CLOUD ARCHITECTURE- HEALTH GP

AWS Cloud Architecture For Health General Practitioner(GP)

CLOUD ARCHITECTURE- HEALTH GP

The hospital environment is one of the areas that requires top notch efficiency, because in most cases it entails dealing with individuals that are very sick and are fighting to save their lives. Such an environment requires meticulous planning, that can only be aided through provisioning a scalable and robust information technology infrastructure. Factors to be investigated, creation of the database, data security, and analytics.

In the case of health GP Services, the hospital is still using outdated procedures in their service delivery. For instance, when patients make an appointment, they must call their doctor through the phone, which is tedious, time consuming, and cumbersome in today's digital age. From such a perspective, this paper proposes a cloud computing infrastructure enabling remote patient appointment through apps and web portals. Besides, such a technological eco-system will ensure that patients records shall be stored in the clouds.

2. PROJECT PLAN:

Task Assigned	Start Plan	Time Taken (Days)	Completion (%)
Introduction	1	1	100%
Issues in Health-GP	1	1	100%
Facing necessary conditions	1	1	100%
Functional and Non-Functional Requirements	2	2	100%

CLOUD ARCHITECTURE- HEALTH GP

Make a choice of Cloud Platform	3	2	100%
Choice of Data Center and Standards	4	1	100%
Design of Health-GP Architecture	5	3	100%
System Implementation>50	8	1	100%
Analysis and Reflection	6	1	100%
Conclusion	7	1	100%
Including Reference	9	1	100%
Edit and Wrap Up Documentation	10	1	100%

3.REQUIREMENTS GATHERING:

3.1 FUNCTIONAL REQUIREMENTS:

CLOUD ARCHITECTURE- HEALTH GP

Registration Processes

The system should facilitate the registration requirements, through different approaches that may include:

- *Adding the patients:* through the front-office application, the system should be able to add new patients
- *Assigning ID:* The system should be able to provide a unique identifier to the patients

Deleting patient Information

- *Deleting:* the system should be able to deletes the patient information if they happen to change the service provider
- *Adding beds:* the system should automatically check the no. of available beds so that a patient can be booked or not for admission

Generating reports

- *Generation of reports:* The system should automatically generate reports about the patient including the no of visits to the facility, drugs administered, allergies, appointments etc.

Drug Administration

- *Drug administration:* The system should be able to review the drugs administered to the patient.

3.2 NON- FUNCTIONAL REQUIREMENTS:

Security

- *Patient identification:* the system must recognize the patient through a unique identifier

CLOUD ARCHITECTURE- HEALTH GP

- *Log in:* the users must have valid credentials

- *Modifications*: the modifications must be initiated by authorized users

Performance

- *Response:* the system should have a superior uptime with instantaneous response

- *Capacity*: the system should be scalable alongside the capacity of the customer

- *User interface*: the system should be user friendly

Maintainability

- *Backup:* the data should be automatically backed up

- *Errors:* the system should have error handling capabilities

Reliability

Availability: The system should be available round the clock

3.3 KEY CHARACTERISTICS

S.NO	KEY CHARACTERISTICS	CLOUD COMPUTING USES
1	24/7 Booking and Services	Through the AWS, it is possible to deploy a virtual machine in minutes, which helps the users to uses the services for 24/7.
2	Generation of Patients Reports and Users Dashboards	Amazon CloudWatch is a tool which used to create a dashboard for monitoring the patients details which stored in the databases and in the storage.
3	More Secured Services	The servers come with built-in security mechanisms ensuring that only legitimate users can access the system. It is nearly impossible for an external entity to identify the exact EC2 instances, and the Dynamo DB servers that the organization will be running.

AWS provide services through the cloud platform is analytics which is critical for enterprises acquiring a competitive business edge through business intelligence leveraging on the capabilities of big data (Nath et al., 2019). Some of the justifications for selecting the AWS as the main service provider for health GP services includes:

Pricing

In most instances, billing is done per minute, meaning that if the hospital facility only utilizes 45 minutes a week in accessing the database, they are only going to be charged for those 45 minutes (Ucuz, 2020).

Zero Commitment

Individual's do not need to make an upfront commitment fee because they are using a virtual machine and considering that they are billed according to the usage, the clients are not bound into making monthly, quarterly, semi-annual, or annual commitments with the company.

Scalability and Procurement

Regarding the scalability, the AWS ensure that the services scale up or down in tandem with spikes faced by the infrastructure, which otherwise is challenging to attain with an on-premises infrastructure.

Security

The system is designed with several authentication mechanisms like firewalls, usage of passwords, and encryption and decryption keys, implying that sensitive user information are protected against misuse. Without access to the exact virtual machines, an attacker is likelier to find it challenging accessing the organizations IT infrastructure, in particular the database holding

the medical related information for the clients. The systems are physically and logically secured over the network.

Flexibility

Through the platform, it is possible to configure everything from scratch to a platform comprising of pre-built templates facilitating deploying of services automatically. Through such a context, users only need to integrate their code in a service less computing service, and the AWS automatically takes care of the rest.

5. CHOICE OF DATA CENTER AND STANDARDS:

There are several standards that are going to be considered in the following proposals, and they shall include:

Regulatory standards

According to the context of the proposal, the paper shall adhere to the health Insurance Portability and Accountability act (HIPAA) that usually governs data transmission in a health care environment.

Operational Standards

There are several standards to select, but in this particular case the project shall apply the ISO 9000 – Quality system, and ISO 27001 information Security, which ensures that IT projects are secure data transmission channels.

CLOUD ARCHITECTURE- HEALTH GP
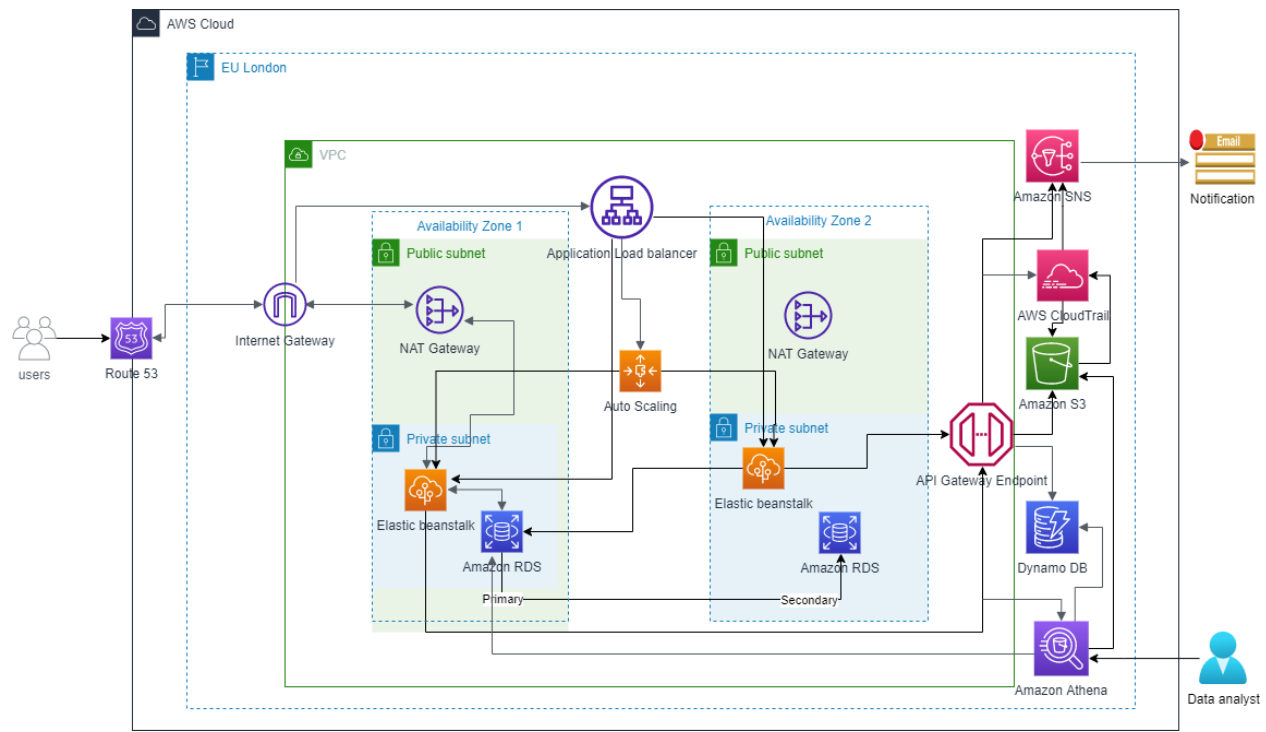
The following section proposes the features that are going to be integrated when developing the health GP services through the Amazon Cloud. Health GP services have been having a clinical application, that is used for managing the patients' records, and other medical related transactions like the patient medical history, treatments undertaken, drugs dispensed, the no of visits etc. And one of the main cases while booking an appointment we can use the web applications which is very easier to use. Hence Elastic beanstalk is used for the web applications portals. With Elastic beanstalk, we can create an application with a required environment. A network address translation (NAT) gateway in the public subnet allows instances in the private subnet to connect to the Internet via Internet Gateway. Amazon Route 53 is a highly accessible domain intended to users to the applications by translating domain names to IP address to communicate each other. Amazon RDS is the relational database service which stores patients' sensitive information details privately in a

8

structured format. Hence primary RDS if leads to slow down it processes and then manage it with the secondary RDS database. Application Load Balancer is the load balancing service which holds the incoming traffic from the users and increases it performance for using web applications. A request is mapped to a target group by an application load balancer. A process in elastic beanstalk represents a target group. Auto scaling groups is the scaling computing resources based on the increase of bandwidth or CPU performance. API Gateway is the application programming interface which can create, deploy, and manage to expose HTTP endpoints, Elastic beanstalk and connect with S3 bucket and Dynamo DB and other AWS services with API. S3 bucket is the storage service in AWS which can handles storing the objects such as images, videos, etc., for example in health care systems S3 buckets are used for storing patients body scan X-rays, MRI scan images, CT scan, etc., Amazon Dynamo DB is a NOSQL Database which is used for creating a table for storing the hospital information with a table format. In healthcare Dynamo DB is used for storing hospital records, medical records, medical exams results, and this database cannot store the PDF content so incase we use S3 for storing images and PDF documents. AWS CloudTrail is the monitoring service which is used for monitoring the IP address where the requests came from and when it is happened. CloudTrail monitors the log files which published in the S3 bucket. We can set notifications like messages, emails through Amazon Simple notification service (SNS). This SNS is used to manage alerts. Once we must receive notification, we can set CloudTrail to send update information to SNS. Once subscriptions are made, we can use with Amazon SNS. Amazon Athena is the data analytics tool in AWS service, which can used for the analysis of the data's which stored in the databases and storages. Athena is mainly used for without loading the data into Athena, we can run the queries using ANSI SQL. These are the complete health care GP

CLOUD ARCHITECTURE- HEALTH GP

system used with AWS services for computing, networking, storage, security, databases, and monitoring.
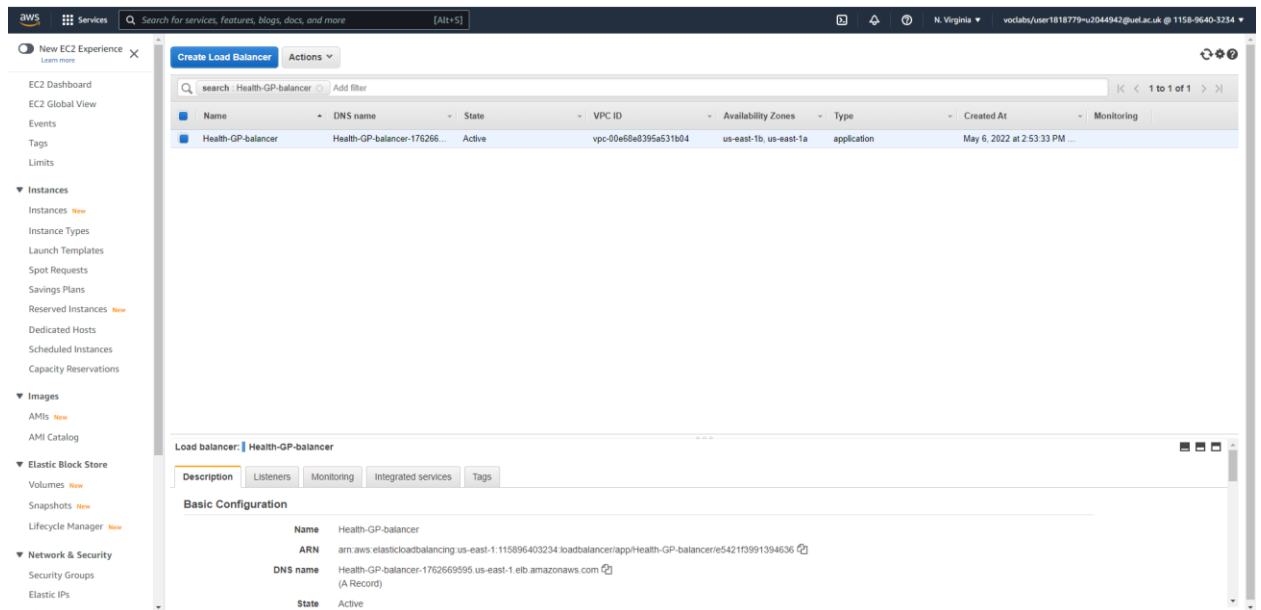
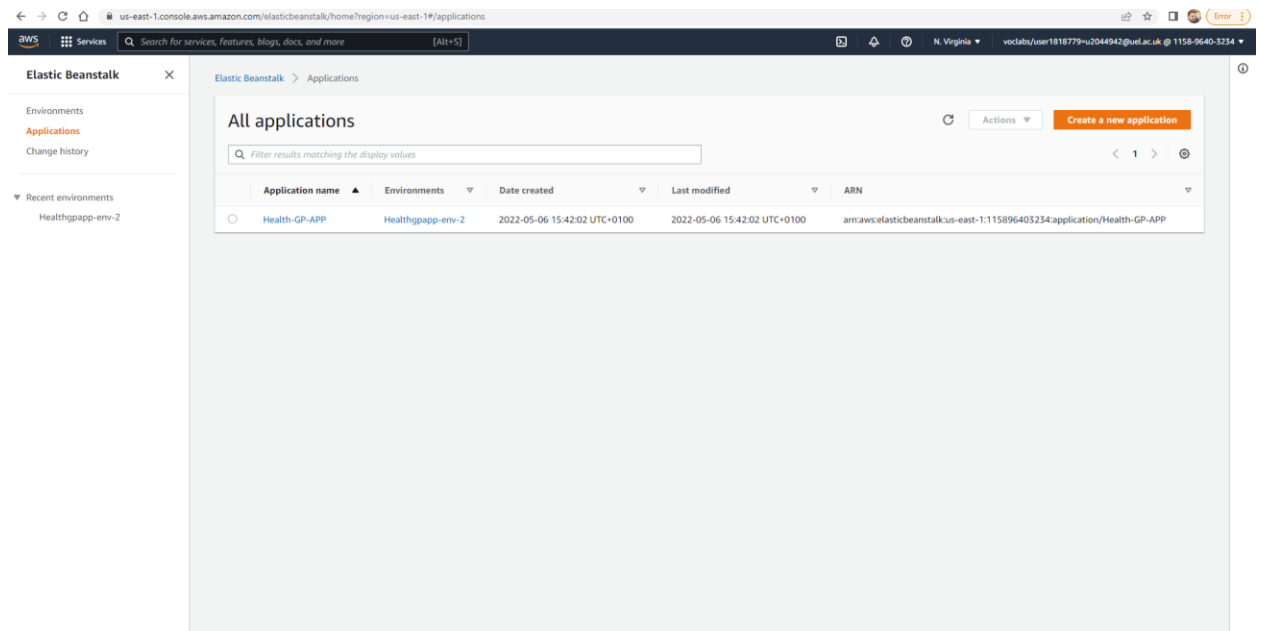1.Creating Virtual private cloud (VPC) for health care system in the name of Health-GP-VPC.
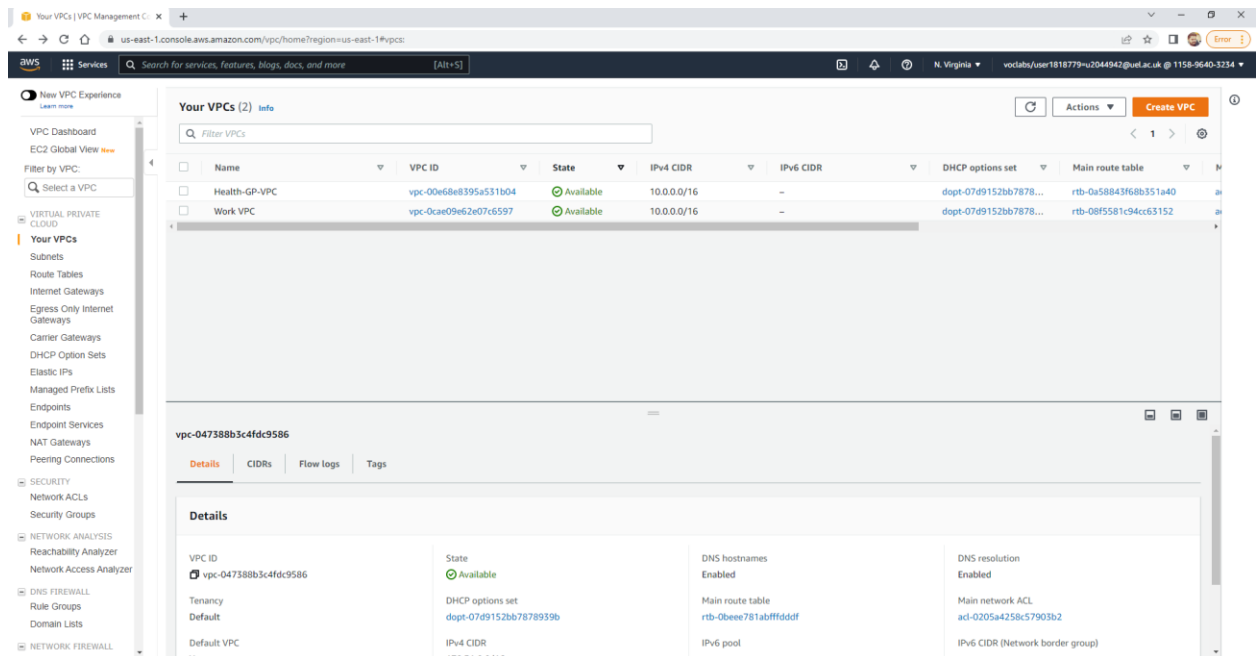
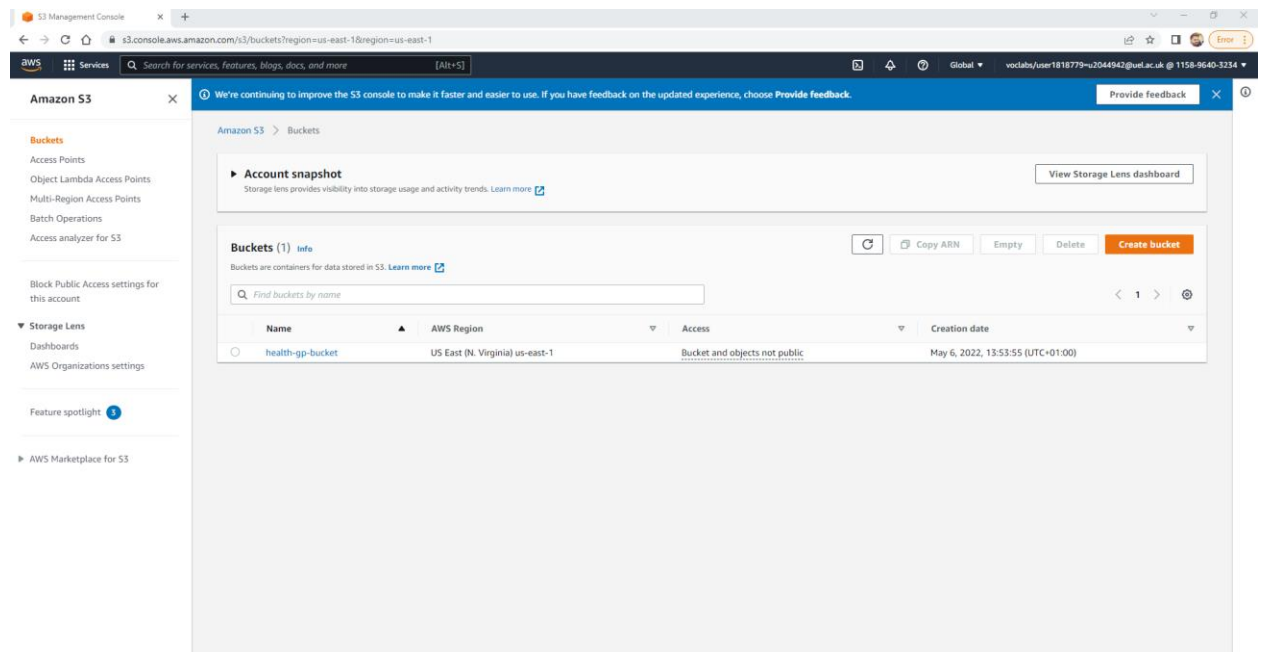### 2.Creating Application Load Balancer for maintaining the traffic.

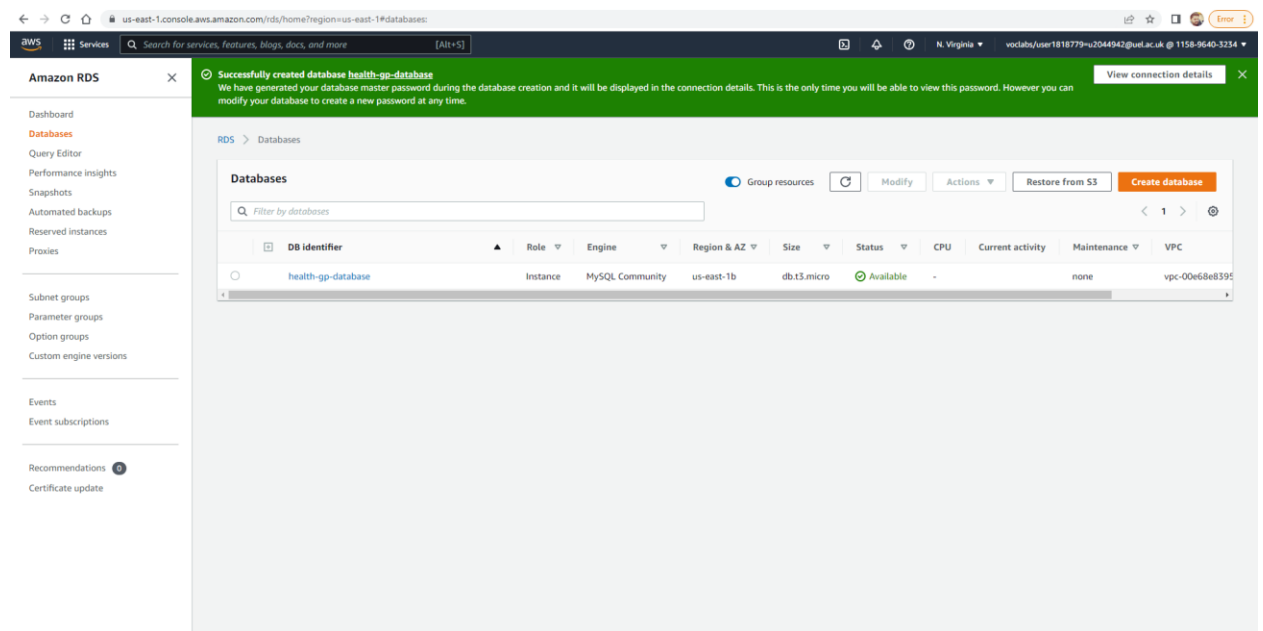### 3.Creating Elastic Beanstalk applications with the health GP app environment.

CLOUD ARCHITECTURE- HEALTH GP

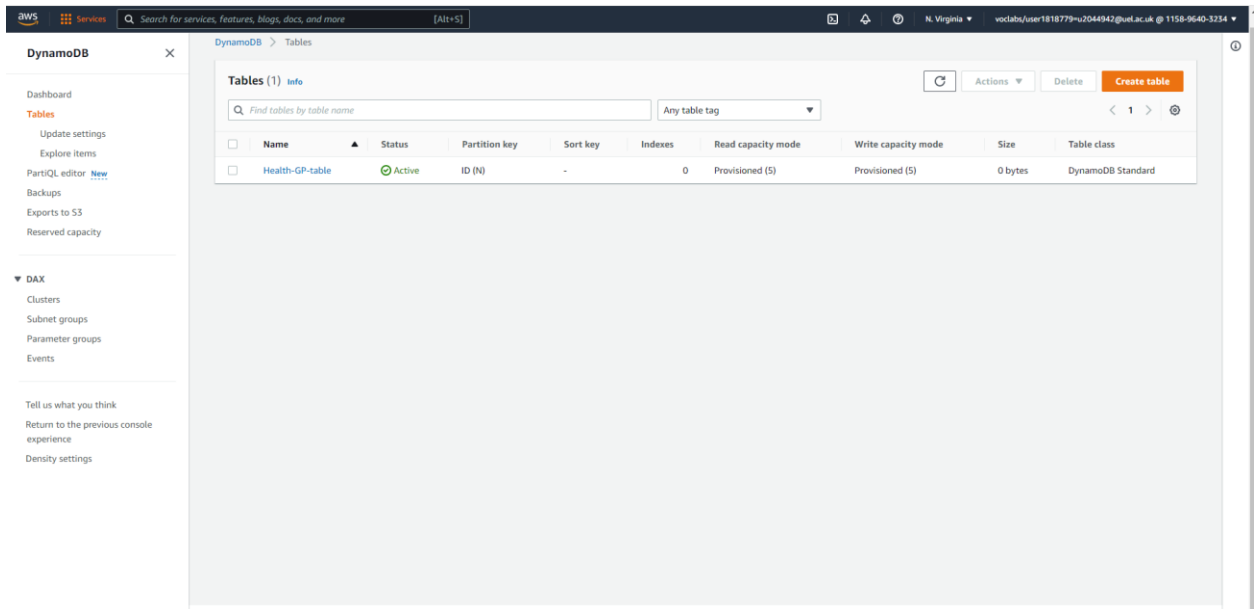4.Creating the S3 Bucket for storing the data in unstructured format.

5.Creating Relational Database Service (RDS) for storing private and
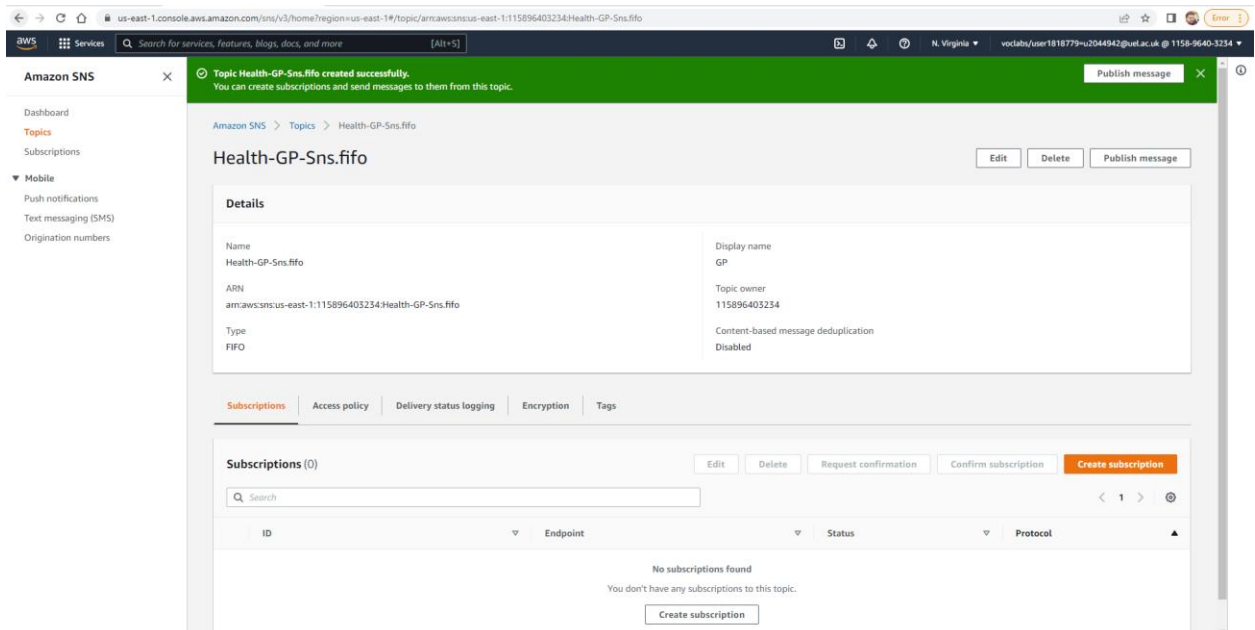
Confidential information.

6.Creating Dynamo DB for maintaining the data in the table format.

7.Creating Amazon Simple Notification Service (SNS)
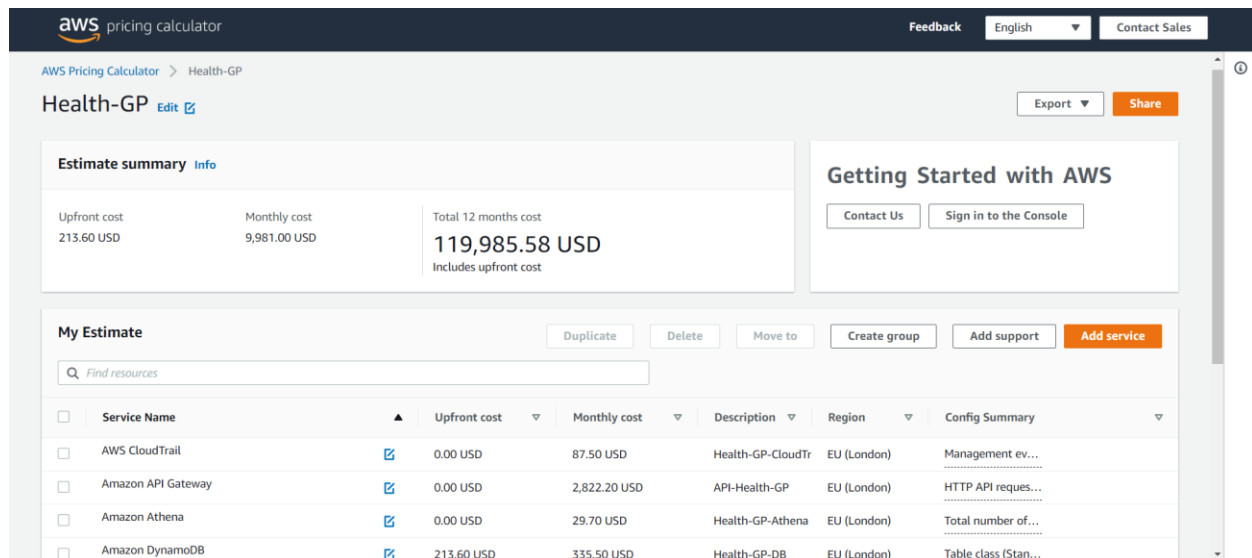
CLOUD ARCHITECTURE- HEALTH GP

8.1 ANALYSIS:

Considering the patient-doctor confidentiality, data security and reliability is of utmost importance. In such projects, it is important to understand the benefits of cloud computing to an organization, and how the technology can streamline operations in the health care environment. Before embarking on the process of deploying the solution, it is appropriate that the developer must review the functional and the non-functional requirements. Through such review, it is possible to come with a formidable systems architecture, so that when deploying the solution in the cloud, the developer exactly understands the features and platforms to use in deploying the solution.

8.2 COSTING:

We are creating estimation budget for our Health – GP system using AWS services

CLOUD ARCHITECTURE- HEALTH GP

9.CONCLUSION:

Through cloud computing migration, Health GP services are likely to realize that their current legacy application can be deployed with minimal operational expenditure because they only focus on renting the infrastructure that is billed on a per minute basis, instead of channeling expenditures towards the acquisition of expensive hardware infrastructure.

10.REFERENCES:

Nath, M. P., Sridharan, R., Bhargava, A., & Mohammed, T. (2019). Cloud computing: an overview, benefits, issues & research challenges. *idea*, *1*, 3.

Lee, T. D., Lee, B. M., & Noh, W. (2018). Hierarchical cloud computing architecture for context aware IoT services. *IEEE Transactions on Consumer Electronics*, *64*(2), 222-230.

Odun-Ayo, I., Ananya, M., Agono, F., & Goddy-Worlu, R. (2018, July). Cloud computing architecture: A critical analysis. In *2018 18th international conference on computational science and applications (ICCSA)* (pp. 1-7). IEEE.

Zulu, L. L., Ogudo, K. A., & Umenne, P. O. (2018, December). Emulating software defined network using Mininet, and Open Daylight controller hosted on Amazon Web Services cloud platform to demonstrate a realistic programmable network. In *2018 International Conference on Intelligent and Innovative Computing Applications (ICONIC)* (pp. 1-7). IEEE.

Ucuz, D. (2020, June). Comparison of the IoT platform vendors, Microsoft Azure, Amazon Web Services, and Google Cloud, from users' perspectives. In *2020 8th International Symposium on Digital Forensics and Security (ISDFS)* (pp. 1-4). IEEE.