databricks

Manage Data Access for Analytics

Module Objectives

By the end of this course, you will be able to:

1. Describe Unity Catalog key concepts and how it integrates with the Databricks platform
2. Access Unity Catalog through clusters and SQL warehouses
3. Create and govern data assets in Unity Catalog
4. Adopt Databricks recommendations into your organization’s Unity Catalog based solutions

Module Agenda

Manage Data Access for Analytics with Unity Catalog

Introduction to Unity Catalog

Data Access Control in Unity Catalog

DE 6.1 - Create and Govern Data with UC

DE 6.2 - Create and Share Tables in Unity Catalog

DE 6.3 - Create Views and Limit Table Access

DE 6.99 - OPTIONAL Administration

- Create compute resources for Unity Catalog access
- Upgrade a table to Unity Catalog

Introduction to Unity Catalog

Overview of Data Governance

80% of organizations seeking to scale digital business **will fail** because they do not take a modern approach to **data and analytics governance**

Source: Gartner

Data Governance

Four key functional areas

Data Access Control

Control who has access to which data

Data Access Audit

Capture and record all access to data

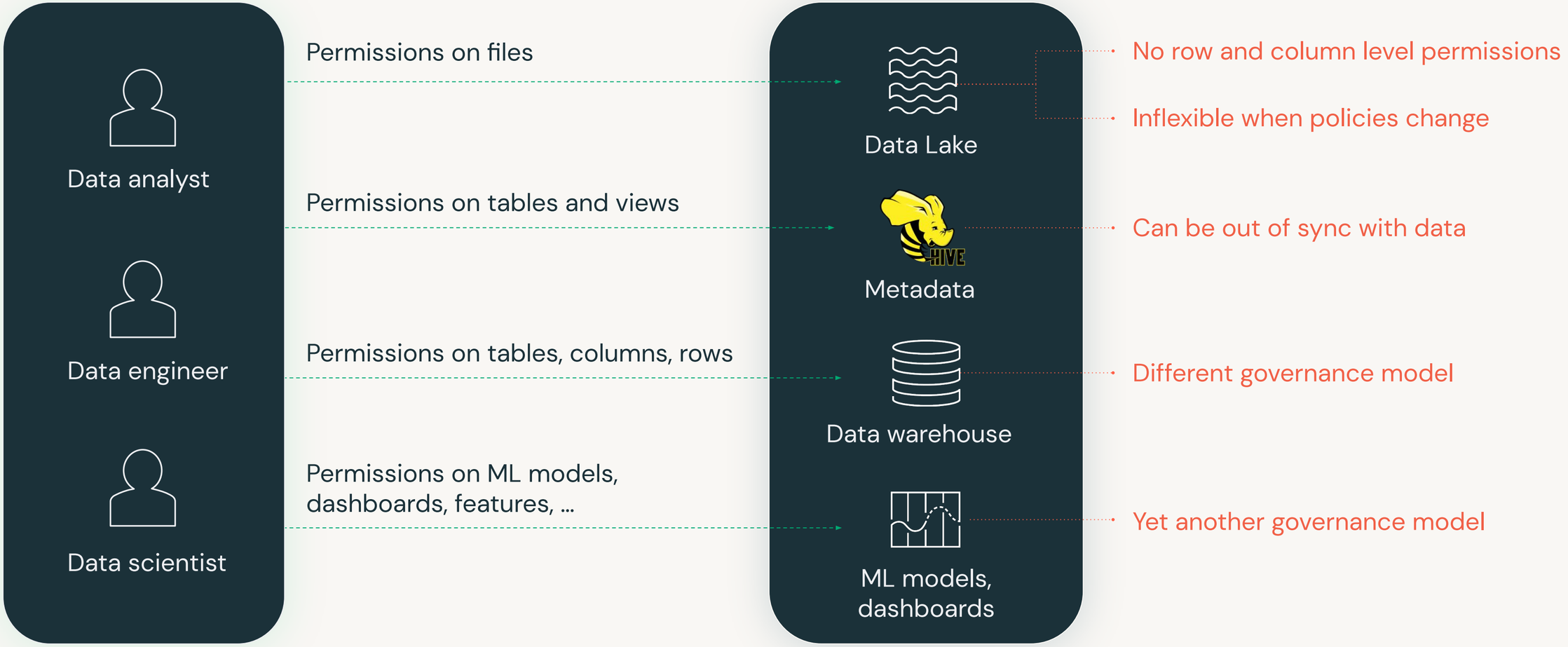
Data Lineage

Capture upstream sources and downstream consumers

Data Discovery

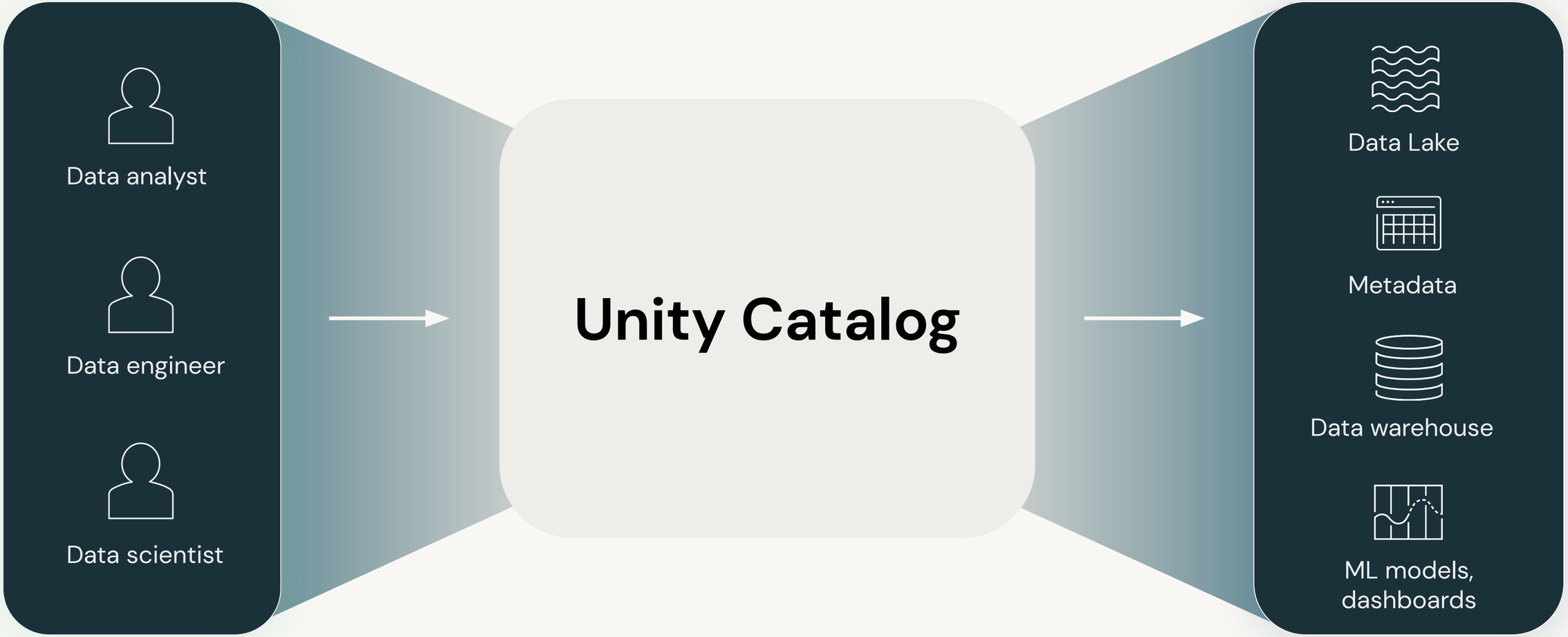
Ability to search for and discover authorized assets

Governance for data, analytics and AI is complex



Databricks Unity Catalog

Unified governance for data, analytics and AI



Unity Catalog

Overview

Unify governance across clouds

Fine-grained governance for data lakes across clouds - based on open standard ANSI SQL.

1

Unify data and AI assets

Centrally share, audit, secure and manage all data types with one simple interface.

2

Unify existing catalogs

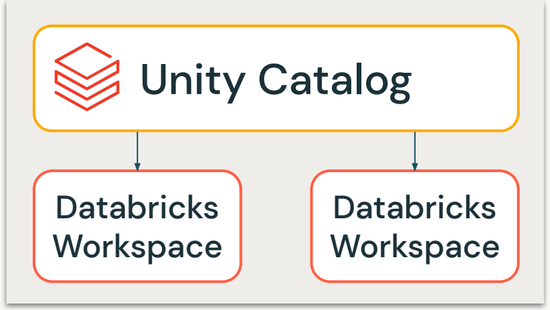
Works in concert with existing data, storage, and catalogs - no hard migration required.

3

Unity Catalog

Key Capabilities

- Centralized metadata and user management
- Centralized data access controls
- Data access auditing
- Data lineage
- Data search and discovery
- Secure data sharing with Delta Sharing

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GRANT ... ON ... TO ...
REVOKE ... ON ... FROM ...
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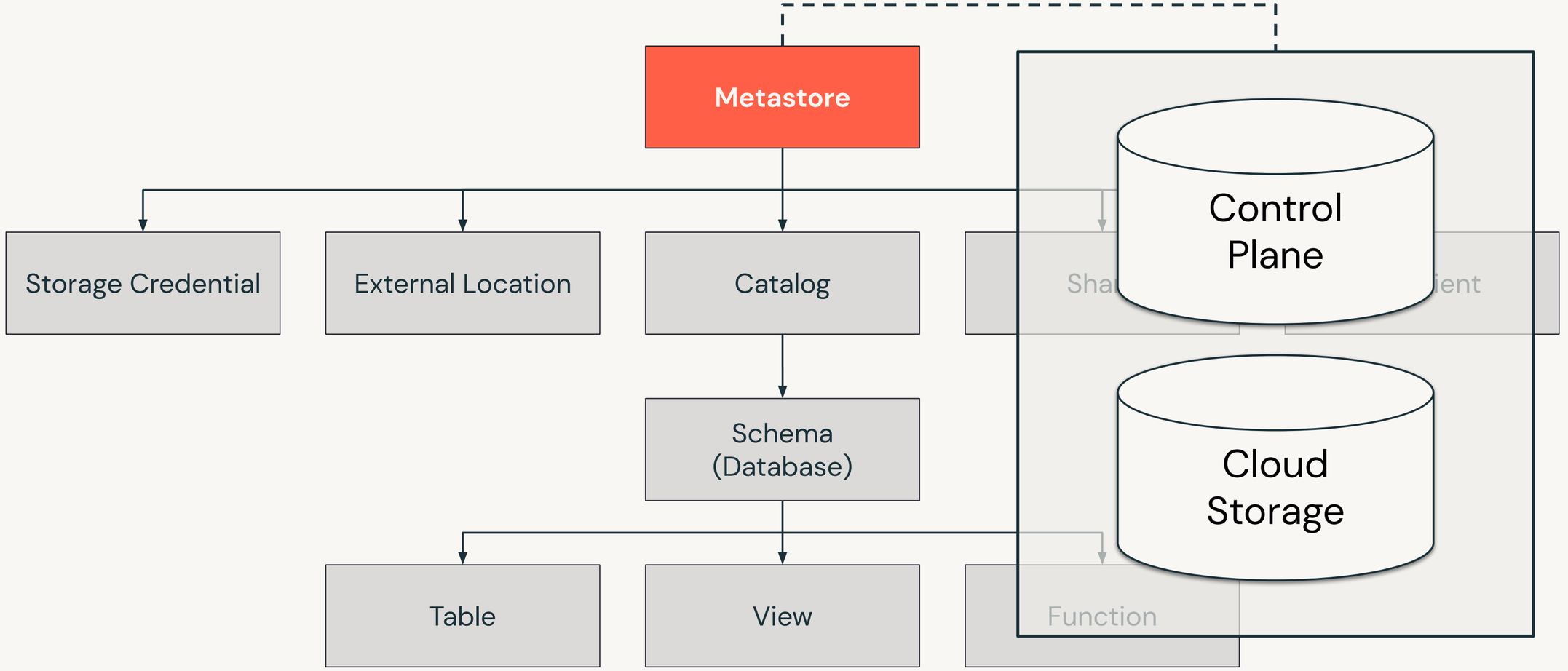
Catalogs, Databases (schemas), Tables, Views, Storage credentials, External locations

Unity Catalog Key Concepts

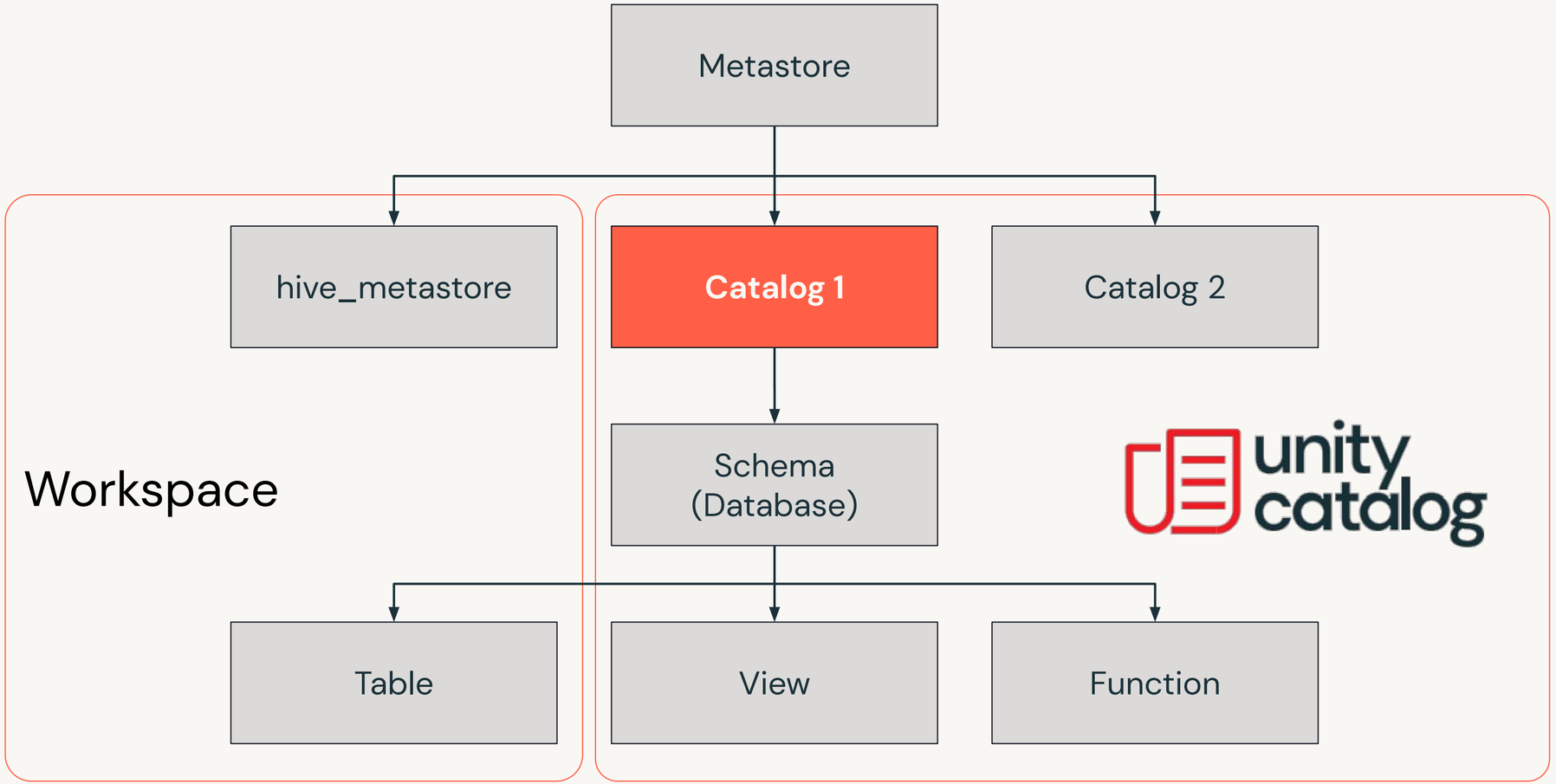
Metastore

Unity Catalog metastore elements



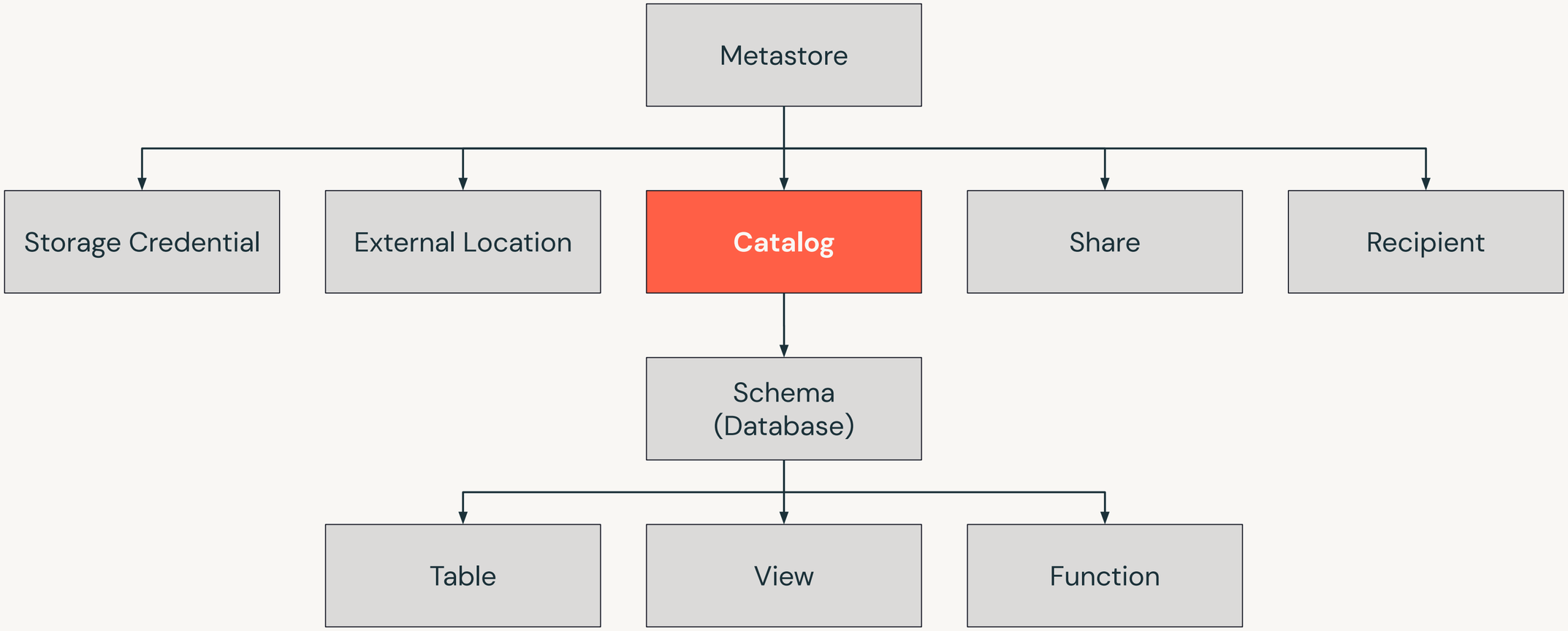
Metastore

Accessing legacy Hive metastore



Catalog

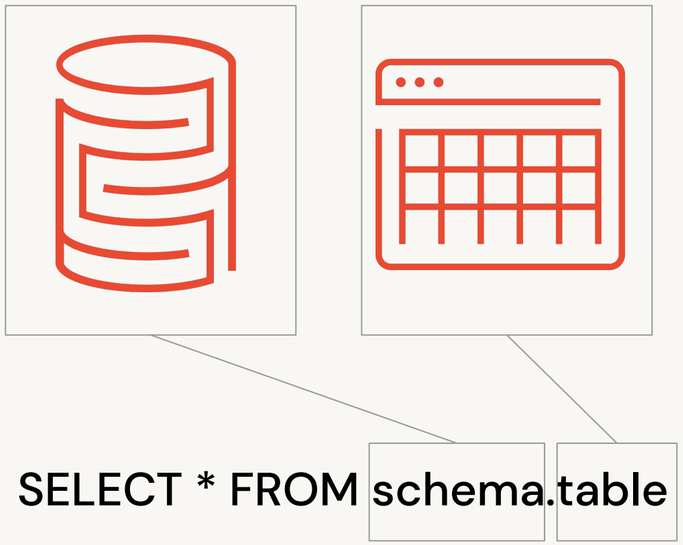
Top-level container for data objects



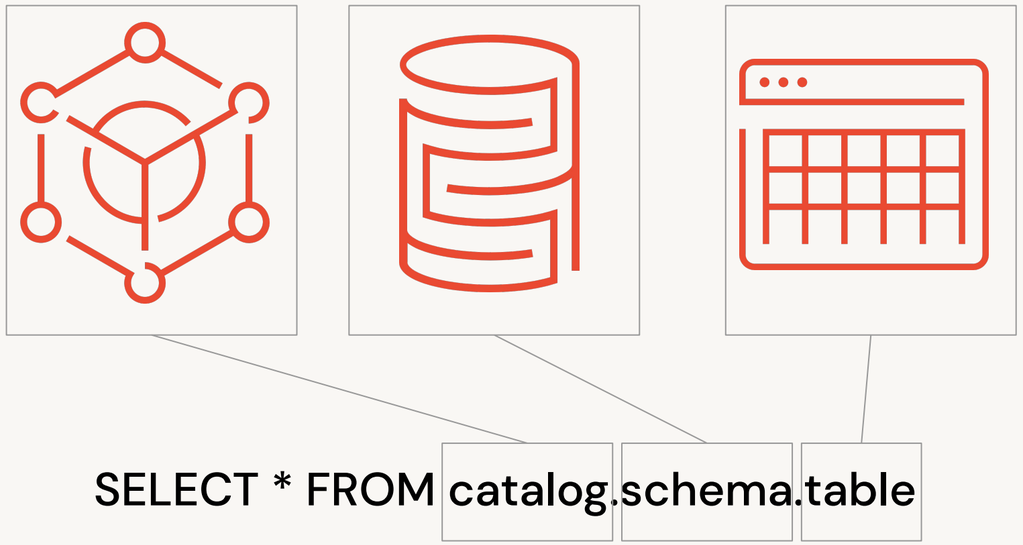
Catalog

Three-level namespace

Traditional SQL two-level namespace

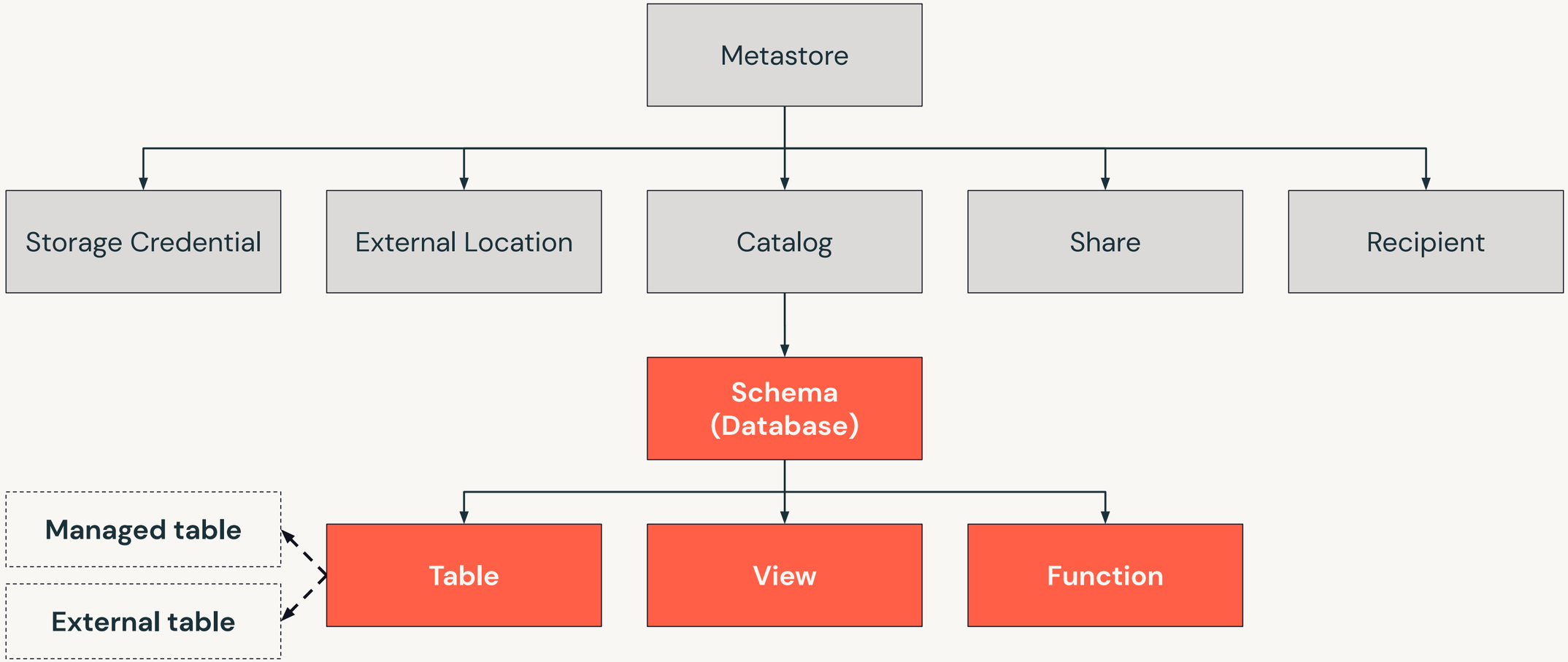


Unity Catalog three-level namespace



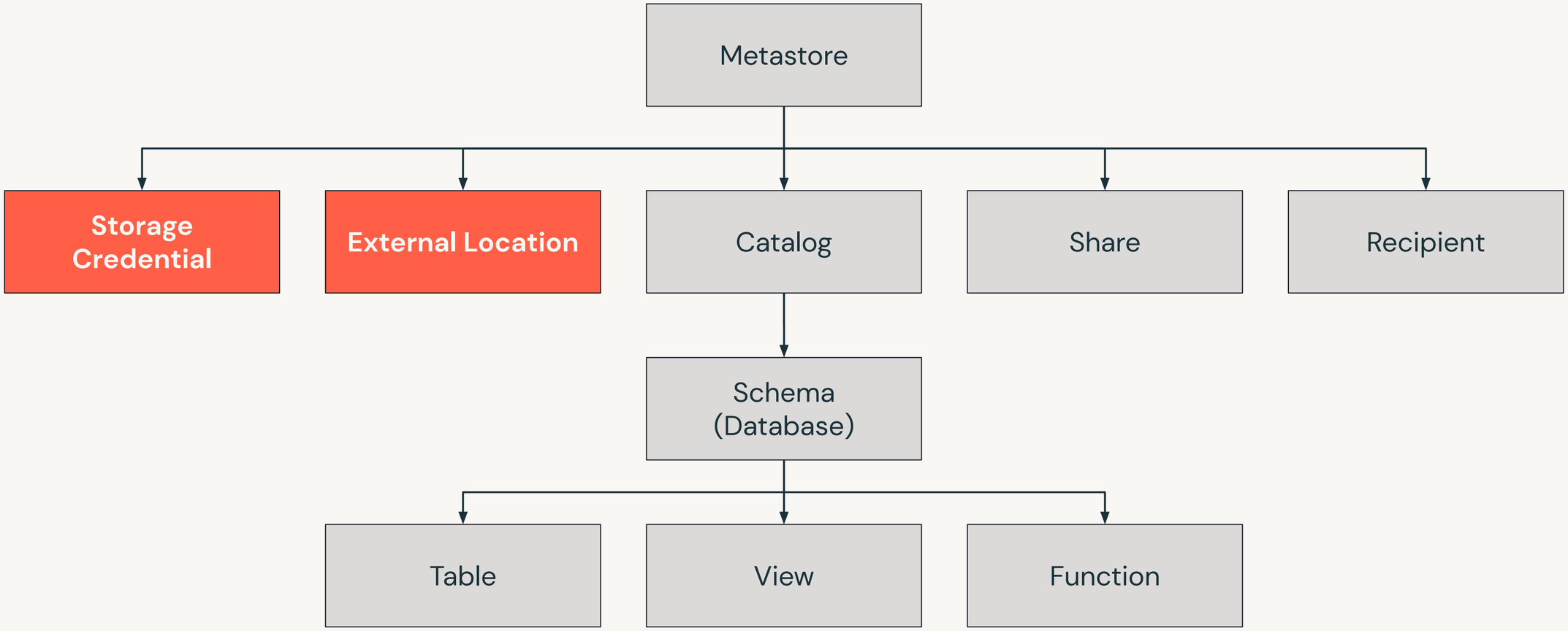
Data Objects

Schema (database), tables, views, functions



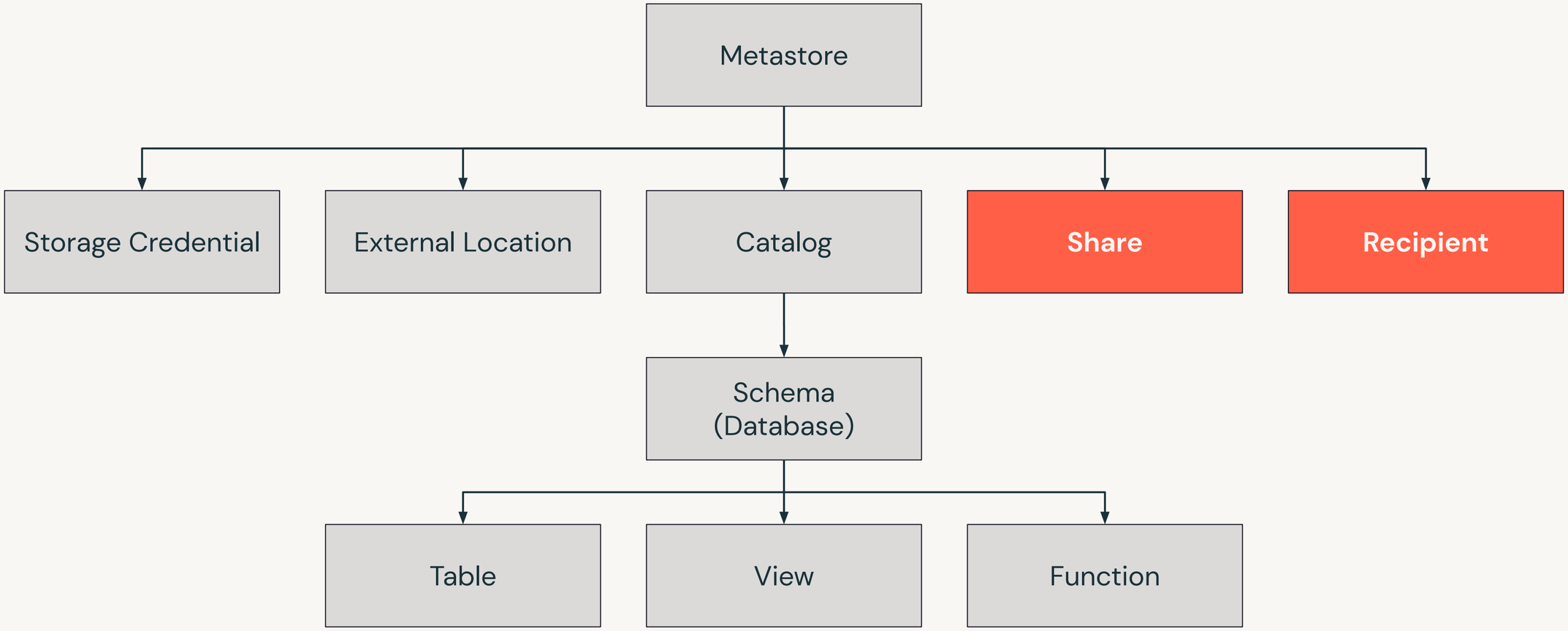
External Storage

Storage credentials and external locations



Delta Sharing

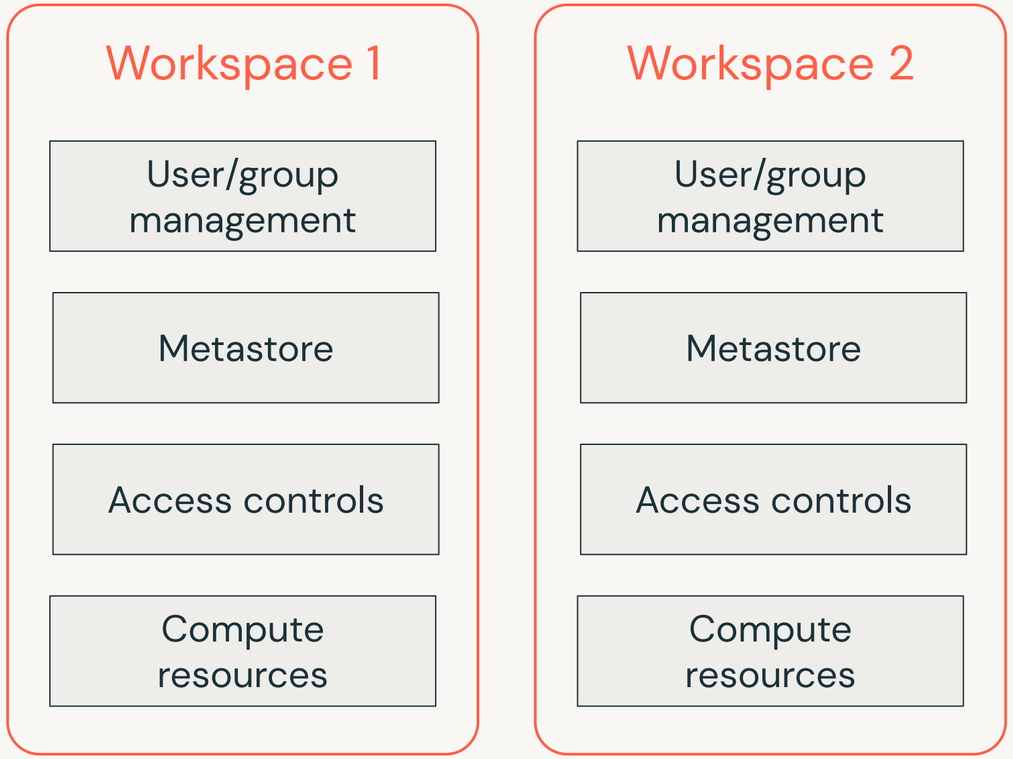
Shares and recipients



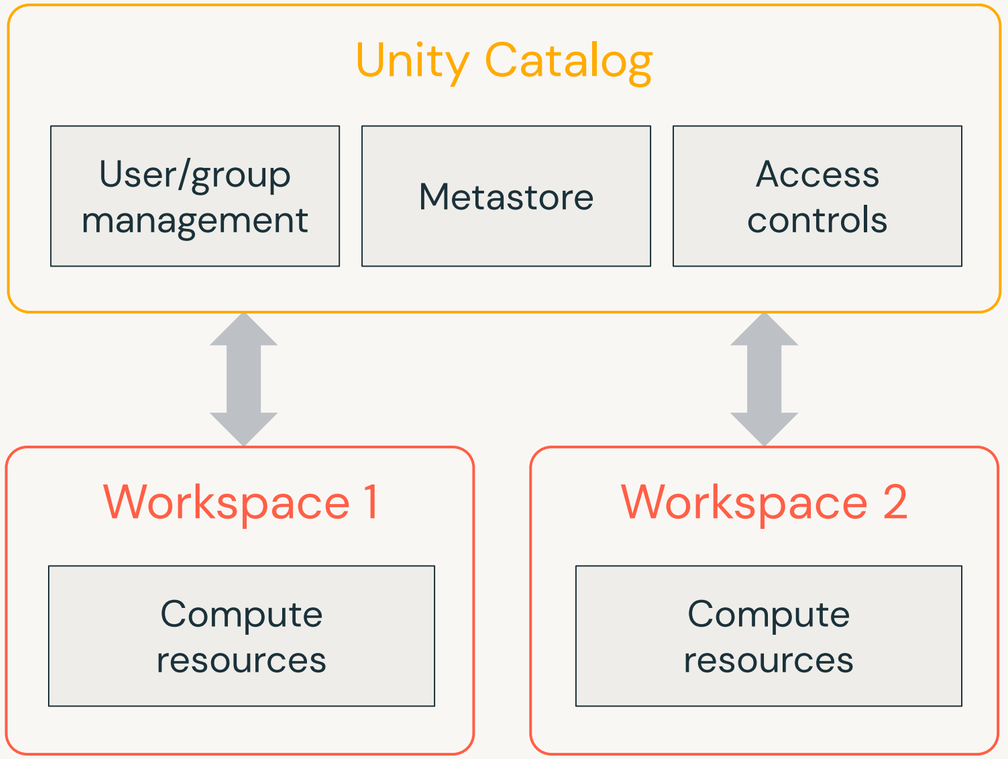
Unity Catalog Architecture

Architecture

Before Unity Catalog

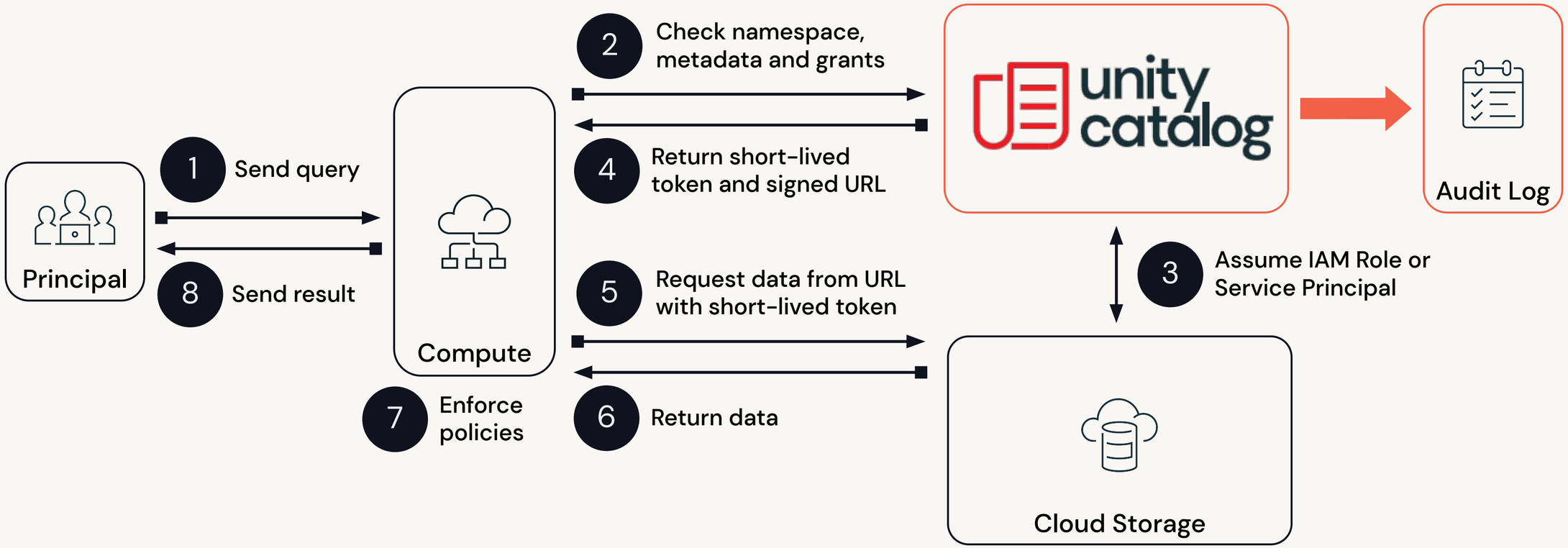


With Unity Catalog



Query Lifecycle

Unity Catalog Security Model



Compute Resources and Unity Catalog

Compute Resources for Unity Catalog

Cluster Access Mode

Modes supporting UC

Single user
Multiple language support, not shareable

Shared
Shareable, Python and SQL, legacy table ACLs

Modes not supporting UC

No isolation shared

Multiple language support

Cluster Access Mode

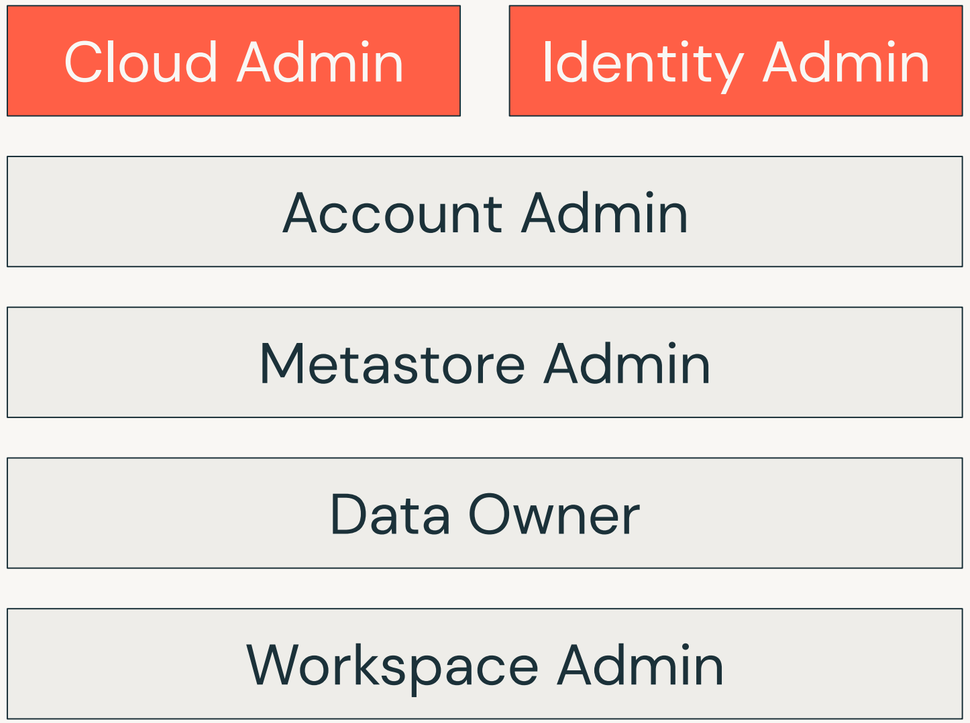
Feature matrix

Access mode	Supported languages	Legacy table ACL	Credential passthrough	Shareable	RDD API	DBFS Fuse mounts	Init scripts and libraries	Dynamic views	Machine learning
No Isolation Shared	All			●	●	●	●		●
Single user	**All**				●	●	●		●
Shared	**SQL Python**	●		●				●	

Roles and Identities in Unity Catalog

Unity Catalog

Roles



Cloud Admin

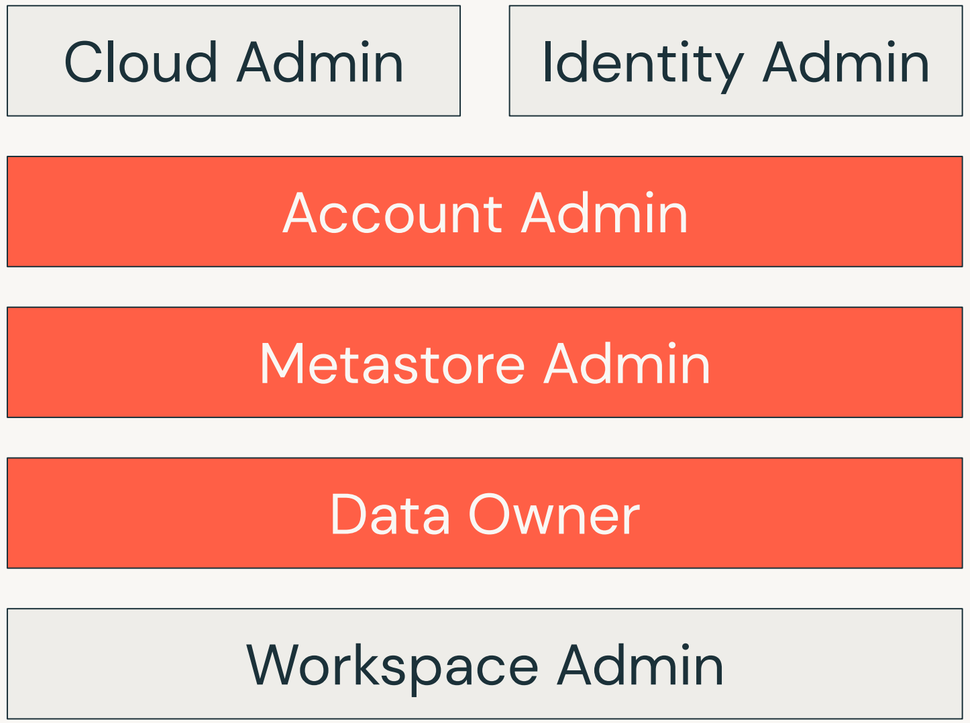
- Manage underlying cloud resources
  - Storage accounts/buckets
  - IAM role/service principals/managed identities

Identity Admin

- Manage users and groups in the identity provider (IdP)
- Provision into account (with account admin)

Unity Catalog

Roles



Account Admin

- Create or delete metastores, assign metastores to workspaces
- Manage users and groups, integrate with IdP
- Full access to all data objects

Metastore Admin

- Create or drop, grant privileges on, and change ownership of catalogs and otherdata objects

Data Owner - owns data objects they created

- Create nested objects, grant privileges on, and change ownership of owned objects

Unity Catalog

Roles

Cloud Admin

Identity Admin

Account Admin

Metastore Admin

Data Owner

Workspace Administrator

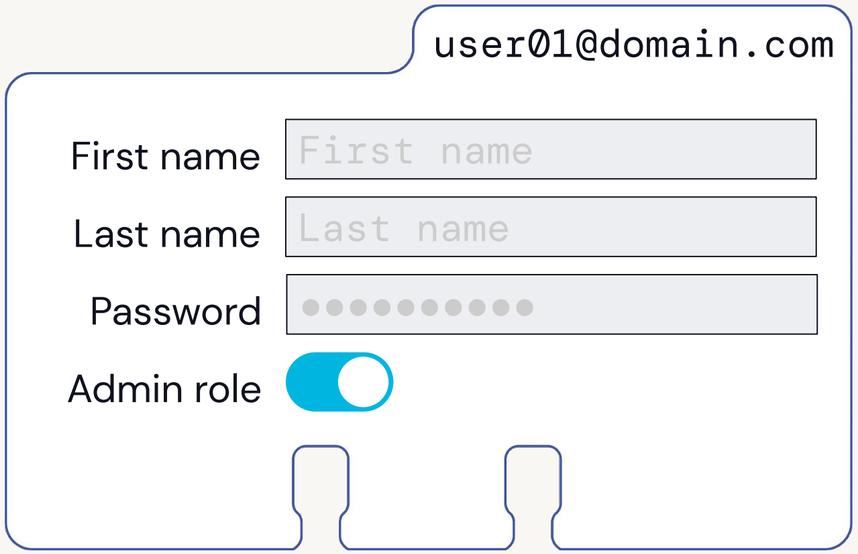
Workspace Admin

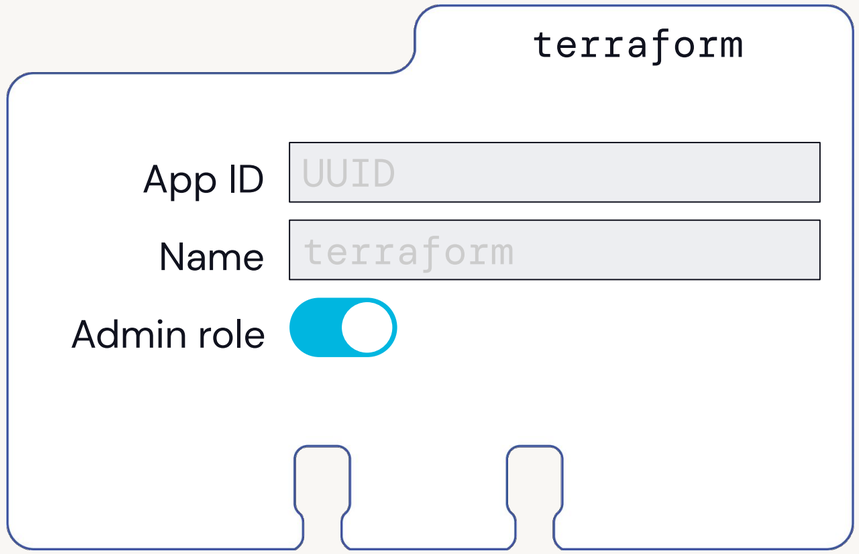
- Manages permissions on workspace assets
- Restricts access to cluster creation
- Adds or removes users
- Elevates users permissions
- Grant privileges to others
- Change job ownership

Unity Catalog

Identities

- User
- Account Administrator
- Service Principal
- Service Principal with administrative privileges

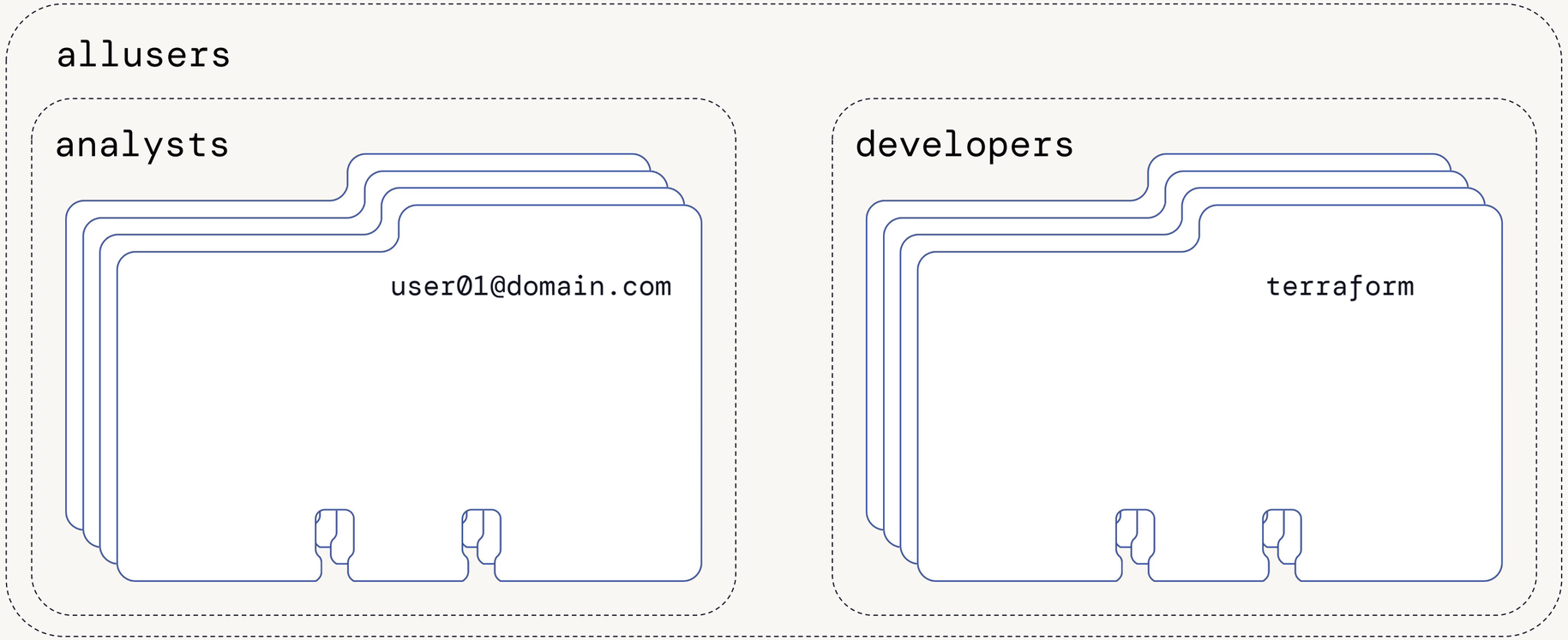




Unity Catalog

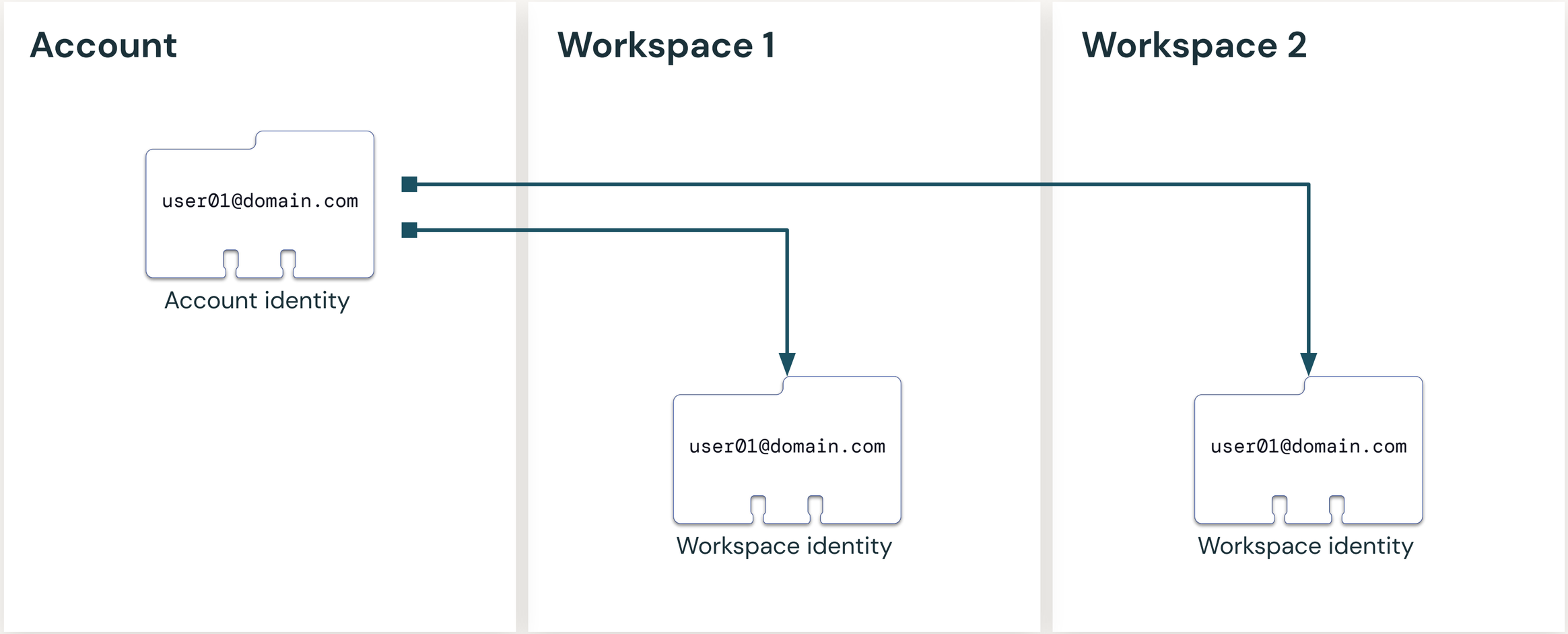
Identities

- Groups



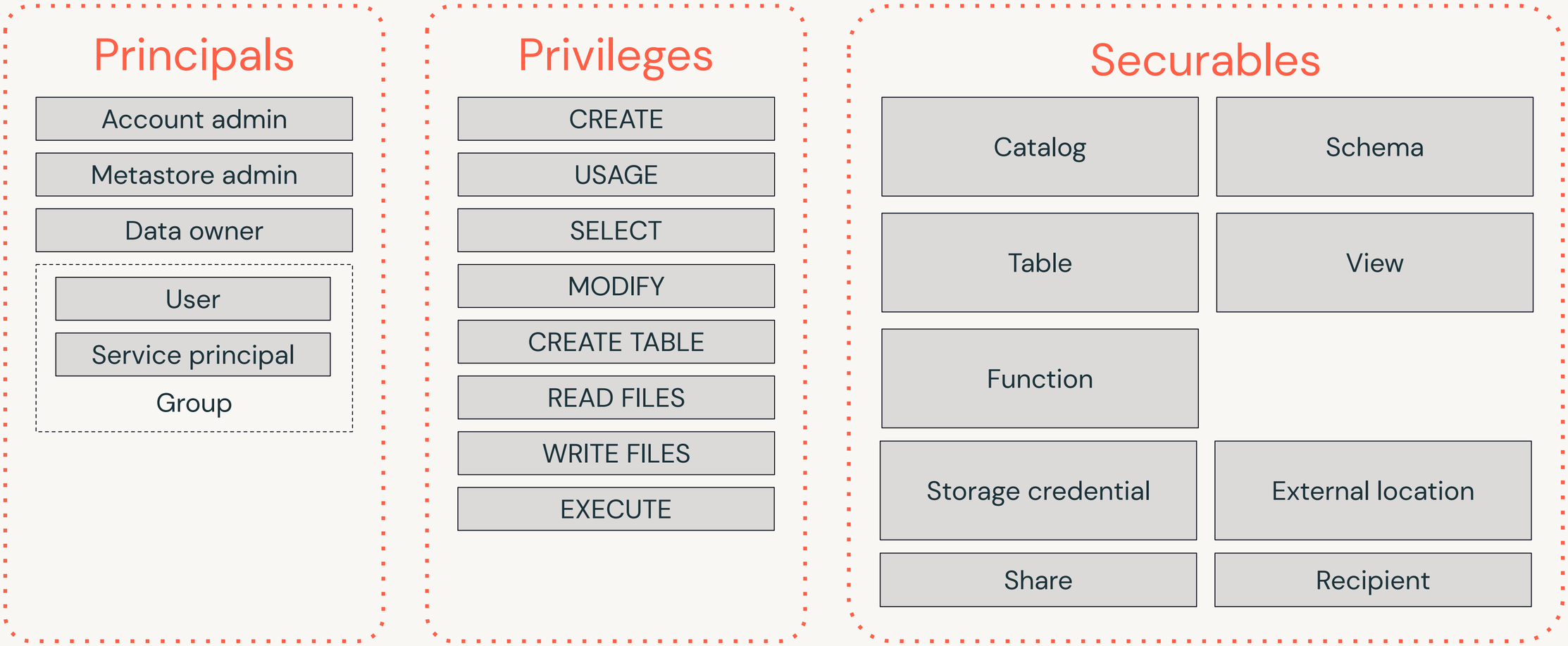
Unity Catalog

Identity Federation

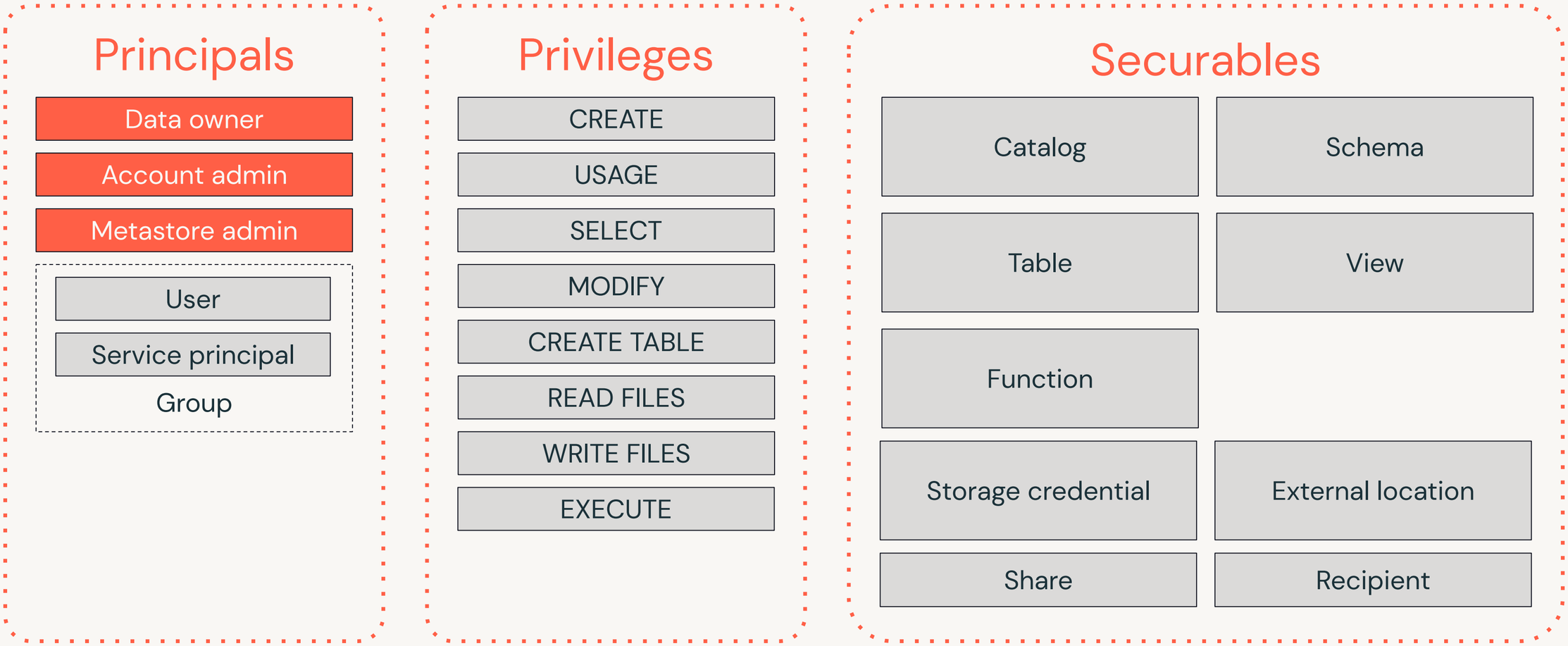


Data Access Control in Unity Catalog

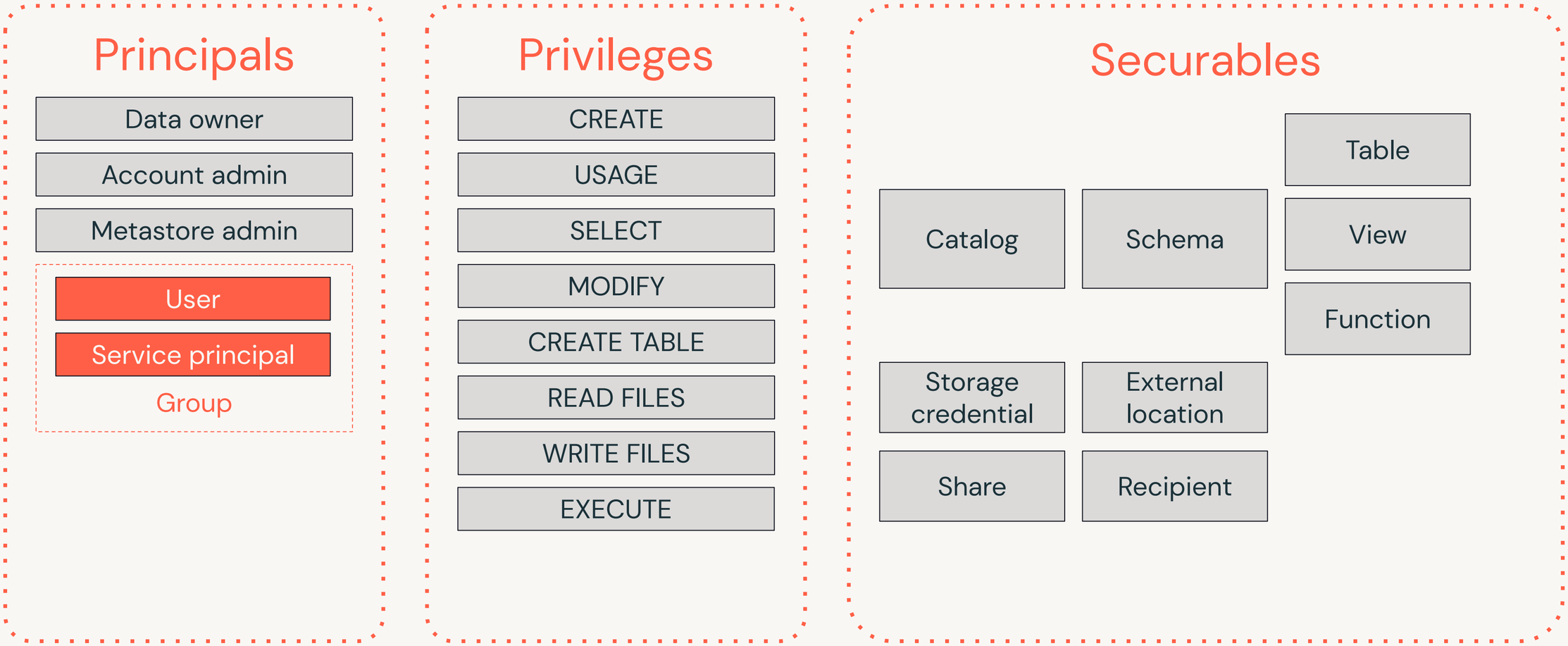
Security model



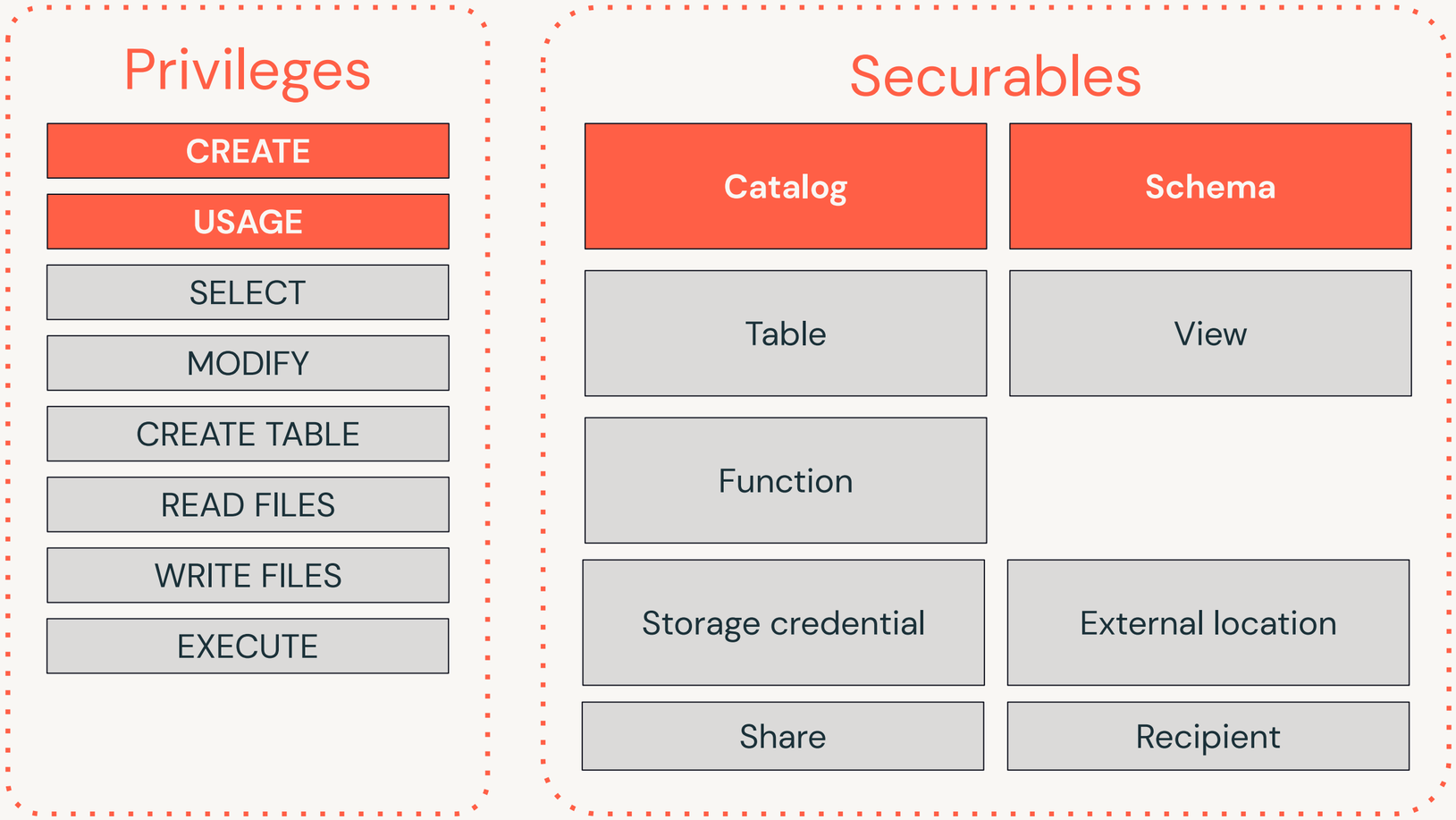
Security model



Security model



Security model



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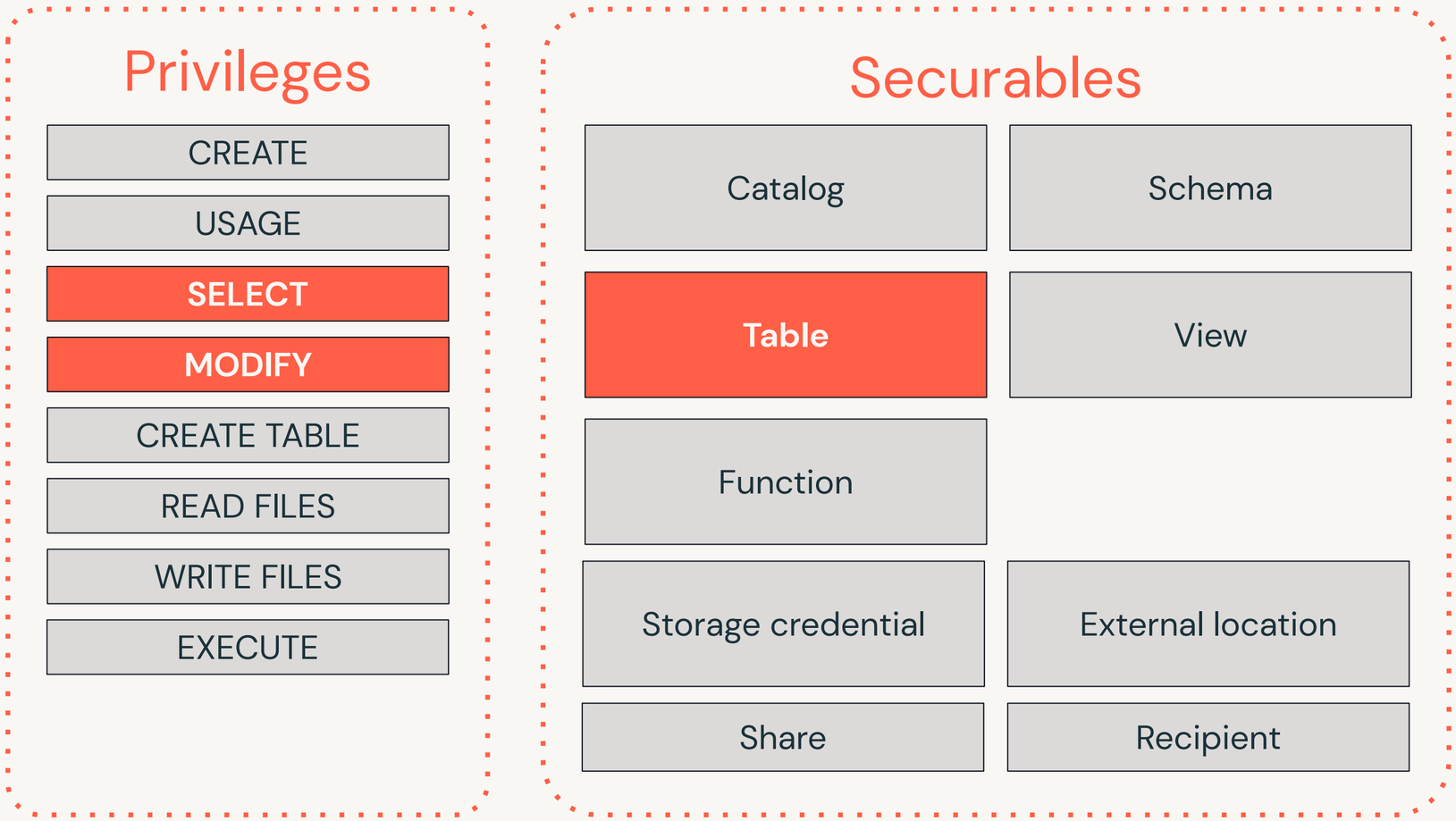

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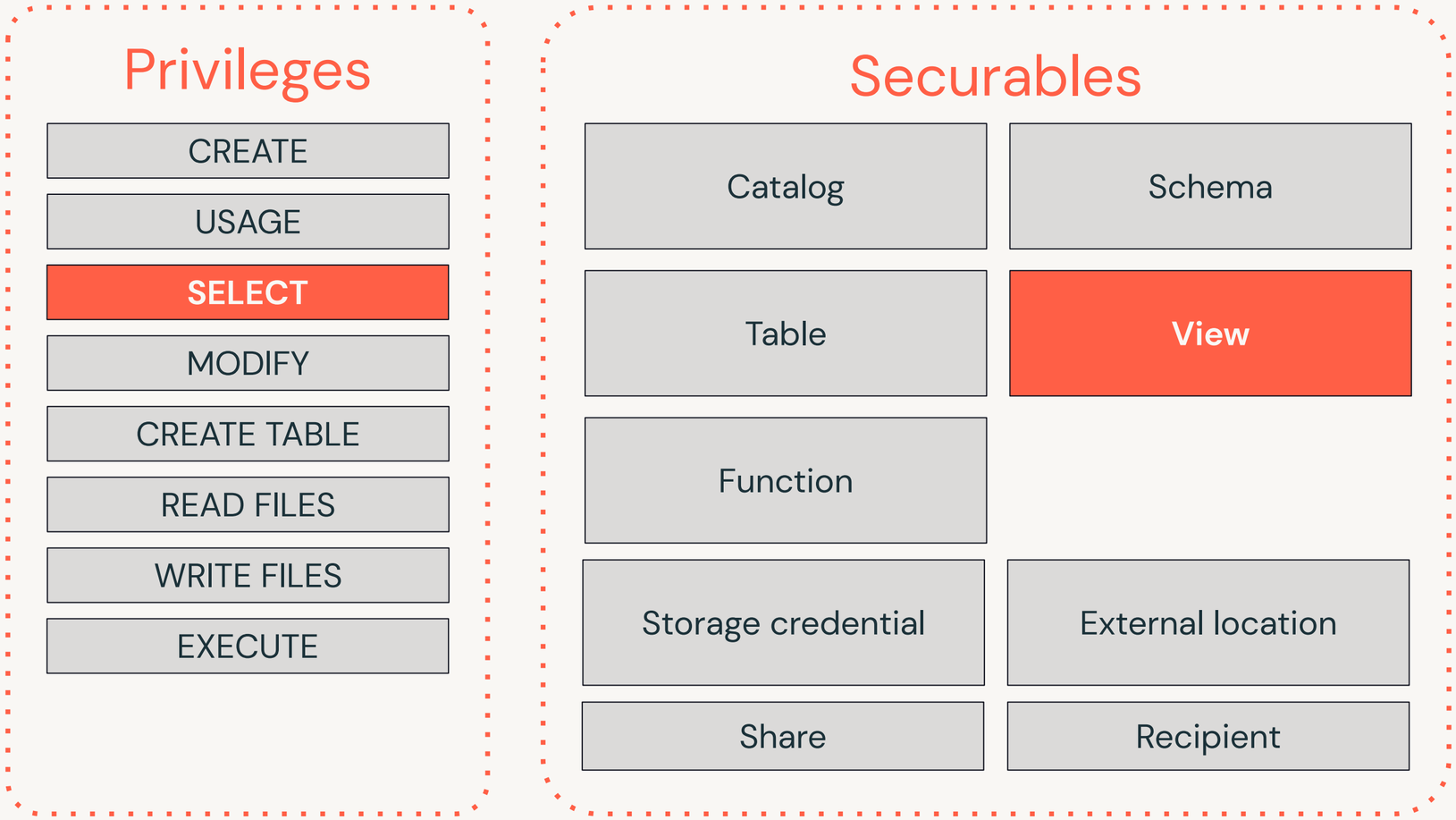

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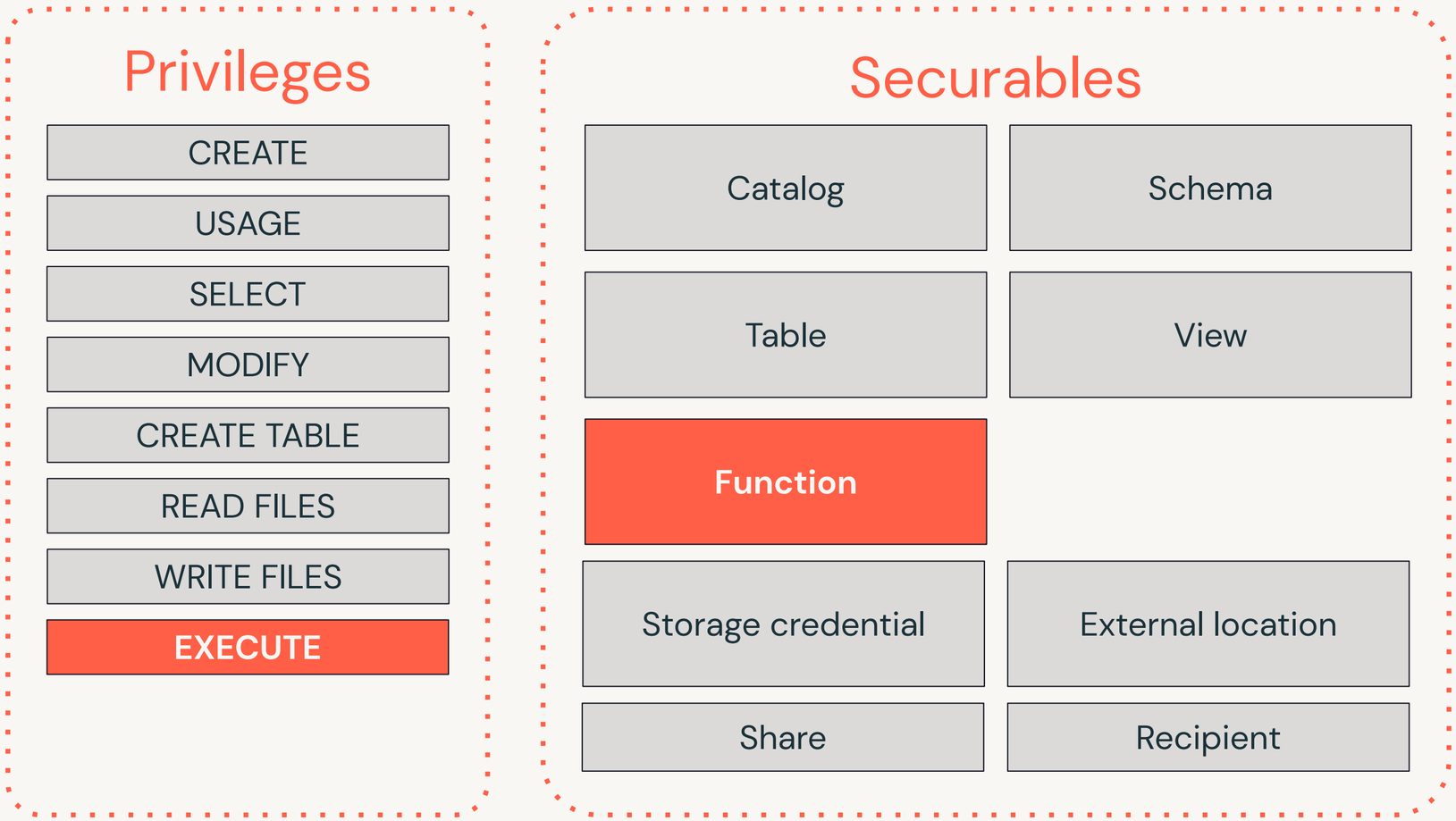

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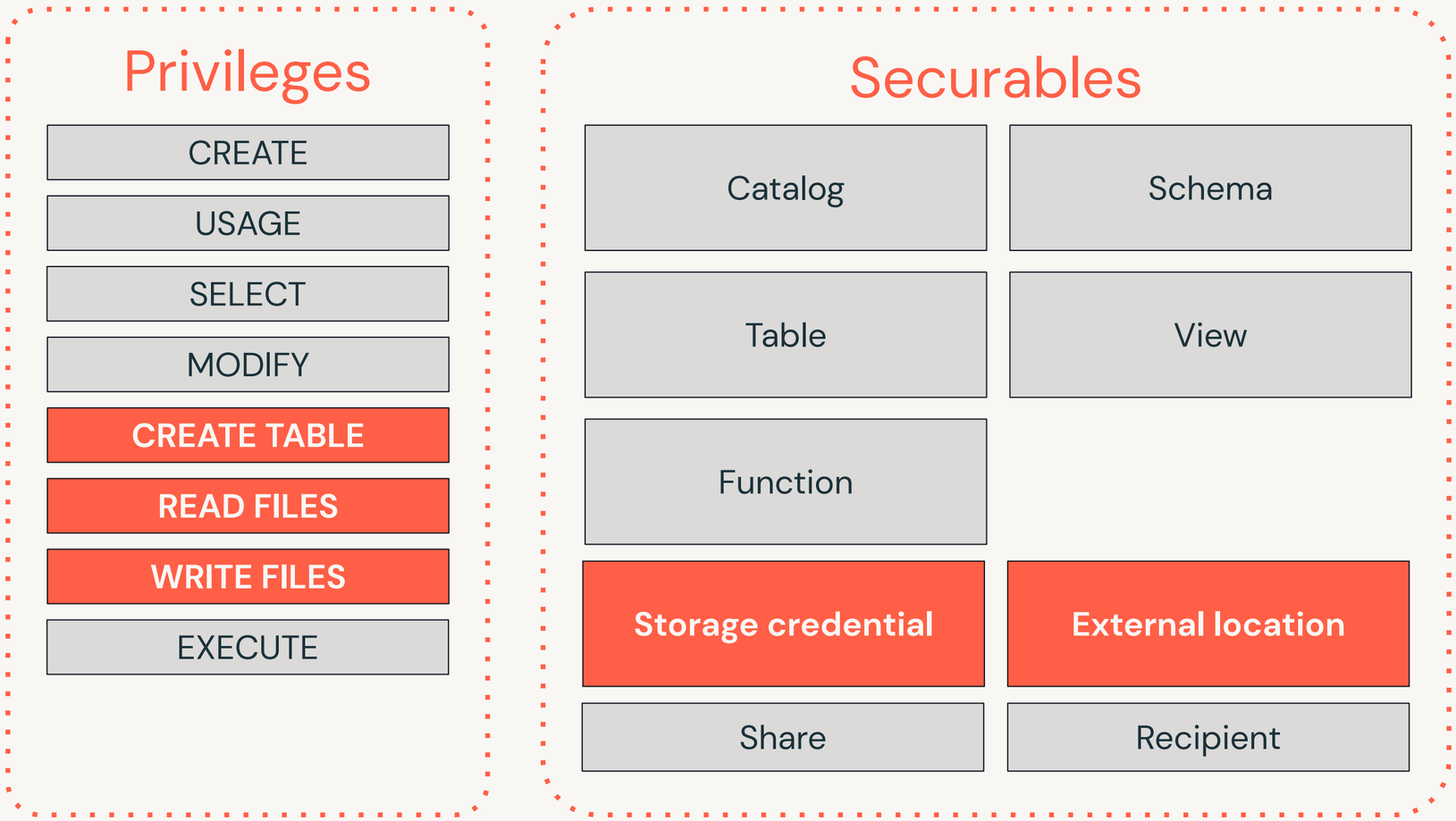

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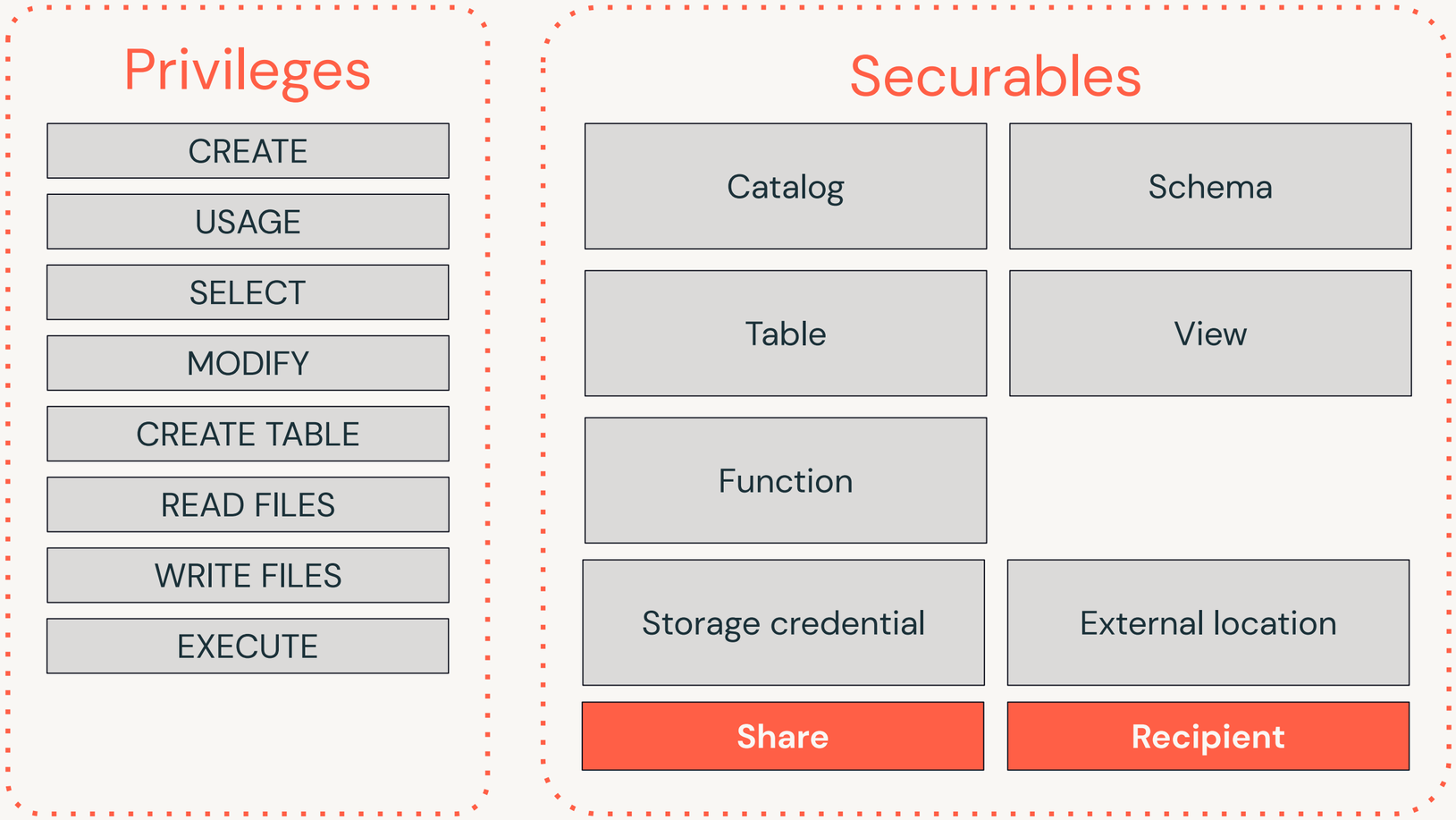
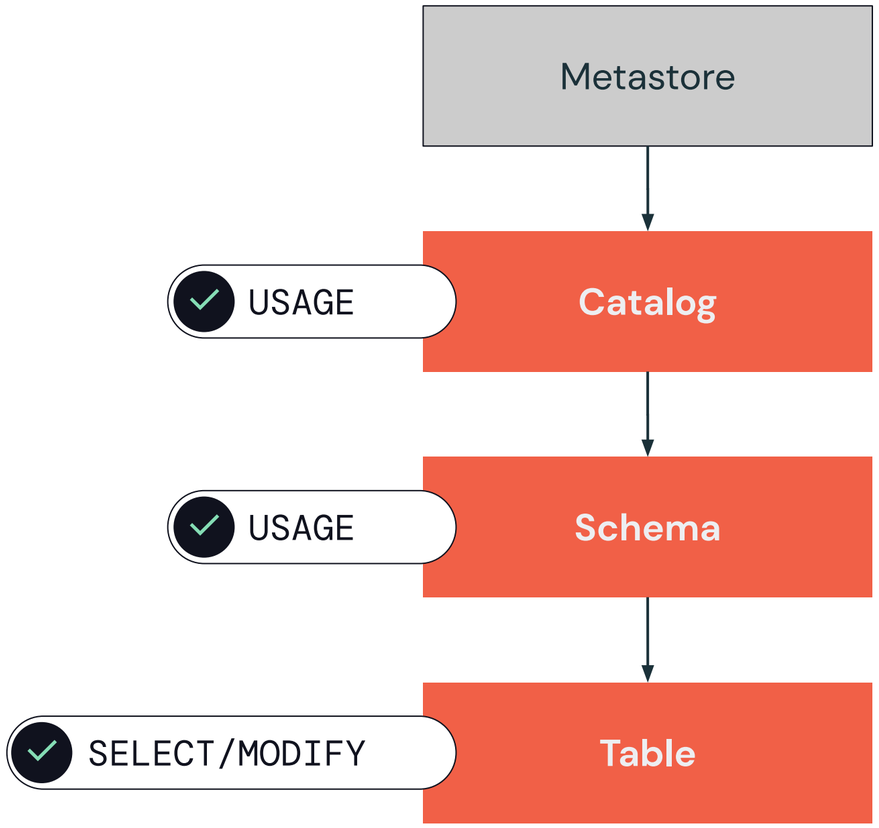


Privilege Recap

Tables



Querying tables (**SELECT**)

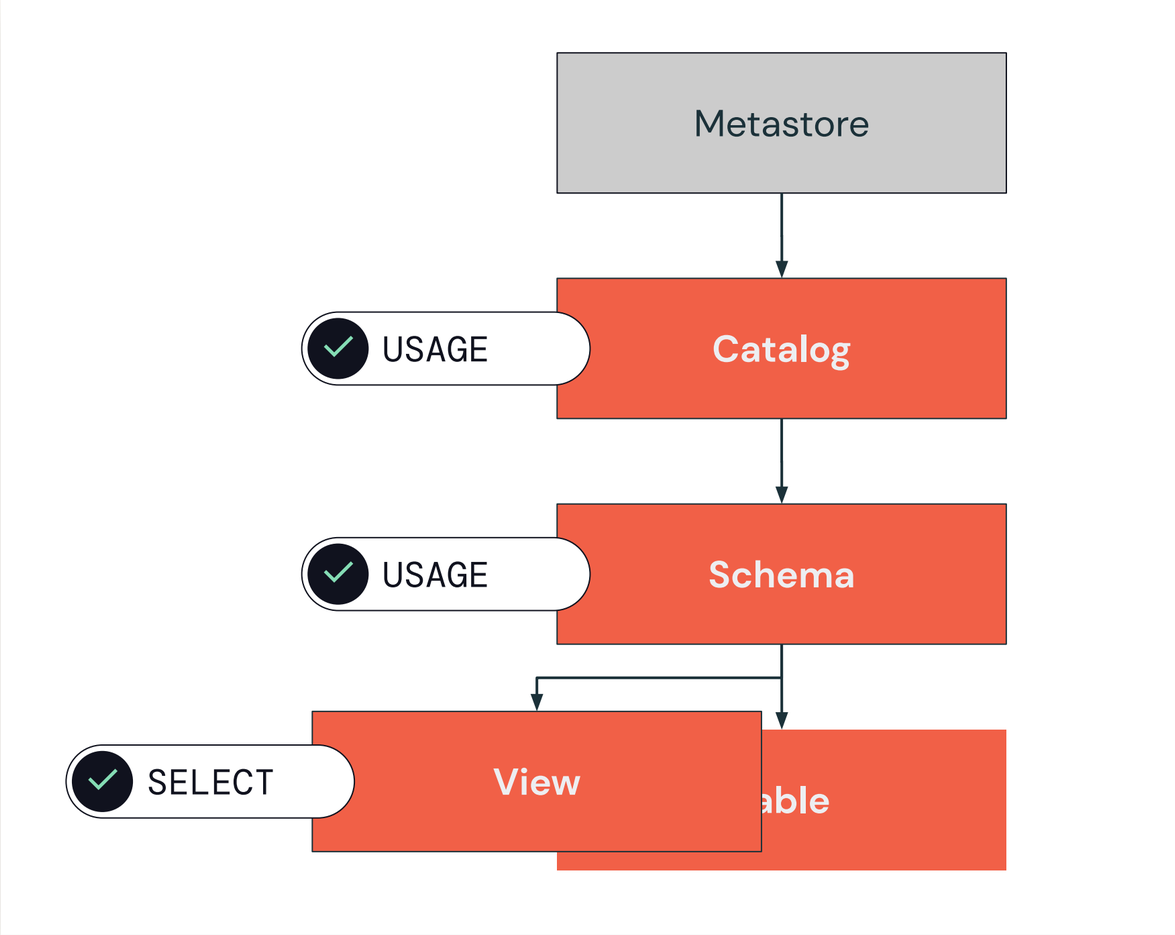
Modifying tables (**MODIFY**)

- Data (INSERT, DELETE)
- Metadata (ALTER)

Traverse container (**USAGE**)

Privilege Recap

Views



Abstract complex queries

- Aggregations
- Transformations
- Joins
- Filters

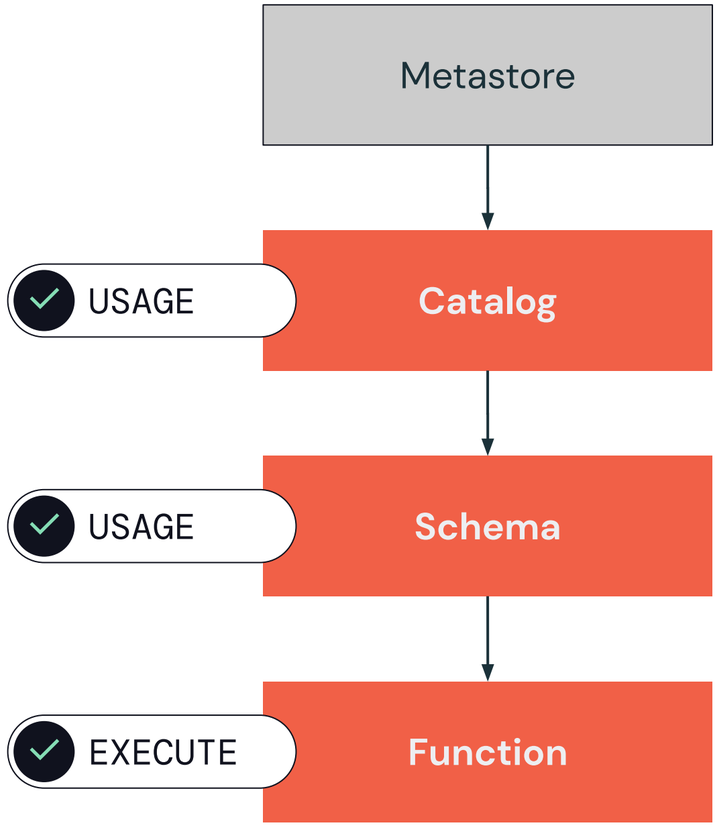
Enhanced table access control

Querying views (**SELECT**)

Traverse container (**USAGE**)

Privilege Recap

Functions



Provide custom code via user-defined functions

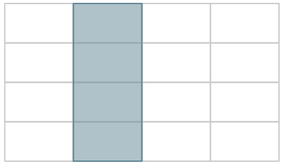
Using functions (**EXECUTE**)

Traverse container (**USAGE**)

Dynamic Views

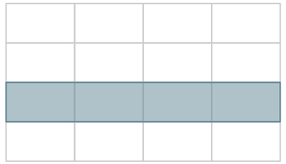
Limit access to columns

Omit column values from output



Limit access to rows

Omit rows from output



Data Masking

Obscure data

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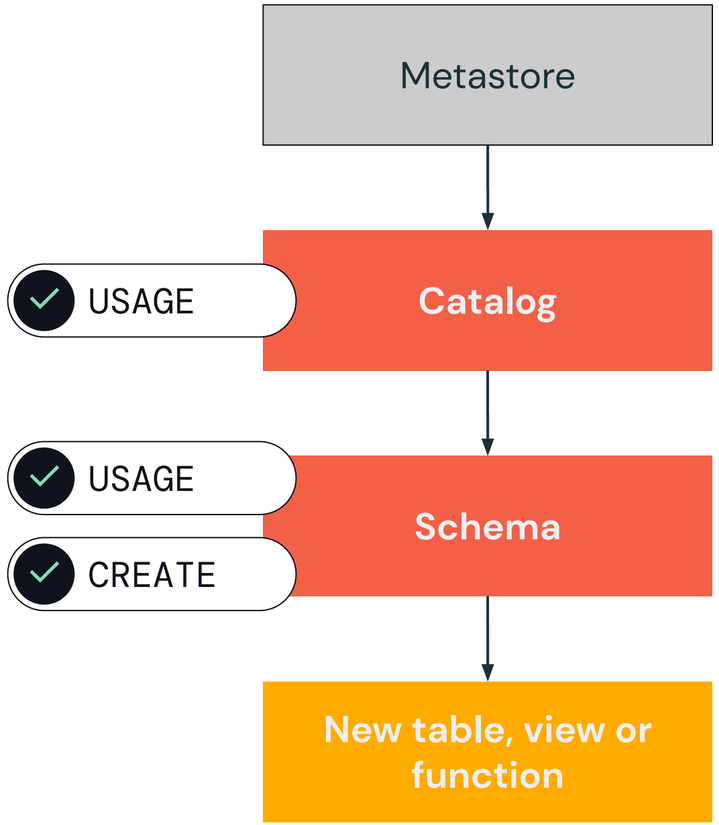
Can be conditional on a specific user/service principal or group membership through Databricks-provided functions

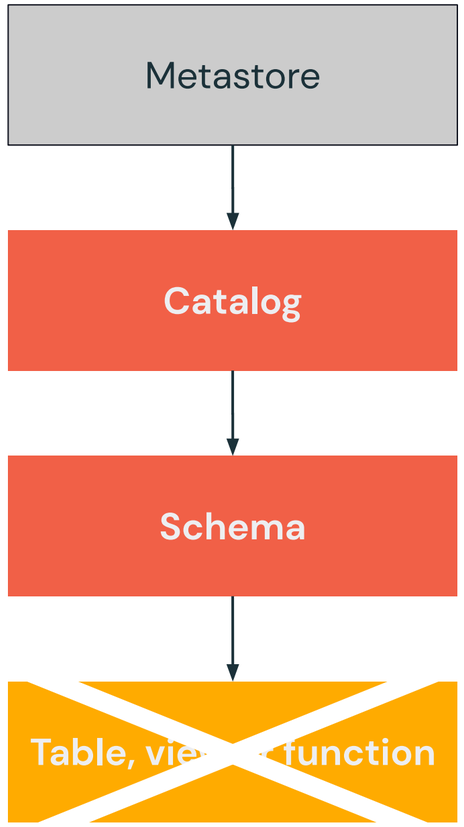
Creating New Objects



Create new objects (**CREATE**)

Traverse container (**USAGE**)

Deleting Objects



DROP objects

Unity Catalog External Storage

Storage Credentials and External Locations

Storage Credential

Enables Unity Catalog to connect to an external cloud store

Examples include:

- IAM role for AWS S3
- Service principal for Azure Storage

External Location

Cloud storage path + storage credential

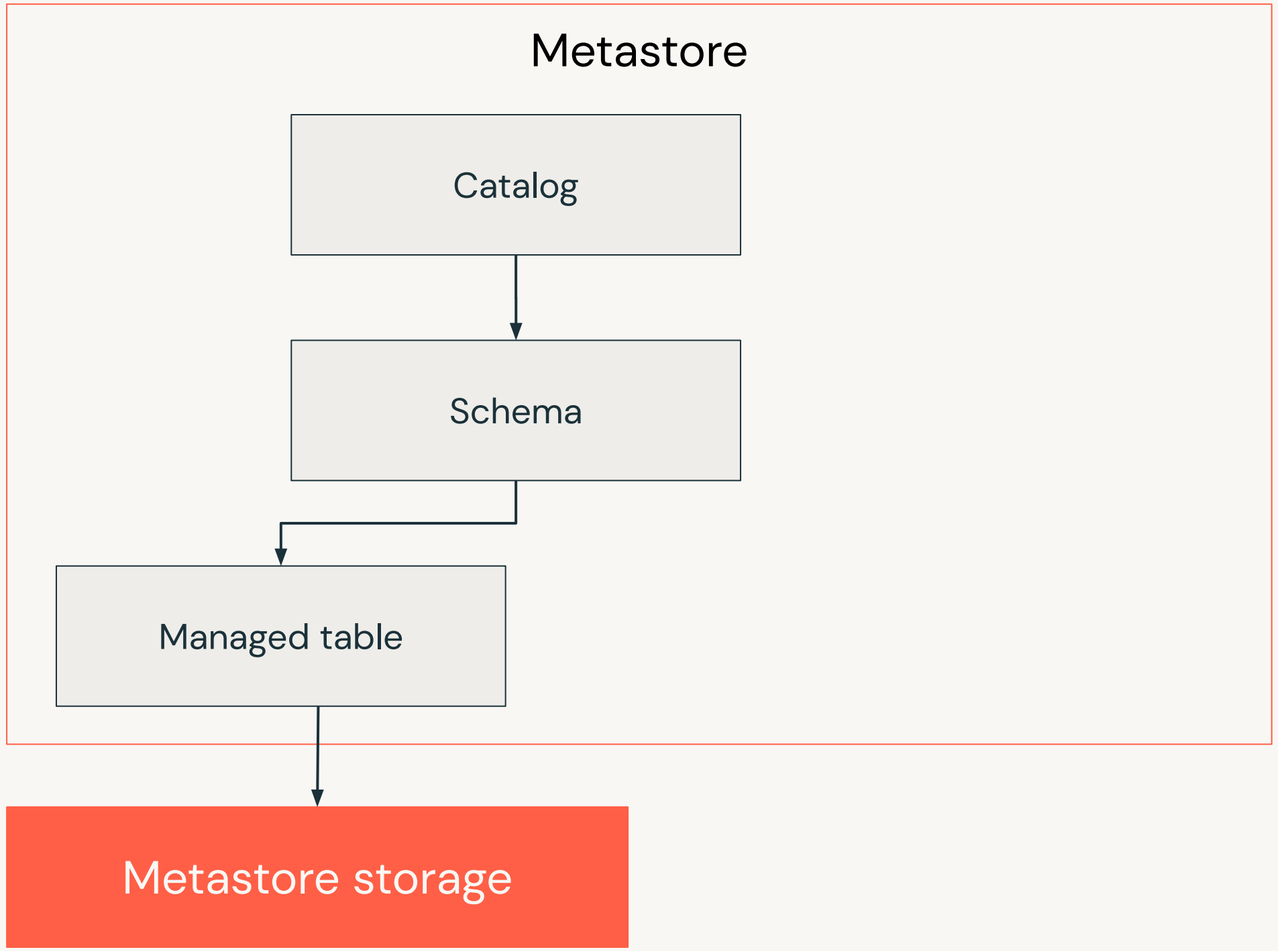
- Self-contained object for accessing specific locations in cloud stores
- Fine-grained control over external storage

Storage Credentials and External Locations

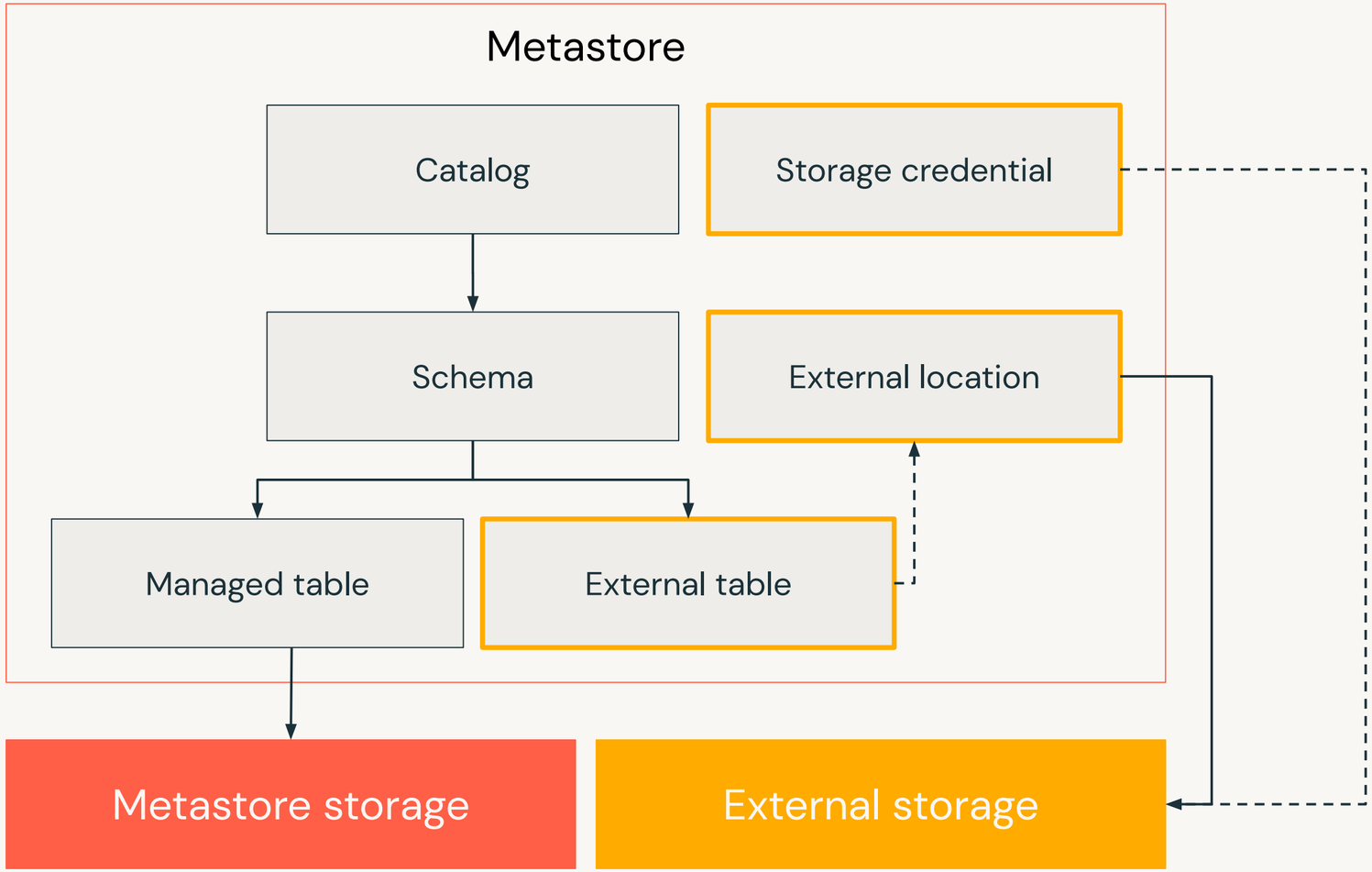
Access Control

CREATE TABLE	READ FILES	WRITE FILES
Create an External Table directly using this Storage Credential	Read files directly using this Storage Credential	Write files directly using this Storage Credential
Storage Credential		
External Location		
Create an External Table from files governed by this External Location	Read files governed by this External Location	Write files governed by this External Location

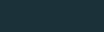
Managed Tables



External Tables

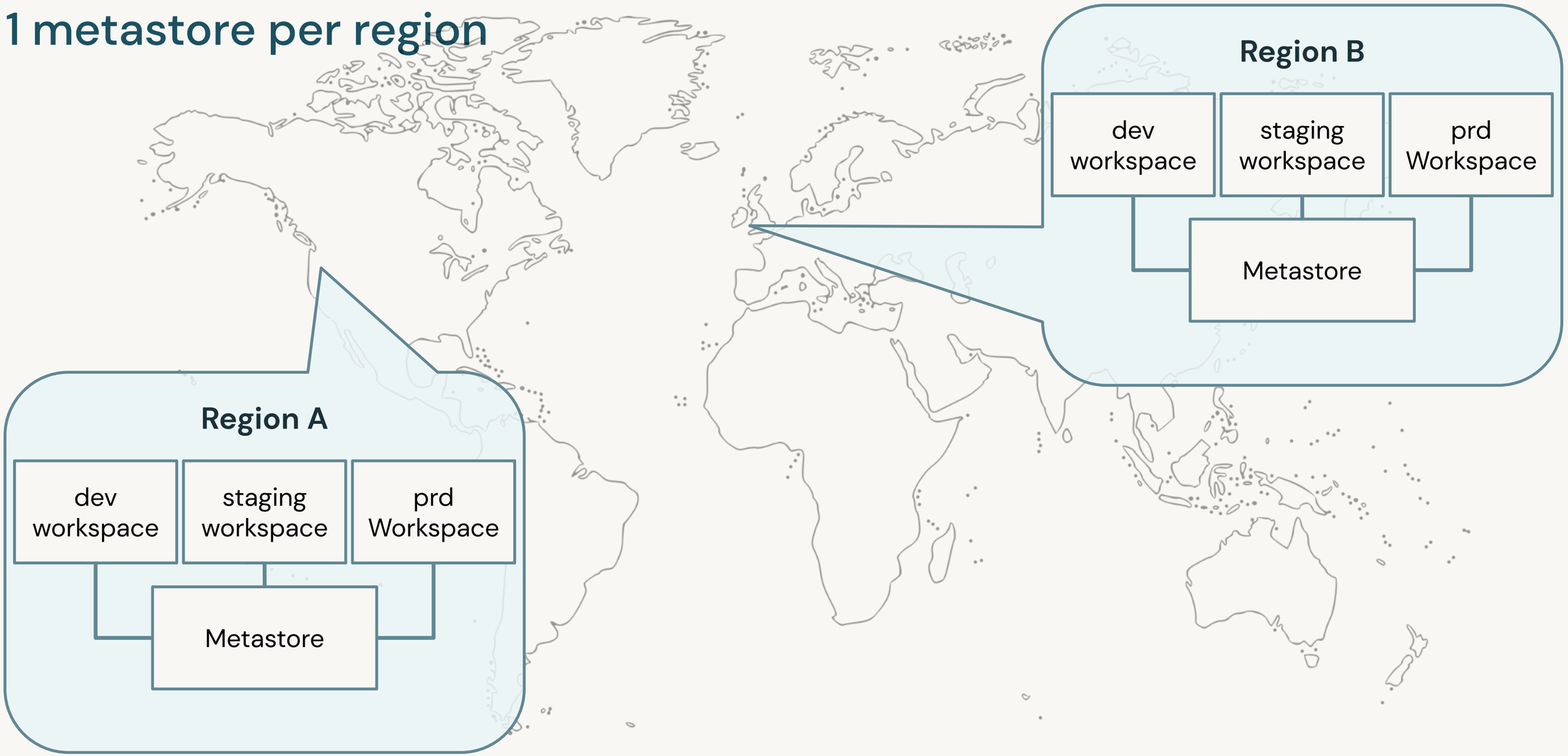


Unity Catalog Patterns and Best Practices



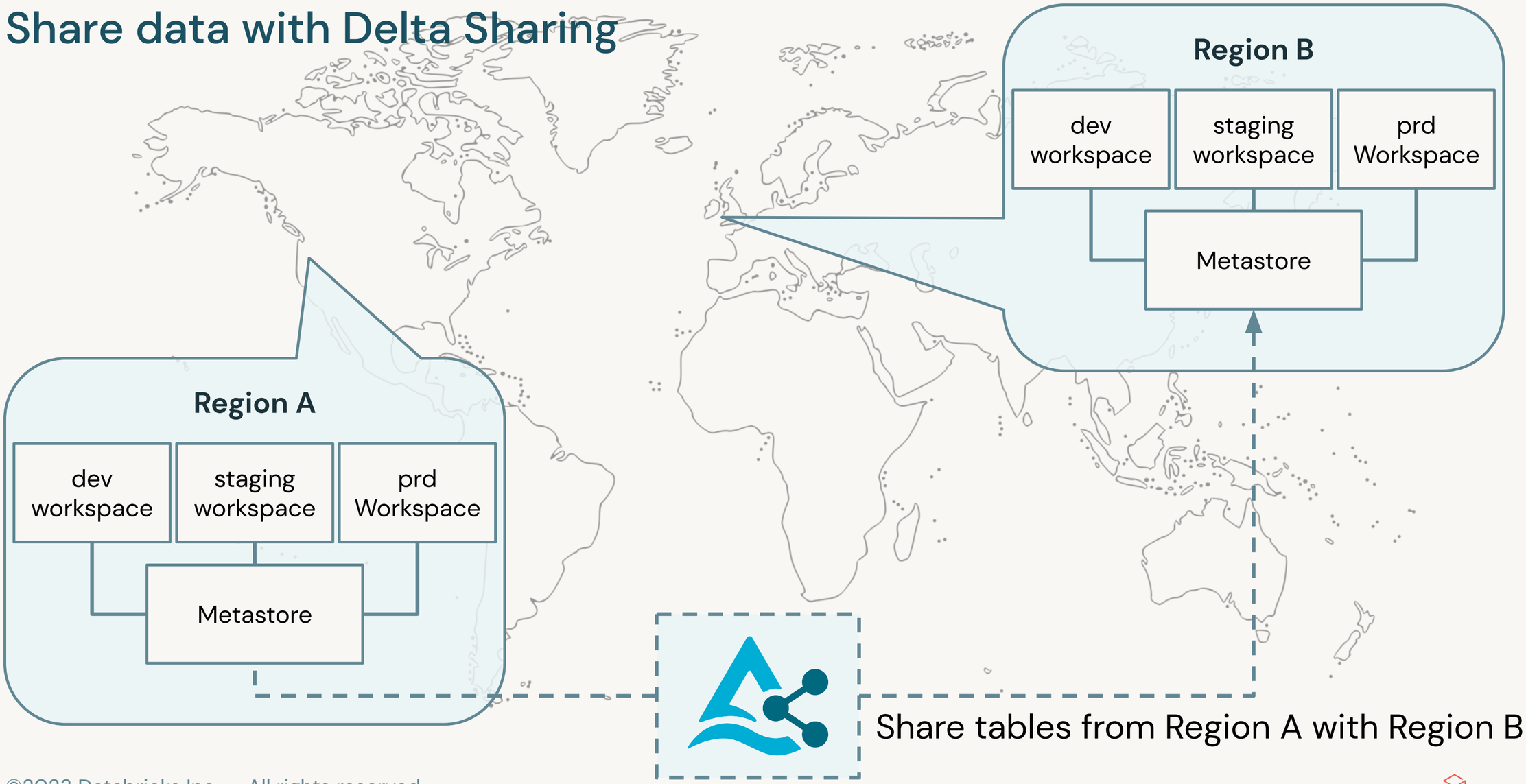
UC Patterns & Best Practices

1 metastore per region



UC Patterns & Best Practices

Share data with Delta Sharing



UC Patterns & Best Practices

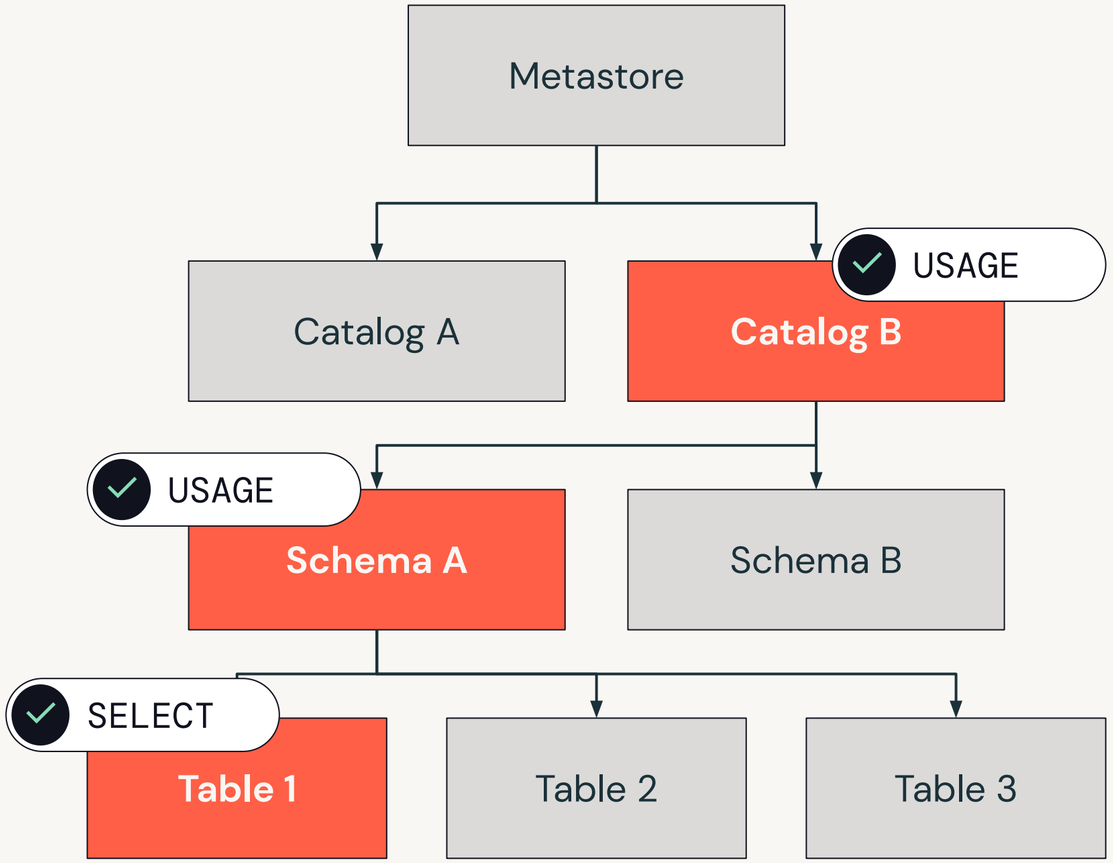
Data Segregation

Use **catalogs** (not metastores) to segregate data

Apply permissions appropriately

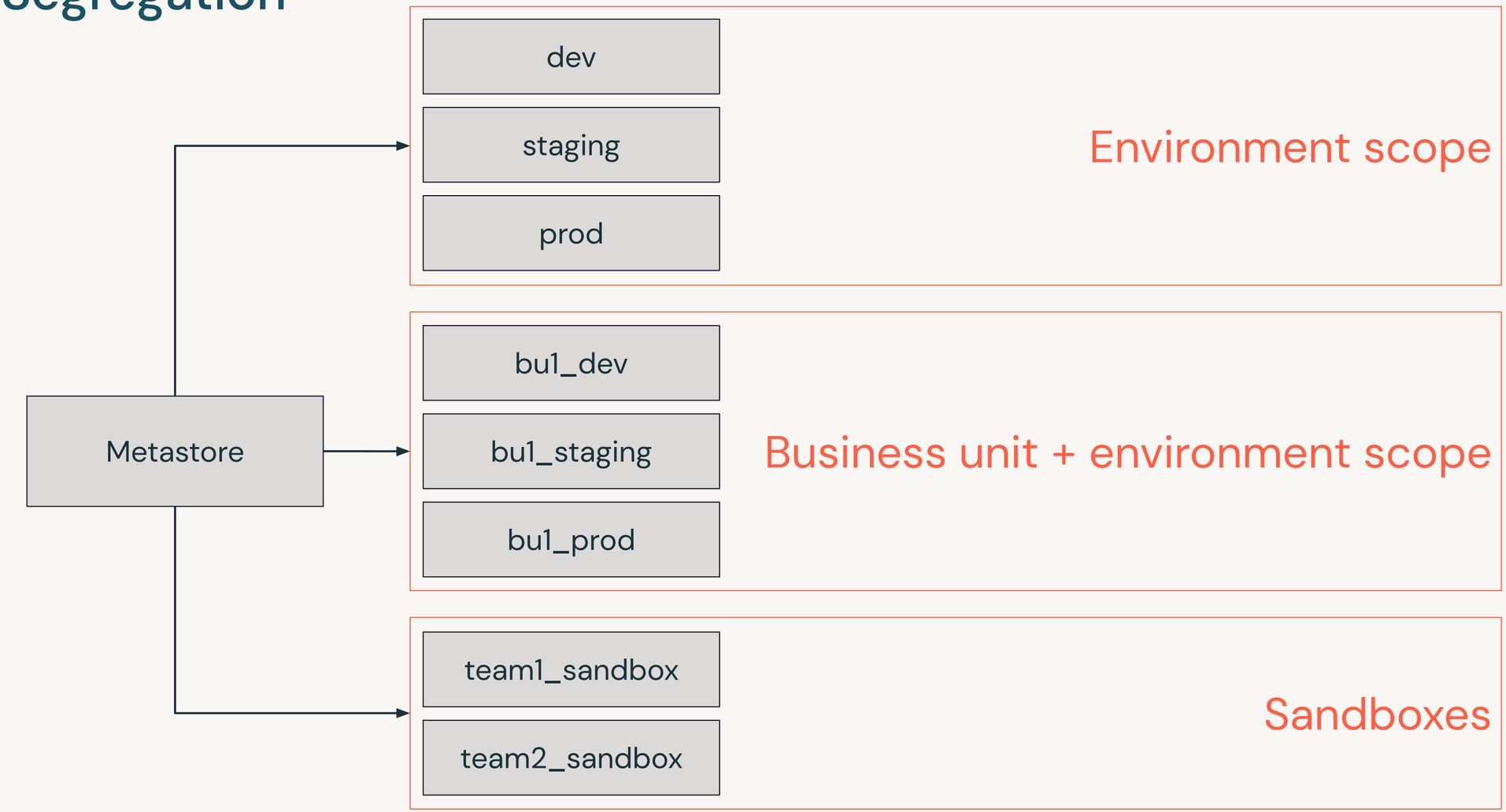
For example, grant to group B:

- **USAGE** on catalog B
- **USAGE** on all applicable schemas in catalog B
- **SELECT/MODIFY** on applicable tables



UC Patterns & Best Practices

Data Segregation



UC Patterns & Best Practices

Identity Management

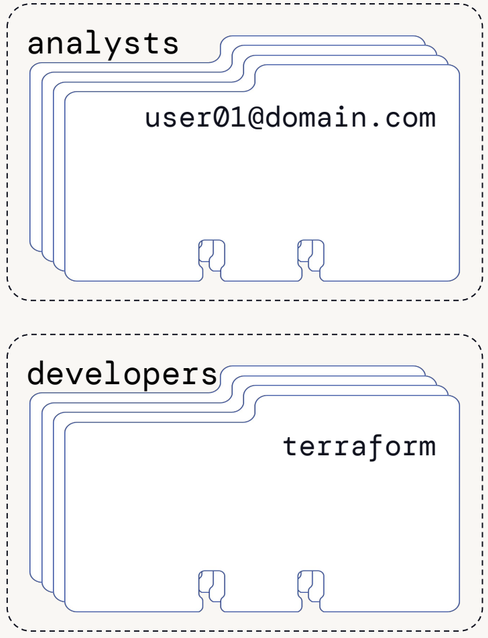
Account-level Identities

Manage all identities at the account-level

Enable UC for workspaces to enable identity federation

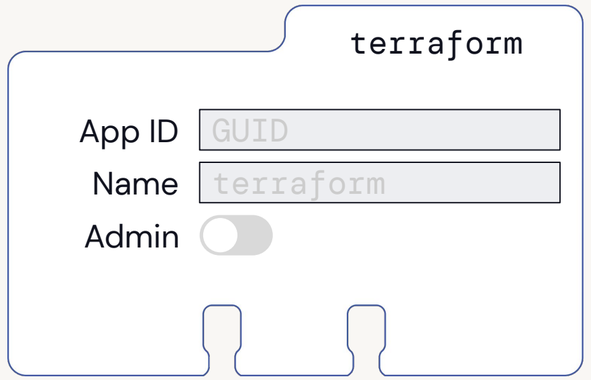
Groups

Use groups rather than users to assign access and ownership to securable objects



Service Principals

Use service principals to run production jobs



UC Patterns & Best Practices

Storage Credentials and External Locations

Storage Credential

Enables Unity Catalog to connect to an external cloud store

Examples include:

- IAM role for AWS S3
- Service principal for Azure Storage

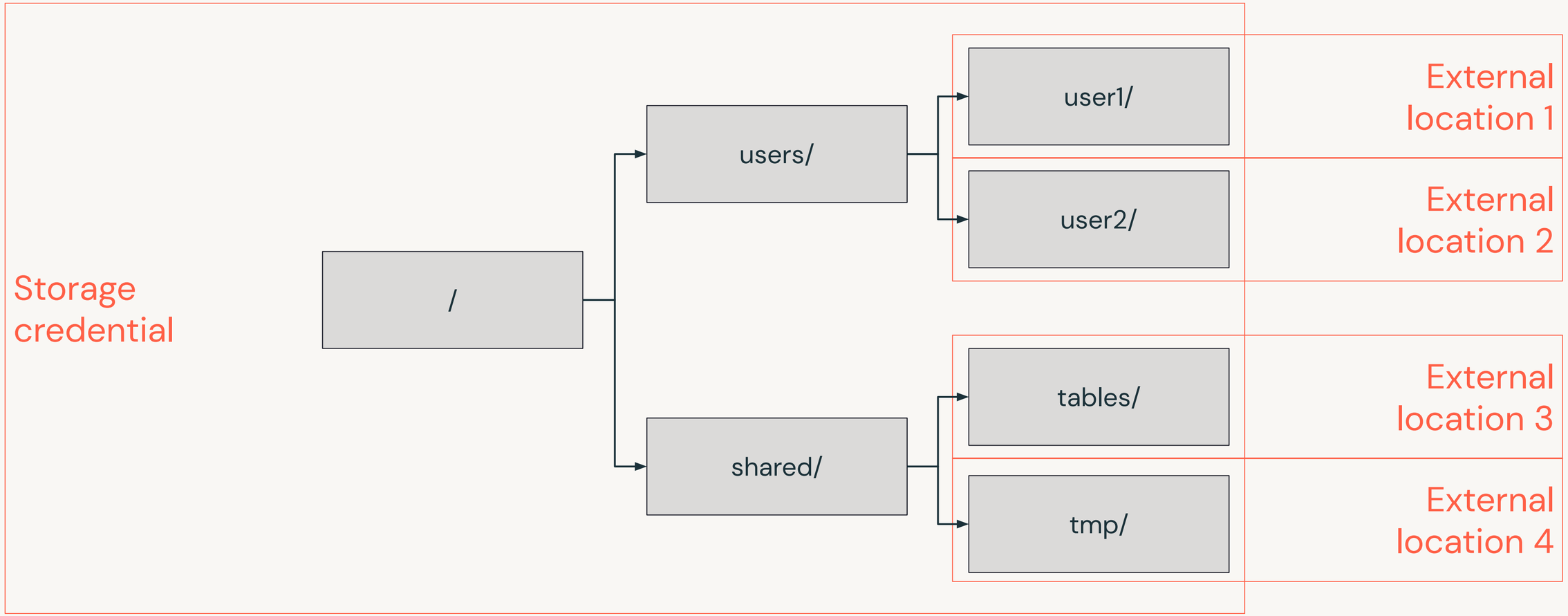
External Location

Cloud storage path + storage credential

- Self-contained object for accessing specific locations in cloud stores
- Fine-grained control over external storage

UC Patterns & Best Practices

Storage Credentials and External Locations



UC Patterns & Best Practices

Managed versus External Tables

Managed Tables

Metadata lives in control plane

Data lives in metastore managed storage location

DROP discards data

Delta format only

External Tables

Metadata lives in control plane

Data lives in user-provided storage location

DROP leaves data intact

Several formats supported

UC Patterns & Best Practices

When to use external tables?

Quick and easy upgrade from external table in Hive metastore

External readers or writers

Requirement for specific storage naming or hierarchy

Infrastructure-level isolation requirements

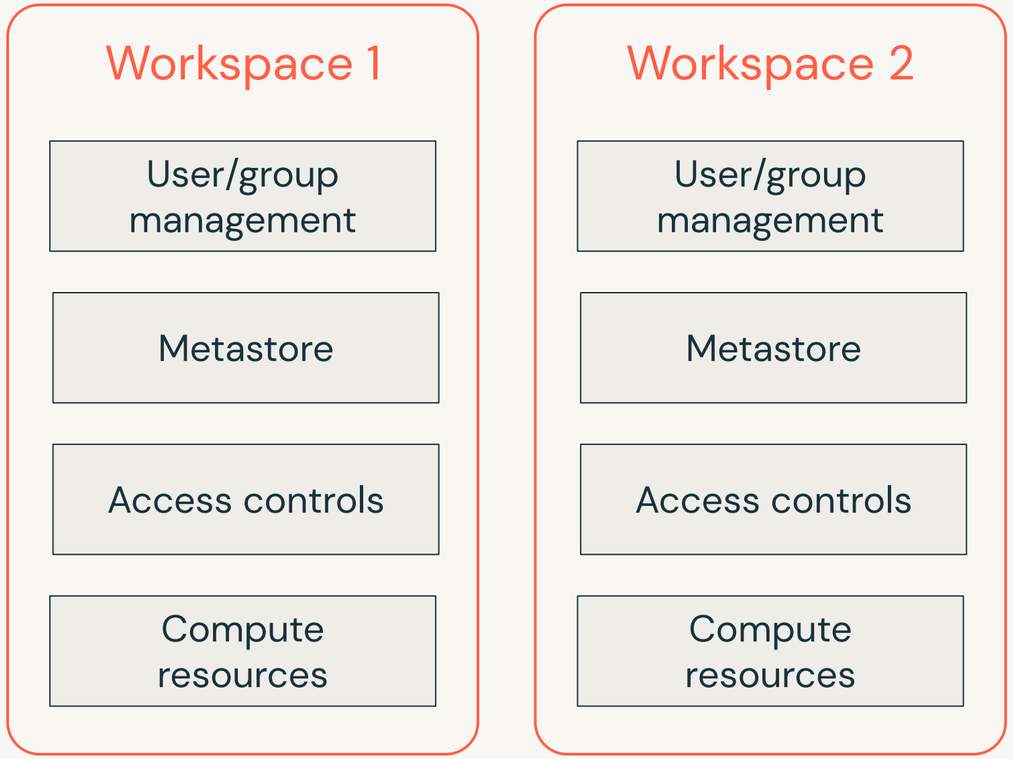
Non-Delta support requirement

Unity Catalog Key Capabilities

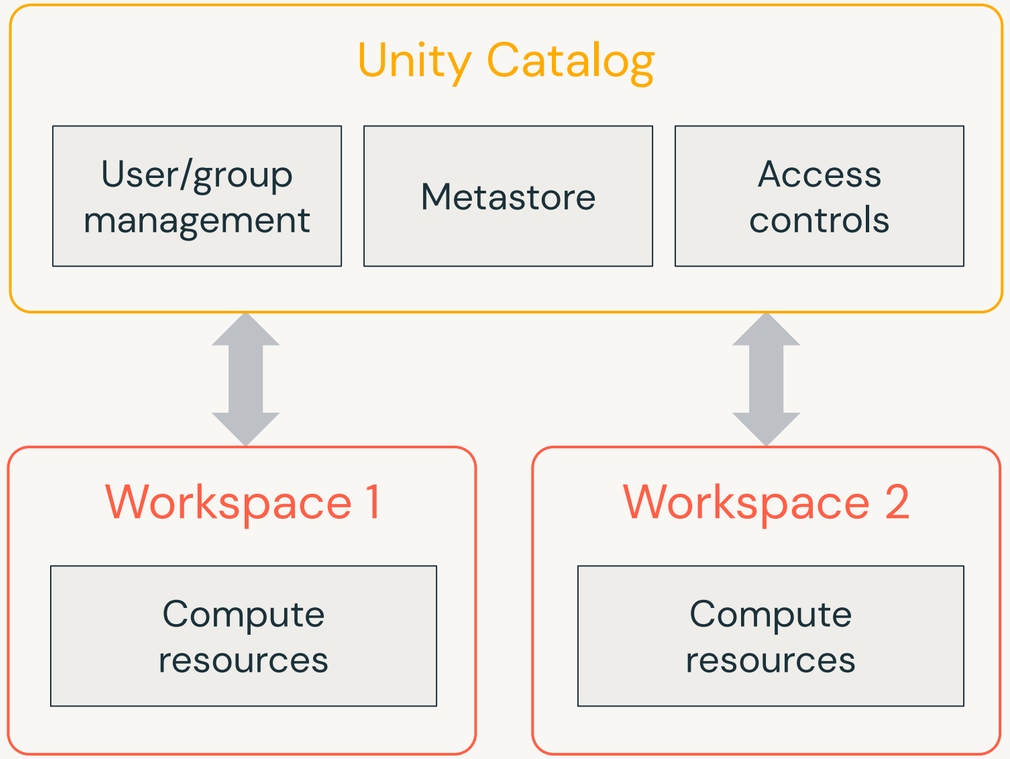
Centralized metadata and user management

Unity Catalog Architecture

Before Unity Catalog



With Unity Catalog



Centralized Access Controls

Centrally grant and manage access permissions across workloads

Using ANSI SQL DCL

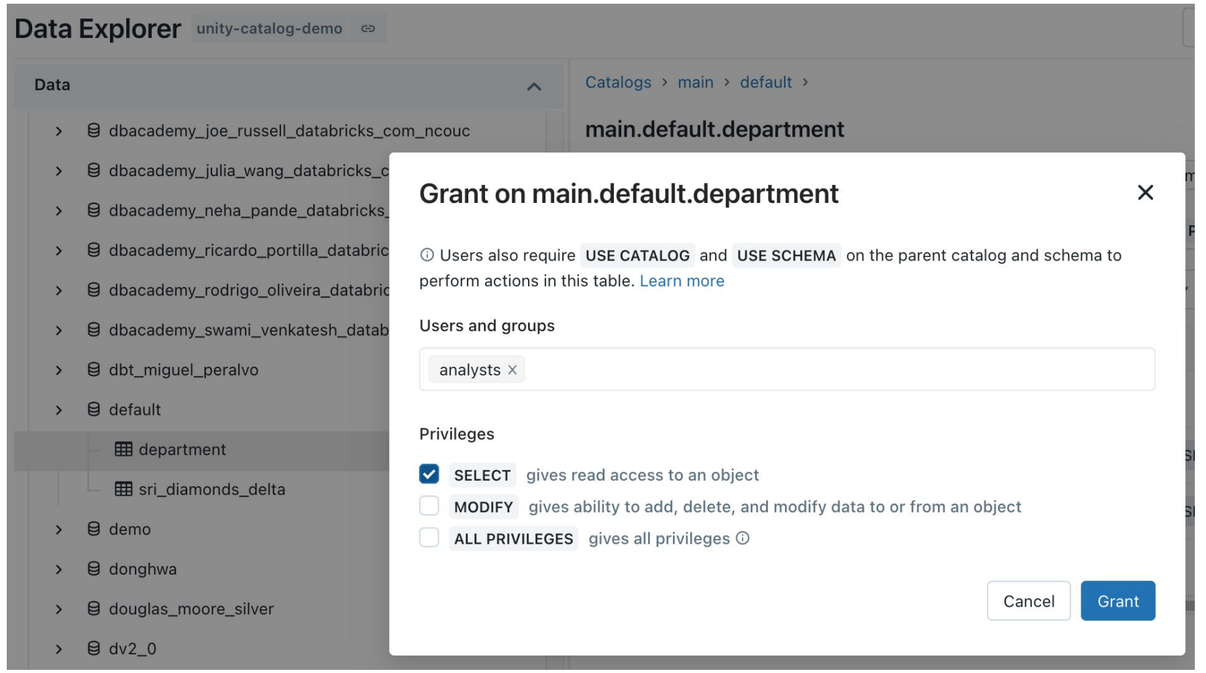
```
GRANT <privilege> ON <securable_type>
<securable_name> TO `<principal>`

GRANT SELECT ON iot.events TO engineers
```

Choose permission level

'Table'= collection of files in S3/ADLS

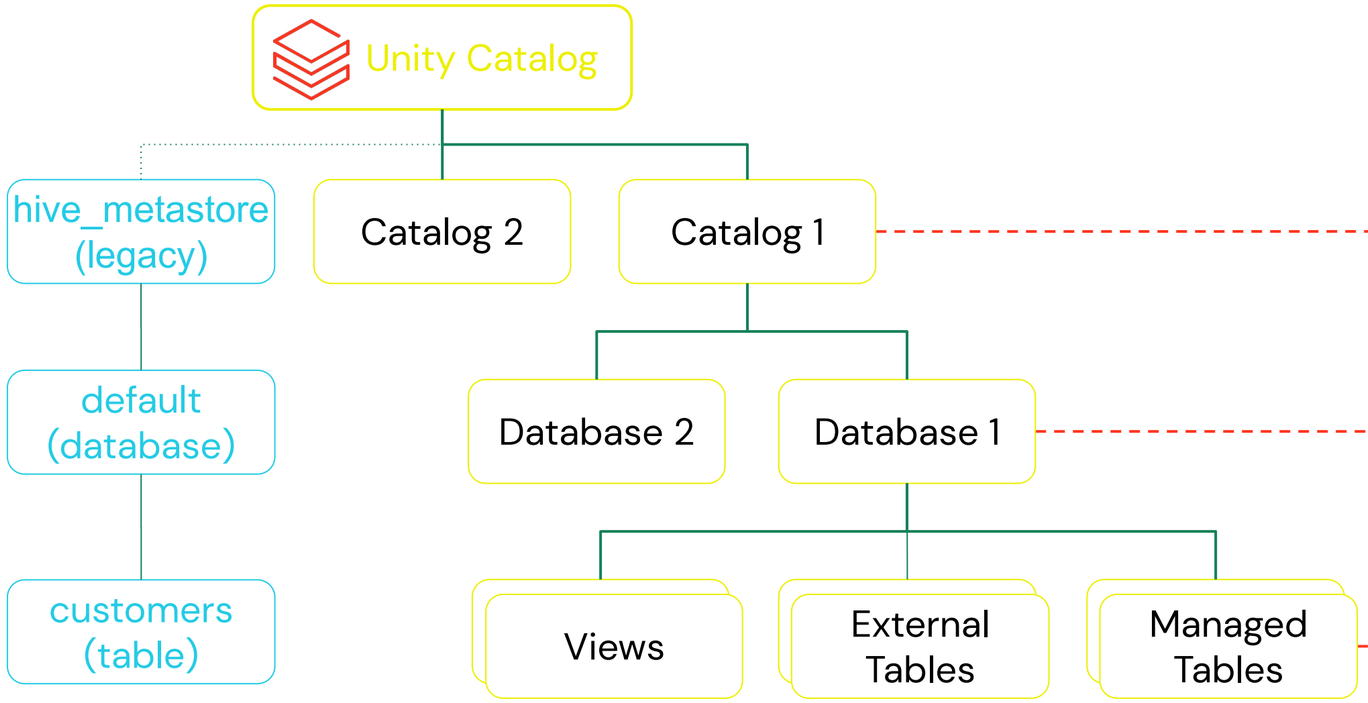
Sync groups from your identity provider

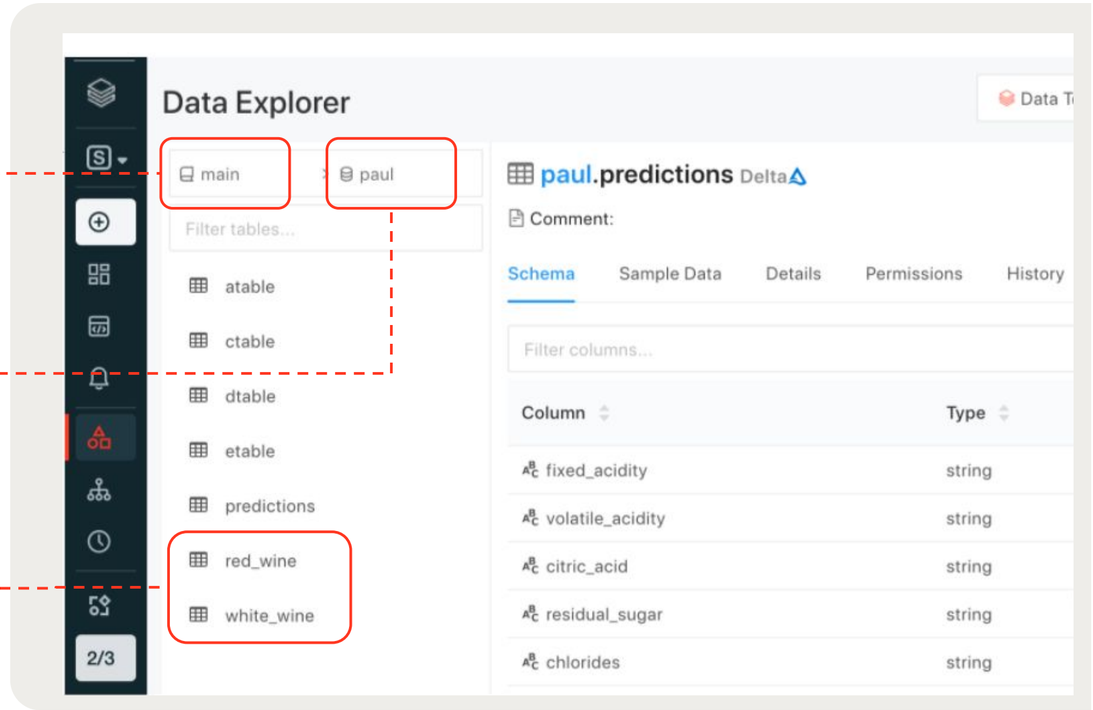
Using UI



Three level namespace

Seamless access to your existing metastores

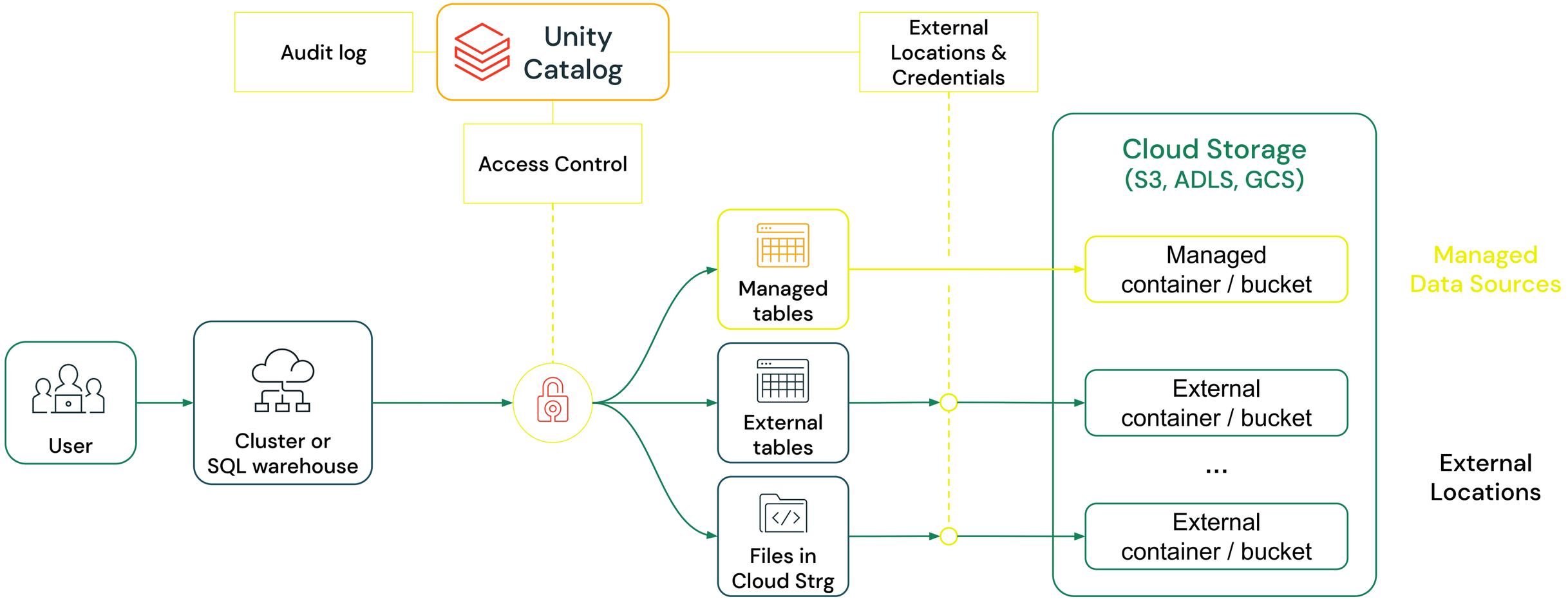





```
SELECT * FROM main.student.example;  -- <catalog>.<database>.<table>

SELECT * FROM hive_metastore.default.customers;
```

Managed Data Sources & External Locations

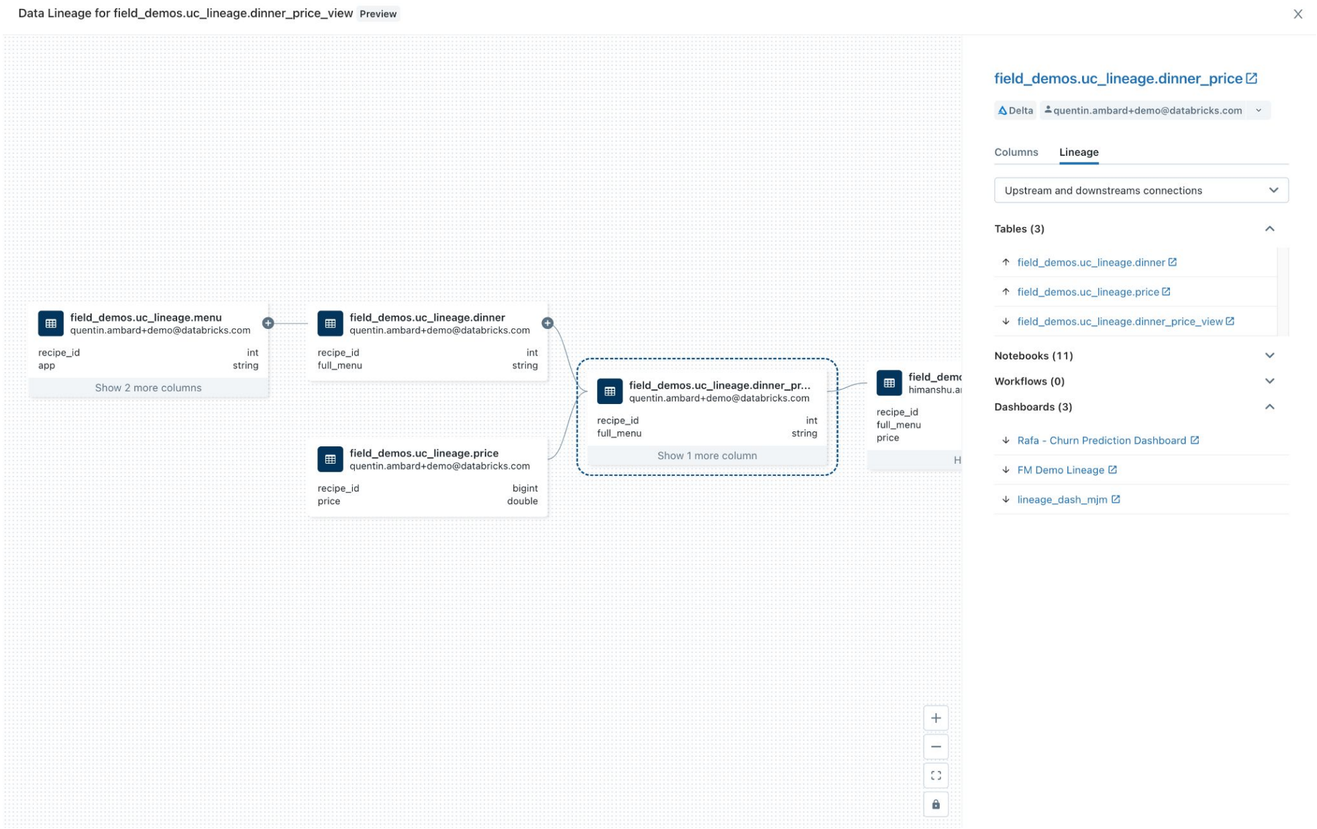
Simplify data access management across clouds



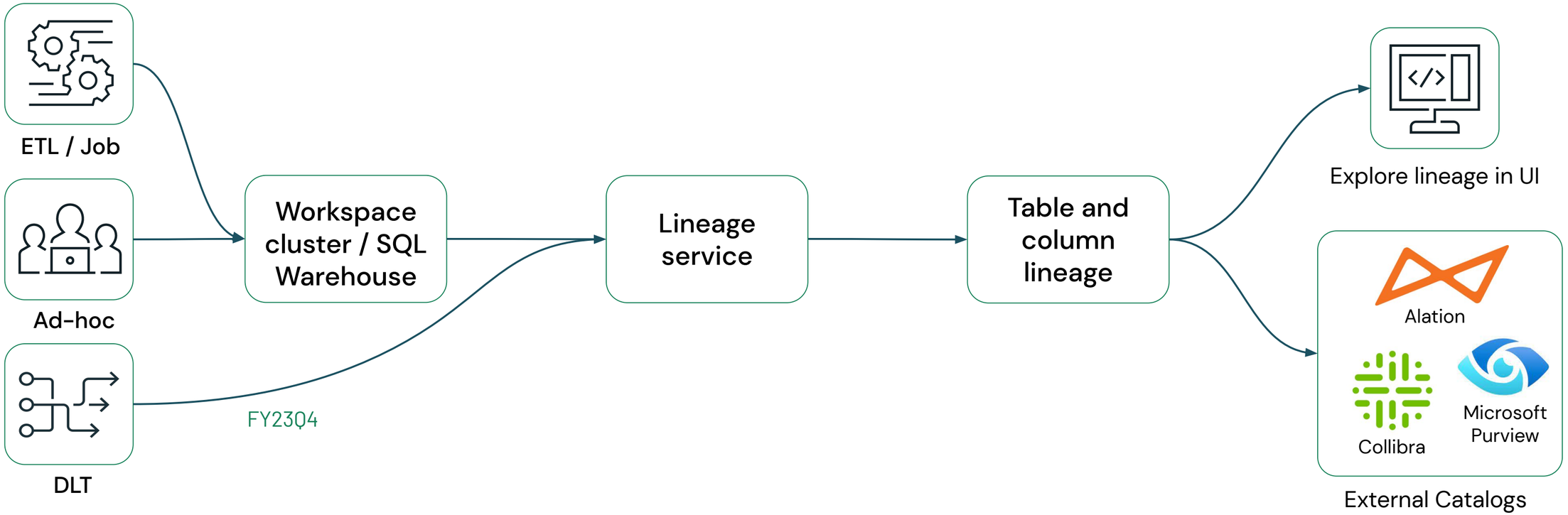
Automated lineage for all workloads

End-to-end visibility into how data flows and consumed in your organization

- Auto-capture runtime data lineage on a Databricks cluster or SQL warehouse
- Track lineage down to the table and column level
- Leverage common permission model from Unity Catalog
- Lineage across tables, dashboards, workflows, notebooks



Lineage flow - How it works



- Code (any language) is submitted to a cluster or SQL warehouse or DLT* executes data flow

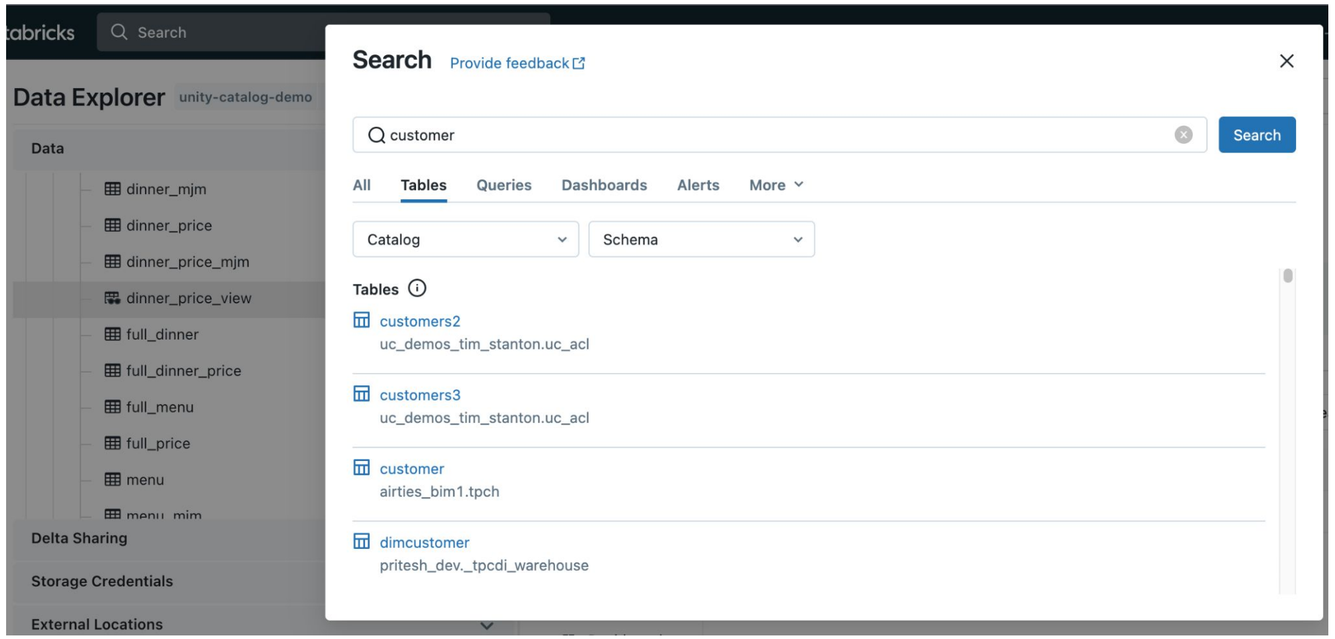
- Lineage service analyzes logs emitted from the cluster, and pulls metadata from DLT
- Assembles column and table level lineage

- Presented to the end user graphically in Databricks
- Lineage can be exported via API and imported into other tool

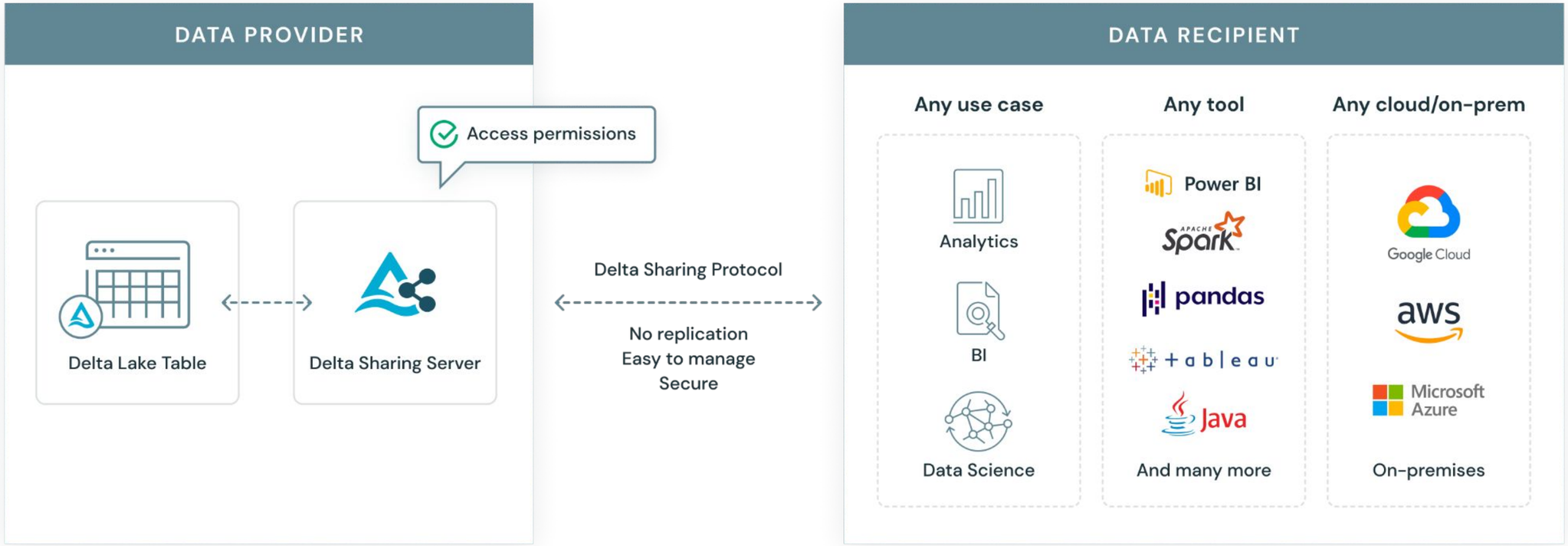
Built-in search and discovery

Accelerate time to value with low latency data discovery

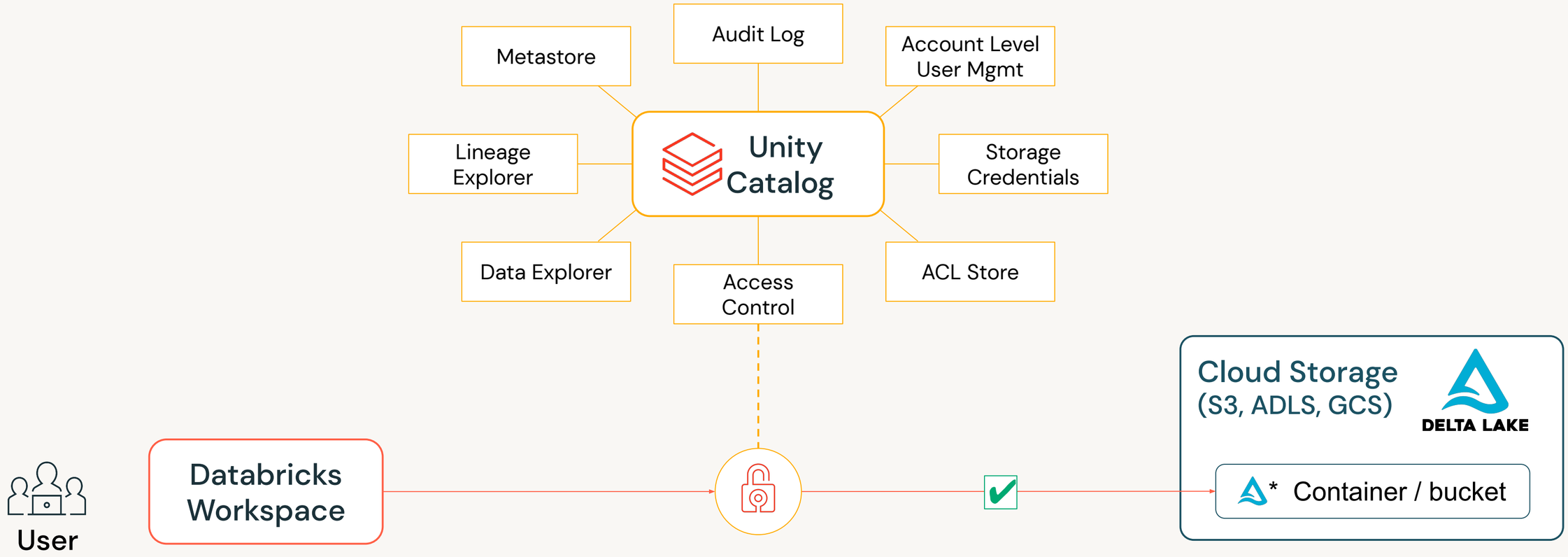
- UI to search for data assets stored in Unity Catalog
- Unified UI across DSML + DBSQL
- Leverage common permission model from Unity Catalog



An open standard for secure sharing of data assets



Unity Catalog -Architecture



* Unity Catalog will support any data format (table or raw files)