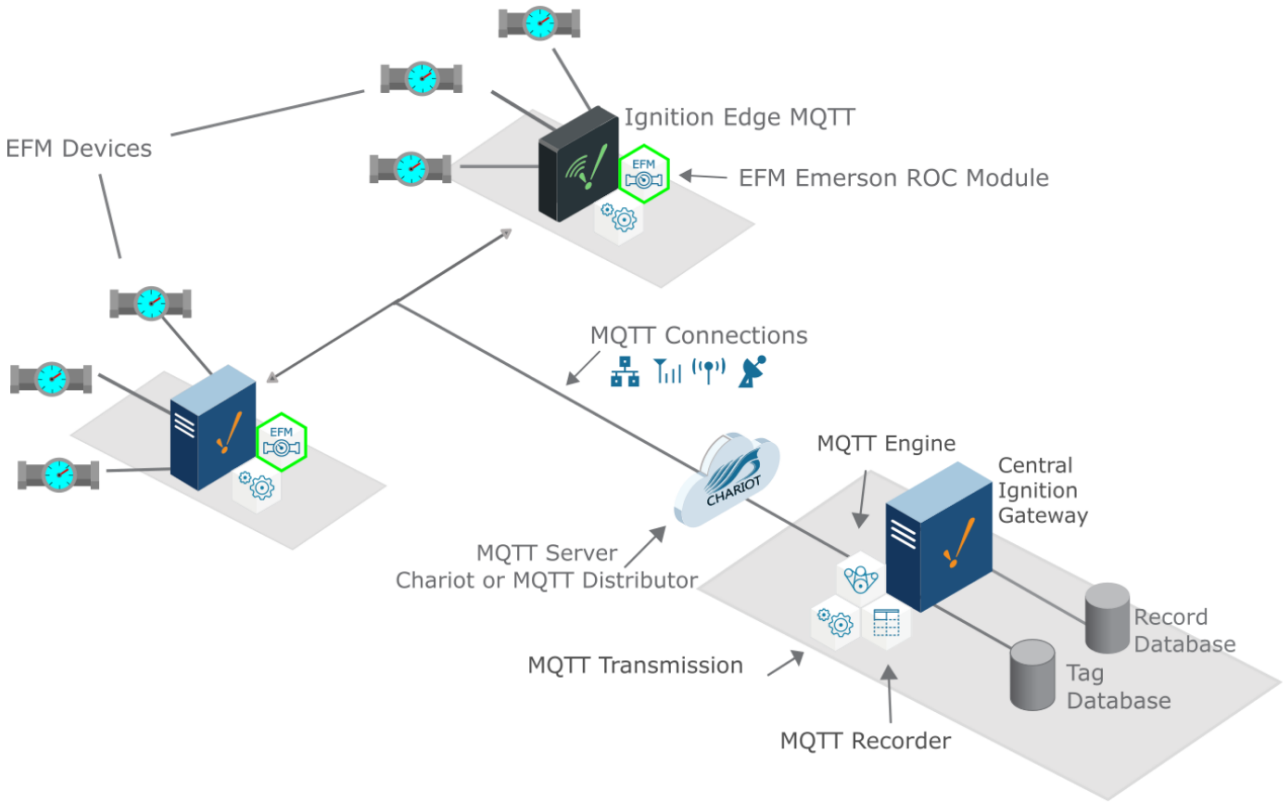
Sending ROC History to a Central Ignition Gateway

Prerequisites

- Installing the Java Runtime Environment
- Installing Ignition
- Installing the following MQTT Modules on two Ignition systems
    - Ignition System 1 (Central Ignition Gateway)
        - MQTT Distributor
        - MQTT Engine
        - MQTT Recorder
    - Ignition System 2 (Remote/Edge Ignition Gateway)
        - MQTT Transmission
        - EFM Emerson ROC driver module

Overview

The EFM Emerson ROC module is capable of polling history data from a ROC device based on a specified polling rate. With MQTT Transmission, this history data can be published as Sparkplug records to an MQTT server. Any client subscribed on Sparkplug RECORD messages can receive these objects. In addition, MQTT Engine when combined with MQTT Recorder can also receive these messages and store these objects in a configured Ignition database. The following drawing shows the general architecture used to do this. This tutorial outlines the process of getting history to the central Ignition gateway.



Sending ROC History to a Central Ignition Gateway

We must configure a total of five Cirrus Link modules on two different Ignition gateways to get history data flowing from an Emerson ROC device to a central database. These are:

- Central Ignition Gateway
    - MQTT Distributor
    - MQTT Engine
    - MQTT Recorder
- Remote/Edge Ignition Gateway
    - MQTT Transmission
    - EFM Emerson ROC

The configuration of each of these modules is covered below based on the Ignition gateway they're installed on.

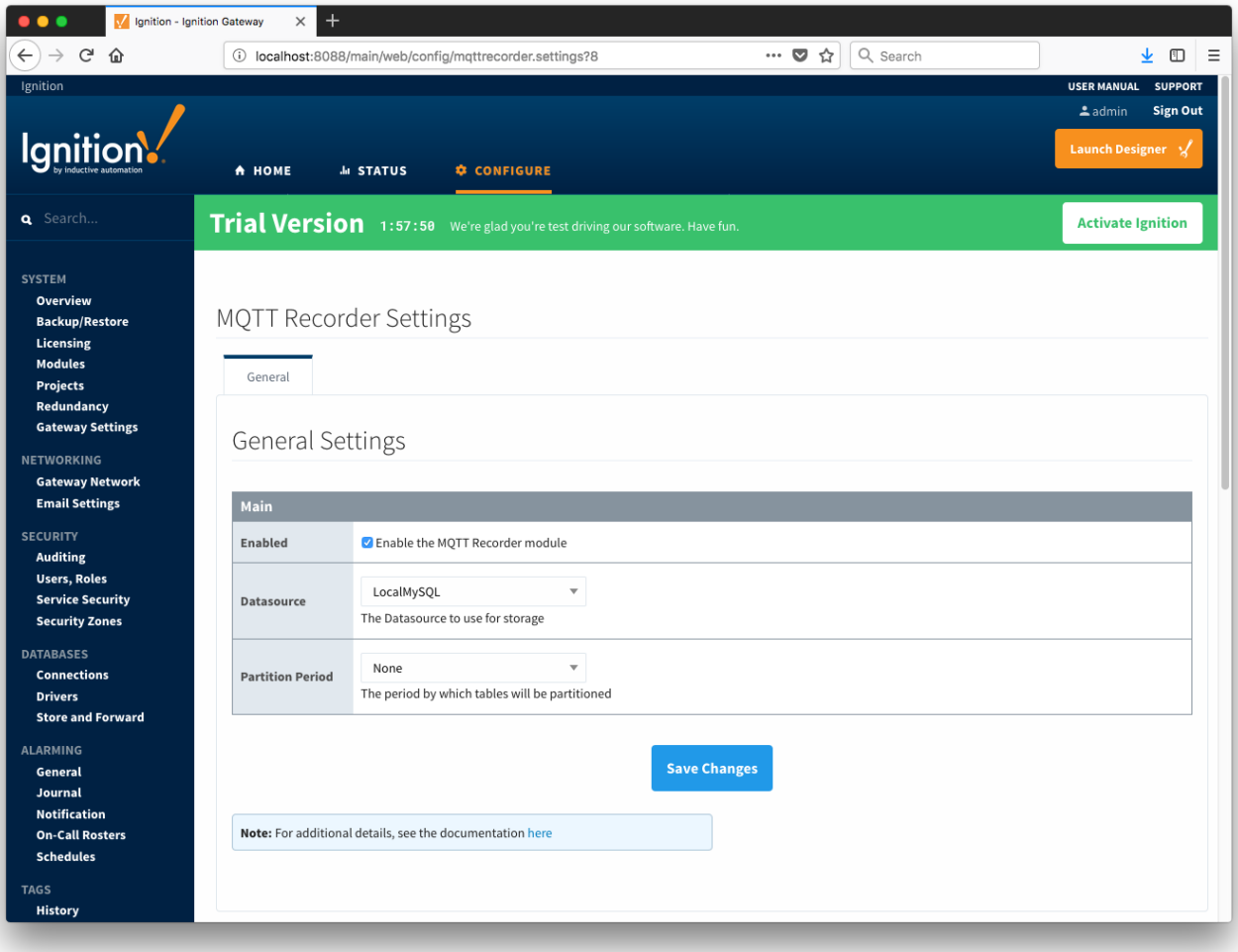
Central Ignition Gateway Setup

MQTT Distributor can be left in its default configuration.

MQTT Engine can also be left in its default configuration.

MQTT Recorder requires that a database be set up in Ignition. That can be done as described in the 'Connect to a Database' section here. Note Ignition supports additional database types. For more detailed information about supported types, take a look at the information provided here. Once a database is set up, MQTT Recorder can be configured. Do so by opening the Ignition Gateway Web UI and browsing to the Configure tab at the top of the screen and then selecting 'MQTT Recorder Settings' as shown in the lower left below.

Once there, select a Datasource as shown in the image below. This drop-down will be populated with any database connections set up in Ignition. Optionally, a Partition Period can be selected to segregated tables by time periods.

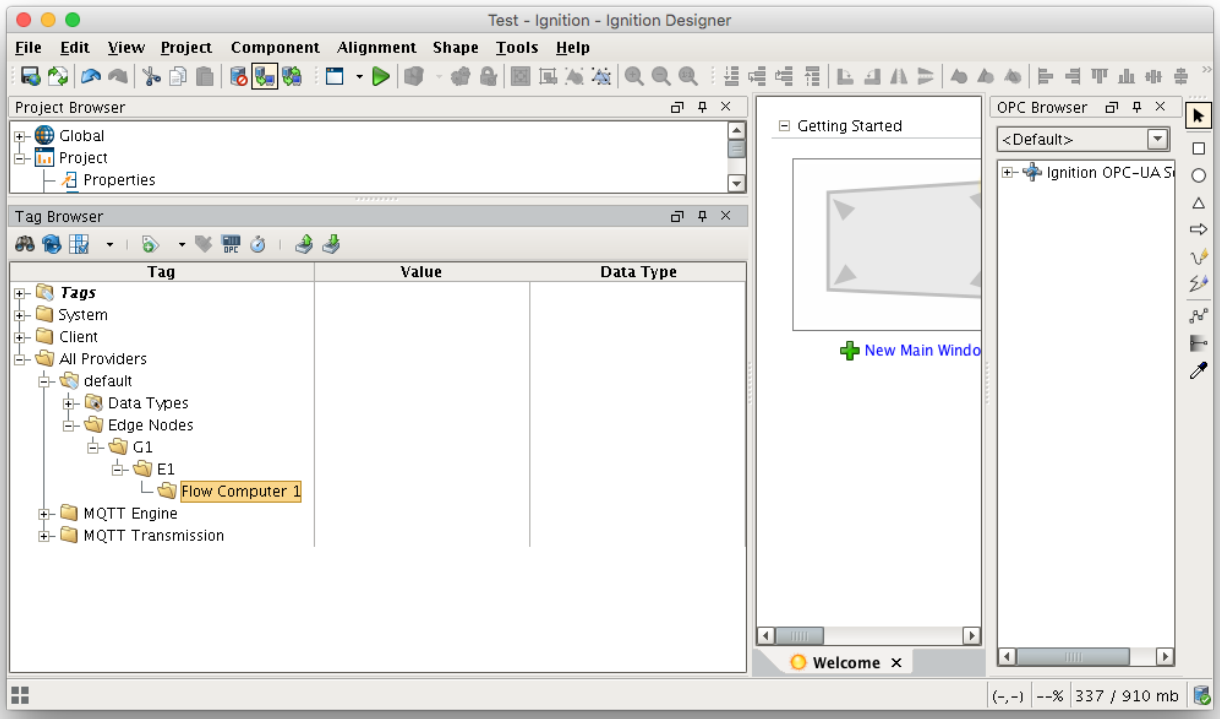


At this point, the Central Ignition Gateway with MQTT Distributor, MQTT Engine, and MQTT Recorder is fully configured and ready to receive MQTT Sparkplug messages from the Remote/Edge Ignition Gateway. MQTT Distributor listens on TCP port 1883 by default for inbound MQTT connections. Make sure the Operating System's Firewall, Antivirus, and Malware protection services allow inbound connections on port 1883/TCP before proceeding.

Remote/Edge Ignition Gateway Setup

With the Central Ignition Gateway ready to receive MQTT/Sparkplug RECORD objects, the EFM Emerson ROC and MQTT Transmission modules can be configured on the Remote/Edge Ignition Gateway.

Start by configuring the MQTT Transmission module. Do so by opening Ignition Designer and creating a tag structure similar to what is shown below.



Note this structure is based on usage of the 'Default Transmitter' in MQTT Transmission. So, the directory structure is very important. Note the structure.

- tag provider/Edge Nodes/[Group ID]/[Edge Node ID]/[Device ID]/...

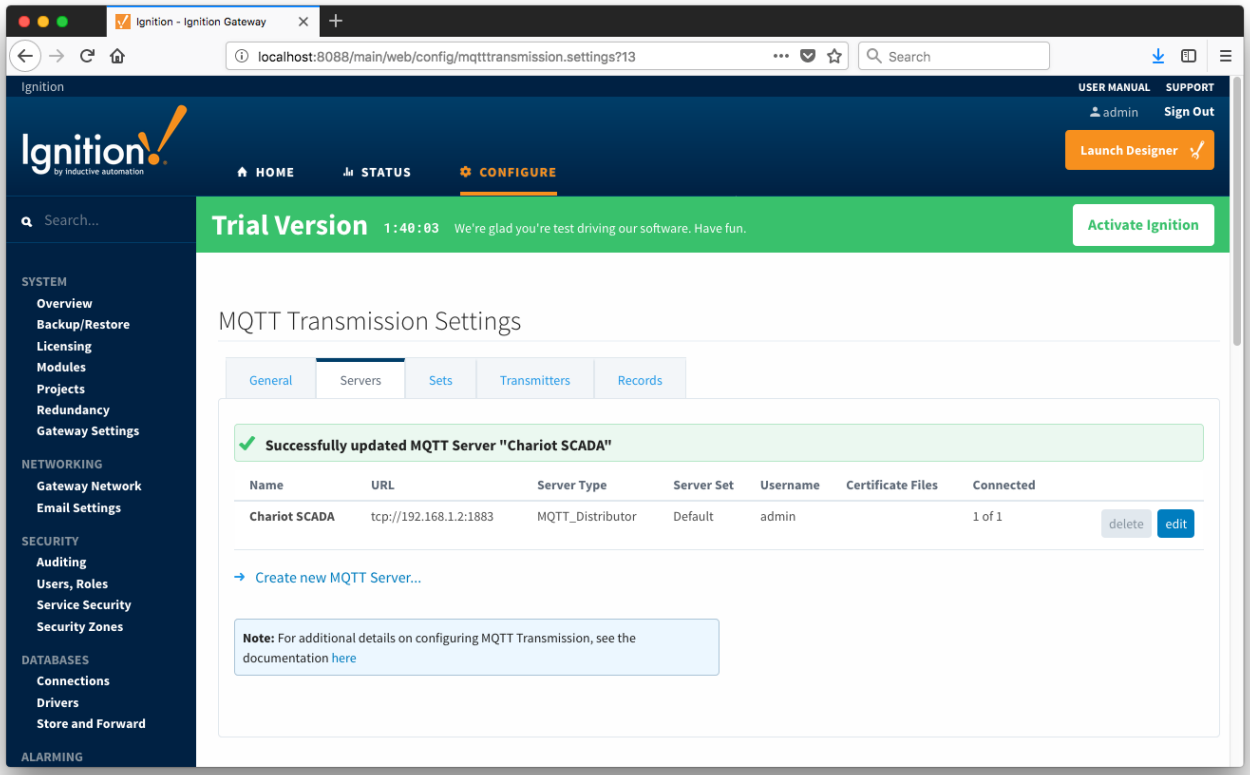
In the example below this implies the following definitions:

- [Group ID] = G1
- [Edge Node ID] = E1
- [Device ID] = Flow Computer 1

These exact values will be used for the EFM Emerson ROC connection Sparkplug parameters to tell the EFM Emerson ROC which MQTT Transmission Transmitter configuration to use and, in turn, which MQTT connection to use to send the history data on.

Next the MQTT Transmission server configuration must be modified to point to the Central Ignition Gateway we set up earlier. To do so, in the Ignition Gateway Web UI browse to the Configure tab on the top and then to MQTT Transmission Settings in the lower left as shown below.

In the MQTT Transmission Settings configuration, click the Servers tab. Then click 'edit' on the Chariot SCADA MQTT Server definition. Modify the URL to match the URL of the Central Ignition Gateway. In this example, MQTT Distributor is installed on a Central Ignition Gateway at the IP address of 192.168.1.2. Once the URL is modified to match the configuration, there should be a '1 of 1' in the Connected column as shown below.



The next step is configuring the EFM Emerson ROC module. This is done as described in the Emerson ROC Configuration manual. In going through the basic setup and configuration for History configuration the following steps must be performed:

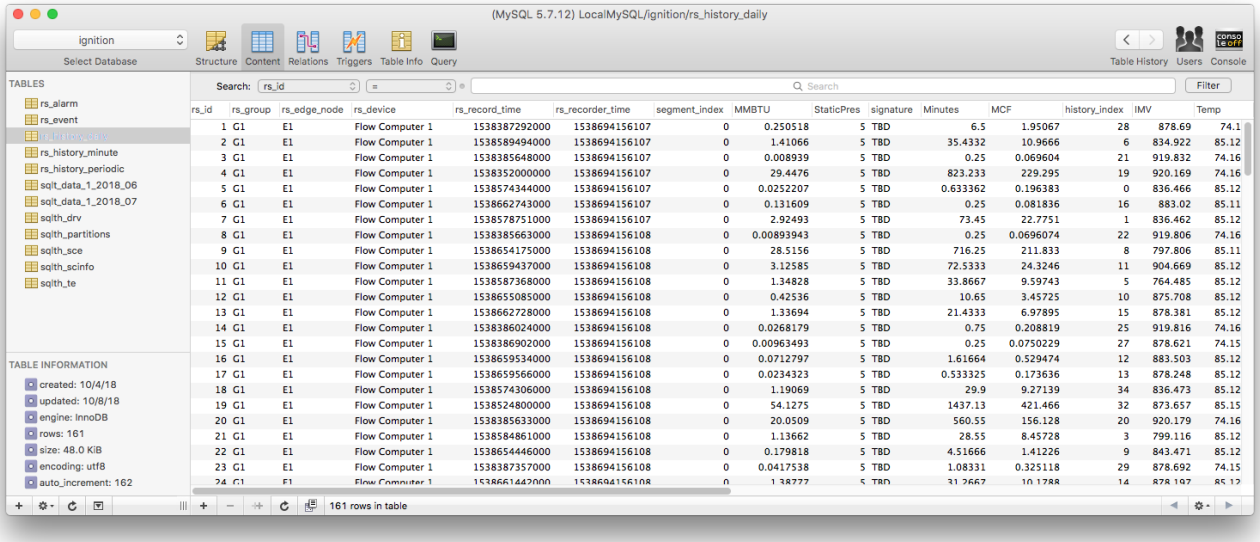
1. Define the global TLP definitions available for all ROC devices in this Ignition instance
2. Upload the Configuration Mappings for all ROC devices in this Ignition instance
3. Upload the Periodic Mappings for all ROC devices in this Ignition instance
4. Create the base device connection to the ROC
    a. The 'Minute History Scan Rate' in this connection configuration must be greater than zero to tell the driver to poll for minute history data at the specified rate
    b. The 'Periodic History Scan Rate' in this connection configuration must be greater than zero to tell the driver to poll for periodic history data at the specified rate
    c. The 'Daily History Scan Rate' in this connection configuration must be greater than zero to tell the driver to poll for daily history data at the specified rate
    d. Set the Sparkplug Group ID, Edge Node ID, and Device ID that represent this device. These will be used again later in the MQTT Transmission configuration.
5. Specify the subset of global TLP definitions that this specific ROC uses

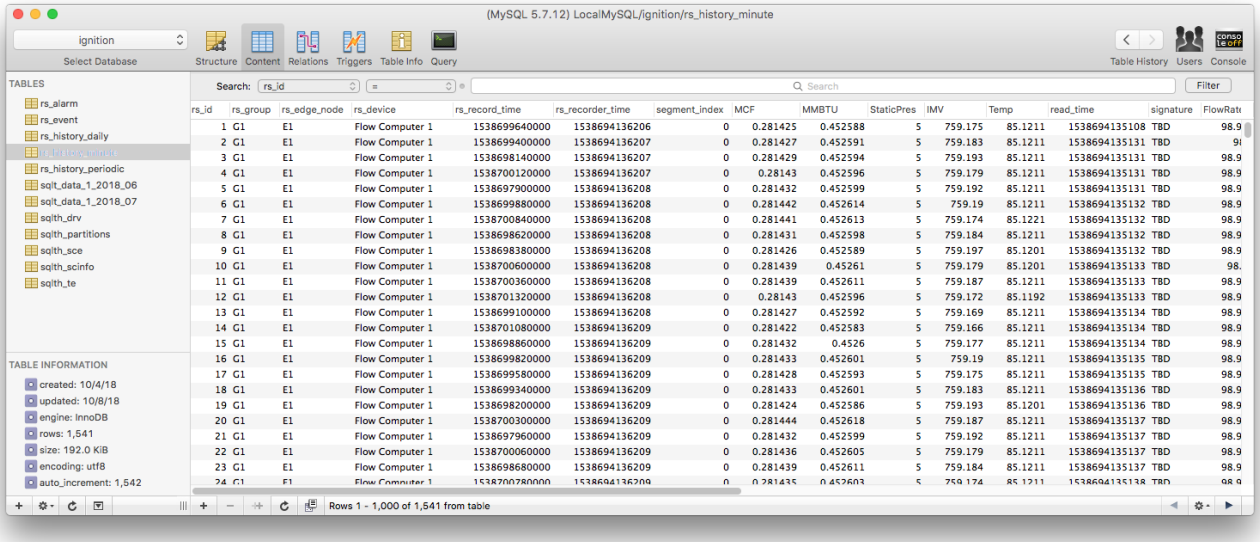
These steps can be skipped if not configuring the driver to poll for TLP data:

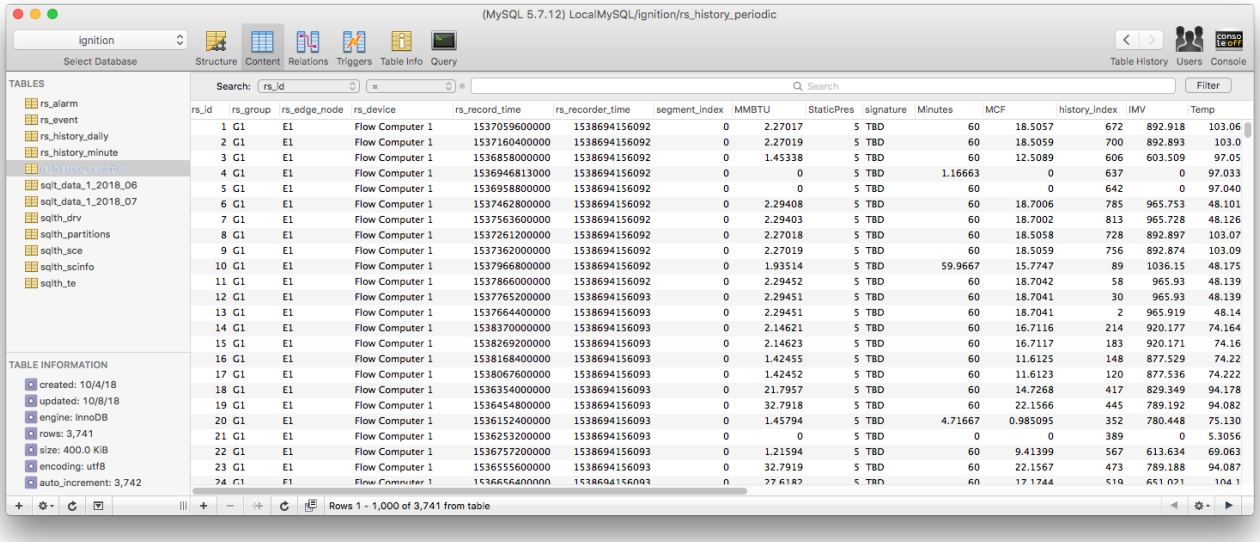
1. Create TLP Template(s) which define groups of TLPs should be polled as a logical group
2. Create TLP Poll Group(s) which specify the logical parameters associated with a given TLP Template
3. Use Ignition designer to pull tags into a tag provider

At this point the EFM Emerson ROC driver is configured and is polling for history data at the rate specified in the EFM Emerson ROC device configuration.

MQTT Transmission is connected to the MQTT Server and as a result MQTT Engine is receiving tag change events. In addition, because an EFM Emerson ROC device has been created and configured with the same Sparkplug Group ID, Edge Node ID, and Device ID, history data will also be pushed to the MQTT server as Sparkplug RECORD objects. When new history data is polled by the EFM Emerson ROC driver, they will be published to the MQTT server, consumed by MQTT Engine, passed on to MQTT Recorder, and then inserted into the specified database. Below are a few views of some history records using a third party database viewing tool.


(MySQL 5.7.12) LocalMySQL/ignition/rs_history_daily
ignition
Select Database
Structure
Content
Relations
Triggers
Table Info
Query
Table History
Users
Console
TABLES
rs_alarm
rs_event
rs_history_daily
rs_history_minute
rs_history_periodic
sqlt_data_1_2018_06
sqlt_data_1_2018_07
sqlth_drv
sqlth_partitions
sqlth_sce
sqlth_scinfo
sqlth_te
TABLE INFORMATION
created: 10/4/18
updated: 10/8/18
engine: InnoDB
rows: 161
size: 48.0 KiB
encoding: utf8
auto_increment: 162
Search:
rs_id
=
Search
Filter
rs_id rs_group rs_edge_node rs_device rs_record_time rs_recorder_time segment_index MMBTU StaticPres signature Minutes MCF history_index IMV Temp
1 G1 E1 Flow Computer 1 1538387292000 1538694156107 0 0.250518 5 TBD 6.5 1.95067 28 878.69 74.1
2 G1 E1 Flow Computer 1 1538589494000 1538694156107 0 1.41066 5 TBD 35.4332 10.9666 6 834.922 85.12
3 G1 E1 Flow Computer 1 1538385648000 1538694156107 0 0.008939 5 TBD 0.25 0.069604 21 919.832 74.16
4 G1 E1 Flow Computer 1 1538352000000 1538694156107 0 29.4476 5 TBD 823.233 229.295 19 920.169 74.16
5 G1 E1 Flow Computer 1 1538574344000 1538694156107 0 0.0252207 5 TBD 0.633362 0.196383 0 836.466 85.12
6 G1 E1 Flow Computer 1 1538662743000 1538694156107 0 0.131609 5 TBD 0.25 0.081836 16 883.02 85.11
7 G1 E1 Flow Computer 1 1538578751000 1538694156107 0 2.92493 5 TBD 73.45 22.7751 1 836.462 85.12
8 G1 E1 Flow Computer 1 1538385663000 1538694156108 0 0.00893943 5 TBD 0.25 0.0696074 22 919.806 74.16
9 G1 E1 Flow Computer 1 1538654175000 1538694156108 0 28.5156 5 TBD 716.25 211.833 8 797.806 85.11
10 G1 E1 Flow Computer 1 1538659437000 1538694156108 0 3.12585 5 TBD 72.5333 24.3246 11 904.669 85.12
11 G1 E1 Flow Computer 1 1538587368000 1538694156108 0 1.34828 5 TBD 33.8667 9.59743 5 764.485 85.12
12 G1 E1 Flow Computer 1 1538655085000 1538694156108 0 0.42536 5 TBD 10.65 3.45725 10 875.708 85.12
13 G1 E1 Flow Computer 1 1538662728000 1538694156108 0 1.33694 5 TBD 21.4333 6.97895 15 878.381 85.12
14 G1 E1 Flow Computer 1 1538386024000 1538694156108 0 0.0268179 5 TBD 0.75 0.208819 25 919.816 74.16
15 G1 E1 Flow Computer 1 1538386902000 1538694156108 0 0.00963493 5 TBD 0.25 0.0750229 27 878.621 74.15
16 G1 E1 Flow Computer 1 1538659534000 1538694156108 0 0.0712797 5 TBD 1.61664 0.529474 12 883.503 85.12
17 G1 E1 Flow Computer 1 1538659566000 1538694156108 0 0.0234323 5 TBD 0.533325 0.173636 13 878.248 85.12
18 G1 E1 Flow Computer 1 1538574306000 1538694156108 0 1.19069 5 TBD 29.9 9.27139 34 836.473 85.12
19 G1 E1 Flow Computer 1 1538524800000 1538694156108 0 54.1275 5 TBD 1437.13 421.466 32 873.657 85.15
20 G1 E1 Flow Computer 1 1538385633000 1538694156108 0 20.0509 5 TBD 560.55 156.128 20 920.179 74.16
21 G1 E1 Flow Computer 1 1538584861000 1538694156108 0 1.13662 5 TBD 28.55 8.45728 3 799.116 85.12
22 G1 E1 Flow Computer 1 1538654446000 1538694156108 0 0.179818 5 TBD 4.51666 1.41226 9 843.471 85.12
23 G1 E1 Flow Computer 1 1538387357000 1538694156108 0 0.0417538 5 TBD 1.08331 0.325118 29 878.692 74.15
161 rows in table


(MySQL 5.7.12) LocalMySQL/ignition/rs_history_minute
ignition
Select Database
Structure
Content
Relations
Triggers
Table Info
Query
Table History
Users
Console
TABLES
rs_alarm
rs_event
rs_history_daily
rs_history_minute
rs_history_periodic
sqlt_data_1_2018_06
sqlt_data_1_2018_07
sqlth_drv
sqlth_partitions
sqlth_sce
sqlth_scinfo
sqlth_te
TABLE INFORMATION
created: 10/4/18
updated: 10/8/18
engine: InnoDB
rows: 1,541
size: 192.0 KiB
encoding: utf8
auto_increment: 1,542
Search:
rs_id
=
Search
Filter
rs_id rs_group rs_edge_node rs_device rs_record_time rs_recorder_time segment_index MCF MMBTU StaticPres IMV Temp read_time signature FlowRate
1 G1 E1 Flow Computer 1 1538699640000 1538694136206 0 0.281425 0.452588 5 759.175 85.1211 1538694135108 TBD 98.9
2 G1 E1 Flow Computer 1 1538699400000 1538694136207 0 0.281427 0.452591 5 759.183 85.1211 1538694135131 TBD 98
3 G1 E1 Flow Computer 1 1538698140000 1538694136207 0 0.281429 0.452594 5 759.193 85.1211 1538694135131 TBD 98.9
4 G1 E1 Flow Computer 1 1538700120000 1538694136207 0 0.28143 0.452596 5 759.179 85.1211 1538694135131 TBD 98.9
5 G1 E1 Flow Computer 1 1538697900000 1538694136208 0 0.281432 0.452599 5 759.192 85.1211 1538694135131 TBD 98.9
6 G1 E1 Flow Computer 1 1538699880000 1538694136208 0 0.281442 0.452614 5 759.19 85.1211 1538694135132 TBD 98.9
7 G1 E1 Flow Computer 1 1538700840000 1538694136208 0 0.281441 0.452613 5 759.174 85.1221 1538694135132 TBD 98.9
8 G1 E1 Flow Computer 1 1538698620000 1538694136208 0 0.281431 0.452598 5 759.184 85.1211 1538694135132 TBD 98.9
9 G1 E1 Flow Computer 1 1538698380000 1538694136208 0 0.281426 0.452589 5 759.197 85.1201 1538694135132 TBD 98.9
10 G1 E1 Flow Computer 1 1538700600000 1538694136208 0 0.281439 0.45261 5 759.179 85.1201 1538694135133 TBD 98.
11 G1 E1 Flow Computer 1 1538700360000 1538694136208 0 0.281439 0.452611 5 759.187 85.1211 1538694135133 TBD 98.9
12 G1 E1 Flow Computer 1 1538701320000 1538694136208 0 0.28143 0.452596 5 759.172 85.1192 1538694135133 TBD 98.9
13 G1 E1 Flow Computer 1 1538699100000 1538694136208 0 0.281427 0.452592 5 759.169 85.1211 1538694135134 TBD 98.9
14 G1 E1 Flow Computer 1 1538701080000 1538694136209 0 0.281422 0.452583 5 759.166 85.1211 1538694135134 TBD 98.9
15 G1 E1 Flow Computer 1 1538698860000 1538694136209 0 0.281432 0.4526 5 759.177 85.1211 1538694135134 TBD 98.9
16 G1 E1 Flow Computer 1 1538699820000 1538694136209 0 0.281433 0.452601 5 759.19 85.1211 1538694135135 TBD 98.9
17 G1 E1 Flow Computer 1 1538699580000 1538694136209 0 0.281428 0.452593 5 759.175 85.1211 1538694135135 TBD 98.9
18 G1 E1 Flow Computer 1 1538699340000 1538694136209 0 0.281433 0.452601 5 759.183 85.1211 1538694135136 TBD 98.9
19 G1 E1 Flow Computer 1 1538698200000 1538694136209 0 0.281424 0.452586 5 759.193 85.1201 1538694135136 TBD 98.9
20 G1 E1 Flow Computer 1 1538700300000 1538694136209 0 0.281444 0.452618 5 759.187 85.1211 1538694135137 TBD 98.9
21 G1 E1 Flow Computer 1 1538697960000 1538694136209 0 0.281432 0.452599 5 759.192 85.1211 1538694135137 TBD 98.9
22 G1 E1 Flow Computer 1 1538700060000 1538694136209 0 0.281436 0.452605 5 759.179 85.1211 1538694135137 TBD 98.9
23 G1 E1 Flow Computer 1 1538698680000 1538694136209 0 0.281439 0.452611 5 759.184 85.1211 1538694135137 TBD 98.9
Rows 1 - 1,000 of 1,541 from table


(MySQL 5.7.12) LocalMySQL/ignition/rs_history_periodic
ignition
Select Database
Structure
Content
Relations
Triggers
Table Info
Query
Table History
Users
Console
TABLES
rs_alarm
rs_event
rs_history_daily
rs_history_minute
rs_history_periodic
sqlt_data_1_2018_06
sqlt_data_1_2018_07
sqlth_drv
sqlth_partitions
sqlth_sce
sqlth_scinfo
sqlth_te
TABLE INFORMATION
created: 10/4/18
updated: 10/8/18
engine: InnoDB
rows: 3,741
size: 400.0 KiB
encoding: utf8
auto_increment: 3,742
Search:
rs_id
=
Search
Filter
rs_id rs_group rs_edge_node rs_device rs_record_time rs_recorder_time segment_index MMBTU StaticPres signature Minutes MCF history_index IMV Temp
1 G1 E1 Flow Computer 1 1537059600000 1538694156092 0 2.27017 5 TBD 60 18.5057 672 892.918 103.06
2 G1 E1 Flow Computer 1 1537160400000 1538694156092 0 2.27019 5 TBD 60 18.5059 700 892.893 103.0
3 G1 E1 Flow Computer 1 1536858000000 1538694156092 0 1.45338 5 TBD 60 12.5089 606 603.509 97.05
4 G1 E1 Flow Computer 1 1536946813000 1538694156092 0 0 5 TBD 1.16663 0 637 0 97.033
5 G1 E1 Flow Computer 1 1536958800000 1538694156092 0 0 5 TBD 60 0 642 0 97.040
6 G1 E1 Flow Computer 1 1537462800000 1538694156092 0 2.29408 5 TBD 60 18.7006 785 965.753 48.101
7 G1 E1 Flow Computer 1 1537563600000 1538694156092 0 2.29403 5 TBD 60 18.7002 813 965.728 48.126
8 G1 E1 Flow Computer 1 1537261200000 1538694156092 0 2.27018 5 TBD 60 18.5058 728 892.897 103.07
9 G1 E1 Flow Computer 1 1537362000000 1538694156092 0 2.27019 5 TBD 60 18.5059 756 892.874 103.09
10 G1 E1 Flow Computer 1 1537966800000 1538694156092 0 1.93514 5 TBD 59.9667 15.7747 89 1036.15 48.175
11 G1 E1 Flow Computer 1 1537866000000 1538694156092 0 2.29452 5 TBD 60 18.7042 58 965.93 48.139
12 G1 E1 Flow Computer 1 1537765200000 1538694156093 0 2.29451 5 TBD 60 18.7041 30 965.93 48.139
13 G1 E1 Flow Computer 1 1537664400000 1538694156093 0 2.29451 5 TBD 60 18.7041 2 965.919 48.14
14 G1 E1 Flow Computer 1 1538370000000 1538694156093 0 2.14621 5 TBD 60 16.7116 214 920.177 74.164
15 G1 E1 Flow Computer 1 1538269200000 1538694156093 0 2.14623 5 TBD 60 16.7117 183 920.171 74.16
16 G1 E1 Flow Computer 1 1538168400000 1538694156093 0 1.42455 5 TBD 60 11.6125 148 877.529 74.22
17 G1 E1 Flow Computer 1 1538067600000 1538694156093 0 1.42452 5 TBD 60 11.6123 120 877.536 74.222
18 G1 E1 Flow Computer 1 1536354000000 1538694156093 0 21.7957 5 TBD 60 14.7268 417 829.349 94.178
19 G1 E1 Flow Computer 1 1536454800000 1538694156093 0 32.7918 5 TBD 60 22.1566 445 789.192 94.082
20 G1 E1 Flow Computer 1 1536152400000 1538694156093 0 1.45794 5 TBD 4.71667 0.985095 352 780.448 75.130
21 G1 E1 Flow Computer 1 1536253200000 1538694156093 0 0 5 TBD 0 0 389 0 5.3056
22 G1 E1 Flow Computer 1 1536757200000 1538694156093 0 1.21594 5 TBD 60 9.41399 567 613.634 69.063
23 G1 E1 Flow Computer 1 1536555600000 1538694156093 0 32.7919 5 TBD 60 22.1567 473 789.188 94.087
Rows 1 - 1,000 of 3,741 from table

Additional Resources

- Inductive Automation's Ignition download with free trial
  - https://inductiveautomation.com/downloads/
- Azure Injector download with free trial
  - https://inductiveautomation.com/downloads/third-party-modules
- Questions about this tutorial?
  - Check out the Cirrus Link Forum: https://forum.cirrus-link.com/
  - Contact support: support@cirrus-link.com
- Sales questions
  - Email: sales@cirrus-link.com
  - Phone: +1 (844) 924-7787
- About Cirrus Link
  - https://www.cirrus-link.com/about-us/