ULSTEIN®

BLUE BOX™

– POWERED BY X-CONNECT™

MARCH 11, 2021

ULSTEIN.COM

Prepare your ship for a digital future

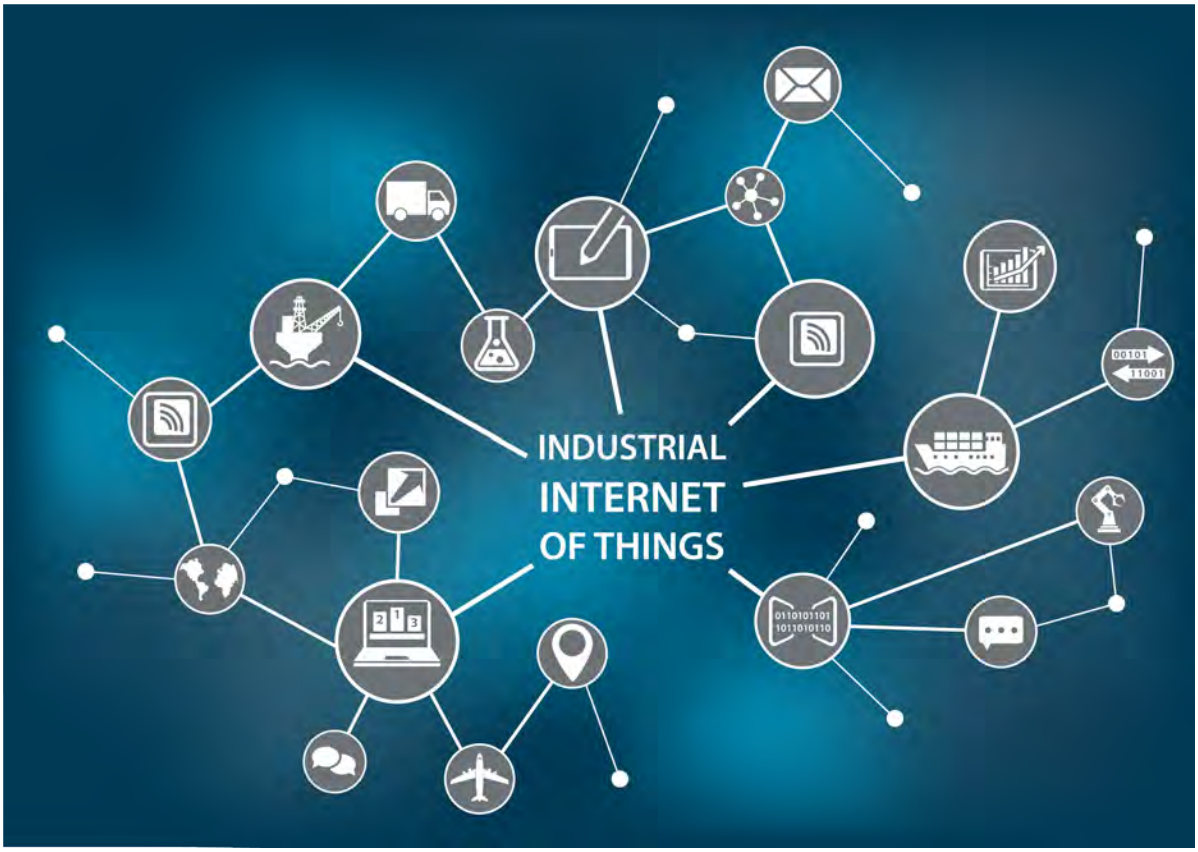
New technologies can radically improve the efficiency of how a ship is operated. The future is about embracing these possibilities, developing products for safer and more efficient operations.

This is at the core of product development in X-CONNECT. With our effort on offering products and systems that utilize digital possibilities, you can offer ship intelligence that make your business smarter, safer and greener.

Prepare your ship with solutions utilizing digital opportunities.

1 The value of accessible live data

It seems like everyone talks about data these days - lots and lots of data - and the buzzword *Big Data* seems to follow us everywhere. In this era of digitalization and Industrial Internet of Things (IIoT), data, and access to live data, has become one of the most important aspects in making businesses more efficient. By gaining access to informative and important data, a number of manual tasks, such as exporting data to a correct format or generating reports, can be automated. By automating reporting processes time is saved, but maybe more important – human errors are eliminated.



Automated reports might be quite a time saver, but maybe the most valuable aspect by having access to rich and informative live data is to understand your business and its processes better. Access to data is imperative to understand a process or system and be able to make it more efficient. Questions such as *How is the process/system really working?*, *Is the process/system working optimally?* and *Can the process/system become more efficient?* can be answered by exploring and finding the hidden information in the data through suitable analyses. The analyses might be as simple as visualization of data, such as performance factors, or span to use neural network, statistical analyses or more advanced data analytics methods.

As an example, by using the available data in a platform supply vessel to inform the crew how the vessel is operated in different operating conditions, and helping the crew to take right decisions, our customers have experienced a 10% average reduction in fuel consumption. Reduction in fuel consumption for a platform supply vessel is just one example. Another example

is to surveillance your equipment through the available data and find factors that can indicate the need for maintenance before the equipment breaks down. Such a feature can reduce your maintenance costs in different ways.

With access to live and rich data the potential for improving your processes and systems are endless – it just boils down to creativity, and to identify and formulate problems or measures of streamlining your business that can be solved by using the available data. But how can you get access to your processes' or systems' live data? This is where the Blue Box™comes in.

2 What is Blue Box™?

First and foremost, Blue Box™is a low-cost flexible hardware and software infrastructure that is installed in your vessel – as its name states, it's a box. The Blue Box™is connected to the vessel's remote link (such as VSAT or 4G) and any third party systems, such as the vessel's Integrated Automation System (IAS), through standardized interfaces. Available data accessible through the standardized interfaces are collected, filtered, compressed, transported and stored in a cloud service by the Blue Box™. By cloud service/server it is meant a redundant and secured online database server, that can be accessed all over the world through log-in credentials.

If the vessel's internet connection is down, the Blue Box™is able to buffer your data until the vessel is *online* again. Once online, the box will transport and store your data in the cloud service. To conserve the vessel's bandwidth, the Blue Box™exhibits a highly compressed communication with the cloud service, and the bandwidth usage can be configured to avoid occupying the whole bandwidth when transporting buffered data to the cloud service after a period without connection.

A simple illustration of the scope of Blue Box™is presented in Figure 1. As showcased in the figure, the box provides the infrastructure you need to access your live data onboard your vessel. In the following we will answer a few questions to further elaborate the features of the Blue Box™.

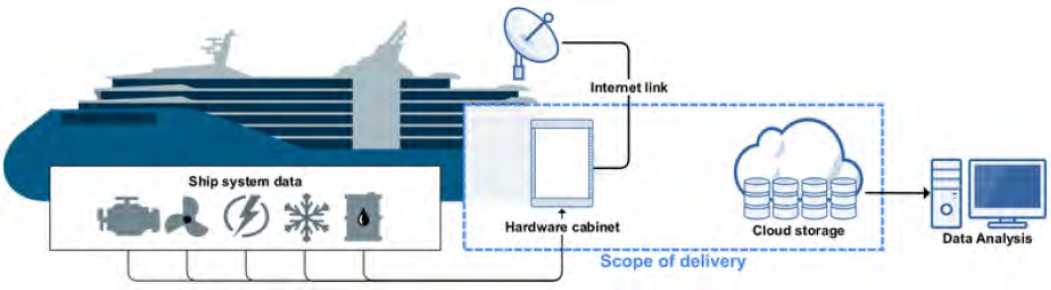


Figure 1: Example of the Blue Box™scope of delivery in a marine vessel.

How can the data be accessed?

The data made available by Blue Box™in the cloud service can be accessed through any system with database integration that supports PostgreSQL or Influx. PostgreSQL is one of the most used database systems in the world, and is considered a standard in most database tools. If your company uses e.g. the Microsoft platform, and you are familiar with Power BI, the data can be accessed through Power BI's external database integration. Other examples of systems that can be used to access the data are data analytics tools in Google Cloud[1], Tableau[2], Grafana[3] or specific fleet/vessel management/maintenance systems with external database integration supporting PostgreSQL or Influx. You can also make your own tools (e.g. in Python) to access the data and conduct analyses of your choice. An example is shown in Figure 2, where Grafana has been used to present data acquired by the Blue Box™by simply importing the cloud database through log-in credentials.

Figure 2: Example of dashboard made in Grafana to present data from Blue Box™.

Which data can be made available through the Blue Box™?

All data available from third party systems, accessible through standardized interfaces, can be collected and processed by the Blue Box™. Examples of typical data objects that can be collected by the box are signals, parameters and alarms. Ulstein's blue box can easily be configured remotely if the end user wants to collect more data objects in the cloud server, as long as the data objects are available on connected interfaces onboard the vessel.

[1] https://cloud.google.com/solutions/big-data/
[2] https://www.tableau.com/
[3] https://grafana.com/

What about bandwidth strain?

Blue Box™is designed to exhibit a highly compressed communication with the cloud service. Moreover, Blue Box™is an event-based system, meaning data objects are transported to the cloud server only when the changes in the data values exceeds a configurable threshold. This will minimize the overall data transmission, thus keeping the bandwidth strain to a minimum. Another feature of Blue Box™is configurable bandwidth allocation, meaning that the box can be configured to occupy a desired maximum bandwidth allocation. As an example, Blue Box™might be configured to occupy at maximum 40% of the total available bandwidth. Blue Box™can be used with internet connections with bandwidths as low as 128 Kbit.

What happens if the vessel's remote connection goes down?

If the vessel's remote connection (network connection) goes down, Blue Box™starts buffering data. Once the network connection is up and running (vessel is online), the box transports the buffered data to the cloud server. Blue Box™provides a configurable bandwidth limitation to avoid choking the communication link during the transport of locally buffered data to the cloud server.

Does Blue Box™provide any data filtering functionality?

The short answer to this is yes. Blue Box™includes a number of filtering options that can be configured to pre-process your data before data is transmitted to the cloud server. Filters, such as high-pass, low-pass and average filters, are available for each signal collected by Blue Box™. In addition, the box provides individual configurable rate changes (or thresholds) that triggers transmission of a data object/signal.

Is my data safe in, and during transport to, the cloud server?

Yes. Blue Box™uses a type of communication when transporting the data to the cloud service that is encrypted through the industry standard Secure Schell protocol, using 2048-bit RSA private keys and a recommended cipher. The data in the cloud server is securely stored and can only be accessed through log-in credentials. The cloud service regularly undergo independent verification of security, privacy and compliance controls. The cloud service is, as examples, certified according to ISO 27001, ISO 27017, ISO 27018 , SOC 1, SOC 2, SOC 3 and GDPR. The complete certificate list can be provided upon request.

3 How can Ulstein help you in improving your operations?

Ulstein has a wide competence specter that can help you as a customer to improve and optimize your operations. We are happy to help you improve your vessel with future-oriented automation products. We have also quite competent partners that can help you to design and implement decision-making, automated reporting and other features that might suit your needs. In addition to Blue Box™, Ulstein supplies a range of different products based on the X-CONNECT™automation platform.

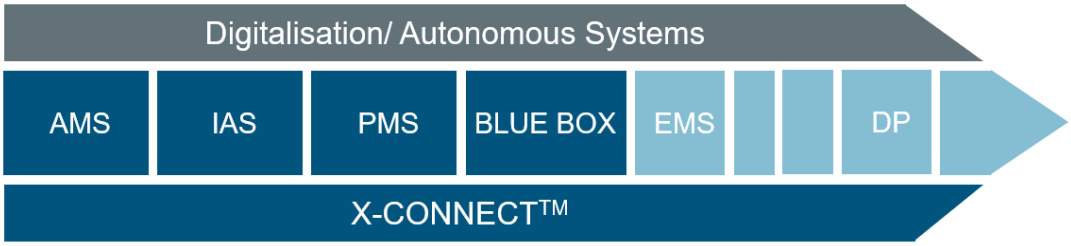


Figure 3: The X-CONNECT™product line.

4 Technical details: Blue Box™

Description	Specification
Cloud database system	PostgreSQL or Influx
Cloud server size/storage	Standard delivery includes 500 GB cloud storage, and 500GB download/mth, however, more storage and download capacity can be provided to fit the customer's needs
User interface	Log-in credentials to PostgreSQL/Influx database interface
Standard third-party system interface	NMEA 0183 (serial) / NMEA 450 UDP
Other supported interfaces	MODBUS TCP/RTU, CAN, digital/analog IOs
Requirements for third-party system integration	Data available on standardized interfaces
Communication link encryption	Standard Secure Shell protocol, using 2048-bit RSA private keys and a recommended cipher
Configurable bandwidth limitation	Yes
Local data buffering if remote connection goes down	Yes
Data compression feature during data transport to cloud server	Yes
Measures during offline operation	Local data buffering
Remotely configurable	Yes

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