

Digitalization in Seaports – Key Driver to Increase Efficiency

Prof. Dr.-Ing. Carlos Jahn, AGKN-Travelling Conference, Feb 2017

Agenda

1. Digitalization

2. Examples

3. Conclusion

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Institute of Maritime Logistics / Fraunhofer CML

- Hamburg University of Technology
 - Institute of Maritime Logistics
 - Teaching and basic research



- Fraunhofer-Center for Maritime Logistics and Services CML

Applied research

- Port and terminal development
- Ship and fleet management
- Sea traffic and nautical solutions



Port of Hamburg: Economic Heart in the Middle of Hamburg

[Quelle: Hafen Hamburg HHM / M. Lindner]

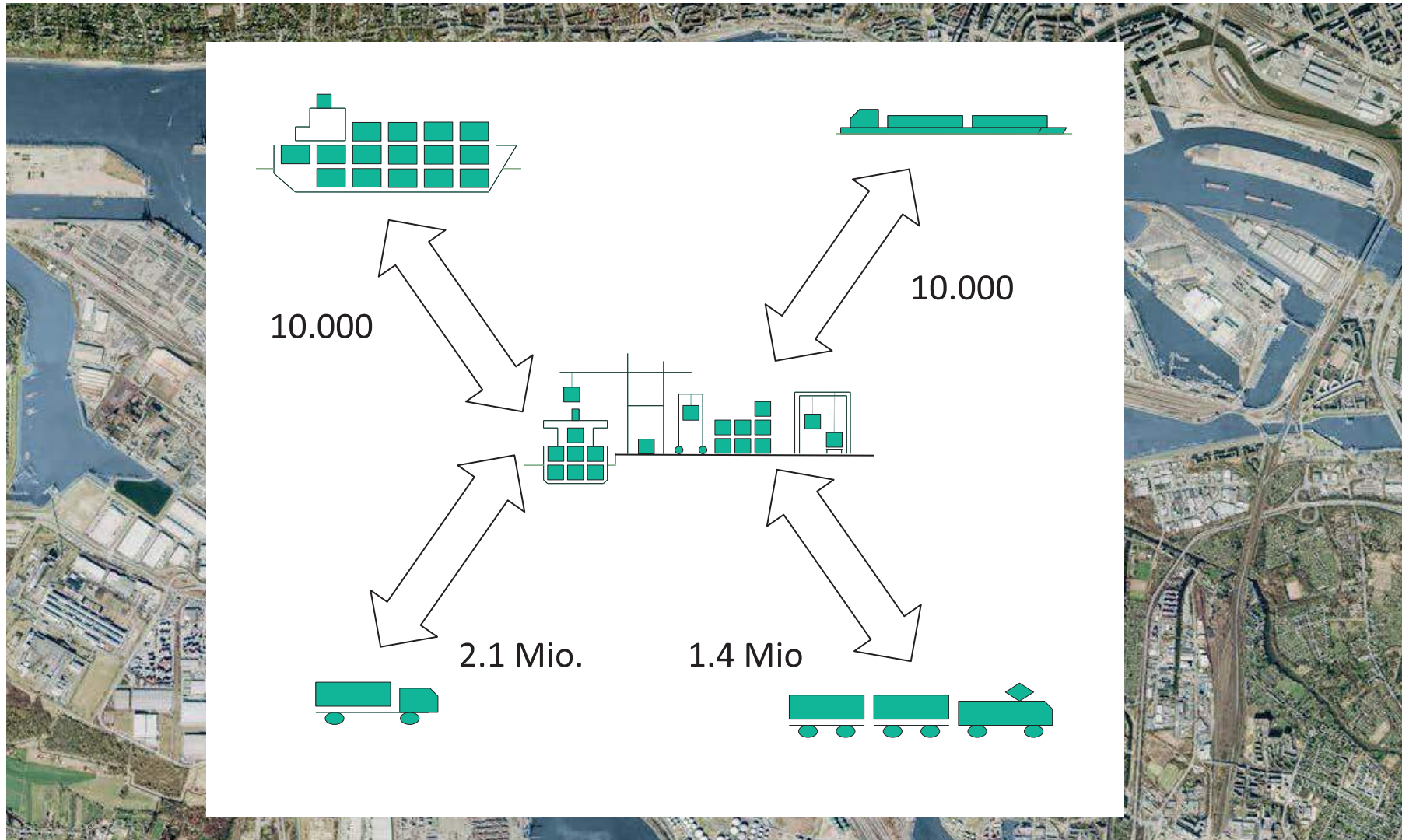


Port of Hamburg



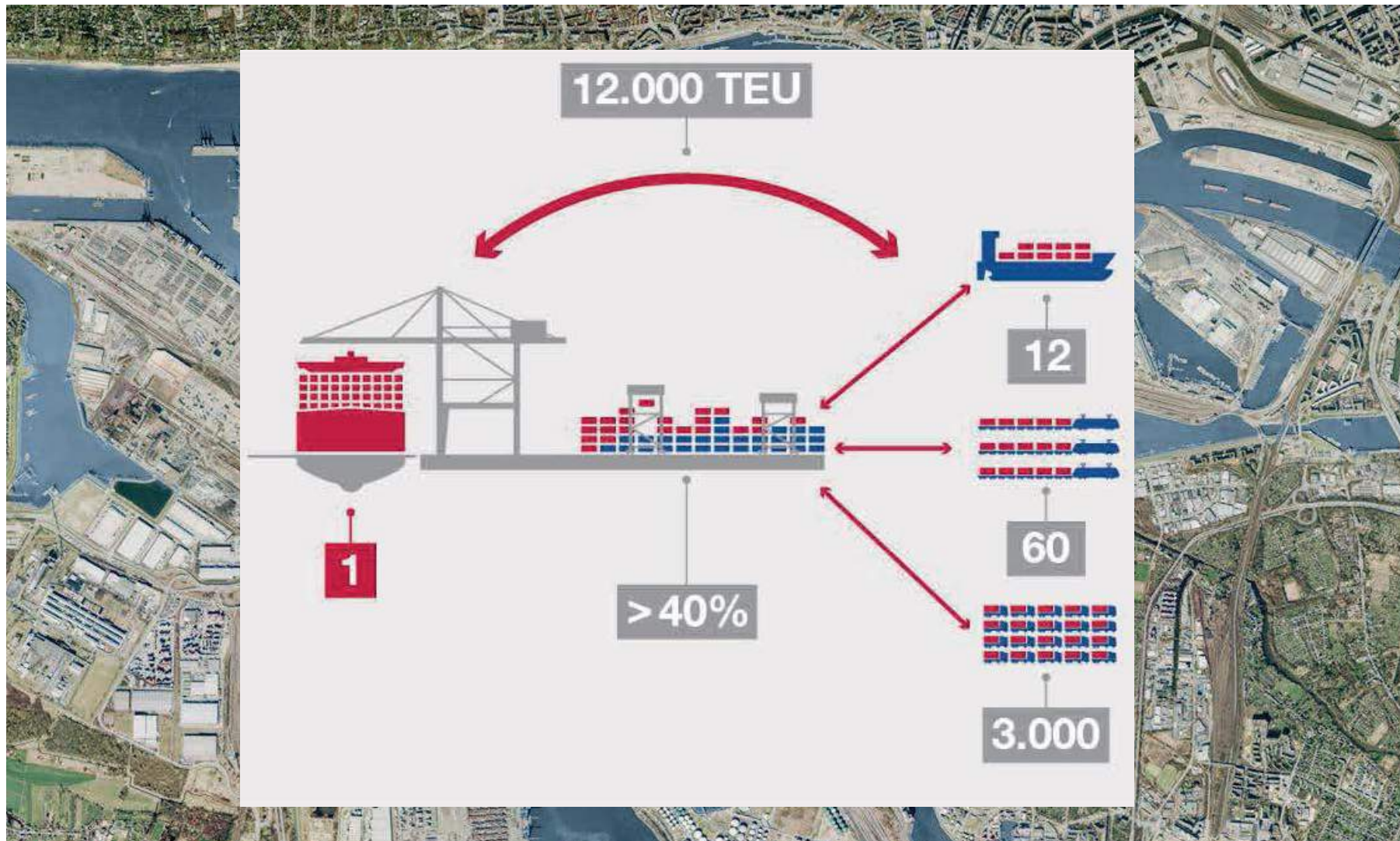
Picture: Hamburg Port Authority

Port of Hamburg



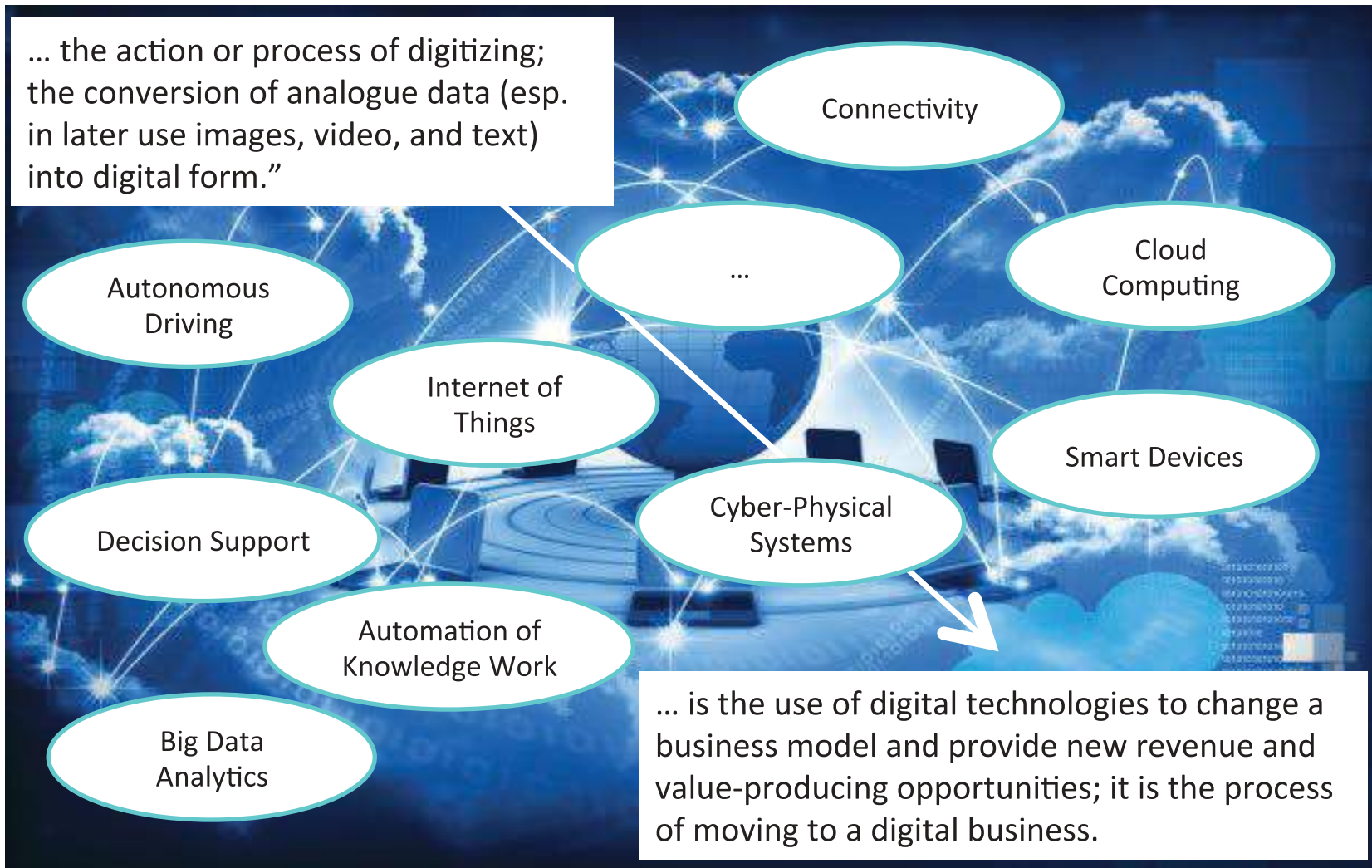
Picture: Hamburg Port Authority

Port of Hamburg



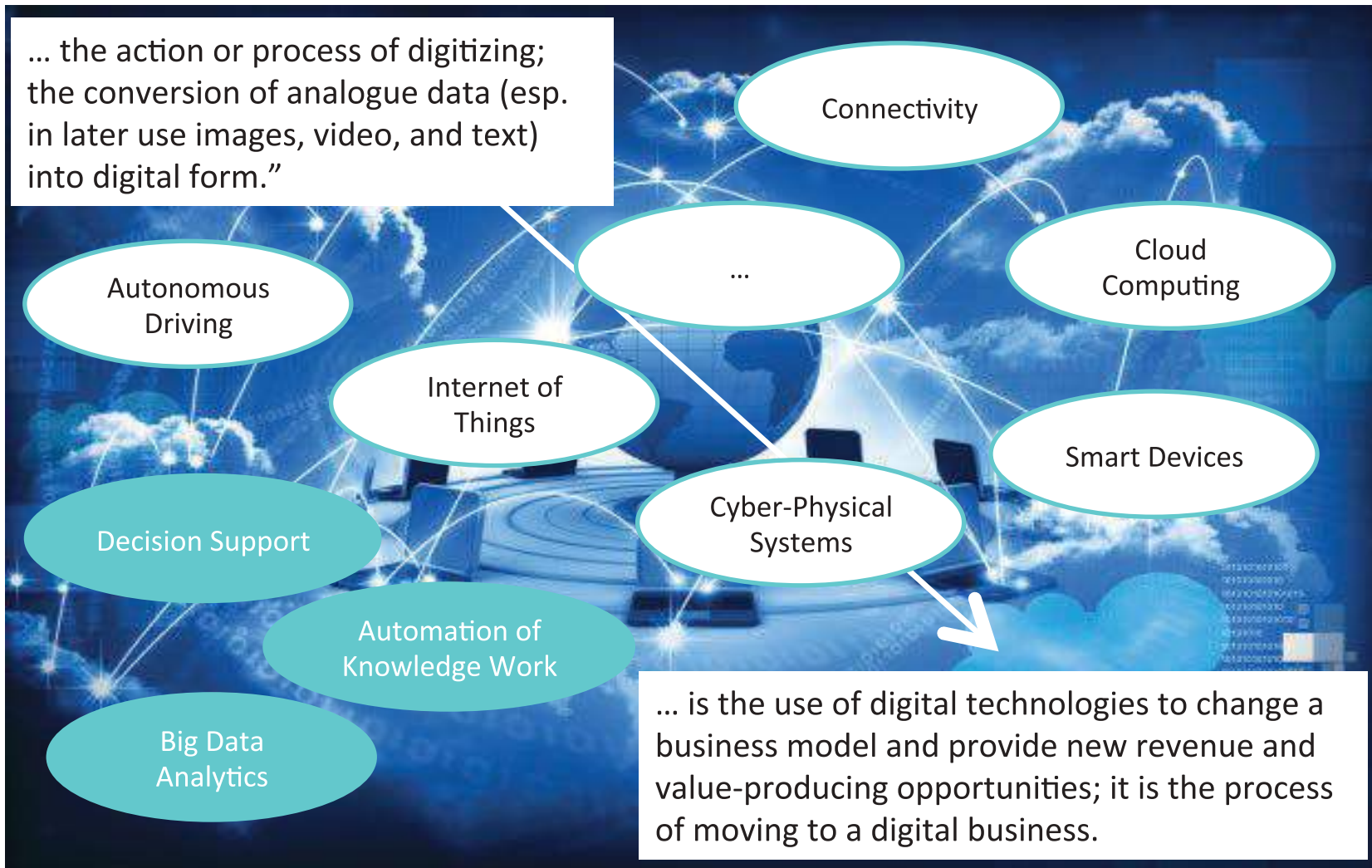
Picture: Hamburg Port Authority

Digitalization is...



Sources: 1 Oxford English Dictionary, 2 Gartner Group, Graphic www.euroforum.de/dconomy/megatrends-digitalisierung

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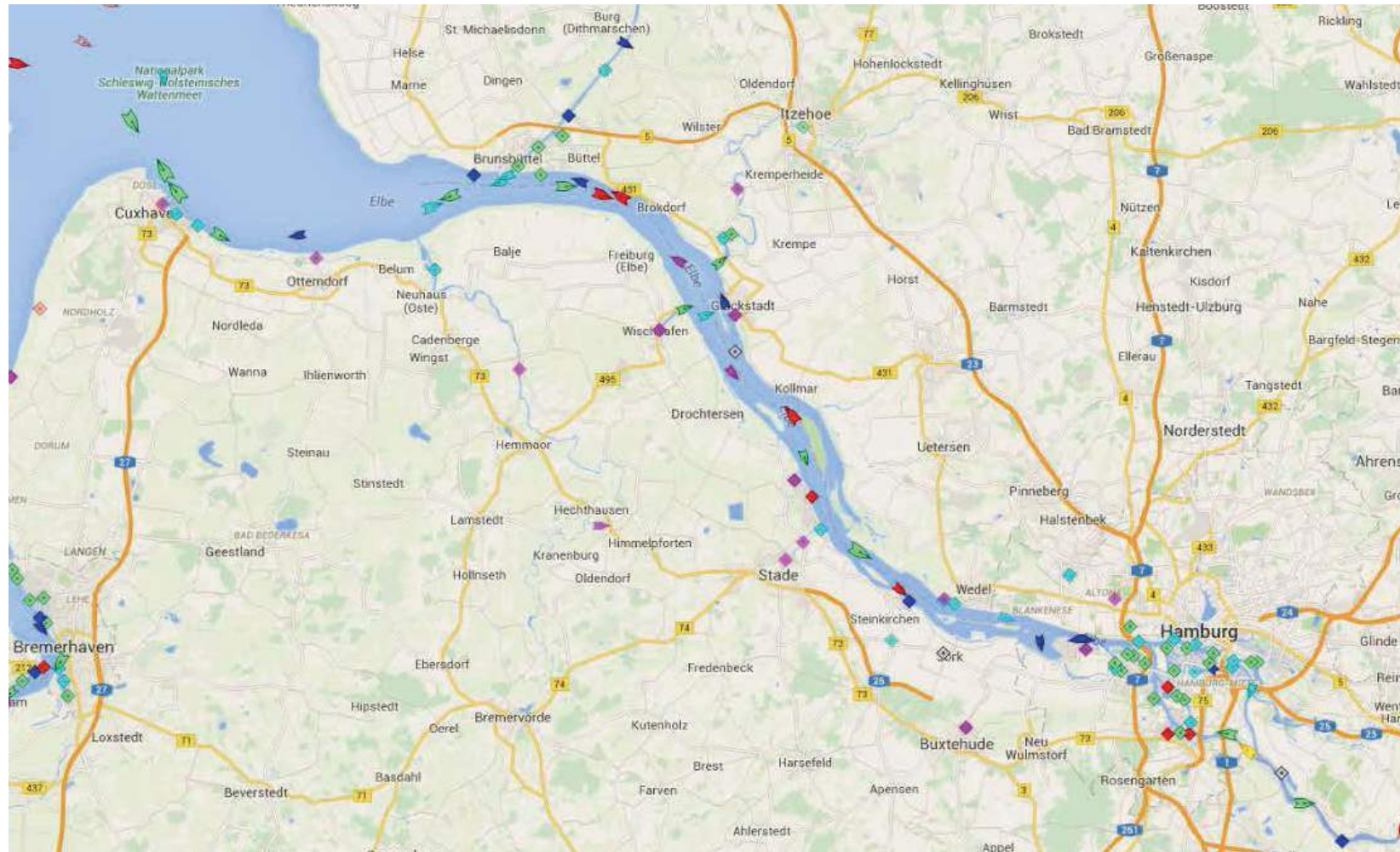
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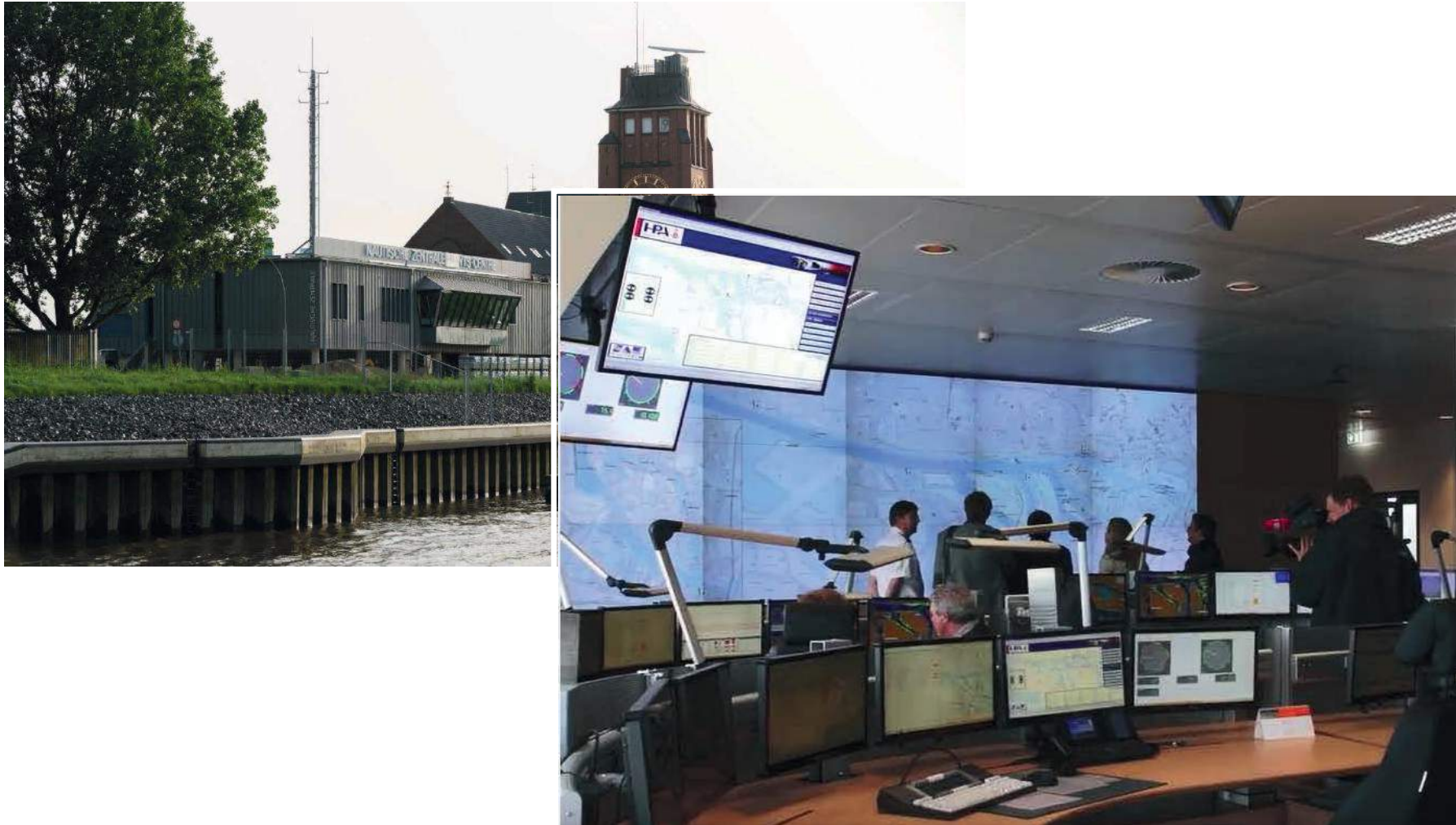
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Example 1: Ship Arrival Time Forecasting



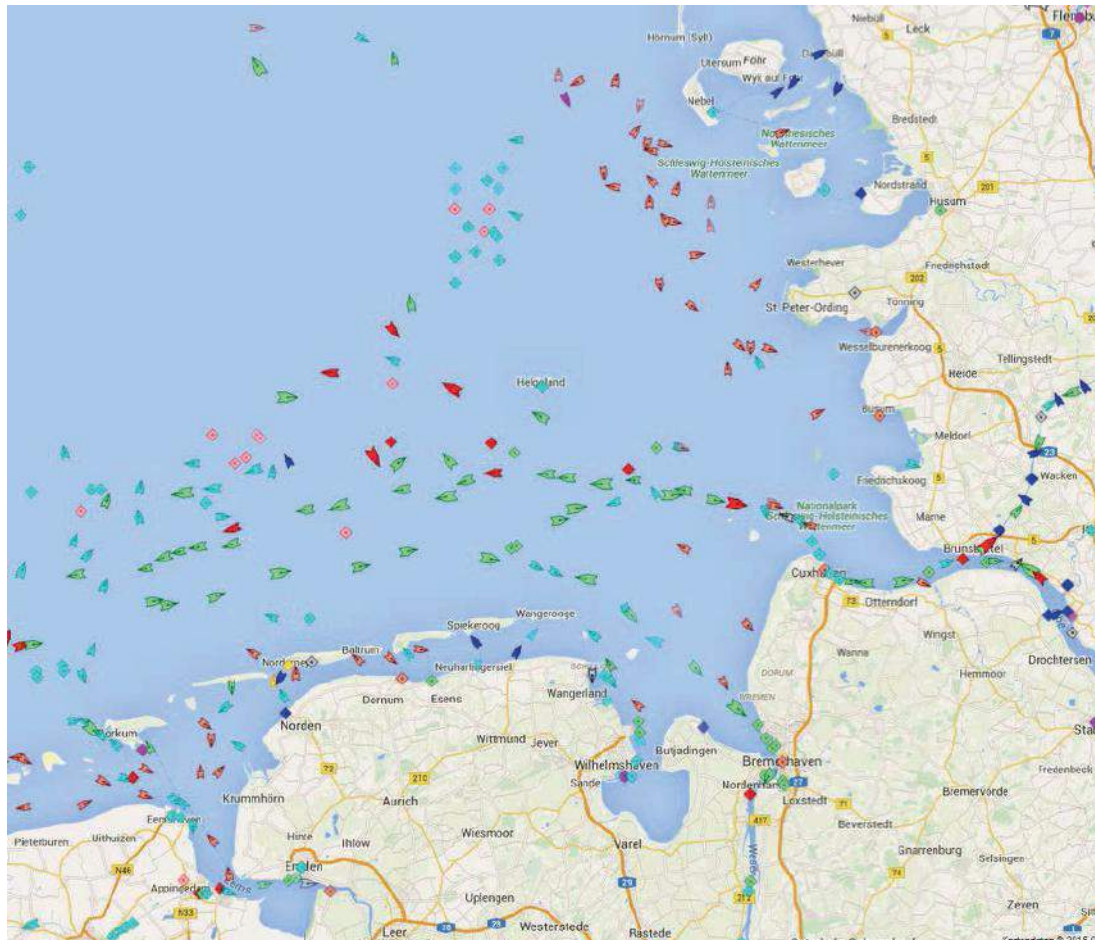
Source: marinetransit 25.05.2016

Port Monitor: Vessel Traffic Service Center



Source: Port of Hamburg Magazin

AIS - Vessel Information: Example Marine Traffic

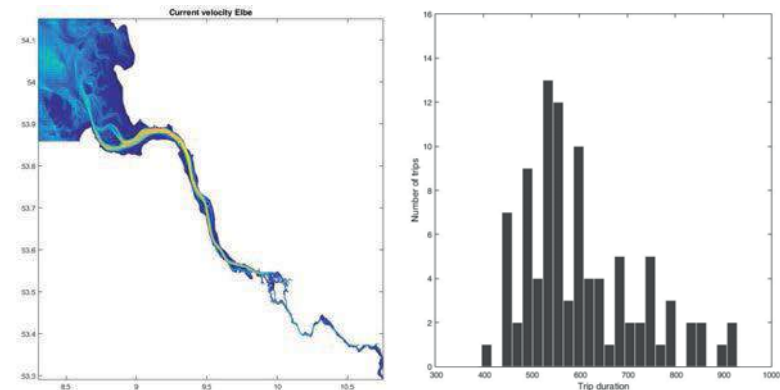
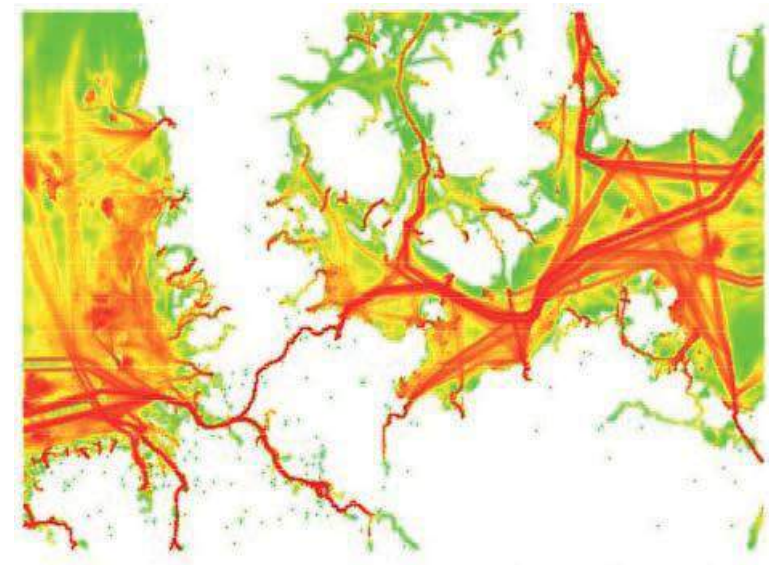


- Display of current situation, port of departure and port of arrival, ETA (estimated time of arrival), course and speed, draught, route (historical view)
- For an extra charge additional options are available
- Incomplete and inaccurate

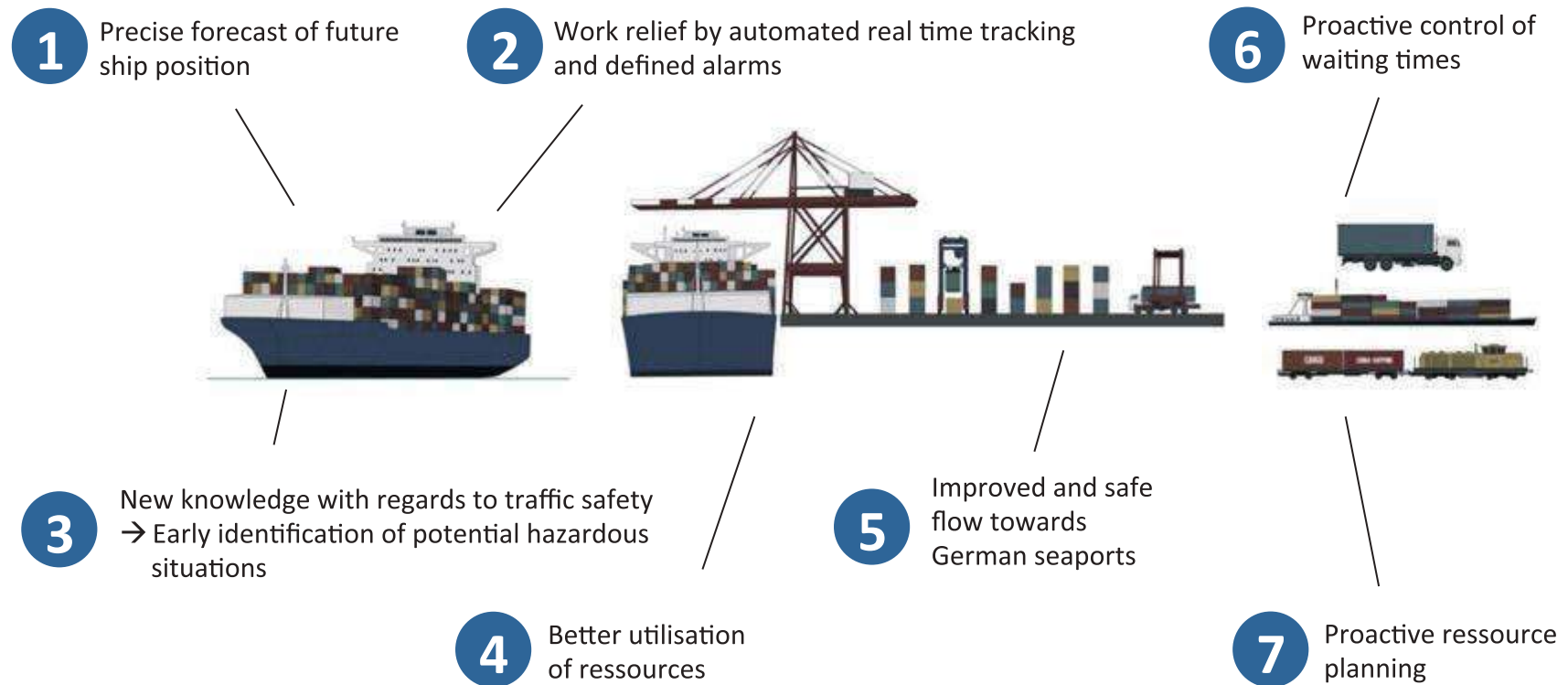
Example of Traffic in the German Bight © MarineTraffic

Vessel traffic forecast

- Analysis of statistical correlations and significant influencing factors, e.g.:
 - Weather
 - Current
 - Tides
 - Locks
 - Traffic Density
- Development of reliable and independent forecasts for ship **ETA** (up to 72h) for the North Sea and Baltic Sea
- Automated, realtime calculation with customer-individual adaptability



ETA forecasts: Benefits



Example 2: Truck Waiting Time Forecasting



Port of Hamburg: Road traffic sensor system



<http://www.hamburg-port-authority.de/en/press/Press-archive/Seiten/Press-release-21-05-2013.aspx>

Forecast of truck waiting times at logistical hubs



Motivation

Frequent peak loads and stochastic operational and environmental influences lead to fluctuating truck arrivals at the logistical hubs.

⇒ Forwarders/Truckers:
big share of unproductive operational time

⇒ Logistical hubs:
high and more expensive use of personnel and equipment

Waiting times calculation: Common systems

Camera Systems

- Services from node to its customers
- Show snapshots
- Updated every few minutes
- View of the entrance area



Container Terminal Altenwerder
(HHLA)



Container Maintenance Repair
Hamburg GmbH



Hamburger
Container Service GmbH

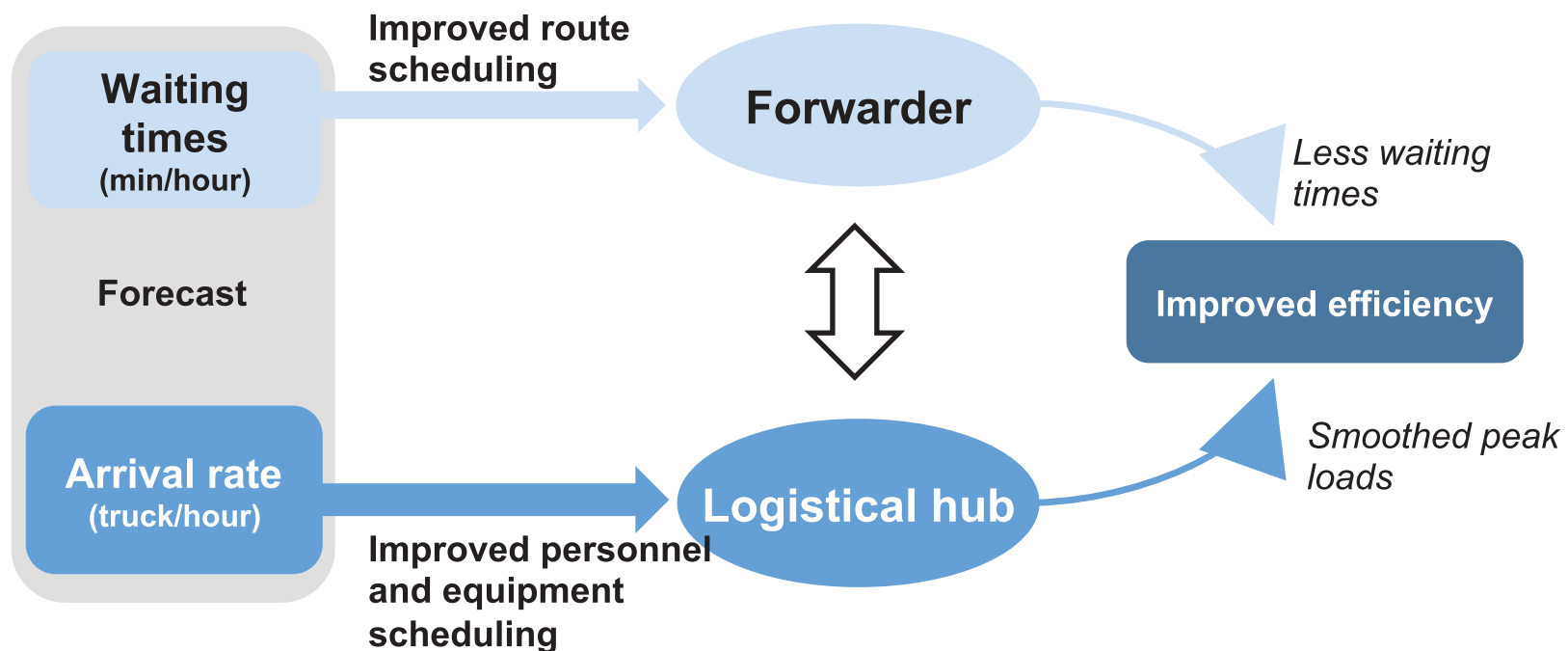


Sources:
<http://www.hcs-depot.de/PopUp/WebCamPopUp.aspx>
https://hhla.de/de/webcams-cta.html?no_cache=1
<http://www.cmr-hamburg.de/eng/camera.html>
Retrieved 2nd of Feb. 2016.

Problems

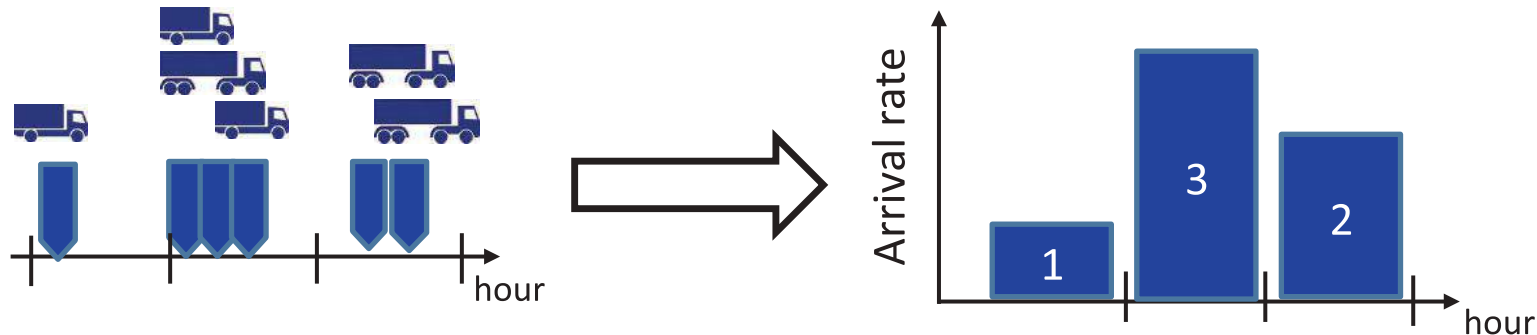
- Show only a part of the area
- Experience needed
- Failures

Truck waiting times and arrival rate forecasts

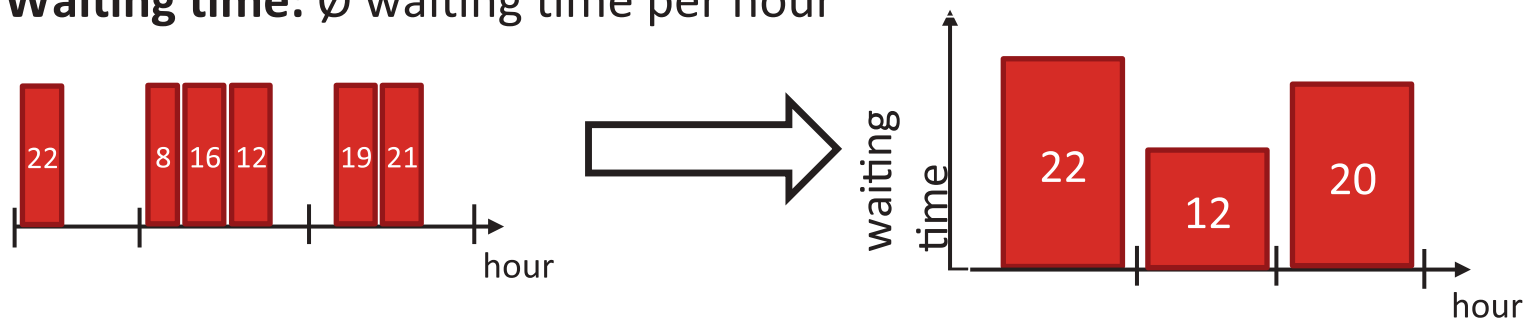


Forecast problem: time series approach

Arrival rate: #trucks per hour



Waiting time: $\emptyset$ waiting time per hour

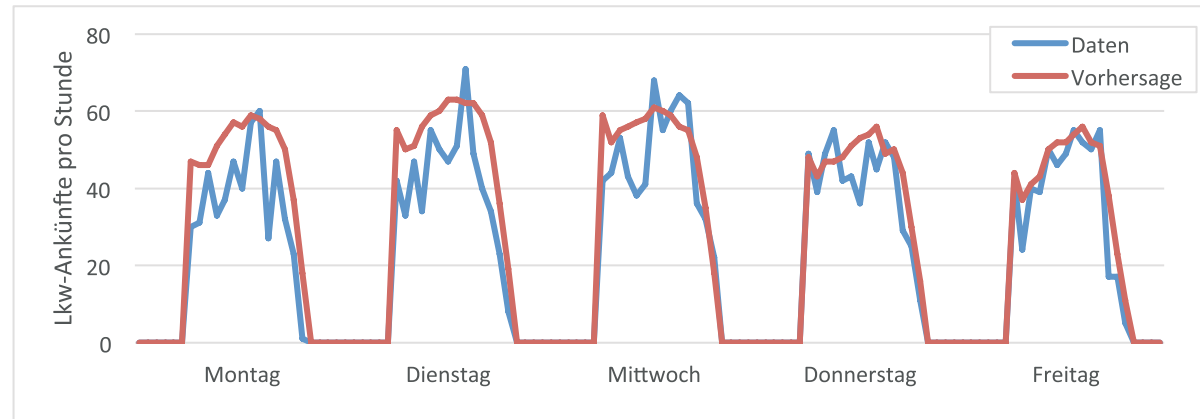


Results

Arrival rate

Ø Dev.

10 #trucks

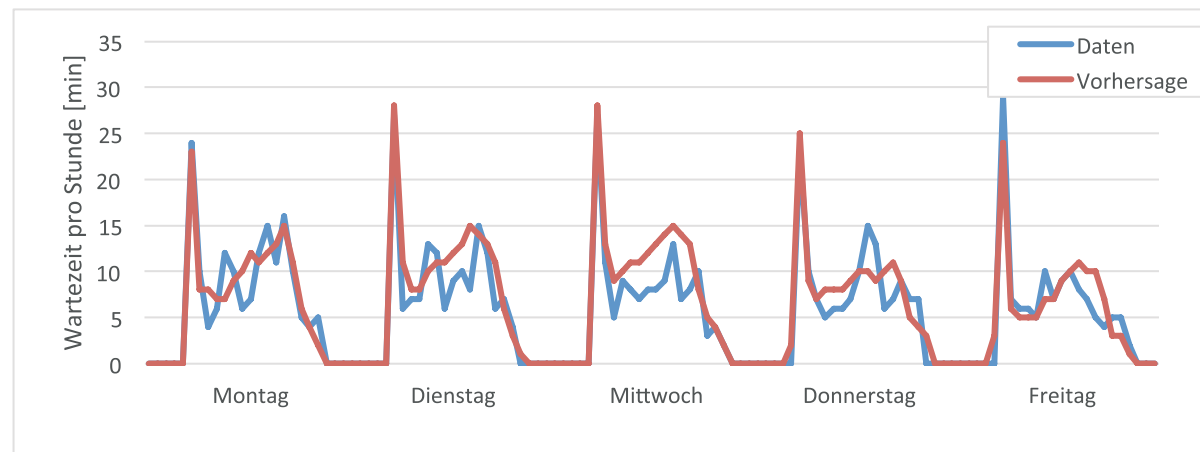


Real data
Forecast

Waiting times

Ø Dev.

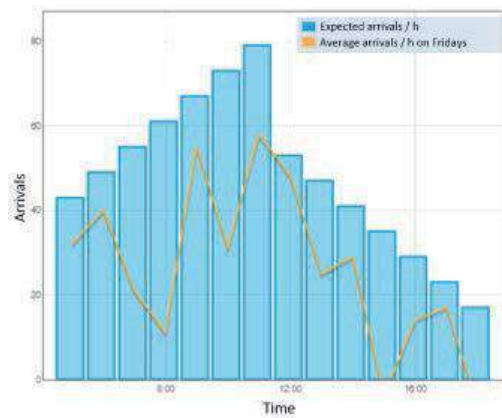
2,4 min.



Decision support



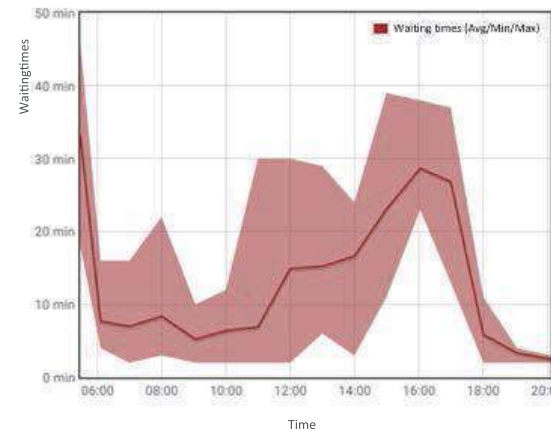
„Do we need additional workers for tomorrow?“



→ Decision: Yes



„Should we drive to the terminal in the morning or afternoon?“



→ Decision: At 18:00

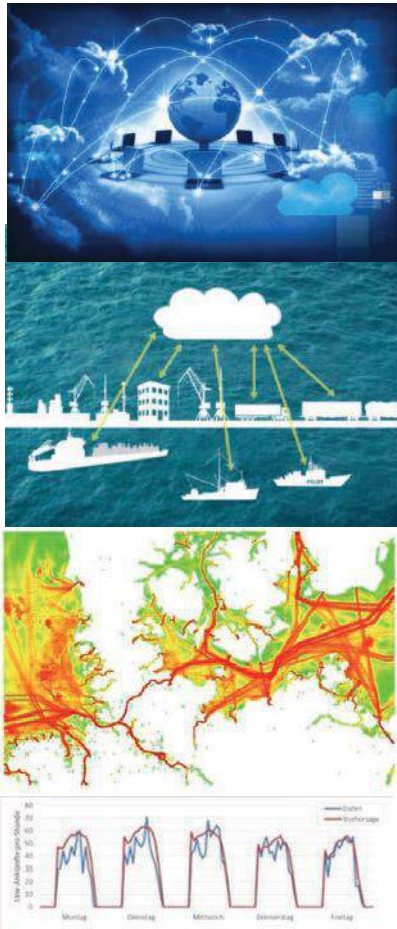
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Conclusion



1

Digitalization

- Key driver to increase efficiency
- Numerous applications to synchronize the use of resources

2

Examples

- Big data analytics, automation of knowledge work, decision support
- Vessel traffic forecasts: Ship arrival times
- Truck waiting times and truck arrival rate forecasts

3

Future research

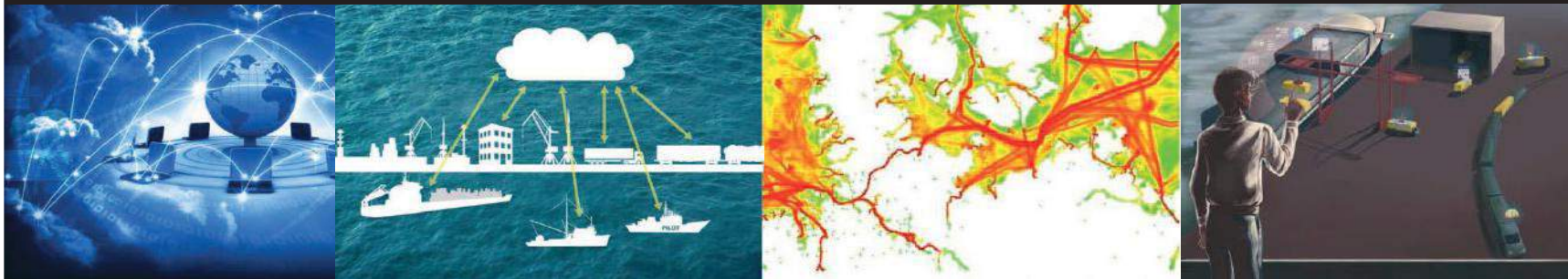
- Needed
- Interdisciplinary
- Cooperation

Thank You very much for Your Attention!



**“The future is already
here -
it's just not very evenly
distributed. “**

William Gibson, 1993
SF author, USA



Quelle: http://en.wikipedia.org/wiki/William_Gibson