Shore-based teleoperation of deep submergence ocean exploration vehicles (ROV, AUV, HOV) on Unols vessels

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WOODS HOLE OCEANOGRAPHIC INSTITUTION

NOAA

oeci

NSF

Vision

Status Quo

Ocean Exploration affected by staffing, berthing, pandemics and ship availability

New Insights

Upcoming Research Vessels supporting Ocean Exploration shrinking in size with a move to fully autonomous surface vessels inevitable in the future

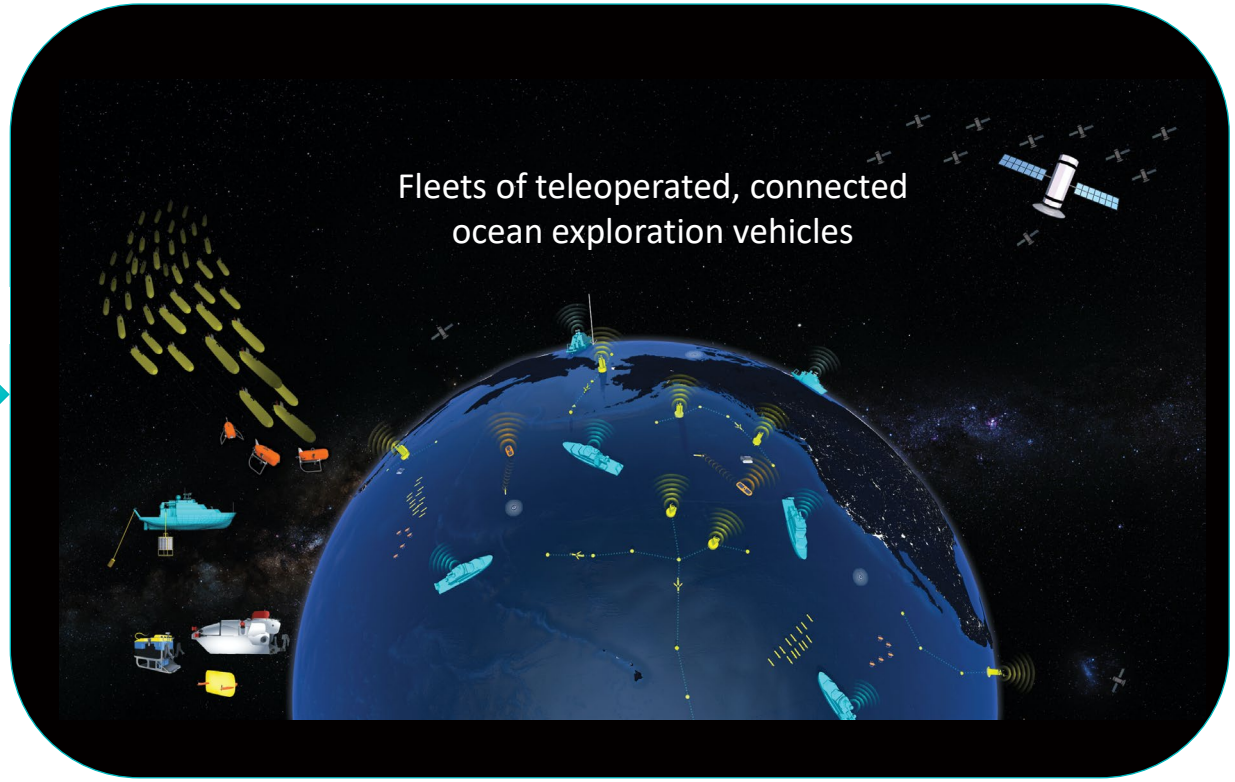
Teleoperation solution

Coordinated operation of surface and underwater research vehicles from shore

Leverage:

- "Always connected" Unols vessels as "access points"
- Upcoming LEO satellites
- Economies of scale
- Existing exploration vehicles as prototyping platforms

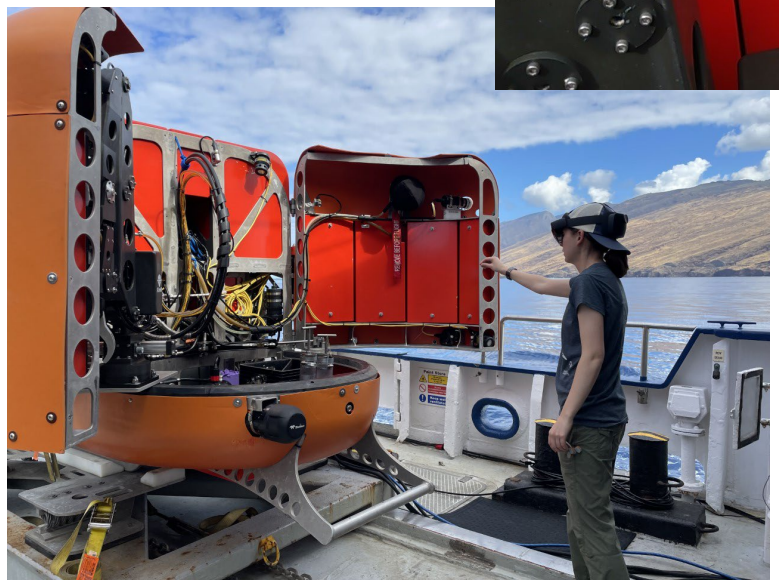
Final Goal



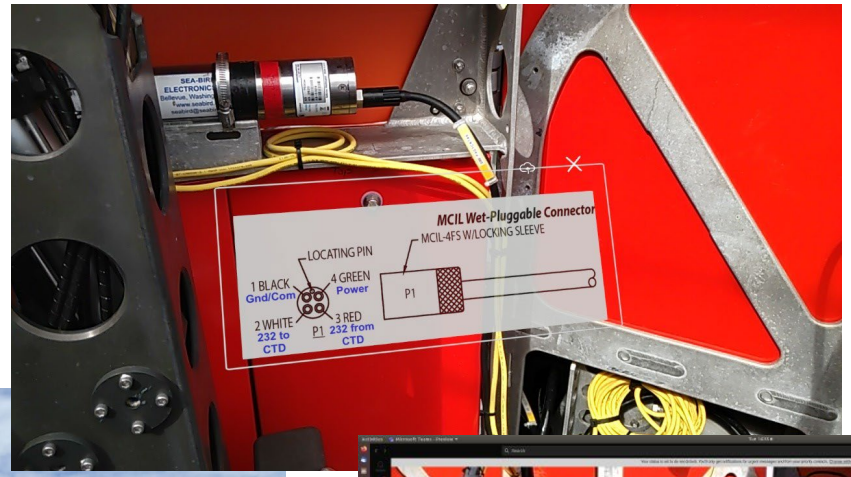
Real-time engineering and troubleshooting with AR

Distributed expertise

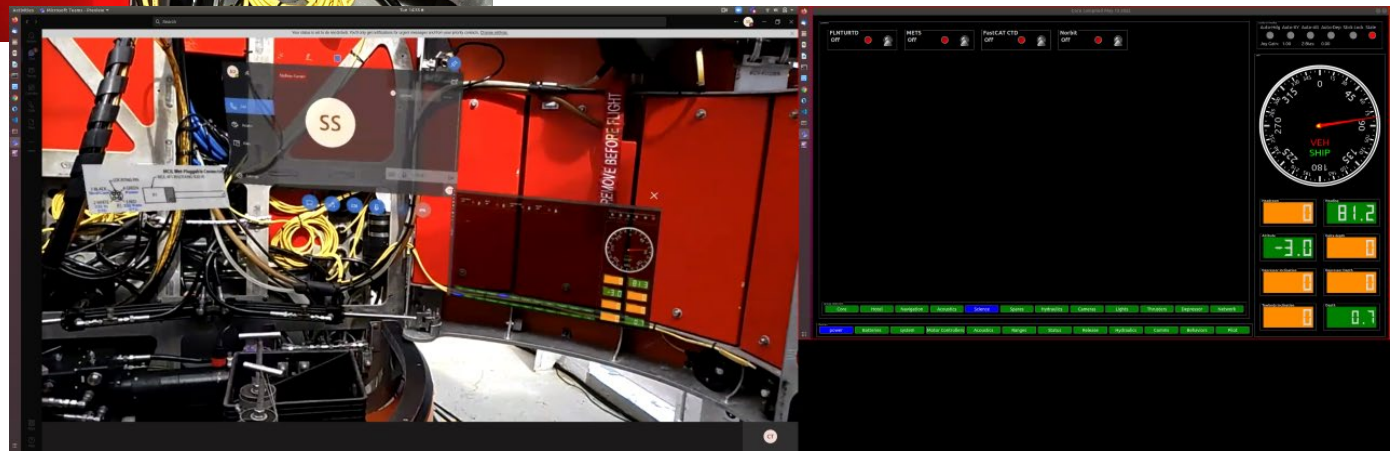
Field technician interacting with holograms sent by shoreside personnel



Field technician AR view

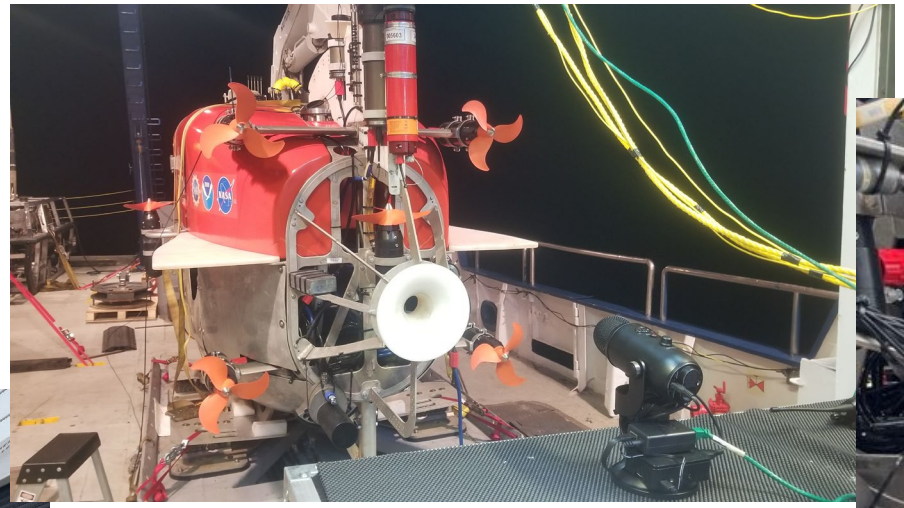


Remote operator view

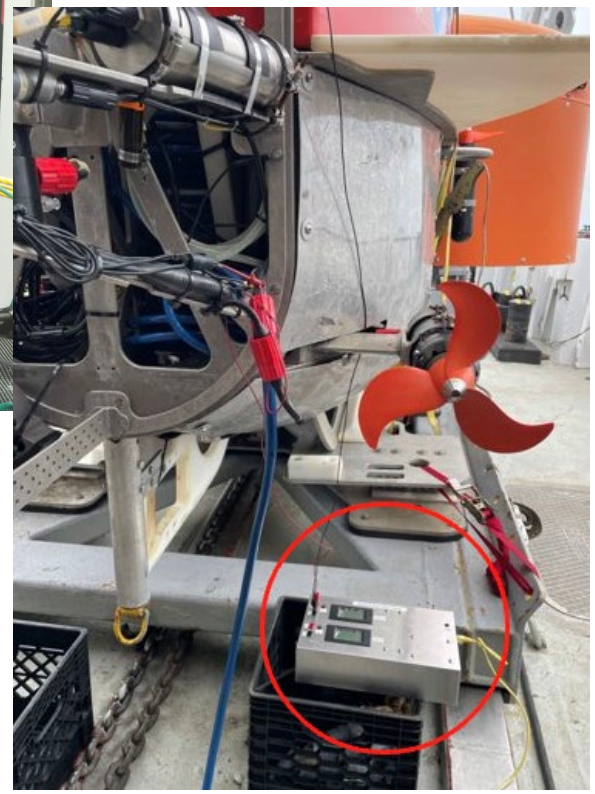


Remote checkouts

IP cameras



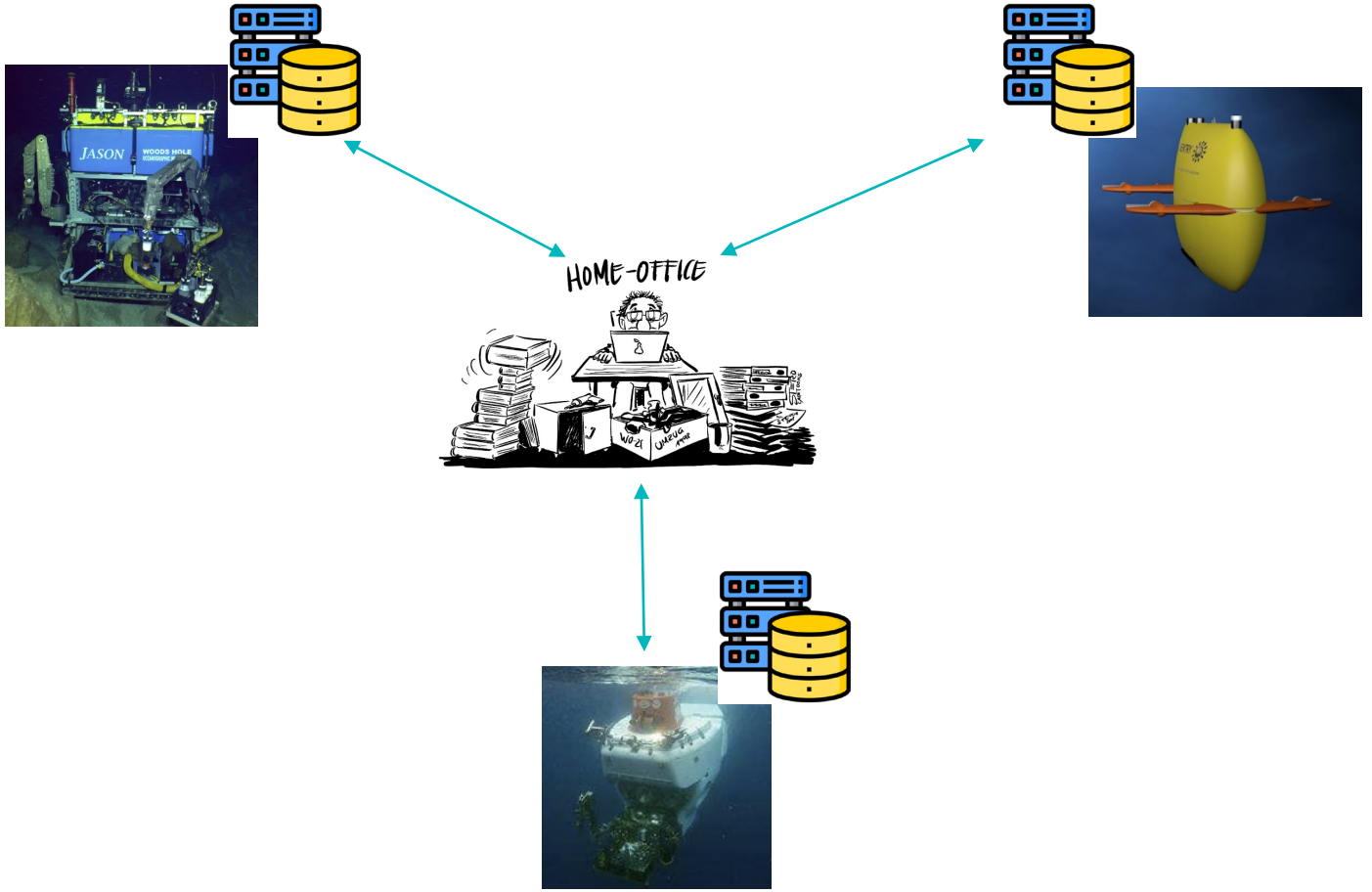
Network-enabled acoustic communications checkout tool



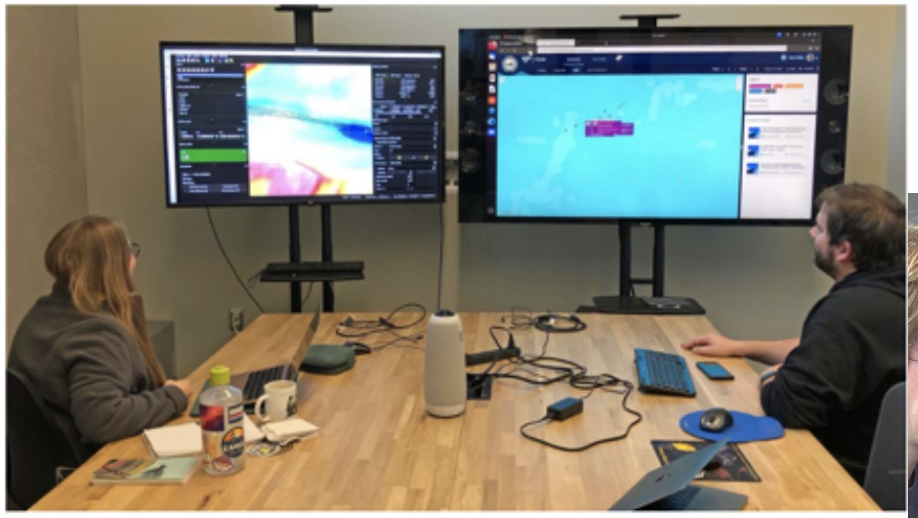
Network-enabled safety releases tester

Data services

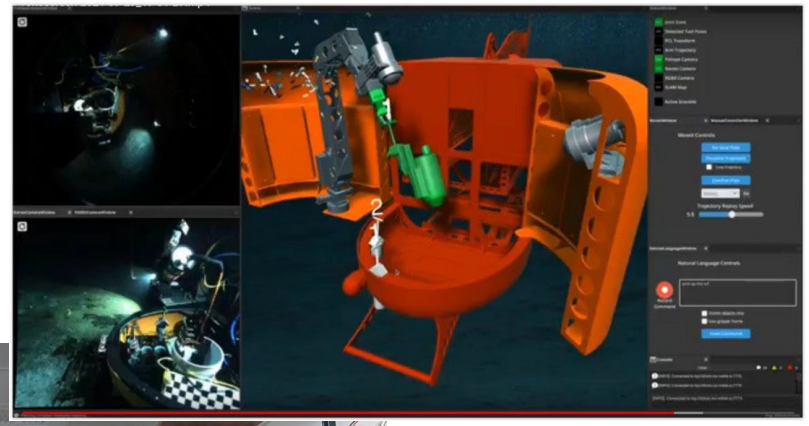
Shore-driven edge processing



Remote operations



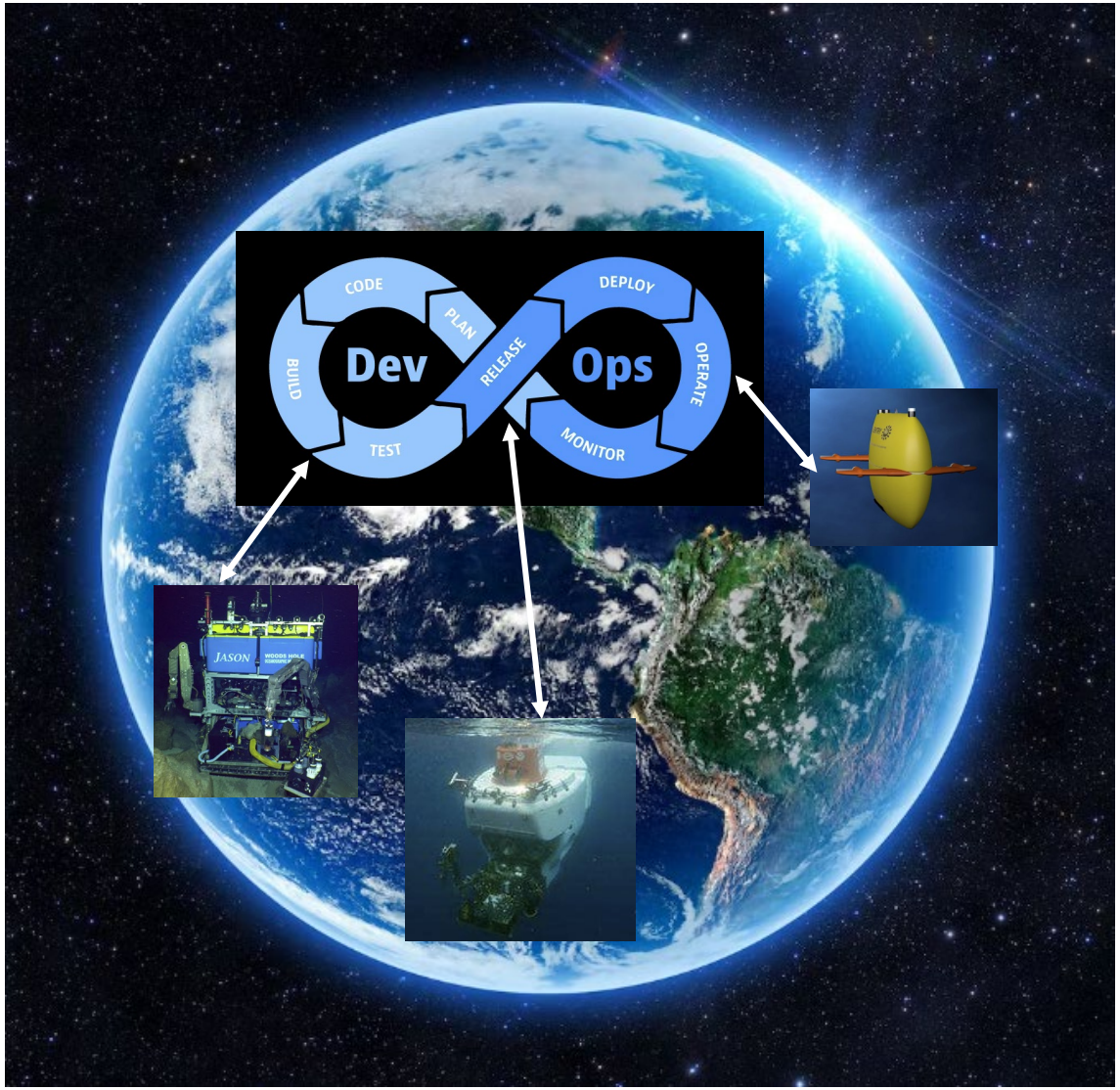
Melinda Bahruth, PhD student from the University of Delaware and Stefano Suman from the Sentry team work in real-time with co-PI Chris German during the 4CAST GOFAR project.



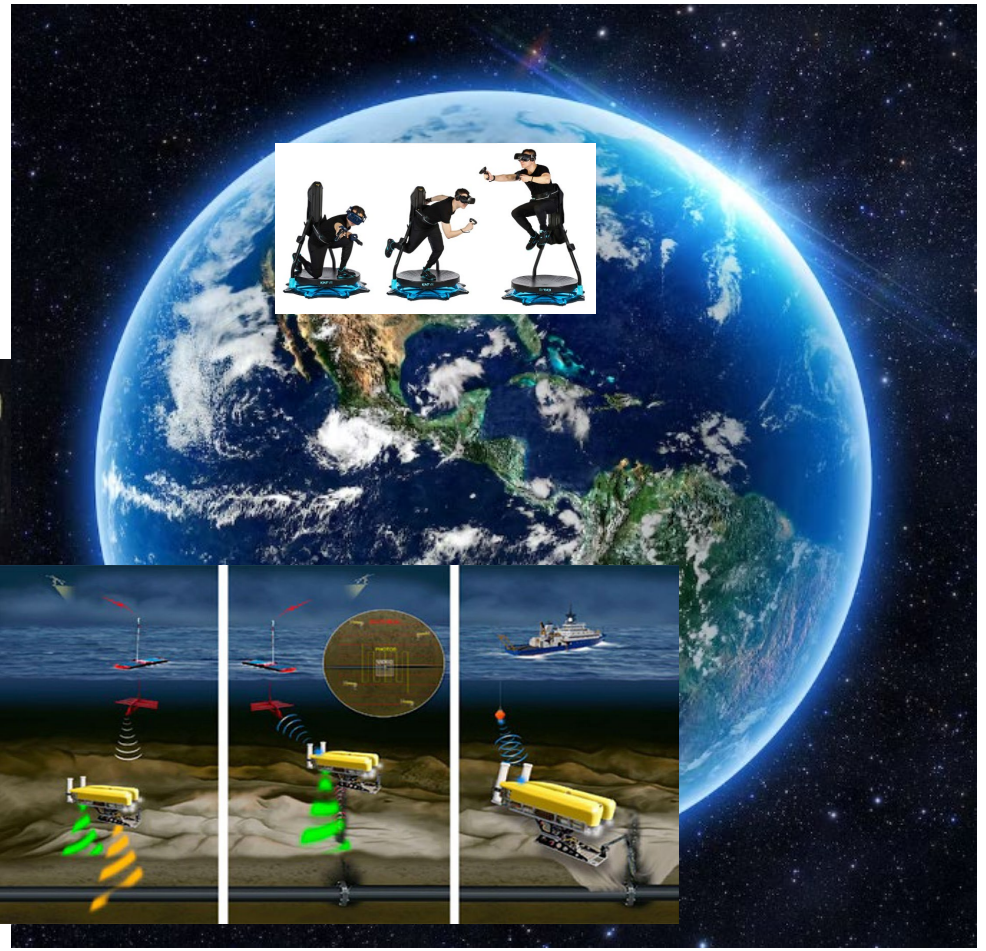
Remote manipulation

Remote piloting and watchstanding

DevOps over VPN and satellite: merging technology development and IT operations



From tech demos to routine teleoperations



Next steps

- Establishment of working group to build routine teleoperation capability
- Development of "Service Level Agreements" (SLA) and a new Unols appendix on guaranteed connectivity expectations (uptime, bandwidth, etc...) for teleoperable guest assets
- Cybersecurity implications
- Distributed teams communication protocols and methods
- Safety and failsafes

Thank you

Breakout session on Wednesday to discuss next steps

Questions or discussion? Contact: ssuman@whoi.edu