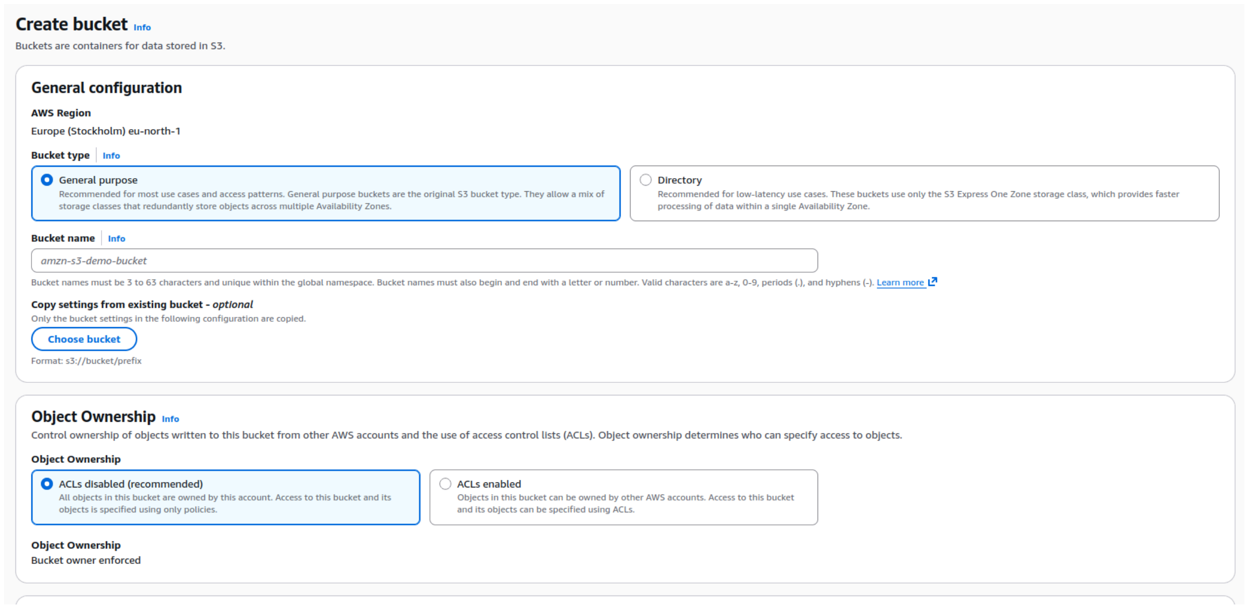
Handle AWS Part

1.Create S3 Bucket
2.Create IAM Policy for kafka and spark Streaming
3.Create IAM User and assign polices
4.Create Access token and secret Key
5.Prepare Full Needed Connection Info
6.Create IAM Policy for Snowflake
7.Create IAM Role for Snowflake
8.Additional Steps To make connection with snowFlake

1.Create S3 Bucket with the following settings to use as staging layer

Make Prefix Kafka/ for kafka and spark data



Create bucket Info
Buckets are containers for data stored in S3.

General configuration
AWS Region
Europe (Stockholm) eu-north-1

Bucket type | Info
[✓ General purpose] Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple Availability Zones.
Directory: Recommended for low-latency use cases. These buckets use only the S3 Express One Zone storage class, which provides faster processing of data within a single Availability Zone.

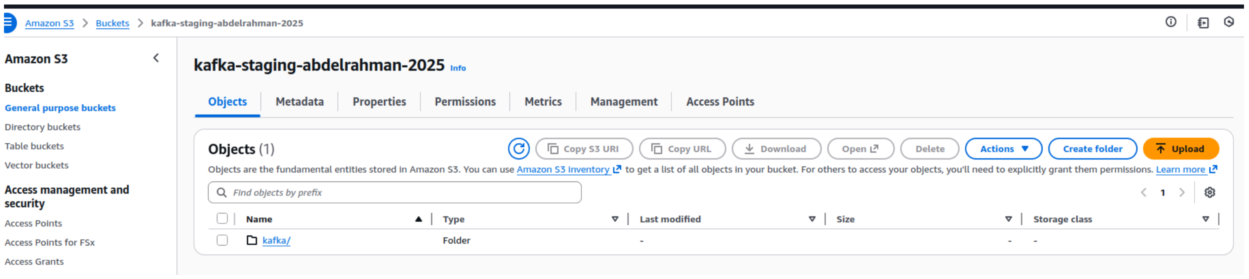
Bucket name | Info
amzn-s3-demo-bucket
Bucket names must be 3 to 63 characters and unique within the global namespace. Bucket names must also begin and end with a letter or number. Valid characters are a-z, 0-9, periods (.), and hyphens (-). Learn more

Copy settings from existing bucket - *optional*
Only the bucket settings in the following configuration are copied.
Choose bucket
Format: s3://bucket/prefix

Object Ownership Info
Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

Object Ownership
[✓ ACLs disabled (recommended)] All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.
ACLs enabled: Objects in this bucket can be owned by other AWS accounts. Access to this bucket and its objects can be specified using ACLs.

Object Ownership
Bucket owner enforced



Amazon S3 > Buckets > kafka-staging-abdelrahman-2025

kafka-staging-abdelrahman-2025 Info

Objects (1)
Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

Name	Type	Last modified	Size	Storage class
kafka/	Folder	-	-	-

2. Create IAM Policy for kafka and spark Streaming Using Json

Policy name S3andSpark

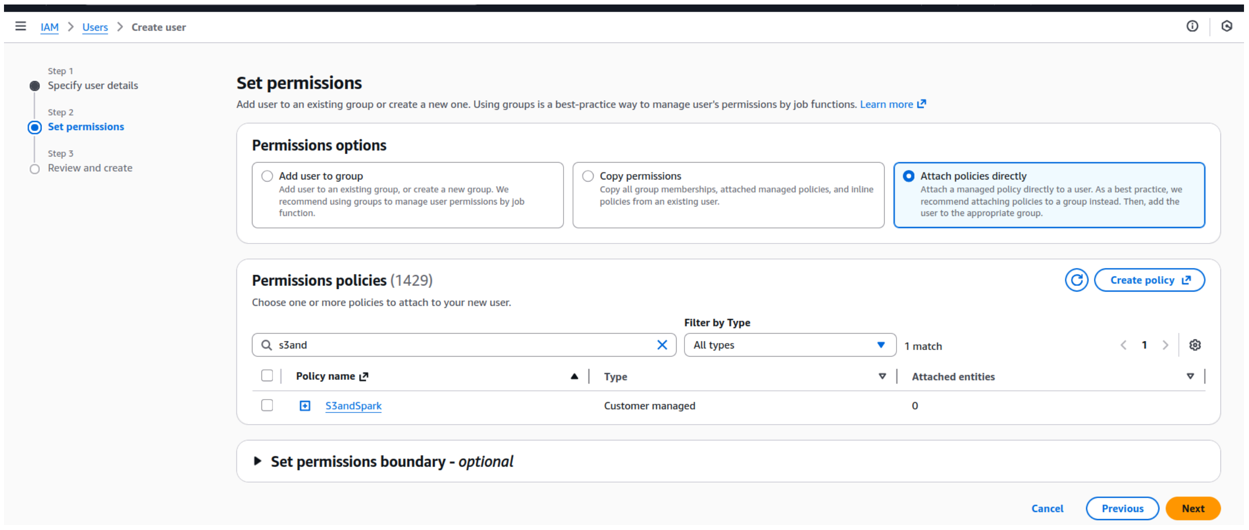
```
{
   "Version": "2012-10-17",
   "Statement": [
       {
           "Sid": "AllowListBucketRoot",
           "Effect": "Allow",
           "Action": "s3:ListBucket",
           "Resource": "arn:aws:s3:::kafka-staging-abdelrahman-2025"
       },
       {
           "Sid": "AllowListSpecificPrefix",
           "Effect": "Allow",
           "Action": "s3:ListBucket",
           "Resource": "arn:aws:s3:::kafka-staging-abdelrahman-2025",
           "Condition": {
               "StringLike": {
                   "s3:prefix": [
                       "kafka/flights/*",
                       "kafka/flights/_spark_metadata/*"
                   ]
               }
           }
       },
       {
           "Sid": "AllowObjectOperations",
           "Effect": "Allow",
           "Action": [
               "s3:GetObject",
               "s3:PutObject",
               "s3:DeleteObject"
           ],
           "Resource": "arn:aws:s3:::kafka-staging-abdelrahman-2025/*"
       }
   ]
}
```

Also, I created another one with full access for testing
FullS3Acces

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Sid": "AllowFullS3Access",
            "Effect": "Allow",
            "Action": "s3:*",
            "Resource": [
                "arn:aws:s3:::kafka-staging-abdelrahman-2025",
                "arn:aws:s3:::kafka-staging-abdelrahman-2025/*"
            ]
        }
    ]
 }
```

3.Create IAM User and assign polices

Create user “kafka_local_writer” with the following setting and choose the policy created



IAM > Users > Create user

Step 1
Specify user details
Step 2
Set permissions
Step 3
Review and create

Set permissions

Add user to an existing group or create a new one. Using groups is a best-practice way to manage user's permissions by job functions. Learn more

Permissions options

- Add user to group — Add user to an existing group, or create a new group. We recommend using groups to manage user permissions by job function.
- Copy permissions — Copy all group memberships, attached managed policies, and inline policies from an existing user.
- [✓ Attach policies directly] — Attach a managed policy directly to a user. As a best practice, we recommend attaching policies to a group instead. Then, add the user to the appropriate group.

Permissions policies (1429)

Choose one or more policies to attach to your new user.

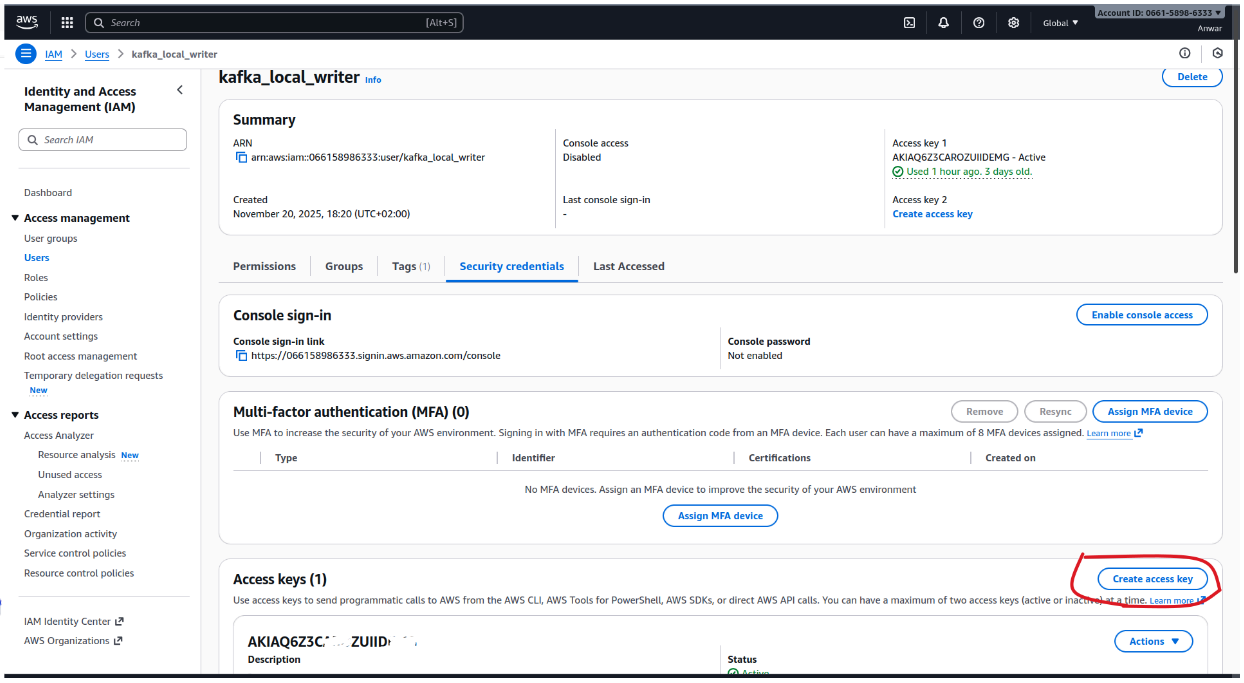
Search: s3and — Filter by Type: All types — 1 match

	Policy name	Type	Attached entities
☐	S3andSpark	Customer managed	0

Set permissions boundary - *optional*

4. Create an Access token and a secret Key

From the user page, go to Security credentials and Create access key


aws | Search [Alt+S] | Global | Account ID: 0661-5898-6333 | Anwar

IAM > Users > kafka_local_writer

Identity and Access Management (IAM)

Search IAM

- Dashboard
- Access management
  - User groups
  - Users
  - Roles
  - Policies
  - Identity providers
  - Account settings
  - Root access management
  - Temporary delegation requests New
- Access reports
  - Access Analyzer
    - Resource analysis New
    - Unused access
    - Analyzer settings
  - Credential report
  - Organization activity
  - Service control policies
  - Resource control policies
- IAM Identity Center
- AWS Organizations

kafka_local_writer Info — Delete

Summary

ARN arn:aws:iam::066158986333:user/kafka_local_writer	Console access Disabled	Access key 1 AKIAQ6Z3CAROZUIIDEMG - Active Used 1 hour ago. 3 days old.
Created November 20, 2025, 18:20 (UTC+02:00)	Last console sign-in -	Access key 2 Create access key

Permissions | Groups | Tags (1) | Security credentials | Last Accessed

Console sign-in — Enable console access

Console sign-in link: https://066158986333.signin.aws.amazon.com/console
Console password: Not enabled

Multi-factor authentication (MFA) (0) — Remove | Resync | Assign MFA device

Use MFA to increase the security of your AWS environment. Signing in with MFA requires an authentication code from an MFA device. Each user can have a maximum of 8 MFA devices assigned. Learn more

Type	Identifier	Certifications	Created on

No MFA devices. Assign an MFA device to improve the security of your AWS environment

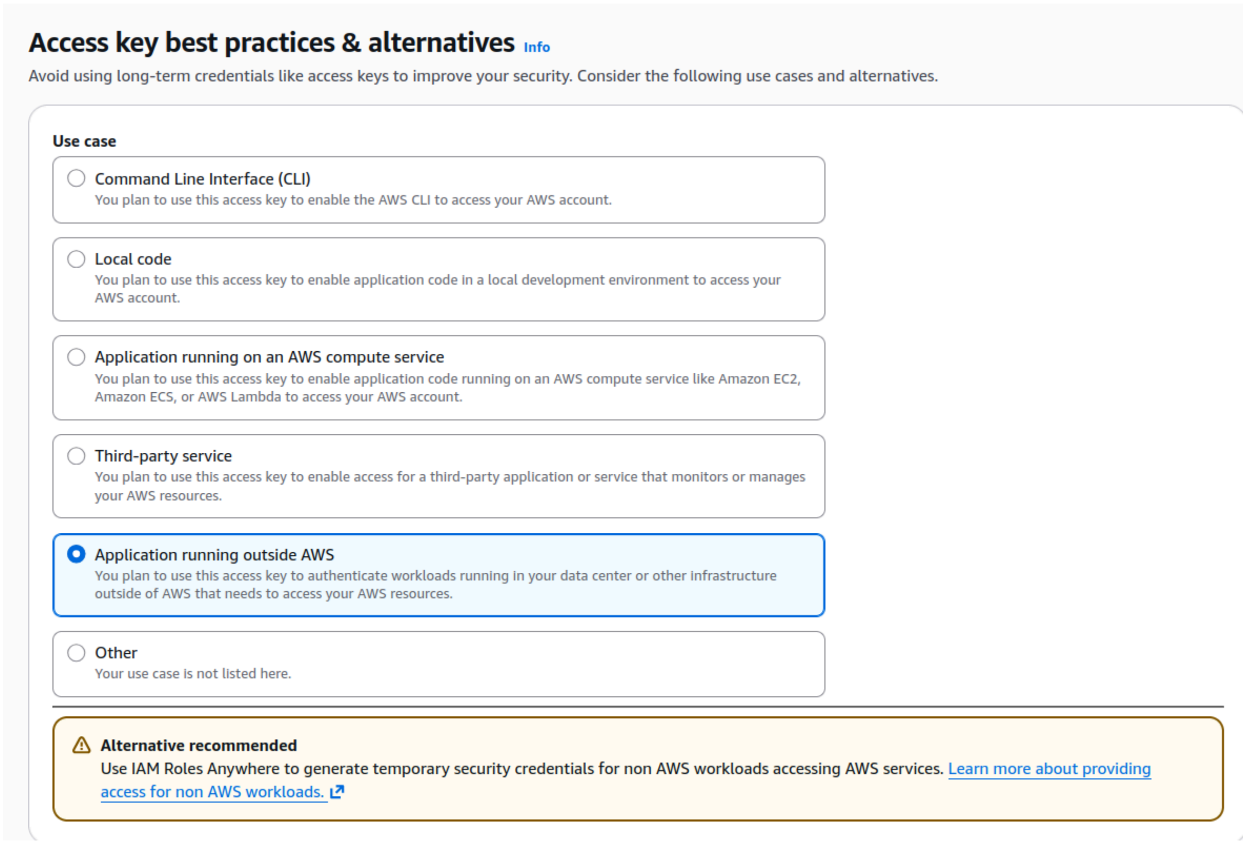
Assign MFA device

Access keys (1) — Create access key

Use access keys to send programmatic calls to AWS from the AWS CLI, AWS Tools for PowerShell, AWS SDKs, or direct AWS API calls. You can have a maximum of two access keys (active or inactive) at a time. Learn more

AKIAQ6Z3C[redacted]ZUIID[redacted] — Actions

Description | Status: Active


Access key best practices & alternatives Info

Avoid using long-term credentials like access keys to improve your security. Consider the following use cases and alternatives.

Use case

- ( ) **Command Line Interface (CLI)**
  You plan to use this access key to enable the AWS CLI to access your AWS account.
- ( ) **Local code**
  You plan to use this access key to enable application code in a local development environment to access your AWS account.
- ( ) **Application running on an AWS compute service**
  You plan to use this access key to enable application code running on an AWS compute service like Amazon EC2, Amazon ECS, or AWS Lambda to access your AWS account.
- ( ) **Third-party service**
  You plan to use this access key to enable access for a third-party application or service that monitors or manages your AWS resources.
- [✓ **Application running outside AWS**]
  You plan to use this access key to authenticate workloads running in your data center or other infrastructure outside of AWS that needs to access your AWS resources.
- ( ) **Other**
  Your use case is not listed here.

Alternative recommended
Use IAM Roles Anywhere to generate temporary security credentials for non AWS workloads accessing AWS services. Learn more about providing access for non AWS workloads.

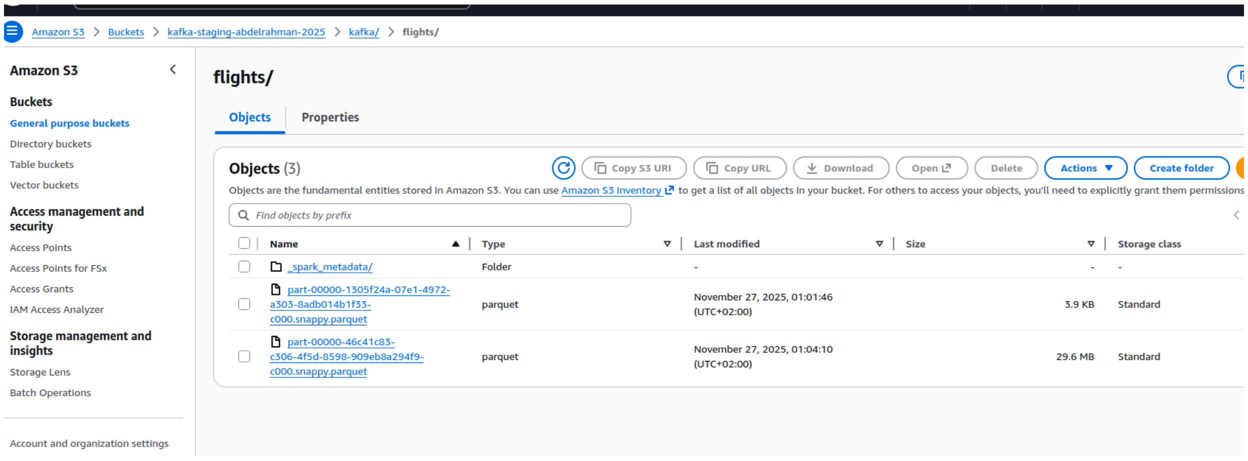
5. Prepare Full Needed Connection Info

```
{
 "connector.class": "io.confluent.connect.s3.S3SinkConnector",
 "tasks.max": "1",
 "topics": "my-topic",
 "s3.bucket.name": "kafka-staging-abdelrahman-2025",
 "s3.region": "eu-north-1",
 "aws.access.key.id": "AKIAQ6Z3**********",
 "aws.secret.access.key": "WMzzoVfcbBW****************",
 "s3.part.size": 5242880,
 "flush.size": 1000,
 "storage.class": "io.confluent.connect.s3.storage.S3Storage",
 "format.class": "io.confluent.connect.s3.format.csv.CsvFormat",
 "s3.prefix": "kafka/"
}
```

and you can test the connection by run this code in your local machine

```
from pyspark.sql import SparkSession

spark = SparkSession.builder \
   .appName("WriteToS3") \
   .config("spark.hadoop.fs.s3a.impl",
"org.apache.hadoop.fs.s3a.S3AFileSystem") \
   .config("spark.hadoop.fs.s3a.access.key", "AKIAQ6Z3**********") \
   .config("spark.hadoop.fs.s3a.secret.key",
"WMzzoVfcbBW****************") \
   .config("spark.hadoop.fs.s3a.endpoint", "s3.eu-north-1.amazonaws.com")
\
   .config("spark.hadoop.fs.s3a.path.style.access", "true") \
   .config("spark.hadoop.fs.s3a.aws.credentials.provider",
"org.apache.hadoop.fs.s3a.SimpleAWSCredentialsProvider") \
   .config("spark.hadoop.fs.s3a.fast.upload", "true") \
   .getOrCreate()

spark.sparkContext.setLogLevel("ERROR")

data = [("Alice", 25), ("Bob", 30)]
df = spark.createDataFrame(data, ["name", "age"])

df.write.mode("overwrite").parquet("s3a://kafka-staging-abdelrahman-2025/k
afka/test-staging")
```

Tell this your data Should be uploaded normally into the staging layer in S3



Objects (3)

Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others to access your objects, you'll need to explicitly grant them permissions

Name	Type	Last modified	Size	Storage class
_spark_metadata/	Folder	-	-	-
part-00000-1305f24a-07e1-4972-a303-8adb014b1f33-c000.snappy.parquet	parquet	November 27, 2025, 01:01:46 (UTC+02:00)	3.9 KB	Standard
part-00000-46c41c83-c306-4f5d-8598-909eb8a294f9-c000.snappy.parquet	parquet	November 27, 2025, 01:04:10 (UTC+02:00)	29.6 MB	Standard

During these steps, we encountered several different problems. For example, I modified the policy more than ten times, and there were problems with the Access Token, Connection config, and others. One of the most significant problems was that the signature had expired.

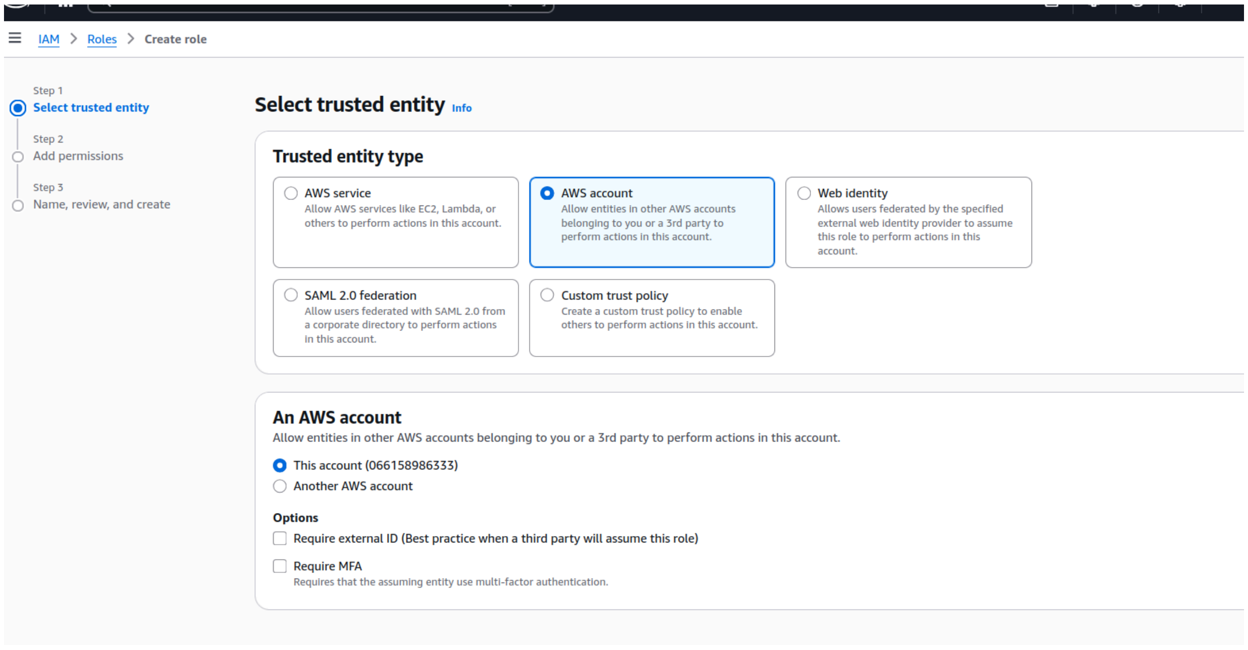
6. Create IAM Policy for Snowflake

Snowflakegetobj

```
{
   "Version": "2012-10-17",
   "Statement": [
       {
           "Effect": "Allow",
           "Action": [
               "s3:GetObject",
               "s3:ListBucket"
           ],
           "Resource": [
               "arn:aws:s3:::kafka-staging-abdelrahman-2025",
               "arn:aws:s3:::kafka-staging-abdelrahman-2025/kafka/*"
           ]
       }
   ]
}
```

7. Create IAM Role for Snowflake

First, create a Role AWS Account without an external ID



IAM > Roles > Create role

Step 1
Select trusted entity

Step 2
Add permissions

Step 3
Name, review, and create

Select trusted entity Info

Trusted entity type

- AWS service
  Allow AWS services like EC2, Lambda, or others to perform actions in this account.
- [✓ AWS account]
  Allow entities in other AWS accounts belonging to you or a 3rd party to perform actions in this account.
- Web identity
  Allows users federated by the specified external web identity provider to assume this role to perform actions in this account.
- SAML 2.0 federation
  Allow users federated with SAML 2.0 from a corporate directory to perform actions in this account.
- Custom trust policy
  Create a custom trust policy to enable others to perform actions in this account.

An AWS account

Allow entities in other AWS accounts belonging to you or a 3rd party to perform actions in this account.

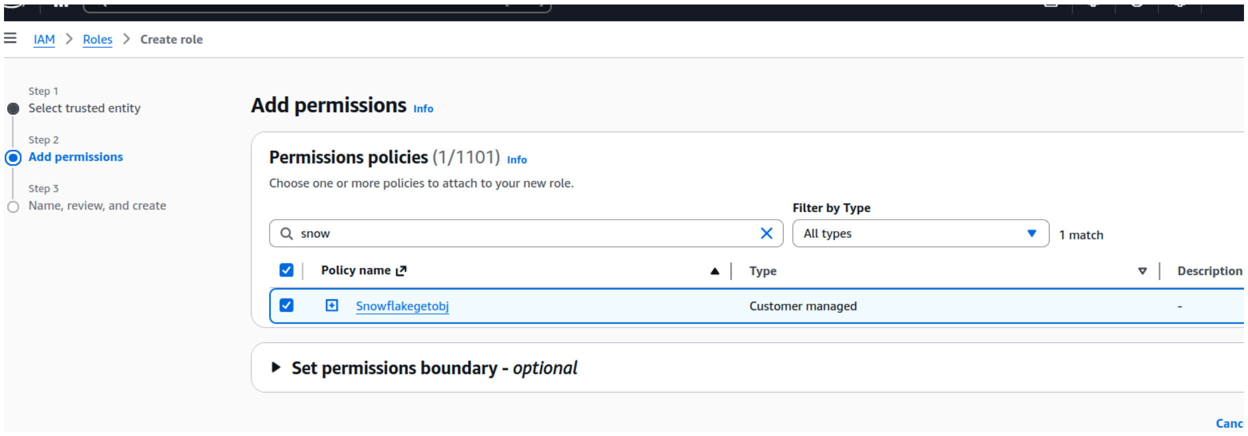
[✓ This account (066158986333)]
Another AWS account

Options

☐ Require external ID (Best practice when a third party will assume this role)

☐ Require MFA
Requires that the assuming entity use multi-factor authentication.

Add the policy



IAM > Roles > Create role

Step 1
Select trusted entity

Step 2
Add permissions

Step 3
Name, review, and create

Add permissions Info

Permissions policies (1/1101) Info

Choose one or more policies to attach to your new role.

Search: snow

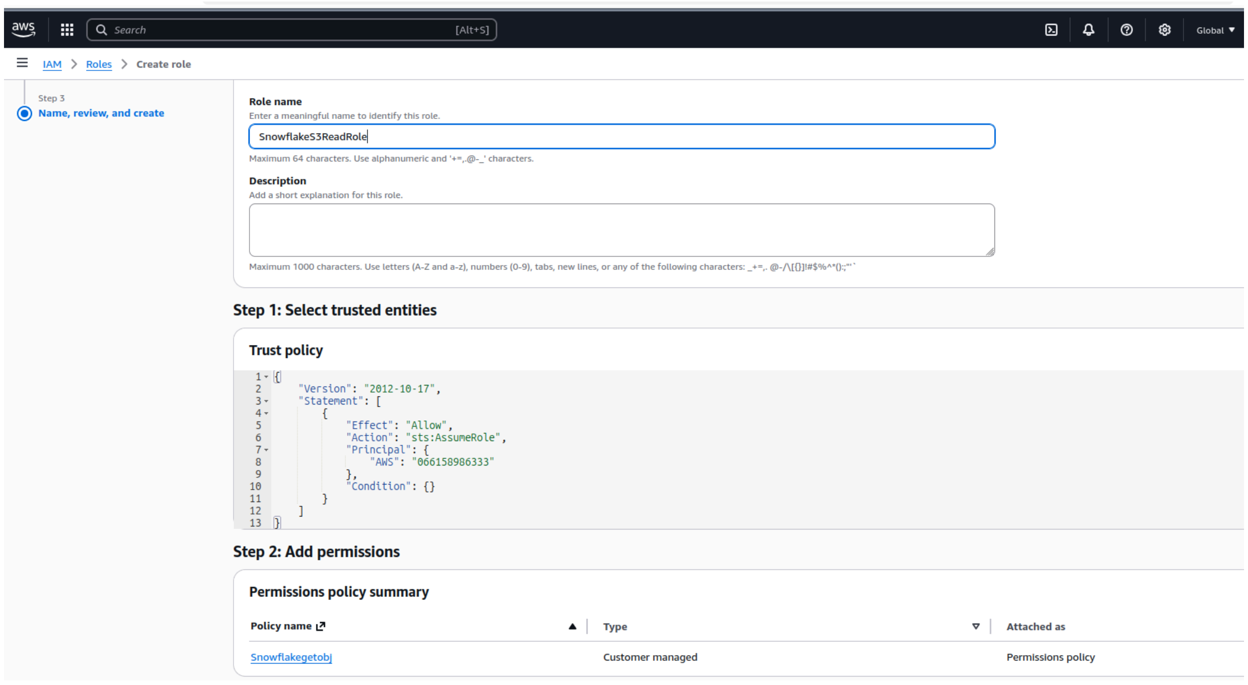
Filter by Type: All types

1 match

✓	Policy name	Type	Description
✓	Snowflakegetobj	Customer managed	-

▶ Set permissions boundary - *optional*

Canc



Role name
Enter a meaningful name to identify this role.
SnowflakeS3ReadRole
Maximum 64 characters. Use alphanumeric and '+=,.@-_' characters.

Description
Add a short explanation for this role.

Maximum 1000 characters. Use letters (A-Z and a-z), numbers (0-9), tabs, new lines, or any of the following characters: _+=,. @-/\[{}]!#$%^*();:"'`

Step 1: Select trusted entities

Trust policy

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "sts:AssumeRole",
            "Principal": {
                "AWS": "066158986333"
            },
            "Condition": {}
        }
    ]
}
```

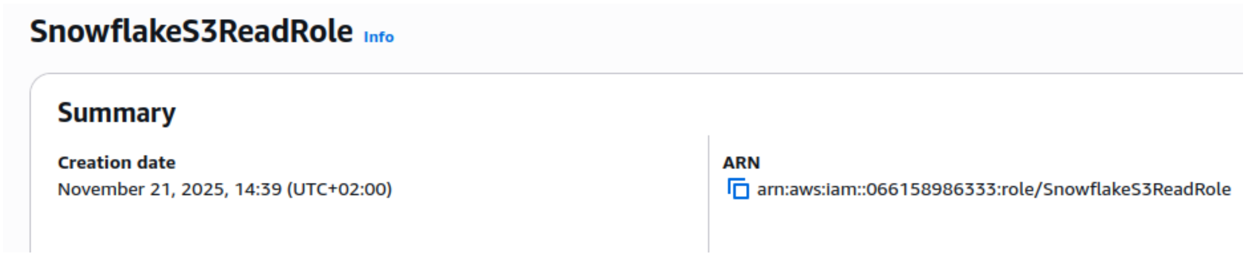
Step 2: Add permissions

Permissions policy summary

Policy name	Type	Attached as
Snowflakegetobj	Customer managed	Permissions policy

8. Additional Steps to make a connection with Snowflake

Now the Role is ready. We need the Role ARN



SnowflakeS3ReadRole

Summary

Creation date
November 21, 2025, 14:39 (UTC+02:00)

ARN
arn:aws:iam::066158986333:role/SnowflakeS3ReadRole

Next, go to Snowflake and run the following

```
DESC INTEGRATION KAFKA_S3_INT;
```

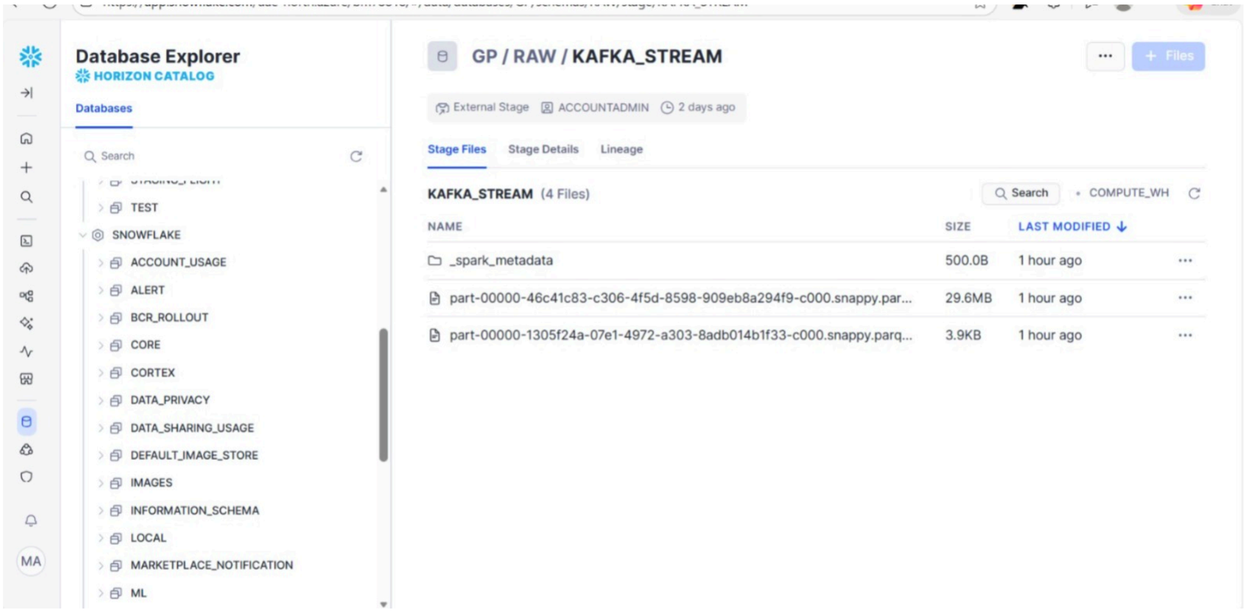
```
CREATE OR REPLACE STORAGE INTEGRATION KAFKA_S3_INT
 TYPE = EXTERNAL_STAGE
 STORAGE_PROVIDER = S3
 ENABLED = TRUE
 STORAGE_AWS_ROLE_ARN = arn:aws:iam::066158986333:role/SnowflakeS3ReadRole
 STORAGE_ALLOWED_LOCATIONS =
('s3://kafka-staging-abdelrahman-2025/kafka/');
```

```
DESC INTEGRATION KAFKA_S3_INT;
```

Then a Table will be shown we need the following information from it
External ID and Principal code
Then, go to the Role and edit Trusted entities :

```
{
   "Version": "2012-10-17",
   "Statement": [
       {
           "Effect": "Allow",
           "Principal": {
               "AWS": "arn:aws:iam::<aws-snowflake arn code >:root"
           },
           "Action": "sts:AssumeRole",
           "Condition": {
               "StringEquals": {
                   "sts:ExternalId": "<ExternalId>"
               }
           }
       }
   ]
}
```

Now you can see the data in Snowflake



GP / RAW / KAFKA_STREAM

External Stage · ACCOUNTADMIN · 2 days ago

KAFKA_STREAM (4 Files)

NAME	SIZE	LAST MODIFIED
_spark_metadata	500.0B	1 hour ago
part-00000-46c41c83-c306-4f5d-8598-909eb8a294f9-c000.snappy.par...	29.6MB	1 hour ago
part-00000-1305f24a-07e1-4972-a303-8adb014b1f33-c000.snappy.parq...	3.9KB	1 hour ago