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Underwater Robotics – current commerical capabilities and future requirements


DISCOVERY
TOBI

Upfront SeeByte Lessons Learnt

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- Demonstrating capability and fielding a solution are not the same thing
- Robustness versus Openness
- Some sectors are demanding lots of robotics research while others have shown little uptake or interest
- Customer trust is hard to obtain and easy to lose.
- Testing software is hard!
- Too much data to process

SeeByte Summary

Smart software for unmanned maritime systems and sensors

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Offices in Edinburgh, Southampton, UK and San Diego, US

Serving over 20 navies across the globe

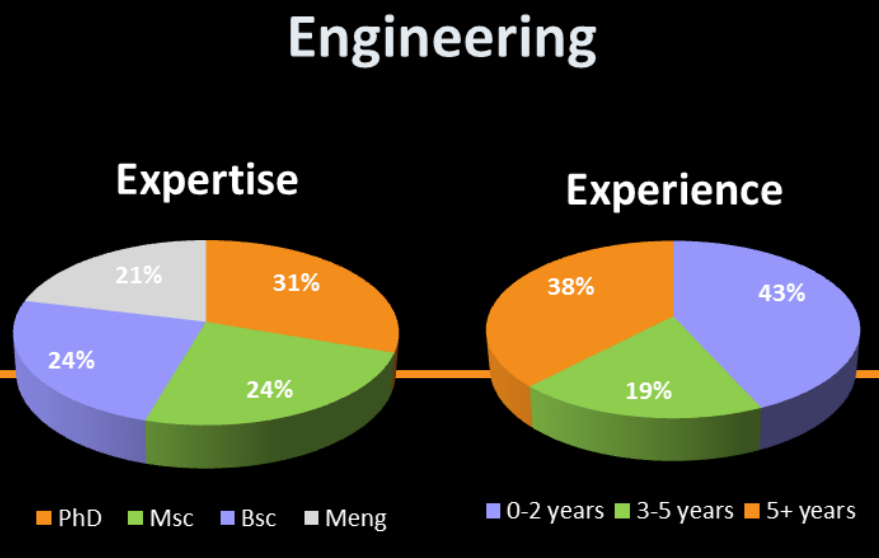
Providing solutions to the oil and gas domain

Adding value to hardware through expert software engineering

Working in partnership with leading sensor and vehicle vendors

SeeByte is appraised at CMMI® Level 2 and has ISO9001 certification

SeeByte is a subsidiary of Battelle



Latitude: 5.66096
Longitude: 139.07235
Distortion: 1.01

SeeTrack

Command, Control & Data Management

Latitude: 28.89369
Longitude: 150.67793
Distortion: 1.30

Neptune

Embedded Autonomy

28.89369 / 150.67793 / 1.30

Solutions

Bespoke Software

Photo: Janice Lang, DRDC/DND.

5.66096 / 139.07235 / 1.01

Mission progress:

35%

-35.63687 / 167.95253 / 1.51

CoPilot

ROV Control

Autonomy

Enabling persistent and collaborative operations

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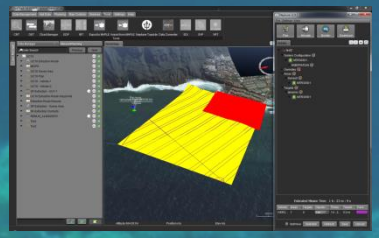
PRODUCTS

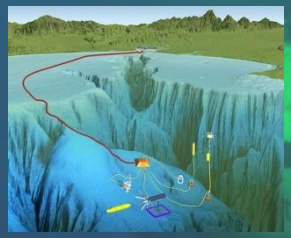


Neptune Product

AIV

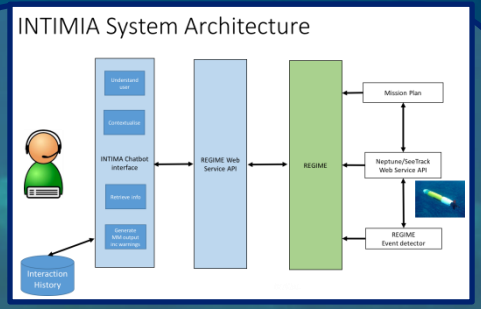
PROJECTS

Mk18 Family of Systems



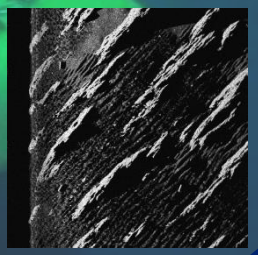
FDECO

RESEARCH



Evaluation of Autonomy

Simulation



Command and Control

Interfacing with unmanned assets

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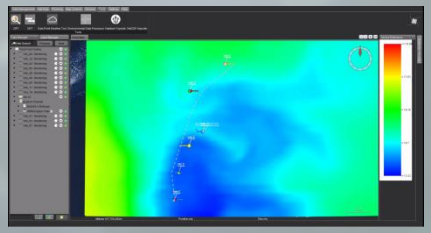
SeeTrack 4

CoPilot

PRODUCTS

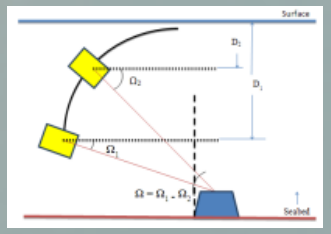
UxV C2 with the UK MoD

Smart ROV

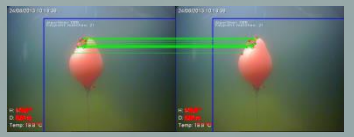


AAOSN

PROJECTS



6 DOF control



Visual Servoing /
Coupled Control

RESEARCH

Sensor Processing

Converting Data to Actionable Information

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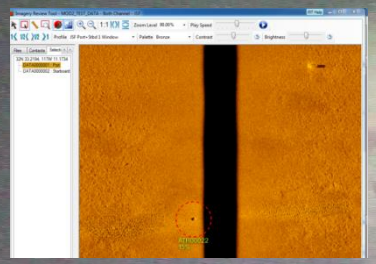
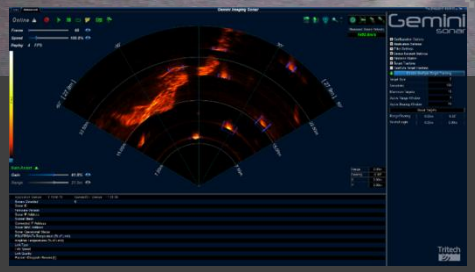
PRODUCTS

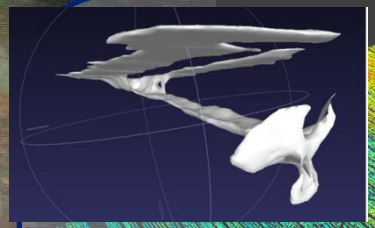


ATR



FLS ATR

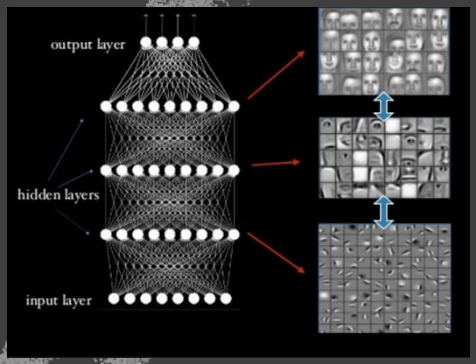
PROJECTS



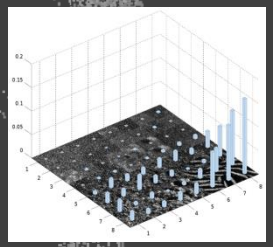
3D processing

Adaptive Video ATR

RESEARCH



Deep Learning



Performance Estimation

Sensor Processing is a key **Autonomy Enabler** that many SeeByte solutions leverage.

Technology Transition

AIV and Full Autonomy

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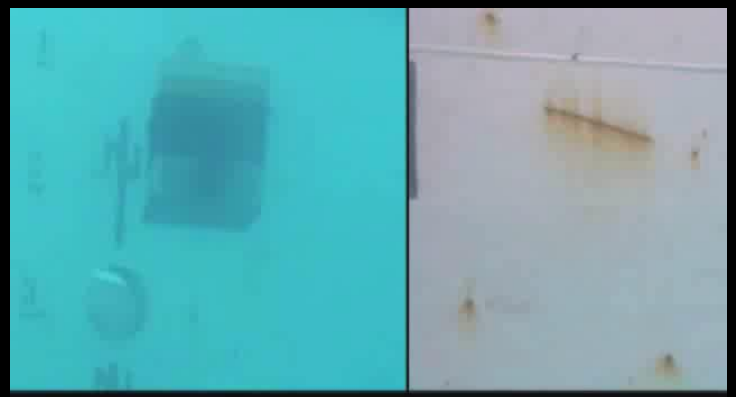
2006

SPINAV

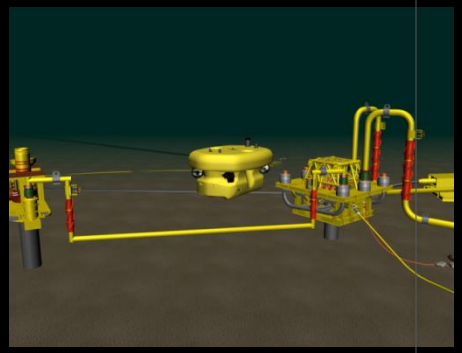
2009



PAIIV

2012

Docking Tests



The transition from a technical demonstrator to a fielded autonomy system is time-consuming and has required extensive simulation and real-world testing

Technology Transition

Smart ROV

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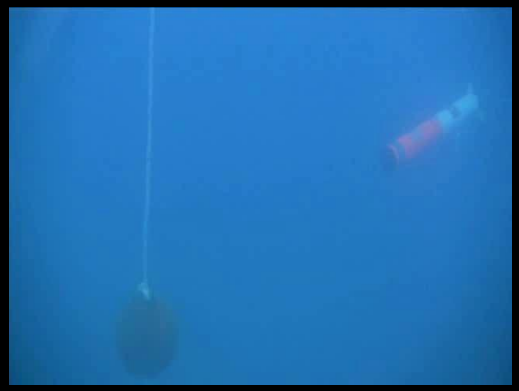
2006

COPILOT PRODUCT

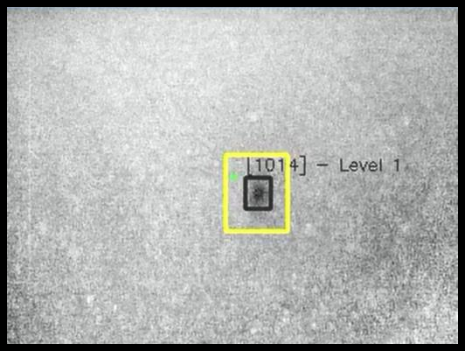
2011- 2014



ONR Neutralizer and Hull Inspection

SSRWIN

2016



UK MoD Disposal

SeeByte have transferred technology between the offshore and military domains to meet customer requirements

Neptune

Multi-vehicle collaborative autonomy

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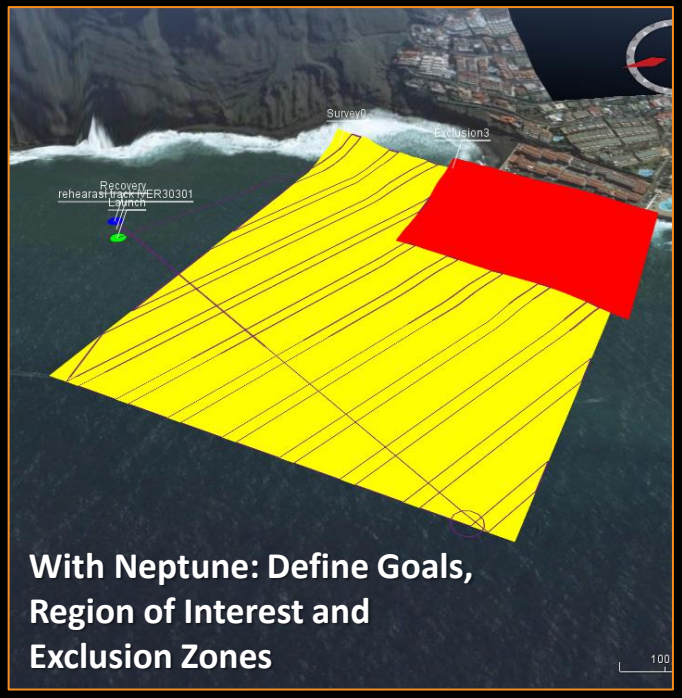

With Neptune: Define Goals, Region of Interest and Exclusion Zones



Autonomous Mission Planner

PAYLOAD

Pool of Functions

Pool of Behaviors

Pool of Vehicles

UMS share world model to carry out goals

Unmanned Warrior 2016

Royal Navy's Maritime Autonomous Systems Demonstration

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- Hell Bay 4 a TTCP Trial
- Neptune used to run autonomous collaborative missions
- Integrated assets from US NSWC-PCD, DRDC, Dstl and Royal Navy's MASTT team
- Working with 5 different manufacturers
- Across air, sea surface and subsea

World first multi-squad collaborative autonomous MCM mission using seven AUVs, two USVs and one UAV. A total of ten robots.

Assets

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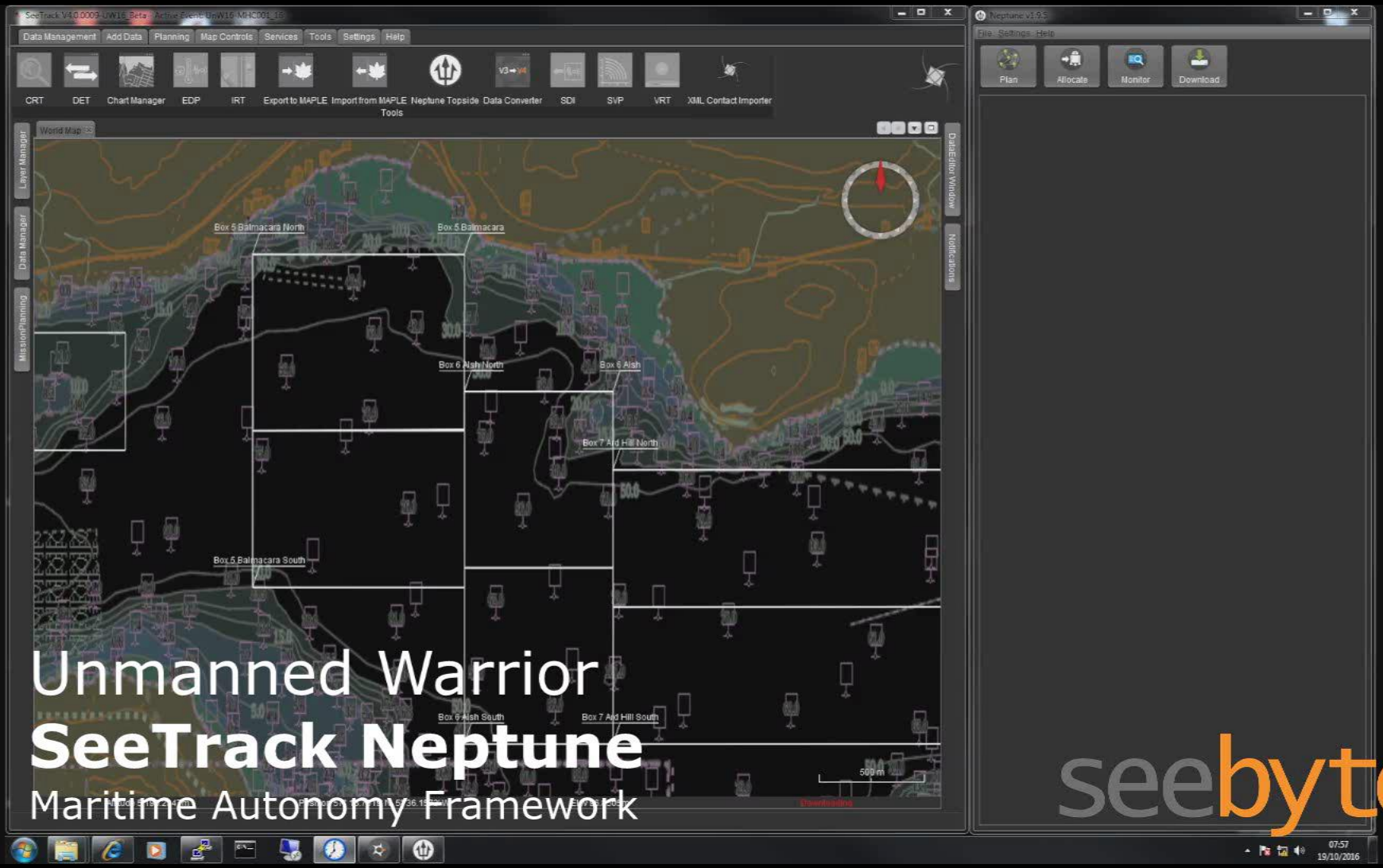
UK

CANADA

USA



Unmanned Warrior

SeeTrack Neptune

Maritime Autonomy Framework

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Autonomous Inspection Vehicle

Life-of-field inspection capability for offshore oil and gas industry

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Subsea 7 is bringing to the market a hover-capable autonomous and intelligent inspection vehicle. Designed in exclusive collaboration with SeeByte and to be launched from a host platform, from vessels of convenience or existing field support vessels, in single or multiple vehicle modes.

subsea 7

Concluding Comments

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- Single and multi-vehicle autonomous missions are now a commercial reality
- Software is key to future development but is also very hard to test without lots of in-water time. Simulation is vital for de-risking.
- The transition from technical demonstrator to a fielded software system takes a long time.
- While research and interest in robotics is huge just now, uptake in some sectors is very slow.
- Key SeeByte research requirements lie in **adaptive learning**, **data management**, **Intervention** and **HMI**. We are keen to look at options for PhD programs with interested universities


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