uROV: A Digitally Enabled Platform for the Future of IMR

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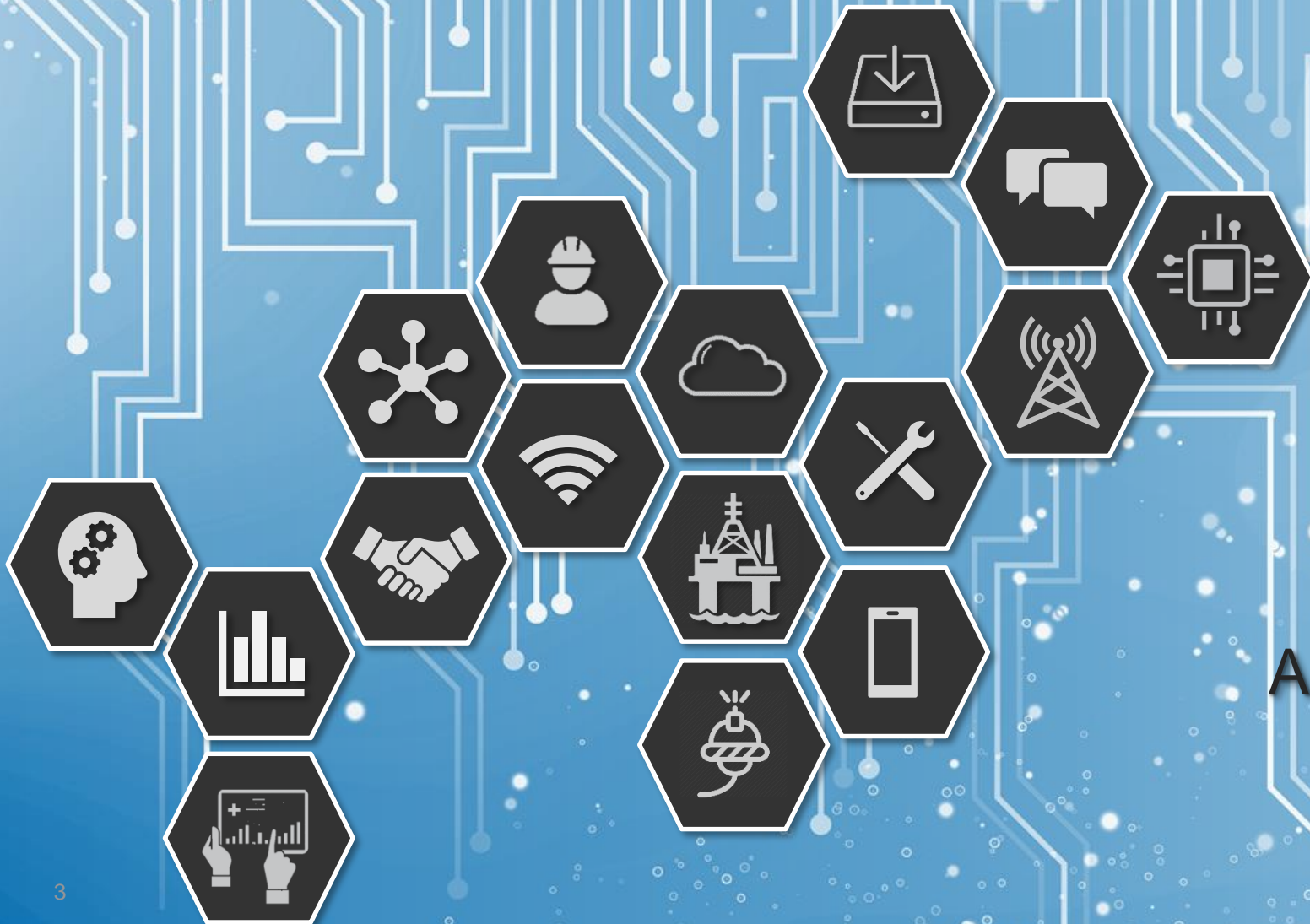
Agenda

- Digital enablement

- uROV program

- What's next

- Questions

ACCESSIBILITY

CONNECTIVITY

DATA

ANALYTICS

IOT

ADVANCED SENSING

AUTOMATION

Digital Enablement: OneSubsea Perspective

ACCESSIBILITY

CONNECTIVITY → Enabled residency

ADVANCED SENSING → Enabled visualization and control

AUTOMATION → Enabled efficiency in workflows

ANALYTICS

OneSubsea
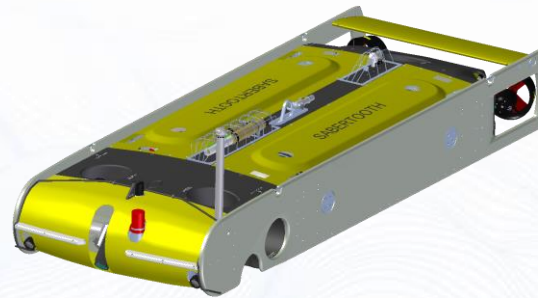A Schlumberger Company

uROV Program

Strategic drivers

$ Deployment efficiency

Next-generation sensing

Digital enablement

uROV platform

Schlumberger technologies deployed on
SAAB Sabertooth vehicles

Key technologies

Subsea communications

Supervised autonomy

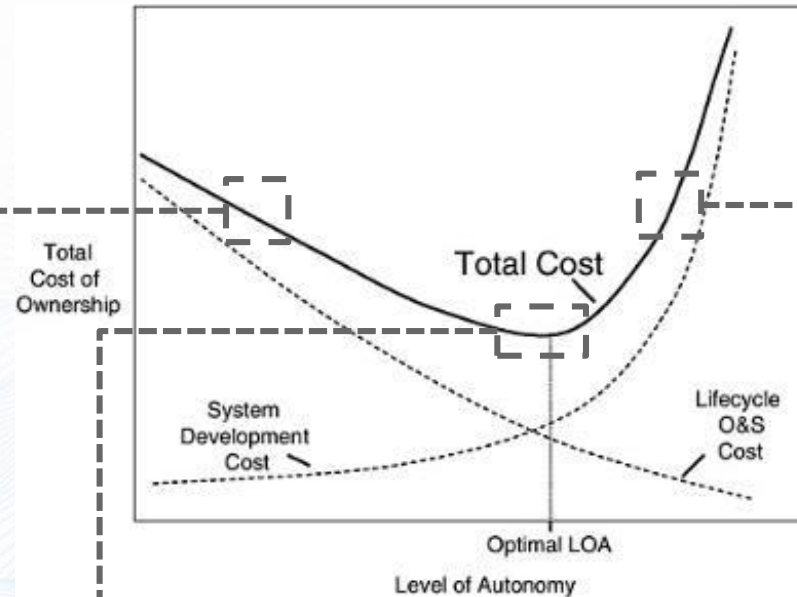Automatic "eventing"

uROV Program

ROV

"Joystick control"

- Legacy approach
- Expensive deployment
- Data through tether

Autonomous Vehicles in Support of Naval
Operations 2005, National Academy of Sciences

Total Cost of Ownership

Total Cost

System Development Cost

Lifecycle O&S Cost

Optimal LOA
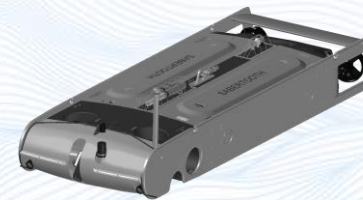
Level of Autonomy

AUV

"Fire and forget"

- Future of IMR
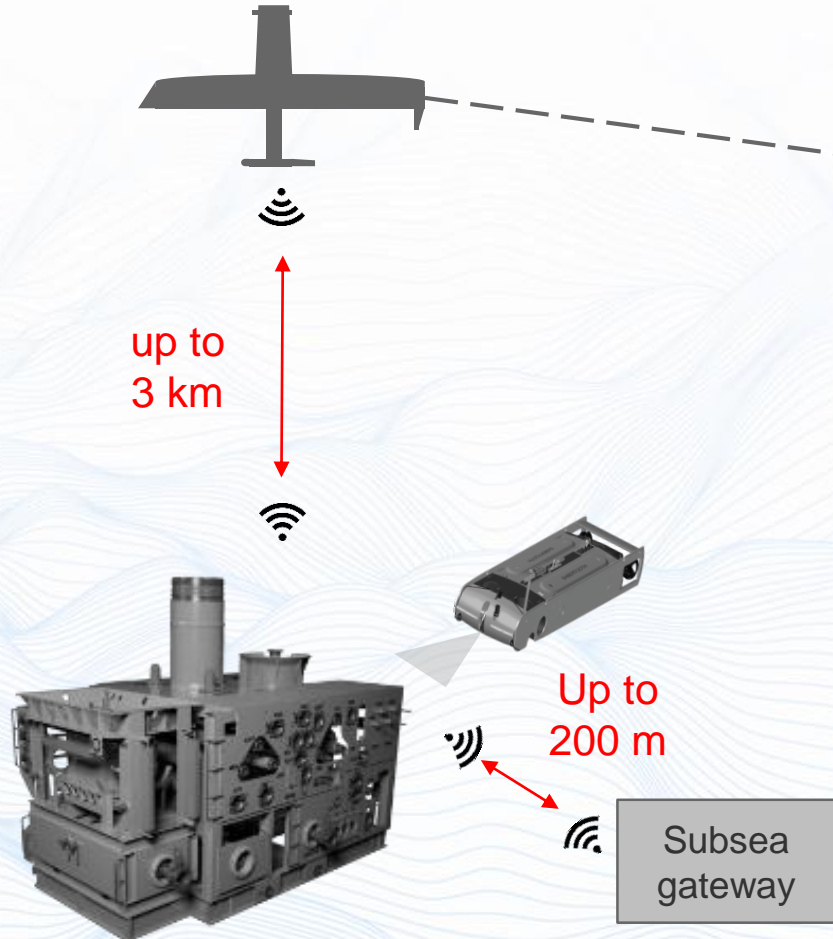- Trust issue around sensitive infrastructure
- Development cost

OneSubsea uROV

"Supervised autonomy"

- Pragmatic approach
- Prescribed real-time data
- Agility
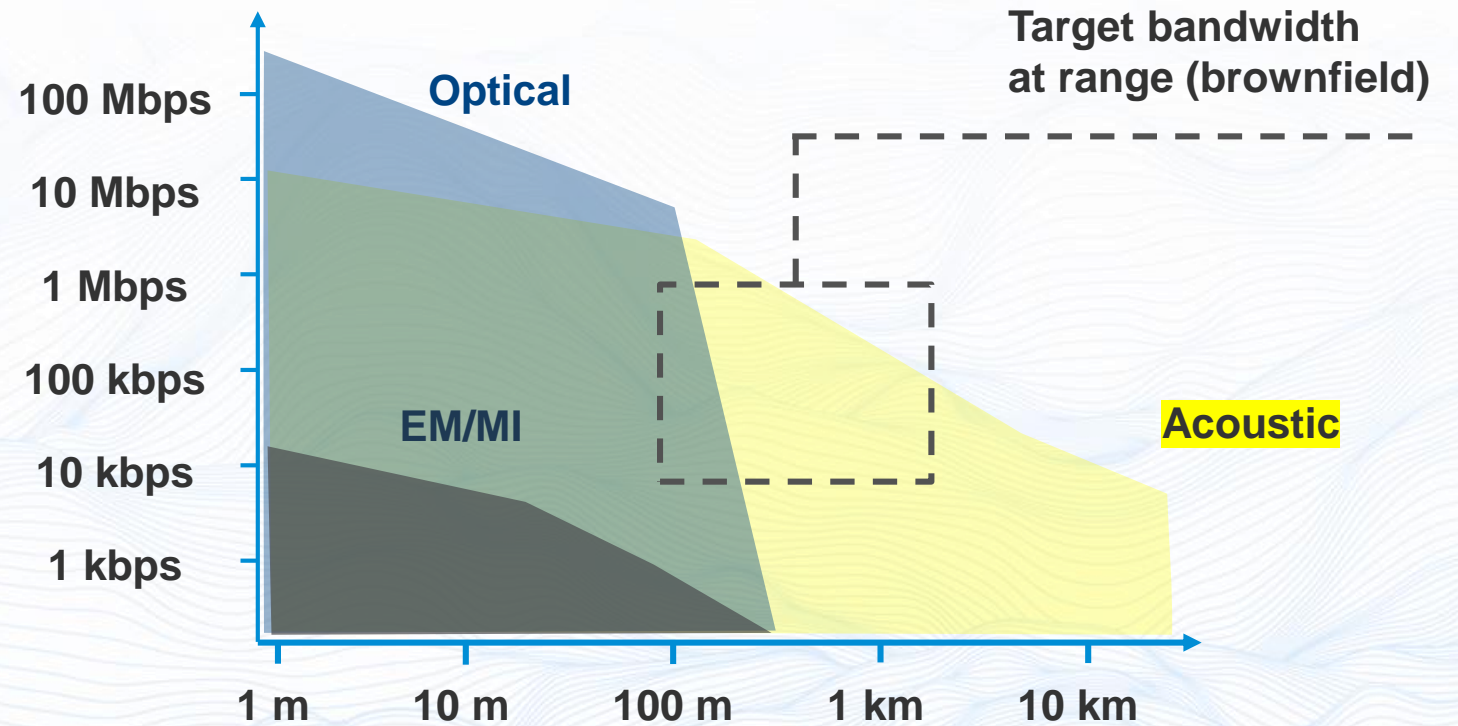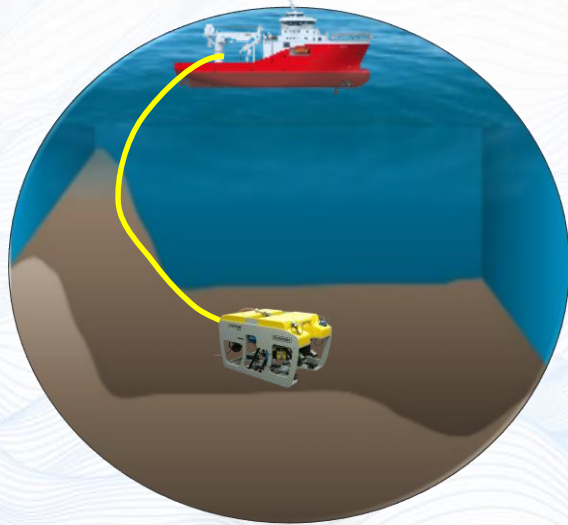
Supervised Autonomy

Surface gateway

up to
3 km

Up to
200 m

Subsea
gateway

Person in
the loop

1. Vessel
2. Host
3. Shore

📶 Subsea Communications

Without connectivity, digital is limited

Optical

EM/MI

Acoustic

Target bandwidth at range (brownfield)

100 Mbps
10 Mbps
1 Mbps
100 kbps
10 kbps
1 kbps

1 m   10 m   100 m   1 km   10 km

Wireless Communications: Acoustics

2017 achievements
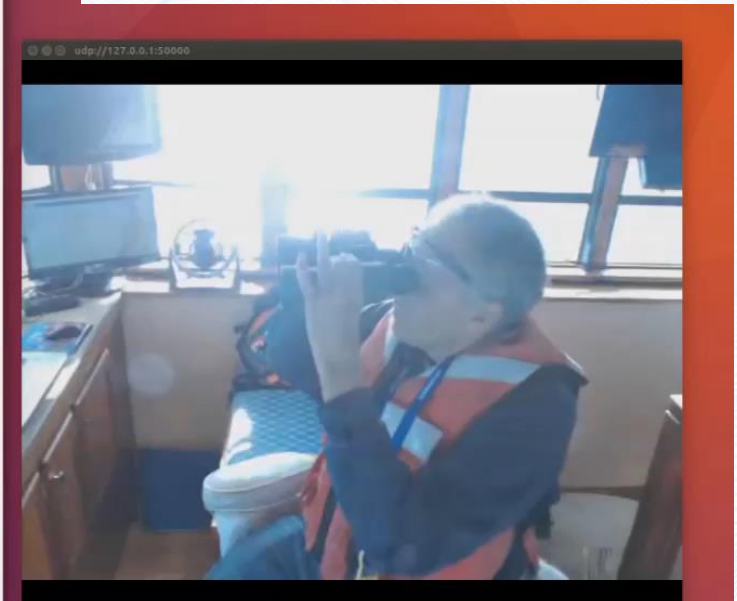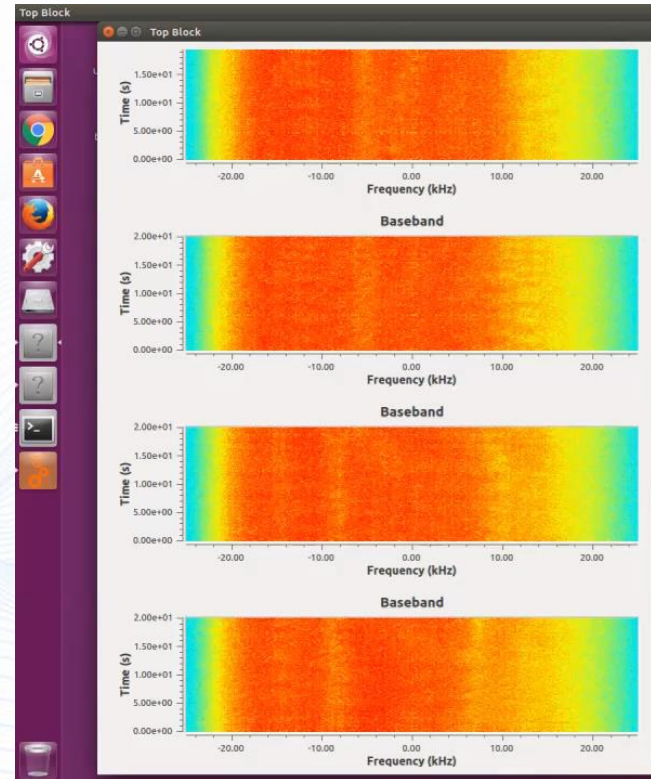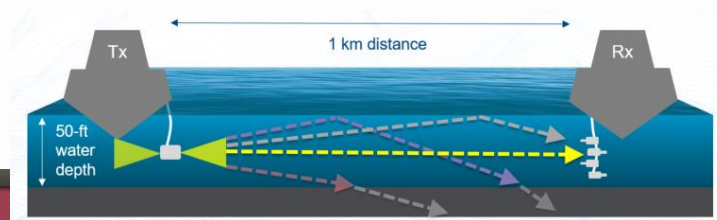
- Live video
- 10× commercial modems

2018

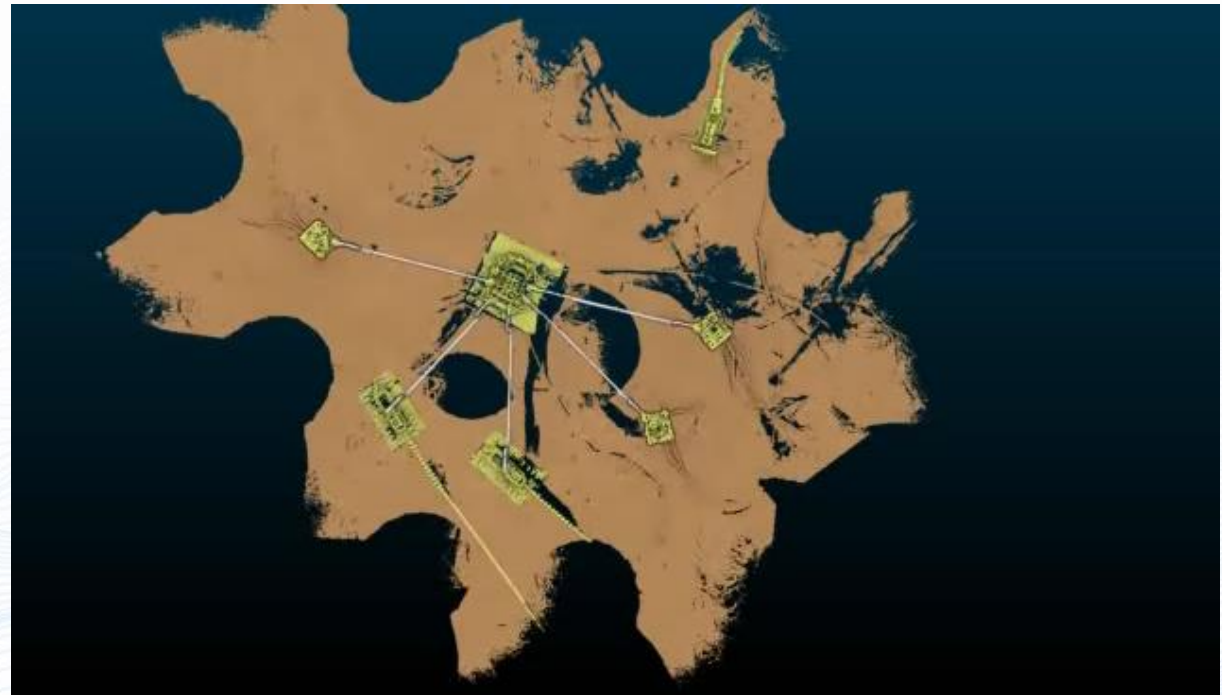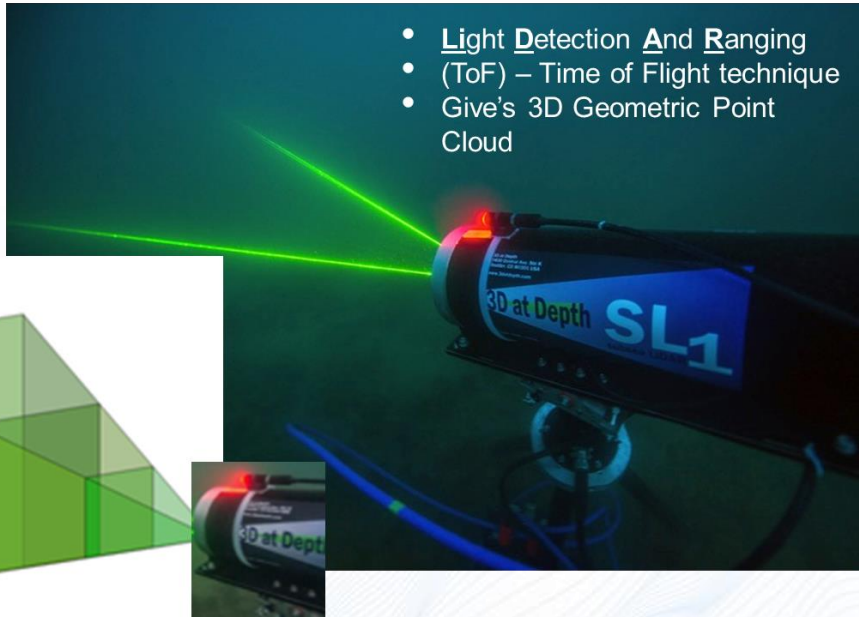- Integration into uROV platform

2019+

- Development to 3 km

⭐ WORLD RECORD

100 kbps at 1 km, video transfer, Boston, Oct. 2017, San Diego Dec. 2017 (vertical).

Next-Generation Visualization and Measurement

- **L**ight **D**etection **A**nd **R**anging
- (ToF) – Time of Flight technique
- Give's 3D Geometric Point Cloud

3D at Depth

Streaming LIDAR

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SUT
Society for Underwater Technology

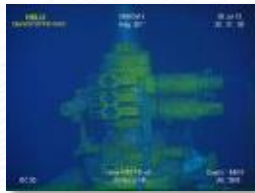# Computer Vision & Machine Learning

Use Cases
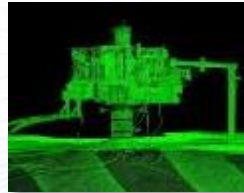
Vehicle Command and Control
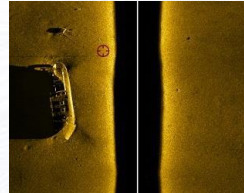
Data Processing Automation

Collect Subsea Data: Offline and Online

Visual

Laser

Sonar

CP, Nav, Depth, SVP, etc.

Others

Feed into Neural Network for Machine Learning

Supervised Learning

- Feature detection
- Autonomy aid
- Online eventing

2018 Project Mantis with major

TRN: -0.4

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SUT
Society for Underwater Technology

uROV 1.0

Supervised Autonomy
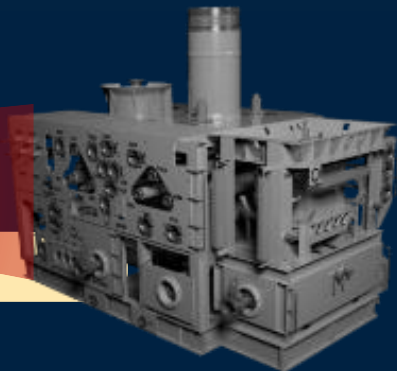- Interactive mission planning
- Situational awareness

Cognitive Telemetry
- High-speed acoustic video streaming
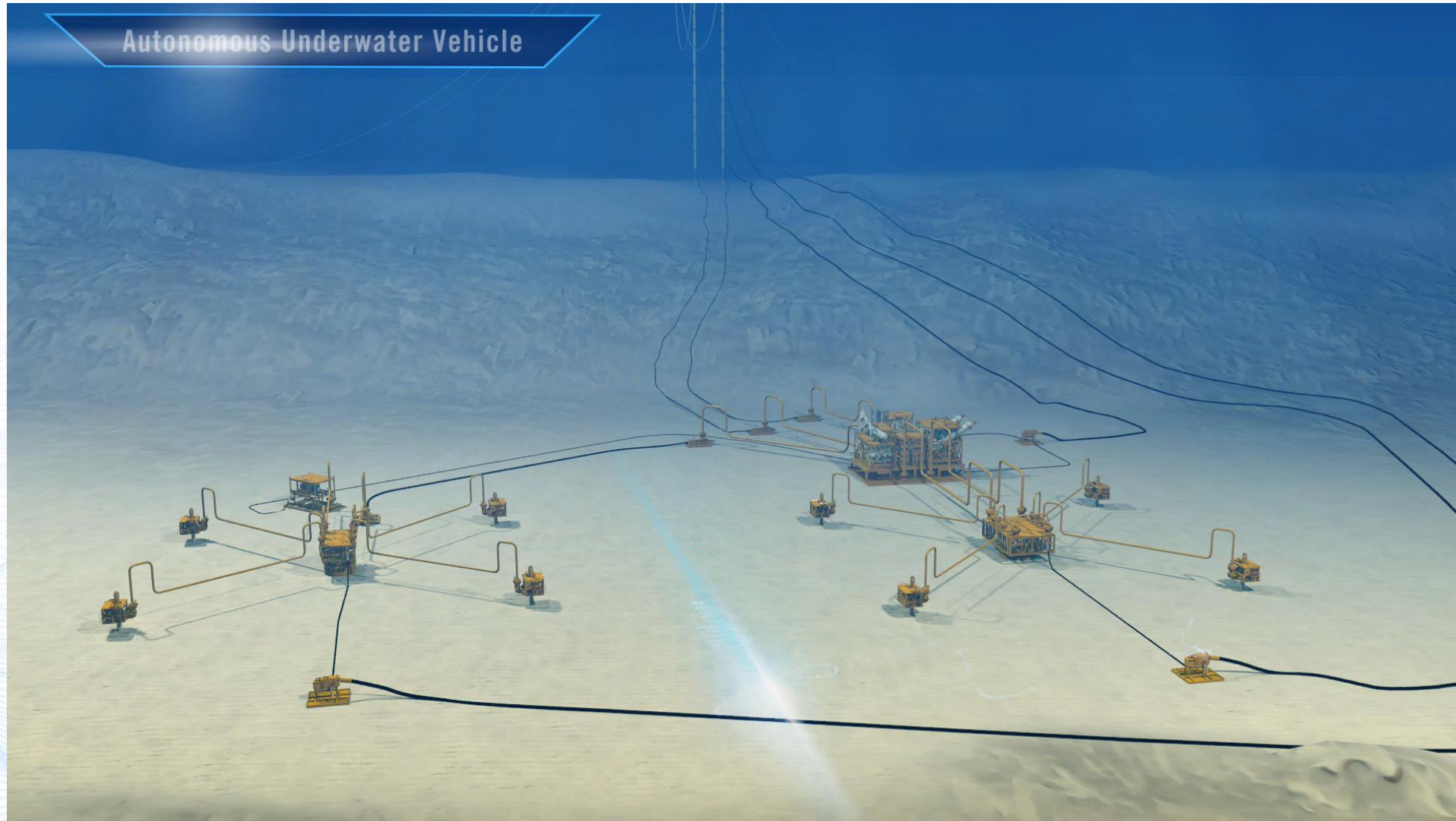- Adaptive data delivery
- Telemetry manager

Next-Generation Sensing
- LIDAR
- Efficient acquisition
- Automated processing

Residency

Autonomous Underwater Vehicle

Acknowledgements

OneSubsea Services Team
Schlumberger–Doll Robotics Research
SAAB

Thank you.

Questions?