Energy Management for Ports and Terminals
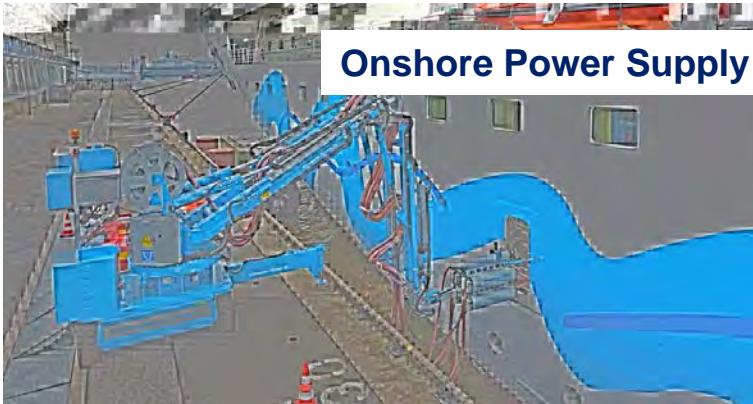
HPC Hamburg Port Consulting GmbH, Germany

Sept. 28th 2022 | Frank Busse, Associate Partner

Many Options to reduce Emissions in Ports

Emission Reduction Options

Technological Measures

Onshore Power Supply

Equipment Electrification

Operational Measures

AI-Stack Optimization

Vehicle Booking System

Behavioral Measures

Eco-Driving Training

Eco-Awareness Training

**...and many more**

Green Port Operation | What can be done?

There is a broad range of measures for ports and terminals to foster energy sustainability in the whole port area

Renewable energy sources	Energy sustainability measures	Energy storage and buffer systems	Emission reduction

- Integration of renewable energy sources
- Analysing energy demands
- Assess feasibility of:
  - Solar power, wind turbines, biogas plants, etc.
  - In terms of average/peak loads
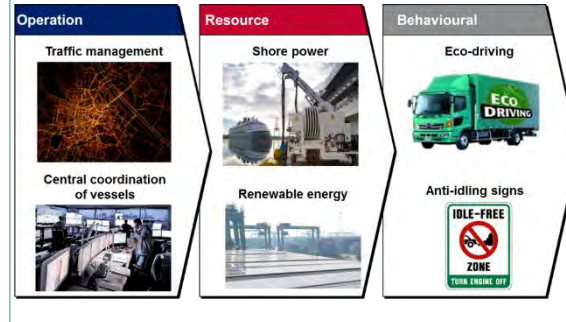
- Harnessing energy efficiency and saving potentials:
  - Technical
  - Operational
  - Behavioural

- Using battery capacities of handling equipment to minimize fluctuations of energy networks
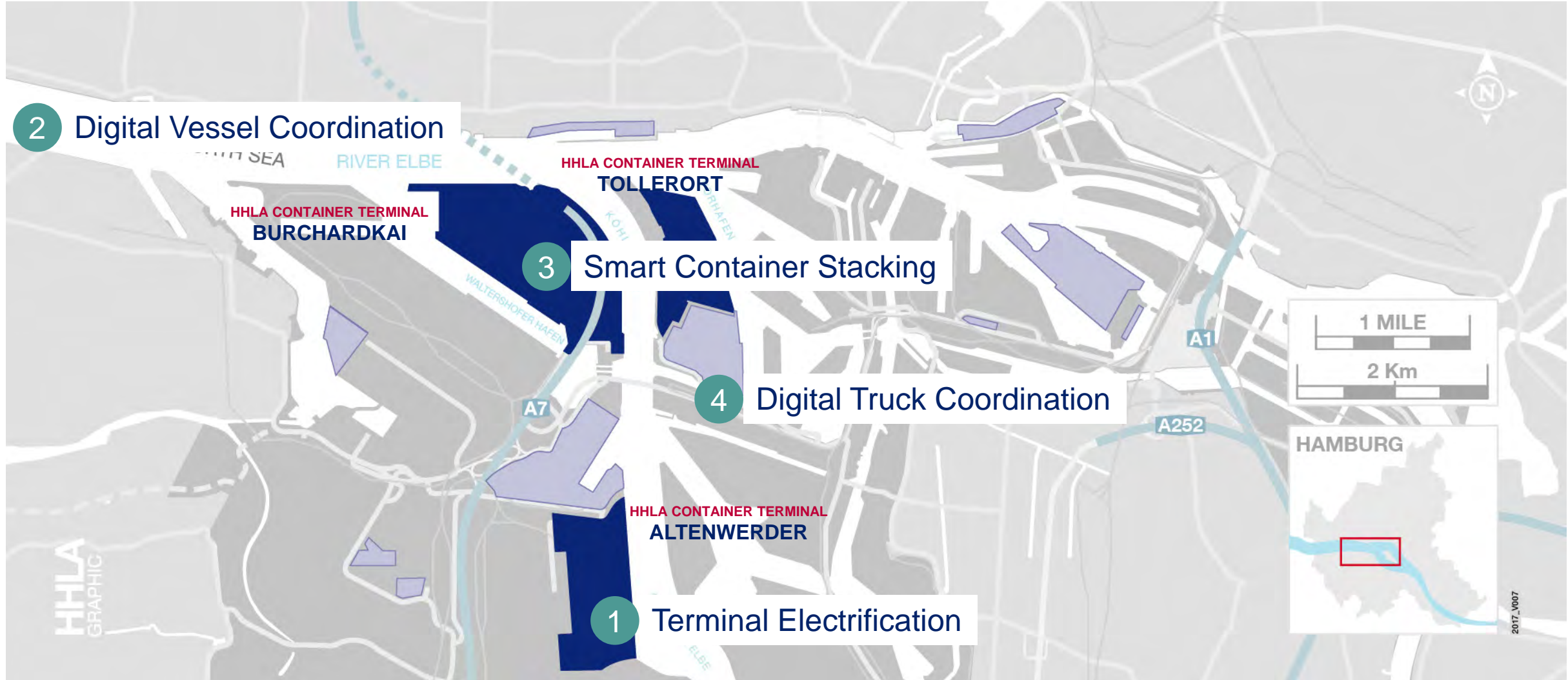- Exploring potential hydrogen applications

- Analyse shore power feasibility
- Assessment on infrastructure requirements and implementation solutions
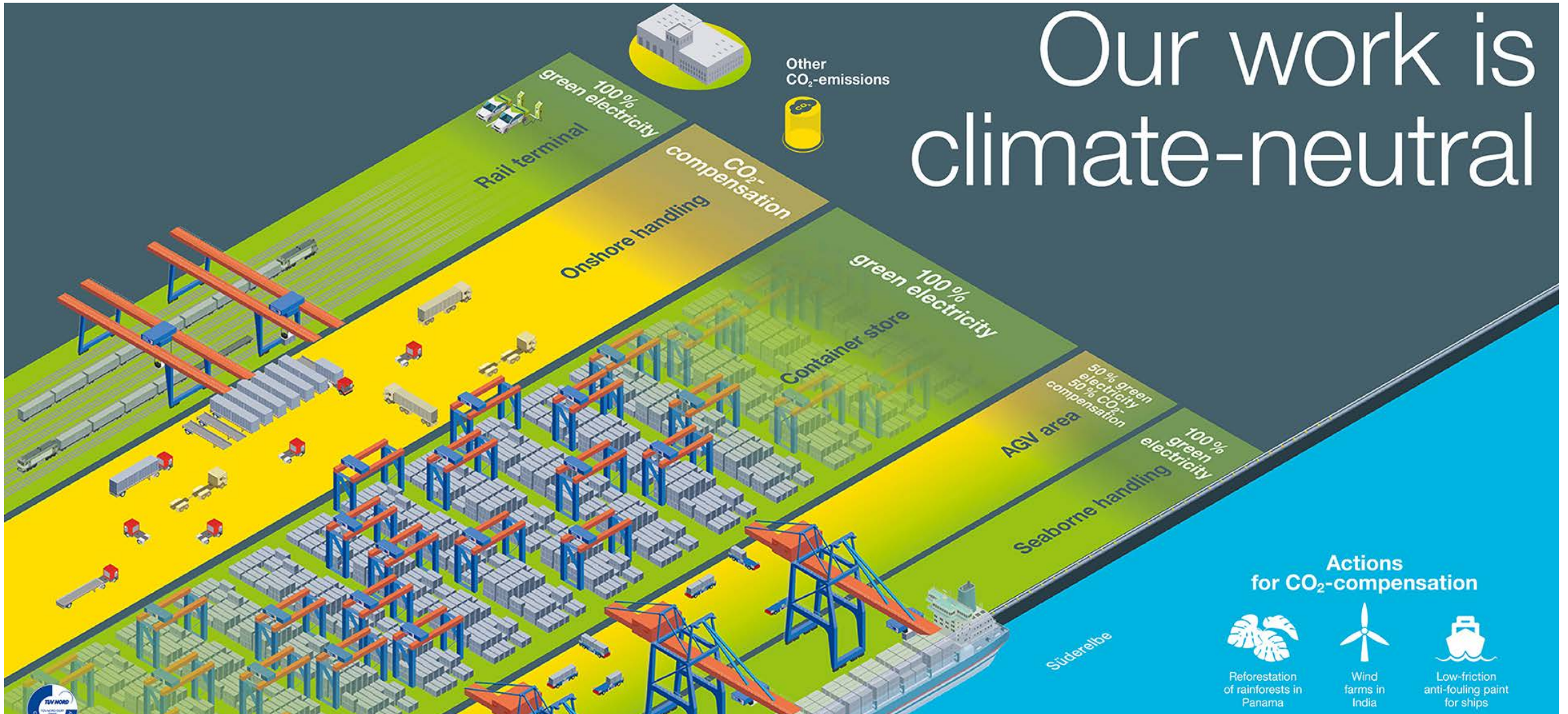
Energy Management
and Decarbonisation

Smart Measures cutting Port Emissions

HPC Experience in the Port of Hamburg

2 Digital Vessel Coordination

RIVER ELBE

HHLA CONTAINER TERMINAL
TOLLERORT

HHLA CONTAINER TERMINAL
BURCHARDKAI

3 Smart Container Stacking

4 Digital Truck Coordination

HHLA CONTAINER TERMINAL
ALTENWERDER

1 Terminal Electrification

1 MILE

2 Km

HAMBURG

A1

A252

A7

HHLA GRAPHIC

HPC Experience 1: Terminal Electrification

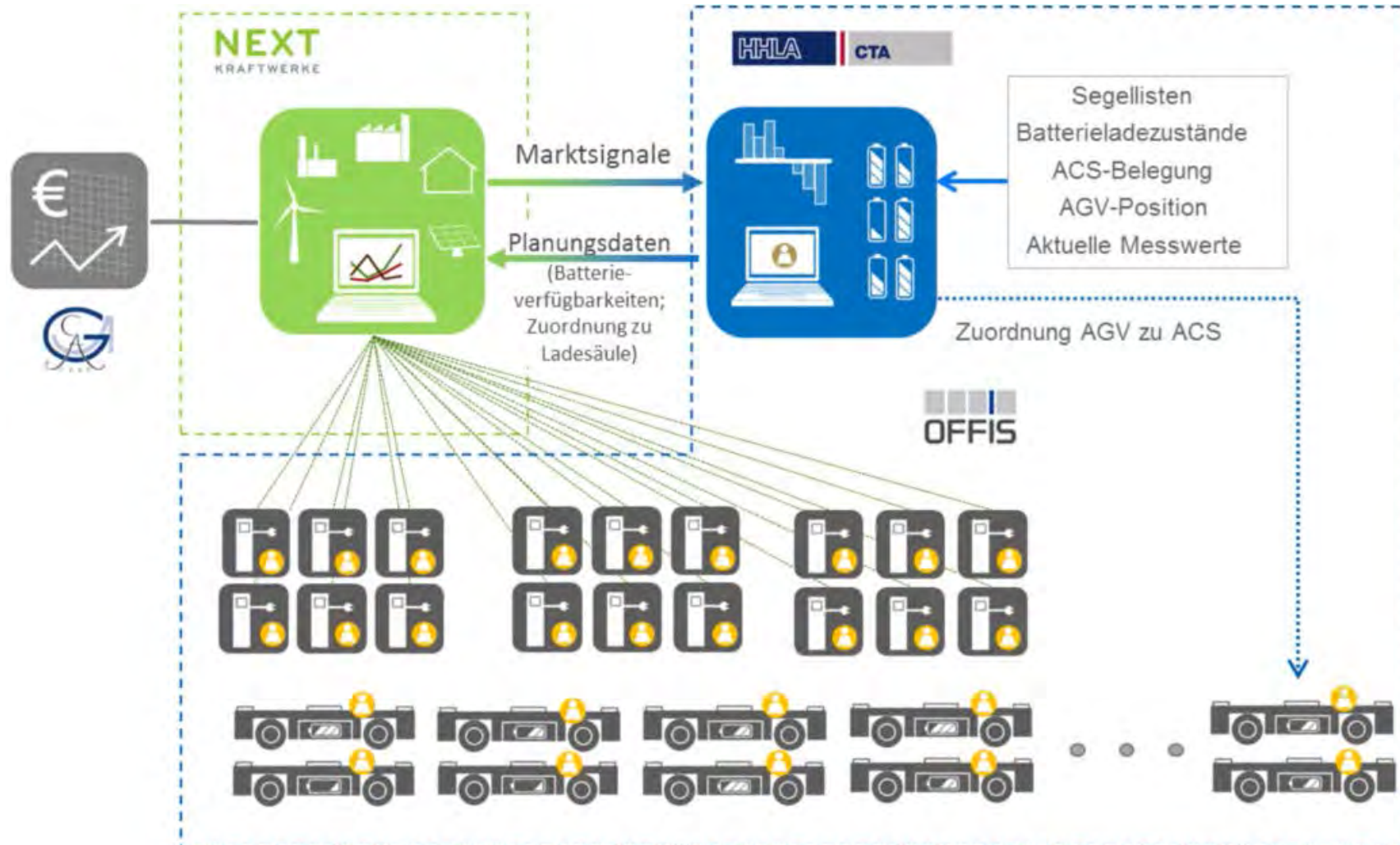World's first certified net-zero Container Terminal – CTA Container Terminal Altenwerder

HPC Experience 1: Digital Terminal Electrification

Smart Charging of AGV Fleet

- **Cooperation of a virtual power plant operator and a container terminal operator**

- **Use the batteries of terminal vehicles to store energy for the public gid**

- **Development of a software balancing market needs and operational situation**

HPC Experience 2: HVCC collaboration platform

One single truth across all partners
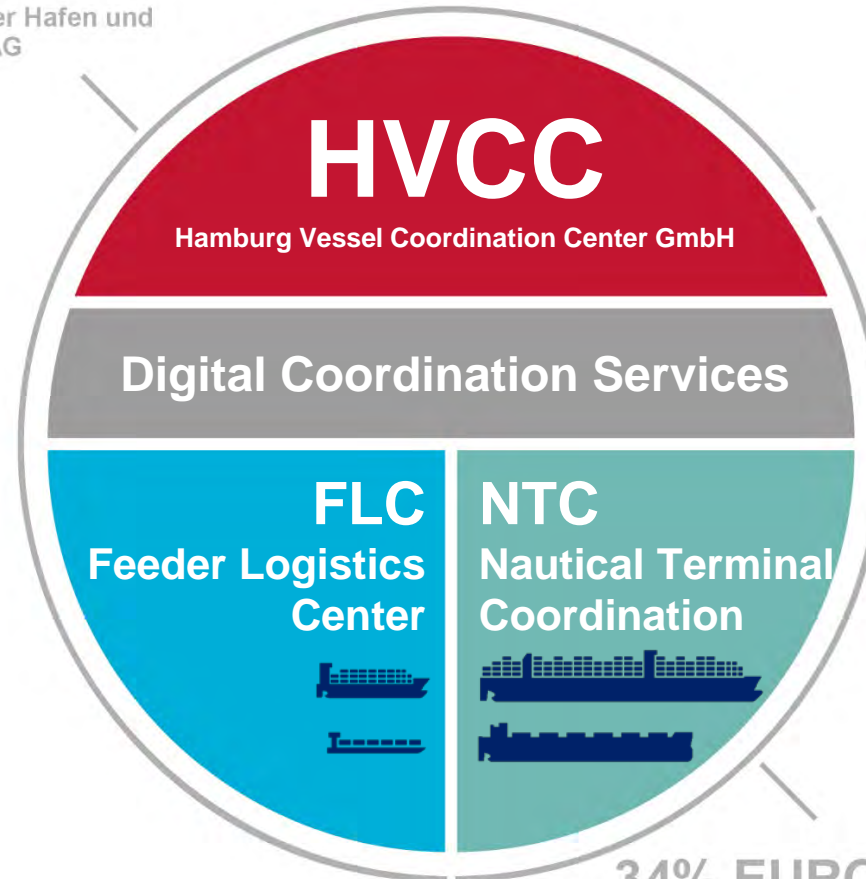
Joint-venture of two competing terminal operators

24/7 operational

Port collaboration platform with more than 400 user

66% HHLA
Hamburger Hafen und Logistik AG

HVCC
Hamburg Vessel Coordination Center GmbH

Digital Coordination Services

FLC
Feeder Logistics Center

NTC
Nautical Terminal Coordination

34% EUROGATE
Eurogate Container Terminal Hamburg GmbH

Port coordination of barges and feeder vessels

Coastal coordination of large vessels

International Taskforce
Port Call Optimization

Member of the International Taskforce Port Call Optimization

HPC Experience 2: HVCC services reducing emissions

HVCC helps vessels to sail at optimal speed to arrive just-in-time

In 2019, HVCC saved
84,000 t
of fuel for shipping lines

Reducing fuel costs by
30m USD

Cutting CO2 emissions
**284,000 t**

HPC Experience 3: AI Dwell Time Prediction

Using hidden Structures to predict Dwell Times of Import Containers and reduce unproductive Rehandling Moves

Motivation

- For import containers, no information on pick-up time by truck is available upon stack-in slot selection.

- Therefore, import containers cannot be stacked in a way that the needed container is always stacked on top of a pile.

- Hence, there is a high risk for additional shuffle moves, that require additional resources, maintenance, energy, etc.

Idea

- Based on container attributes it might be possible to estimate the dwell time of individual containers.

- Use AI-Techniques to learn and identify hidden structures, which can be used to predict individual container dwell times.

- Dwell time estimate can be used to stack containers in a way that containers are only stacked on top of containers that are estimated to be picked up later.

container out |------ dwell time -----| container in
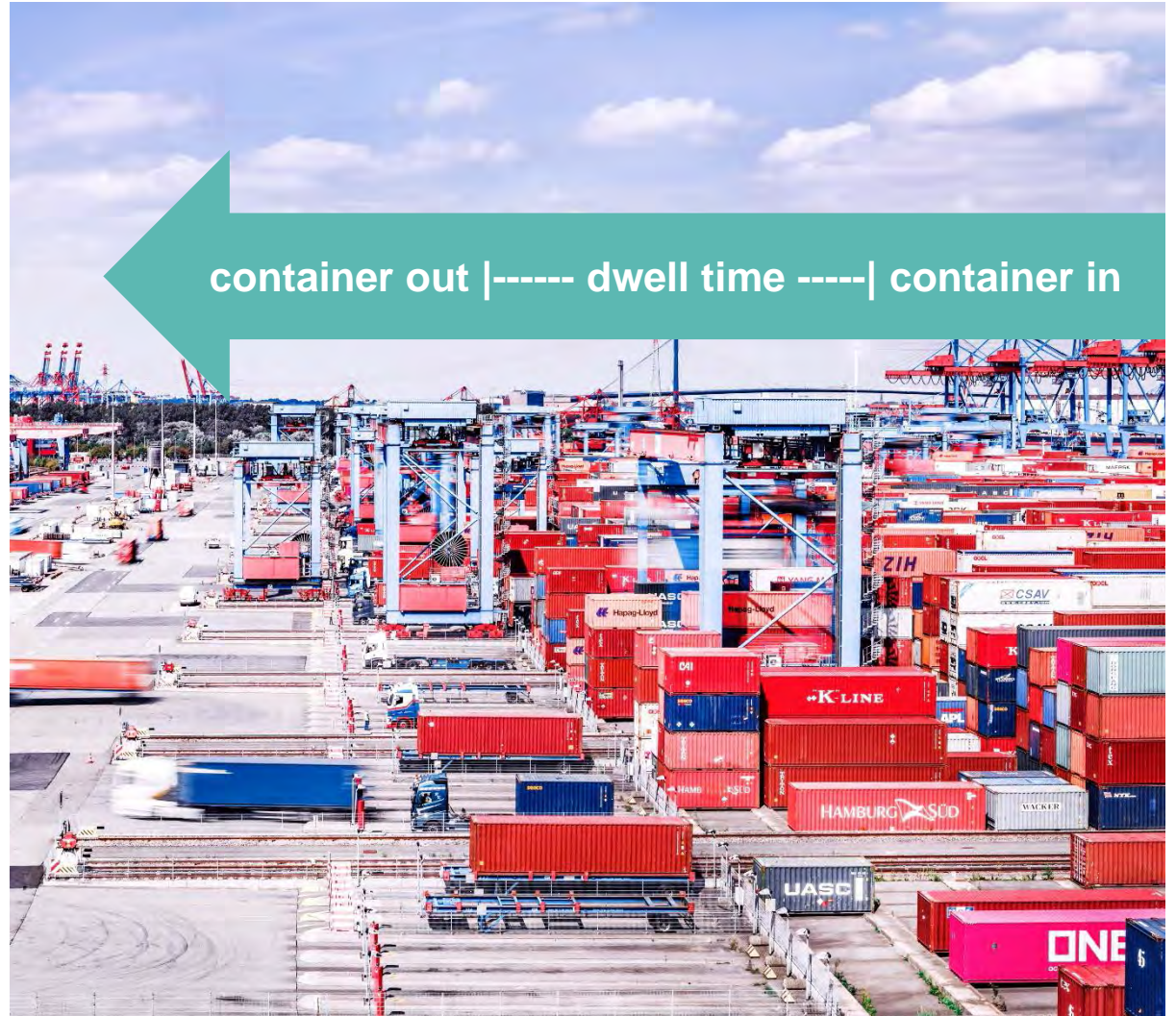
HPC Experience 3: AI Dwell Time Prediction

Improving Cost and Performance of Container Terminals


Technical Setup:

- AI Dwell Time Predictor as TOS add-on module
- Receiving data on container
- Returning optimal container slots
- Implemented at HHLA Container Terminals CTA and CTB in Hamburg

Results:

- Reduced number of unproductive container restacking moves by +120,000 per year
    - ➜ Saving Operating Cost
- Increasing equipment productivities
    - ➜ Improving terminal capacity
    - ➜ Improving terminal service level
- Cutting energy and emissions
    - ➜ Reducing diesel by 390,000 l
    - ➜ Cutting emissions by 1,050 t

HPC

HPC Experience 4: Truck Appointment in the Port of Hamburg

Hinterland traffic management to relieve common pains in the port and its community
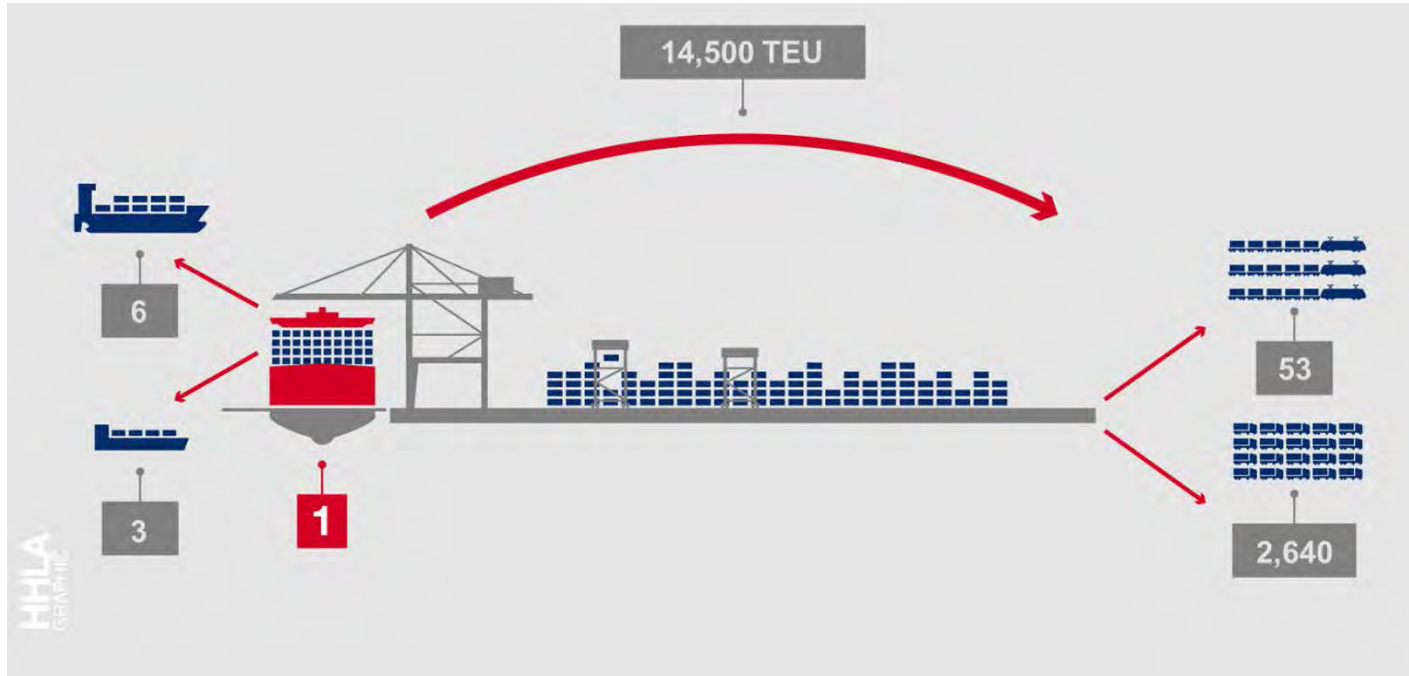
Overview of Partners

Project Owner   **Project Management**   **Software Development**

Overview of Objectives

- Transparency and control of truck arrivals
- Better capacity utilisation by lowering peaks
- Reduction of congestion
- Improved resource planning
- Increased terminal performance
- Reduced emissions

About HPC Hamburg Port Consulting GmbH

HPC has First-Hand Experience in Emission Reduction Projects

Company Profile

1700
Projects in
130 COUNTRIES

1976
Founded as subsidiary of HHLA

180+ PORTS
And terminals planned and optimised

1st FULLY AUTOMATED TERMINAL
Automated operations for more than 20 years

100 ENTHUSIASTS
With background from port and terminal operations and software

GREEN TRANSITION
Alternative Energies

OPTIMISATION
Improved working conditions and reduced costs

Guiding Port of Hamburg's green Transition

Hinterland connectivity
120 projects implemented intermodal rail terminals, inland ports and warehouse logistics

Developed *HPC Ukraina* (now HHLA CTO) as terminal operator in Odessa

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