

Hamburg – interdependence of the port and the city



Maciej Brzozowski

Hafen Hamburg Marketing e.V.

Gdynia

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Economic impact

Economic impact of the Port of Hamburg in 2010

Jobs: 261,000
of which

Added value: € 20.6 billion
of which

Tax revenues for Hamburg



€ 751 million



Economic impact

Economic impact of the German sea and inland ports (2019)

	Engaged in transport in port related companies	Aggregated economic effects in port related companies
Jobs	176,000	521,300
Revenues (in bill. EUR)	27,4	62,0
Added value (in bill. EUR)	9,7	25,6

Source: Untersuchung der volkswirtschaftlichen Bedeutung der deutschen See- und Binnenhäfen auf Grundlage ihrer Beschäftigungswirkung, ISL with Fraunhofer CML/IML, ETR and Prof. Holocher

Driving forces behind current developments in the port



High cargo volumes in limited areas

2000: 85 million tons

2018: 135 million tons



Increasing traffic



Digitalisation



Larger vessels & cargo loads

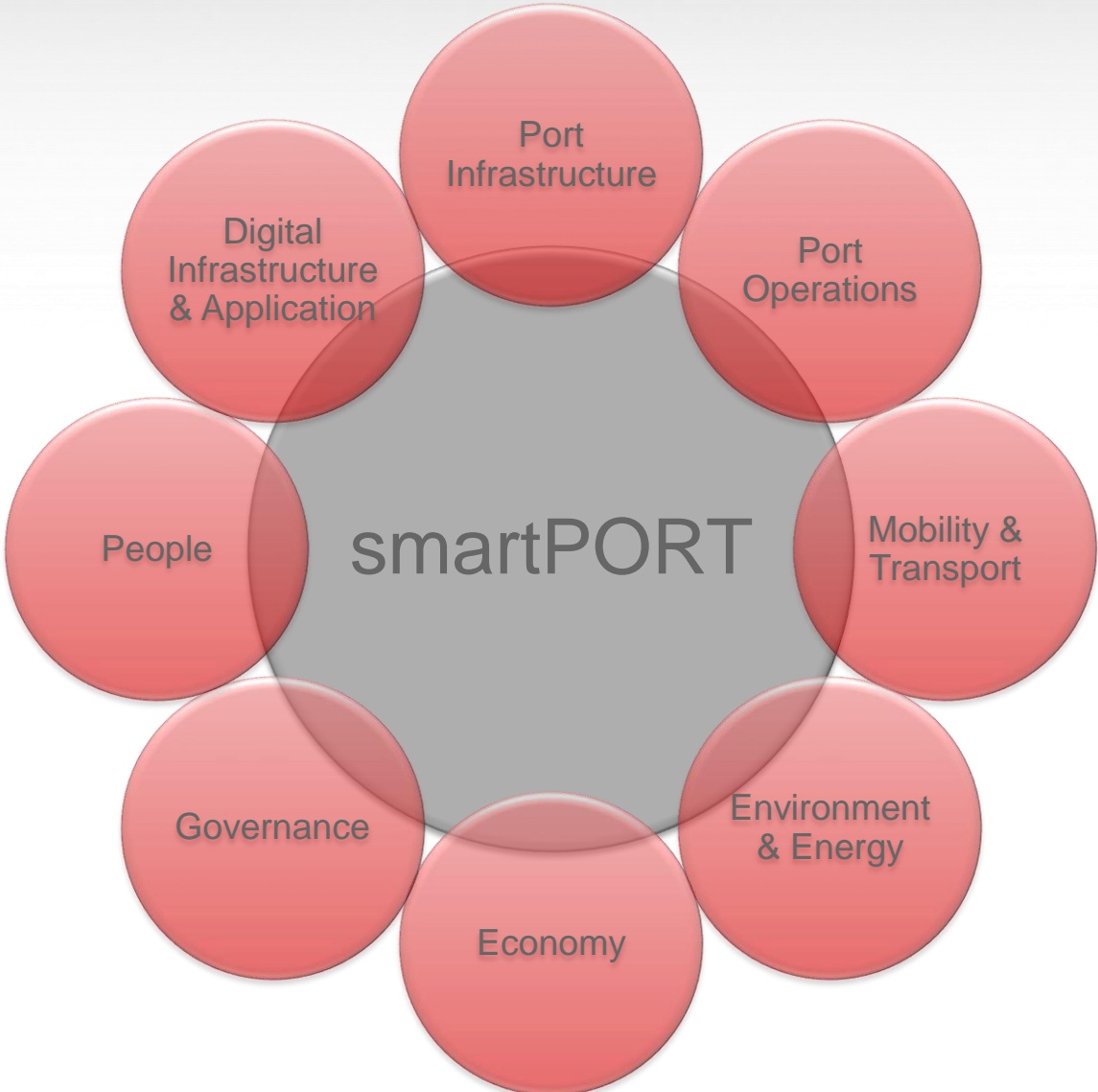
2000: 126 ships

2018: 681 ships



Increased environmental awareness

Transforming Port of Hamburg to a Digital Leader for Port and Traffic Management



Source: HPA (2018)



Development of innovative technology

Reducing dependency on conventional energy sources



Improved energy efficiency

Reducing emissions



Innovative transportation planning

Reducing energy use and costs

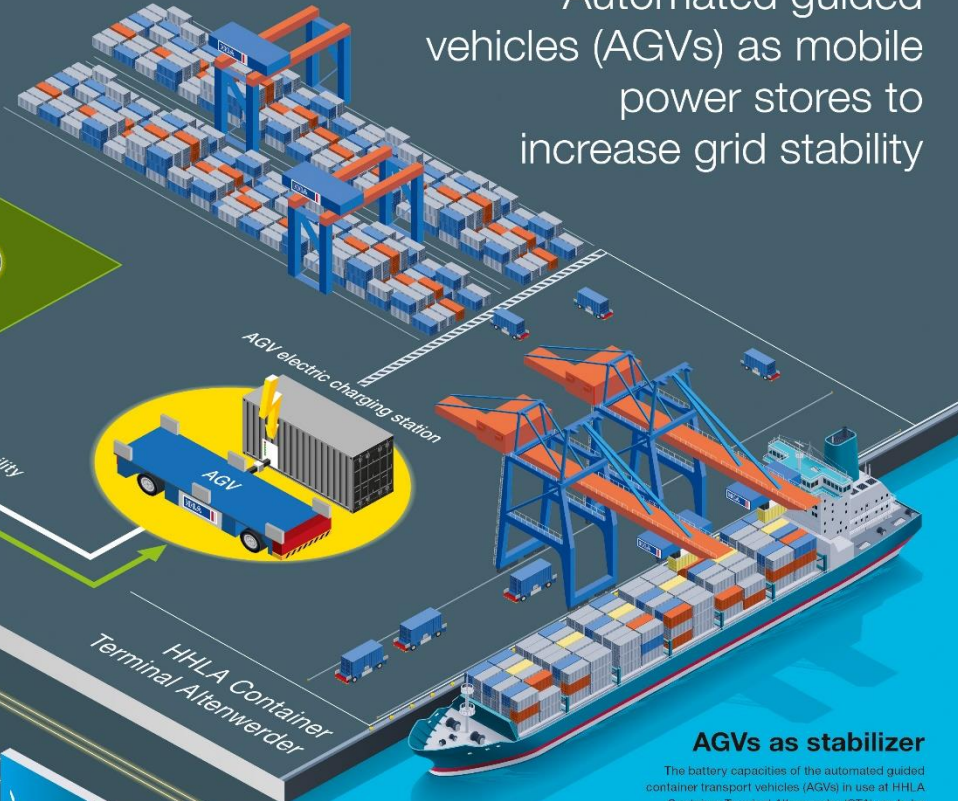
FRESH Project – A Contribution to the Energy Transition

Digital networking

Virtual power plants like NEXT create a digital network of electricity producers and consumers, bundling their electricity generation and consumption. These networks can then be used to provide aggregated systems with a control reserve, for example, and therefore contribute to grid stability.



Automated guided vehicles (AGVs) as mobile power stores to increase grid stability



Greatest challenges of the energy transition is the safeguarding of grid stability (50 hertz).

A solution are virtual power plants

AGV support grid stability as mobile power storage units.

By 2022 about 100 AGVs will be converted to fast charging lithium-ion batteries (4 megawatt capacity at 18 charging stations).

AGVs as stabilizer

The battery capacities of the automated guided container transport vehicles (AGVs) in use at HHLA Container Terminal Altenwerder (CTA) are to be integrated into the German energy network as flexible storage units that increase the grid stability of the power supply. In purely mathematical terms, the fast-charging lithium-ion batteries could provide up to 4 megawatts to the energy market via the CTA's 18 electric charging stations.

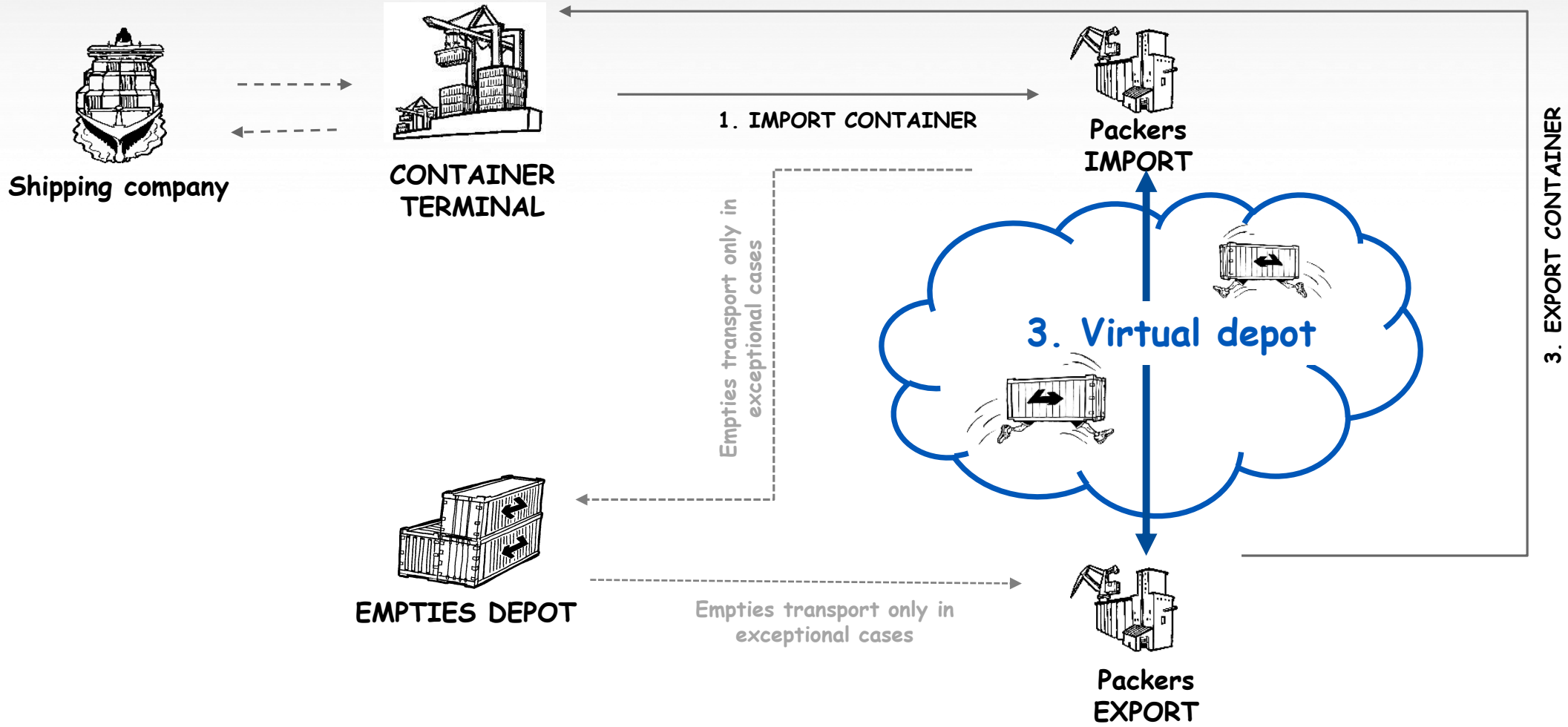
The right frequency

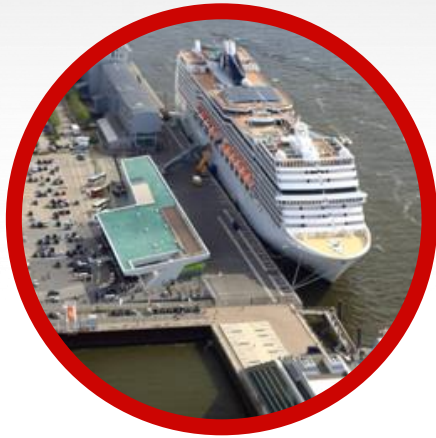
For the power grid to operate stably and reliably, there has to be a balance between energy production and energy consumption. Imbalances are indicated by fluctuations in the grid frequency from its nominal value of 50 hertz (Hz). These fluctuations, which in a worst-case scenario could cause the power supply to collapse completely, are balanced out with control reserves.



Graphic: HHLA / Redaktion 4

Virtuell Empty Container Storage System Reduces Transports





**Onshore power supply facility in
the Hamburg Cruise Center Altona**



**Floating liquid gas power plant
LNG Hybrid Barge "Hummel"**

Landside power supply for cruise ships reduces emission compared to ships' generators –
reduction of air pollution, CO₂ and noise emission



- LNG PowerPac®
.....
- Alternative for shore power supply for moored ships
.....
- Two units of the size of 40” containers are loaded onto the ships and will supply those with LNG generated power
.....
- Generators of ships can be turned off
.....
- No cables from shore to ship
.....
- First PowerPac® in the Port of Hamburg in 2017



Optimized transportation management & use of traffic networks

- More efficient use of existing infrastructures

Development of new intelligent infrastructures

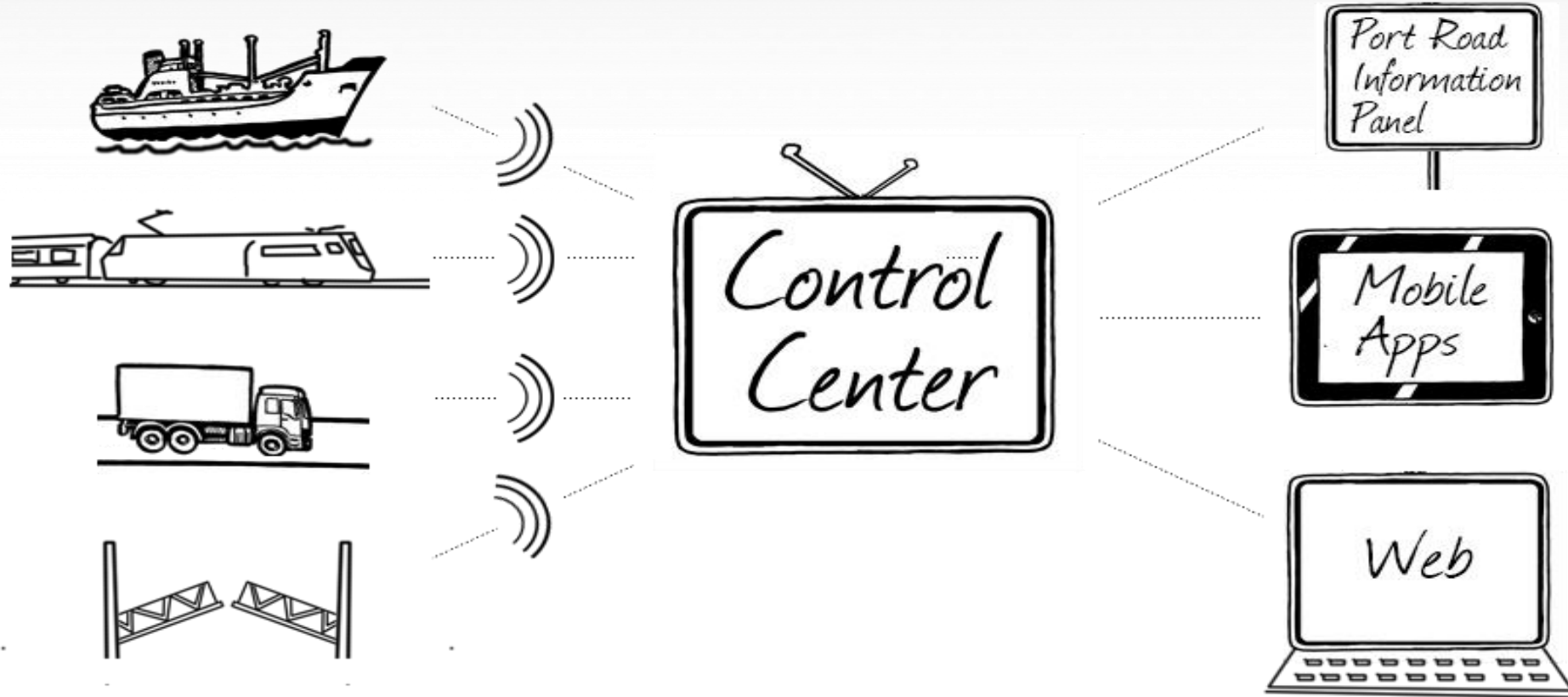
Optimization of the flow of traffic and goods traffic

Digital networks link all processes and participants

CO₂

Long-term reduction of emissions and air pollution

HPA is Developing a Port Traffic Center Covering all Modes





Digitalisation in Logistics

To Achieve Best Possible Utilisation Degrees



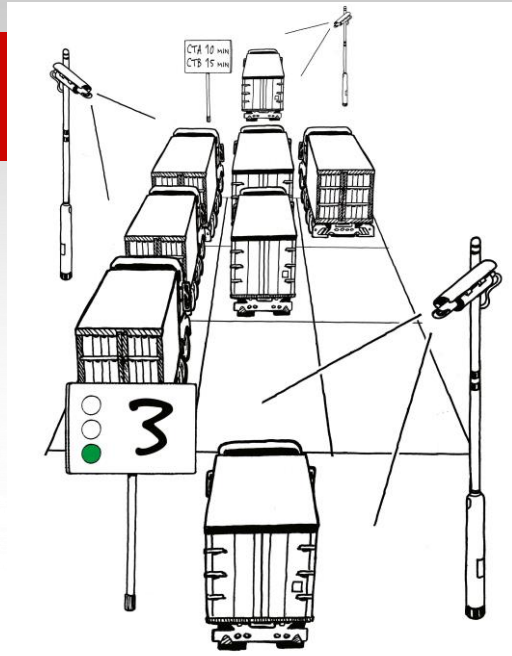
Smart Infrastructure
 Smart Logistics
 Smart Port
 Smart Modes...



Predictive Maintenance
 Machine Learning
 Internet of Things
 Drone applications
 Car2Car communication
 V2X communication
 Big data analytics
 Artificial intelligence...



Reduction of drives
 Reduction of emission
 Reduction of fuel used
 Increased efficiency...
 Reduction of costs

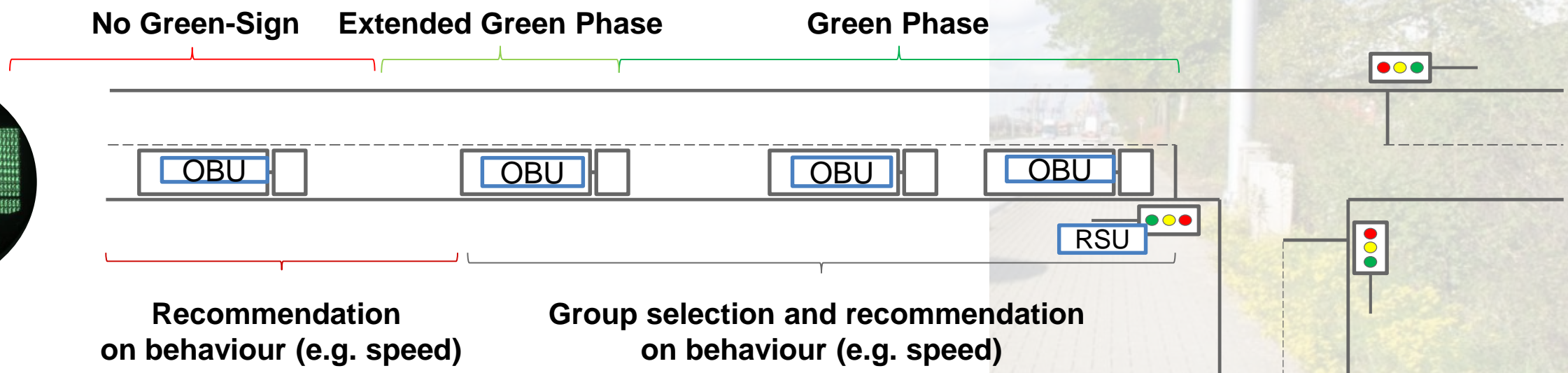


Current Traffic Situation: DIVA

P	Altenwerder Hauptd. belegt
P	Aluminiumstraße 45 frei
P	Dessauer Straße 23 frei

Smart Area Parking / prePORT

Green4TransPORT



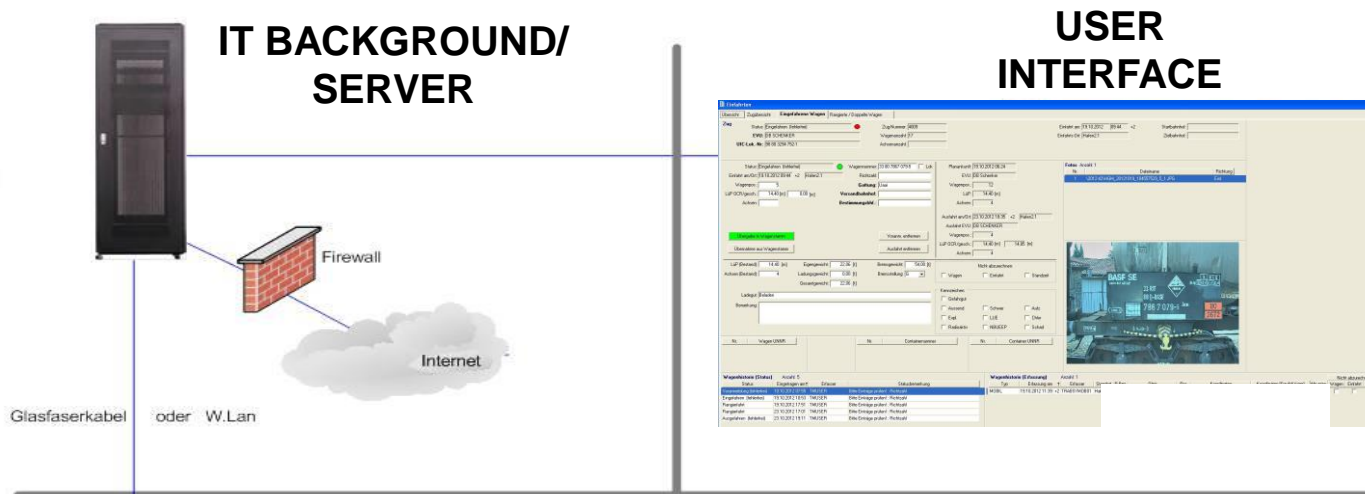
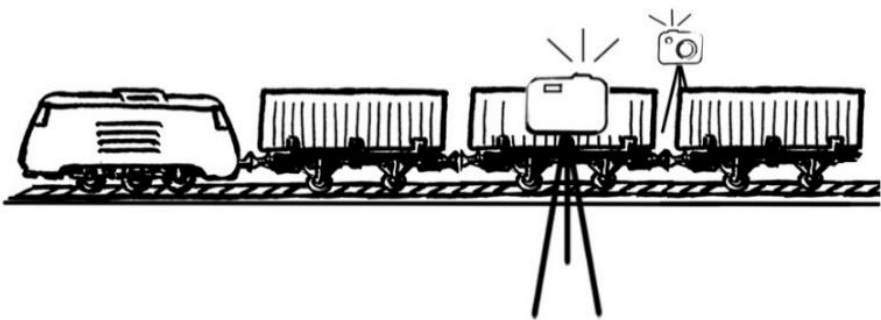
■ HVCC - Traffic Flow Optimisation by Digitalisation



Optimizing the Port Railway System



Rail Data Gate screening rail transport

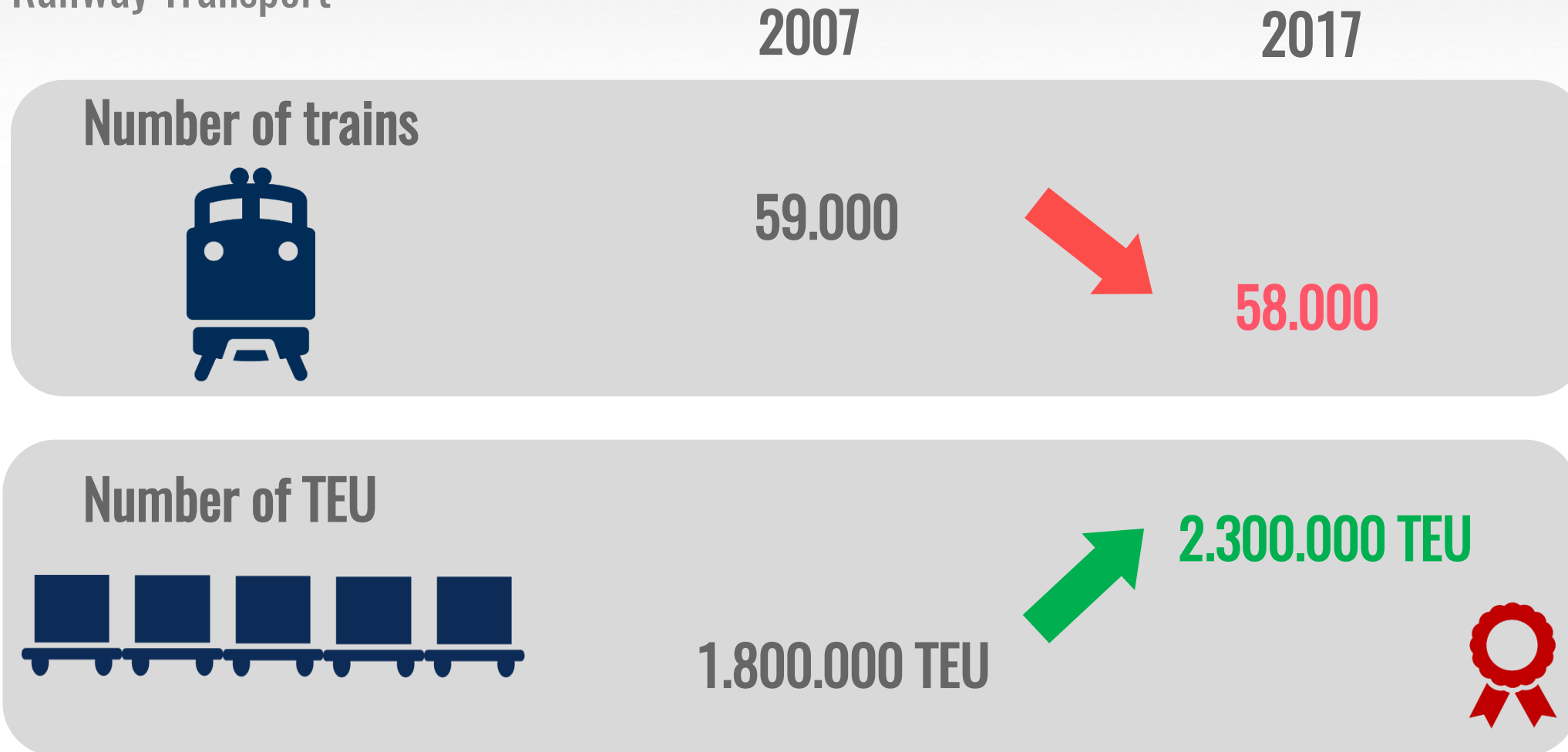


SCREENING PROCESS



Results of Smart Traffic Management

Linking Investments in modern Infrastructure with smart digital Solutions to optimize Railway Transport



**fewer trains
but + 30% TEU**



Other projects



5G Testbed – Investing in the Infrastructure of the Future



MoNArch Project (H2020, Call: ICT-2016-2)



5G Mobile Network Architecture for diverse services, use cases, and applications in 5G and beyond

5G utilization tests in the Port of Hamburg:

- Mobile and flexible controlling of traffic computers to optimise traffic management
- Virtual-/augmented-reality for the planning of new buildings
- Environmental mobile sensors on the vessels of the fleet of Hamburg



Future opportunities offered by 5G technology:

- Remote control of the port infrastructure by using a secure mobile network
- Establishment of a network of real time sensors, e.g. in containers
- Automized inspections tours in the port (e.g. by drones) // underwater drones for vessel inspection and roboter-based services on demand.

 Thank you for your attendance!

