

A series of horizontal bars of varying lengths and colors (teal, blue, green) on the left side of the slide.

# Ensuring Distributed Data custody on Cloud Platforms

## Data Handling & Data Engineering – DH08

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# Ensuring Distributed Data custody on Cloud Platforms

## Use-case(s)

- **Data stored** in one cloud solution needs to be merged with data stored in another cloud solution
- **Analyses** completed in one cloud solution needs to be posted to another cloud solution
- **Audit Trails** tracking data exchange between cloud solutions are required to maintain chain of custody

# Ensuring Distributed Data custody on Cloud Platforms

## Introduction

- **Governance** is the oversight role and process by which companies manage and mitigate business risk
- **Compliance** ensures that an organization has the process and internal controls to meet the requirements imposed by governance body
- **Data Custody**
  - Authentication
  - Authorization ( Permissions )
  - Audit Trail

# Ensuring Distributed Data custody on Cloud Platforms

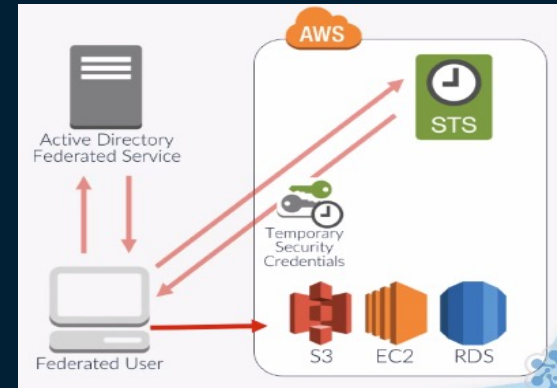
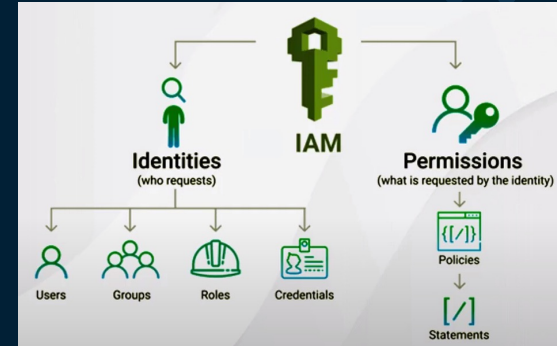
## AWS - Authentication

- AWS Identity and Access Management (IAM)

Allows to centrally manage users, security credentials such as access keys, and permissions that control which resources users can access

- Federated sign-in through AD and ADFS

streamline identity management by sourcing and managing all your user identities from Active Directory

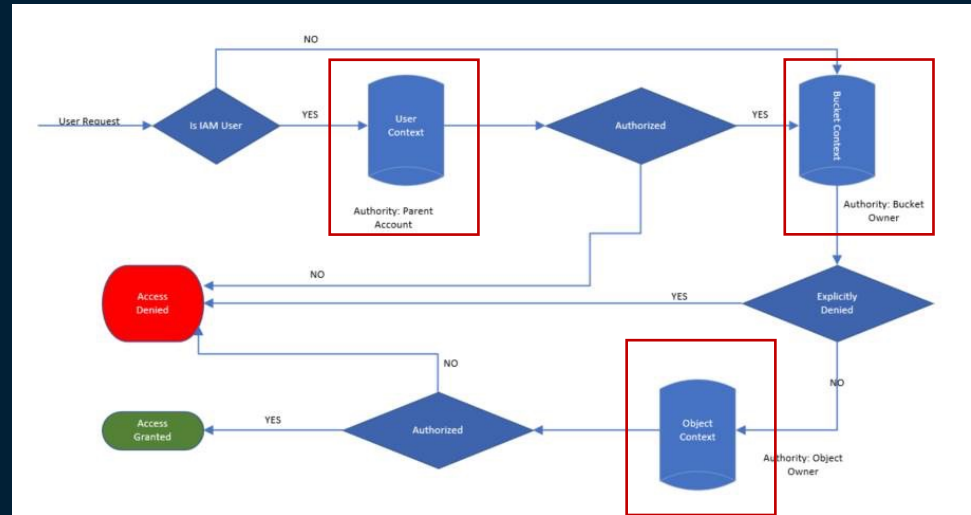


Reference: <https://aws.amazon.com/blogs/security/aws-federated-authentication-with-active-directory-federation-services-ad-fs/>

# Ensuring Distributed Data custody on Cloud Platforms

## AWS - Authorization

- S3 evaluates the policies in 3 context to authorize or deny request
  - **User context** – access policies attached to user
  - **Bucket context** - access policies owned by the bucket owner
  - **Object context** - access policies owned by the Object owner



Reference : <https://shunliz.gitbooks.io/aws-certificate-notes/content/s3/s3-permissions-overview.html>

# Ensuring Distributed Data custody on Cloud Platforms

## AWS - Audit Trail

- Server Access Logging
  - managed service that records access attempts made against objects in your bucket

Athena Query editor

Query editor | Saved queries | History | Data sources | Workgroup: primary | Settings | Tutorial | Help | What's new

New query 1 | New query 2 | New query 3 | New query 4

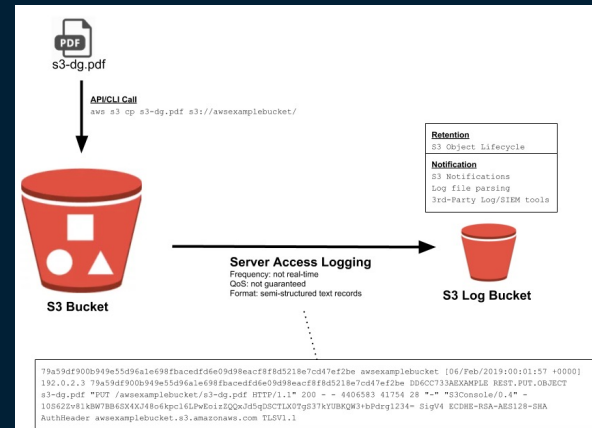
```
1 SELECT Requester,bucket_name,RemoteIP, HTTPStatus, ErrorCode, RequestDateTime
2 FROM mybucket_logs
3 LIMIT
4 parse_datetime(RequestDateTime,'dd/MM/yyyy:HH:mm:ss Z')
5 EC2InstanceId, parse_datetime('2021-08-12 00:00:00', 'yyyy-MM-dd(HH:mm:ss)')
6 AND
7 parse_datetime('2021-08-14 00:00:00', 'yyyy-MM-dd(HH:mm:ss)')
```

Run query | Save as | Create (Run time: 0.75 seconds, Data scanned: 11.12 KB)

Use Ctrl + Enter to run query, Ctrl + Space to autocomplete

Athena engine version 2 | Release versions

| Requester                                                                                | bucket_name | RemoteIP      | HTTPStatus | ErrorCode                  | RequestDateTime           |
|------------------------------------------------------------------------------------------|-------------|---------------|------------|----------------------------|---------------------------|
| 1 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                   | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:20:41+0000 |
| 2 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                   | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:24:45+0000 |
| 3 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                   | hidata      | 149.173.8.100 | 404        | NoSuchWebSiteConfiguration | 13/Aug/2021:13:24:45+0000 |
| 4 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                   | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:24:45+0000 |
| 5 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                   | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:20:41+0000 |
| 6 am.aws.sts: 617292774220:assumed-role/AmazonServiceRole/sandbox/Sandeeep_Junja@SAS.com | hidata      | 10.246.160.80 | 200        | -                          | 13/Aug/2021:13:30:37+0000 |
| 7 am.aws.sts: 617292774220:assumed-role/AmazonServiceRole/sandbox/Sandeeep_Junja@SAS.com | hidata      | 10.246.160.80 | 200        | -                          | 13/Aug/2021:13:30:37+0000 |
| 8 am.aws.sts: 617292774220:assumed-role/AmazonServiceRole/sandbox/Sandeeep_Junja@SAS.com | hidata      | 10.246.160.80 | 200        | -                          | 13/Aug/2021:13:22:52+0000 |
| 9 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                   | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:20:41+0000 |
| 10 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                  | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:24:45+0000 |
| 11 am.aws.sts: 617292774220:assumed-role/sandbox/Sandeeep_Junja@SAS.com                  | hidata      | 149.173.8.100 | 200        | -                          | 13/Aug/2021:13:24:45+0000 |



- Use Athena query editor for Server Access logs

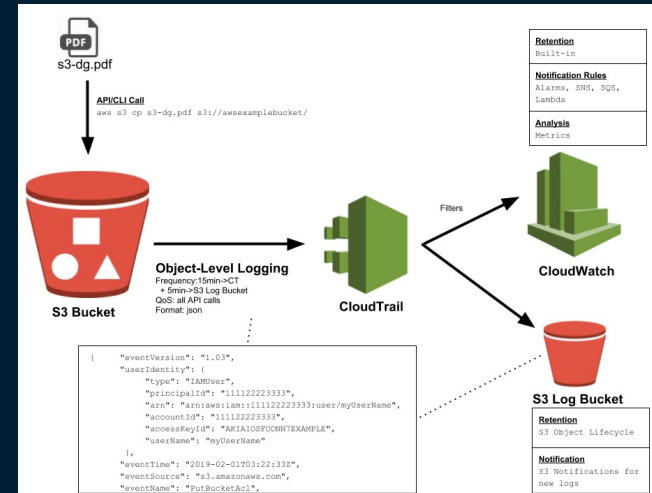
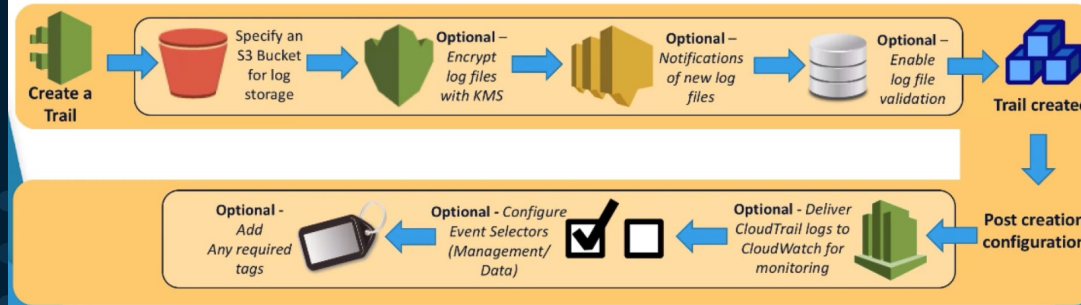
Reference: <https://docs.aws.amazon.com/AmazonS3/latest/userguide/using-s3-access-logs-to-identify-requests.html>

# Ensuring Distributed Data custody on Cloud Platforms

## AWS - Audit Trail

- Object Level Logging
  - central auditing and logging in CloudTrail
  - Ability to control what buckets, prefixes, and objects will be audited, and what types of actions to audit.

### CloudTrail Process Flow (1 of 2)



It's recommended to use AWS CloudTrail data events instead of Amazon S3 access logs. CloudTrail data events contain more information

# AWS – Mount S3 as local drive

- [illegible]

[illegible]

```

"Credentials": {
  "AccessKeyId": "ASIA70MEHNKGDUCJPE",
  "SecretAccessKey": "XgDgEK22AAdkAXI4ZYqallEiZ0f76wIiv2CAyl1",
  "SessionToken": "IQ0b3w3p21uXZQJ6IEtACVkcLWvhc3QtM5JIMEYCIQD1iWVRgXb+H1osiuPGb2v125+d",
  "Expiration": "2021-08-15T02:18:00+00:00"
},
"AssumedRoleUser": {
  "AssumedRoleId": "AROAY70MEHNKXPZDROA3:Sandeep.Juneja@SAS.com",
  "Arn": "arn:aws:sts::444444444444:assumed-role/sandbox/Sandeep.Juneja@SAS.com"
},

```

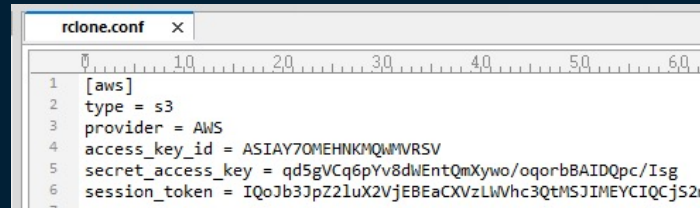
# Ensuring Distributed Data custody on Cloud Platforms

## AWS – Mount S3 as local drive

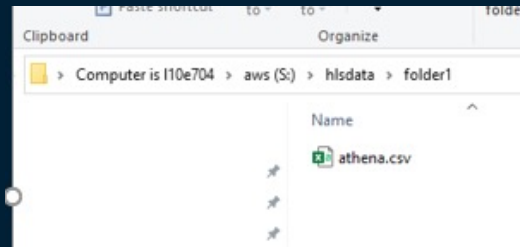
- Setup using RClone - command line program to manage files on cloud storage (<https://rclone.org/>)
- Follow the instructions - <https://rclone.org/s3/>
- Configuration file for Rclone is located - C:\Users\<userid>\AppData\Roaming\rclone

```
-----  
[aws]  
type = s3  
provider = AWS  
access_key_id = ASIAY70MEHNKMQMMVRSV  
secret_access_key = qd5gVCq6pYv8dWEntQmXywo  
session_token = IQoJb3JpZ2luX2VjEBEaCXVzLWV/  
dWByK+j8/kRBE4DIn+AXLZC20MJ8kuYCCDoAhoMnJE  
WmWQn5zd5G85LdNAiXIU40/xXpkB8xCnr9HvRwjqt+D  
KvFcVBIzznK0Kf5ZYv7Cg2ufezQDEg58jK0nQ/raLjZi  
2Eeov0Yo6aJg7dd0VsqUIdZyf/rYazsXMKT3jfnK3s3  
WZ5ERSheaGt30Sw88xrWk8Mj7ZRDkjDZz+GIBjqIAX8  
wWl+RbeEEc9zkEqQ1if3HnmsqejMLFDvEg48/mj5L5G  
+UmcBHas8BHFwhlqcg==  
-----  
y) Yes this is OK (default)  
e) Edit this remote  
d) Delete this remote  
y/e/d> |
```

```
.\rclone.exe mount aws: s:|
```



```
rclone.conf x  
1 [aws]  
2 type = s3  
3 provider = AWS  
4 access_key_id = ASIAY70MEHNKMQMMVRSV  
5 secret_access_key = qd5gVCq6pYv8dWEntQmXywo/oqorbBAIDQpc/Isq  
6 session_token = IQoJb3JpZ2luX2VjEBEaCXVzLWVhc3QtMSJIMEYCIQCjS2m
```

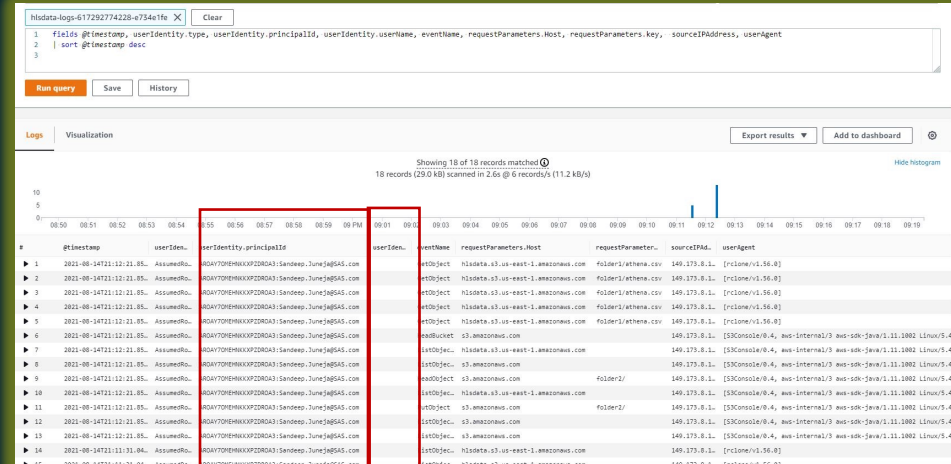


# Ensuring Distributed Data custody on Cloud Platforms

## AWS Audit Trail

- Using IAM user to mount drive
  - Obscured Audit Trail
- Using AD User to mount drive
  - Concise Audit Trail

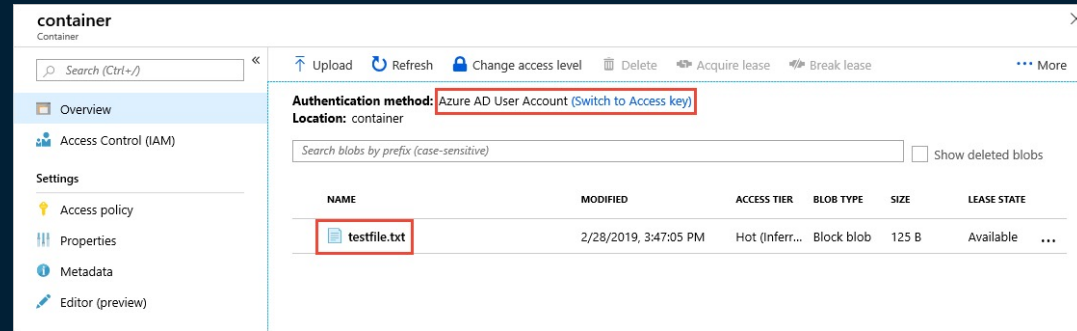
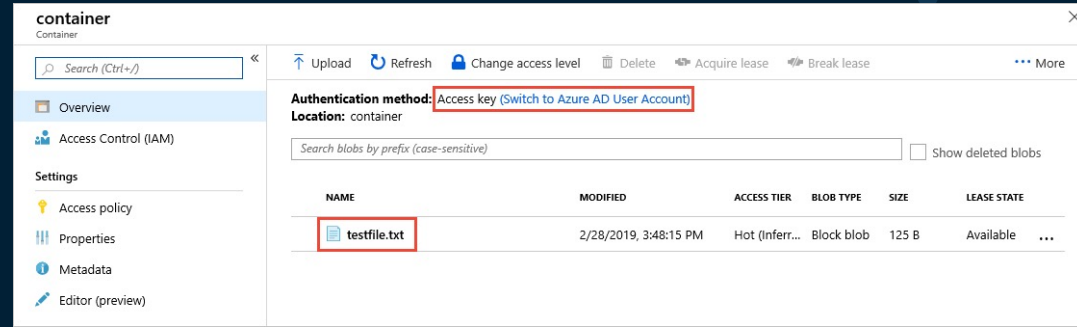
| #    | @timestamp              | userIdem. | userIdentity.principalId                       | userIdem. | eventName   | requestParameters.Host             | sourceIPAd.                              | userAgent                       |
|------|-------------------------|-----------|------------------------------------------------|-----------|-------------|------------------------------------|------------------------------------------|---------------------------------|
| ▶ 35 | 2021-08-14T20:45:01.76. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]AutoConfig-Describe    |           | awsS3bucket | hlsdata.s3.us-east-1.amazonaws.com | AUS Internal                             | AUS Internal                    |
| ▶ 36 | 2021-08-14T20:22:54.73. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 37 | 2021-08-14T19:13:04.67. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 38 | 2021-08-14T19:13:04.67. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 39 | 2021-08-14T19:42:24.36. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 40 | 2021-08-14T19:36:23.03. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 41 | 2021-08-14T19:30:19.06. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 42 | 2021-08-14T19:24:30.96. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 43 | 2021-08-14T19:18:59.38. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 44 | 2021-08-14T19:13:03.33. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 45 | 2021-08-14T19:07:03.56. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 46 | 2021-08-14T19:01:53.56. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 47 | 2021-08-14T19:01:53.56. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 48 | 2021-08-14T19:01:53.56. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 49 | 2021-08-14T19:16:43.53. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 50 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | awsS3bucket | s3.amazonaws.com                   | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 51 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | awsS3bucket | s3.amazonaws.com                   | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 52 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | awsS3bucket | s3.amazonaws.com                   | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 53 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | awsS3bucket | s3.amazonaws.com                   | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 54 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | s3GetObject | s3.amazonaws.com                   | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 55 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | s3GetObject | s3.amazonaws.com                   | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 56 | 2021-08-14T19:09:53.47. | AssumeRb. | AKIA770H6HKKXP2D8Q3[SAN]Sandbox-JuneJagS45.com |           | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | [S3Console/0.4. us-east-1.amazonaws.com] | aws-s3-jaws/1.11.1002 Linux/5.4 |
| ▶ 57 | 2021-08-14T19:16:43.53. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 58 | 2021-08-14T19:04:13.23. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | awsS3bucket | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 59 | 2021-08-14T19:04:13.23. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 60 | 2021-08-14T19:30:09.36. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |
| ▶ 61 | 2021-08-14T19:16:03.39. | IAFuser   | AKIA770H6HKKXP2D8Q3                            | saJume    | s3GetObject | hlsdata.s3.us-east-1.amazonaws.com | 149.173.8.1.                             | [rclone/v1.56.0]                |



# Ensuring Distributed Data custody on Cloud Platforms

## Azure Authorization

- Storage account access key
  - Access key used to access data from the Storage Account
- Azure AD Account
  - Users have identities in a centralized Identity and Access Management system and use their own identity to access the data in the Storage Account
  - hence accurate audit trail can be captured



Reference: <https://docs.microsoft.com/en-us/azure/storage/blobs/authorize-data-operations-portal>

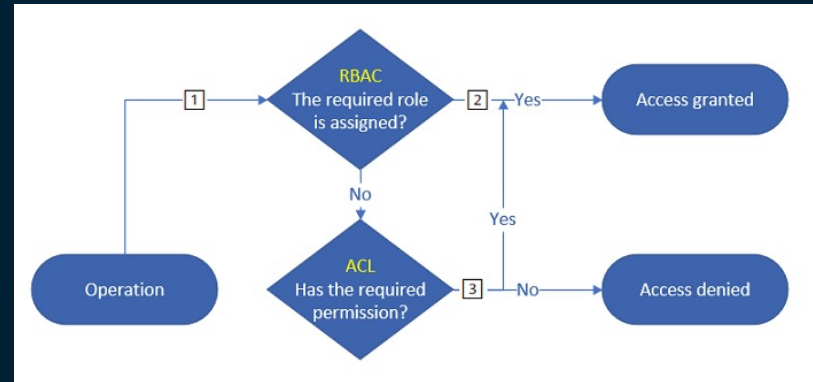
# Ensuring Distributed Data custody on Cloud Platforms

## Azure Authorization

- Azure Storage (Data Lake Storage Gen2) supports the following authorization mechanisms
  - Shared Key authorization
  - Role-based access control (Azure RBAC)
  - Shared access signature (SAS) authorization
  - Access control lists (ACL)

How permissions are evaluated - During security principal-based authorization, permissions are evaluated in the following order.

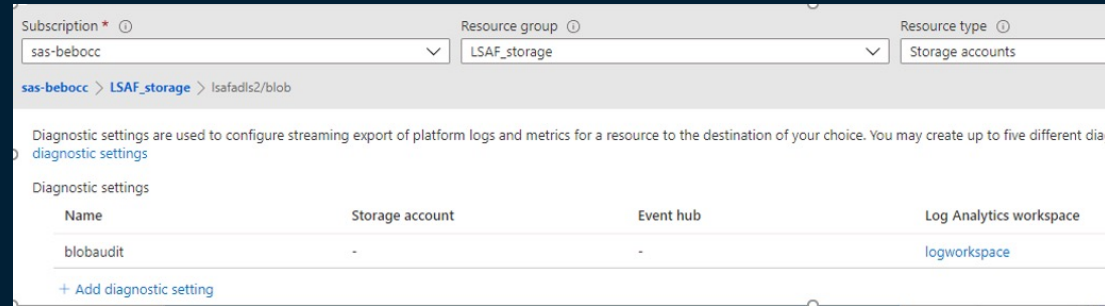
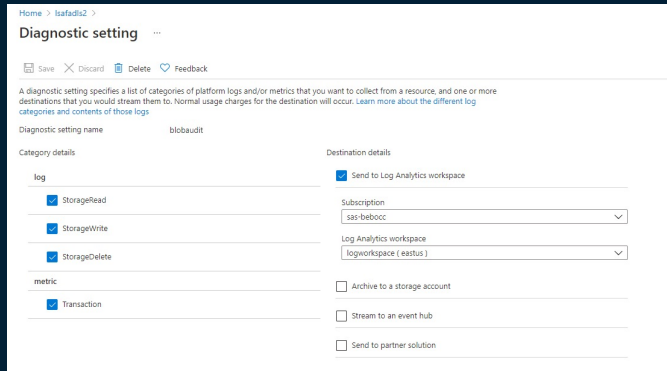
1. Role Assignments
2. ACLs



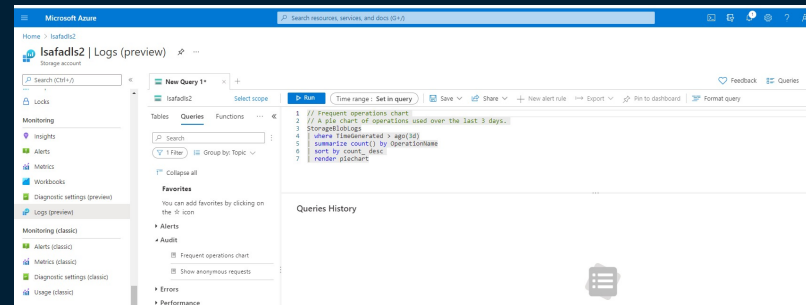
# Ensuring Distributed Data custody on Cloud Platforms

## Azure Audit Trail

- Azure Monitor Logs - consolidates logs and metrics from multiple services and other data sources
  - create a Diagnostic setting to collect platform metrics, activity log, and resource logs into a Log Analytics workspace in Azure Monitor.



- Log Analytics allows you perform advanced analysis of log data using a fully featured query language



Reference: <https://docs.microsoft.com/en-us/azure/azure-monitor/essentials/monitor-azure-resource>

## Azure – Mount Storage account as local drive

- Reference: <https://docs.microsoft.com/en-us/azure/storage/blobs/authorize-data-operations-portal>



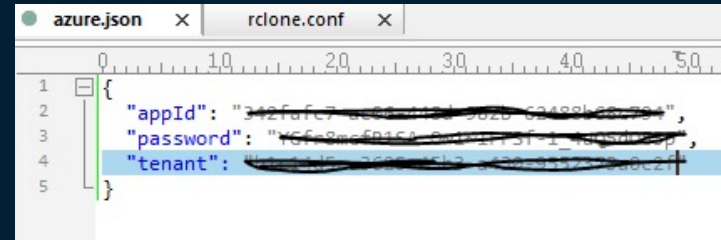
# Ensuring Distributed Data custody on Cloud Platforms

## Azure – Mount Storage account as local drive

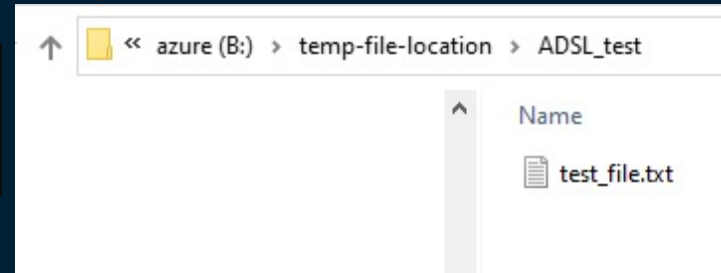
- Setup using RClone - command line program to manage files on cloud storage (<https://rclone.org/>)
- Follow the instructions - <https://rclone.org/azureblob/>
- Configuration file for Rclone is located - C:\Users\<userid>\AppData\Roaming\rclone

```
[azure]
type = azureblob
account = lsafadls2
service_principal_file = C:\Users\sajune\AppData\Roaming\rclone\azure.json
y) Yes this is OK (default)
e) Edit this remote
d) Delete this remote
```

```
PS C:\Users\sajune\Downloads\rclone-v1.56.0-windows-amd64\rclone-v1.56.0-windows-amd64> .\rclone.exe ls azure:
-1 2021-08-11 09:43:29      -1 $root
-1 2021-01-22 08:15:04      -1 empty1
-1 2021-08-02 16:54:35      -1 sas-test
-1 2021-07-13 13:19:20      -1 temp-file-location
-1 2021-02-28 20:05:08      -1 test3
PS C:\Users\sajune\Downloads\rclone-v1.56.0-windows-amd64\rclone-v1.56.0-windows-amd64> .\rclone.exe mount azure: b:
The service rclone has been started.
```



```
{
  "appId": "342f8c7-8c88-402d-802b-63488b8c7894",
  "password": "W6f-8m68368-8m68368-8m68368-8m68368",
  "tenant": "8m68368-8m68368-8m68368-8m68368"
}
```



# Ensuring Distributed Data custody on Cloud Platforms

## Azure Audit Trail

- Audit Records

New Query 1\* | Isafadls2 | Select scope | Run | Time range: Set in query | Save | Share | New alert rule | Export | Pin to dashboard | Format query

```
1 StorageBlobLogs
2 where TimeGenerated > ago(6h)
3
```

| Results      | Uri                  | Uri                  |
|--------------|----------------------|----------------------|
| Completed    | CallerIpAddress      | CallerIpAddress      |
|              | CorrelationId        | CorrelationId        |
| TimeGener    | SchemaVersion        | SchemaVersion        |
| > 8/17/2021, | OperationVersion     | OperationVersion     |
| > 8/17/2021, | AuthenticationHash   | AuthenticationHash   |
| > 8/17/2021, | RequesterObjectId    | RequesterObjectId    |
| > 8/17/2021, | RequesterTenantId    | RequesterTenantId    |
| > 8/17/2021, | RequesterAppId       | RequesterAppId       |
| > 8/17/2021, | RequesterAudience    | RequesterAudience    |
| > 8/17/2021, | RequesterTokenIssuer | RequesterTokenIssuer |
| > 8/17/2021, | RequesterUpn         | RequesterUpn         |
|              | UserAgentHeader      | UserAgentHeader      |
|              | ReferrerHeader       | ReferrerHeader       |
|              | ClientRequestId      | ClientRequestId      |

# Ensuring Distributed Data custody on Cloud Platforms

## SAS Life Science Analytics Framework (LSAF) Authentication

- Authentication

- Internal

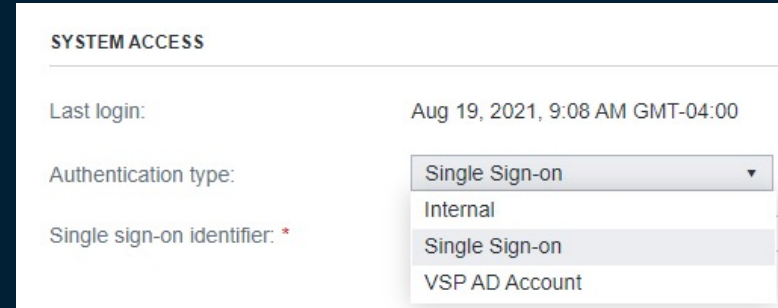
- Authentication mechanism controlled by application

- Active Directory

- Authentication passed o AD

- Single Sign-on

- SAML



SYSTEM ACCESS

Last login: Aug 19, 2021, 9:08 AM GMT-04:00

Authentication type:

Single sign-on identifier: \*

Internal

Single Sign-on

VSP AD Account



SYSTEM ACCESS

Last login: Aug 19, 2021, 9:24 AM GMT-04:00

Authentication type:

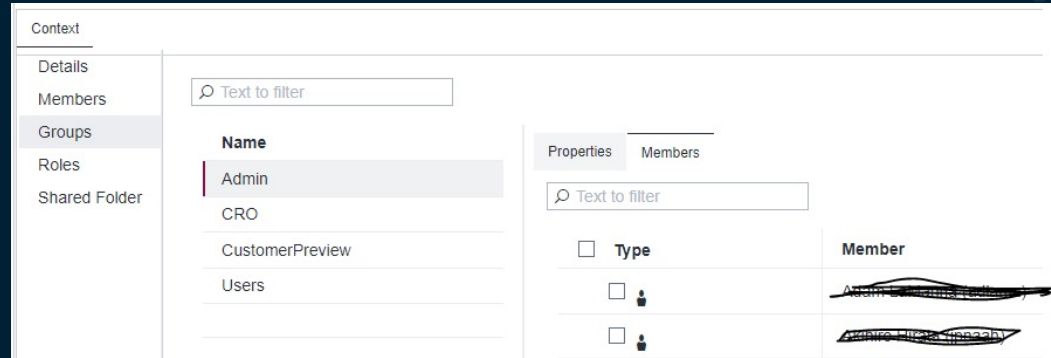
Single sign-on identifier: \*

# Ensuring Distributed Data custody on Cloud Platforms

## SAS Life Science Analytics Framework (LSAF) Authorization

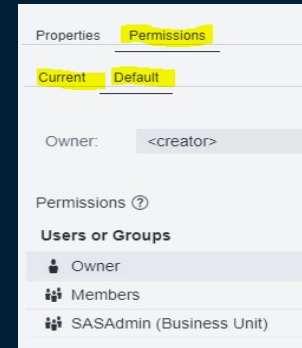
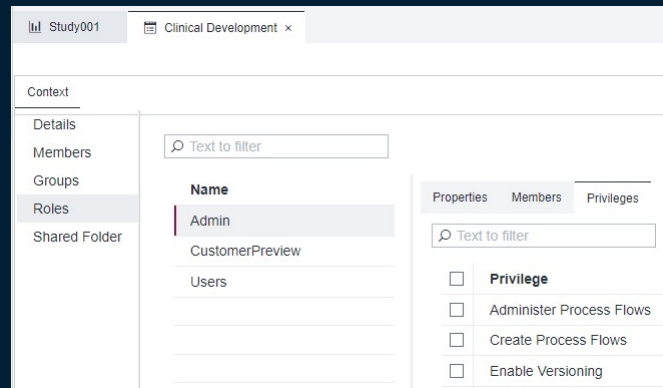
- Authorization

- Groups – Collection of principals
- Roles – Privileges controls what actions user can perform in application



- Permissions – controls what objects user can access in application

- Current
- Default



# Ensuring Distributed Data custody on Cloud Platforms

## SAS Life Science Analytics Framework (LSAF) Audit Trail

- Audit Trail – Tracks all editable actions

Text to filter123 Items

QUERY PARAMETERS

Object:  
(any object)

Name:

Location:

Action:  
(any action - excluding downloaded)

Acted on by:  
sajune2 (Sandeep Juneja SAML)

Mode:  
(any mode)

From:  
Jul 19, 2021, 12:00:00 AM

To:  
Aug 19, 2021, 11:59:59 PM

FindReset

| Object      | Name          | Location       | Action              | Acted On By (Display Na...  | M... | Date Acted On                |
|-------------|---------------|----------------|---------------------|-----------------------------|------|------------------------------|
| User        | sajune2       |                | Log on              | sajune2 (Sandeep Juneja ... |      | Aug 19, 2021, 8:40:47 AM ... |
| User        | sajune2       |                | Log on              | sajune2 (Sandeep Juneja ... |      | Aug 19, 2021, 8:40:46 AM ... |
| User        | sajune2       |                | Log on              | sajune2 (Sandeep Juneja ... |      | Aug 19, 2021, 8:40:46 AM ... |
| User        | sajune2       |                | Timed out           | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 7:07:05 PM ... |
| User        | sajune2       |                | Timed out           | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:39:04 PM ... |
| File        | readme.txt    | /Users/sajune2 | Owner changed       | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:20:00 PM ... |
| File        | readme.txt    | /Users/sajune2 | Permissions created | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:20:00 PM ... |
| File        | readme.txt    | /Users/sajune2 | Created             | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:20:00 PM ... |
| User Folder | sajune2       | /Users         | File added          | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:20:00 PM ... |
| File        | readme.txt    | /Users/sajune2 | Associated          | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:20:00 PM ... |
| File        | test_file.txt | /Users/sajune2 | Deleted             | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:08:15 PM ... |
| User Folder | sajune2       | /Users         | File removed        | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:08:15 PM ... |
| File        | test_file.txt | /Users/sajune2 | Disassociated       | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:08:15 PM ... |
| File        | readme.txt    | /Users/sajune2 | Deleted             | sajune2 (Sandeep Juneja ... |      | Aug 17, 2021, 6:08:15 PM ... |

Attribute

File

From

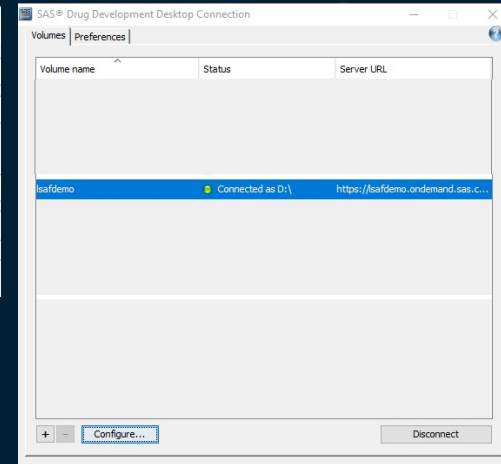
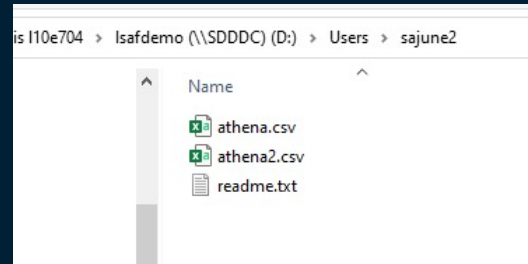
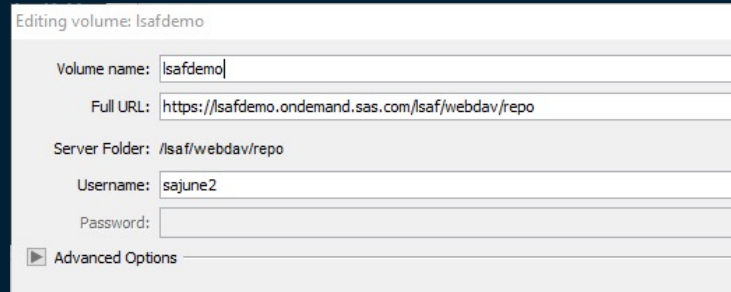
To

readme.txt

# Ensuring Distributed Data custody on Cloud Platforms

## Mounting SAS Life Science Analytics Framework (LSAF) as local drive

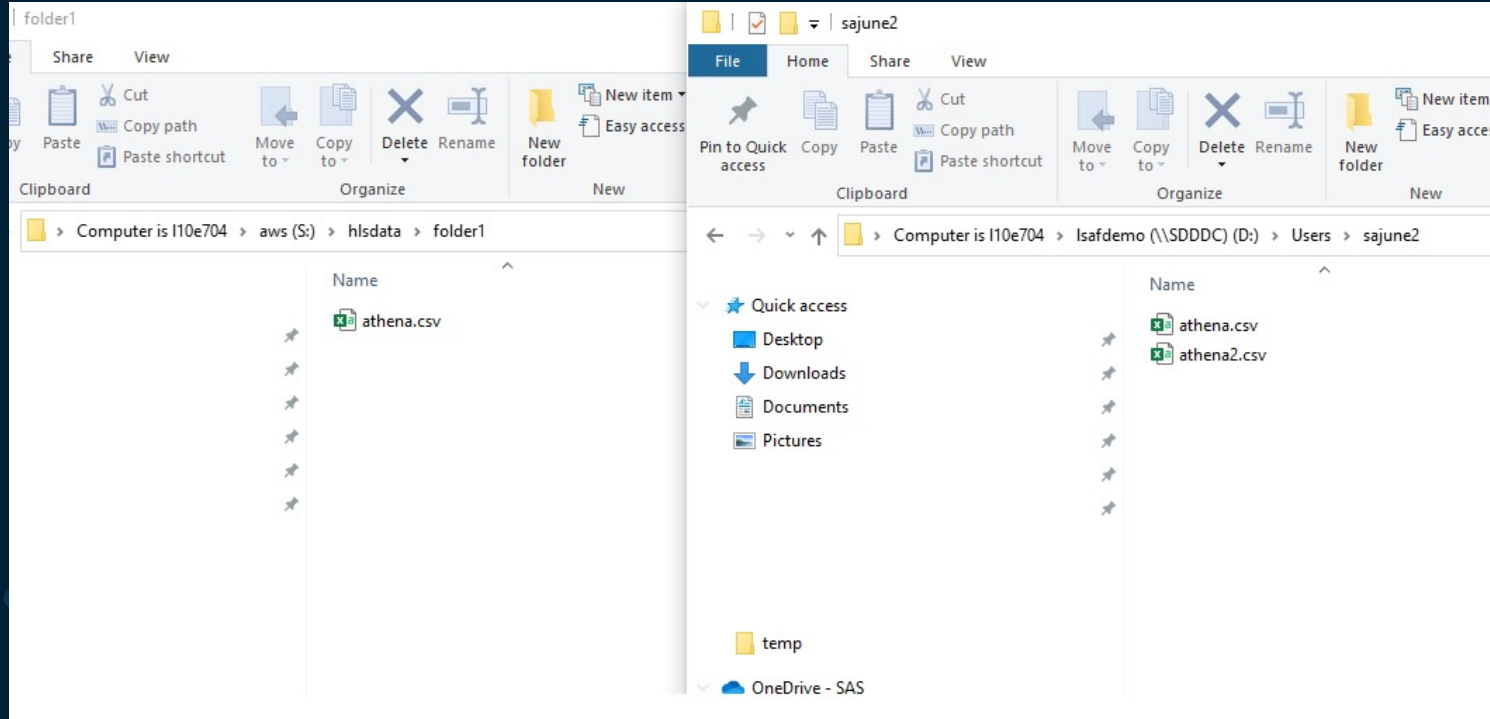
- Using SAS Drug Development Desktop Connect
- Configure URL and credentials



# Ensuring Distributed Data custody on Cloud Platforms

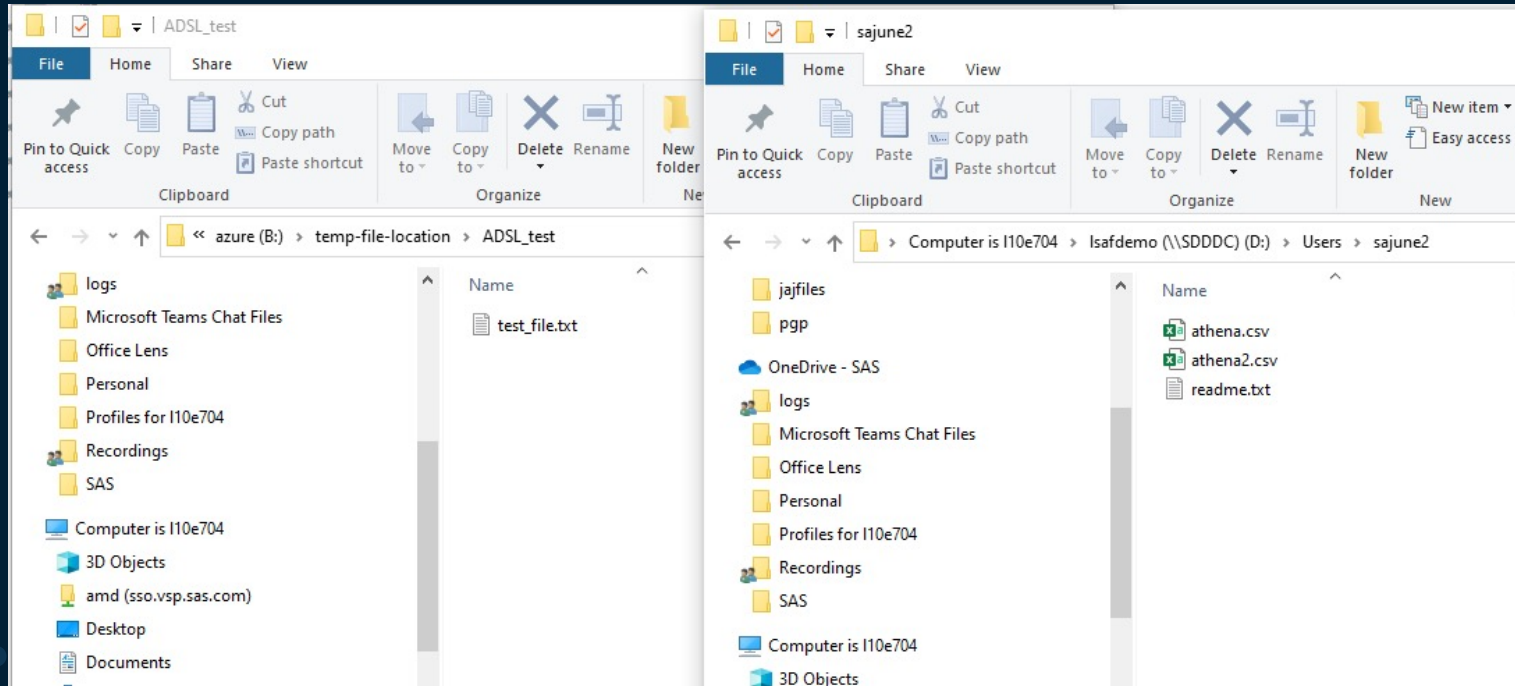
## AWS S3 To LSAF Repository

- Data Exchange between cloud storages using drive mounts



# Ensuring Distributed Data custody on Cloud Platforms

## Azure Storage account to LSAF Repository



# LSAF Audit Records

7 items

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**QUERY PARAMETERS**

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Object:

(any object) ▾

Name:

Location:

▾

Action:

File added ▾

Acted on by:

sajune2 (Sandeep Juneja SAML) ▾

Mode:

(any mode) ▾

From:

Jul 19, 2021, 12:00:00 AM

To:

Aug 19, 2021, 11:59:59 PM

► Find
 Reset

| Object      | Name    | Location | Action     | Acted On By (Display Na...   | M... | Date Acted On                |
|-------------|---------|----------|------------|------------------------------|------|------------------------------|
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 17, 2021, 6:20:00 PM ... |
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 17, 2021, 5:03:33 PM ... |
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 17, 2021, 2:51:24 PM ... |
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 14, 2021, 9:12:54 PM ... |
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 14, 2021, 9:07:13 PM ... |
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 14, 2021, 6:27:25 PM ... |
| User Folder | sajune2 | /Users   | File added | sajune2 (Sandeep Juneja S... |      | Aug 14, 2021, 6:25:04 PM ... |
|             |         |          |            |                              |      |                              |
|             |         |          |            |                              |      |                              |
|             |         |          |            |                              |      |                              |
|             |         |          |            |                              |      |                              |
|             |         |          |            |                              |      |                              |

Attribute

↑

From

To

|      |  |  |            |
|------|--|--|------------|
| File |  |  | readme.txt |
|      |  |  |            |
|      |  |  |            |
|      |  |  |            |
|      |  |  |            |

# Ensuring Distributed Data custody on Cloud Platforms

## Data Traceability across cloud Environments

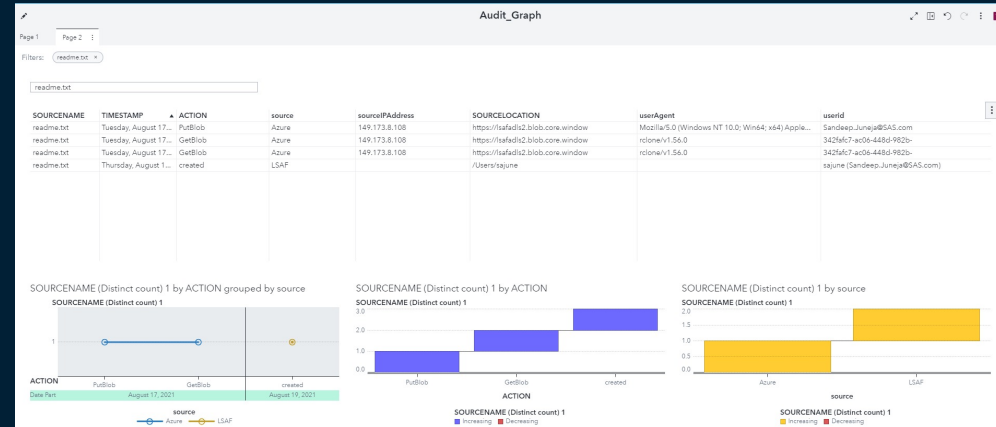
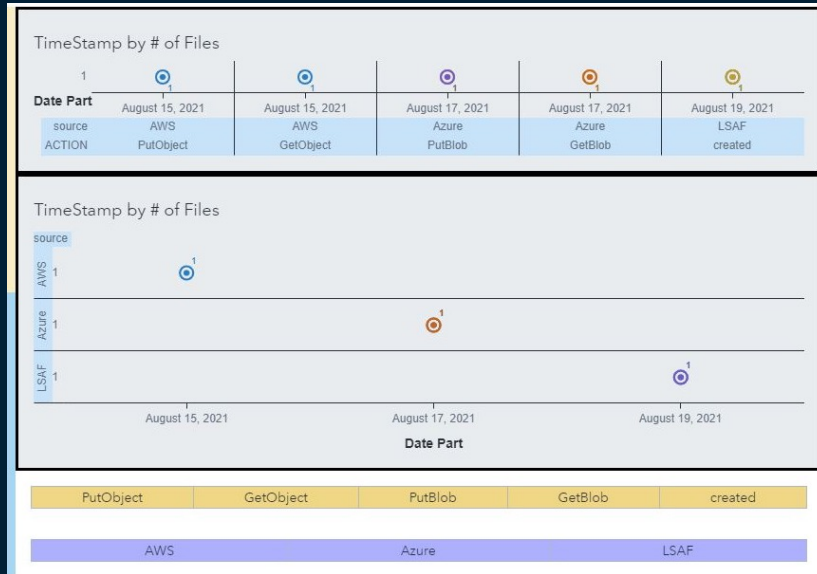
- Combining Audit Data across Cloud Environment provides data traceability

| userAgent                | source | action    | userid                                                    | sourceLocation                     | sourceName    |
|--------------------------|--------|-----------|-----------------------------------------------------------|------------------------------------|---------------|
| [rclone/v1.56.0]         | AWS    | GetObject | AROAYTOMEHNKXPZDROA3:Sandeep.Juneja@SAS.com (AssumedRole) | hlsdata.s3.us-east-1.amazonaws.com | athena2.csv   |
| [rclone/v1.56.0]         | AWS    | GetObject | AROAYTOMEHNKXPZDROA3:Sandeep.Juneja@SAS.com (AssumedRole) | hlsdata.s3.us-east-1.amazonaws.com | athena2.csv   |
| [rclone/v1.56.0]         | AWS    | GetObject | AROAYTOMEHNKXPZDROA3:Sandeep.Juneja@SAS.com (AssumedRole) | hlsdata.s3.us-east-1.amazonaws.com | athena2.csv   |
| [rclone/v1.56.0]         | AWS    | GetObject | AROAYTOMEHNKXPZDROA3:Sandeep.Juneja@SAS.com (AssumedRole) | hlsdata.s3.us-east-1.amazonaws.com | athena2.csv   |
| AzCopy/10.11.0 Azure-... | Azure  | GetBlob   | Sandeep.Juneja@SAS.com                                    | https://lsafadls2.blob.core.window | 000000.log    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | 000000.log    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | 000000.log    |
| Mozilla/5.0 (Windows ... | Azure  | PutBlob   | Sandeep.Juneja@SAS.com                                    | https://lsafadls2.blob.core.window | test_file.txt |
| Mozilla/5.0 (Windows ... | Azure  | PutBlob   | Sandeep.Juneja@SAS.com                                    | https://lsafadls2.blob.core.window | readme.txt    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | readme.txt    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | readme.txt    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | readme.txt    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | readme.txt    |
| rclone/v1.56.0           | Azure  | GetBlob   | 342fafc7-ac06-448d-982b-                                  | https://lsafadls2.blob.core.window | readme.txt    |
|                          | LSAF   | created   | sajune (Sandeep.Juneja@SAS.com)                           | /Users/sajune                      | athena.csv    |
|                          | LSAF   | created   | sajune (Sandeep.Juneja@SAS.com)                           | /Users/sajune                      | athena2.csv   |
|                          | LSAF   | created   | sajune (Sandeep.Juneja@SAS.com)                           | /Users/sajune                      | readme.txt    |

# Ensuring Distributed Data custody on Cloud Platforms

## Data Traceability across cloud Environments

- Combining Audit Data across Cloud Environment provides data traceability



# Questions

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