Configuration Manual

MSc Research Project
Cloud Computing

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MSc Project Submission Sheet

School of Computing

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Programme:	: Cloud Computing **Year:** 2024
Module:	MSc Research Project
Lecturer:	Rashid Mijumbi
Submission Due Date:	12/08/2024
Project Title:	A Serverless Federated Learning Service Ecosystem for Secure and Flexible Model Sharing in Multi-Cloud Environments
Word Count:	527 **Page Count: 4**

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
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Signature: Dhyanesh Pradip Naik

Date: 12th August 2024

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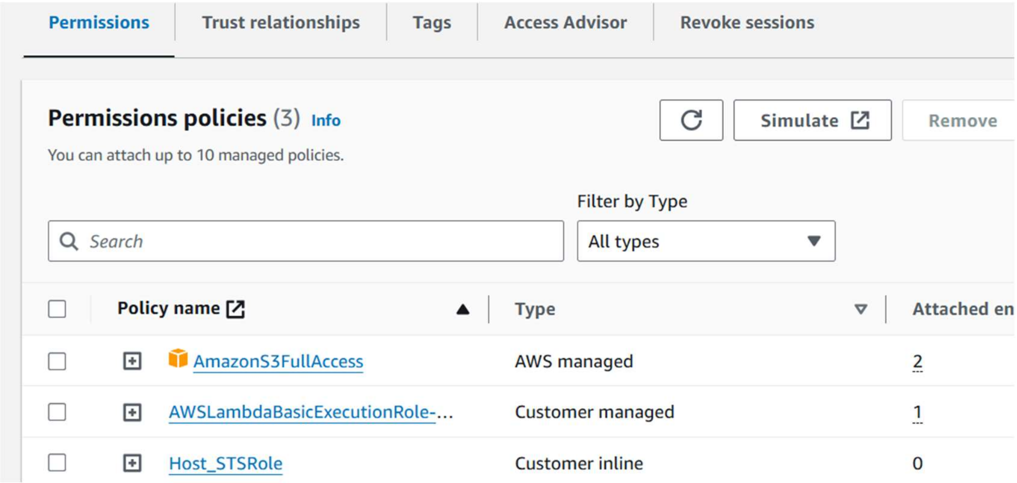
Configuration Manual

Dhyanesh Naik
X22206124

1 Introduction

This Configuration Manual covers all AWS prerequisites for repeating the study and its outcomes. This document covers a synthetically generated dataset, Python ML packages, AWS Lambda, and AWS CloudFormation implementation.

2 AWS Lambda Configuration



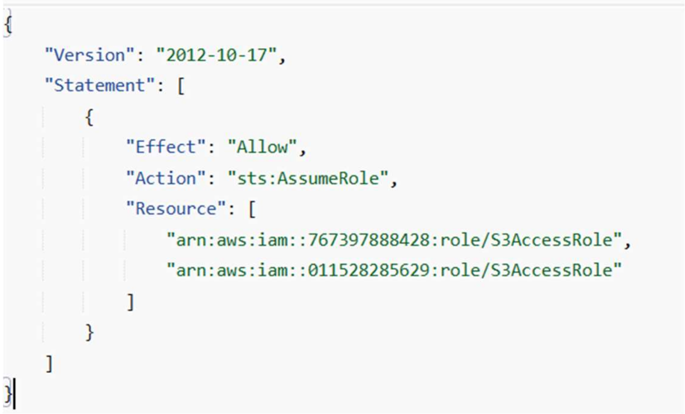
Permissions policies (3) Info

You can attach up to 10 managed policies.

Filter by Type: All types

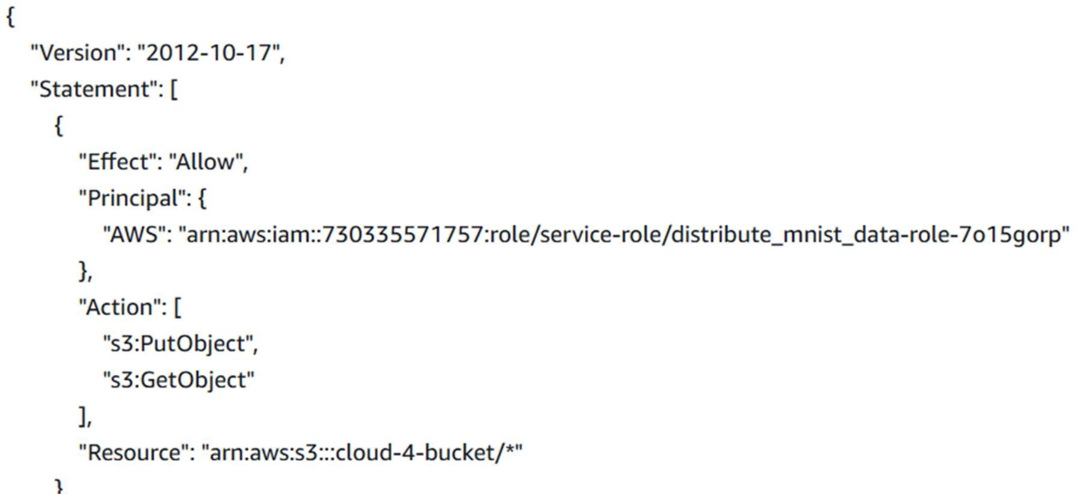
□	Policy name	Type	Attached en
□	AmazonS3FullAccess	AWS managed	2
□	AWSLambdaBasicExecutionRole-...	Customer managed	1
□	Host_STSRole	Customer inline	0

Figure 1: IAM Execution Role for MNIST Distribute Lambda Function



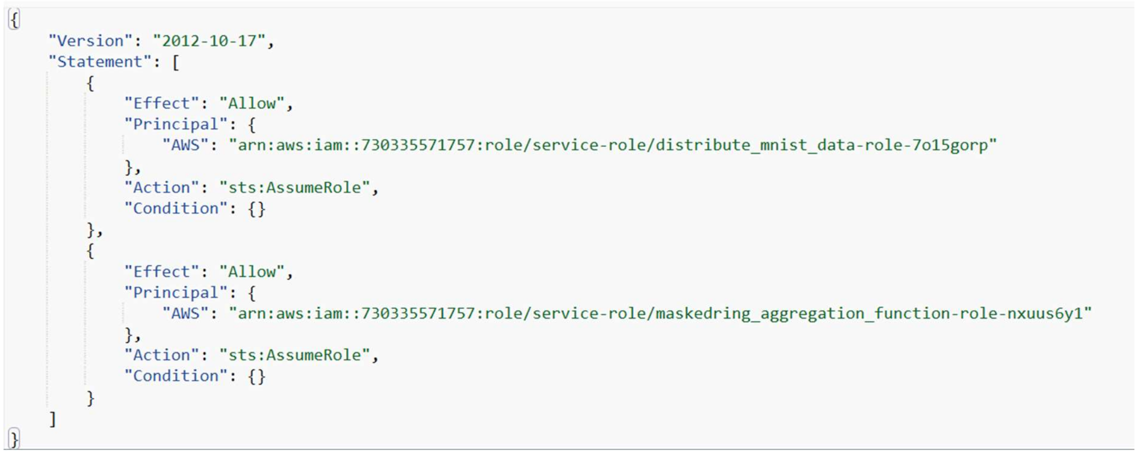
```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "sts:AssumeRole",
            "Resource": [
                "arn:aws:iam::767397888428:role/S3AccessRole",
                "arn:aws:iam::011528285629:role/S3AccessRole"
            ]
        }
    ]
}
```

Figure 2: Security Token Service Role Policy for Cross-cloud Access



```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "AWS": "arn:aws:iam::730335571757:role/service-role/distribute_mnist_data-role-7o15gorp"
      },
      "Action": [
        "s3:PutObject",
        "s3:GetObject"
      ],
      "Resource": "arn:aws:s3:::cloud-4-bucket/*"
    }
```

Figure 3: S3 bucket policy to access the client bucket, cloud-4-bucket from host cloud lambda function



```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::730335571757:role/service-role/distribute_mnist_data-role-7o15gorp"
            },
            "Action": "sts:AssumeRole",
            "Condition": {}
        },
        {
            "Effect": "Allow",
            "Principal": {
                "AWS": "arn:aws:iam::730335571757:role/service-role/maskedring_aggregation_function-role-nxuus6y1"
            },
            "Action": "sts:AssumeRole",
            "Condition": {}
        }
    ]
}
```

Figure 4: S3AccessRole Trust Relationship for Cross-cloud Access from Host Cloud

3 Data Science Environment and Packages

- Pandas
- Numpy
- Matplotlib
- Scikit-learn
- TensorFlow
- PyTorch
- PyCryptodome
- Imblearn
- Boto3
- Logging
-

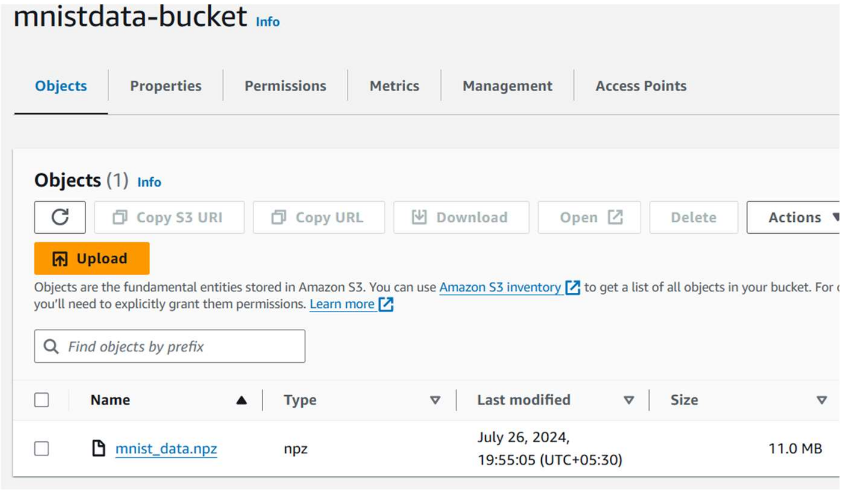
4 Dataset

This work uses MNIST dataset for model aggregation on the host cloud, and distributes the MNIST subsets across client clouds. The MNIST is a database of handwritten digits. It consists of 60,000 training Examples and a Test set with 10,000 examples It is a subset of the larger NIST Special Database 3 and Special Database 1, which contain binary images. NIST originally designated black and white, bilevel images in a (minimum) 20x20 pixel box with aspect ratio preserved.

The MNIST dataset can be download from the link,

https://paperswithcode.com/dataset/mnist

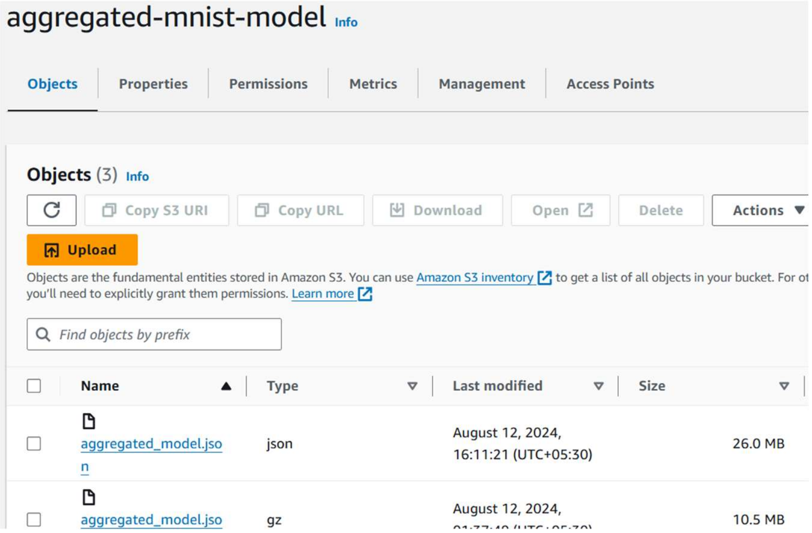
5 AWS S3 Access



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
you'll need to explicitly grant them permissions. Learn more

□	Name ▲	Type	Last modified	Size
□	mnist_data.npz	npz	July 26, 2024, 19:55:05 (UTC+05:30)	11.0 MB

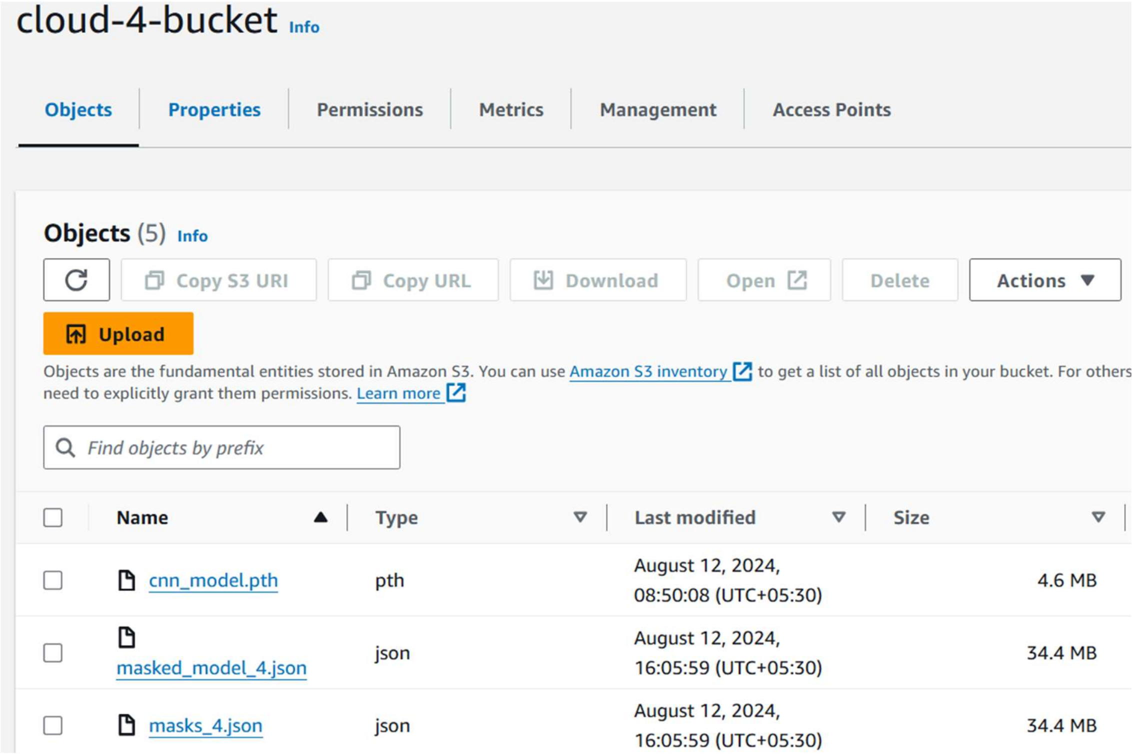
Figure 5. MNIST Host Data Bucket



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 ot
you'll need to explicitly grant them permissions. Learn more

□	Name ▲	Type	Last modified	Size
□	aggregated_model.json	json	August 12, 2024, 16:11:21 (UTC+05:30)	26.0 MB
□	aggregated_model.jso	gz	August 12, 2024,	10.5 MB

Figure 6. MNIST Host Model Bucket

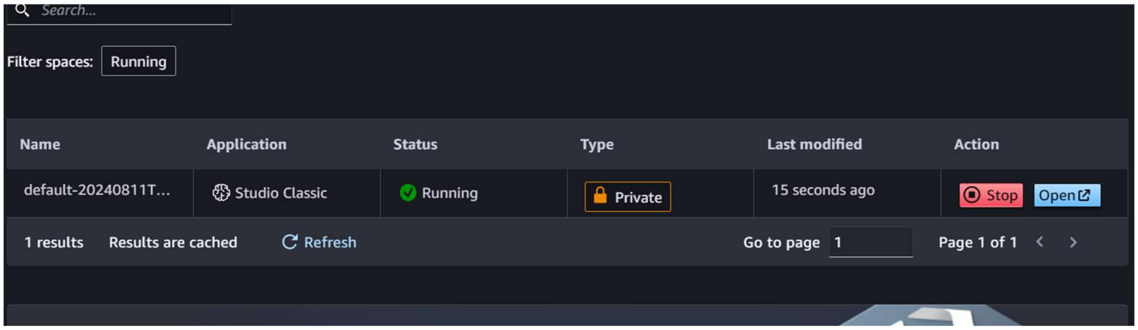


Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory to get a list of all objects in your bucket. For others need to explicitly grant them permissions. Learn more

□	Name ▲	Type	Last modified	Size
□	cnn_model.pth	pth	August 12, 2024, 08:50:08 (UTC+05:30)	4.6 MB
□	masked_model_4.json	json	August 12, 2024, 16:05:59 (UTC+05:30)	34.4 MB
□	masks_4.json	json	August 12, 2024, 16:05:59 (UTC+05:30)	34.4 MB

Figure 7. MNIST Client Model and Data Bucket

6 AWS Sagemaker Domain



Name	Application	Status	Type	Last modified	Action
default-20240811T...	Studio Classic	Running	Private	15 seconds ago	Stop Open

1 results Results are cached

Figure 8. SageMaker Domain Access for Local Training

References

Amazon Web Services (2023) What is AWS CloudFormation? Available at: https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/Welcome.html (Accessed: 12 August 2024).
Serverless, Inc. (2023) AWS Lambda: The Ultimate Guide. Available at: https://www.serverless.com/aws-lambda (Accessed: 12 August 2024).