Model testing of autonomous ships

Remotely controlled and autonomous ships represent a fundamental change in shipping over the next decades and are driving the digital transformation in the sector. Aker Arctic is currently developing the in-house testing facility to enable tests with autonomous vessels.

Multiple instruments are used in support of operating and manoeuvring modern ships and all current vessels have a captain and crew who are responsible for handling the ship and ensuring that nothing goes wrong. However, during the past few years, the idea of developing vessels which can work autonomously has evolved and it is believed that these will become reality over the next decades. The development is expected to start with small vessels with a reduced crew and will eventually evolve into large unmanned ocean-going ships. There are nevertheless many opinions on how the development will take place and how quickly autonomous ships will become reality.

Model testing benefits the development

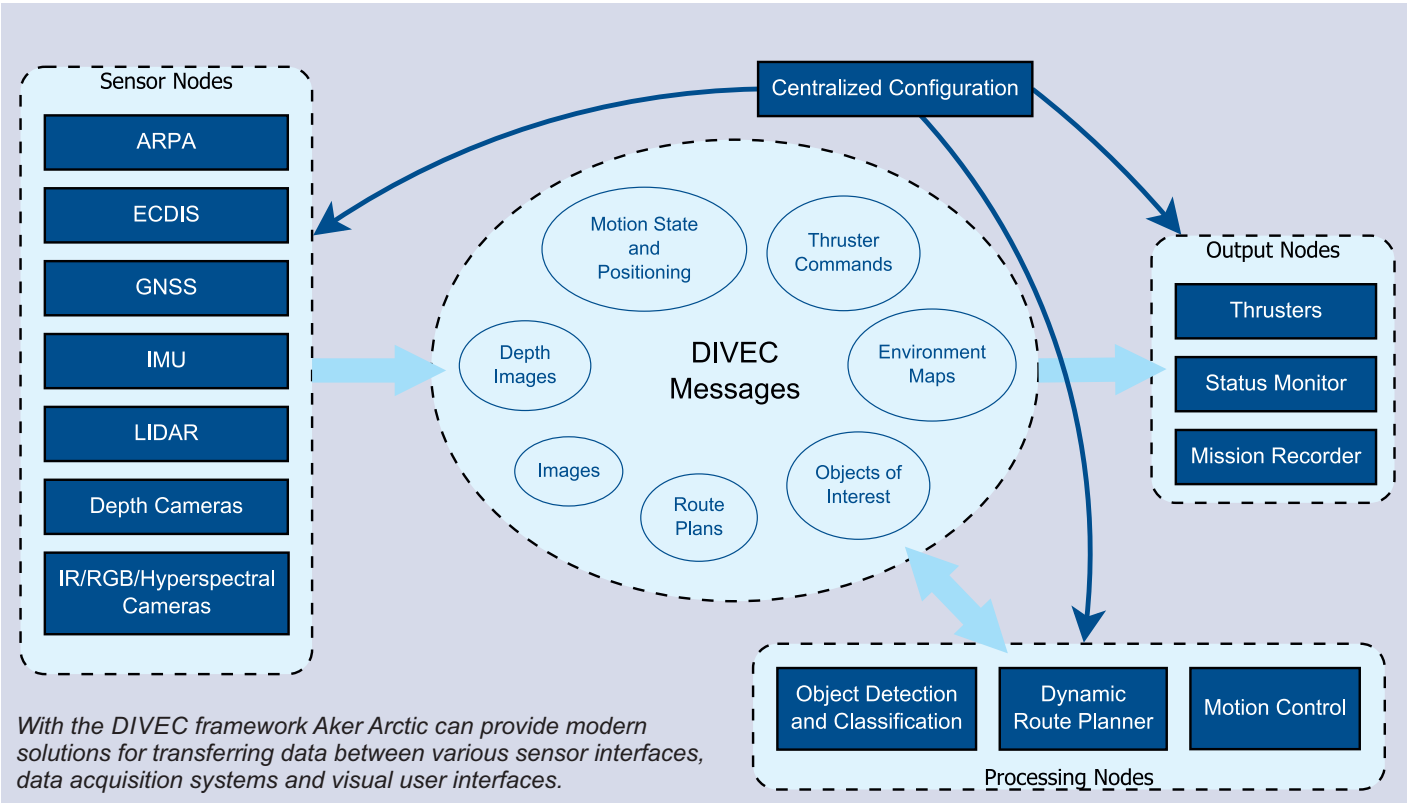
When developing technologies and automated control systems for autonomous vessels, it is useful to test these first in model tanks. Aker Arctic's ice laboratory provides an attractive tool for testing and developing automated controls because many different conditions, even freezing and misty weather, can be simulated. It is a much more economical way than to first building a real size vessel and then testing it under full-scale conditions.

In order to carry out autonomous ship model testing, some major improvements to equipment and procedures have been made. The testing facility is currently being equipped with a wireless system allowing complete free manoeuvrability of the models when testing autonomous vessels.

"New propulsion units and propulsion control units have also been developed,"

says project engineer Jukka-Pekka Sallinen, who is heading the development team at Aker Arctic.

New propulsion units for model testing have been developed.



With the DIVEC framework Aker Arctic can provide modern solutions for transferring data between various sensor interfaces, data acquisition systems and visual user interfaces.

The propulsion control required a new software interface, in which Aker Arctic's newly developed DIVEC (Distributed Intelligent Vessel Components) system was applied.

“We will initiate tests with the new propulsion unit system, which allows specific control of the vessel motion. Once the tests prove successful we will continue to test our in-house path finding algorithm and route execution tests,” says Sallinen.

What is DIVEC?
Aker Arctic's newly developed software DIVEC is a simple, powerful and almost zero-configuration networking architecture, originally designed for the ice load monitoring system to transmit messages between different systems. It proved to be so useful, that it has also been applied in the ice simulator and the autonomous model testing system.

The software architecture allows reliable communication between different software components. Expanding the network is easy due to the automatic node discovery, and its centralized configuration management enables the development of plug-and-play devices.

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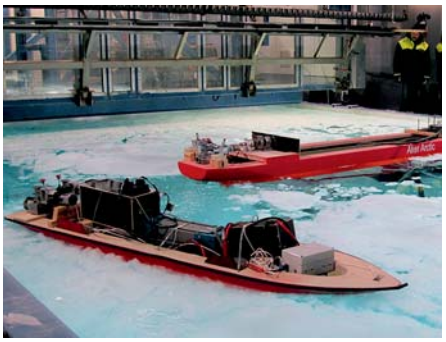
Co-operation with SSPA and Aalto University
One of the challenges in developing autonomous vessels is that maritime laws do not recognize vessels with a reduced crew, or no crew at all. "The technology is evolving, but there are no regulations or technical standards for autonomous vessels yet," Sallinen says.

Aker Arctic, SSPA and Aalto University have therefore decided to start a co-operation project with the aim to standardize the procedures for autonomous ship model testing. The purpose is to create an interface that allows testing the same systems and algorithms in all test facilities.



A wireless system allows complete free manoeuvrability of the models.

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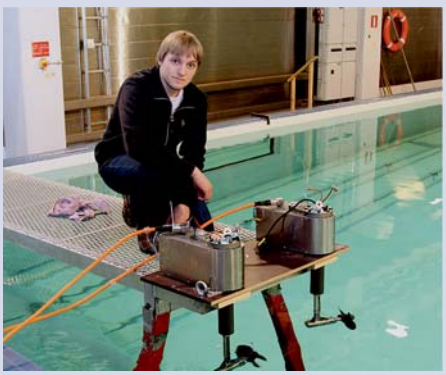
Meet Olli Kokko



Olli Kokko joined Aker Arctic in fall 2017 after graduating from Aalto University. In his master's thesis, he developed a reactive navigation system for model testing, and has since been tasked with various software and technical development projects for the Electrical and IT team. DIVEC networking architecture and its various components are a major part of his development efforts.

In his spare time, Olli enjoys climbing, jogging and tinkering with electronics and machines.