placed in CSC system • Status update manually • Tracking of orders less efficient • Maintaining and support Twin Hub order web interface

This second scenario is a step too far for the current status of the Twin Hub pilot but should be investigated further if the pilots prove to be successful. There are companies that can provide cheap but efficient development and support for creating a Twin Hub web interface. It would be preferable to integrate the order directly in the systems of the Rail operators but this can prove timely and costly. The placed order can also be simply send by web interface to the mailbox of the CSC of the Rail operator with an automated delivery reply for the customer. After receiving the order all the processes (scenario 1) will become active.

5.3 Scenario/Option 3: Customer books Customer books at dedicated Twin Hub CSC



The third scenario is the most complex, time consuming and ICT driven but also the efficient, effective and preferred solutions if the project will become successful and other Rail operators (Minimal of 5 but preferably more) want to connect to the Twin Hub concept. A dedicated Twin Hub customer service centre with an interactive booking system handles all the orders (web based order is an added feature). As in the scenarios 1-3 the Twin Hub rail operators need to upload by EDI (or manually) the basic information of the Twin Hub planning to the Twin Hub booking system.

Based on that information the Twin Hub CSC will book and plan orders for the Twin Hub rail operators. Confirmation of the booking and planning will be send automatically to the Rail operator. The dedicated Twin Hub CSC will handle all communication to the customers and will arrange the interaction between the Rail operators. The execution of the order will be in control of the Rail operators.

PROS	CONS (actions needed)
• Central Point of Contact for customer • Direct booking /matching in system • Automatic (real-time) handling • Startup fase an excel sheet with availability is sufficient • Minimum type of information to be able to plan and book an order in template • Usage of existing infrastructure Rail operators • Dedicated CSC checks with other operators if needed • Dedicated CSC handles the order in booking system • Effective exchange of Twin Hub information between operators • Control of the execution of the order stays with the Rail operator	• Twin Hub order template • Agreement on timely output (excel) of order status (capacity and availability) of Twin Hub trains • Work instructions for CSC, planning and sales department • Current booking system of Rail operators need to make small adjustments (Twin Hub field) to make an Twin Hub order visible • Cost of IT, staff • Twin Hub booking system is needed when number of Rail operators increases • Interface with bookingsystem of Rail operators • Authorization is needed • Processes need to be defined, capacity for CSC is required • Twin Hub Communication and regular communication can interfere • Extra system besides existing systems • More (administrative) handling time

Setting up and staffing a dedicated Twin Hub Customer Service Centre with an interactive booking system and interfaces with Rail operators is costly and for reasons already mentioned not feasible. If the project is successful it is advised to look further at existing options in the market and do extensive market research.

A similar project like Twin Hub started in 2010 in the UK which resulted last year in the FreightArranger solutions (see appendix B for more information), after a three year period of development, testing and trials. It allows Rail Freight Operating Companies to make visible to other participants, train capacity which they want to sell or share. Consignors make movement requests, and FreightArranger finds the best combination of rail freight services, timing and price to offer a solution, and an automated booking service. Transactions are near-instantaneous because FreightArranger is hosted in the cloud.

FreightArranger has been supported by the UK Technology Strategy Board, won second prize in the Enabling Innovation Team's Customer Experience competition and has been shortlisted for the UK Rail Industry Awards. FreightArranger is a great alternative for the Twin Hub project for the joint interactive booking information system. Possibly FreightArranger needs to be adjusted and adapted for working in NW Europe.

The technical requirements for FreightArranger to work are minimal as it is hosted in the cloud – all one needs is an internet capable device and EDI messaging. The features which FreightArranger provides which should be helpful to Twin Hub are:

- Train timetables,
- Customisable time thresholds for each train service to accept bookings, load and unload containers,
- Ability to specify number and type of wagon on each train, including mixtures of wagon types,
- Ability to add extra wagons to trains, or reduce number of wagons up to the time of departure,
- Automated checks for length and weight of containers to prevent over-loading of wagons,
- Ability to re-allocate containers to different wagon or train,
- Ability to manage dangerous goods bookings,
- Price matrix with discount and surcharge options, and
- Comprehensive suite of dashboards and reports to show train loading information,

Depending on the way FreightArranger would be used, the cost can vary. In the UK, they charge a transaction fee for each booking and an annual licence fee. The booking fee rate varies depending on whether FreightArranger is booking small amounts of spare capacity on a train, or managing the entire train length, for which the fee per container is lower. Freight Arranger can be flexible over the weighting of the fees between the fixed and variable elements to fit the business model of the Twin Hub operators. Depending on the time taken to setup the system, there may be a charge for setup.

The future possibilities are that FreightArranger could enable Twin Hub to grow into something much larger within the existing capability of FreightArranger. For example, this could be:

- Adding further ports and their trains to create a wider collaboration network,
- A sales platform for moving containers to participating ports for export,
- A sales platform for inland rail terminal to door movements (the final mile/kilometre),
- A sales platform making train capacity available to third parties, and
- Inter-connection with other trains on inland routes to create a wider rail network.

This last scenario is very interesting but only if the project and pilots proof to be successful and all the deliverables from the project are implemented. After a successful Twin Hub project a business case study is advisable for connecting to Freight Arranger (or other booking systems or initiatives in development depending on the results of market research). For the current status of the project and pilot it is advised to follow scenario 1.

5.4 Conclusions scenario's/Options

Depending on the success of the pilots and the success of future implementation of the Twin Hub concept, scenario/option 1 is very simple and easy to implement without extra costs and of all the scenarios is the preferred one too follow during the pilot phase of the project.

Scenario/option 2 is a step too far for the current status of the Twin Hub pilot but should be investigated further if the pilots prove to be successful. There are companies that can provide cheap but efficient development and support for creating a Twin Hub web interface.

Scenario/option 3 is only interesting if the project and pilots proof to be successful and all the deliverables from the project are implemented. After a successful Twin Hub project a business case study and

additional market research for connecting to Freight Arranger or a similar solution. There are off course more options than Freight Arranger. For the current status of the project and pilot it is advised to follow scenario 1.

The hesitation of rail operators in the pilot to develop a new booking system does not in any way indicate that there is no need for or value added by such system. It only shows that the benefits **in the concrete context** do not prevail above the costs and other efforts to implement and run it.

6 Functional description Twin Hub Order Booking System

In this chapter we take a closer look at the base functions of a general order booking system. If operators want to interactively book train capacity on a train of another rail operator (in the pilot), matching transport demand and train capacity, an order booking system should be operational and based and built around one key corner stone: the order.

6.1 Orders

The order is the actual linking pin in a booking system, integrating 'contract to invoice' for every transport. The order contains the customer (Twin Hub rail operators) order information (what needs to be shipped where and when or which services need to be provided) combined with the information on tariffs, contracts, pricing, etc. Every time something changes in the execution of an order as a result of change requests by the customers (e.g. more goods to transport or different services to provide), or as a result of changes in the execution (e.g. alternate route due to closed paths) the order will be updated, the related costs need to be re-calculated and execution and the financial output adjusted to the new situation.

6.2 Tariffs

In the world of European rail cargo, models define the price of a customer order and subsequent handling of the revenue with direct tariffs, with contracts or with a pricelist (the company's price catalogue). These tariffs need to be included in the in the systems of the Rail operators. Output of the tariffs of the Rail operators need to be interfaced to the Twin Hub order system, including the possibility to create project orders (a combination of one or more types of orders, all to be invoiced as a single project) and the use of order templates.

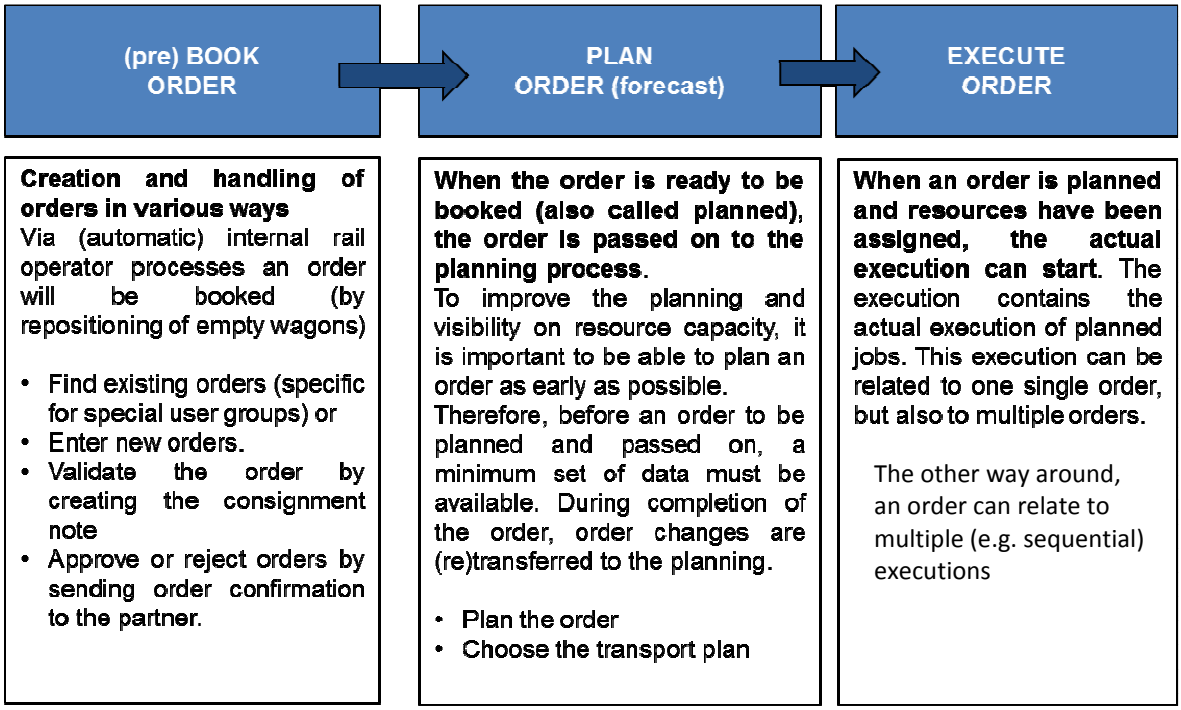
6.3 Operational & execution

The order directly relates to the operational (planning) and execution. When the customer order is available it needs to be planned and checked against available capacity. Within the Twin Hub project it is defined that all the capacity planning and execution will be handled by the current systems of the rail operators. Based on the information of the order, check if the Twin Hub capacity is available (or made available). If available the order can be planned for execution and resources are assigned. The executable tasks lead to detailed activity lists for the employees. The execution of production tasks includes movements (retrieve customer wagons, shunting, checks, and transport) and services (weighing, repair, customs, etc). These execution tasks are out of scope of the Twin Hub booking system.

6.4 Workflow orders

The order is the core in which all information regarding tasks to be executed from the customers' point of view is stored. The order can be initiated in different ways. The general workflow of an order is as follows:

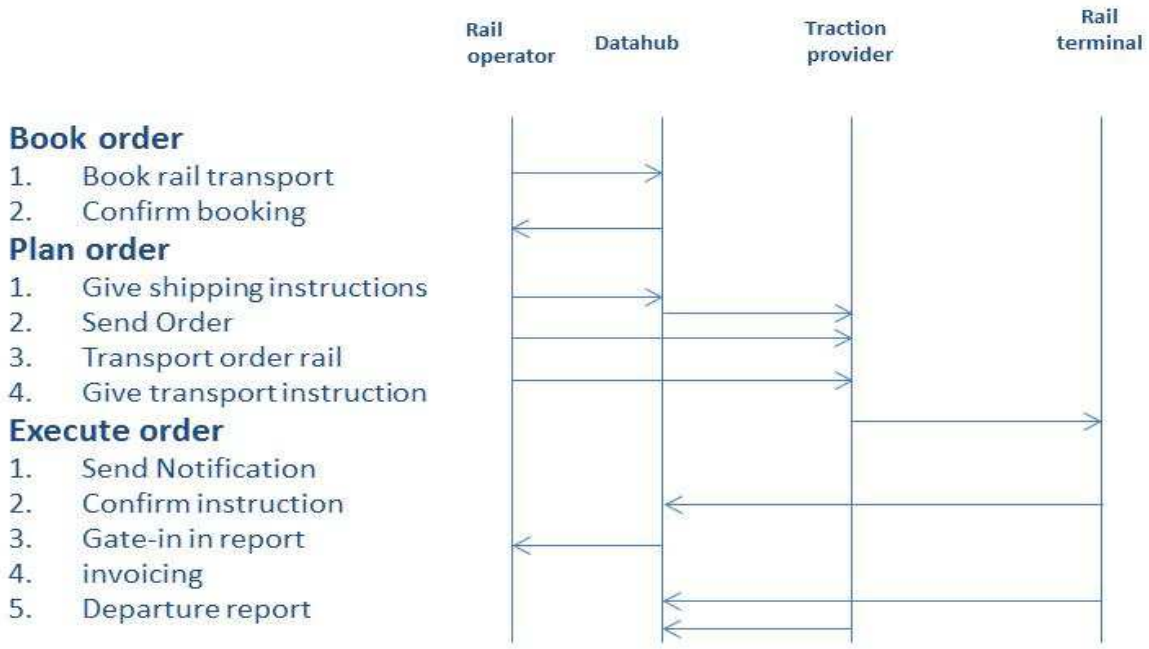
- **Book the order (by the order administrator)**
  - Find existing orders or Enter new orders
  - Enter extra services
  - Create a consignment note for proof of receipt of consignment
  - (Re)open and select orders
  - Approve or reject orders
  - Print the order confirmation for the client
- **Plan the order**
  - Choose the transport plan
  - Record order fulfilment / completion, manually or automatically
- **Execute the order**
  - Match capacity
  - Assign tasks



You can search relevant orders via various details. Orders can be of type domestic, export, import or transit. An order can exist without a contract and can be coupled to other orders (empty wagon to customer, charter by customer, return empty wagons to customer). An order can be based on a contract, on international tariffs, on a domestic tariff or on the price catalogue. For the Twin Hub project an order needs to be identified as a Twin Hub project. The Twin Hub flows need to be assigned to the order after which the order can be initiated in different ways:

- Automatically via interfaces from the customer (EDI)
- Automatically via interfaces from the international Twin Hub railway partners
- Internal by the service centres of the Twin Hub Rail operator
- External by the customer himself thru a web application/interface
- External by external CSC

6.5 Process flow



6.6 Key characteristics orders

- Status driven. Orders are completely status driven. Order statuses are used for steering the order through the system. While statuses are volatile and keep changing, important statuses and events are kept in internal indicators.
- Order templates. Orders must be generated based on order templates. A template is a customer specific predefined and pre-filled order. Templates must be uniquely numbered and be related to the individual customer. Customers can place orders based on template numbers.
- Detailed information. Detailed information is kept in the order, e.g. on which track the customer is expecting the wagons, local trains and feeding trips.
- Cancellation. Cancelling of the order is subject to rules, and is only allowed up to a specific order status or execution status. Cancelling can be done by the customer or by the railway operator.

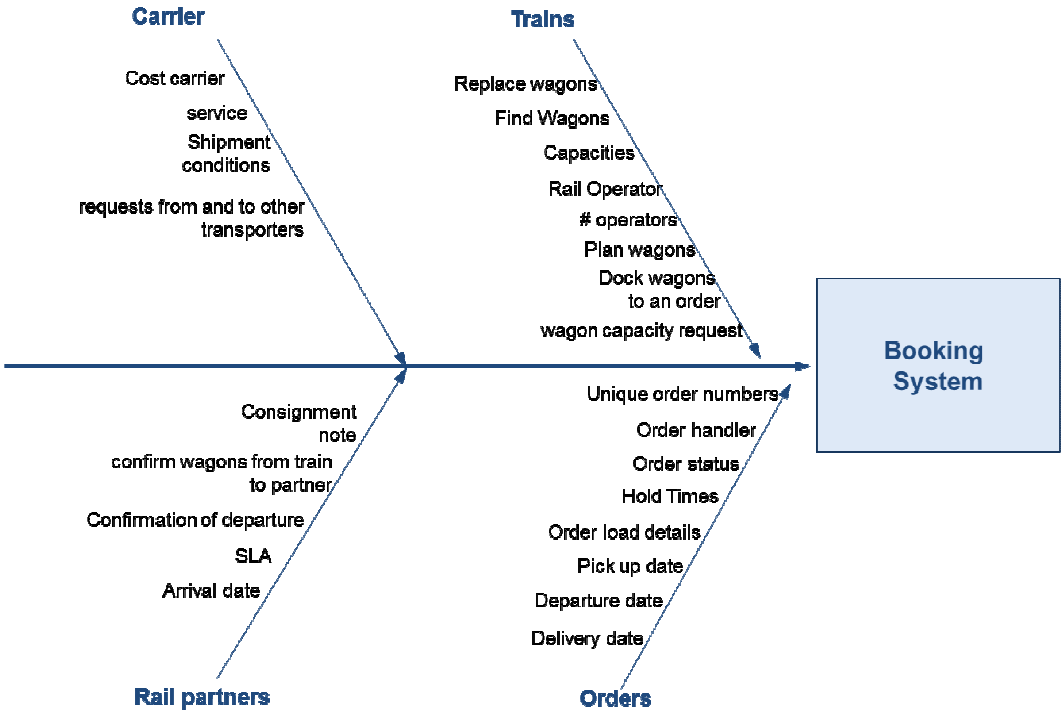
6.7 Order versioning and order changes

To be able to keep track on changes and the order history, full order versioning functionality is needed. Related to important order statuses in the order life cycle, it is imperative to keep and safeguard a part of the order or all of the order content. This can be important in relation to customer appointments and customer delivered information or customer requests.

Changes can have impact on order planning and execution, like re-planning an order or printing a CIT document as an appendix to the consignment note to reflect the changes to a consignment note.

6.8 Completion of the order

The Twin Hub order booking system needs the basic information from the rail operators, see below.



After the order fulfilment / completion (depending on the availability of Twin Hub cargo space and trains), the order can be further processed for execution within the systems of the Rail operators. The various scenarios are described in the next chapter. Determination and registration of order completion will normally be done automatically, but can also be done manually in the order. In the execution domain of the rail operators systems all detailed jobs and movements must be registered as completed. Further processing consists of checking if everything is completed and final, if all information is recorded or if information is expected back from other rail operators.

The order is checked against the contract status and parameters for financial settlement and if everything is correct, the order is automatically passed on to the financial system of the Rail operator. If not, the order is placed in a waiting or error status.

The consignment note, with the new COTIF, can now be created and printed. Externally created consignment notes can be processed. Most rail operators handle export and domestic transports as well as import and transit transports. The processing of consignment notes is handles by the rail operators and out of scope of the Twin Hub booking system. The order and consignment note are closely coupled, in a way that the consignment note can be regarded as a ‘print of the order’. All data is extracted from the order on generation or re-generation time, and nearly no additional data needs to be entered. A consignment note can simply not exist without an order.

6.9 List of functionality for Orders

The list below describes the functionalities needed in a TWIN hub booking system - Order.

Functionality Nr.	Description
1	**Creation and handling of orders in various ways:** • Automatically via interfaces from the customer (EDI) • Automatically via interfaces from the international railway partners, like: o Orpheus o Hermes • Internal by the customer service centre • External by the customer himself via a web application using templates
2.	**Order flow:** • **Book the order** o Find existing orders or Enter new orders o Enter extra services o Create a consignment note o (re)open and select orders o Approve or reject orders o Print the order confirmation to the client • **Plan the order** o Choose the transport plan o Record order fulfilment / completion, manually or automatically • **Execute the order**
3.	**Transport orders can be of type:** • domestic, • export, • import or • Transit. • 'Horse shoe' - the 'domestic order' via a neighbouring country. • An extension to the 'horse shoe' – is the import or export order with two domestic parts (domestic, foreign, domestic, foreign, …) Note: a special case of the domestic order is the 'domestic order' via a neighbouring country (horse shoe - domestic, foreign, domestic).
4.	**An order can be based on:** • a contract, • the international base tariffs, • a domestic tariff or • A price catalogue. An order can be based on only the international base tariff (a gross order without a contract).
5.	**An order can be of various types:** • Loaded transport including the request for empty wagons • empty wagon to customer,

	• charter by customer, • return empty wagons to customer • loaded transport • Book available “space’ of wagon of other Twin Hub partner **Orders can be for charter cargo, unit cargo, shuttles or empty wagons.** • Unit cargo – handling of wagon cargo on the level of wagons • Charter cargo – handling of whole trains • Shuttles – handling of intermodal – containers • Wagon usage can be for wagons: o privately (customer) owned wagons o own wagons o partner owned wagons
6.	**Order specifics:**
	• Status driven. Orders must be completely status driven. Order statuses are used for steering the order. • Order templates. Orders can be generated based on order templates. A template is a customer specific predefined and pre-filled order. Templates are uniquely numbered and can be related to the individual customer. Customers can place orders based on template numbers. • Standing orders. Recurring orders must be automatically generated using predefined parameters. • Order validation. Order validation must be built in different levels to tune the validation requirements with the order process. In each higher validation level more and more thorough validation checks must be performed. • Detailed information. Detailed information must be kept in the order, e.g. on which track the customer is expecting the wagons, local trains and feeding trips. • Cancellation. Cancelling of the order is subject to rules, and is only allowed up to a specific order status or execution status. Cancelling can be done on request of the customer or by a railway operator.

7.	**Order data (a subset of possible data elements):**
	Unique order numbers: each order has its own order number Order status: orders can have several statuses like: o Work version o Manually approved o Manually rejected o Cancelled o In Planning / Production o In Financial domain o To be changed o Etc. etc. Country UIC codes — all existing country codes are being used Station UIC codes — all existing Station codes are being used, existing out of two groups: tariff-stations and production-stations Order handler — administration off the person who and what he has changed in the order Partners — all related partners are set in standing data and are usable through entire system by codes Partners can have several indications of kind of partner (consignee, consigner, and contract) and are validated upon in the input of the order. Rail partners — transport partners can be pointed out as a sub transporter, main transporter, follow up transporter, all with specific financial consequences. Wagons — all data of used or to be used wagons can be inserted into standing data, and is to be used throughout the system. Divided into wagon type groups, customer groups, own wagon groups, wagon data.
8.	**Wagon data** The wagon data must at least exist out of data like: • Own weight, type of brakes, max. Allowed speed related to weight, revision date, size and length, number of axles, brake weight, etc.
9.	**Administration of dates** the following dates can be inserted and will be administrated and used in the order process • Pick up date • Departure date • Arrival date • Delivery date • Service date

10.	**Shipment conditions** worldwide transport conditions (INCO Terms) must be inserted and are used for financial dealing: • Prepaid/Franco CIP (cost insurance paid) • CPT(carriage paid to) • DAF (delivered at frontier) • DDP (delivery duty paid) • DDU (delivery duty unpaid) • Not Franco EXW (Ex works) • FCA (free carrier) With the prepaid shipment condition it is possible to indicate to which border crossing or to which handover station the freight is prepaid.
11.	**Order load details** the order exists out of at least the following data: • Number of wagons • Complete train yes/no • Type of wagons • Wagon identification and other data • Cargo type in or on the wagon (container, empty wagon etc.) • Cargo weight • NHM codes of the cargo in the wagon or load type (such as container) • Dangerous or hazardous goods (according to the international dangerous goods rules RID GEVI) • Special instructions for transport (no shunting, heavy load etc.) • Type of packaging and Weight of packaging
12.	**Services**
	Services - several services can be administrated, the following can be inserted and used in financial dealing of the service • Service type • information • Cost carrier • Production • Kind of service (all kinds of services are defined in the standing data) • Price of the service • Currency of the price • Indication if the amount payable is per wagon or per consignment note, per train, etc. • Place of the service (which also decides which partner is due to pay) • Service date • Shipment condition of the service (Franco / unfranco)

13	**Completion of the order** After the order fulfilment / completion, the order is passed back for further processing. Further processing consists of checking if everything is completed and final, if all information is recorded or if information is expected back from other rail operators (by means of a CIT document). The order is checked against the contract status and parameters for financial settlement. If everything is correct, the order is automatically passed on to the financial domain. If not, the order is placed in a waiting or error status.
14	**Booking of orders – sending the order to the planning as soon as possible.** This requires only a minimum set of data in the order. Resending orders after changes and adding of data to the order is possible.
15	**Consignment note: the consignment note has various statuses and flow:** • Generated • Validated • Validation error • Printed Final • Arrived Final.

6.10 Operational Planning & Execution

The operational planning can be incorporated in the booking system. For the Twin Hub project al planning and execution functions will be handled by the systems of the rail operators themselves. See scenarios in the next chapter, but it is optional to combine order and execution in one system.

When the order is ready to be booked or planned, the order is passed on to the planning process. To improve the planning and visibility on resource capacity, it is important to be able to plan an order as early as possible. Therefore, before an order to be planned and passed on, a minimum set of data must be available. During completion of the order, order changes are transferred to planning.

6.11 Workflow

- Find the arrivals of trains
- Report the arrivals of trains
- Plan and confirm wagons in an arrival track
- Plan and confirm wagons in a local train
- Plan and confirm wagons from local train to customer
- Dock wagons to an order
- Plan and confirm to unload local trains
- Replace wagons
- Appoint departure track
- Plan and confirm wagons on departure track and train
- Alter the order of the wagons
- Process defects to trains and wagons

- Verified orders are planned to possible resources and booked on date specific trains.

6.12 Execution

When an order is planned and resources have been assigned, the actual execution can start. Service level agreements, reserved capacity, sequence of sub processes etc. are taken into account. The execution contains the actual execution of planned jobs. This execution can be related to one single job, but also to a series of jobs from multiple orders. An occurrence during execution can lead to exception handling. For instance, a broken down will lead to a 'repair order'.

6.13 List of functionality for Operational – Planning

The list bellows describes the function for a Operational – Planning module in a booking system when order and execution are integrated.

Nr.	Description
1.	**Booking of orders** • When the order is ready to be booked (also called planned), the order is passed on to the planning process and is broken down into a list of linked jobs. • To improve the planning and visibility on resource capacity, it is important to be able to plan an order as early as possible. • Therefore, before an order to be planned and passed on, a minimum set of data must be available. • During completion of the order, order changes are (re)transferred to the planning. In the operational planning domain verified orders are planned to possible resources and booked on date specific trains.
2	**Workflow operational domain:** • Find the arrivals of trains • Report the arrivals of trains • Plan and confirm wagons in an arrival track • Plan and confirm wagons in a local train • Plan and confirm wagons from local train to customer • Dock wagons to an order • Plan and confirm to unload local trains • Replace wagons • Appoint departure track • Plan and confirm wagons on departure track and train • Alter the order of the wagons • Process defects to trains and wagons
8	**Requiring train paths from the Infrastructure Management** • Manually
9	**Registering and maintaining of the Train schedules**

	• Manual planning of orders, insert trajects for trains, local trains and inserting stations and terminal codes • Automatic planning of orders with multiple propositions on base off the transport plans and conditions such as transport type and shunting groups • Deleting planning's and trajects

6.14 Operational – Execution

Nr.	Description
1.	When an order is planned and resources have been assigned, the actual execution can start. The execution domain contains the actual execution of planned jobs. This execution can be related to one single job, but also to a series of jobs from multiple orders.
2	**Execution can be divided into the following steps:** • Preparation and validation o Checking order, status and documentation of wagons. o If necessary updating actual sequence of wagons on the track or in the prepared train. o Preparing documents for wagons with operational restrictions. o Printing of transport documents. • Handing over and execution o After all checks have been processed and documentation is prepared, the train as such is ready for departure and can, on administrative level, be handed over to the next station/process coordinator for further handling. o At this time all tasks and jobs needed to be executed at the next station are activated and presented on the 'To-Do' list of the process coordinator of the following station. o The last step is receiving the trigger that the train has departed and updating the actual departing time which is stored separately from the planned departure times. o Keep track of the sequence number of wagons whether they are located on a track or in a train and takes orientation of stations and Run-Rounds at intermediate stations into account. • Exception handling o Each performed activity can trigger the creation of new activities not only if activities are executed along the planned path but also if they are not executed within their tolerances or are not executed on time. o This means that each occurrence of an unexpected event will lead to the generation of new tasks or jobs to be performed to

	solve the risen situation. • Preparation for financial domain o Executed orders are prepared and send to the financial domain for further processing and invoicing.
3	**Coupling of wagons to orders and after that the final coupling on base of availability of wagon and track.** • The possibility to request: o the status of the wagon (defects and stickers) o wagon history (what was the wagon used for in history) o transport history (what orders was the wagon used for before) • Re-planning off trains to optimize the usage of capacity on trains both in length and weight
4	**Displacement of wagons** • Proposition for replacements of wagons from track into train • Displacement need to be planned before confirmed • Displacement of wagons on the track (with sequence in train) and date and time • Displacement of wagons on track into a train • Displacement of wagons in a train to a track
7	**Book wagons in train** • Inserting track number of leaving • Requesting train status (whereas at station, track in total procedures) • Approval of departure (train reported ready for departure) leads to: • Sending out the Hermes message • Printing/sending out the wagon list in the right sequence (a-z = z-a) with all necessary details (dangerous goods, wagon numbers, weights etc.) • Printing RID list (detailed information about the dangerous goods on the train) • Message and wagon list towards Infrastructure manager • Undo and cancel the approval of departure • Registration of performance of the technical and cargo check of the train with the status of the check and date and time • Confirmation of departure (automatic message) • Undo confirmation of departure • Confirmation of arrival (printing train list in right sequence with all related details) • Registration of hand over / takeover of the train to or from a foreign railway company (registration of date and time) • The processing of the Hermes Border In message: this results in the automated confirmation of approval of departure, confirmation of

	departure, activated train, and acceptance of 'take over' of the train.
8	**Booked wagons in local train** • Confirmation of placing train into terminal, printing local train list (including details as dangerous goods) • Confirmation of leaving of the terminal, printing local train list (including details as dangerous goods)
9	**Repositioning of wagons (wagon capacity request)** • Overview of wagon requests, requests from and to other transporters for certain wagon types • Wagon capacity overview, registration of requested and confirmed wagon requests

7 Acknowledgements

7.1 About Ab Ovo

Ab Ovo is an innovative and independent business & software solutions provider, incorporated in 1997 with currently almost a 100 employees. We have offices in the Netherlands (Rotterdam and Amsterdam) and Germany (Dusseldorf). From the start, its name has represented the vision on the job: a solid commitment to the delivery of IT projects from start to finish, or in Latin: ab ovo usque ad mala (from egg to apple, the start and finish of a Roman meal). From the beginning of our existence we have had an emphasis on the transport & logistics industries. Ab Ovo is a key player in the field of logistics and market leader in the European rail industry where we developed an even stronger specialization with our solutions.

Starting out as a provider of consultancy and interim & project management services, Ab Ovo is presently for a large part also a provider of advanced software solutions for a broad range of logistic processes. We offer our clients solutions and support for various parts of their businesses, with proprietary software, with standard solutions and also with solutions from our alliance partners. Ab Ovo uses two different channels to approach the market: Logistics and Rail. Besides these channels, we have separate Business Units for the delivery of the various services and solutions, in different European regions.

Ab Ovo deliver unique company solutions based on our in-house development tool TET and / or specialist third-party partner software. Our solutions include:

- Rail Cargo System (RCS): The Rail Cargo System is a dedicated solution for rail freight operators, which supports the whole transport process from terminal to terminal including local service traffic, contracts, orders and financial settlement. The solution is developed with our own model-driven software development platform (TET).
- Advanced Planning & Scheduling: Our software solves the daily puzzle of supply chain planning so companies can produce or transport more with fewer resources.

8 Appendix A: Order Template

Below is an example of an order template with all the characteristic of an Twin Hub order, which can be used for future order handling within Twin Hub.

Order form

Customer Service Centre
Tel:
Fax:

• **Customer details**		• **Acknowledgement of receipt**	
Firm. Name		Order number	
Partner Number		Order Type	Domestic
		Order Status	Work version
Customer number		Date	
Contact person			
Ref. no. Customer		**Handled By**	
Tel	Fax	Send waybill data to "Goods Administration"	
Is the order also a request for wagons?		No	
if yes, date placing wagon(s)	•		
If no, (p)-wagon number(s)	•		

• **Transport details**			
Contract number		Template number	
From station		Terminal	Track
Installation point			
Date of departure		Dept.ready from	Hour
Pick up date		Arrival Date	
Number of wagons		Wagon type	

Adressee		Tot. weight. cargo	
To station		UIC-code	
Country of destination		INCO Terms	
Border stations			
Product Type (NHM code)		Gevi UNnr	
		Customs goods	No
Shipment conditions	CIP	Consignment note	Generated
• Details:			

9 Appendix B: FreightArranger Brochure

Adobe Acrobat
PDFXML Document

10 References

- Rail Cargo System Product Description 2.0 – Ab Ovo Nederland B.V.
  - Various case studies
  - Functional Description
  - Technical Description
- Freight Arranger Website
- TWIN Hub business plan
- TWIN Hub Pilot plan
- Interview session Rail operators TWIN Hub project