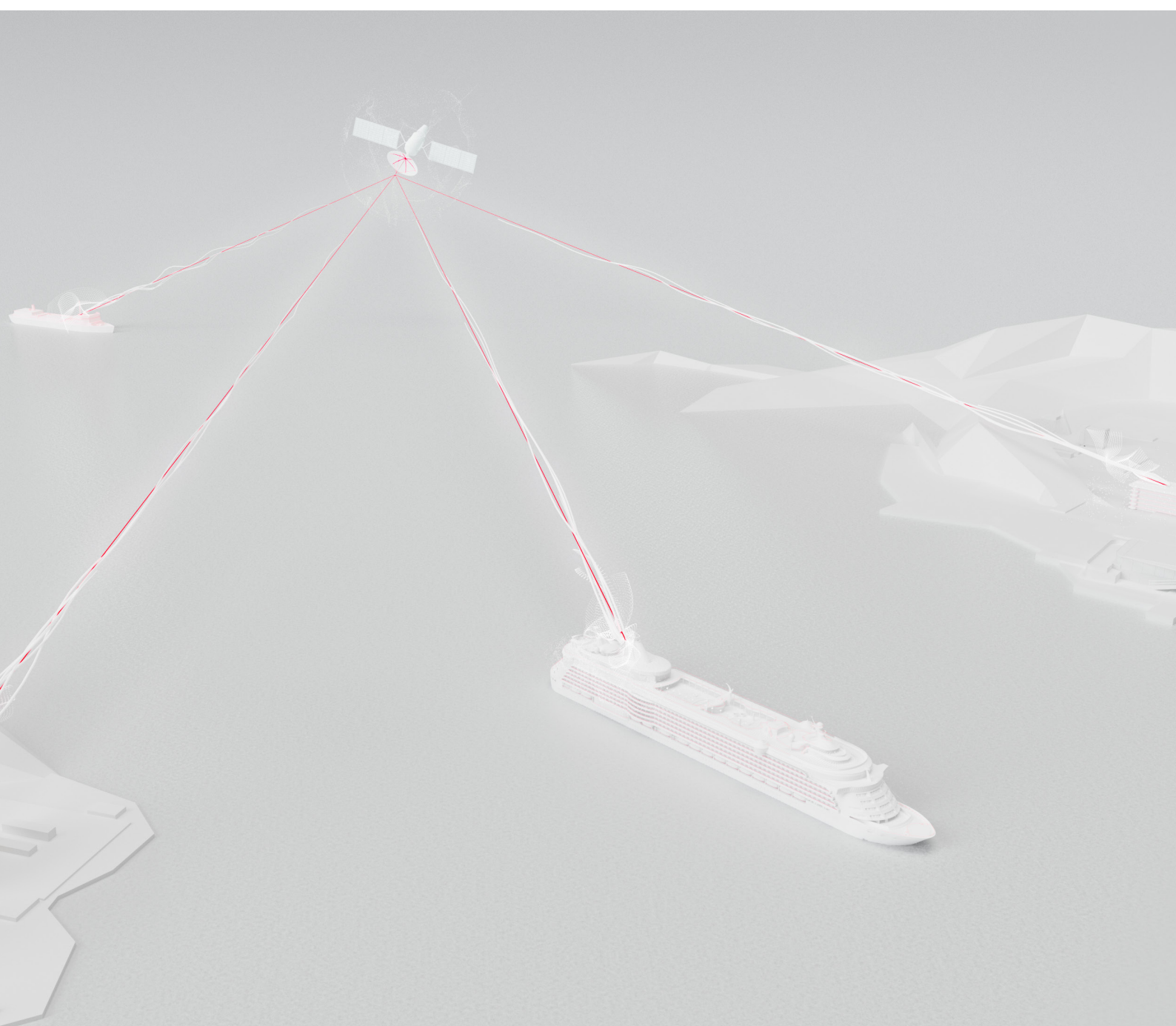

GLOBAL SERVICE | MARINE & PORTS

Remote Diagnostic Services

Predicting by analyzing



With ABB Software, remote connections, and service built around the solution, we enable customers to digitalize their operations.

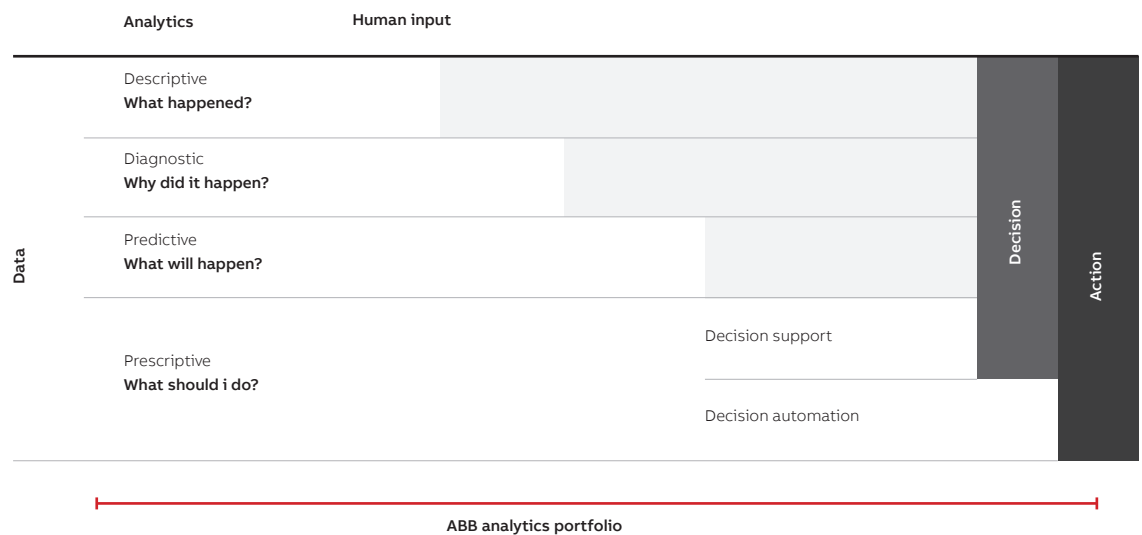
Integrated operations is a way of operating that allows the site, headquarter, and supplier to operate on the same tool set. With new digital services we grow from descriptive to predictive analytics, supporting decision makers, and ultimately automating the decision making towards more efficient operations.

We combine ABB Software with remote connections and service built around the solution. Data collected for equipment monitoring is further enabling customers to digitalize their operations by using ABB Fleet Portal, Fleet Intelligence, or a full fledge customer's own replication of ABB's Integrated Operations centers. We assist in the future centralization of onshore customer operations centers which provide enhanced support for the complete fleet.

We are digitalizing the operation with cloud-to-cloud integration, and cyber-secure vessel remote access platforms built in to the services.

The usage of data has historically been in collecting it to be able to determine what has happened in order to identify the cause for the incident. With human input, by analyzing the data we can offer predictions on what will happen. We offer support on the decision making process onboard and onshore. The future of shipping, just as other industries, is in relying on data analytics for decision automation.

Today we offer decision making support by analyzing the data gathered from vessels and components onboard vessels.



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Source: Gartner
February 2015;
Also presenting ABB's
analytics portfolio.



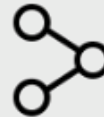
Up to 70% reduced
need for service engineers on board



Up to 50% reduced
cost of maintenance and class survey



650 vessels
connected to ABB's Integrated Operations Centers



Connect
to a vessel anywhere in the world

—
ABB has set a target to be connected to 3000 vessels by the year 2020 with their Integrated Operations Centers.

The new service for remote diagnostics

ABB have proven remote services; a track record of 10 years and over 650 connected vessels to our Integrated Operations centers, from which 200 are under continuous monitoring. We are optimizing the operations and maintenance of the vessel together with the customers.

—
The new service level enhances ABB Remote Diagnostic Services with Edge Analytics and System/Fleet Analytics on multiple vessels, within a similar application onshore and automated notification of the ABB Integrated Operations centers.

With the new level of service, Service Level 3 RDS - Prediction, remote services are taken to the next level, adding predictive analytics algorithms

and cloud technologies. We have divided our services into three levels from which our customers can choose to best match their needs.

Offering customers predictive services to support decision making

We service our customers with failure prediction by delivering predictive analytics algorithms which are implemented both onboard the vessel and Cloud. With ever developing cloud technologies, we are able to provide highly advanced and embedded analytics on the collected data, whether it is at the equipment, system or fleet level.

ABB's software embedded advanced analytics platform also allows third party analytics through various software extensibility points. By keeping algorithms in house, customers are also able to carry out their own analytics without sharing proprietary information.

Service Level 1
RDS - Troubleshoot

Connectivity & System Monitoring

Incident Report

24/7 Care - Remote Assistant

Service Level 2
RDS - Prevention

Fleet Portal

Data Transfer, Critical Trip notification

Connectivity & System Monitoring

Incident Report

24/7 Care - Remote Assistant

Service Level 3
RDS - Prediction

Onshore Prediction Analytics to IOC

Onboard Edge Analytics

Fleet Portal

Data Transfer, Critical Trip notification

Connectivity & System Monitoring

Incident Report

24/7 Care -Remote Assistant

Further developed user interface

The new Onboard Graphical User Interface has been aligned with ABB Marine's software design language which focuses on user awareness and experience in order to provide a collaborative environment with views ashore.

The new UI has been tailored for diagnostics and fault tracing purposes, from high level analytics to low level measurement recordings.

The outlook of the new user interface follows the ABB design vision of "only essentials". The color schemes are based on the human factors reflected from the actual need of the operation. And the chosen color contrasts highlight the safety and user guidance - ensuring better operation.

Customer Benefits

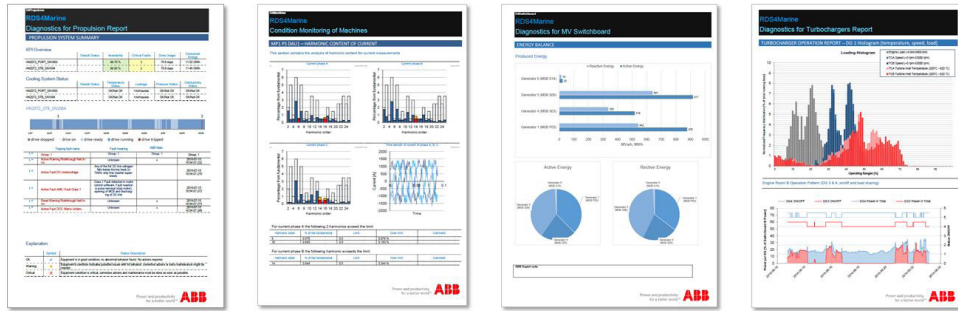
With reductions in downtime, maintenance costs and labor costs, customers benefit from significant costs savings while still maintaining appropriate safety and operational margins. These are achieved by:

- Reduced maintenance cost by continuously monitoring equipment health status
- Reduced of production stops due to machinery failures and optimizing your planned maintenance activities according to operational requirements
- Up to 50% on direct reduced maintenance cost according to internal ABB study.
- Reduce labor by automating data collection and enabling operators to focus on understanding the data and system status.
- Reduce the need for ABB service engineer attendance onboard. In some segments, this has seen a reduction of up to 70% of ABB onboard visits.

The new Onboard Graphical User Interface has been aligned with ABB Marine's software design language.



Advanced reporting for preventive and predictive analytics.



Motor with a smart sensor.



Example of RDS predictive analytics

RDS system onboard continuously collects and analyses recordings from the ABB Medium Voltage frequency converter water cooling system. In case increased cooling water pressure drop is detected, RDS compares it with the mathematical model of the cooling circuit and predicts the time when cooling media is to be filled.

Example of asset condition assessment; Analytics for rotating equipment.

RDS collects vibration, current and voltage signals with a high sampling frequency (up to 50 kHz) and performs a number of signal processing analytics to detect abnormalities in their very early stage. The RDS system gives an early warning to the crew onboard as well as the ABB expert in the Integrated Operations center. This allows the case to be followed with proactive planned maintenance.

Asset condition assessment on rotating equipment.



MARINE & PORTS GLOBAL SERVICE

ABB Marine Services provides service solutions, support and training to any vessel with ABB equipment onboard. We also offer long-term agreements that lower your costs and you may consult us about making your vessels more energy efficient. With nearly 300 highly qualified service personnel available in over 25 international Marine Service Centers, we can always respond at short notice with whatever resources a situation demands. In addition ABB has offices in over 100 countries, which ensures that we are within reach wherever in the world you operate.

WRITING THE FUTURE. TOGETHER WITH ABB.

With Integrated Operations we are enabling next generation vessel and customer onshore operations. We are bringing advanced analytics, portals, and the possibilities given with digital twin technology, to drive the digitalization of ship operations.

**By digitalizing our services,
we are easing the transformation
for our customers from traditional
marine operations towards
a digitalized future.**

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