

MARITIME

Autonomous and remotely operated ships

Presented at DVIS

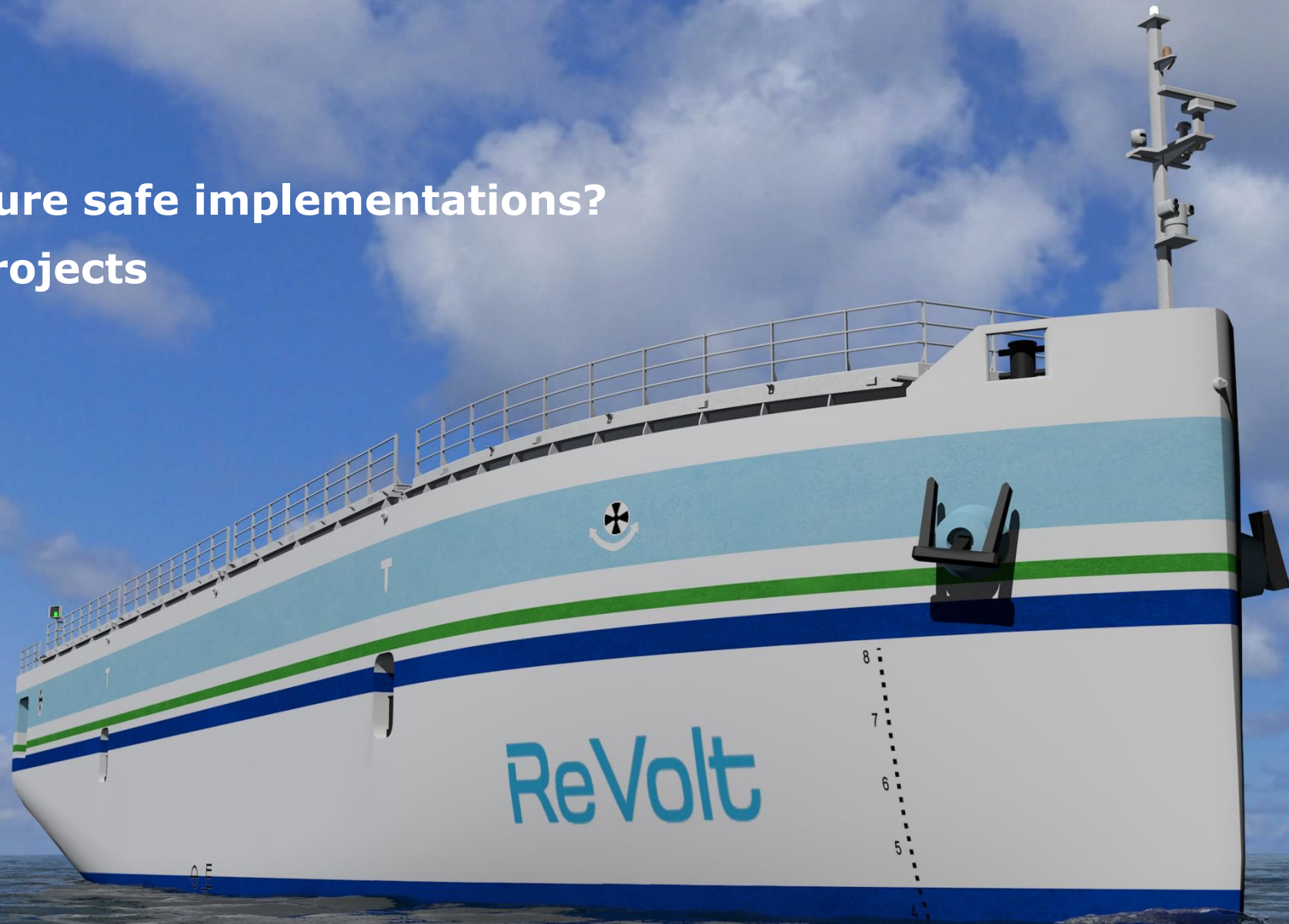
Rasmus Stute

29 June 2017

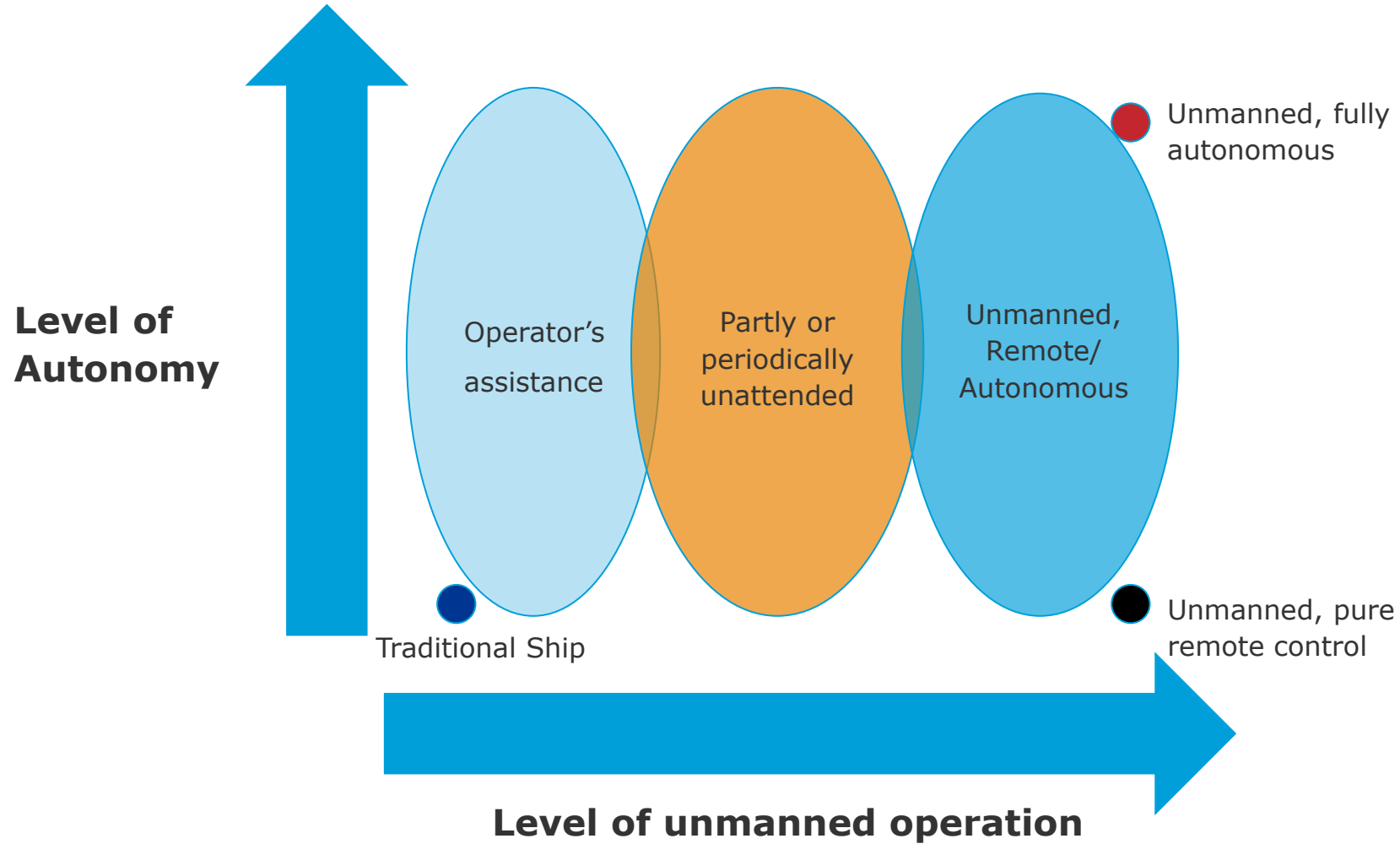
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Agenda

1. What is it?
2. How to ensure safe implementations?
3. Research projects
4. Is it legal?



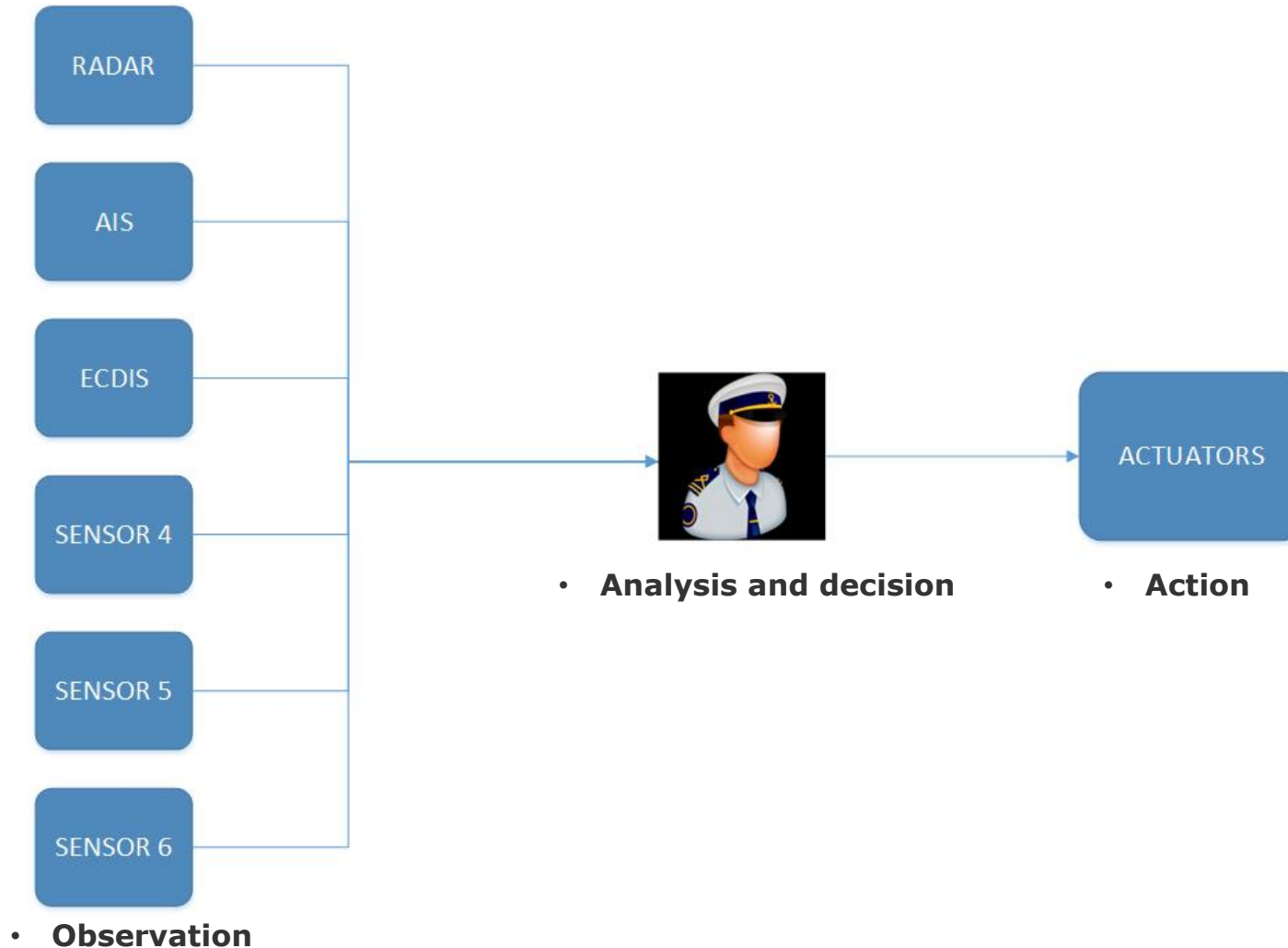
“Autonomous Ships” – what does it encompass?



Degrees of Autonomy - Navigation

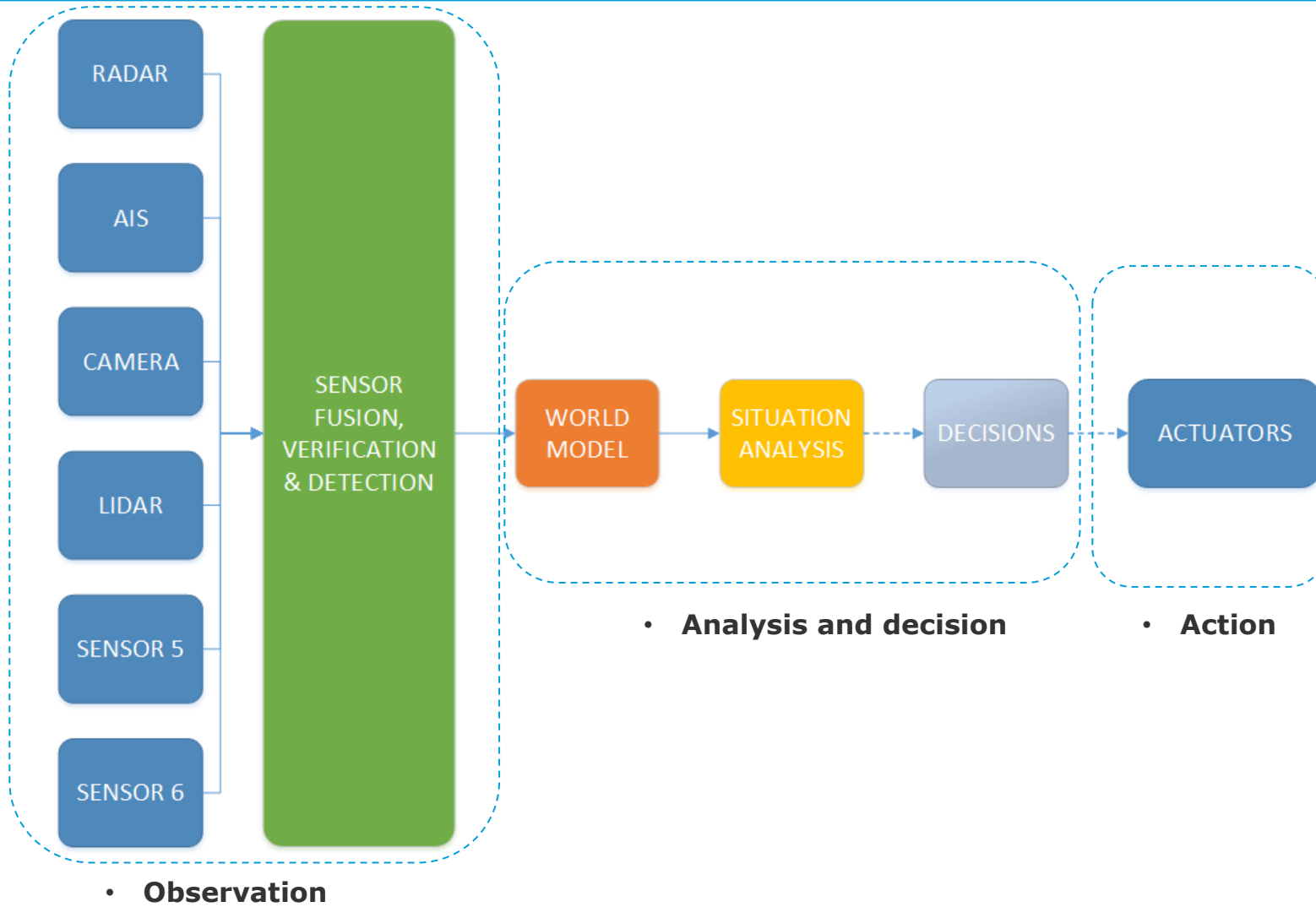
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Human navigation



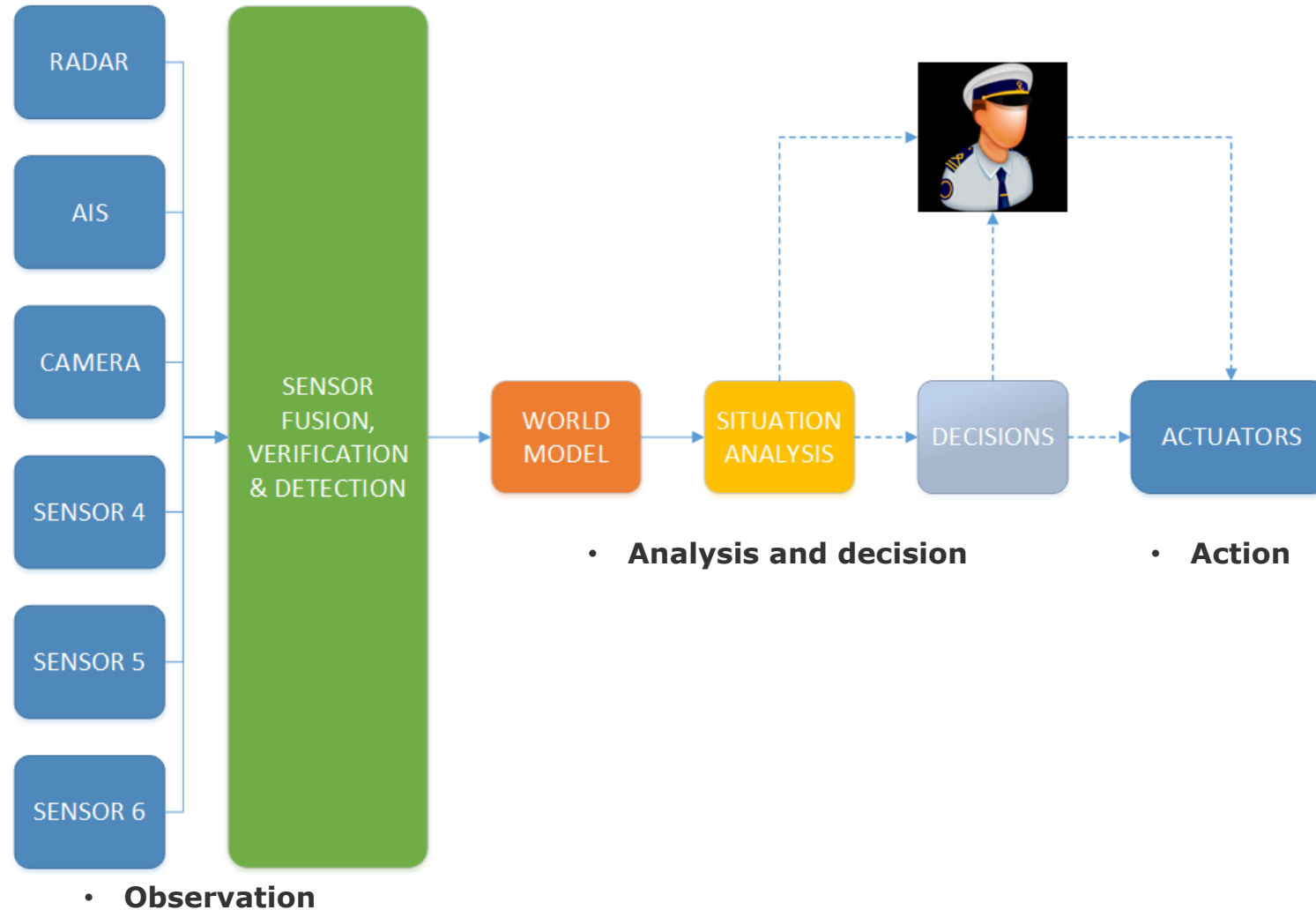
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Autonomous navigation



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Human in the loop



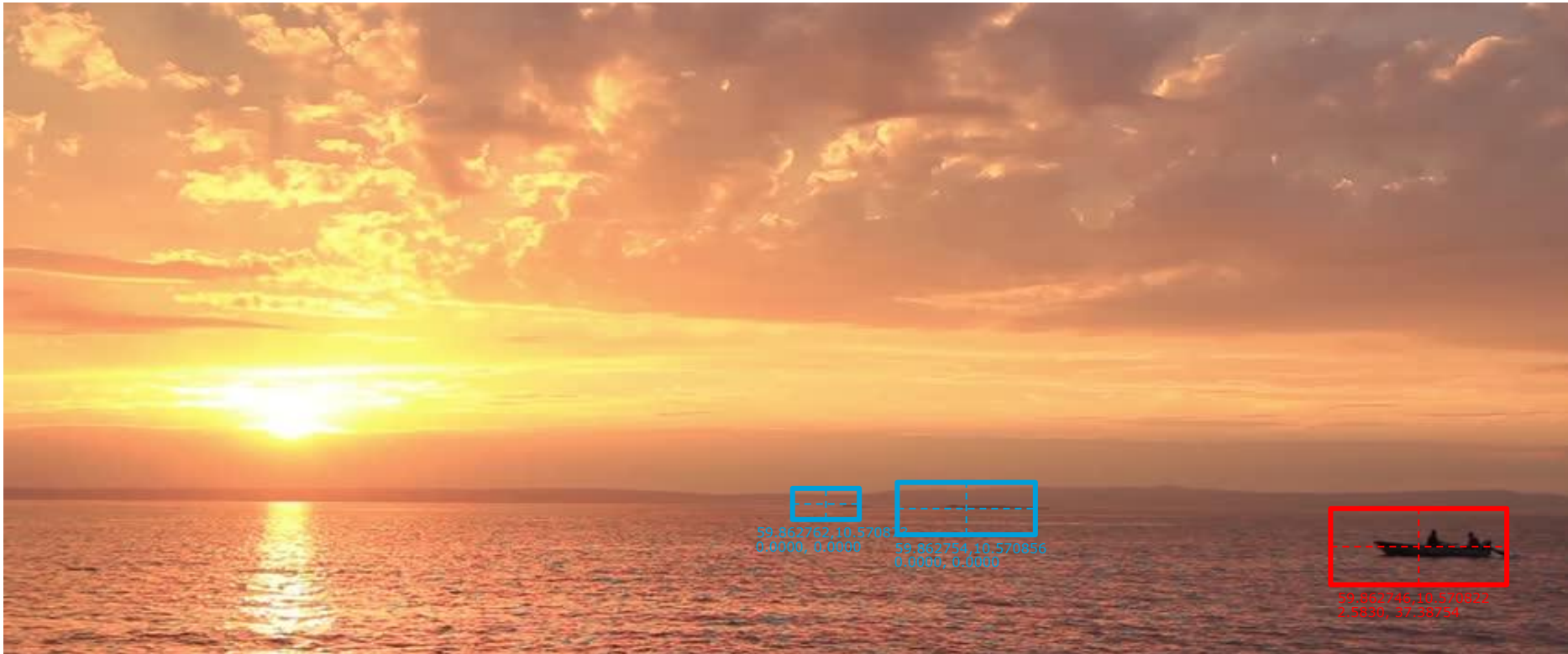
How to ensure safe implementations?



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Areas where new requirements are needed.

- **Sensor capabilities**



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Areas where new requirements are needed...

- Sensor capabilities
- **Decision algorithms**

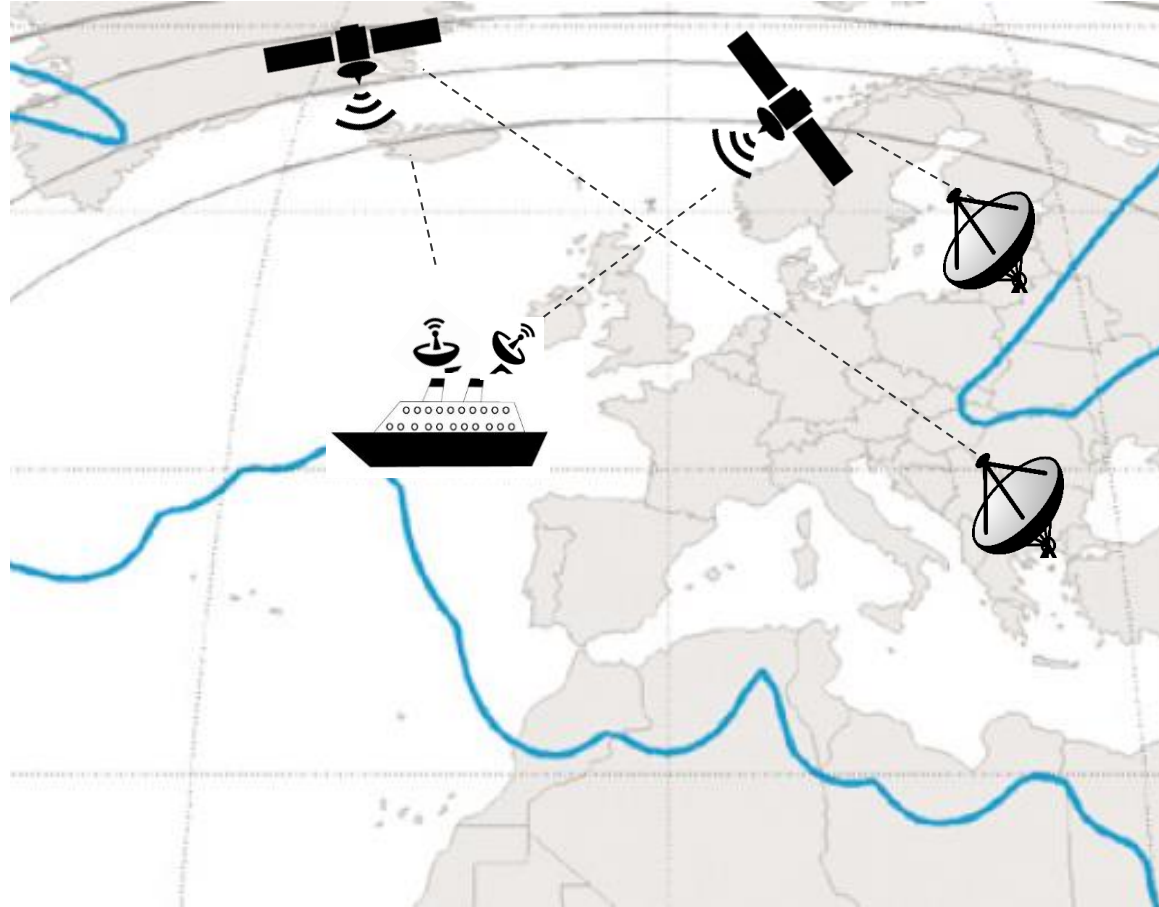


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From the ReVolt Movie - <https://youtu.be/rhYaNHx5D00>

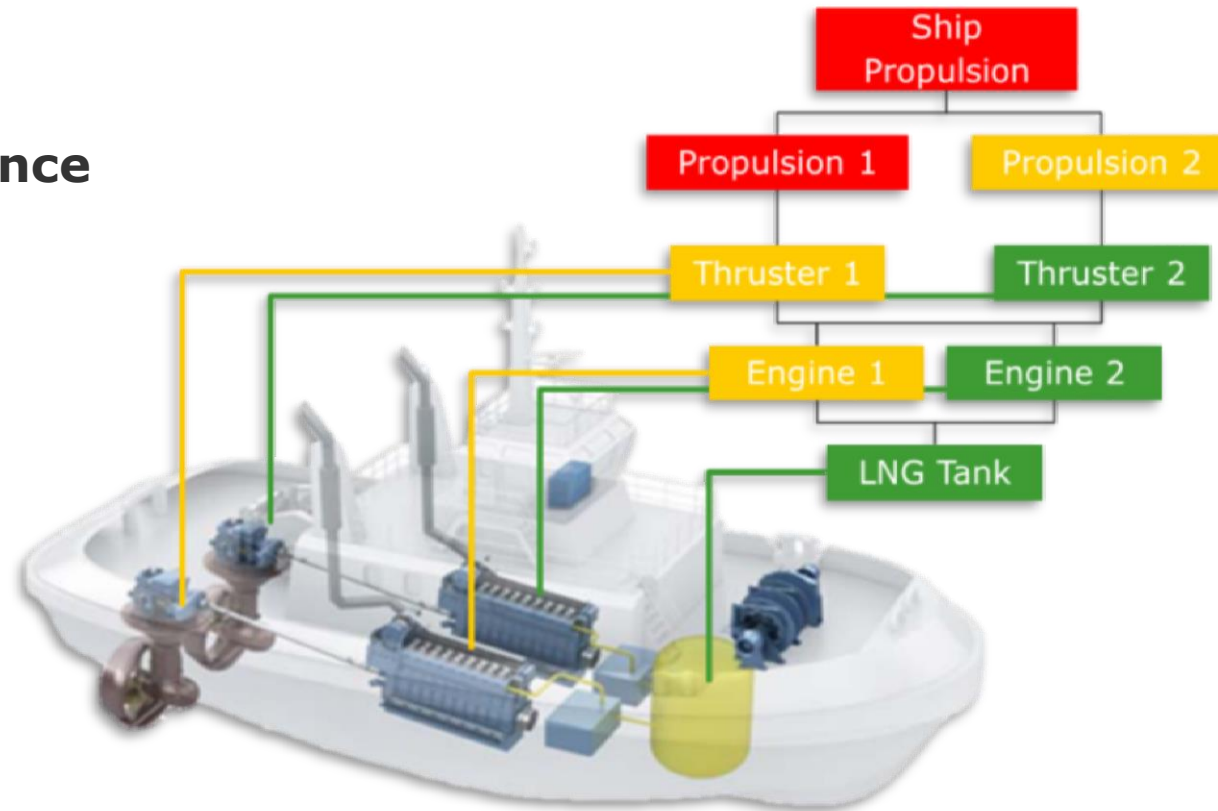
Areas where new requirements are needed...

- Sensor capabilities
- Decision algorithms
- **Ship-shore communication**



Areas where new requirements are needed...

- Sensor capabilities
- Decision algorithms
- Ship-shore communication
- **Machinery design & maintenance**



Areas where new requirements are needed...

- Sensor capabilities
- Decision algorithms
- Ship-shore communication
- Machinery design & maintenance
- **On-shore control centre**



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Areas where new requirements are needed...

- Sensor capabilities
- Decision algorithms
- Ship-shore communication
- Machinery design & maintenance
- On-shore control centre
- **Cyber security**



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Research Projects

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The SIMAROS project

Safe Implementation of Autonomous and Remote Operation of Ships

■ Unmanned offshore vessel

- Technology development
- Development of risk assessment tools and standards
- Ambition: Enable national regulations and class to allow for commercial unmanned operation
- Building planned 2018

■ Partners:



KONGSBERG

Press Release

Automated Ships Ltd and KONGSBERG to build first unmanned and fully-automated vessel for offshore operations

- First full size unmanned ship to be built through UK and Norwegian co-operation
- Offshore vessel 'Hrönn', to be contracted January 2017 and in operation in 2018



Artists impression of the 'Hrönn'

The AAWA project

Advanced Autonomous Waterborne Applications

■ Areas of focus:

- Technology
- Safety and security
- Societal & legal acceptance
- Economy and business models

■ DNV GL focus:

- Class requirements and assurance of safety and performance

■ Partners:



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The Autosea project



- **Areas of focus:**
 - Sensor fusion
 - Collision avoidance
 - System architecture
- **DNV GL focus:**
 - Competence on core technologies

■ **Partners:**

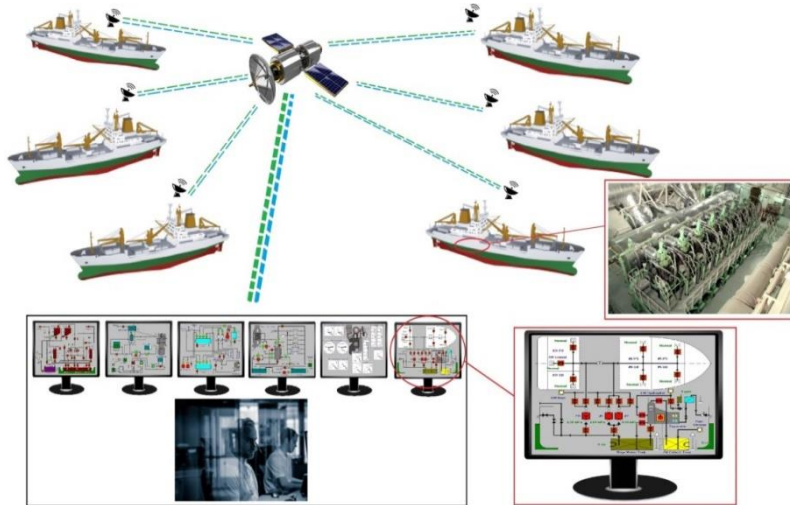


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The ROMAS project (On Shore ECR)

Remote Operations of Machinery and Automation Systems



The ReVolt Project

- **Concept developed by DNV GL**
 - Released 2014
 - Unmanned, zero emission container vessel
- **ReVolt Student project**
 - 1:20 Scale model
 - Fully capable Dynamic Positioning
 - Two summer students and MSc's 2016/2017
 - Three summer students and MSc's 2017/2018



Is it legal?

- Short answer: No
- **IMO Conventions:** STCW, SOLAS, COLREGS, MARPOL, ...
 - Written for manned operation
 - References to operator/captain/officer
 - Topic on the agenda at IMO (MSC98/20/2 and MSC98/20/13)
 - Process will take time
- **Flag-states can, however:**
 - Provide exemptions within national waters
 - Make bi-lateral agreements with other states



First commercial application?



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Summary

- Operation:
Will be hybrid of remote control and autonomy, degree will depend on type of vessel and trade
- Technologies:
Technologies to make remote and autonomous ships a reality exist. Finding the right balance is the challenge.
- Safety:
Ships will be as safe as existing vessels, at least.
- Legislation:
Can be changed if there is a political will. It will start on national level and grow global. Liability issues still open.



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Unmanned Cargo Ship Development Alliance launched in Shanghai

 JUNE 29TH, 2017

 JASON JIANG

 GREATER CHINA, TECH

 0 COMMENTS

Time for Discussion

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SAFER, SMARTER, GREENER

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