PUBLIC

KONGSBERG

SIS Remote
Remote control application
Operator Manual
Release SIS 5.12

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. You must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

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Support information

If you require maintenance or repair, contact Kongsberg Maritime's support organisation. You can also contact us using the following address: km.hydrographic.support@km.kongsberg.com. If you need information about our other products, visit https://www.kongsberg.com/discovery.

Kongsberg Discovery support is also available in the KM-App.

Our support application is available for free in the App Store and Google Play. The use of our support application is free of charge. Your mobile phone provider may charge you the cost of the communication.

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About this manual

The purpose of this publication is to provide the descriptions, procedures and detailed parameter explanations required to allow for safe and efficient use of the SIS Remote software. The publication also provides you with a thorough understanding of the parameters and adjustments provided by the SIS Remote software.

Target audience

This publication is intended for all users of the SIS Remote software. Due to the nature of the descriptions and the level of detail provided by this publication, it is well suited for those who are - or wish to be - expert users.

A good understanding of software functions and controls is essential to fully take advantage of the functionality provided. Sea conditions vary, sometimes drastically. The acoustic conditions are also changing. Temperature and salinity layers differ from one day to the next, and from one position to another. It is not possible to identify settings that will provide the best data at all times. A careful study of the information in this manual is highly recommended, preferably while exploring the functionality offered by the SIS Remote software.

Online information

For information about the SIS Remote and other products from Kongsberg Discovery, visit our website.

https://www.kongsberg.com/discovery

License information

The SIS Remote software is a licensed product. To obtain a license, contact support.

Software version

This SIS Remote Operator Manual complies with software version SIS 5.12.

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SIS Remote

Topics

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About the Seafloor Information System (SIS) application

SIS is the software and user interface for real-time data acquisition for EM® systems and can be used with all EM multibeam echo sounders from Kongsberg Discovery. It is an intuitive and user friendly interface for the surveyor, providing the functionality needed for running a survey efficiently.

It is an intuitive and user friendly interface for the surveyor, providing the functionality needed for running a survey efficiently.

SIS runs on a Windows operating system. Up to four screens can be used on one Hydrographic Work Station (HWS). The software can also show geographical views on several remote computers in the network.

All necessary sensor interfaces, data displays for quality control and sensor calibration, seabed visualization, and data logging are standard parts of the software application.

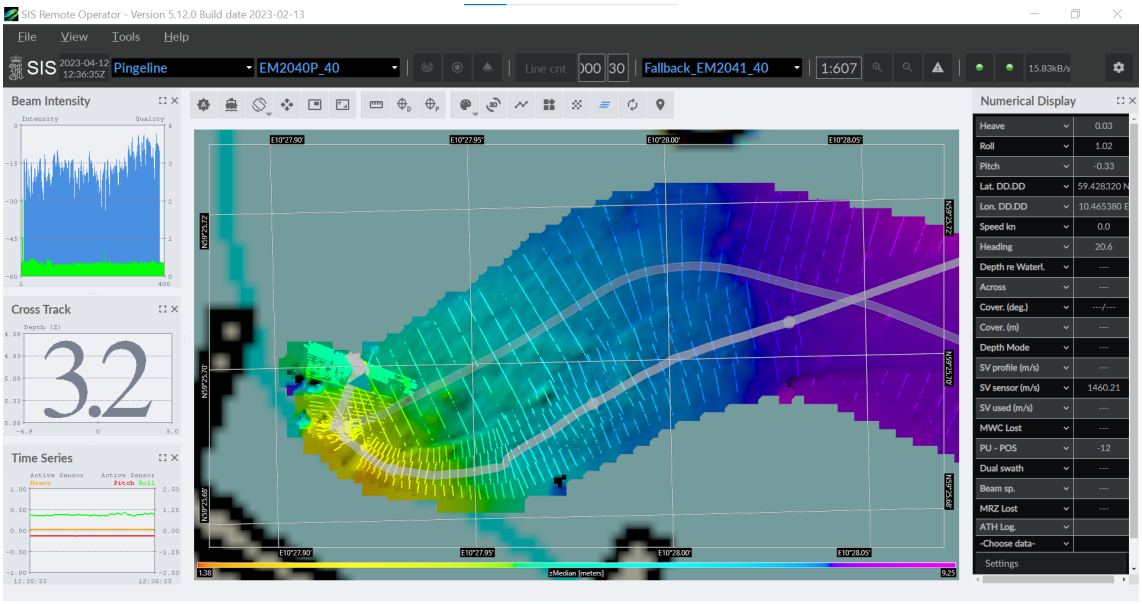
Key features

The Seafloor Information System (SIS) application offers:

- Flexible layout with simultaneous windows you can define
- Enhanced functionality for visual and automated data quality control
- Graphical views to read the sound speed at the transducer, as well as the sound speed profile
- Built-in health tests of the multibeam echo sounder, continuous monitoring of input data quality
- Error situations are logged, relevant user notifications are provided, each advising what action you should take
- Imaging of acoustic reflectors in the water column (e.g. fish, biomass)
- Real-time computation of the mean sea level using a geoid model
- Normal operational when an echo sounder is mounted on a remotely operated vehicle or an autonomous underwater vehicle
- Delayed (true) heave logging for post-processing purposes

About the SIS Remote application

SIS is the software and user interface for real-time data acquisition for EM® systems and can be used with all EM multibeam echo sounders from Kongsberg Discovery. You can use the SIS Remote application to operate the SIS from a remote location.
In recognition of survey platforms' increasing requirements to support remote operations, Kongsberg Discovery provides remote watchstander capability. The SIS Remote application, which is an add-on to Seafloor Information System (SIS), can work with nearly any strength bandwidth connection. The SIS Remote application requires as little as 8 kilobytes per second to provide multibeam echo sounder status information to the remote computer. The remote computer can be located anywhere in the world. The installation and configuration of the Seafloor Information System (SIS) application on the vessel is required to run the SIS Remote application on the remote computer.



This method of remote monitoring is easier and uses less bandwidth than a traditional remote desktop. Remote desktop works very well on high bandwidth, whereas SIS Remote works well on unstable networks and lower bandwidth. You can manually reduce the data transfer rates by transferring only what you want to see on the remote computer. Remote desktop will only connect to one computer/system on one platform at a time while the SIS Remote will display multiple EM® systems on multiple vessels in one display. SIS Remote can offer automatic data extraction and/or data compression.

SIS Remote enables the SIS to be operated by remote watchstanders where the user-defined portions of the data collected from the EM multibeam echo sounders can be transferred in real time to a remote location. This solution enables communication and control between a any survey vessel, whether crewed or uncrewed, and a mothership or shoreside control station, henceforth collectively as ‘remote computer’. The survey vessel must have a standard SIS installation with a SIS Remote license enabled. Remote control functionality must be enabled in the SIS software settings.

SIS on the vessel runs all the data through a decimation filter before it sends a user-defined subset of the data to the remote computer. The data consists of status messages, real time depths, ping display information and the complete terrain model files collected. From the remote computer you can in return alter runtime settings and installation parameters. You can also start and stop pinging and control the data logging. Depending on the available bandwidth, you can monitor and control the EM® multibeam echo sounders systems in near real time. SIS Remote uses any form of radio link marine broadband radio (MBR), mobile networks or satellite) to transfer real-time multibeam data.

The same SIS installer file is used on the vessel, at the remote computer, or in the Kongsberg Blue Insight cloud.

Remote operation

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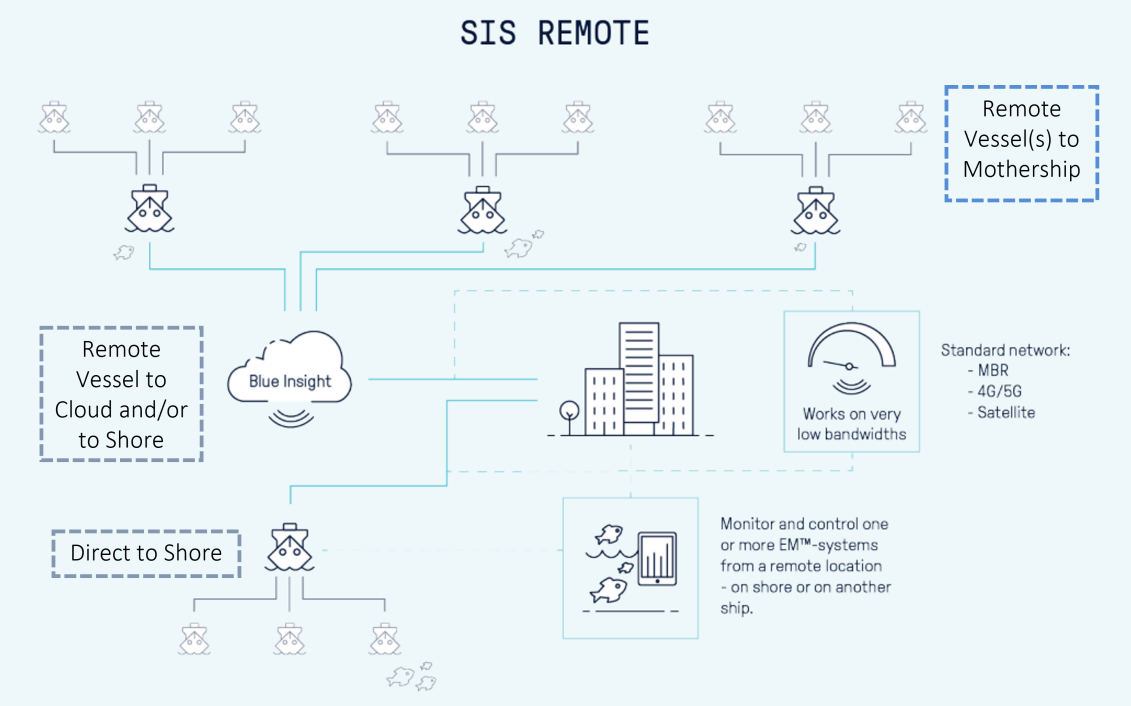
Remote operation using the SIS Remote application

There are several different ways to configure the SIS Remote application depending on your network setup and purpose. The important component to consider is the MQTT message broker. The MQTT message broker is used to communicate messages between ship and shore.

The following remote control options are available:

- Remote vessels to mothership
- Remote vessels to cloud and/or shore station
- Remote vessel to shore station



With any of these options, a few key items are required:

EM multibeam echo sounder system with Processing Unit (PU)

Each EM system is provided with a Processing Unit (PU).

Seafloor Information System (SIS) application with SIS Remote License

You need a licenced installation of the SIS application on the vessel. One SIS Remote license is required for each SIS installation on the vessel. The SIS Remote feature must then be enabled in SIS on the vessel.

Hydrographic Work Station (HWS)

The HWS is the computer used to control the EM multibeam echo sounder system. It must be connected to the same network as the Processing Unit to operate the SIS application.

The Hydrographic Work Station must be on the same network as the MQTT broker.

SIS Remote application

The same SIS installer that is used on the vessel HWS is also used on the remote computer.

There is no license required for the remote operator, there may be multiple remote end users.

MQTT message broker

The MQTT message broker application transfers the data from the SIS application running on the HWS on the vessel, to the remote computer running the SIS Remote application.

The MQTT message broker may be installed on the vessel, in a cloud application, or on the shoreside remote computer.

We recommend that you use the MQTT message broker created by Eclipse.

- See the Mosquitto internet page https://mosquitto.org/.

Communication method

This can be via a Seatex Marine Broadband Radio (MBR), a cellular network or satellite communication.

Remote computer

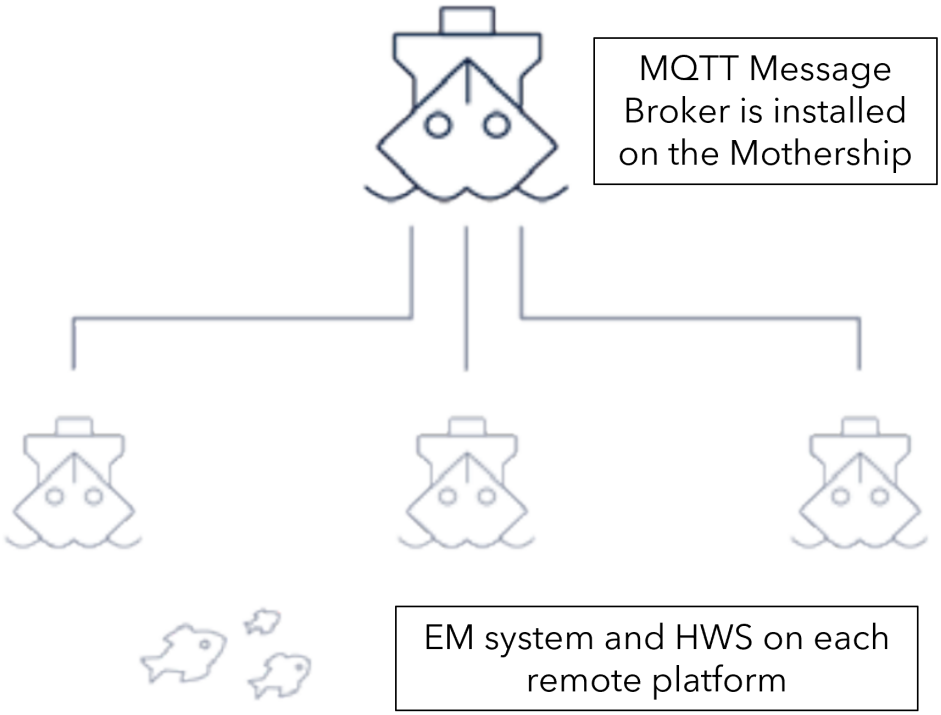
The remote computer can be a virtual machine in the cloud. It can also be a physical computer at the shore station.

This figure illustrates the connection between the ship and the shore station.

Note

The configuration you chose will depend on the vessel operations and survey staffing requirements. Kongsberg Discovery takes no responsibility for this setup or the relevant security requirements. The client's system administrators must be involved to ensure that relevant cyber security requirements are met.

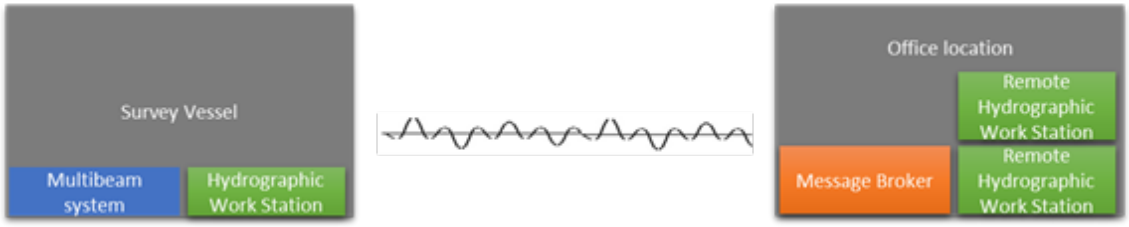
Remote Vessel(s) to Mothership



In this configuration the radio link has very low latency and usually high availability. Typical setup is a Marine Broadband Radio (MBR) on the ship and one MBR on shore, or MBR on remote vessel and MBR on mothership. WIFI WLAN can also be used, or even 4G as network carrier.

In this setup only one MQTT message broker is installed on the HWS on the mothership.If the radio communication is interrupted, real time data are no longer transmitted and will not be re-transmitted when the communication is re-established.

However, logging continues on the survey vessel, and the DTM is stored and transmitted in full when the communication is re-established.

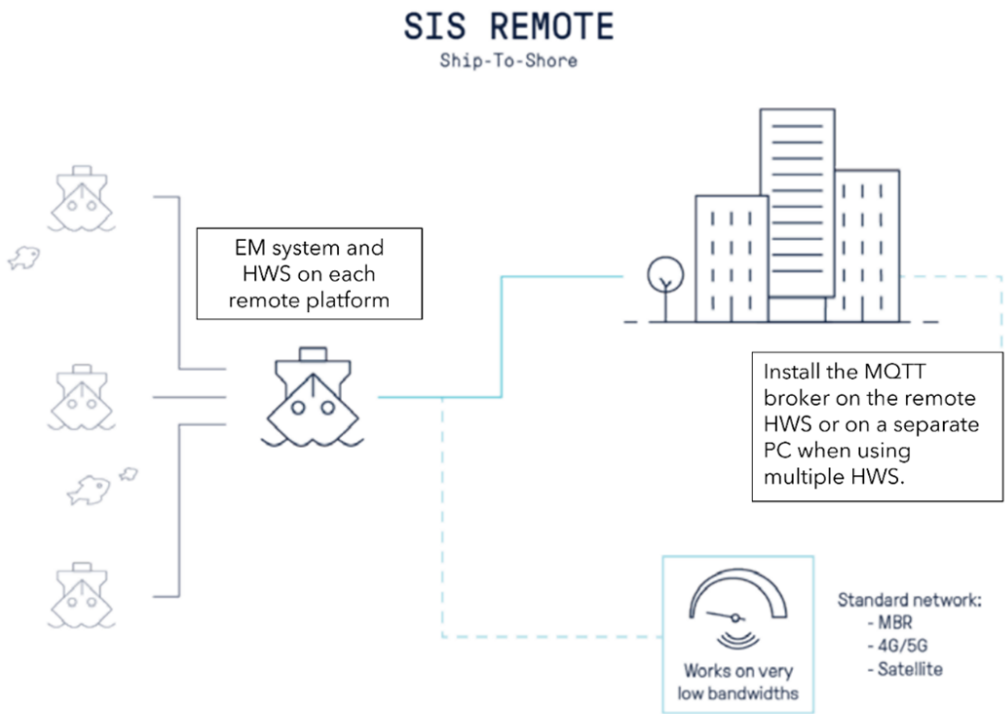


One mothership may have several remote vessels in addition to the EM on the mothership itself. The connection between the mothership and the vessels can use MBR with high bandwidth so the surveyor on the mothership can control each EM directly.

Then the connection between the mothership and cloud (e.g., Blue Insight) can be satellite communication with lower bandwidth transmitting the Digital Terrain Model (DTM) from all vessels at regular intervals. A Message Broker Bridge and/or repeater can be configured to strengthen the connectivity between platforms.

This setup makes it possible for one surveyor to effectively control several EM systems from one mothership, and to report progress ashore in near real time.

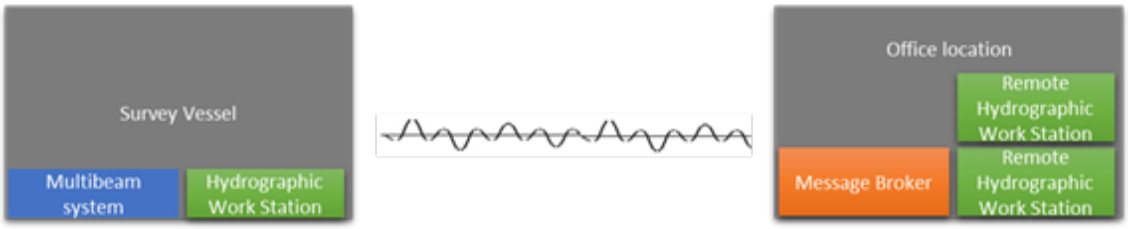
Ship to Shore with Direct Communication



In this configuration the radio link has very low latency and usually high availability. Typical setup is an MBR on the ship and oneMBR on shore, or MBR on survey launch and MBR on mothership. WIFI WLAN can also be used, or even 4G as a network carrier.

In this setup only one MQTT message broker is installed on the HWS in the office. If the radio communication is interrupted, real time data are no longer transmitted and will not be re-transmitted when the communication is re-established.

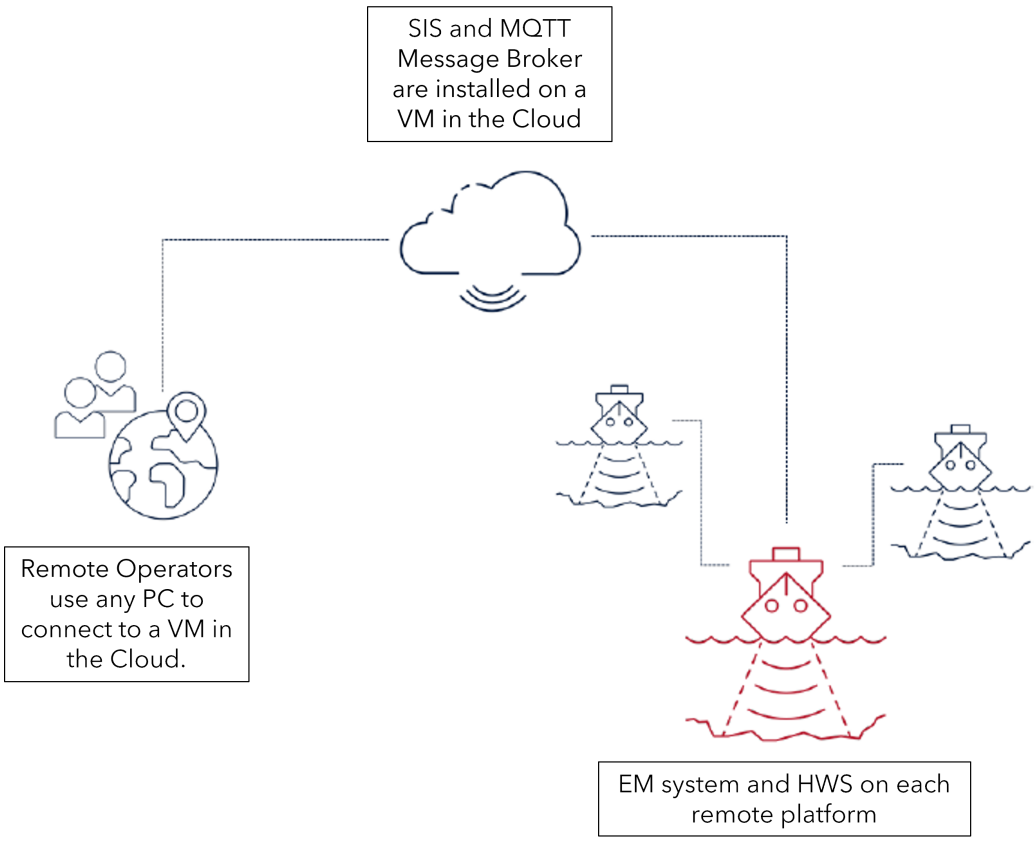
However, logging continues on the survey vessel, and the DTM is stored and transmitted in full when the communication is re-established.



Here, the radio setup is the same as above, but now the MQTT message broker is installed on the shoreside remote computer.

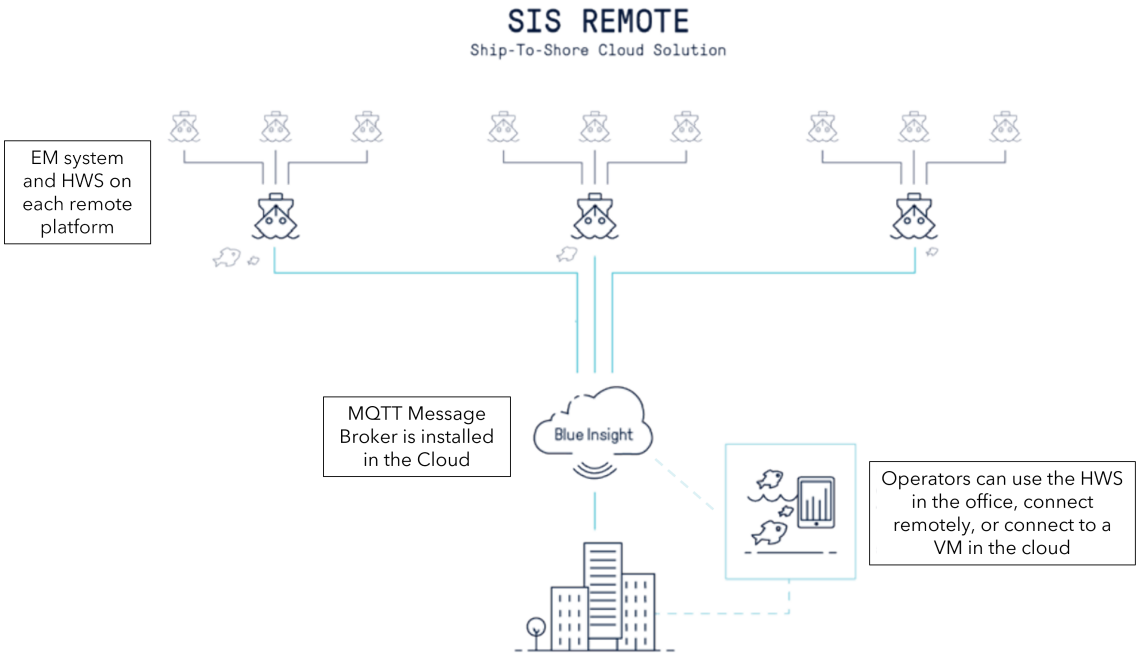
The HWS and remote computer must be on the same network to allow communication between the vessel and the office. This may be a desirable solution as it gives the network security officer good control of the network interface to the radio and what data are to be allowed into the network where the HWS's are. This configuration is helpful if you have multiple systems, multiple vessels, and/or multiple survey personnel.

Ship to cloud communication



In this configuration, the remote survey personnel would use any available computer either at home or in the office with the designated network configuration and credentials to access SIS Remote installed on a Virtual Machine in the cloud. This is a useful setup when there are rotating contracted personnel and credentials, hardware and access need to be carefully managed.

Ship to Shore via Cloud



The MQTT message broker can be installed on a virtual machine (VM) in the cloud (e.g., Blue Insight). The network between the ship(s) and the cloud will typically be a direct satellite link. From the cloud (e.g., Blue Insight) to one or more remote locations, land-based high speed Internet connections can be used.

This setup allows multiple survey vessels to send their data to one common MQTT message broker. Data can be displayed simultaneously at several locations and easily monitored by multiple surveyors. This is a recommended setup for over-the-horizon operations where staff may be located remotely from the office location and in particular when the vessel or vehicle is uncrewed. Instead of using a VM in the cloud for SIS Remote, each user would configure their remote computer - either in the operations center or home office.

Support information

If you need technical support for your SIS Remote application you must contact a Kongsberg Discovery office. A list of all our offices is available on our website. You can also contact our main support office in Norway.

A 24 hour telephone support service may also be available depending on your Service Level Agreement.

- **Company name**: Kongsberg Discovery AS
- **Address**: Strandpromenaden 50, 3183 Horten, Norway
- **Website** : https://www.kongsberg.com/maritime/
- **Email address**: km.hydrographic.support@kongsberg.com

Kongsberg Discovery support is also available in the KM-App.

Our support application is available for free in the App Store and Google Play. The use of our support application is free of charge. Your mobile phone provider may charge you the cost of the communication.

Operating procedures

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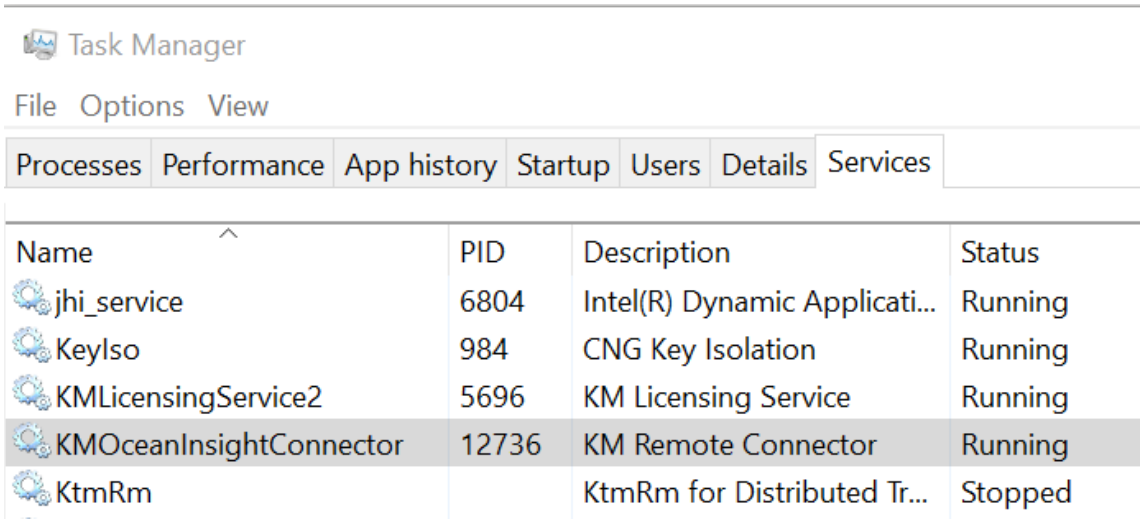
Monitoring the MQTT Connection

Operating SIS and SIS Remote will light up two lamps on the control bar. The left lamp is for the sonar inputs and the right lamp is for the connection to the MQTT server. Pay attention to the lamps in SIS, both on the ship and on shore. The right one must be green both onboard and on shore to transmit and receive data through the MQTT-broker. If both lamps are green, you should see the vessel(s), sonar(s) and current survey in the dropdown menus.

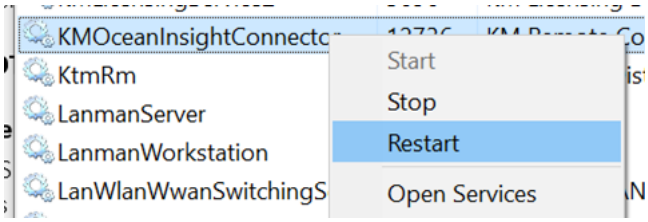
Procedure

1 Select Windows **Task Manager - Services** if the MQTT connection is red.

2 Search for KMOceanInsightConnector.



3 Right click and select **Restart**

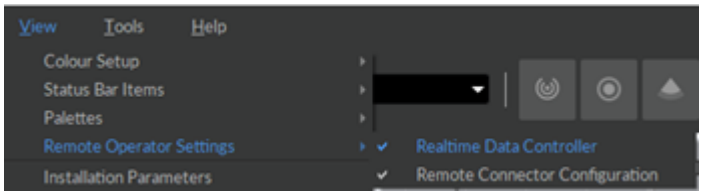


4 Wait a minute, and you should see the MQTT connector indicator in SIS go green.

Realtime Data Controller

Procedure

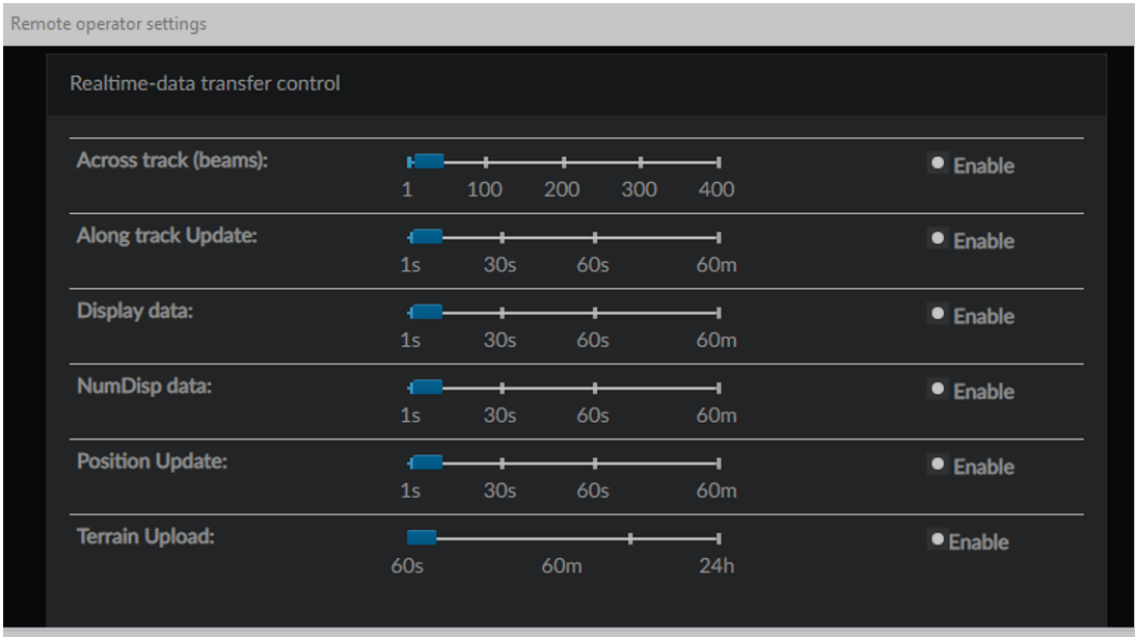
1 Data streams are controlled by the menu found at **View - Remote Operator Settings - Realtime Data Controller**.



2 Set the **interval** for how often to update for each item, and click **enable** to activate this data transfer.

3 Enable/disable the desired data streams.

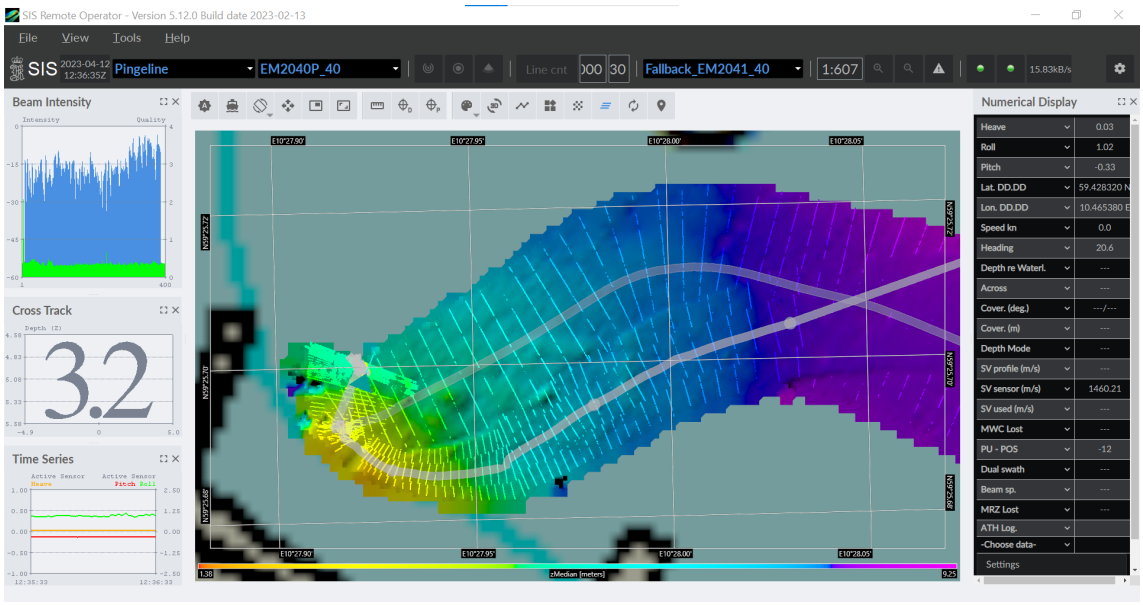
4 Use the sliders to change the interval of the data transmission to accommodate the available bandwidth.



- *Across track (beams)* - Number of beams in the ping to transfer.
- *Display data* - Display data is the item that uses the most bandwidth. If there is no need for Crosstrack and Beam Intensity, this item should be off.
- *NumDisp data* - This populates the Numerical Display, which uses less bandwidth than Display data.

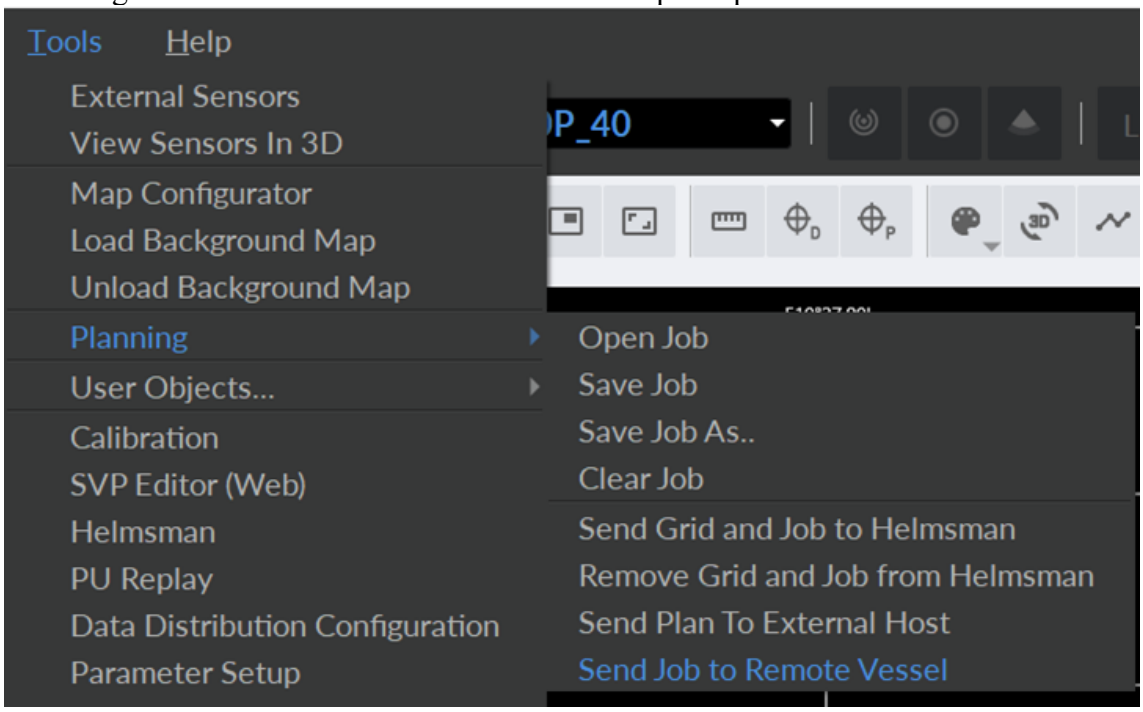
- *Position Update* - This is the vessel indicator in the Geographical Display.
- *Terrain Upload* - This is the gridded data viewed in the Geographical Display. As in SIS, the grid data will not fill in unless the system is logging.

Once a data stream is enabled, data is received by SIS Remote from the vessel(s).



Transfering Line Plans to Remote Vessel

The **Send Job to Remote Vessel** function allows the Operator to send points, lines and polygons to the vessel. The intention is to spend effort line planning on shore, and send the final result directly to the vessel instead of having to transfer a file then use remote desktop to open the file in SIS.



Prerequisites

For details on creating points, lines and polygons in SIS, please refer to the SIS Operator Manual.

Procedure

1 Select **Tools - Planning - Open Job** to select the file you would like to transfer.

2 Select **Tools - Planning - Send Job to Remote Vessel**

3 The points, lines and polygons should now be visible in SIS on the vessel.

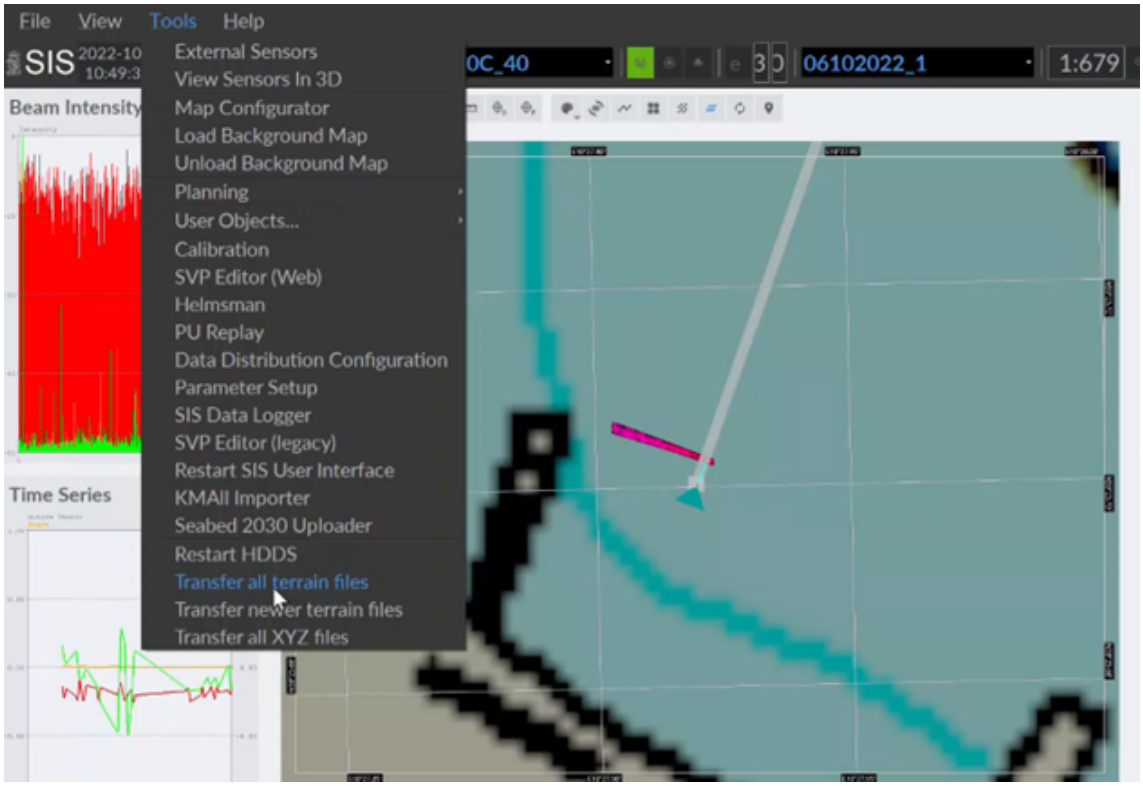
Transfering all Terrain Files

This function will transfer all terrain files to the SIS Remote computer from the entire current survey.

Procedure

1 In SIS, select **Tools - Transfer all terrain files**.

2 The terrain files will be transfered to the remote computer, and should automatically update the grid in the geographic display.



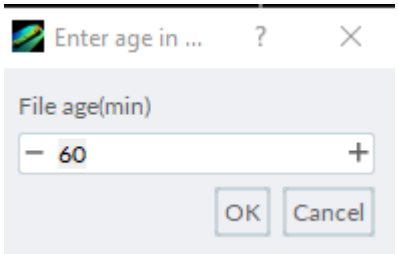
Transfering newer terrain files

This function will only transfer terrain files for the last number of minutes designated in the file age dialog.

Procedure

1 Select **Tools - Transfer newer terrain files**.

2 Fill in the **File age** dialog.



Transfering all XYZ files

Onboard the vessel, XYZ files (*.csv) will be created in the following location and automatically compressed via 7zip: [raw data drive]:/sisdata/XYZ/vessel name/survey name. Data will be transferred to the remote computer here: [drive]:/sisdata/XYZ/vessel name/survey name.

Procedure

1 Open Preferences.

2 Select the Application tab.

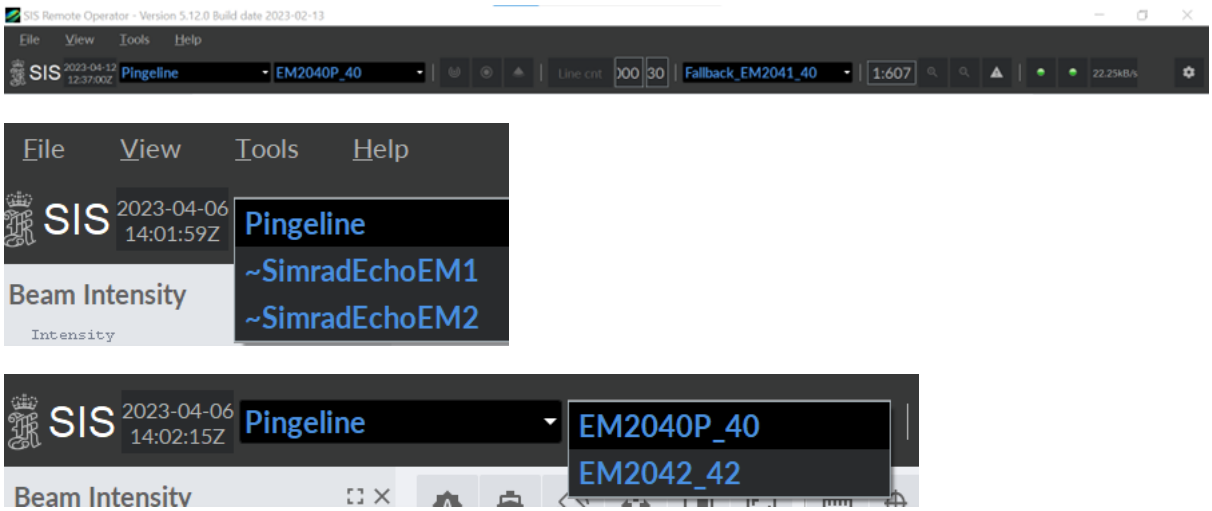
3 Check "create xyz files" to say "True".

Monitoring multiple vessels and/or systems

If you configured multiple vessels and/or systems in the Remote PC configuration, you can utilize the dropdown menus at the top of the screen to switch between vessels, systems and surveys.

Procedure

- Switch between vessels, systems and surveys.



Installing the software

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Installation summary

For the remote operation to work you must install and configure a message broker application. We recommend that you use the MQTT message broker created by Eclipse. You must also install the necessary licenses.

Context

We recommend that you install the MQTT message broker on the SIS Remote computer. It is also possible to install the application on a cloud server.

You only need to install the message broker on the the SIS Hydrographic Work Station if you want to set up communication with remote survey launches from the mothership.

Procedure

1 Download the Mosquitto application.

2 Install the application on the SIS Remote computer.

3 Make the necessary configurations.

4 Install the SIS Remote software license on the mother ship.

Connecting the HWS to the PU onboard

The Hydrographic Work Station has at least two network connections. In a typical installation, one is connected to the Processing Unit.

Procedure

- Make sure the network connections are set up.

Note

There may be firewalls between the radio and the HWS both on the ship and on shore. Please be advised that the network security setup must be configured to allow communication between the radio and the HWS. This configuration must be handled by the local network security officer.

HWS from ship to shore

The second network connection is set up in the same way. This connection must reach a PC or VM where an MQTT broker is installed. When using MBR for communications, you will use a DHCP or static IP address. When using 4G, satellite or similar to connect to a resource in the cloud, a URL address may be preferred. The HWS must be able to communicate with the MQTT broker. The connection should be tested using the ping-command or similar in a command prompt or other network telecommunication program. This may require assistance from an IT Administrator.

Configuring the MQTT message broker

To communicate between the two locations, SIS Remote uses a message format called MQ Telemetry Transport (mosquitto or MQTT). A MQTT server must be configured and reachable at both locations. The MQTT server can be installed on one of the SIS HWS, cloud VM or remote computer. This procedure describes how to set up the MQTT message broker in a general way, then how to configure it for the various communication strategies. Eclipse Mosquitto is an open source (EPL/EDL licensed) message broker that implements the MQTT protocol versions 3.1 and 3.1.1. See the Mosquitto internet page https://mosquitto.org/. This installation must be done for each computer the MQTT message broker shall be installed in. One broker can be used for multiple connections, depending on the configuration option chosen, see Configuration Options Overview.

Further requirements

Note

The installation and software for an MQTT broker is not part of the SIS installation since this can be done in various ways. It is commonly installed using the Mosquitto MQTT-broker by Eclipse.

Installing the MQTT message broker

The MQTT message broker application transfers the data from the SIS application running on the HWS on the vessel, to the remote computer running the SIS Remote application.

Prerequisites

You need administrative privileges on your computer to do the software installation.

Context

We recommend that you use the MQTT message broker created by Eclipse.

See links https://mqtt.org/ and https://mosquitto.org/

Procedure

1 Download the software.

2 Run the executable file to start the installation.

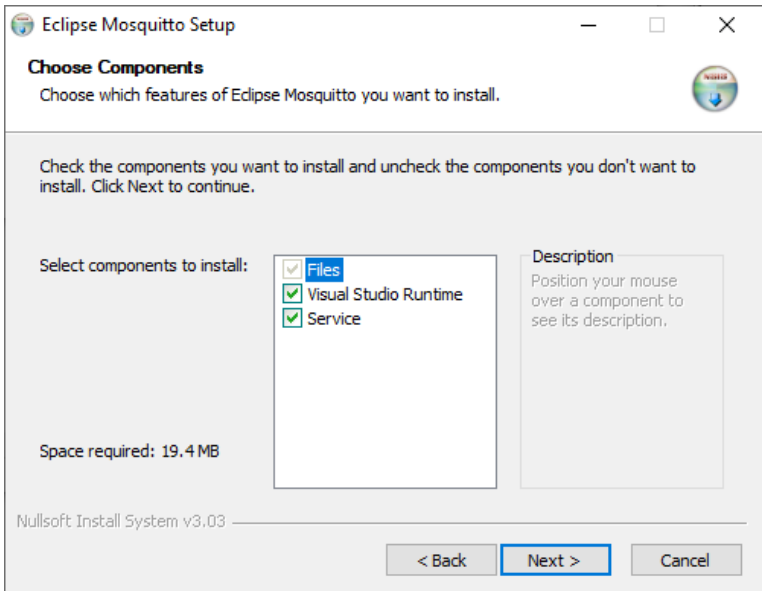
3 Use a file manager application on the computer to access the software files.

```
C:\Program Files\mosquitto
```

4 Locate the instructions.

```
readme-windows.txt
```

5 Select the service option and follow the prompts for the default installation (if using the **graphical installer**).



6 Open the link (found in the readme file) and download Win64 OpenSSL v1.1.1a Light (3Mb).

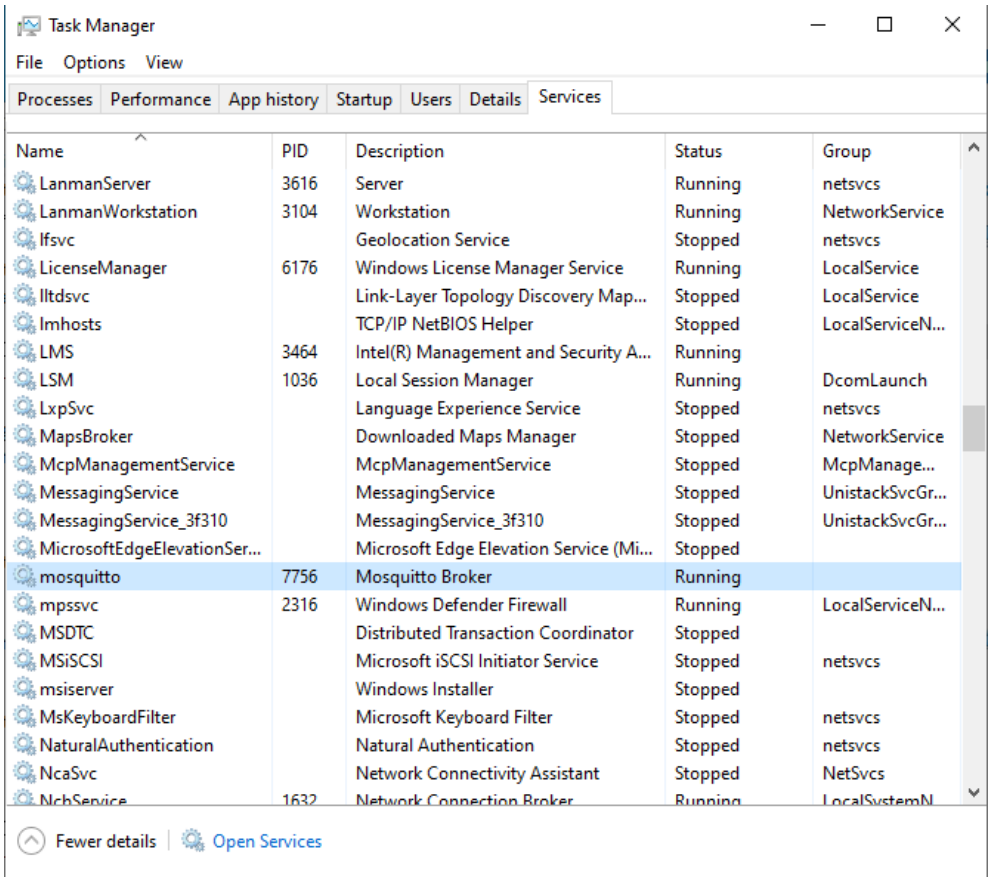
7 Run the installer: Win64OpenSSL_Light-1_1_1a.exe

Note

*If installing via **command line**, open a command window as Administrator and run the command:* `C:\ProgramFiles\mosquitto\install`

This also installs the MQTT as a service.

8 Open **Task Manager - Services** and observe that Mosquitto Broker is running:



Editing and saving the message broker configuration file

Once you have completed the installation of the MQTT message broker you must set it up.Save the finalized configuration file in a secure location.

Procedure

1 Configure the message broker.

Note

An example configuration file (mosquitto.conf) can be found in the SIS installation files under C:\Program Files\Kongsberg Maritime\EMSystem\Doc\SIS.

2 Store the Mosquitto configuration in a configuration file.
The key components of the configuration are described in the following.

Topics

Defining a listener, page 30

Configure Mosquitto to only allow authenticated users, page 31

Creating a password file, page 31

Testing the MQTT Server, page 32

Defining a listener

The latest versions of Mosquitto must be configured to allow for remote access. This is done by adding a “Listener” to the mosquitto.conf file.

Procedure

1 Add a line like this; **listener1883 157.237.60.245** under the # Listeners section.
This will create a listener on port 1883 and ip address 157.237.60.245.

2 Save the file.

3 Restart mosquitto

Configure Mosquitto to only allow authenticated users

Mosquitto can be configured to allow only authenticated users to connect to the broker. This is how to configure Mosquitto to do this.

Procedure

1 Search for “#allow_anonymous” and remove the #

2 Use true or false according to your needs as described in the comments.

3 This parameter is set to false by default.

Creating a password file

You can create a password file after installing Mosquitto.

Procedure

1 Open a command prompt with Administrator privileges and change directory to **C:\Program Files\mosquitto**

2 Enter the following command to create a new password file named pl.txt with the initial user kmuser: **mosquitto_passwd -c pl.txt kmuser**

You will be prompted to enter a password for the user.

Note

Be careful as the password is not echoed and it does not look like it is being accepted but it is.

3 Use the command **mosquitto_passwd -b pl.txt user password** to add additional users to the file.

4 Delete users from the password file using the command **mosquitto_passwd -D passwordfile user**.
On a Windows PC, the password file will be saved to the default installation directory **C:\ProgramFiles\mosquitto**.

For Linux:

5 Copy the password file into the etc\mosquitto folder.

6 Open the .conf file and locate the line that contains “password_file” and change it to look like; password_file C:\PROGRA~1\MOSQUI~1\pl.txt.

7 Be sure to use the full path to the pl.txt file and without spaces. Save the .conf file and restart the Mosquitto service.

Note

Mosquitto must be started with the -c option, e.g. mosquitto -c mosquitto.conf when running as a stand alone application. When running as a Windows service, the config file is automatically loaded when the service is restarted.

Testing the MQTT Server

This procedure describes testing of the MQTT Server.

Procedure

1 After the Mosquitto server has been configured and is up and running, use a MQTT test tool to verify that it is working and accessible from all locations. Kongsberg recommends using **MQTT Explorer** for testing.

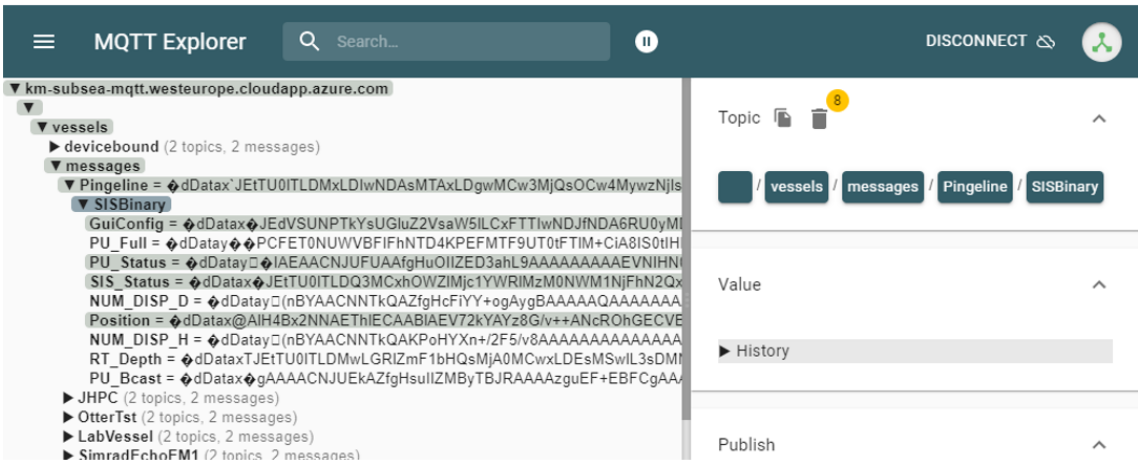
2 Download MQTT Explorer from http://mqtt-explorer.com/.

3 After MQTT Explorer is installed, start it and enter settings like below:

4 Enter the correct IP address and credentials that are used in your MQTT Server.

5 Connect to the server to verify that a connection can be established.

6 Repeat this on both the vessel and the remote site.



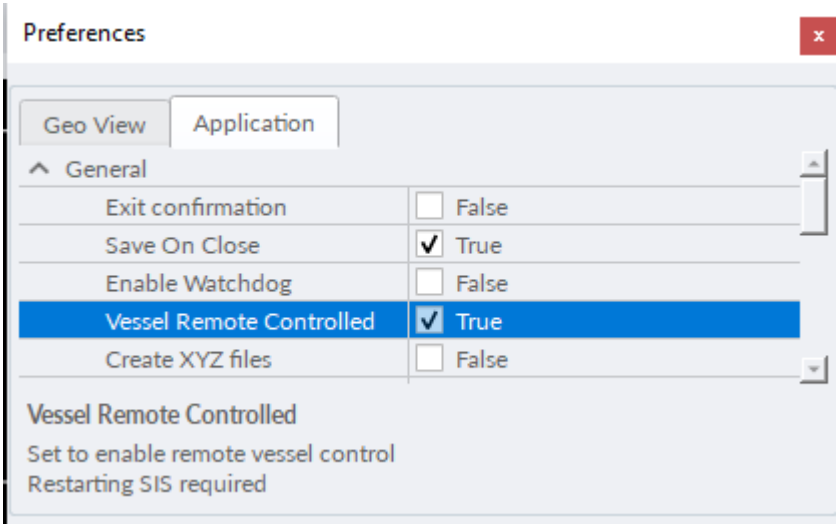
7 Using this tool you can verify that messages are sent from the vessel.

Installing SIS Remote License

Once the license has been purchased, you will receive an email from Customer Support with the license and activation instructions.

Procedure

1 Install the SIS Remote license on the dongle.



2 Open preferences in SIS.

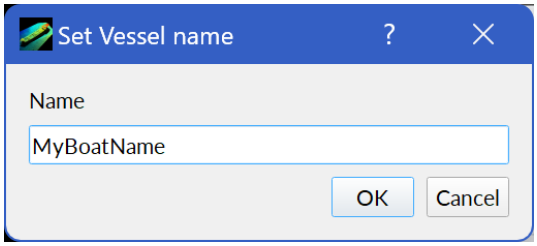
3 Click on the Application tab.

4 Enable Vessel Remote Controlled.

5 Restart SIS.

6 Set vessel name.

7 Set a unique name for this vessel and select OK. It is suggested to not use spaces in the name.

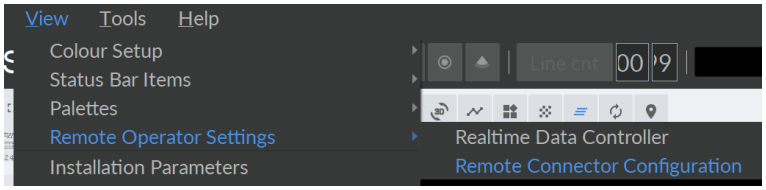


Configuring the MQTT connection in the SIS Interface Onboard the Vessel

The following procedure is for configuring the MQTT connection in the SIS.

Procedure

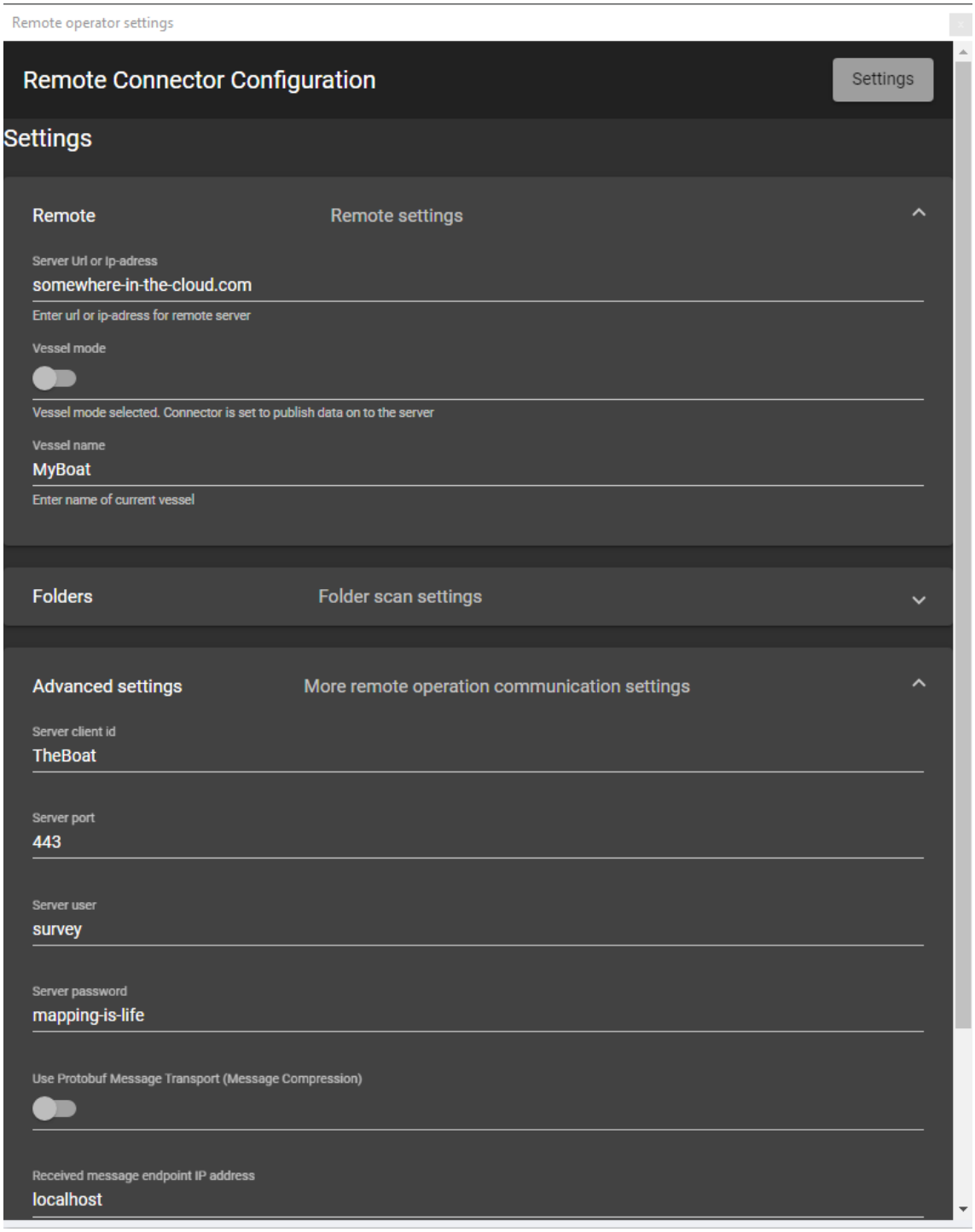
1 Select **View - Remote Operator Settings - Remote Connector Configuration** to complete the setup.



Note

If the license is not correctly installed, and remote vessel is not enabled, this option will not appear in the menu.

2 Fill out the form with the relevant connection details.



Remote Server URL or IP address: this is the IP address or public URL of the computer or VM running the MQTT broker on the network. If using Maritime Broadband Radio for communication, or the MQTT is on the same PC as the SIS

Remote software, an IP address will be used. If the MQTT broker is installed in the cloud, then this will likely be a URL.

3 Verify that the toggle is set to "vessel remote".

4 Enter the boat name that you provided when you restarted SIS after enabling remote control.

5 The client ID must be unique from any other clients on the network.

6 Server Port, Server User and Server Password: These are all designated in the configuration of the MQTT message broker. Ports 433 or 1883 are common choices, as they are open by default in most firewalls.

Note

If a different port is selected, the network administrator should ensure that it is open in the relevant firewalls.

7 **Save**.

8 Restart SIS to verify that the settings are stored properly.

Note

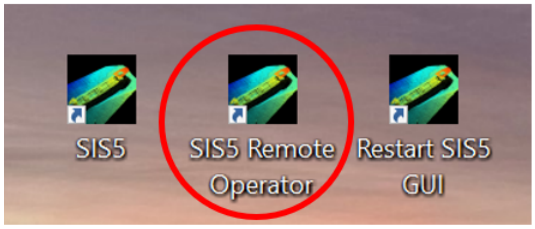
It may be required to restart the "KMOceanInsightConnector" after changing the Vessel name. This can be done by restarting the HWS or using Task Manager "Services" to right click and restart the service. When the HWS or the service has been restarted, SIS Remote is ready to be used.

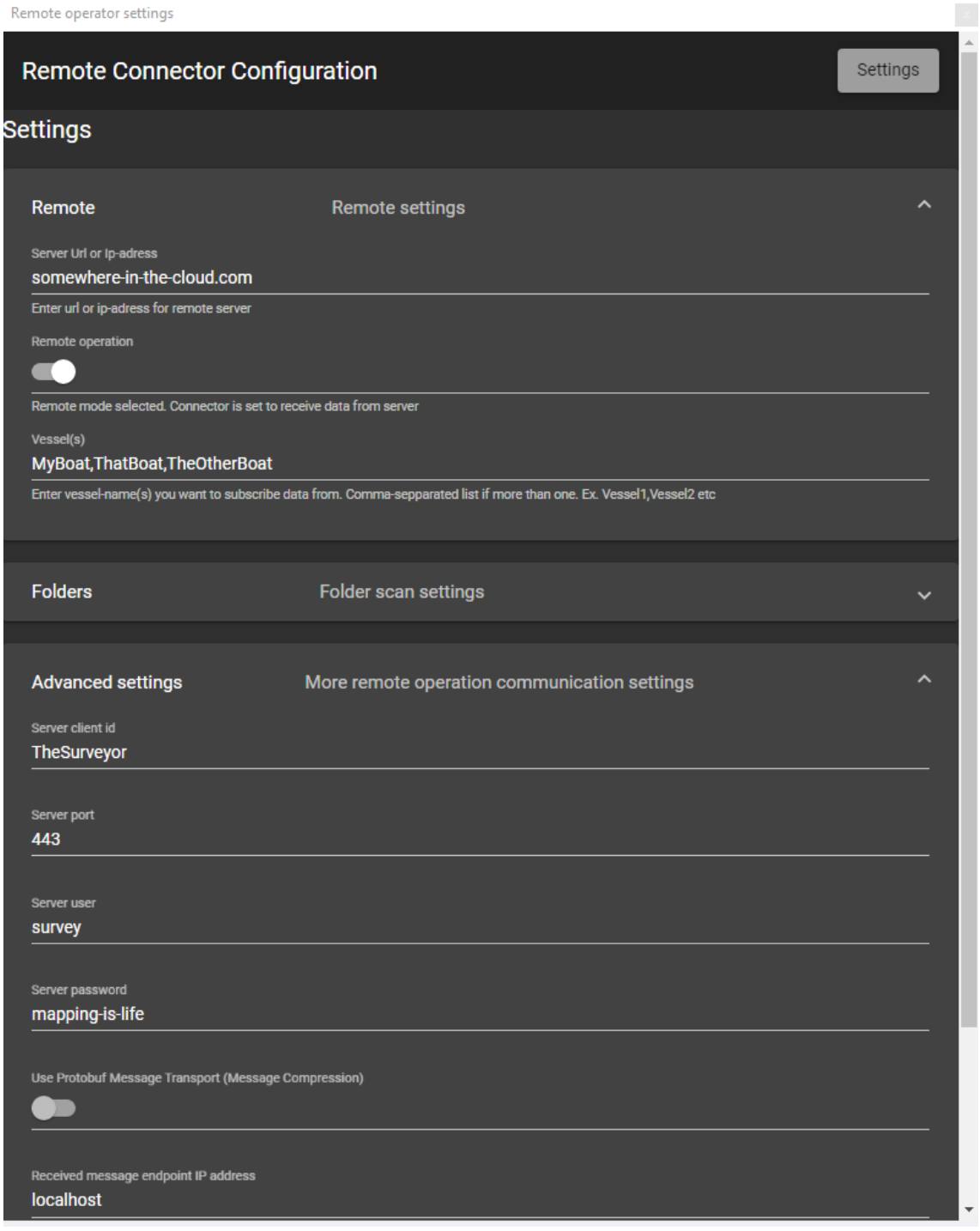
Configuring the MQTT connection in the SIS Interface on the Remote computer

Follow this procedure to configure the MQTT connection in the SIS Interface on the remote computer.

Procedure

1 Select **SIS Remote Operator** with the shortcut on the desktop of the remote PC, then open the Remote Connector Configuration by selecting **View - Remote Operator Settings - Remote Connector Configuration**

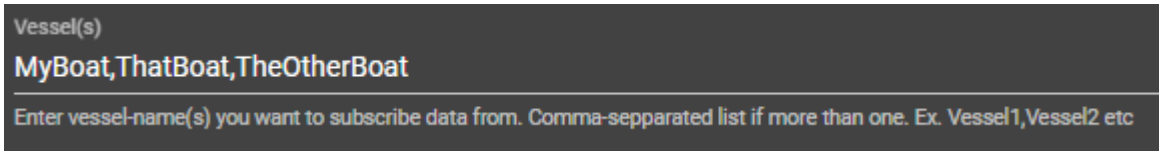

SIS5
SIS5 Remote Operator
Restart SIS5 GUI


Remote operator settings
Remote Connector Configuration
Settings
Settings
Remote
Remote settings
Server Url or Ip-adress
somewhere-in-the-cloud.com
Enter url or ip-adress for remote server
Remote operation
Remote mode selected. Connector is set to receive data from server
Vessel(s)
MyBoat,ThatBoat,TheOtherBoat
Enter vessel-name(s) you want to subscribe data from. Comma-sepparated list if more than one. Ex. Vessel1,Vessel2 etc
Folders
Folder scan settings
Advanced settings
More remote operation communication settings
Server client id
TheSurveyor
Server port
443
Server user
survey
Server password
mapping-is-life
Use Protobuf Message Transport (Message Compression)
Received message endpoint IP address
localhost

2 Enter the same server IP/url as onboard.

3 Switch the Vessel Mode/Remote operation to **Remote Operation**.

4 List all ships controlled from one SIS Remote with a single comma between the names (no spaces).



5 The client ID for the vessel and each remote should be unique. If you have multiple remote computers, use different client IDs for each.

6 The server port, user and password are the same as was used on the vessel.

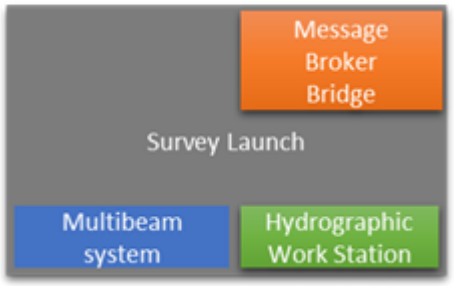
7 Restart SIS Remote.

Installing the MQTT bridge

In all the SIS Remote configurations, there is a possibility to install a local Message Broker Bridge on the remote vessel. This is done in case the radio link has frequent outages or if buffering on the vessel is desirable.

Procedure

- Install a local Message Broker Bridge on the survey launch



Configuring MQTT bridge on vessel

You can now use the MQTT message broker as a bridge to send data from one location to another via a second MQTT message broker.

Procedure

1 Look for section called “Bridges” in the configuration file for Mosquitto broker, located default in **C:\Program Files\mosquitto\mosquitto.conf**

```
652
653  # ================================================================
654  # Bridges
655  # ================================================================
656
657  connection <your name>
658  address <ip to remote broker>:443 #ex. 192.168.1.184:443
659  topic # out 0
660  topic # in 0
```

2 The token **connection** should be given a name, say MyBridge. This is used to define this bridge.

3 The token **address** must point to the MQTT message broker where the receiver is installed, the next jump in this bridge. If this is in Blue Insight, this address is sent to you from Kongsberg.

4 Configure the file **"C:\Program Files\Kongsberg Maritime\EMSystem\SIS-MqttClient\Bin\SISMqttClient.exe.config"** for each remote computer.

5 Update the list of receivers (subscribeTopics) for all clients.

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