NiFi-Example-Workflow

Introduction

This document is for sending data to MySQL from NiFi. This workflow is designed for covering multiple processors.

It talks about consuming data from kafka and send it to multiple destinations like MySQL, PostgresSQL, ElasticSearch, Kafka etc.

Prerequisites

Make sure python3, pip3, git, docker and docker compose are installed on your system.

If not, run as root the following on Ubuntu based system

```
# Add Docker's official GPG key:
sudo apt-get update
sudo apt-get install ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings
sudo curl -fsSL https://download.docker.com/linux/ubuntu/gpg -o
sudo chmod a+r /etc/apt/keyrings/docker.asc
```

```
# Add the repository to Apt sources:
echo \
  "deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/key
  $(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update

sudo apt-get install git python3-pip docker-ce docker-ce-cli con
```

For debian systems, follow

```
# Add Docker's official GPG key:
sudo apt-get update
sudo apt-get install ca-certificates curl
sudo install -m 0755 -d /etc/apt/keyrings
sudo curl -fsSL https://download.docker.com/linux/debian/gpg -o
sudo chmod a+r /etc/apt/keyrings/docker.asc

# Add the repository to Apt sources:
echo \
  "deb [arch=$(dpkg --print-architecture) signed-by=/etc/apt/key
  $(. /etc/os-release && echo "$VERSION_CODENAME") stable" | \
  sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
sudo apt-get update

sudo apt-get install git python3-pip docker-ce docker-ce-cli con
```

Refer to here https://docs.docker.com/engine/install/ for installing docker components on other systems.

Step 1 - Cloning the repository

Clone the git repository which contains everything related to this lab example.

```
git clone https://github.com/cloudpoet-in/nifi-training.git
```

Step 2 - Setting up kafka server

Setup kafka server if you dont have it already.

In git repo, navigate to directory `nifi-training/sandbox-deployments/kafka` and then run

```
docker compose up -d
```

This will start a kafka server which will listen on `localhost:9092`

Step 3 - Produce data to Kafka

Produce some data to kafka using simulator script.

Simulator script requires a python library called as `confluent-kafka` which can be installed by running

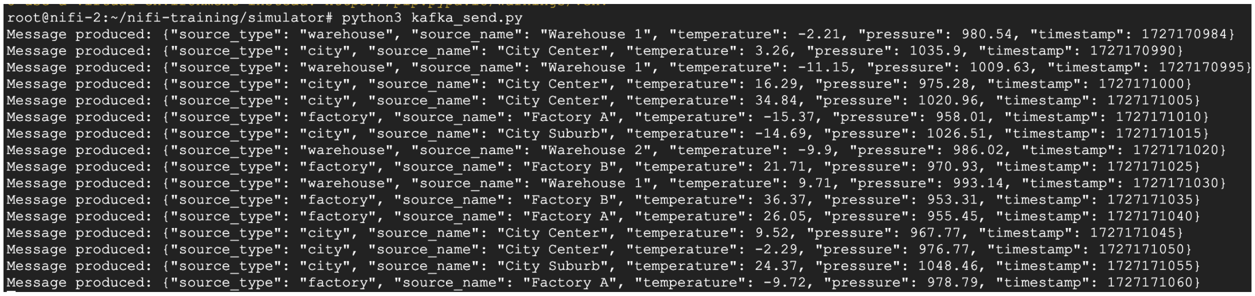
```
pip3 install confluent-kafka

# if this doesnt work, run
# pip3 install confluent-kafka --break-system-packages
```

Once dependency is ready, navigate to `nifi-training/kafka-producer-simulator` and run

```
python3 kafka_send.py
```

This will coninuosly produce some dummy records to kafka running at localhost:9092 in topic named `nifi-dummy` . Keep the script running in the background as it will produce data every 5 seconds. Feel free to update it as per needs.

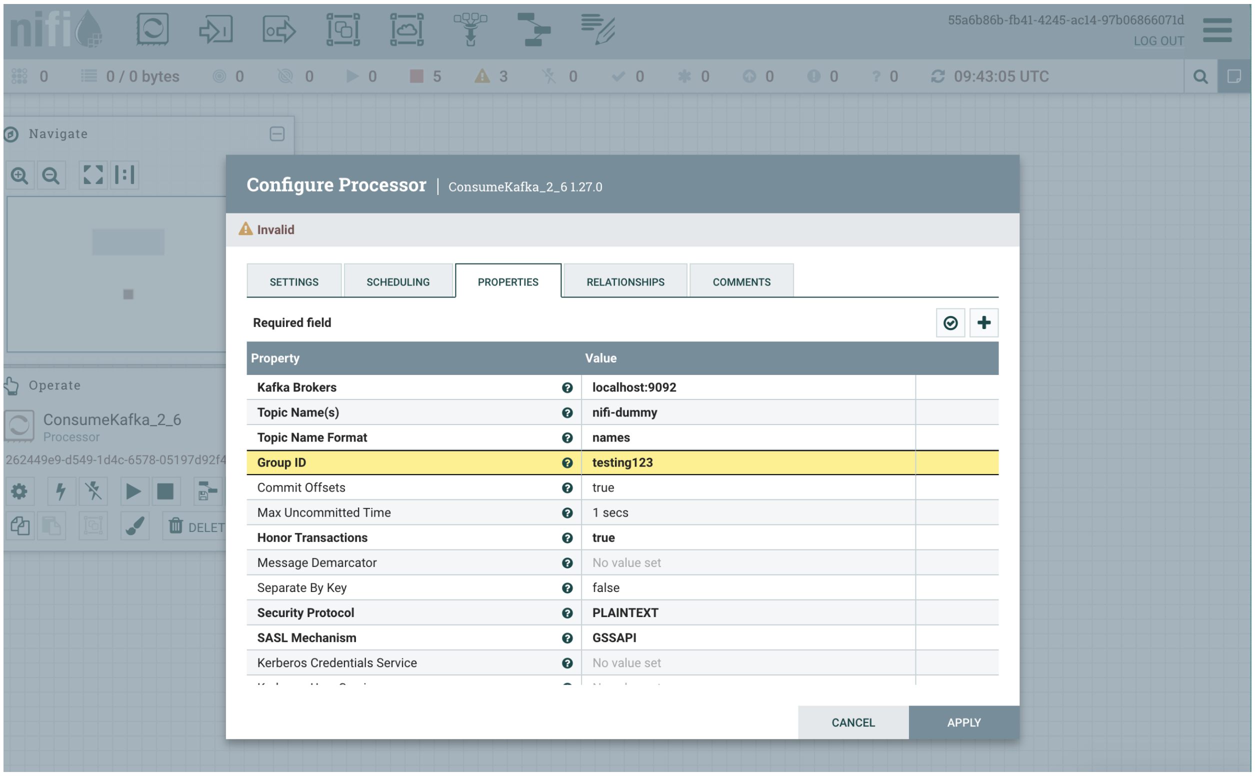
Successful logs looks like this



```
root@nifi-2:~/nifi-training/simulator# python3 kafka_send.py
Message produced: {"source_type": "warehouse", "source_name": "Warehouse 1", "temperature": -2.21, "pressure": 980.54, "timestamp": 1727170984}
Message produced: {"source_type": "city", "source_name": "City Center", "temperature": 3.26, "pressure": 1035.9, "timestamp": 1727170990}
Message produced: {"source_type": "warehouse", "source_name": "Warehouse 1", "temperature": -11.15, "pressure": 1009.63, "timestamp": 1727170995}
Message produced: {"source_type": "city", "source_name": "City Center", "temperature": 16.29, "pressure": 975.28, "timestamp": 1727171000}
Message produced: {"source_type": "city", "source_name": "City Center", "temperature": 34.84, "pressure": 1020.96, "timestamp": 1727171005}
Message produced: {"source_type": "factory", "source_name": "Factory A", "temperature": -15.37, "pressure": 958.01, "timestamp": 1727171010}
Message produced: {"source_type": "city", "source_name": "City Suburb", "temperature": -14.69, "pressure": 1026.51, "timestamp": 1727171015}
Message produced: {"source_type": "warehouse", "source_name": "Warehouse 2", "temperature": -9.9, "pressure": 986.02, "timestamp": 1727171020}
Message produced: {"source_type": "factory", "source_name": "Factory B", "temperature": 21.71, "pressure": 970.93, "timestamp": 1727171025}
Message produced: {"source_type": "warehouse", "source_name": "Warehouse 1", "temperature": 9.71, "pressure": 993.14, "timestamp": 1727171030}
Message produced: {"source_type": "factory", "source_name": "Factory B", "temperature": 36.37, "pressure": 953.31, "timestamp": 1727171035}
Message produced: {"source_type": "factory", "source_name": "Factory A", "temperature": 26.05, "pressure": 955.45, "timestamp": 1727171040}
Message produced: {"source_type": "city", "source_name": "City Center", "temperature": 9.52, "pressure": 967.77, "timestamp": 1727171045}
Message produced: {"source_type": "city", "source_name": "City Center", "temperature": -2.29, "pressure": 976.77, "timestamp": 1727171050}
Message produced: {"source_type": "city", "source_name": "City Suburb", "temperature": 24.37, "pressure": 1048.46, "timestamp": 1727171055}
Message produced: {"source_type": "factory", "source_name": "Factory A", "temperature": -9.72, "pressure": 978.79, "timestamp": 1727171060}
```

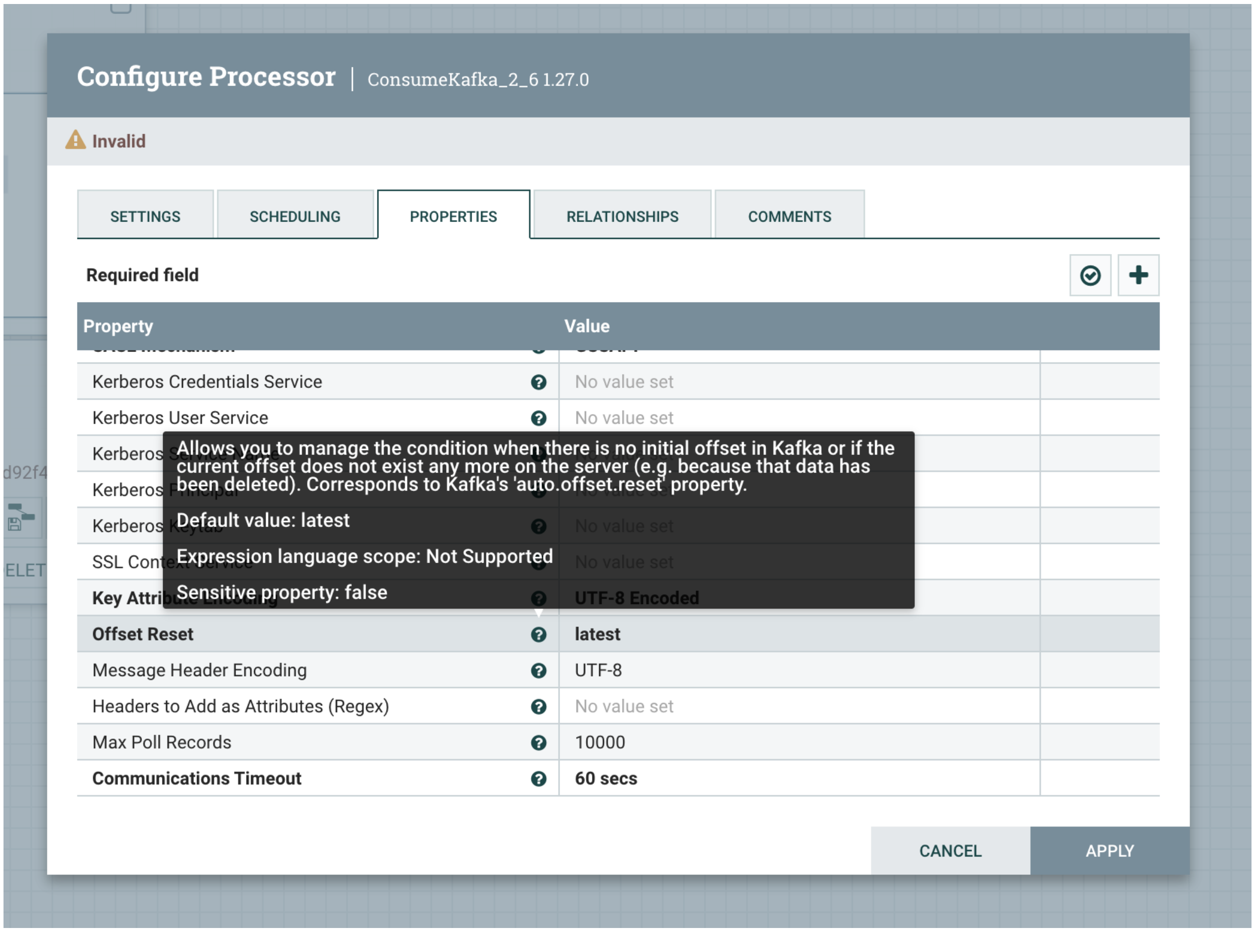
Step 4 - Consume kafka to NiFi

Drag a processor in nifi named `ConsumeKafka_2_6` **and configure it as shown. Add unique GroupID.**



Property	Value
Kafka Brokers	**localhost:9092**
Topic Name(s)	**nifi-dummy**
Topic Name Format	**names**
Group ID	**testing123**
Commit Offsets	true
Max Uncommitted Time	1 secs
Honor Transactions	**true**
Message Demarcator	No value set
Separate By Key	false
Security Protocol	**PLAINTEXT**
SASL Mechanism	**GSSAPI**
Kerberos Credentials Service	No value set

The property named `Offset Reset` can be changed to consume from end of topic or start of the topic.



Configure Processor | ConsumeKafka_2_6 1.27.0

⚠ Invalid

Required field

Property	Value
Kerberos Credentials Service	No value set
Kerberos User Service	No value set
Kerberos	
Kerberos	
Kerberos	No value set
SSL Cont	No value set
Key Attri	**UTF-8 Encoded**
Offset Reset	**latest**
Message Header Encoding	UTF-8
Headers to Add as Attributes (Regex)	No value set
Max Poll Records	10000
Communications Timeout	**60 secs**

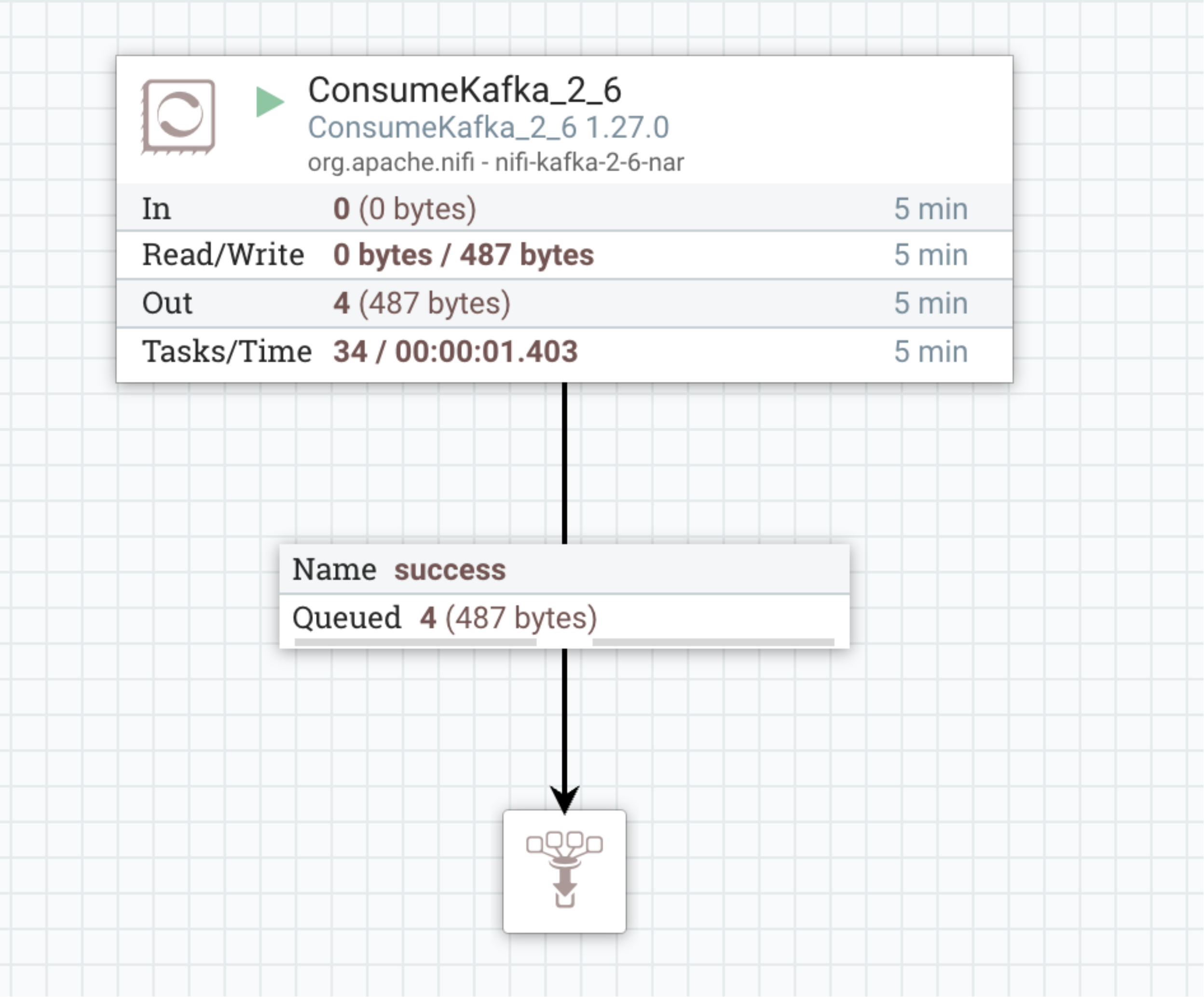
Allows you to manage the condition when there is no initial offset in Kafka or if the current offset does not exist any more on the server (e.g. because that data has been deleted). Corresponds to Kafka's 'auto.offset.reset' property.

Default value: latest

Expression language scope: Not Supported

Sensitive property: false

Make sure you are able to consume from kafka as shown



ConsumeKafka_2_6
ConsumeKafka_2_6 1.27.0
org.apache.nifi - nifi-kafka-2-6-nar

```
In            0 (0 bytes)                5 min
Read/Write    0 bytes / 487 bytes        5 min
Out           4 (487 bytes)              5 min
Tasks/Time    34 / 00:00:01.403          5 min
```

```
Name  success
Queued  4 (487 bytes)
```

Step 5 - Extract the contents of flowfile into attributes

Our records contain 3 types of data i.e. factory, warehouse, city based.

e.g.

Sample - 1

```
{
  "source_type": "factory",
  "source_name": "Factory A",
  "temperature": 20.1,
  "pressure": 1040.88,
  "timestamp": 1727171070
}
```

Sample - 2

```
{
  "source_type": "warehouse",
  "source_name": "Warehouse 1",
  "temperature": 0.37,
  "pressure": 957.9,
  "timestamp": 1727171080
}
```

Sample - 3

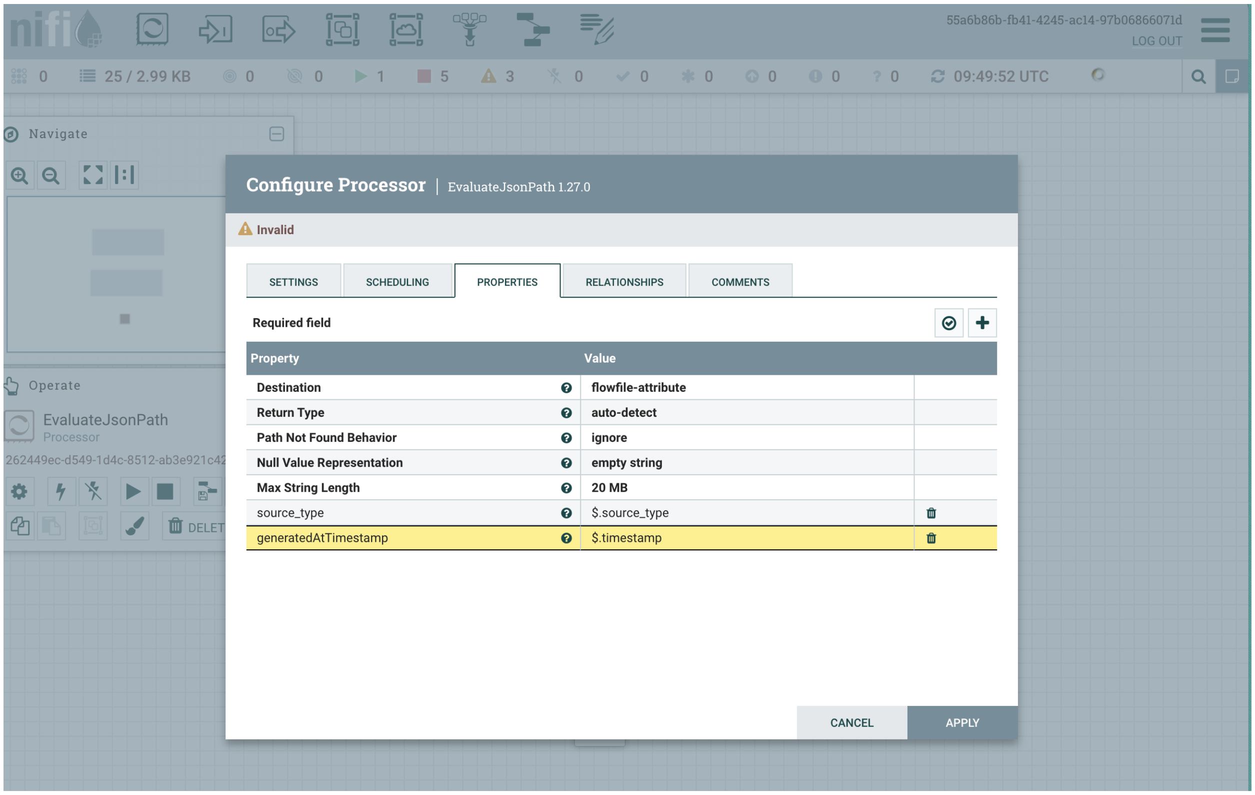
```
{
  "source_type": "city",
  "source_name": "City Center",
  "temperature": 25.23,
  "pressure": 1024.26,
  "timestamp": 1727171105
}
```

Next, we need to extract keys from these json into the flowfile attributes.

For that, we need to use a processor called as `EvaluateJsonPath`

Let us extract `timestamp` and `source_type` into the flowfile attributes by configuring processor as shown. Add properties manually by clicking + icon in the top right of the processor

Set the destination to `flowfile-attribute`



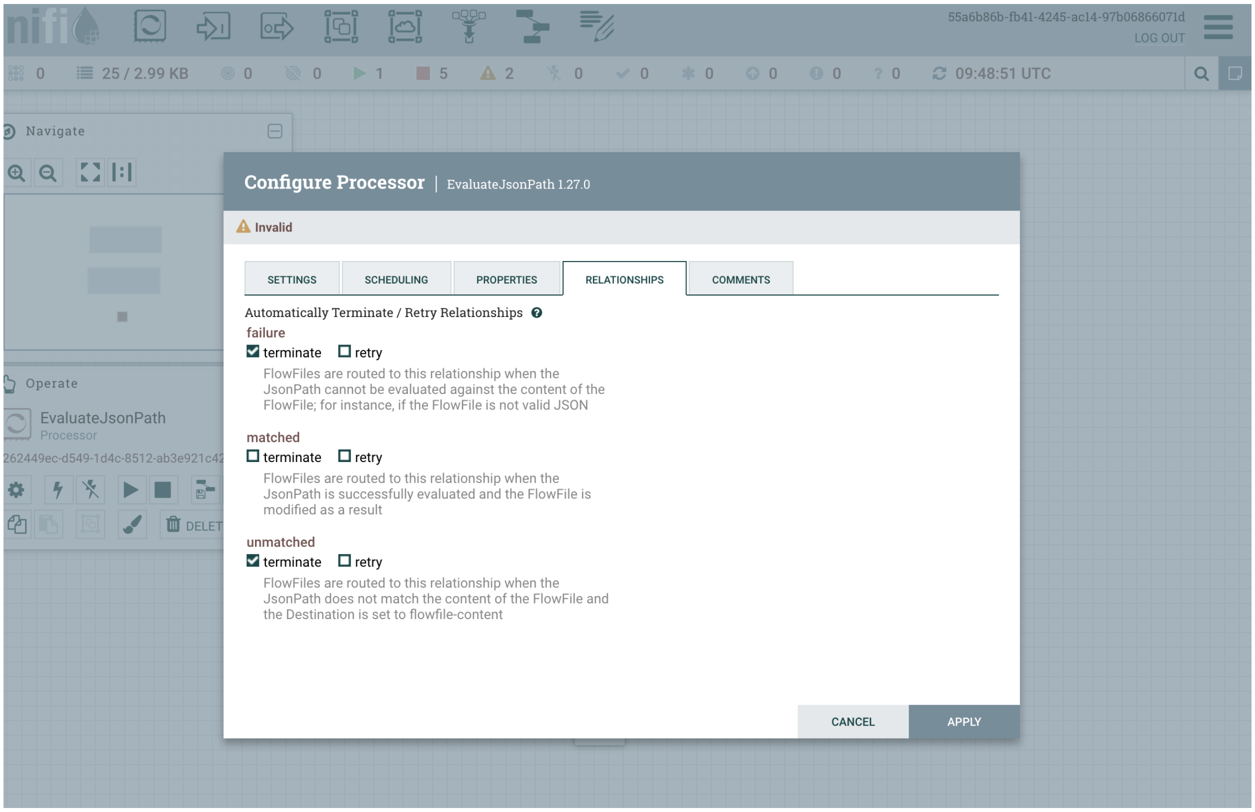
Configure Processor | EvaluateJsonPath 1.27.0

Invalid

Required field

Property	Value
Destination	flowfile-attribute
Return Type	auto-detect
Path Not Found Behavior	ignore
Null Value Representation	empty string
Max String Length	20 MB
source_type	$.source_type
generatedAtTimestamp	$.timestamp

Terminate the failure and unmatched relationship since we dont need to process those records at all in this example.



Configure Processor | EvaluateJsonPath 1.27.0

Invalid

SETTINGS | SCHEDULING | PROPERTIES | RELATIONSHIPS | COMMENTS

Automatically Terminate / Retry Relationships

failure

☑ terminate □ retry

FlowFiles are routed to this relationship when the JsonPath cannot be evaluated against the content of the FlowFile; for instance, if the FlowFile is not valid JSON

matched

□ terminate □ retry

FlowFiles are routed to this relationship when the JsonPath is successfully evaluated and the FlowFile is modified as a result

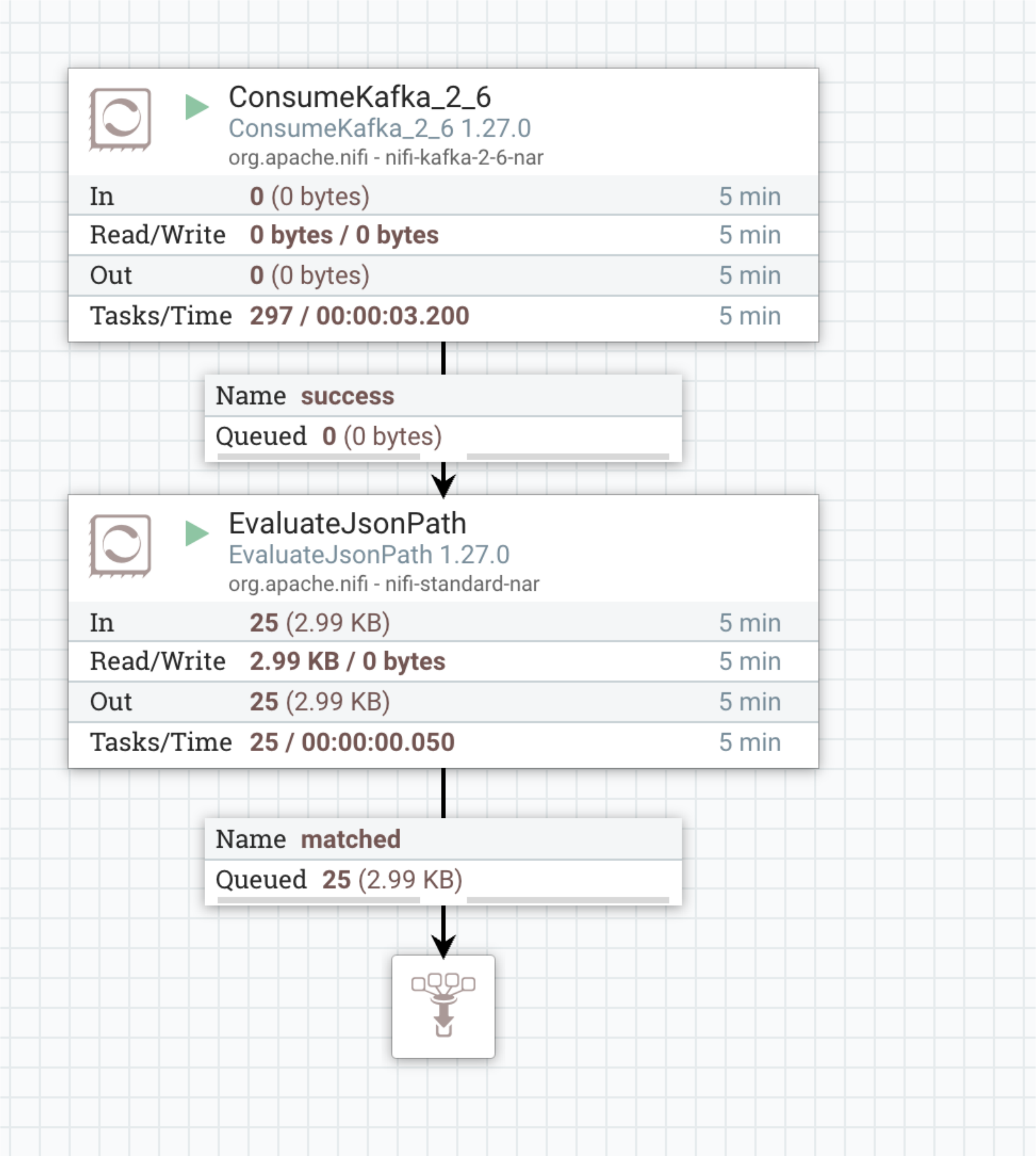
unmatched

☑ terminate □ retry

FlowFiles are routed to this relationship when the JsonPath does not match the content of the FlowFile and the Destination is set to flowfile-content

CANCEL APPLY

Make sure everything looks on UI like shown and there are no errors.



ConsumeKafka_2_6
ConsumeKafka_2_6 1.27.0
org.apache.nifi - nifi-kafka-2-6-nar

In	0 (0 bytes)	5 min
Read/Write	0 bytes / 0 bytes	5 min
Out	0 (0 bytes)	5 min
Tasks/Time	297 / 00:00:03.200	5 min

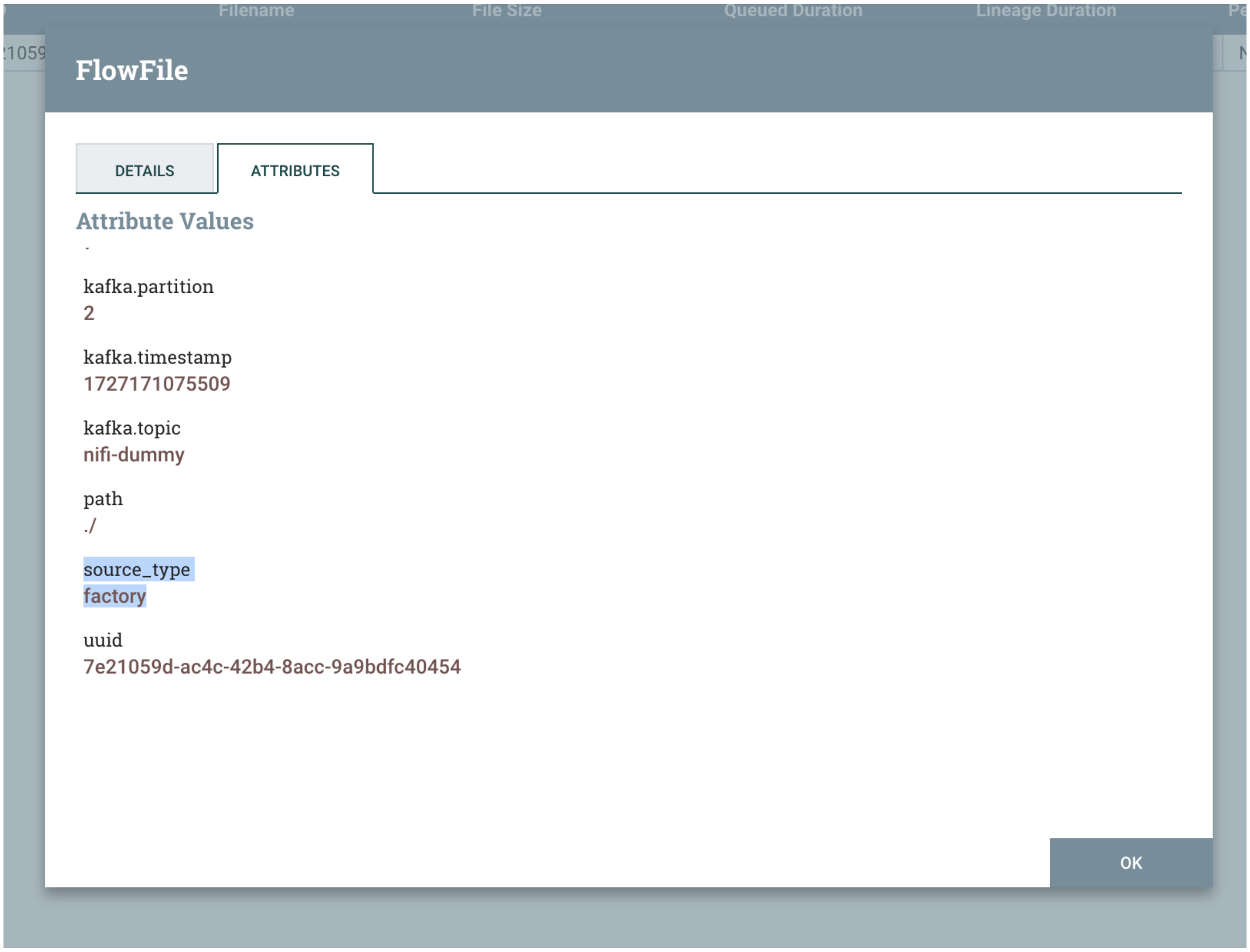
Name success
Queued 0 (0 bytes)

EvaluateJsonPath
EvaluateJsonPath 1.27.0
org.apache.nifi - nifi-standard-nar

In	25 (2.99 KB)	5 min
Read/Write	2.99 KB / 0 bytes	5 min
Out	25 (2.99 KB)	5 min
Tasks/Time	25 / 00:00:00.050	5 min

Name matched
Queued 25 (2.99 KB)

Also check the attributes of processed flowfiles to see if they contain our custom attributes.



Attribute Values

kafka.partition
2

kafka.timestamp
1727171075509

kafka.topic
nifi-dummy

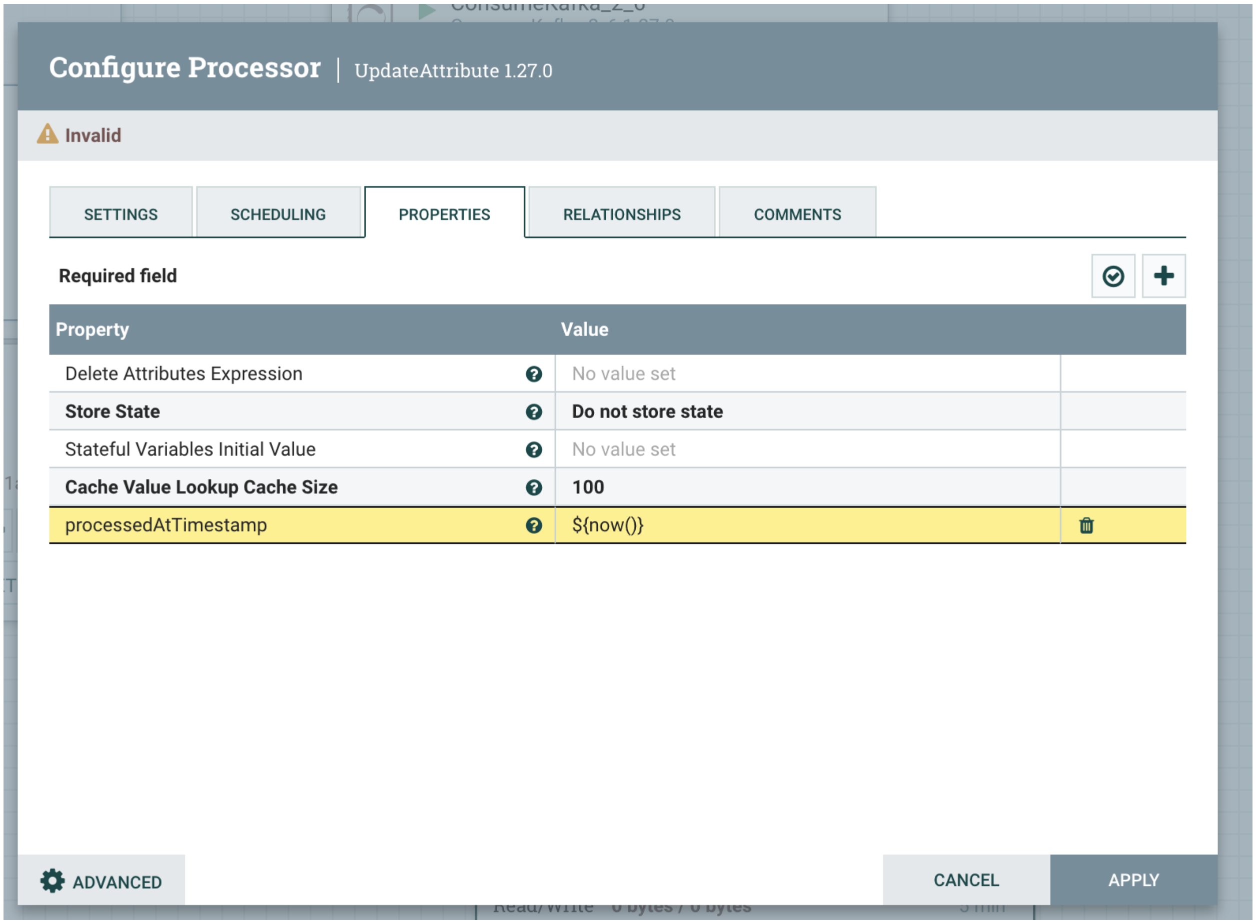
path
./

source_type
factory

uuid
7e21059d-ac4c-42b4-8acc-9a9bdfc40454

Step 6 - Update the attributes of flowfile to add processedAtTimestamp

Add a processor named UpdateAttributes and configure it as shown. Add a function `${now()}`



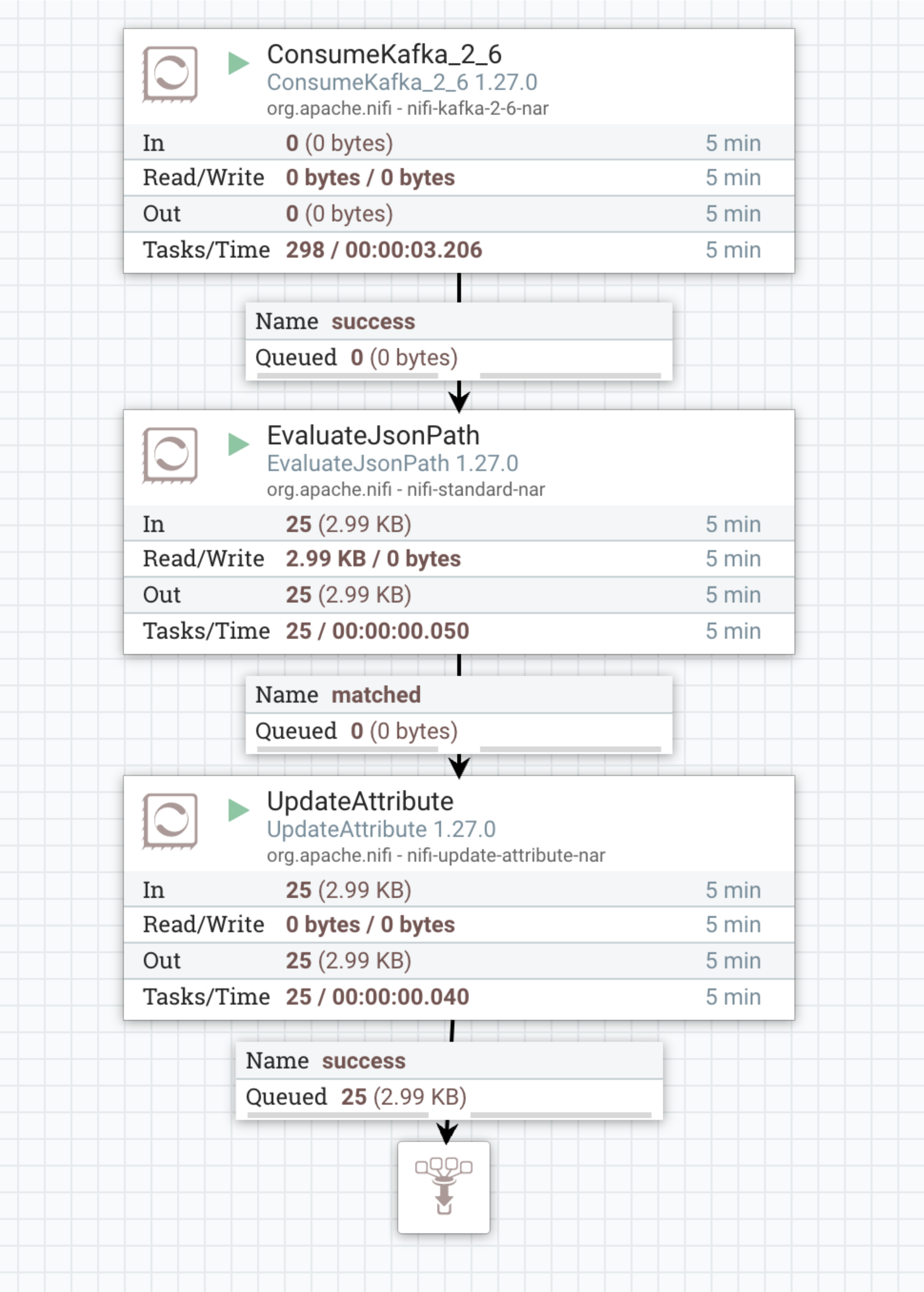
Configure Processor | UpdateAttribute 1.27.0

⚠ Invalid

Required field

Property	Value
Delete Attributes Expression	No value set
Store State	**Do not store state**
Stateful Variables Initial Value	No value set
Cache Value Lookup Cache Size	**100**
processedAtTimestamp	${now()}

Make sure it looks good



ConsumeKafka_2_6
ConsumeKafka_2_6 1.27.0
org.apache.nifi - nifi-kafka-2-6-nar

In	**0** (0 bytes)	5 min
Read/Write	**0 bytes / 0 bytes**	5 min
Out	**0** (0 bytes)	5 min
Tasks/Time	**298 / 00:00:03.206**	5 min

Name **success**
Queued **0** (0 bytes)

EvaluateJsonPath
EvaluateJsonPath 1.27.0
org.apache.nifi - nifi-standard-nar

In	**25** (2.99 KB)	5 min
Read/Write	**2.99 KB / 0 bytes**	5 min
Out	**25** (2.99 KB)	5 min
Tasks/Time	**25 / 00:00:00.050**	5 min

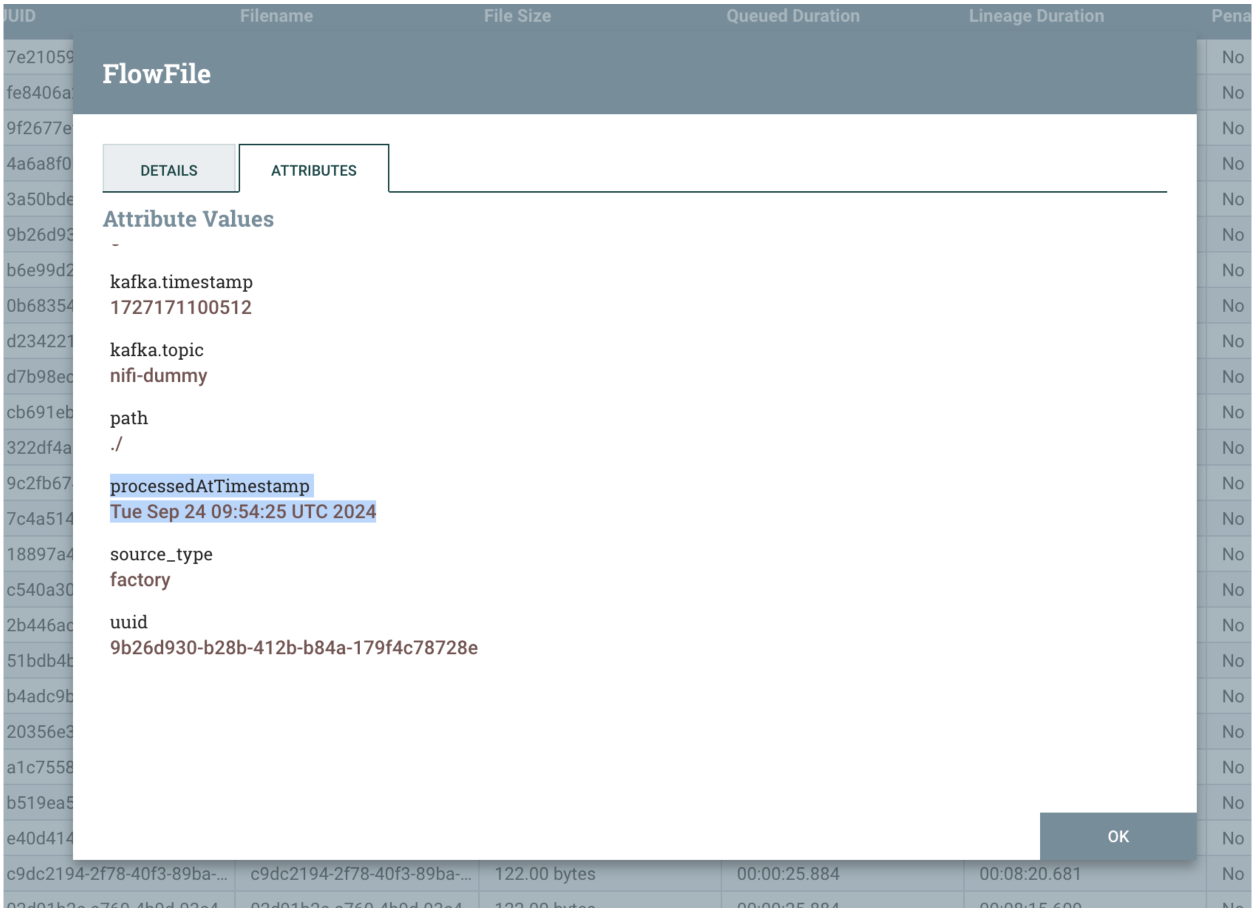
Name **matched**
Queued **0** (0 bytes)

UpdateAttribute
UpdateAttribute 1.27.0
org.apache.nifi - nifi-update-attribute-nar

In	**25** (2.99 KB)	5 min
Read/Write	**0 bytes / 0 bytes**	5 min
Out	**25** (2.99 KB)	5 min
Tasks/Time	**25 / 00:00:00.040**	5 min

Name **success**
Queued **25** (2.99 KB)

Check the attributes if it contains our custom attribute.



FlowFile

Attribute Values

-

kafka.timestamp
1727171100512

kafka.topic
nifi-dummy

path
./

processedAtTimestamp
Tue Sep 24 09:54:25 UTC 2024

source_type
factory

uuid
9b26d930-b28b-412b-b84a-179f4c78728e

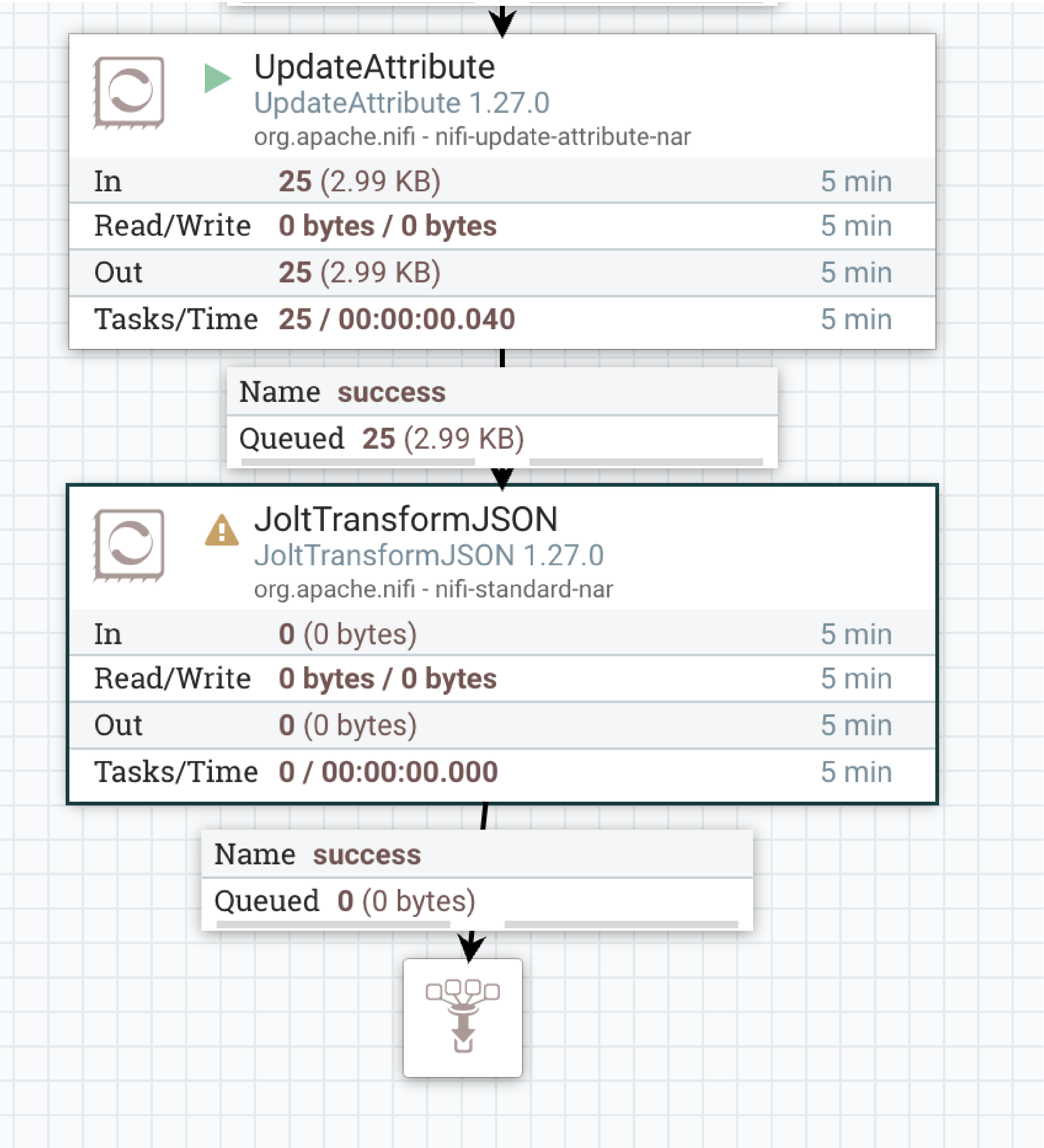
c9dc2194-2f78-40f3-89ba-...	c9dc2194-2f78-40f3-89ba-...	122.00 bytes	00:00:25.884	00:08:20.681	No

The timestamp is in format `Tue Sep 24 09:54:25 UTC 2024` **. We might need our own format sometimes to support different systems.**

In that case, ${now()} function can be updated as `${now():format('yyyy-MM-dd HH:mm:ss')}`

Step 7 - Rename and pull the values back to flowfile contents using Jolt processor

Use a processor named `JoltTransformRecord` next in line.



UpdateAttribute
UpdateAttribute 1.27.0
org.apache.nifi - nifi-update-attribute-nar

In	**25** (2.99 KB)	5 min
Read/Write	**0 bytes / 0 bytes**	5 min
Out	**25** (2.99 KB)	5 min
Tasks/Time	**25 / 00:00:00.040**	5 min

Name **success**
Queued **25** (2.99 KB)

JoltTransformJSON
JoltTransformJSON 1.27.0
org.apache.nifi - nifi-standard-nar

In	**0** (0 bytes)	5 min
Read/Write	**0 bytes / 0 bytes**	5 min
Out	**0** (0 bytes)	5 min
Tasks/Time	**0 / 00:00:00.000**	5 min

Name **success**
Queued **0** (0 bytes)

Jolt is very powerful processor to manipulate JSON. It required Jolt specification which is an expression language of its own.

To learn more about Jolt, refer https://jolt-demo.appspot.com/#inception

In our case, we want to manipulate JSON as shown where

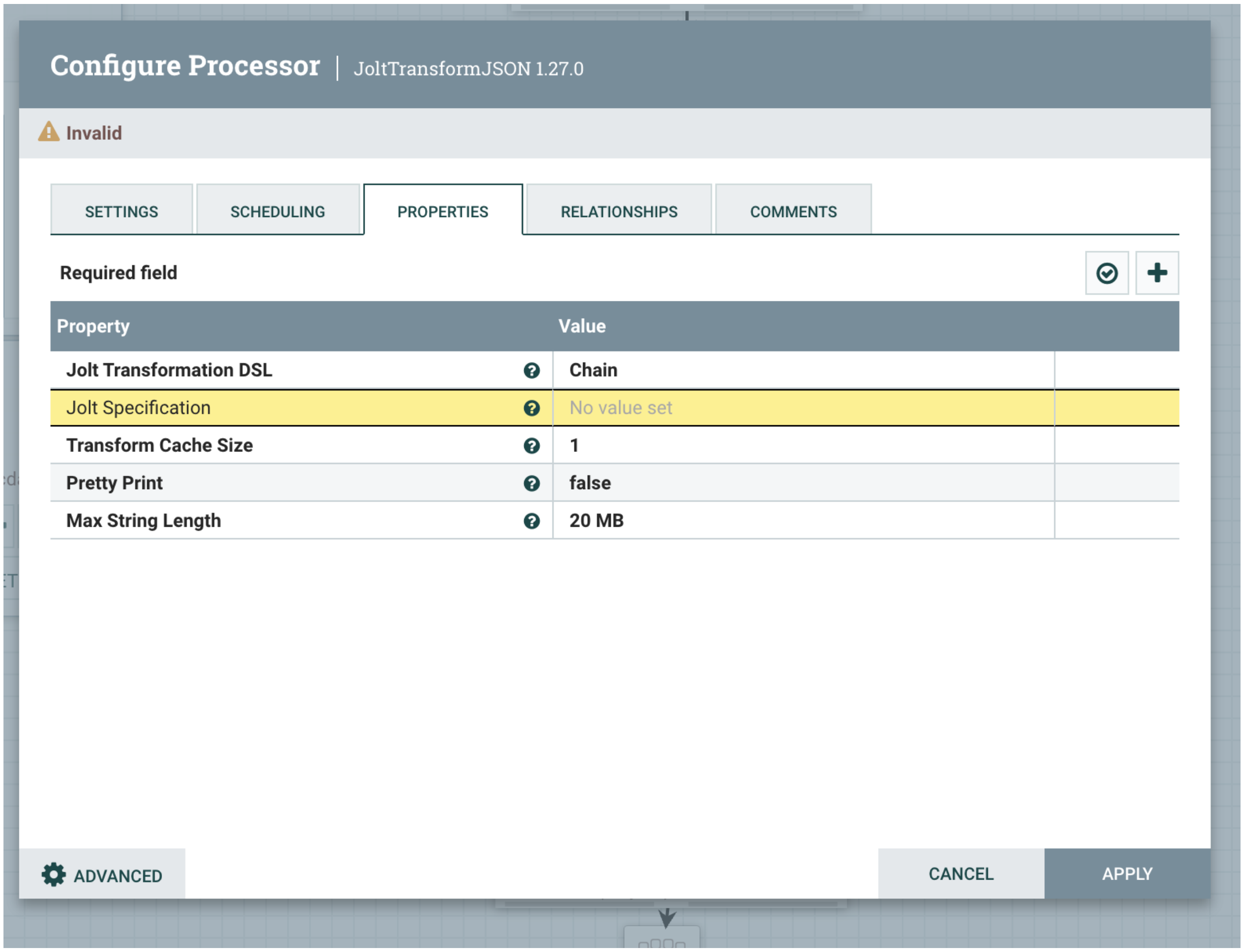
INPUT

```
{
  "source_type": "factory",
  "source_name": "Factory A",
  "temperature": 20.1,
  "pressure": 1040.88,
  "timestamp": 1727171070
}
```

Transformed OUTPUT

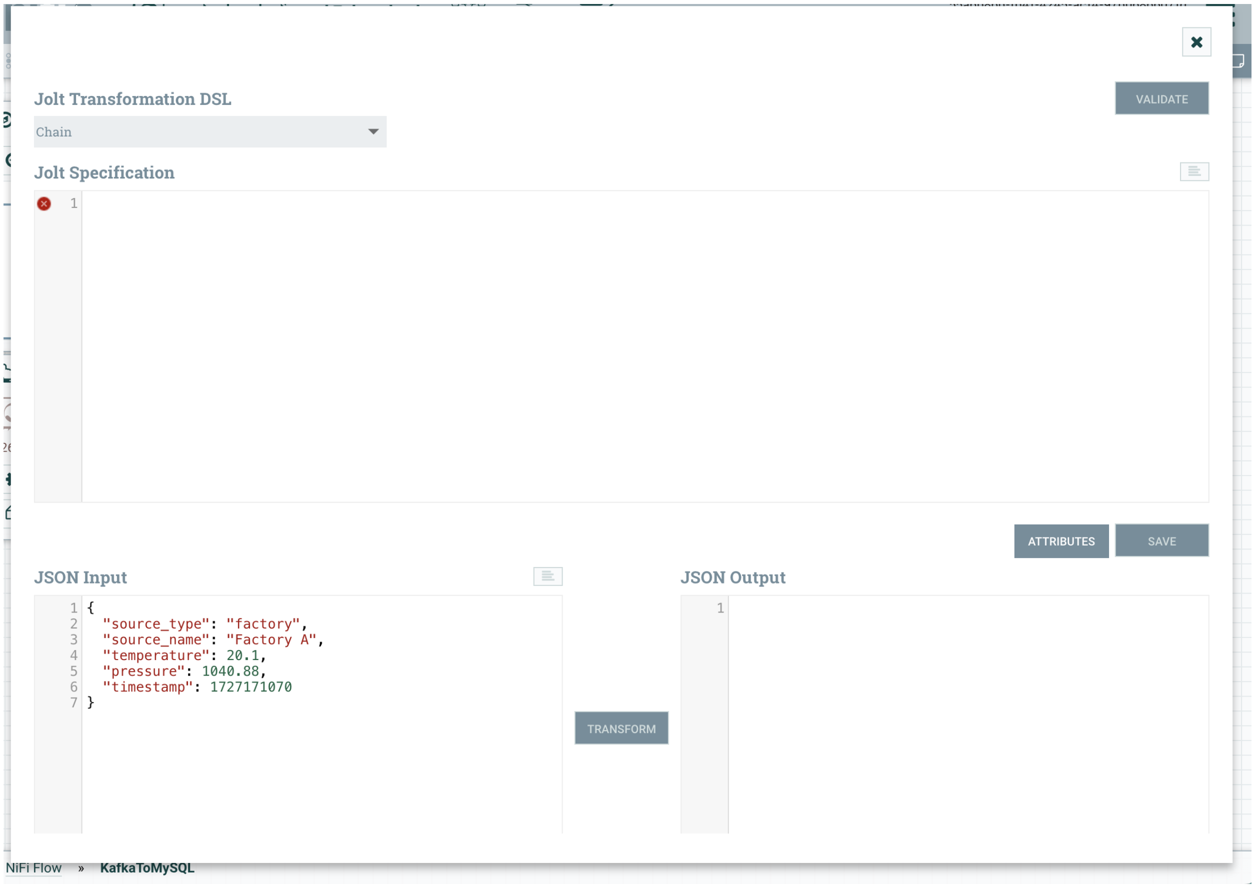
```
{
  "SOURCE_TYPE": "factory",
  "SOURCE_NAME": "Factory A",
  "TEMPERATURE": 20.1,
  "PRESSURE": 1040.88,
  "TIMESTAMP": 1727171070
}
```

For development, click the advanced button in the bottom left corner.



Property	Value
Jolt Transformation DSL	Chain
Jolt Specification	No value set
Transform Cache Size	1
Pretty Print	false
Max String Length	20 MB

It will open Jolt DSL window where we can feed our custom JSON and put some specification to test it out.



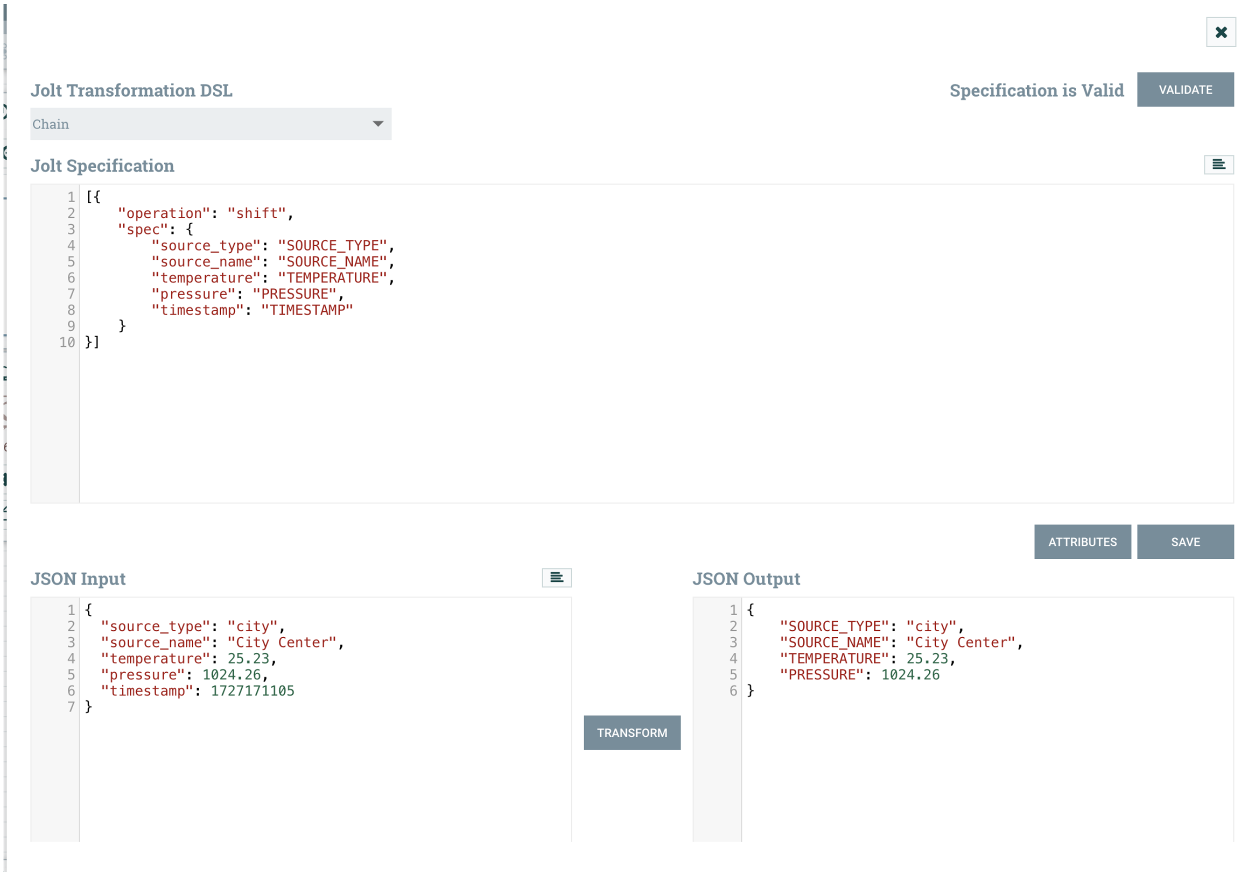
Chain

```
{
  "source_type": "factory",
  "source_name": "Factory A",
  "temperature": 20.1,
  "pressure": 1040.88,
  "timestamp": 1727171070
}
```

e.g. to rename our keys, we can put specification

```
[{
    "operation": "shift",
    "spec": {
        "source_type": "SOURCE_TYPE",
        "source_name": "SOURCE_NAME",
        "temperature": "TEMPERATURE",
        "pressure": "PRESSURE",
        "timestamp": "TIMESTAMP"
    }
}]
```

So results will look like,



```
[{
    "operation": "shift",
    "spec": {
        "source_type": "SOURCE_TYPE",
        "source_name": "SOURCE_NAME",
        "temperature": "TEMPERATURE",
        "pressure": "PRESSURE",
        "timestamp": "TIMESTAMP"
    }
}]
```

```
{
  "source_type": "city",
  "source_name": "City Center",
  "temperature": 25.23,
  "pressure": 1024.26,
  "timestamp": 1727171105
}
```

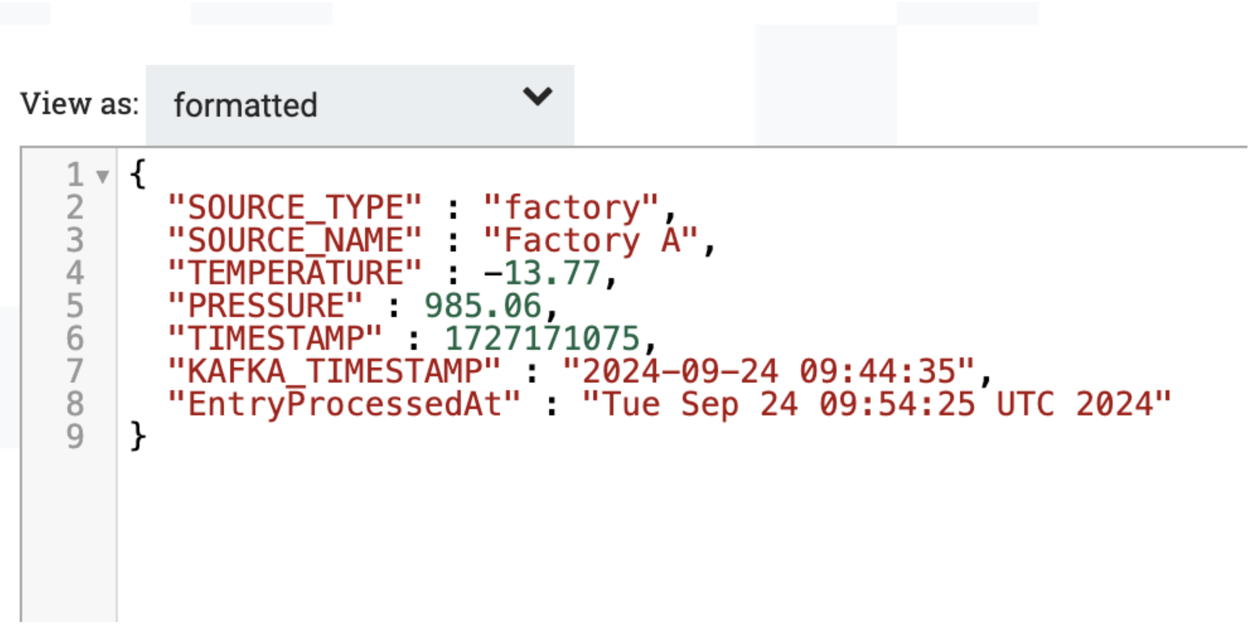
```
{
    "SOURCE_TYPE": "city",
    "SOURCE_NAME": "City Center",
    "TEMPERATURE": 25.23,
    "PRESSURE": 1024.26
}
```

Now, we have to fetch some extra properties from flowfile attributes. It can be done by adding attribute field to specifications using default operation as shown

```
[{
    "operation": "shift",
    "spec": {
        "source_type": "SOURCE_TYPE",
        "source_name": "SOURCE_NAME",
        "temperature": "TEMPERATURE",
        "pressure": "PRESSURE",
        "timestamp": "TIMESTAMP"
    }
}, {
    "operation": "default",
    "spec": {
        "EntryProcessedAt": "${processedAtTimestamp}",
            "KAFKA_TIMESTAMP": "${kafka.timestamp:format('yyyy-MM-d
        }
    }]
```

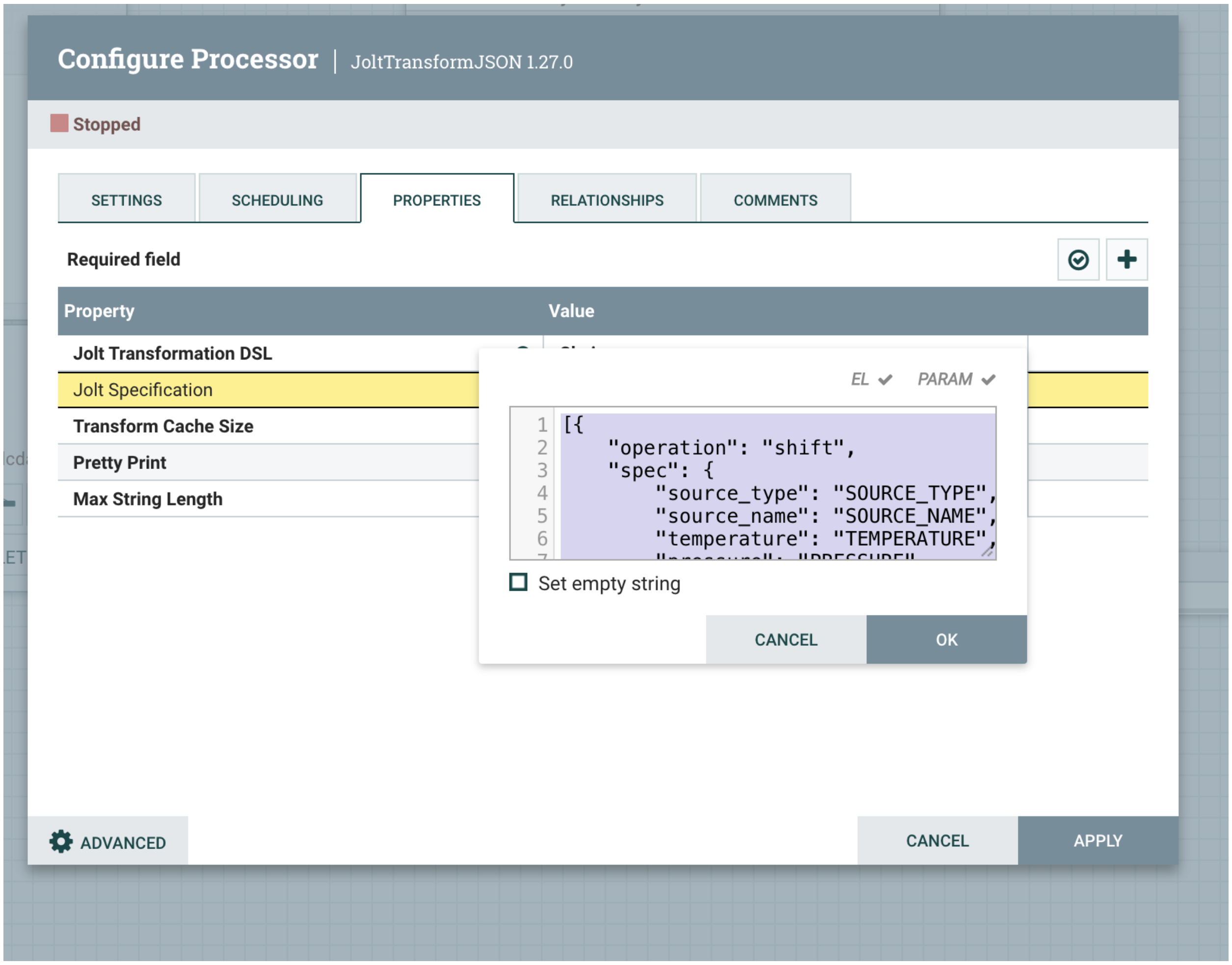
here, `processedAtTimestamp` and `kafka.timestamp` are the names of attribute that we want inside content. We are processing them inside JOLT.

With above specs, out records will look like this



```
{
  "SOURCE_TYPE" : "factory",
  "SOURCE_NAME" : "Factory A",
  "TEMPERATURE" : -13.77,
  "PRESSURE" : 985.06,
  "TIMESTAMP" : 1727171075,
  "KAFKA_TIMESTAMP" : "2024-09-24 09:44:35",
  "EntryProcessedAt" : "Tue Sep 24 09:54:25 UTC 2024"
}
```

Jolt processor, put the spec here.



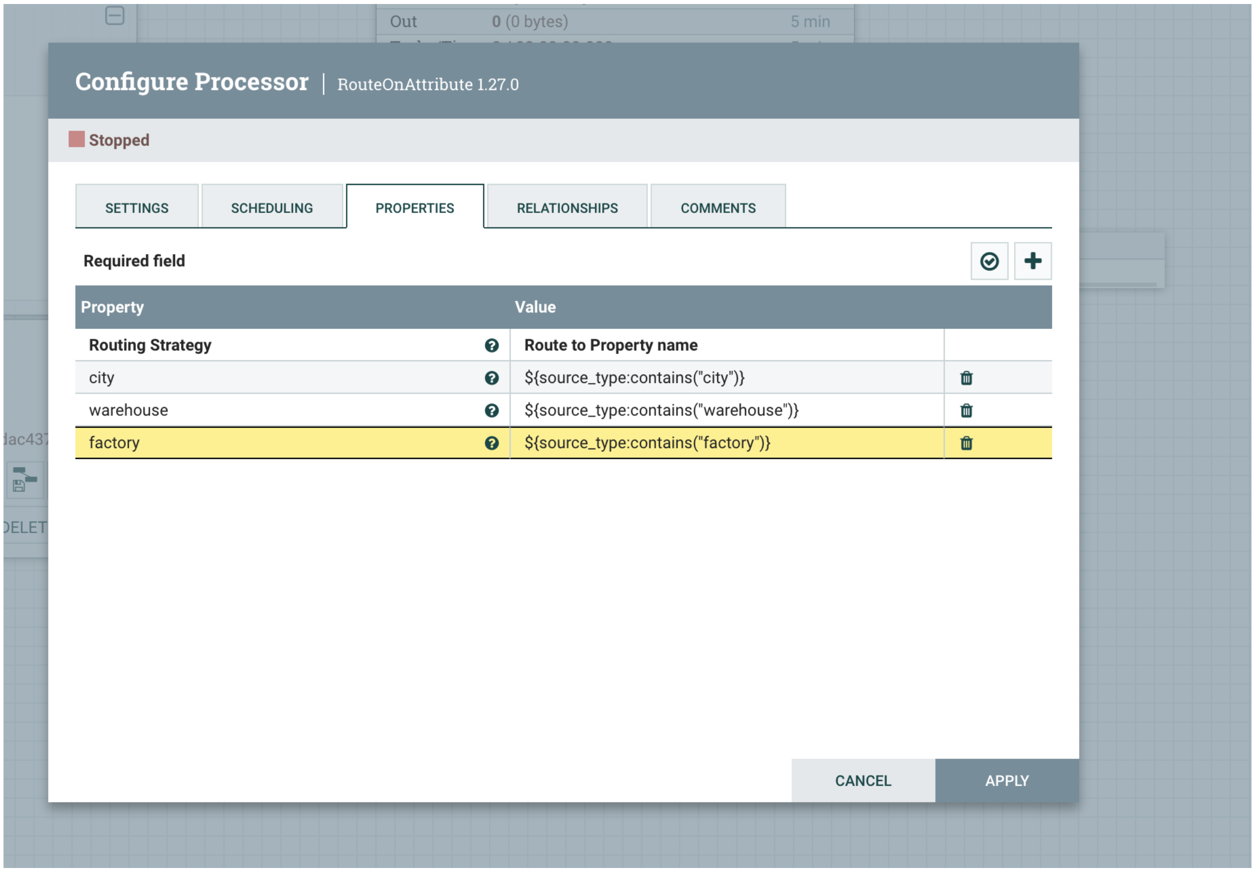
Property	Value
Jolt Transformation DSL	
Jolt Specification	
Transform Cache Size	
Pretty Print	
Max String Length	

```
[{
    "operation": "shift",
    "spec": {
        "source_type": "SOURCE_TYPE",
        "source_name": "SOURCE_NAME",
        "temperature": "TEMPERATURE",
        "pressure": "PRESSURE"
```

□ Set empty string

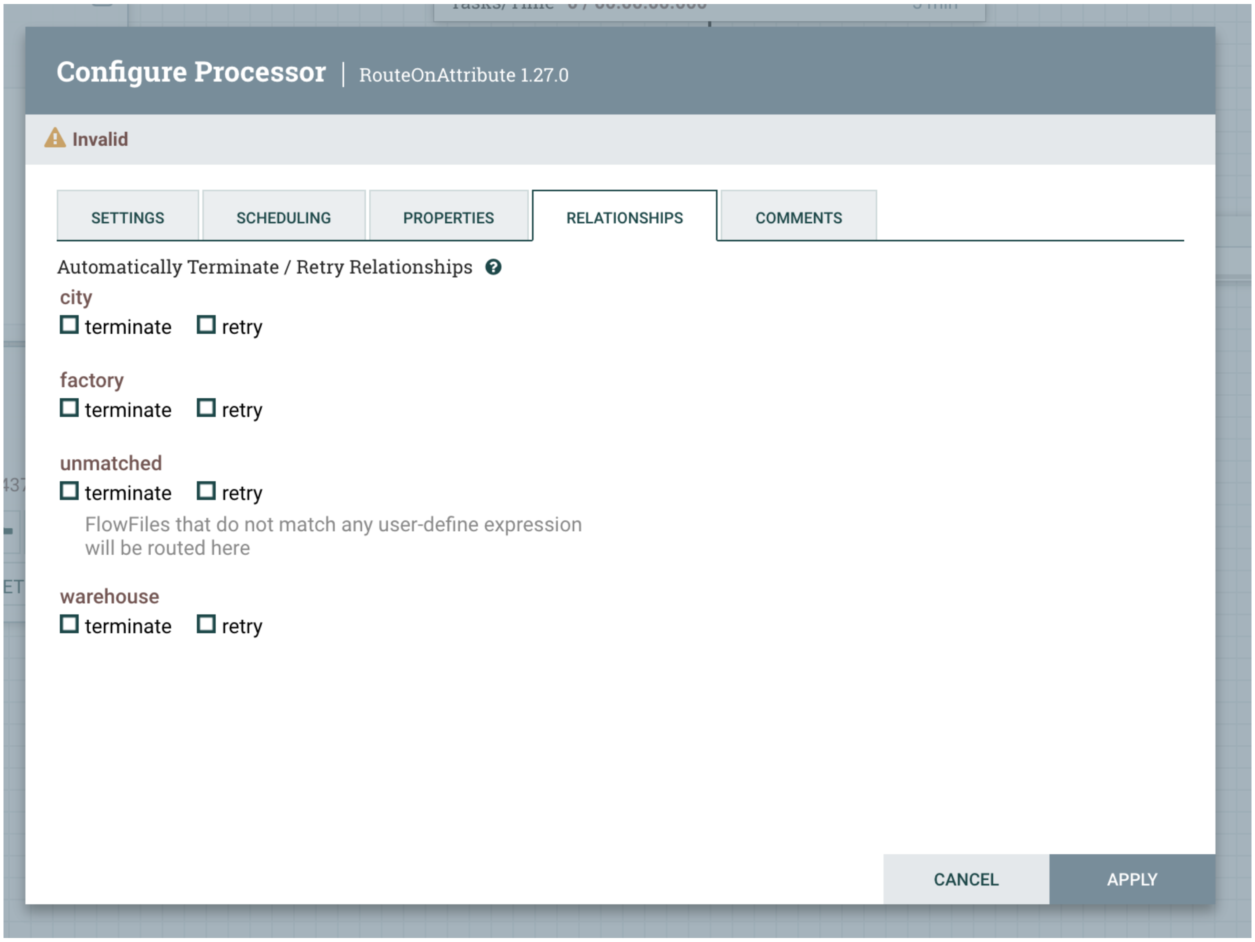
Step 8 - Route the flowfiles to different destination based on attributes

Add processor named `RouteOnAttribute` and make its properties as shown.



Property	Value
Routing Strategy	Route to Property name
city	${source_type:contains("city")}
warehouse	${source_type:contains("warehouse")}
factory	${source_type:contains("factory")}

This will essentially create 3 relationships for the processor which will route records accordingly.



Configure Processor | RouteOnAttribute 1.27.0

Invalid

Automatically Terminate / Retry Relationships

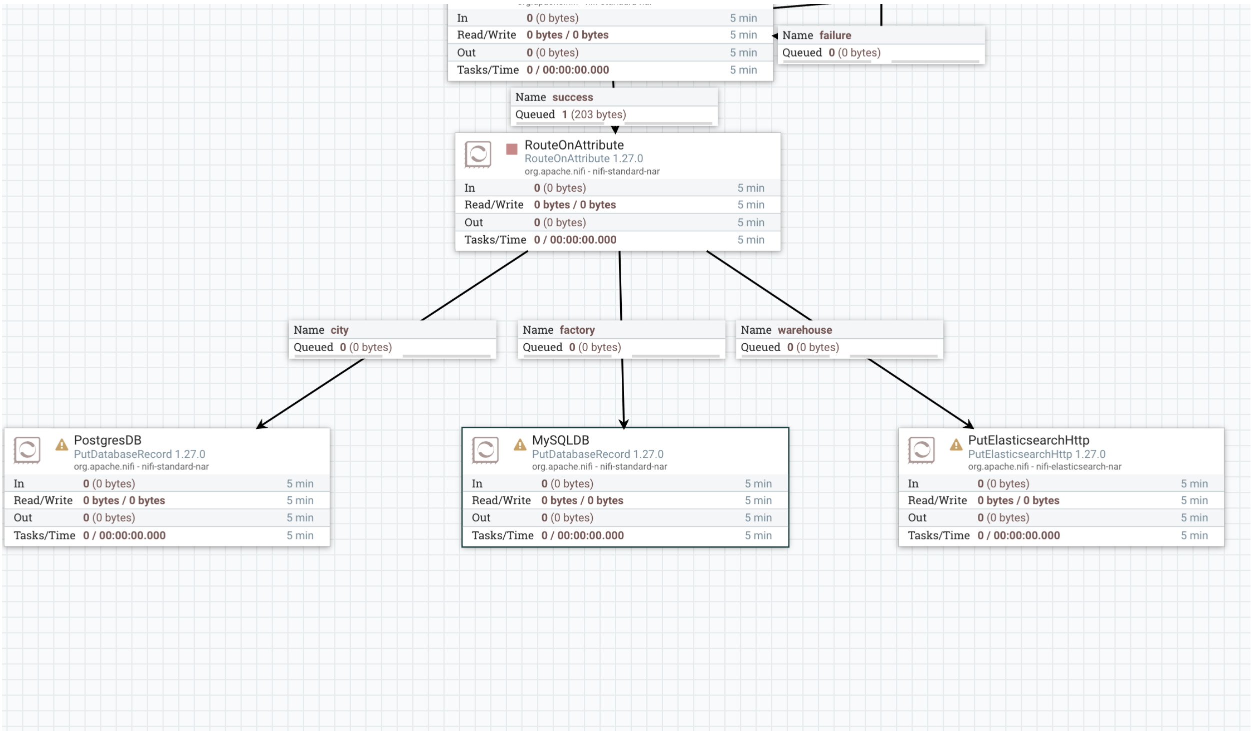
city
□ terminate □ retry

factory
□ terminate □ retry

unmatched
□ terminate □ retry
FlowFiles that do not match any user-define expression will be routed here

warehouse
□ terminate □ retry

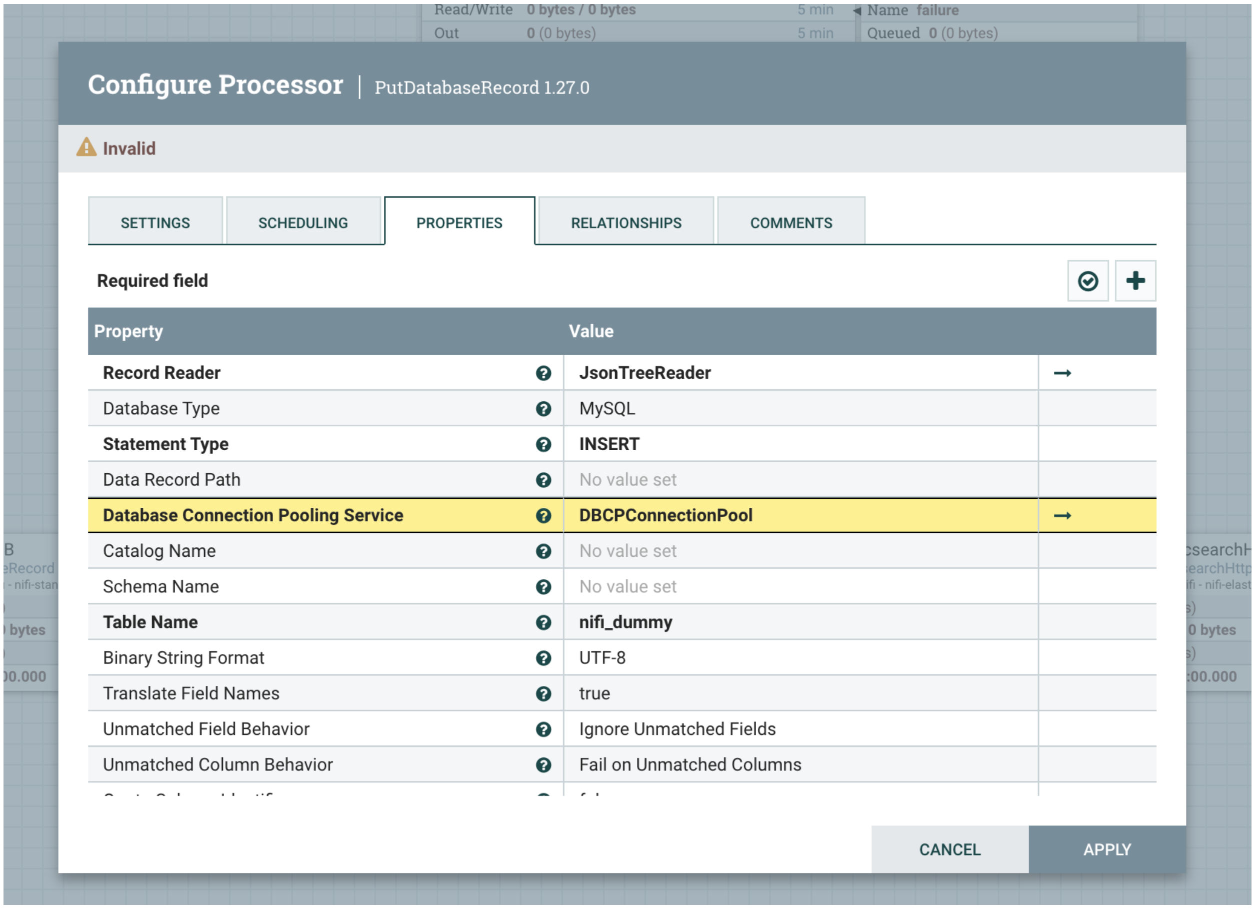
Now what we want to achieve here is this -


In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
Name failure
Queued 0 (0 bytes)
Name success
Queued 1 (203 bytes)
RouteOnAttribute
RouteOnAttribute 1.27.0
org.apache.nifi - nifi-standard-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
Name city
Queued 0 (0 bytes)
Name factory
Queued 0 (0 bytes)
Name warehouse
Queued 0 (0 bytes)
PostgresDB
PutDatabaseRecord 1.27.0
org.apache.nifi - nifi-standard-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
MySQLDB
PutDatabaseRecord 1.27.0
org.apache.nifi - nifi-standard-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min
PutElasticsearchHttp
PutElasticsearchHttp 1.27.0
org.apache.nifi - nifi-elasticsearch-nar
In 0 (0 bytes) 5 min
Read/Write 0 bytes / 0 bytes 5 min
Out 0 (0 bytes) 5 min
Tasks/Time 0 / 00:00:00.000 5 min

Step 9 - Configure MySQL and PostgreSQL database connection

Here, we are using `PutDatabaseRecord` processor to send data to MySQL.

Configuration should look like this



Configure Processor | PutDatabaseRecord 1.27.0

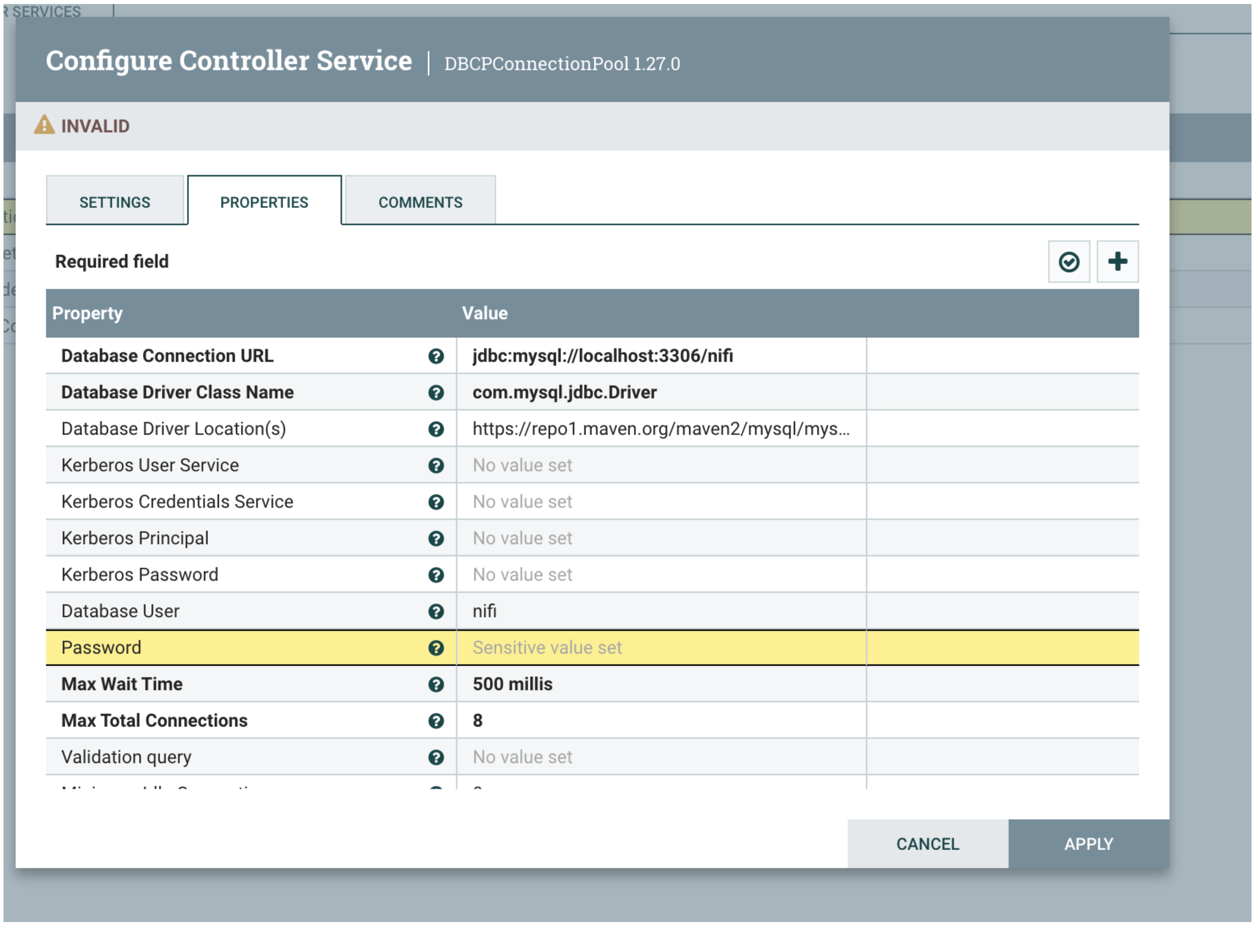
Invalid

Required field

Property	Value
Record Reader	**JsonTreeReader**
Database Type	MySQL
Statement Type	**INSERT**
Data Record Path	No value set
Database Connection Pooling Service	**DBCPConnectionPool**
Catalog Name	No value set
Schema Name	No value set
Table Name	**nifi_dummy**
Binary String Format	UTF-8
Translate Field Names	true
Unmatched Field Behavior	Ignore Unmatched Fields
Unmatched Column Behavior	Fail on Unmatched Columns

Here, since we are expecting JSON input, we use JsonTreeReader processor with everything default config.

Then, we have DBCPConnectionPool Controller service which requires extra configuration.



Property	Value
Database Connection URL	**jdbc:mysql://localhost:3306/nifi**
Database Driver Class Name	**com.mysql.jdbc.Driver**
Database Driver Location(s)	https://repo1.maven.org/maven2/mysql/mys...
Kerberos User Service	No value set
Kerberos Credentials Service	No value set
Kerberos Principal	No value set
Kerberos Password	No value set
Database User	nifi
Password	Sensitive value set
Max Wait Time	**500 millis**
Max Total Connections	**8**
Validation query	No value set

We need to put in Database connection URL, Database driver class name, Database driver location jar files, database user and database password

For MySQL

Database Connection URL	jdbc:mysql://hostname:3306/databasename?serverTimezone=UTC
Database Driver Class Name	com.mysql.jdbc.Driver
Database Driver Location(s)	https://repo1.maven.org/maven2/mysql/mysql-connector-java/8.0.19/mysql-connector-java-8.0.19.jar

For PostgresQL

Database Connection URL	jdbc:postgresql://hostname:3306/databasename?serverTimezone=UTC

Database Driver Class Name	org.postgresql.Driver
Database Driver Location(s)	https://jdbc.postgresql.org/download/postgresql-42.7.4.jar

Now by the design of SQL databases, the tables must be already created before sending data to them. Otherwise, it would complain of table not being existing.

That is it. Try to run entire workflow now and it should send data properly to databases.