

Configuration Manual

MSc Research Project
Msc Cloud Computing

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MSc Project Submission Sheet



School of Computing

Student Name: Silver Stalan Inbaraj

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Programme: Msc in Cloud Computing

Year: 2024 - 2025

Module: Msc Research Project

Lecturer: Sai Emani

Submission Due

Date: 15 / 09 /2025

Project Title: **Improving Elastic Federated Learning Efficiency in Serverless Environments using Dynamic Resource Allocation and Intelligent Client Selection**

Word Count: 381 **Page Count:** 3

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Date: 15/09/2025

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Configuration Manual

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1 Environment Requirements

1.1 System Requirements

- Latest version windows operating System recommended
- Minimum 16GB RAM
- Storage at least 256GB with free space SSD
- For service interaction and AWS CLI Reliable broadband Internet connection needed

1.2 AWS Services

- Used AWS Lambda Serverless computing for executing backend logic
- For storing structured data Amazon DynamoDB NoSQL database table
- To keep CSV files and datasets Amazon S3 Object storage service
- For handling asynchronous message passing Amazon SQS Queue service
- To track performance and system metrics Amazon CloudWatch Monitoring and logging service

2 Package Requirements

```
# Core packages (requirements.txt)
numpy>=1.21.0
boto3>=1.26.0
pandas>=1.5.3
scipy>=1.9.0
```

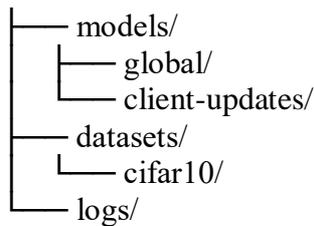
3 AWS Configuration

1. S3 Bucket Configuration

Bucket Name: elasticfl-silver

Structure:

elasticfl-silver/



2. DynamoDB Tables

- FL-Jobs for Job state and configuration storage
- Client-Registry for Client capabilities and performance data
- Training-Metrics for Performance metrics and training results
- Scaling-Policies for Auto-scaling configuration
- Scaling-Decisions for Scaling actions and analysis
- Scaling-Analysis for Historical scaling performance

4 Installation

Prerequisites

- With permissions AWS Academy Account
- AWS CLI installed and configured
- Installed Python 3.9+

Environment:

- For Create the virtual environment
`python -m venv venv`
- For Activate the virtual environment
Windows:
`venv\Scripts\activate`
Linux/Mac:
`source venv/bin/activate`
- Install the dependencies
- `pip install boto3 pandas numpy scipy`

AWS CLI Configuration:

- Configure the AWS credentials (AWS Academy)
- `aws configure`
AWS Access Key ID: [From AWS Academy]
AWS Secret Access Key: [From AWS Academy]
Default region: us-east-1
Default output format: json
- Verify the configuration
`aws sts get-caller-identity`

5 Setup and Deployment

1. Infrastructure Setup

- Create the S3 bucket
- Create the DynamoDB tables
- Setup the CloudWatch namespace

2. Lambda Function Deployment Order

- FL Coordinator
- Client Manager
- Model Aggregator
- Resource Optimizer
- Scaling logic

3. SQS Queue Configuration

```
aws sqs create-queue --queue-name model-updates-queue
```

6 Execution Steps

- Main Script

```
python run_evaluation.py
```
- Phase test for straggler analysis

```
python phase3_test
```
- Comparison visualizations

```
Python visualization.py
```

7 Scaling Test Scenarios

- Baseline Scenario - 5 clients, light workload
- Scale Testing - clients 10, 20, 30, 40
- Straggler Simulation
- With different workload complexities Resource Optimization