Twin hub
Intermodal rail freight Twin hub Network North West Europe
ITN-NWE

Concept and project structure

Kick off meeting  8 + 9 December 2011  Delft
Twin hub. The conceptual framework
Starting notions for the project

- Rail transport is important for sustainable transport and competitive Europe
- Classical rail products are losing market shares
- Intermodal rail transport is spearhead of rail sector
- But its growth is smaller than needed
- Due to intermodal quality
- And due to cost performance
- Also, rail capacity problems in large nodes

CONCLUSION:
- Search for innovative rail concepts
- Search for innovative collaborations between service providers

TWIN HUB is one answer to this challenge
Starting notions for the concept

- Many intermodal rail flows are too small for direct train services ...
- ... also from and to large nodes
- “Complex bundling” is required for many relations

**Direct bundling**

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**Complex bundling**

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**LEGEND:**

- Partially loaded trains
- Fully loaded trains
- Begin-and-end-terminal

Detour and perhaps local rail transport
Transhipment or other type of exchange

Higher loading degree
More end terminals

EK, 1998
Starting notions for the concept (2)

Alternative basic bundling concepts

Direct network
(= BE network)

Hub-and-spoke network
(= HS network)

Line network
(= L network)

Fork network
(= TCD network)

Trunk-feeder network
(= TF network)

Only trunk rail network
(with full trainloads)

Trunk rail and local rail network
(with full and small trainloads)

Source: Kreutzbeger, 2008
Reflection on hub-and-spoke bundling in comparison to direct bundling

• If flows are sufficiently large for direct trains, ride direct trains

• Otherwise HS networks have the following potential advantages:
  • Larger trainloads
  • Higher frequencies
  • Smaller network transport volumes required
  • More efficient use of infrastructure
  • Higher network connectivity

• To be balanced with potential disadvantages:
  • Detours
  • Additional exchange at the hub

HS transport can be carried out by block trains or shuttles (without shunting, just like in direct networks)
Relevance of the performances

- Larger trainloads -> lower costs per load unit
  (most important for train costs)

- Higher frequencies -> lower costs of shipper:
  - E.g. interest costs for goods in circulation
  - Storage costs at the shippers’ locations

- Higher network connectivity -> shorter distances pre- and post-haulage
  -> lower door-to-door costs

- More efficient use of infrastructure -> less land use and lower infrastructure and hence transport costs per load unit
Relevance of the performances

Intermodal rail terminals served from Rotterdam in its “own” hinterland.
Reflection on hub-and-spoke bundling in comparison to other types of complex bundling

- Only trunk trains (no local = shorter trains)

- Advantage for efficient use of tracks in the seaport

- Easy to integrate the flows of many seaport rail terminals without large detours and efforts
The advantages of HS bundling

**HS network: larger trainloads**

- **Direct network**
  - Begin terminals
  - End terminals

- **Hub-and-spoke network**
  - Begin terminals
  - Hub
  - End terminals

**HS network: smaller transport network volumes required**

- **Direct network**
  - Begin terminals
  - End terminals

- **Hub-and-spoke network**
  - Begin terminals
  - Hub
  - End terminals

**HS network: higher transport frequencies**

- **Direct network**
  - Begin terminals
  - End terminals

- **Hub-and-spoke network**
  - Begin terminals
  - Hub
  - End terminals
The Twin hub concept

LEGEND
- terminal
- hub terminal Antwerp
- hub terminal Rotterdam
- services via hub Antwerp
- services via hub Rotterdam
- services beyond NWE
The Twin hub concept

- Transport Dutch containers (load units) in Antwerp trains wherever these have or could have a strong market position
- Transport Belgian containers (load units) in Rotterdam trains wherever these have or could have a strong market position
- Complementary markets in acknowledgement of seaport competition
- Transport containers (load units) between inland terminals and west seaports in the same train
- Organise such transport by means of HS networks
- Two HS networks, centred around hub Antwerp and hub Rotterdam
- Enlargement of service area of Belgian hub to NL and Dutch hub to B increases the advantages of HS bundling (trainloads, frequencies, network connectivity, infrastructure efficiency)
The Twin hub concept

LEGEND= train services to/from European inland terminals

Twin hub Kick off meeting 8 + 9 December 2011, Delft
Alternative physical means for rail-rail exchange at hubs

Shunting of wagons (formerly including containers)  
Crane transhipment of containers at a terminal

Megahub Antwerp

Source: Interferryboats, 2004
Reflection on physical means in HS networks

- Shunting single wagons:
  - Requires gravity shunting yard
  - Long operational times and high costs for hub exchange (-)
  - Also suitable for very small flow markets (+)

- Shunting wagon groups (e.g. 3 – 4 directions per train):
  - Possible on any shunting yard including flat ones
  - Competitive exchange times and costs for hub exchange (+)
  - Only suitable for markets wagon group market (-)

- Transhipment of containers at terminals
  - Preferably at rail-rail terminal, otherwise at rail-road terminals
  - Competitive exchange times and costs for hub exchange (+)
  - Suitable for all markets (+)
  - Shuttles or block trains. No shunting (+). More empty wagons (-)
Location hub terminals, long term

- Antwerp has the Mainhub terminal, designed for rail-rail exchange.
- Rotterdam:
  - Has no hub terminal (current complex bundling = line bundling)
  - There are hubs across the border (Duisburg, Cologne, Neuss, Antwerp), but each of them is only useful for one corridor
- Twin hub perception:
  - Many new rail terminals in the seaport
  - Integration of flows: HS bundling = very promising
  - Maasvlakte: own bundling, possibly via own hub
  - Hub location Twin hub at east side of the seaport:
    - good for integration Rotterdam flows
    - good for integration of flows of other seaports
  - There is functional space for more more than 1 one hub in Rotterdam
  - Micro-location to be searched
Location hubs, short term.
Options for the pilot

- Antwerp:
  - Mainhub terminal (rail-rail and rail-road terminals; IFB)
  - HUPAC terminal (rail-road terminal)
  - Maybe: flat shunting yards (for wagon group exchange)

- Rotterdam:
  - Rail Service Centre Waal-/Eemhaven (rail-road terminal)
  - Shunting yard Kijfhoek (for wagon group exchange)
  - Maybe: flat shunting yards (for wagon group exchange)
The high-performance hub

- Mainhub Antwerp = pioneer for true rail hub
  - Terminal layout
  - Operations
- Not in terms of high performance or high-tech hub terminals
- Different proposals in the 1990s
- Some still relevant today. Example NOELL

Integrated System for Maximum Throughput in Intermodal Traffic

The high-performance hub

- High-performance generates the productivity required in high welfare society and European competitiveness (Lisbon agenda)

- Reference to robotised container handling (internal transport, stack) of ECT on the Maasvlakte

- Comparable breakthrough almost absent for hub. Different factors

- Addressed in Twin hub project, although not main subject
Twin hub. Main features
Twin Hub. Main features

- Transnational: the benefits of Twin hub operations are for all accessed regions

- Transnational and innovative: the cooperation in the project is one between competitors:
  - Rail operators (including SMEs). HS bundling now typically within a rail family (e.g. DB, SNCF, SNCB).
    Cooperation refers to joint business plan, pilot, later operations, ICT
  - Seaports in different countries. HS bundling now typically within one country (e.g. Germany, France)

- Innovative: ICT (booking system)

- Promoting true rail hub bundling (operations, infrastructure, high performance technology development)
Twin Hub. Benefits

- Improved performances lead to:
  - Growth intermodal transport:
    - Modal shift -> more sustainable transport (Gothenburg agenda)
    - Better positioning rail operators in competitive market
  - Transport from and to accessed regions is more robust
  - Increasing territorial, economic and social coherence
  - Declining regional disparities (also smaller seaports and inland terminals accessed)
  - All together increase of European competitiveness and welfare

- Success pilot:
  - Twin hub network becomes more attractive to other operators
  - Advocates need of long-term HS infrastructure
Twin hub. Project structure
Four work packages

- **WP 1:** identify promising Twin hub networks
  - Flows
  - Promising networks
  - Modal shift
- **WP 2:** carry out pilot
  - Joint business plan
  - Pilot
  - Monitoring pilot
  - Booking system

\[=\text{CENTRE OF THE PROJECT}\]

- **WP 3:** long-term Twin hub infrastructure
  - Rotterdam
  - Antwerp
- **WP 4:** societal benefits
  - Intermodal rail sector and sustainability transport
  - Regions
  - European policies
  - Total
Time planning
(December 2011 – September 2015)

• WP 1: identify promising Twin hub networks
  (December 2011 – December 2012)

• WP 2: carry out pilot
  • Joint business plan (September 2012 – December 2012)
  • Pilot (December 2012 – end of project)
  • Monitoring pilot (December 2012 – end of project)
  • Booking system (December 2012 – July 2013)

• WP 3: long-term Twin hub infrastructure
  (July 2013 – June 2014)

• WP 4: societal benefits
  June 2014 – September 2015)
Project partners (from 5 countries)

1. TU Delft
2. VUB (Brussels)
3. EUR (Rotterdam)
4. TU Karlsruhe
5. Panteia (former NEA)
6. Nieuwenhuis
7. Ab-Ovo
8. Rail operator Russell (participating in the pilot)
9. Rail operator ... (participating in the pilot)
10. Rail operator ACTS (participating in the pilot)
11. Rail operator IMS Rail Switzerland
12. Port of Rotterdam
13. Port of Zeeland
Advisors (from 6 countries)

1. Rhine-Scheldt Delta co-operation (NL, B)
2. Cluster for Logistics (L)
3. Industrie- und Handelskammer Würzburg-Schweinfurt (D)
4. West Midlands Freight Quality Partnership (UK)
5. ECT (NL)
6. PSA/HNN (B)
7. Ambrogio Intermodal (B, I)
8. INRETS/SPLOTT (F)
9. Newcastle University, Freight and Logistics Research Group (UK)
10. University of Antwerp (B)
Management structure

INTERREG Secretariat

Steering Committee:
- Content
- Management
(Representatives of all partners)

Management team
- Project coordinator
- Project manager
- Communication manager
- Financial manager

Advisory group

- 2 plenary meetings per year
- Each one with time for Steering Committee
- Each second one also with time for advisors
Budget

- Total = 5,7 million Euros

- Of which 3,9 million for pilot to cover potential gap between revenues and costs in the initial phase

- Hence 1,8 million for research, development and publicity

- European Commission has approved state aid to rail operators (5 October 2011)
Input and output

- Project builds on previously EU-funded initiatives
- Network is open one
- Project contributes to a more cohesive EU society and is based on the cooperation of people from different countries to work in a common topic that touches the lives of EU-citizens
- Large efforts for publicity
- Results public except for sensitive information
Questions ?