Cloud Computing: Term Paper/Report

Topic Name: ONE HEALTH CARD USING CLOUD

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1. Introduction:

Have you ever thought how most of the Hospitals and health centers save all our details and past medical history for forever, which really helps you and them to fix appointments much faster and easier. And how our records move from one reception to another in no time. The Answer to this is **"cloud"**. Cloud gives us the ability to store infinite amounts of data which can be acced in seconds from any point of the word and makes hospital or health center's work a lot easier and that too in no time. So, we only have to register ourselves in the hospital or health center only for the first visit.

Wait, is it not possible to even reduce this process of everytime registering and making new records for every separate hospital and health center. Well yes, under the new health project of our Prime Minister Narendr Modi **"One health card"** where he aims to have a unique health card number which will be valid all over India and will be used as standard by all the hospitals and health centers.

Storing information of even 50% of 1.7billion population will use a hauge storage and server computation. But if dome successfully, it can benefit us in terms of Time, Storage Space, human resources and overall cost.

- **Time :** Approximately 20 mins are consumed every time a new patient arrives at a hospital in feeding their details and medical history, which can surely be utilized to reduce the time gap between the patient and doctor's appointment.
- **Storage :** Consider the average data size of each patient to be "x" and the patient is registered in "y" number of hospitals and health centers. Here the same data x is stored at y places, consuming extra memory resulting in creating more E-waste which is a serious issue in today's world.
- **Human Resource :** Every time we visit a hospital, the hospital has to appoint a staff to register us or update our information on their servers and maintain our information in the right order. Whereas this staff could have been used for serving patients better and making their experience more comfortable.

- **Cost :** Time, Storage and Human resource all come at their own price which ultimately hospitals and patients have to pay in some or another way. But this cost can really help lower the burden of bills on patients and may also benefit the hospitals and centers.

One Health Card scheme can be a very good solution to these problems and Cloud is surely the best tool to help achieve this milestone. Cloud gives us the ability to reduce our cost, save our time, manage our resources better and ultimately provide the best connectivity across.

2. Motivation:

After going through the Cloud properties, its advantages and its ease of use, I got to know that there are still many more improvements possible in the virtual world of data.

Healthcare, one of the most important and essential sectors to be looked after. It already uses much of the technology to perform high end and efficient tasks resulting in numerous successful treatments. But still there is much more healthcare can adapt to provide a better and quick service to patients. Cloud is one of them. Healthcare still spends an ample amount of time in feeding, updating and managing the records which are already stored at some different location. As our PM shows us a way to solve this problem i.e. One Health Card. Cloud shows us the way to accomplish this milestone.

With the abilities of cloud-like:

- **Scalability :** The capability that increases or diminishes IT resources as required to meet up the changing demand at times.
- **Good Uptime :** The average time span a procedure (appliance/server) is functioning.
- **HighAvailability :** The time proportion for which a system or service is accessible.
- **Durability :** The measurement of how healthy and resilient your data/information is.
- **Firewall :** A cloud firewall gives you a layer of security around cloud support by stopping malicious web traffic.
- **Disaster Recovery :** A cloud-based service that supports you in quickly recovering your institution's critical systems after a disaster and delivers you remote access to your systems in a protected virtual domain.

One Nation One Health Card seems to be an achievable task.

3. Related work:

In the real world there are many apps and websites available where one can easily find any doctor they want and even book an appointment with them. Apps and websites like Practo and Medindia give very good connectivity with Doctors from all over the india. Here one can search Doctors, their clinics and even get support like consultancy of which doctor we should consider and which we should not.

For maintaining Customer data also there are many platforms which provide service to customers to save their details and medical history on cloud and even use it in hospitals and health centers whenever required. Apps and websites like HealthVault, MTBC PHR and many more provide the service of storing medical details and history over the internet.

Even after having these apps all hospitals unitedly can not rely on them and still use their own data center even after the information is already existing. That is where this government scheme makes the difference and allows healthcare facilities to not manage any server for it and provide a 24/7 server access to patient details and help providing treatment sooner.

Limitations:

- Scalability : Surving a big chink of population without cloud seems unachivable without facing the loss of extra unused infrasturce keepts to be utilzed for scalability, which technically comes free with Cloud.
- The existing websites do not provide us the feature to automate the updation of on time documents, for Example if we are undergoing any treatment, we have to enter the details later by ourselves which may cause a delay or misinterpretation of information. Whereas if we provide a unique id and legalize hospitals to automatically update our data.
- These websites do not allow access to all the hospitals to use, access and update the user information, which can be done under this scheme and help the process go much smoother.

4. Proposed Cloud Architectural Solution:
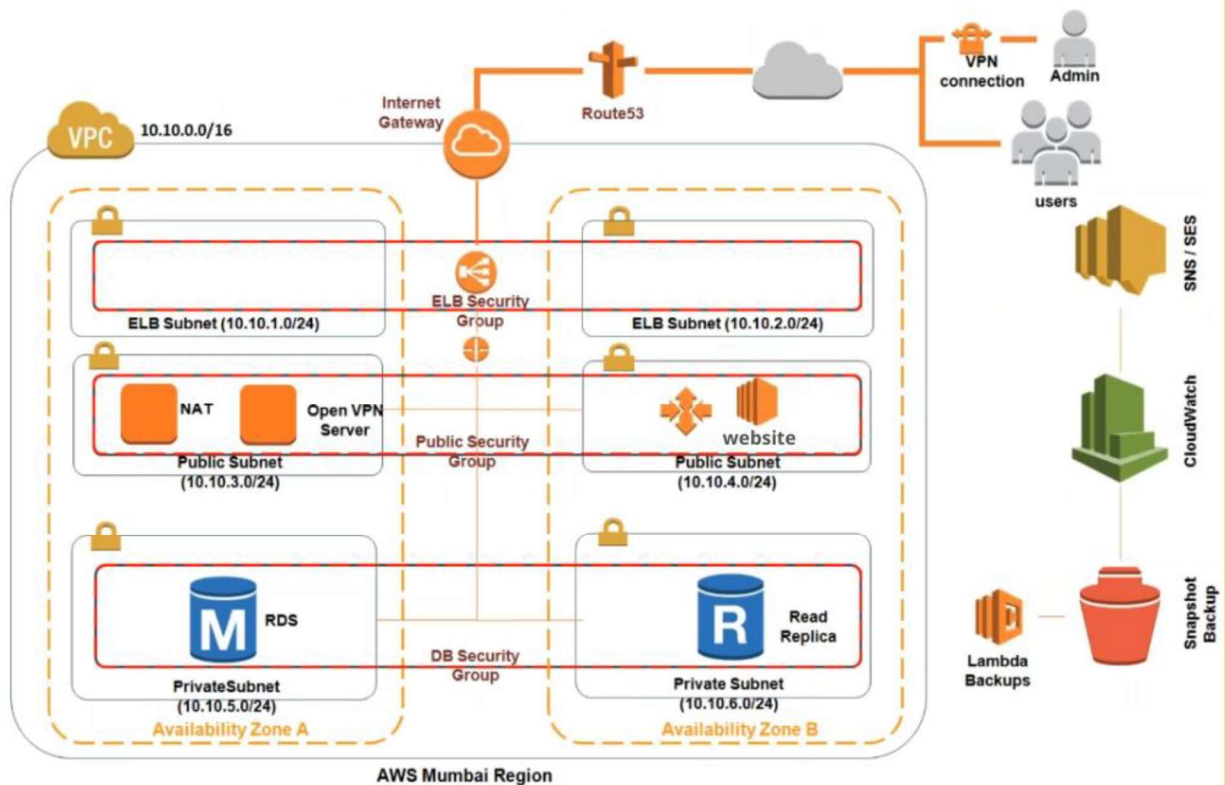
Functionality in terms of AWS:

- <u>Autoscaling</u>: As soon as load will increase on our website, new instances will be created automatically to handle the load and will get deleted when the load is less to reduce the wastage of resources.
- <u>IAM Roles</u>: It will help us to access our data in case our instances go down.
- <u>Lambda</u>: To take snapshots of EC2 instance to take a backup in real time environment
- <u>Cloud watch</u>: As if something goes off from or EC2 instances we can get notifications.
- <u>openVPN</u>: In order to access our data servers in secure way
- <u>Route53</u>: For mapping our domain to our website so that customers can access our website

For the AWS part of the project, first we will create the vpc and its components like public and private subnet, IGW, NAT gateway, etc. followed by creating the EC2 instances.

Then we create an RDS security group and RDS subnet group with a private subnet. After which we will launch an RDS instance in multi-AZ.

Then we have IAM roles and S3 buckets to keep out data bcs in case an instance goes down we can still get access to our data. Also we will use IAM rolls to copy our data from EC2 to S3 bucket or from S3 bucket to EC2. Then we will use the Route53 hosted zone to map with our domain and create AMI for EC2 instances. Next we will create ELB so that we can attach all backend EC2 to the ELB and create Launch configuration and AutoScaling to scale up depending upon the load on our website. Then we can enable ACM in ELB which is a part of security

5. Strength of Proposed Cloud based Architectural Solution:

Cloud computing can be chosen as a preferred partner at any stage of the project i.e. either in the beginning or even if the project is running. So it is very easy to utilize the cloud and make a gradual movement of projects in no time to save money and get all the good features of cloud offered by AWS. Some of the main strength of our proposed system are:

- **Cost- Effective:** primarily, it provides a way to pay as you use for the services. It can also be called a consumption based pricing model, because you really do not have to pay any upfront predefined amount for the computing resources or hardware. It's just like renting the hardware, you just use them and then give it back to the AWS and then you pay for the amount of time you have utilized it.
- **Cost- prediction:** In AWS, prices for individual resources and services are all predefined which gives us the ability to predict how much we have to spend in the given billing period and accordingly set our budget for the project.
- **Scalability:** You may have to increase or decrease the resources and services based on demand, which is not so easy when the infrastructure is on premises. If we want to keep your infrastructure scalable then one needs to procure a lot of infrastructure. But on AWS scalability is done on demand.

- **Elasticity:** Considering our project, in case of season change, patients' information may be needed to retrive in high amounts and may lead to spike in traffic overnight. Because the AWS is elastic in nature, it will automatically allocate more resources to handle the increased traffic and when the traffic begins to normalize the AWS will automatically deallocate the additional resources to minimise the cost. So when there will be a load of traffic, there will be a rise of CPU usage, memory usage, network utilization. Here AWS automatically bounce up new instances in your infrastruc in the cloud and in the same way when the situation gets back to normal, AWS removes the extra added instances and helps reduce the cost.
- **Reliable:** while running a project like this, we have to be confident that the data is always going to be there i.e. the availability is provided by the AWS. AWS provides data backups, disaster recovery and replication services to make sure your data is safe. In addition redundancy is often built into cloud services architecture, so if one component fails, a backup component takes its place. This is also called fault tolerance. It ensures that customers are not affected in case any disaster occurs.

6. Conclusion and Future direction for further Improvement:

In this fast growing India, the Healthcare sector has also grown much. Serving 1.7 billion of the population, healthcare involves a lot of tasks including keeping record of each treatment occurring in present. Now this data is separately stored with every individual hospital, doctor and other health centers leading to multiple clones of the same data. Instead our PM inspired scheme One Health Card can be used as standard at all the healthcare centers and reduce the Storage usage, human resources cost invested and time utilized.

To build such a high performing project there is a keen requirement of having good availability, cost effective scalability and minimum latency. For which the best possible solution is CLOUD. AWS is the most used and reliable platform to build, deploy and surve mega projects like this. Using AWS as our partners we can avail the benefits like Cost-effectiveness, scalability, elasticity, current running softwares and tool/ updated technology and resources, reliable environment, its global reach, and secured services.

To build a powerful, secured, scalable and least latency project we can use multiple AWS services mainly: Route53 for hosting domain and record sets; VPC for subnets, internet gateways route tables and security groups; SNS internally it will use SES; we will also

use ELB where we will use SSL certificate to secure our environment for which we will use ACM; EC2 instances with elastic IP and autoscaling; RDS for RDS master, read replica, snapshots and RDS subnets; S3 buckets and IAM access; Lambda snapshots; cloud watch to monitor events and alerts to SNS and lastly OpenVPN for admin access.

For future work with time there may become a chance for making more cost optimized solutions using AWS itself. After running and understanding the market, optimal instance type and storage types can be used such as if we observe that at time or season change there comes a sudden hike in the traffic, then by analyzing the graph we can make use of reserve instances and if there is a particular set of information which is not required to be accessed for long time can be stored in glaciers to reduce cost.

7. References :

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