

A wide-angle photograph of several offshore oil rigs at sea during sunset. The rigs are illuminated with warm yellow lights, and their structures are silhouetted against the bright orange and yellow sky. The water is dark, reflecting the lights from the rigs. The sky is filled with soft, wispy clouds, and the sun is low on the horizon to the right, creating a strong glow.

Leading the Evolution of Secure Communication at Sea

Tom Løwehr, CSO Offshore

Telenor Maritime – Building standardized, cross-industry connectivity solutions

Passengers & crew



Cruise vessels



Ferries

>25.000.000 persons connected
>500 vessels
>200 ship / rig / platform owners

Offshore



Oil & Gas



Wind farms

Fisheries



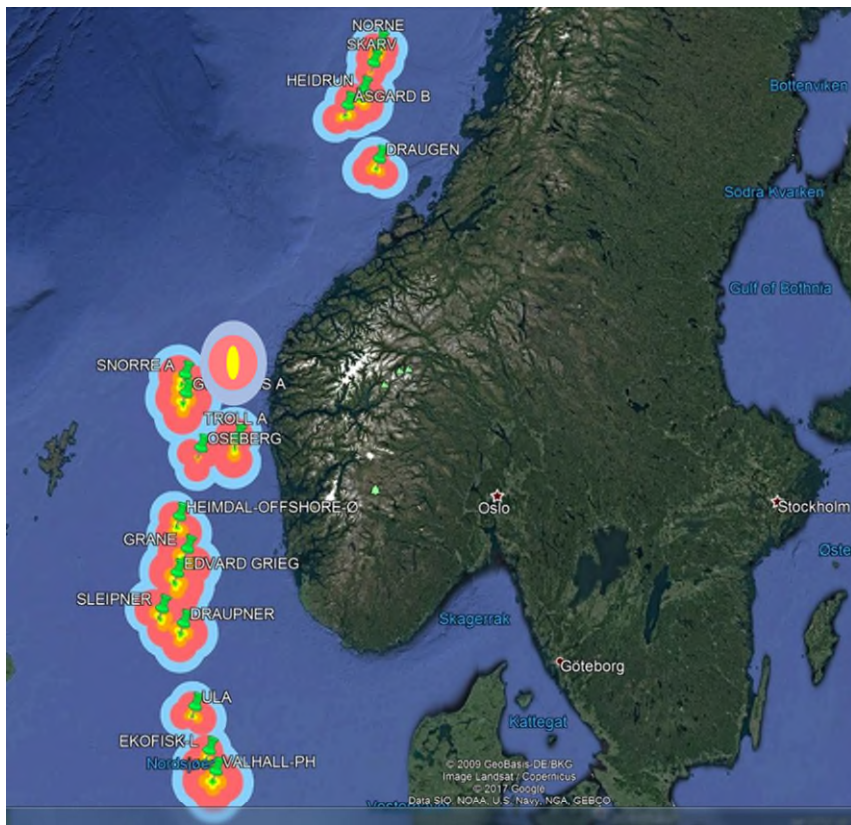
Aqua farms



Fishing vessels

Telenor - Top 10 mobil operator globally
Telenor Maritime – 500 mNOK revenues
Global operations

Our unique position on NCS is the platform for further expansion



7 operators



>20000 people

>100 nationalities



Norwegian waters

20 base stations



>40 O&G fields

>200 vessels & rigs



A single drilling rig may have ~30.000 sensors

- Generating up to 10 terabytes / day
- Only 1 % is examined and used in decision making

“As more devices connect to the cloud, data generation continues to grow exponentially. This explosion of data—combined with advanced analytics and machine-learning tools—lets companies fundamentally reimagine how and where work gets done.”

Source: “McKinsey & partners



The Digital oil field and connectivity

2006

A report by Deloitte roughly defined the digital oilfield as

"the evolution and convergence of a number of oil and gas drilling, exploration, digital control technologies *coupled with standardized communication technologies*".



Cell phones change



Tesla Roadster

The Digital oil field is not a new invention...

2003

Valhall field-seismic on demand

BP's Valhall field, which started production in 1982, was one of the first to use a life of field seismic system, using a network of permanent buried cables to record 3D seismic data.

In 2002, BP was one of the early adopters of 4D seismic data, which emerged around the year 2000.



Nokia on the top



Self-parking car

Creating The data overload Monster

2014

Bain & Co. estimates that better data analysis could help O&G companies boost production by 6 to 8 %

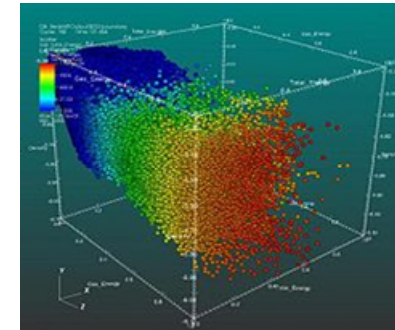
How to effectively use and integrate all the data that is collected.

- Reports and status updates for event sequence
- Cycle counts
- Condition-based and predictive maintenance.

In terms of making relevant data streams more digestible, a range of visualization software has been released allowing complex information to be converted into clear graphics that make the decision



Smartphones...



Visualization

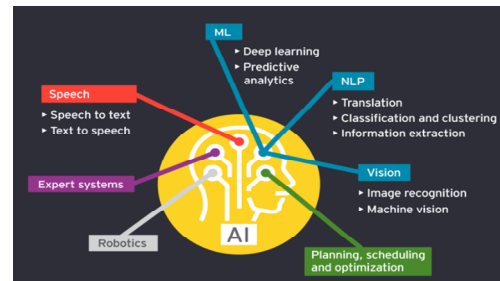
What now? Artificial Intelligence and Augmented Reality

2019

AI is a collection of technologies that includes ML, natural language processing (NLP) and robotics that allow machines to sense, interpret, act and learn on data to aid decision-making

The primary value of Augmented Reality is

- How components of the digital world blend into a person's perception of the real world*
- And perceived as natural parts of an environment*
- Different from a simple display of data*



4G and 5G are enabling technologies for digitization



The opportunity now is to leverage new technology like 5G, Cloud computing and IoT to unleash the value of data for decision making.

- Moving the cloud to the Edge
 - Cloud and Edge creates a distributed architecture
 - An edge solution help to manage critical workloads onsite while other less critical data can be handled on cloud servers
- Leveraging artificial intelligence with edge computing in IoT applications
 - Transforms data, to deliver real-time operational information directly to the people and places where needed.



How 4G / 5G can improve efficiency

- Operational efficiency

- Enhanced Exploration with Machine learning
- Improved field planning leveraging on AI
- Drilling Optimization using Big Data analytics
- Reduce production downtime via Data visualization
- Remote operation giving less people onboard

- Additional areas

- Risk assessment – Real-time information
- Maintenance – Live feed of maintenance needs
- Training – Real-time tutorials and support in the field
- R&D – Create and iterate

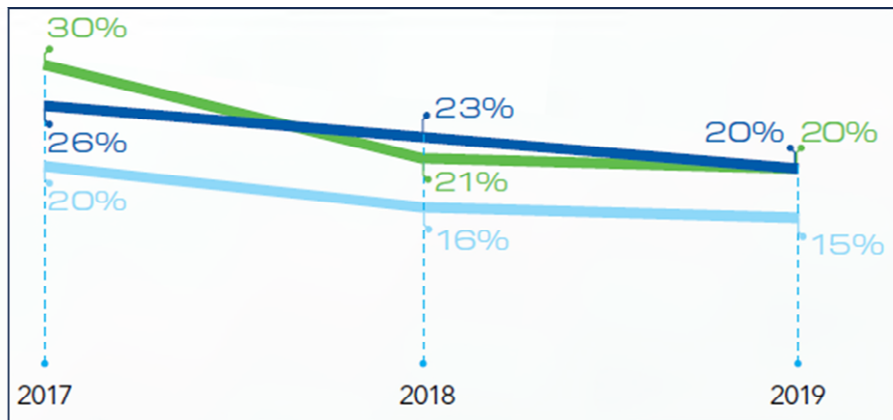


Cuts down

- Overall travel
- Optimizing efficiency
- Extends life time

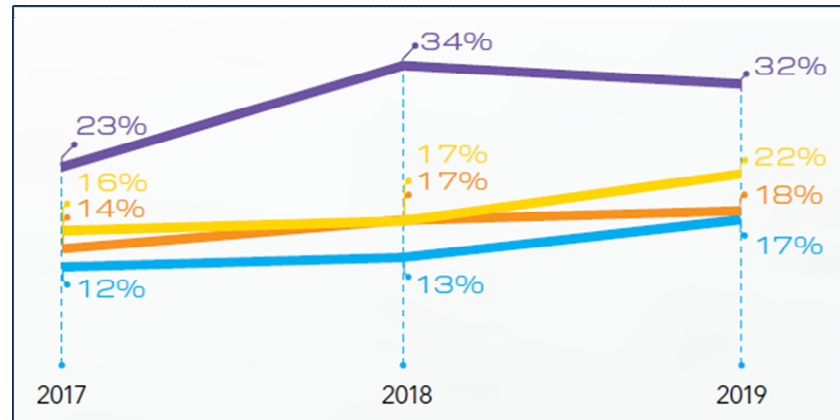
Secure connectivity solutions, high bandwidth and low latency is the enabler

Old barriers are falling



■ Bureaucratic / procedural obstacles ■ Lack of funding
■ Lack of awareness

New barriers arise



■ Access to data ■ Reliability of data ■ Cybersecurity concerns
■ Lack of skills

Source: DNV GL - A Test of Resilience - The outlook for the oil and gas industry in 2019

A common infrastructure – Assets, People & Things

Moving assets



People on the move



The “Things (IoT)”



Remote operations



A seamless, homogenous network infrastructure from field coverage to onboard access

- Standardized technology
- Standard devices
- Predictable technology road map

Thank you

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