DEDS Assignment 2

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In [13]:
```
import boto3
import uuid
import random
import pandas as pd
from faker import Faker
from boto3.dynamodb.conditions import Key
```

Description of use case and justification for the use of a NoSQL database

Entities Stored in NoSQL

- `LabelObject` - partition key is `label_id` (e.g. `LABEL#1234`) sort key is `METADATA`
- `ArtistObject` - partition key is `artist_id` (e.g. `ARTIST#1234`) sort key is `METADATA`
- `SongObject` - with columns:
    - `song_id` - (e.g. `SONG#1234`)
    - `label_id`
    - `artist_id`
    - `song_title`
    - `label_name`
    - `artist_name`
    - `play_count`
    - `sold_amount_in_php`

Access patterns:

- Get all songs under a label
- Get all songs by artist
- Get songs by artist or label on `play_count` condition
- Get songs by artist or label on `sold_amount_in_php` condition

Python code for adding the items

In [65]:
```
fake = Faker()
s3_client = boto3.client("s3")
dynamodb = boto3.resource('dynamodb', region_name='us-east-1')
table_name = "nosql_music_stream_service"
table = dynamodb.Table(table_name)
```

In [66]:
```
# Generate Labels
labels = []
for i in range(3):
    label_id = f"LABEL#{i+1}"
    labels.append({"pk": label_id, "sk": "METADATA", "label_name": fake.company()})

# Generate Artists
artists = []
for i in range(17):
    label = random.choice(labels)
    artist_id = f"ARTIST#{i+1}"
    artists.append({"pk": artist_id, "sk": "METADATA", "artist_name": fake.name(), "label_id": label["pk"]})

# Generate Songs
songs = []
for i in range(80):
    artist = random.choice(artists)
    label = next(l for l in labels if l["pk"] == artist["label_id"])
    song_id = f"SONG#{i+1}"
    song = {
        "pk": song_id,
        "sk": "METADATA",
        "song_title": fake.sentence(nb_words=3),
        "artist_id": artist["pk"],
        "artist_name": artist["artist_name"],
        "label_id": label["pk"],
        "label_name": label["label_name"],
        "play_count": random.randint(1000, 100000),
        "sold_amount_in_php": random.randint(50000, 1000000)
    }
    songs.append(song)
```

In [67]:
```
for label in labels:
    table.put_item(Item=label)
for artist in artists:
    table.put_item(Item=artist)
for song in songs:
    table.put_item(Item=song)
```

Screenshot of dynamodb table items. The table should have at least 100 items.

```
In [68]: scan_response = table.scan()
         print(f"Item count: {scan_response['Count']}")
         all_scan = pd.DataFrame(scan_response['Items'])
         display(all_scan)
```

```
Item count: 100
```

	artist_id	label_name	play_count	sold_amount_in_php	sk	artist_name	label_id	pk	song_title
0	ARTIST#3	Aguirre Ltd	30530	656367	METADATA	Mackenzie Gonzalez	LABEL#3	SONG#14	Short whatever tonight.
1	NaN	NaN	NaN	NaN	METADATA	Brandon Vasquez	LABEL#3	ARTIST#4	NaN
2	ARTIST#9	Aguirre Ltd	62308	374814	METADATA	Scott Garrett	LABEL#3	SONG#9	Certain.
3	ARTIST#11	Lopez, Torres and Norris	20960	259246	METADATA	Cody Gray	LABEL#1	SONG#63	Central southern.
4	ARTIST#2	Aguirre Ltd	8282	763056	METADATA	Allison Green	LABEL#3	SONG#2	Program behind water.
...	...	...	...	...	...	...	...	...	...
95	ARTIST#15	Nixon, Williams and Solis	90450	763397	METADATA	Kathleen Duran	LABEL#2	SONG#79	Young stage.
96	ARTIST#7	Lopez, Torres and Norris	17410	234439	METADATA	Timothy George	LABEL#1	SONG#72	Leader just start.
97	ARTIST#8	Aguirre Ltd	5156	85405	METADATA	Alexis Martin	LABEL#3	SONG#45	Parent morning know.
98	ARTIST#17	Lopez, Torres and Norris	60551	104202	METADATA	Michelle Nelson	LABEL#1	SONG#29	Would point old.
99	ARTIST#7	Lopez, Torres and Norris	13249	808115	METADATA	Timothy George	LABEL#1	SONG#39	Share shoulder.

100 rows × 9 columns

Put this to raw zone

```
In [53]: csv_buffer = all_scan.to_csv(index=False)
         s3_client.put_object(
             Bucket="datalake-music-streaming",
             Key="landing/all_scan.csv",
             Body=csv_buffer
         )
```

```
Out[53]: {'ResponseMetadata': {'RequestId': 'A252BBBE8M6R52R6',
           'HostId': 'iAAkhmfVihjPQWqIGr34n55LiM2BRlHobPro+ZS6QOSP3CNbu4bXB0NvHu4tVKxMXYGOncWGhno=',
           'HTTPStatusCode': 200,
           'HTTPHeaders': {'x-amz-id-2': 'iAAkhmfVihjPQWqIGr34n55LiM2BRlHobPro+ZS6QOSP3CNbu4bXB0NvHu4tVKxMXYGOncWGhno=',
            'x-amz-request-id': 'A252BBBE8M6R52R6',
            'date': 'Sun, 02 Mar 2025 14:43:01 GMT',
            'x-amz-server-side-encryption': 'AES256',
            'etag': '"88c7396ca0d29c0b938657b2844f1e35"',
            'x-amz-checksum-crc32': 'iCBFWw==',
            'x-amz-checksum-type': 'FULL_OBJECT',
            'content-length': '0',
            'server': 'AmazonS3'},
           'RetryAttempts': 0},
          'ETag': '"88c7396ca0d29c0b938657b2844f1e35"',
          'ChecksumCRC32': 'iCBFWw==',
          'ChecksumType': 'FULL_OBJECT',
          'ServerSideEncryption': 'AES256'}
```

Curated Queries

- Get songs by `artist_id` with less than or equal 100k `play_count`
- Get songs by `artist_id` with greater than or equal 100k `sold_amount_in_php`
- Get songs by `label_id` with less than or equal 100k `play_count`
- Get songs by `label_id` with greater than or equal 100k `sold_amount_in_php`

```
In [86]: resp = table.query(
             IndexName="artist_id-play_count-index",
             KeyConditionExpression=(
                 Key("artist_id").eq("ARTIST#17") & Key("play_count").lte(100_000)
             ),
             ScanIndexForward=False,  # Sort by play_count DESC
         )
         curated_1 = pd.DataFrame(resp['Items'])
```

```
In [87]: resp = table.query(
             IndexName="artist_id-sold_amount_in_php-index",
             KeyConditionExpression=(
                 Key("artist_id").eq("ARTIST#17") & Key("sold_amount_in_php").gte(100_000)
             ),
             ScanIndexForward=False,  # Sort by play_count DESC
         )
         curated_2 = pd.DataFrame(resp['Items'])
```

```
In [88]: resp = table.query(
             IndexName="label_id-play_count-index",
             KeyConditionExpression=(
        Key("label_id").eq("LABEL#1") & Key("play_count").lte(100_000)
    ),
    ScanIndexForward=False,  # Sort by play_count DESC
)
curated_3 = pd.DataFrame(resp['Items'])
```

In [89]:

```
resp = table.query(
    IndexName="label_id-sold_amount_in_php-index",
    KeyConditionExpression=(
        Key("label_id").eq("LABEL#1") & Key("sold_amount_in_php").gte(100_000)
    ),
    ScanIndexForward=False,  # Sort by play_count DESC
)
curated_4 = pd.DataFrame(resp['Items'])
```

In [90]:

```
display(curated_1)
display(curated_2)
display(curated_3)
display(curated_4)
```

	artist_id	label_name	sold_amount_in_php	sk	play_count	artist_name	label_id	pk	song_title
0	ARTIST#17	Lopez, Torres and Norris	254409	METADATA	92677	Michelle Nelson	LABEL#1	SONG#49	Have character page decision.
1	ARTIST#17	Lopez, Torres and Norris	104202	METADATA	60551	Michelle Nelson	LABEL#1	SONG#29	Would point old.
2	ARTIST#17	Lopez, Torres and Norris	493925	METADATA	49969	Michelle Nelson	LABEL#1	SONG#76	Service approach produce.
3	ARTIST#17	Lopez, Torres and Norris	321314	METADATA	44699	Michelle Nelson	LABEL#1	SONG#36	Art day tend.
4	ARTIST#17	Lopez, Torres and Norris	680037	METADATA	20836	Michelle Nelson	LABEL#1	SONG#20	Fill base.
5	ARTIST#17	Lopez, Torres and Norris	163584	METADATA	7355	Michelle Nelson	LABEL#1	SONG#4	Wrong bit.

	artist_id	label_name	play_count	sk	sold_amount_in_php	artist_name	label_id	pk	song_title
0	ARTIST#17	Lopez, Torres and Norris	20836	METADATA	680037	Michelle Nelson	LABEL#1	SONG#20	Fill base.
1	ARTIST#17	Lopez, Torres and Norris	49969	METADATA	493925	Michelle Nelson	LABEL#1	SONG#76	Service approach produce.
2	ARTIST#17	Lopez, Torres and Norris	44699	METADATA	321314	Michelle Nelson	LABEL#1	SONG#36	Art day tend.
3	ARTIST#17	Lopez, Torres and Norris	92677	METADATA	254409	Michelle Nelson	LABEL#1	SONG#49	Have character page decision.
4	ARTIST#17	Lopez, Torres and Norris	7355	METADATA	163584	Michelle Nelson	LABEL#1	SONG#4	Wrong bit.
5	ARTIST#17	Lopez, Torres and Norris	60551	METADATA	104202	Michelle Nelson	LABEL#1	SONG#29	Would point old.

	artist_id	label_name	sold_amount_in_php	sk	play_count	artist_name	label_id	pk	song_title
0	ARTIST#17	Lopez, Torres and Norris	254409	METADATA	92677	Michelle Nelson	LABEL#1	SONG#49	Have character page decision.
1	ARTIST#16	Lopez, Torres and Norris	131017	METADATA	87936	Ashley Cole	LABEL#1	SONG#73	Commercial paper large.
2	ARTIST#1	Lopez, Torres and Norris	761125	METADATA	85456	Cassie Padilla	LABEL#1	SONG#56	Way black find.
3	ARTIST#10	Lopez, Torres and Norris	772420	METADATA	79115	Jessica Cobb	LABEL#1	SONG#47	Level sister movie.
4	ARTIST#1	Lopez, Torres and Norris	982458	METADATA	78525	Cassie Padilla	LABEL#1	SONG#35	Food lay political.
5	ARTIST#7	Lopez, Torres and Norris	222050	METADATA	77634	Timothy George	LABEL#1	SONG#26	Sea who senior.
6	ARTIST#11	Lopez, Torres and Norris	565545	METADATA	76294	Cody Gray	LABEL#1	SONG#71	Enjoy less summer.
7	ARTIST#7	Lopez, Torres and Norris	945172	METADATA	69255	Timothy George	LABEL#1	SONG#44	Effect eye keep.
8	ARTIST#10	Lopez, Torres and Norris	722809	METADATA	67176	Jessica Cobb	LABEL#1	SONG#70	Total toward.
9	ARTIST#16	Lopez, Torres and Norris	464566	METADATA	64756	Ashley Cole	LABEL#1	SONG#67	According board feel natural.
10	ARTIST#7	Lopez, Torres and Norris	606842	METADATA	61391	Timothy George	LABEL#1	SONG#12	Turn view station.
11	ARTIST#17	Lopez, Torres and Norris	104202	METADATA	60551	Michelle Nelson	LABEL#1	SONG#29	Would point old.
12	ARTIST#10	Lopez, Torres and Norris	894098	METADATA	59060	Jessica Cobb	LABEL#1	SONG#15	Week.
13	ARTIST#10	Lopez, Torres and Norris	533763	METADATA	58804	Jessica Cobb	LABEL#1	SONG#57	White contain.
14	ARTIST#6	Lopez, Torres and Norris	250127	METADATA	56345	Kyle Williams	LABEL#1	SONG#8	Through station challenge.
15	ARTIST#17	Lopez, Torres and Norris	493925	METADATA	49969	Michelle Nelson	LABEL#1	SONG#76	Service approach produce.
16	ARTIST#6	Lopez, Torres and Norris	584034	METADATA	45308	Kyle Williams	LABEL#1	SONG#50	Court general southern.
17	ARTIST#17	Lopez, Torres and Norris	321314	METADATA	44699	Michelle Nelson	LABEL#1	SONG#36	Art day tend.
18	ARTIST#1	Lopez, Torres and Norris	674491	METADATA	33472	Cassie Padilla	LABEL#1	SONG#42	Herself book south own.
19	ARTIST#10	Lopez, Torres and Norris	918065	METADATA	33265	Jessica Cobb	LABEL#1	SONG#74	Star information.
20	ARTIST#11	Lopez, Torres and Norris	465865	METADATA	32322	Cody Gray	LABEL#1	SONG#55	Energy market strong.
21	ARTIST#11	Lopez, Torres and Norris	969696	METADATA	30111	Cody Gray	LABEL#1	SONG#1	Trip hotel.
22	ARTIST#11	Lopez, Torres and Norris	259246	METADATA	20960	Cody Gray	LABEL#1	SONG#63	Central southern.
23	ARTIST#6	Lopez, Torres and Norris	441722	METADATA	20853	Kyle Williams	LABEL#1	SONG#53	Power allow common.
24	ARTIST#17	Lopez, Torres and Norris	680037	METADATA	20836	Michelle Nelson	LABEL#1	SONG#20	Fill base.
25	ARTIST#6	Lopez, Torres and Norris	379216	METADATA	19207	Kyle Williams	LABEL#1	SONG#34	Weight value order.
26	ARTIST#11	Lopez, Torres and Norris	605501	METADATA	18983	Cody Gray	LABEL#1	SONG#40	Early lose.
27	ARTIST#10	Lopez, Torres and Norris	111448	METADATA	18547	Jessica Cobb	LABEL#1	SONG#75	Should matter treatment.
28	ARTIST#7	Lopez, Torres and Norris	234439	METADATA	17410	Timothy George	LABEL#1	SONG#72	Leader just start.
29	ARTIST#7	Lopez, Torres and Norris	596755	METADATA	16409	Timothy George	LABEL#1	SONG#48	End attack work.
30	ARTIST#7	Lopez, Torres and Norris	808115	METADATA	13249	Timothy George	LABEL#1	SONG#39	Share shoulder.
31	ARTIST#17	Lopez, Torres and Norris	163584	METADATA	7355	Michelle Nelson	LABEL#1	SONG#4	Wrong bit.
32	ARTIST#11	Lopez, Torres and Norris	574815	METADATA	1310	Cody Gray	LABEL#1	SONG#22	Record dog.

	artist_id	label_name	play_count	sk	sold_amount_in_php	artist_name	label_id	pk	song_title
0	ARTIST#1	Lopez, Torres and Norris	78525	METADATA	982458	Cassie Padilla	LABEL#1	SONG#35	Food lay political.
1	ARTIST#11	Lopez, Torres and Norris	30111	METADATA	969696	Cody Gray	LABEL#1	SONG#1	Trip hotel.
2	ARTIST#7	Lopez, Torres and Norris	69255	METADATA	945172	Timothy George	LABEL#1	SONG#44	Effect eye keep.
3	ARTIST#10	Lopez, Torres and Norris	33265	METADATA	918065	Jessica Cobb	LABEL#1	SONG#74	Star information.
4	ARTIST#10	Lopez, Torres and Norris	59060	METADATA	894098	Jessica Cobb	LABEL#1	SONG#15	Week.
5	ARTIST#7	Lopez, Torres and Norris	13249	METADATA	808115	Timothy George	LABEL#1	SONG#39	Share shoulder.
6	ARTIST#10	Lopez, Torres and Norris	79115	METADATA	772420	Jessica Cobb	LABEL#1	SONG#47	Level sister movie.
7	ARTIST#1	Lopez, Torres and Norris	85456	METADATA	761125	Cassie Padilla	LABEL#1	SONG#56	Way black find.
8	ARTIST#10	Lopez, Torres and Norris	67176	METADATA	722809	Jessica Cobb	LABEL#1	SONG#70	Total toward.
9	ARTIST#17	Lopez, Torres and Norris	20836	METADATA	680037	Michelle Nelson	LABEL#1	SONG#20	Fill base.
10	ARTIST#1	Lopez, Torres and Norris	33472	METADATA	674491	Cassie Padilla	LABEL#1	SONG#42	Herself book south own.
11	ARTIST#7	Lopez, Torres and Norris	61391	METADATA	606842	Timothy George	LABEL#1	SONG#12	Turn view station.
12	ARTIST#11	Lopez, Torres and Norris	18983	METADATA	605501	Cody Gray	LABEL#1	SONG#40	Early lose.
13	ARTIST#7	Lopez, Torres and Norris	16409	METADATA	596755	Timothy George	LABEL#1	SONG#48	End attack work.
14	ARTIST#6	Lopez, Torres and Norris	45308	METADATA	584034	Kyle Williams	LABEL#1	SONG#50	Court general southern.
15	ARTIST#11	Lopez, Torres and Norris	1310	METADATA	574815	Cody Gray	LABEL#1	SONG#22	Record dog.
16	ARTIST#11	Lopez, Torres and Norris	76294	METADATA	565545	Cody Gray	LABEL#1	SONG#71	Enjoy less summer.
17	ARTIST#10	Lopez, Torres and Norris	58804	METADATA	533763	Jessica Cobb	LABEL#1	SONG#57	White contain.
18	ARTIST#17	Lopez, Torres and Norris	49969	METADATA	493925	Michelle Nelson	LABEL#1	SONG#76	Service approach produce.
19	ARTIST#11	Lopez, Torres and Norris	32322	METADATA	465865	Cody Gray	LABEL#1	SONG#55	Energy market strong.
20	ARTIST#16	Lopez, Torres and Norris	64756	METADATA	464566	Ashley Cole	LABEL#1	SONG#67	According board feel natural.
21	ARTIST#6	Lopez, Torres and Norris	20853	METADATA	441722	Kyle Williams	LABEL#1	SONG#53	Power allow common.
22	ARTIST#6	Lopez, Torres and Norris	19207	METADATA	379216	Kyle Williams	LABEL#1	SONG#34	Weight value order.
23	ARTIST#17	Lopez, Torres and Norris	44699	METADATA	321314	Michelle Nelson	LABEL#1	SONG#36	Art day tend.
24	ARTIST#11	Lopez, Torres and Norris	20960	METADATA	259246	Cody Gray	LABEL#1	SONG#63	Central southern.
25	ARTIST#17	Lopez, Torres and Norris	92677	METADATA	254409	Michelle Nelson	LABEL#1	SONG#49	Have character page decision.
26	ARTIST#6	Lopez, Torres and Norris	56345	METADATA	250127	Kyle Williams	LABEL#1	SONG#8	Through station challenge.
27	ARTIST#7	Lopez, Torres and Norris	17410	METADATA	234439	Timothy George	LABEL#1	SONG#72	Leader just start.
28	ARTIST#7	Lopez, Torres and Norris	77634	METADATA	222050	Timothy George	LABEL#1	SONG#26	Sea who senior.
29	ARTIST#17	Lopez, Torres and Norris	7355	METADATA	163584	Michelle Nelson	LABEL#1	SONG#4	Wrong bit.
30	ARTIST#16	Lopez, Torres and Norris	87936	METADATA	131017	Ashley Cole	LABEL#1	SONG#73	Commercial paper large.
31	ARTIST#10	Lopez, Torres and Norris	18547	METADATA	111448	Jessica Cobb	LABEL#1	SONG#75	Should matter treatment.
32	ARTIST#17	Lopez, Torres and Norris	60551	METADATA	104202	Michelle Nelson	LABEL#1	SONG#29	Would point old.

Save curate queries to `gold`

In [91]:
```
def save_to_s3(df, dataset_name):
    path = f"s3://datalake-music-streaming/gold/{dataset_name}/"
    df.to_parquet(path, index=False)
    print(f"Saved {dataset_name} to {path}")

# Assuming curated_1 to curated_4 exist
save_to_s3(curated_1, "curated_1")
save_to_s3(curated_2, "curated_2")
save_to_s3(curated_3, "curated_3")
save_to_s3(curated_4, "curated_4")
```

```
Saved curated_1 to s3://datalake-music-streaming/gold/curated_1/
Saved curated_2 to s3://datalake-music-streaming/gold/curated_2/
Saved curated_3 to s3://datalake-music-streaming/gold/curated_3/
Saved curated_4 to s3://datalake-music-streaming/gold/curated_4/
```

Simple Data Lake Setup

Just 2 roles and 3 zones for simplicity in this assignment.

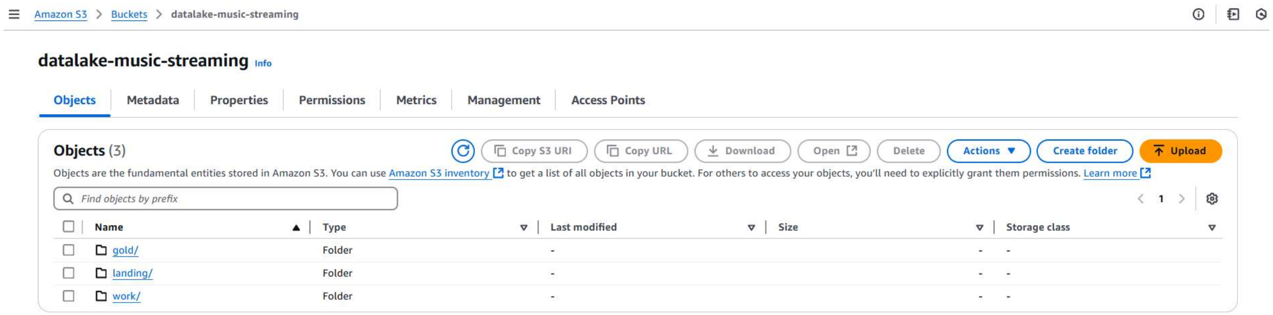
Roles:

- `Data Engineer`
- `Data Scientist`

Directory Structure and Zones:

- `datalake-music-streaming` bucket
  - `landing`
    - Landing zone for data dump from DynamoDB.
    - Accessible by: `Data Engineer`
  - `work`
    - Contains notebooks etc.
    - Accessible by: `Data Scientist`, `Data Engineer`
  - `gold`
    - Curated data for business use.
    - Accessible by: `Data Scientist`

Bucket screenshot

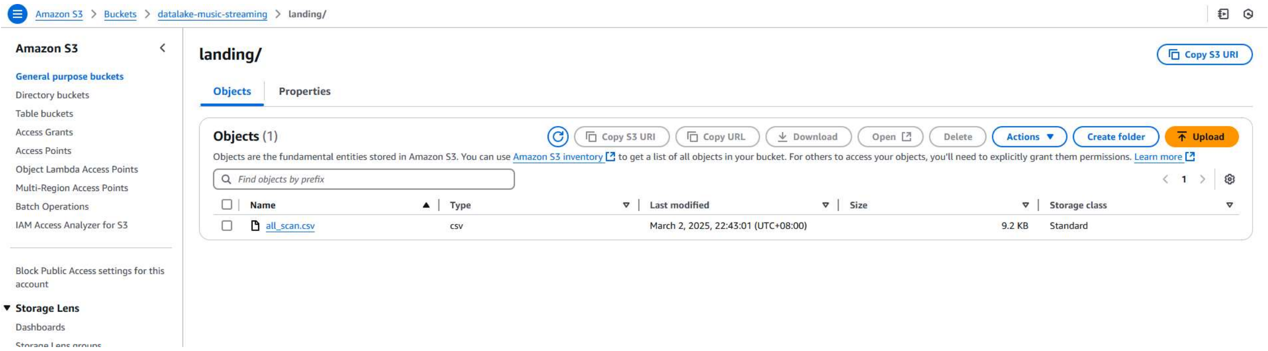


Objects (3)

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. Learn more

Name	Type	Last modified	Size	Storage class
gold/	Folder	-	-	-
landing/	Folder	-	-	-
work/	Folder	-	-	-

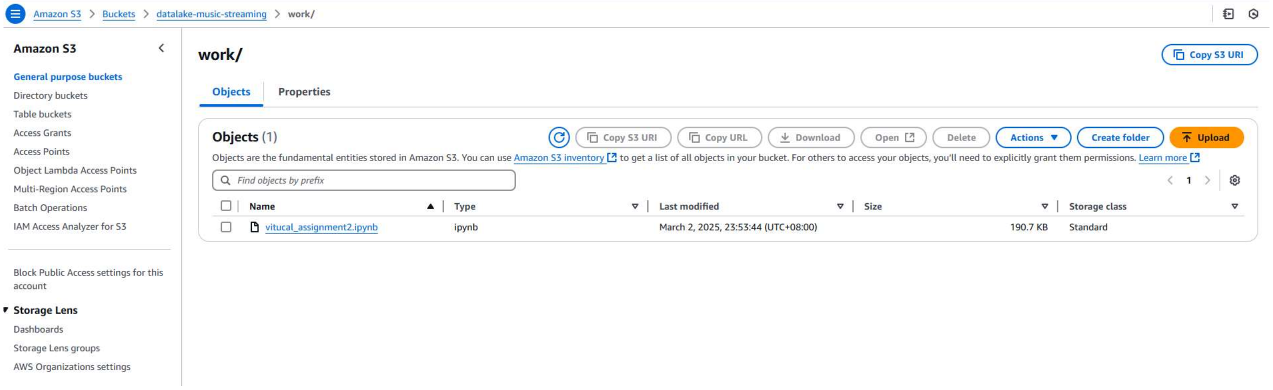
Contents



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

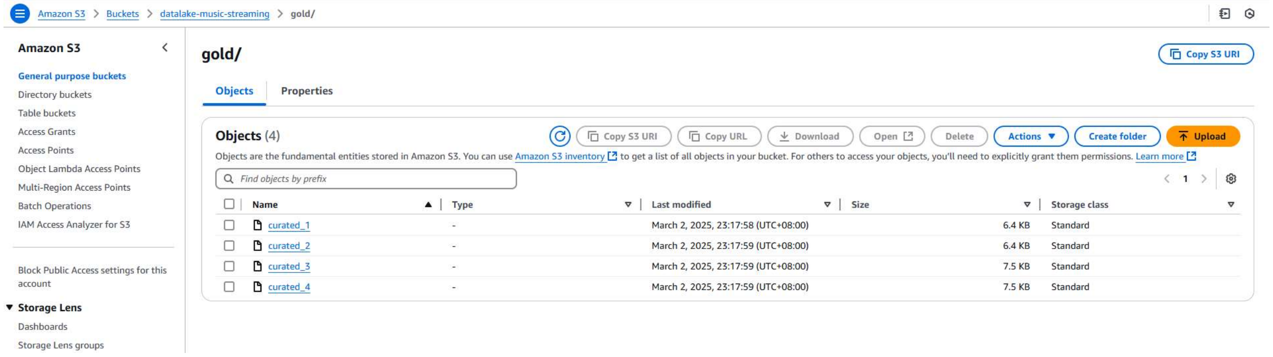
Name	Type	Last modified	Size	Storage class
all_scan.csv	csv	March 2, 2025, 22:43:01 (UTC+08:00)	9.2 KB	Standard



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
vitucal_assignment2.ipynb	ipynb	March 2, 2025, 23:53:44 (UTC+08:00)	190.7 KB	Standard



Objects (4)

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
curated_1	-	March 2, 2025, 23:17:58 (UTC+08:00)	6.4 KB	Standard
curated_2	-	March 2, 2025, 23:17:59 (UTC+08:00)	6.4 KB	Standard
curated_3	-	March 2, 2025, 23:17:59 (UTC+08:00)	7.5 KB	Standard
curated_4	-	March 2, 2025, 23:17:59 (UTC+08:00)	7.5 KB	Standard

Access summary with aws profiles

Data Engineer IAM role for S3

```
{
        "Version": "2012-10-17",
        "Statement": [
                {
                        "Effect": "Allow",
                        "Action": [
                                "s3:ListBucket"
                        ],
                        "Resource": "arn:aws:s3:::datalake-music-streaming",
                        "Condition": {
                                "StringLike": {
                                        "s3:prefix": [
                                                "landing/*",
                                                "work/*",
                                                "landing",
                                                "work"
                                        ]
                                }
                        }
                },
                {
                        "Effect": "Allow",
                        "Action": [
                                "s3:GetObject",
                                "s3:PutObject",
                                "s3:DeleteObject"
                        ],
                        "Resource": [
                                "arn:aws:s3:::datalake-music-streaming/landing/*",
                                "arn:aws:s3:::datalake-music-streaming/work/*"
                        ]
                },
                {
                        "Effect": "Deny",
                        "Action": "s3:ListBucket",
                        "Resource": "arn:aws:s3:::datalake-music-streaming",
                        "Condition": {
                                "StringLike": {
                                        "s3:prefix": "gold/*"
                                }
                        }
                },
                {
                        "Effect": "Deny",
                        "Action": [
                                "s3:GetObject",
                                "s3:PutObject",
                                "s3:DeleteObject"
                        ],
                        "Resource": "arn:aws:s3:::datalake-music-streaming/gold/*"
                }
        ]
}
```

Data Scientist IAM role for S3

```
{
        "Version": "2012-10-17",
        "Statement": [
                {
                        "Effect": "Allow",
                        "Action": [
                                "s3:ListBucket"
                        ],
                        "Resource": "arn:aws:s3:::datalake-music-streaming",
                        "Condition": {
                                "StringLike": {
                                        "s3:prefix": [
                                                "work/*",
                                                "gold/*",
                                                "work",
                                                "gold"
                                        ]
                                }
                        }
                },
                {
                        "Effect": "Allow",
                        "Action": [
                                "s3:GetObject",
                                "s3:PutObject",
                                     "s3:DeleteObject"
                             ],
                             "Resource": [
                                     "arn:aws:s3:::datalake-music-streaming/work/*"
                             ]
                     },
                     {
                             "Effect": "Allow",
                             "Action": "s3:GetObject",
                             "Resource": "arn:aws:s3:::datalake-music-streaming/gold/*"
                     },
                     {
                             "Effect": "Deny",
                             "Action": "s3:ListBucket",
                             "Resource": "arn:aws:s3:::datalake-music-streaming",
                             "Condition": {
                                     "StringLike": {
                                             "s3:prefix": "landing/*"
                                     }
                             }
                     },
                     {
                             "Effect": "Deny",
                             "Action": [
                                     "s3:PutObject",
                                     "s3:DeleteObject"
                             ],
                             "Resource": "arn:aws:s3:::datalake-music-streaming/gold/*"
                     }
             ]
     }
```

In [95]:

```python
bucket_name = "datalake-music-streaming"
directories = ["landing/", "work/", "gold"]
```

In [96]:

```python
de_session = boto3.Session(profile_name="data_engineer")
s3_client_de = de_session.client("s3")

for directory in directories:
    try:
        response = s3_client_de.list_objects_v2(Bucket=bucket_name, Prefix=directory, MaxKeys=5)
        if "Contents" in response:
            print(f"Access granted to {bucket_name}/{directory} contents:")
            for obj in response['Contents']:
                print(f"- {obj['Key']}")
    except s3_client_de.exceptions.ClientError as e:
        print(f"- Access denied for {bucket_name}/{directory}: \n{e.response['Error']['Message']}")
```

```
Access granted to datalake-music-streaming/landing/ contents:
- landing/
- landing/all_scan.csv
Access granted to datalake-music-streaming/work/ contents:
- work/
- work/vitucal_assignment2.ipynb
- Access denied for datalake-music-streaming/gold:
User: arn:aws:iam::277707127732:user/v_de is not authorized to perform: s3:ListBucket on resource: "arn:aws:s3:::datalake-music-streaming" because no i
dentity-based policy allows the s3:ListBucket action
```

In [97]:

```python
ds_session = boto3.Session(profile_name="data_scientist")
s3_client_ds = ds_session.client("s3")

for directory in directories:
    try:
        response = s3_client_ds.list_objects_v2(Bucket=bucket_name, Prefix=directory, MaxKeys=5)
        if "Contents" in response:
            print(f"Access granted to {bucket_name}/{directory} contents:")
            for obj in response['Contents']:
                print(f"- {obj['Key']}")
    except s3_client_ds.exceptions.ClientError as e:
        print(f"- Access denied for {bucket_name}/{directory}: \n{e.response['Error']['Message']}")
```

```
- Access denied for datalake-music-streaming/landing/:
User: arn:aws:iam::277707127732:user/v_ds is not authorized to perform: s3:ListBucket on resource: "arn:aws:s3:::datalake-music-streaming" with an expl
icit deny in an identity-based policy
Access granted to datalake-music-streaming/work/ contents:
- work/
- work/vitucal_assignment2.ipynb
Access granted to datalake-music-streaming/gold contents:
- gold/
- gold/curated_1
- gold/curated_2
- gold/curated_3
- gold/curated_4
```

In [ ]: