User Manual FFT DataBridge

v. 2.0.0-release

as of 17.12.2025

Table of Contents

Disclaimer of liability

This document serves as a user guide for the use of the **FFT DataBridge**. It does not replace Siemens' official product and IIH documentation.

Scope / Versions: The content reflects the features available at the time of writing for the FFT DataBridge and the IIH Essentials OpenAPI (≥ 2.2.0). Interfaces, menus, and screenshots may vary depending on IEM, firmware, and app versions. Subject to change without notice

Responsibility: Installation, configuration, operation, and network security (in particular access rights, port exposure, certificates) are the responsibility of the operator. Ensure compliance with all regulatory, data protection, and IT security requirements (e.g., GDPR) and maintain appropriate backups.

Third-Party Dependencies: Examples include "Industrial Information Hub (IIH)" and "Snowflake," which are trademarks and/or products of their respective owners. References to external products are solely for integration purposes and do not constitute an endorsement**.**

FFT Produktionssysteme GmbH & Co. KG
Schleyerstr. 1
D-36041 Fulda
Tel.: +49 661 2926-0
Homepage: www.fft.de

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1. Preface

1.1. Introduction

FFT DataBridge solution empowers manufacturing companies to securely, scalably, and efficiently move production data into the cloud. Targeted at production managers, data engineers, and IT leaders. This solution addresses common challenges like data silos, limited transparency, and inefficient analytics. With a standardized interface architecture, it connects shopfloor systems directly to the Snowflake AI Data Cloud. Customers benefit from real-time analytics, AI-based forecasting, and reduced downtime. The solution delivers measurable value through faster decision-making, higher data quality, and optimized IT costs — a key enabler for data-driven Smart Manufacturing.

1.2. Target Audience

This guide is intended for technical professionals with prior experience in Industrial Information Hub (IIH) and Snowflake Data Cloud environments. The intended audience includes:

- Data engineers
- Automation engineers
- Edge andCloud integration specialists
- IT personnel responsible for industrial data pipelines and cloud analytics.

Familiarity with the following is expected:

- IIH components (e.g. Databus, Semantics, Common Configurator),
- Edge device deployment and configuration using Industrial Edge Management (IEM),
- Basic Snowflake concepts such as warehouses, roles, stages, pipes, and authentication using private/public key pairs.

This guide does **not** provide introductory explanations for Snowflake or IIH. It assumes a working knowledge of these systems, focusing instead on the configuration and deployment of the **FFT DataBridge** in a production-grade environment.

2. Overview

The FFT Databridge works in combination with the FFT-developed DataService. The Data Service is available in the Marketplace. The infrastructure works as follows. The DataService communicates with the IIH Essentials Open API and returns the requested data in the configured format back to the FFT Data Bridge. The DataBridge sends the data to Snowflake and transfers the data into the preconfigured Snowflake Tables. The IIH Essentials Open API must be at least **version 2.2.0** or higher**.**
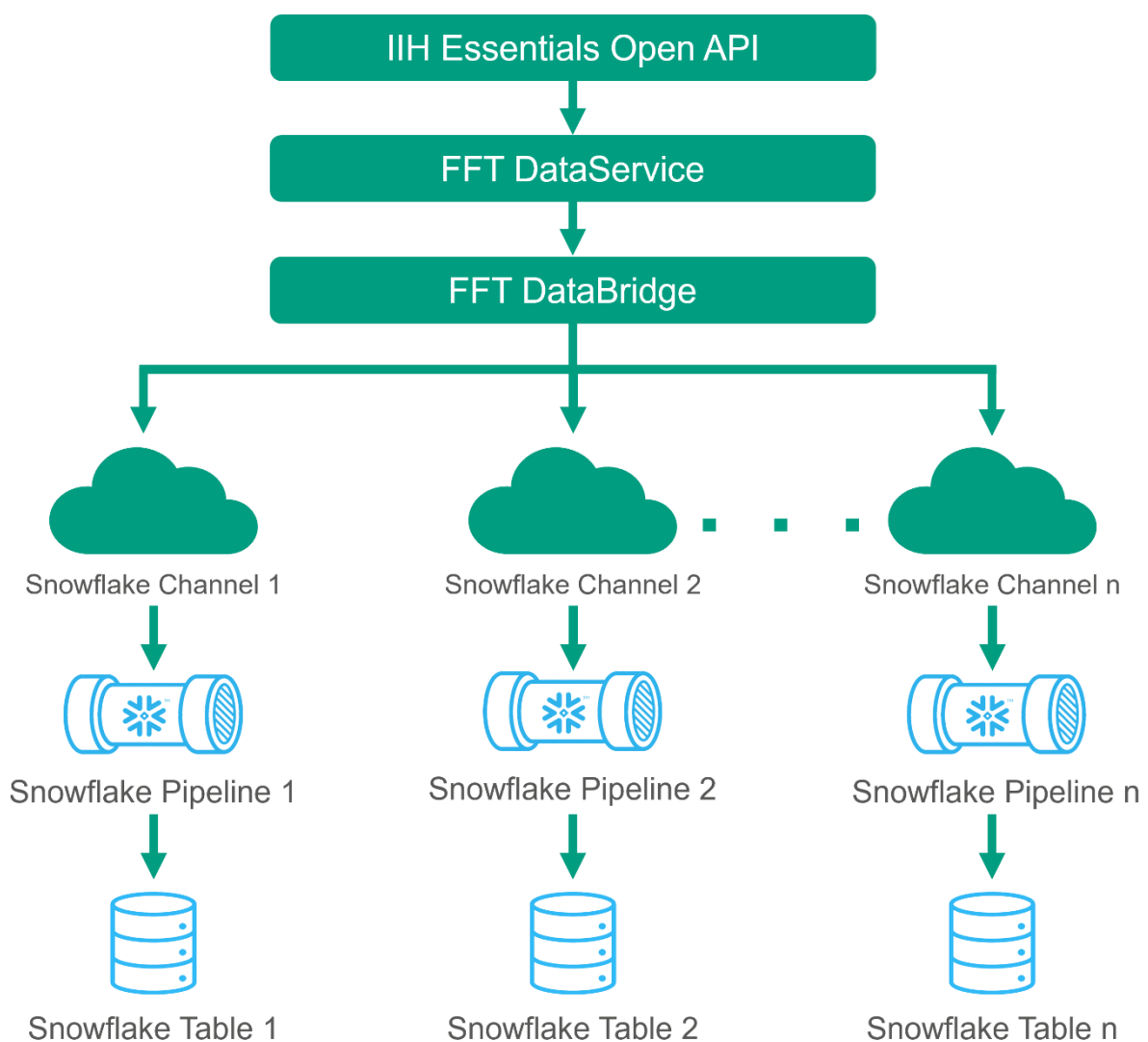
3. Installing the App

3.1. Software Requirements

- IIH Essentials
- FFT DataService

3.2. Hardware Requirements

- Running Industrial Edge Management (IEM) instance is required. Tested with IEM ISO 1.11.7 and later; other versions may be compatible.
- An Edge Device that is compatible with Industrial Edge Management
    - IED Model e.g. Simatic IPC427 E, IPC227G,
    - Hard disk at least 2 GB
    - RAM: 500 MB RAM available

3.3. Install the App itself

[How to install an Industrial Edge App? - ID: 109824882 - Industry Support Siemens](#)

4. Configuring Snowflake

The configuration is split into two parts, the first part is the Snowflake configuration, in this part we prepare the Snowflake, Pipeline, Table and the required privileges. The second part is the configuration for the app itself on the edge device.

It is recommended to create an individual user only for the FFT DataBridge with a role that follows the least privilege principle. The user only needs these rights and configurations:

- Key Value Pair Authentication configured see Snowflake tutorial here for encrypted private key without MFA:

  ([Key-pair authentication and key-pair rotation | Snowflake Documentation](#))

- USAGE ON DATABASE "*DATABASE_NAME*"

- USAGE ON SCHEMA "*SCHEMA_NAME*"

- INSERT, SELECT on "*TABLE_NAME*"

- OPERATE, MONITOR ON "*PIPE_NAME*"

Note: the Names are only examples

The template below outlines how the required Snowflake objects must be created.
Parameters enclosed in angle brackets (e.g. <TABLENAME>) are placeholders and
should be replaced with actual values.

Example template for the configuration:

```
USE DATABASE <DATABASE_NAME>;
USE SCHEMA <SCHEMA_NAME>;


--Here you can change the TABLE_NAME, the column definitions must not be -----
--changed
CREATE TABLE IF NOT EXISTS <TABLE_NAME>(
    ANCESTORNAME VARCHAR(16777216),
    VARIABLENAME VARCHAR(16777216),
    TIMESTAMP TIMESTAMP_NTZ(9),
    VALUE VARIANT
);



CREATE PIPE IF NOT EXISTS  <PIPE_NAME>
AS
COPY INTO <TABLE_NAME>
FROM TABLE(DATA_SOURCE(TYPE => 'STREAMING'))
MATCH_BY_COLUMN_NAME = CASE_INSENSITIVE;


-- Required privileges: make sure your user has the following grants before --
--installing the FFT Data Bridge.
GRANT USAGE ON DATABASE <DATABASE_NAME> to ROLE <DATABRIDGE_ROLE_NAME>;
GRANT USAGE ON SCHEMA <DATABASE_NAME>.<SCHEMA_NAME> to ROLE
<DATABRIDGE_ROLE_NAME>;
GRANT INSERT, SELECT on Table <DATABASE_NAME>.<SCHEMA_NAME>.<TABLE_NAME> TO
ROLE <DATABRIDGE_ROLE_NAME>;
GRANT OPERATE, MONITOR ON PIPE <DATABASE_NAME>.<SCHEMA_NAME>.<PIPE_NAME> to
ROLE <DATABRIDGE_ROLE_NAME>;
```
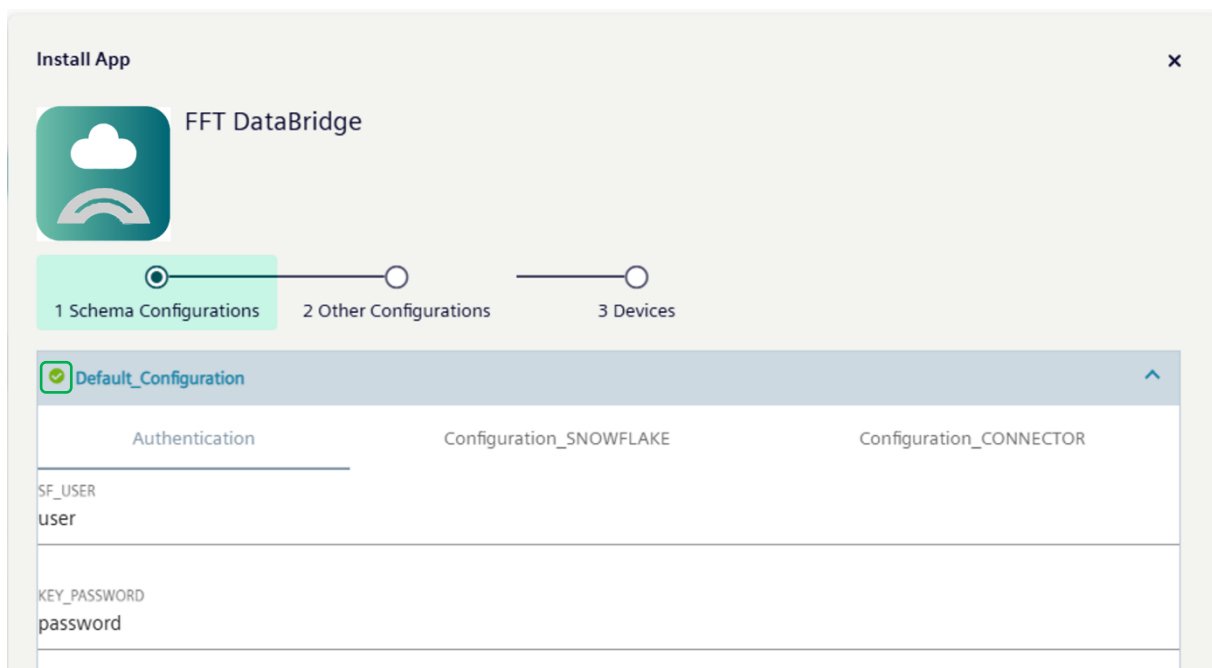
5. Configuring DataBridge

There are two different configuration modes. The first mode is intended for standard users who simply want to transfer all data available in the IIH API to the Snowflake Cloud with minimal setup.

The second mode is designed for expert users who require fine-grained control over which data is written to which table. This mode offers advanced filtering options but comes with increased configuration complexity.

5.1. Standard-Setup

The following explanations are for the standard user. It is very important to click the green checkmark to activate the Default_Configuration.


Authentication		
Attribut	**Default**	**Description**
SF_USER	""	Username for Data Bridge User
KEY_PASSWORD	""	Password for encrypted Private key

Configuration_SNOWFLAKE		
Attribute	**Default**	**Description**
ACCOUNT	<account-identifier>	Account to which connector should connect
Snowflake_Server_URL	<account-identifier> .snoflakecomputing.com>	Complete Account/Server URL from Snowflake
PIPE	<PIPENAME>	Created pipe for connector
SCHEMA	<SCHEMANAME>	Database schema
DATABASE	<DATABASENAME>	Database where data should be stored

Configuration_CONNECTOR		
Attribute	**Default**	**Description**
QUERY_INTERVAL	20	The interval in which data is fetched from FFT Data Service. Minimum is 1 second.
START_TIMESTAMP_OVERRIDE	""	Starttime where the DataBridge starts the loading of the history data. When none is given all data is fetched. The format is the following: YYYY-MM-DDTHH:MM:SS.000000Z

The second step involves uploading the private key file that is configured for the Snowflake user. It is important to convert the file to *.txt format before uploading, as the file upload feature does not allow *.p8 or *.pem files.
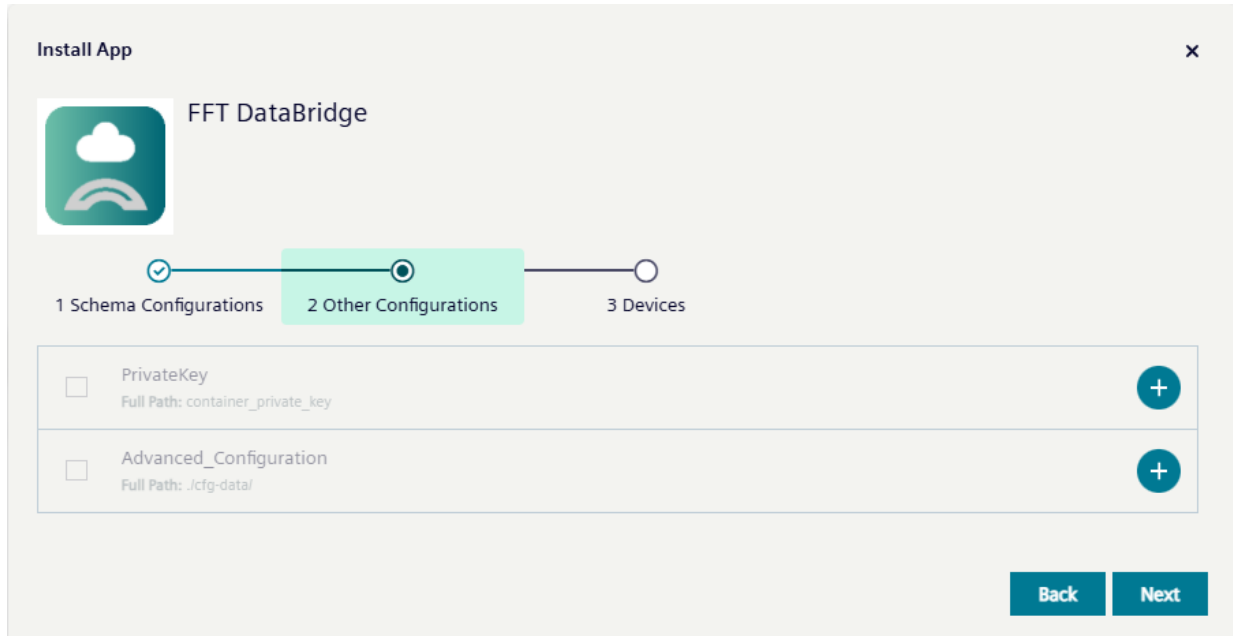
It is essential that the FFT DataService is installed before deploying the FFT DataBridge. Once the DataService is running and the device_list file can be downloaded, the FFT DataBridge may be installed. After installation, all variables available in the DataService as listed in the device list will be transferred to the target table.

If you want to switch the configuration mode, you must uninstall the application and reinstall it following the guidelines for the advanced setup. Vice versa.
Note as soon as the checkmark is set and the app is updated or uploaded to the device, the IEM automatically generates a configuration, which overrides an existing *.toml configuration.

5.2. Advanced-Setup

This section describes the advanced rule-based routing mechanism used to map incoming datapoints to specific Snowflake tables. It is intended for expert users who require fine-grained control over how data is filtered and stored. The configuration does not use the UI schema configuration used in the standard setup, to maintain full flexibility the following *.**toml** file configures every step.

The Configuration is split into four parts. The Logging configuration, snowflake base configuration, IIH configuration and pipeline filter configuration.

5.2.1. Logging Configuration

[logging]		
Attribute	**Default**	**Description**
console_log	true	Enables/disables console logging.
level	INFO	Defines log level (INFO, WARNING, ERROR).
file_path	./logs/app.log	Path to the log file. Must remain the default for logs to be mounted.
file_max_size_bytes	10485760	Maximum size of a single log file (in bytes).
file_backup_count	3	Number of rotated log files to keep.

5.2.2. Snowflake Base Configuration

[snowflake]		
Attribute	**Default**	**Description**
SF_USER	""	Snowflake User
ACCOUNT	""	Snowflake Account
HOST	""	Snowflake URL
KEY_PASSWORD	""	Password for encrypted private key

5.2.3. IIH Configuration

[iih]		
Attribute	**Default**	**Description**
Data_Service_Container_Name	""	Default name and port is set automatically. If you have changed the port in the DataService configuration you have to adapt this value.
QUERY_INTERVALL	20	The interval in which data is fetched from FFT Data Service. Minimum is 1 second
START_TIMESTAMP_OVERRIDE	""	Starttime where the DataBridge starts the loading of the history data. When none is given all data is fetched. The format is the following: YYYY-MM-DDTHH:MM:SS.000000Z

5.2.4. Pipeline Filter Configuration

[pipelines.<name>]		
Attribute	**Default**	**Description**
DATABASE	""	Snowflake Database
SCHEMA	""	Snowflake Schema
PIPE	""	Snowflake Snowpipe
MATCH	""	Match Filter

5.2.5. Mapping Definition

The Mapping rules are based on the generated device_list. The Device list contains every variable accessible in the IIH. This File can be downloaded shortly after deploying the FFT DataService on the Edge Device. The FFT Data Bridge automatically fetches the device list. The file contains two variables to identify the Variable in the IIH.

- assetPath → full datapath in the defined Data Structure in IIH
- variable → Variable Name

To be able to filter every possible variable the filter merges these together. So, the filter always becomes

rulePath = assetPath.variableName

5.2.6. Mapping Rules

1. Exact Match

The rule must match the full asset path exactly.

Example: MATCH = "Factory.Line1"

- only matches this specific path
- highest priority

2. Prefix Match

The rule ends with # and matches all asset paths that start with the given prefix.

Example: MATCH = "Factory.Line1.#"

- Matches all paths that start with Factory.Line1., such as:
    - Factory.Line1.Robot1.speed
    - Factory.Line1.Robot9.Axis4.current
    - Factory.Line1.MotorA.temperature
- longer prefix wins over shorter (more specific match)

3. Wildcard Match

Wildcard	Meaning
*	exactly one path segment
#	multiple arbitrary segments
.#.	multiple nested segments

Example: MATCH =MATCH = "Factory.*.Robot*.temp*"

- Matches following patterns:
    - Factory.Area1.Robot3.temp
    - Factory.XYZ.Robot9.temperature_raw

Example: MATCH="Factory.#.Temperature"

- Matches following patterns
    - Factory.LineA.Sensor.Temperature
    - Factory.Temperature

5. Mixed Match Rules

Example: MATCH = "*.Robot.#"

- Matches following patterns:
    - Line1.Robot.Temperature"
    - Line2.Robot.Axis1.Torque"
    - Line2.Robot.Axis2.Torque"
- Different Match Rule types, can be combined to get desired variables into one table

5. Multiple Match Rules

Example: MATCH = ["Combo.Path1.#", "Combo.Path2.Sub#"]

- Matches following patterns:
    - Combo.Path1.Test.Value
    - Combo.Path2.SubSection.Deeper
- Multiple Match Rules can be applied to one Pipeline

6. Catch All Match

This rule is active, if the MATCH part for the Pipelinedefiniton is **MATCH= ""**. If not rule applies every datapoint is written in this Pipeline. That's the same pipeline definition that's used in the standard setup configuration. But **only one** Catch All Pipeline is **allowed** per DataBridge deployment.

5.2.7.   Map Priority

The router processes MAP rules in strict order:

1. Exact Match
2. Prefix Match (longest prefix wins)
3. Wildcard Match
4. Catch-All Match

5.2.8.   Troubleshooting

To simplify debugging, the filtered results generated by the mapping rules can be verified by downloading the device_list.json file from the DataBridge. This file contains all asset paths and variables that match a given filter.

To compare these with the total number of available asset paths and variables, the device list can be downloaded from the DataService and compared using a diff tool. Note that only variables that appear in the device list can be retrieved.

No datapoint can be stored in multiple tables, the first declared table that contains a matching filter gets the datapoint.

5.2.9.   Upload File to IEM

To activate the configured setup, you must skip the first part of the wizard and must not select the checkbox for the default configuration.

Under 2. Other Configuration, drag and drop or double-click the corresponding field. The ***.toml** file is uploaded to the Configuration field, and the ***.txt** private key file is uploaded to the Private Key field.

5.2.10. Full Example config.toml

```toml
[logging]
console_log = true
level = "INFO"
file_path = "./logs/app.log"
file_max_size_bytes = 10485760
file_backup_count = 3

[snowflake]
SF_USER = "<DataBridge_User>"
ACCOUNT = "<Snowflake_Account>"
HOST = "<Snowflake_Account>.snowflakecomputing.com"
KEY_PASSWORD = "<PrivateKey_Password>"

[iih]
Data_Service_Container_Name = ""
QUERY_INTERVALL = "20"
START_TIMESTAMP_OVERRIDE = ""


[pipelines]
[pipelines.<FILTERNAME_1>]
DATABASE = "<DATABASE_NAME_1>"
SCHEMA = "<SCHEMA_NAME>"
PIPE = "<PIPE_NAME_1>"
MATCH = "<FILTER_1>"


[pipelines.<FILTERNAME_2>]
DATABASE = "<DATABASE_NAME_2>"
SCHEMA = "<SCHEMA_NAME>"
PIPE = "<PIPE_NAME_2>"
MATCH = "<FILTER_2>"

[pipelines.<FILTERNAME_3>]
DATABASE = "<DATABASE_NAME_3>"
SCHEMA = "<SCHEMA_NAME>"
PIPE = "<PIPE_NAME_3>"
MATCH = "<FILTER_3>"
```

18

6. Logging

The Logs are divided in two files. These files are available in the Docker volume view in the edge device.

The app.log file contains application logs generated during the runtime of the application and can be accessed in the app view inside the Edge Device.

These files are stored using a ring-buffer mechanism, which can be adjusted in the advanced setup settings.

Logs can also be downloaded via the IIH Web UI. They are separated into two files:

- fft_databridge.log contains general startup logs and external logs.
- fft_databridge-error.log contains error logs

7. Limitations

7.1. Variables and data frequency

The DataBridge was tested with a total of 5000 individual variables.

Data was processed at a frequency ranging from 500 ms to 1 second, with moderate CPU and RAM usage. Memory consumption remained below 500 MB during testing.

For optimal performance, we recommend using an edge device with 16 GB RAM and a CPU with at least 8 cores.

7.2. Cost Monitoring Snowflake

The end customer is responsible for monitoring all costs resulting from the use of the FFT DataBridge. This includes any expenses related to data transfer and storage, such as pipeline usage and storage consumption. Data transfer costs cannot be monitored using resource monitors. Instead, use budgets to detect anomalies and monitor consumption. [Monitor credit usage with budgets | Snowflake Documentation](#)

7.3. Compatibility

The used Snowflake service is available in all Amazon Web Services (AWS), Microsoft Azure regions except for government-specific regions and regions in China.

The maximum number of PIPE objects configured for Snowpipe Streaming is by default limited to 1,000 per account and 10 per table.

8. Change history

Revision	Date	Name	Comment
1.0.0	22.09.2025	T.Dobritz	creation
2.0.0	17.12.2025	T.Dobritz	Refactored for the updated architecture.