MQTT History

To enable history configuration is required at MQTT Engine, at each MQTT tag, and at the MQTT Transmission module. In addition, a History Store must also be defined for MQTT Transmission.

> Store and Forward does not guarantee all data is stored and forwarded. There are some edge cases that are not currently handled with regard to data loss in the event of connection failures related to MQTT keep alive timeouts. This window of potential missed data can be reduced by decreasing MQTT Transmission and MQTT Engine configurable keep alive timeouts.

MQTT Transmission History Store

1. Define and enable an MQTT Transmission History Store
2. Config your transmitter to consume the enabled History Store
3. Store and forward controls whether or not a tag is stored in the configured History Store when Transmission is offline. By default the global setting of "Enable History Storage by Default" is selected for all tags. To override , individual tags will require a custom tag property 'StoreAndForward' (type: boolean) to be created and set to the reverse state of the global setting.

MQTT Engine Tags

1. History ***must*** be enabled on the MQTT Engine Tag and the history settings for that tag must be as follows:
    - History Enabled: true
    - Storage Provider: Must be set to an existing Storage Provider
    - Sample Mode: On Change
    - Min Time Between Samples: 0 ms
        - This is required in cases where historical metrics flushed from the Edge have very high resolution; e.g., the historical metrics have timestamps 1 ms apart for a single tag.

See the Ignition documentation Configuring Tag History for additional help.

Historical Event Processing

There are two ways that MQTT Engine historical event processing can insert historical data into Ignition's Tag Historian Module:

1. Engine is configured to write historical events directly to the database, via the Historian, bypassing the Tag.
2. Engine is configured to write historical events to the Tag instead of directly to the Historian.

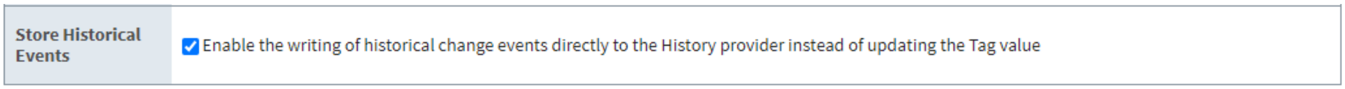
Writing historical events directly to the database, via the Historian, bypassing the tag

The configuration parameters required to write historical events directly to the database, via the Historian, bypassing the Tag are detailed below.

> These are the default settings for both MQTT Engine and MQTT Transmission. Enabling the In-Order History for MQTT Transmission is unnecessary and will result in a waste of resources.

MQTT Engine

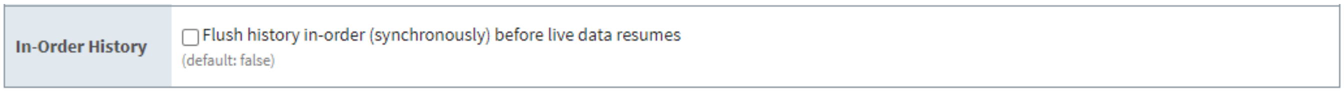
Under the MQTT Engine Settings General Tab, navigate to the Miscellaneous Settings and ensure Store Historical events is selected



Store Historical Events	☑ Enable the writing of historical change events directly to the History provider instead of updating the Tag value

MQTT Transmission

Under the MQTT Transmission Settings for your transmitter, navigate to the History Settings and ensure that In-Order History is de-selected.



In-Order History	☐ Flush history in-order (synchronously) before live data resumes (default: false)

Writing historical events directly to tag

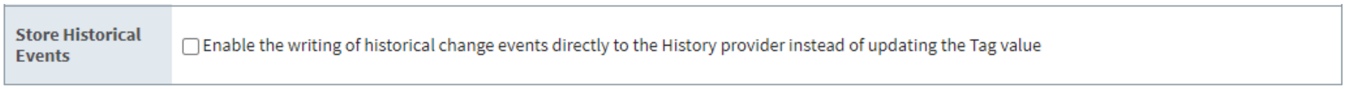
There are several reasons why you might need to write directly to the tag which include:

- To have Tag Events scripts fire when applicable
- If indirectly referencing MQTT Engine tags
- To have alarms triggered when applicable

The configuration parameters required to write historical events to the Tag instead of directly to the Historian are detailed below.

MQTT Engine

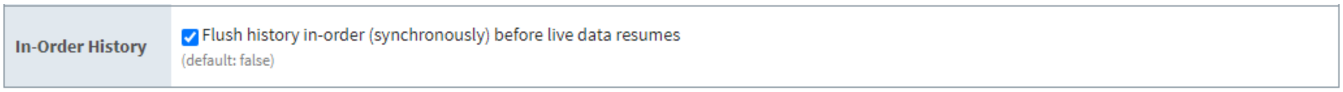
Under the MQTT Engine Settings General Tab, navigate to the Miscellaneous Settings and ensure Store Historical events is de-selected



Store Historical Events ☐ Enable the writing of historical change events directly to the History provider instead of updating the Tag value

MQTT Transmission

Under the MQTT Transmission Settings for your transmitter, navigate to the History Settings and ensure that In-Order History is selected. This ensures that when the Edge side client comes back online and flushes history, it will flush the oldest historical events first (in order) before sending live Tag changes events to Engine.



In-Order History ☑ Flush history in-order (synchronously) before live data resumes
(default: false)

If you do not select In-Order History, data will be lost/ignored at MQTT engine because Ignition will ignore writes to the Tag if the timestamp on the Tag change is older that the current value.

Whilst the history flush is in progress, all new change events are written to the history store until it has been completely flushed. If the tag change rate at the Edge is faster than the MQTT Transmission Flush Period this can cause a build up of data in history store(s) and prevent the publishing of live data.

History Configuration Persistence

Deleting an MQTT Engine tag will result in a loss of history configuration.

However, deleting MQTT Engine tags can be required in certain cases. One example is if UDTs are being propagated from the Edge and the UDT definition on the Edge has been updated. This requires one to delete all instances of the UDT under MQTT Engine **and** delete the corresponding UDT definition so that it can be recreated/updated at MQTT Engine for the Edge side changes to take affect.

There are two options for persisting history configuration in this case and they are as follows:

1. Use **Reference** tags to indirectly reference MQTT Engine tags such that history configuration can be persisted on the Reference tag when the underlying MQTT Engine tags are deleted. This is the recommended way of configuring history on MQTT Engine tags (indirectly) so history configuration persists.
2. Use Ignition scripting to reapply history configuration directly on MQTT Engine tags on demand. This is a bit more cumbersome as there must be some mechanism to "trigger" the script execution.

History and Indirect References to MQTT Engine Tags

Configuring history on tags indirectly referencing MQTT Engine tags will work properly if the referencing tag is a **Reference** tag only. Derived, Expression and OPC tags (expose MQTT Engine tag provider through OPCUA server) will not properly store history when MQTT Engine tags are updated with historical data at a high rate of speed. This is a limitation within the Ignition platform and may be addressed in a future release.

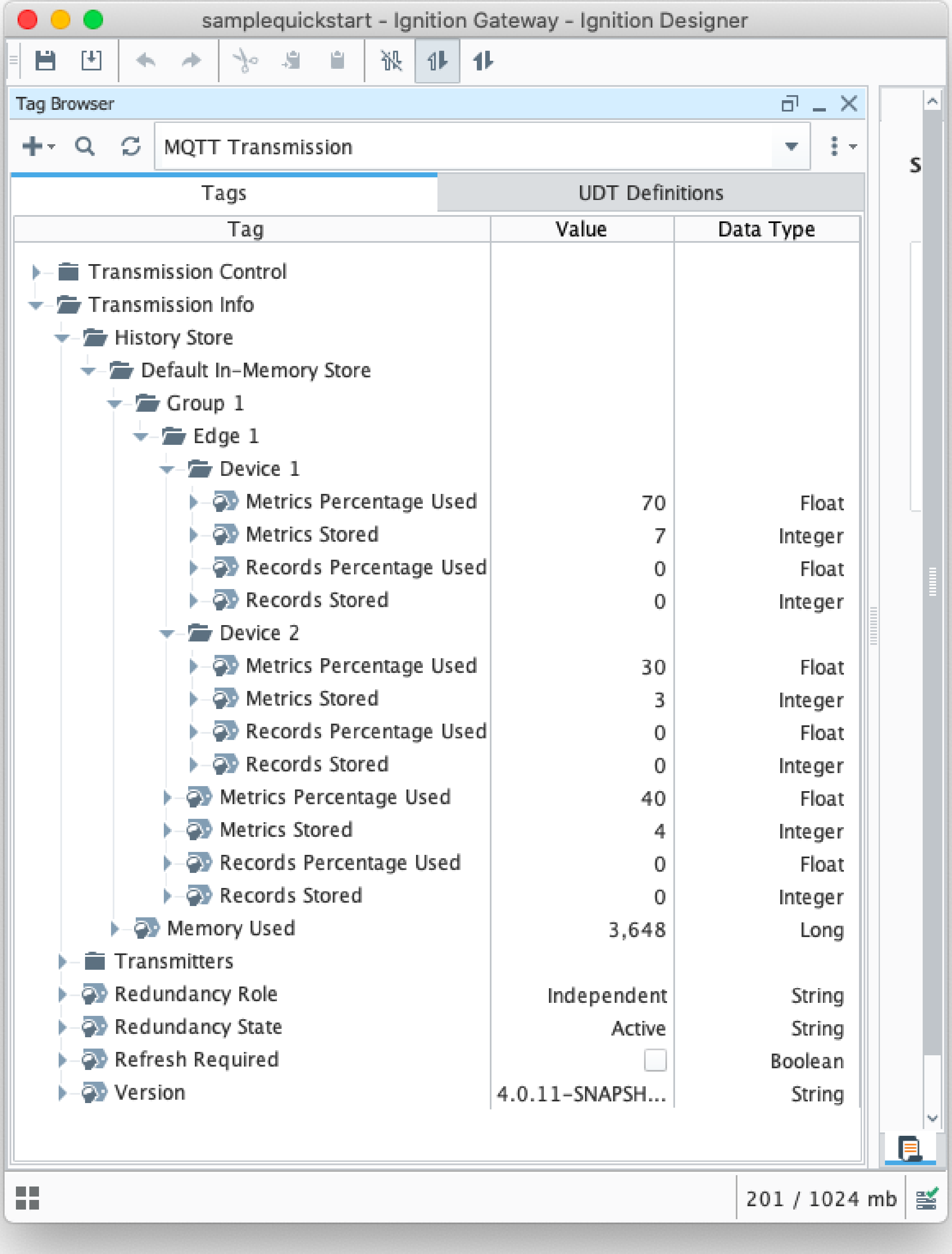
⚠ **If using an Ignition release before v8.1.4 with MQTT Engine** - In order for historical tag changes at the MQTT Engine tag to propagate to the referencing tag, MQTT Engine must be configured to write historical data directly to its tags and MQTT Transmission must be configured to flush history in-order. See this section above for more details on these configuration requirements.

⚠ **If using an Ignition v8.1.4 or later with MQTT Engine** - Historical back-fill support was added in Ignition which allows Reference Tags in Ignition to be updated even if history arrives out of order. See the following document for details: MQTT History Back-Fill with Reference Tags

History Stores Metrics & Flushing History

One can determine the current size of the History Store by examining the History Store metric tags under [MQTT Transmission]Transmission Info/History Store. These tags will show the number of historical metrics stored per edgenode/device and how much memory/disk is being consumed by these metrics. These tags update live (count down) as historical data is flushed.

Review Determining the settings for an MQTT Transmission History Store for help in determining the correct configuration for your History Store



Tag	Value	Data Type
Transmission Control		
Transmission Info		
History Store		
Default In-Memory Store		
Group 1		
Edge 1		
Device 1		
Metrics Percentage Used	70	Float
Metrics Stored	7	Integer
Records Percentage Used	0	Float
Records Stored	0	Integer
Device 2		
Metrics Percentage Used	30	Float
Metrics Stored	3	Integer
Records Percentage Used	0	Float
Records Stored	0	Integer
Metrics Percentage Used	40	Float
Metrics Stored	4	Integer
Records Percentage Used	0	Float
Records Stored	0	Integer
Memory Used	3,648	Long
Transmitters		
Redundancy Role	Independent	String
Redundancy State	Active	String
Refresh Required	☐	Boolean
Version	4.0.11-SNAPSH...	String

Additional Resources

- Inductive Automation's Ignition download with free trial
    - Current Ignition Release

- Cirrus Link Solutions Modules for Ignition
    - Ignition Strategic Partner Modules
- Support questions
    - 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/