





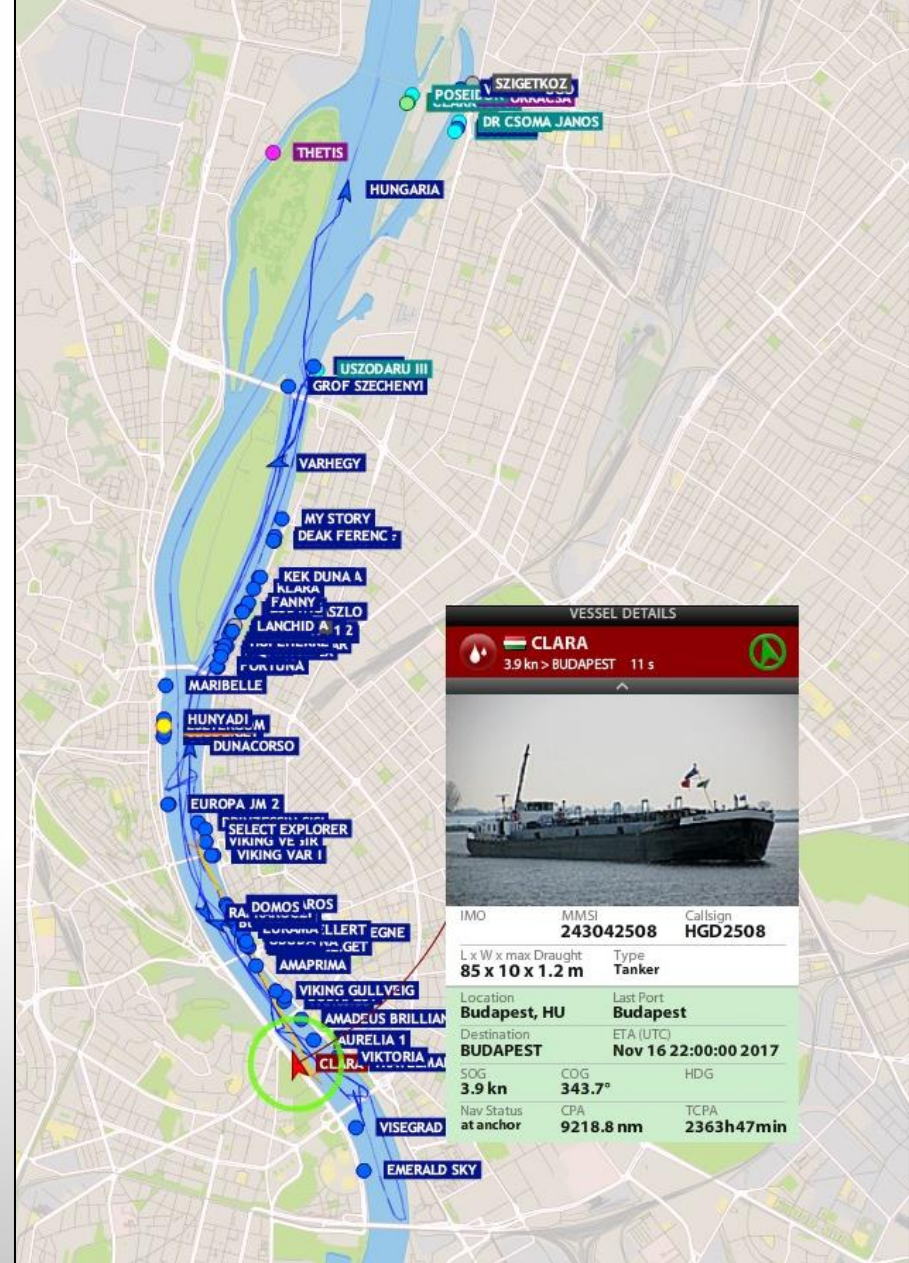
# Operating TENs while optimizing changing modes of transportation at sea terminals

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# Agenda:

- Objective & Motivation
- Approach and Database
- Functionality
- Optimization

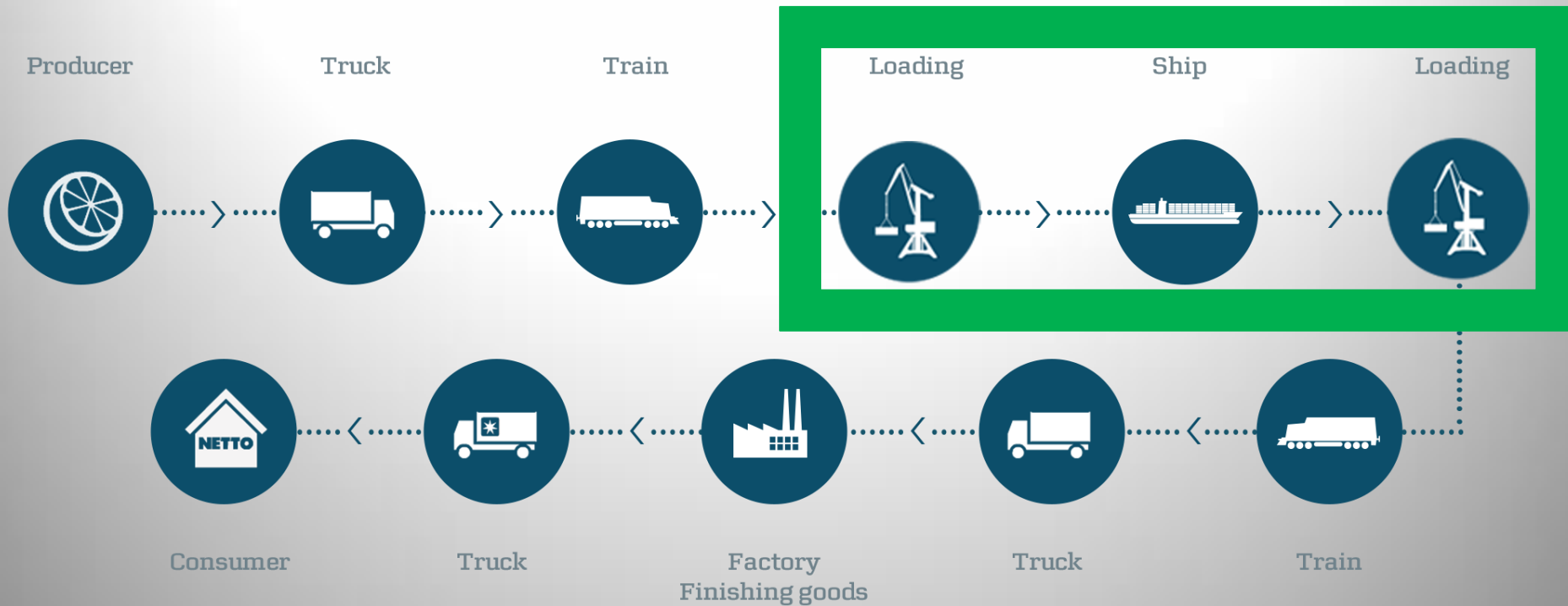


# FleetMon:

- One of world's leading companies in field of work
- Coverage of global maritime commodity flows
- Based on Automatic Identification System (AIS)
- Reception with thousands of stations and satellites
- Handling of >300.000.000 messages per day
- Actual paying customers from 164 countries
- Marine, customs, coast guard, SAR,  
Greenpeace, DNV-GL, Daimler or Microsoft

# Objective:

- 94 seaports assigned in network corridors
- Aim is optimizing in change of transport

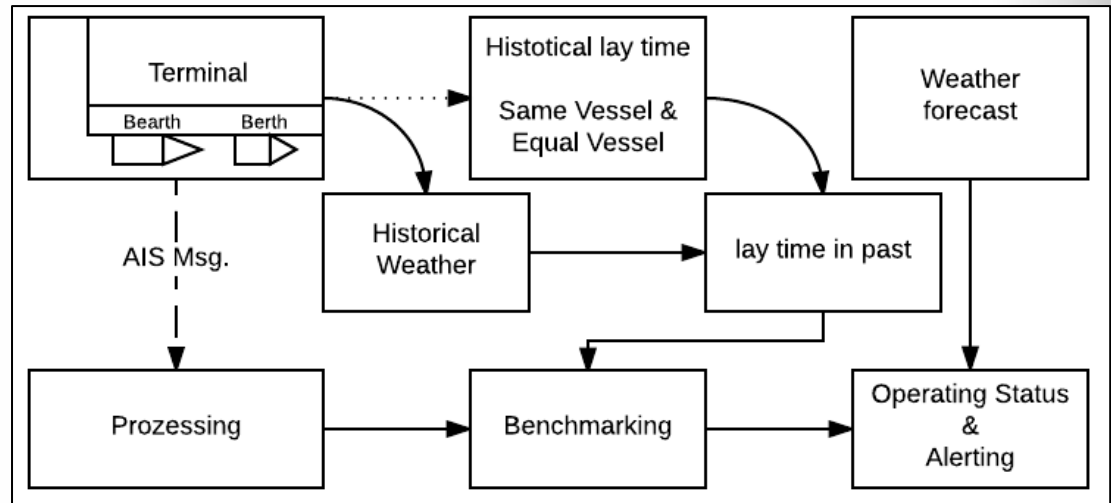


# Motivation:

- 3,8 billion tons of goods are handled 2014 in EU-28 ports
- 80 million containers are handled per year in EU-28
- Multiple reasons why the ship is out of schedule (weather, technical breakdowns, customs, strikes...)
- Assumption: 8.000 TEU ship, 10% cargo handling, modal split 3:1 (truck : train) – time delay
- 300 trucks and 2 block trains have to wait

# Approach:

- Only the crew, ship operator and port are informed about problems



- Information about the vessel to the clients: duration of actual laytime, previous lay time of the vessel, lay time of comparable ships, forecast and identification of correlations in weather
- Awareness → contacting the cargo operator

# Database & Technology:

- All ships on international (or commercial) voyage use the Automatic Identification System (AIS)
- Initiated 2005 by International Maritime Organization
- Reason was improvement of collision avoidance
- Contains static and dynamic information
- Like: position, speed, course, rate of turn, heading, navigation status, draft, length or ship type...
- Every 2sec until 3min (depending on navigation status)

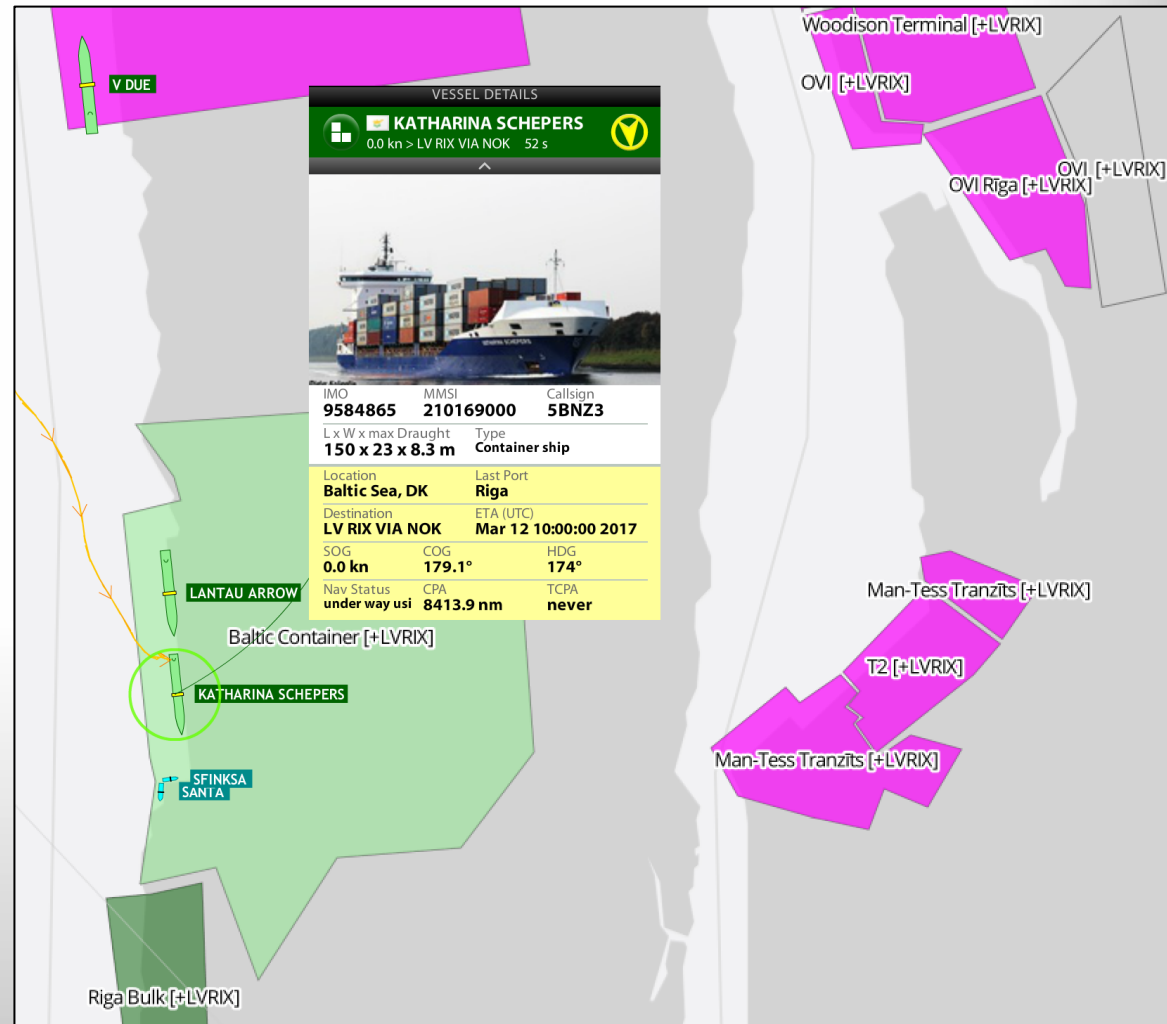


# Reliability of Data:

- Normally AIS has a range of 20 nm (nautical miles)
- With signal transduction 50 nm
- Automatic data are reliable (position, speed)
- The information from nautical officers are not trustable (navigation status)
- Problem: “moored” navigation status on terminal

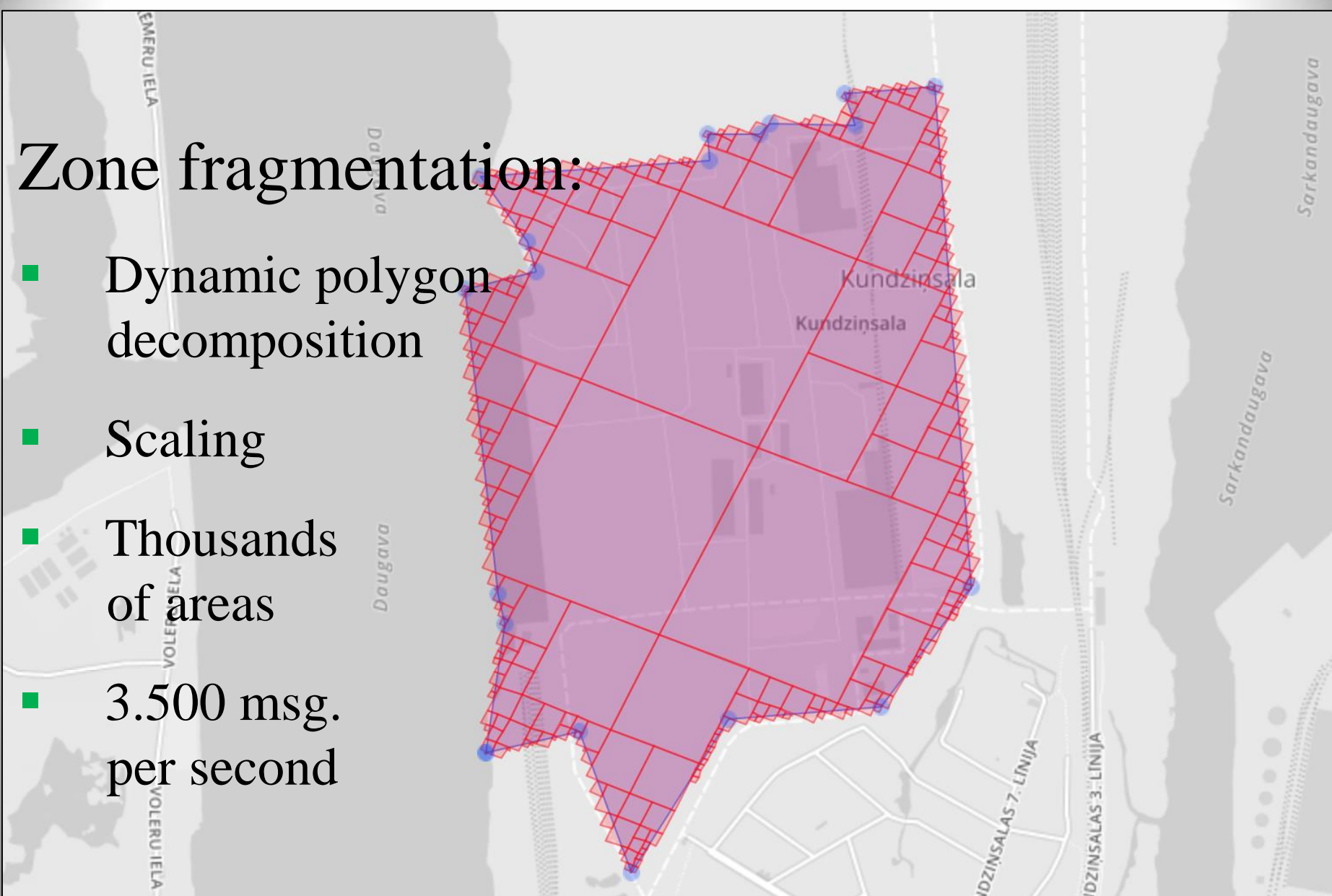
# Geo-Fencing:

- Baltic container terminal Riga
- Exact capture of all zones
- In & out + stop events



# Zone fragmentation:

- Dynamic polygon decomposition
- Scaling
- Thousands of areas
- 3.500 msg. per second





# Laytime prediction:

- Based on the laytime of the same ship in the past
- And the laytime of equal vessels (length, cargo type)

$$TL_{pr} = \frac{1}{n_{sa}} \sum_{i=1}^{n_{sa}} TL_{sa} + \frac{TL_{eq} \left( \frac{n_{eq}}{2} \right)}{2}$$

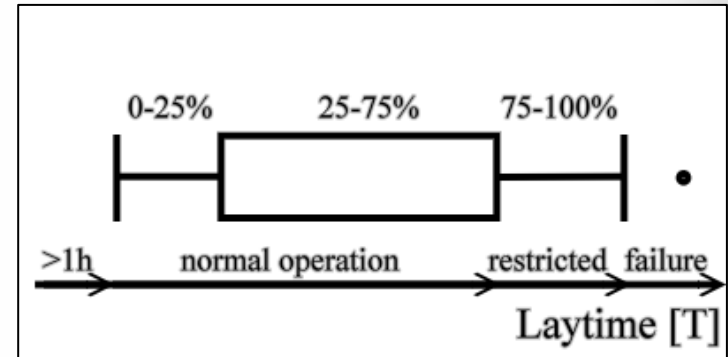
$TL_{pr}$  = Laytime predicted

$TL_{sa}$  = Laytime same ship

$TL_{eq}$  = Laytime equal vessel

# Terminal Status:

- Based on predicted laytime of equal vessels on terminal
- Laytime over prediction  
→ information to client
- Laytime longer than 75% of all equal ships  
→ terminal status: restricted
- Ongoing laytime more than three times standard deviation of all lay times = outlier  
→ alert to client: vessel or terminal failure





VESSEL DETAILS

**CSCL ZEEBRUGGE**  
0.0 kn > NINGBO 59 s

IMO	MMSI	Callsign
<b>9314234</b>	<b>477690700</b>	<b>VRCS2</b>
L x W x max Draught	Type	
<b>337 x 46 x 10.7 m</b>	<b>Container ship</b>	
Location	Last Port	
<b>East China Sea, CN</b>	<b>Ningbo-Zhoushan</b>	
Destination	ETA (UTC)	
<b>NINGBO</b>		
SOG	COG	HDG
<b>0.0 kn</b>	<b>329.0°</b>	<b>78°</b>
Nav Status	CPA	TCPA
<b>moored</b>	<b>3670.9 nm</b>	<b>never</b>

# Nigbo Yuandong Container Terminal

## China



# Front-end



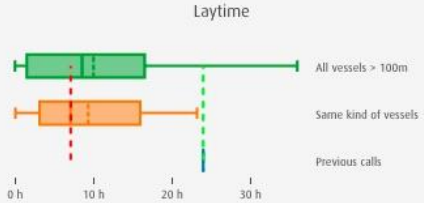




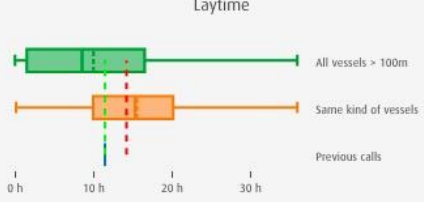
## Nigbo Yuandong Container Terminal (China)

May 30, 2017 11:14 PM

### Nigbo Yuandong Container Terminal CNNGB

Ningbo-Zhoushan, China © May 30, 2017 3:14 PM UTC

Vessels at the Terminal **10** Arriving Vessels **28** Only conspicuous Vessels

Name	Expected Time of Departure UTC	Time of Arrival UTC	Signal Age
 <b>CMA CGM GANGES</b> Container ship	May 29, 2017 10:19 PM <span style="color: green;">●</span> 16 hours 55 mins overdue	May 29, 2017 10:19 PM	28 minutes ago
	IMO: 9718117 MMSI: 538006387 Callsign: V7MN2 Length: 299m x 48m Current Draught: 11.0m Container Capacity: TEU		
 <b>COSCO AUCKLAND</b> Container ship	May 30, 2017 1:36 PM <span style="color: green;">●</span> 1 hour 38 mins overdue	May 30, 2017 1:36 PM	27 minutes ago
 <b>CSCL CALLAO</b> Container ship	May 31, 2017 4:31 AM <span style="color: green;">●</span> 13 hours 16 mins left	May 31, 2017 4:31 AM	28 minutes ago
 <b>CSCL ZEEBRUGGE</b> Container ship	May 30, 2017 6:00 PM <span style="color: green;">●</span> 2 hours 45 mins left	May 30, 2017 6:00 PM	26 minutes ago
	IMO: 9314234 MMSI: 477690700 Callsign: VRCS2 Length: 337m x 46m Current Draught: 10.7m Container Capacity: 9,580 TEU		

## Conclusion:

- Involved parties will be informed
- Trucks could wait in stopping areas outside the port
- Improved ETA and ETD for trucks and trains
- System is usable for RoRo or bulk cargo too

*We are very interested to work together with you  
on EU research projects / H2020*

*Thank you  
for your attention*

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