

New Frontier Wireless Telemetry

Jack Vincent – Product Champion Subsea IMR Services

Co-Authors: N. Herbst, A. Jarrot, G. Choi, A. Gelman, A. Croux



OneSubsea

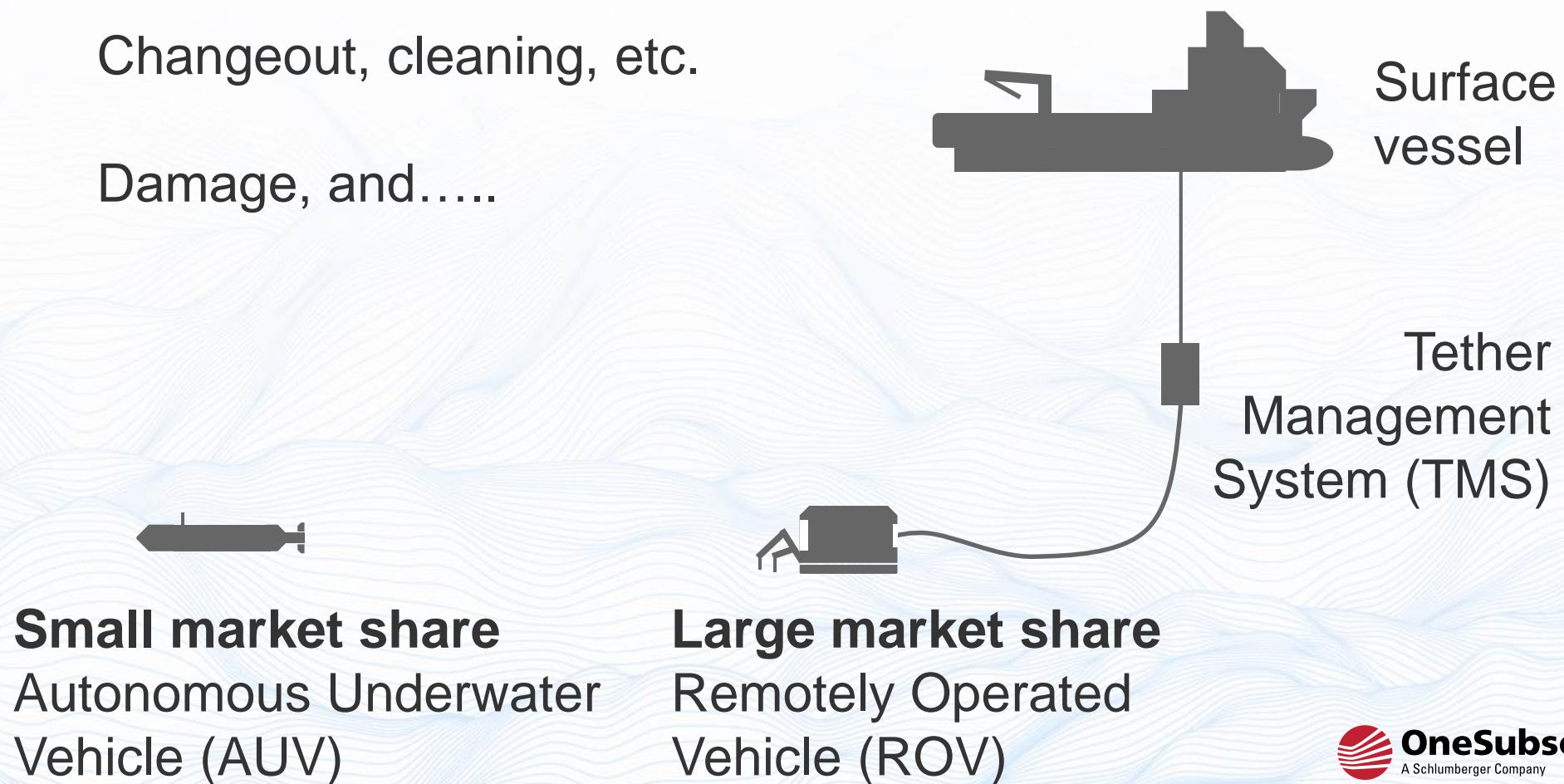
A Schlumberger Company

Agenda

- IMR Services
- uROV Program
- Dolphin Wireless Telemetry
- What's Next
- Questions

IMR Services

- Inspection Visual, SONAR, LiDAR, etc.
- Maintenance** Changeout, cleaning, etc.
- Repair Damage, and.....



uROV Program

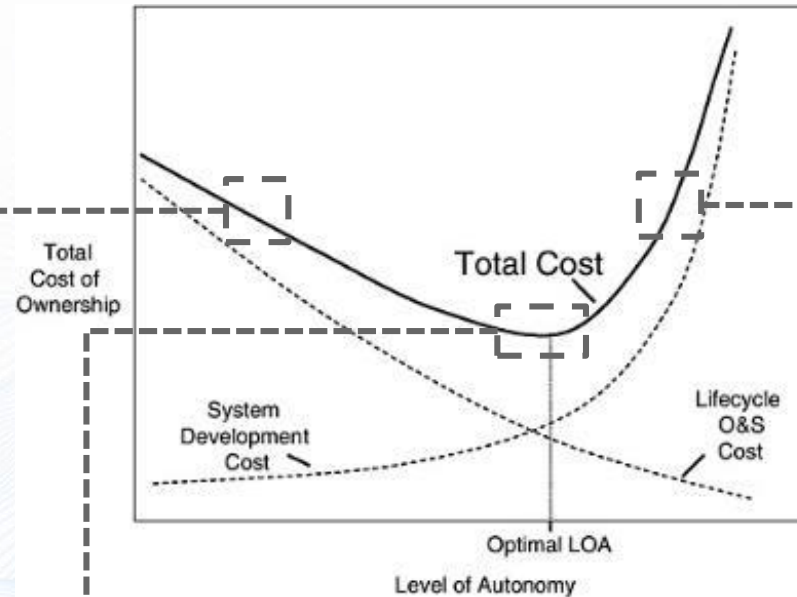
ROV

“Joystick control”

- Legacy approach
- Expensive deployment
- Data through tether



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



AUV

“Fire and forget”

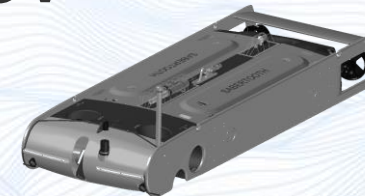
- Future of IMR
- Trust issue around sensitive infrastructure
- Development cost



OneSubsea uROV

“Supervised autonomy”

- Pragmatic approach
- Prescribed real-time data
- Agile



uROV Program

Strategic drivers



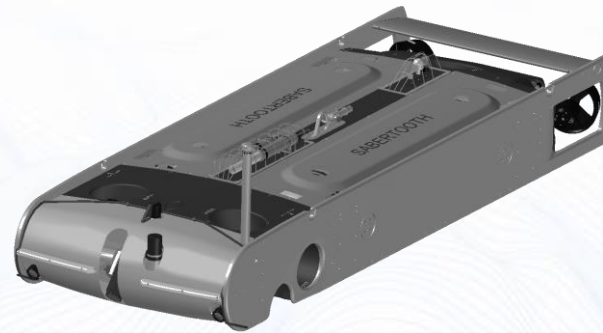
Deployment efficiency



Next-generation sensing



Digital enablement



uROV platform

Schlumberger technologies deployed on SAAB Sabertooth vehicles

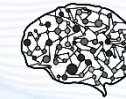
Key technologies



Subsea communications

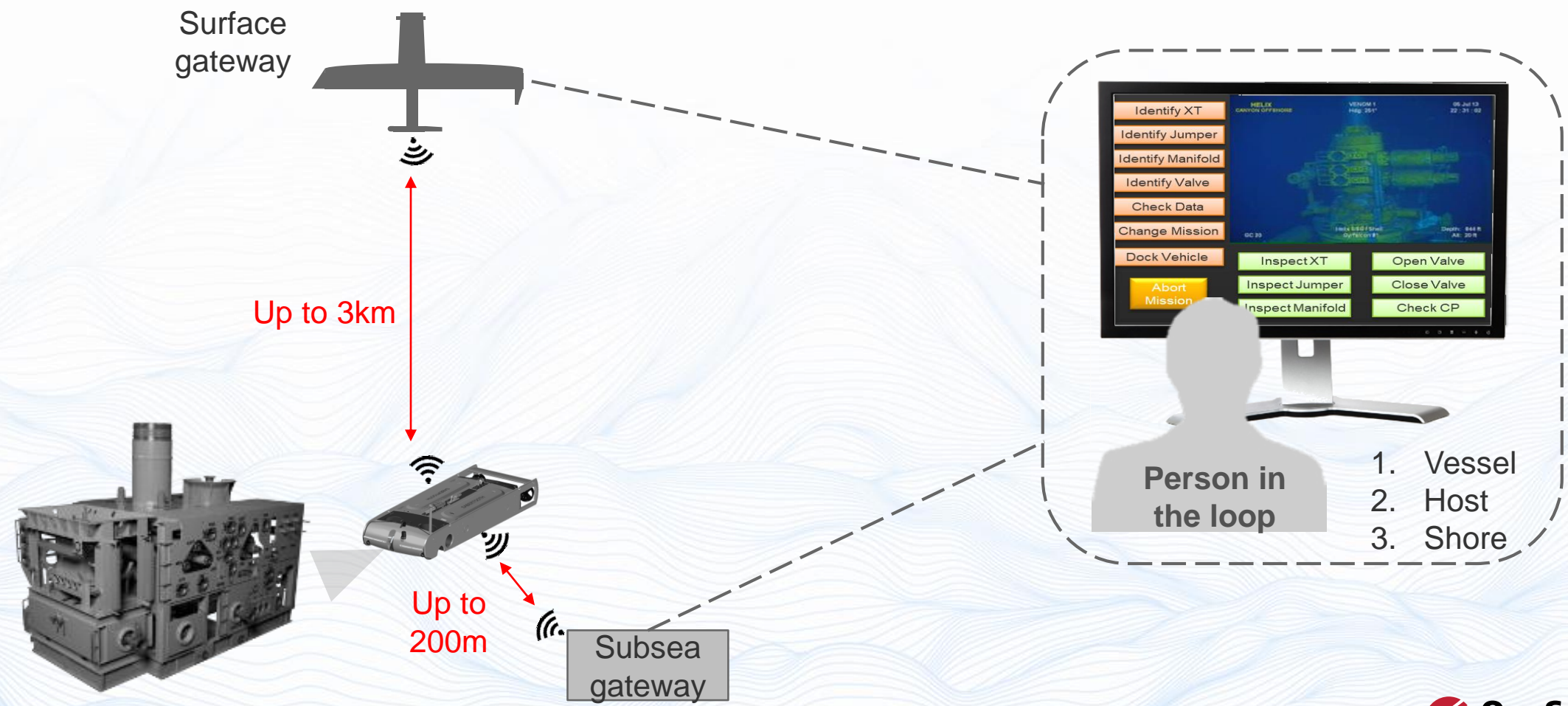


Supervised autonomy



Automatic eventing

uROV Program – Supervised Autonomy



Subsea Wireless at Range

Subsea Acoustic Telemetry Challenges

Attenuation

Ray Bending

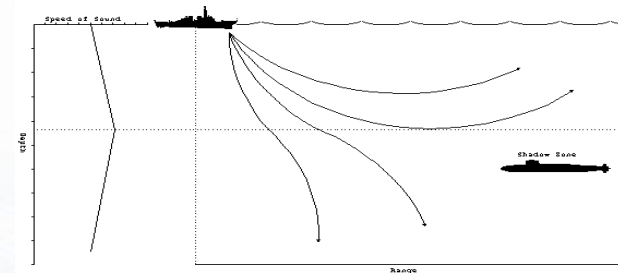
Multipath

Doppler

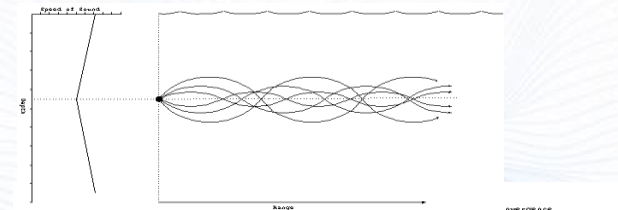
Noise

Computation

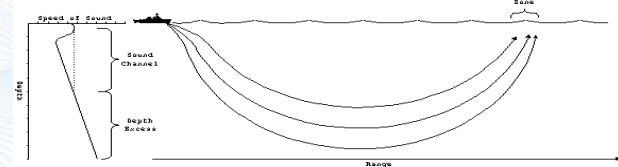
Signal propagation in open water



“Shadowing”



“Channeling”
or “Funneling”



Dead spots

http://fas.org/man/dod-101/navy/docs/es310/SNR_PROP/snr_prop.htm

Subsea Wireless at Range

Subsea Acoustic Telemetry Challenges

Attenuation

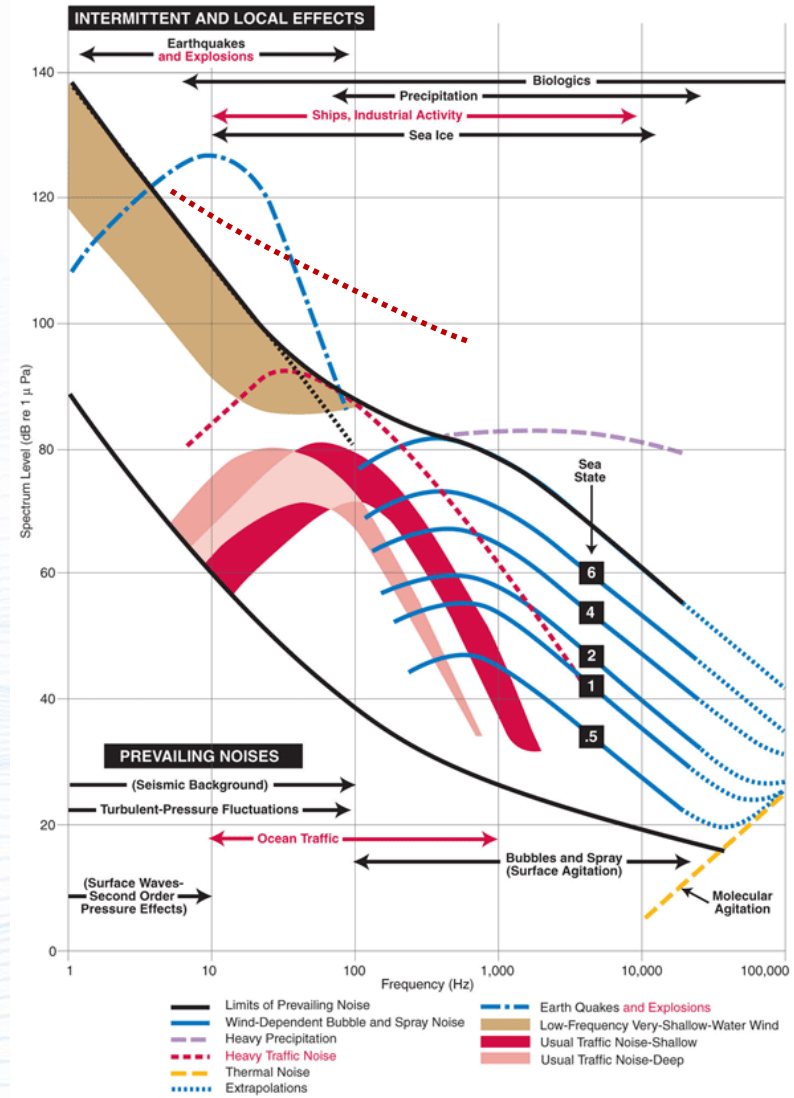
Ray Bending

Multipath

Doppler

Noise

Computation



<https://dosits.org/science/sounds-in-the-sea/what-are-common-underwater-sounds/>

Subsea Wireless at Range

Subsea Acoustic Telemetry Challenges

Attenuation

Ray Bending

Multipath

Doppler

Noise

Computation

Underwater noise from offshore oil production vessels

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Fig. 1. (Color online) Photo of the Cossack Pioneer FPSO (bow attached to riser on the right side of the picture).

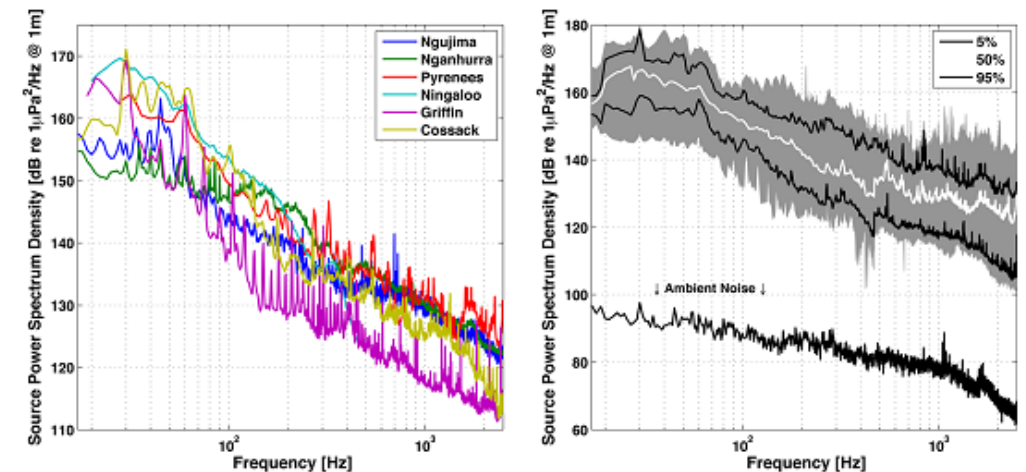


Fig. 4. (Color online) Left: Mean monopole source spectra of the six FPSOs. Right: Range of all monopole source spectra recorded from the six FPSOs (gray), median monopole source spectrum (white), 5th and 95th percentile spectra (black), and ambient noise (black).

Curtin, University - Perth

Schlumberger – Best in Class DH Telemetry

Drilling and Measurements**

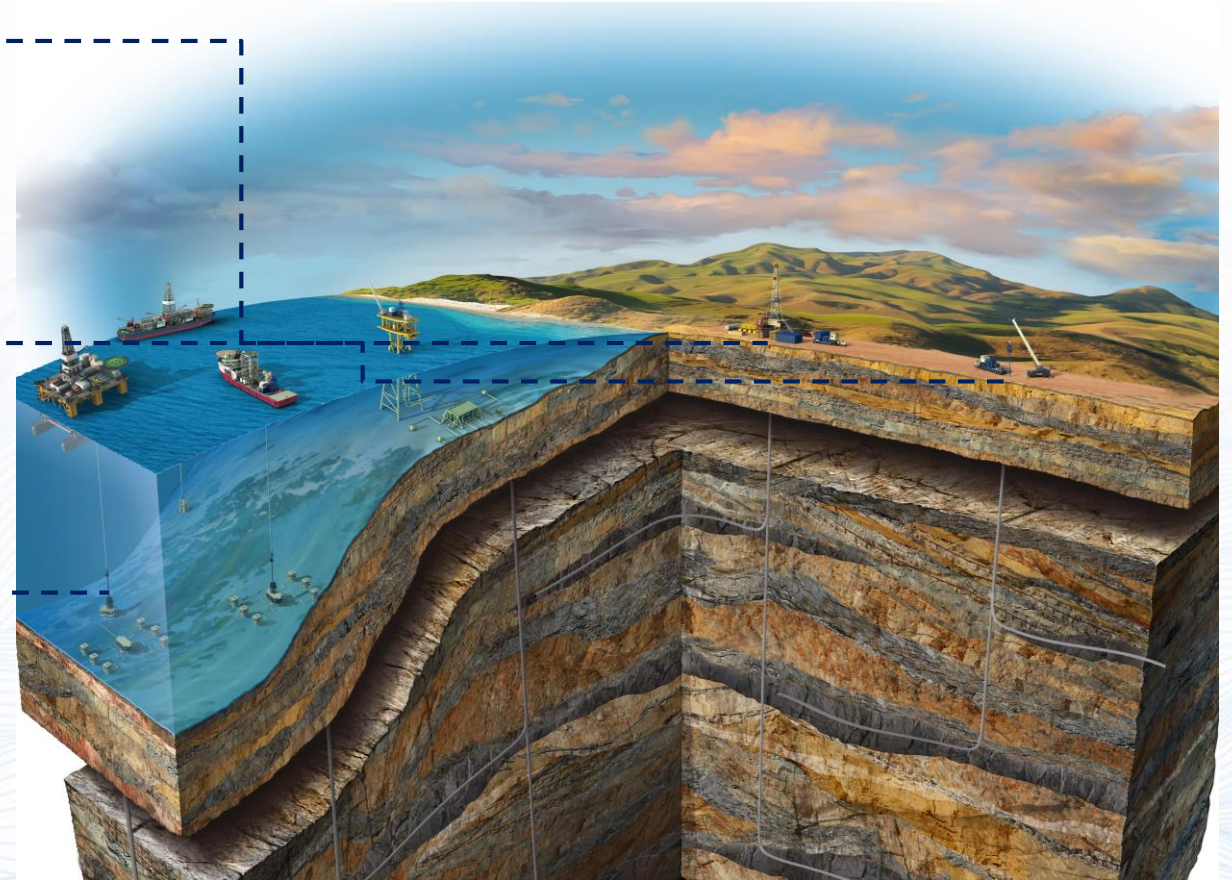
xBolt TeleScope DigiScope ImPulse

Wireline

LIVE MTS EDTS LTS ThruBit

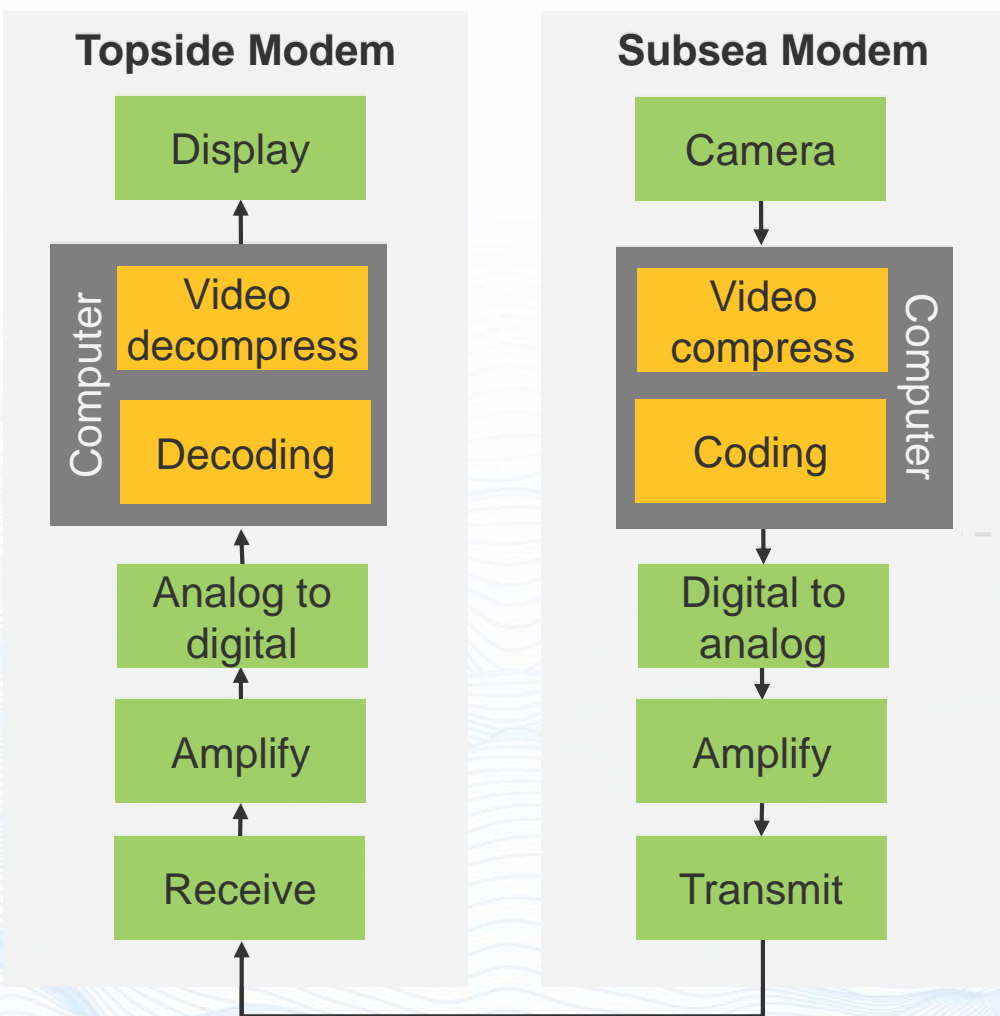
Testing

Muzic



** Can stream up to 6bps over 15km in drilling mud

Dolphin Wireless Telemetry




Digital Algorithms

Acoustic Modeling

Transducers and Receivers

Schlumberger Research

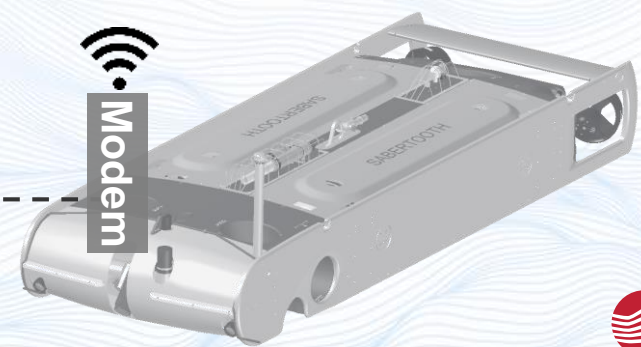


High Performance Computing

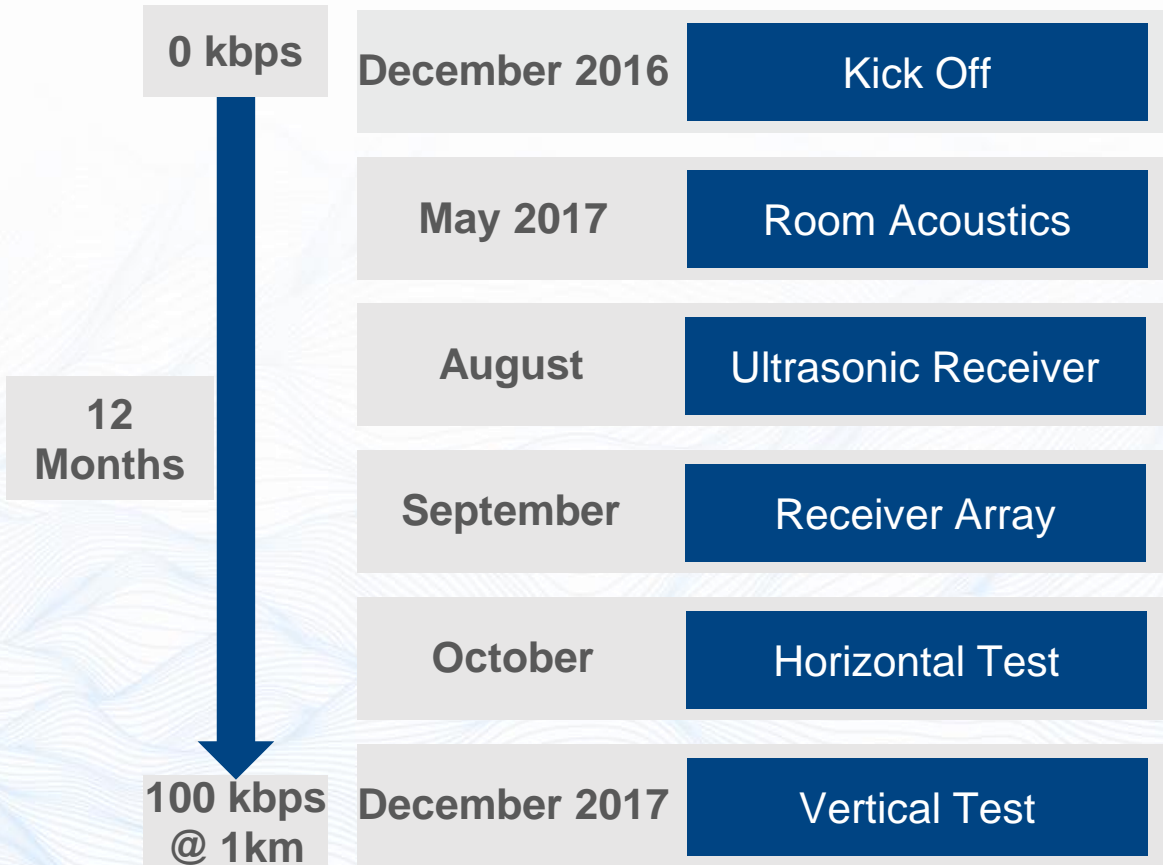
Digital Platform

Testing and Integration


External Partners



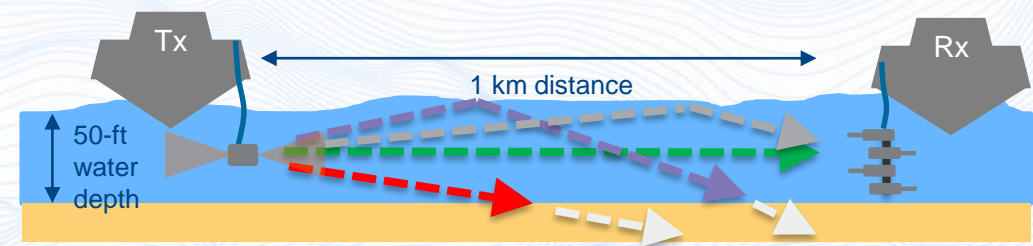
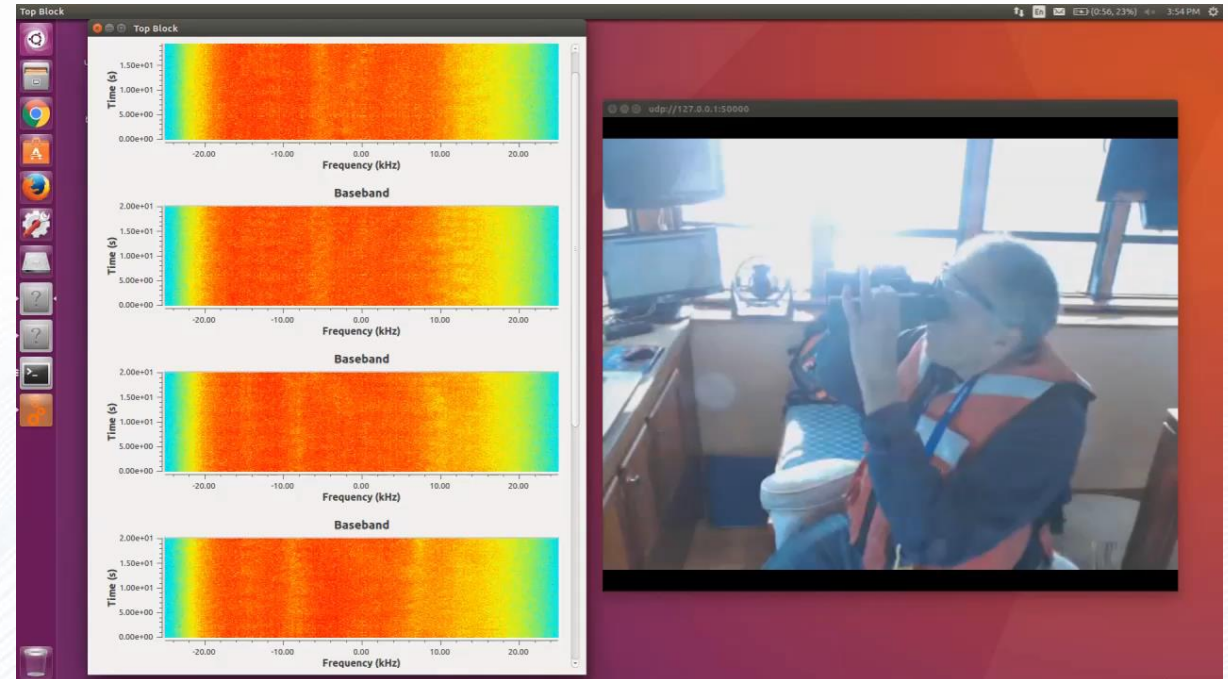
Dolphin Wireless Telemetry



Dolphin Wireless Telemetry

World Record 

2017	Live Video @ 1km
2018	uROV Integration
2019+	Roadmap to 3km vertical



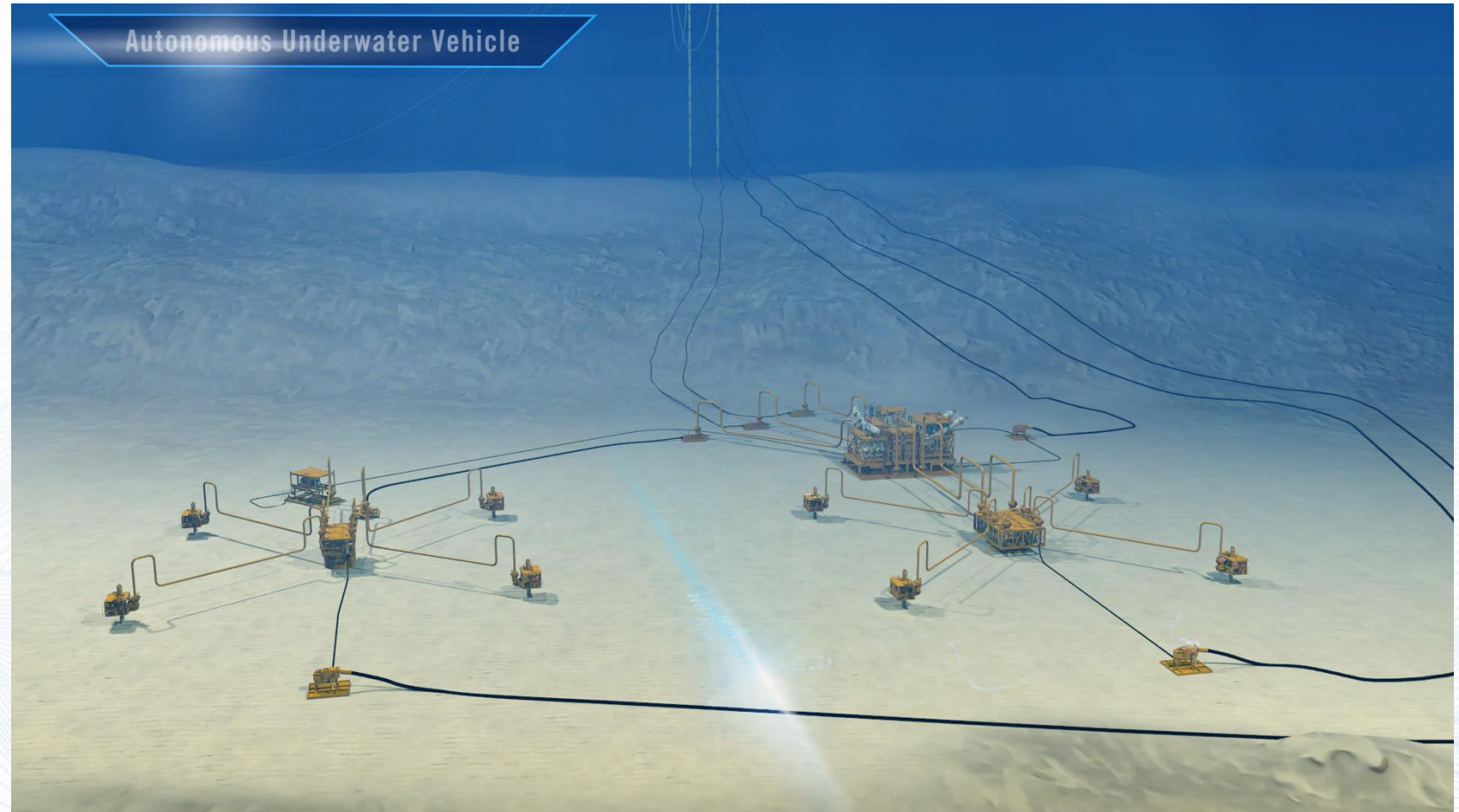
Boston Oct. 2017
(vertical repeat in San Diego Dec 2017)

What's Next

Residency – SPS Interface

Multi-Physics Comms

Wireless Networks



Questions

Thanks to Co-Authors



Arnaud Croux – Senior Research
Scientist



Andriy Gelman – Senior Research
Scientist



Gloria Choi – Research Scientist



Arnaud Jarrot – Senior Research
Scientist



Neil Herbst – Program Manager

Questions