

# Expanding Operations Over the Horizon

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# PRESENTATION OVERVIEW

- MBR-Maritime Broadband Radio
- Product Family
- NAVO; from idea to installation.
- Test results
- Conclusion



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# Maritime Broadband Radio

## Operational Excellence Through Communication Performance



# Facts and numbers



**IP- based data networking**

**16,5 Mbps Payload**

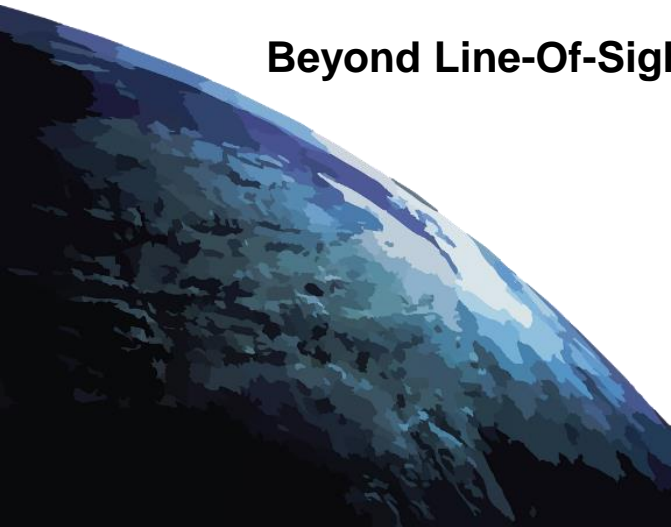


**Point to point and point to multipoint**

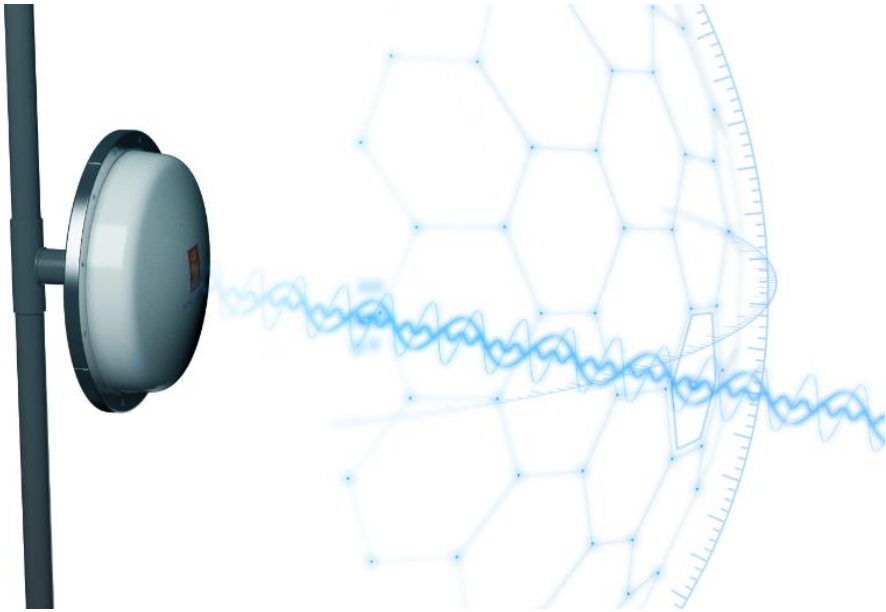
**Beyond Line-Of-Sight**



**Deterministic Latency**



# Product family



**MBR 189**

High gain version for vertical installation



**MBR 179/169**

High gain version for horizontal installation

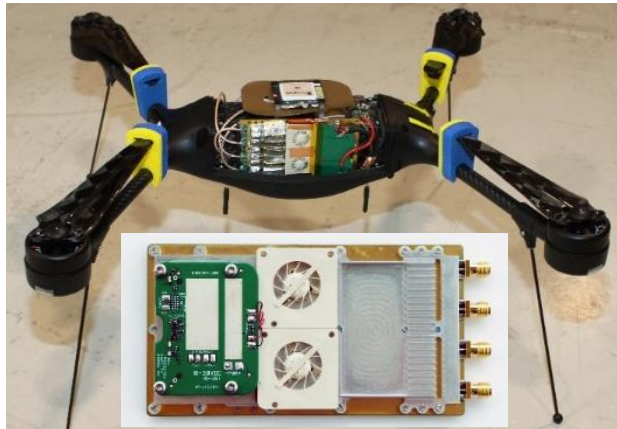


**MBR 144**

Portable mobile version

# MBR 144 Product Types

1. MBR 144 OEM
2. MBR 144 Personal
3. MBR 144 Fixed
4. MBR 144 UAV
5. MBR 144 Submersible

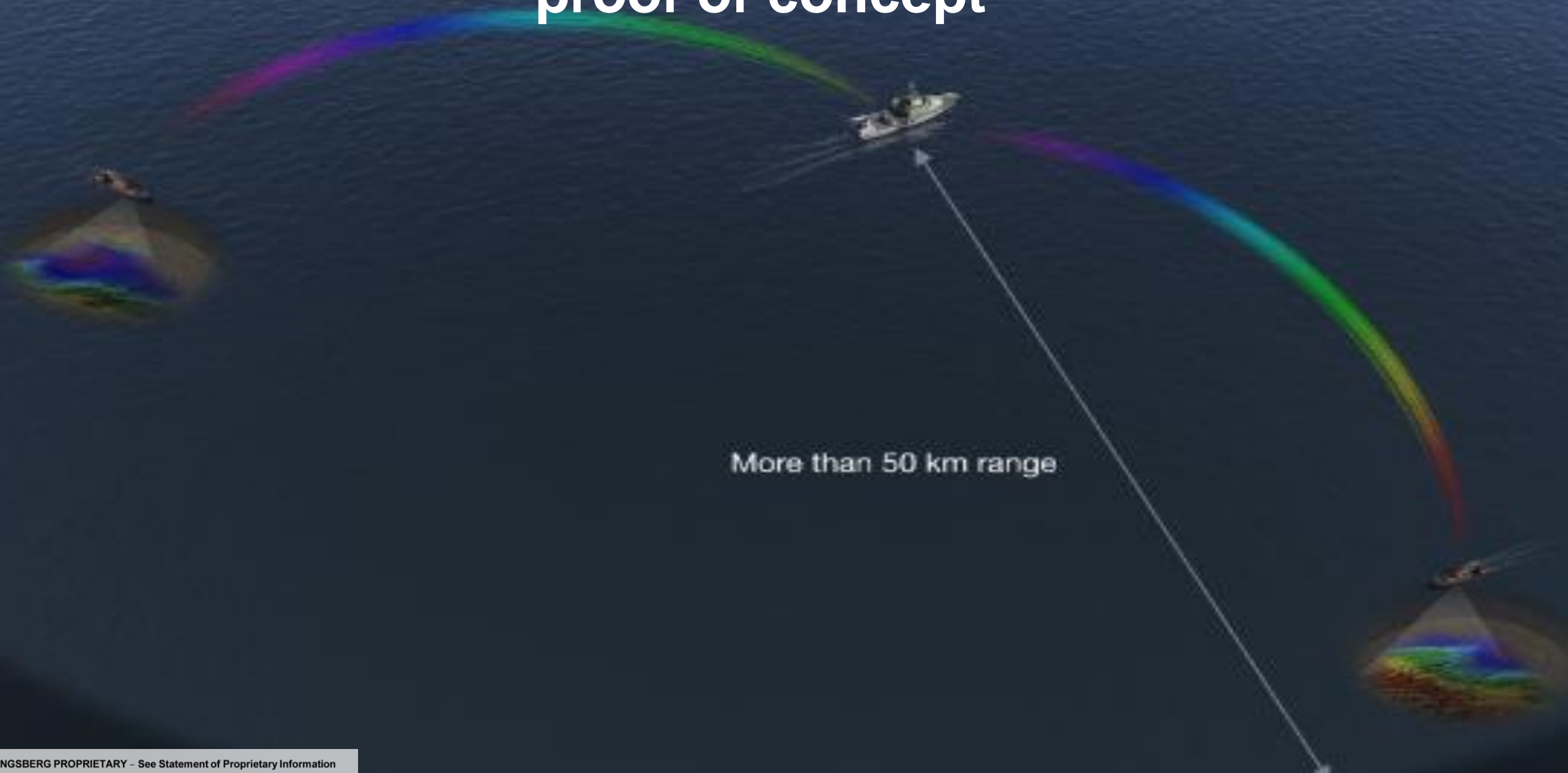




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# NAVO-Naval Oceanographic Office From Idea to Installation

# NAVO Sidney BC, July 2015, proof of concept



More than 50 km range





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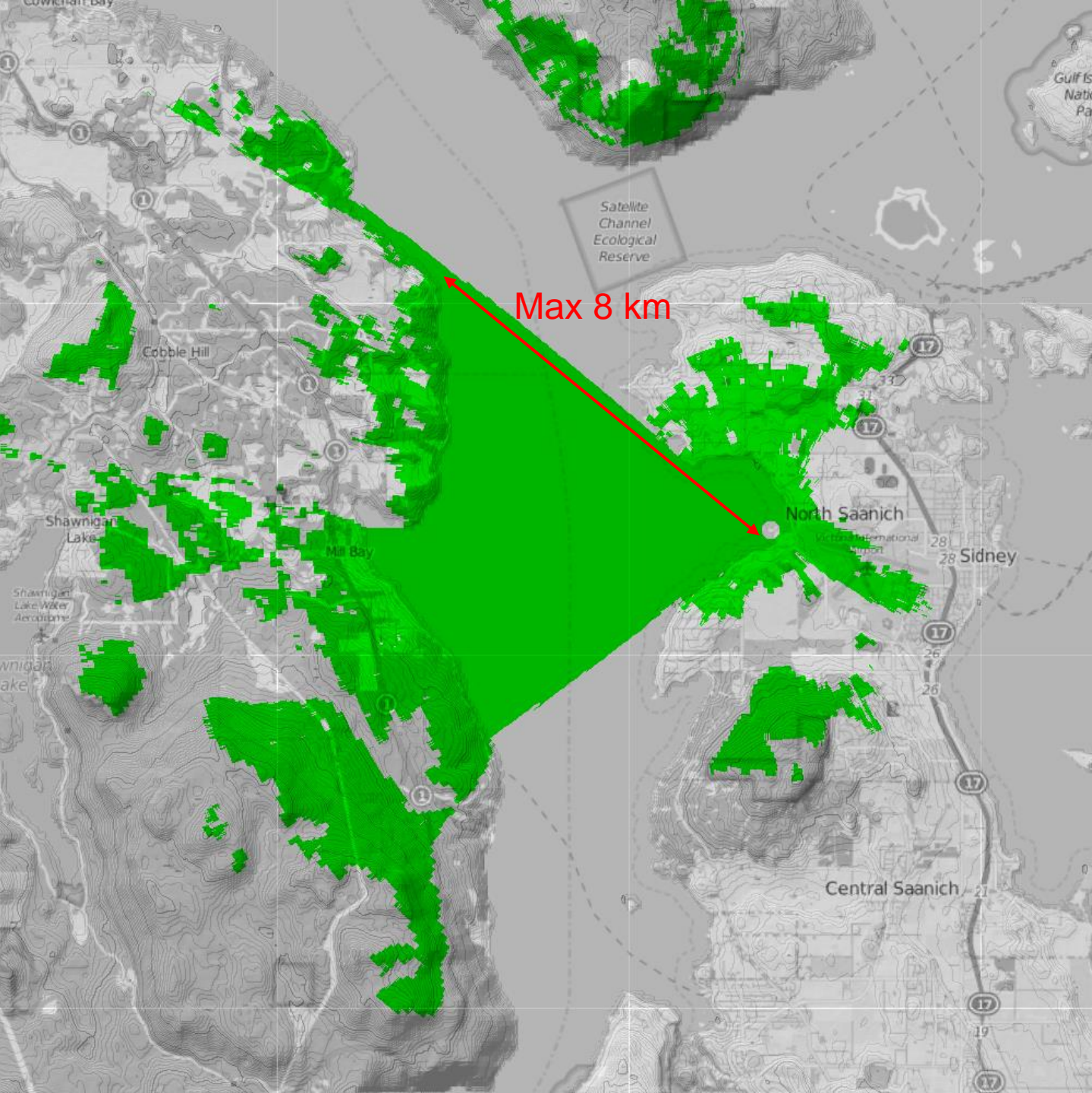


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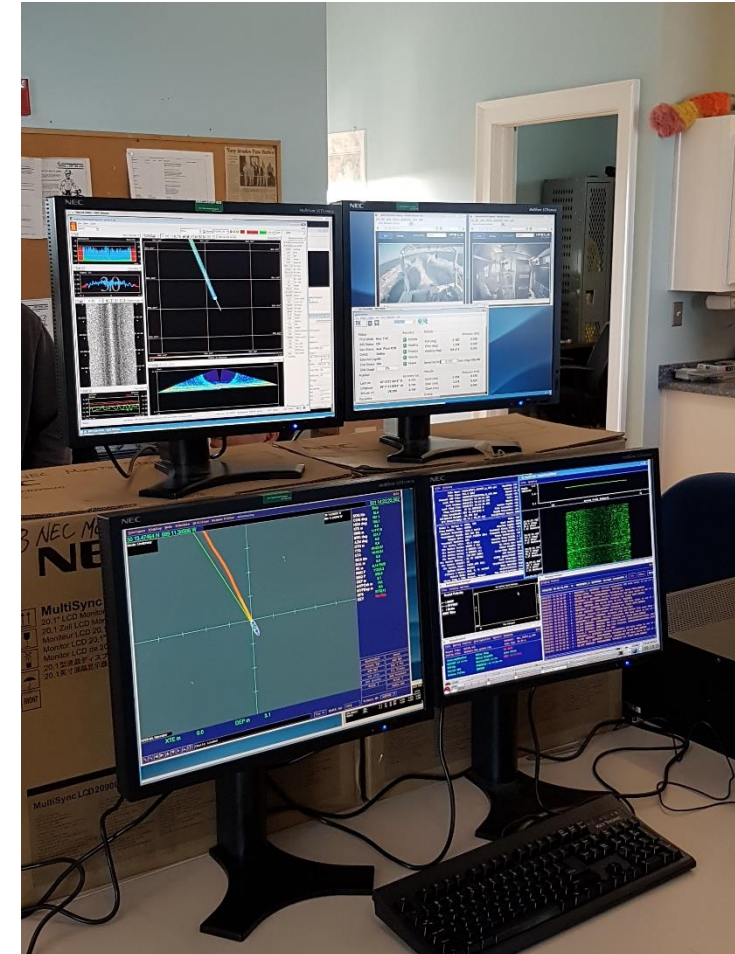




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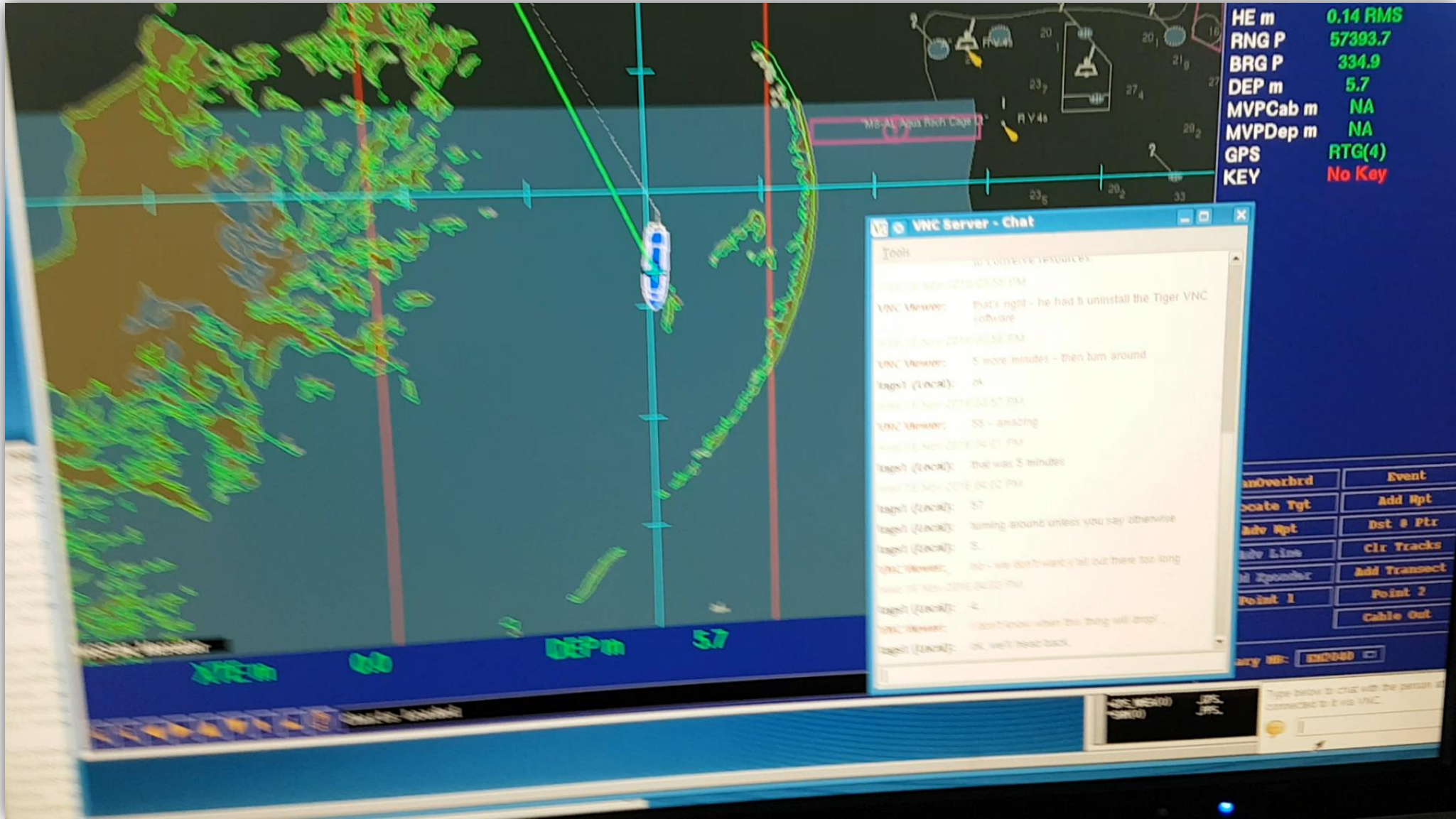
# Mississippi Nov 2016



# Over the Horizon Remote Operation > 57 km!!



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# Full integration with two launches, Jan. 2017



VNC (Remote Desktop)  
> Multibeam  
> Sidescan/MVP/IMU  
> Survey Database  
IP cameras (in/out)



1 launch (179/189)  
**> 57 km**  
2 launches (2x179 / 189)  
**> 30 km**

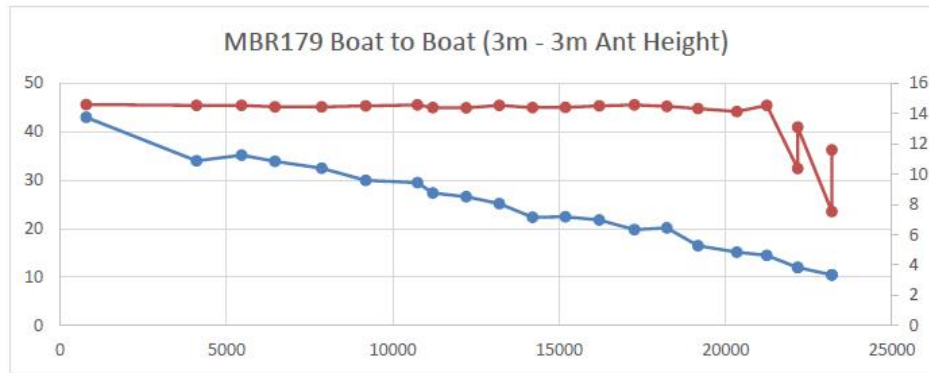




# Test vessel-vessel and vessel-land

## 6.3 Test 1 – Vessel to Vessel

The graph below shows the signal strength in db (blue, left axis) and data bandwidth in Mbps (orange, right axis) plotted against range between the two vessels in metres.



From the initial starting range of around 700m the data bandwidth remained fairly constant at around 14.5Mbps until just after 21km when it started to drop significantly. It should be noted that the calculated line-of-sight between the two radios was 12.5km and the full data rate continued well beyond this range.

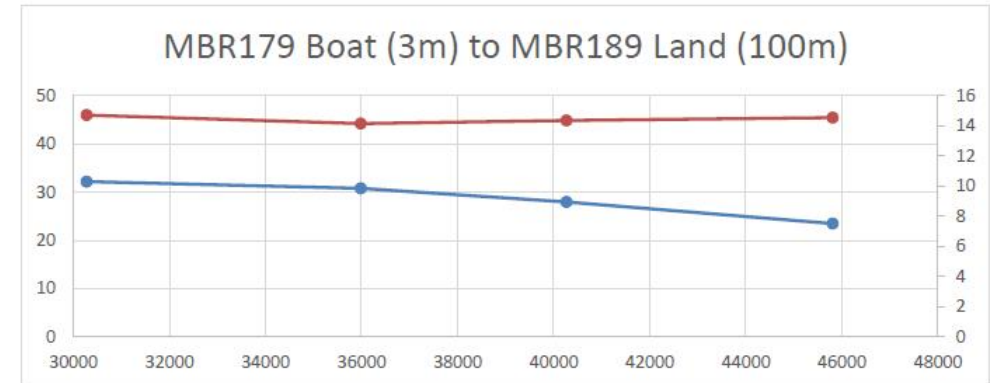
The signal strength was shown to be reducing in a near-linear fashion down to around 10.5dB which is close to the point where the link becomes unstable. It was estimated that a link could be maintained until around 24km albeit at a lower data rate.

Repeated tests at this limit gave improved data rate results but the signs of instability would suggest that the useable limit had been reached.

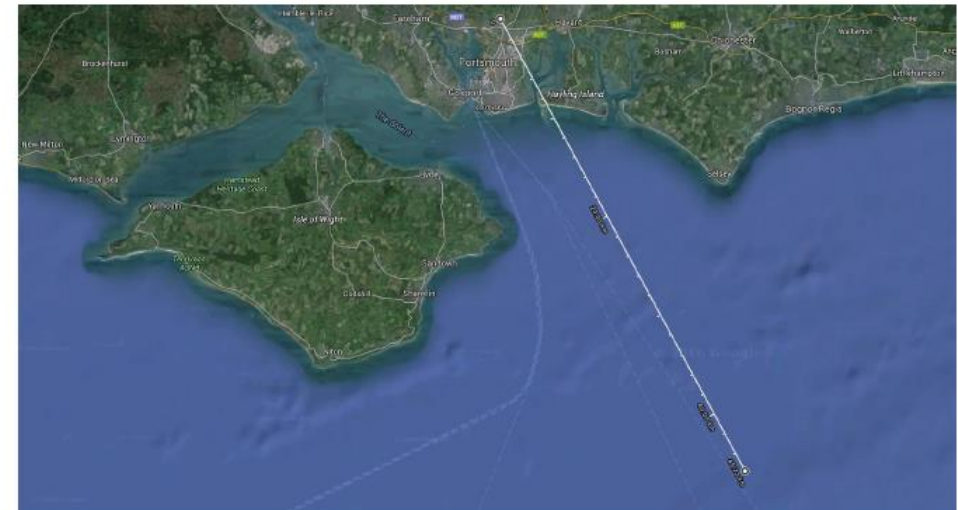


## 6.4 Test 2 – Land to Vessel

This graph shows the results of the second test, between the vessel and the land station at 100m.



Starting at a range of just over 30km with full data rate (14.7 Mbps) the data rate remained above 14Mbps until the trial was terminated at 46km with a data rate still at 14.5Mbps) the signal strength had fallen but only to 23.5dB. This indicates that the calculated range of 48km appears achievable with full data rate or even beyond.



Screen shot of map showing positions of the vessel and land station at 45.73km spacing



# Land-vessel (20m-15m)

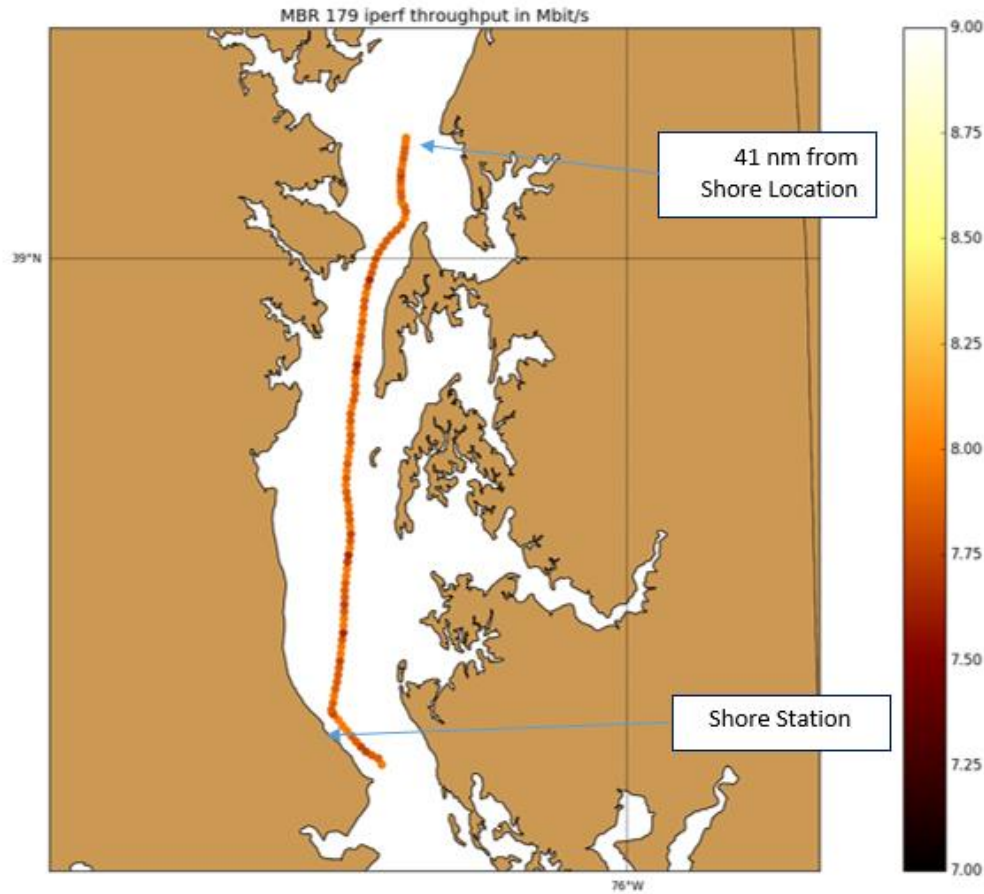


Figure 5: Kongsberg MBR Performance

Finally, we performed a throughput versus distance analysis for all three radios (Figure 8). This image clearly illustrates the impressive range of the MBR system.

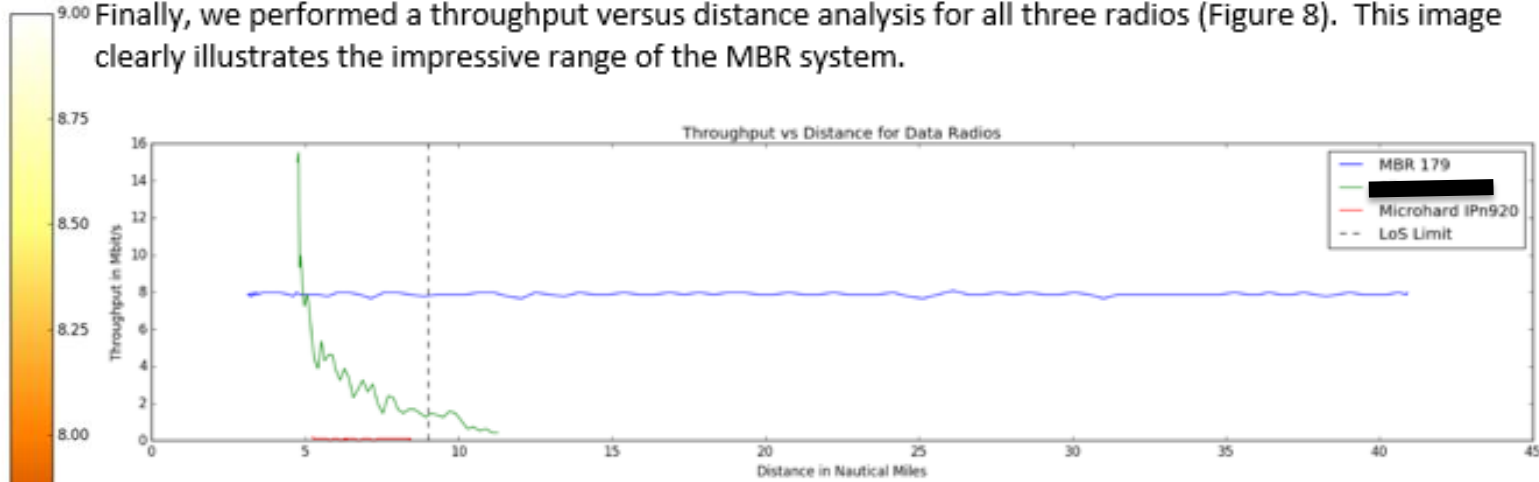


Figure 8: Throughput vs Distance for Data Radios:

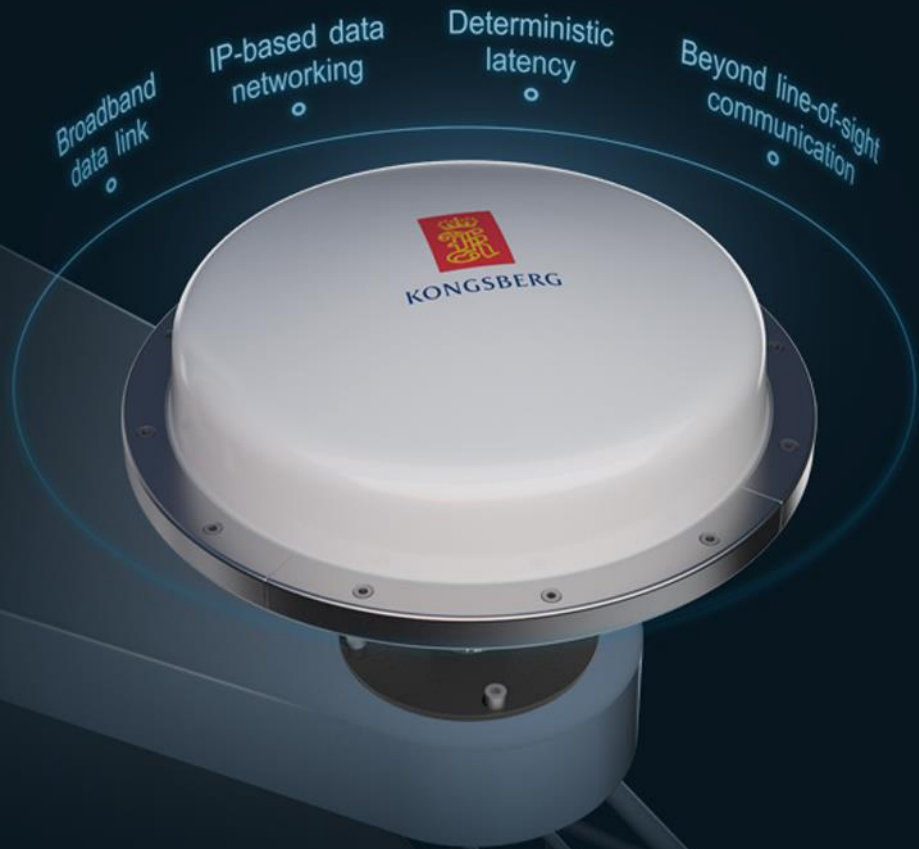
# Ocean Business 2017

- Used a C-worker 5 from ASV( MBES, 2040P, SP130, Mikropap, FLIR, 4 Kameronas)
- 3 MBR antennas set-up
- Live remote Subsea Mapping, shown at KM stand(operator survey) and ASV stand( monitoring only) and at the vessel in command(operation center).





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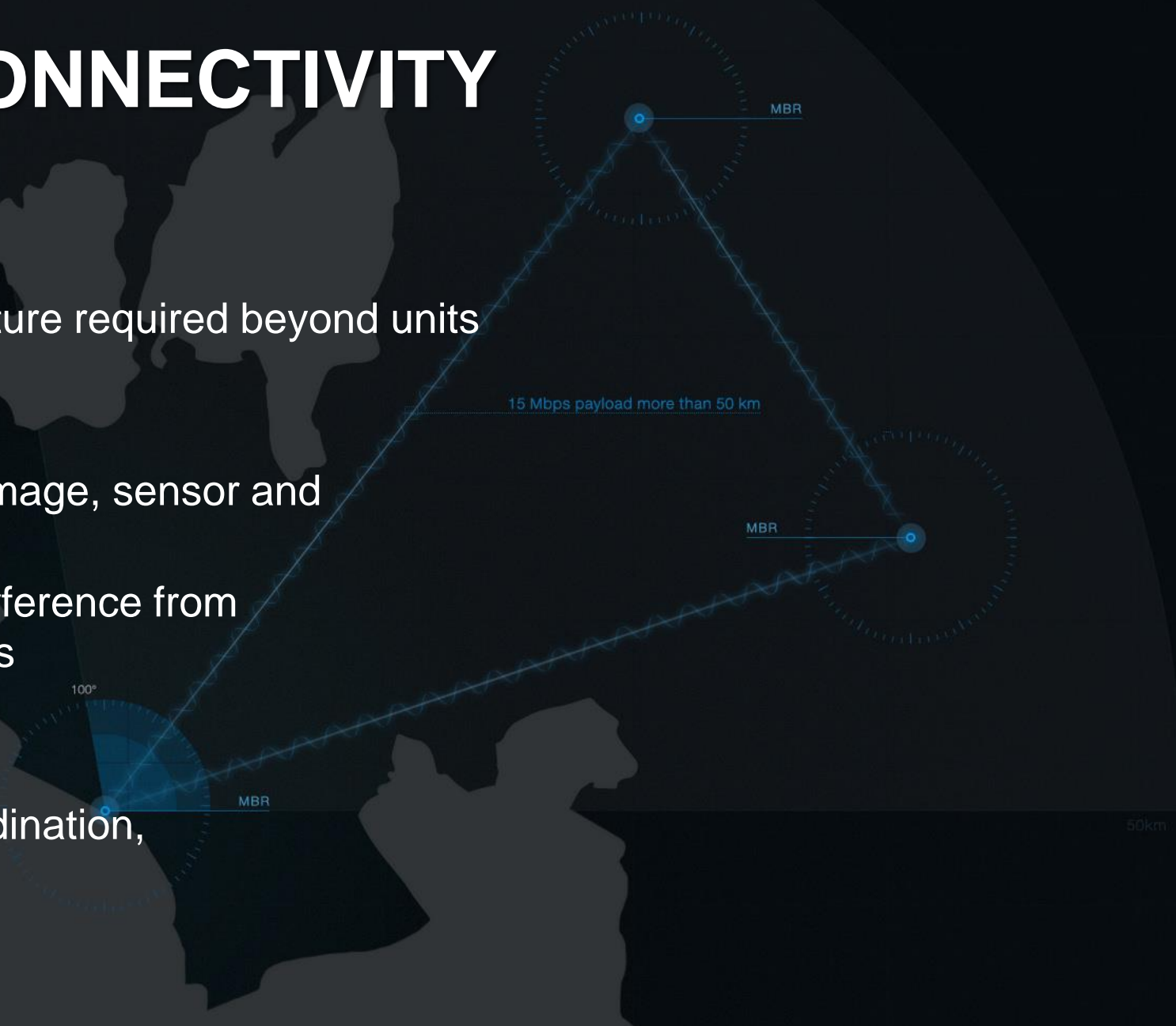


## HIGH PERFORMANCE TECHNOLOGY

- **High-capacity communication**
  - Sensors, video, monitoring data, & shore-based communication
- **Fast & long range communication**
  - Secure real-time information exchange
  - Up to several hundred kilometres range
- **High-performance communication infrastructure**
  - Smart configuration, more bandwidth, low latency
  - No compatibility restrictions beyond network standards

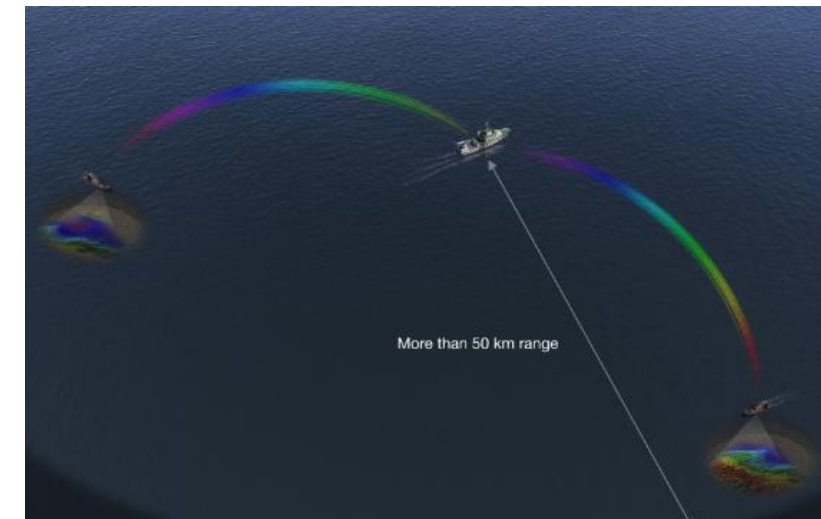
# COMPLETE CONNECTIVITY

- **Wireless simplicity**
  - No additional infrastructure required beyond units
- **Robust communication**
  - High quality, real-time image, sensor and video exchange
  - No communication interference from objects or other systems
- **Precise information**
  - Enables precision coordination, command and control



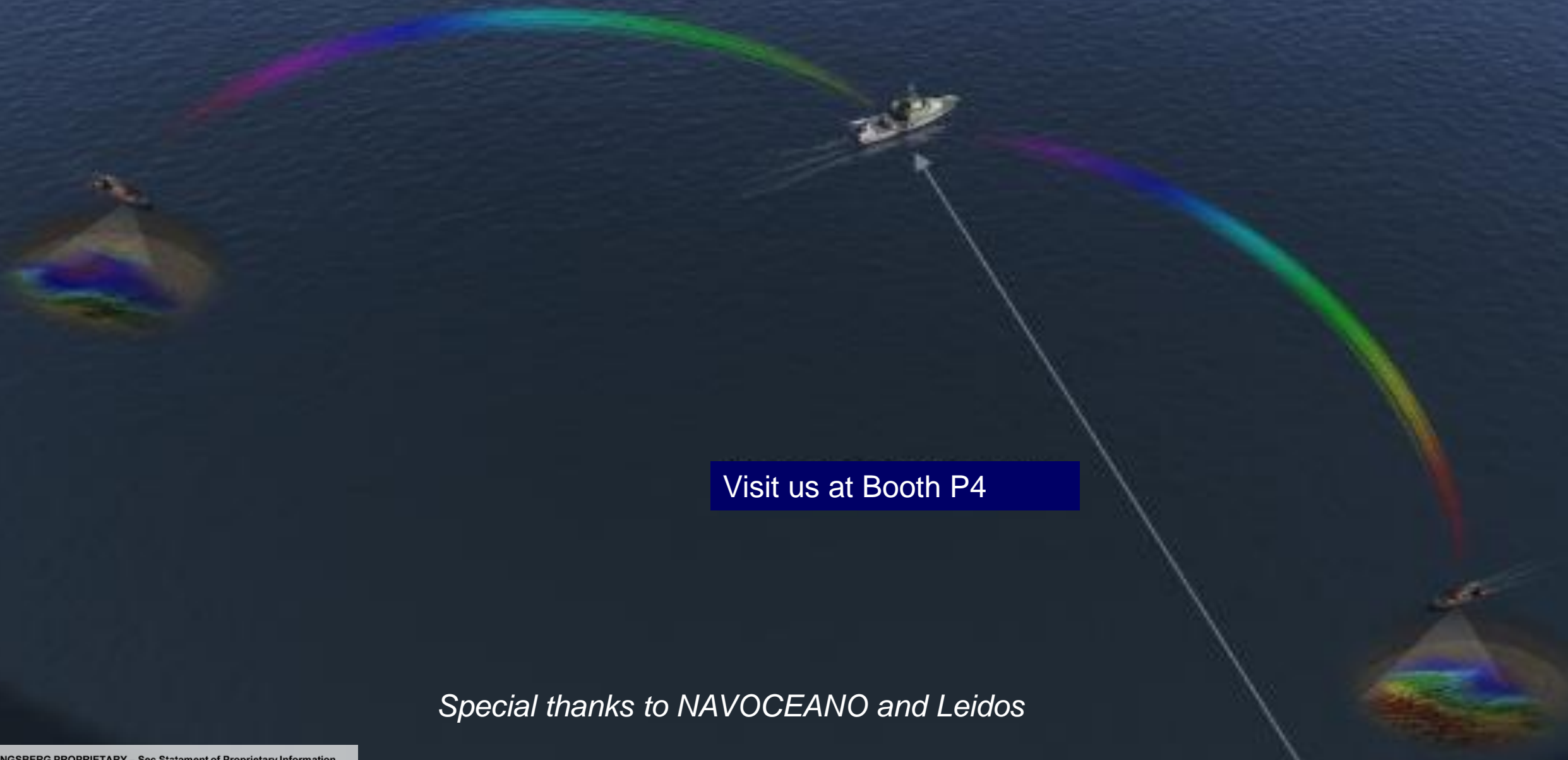
# Conclusions – Remote Hydrography

- Stable communication link between survey vessel(s) and base of operations
- Possible to remotely control and configure survey equipment
- Control and configure can extend to multiple launches, for one operator to control
- Stable and robust link for transferring data between vessels
- Potential to reduce or retask survey personnel
- Enhances safety and situational awareness





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*Special thanks to NAVOCEANO and Leidos*