

Configuration Manual

MSc Research Project Master of Science in Cloud Computing

NIKHIL DEVABHAKTUNI Student ID: x22156411

School of Computing National College of Ireland

Supervisor: Shreyas Setlur Arun

National College of Ireland

MSc Project Submission Sheet



School of Computing

| Student Name: NIKI | HIL DEVABHAKTUNI |
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- **Student ID:** <u>x22156411</u>
- Programme: Master of Science in Cloud Computing Year: Jan 2023
- Module: MSc Research Project
- Lecturer: Shreyas Setlur Arun

Submission Due Date: 25/04/2024

Project Title: Enhanced File Transfer Security in Django Web Applications with TOTP-Based Multi-Factor Authentication and Blowfish/AES Encryption on AWS Cloud

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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: Nikhil Devabhaktuni

Date: 25/04/2024

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Configuration Manual

NIKHIL DEVABHKTUNI Student ID: x22156411

A configuration manual detailing the hardware and software tools required to implement the proposed research.

1 Hardware Requirements

- Intel Quad-core processor-based PC
- 16GB RAM or higher
- At least 256 GB SSD storage

2 Software Requirements

- Operating system: Windows/Linux
- Python >=3.8
- Django >=3.2
- Web Browser

3 Python Packages

The following list outlines the prerequisites essential for the proper functioning of the web application.

- asgiref==3.5.2
- attrs==22.1.0
- autopep8==2.0.0
- boto3==1.34.69
- botocore==1.34.69
- certifi==2022.12.7
- cffi==1.16.0
- charset-normalizer==2.1.1
- coreapi==2.3.3
- coreschema==0.0.4
- cryptography==42.0.5
- Django==4.1.4
- django-cors-headers==3.13.0
- djangorestframework==3.14.0
- drf-yasg==1.21.4
- idna==3.4

- inflection==0.5.1
- itypes==1.2.0
- Jinja2==3.1.2
- jmespath==1.0.1
- jsonschema==4.17.3
- MarkupSafe==2.1.1
- packaging==22.0
- pycodestyle==2.10.0
- pycparser==2.21
- pycryptodome==3.20.0
- pyotp==2.7.0
- pyrsistent==0.19.2
- python-dateutil==2.9.0. post0
- pytz==2022.6
- PyYAML==6.0
- requests==2.28.1
- ruamel.yaml==0.17.21
- ruamel.yaml.clib==0.2.8
- s3transfer==0.10.1
- six==1.16.0
- sqlparse==0.4.3
- swagger-spec-validator==3.0.3
- tomli==2.0.1
- typing_extensions==4.4.0
- tzdata==2022.7
- uritemplate==4.1.1
- urllib3==1.26.13

4 Create & Activate Virtual Environment for Packages Installation

To establish a virtual environment for this project, the following commands were utilized. This setup aids in ensuring that Elastic Beanstalk obtains any necessary packages or resolves missing dependencies from the virtual environment.

- python -m venv <virtual environment name>
- bash><virtual environment name>\Scripts\activate.bat

5 Install MySQL and create 'multistagecloud' database

To set up the web application, MySQL must be installed, and a database named 'multistagecloud' needs to be created. This involves downloading MySQL from the provided link, establishing a root user password, and executing SQL commands to create the specified tables within the 'multistagecloud' database.

- <u>https://dev.mysql.com/downloads/installer/</u>
- Create root user password.
- Create MySQL Database as shown:

```
create database multistagecloud;
use multistagecloud;
create table register(
 username varchar(30) primary key,
  password varchar(30),
 contact varchar(12),
 email varchar(30),
 address varchar(40),
 totp secret varchar(255)
);
create table files(
 username varchar(50),
 filename varchar(50),
 filekeys varchar(200),
 encryption type varchar(20),
  aes key varchar(255),
 encryption_time float,
  compression ratio float
);
```

6 Cloud Services

The web application was built using a combination of cloud services:

- Cloud9: For coding and collaboration.
- Code Pipeline: Automated the continuous integration and continuous deployment (CI/CD) process.
- Code Build: Provided build and test capabilities as part of the CI/CD pipeline.
- CloudWatch: logging and alerting functionalities.
- Elastic Beanstalk: Deployed and managed the web application in a scalable and flexible environment.
- RDS: Hosted the MySQL database for storing application data securely.
- S3: Stored and served static assets such as images, CSS, and JavaScript files for the web application and separately by using Secret key storing the uploaded files from the web application.

7 Encryption Mechanism

The code uses both Blowfish and AES encryption algorithms to store data during saving files an S3 bucket and this encryption approach ensures protection of information, potential security risks and unauthorized access. By using Blowfish and AES algorithms, the application improves data integrity and confidentiality.



Fig-1: Blowfish and AES encryption

8 Additional Functionality including new Library

Email notifications are sent to customers using the SMTP protocol whenever there's a website login. Additionally, a custom library is employed to retrieve user locations and IP addresses. In the event of unauthorized website access, customers receive an email notification.



Fig-2: Library named IpLibrary



Fig-3: Mail received to the customer.

9 Django App File Structure



8 AWS S3 Storage Access:

- Log in to the AWS Management Console using https://aws.amazon.com/.
- Navigate to the IAM service.
- In the IAM dashboard, select "Users" from the left-hand menu.
- Click on the "Create user" button.
- Enter a username for the new IAM user.
- On the "Set permissions" page, choose "Attach policies directly."
- Search for and attach the policy named "AmazonS3FullAccess" to grant full access to S3.
- Review the configuration and click "Next".
- Review the user details and permissions one last time.
- Click "Create user."
- Once the user is created, go to security credentials and click on create Access key.
- Next, click "Download .csv" to download the user's access key ID and secret access key.
- Configure the access keys for the IAM user in the code.

10 To run Web Application

- Install Python 3.7.6 (Don't forget to tick "Add to Path" while installing Python).
- Open Terminal and execute the following commands:
- Download the project zip folder and extract it.
- Move to the project folder in Terminal and run the following commands:
 - o python -m pip install -r requirements.txt
 - py manage.py makemigrations
 - o py manage.py migrate
 - py manage.py runserver
 - Enter the following URL in your browser installed on your PC: <u>http://127.0.0.1:8000/</u>

References

References should be formatted using APA or Harvard style as detailed in NCI Library Referencing Guide available at <u>https://libguides.ncirl.ie/referencing</u> You can use a reference management system such as Zotero or Mendeley to cite in MS Word.

Beloglazov, A. and Buyya, R. (2015). Openstack neat: a framework for dynamic and energyefficient consolidation of virtual machines in openstack clouds, *Concurrency and Computation: Practice and Experience* 27(5): 1310–1333.

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