

# Autonomous ships In DENMARK

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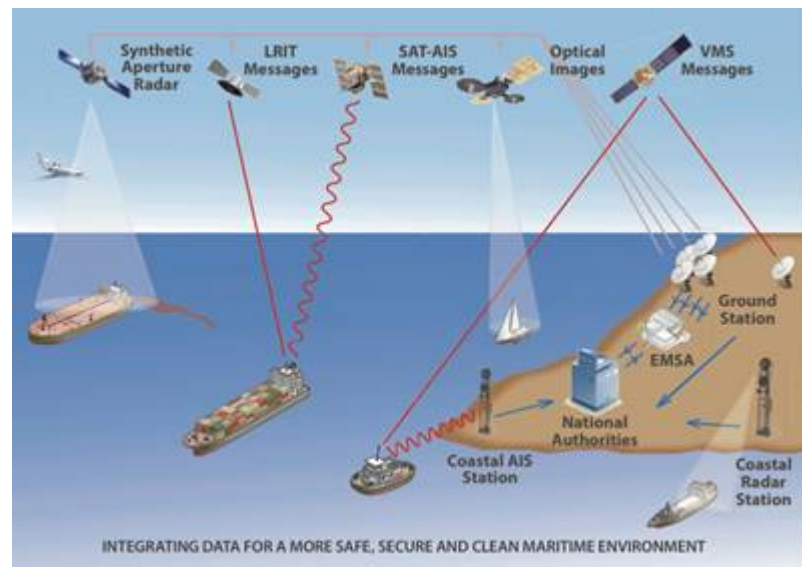
# We have done it since 1992

## Simple autonomous ships





# Lookout – from sailor to electronics



# Regulation

- Regulatory scoping project.
- Finished 1st December 2017
- Will be basis for proposal to IMO & EU



# Another framework

Regulatory Level of Autonomy (RLA)	Description
L (local)	<p>Master physical available on board.  Ship operated by crew on board.  Possibility of monitoring and analytical/decision support from shore to on board crew.  Periodical un-manned bridge possible, with manual back-up available on board.</p>
R (remote)	<p>Master physical available on board.  Ship operated from shore. Crew available on board with possibility of taking over control by request from shore, or by alarm from on board systems.  Possibility of monitoring and analytical/decision support from shore to on board crew.  Periodical un-manned bridge possible, with monitoring/control from shore and manual back-up available on board.</p>
RU (remote unmanned)	<p>Master <u>not</u> physical available on board.  Ship full time monitored and operated from shore, with some analytical &amp; decision making systems available on board (i.e. autopilot, track control).</p>
A (autonomus)	<p>Master <u>not</u> physical available on board.  Ship operates autonomously, on board systems has full situation awareness, calculates consequences and makes operational decisions without interference from shore.  Shore operation <u>tasks</u> ship systems with e.g. route requirements, and may give guidance or even take over control of the ship, at the request of the on board system.</p>

## Danish Projects

- **Driven by Administration and Shipowners**
- **Open for testing in Danish waters**
- **Focusing on facilitation**
- **Real projects:**
  - **Tug**
  - **Harbour-bus/small ferry – Urban Transport**
  - **The periodical un-manned bridge**

# Test area



## The elephant in the room

- **Insurance**
- **Responsibility**
- **Liability**
  
- **Based upon Roman Law with hundreds of years of case law**
- **This is slower than even IMO**

# Cyber Security





**Questions???**

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