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HARNESSING THE POWER OF IOT TECHNOLOGIES
TO SIMPLIFY ASSET INTEGRITY AND MONITORING

AGENDA

- Marine structures, failures, and causes
- Problems in asset monitoring and integrity
- Miros' technology and SaaS solutions
- Use cases
- Conclusion

96

Non-access days

Marine structures are heavily affected by environmental factors.

28.47

Outages / turbine

Many turbines closed due to weather - high wind speed.

6.5

Avg transfer/turbine

157

Asset damages

Source: SPARTA 2021/2022 Portfolio review
G+ H&S Statistics 2022 Report

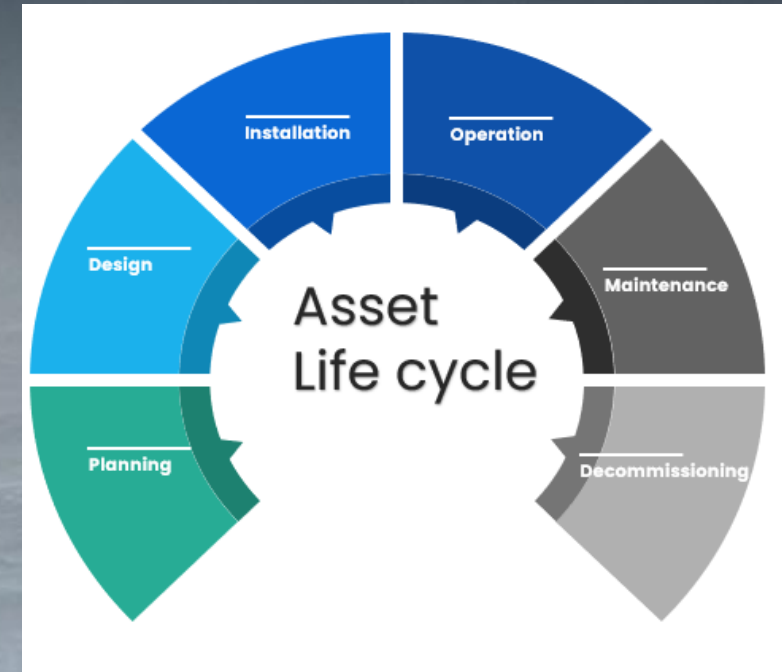
ENVIRONMENTAL FACTORS

Waves:

- Wave Height -> Fatigue
- Wave Period -> Resonant conditions causing increased stress
- Wave Direction -> Varying stress distribution
- Wave Steepness -> Increase in erosion

Weather:

- Degradation of materials, expansion, contraction, corrosion rate, coatings.



ASSET DAMAGE - MOST LIKELY CAUSE

Table 1: Summary of relevant significant structural failure modes and typical causes for offshore structures.

Failure mode	Global structure		Loading systems ¹	Local structure ²	Most likely (typical) cause
	Fixed	Floating			
Cracking (through thickness)	x	x	x	x	Fatigue and/or corrosion
Member separation	x	x	-	x	Fatigue and/or corrosion
Missing member	x	-	-	x	Fatigue and/or corrosion
Dents and bows	x	x	-	x	Vessel impact / dropped object
Grouted connection (slippage and failure)	x	-	-	-	-
Overloading (settlement and subsidence)	x	-	x	-	Settlement and subsidence
Scour (foundation)	x	-	x	-	-
Excessive/unexpected vibration ³	x	x	-	x	Multiple reasons
Bridge bearing issues (interconnecting bridges)	-	-	-	x	Multiple reasons
Vortex-induced vibration issues	x	-	-	x	Wind, wave, or current actions



Source: Ramboll- The evaluation of damage detection and structural health monitoring of offshore structures Norway (2022)

CHALLENGES IN TRADITIONAL ASSET MONITORING

- Changing environmental factors
- Limited data collection
- Delayed data transmission
- (Lack) of remote monitoring
- Manual process and human errors
- Limited scalability
- Time-consuming
- Costly
- Inefficient resource utilization



IOT – UNLEASHING THE POWER OF INNOVATION

IoT, or the Internet of Things, is a network of interconnected devices that collect and exchange data.



WHY IOT



- Real-time
- Accessibility
- Scalability
- Sustainability
- Enhanced solutions
- Efficiency
- Cost reduction



IoT data can be analyzed in real-time to identify patterns, trends, and anomalies that can help businesses optimize their operations.

Vision

The Innovator
in Ocean
Insights

Mission

Help customers
enhance safety,
sustainability,
and performance

Miros is a technology leader who has specialized in measuring real-time ocean insights for the global offshore and maritime industry for 4 decades.

Miros makes **IoT instruments** and systems to provide innovative and sustainable solutions in ocean insights for customers across the globe.



Waves



Current



STW



Prediction



Oil spills

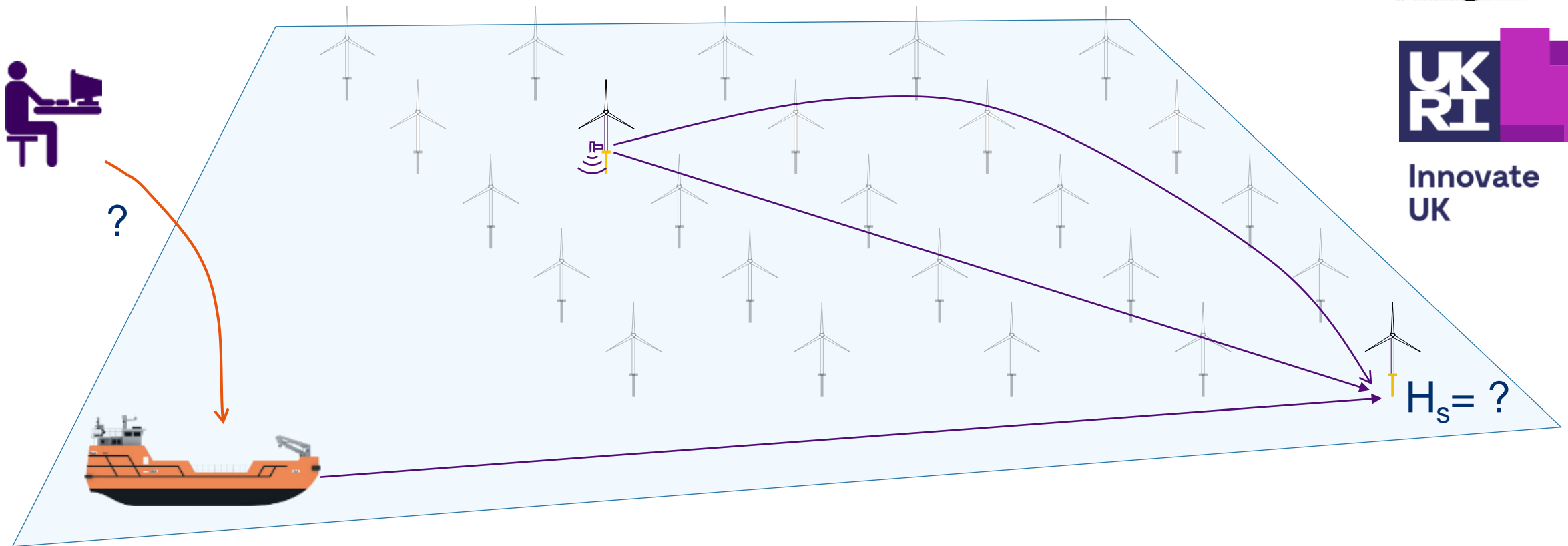


IoT

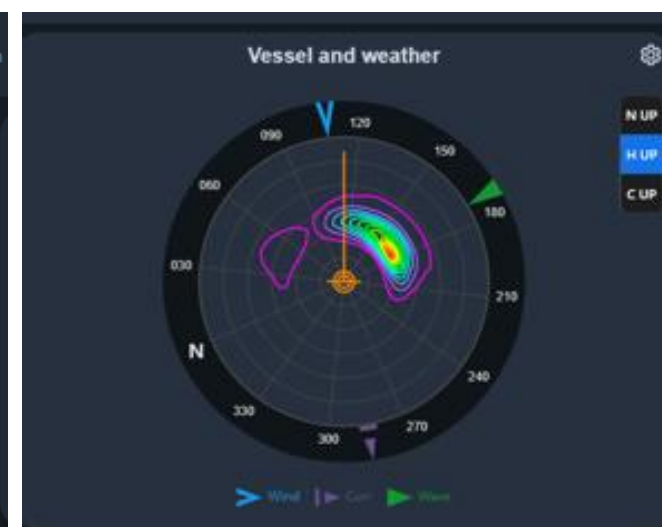
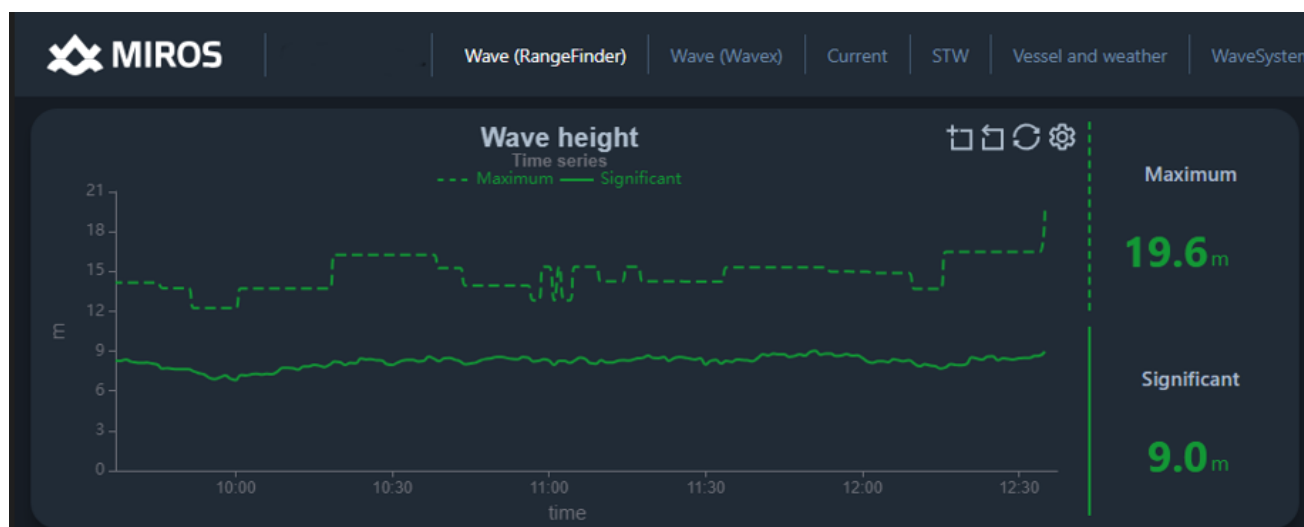
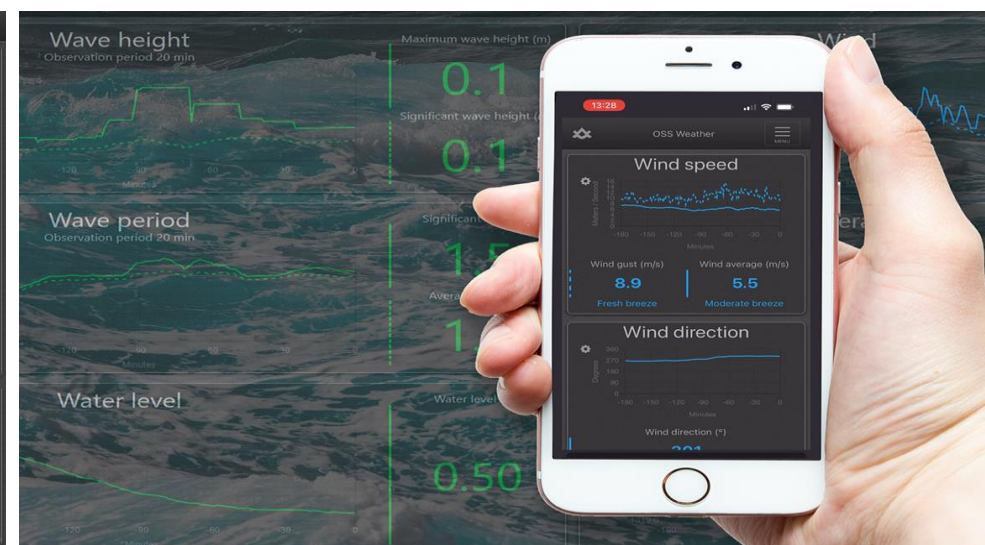
- ▶ Real-time wave data for operational assistance, day and night
- ▶ 120 seconds wave and motion prediction for increased safety and operability
- ▶ Accurate speed-through-water (STW) data for vessel performance analysis
- ▶ Automatic detection of oils spills for surveillance and recovery operations
- ▶ Advanced IoT system for efficient collaboration

VESSEL DISPATCH DECISIONS

- How to assess the conditions out on the site?
- Is it safe to operate at any location?



BASICS: REAL-TIME & MAKING DATA AVAILABLE



SIMPLIFYING ASSET MONITORING WITH IOT

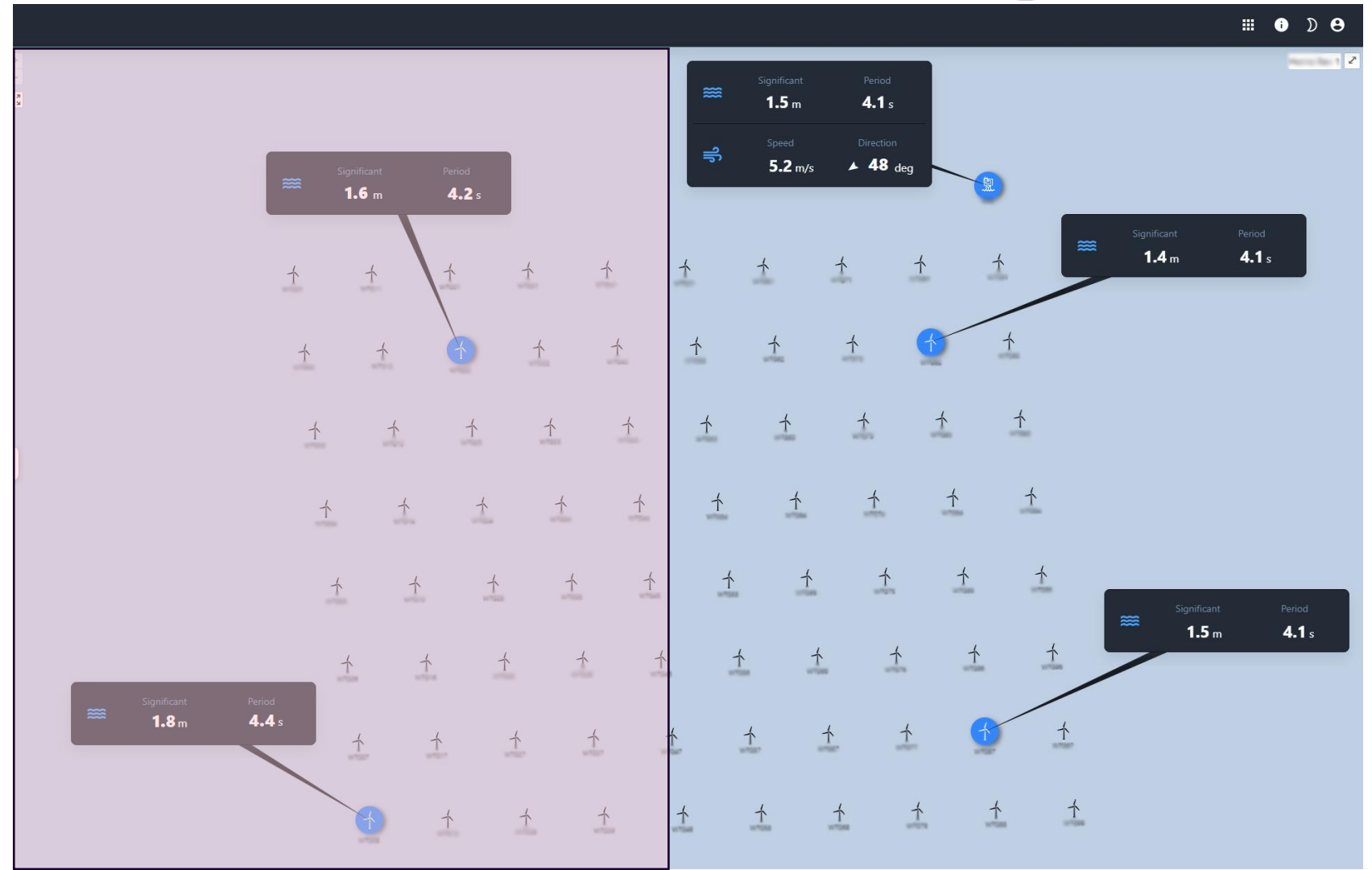


Monitoring assets across multiple locations.

Facilitate quick response without physical presence.

Reduce wasted vessel trips and minimize turbine downtime to **save £ 1 million/year** from having real-time sea state awareness.

O&M costs – 30% of the overall cost of a wind farm.



[Case Study: Steadfast economic benefit from real-time wave measurements](#)

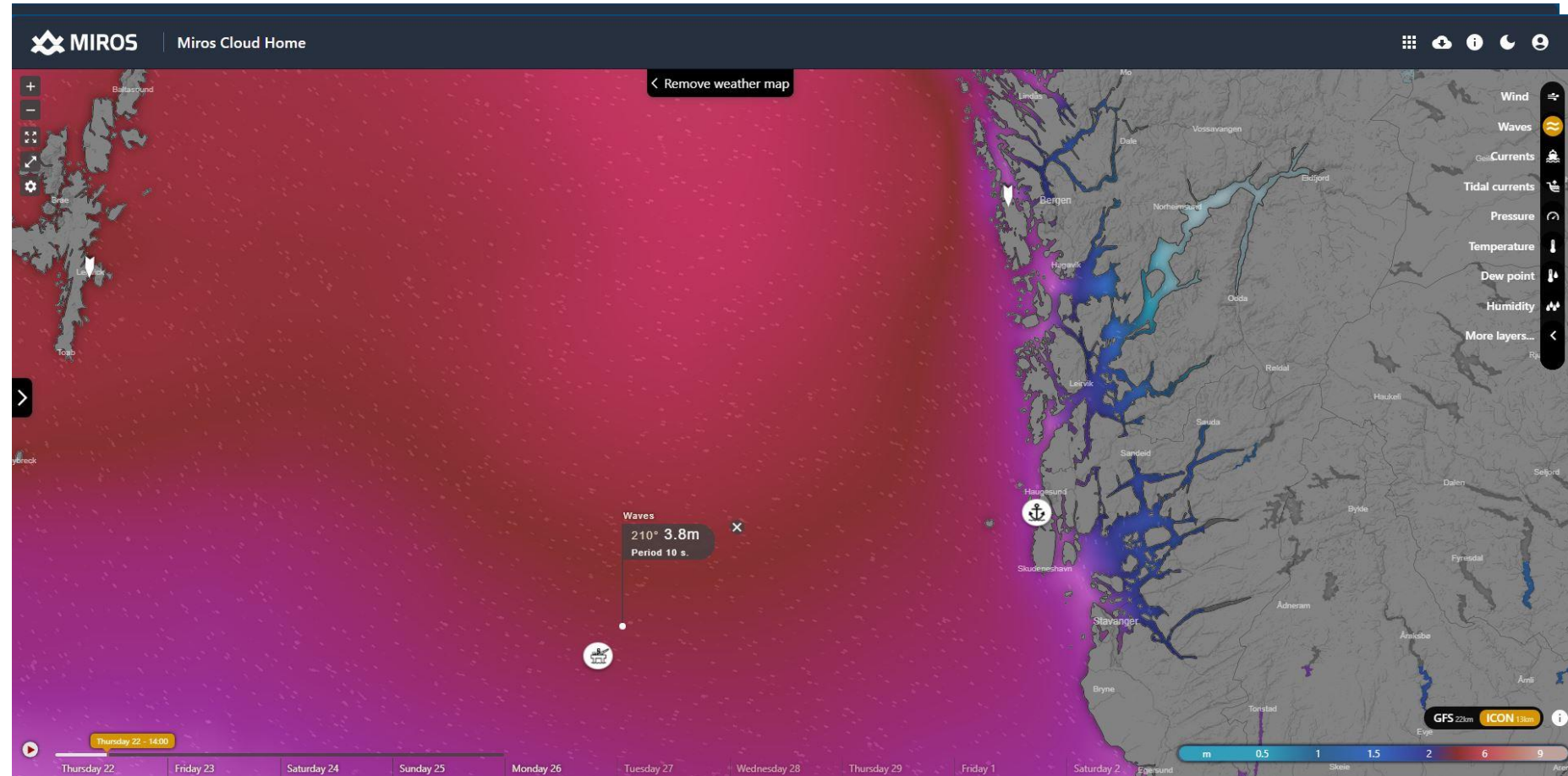
OFFSHORE OPERATIONS



Is the weather within the operational limits?

What is the forecasted probability of successful vessel access?

Are the weather conditions worsening?



SIMPLIFYING ASSET MONITORING WITH IOT



Provides continuous and reliable data streams for analysis.

Enables proactive decision-making based on up-to-date information for crew transfer, instrument deployment, manage ballasting.

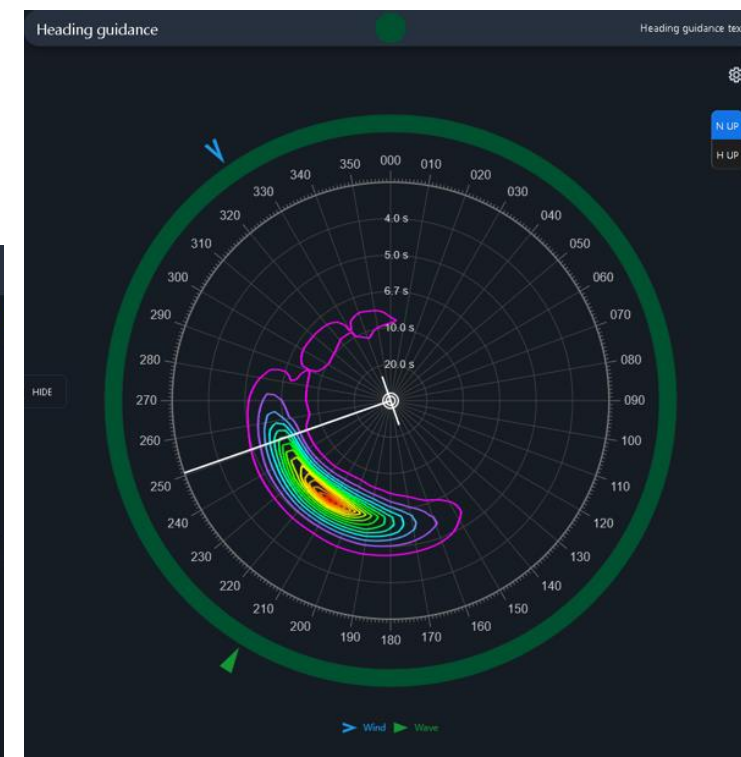
Eliminates manual data entry errors and inaccuracies.



SIMPLIFYING ASSET MONITORING WITH IOT

What is the sea state variability within the site?

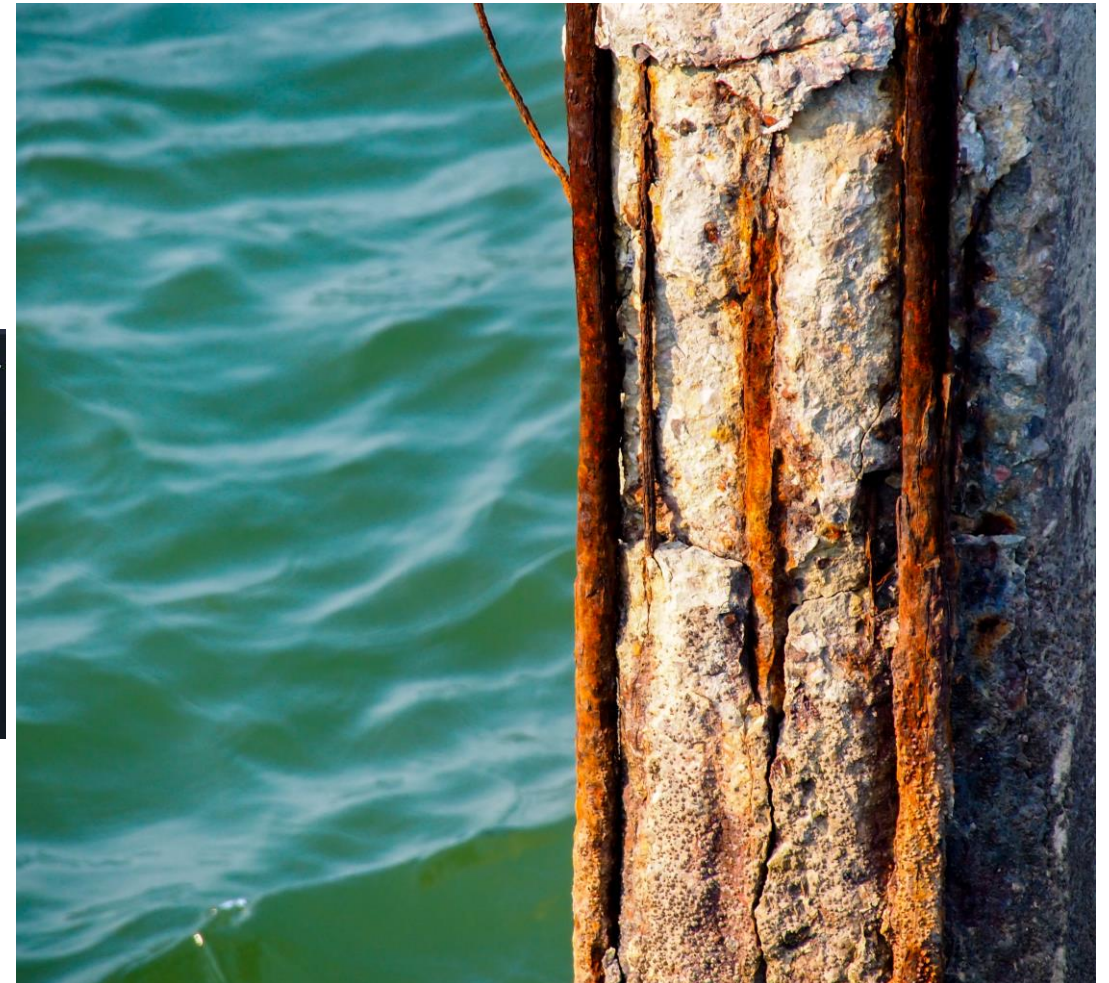
Which vessel heading should I keep for safe operations?



ASSET INTEGRITY - PREVENTIVE MAINTENANCE

What impacted my asset to fail?

Can I take preventive measures to not worsen the situation?



ASSET INTEGRITY - HISTORICAL DATA



Access historical data at the finger-print.

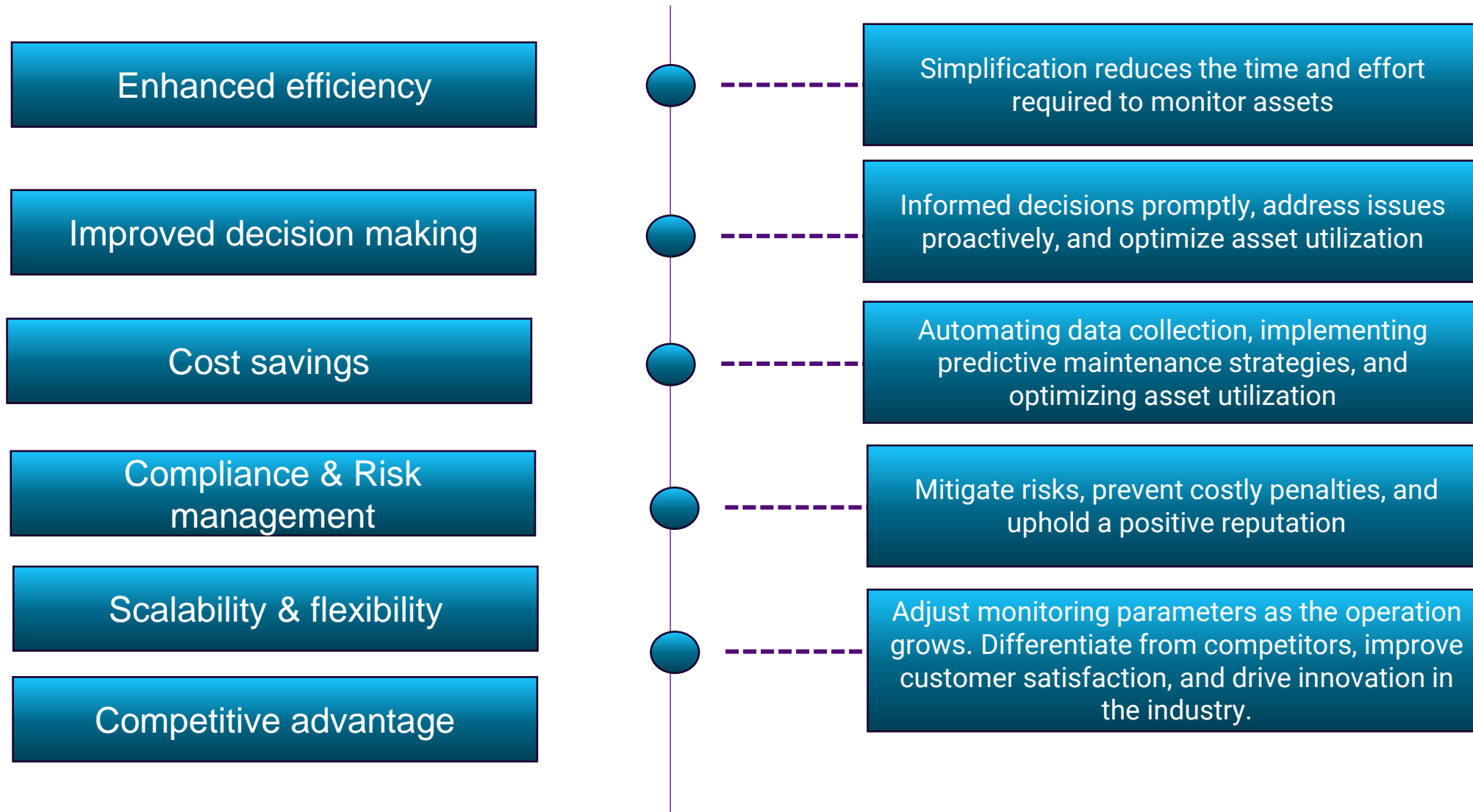
Reduces unplanned downtime and maintenance costs.

Extends asset lifespan by addressing issues before they escalate.

Improves operational efficiency and asset reliability.



IMPORTANCE OF SIMPLIFYING ASSET MONITORING & INTEGRITY



SUMMARY



- Miros approach is to provide a smart distribution of sea state IoT instrumentation and make real-time and historical data easily available to all stakeholders.
- In addition to that, we are together with our partners continuously deploying decision support solutions for optimized and sustainable marine activities.



It's not just about building things, but about understanding our world and using that knowledge to create structures that can withstand the tests of time and nature.



Thank you!

For further discussions: Stand E500

Live data @ <https://miros.app>