



# **SAFE GREEN LOGISTICS A/S**

*- competitive & sustainable*



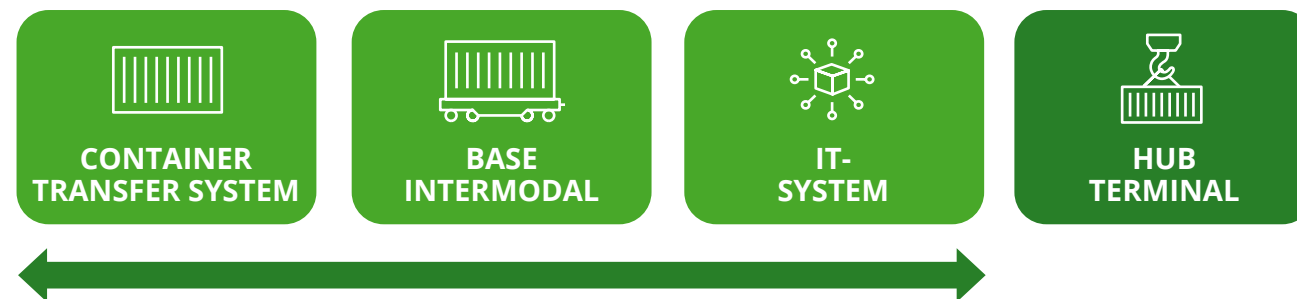
# CTS the Intermodal freight technology & concept

– competitive and sustainable

## The four pillars of the CTS technology

SGL has developed a full scale solution. A solution for fast and cost-effective transfer of standard ISO freight containers and or swap bodies between the two modes: rail and road. CTS is the key enabling element of the entire SAFE-CTS Concept and encompasses following four pillars:

Long term implementation



(I) Container Transfer System, (II) Base for intermodal operations, (III) IT-system for container identification track/and trace, etc. and (IV) HUB terminal.

## I - SAFE-CTS Technology

The Container Transfer System consists of the operational hardware combination listed in the following.

The technology is patented and is reviewed on a continuous basis.

The Container Transfer System consists of a; Trailer-unit, Wagon-unit, and a regular standard ISO container. The container is moved on its corner casting sliding horizontally between the CTS trailer surface and the train wagon adapter surface. These platforms are, in short description, called; T-unit (trailer unit) and the W-unit (wagon unit).

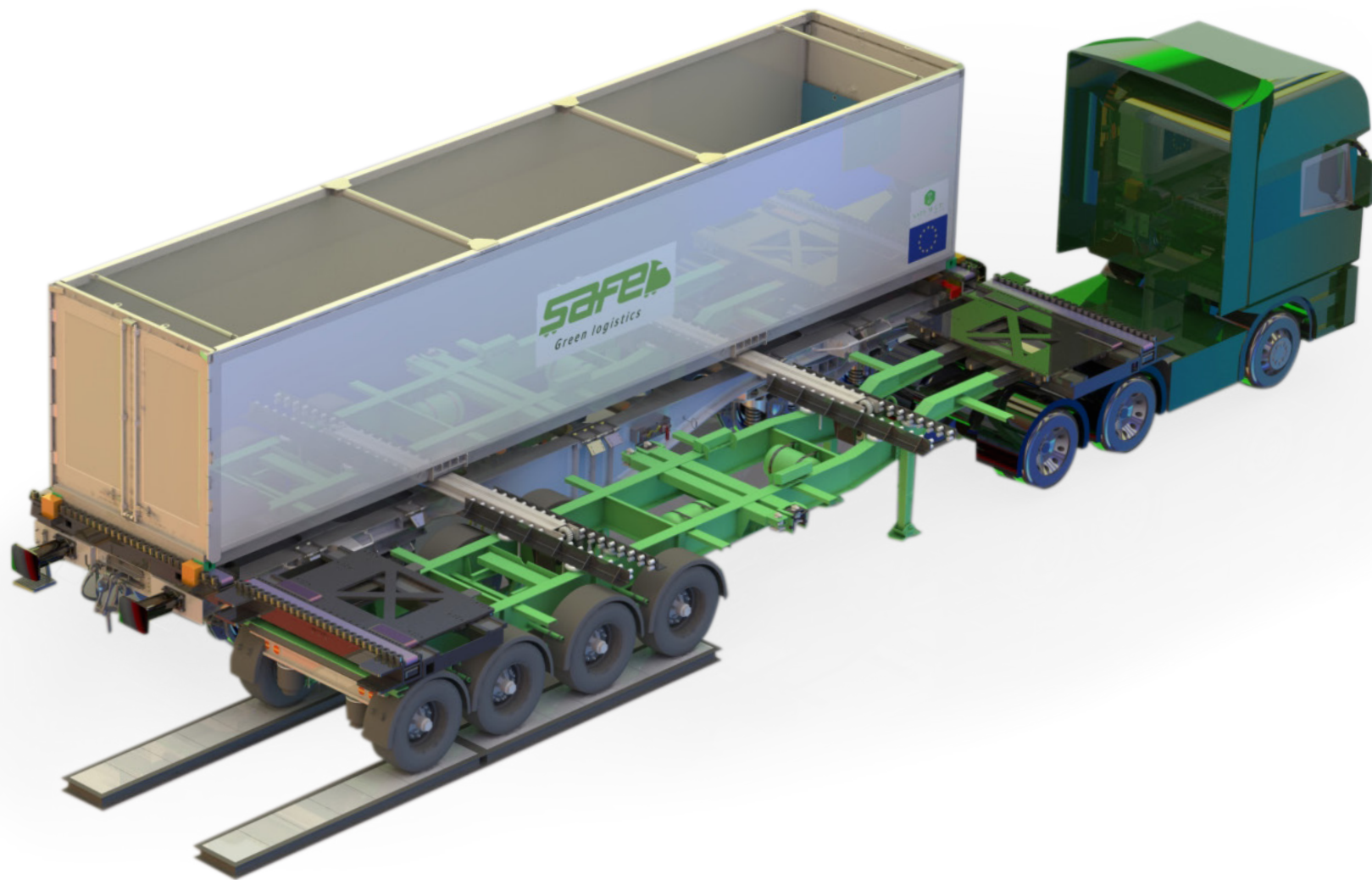
## The units' functionalities

1. The wagon (w-unit) adapter is placed on an existing articulated container wagon enabling the receival and release of a container to and from the adapter.
2. The Trailer unit (t-unit) is a complete integrated CTS trailer equipped with the advanced transfer technology. It is capable of performing a seamless and smooth transfer of a regular ISO 40' or similar container with ISO corner castings. The transfer is performed between the trailer and rail wagon horizontally. The trailer enables fast and efficient container exchange between road and rail modes, without using heavy cranes, vehicles or other equipment.

## CTS Trailer Unit

The trailer unit (T-unit) is an integrated truck and transfer chassis. It contains a built in high speed and durable transfer technology. The trailer is equipped rear/front end with custom profiles for easy and frictionless standard ISO container transfer. Strong in its ability to operate under high pressure and resilient in its capacity to perform under high forces. Chain drive transfer aggregates ensure swift and effortless transfer of a container upwards of 40 ton.





### CTS W-unit (wagon unit)

The CTS W-unit is made to ensure compatibility, stability and receiving surface to the CTS T-unit. It is a passive mechanical solution enabling a seamless and effortless receipt and release of a standardized container. The transfer in its automation comes from the mounted technology on the truck/trailer. The w-unit ensures and enables the stabilization between wagon, the trailer connecting part, and the lock and built-in resistance once the two units have been secured and sealed.

No modification of or to the existing wagon is needed, as the CTS wagon unit is mounted on the wagon's existing locking mechanism. The locking mechanism between the CTS Wagon Unit and the Wagon fulfills the standard of EN 12663-2.

- Train wagon standard modification procedure.
- All components are passive, enabling more safety and less maintenance.

### The process

The transfer takes place by the truck positioning the trailer parallel to the train-wagon and railway tracks. When the trailer is in the correct position, the system will be activated from the CTS control system inside the cabin of the truck. Upon activation, the air of the trailer is adjusted to match the height of the train wagon, a conical pawl is pushed out at the rear and in front of the trailer, and engages with the rolling profile of the train wagon. When fully connected both devices are now secured together and locked. The container can therefore be released for transfer. The connection ensures that the profiles on each trailer and the train wagon are seamlessly locked. The trailer and train wagon's surface are therefore interconnected and ready to execute the container transfer. A chain drive transfer aggregate ensures an elegant and safe transfer from and to the train wagon via the container's corner castings. Once the container has been moved from or to the trailer, the container is secured to the trailer or wagon's spigots. A trigger can then release and separate the trailer and train wagon.

CTS technology is a highly competitive and network based solution, pulling on the advances and excluding the disadvantages of both rail and road. This multimodal efficient carrier freight solution, as a fully integrated system, will incorporate known technologies with a seamless automated and rapid method of transfer. Including a concept that structures the distribution to accommodate the ever-growing need for product movement. This is specifically visible and noticeable in the capability of transferring any standard ISO certified containers to and from a truck/trailer and a train wagon. This without any adaptations needed on the container(s). This is a key competitive advantage and a unique and differential selling point, making the CTS technology the most advanced and usable technology within the industry offered alternatives. Because of the technology's rapid transfer speed and value adding structural optimization the CTS technology and concept will optimize and overall advance the way people and products are transported.



*The only specific need at the base is e.g. an asphalt road in parallel to the railway.*

## II - The Transfer BASE

The requirements at the base level to exchange containers between trucks and trains through SAFE-CTS are minimal. The only specific need at the base is e.g. an asphalt road in parallel to the railway. The truck equipped with the CTS T-unit will park parallel to the train and move the container sideways onto the train wagon (and vice versa).

- *Truck circulates picking-up and delivering goods only in an approx. 50 km zone.*
- *Low investment cost (only a road parallel to the railway) for establishing bases.*

This process is significantly more energy efficient, less time consuming and needs less labour than conventional operation with container cranes.

It is thought-provoking that the innovation of CTS is a simplification of investment and resources compared to today's practices, and yet it is cheaper and faster and last but not least good for the environment.



## III - The IT-system

The IT system, including RFID-based tagging and tracking of containers/units, is the third pillar of the system and will also be fully functional during the commercialization. However, the full potential of the IT-system will be reached with the HUB implementation through controlling and optimizing major parts of the logistical system. The CTS IT system will be able to operate from a standard tablet computer or from an app by the truck driver. The software has been developed by SGL with the aim to replicate other truck applications in order to promote faster adaptation by chauffeurs. The software will control the truck/train approach, the transfer, and in addition collect/send data about operations, container weight, time, and place, etc. to a central server by internet. This web-based service will provide several benefits such as:

- *Service can display "warnings"; giving SGL an opportunity to make sure the system operates in a reliable way. Identical service can be found in modern cars.*
- *Since the history of operations is stored, technicians can get support from the system when eventual problems occur and in most cases handle eventual issues from a service centre.*
- *A possibility to integrate with other IT systems, e.g. that the clients may have.*



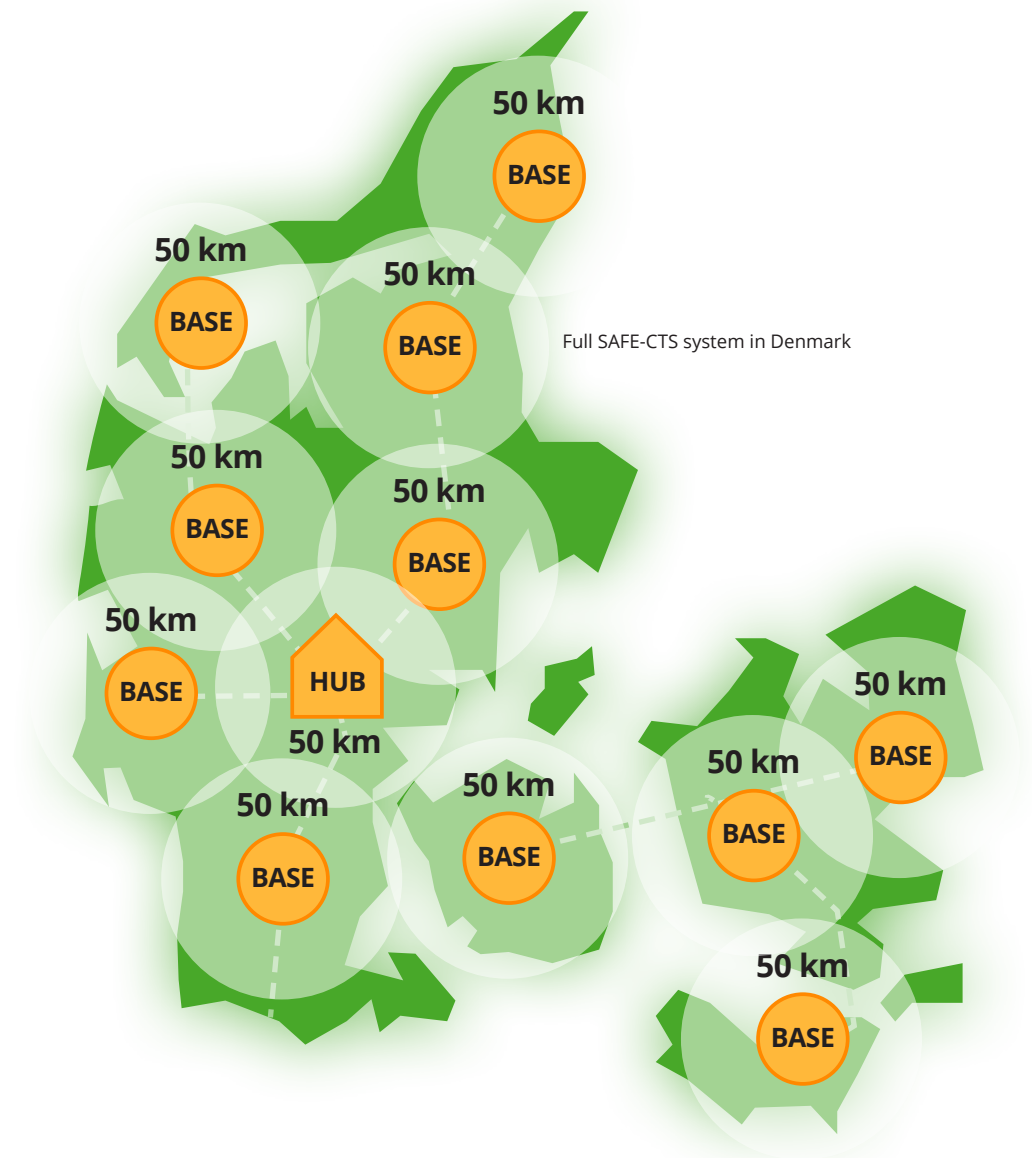


#### IV The Concepts (PtoP/HUB/RAPID);

The CTS technology encompasses an entire integrated concept, adapted and fitted to create more lean and sustainable transportation of both people and products.

By using SAFE-CTS technology, each container transfer is done in approx 1 min. As the process can be done simultaneously, an entire train set can be unloaded and loaded swift and lean. These prospects empower the opportunity to both enhance the rate of transportation by intermodal (rail/truck) modes, eliminating bottlenecks such as e.g. time, and cost-vaste in terminals where only cranes or reach-stackers operate. Besides these central hubs or central clusters the CTS technology can operate next to the railway tracks in any area, given the surface is a plane foundation suitable for un/offloading by truck. The overall freight transport process by using the SAFE-CTS technology, will for the road-rail point-to-point transport, be performed according to the process shown in figure below. Trucks carry the goods/containers from the sender to the closest base, a first mile distribution. At the base the truck equipped with the CTS trailer unit will position itself next to the train-line in parallel and in receiving/or transfer distance to the train wagon. When in position the transfer can be initiated. This operation takes approximately 1 min. The cargo is then transported by train to the receiving base. Here the container is transferred, again via CTS, to another truck (another 60 second operation). Once the process is completed the container is then transported the last mile to the receiver for its final delivery destination.

Overall transportation process of SAFE-CTS concept.



The supporting concepts are built upon the opportunities from the efficient CTS technology to scale and maximize load frequency from a point-to-point setup to combining passengers and people. The focus is on a complete and sustainable utilization of the infrastructure capacity available on rail. By prioritizing passenger transportation equal to cargo freight external costs on society, e.g. congestion, pollution, emission, and overall work-life-balance can be mitigated if not completely remedied.





**To learn more about the concept  
please go to the following web-links;**

[www.safegl.eu/3034A78ED123AB77996F29D2F75D06FA.mp4](http://www.safegl.eu/3034A78ED123AB77996F29D2F75D06FA.mp4)

[www.safegl.eu/Video/SAFE-Rapid.mp4](http://www.safegl.eu/Video/SAFE-Rapid.mp4)

[www.safegl.eu/Video/final-version-graded.mp4](http://www.safegl.eu/Video/final-version-graded.mp4)