MQTT SpB Publisher Simulator Connector

Publish to brokers compatible with the MQTT Sparkplug B

- Name: **MQTTspBSimulator**
- Version 1.0.0.0
- Protocol: MQTT
- Interface: TCP/IP
- Runtime: NET 4.8
- Configuration:
    - DataExplorer / MQTT Tools

Included Features
Simulator Execution Window
Customize the Simulation Data Structure
Data Browser TreeView
Command Line Parameters
XML Configuration File

Overview

This document provides information on configuring and running the MQTTspB Simulator, including its integration with Data Explorer Tools and runtime behavior. The simulator can be started from the Data Explorer UI or by executing it with command line parameters, creating an MQTTspB Client that connects to a configured broker and publishes simulated data to mapped topics.

Included Features

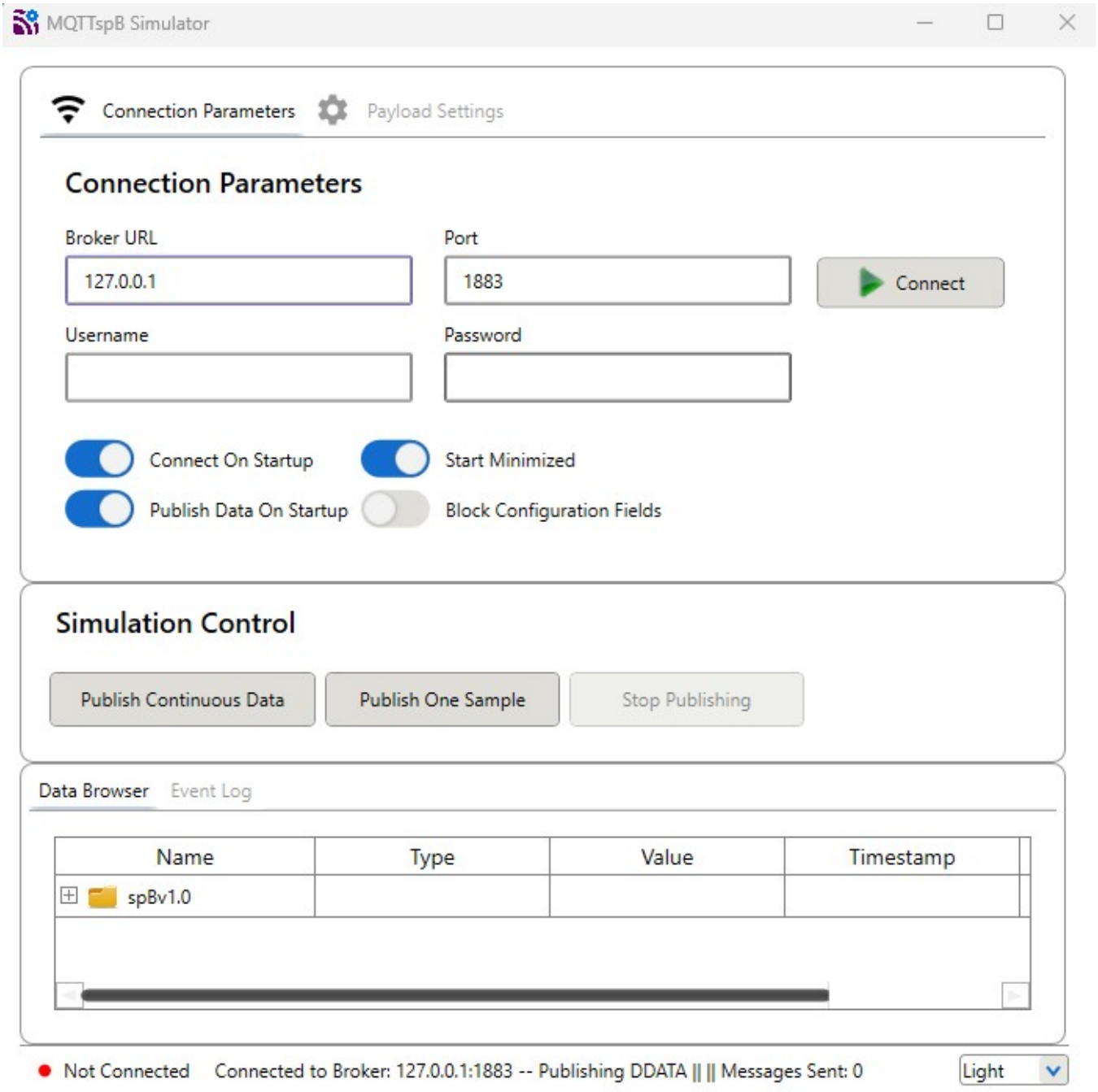
The following features are supported:

- Connection to brokers (local and remote) with or without username and password.
- Customization of topic parameters: GroupID, NodeID, and DeviceID.
- Creation of multiple NodeIDs within the same GroupID, each with its own DeviceIDs.
- Creation of multiple DeviceIDs within the same NodeID.
- Modification of DeviceIDs attributes using a configuration file.
- Publishing of NBIRTH, DBIRTH, DDATA, NDEATH, and DDEATH messages.

The MQTTspB Simulator is integrated with the Data Explorer Tools, making testing easier and faster by enabling the publication of up to 30,000 simulated values to the MQTT broker from the same design environment. This facilitates project testing, communication validation with the software platform MQTT client, and testing of the new Dynamic TagProvider functionality with MQTT.

Simulator Execution Window

You can start the simulator using the Designer at **Data Explorer** / **MQTT** tools, or directly through the **MQTTspBSimulator** executable file, located inside the protocols folder of the product's installation path in "<ProductPath>\FrameworX\fx-10\Protocols".



Closing this window will terminate the execution of the simulator. You can minimize if you want to keep the simulation in the background.

The Execution window has the Data TreeView and EventLog at the bottom, and configuration panels for:

- Simulation Control
- Connection Parameters
- Payload Settings

Simulation Control

The **Simulation Control** in the MQTTspB Simulator allows users to manage the data publication process.

- **Publish One Data Sample**: Sends **one** DDATA message for each Device created in the session.
- **Publish Continuous Data**: Sends continuous DDATA messages with a time rate of 1 second.

- **Stop Publishing Data:** Stop publishing continuous data.

When the simulator is connected with a Broker, these options are disabled for editing.

You can enable or disable the connection with the Broker using the buttons at the top of the Window.

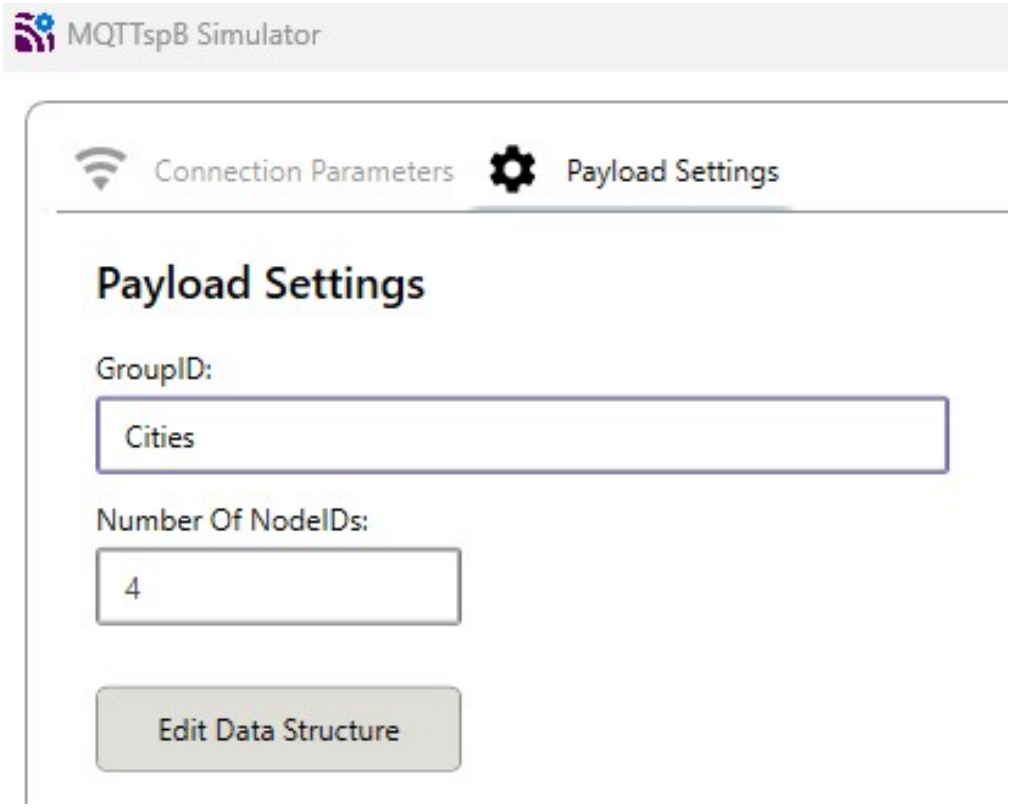
Connection Parameters

MQTTspB Simulator - Connection Parameters Configuration	
Broker URL	MQTT Broker (Server) default value is loopback (local) IP (127.0.0.1).
Broker Port	Port the Broker is connected to.
UserName	Username defined on the Broker, needed for authentication in certain cases (optional).
Password	Password defined on the Broker. This will be requested if the Broker needs this configuration (optional).
Minimized	Application starts minimized (valid for the next time the application is started).
BlockConfigurationField	Make configuration fields read-only.
ConnectOnStartup	MQTTspB Client tries to connect to Broker automatically when application is started (valid for the next time the application is started).
PublishDataOnStartup	MQTTspB Client tries to publish Data to Broker automatically when application is started (valid for the next time the application is started).

The Simulator **does not** support SSL Protocols.

The Connection Parameters are only applied when starting the connection with the Broker.

Payload Settings



The Payload Settings of the MQTTspB Simulator Configuration dialog allow users to manage settings related to the data payload being sent, such as GroupID, Number of NodesIDs and the Edit Data Structure button.

- **GroupID**: Specifies a unique identifier for a group of clients or devices. This identifier helps to organize and manage clients within the same group. The default value is "Cities".
- **Number Of NodeIDs**: Indicates the number of nodes or individual devices within the specified group. This value helps to structure the data to be sent, ensuring that the correct number of nodes is included in the payload.
- **Edit Data Structure**: This button allows users to modify the data structure that will be used in the payload. Clicking on this button opens a configuration popup where users can define or adjust the data points, types, and hierarchical organization of the data to be published.

Payload Data Structure

The structure is defined based on the hierarchy illustrated below:

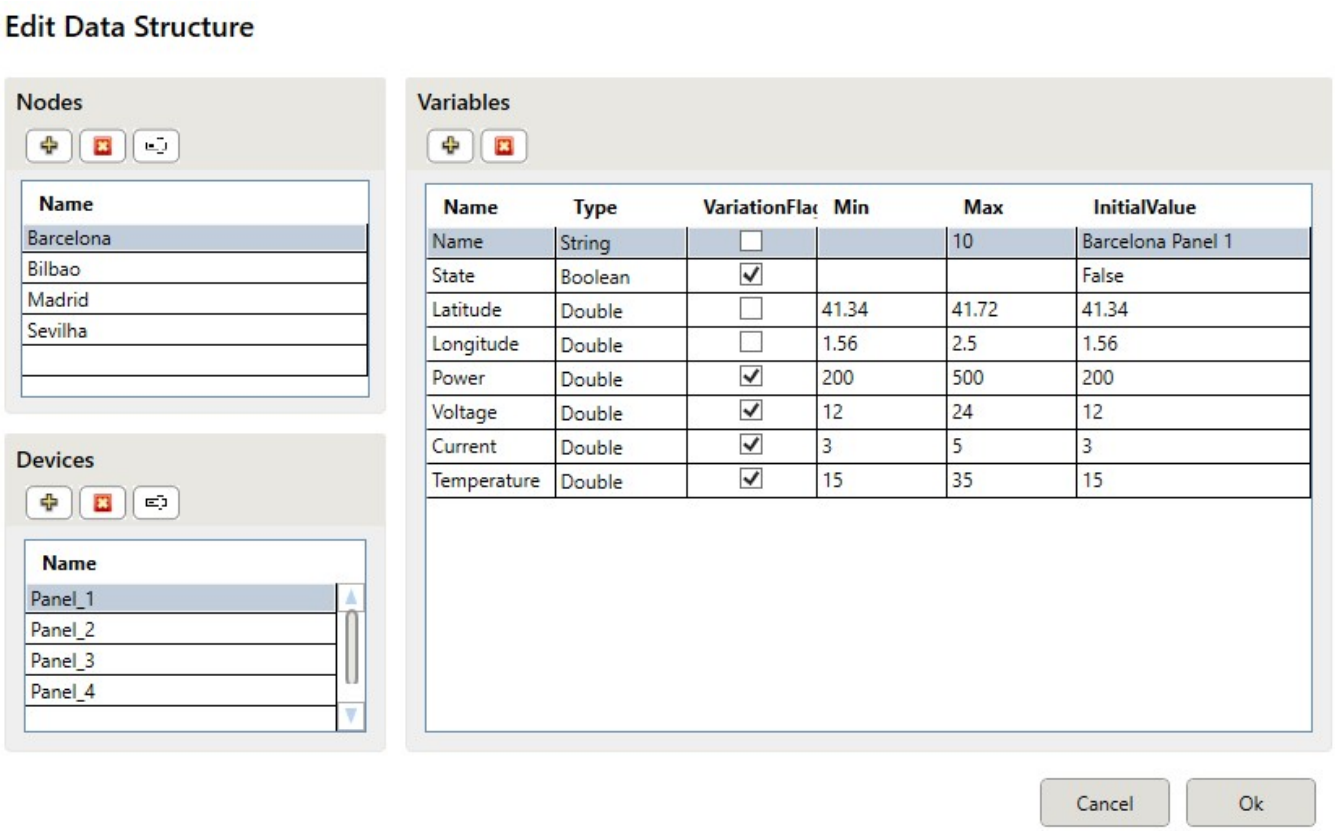
```
<GroupID Name="<GroupName>">
|-- <NodeIDs>
|   |-- <NodeID Name="<NodeName>">
|   |   |-- <DeviceIDs>
|   |   |   |-- <DeviceID Name="<DeviceName>">
|   |   |   |   |-- <Variables>
|   |   |   |   |   |-- Var1
|   |   |   |   |   |-- ...
|   |   |   |   |   |-- VarN
|   |   |   |-- <DeviceID Name="<DeviceName2>">
|   |   |       |-- <Variables>
|   |   |   |   |   |-- Var1
|   |   |   |   |   |-- ...
|   |   |   |   |   |-- VarX
|   |-- <NodeID Name="<NodeName2>">
|       |-- <DeviceIDs>
|       |   |-- <DeviceID Name="<DeviceName>">
|       |   |   |-- <Variables>
|   |   |   |   |   |-- Var1
|   |   |   |   |   |-- ...
|   |   |   |   |   |-- VarY
|       |   |-- <DeviceID Name="<DeviceName>">
|       |       |-- <Variables>
|   |   |   |   |   |-- Var1
|   |   |   |   |   |-- ...
|   |   |   |   |   |-- VarZ
```

To edit the structure, click on the **Edit Data Structure** button and customize your Payload at the dialog window, which is described in detail in the next topic. Alternatively, you can directly modify the XML configuration file.



The Data Structure can only be edited while the OPC Server **is not running**.

Customize the Simulation Data Structure



The Data Structure configuration dialog allows users to define and customize the data payload that the simulator will publish to the MQTT broker. Here is a detailed description and explanation of each section and its components:

NodeIDs

- **NumberOfNodes**: Specifies the number of nodes (or groups of devices) included in the data structure. Default value is set to 4, meaning there are four groups of devices.
- **Node List**: Lists the node names. By default, the nodes are named "Barcelona," "Bilbao," "Madrid," and "Sevilha." Users can add or remove nodes using the add (+) and remove (–) buttons.

DeviceIDs

- **Device List:** Lists the devices under the selected node. By default, the devices are named "Panel_1," "Panel_2," "Panel_3," and "Panel_4." Users can add or remove devices using the add (+) and remove (–) buttons.

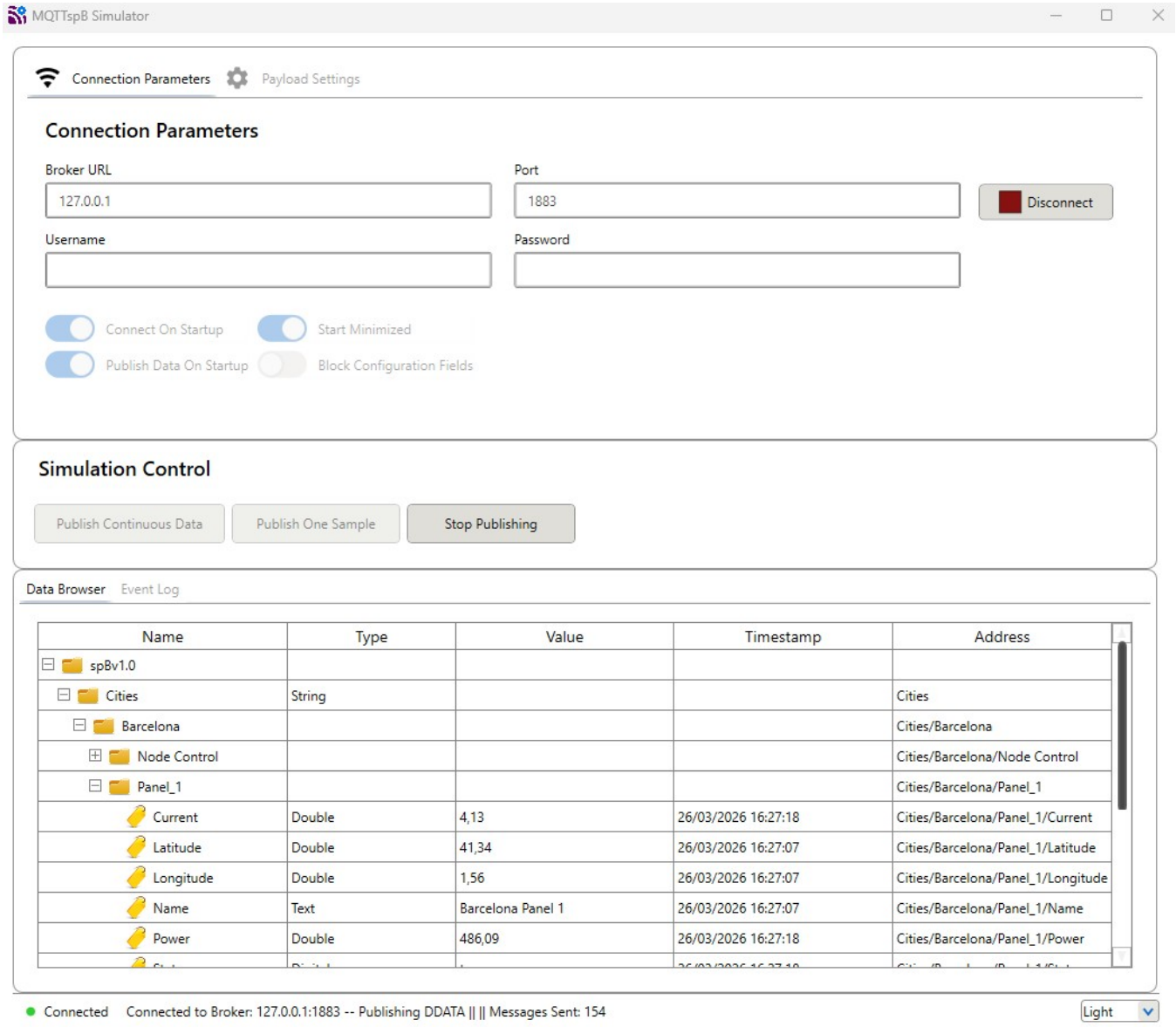
Variables

- **Tags Table**: Defines the tags associated with each device. Each row represents a variable with the following columns:
  - **Name**: The name of the variable (e.g., "Name," "State," "Latitude," "Longitude").
  - **Type**: The data type of the variable (e.g., "String," "Integer," "Double", "Boolean").
  - **VariationFlag**: Indicates whether the variable should vary over time. When checked, the variable's value will change every second during Runtime, according to the specified range.
  - **Min**: The minimum value of the variable when it varies.
  - **Max**: The maximum value of the variable when it varies.
  - **InitialValue**: The initial value assigned to the variable when the simulation starts.

When defining many nodes or properties, it may be easier to edit them directly in the XML configuration file, **MQTTspBSimulator.config.xml**, located in the ToolSettings folder.

Data Browser TreeView

In this region, you will be able to see the Payload Structure existing in the Broker.



> ⚠ The Simulator is **Write-Only!** You will not be able to subscribe to any topic; only publishing is allowed.

EventLog

This log displays useful information regarding the MQTTspB Simulator activity.

? Unknown Attachment

Command Line Parameters

The MQTTspB Simulator can be executed with custom parameters through the command line. The syntax is as follows:

```
"..\MQTTspBSimulator.exe" /param1:<param1Value> ... /paramN
```

The existing parameters are listed below:

- **Minimized**: Application starts minimized.
- **ConnectOnStartup**: MQTTspB Client tries to connect to Broker automatically when application is started

- **PublishDataOnStartup**: MQTTspB Client tries to publish Data to Broker automatically when application is started
- **BlockConfigurationFields**: Make configuration fields read-only.
- **BrokerUrl**: MQTT Broker URL
- **Port:** MQTT Broker listening port
- **UserName:** Username defined on the Broker. This will be requested if the Broker needs this configuration (optional)
- **Password:** Password defined on the Broker. This will be requested if the Broker needs this configuration (optional).
- **GroupId:** Defines the initial GroupID for the Payload Structure.
- **Config**: Full path for ***.xml** configuration file with Server Configuration and custom DataStructure. More details on the syntax for the ***.xml** file in the next section.
- **Path**: Full path of a FrameworX solution directory in which a configuration file can be found

Usage:

```
"..\MQTTspBSimulator.exe" /Minimized /AutoStart
                        /Config:"C:\Documents\CustomConfig.xml"
```



The input parameters **are not** case-sensitive

XML Configuration File

You can customize the MQTTspBSimulator's properties by modifying the default XML configuration file, or by defining a different configuration file using the Config command line parameter explained in the section above.

The syntax for the XML configuration file can be found in "<ProductPath>\FrameworX\fx-10\Protocols" and it is exemplified below:

```
<?xml version="1.0" encoding="utf-8"?>
<MQTTspBSimulator>
        <ConnectionParameters>
                <BrokerUrl>127.0.0.1</BrokerUrl>
                <BrokerPort>1883</BrokerPort>
                <UserName></UserName>
                <Password></Password>
        </ConnectionParameters>
        <PayloadSettings>
                <GroupID Name="Cities">
                        <NodeIDs>
                                <NodeID Name="Barcelona">
                                        <DeviceIDs>
                                                <DeviceID Name="Panel_1">
                                                        <Variables>
                                                                <Variable Name="Name" Type="string"
VariationFlag="false" InitialValue="City"/>
                                                                <Variable Name="State" Type="boolean"
VariationFlag="true"/>
                                                                <Variable Name="Latitude" Type="double"
VariationFlag="true" Min="-5" Max="2" InitialValue="0"/>
                                                                <Variable Name="Longitude" Type="double"
VariationFlag="true" Min="40" Max="43" InitialValue="40"/>
                                                                <Variable Name="Power" Type="double"
VariationFlag="true" Min="200" Max="500" InitialValue="200"/>
                                                                <Variable Name="Voltage" Type="double"
VariationFlag="true" Min="-220" Max="220" InitialValue="0"/>
                                                                <Variable Name="Current" Type="double"
VariationFlag="true" Min="-10" Max="10" InitialValue="0"/>
                                                                <Variable Name="Temperature" Type="double"
VariationFlag="true" Min="15" Max="35" InitialValue="0"/>
                                                        </Variables>
                                                </DeviceID>
                                                <DeviceID Name="Panel_2">
                                                        <Variables>
                                                                <Variable Name="Name" Type="string"
VariationFlag="false" InitialValue="City"/>
                                                                <Variable Name="State" Type="boolean"
VariationFlag="true"/>
                                                                <Variable Name="Latitude" Type="double"
```

```
VariationFlag="true" Min="-5" Max="2" InitialValue="0"
/>
                                                        </Variables>
                                                </DeviceID>
                                        </DeviceIDs>
                                </NodeID>
                                <NodeID Name="Bilbao">
                                        <DeviceIDs>
                                                <DeviceID Name="Panel_1">
                                                        <Variables>
                                                                <Variable Name="Name" Type="string"
VariationFlag="false" InitialValue="City"/>
                                                                <Variable Name="State" Type="boolean"
VariationFlag="true"/>
                                                                <Variable Name="Latitude" Type="double"
VariationFlag="true" Min="-5" Max="2" InitialValue="0"/>
                                                                <Variable Name="Longitude" Type="double"
VariationFlag="true" Min="40" Max="43" InitialValue="40"/>
                                                                <Variable Name="Power" Type="double"
VariationFlag="true" Min="200" Max="500" InitialValue="200"/>
                                                                <Variable Name="Voltage" Type="double"
VariationFlag="true" Min="-220" Max="220" InitialValue="0"/>
                                                                <Variable Name="Current" Type="double"
VariationFlag="true" Min="-10" Max="10" InitialValue="0"/>
                                                                <Variable Name="Temperature" Type="double"
VariationFlag="true" Min="15" Max="35" InitialValue="0"/>
                                                        </Variables>
                                                </DeviceID>
                                                <DeviceID Name="Panel_2">
                                                        <Variables>
                                                                <Variable Name="Name" Type="string"
VariationFlag="false" InitialValue="City"/>
                                                                <Variable Name="State" Type="boolean"
VariationFlag="true"/>
                                                                <Variable Name="Latitude" Type="double"
VariationFlag="true" Min="-5" Max="2" InitialValue="0"/>
                                                        </Variables>
                                                </DeviceID>
                                        </DeviceIDs>
                                </NodeID>
                        </NodeIDs>
                </GroupID>
        </PayloadSettings>
        <SimulatorControl>
                <ConnectOnStartup>false</ConnectOnStartup>
                <PublishDataOnStartup>false</PublishDataOnStartup>
                <Minimized>false</Minimized>
                <BlockConfigurationFields>false</BlockConfigurationFields>
        </SimulatorControl>
</MQTTspBSimulator>
```

In this section...
