



Aalto University
School of Engineering

RAAS – Rethinking Autonomy
and Safety

Autonomous Maritime Ecosystem

Safety in the context

Osiris A. Valdez Banda
Assistant Professor
Aalto University

Marine Technology, Research group on Safe and Efficient Marine Systems and
Experience



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“Autonomous ships have a potential to improve the **safety** and efficiency of the maritime transport ecosystem”

Maritime shipping evolution



Amerigo Vespucci (Italian Navy)



Symphony of the Seas (Royal Caribbean)



Autonomous Ship Concept (Rolls-Royce)

Increment on digitalization and automation

- Ships are sophisticated sensor hubs and data generators
- Satellite communications are improving connectivity
- Digital information flows are driving the automation of processes and functions

“More digitalization and automation increase the ecosystem complexity and risks (1)”

- Integration
- Control systems
- **Emergent behavior**
- **Traditional approaches are not enough**

- New equipment and sensors
- Software errors
- Cyber risks

- more specialized ships and systems,
- more digital connections

- more software controlled systems
- more frequent updates

- system and component interaction creates new risks

- capable to analyze system behavior, software functions and interfaces

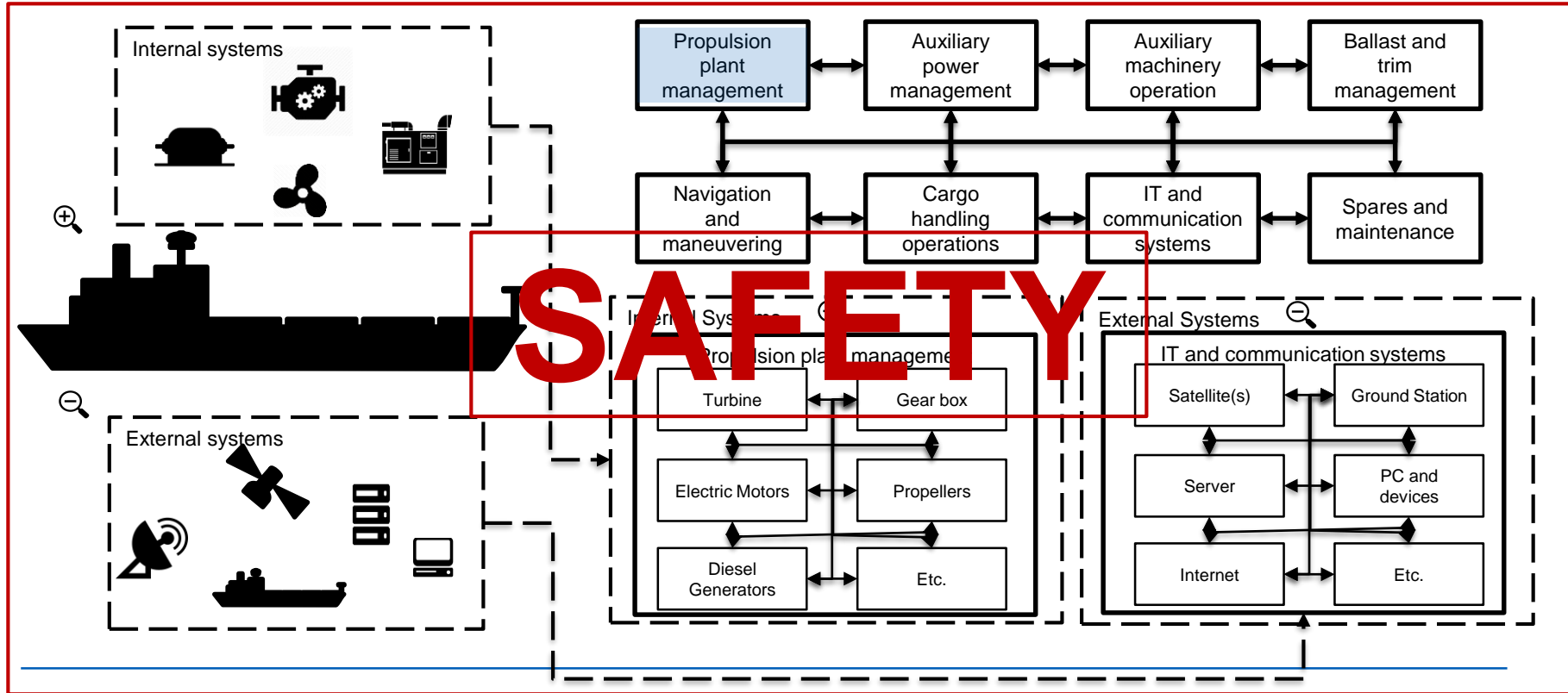
- Adequate measurement
- Proper installation
- Physical degradation

- Programming errors
- AI/ML challenges
- System robustness

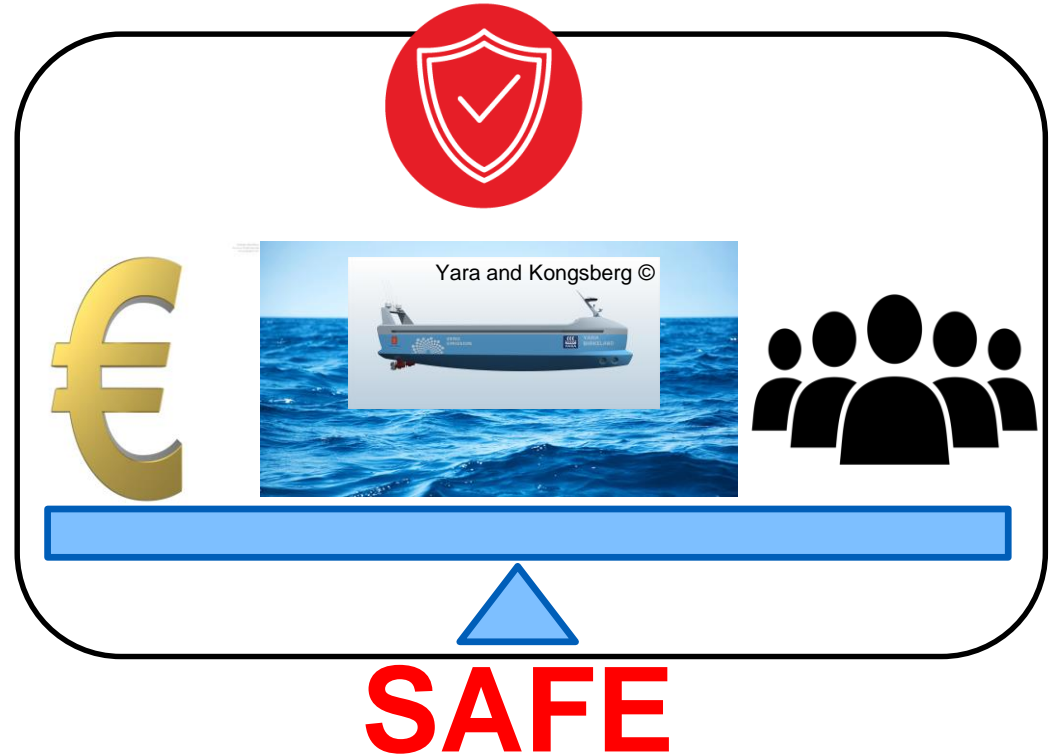
- Safety “unintentional and hidden errors”
- Security “attacks and connectivity risks”

The view of the maritime ecosystem

Safety is a ecosystem property and a dynamic non-event process (2)



“The autonomous maritime ecosystem needs to remain sustainable”



Initiatives towards an autonomous maritime ecosystem



Yara and Kongsberg ©

ONE SEA Autonomous maritime ecosystem



One Sea (Dimecc) ©

S DIMECC Program SEA4VALUE - Fairway

S4V -Fairway (Dimecc) ©



AUTOSHIP EU ©



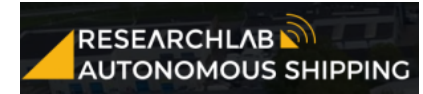
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rasdelft ©



MIL (MPA) ©



Shippinglab.dk ©

Where?



Autonomous Maritime Ecosystem

Final remarks

- The autonomous maritime ecosystem brings challenges but also opportunities for the safety of the maritime traffic
- Advanced digitalization and automation looks like a strong alternative to improve safety, reliability and efficiency
- We need to plan for designing and operating a safe maritime ecosystem by making a proactive management of risks and ecosystem complexity

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Thank you

Osiris A. Valdez Banda
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Experience

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