UPDATE FROM NORWAY AND INAS

Ørnulf Jan Rødseth, Senior Scientist, SINTEF Ocean
Manager, Norwegian Forum for Autonomous Ships
OrnulfJan.Rodseth@sintef.no

Norwegian Forum for Autonomous Ships

- 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.
- 45 Institutional Members
  - Including Industry, authorities, class, insurance research, universities, ports …
  - 2 other institutions as personal members

NFAS Norsk Forum for Autonome Skip

http://nfas.autonomous-ship.org

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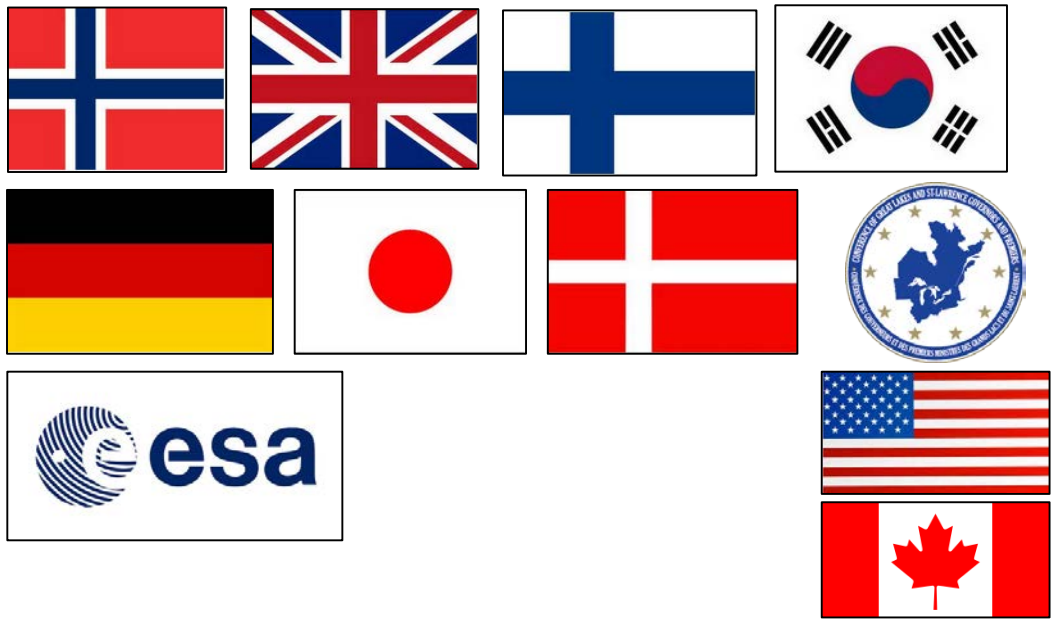
International Network for Autonomous Ships

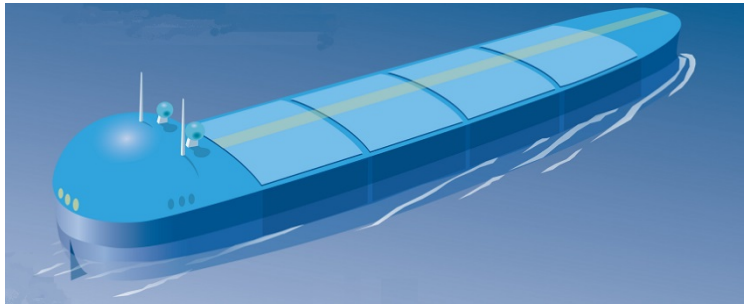
- Agreed on at meeting in Oslo Oct. 30th 2017
- Hosted by NFAS and SINTEF Ocean
- 22 participants at meeting
- Currently 9 nations with own membership organizations
- 29 nations on mailing lists



http://www.autonomous-ship.org/

Some context

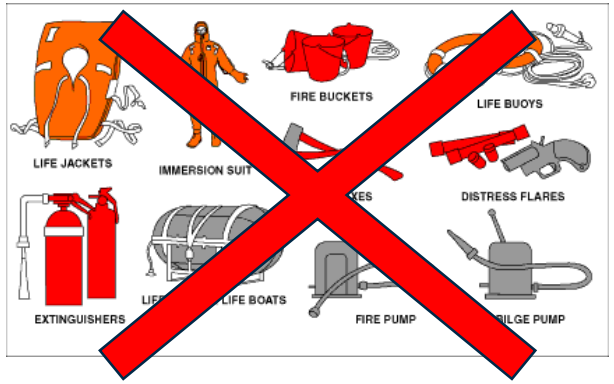
Unmanned gives the most interesting benefits



No accommodation

Less power

More cargo



No safety equipment

No voluntary speed loss

New constructions

Enables completely new

transport system concepts

No crew

No crew related costs

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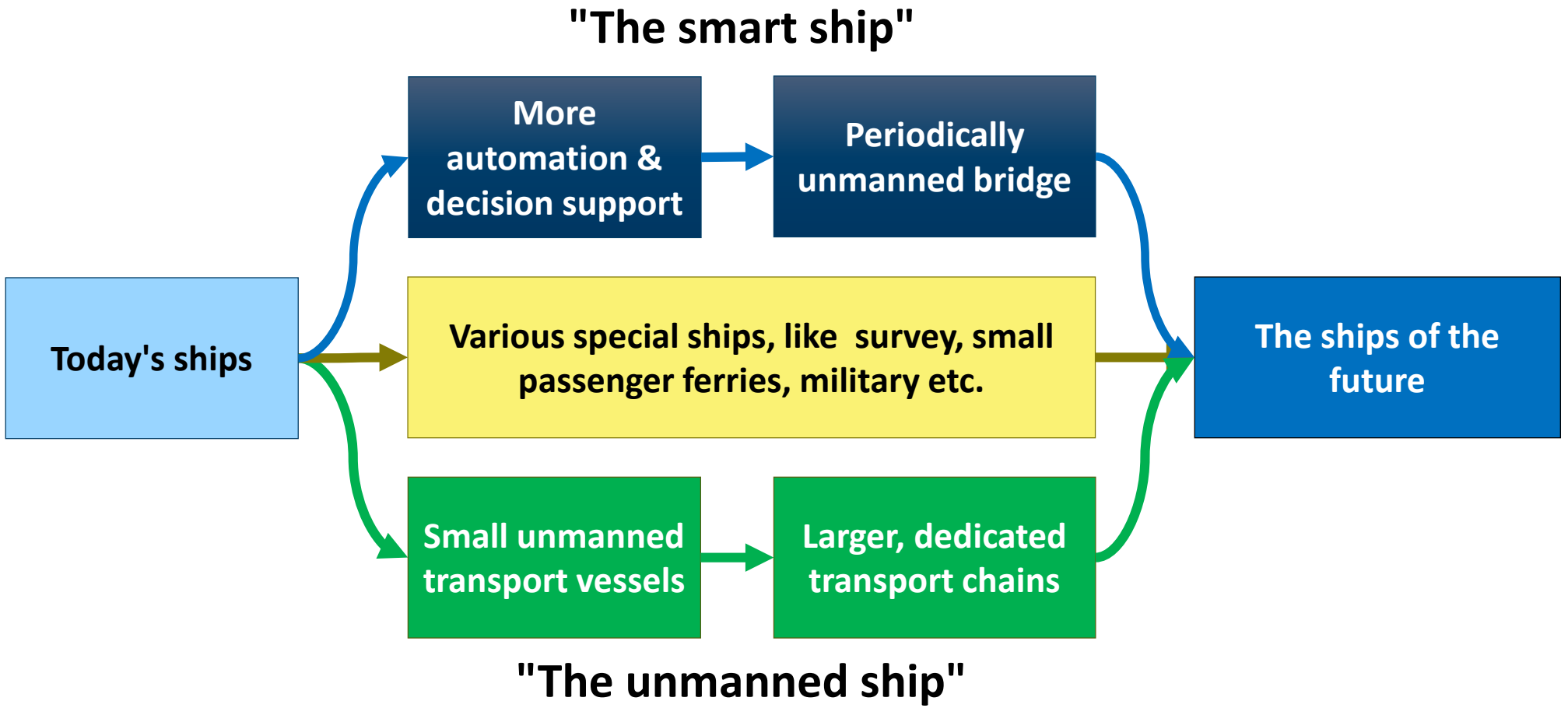
Unmanned and Smart ships



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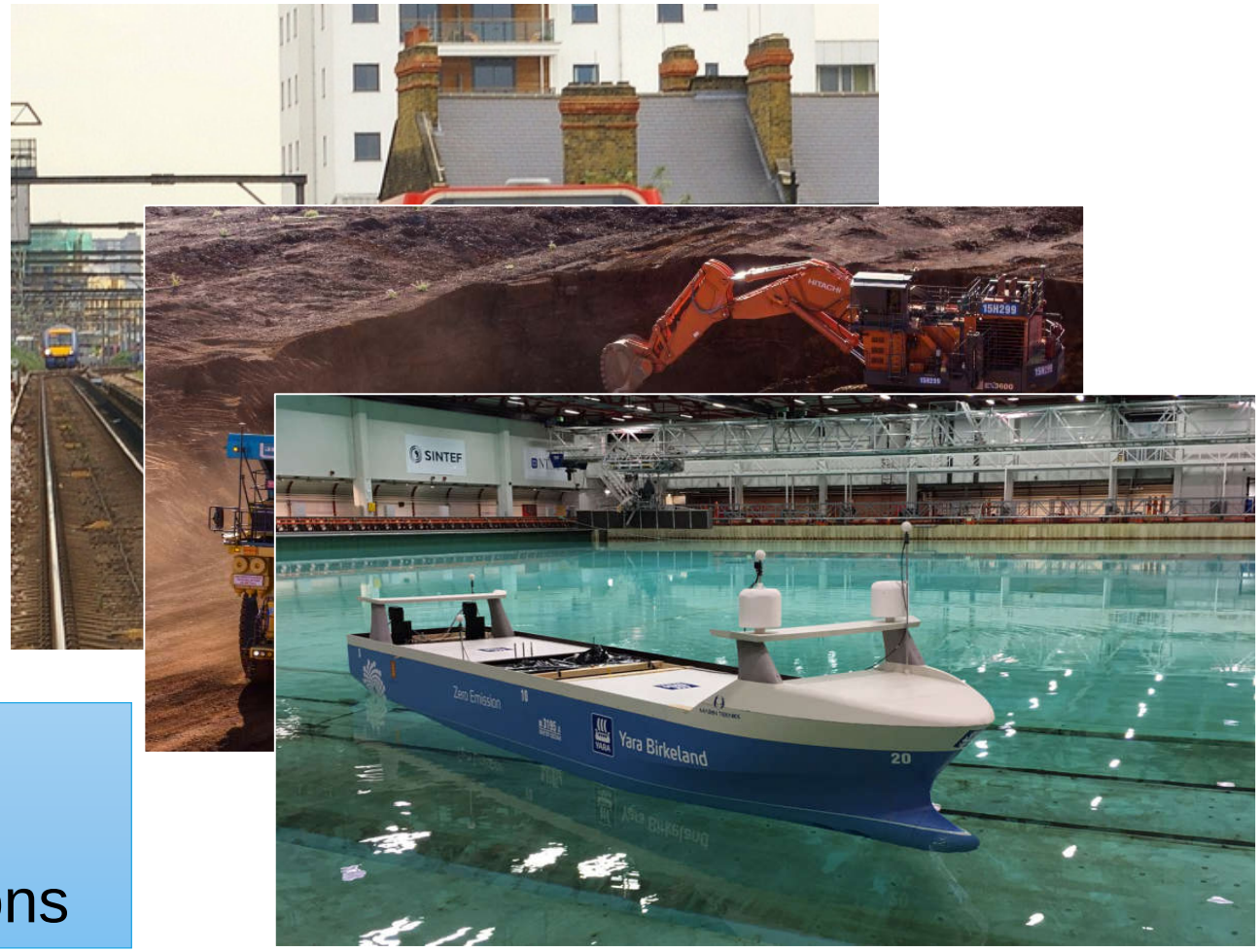
Industrial autonomous system

- Cost-effective in commercial operations
- High value asset
- High damage potential if used improperly



- Autonomy is a means, not a goal
- Keep it simple and stupid (KISS)
- Absolute determinism in operations

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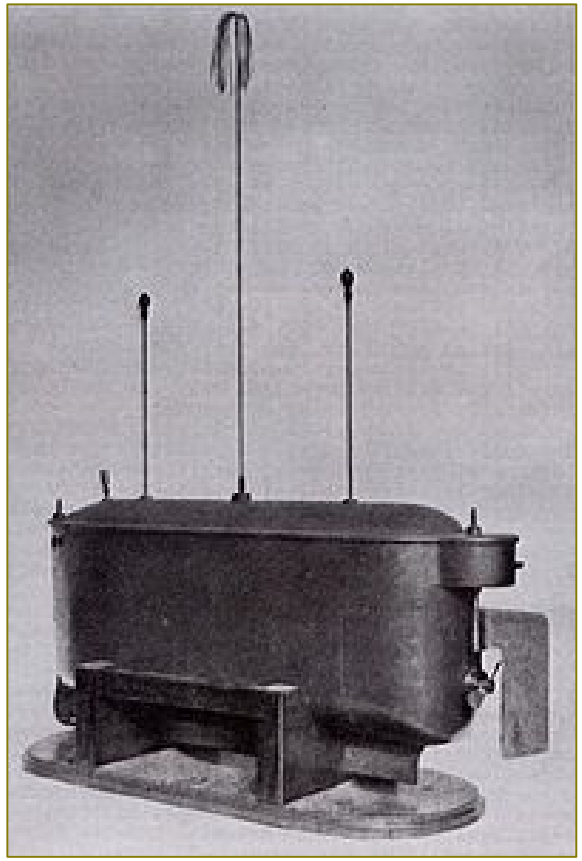
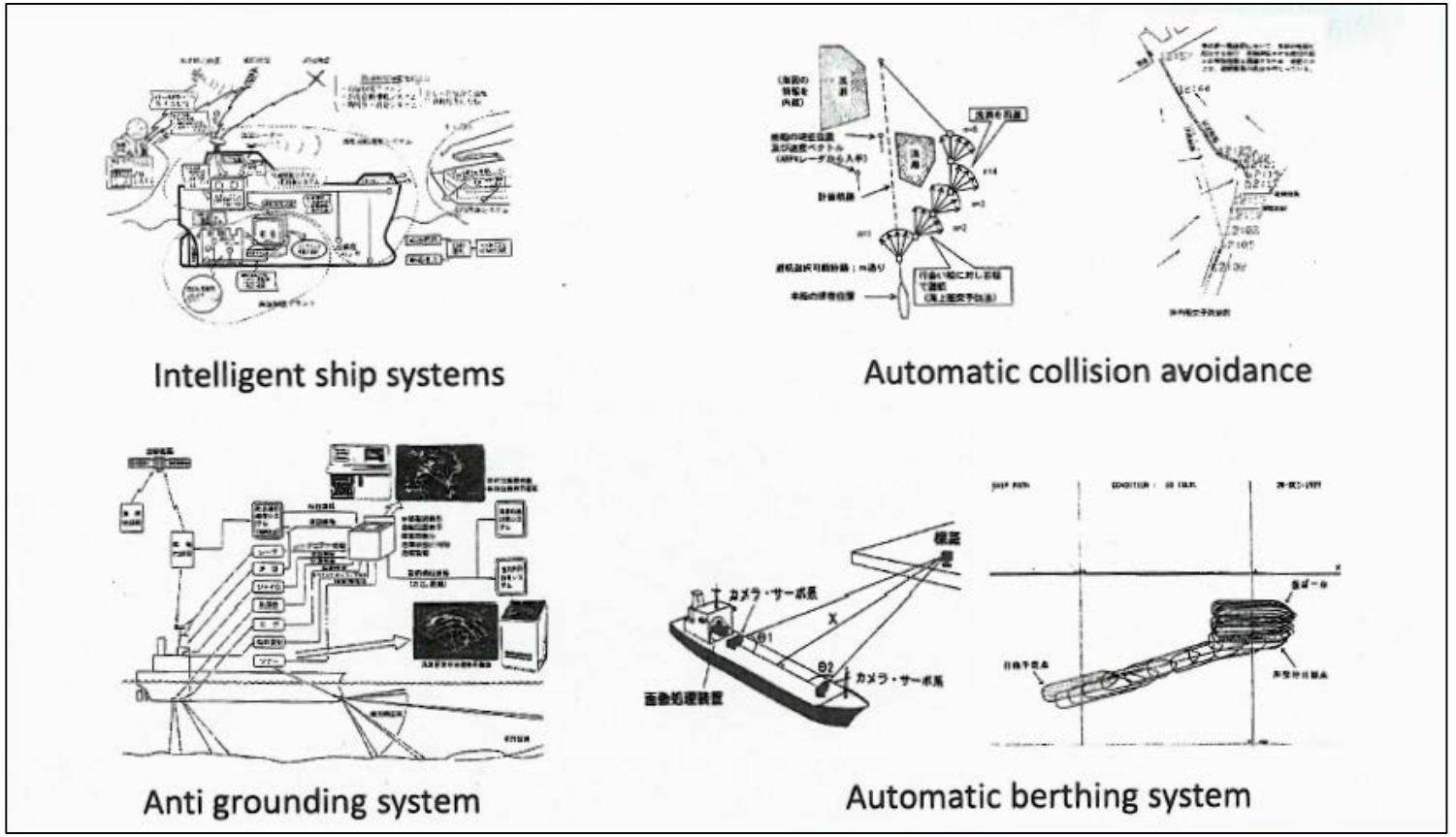
Remote controlled ships are not new!



Nikola Tesla 1898

Various papers in "Bulletin of the Society of Naval Architects of Japan", Vol 721-729



Japan 1982-1988: Highly reliable intelligent ship project

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LP Odyssey (SeaLaunch)

Photo: Frank Leuband/Wikimedia

In operation:
1999-2014

Unmanned and remote control during launch: Dynamic posititioning

Class: DNV-GL
Flag: Liberia

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Why can it succeed this time?

Connected and Automated Transport (CAT)

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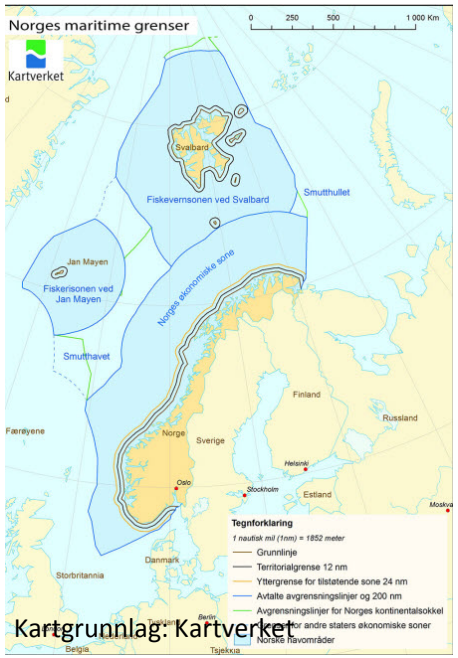
Norway

Why Norway?



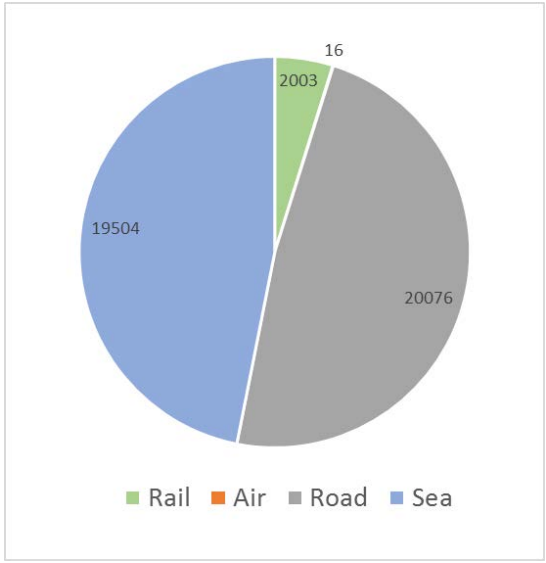
Kartgrunnlag: Kartverket

Coast: 100 000 km
Mainland: 85 000 km
Sea border: 2650 km

A complete maritime cluster.

Maritim Verdiskapingsbok 2015, Maritimt Forum, Norge

14% of value creation from businesses
38 % of export (ex HC)



A big role in inland cargo transport – that needs to be increased

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Further improve efficiency of ship transport

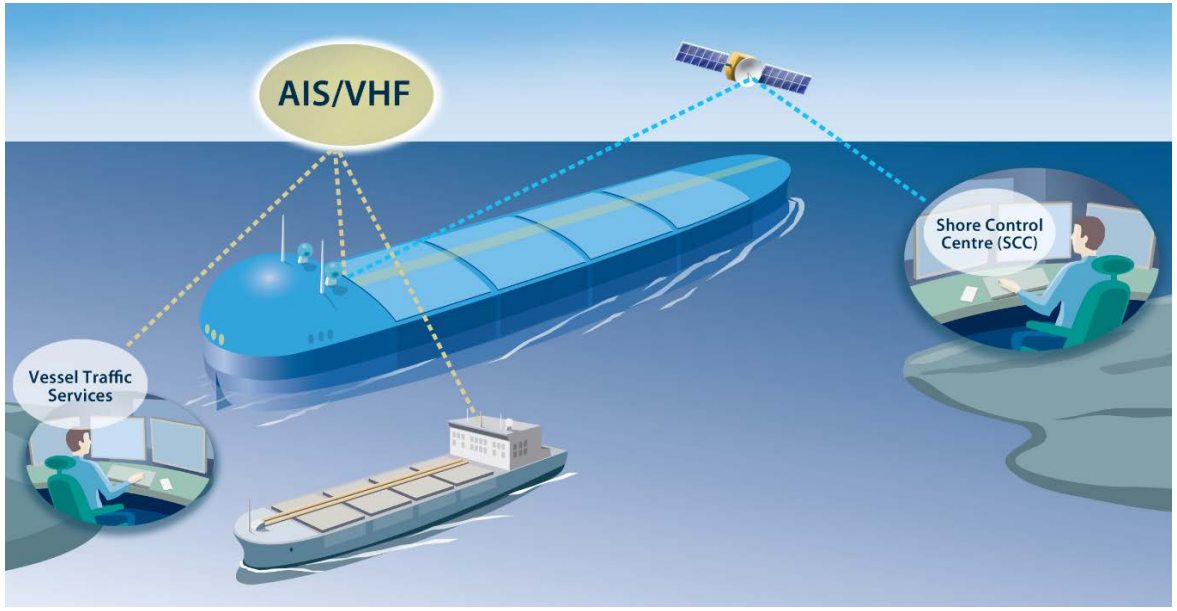
Lower weight: 700 – 1000 tons

Wind resistance: ~ 1% savings

No hotel load: 200 – 270 kW

Lower speed?

Nominal engine effect: ca. 4 MW



20 000 dwt: "Easy" savings: 10-15%

Rolls-Royce/Oscar Levander 2016

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Contributes to non-carbon transport solutions

Li-Ion battery: © PBES

1 ton Li-Ion ~ 40 kg oil

Hydrogen fuel cell
© CommScope/Flickr

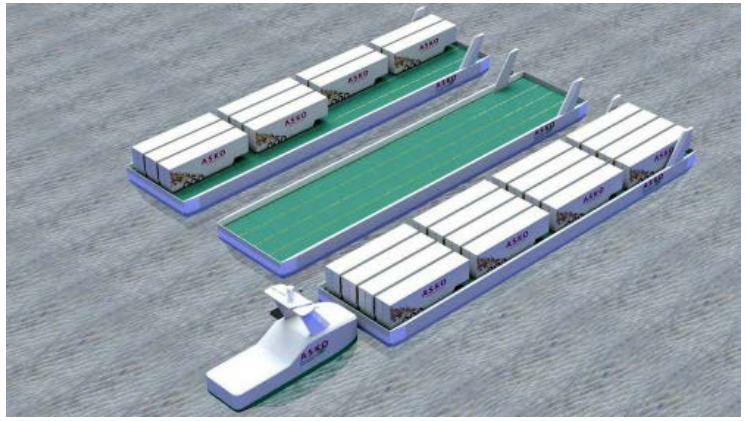
6 liter H_2 (700 bar) ~ 1 liter oil

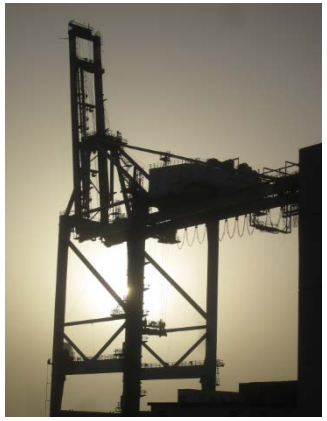
Green energy generally have low energy density.

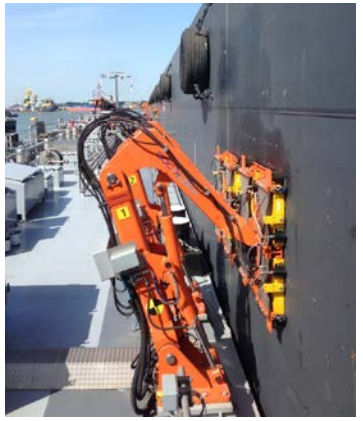
High energy efficiency is critical for use of the technology.

Small size ships also helps!

Improved logistics systems







Reducing total logistics costs and environment impact:

- More flexible transport, smaller ports – more frequent
- Less storage in port, warehouse on ship, less cargo lifts
- Integrated logistics, ship is only one component
- More automation, less crew, less occupational hazards

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Transfer cargo from road to waterborne

- More flexible transport systems
- Smaller, battery operated daughter vessels
- Higher frequency
- Towards door-to-door transportation


Short Sea Pioneer

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Better transport services in rural areas

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Better use of urban waterways

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

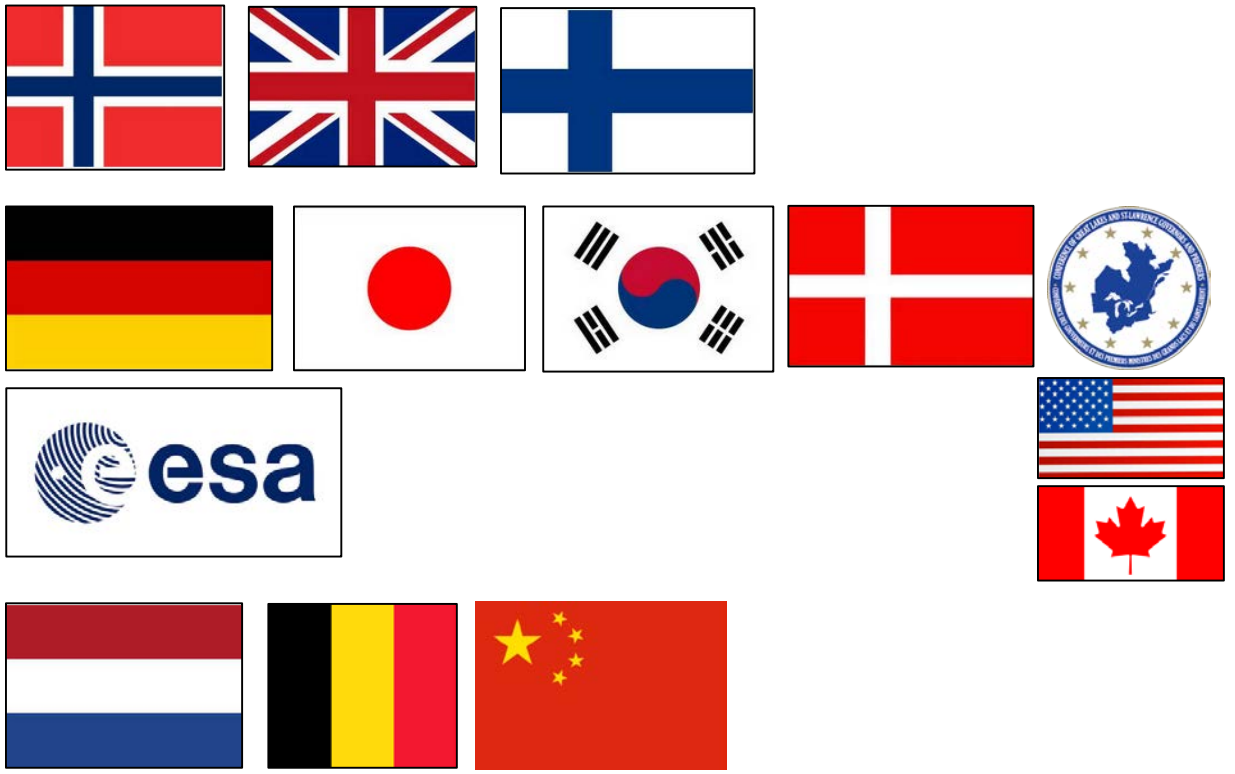
Amsterdam Roboat, Fotocredits: Moyan Br

Internationally (seen from INAS)

Growing international interest

INAS
International Network for Autonomous Ships

- End 2017: 3 full members
- End 2018: 9 full members
- High activity: 3 more nations



http://www.autonomous-ship.org/

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Several guidelines and white papers published

- DNV GL Class guidelines: Autonomous and remotely operated ships, Edition 2018-09
- Bureau Veritas: Guidelines for Autonomous Shipping, December 2017
- Lloyd's register Cyber enabled ships guidelines and procedures
- Maritime Autonomous Systems Regulatory Working Group (UK): Voluntary Industry Code of Practice - Maritime Autonomous Surface Ships
- Class NKA Guidelines for Concept Design of Automated Operation/Autonomous Operation of ships
- CEFOR: Autonomous ships - zooming in on liability and insurance

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Autonomous ship test area guidelines

MSC 99/INF.13: Establishing international test area "Jaakonmeri" for autonomous vessels. Submitted by Finland.

MSC 100/5/3: Proposals for the development of interim guidelines for Maritime Autonomous Surface Ships (MASS) trials. Submitted by Republic of Korea.

MSC 100/5/2: Interim guidelines for MASS trials. Submitted by Norway and BIMCO. Maritime UK: An Industry Code of Practice A Voluntary Code Version 2, November

2018. Maritime Autonomous Surface Ships up to 24 metres in length (HTML).

Code of conduct for tests in Belgium/Flanders (DOCX).

Policy rules for experiments with extensive automated navigation in state waterways (Dutch only - google translate works ok).

International Maritime Organization
MASS Scoping Exercise

The Committee (MSC) established a Correspondence Group on MASS, under the coordination of Finland, and instructed it to (May 2018):

1. in order to test the framework, in particular the methodology agreed for the regulatory scoping exercise, as set out in annex 1 of document MSC 99/WP.9, conduct an initial consideration of SOLAS regulations III/17-1 and V/19.2 and LL regulation 10 and, if time allows, SOLAS regulations II-1/3-4 and V/22;

2. make suggestions for improvement, as appropriate; and

3. submit a report to MSC 100.

New ISO Standard on terminology

Form 4: New Work Item Proposal

Circulation date: 2018-11-09 Closing date for voting: 2019-02-01	Reference number: ISO/NP 23860 (to be given by Central Secretariat) ISO/TC 8 N 1331
Proposer (e.g. ISO member body or A liaison organization) ISO/TC 8	
Secretariat SAC	

Scope of the proposed deliverable.

Definitions of terminology for description of MASS concepts related to automation of the operational processes of MASS. This includes the context of the MASS automation system as well as the automation systems themselves and their taxonomy.

Purpose and justification of the proposal*

Most current publications related to the operational aspects of MASS suffer from a lack of standardized terminology. This makes it difficult to compare approaches to automation, to division of responsibilities between human crew and automation and creates problems in defining unambiguous scopes of new studies into the subject. This standard will alleviate these problems and will create a common understanding of what MASS is and is not.

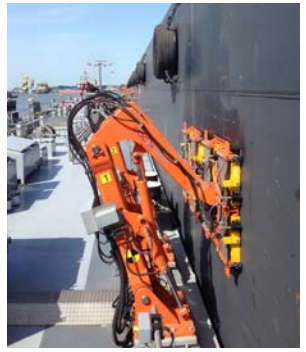
It is not likely that other organizations will undertake this task. IMO would be a natural candidate, but the work requires wider expertise and more details than an IMO working group can easily muster.

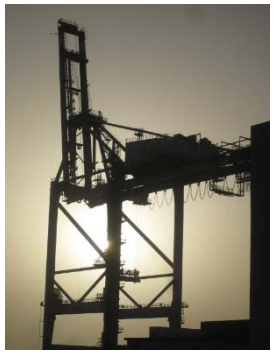
What can happen?

Unmanned ships come at a cost …

More expensive sensors and control system – cyber security

Continuously manned shore control centre

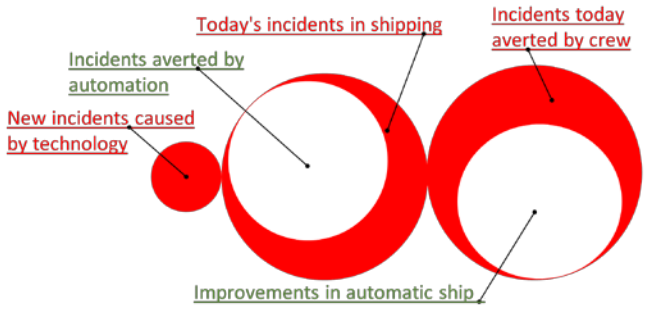




More and automated shore infrastructure

Long time until international legislation is in place.

No crew onboard: No HFO, more redundancy, more costly maintenance



Unclear risk picture and higher safety requirements

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It rules out tramp/voyage charters (for now)!

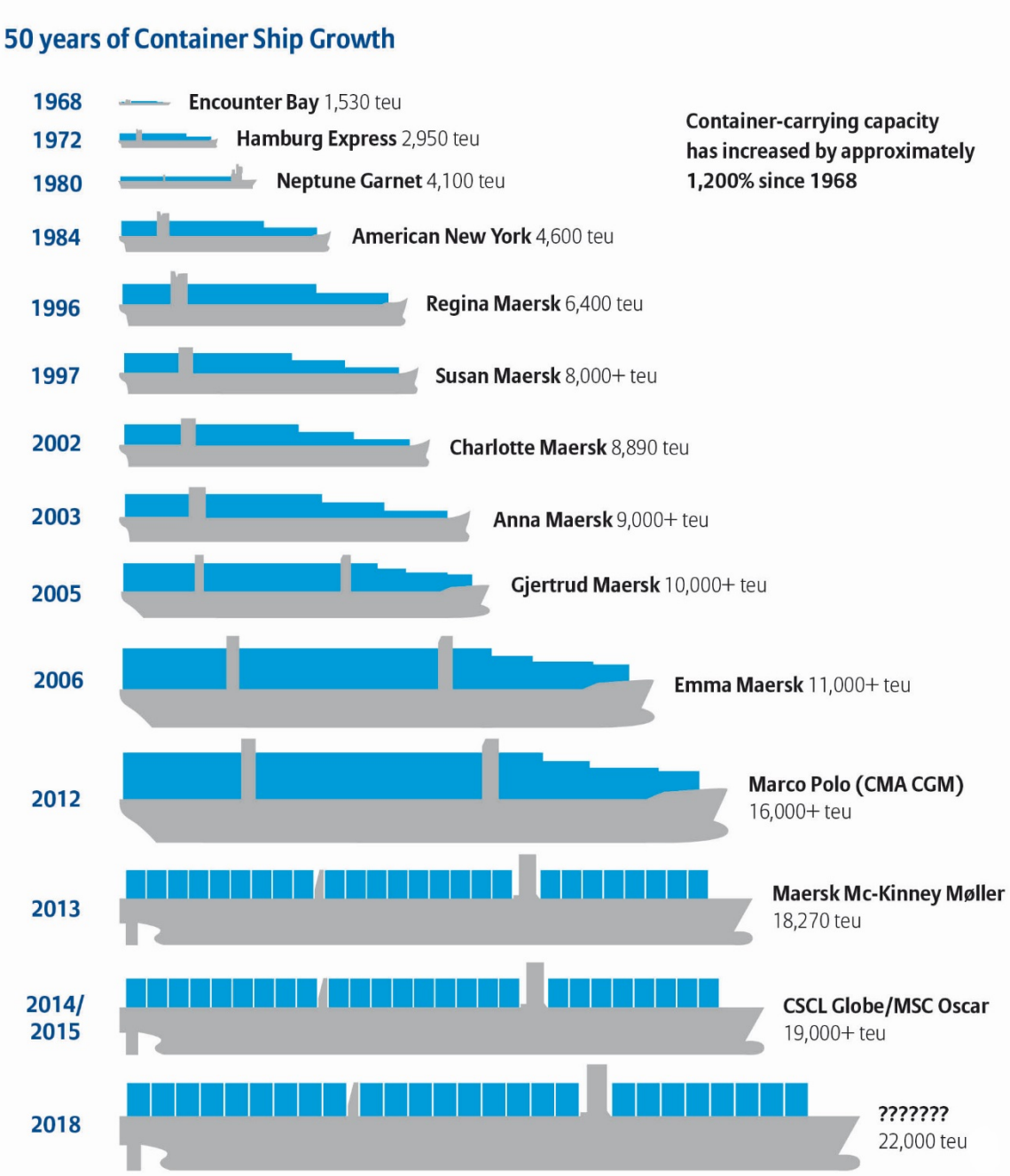
Because:

- Needs special infrastructure in port
- Needs trained personnel
- Needs agreement with port state and port
- Modifying this type of ship is too expensive

However, these factors will change with time!

Can defeat economy of scale

Enables completely new **transport system** concepts



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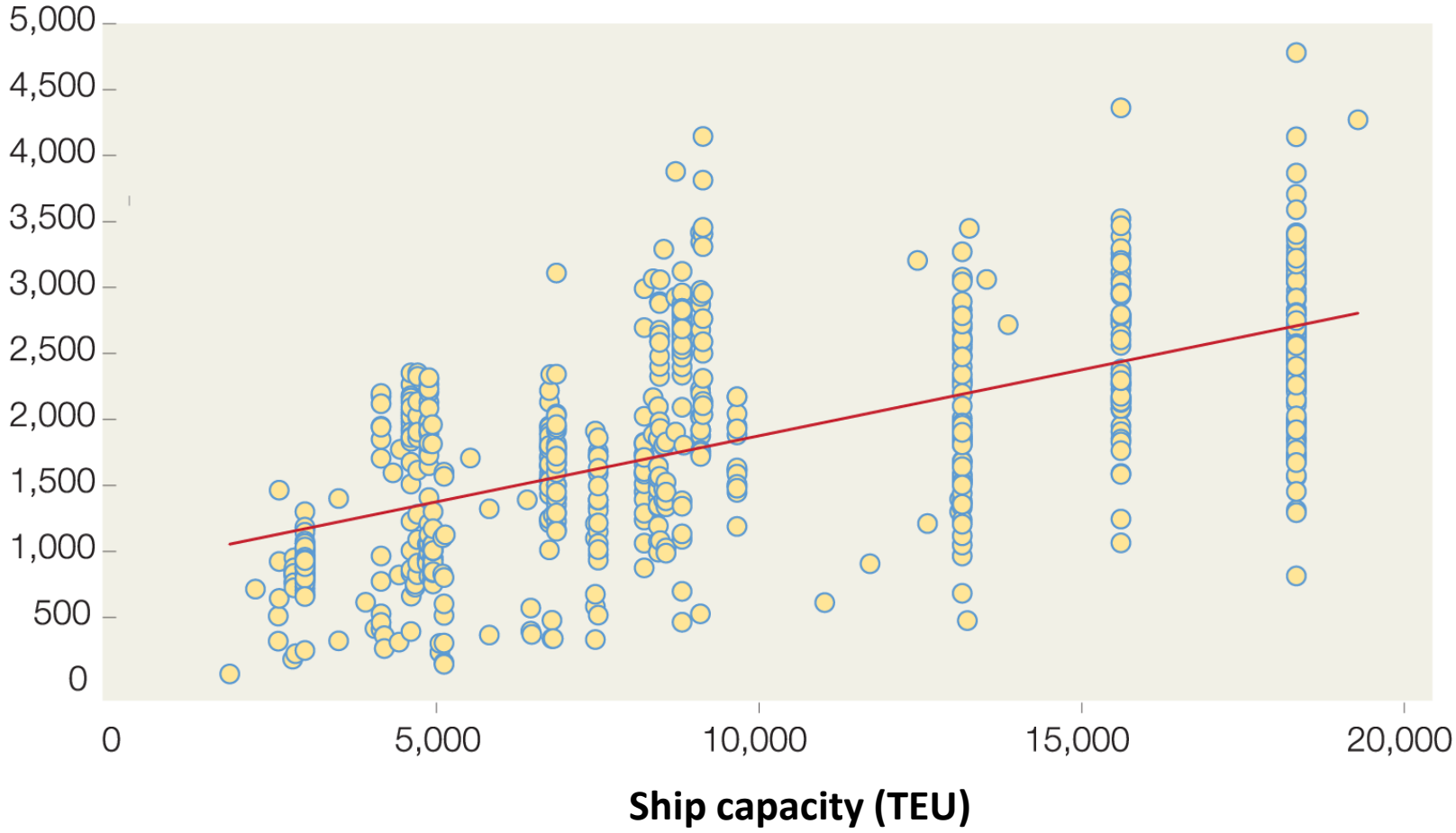
Efficiency of port call

Calls at large EU terminal 2014/15, n=697
How to rethink pricing at container terminals
By Timo Glave and Steve Saxon

McKinsey&Company



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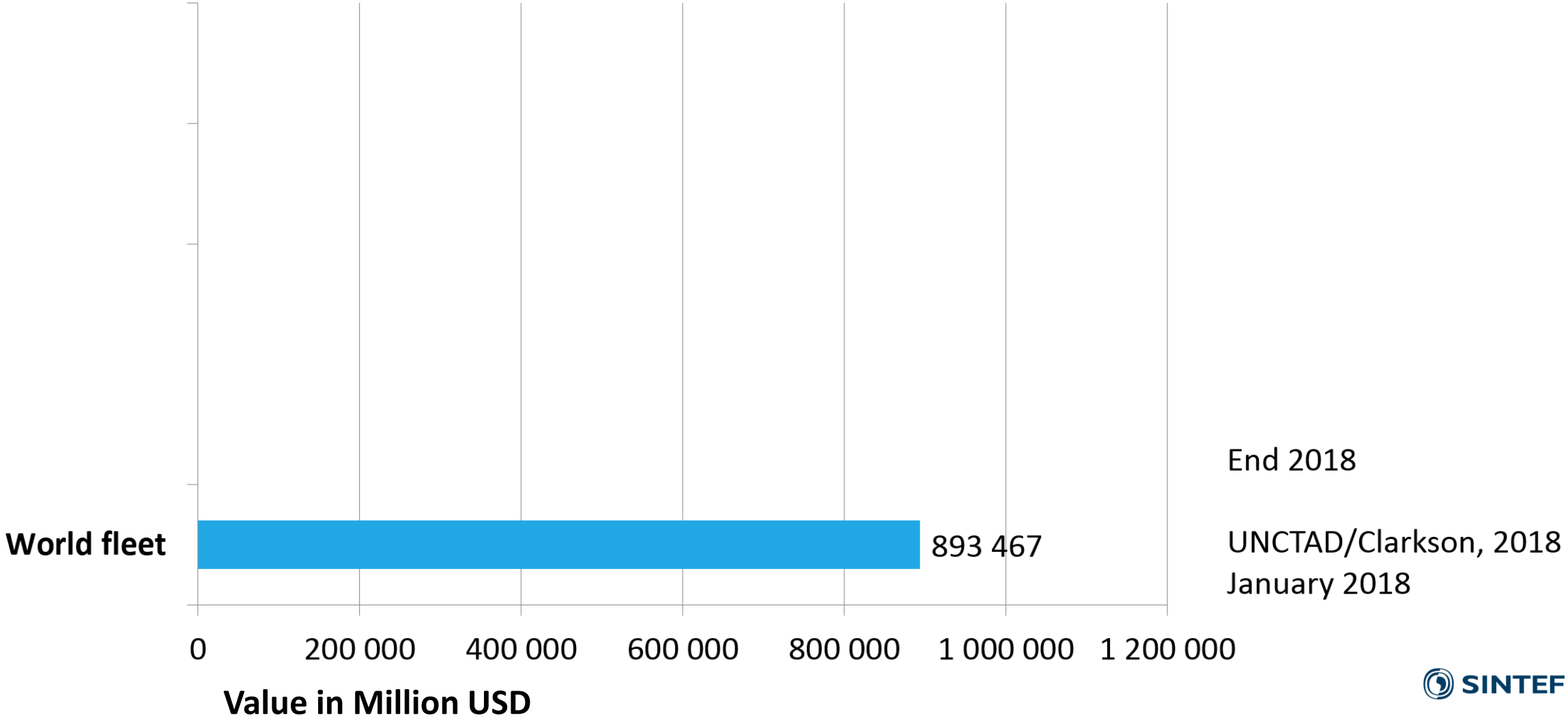
Comparable value of world fleet



End 2018

UNCTAD/Clarkson, 2018
January 2018

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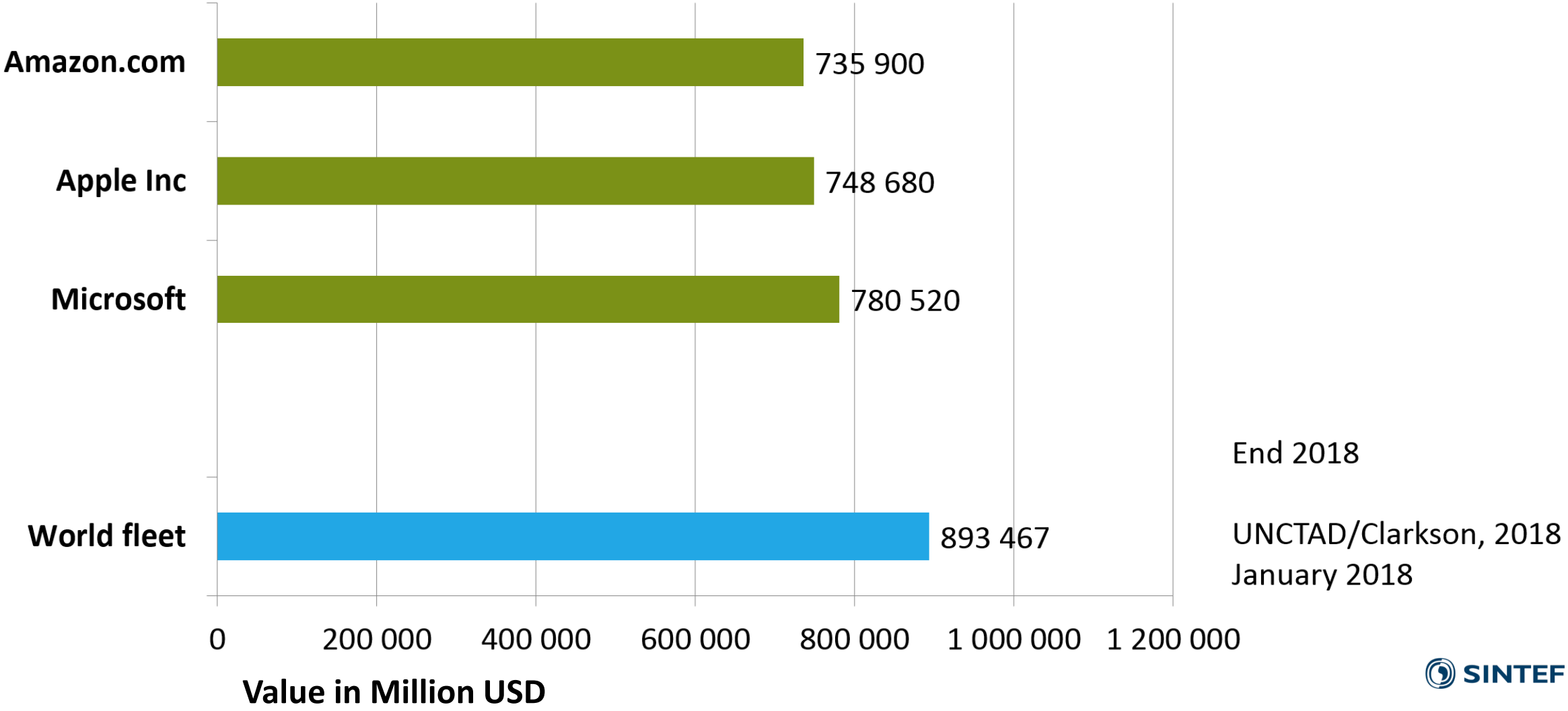
Comparable value of world fleet



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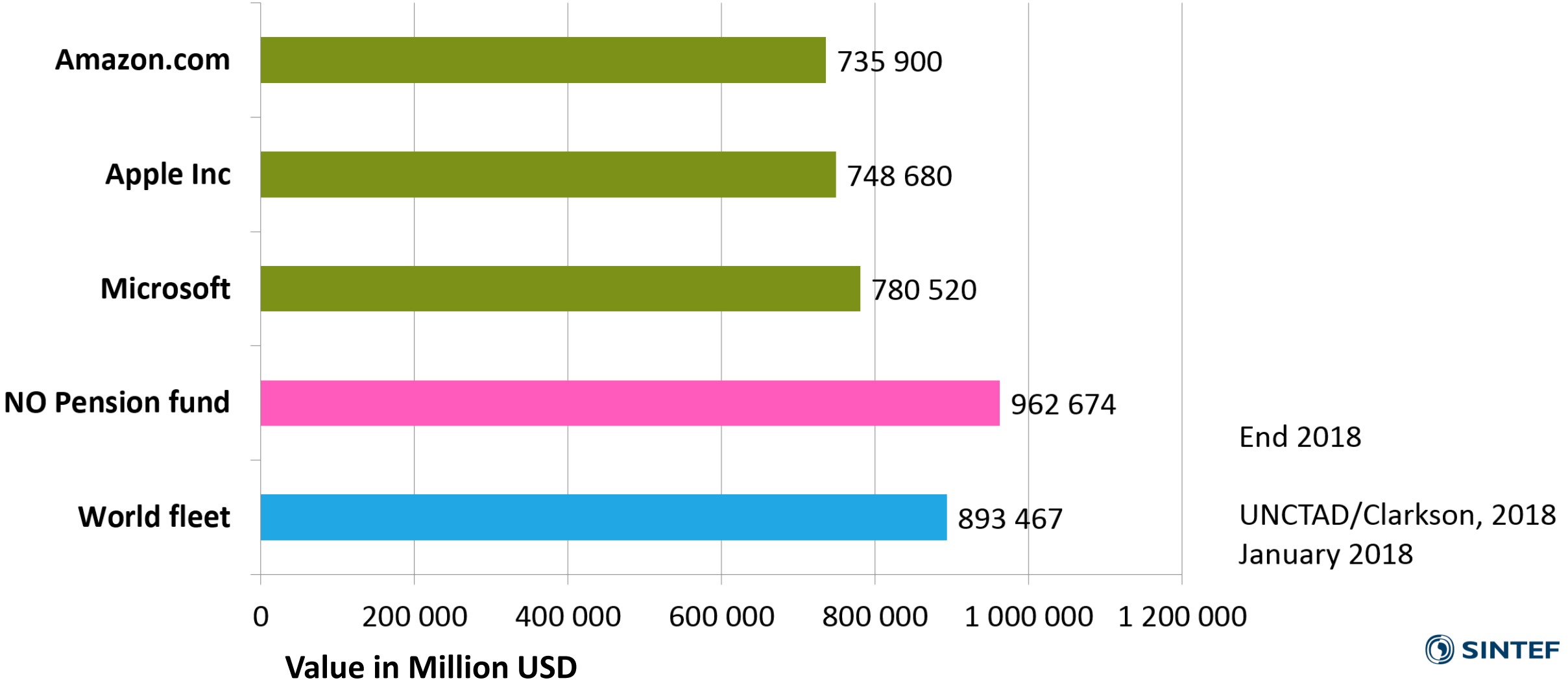
Comparable value of world fleet



End 2018

UNCTAD/Clarkson, 2018
January 2018

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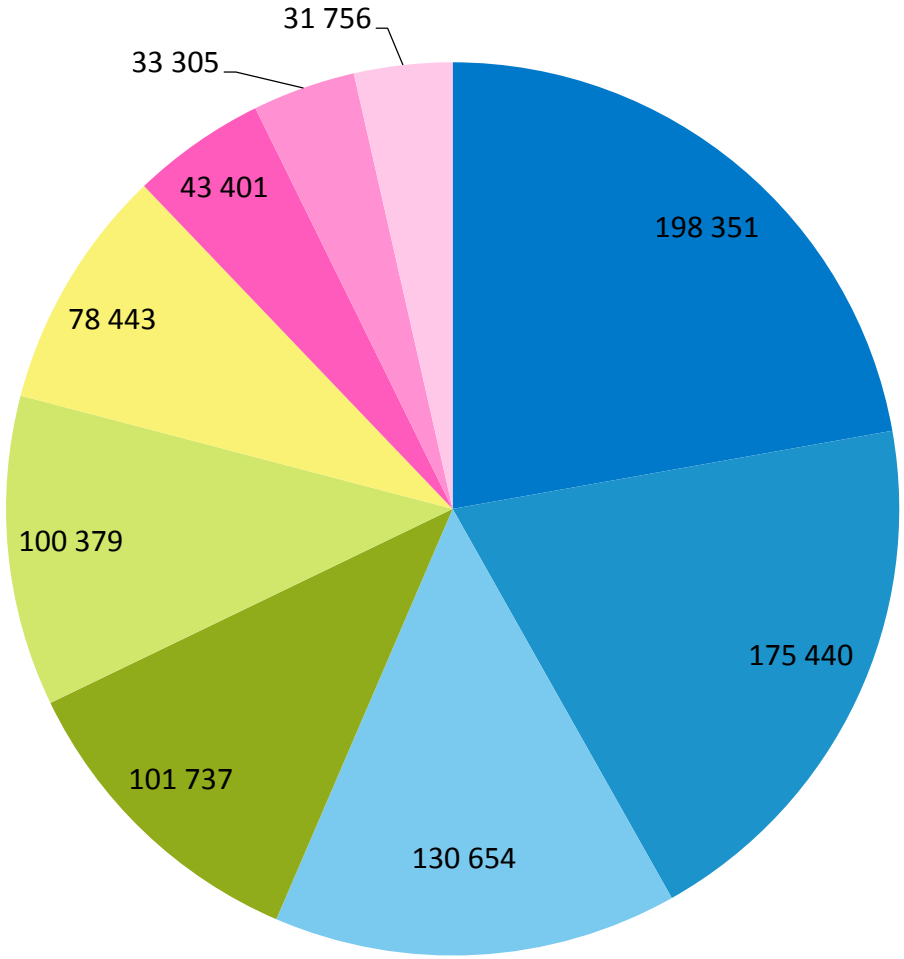
Value of world fleet by ship type



UNCTAD/Clarkson, 2018
Value in Million USD

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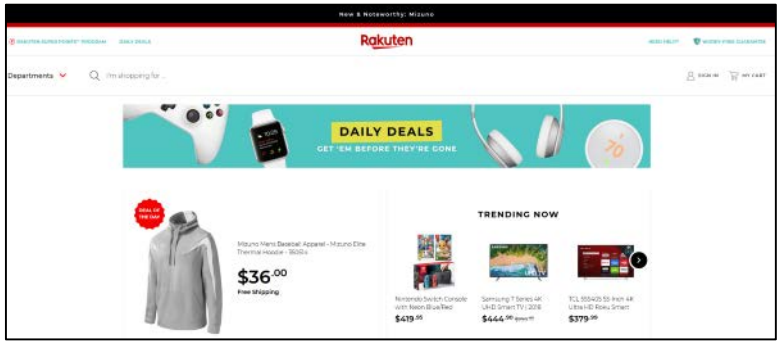
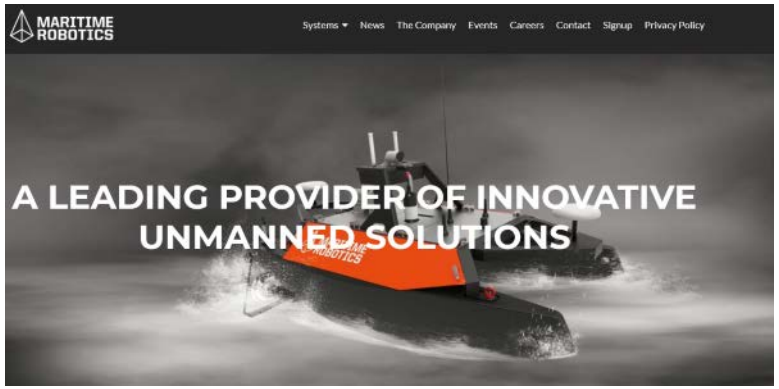
Completely new players and applications: Disruption





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Conclusions

- The time is right for autonomous ships
- Norwegian and international interest is still growing
- It may be a disruptive technology in merchant shipping

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Technology for a better society