Container Transferium Rotterdam: An innovative logistic concept[1]

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Abstract
The competitive position of the Port of Rotterdam (PoR) not only depends on its location and ability to service the largest sea going vessels, but more and more on its connections with the hinterland. However the accessibility of the port by road is endangered by the ever increasing congestion. Although most of the congestion is caused by commuters in the rush hours, the continuing growth in container traffic in the PoR is also contributing to the traffic jams on the port highway. Congestion on the main access road A15 to the port and at the sea terminals result in longer transport times and more important, an unreliable delivery of the cargo.
A Container Transferium situated in the direct hinterland of the PoR is a new logistic concept which allows for large numbers of containers to be transferred by inland vessels in a single movement from the sea terminals at the Maasvlakte (port and industrial area situated in the west of the port of Rotterdam) to the Transferium and vice versa. The Transferium can lead to an improved reliability thanks to a better planning of the inland ships or barges, and a better handling of the trucks, which have no longer to deal with traffic-jams en route to sea terminals and waiting times on the sea terminals.
The improved reliability and time-saving for trucks is very important and helps to justify the costs of the extra handling at the Container Transferium. The paper evaluates the potential of this new hinterland transport concept for PoR and the process from idea to realization.
After discussing the current situation in the PoR in more detail; the Container Transferium is presented discussing the general ideas, different type of operations, possible terminal locations and layout. The paper includes the Strengths, Weaknesses, Opportunities and Threats of the Container Transferium concept and finalizes with the conclusions.

Keywords*:* container logistics, Container Transferium, Port of Rotterdam,.

1. Introduction

As the most important container port of Europe and one of most important ports of the world, the Port of Rotterdam (PoR) must take into account, an increasing growth in container throughput. The increase in container transport demands an expansion of the port. However,

[1] Also presented at PIANC 2010 in Liverpool, UK.

creating new port- and industry area is not sufficient. A good accessibility of the port is crucial for a smooth cargo flow in order for the port to retain its competitive position. Port authorities and operators have conceived for years that only a combination of capacities extension at seaports coupled with flexible and innovative hinterland connections can bring improvements in transport chains.
The expected increase of good flows means that accessibility by road will increasingly become a weak link. The A15 is the only available major road giving access to the port area, which not only endangers future accessibility, but also makes it very vulnerable. Safety and environment around this road are coming under strain. Because of this problem, the idea of a Container Transferium has germinated. A Container Transferium situated in the direct hinterland of the PoR, is a new logistic concept, which allows a large number of containers to be transferred by inland vessels in a single movement from the sea terminals at the Maasvlakte to the Transferium and vice versa. Trucks load and unload at the Transferium instead of at the sea terminals which improves the accessibility of PoR and the quality of life in the region reducing congestion there.

1.1 Growth in container flows

The sea terminals at the Maasvlakte, the most western part of the Port of Rotterdam, have become increasingly difficult to access by road in the past few years. The number of traffic jams and accidents on the A15 motorway has trebled. Due to the expected growth in container throughput (Figure 1), road transport will also continue to increase in the future in absolute figures (6.4 million TEU in 2035 as compared to 1.9 million TEU in 2006). A smaller share for road transport in the modal split of the future (35% in 2035 as compared to 50% in 2006) does not detract from this. The distribution of containers on the A15 can be seen in Figure 1.

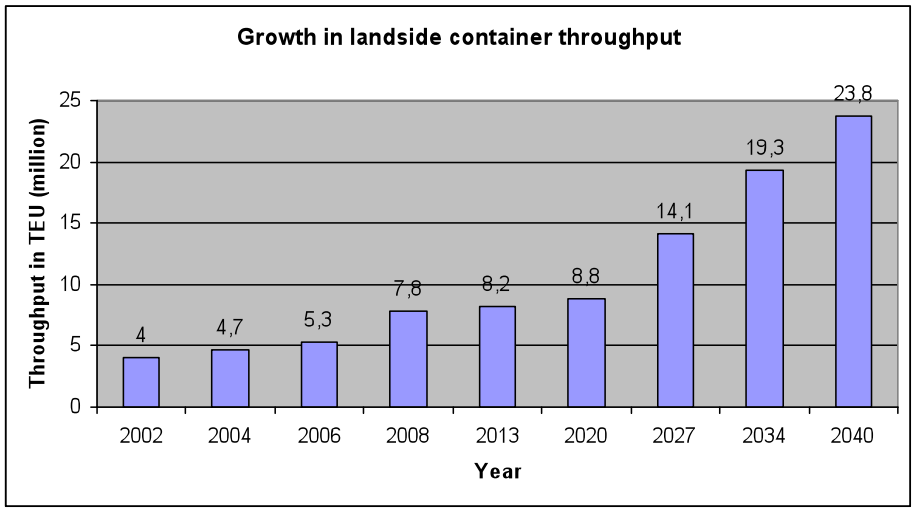

Figure 1. Growth in landside container throughput

The Container Transferium is geared particularly to the more long term. However in addition to this it can also serve an important role in the modification of the A15. According to the current schedule, the modification of the A15 motorway in the port between the Maasvlakte and Vaanplein will take place from 2011 onwards. During work on this project, the Container Transferium will create a congestion-free by-pass via inland shipping. Thus, it will be able to

cushion any possible negative impact the construction work might have on the road traffic flow.
The paper evaluates the potential of this new hinterland transport concept for PoR and the process from idea to realization. After discussing the current situation in PoR in Section 2, it explains the concept of a Container Transferium in Section 3. The services provided and the markets served are described in Section 4 and 5 respectively. Section 6 presents the results of a SWOT analysis of the logistic concept. Section 7 deals with the steps required for the realization of this concept. Section 8 gives the overall conclusions.

2. A NEW LOGISTIC CONCEPT

2.1 The Container Transferium concept

The basic idea behind the Container Transferium is to bundle the container flows which currently are transported to/from the hinterland by road, so they can be transported congestion-free by inland shipping between the sea terminals at the Maasvlakte and a hub terminal in Rotterdam's immediate hinterland. Empty depots and customs facilities form a part of the Container Transferium concept. Moreover, the terminal can be favorable for establishment of distribution centers in the immediate surroundings. The Transferium also aims at a faster handling of the trucks with a shorter waiting time as compared to the sea terminals.

The main reasons for the new innovative logistic concept, in the form of a Container Transferium, are summarized below.

- Continuous growth in the container flows via the Port of Rotterdam
- The autonomous increase in road traffic has resulted in the Maasvlakte becoming less accessible by road. As a consequence, the supply chain for shippers, (network) forwarders and shipping lines (carrier haulage) has become less reliable.
- An increase in fine dust, caused partly by the exhaust of road traffic
- This problem of fine dust is having an increasing impact on the environmental space available for the further development of port activity.
- Attractive logistics concept which improves control of container logistics.

2.2 Services provided by the Container Transferium

The services offered by the Container Transferium can be distinguished into four types, namely truck-barge, barge-barge, empty depot and long stays (Figure 2). These are discussed below.

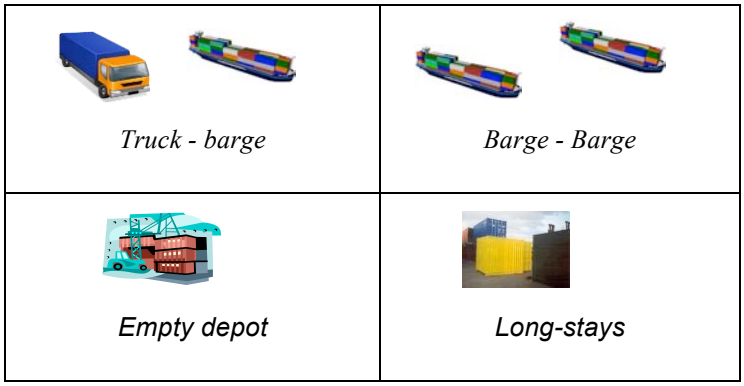

Figure 2. Services

Truck - barge
Instead of having to drive to the container terminals on the Maasvlakte themselves, road hauliers can simply drop off or collect containers at the Container Transferium. A barge provides a frequent connection to the sea terminals on the Maasvlakte.
Barge - barge
Barge operators can collect and drop off their containers at the Container Transferium instead of sailing to and from the Maasvlakte themselves with relatively small call sizes, The Container Transferium barge then sails back and forth to the Maasvlakte with large call sizes.
Empty depot
The Container Transferium is ideal for repositioning empty containers. The Container Transferium will be situated close to both the European shipper and the sea terminals on the Maasvlakte, for transporting empty containers to Asia. In addition to accepting and dispatching empty containers, the Container Transferium's empty depot offers inspection, storage, cleaning and repair services.
Long-stays
The Container Transferium can also be used by companies as a virtual warehouse. This means that containers remain at the terminal for a prolonged period.

The main service of the Container Transferium is the truck - barge service and the other services are aimed at optimizing this service. The barge - barge service offers an opportunity to generate extra volume. An empty depot is of strategic importance since it enables the marketing of the truck - barge service competitively. A road haulier is only prepared to charge a one-way tariff to and from the Container Transferium if he can get a return load. This often involves picking up or dropping off an empty container. By storing long-stay containers the Container Transferium also relieves the seaport by storing long-stay containers. Furthermore, the storage at the Container Transferium will be cheaper.

All parties in the supply chain are potential clients of the Container Transferium: shipping lines, seaport terminals, barge operators, road hauliers/freight forwarders, inland terminals, network forwarders and (large) shippers.

3. CONTAINER TRANSFERIUM

3.1 Location

The planned location for the Container Transferium is to the east of Rotterdam, on the Nieuwland industrial estate in the municipality of Alblasserdam, right on the river "de Noord."

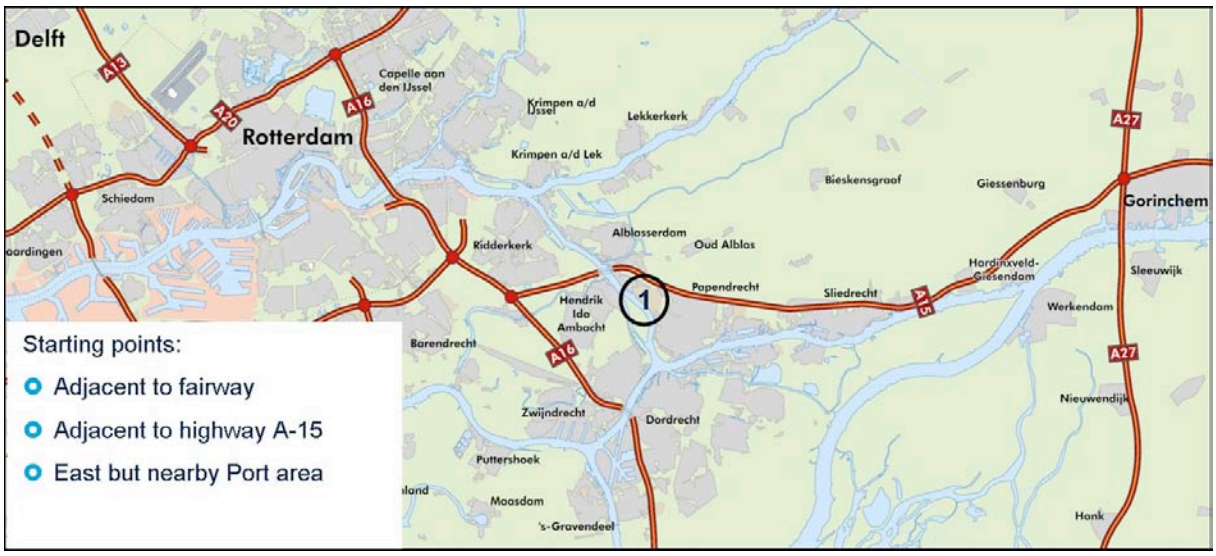

Figure 3. Location of the Container Transferium

By choosing this location close to Rotterdam, the dispersal of containers remains limited, thereby maximising the market for the Container Transferium.

Figure 4. Distribution of containers on A15

Other advantages of this location are:

- directly on main waterway;
- favourable location with respect to the Rotterdam 'ring' and the A15 motorway;
- relatively short sailing time to and from the Maasvlakte.

The location in Alblasserdam offers the opportunity to develop a Container Transferium with 390 meters of quay, with a depth at the edge of at least - 6 meters Amsterdam Ordnance Datum, and 6.5 hectares of land which can be further extended if necessary. The extra costs involved will be borne by the Ministry of Transport, Public Works and Water Management, the Province of South-Holland and the PoR. It has an exemption allowing noise 24 hours a day, 7 days a week on the waterside if operating a sustainable facility.

3.2 Terminal layout and operations

An artist's impression of a container terminal can be seen in Figure 5. The productivity requirements make daily departures to all separate sea terminals on the Maasvlakte necessary, and the estimated turnaround time of a barge for one return journey (including loading and unloading) is 16 hours. Given a capacity of 200,000 TEU for the Container Transferium and an estimated load factor of 80% for a barge, the average call size of a barge will be larger than 100 TEU.

Figure 5. An artist's impression of the Container Transferium

In the final situation (Container Transferium operates on full capacity), there will be two reach stackers, two empty handlers and two gantry cranes. Gantry cranes are preferred to mobile cranes as gantry cranes produce less CO2 and noise. In principle, the Container Transferium will be open around the clock on the waterside and 16 hours a day (closed at night) on the landside on working days. The Container Transferium is to be operational as of 1 January 2012.

The operational design of the Container Transferium is relatively labour intensive. The cranes, reach stackers and empty handlers need to be manned (virtually) all the time. Combined with the generous opening hours, this results in a round-the-clock shift system. In addition to these operational staff, management personnel will also be needed (terminal manager, secretary, etc).

If the Container Transferium is to function optimally, digital data exchange in the supply chain is crucial. Rotterdam's Port Community System already offers two services which

support this desired exchange of information: Barge planning and Road planning. If the Container Transferium is to truly compete with direct truck transport to the Maasvlakte, a customs regime is necessary that makes users feel that the terminal forms one customs area with the seaport. For this reason, Customs is involved in the project. The implementation of extended customs status demands of the participants in the supply chain that they share information and keep joint records.

3.3 Sustainability requirements

The public agreement with the local authorities has set the capacity of the Container Transferium at a maximum of 200,000 TEU on the waterside, with a view to quality of life and the environment. It has also been agreed that the Container Transferium will be developed in accordance with a so-called sustainable plus variant, i.e., the necessary modifications will go further than legally necessary. Sustainability will be put first and the Transferium must cause the least possible hindrance in terms of noise, light, and visually through the choice of layout. Also, from the perspective of safety and accessibility, modifications will have to be made to local roads and junctions. Added to this, the need for further changes on and around the A15 motorway will be investigated. All of these possible measures will be paid for by the government.

4. MARKET SERVED BY THE CONTAINER TRANSFERIUM

4.1 General

This section discusses the market served by the Container Transferium, gives the estimated capacity of the Container Transferium per service type and discusses the potential for market growth.

4.2 Markets

Market for the truck - barge service
With the truck-barge service, the Container Transferium focuses on cargo that is currently transported by road, i.e.:

- regional cargo in the region greater Rotterdam;
- transit cargo transported on the A15 motorway that does not travel via inland terminals

Due to the truck's decreasing economic radius of action, the Container Transferium will be able to capture a large part of this market. Date has been collected from various sources in order to determine the market share won by the CT, namely:

- gate data from the sea terminals on the Maasvlakte (ECT & APMT) for 2008;
- statistics from the PoR;
- counts on the A15;
- ECT postcode survey held in 2005.

Combining the data from these studies results in a potential market of 450,000 to 750,000 TEU for the Container Transferium (see Table 1). It is not realistic to think that 100% of these trucks will start using the Container Transferium. The starting point is that the Container Transferium will be able to capture 60% of the potential truck - barge market at the

most. Based on a market with a lower limit of 450,000 TEU, this results in a market of 270,000 TEU.

Table 1. Calculation of market size (200

Potential market for Container Transferium	**(x 1 million TEU)**
Throughput Rotterdam	10.8
Deepsea Throughput	8.7
Throughput Maasvlakte	7.0
Sea-Sea	2.4
Sea-Land	4.6
Road Transport Terminals	2.2
Road Transport Depots	0.3
Total Road Transport MV	2.5
Via A15 20-30%	0.5-0.75
Count A15	1.0 (50% direction MV)= 0.5
Gate MV	2.1 (20-30%)= 0.45-0.65

Empty depot market
The percentage of empty containers travelling via the Container Transferium is not expected to deviate from the empty container flow passing through the port. This amounts to 20% of the total container flow. A proportion of these empty containers will be transported via the Container Transferium's truck - barge service to the sea terminals on the Maasvlakte. The rest will be provided to exporters in the vicinity of the Container Transferium.

Long-stay market
The long-stay market is substantial yet volatile. The size of the market depends on the temporary capacity shortages or surpluses at various points in the supply chain. In the current market context, 4% of the containers handled are long-stay containers. Assuming a minimum of 270,000 TEU for the truck - barge service the potential market for long-stays amounts to 10,800 TEU.

The government has set the capacity of the Container Transferium at a maximum 200,000 TEU on the waterside, with a view to safeguarding the environment and quality of life. Considering the potential size of the market, 90% of this capacity will be needed for the Container Transferium's main service: the truck-barge. These 180,000 TEU are distributed evenly, i.e., 90,000 TEU imports and 90,000 TEU exports. The remaining 10% of the waterside capacity (20,000 TEU) is earmarked for the barge-barge service. According to estimates, the empty depot will handle 54,000 TEU (delivered empty and dispatched by truck) and there will be an average 160 TEU long-stay containers at the Container Transferium. (The original estimate of long-stays was higher, but this was adjusted downwards at the request of market parties, as a result of economic crisis). These figures are summarized in Table 2.

Table 2. Capacity of Container Transferium and subdivision according to services

Service	**Numbers**
Truck – barge	180,000 TEU
Barge – barge	20,000 TEU

Empty depot	54,000 TEU
Long– stays	Avg. 160 TEU per day

4.3 Potential for growth

The Container Transferium has the potential for reaching maximum capacity quickly. The key growth drivers for this are listed here.

- Following the current recession, the global economy is expected to start expanding again. Added to this, the intertwining of economies and trade blocs - thanks partly to the container - means an even faster increase in world trade. As a result, the container throughput in the PoR will continue to develop strongly
- Road transport is affected by rising fuel and labour costs, resulting in a decrease in the maximum driving times and declining interest in driving as a profession
- Increasing congestion on the A15 motorway will work in favour of the Container Transferium;
- Improvements to the handling of barges at the sea terminals on the Maasvlakte in the event of bigger call sizes will also encourage use of Container Transferium
- Growing numbers of containers forcing sea terminals to reduce dwell times, so that the Container Transferium serves as a 'valve''

5. SWOT

5.1 General

A SWOT analysis is often carried out to clearly show the Strengths, Weaknesses, Opportunities, and Threats of an organization, a product, a new design concept or a logistic concept such as the Container Transferium. In the present case, the strengths and weaknesses of the design concept are related to the services offered and the markets served by the Container Transferium. Opportunities and threats refer to the external factors effecting the concept i.e., its performance and realization, for example, government regulations, new policies, economic and technological developments, and international trade.

5.2 Results

A SWOT analysis is merely the first step. To create the fit with the internal and external environment, strategies must be formulated. This will be done during the next phase, i.e., the realization phase of the project. The results of SWOT are reported in Table 3. As can be seen, the left column far outweighs the right column, which is an evidence of the benefits of the concept for all involved parties.

Table 3. SWOT analysis of the CT concept

Strengths	**Weaknesses**
- time saving for trucks - shorter dwell times for containers on sea terminals - staggered flow of containers on sea terminals leveling of peaks	- capital intensive requires good co-operation among involved parties - logistics of barge transport needs improvement

- less congestion and efficient flow on sea terminals - faster loading/unloading for inland shipping - better accessibility for the hinterland - parties can make better use of their equipment - supply chain becomes much more reliable - cost advantage - improved quality of life creates a better image - strategic locations	
Opportunities	**Threats**
- stricter environmental regulation makes CT concept more attractive - reduced congestion and a better image for the port attracts workers in the port - efficient supply chain leads to lower total costs and attracts more clients - will foster the 'Green port' image of PoR	- low cost trucking - inland shipping rates rise making it non-viable - truckers raise objections - new form of competitive transport (faster and environmentally friendly) appears - bureaucracy - conflicts between parties -

6. REALIZING THE CONTAINER TRANSFERIUM

6.1 Role of the Port of Rotterdam Authority

The Port of Rotterdam Authority took the initiative for the Container Transferium. Following an exploratory phase, the port manager brought market parties together in a consortium to develop a joint business case. Furthermore, the Port of Rotterdam has taken on a leading role when it comes to obtaining support and approval from the authorities, both national and local. All private and public parties now have a shared sense of urgency when it comes to improving the accessibility of the PoR. The Container Transferium is one of the initiatives that will contribute to this improvement. To speed up decision making on the implementation, the Container Transferium was included in the project 'Randstad Urgent' by the Dutch Cabinet. The PoR plans to continue to be pro-active in supervising the process for its realization. However, the Container Transferium will ultimately be run by the business community, with the Port Authority serving as landlord, investing in land and infrastructure, in exchange for a competitive rent. BCTN (Barge Container Terminals Netherlands), the biggest Inland Barge Terminal operator in The Netherlands, will invest in Container Transferium and become the independent operator. The Deepsea Terminals on the Maasvlakte and several shipping companies have expressed their support to BCTN.

6.2 Business case

The business case is based on the Container Transferium being able to sell all four services to as many clients as possible without any commercial and/or operational restrictions. In terms of financing the Container Transferium, the starting point is that the company is fully dependent for capital investment on project finance. After all, the Container Transferium will operate as a neutral entity, independent of corporate balance sheets. The key factors considered in the pricing are discussed below.

Pricing truck - barge product
This tariff is determined based on competitive pricing with road haulage, which can, also transport a container directly between the Container Transferium and the Maasvlakte. Calculations for the tariff were based on meetings with market parties and going market rates. The tariff covers sailing between the Container Transferium and the Maasvlakte and the two moves on the Container Transferium (in and out).

Pricing barge - barge product
This price covers both moves on the Container Transferium and sailing between the Container Transferium and the Maasvlakte. The price is based on the ship's waiting costs and the costs of internal transport at the seaport terminal.

Pricing empty depot product
In the business case, the tariff for use of the empty depot has been set equal to that applied by the empty depots in Rotterdam's Waalhaven/Eemhaven area.

Pricing long-stay product
The main focus of the Container Transferium is on facilitating the container flow and not on the long-term storage of containers. The inland terminals deeper in the hinterland are better suited to this. With this charge, inland terminals remain a more attractive option for the storage of long-stays, but the Container Transferium can relieve the seaport terminal, if necessary, in the event that a container remains there for longer than 1 week.

7. CONCLUSIONS

The sea terminals on the Maasvlakte have become increasingly difficult to access in the past few years. The number of traffic jams and accidents on the A15 motorway has trebled. Due to the expected growth in container throughput road transport will also continue to increase in the future in absolute figures (6.4 million TEU in 2035 as compared to 1.9 million TEU in 2006). The basic idea behind the Container Transferium is to bundle the container flows which currently travel by road, so they can then be transported congestion-free by inland shipping between the sea terminals on the Maasvlakte (west of the port) and a hub terminal in Rotterdam's immediate hinterland. Empty depots and customs facilities form a part of the Container Transferium concept. The Transferium aims at a faster handling of the trucks as compared to the sea terminals. It can be favourable for distribution activities.

The planned location for the Container Transferium is to the east of Rotterdam, in the municipality of Alblasserdam, right on the river "de Noord." The advantages of this location are that it is close to the port (thus, maximising the market for the Transferium), situated directly on main waterway, it is favourable with respect to the Rotterdam 'ring' and the A15 motorway, and the sailing time to and from the Maasvlakte is relatively short. The Container Transferium will be developed to meet the sustainability requirements, i.e., it must cause the least possible hindrance in terms of noise, light, and also visually.
The services offered by the Container Transferium can be distinguished into four types, namely truck-barge, barge-barge, empty depot and long stays. The main service of the Container Transferium is the truck - barge service, amounting to 180,000 TEU and the other services are aimed at optimising this service.

A SWOT analysis was carried out to clearly show the Strengths, Weaknesses, Opportunities, and Threats of this logistic concept. From the results of SWOT it is evident the strengths and opportunities far outweigh the weaknesses and threats.

The Container Transferium is to be operational as of 1 January 2012 and will reach its full capacity according to market expectations shortly after. The Port of Rotterdam Authority plans to continue to be pro-active in supervising the process for its realization. However, it will ultimately be run by the business community, with the Port Authority serving as landlord, investing in land and infrastructure, in exchange for a competitive rent. Together with market parties a business case has been developed, and one of the involved market parties, BCTN, has decided to invest in Container Transferium and thus will become the independent operator.

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