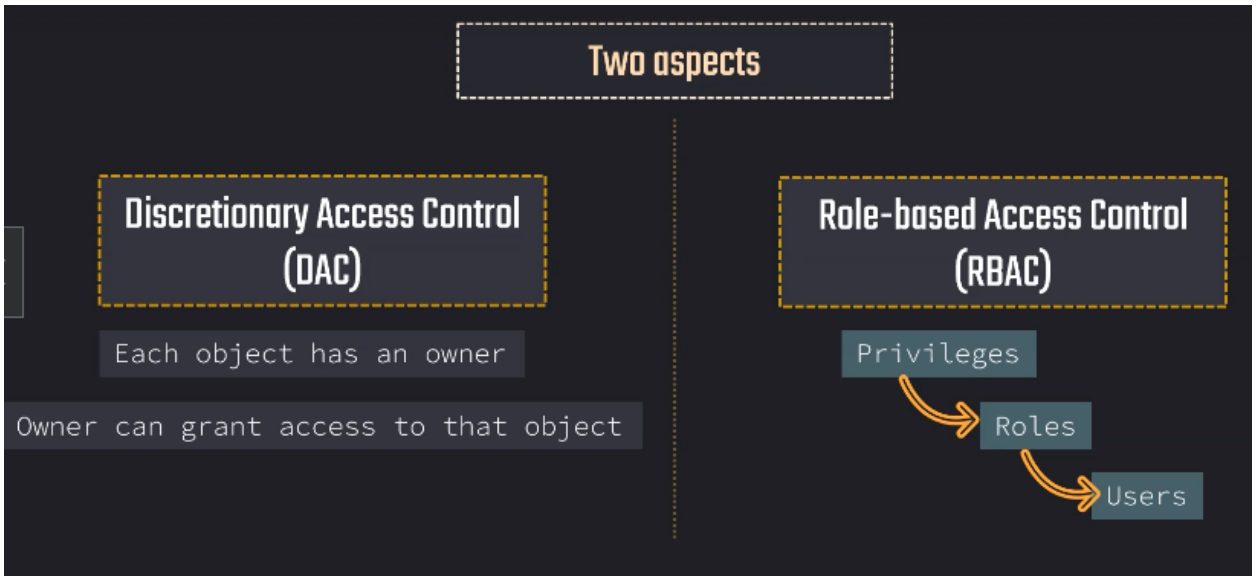
Access Control in SnowFlake

1. 

2. In DAC each object has an owner
3. Typically, the owner is the one that has created this object and the owner can now grant access to this object.
4. RBAC

Role-based access control (RBAC) in Snowflake is a method of controlling access to data, resources, and objects in Snowflake by assigning roles to users and then granting privileges to roles. This allows you to centrally manage access to Snowflake resources and simplify the process of granting and revoking access.

Roles

A role in Snowflake is a named entity that can be granted privileges on securable objects. Roles can be assigned to users and other roles. This allows you to create a hierarchy of roles, with more privileged roles granting access to less privileged roles.

5. **Privileges**

   Privileges in Snowflake are the permissions that users need to perform specific actions on securable objects. For example, the **SELECT** privilege allows users to query data in a table, and the **INSERT** privilege allows users to insert new data into a table.

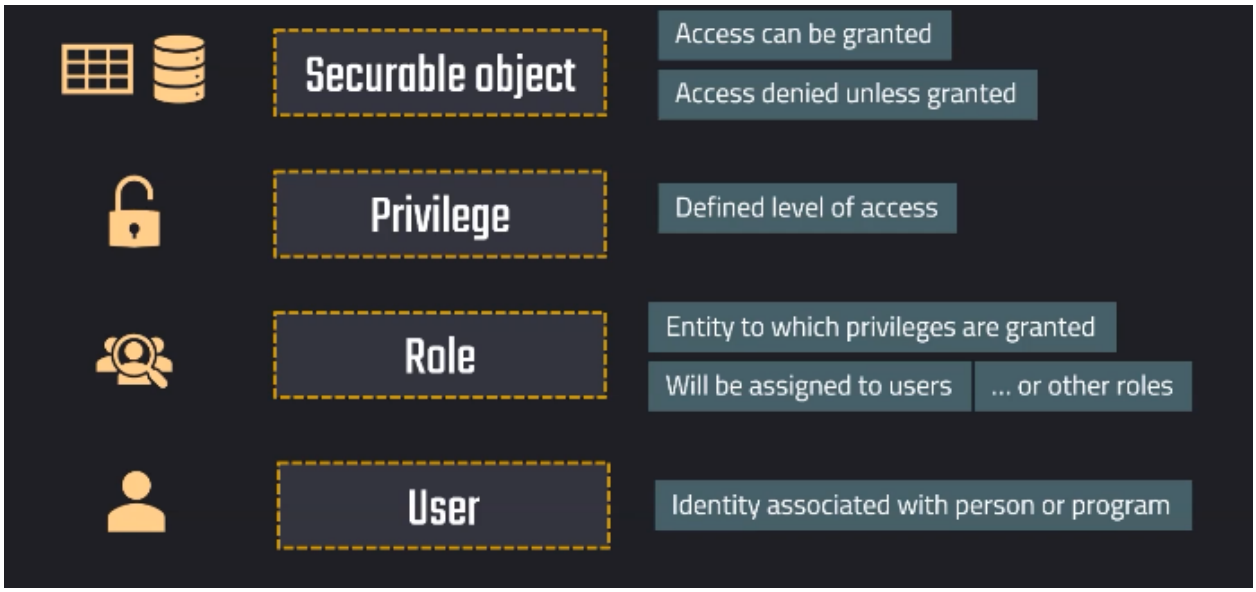
   Granting and revoking privileges

   You can grant and revoke privileges on roles using the `GRANT` and `REVOKE` statements. For example, the following statement grants the **SELECT** privilege on the `my_table` table to the `my_role` role:

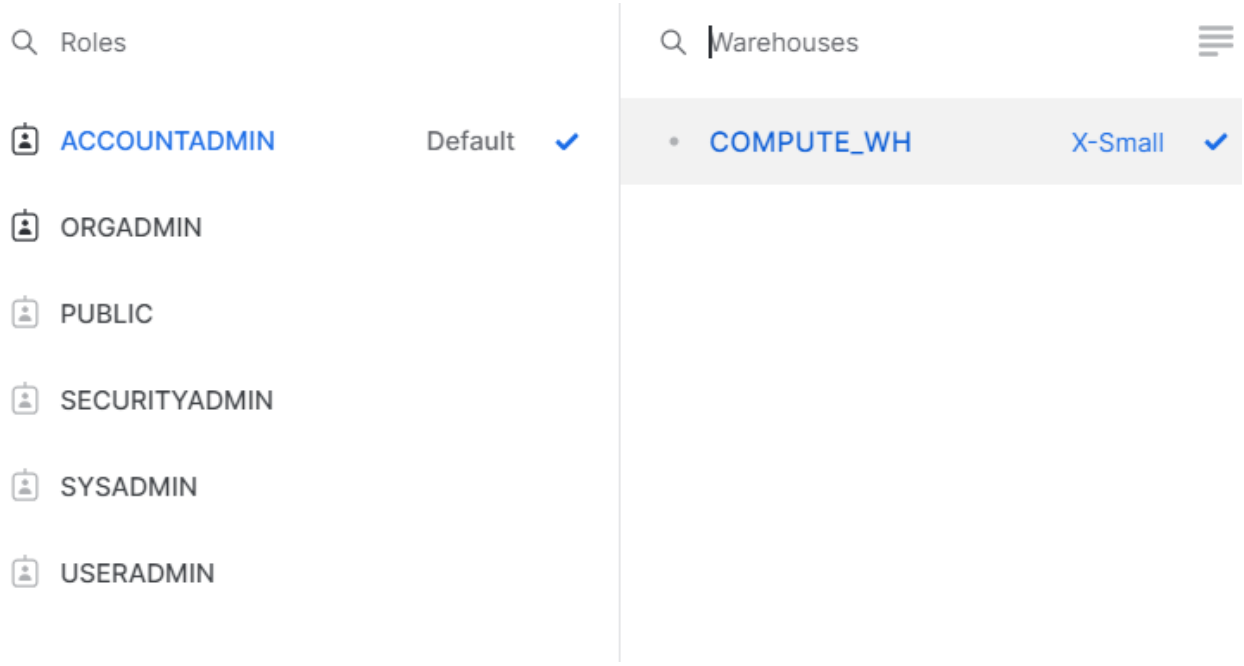
   SQL

   ```
   GRANT SELECT ON my_table TO my_role;
   ```

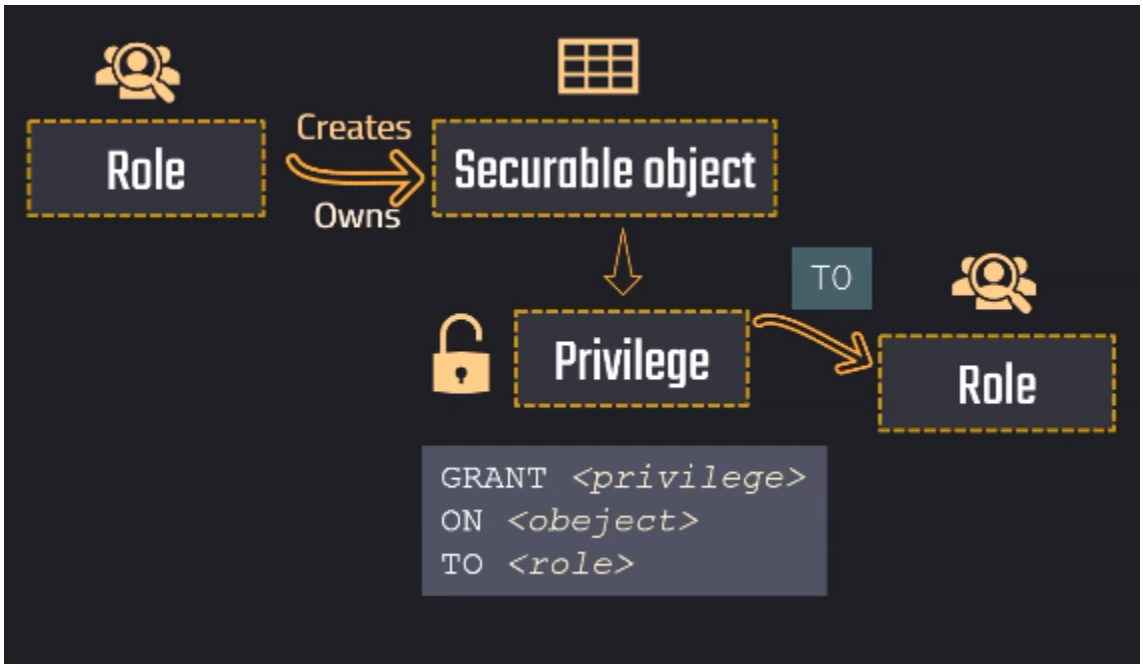
6. Key concepts in Access Control
7. Here the user will be assigned some roles..
8. Based on this roles..a user will get some privileges…and based on this privileges ..the access to the securable object can be granted



9. For example..when we are using worksheets…we need to choose a role to create or query tables etc

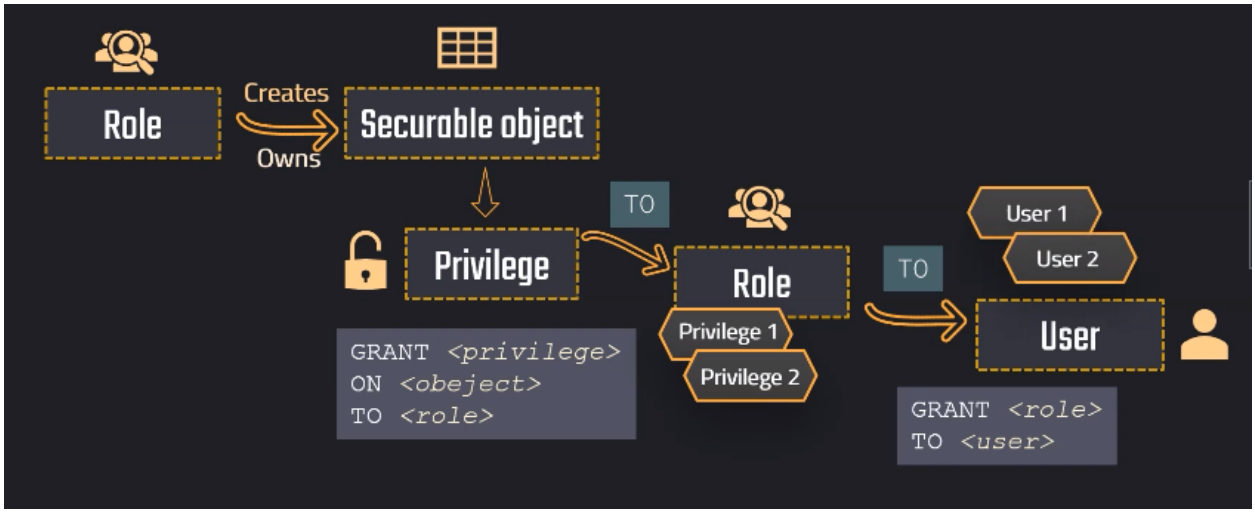


10. Now using this role here we have created a table(secured object)...so now this role is the owner of the this table which is created now
11. And now this role can grant privileges to the other role

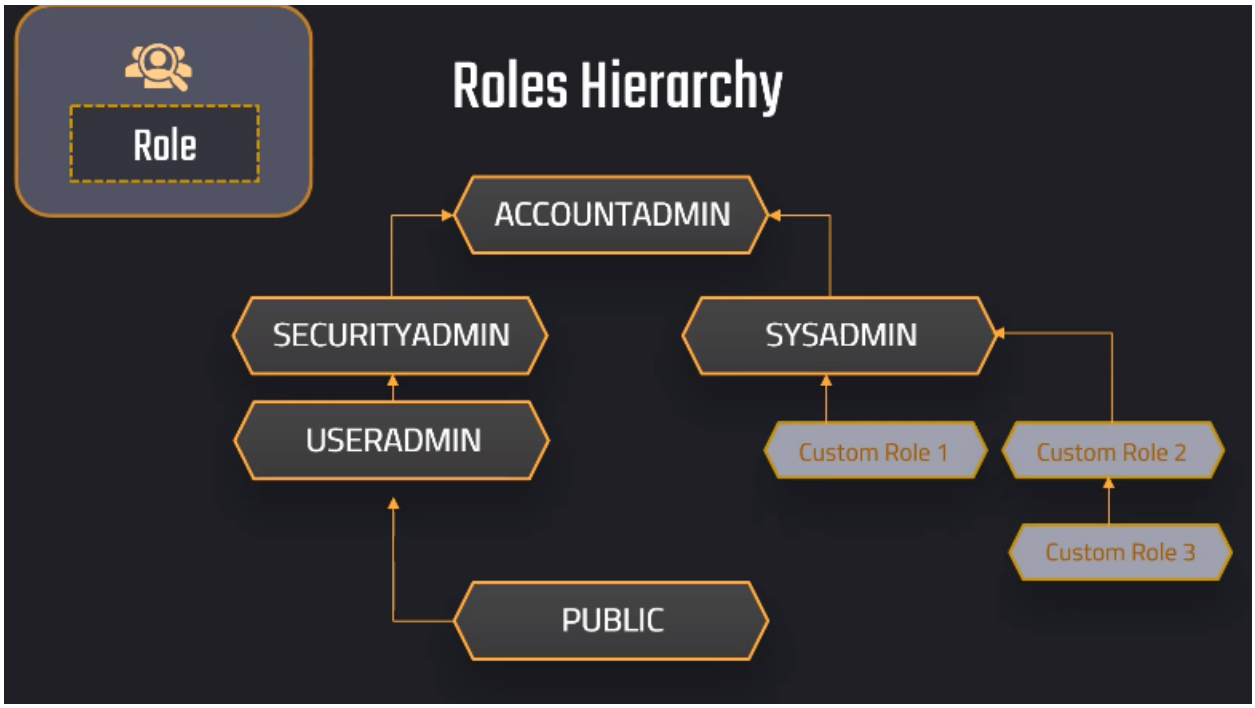


12. Now this roles may have some privileges ..
13. Privileges are nothing but…having rights on properties

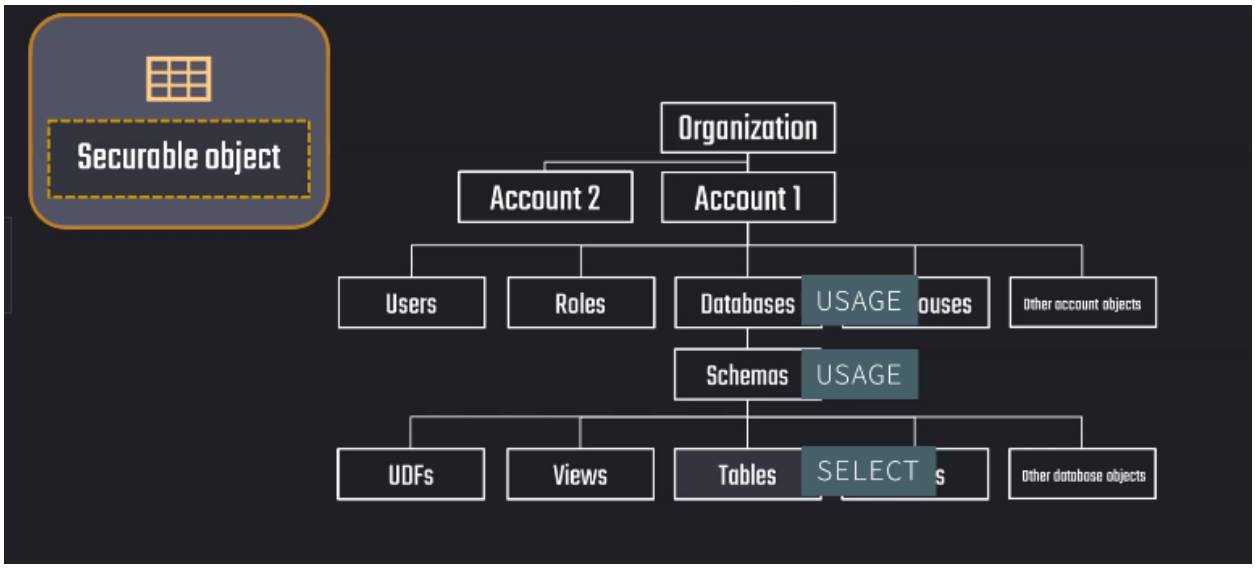
14. And now we can grant this role to some users..using grant command

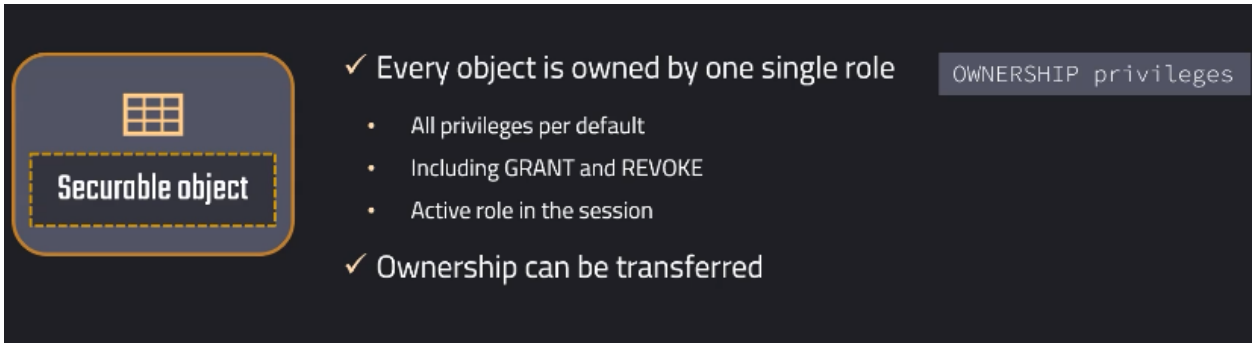


15. There is a hierarchy of system defined roles



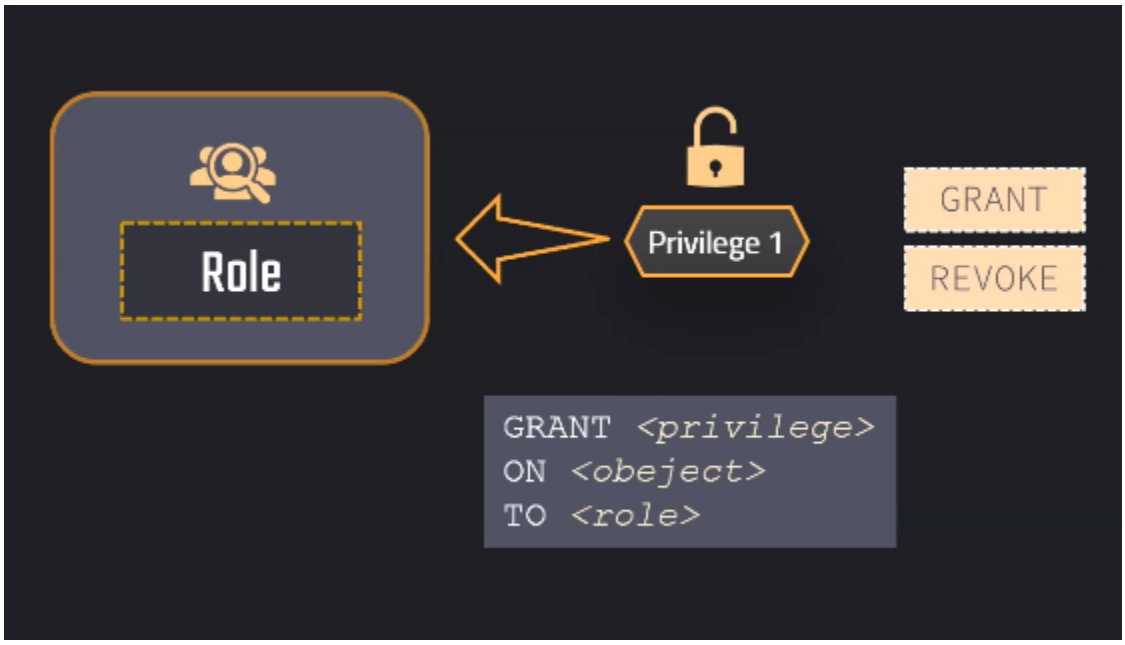
16. we just have to keep in mind that some privileges will be inherited through this hierarchy and we can also create custom roles.

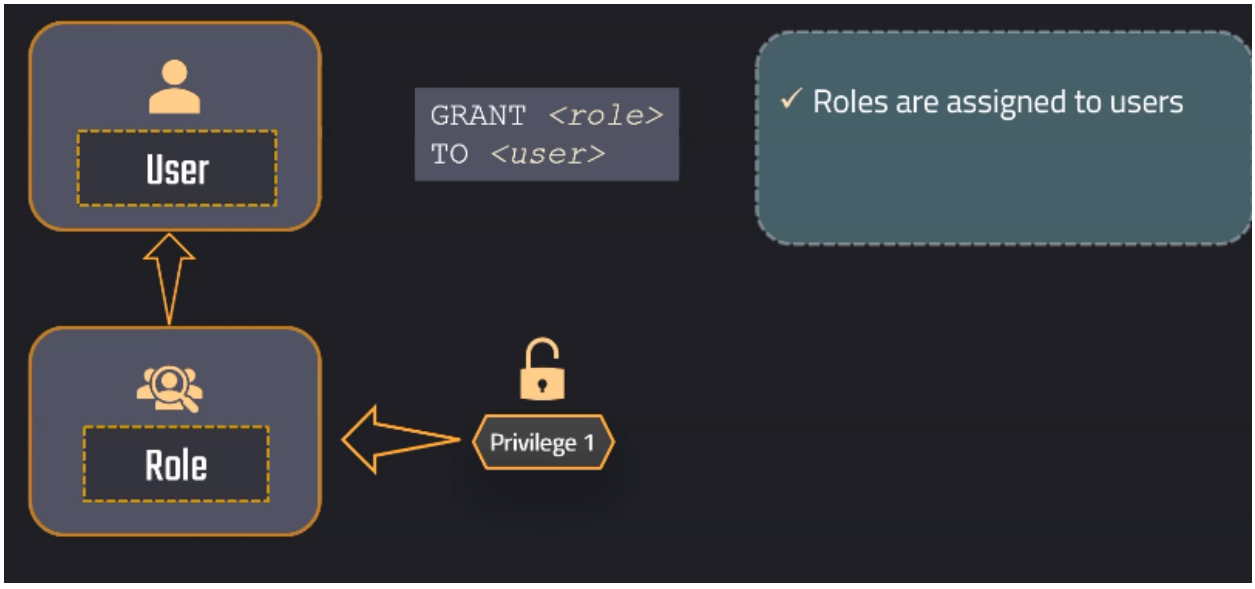
17. 

18. And in here we have to keep in mind that when we want to grant privileges to, for example, a child object, let's say a table, we also have to grant privileges to the parent object.
19. In this case, we would have to grant also usage to the schema and the database where this table is contained in.
20. 

21. So a securable object has always one single owner.
22. This is the one that has the ownership privilege. This cannot be assigned to multiple roles, but it can be transferred to another role.
23. So this ownership privilege also contains the grant and revoke privilege, which means the privileges on this object can be also granted or revoke to other roles.
24. when we create this object, this will be the active role that will be then the owner of this object.

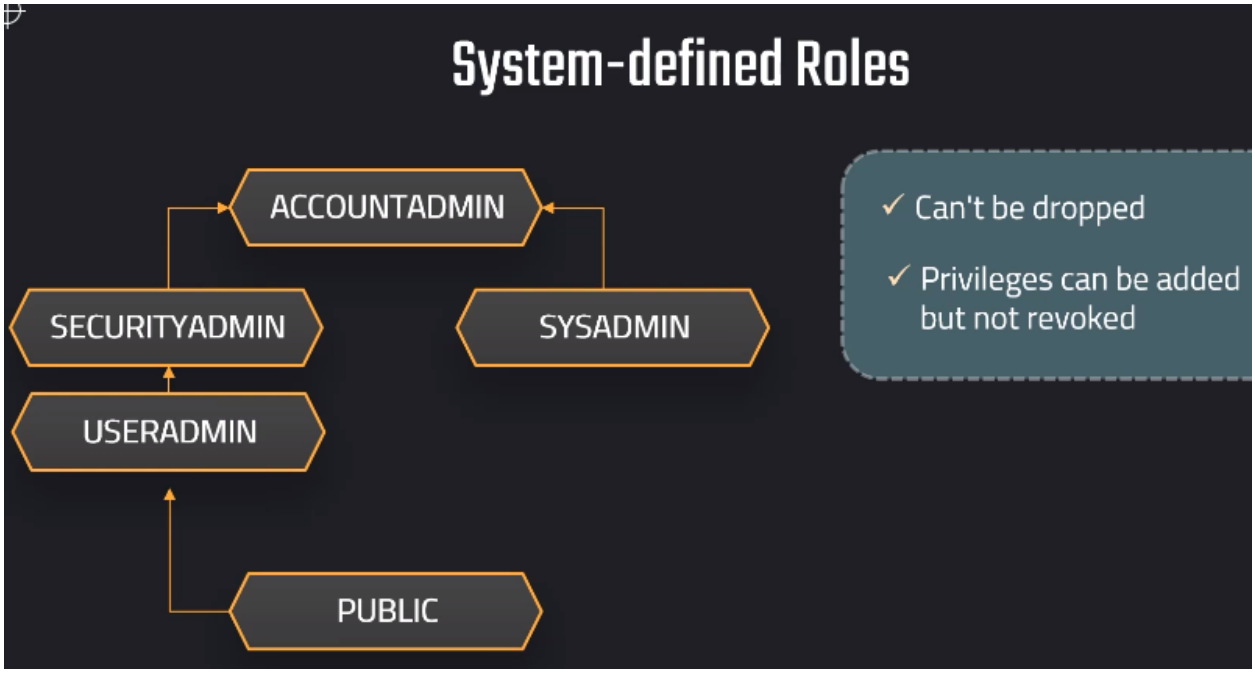
Roles

1. This is the entity to which we are assigning privileges to.
2. 

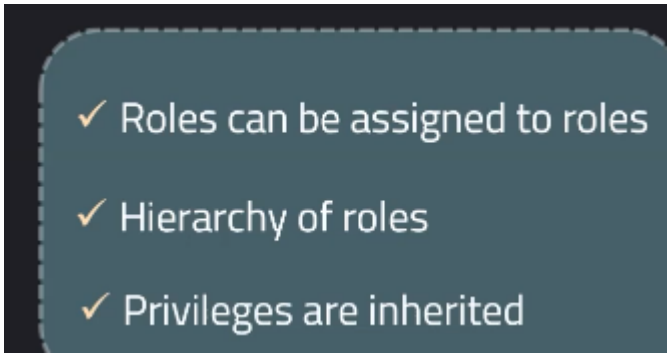
3. We can grant or revoke privileges to Role
4. A privilege can be a **select** command on a table….etc
5. Now we can assign these roles to the users…so the users get this privileges


6. We always give privileges to roles…and assign these roles to the user…so the user gets privileges
7. One user can have multiple roles assigned
8. When we are using worksheets…then there must one role selected ..which is called a primary role

9. Lets come to system defined roles…

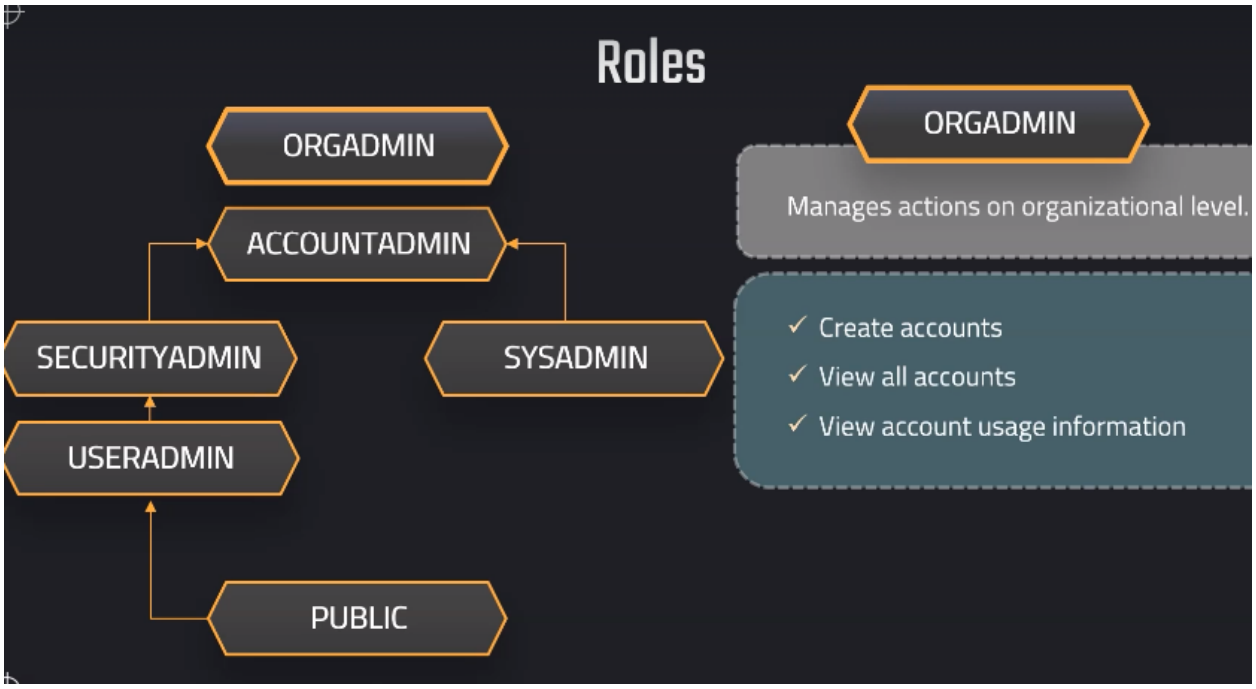


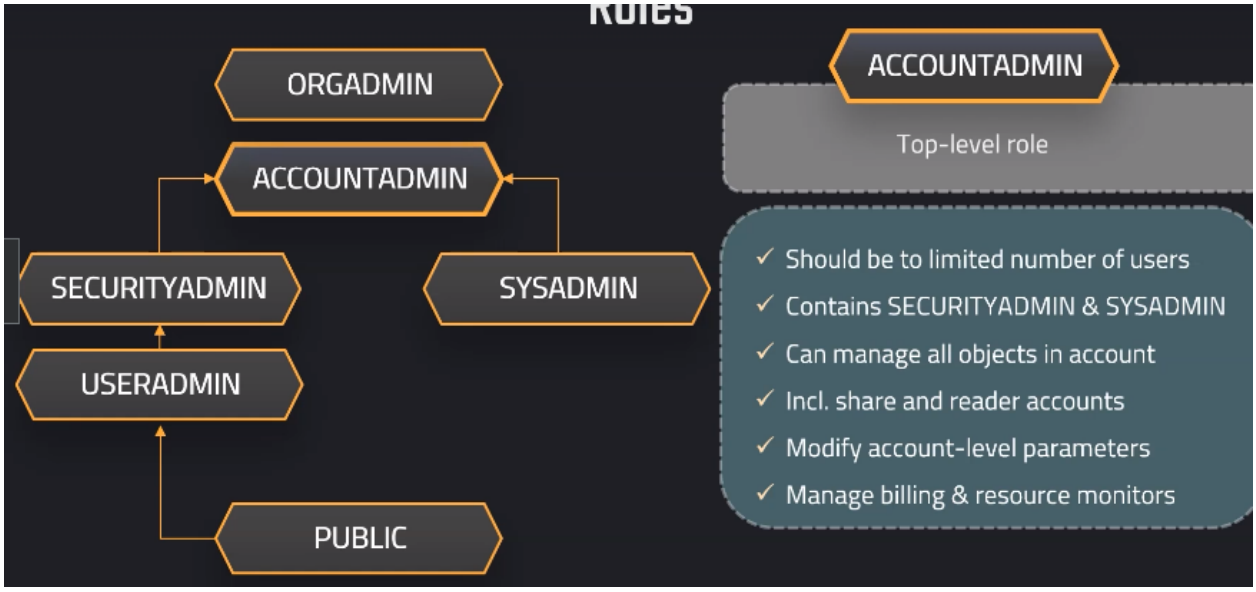
10. These roles cant be dropped..and also we give privileges ..but cannot revoke once added
11. Roles can be assigned to roles…like public role can be assigned to useradmin vice versa



12. We can also create custom roles..with required privileges in our org…and this should be assigned to sysadmin role

13. Outside of hierarchy ..we have special role which is ORGADMIN…it manages the system defined roles in the org



14. In the orgadmin….the top level role is ACCOUNT ADMIN…
15. Accountadmin has all privileges and can manage all objects in account….
16. Using accountadmin…we can create reader account or can create a share
17. 

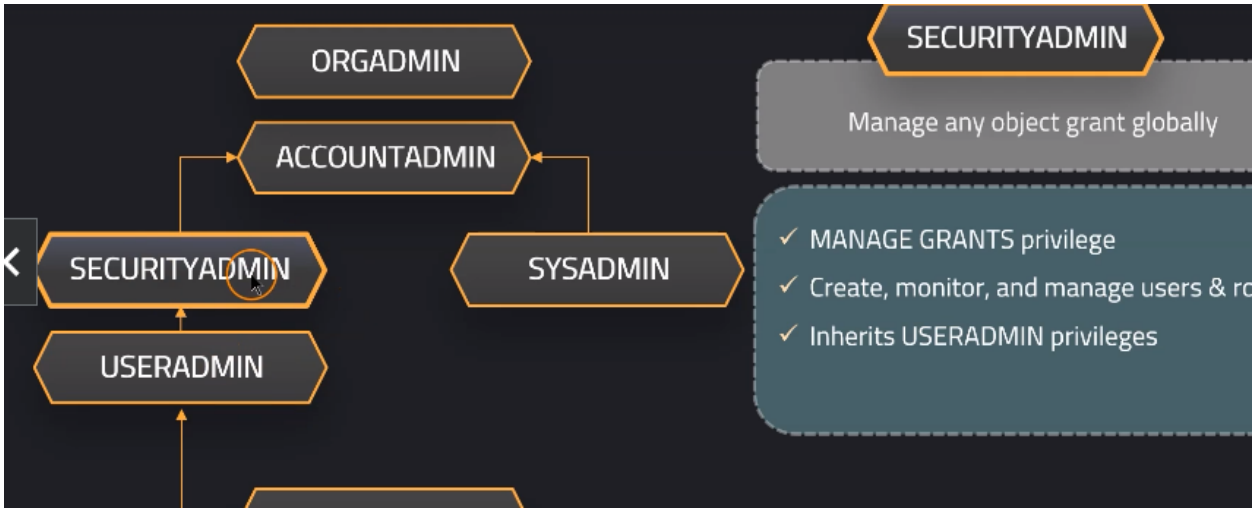
18. Coming to secutiryAdmin…it can have access to any object ,,that has granted globally(any where)

The SECURITYADMIN role in Snowflake is a system-defined role that has the most powerful privileges in the Snowflake account. It can manage any object grant globally, as well as create, monitor, and manage users and roles.

More specifically, the SECURITYADMIN role has the following privileges:

- CREATE USER
- ALTER USER
- DROP USER
- CREATE ROLE
- ALTER ROLE
- DROP ROLE
- GRANT ROLE
- REVOKE ROLE
- MANAGE GRANTS

The SECURITYADMIN role also inherits the privileges of the USERADMIN role, which include the ability to create, manage, and view users and roles.

19. 

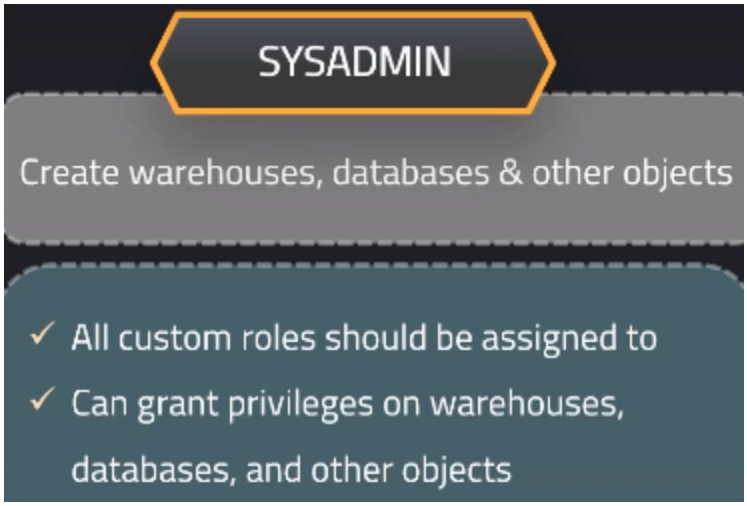
20. Coming to sysadmin role….it has abilities to create warehouse,databases and other objects

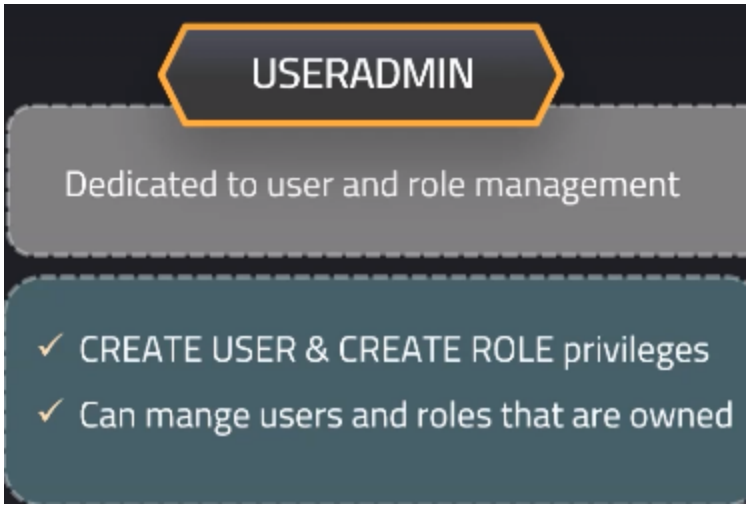
The SYSADMIN role in Snowflake is a system-defined role that has privileges to create warehouses, databases, and all database objects (schemas, tables, etc.), as well as grant those privileges to other roles. It is the second most powerful role in the Snowflake account, after the SECURITYADMIN role.

Here are some of the tasks that can be performed using the SYSADMIN role:

- Create and manage warehouses, databases, and other database objects
- Grant and revoke privileges on objects
- View all objects in the account
- Create, alter, and drop users and roles

The SYSADMIN role is typically granted to a small number of users who are responsible for managing the Snowflake account and its resources. It is important to note that the SYSADMIN role can be used to grant any privilege to any user, except for the SECURITYADMIN role. Therefore, it is

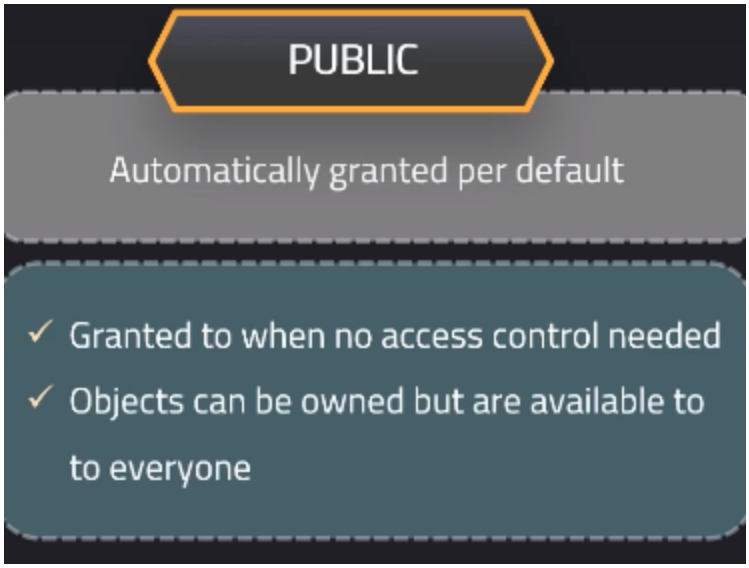
21. 
SYSADMIN
Create warehouses, databases & other objects
✓ All custom roles should be assigned to
✓ Can grant privileges on warehouses, databases, and other objects

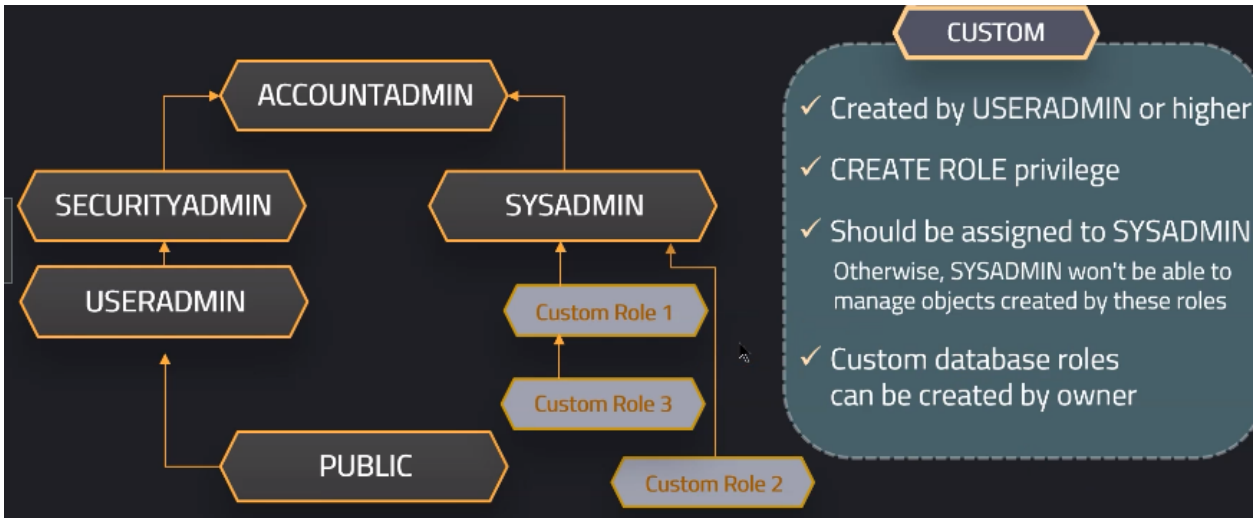
22. 

The USERADMIN role in Snowflake is a system-defined role that has privileges to create and manage users and roles. It is less powerful than the SECURITYADMIN and SYSADMIN roles, but it is still a powerful role that should be used carefully.

Here are some of the tasks that can be performed using the USERADMIN role:

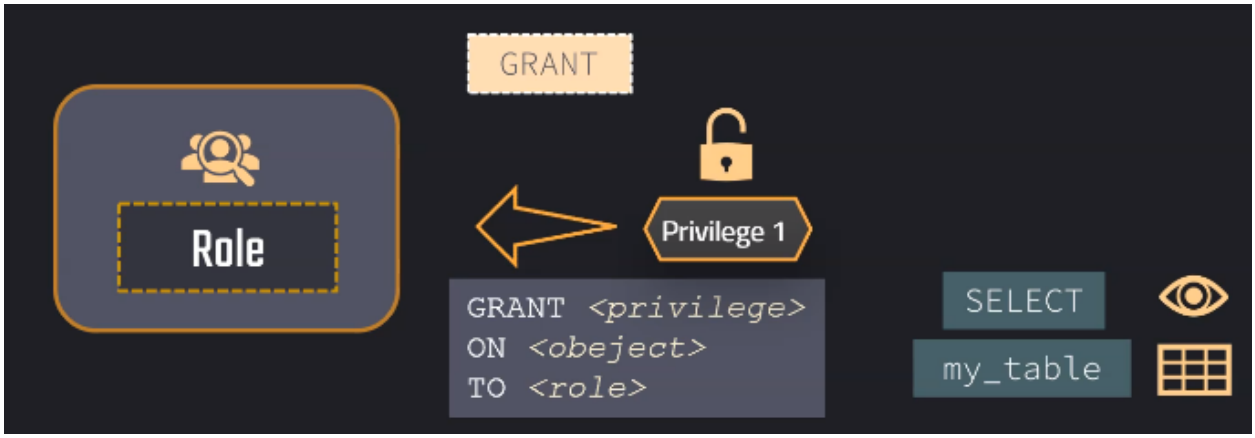
- Create, alter, and drop users
- Create, alter, and drop roles
- Grant and revoke roles to users
- View all users and roles in the account

23. 

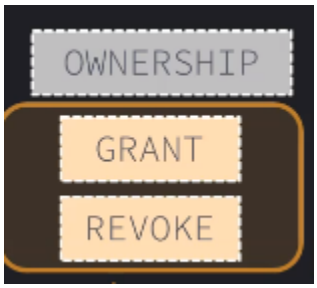
24. 

Privileges

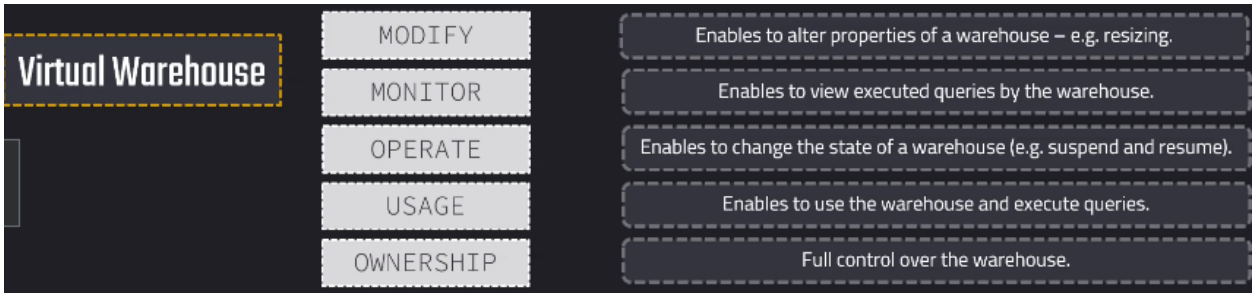
1. This is just the granular level of access to an object that will be granted to a role. So this is done by using the grant command.

2. 

3. So here we are granting select privilege on my_table to role….we can also have objects like schemas etc
4. Also we can revoke a privilege .. So this will be usually possible for the ownership role. This is the role that can grant and revoke those privileges.

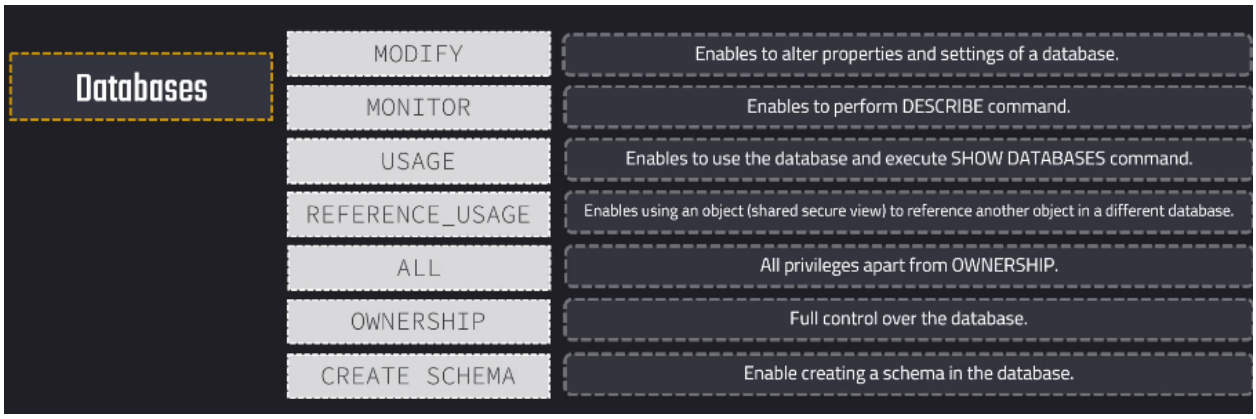


5. Then we have global manage grant privilege..which is handled by sysadmin role
6. Important privileges
7. 

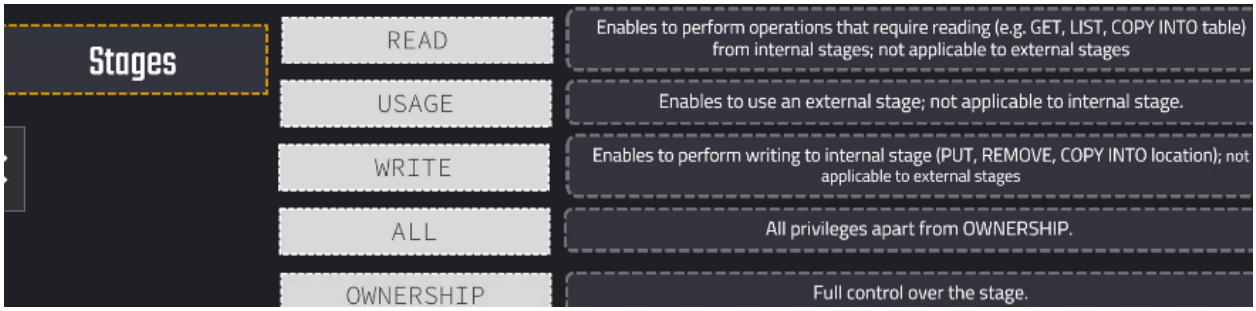
8. ANd for virtual warehouse we have these privile ges
9. 

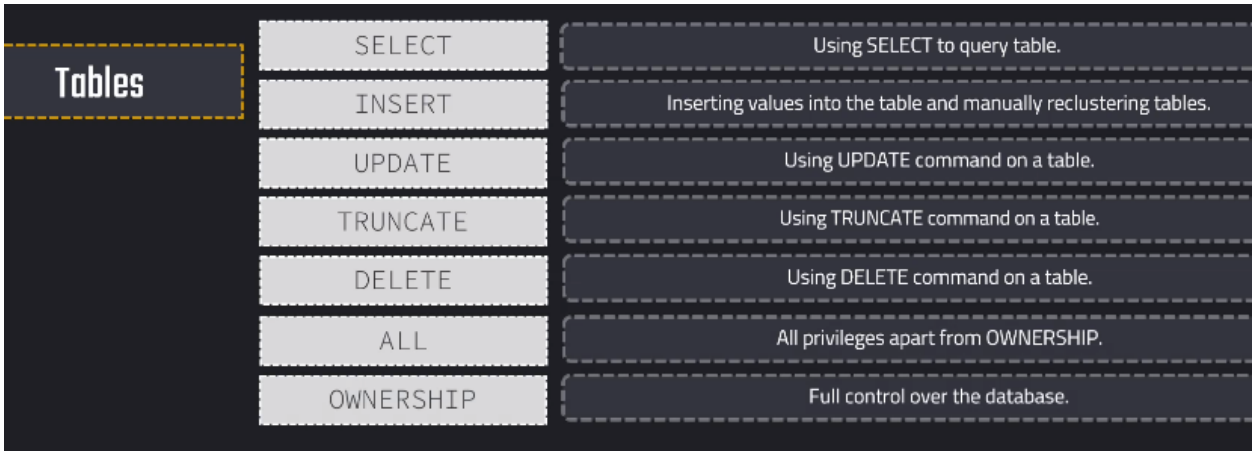
10. The ownership privilege can also be only transferred to another role because always only one single role can have the ownership of an object

11. Next we ALL

12. For databases we have these privileges
13. 

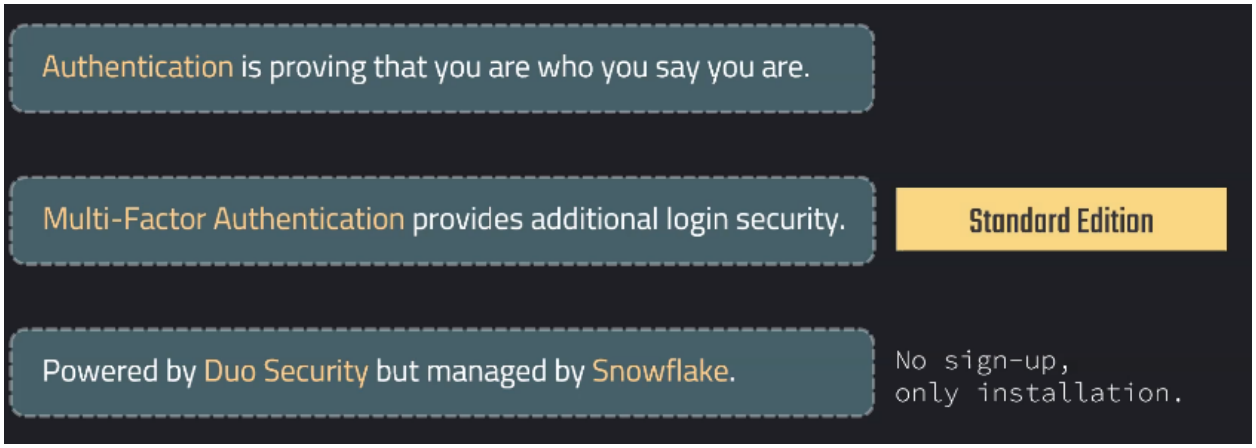
14. For stages we have

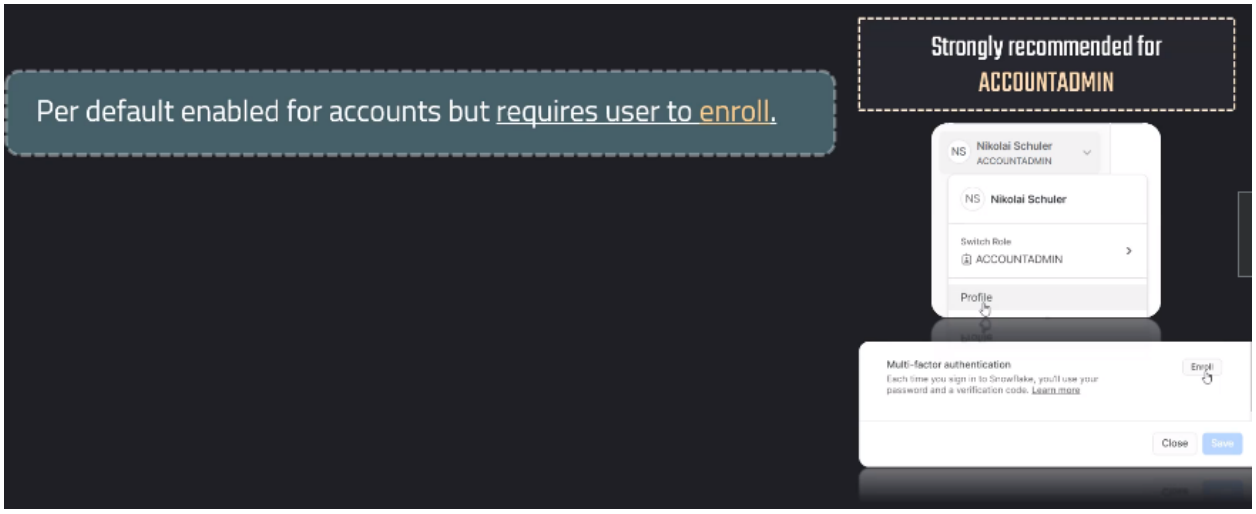


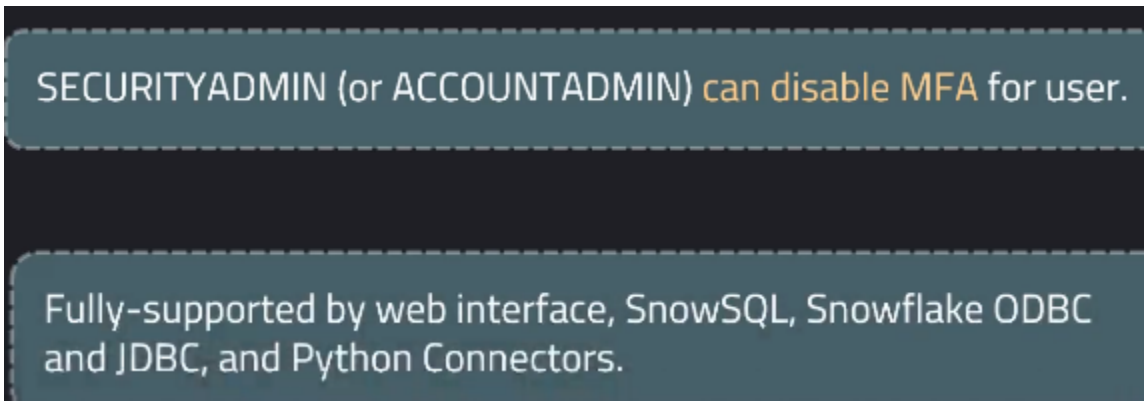
15. 

16. For hands on refer practice

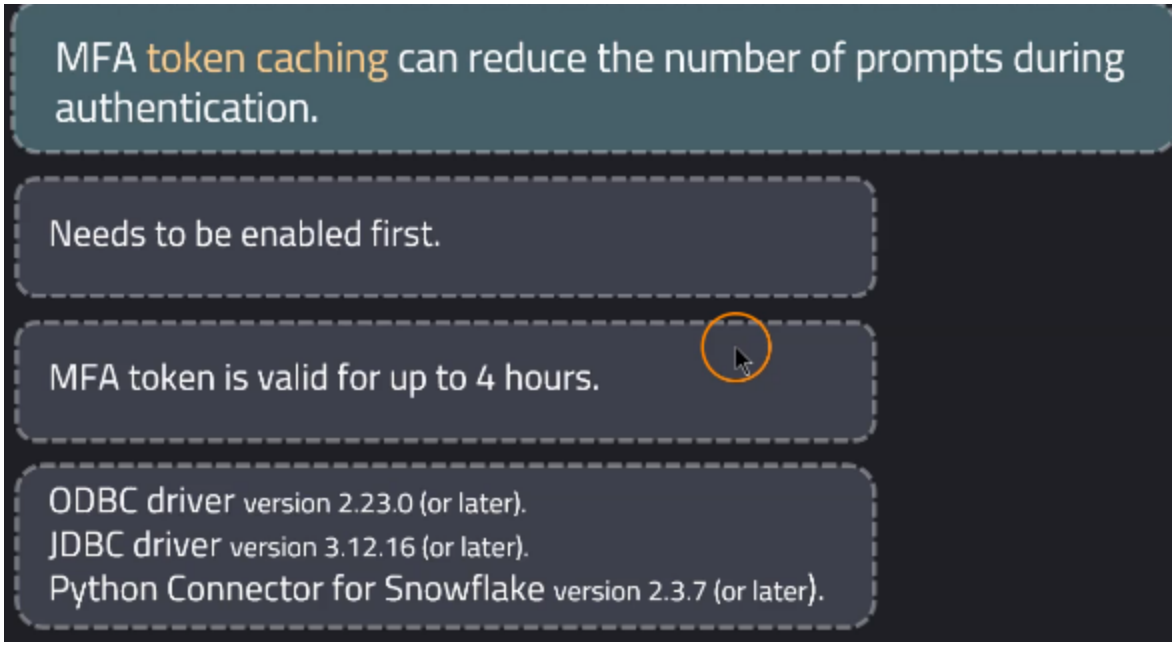
Multi-Factor Authentication

1. 

2. Starting from standard edition it is available to all edition
3. 

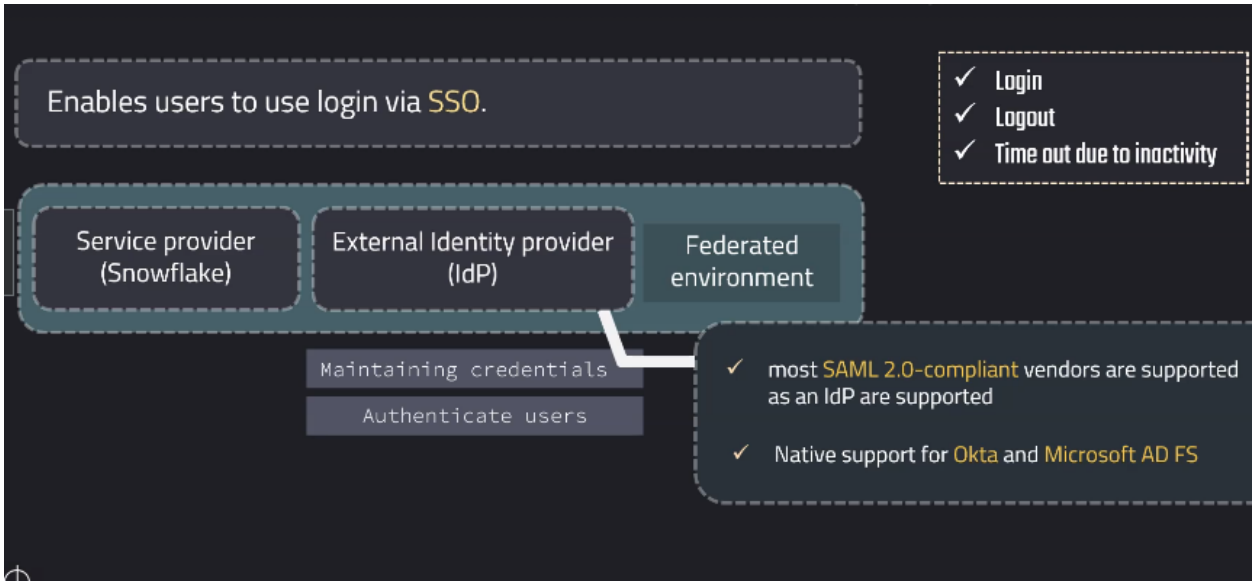
4. 

5. Additionally, we can also enable MFA token caching.
6. This can reduce the number of prompts during authentication, especially if we are trying to authenticate in a short amount of period multiple times.

7. 

Federated Authentication

1. This means that they can just use one set of credentials and use this to log into Snowflake and also other applications.



2. Federated authentication in Snowflake allows users to log in to Snowflake using their credentials from an external identity provider (IdP). This can simplify the user login process and improve security, as users do not need to manage multiple passwords.

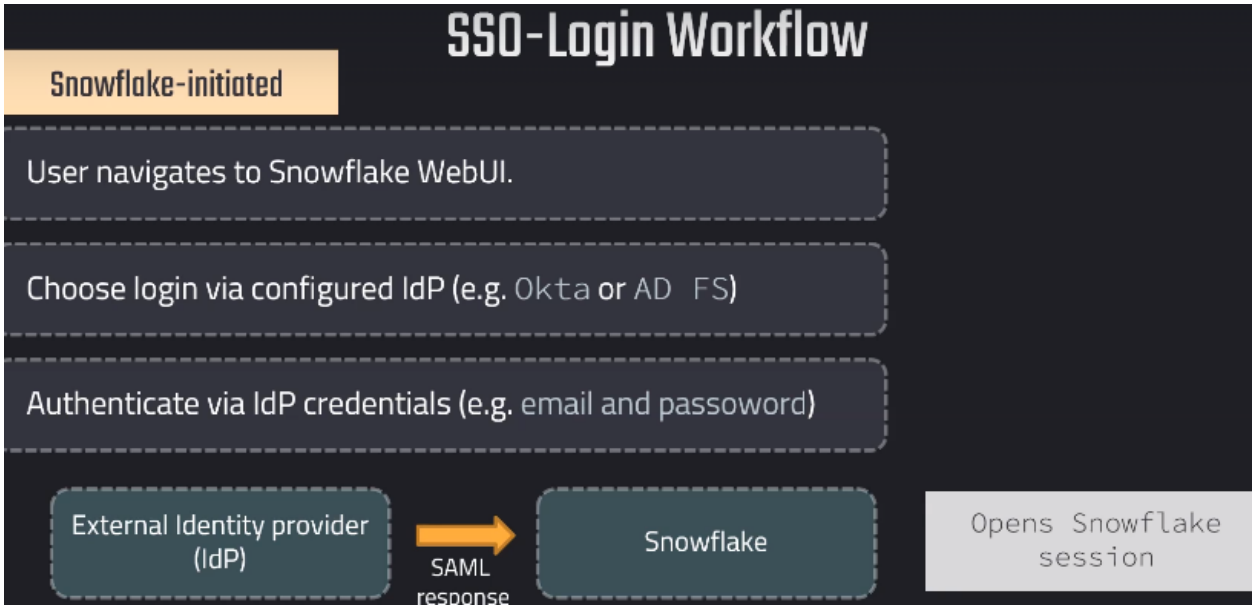
   To enable federated authentication in Snowflake, you must create a security integration with your IdP. This involves providing Snowflake with the necessary information about your IdP, such as the IdP's URL and certificate.

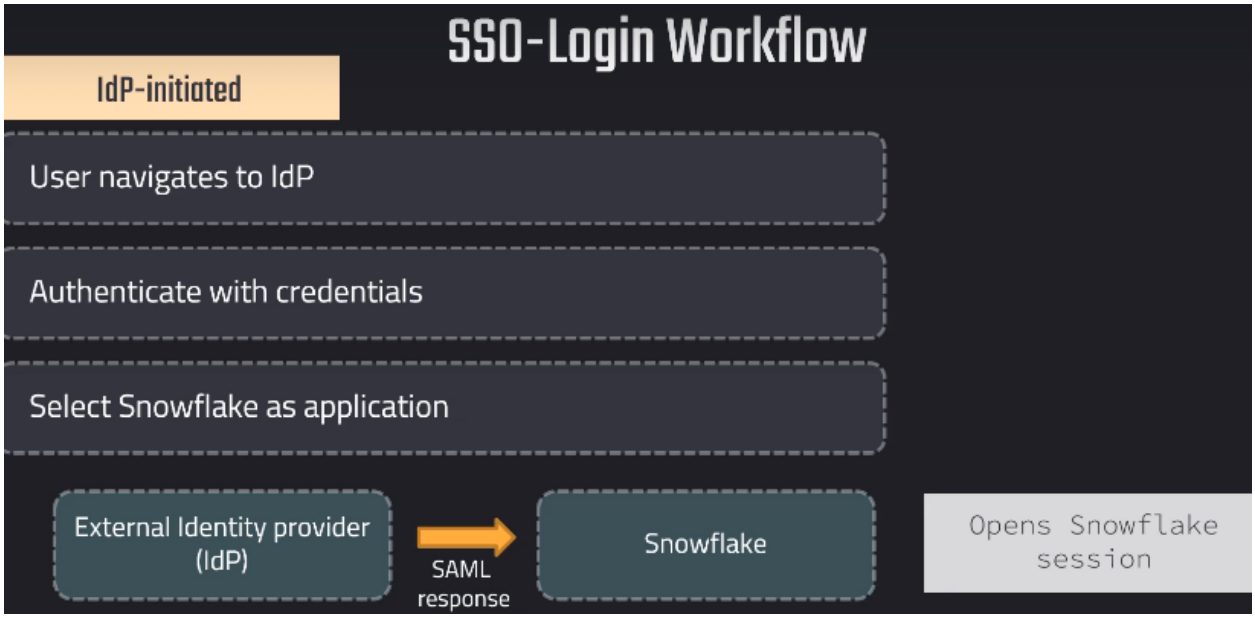
   Once you have created a security integration, you can configure Snowflake to use federated authentication for all users or for a specific set of users.

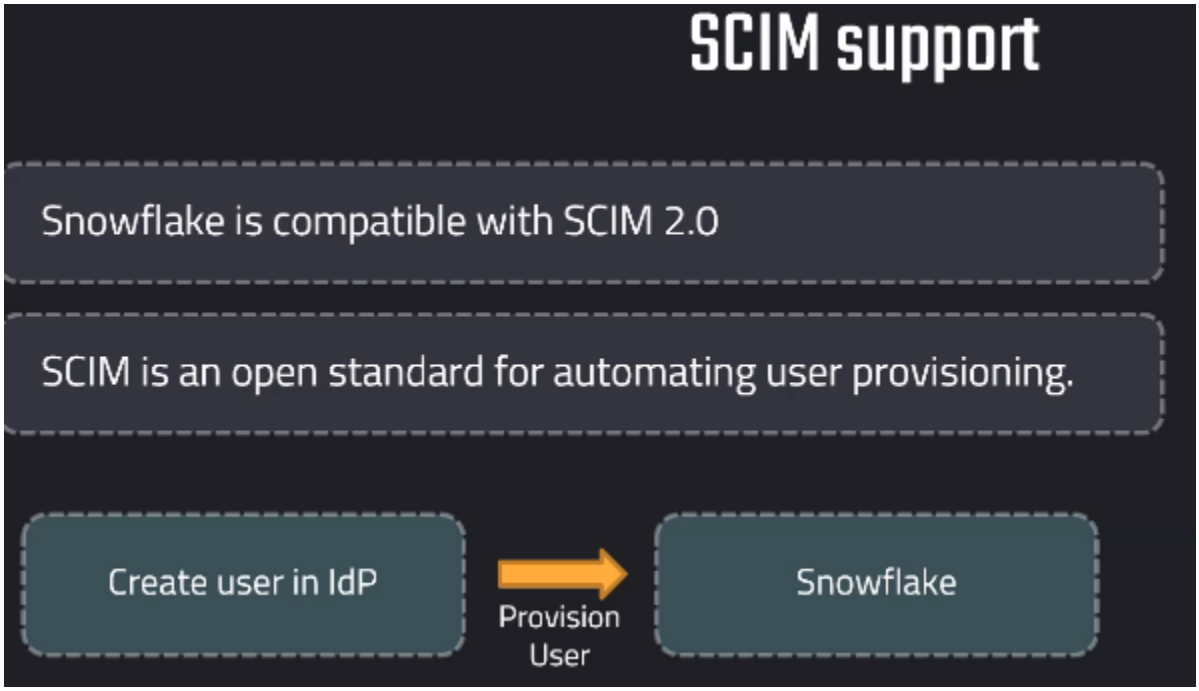
   To log in to Snowflake using federated authentication, users simply need to visit the Snowflake login page and select the "Login with IdP" option. They will then be redirected to the IdP's login page, where they can enter their IdP credentials.

3. Here is an example of how to use federated authentication in Snowflake with Azure Active Directory (AD):

   1. Create a security integration in Snowflake for Azure AD.
   2. Configure Snowflake to use federated authentication for all users.
   3. Users visit the Snowflake login page and select the "Login with IdP" option.
   4. Users are redirected to the Azure AD login page, where they enter their Azure AD credentials.
   5. Once the user has successfully authenticated with Azure AD, they are redirected back to Snowflake and logged in.

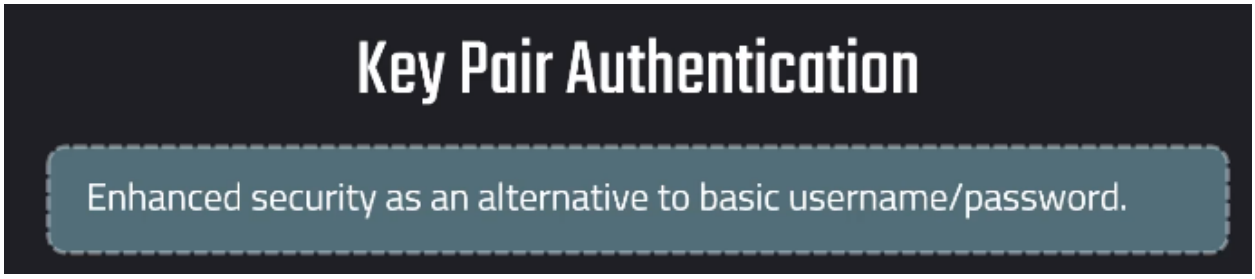
4. 

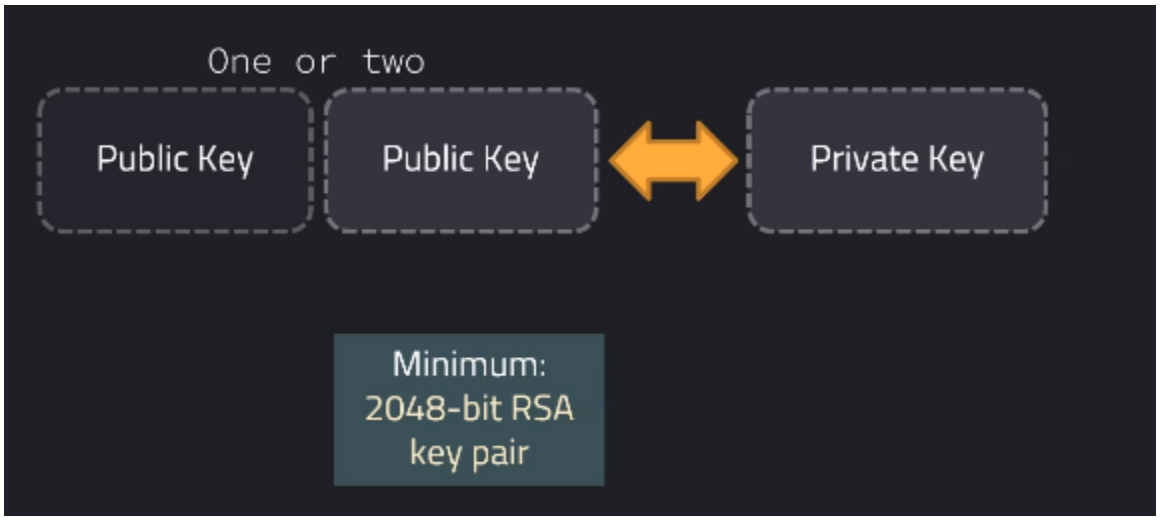
5. 

6. 

7. This means we can also create a user in the identity provider directly and this will then be automatically provisioned to Snowflake.

Key-pair Authentication

1. 

2. Here we will have one or two public key and one private key(pair)
3. 

4. Min key size is 2048bit
5. This can be used when connecting with the snowflake clients …like snowSQL etc
6. Overview
7. 

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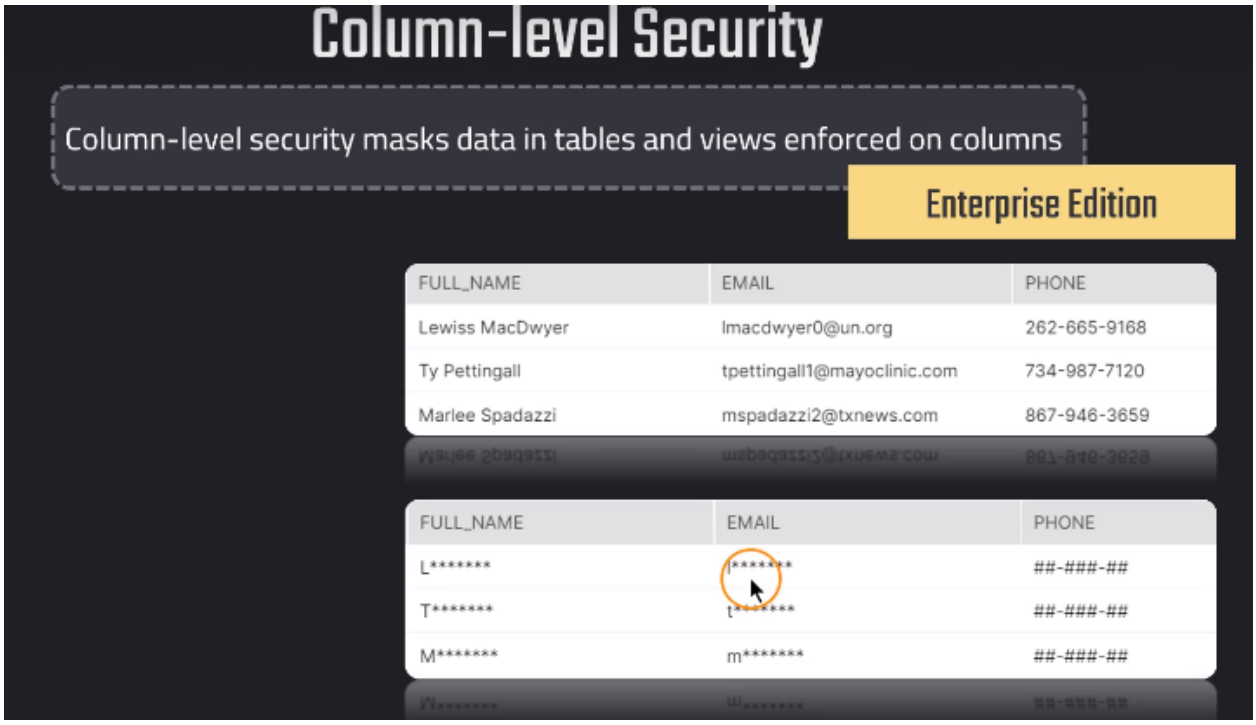
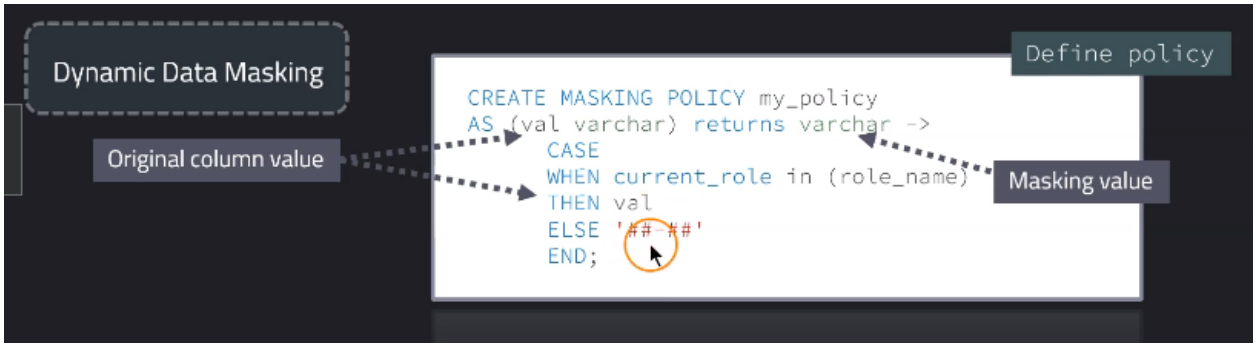
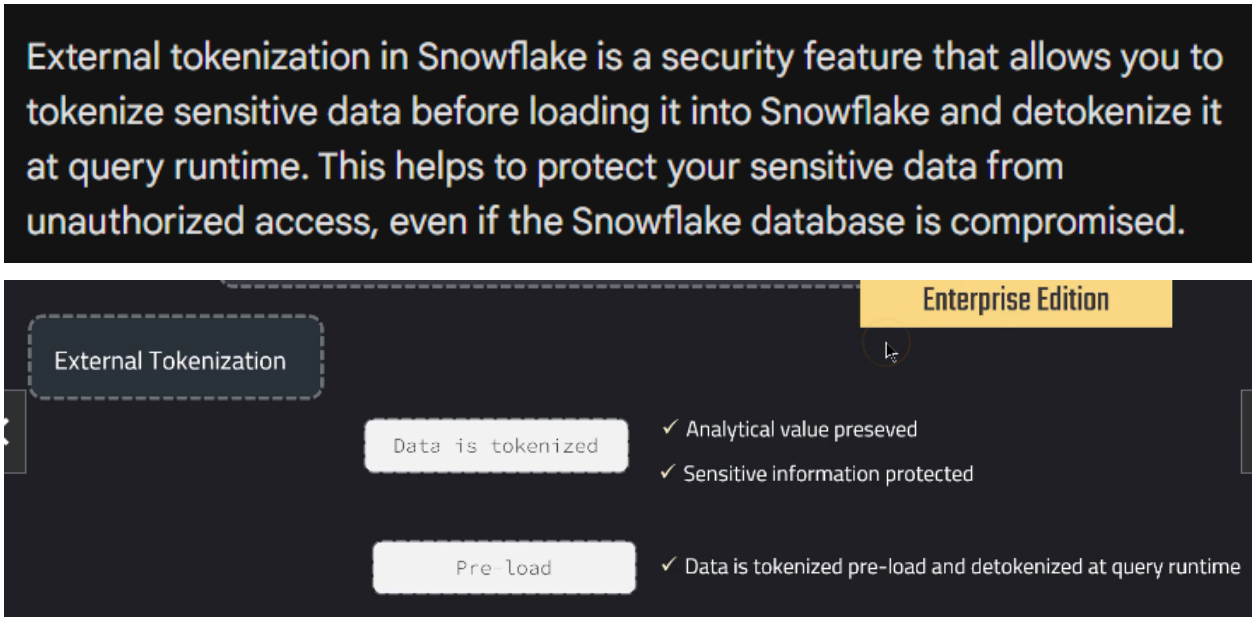
Column Level Security

1. We can assign some security policies on columns and it supports enterprise edition or higher
2. 

3. We can mask the sensitive data on columns
4. So the data is not masked in the database itself, but just based on the currently selected role at query runtime, this is when the data will be masked and then the data will not be revealed to unauthorized users.

5. Syntax
6. 

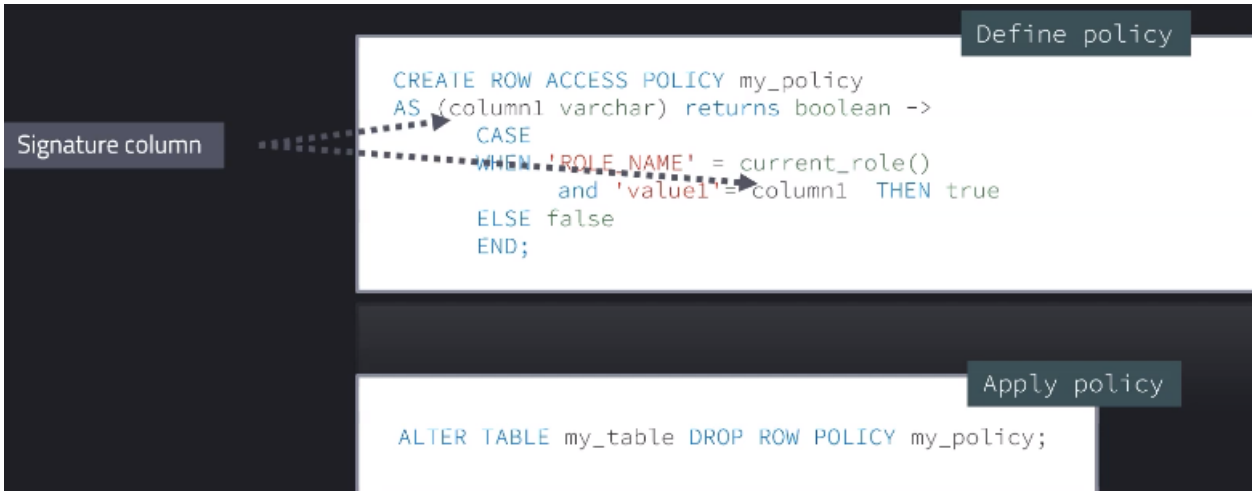
7. Here we are masking the columns to specific role('when current_role)..
8. Apply policy
9. 

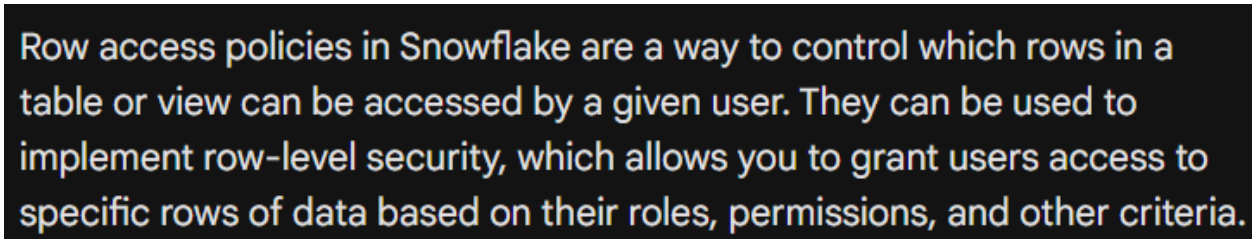
10. We can also unset this by using unset
11. External tokenization
12. 

Row-level security

1. By using row Access policies..we can provide security to particular rows

2. 

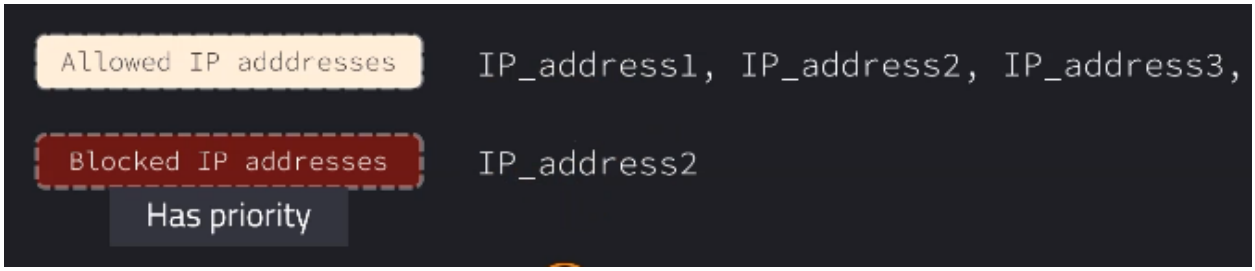
3. How to setup
4. It is a schema level object
5. 

6. 

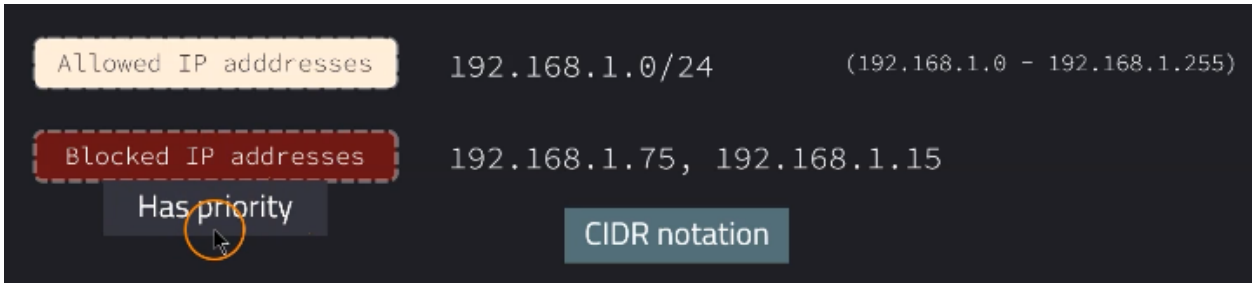
7.
```
-- Policy that role can see everything
USE ROLE accountadmin;
CREATE OR REPLACE ROW ACCESS POLICY category_policy
AS (category varchar) RETURNS BOOLEAN ->
  CASE WHEN 'HOME_MANAGER' = current_role()  and 'Furniture'=category then true
      else false
      end;
```
8. For hands on refer file

Network policies

1. Here we can define..who has access and to whom we restrict access to
2. It maintains two lists



3. If an ip address is present in two lists..then blocked list will be given priority
4. We can have a range of ip address that are allowed



5. Here we have a range 0-255…and two ip address are present in both Allowed and blocked…blocked will get priority
6. We need to have security admin role…to create network policies
7. 

8. 

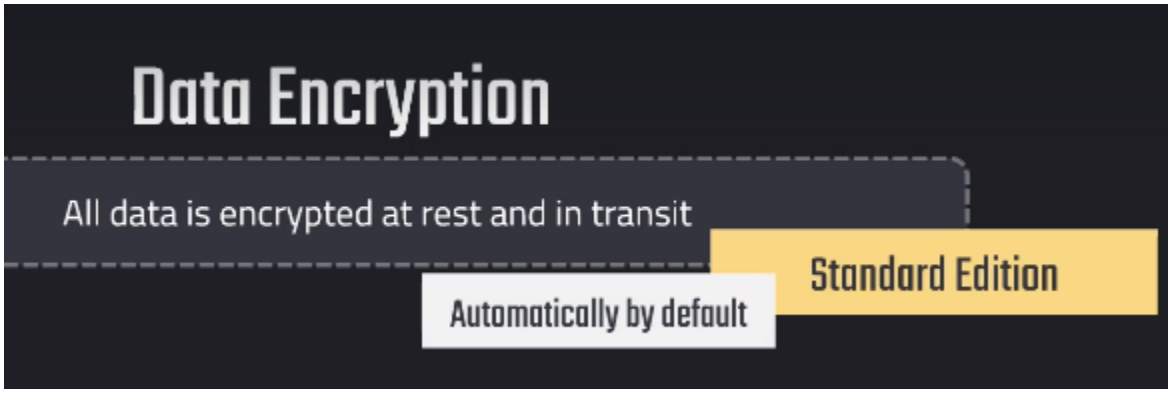
9. To set policies to an account

```
ALTER ACCOUNT SET NETWORK_POLICY = mynetwork_policy;
```

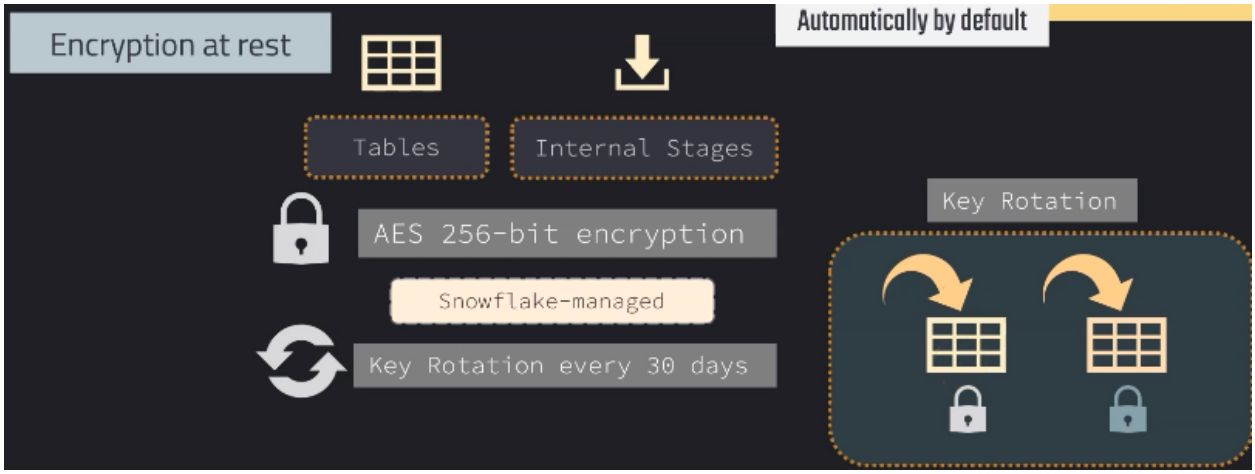
```
ALTER ACCOUNT UNSET NETWORK_POLICY;
```

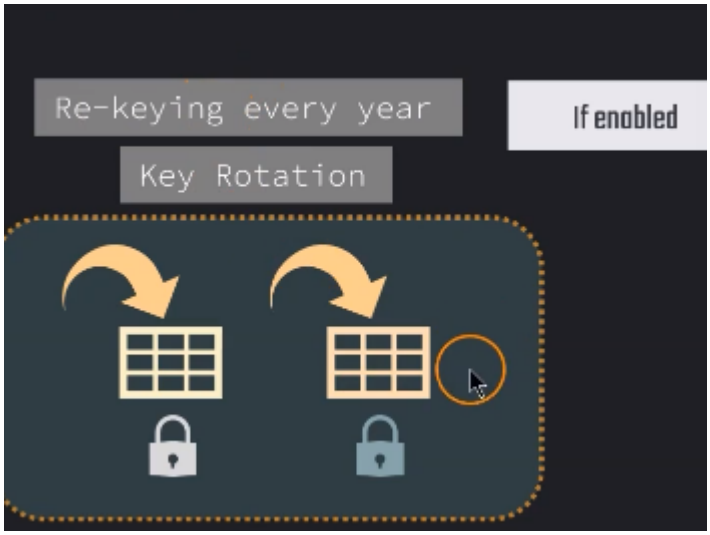
10. To unset we use
11. If we have ownership role…then we can set policies to the user

Data Encryption

1. 

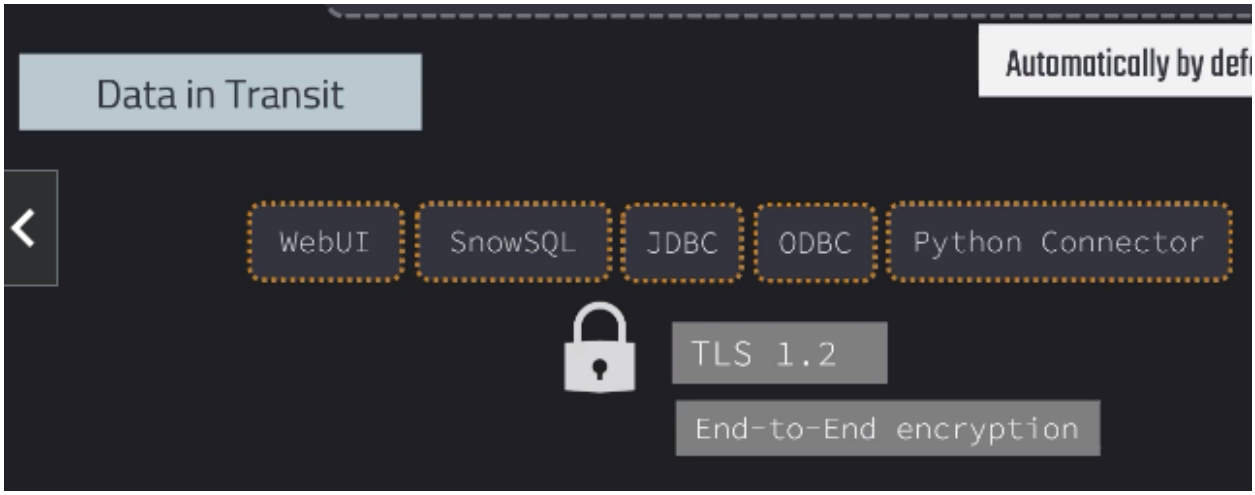
2. For the data which is at rest…like tables and files in internal stages…snowflake uses 256bit encryption

3. 

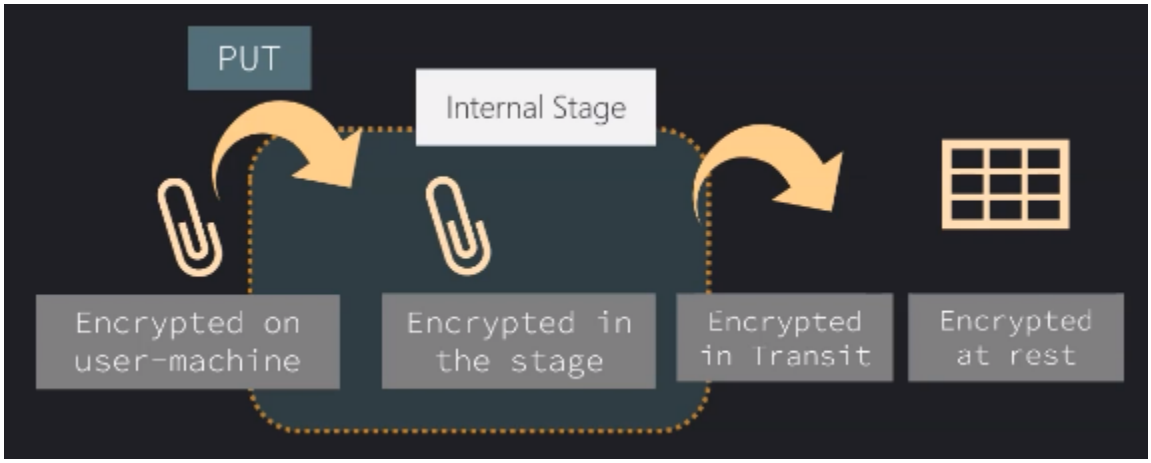
4. When we create a table…snowflake generates a key for the table…till 30 days it uses one key
5. And after 30 days ..when we create a new table…it generates new key…..and old tables..will have old keys
6. So if we have no more tables where a certain key is used, this key will be then destroyed
7. We can also add re-keying every year….which re-keys…every old key..it needs enterprise edition 

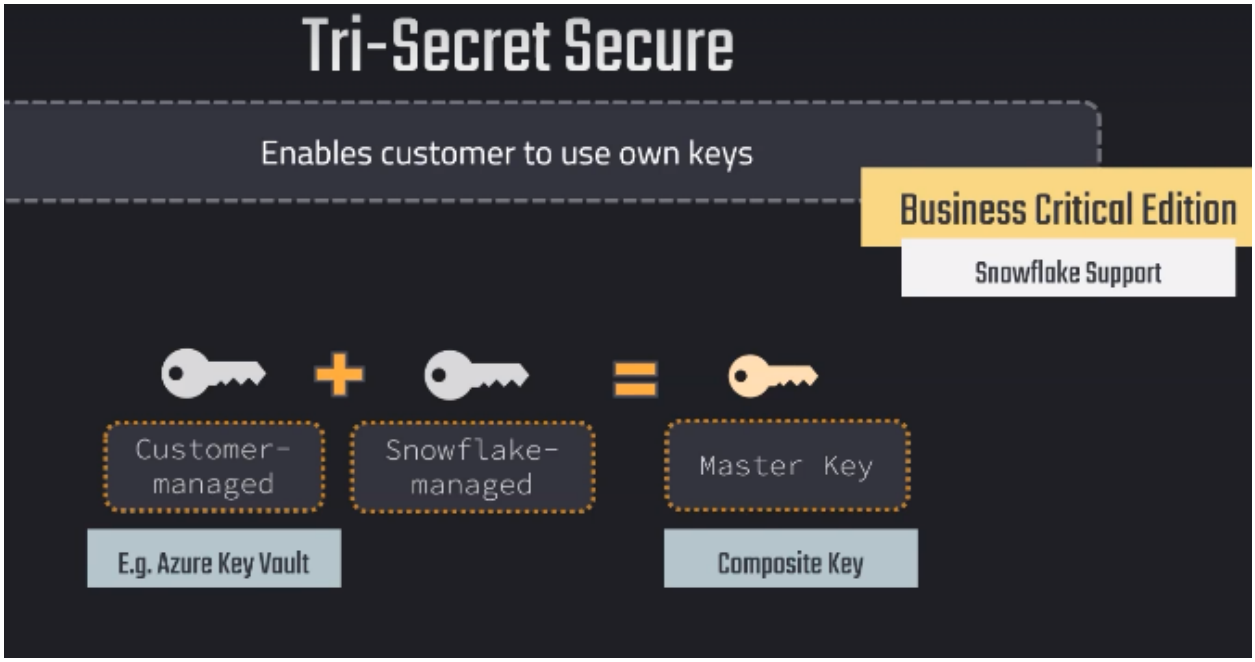
8. ENcryption for data in transit

9. Snowflake uses TLS1.2 encryption for data at transit



10. For example…if put a file in a stage..then it is encrypted on user-machine and as well as by 256bit encryption(for data at rest)
11. When we move this data to table..then it will be encrypted by TLS1.2…and after going into table…it will be in rest

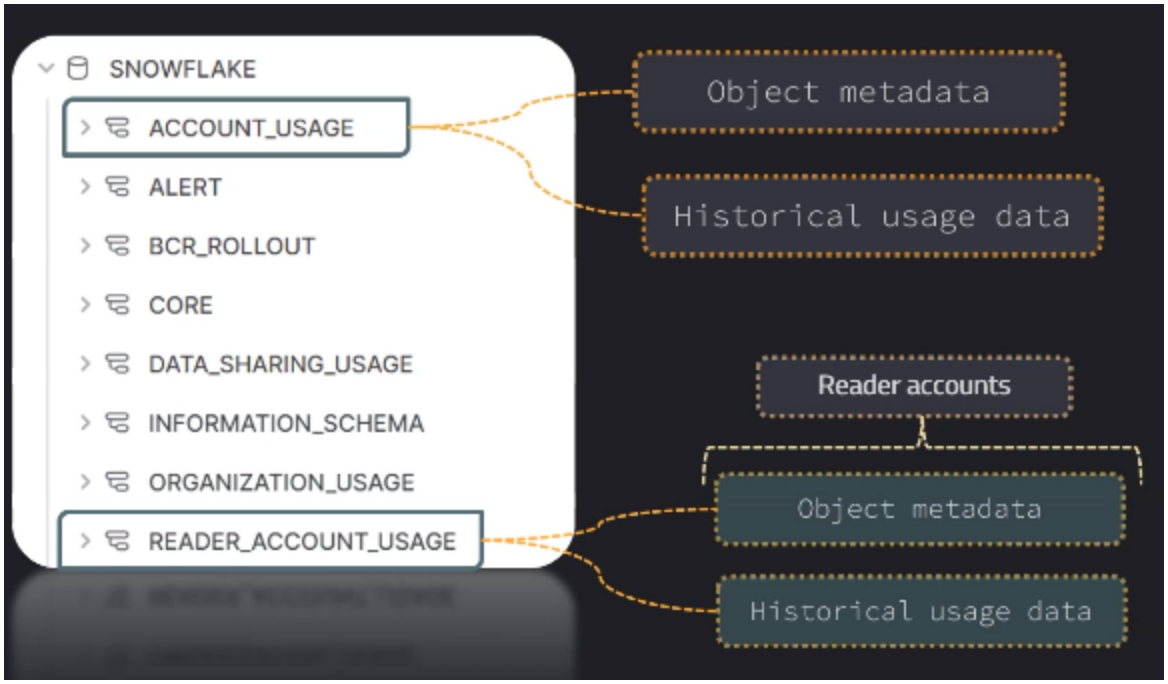


12. 

13. For Tri secret secure we have contact snowflake support(refer bard for more info)

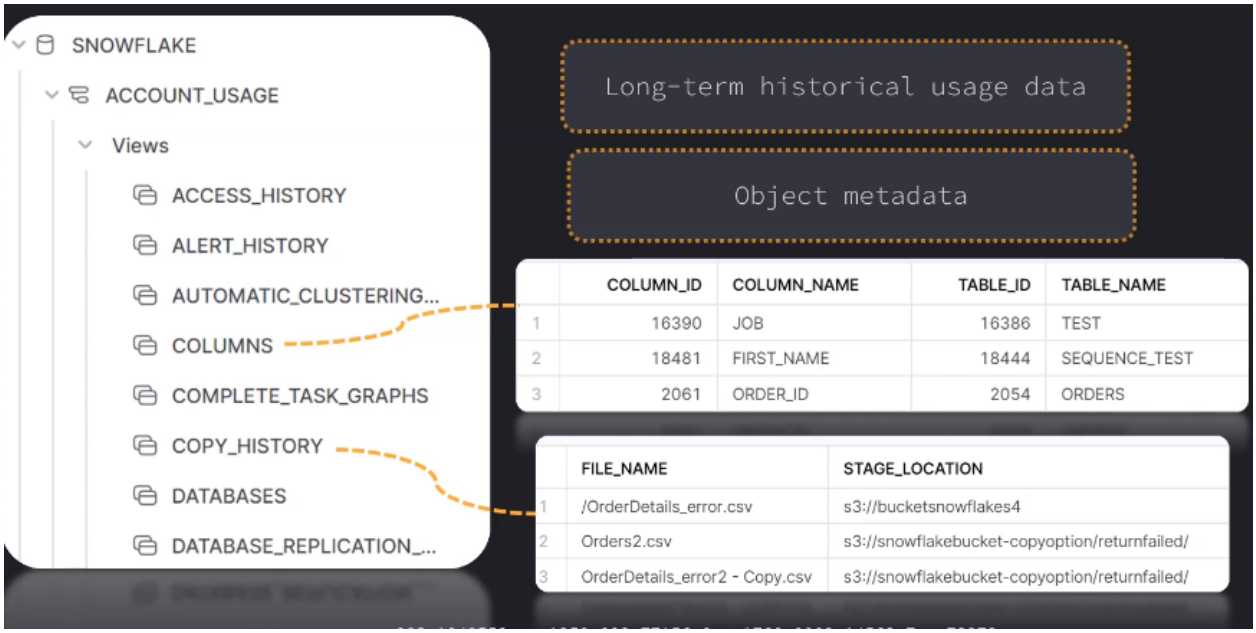
Account usage and information Schema

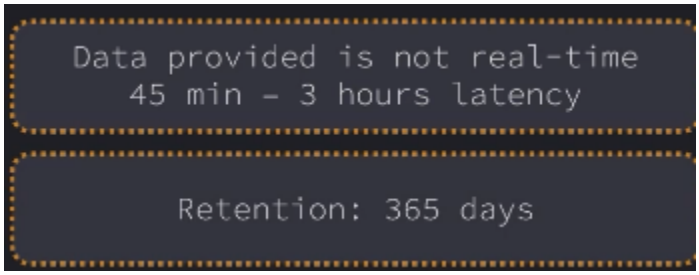
1. Account usage schema that's available in the Snowflake database, which is a shared database… that's per default available to all of the accounts.
2. Account admin can see everything in this schema and can view all data in schema

3. 

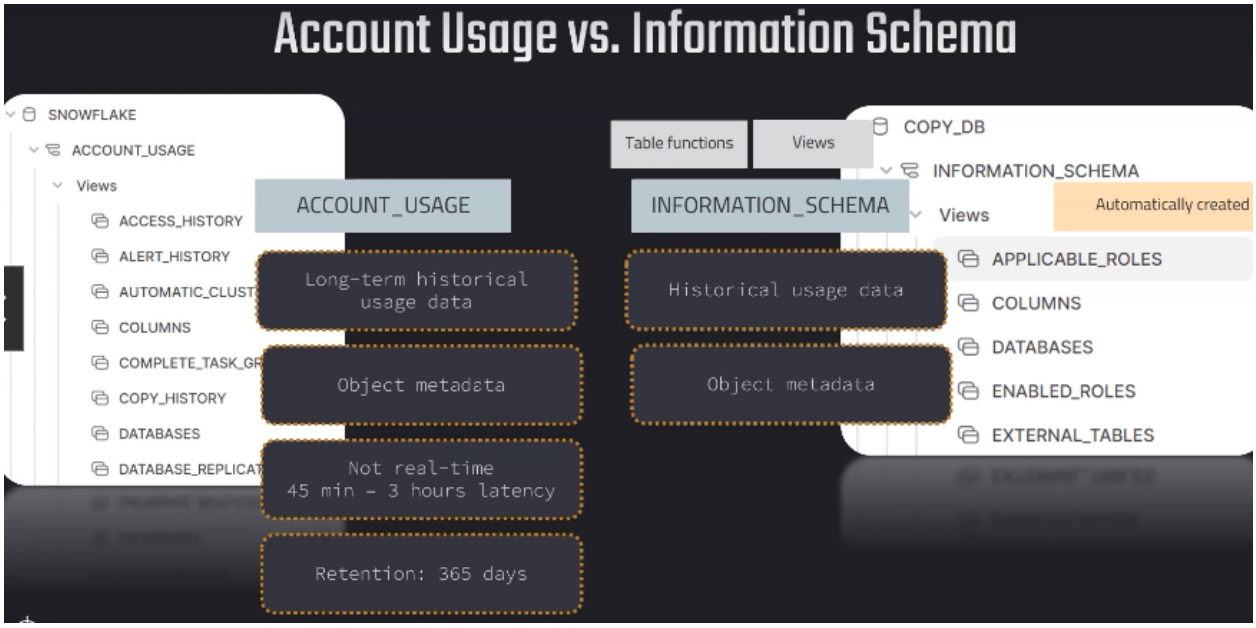
4. Account usage schema gives details about object metadata and historical usage data
5. Then we have reader account usage..see pic
6. Information schema is available in all the databases

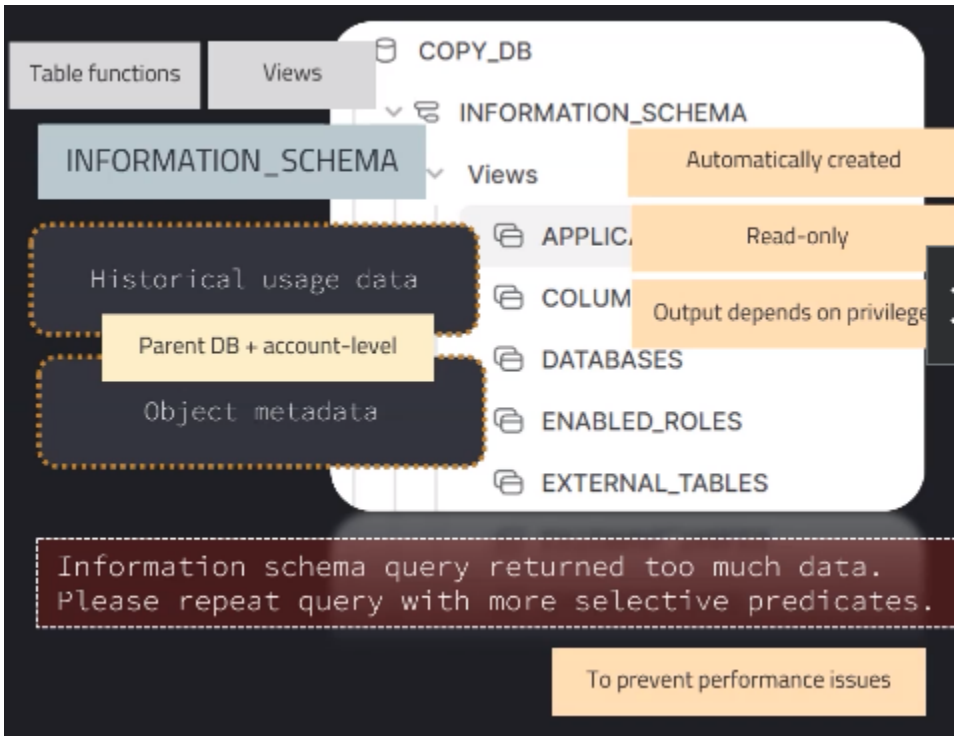
7. Lets look into account usage schema



8. Most of the views have a latency of around two hours and also the data retention in here is, as mentioned,long term.
9. 

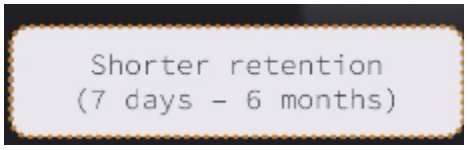
10. Account vs information_schema



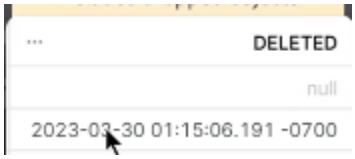
11. 

12. The account usage schema provides information about the usage of your Snowflake account, such as the number of queries executed, the amount of data processed, and the resources consumed. This information can be used to optimize your Snowflake account performance and to track your Snowflake usage costs.

    The information schema provides information about the metadata of your Snowflake account, such as the tables, views, and stored procedures that exist in your account. This information can be used to manage and query your Snowflake database objects.
13. The main diff is in information schema..we have shorter retention

14. 2nd diff is Theres no latency in information schema ..wer as in account we have 45min-3hrs latency
15. 3rd diff is …Account usage schem includes dropped table…

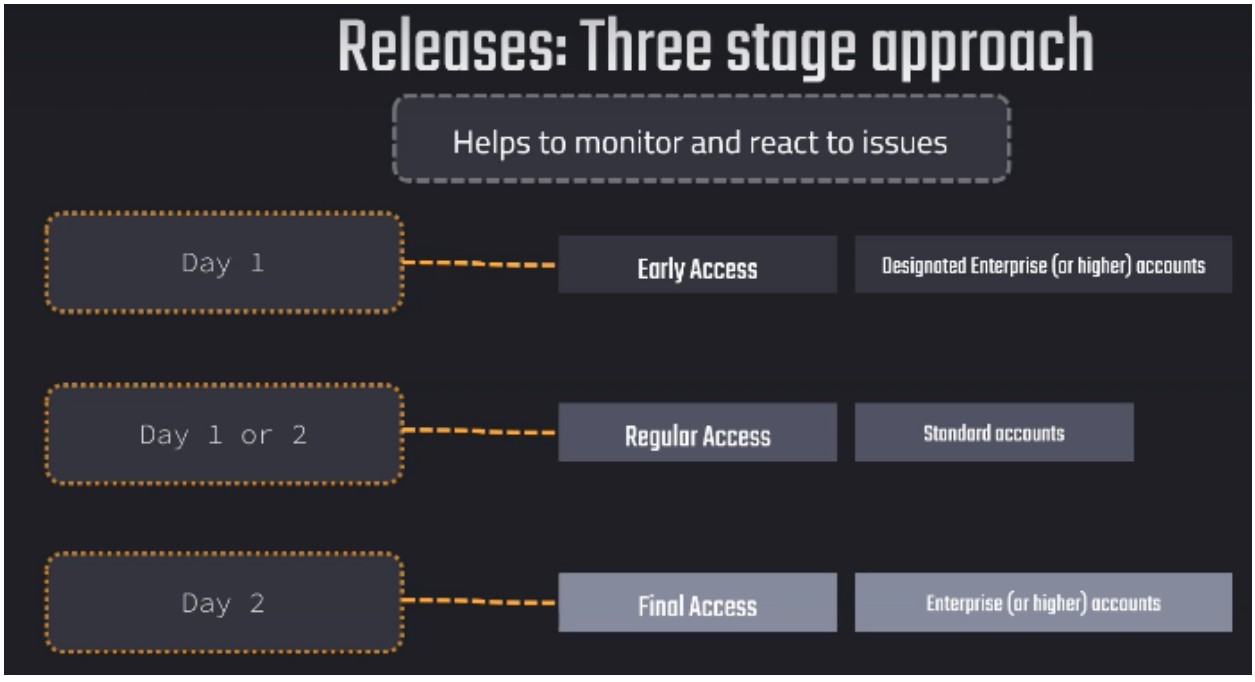
16. Information schema does not include dropped objects

Releases

1. Snowflake releases new features and functionality on a monthly basis. These releases are typically announced in advance and are made available to all customers on a specific date.

   Each Snowflake release includes a variety of new features and enhancements, such as new SQL functions, new database objects, and new performance and security features.

2. 

3. 

4. For early access we have to request snowflake support…if we dont have early access then we will get on final access