To upload data from **AWS S3 to Snowflake**, you can use **three different methods** depending on your use case. Each method offers varying levels of automation, security, and configuration effort. Let's go through them in **beginner-friendly** detail using the diagram you provided.

**✅ Overview**

You have data stored in **Amazon S3**, and your goal is to **load it into Snowflake tables**. Snowflake supports integration with S3 using multiple authentication and loading mechanisms.

The **three methods** shown in the diagram are:

**📌 Method 1: Direct Access Using Access Keys (Manual)**

🔐 Suitable for **quick tests** and **small projects**.  
❌ Not recommended for production (less secure).

**🔧 How it works:**

1. You create an **AWS IAM User** with:
   * Access Key
   * Secret Access Key
   * Permissions to access specific S3 buckets.
2. You create a **stage** in Snowflake (called SF-Stage) with these credentials.
3. You use the COPY INTO command to manually load data into your **target table**.

**🪜 Steps:**

1. **In AWS**:
   * Go to IAM → Users → Add User.
   * Enable "Programmatic Access".
   * Attach a policy that gives access to your S3 bucket.
2. **In Snowflake**:
3. CREATE STAGE my\_stage
4. URL='s3://your-bucket/path/'
5. CREDENTIALS = (AWS\_KEY\_ID='your-access-key' AWS\_SECRET\_KEY='your-secret-key')
6. FILE\_FORMAT = (TYPE = 'CSV' FIELD\_DELIMITER = ',' SKIP\_HEADER = 1);
7. **Load Data**:
8. COPY INTO your\_target\_table
9. FROM @my\_stage
10. FILE\_FORMAT = (FORMAT\_NAME = 'CSV\_FILE\_FORMAT');

**📌 Method 2: Using S3 Integration (Manual Copying via IAM Role)**

✅ Recommended for production  
🔐 Secure because it uses IAM roles, not secret keys

**🔧 How it works:**

1. You create an **IAM Role** in AWS with access to S3.
2. This role is trusted by **Snowflake**, which assumes the role to access S3 securely.
3. You use COPY INTO manually.

**🪜 Steps:**

1. **In AWS**:
   * Create an **IAM Role**.
   * Attach policy to access S3.
   * Allow Snowflake’s account to assume this role (trust relationship).
2. **In Snowflake**:
3. CREATE STORAGE INTEGRATION my\_s3\_integration
4. TYPE = EXTERNAL\_STAGE
5. STORAGE\_PROVIDER = S3
6. ENABLED = TRUE
7. STORAGE\_AWS\_ROLE\_ARN = 'arn:aws:iam::account-id:role/my-snowflake-role'
8. STORAGE\_ALLOWED\_LOCATIONS = ('s3://your-bucket/path/');
9. **Create stage** using this integration:
10. CREATE STAGE my\_stage
11. URL = 's3://your-bucket/path/'
12. STORAGE\_INTEGRATION = my\_s3\_integration
13. FILE\_FORMAT = (TYPE = 'CSV' FIELD\_DELIMITER = ',' SKIP\_HEADER = 1);
14. **Load Data**:
15. COPY INTO your\_target\_table
16. FROM @my\_stage
17. FILE\_FORMAT = (FORMAT\_NAME = 'CSV\_FILE\_FORMAT');

**📌 Method 3: Using Snowpipe (Automated Loading with Notifications)**

🤖 Best for **real-time or automated loading**  
✅ Secure and scalable

**🔧 How it works:**

* Similar to Method 2 but adds a **Pipe**.
* When new files arrive in S3, a **notification** is sent to Snowflake.
* Snowflake automatically loads the data using **Snowpipe**.

**🪜 Steps:**

1. **Same steps as Method 2** (create IAM Role, integration, and stage).
2. **Create a Pipe in Snowflake**:
3. CREATE OR REPLACE PIPE my\_pipe
4. AUTO\_INGEST = TRUE
5. AS
6. COPY INTO your\_target\_table
7. FROM @my\_stage
8. FILE\_FORMAT = (FORMAT\_NAME = 'CSV\_FILE\_FORMAT');
9. **Configure S3 Event Notification**:
   * In AWS S3 console:
     + Go to the bucket.
     + Create an event notification to publish events to an SNS topic.
     + Snowflake subscribes to this SNS topic.
10. **Snowflake automatically loads data** when new files appear.

**🔄 Comparison Table**

| **Feature** | **Method 1** | **Method 2** | **Method 3** |
| --- | --- | --- | --- |
| Security | ❌ Less Secure (Keys) | ✅ IAM Role | ✅ IAM Role |
| Automation | ❌ Manual | ❌ Manual | ✅ Automatic (Snowpipe) |
| Use Case | Quick tests | Production | Real-time ingestion |
| Complexity | 🔹 Simple | 🔸 Medium | 🔺 Advanced |

**✅ Recommendation for You as a Beginner:**

* Start with **Method 1** for learning and testing (easy setup).
* Move to **Method 2** for production-level secure jobs.
* Use **Method 3** if you need automatic real-time data loading.

Would you like step-by-step help for setting up one of these methods on your AWS and Snowflake accounts?