

# **MASS AND CONSEQUENCES FOR IALA**

## **SAINT GERMAINE, 7. OCT. 2019**

Ørnulf Jan Rødseth, Senior Scientist, SINTEF Ocean  
Manager, Norwegian Forum for Autonomous Ships

# SINTEF: Scandinavia's largest independent research organization

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NOK 3.1 billion  
Revenues

NOK 450 MILL  
International sales



# SINTEF Ocean

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From January 2017, a merger of:

- MARINTEK
- SINTEF Fisheries and Aquaculture
- SINTEF Environmental Chemistry

Not-for-profit, independent

Contract research

360 employees



Autonomous ships are happening!

# MUNIN: A concept study for a fully unmanned handymax dry bulk carrier on intercontinental voyage.

- Duration: 01.09-2012 – 31.08.2015
- Funding: 2.9 million EUR of budget 3.8 million EUR
- Activity code: SST.2012.5.2-5: E-guided vessels - the 'autonomous' ship



<http://www.unmanned-ship.org/munin/>



# LP Odyssey (SeaLaunch)

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Photo: Frank Leuband/Wikimedia

In operation:  
1999-2014

S7 Space:  
2016-

Unmanned and  
remote control  
during launch:  
Dynamic  
Positioning

Class: DNV-GL  
Flag: Liberia

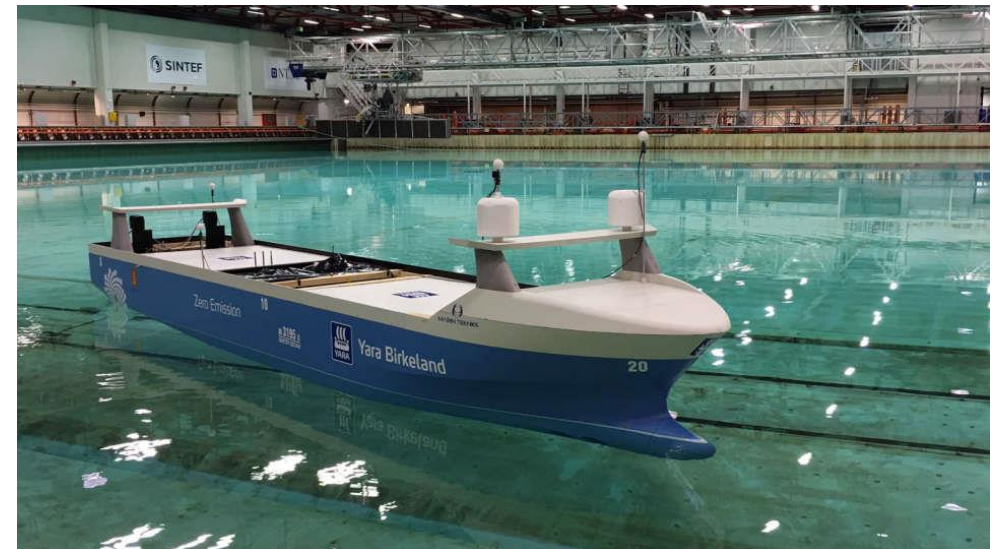
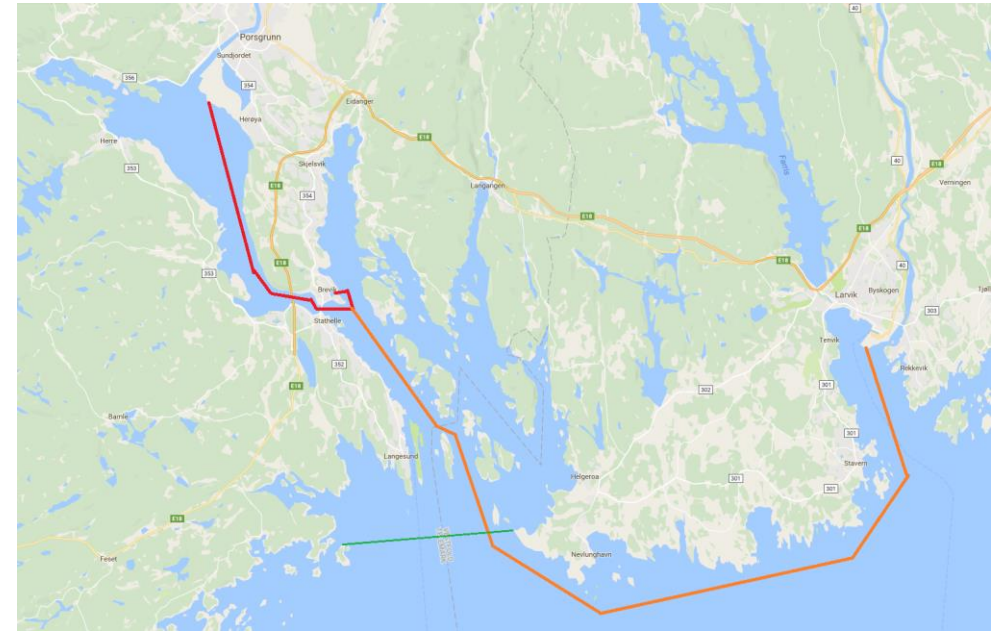
# Yara Birkeland

80x15 m

3500 DWT

6-12 knots

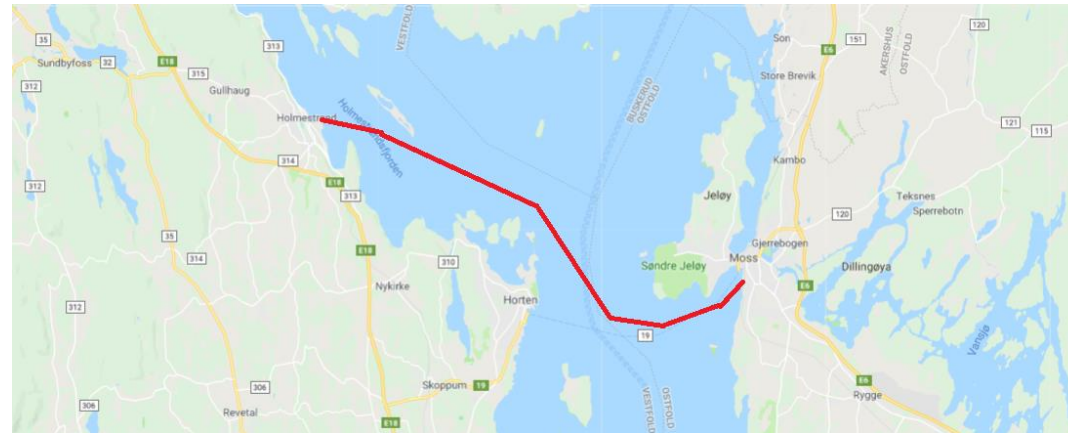
Busy & narrow Fairway



# ASKO trailer ferry

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- Connects warehouses at different sides of the Oslo fjord, 8 nm distance
- Truck trailers automatically positioned on ferry
- Sixteen 45 feet containers with trailers - two or three ferries
- Fully electric ferry and transport chain

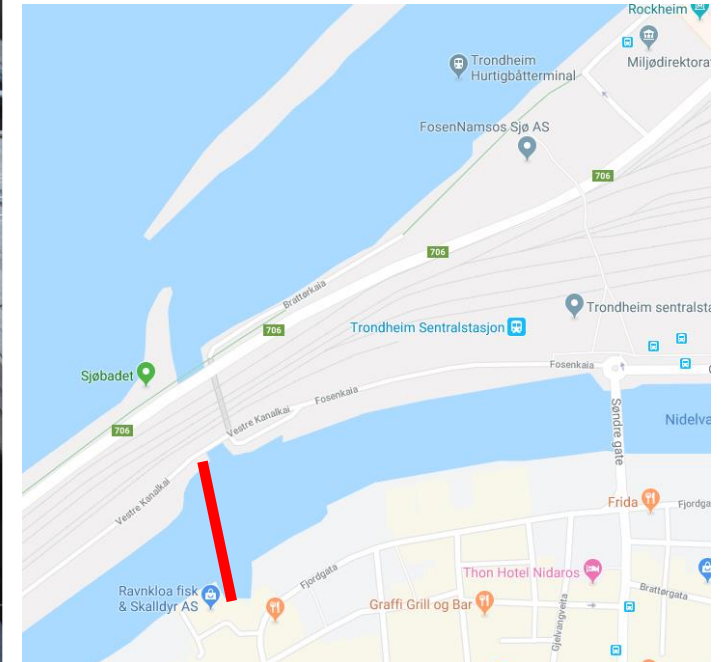




# Autoferry

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- Avoid bridges
  - Blocks other ships, costly
- Flexible and lower cost
  - On-demand operations
  - Only around 80 m distance
  - 24x7 operation without crew
- Environment
  - Battery operation
  - Silent, no congestion
  - Better use of infrastructure



# Automatic road ferries

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Picture: Fjord1



# Autoship – a new EU R&D project



Coordinator: Ciaotech Srl (PNO Group)  
Total project cost: €27,679,830  
EU Contribution: €20,109,109  
Duration: 42 months (from 06/19)

AUTOSHIP will build and operate vessels and their shore control and operation infrastructure to TRL7:

- One inland case
- One short sea case



The project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement N°815012.



# Norwegian Forum for Autonomous Ships

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- Established October 4th 2016
- Operated as a joint industry project at SINTEF Ocean.
- General Manager is Mr. Ørnulf Jan Rødseth.
- A board of governors overseeing operations. General assembly approves budgets and strategies.
- 47 Institutional Members
  - Including Industry, authorities, class, insurance research, universities, ports ...
  - 2 other institutions as personal members



<http://nfas.autonomous-ship.org>

# International Network for Autonomous Ships



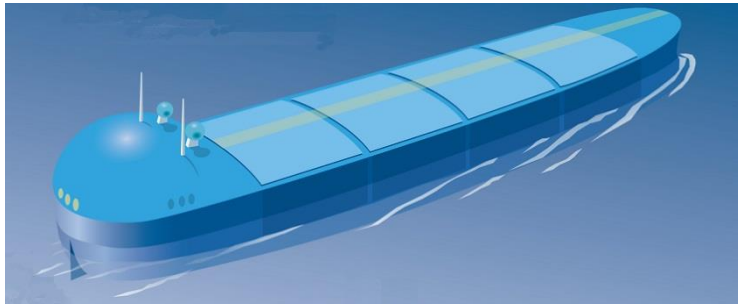
- Agreed on at meeting in Oslo  
Oct. 30th 2017
- Hosted by NFAS and SINTEF  
Ocean
- 13 active countries
- 2 correspondent countries
- 3 regional organizations



# **Why autonomous ships ?**



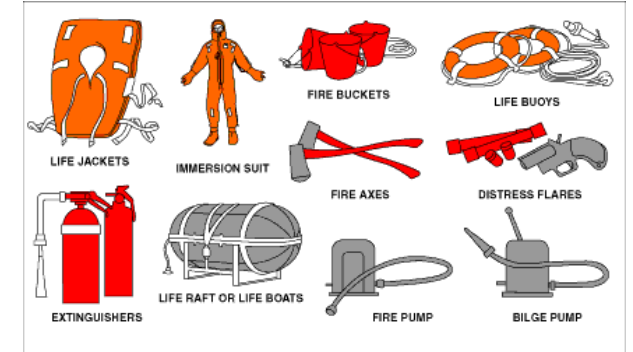
# Fully unmanned gives most benefits!



No accommodation  
Less power  
More cargo



No safety equipment  
New constructions



NCE Maritime Clean Tech & NCL

**Enables completely  
new transport system  
concepts**

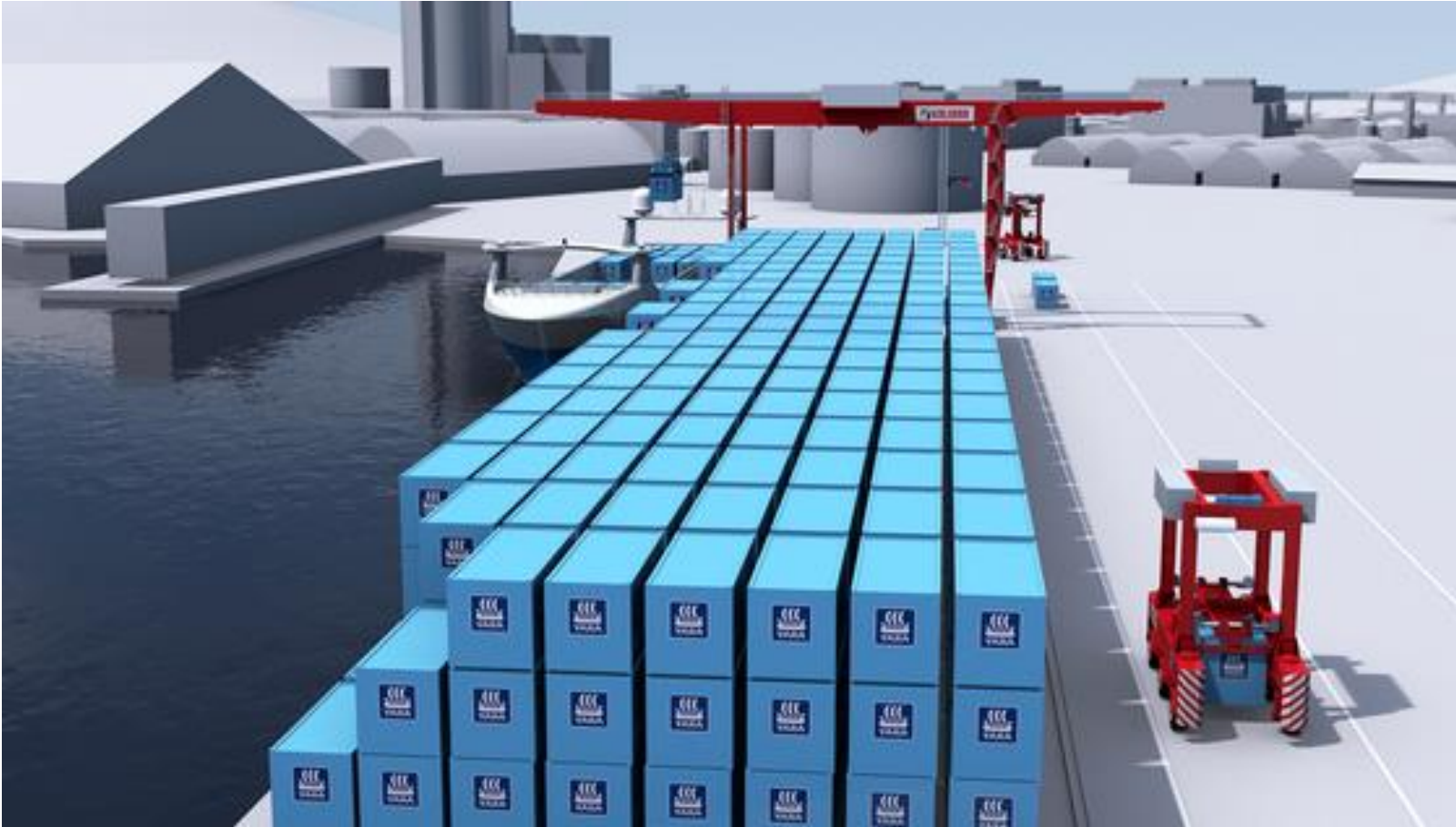


No crew  
No crew related costs



# Automation and integration into supply chain

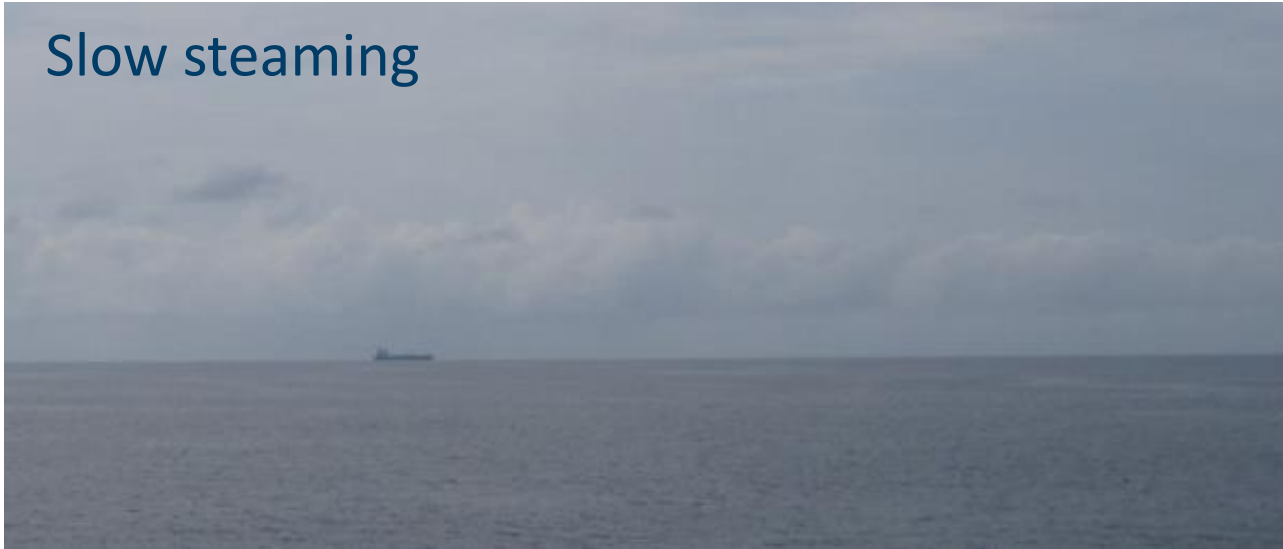
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- Automation
- Last mile, door to door
- Industrial shipping
- Just in time
- Storage on ship

# Reduction of GHG – 50% by 2050

Slow steaming



New and more expensive fuels

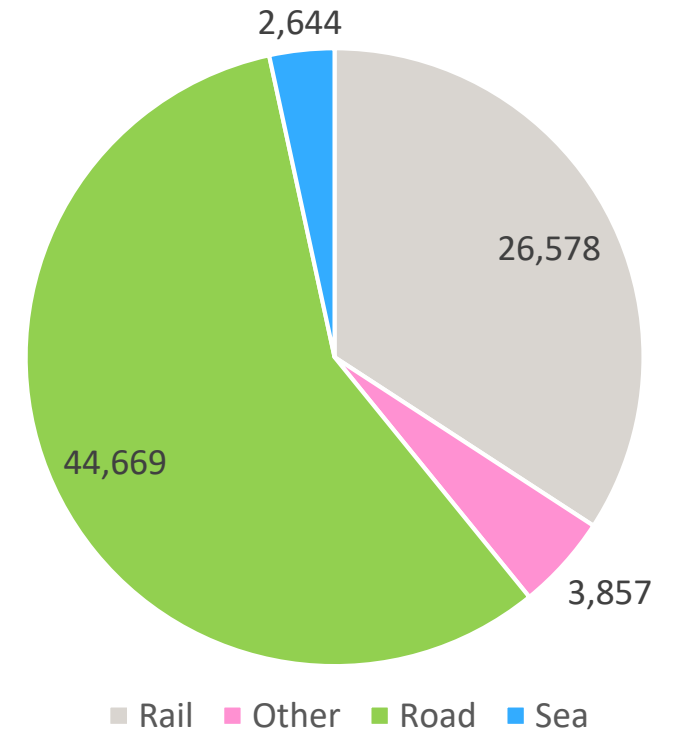


Green energy generally have low energy density and high price. High energy efficiency is critical for use of the technology.



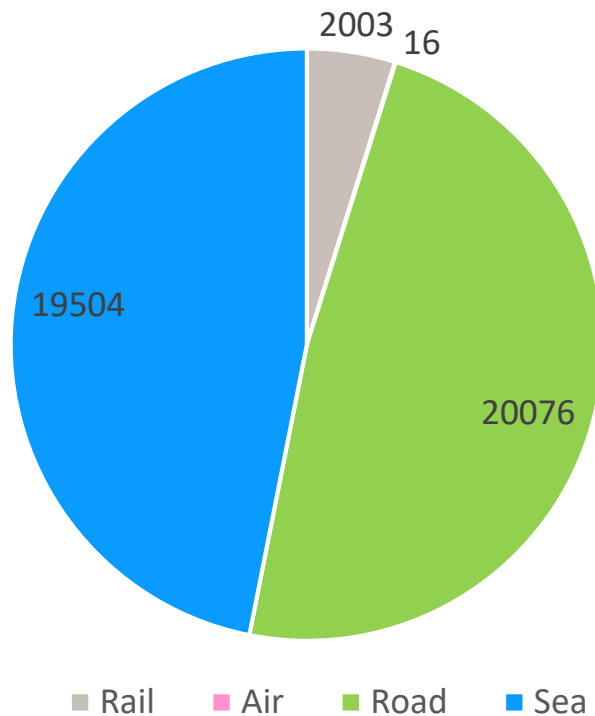
# Reduce road use and congestion

- Reduce investments in expensive infrastructure
- Reduce congestion
- Reduce noise, dust and other pollution
- Increase energy efficiency



National Transport Plan in Norway: Planned investments in million NOK (2018-29)

# ... at a fraction of the cost



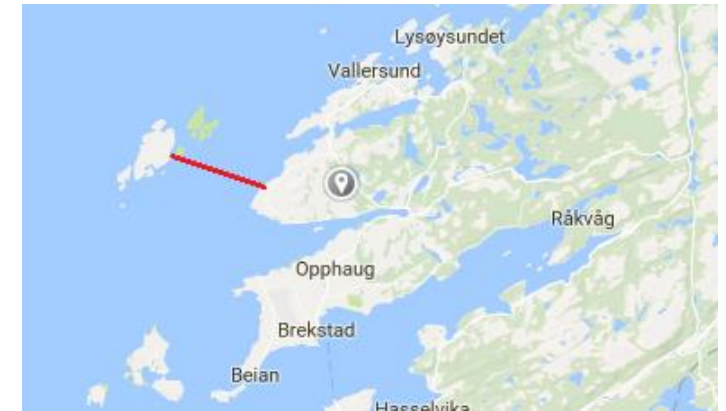
Cargo transport in Norway in million ton-km (2017)

- Short sea fleet is old and needs replacement
- Need to stop growth in road transport
- Wish to further reduce road transport

# New and flexible sea transport for persons/cars

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- Low volume, but important connections
- As alternative to expensive bridge or tunnel projects
- Smaller vessels, higher frequency/on demand



# New energy sources are challenging



Li\_Ion Battery: © PBES

1 ton Li-Ion ~ 50 kg HFO



Hydrogen fuel cell  
© CommScope/Flickr

6 litres H<sub>2</sub> (700 bar) ~ 1 litre HFO

High volumes and weight  
compared to HFO.

New risk factors.

High costs.

Smaller ships, slower,  
unmanned?



A convergence is happening now!

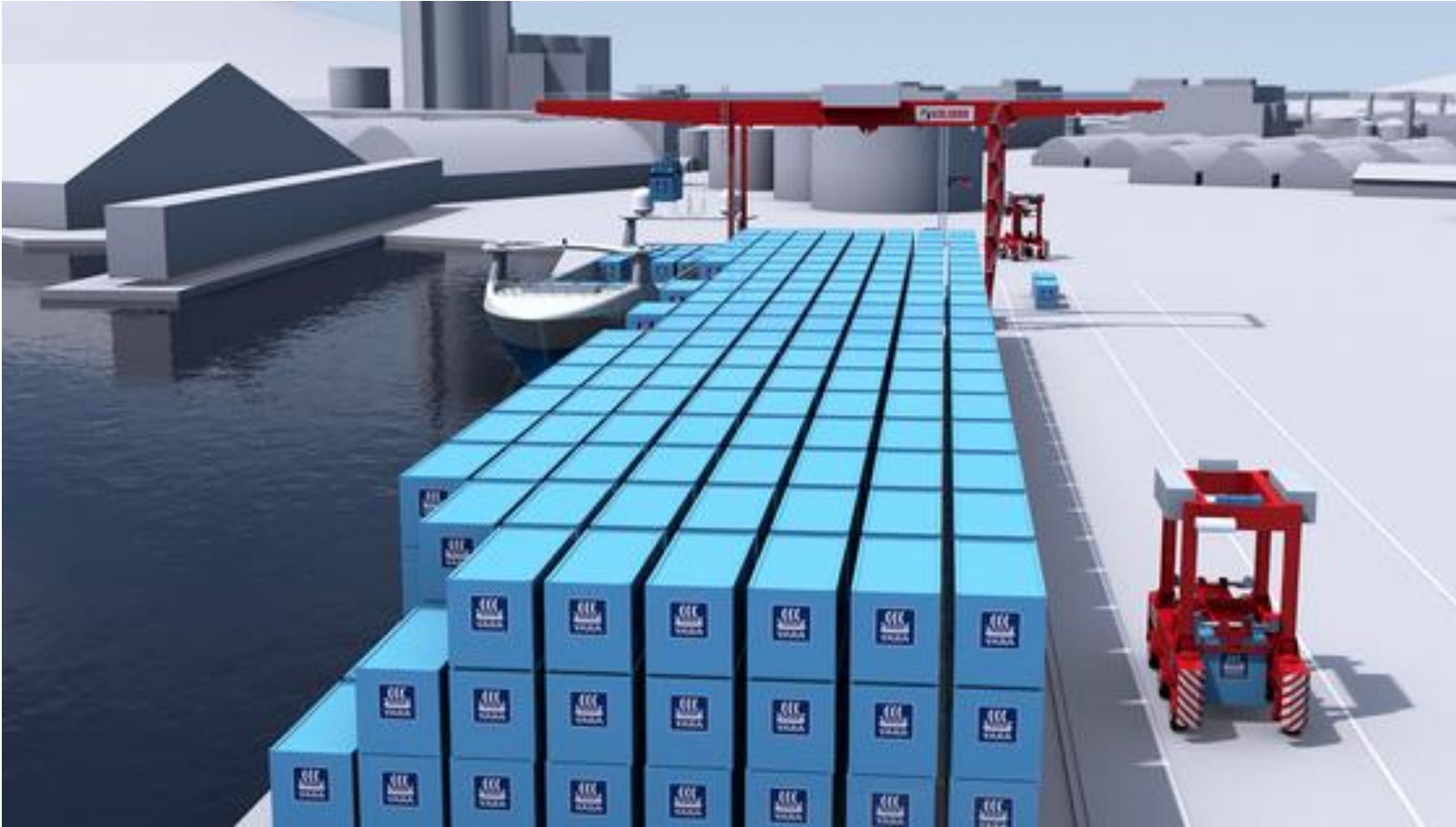
# Very high public focus on sustainability!

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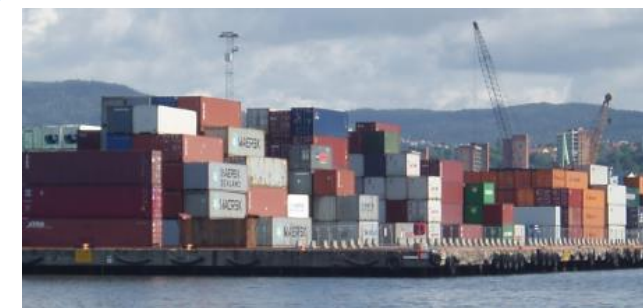
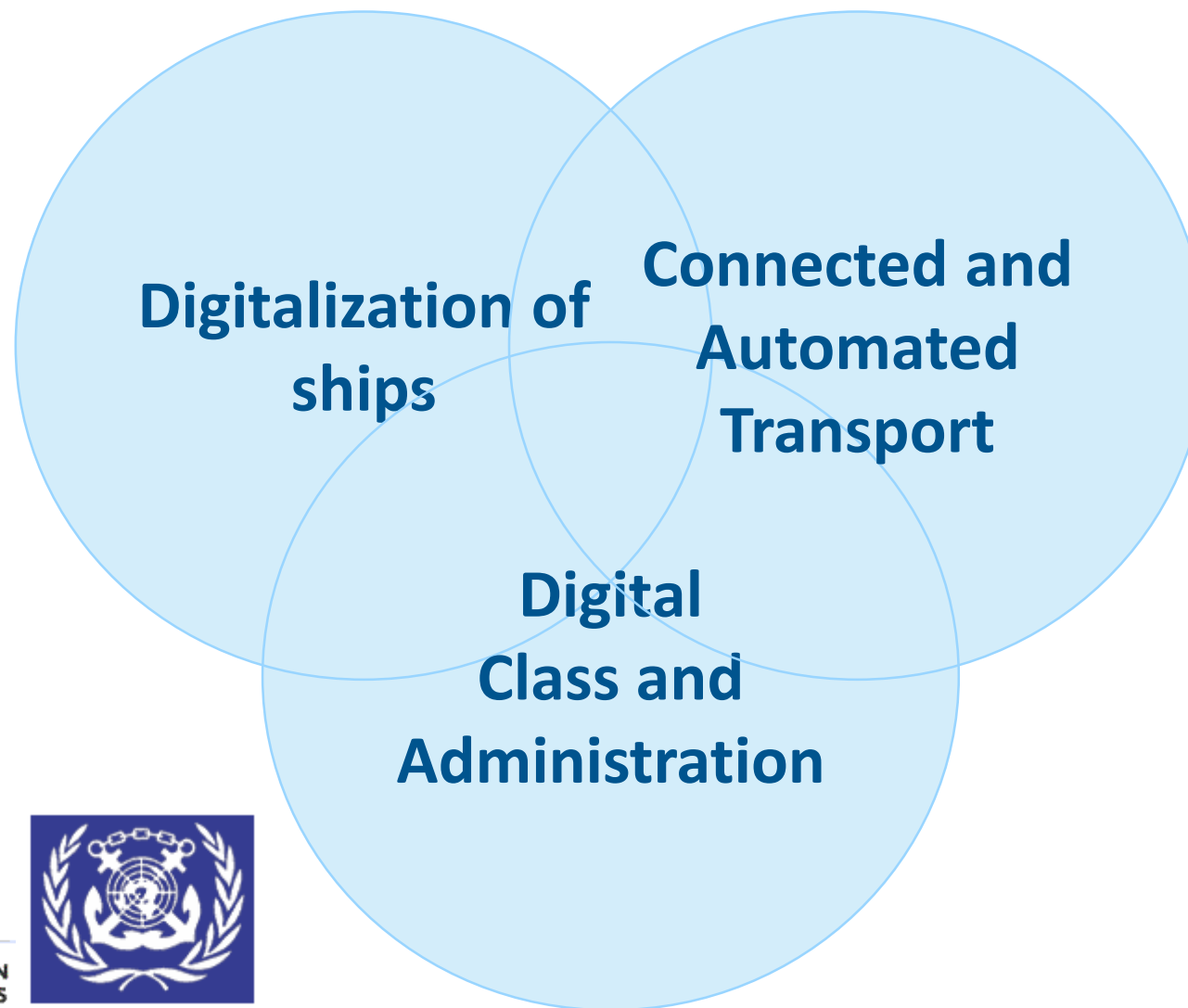
# More automation of physical processes

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- Cargo handling
- Cargo storage
- Berthing
- Mooring
- Charging

# More automation of administrative processes





# Creating the future automated transport system



Ship and port operations



Connected and Automated Transport (CAT)

This makes it interesting for other parties to enter the business, e.g. cargo owners and logistics operators.

# New parties coming into shipping?

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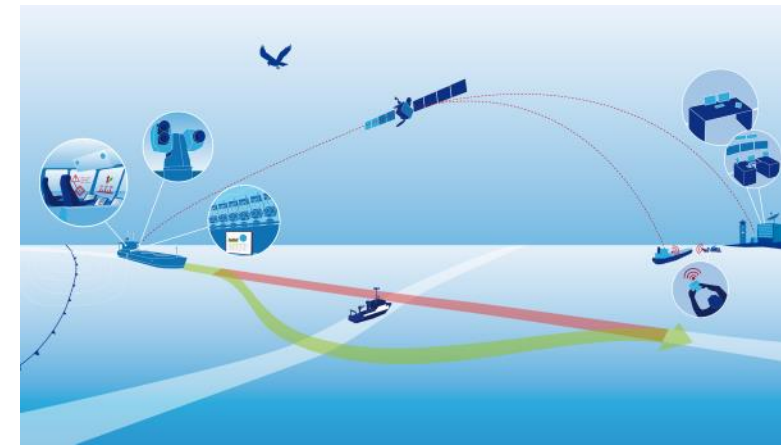
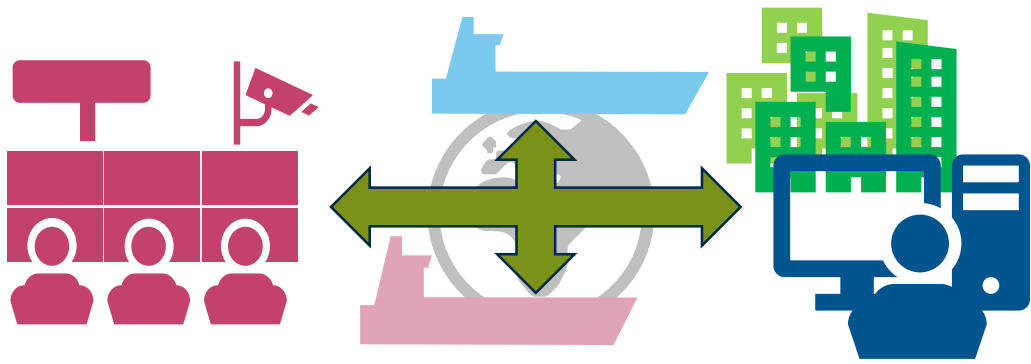


**A|S|K|O**  
– vi forsyner Norge med mat



Consequences?





**Not only autonomous ships, but also**

**Maritime Intelligent Transport Systems (ITS)**

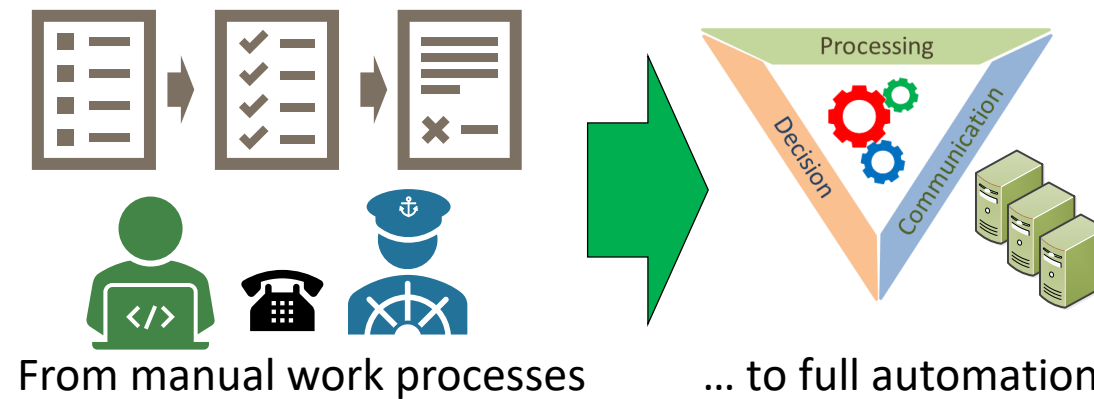
**Smart Ships**

**e-Maritime / e-Navigation**

**Internet of Services at Sea**

# Commonality: Automation of work processes

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**Computer readable  
information**

**Exact and  
unambiguous  
information**

**Digital trust**

# What processes ?

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- Transmit own intentions to other ships (particularly for autonomous)
- Maritime safety information, notices to mariners

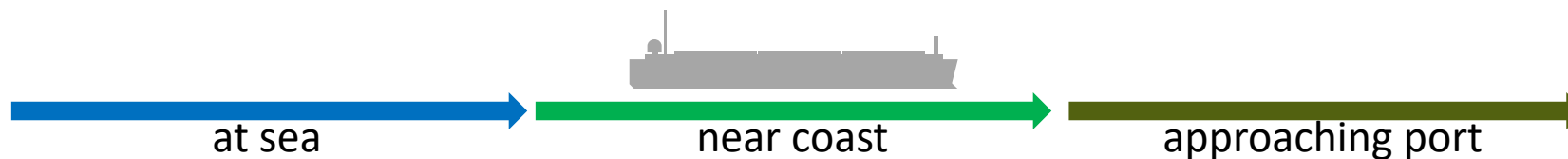




# What processes ?

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- Transmit own intentions to other ships (particularly for autonomous)
- Maritime safety information, notices to mariners
- Digital (virtual) AtoN
- Routine communication with VTS



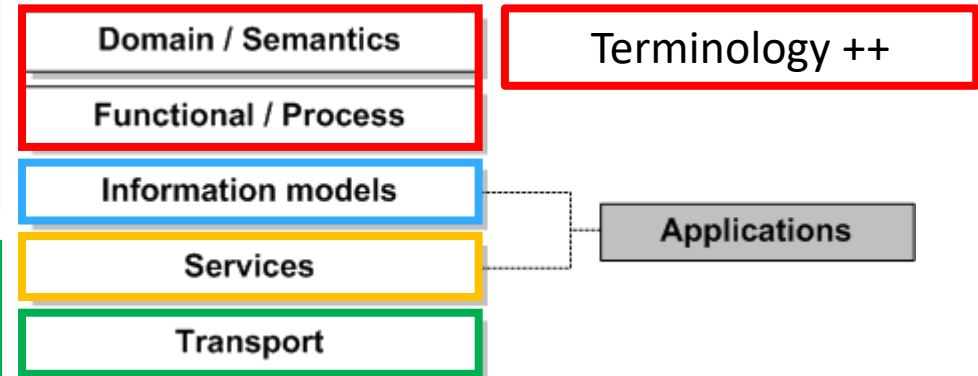
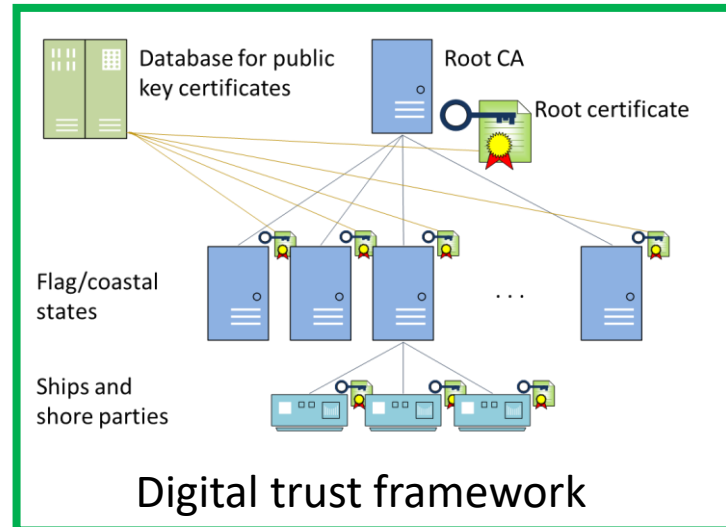
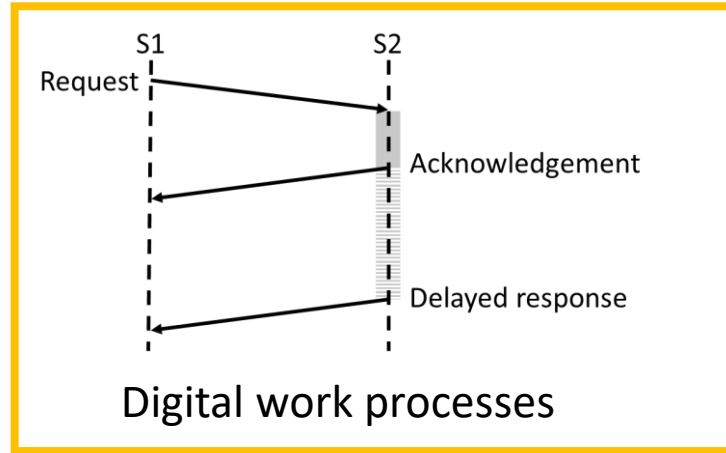
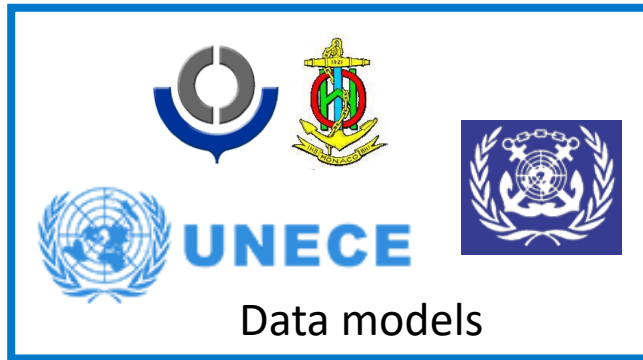
# What processes ?

---

- Transmit own intentions to other ships (particularly for autonomous)
- Maritime safety information, notices to mariners
- Digital (virtual) AtoN
- Routine communication with VTS
- Remote pilotage
- Communication with tugs and mooring systems



# Automation of digital processes: ICT Architecture



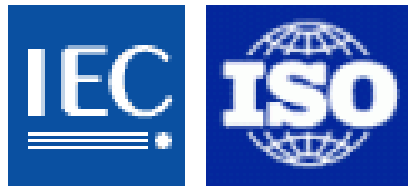
# Data modelling work in IMO and by others



IMO FAL ship reporting  
harmonization group



Harmonized Data Modelling  
Group – S-100



Individual data modelling  
developments in IEC and ISO



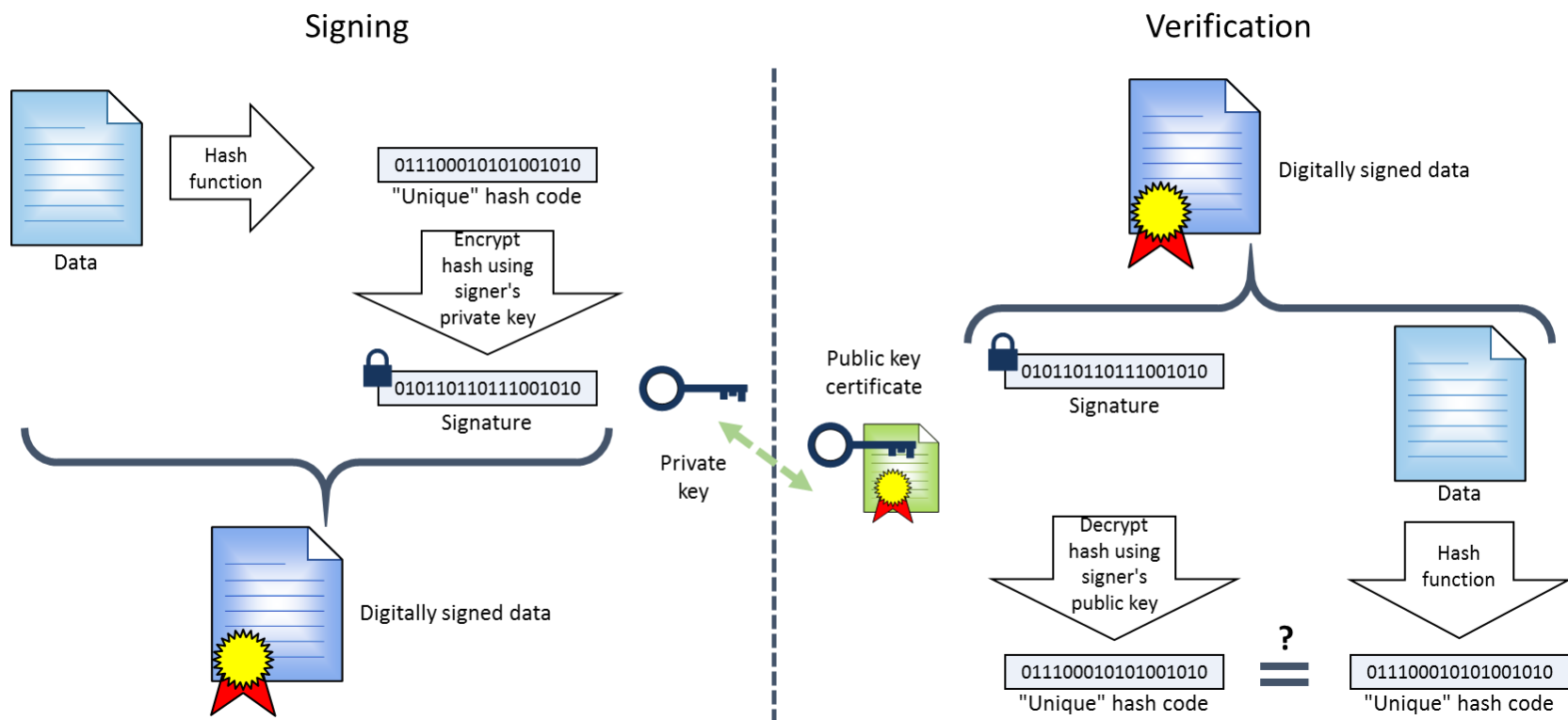
Digital Transport  
Logistics Forum, EMSA, EU



IMO Data Reference Model  
FAL IMO Expert Group on data Harmonization (EGDH)



# Digital signatures for trust in automation



Confidentiality

Integrity

Authentication

Non-repudiation

# Conclusions

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- Autonomous and automated ships are coming
- Much driven by increased focus on sustainability
- This requires digital and automated work processes
- Data models and digital trust are important enabling technology
- **This requires close cooperation between stakeholders**



Teknologi for et bedre samfunn