

A Review on Leaders in Cloud Computing Service Providers and Cloud SQL a Case Study

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Abstract: Cloud Computing is a kind of Information and Communication Technology, which delivers valuable resources to the people as services such as Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). There are several leading IT solution providers offer these services to the customers. Though there are number of Cloud Service Providers available, in this paper we analyze and review the three legends of this field such as Amazon, Google and Microsoft.

Keywords: Amazon, Cloud Computing, Cloud SQL, Google, Microsoft Azure, public cloud, private cloud

INTRODUCTION

If we look at the history of the computing technology, we could understand that it evolves prominently over the period right from stand-alone computing to the latest Cloud Computing, which includes Distributed Computing, Client/Server Computing and Grid Computing. Each technology led the IT world in the respective period of time and now no wonder it is Cloud Computing.

Cloud Computing is a technology framework (collection of Hardware and software), where people can obtain many technology solutions as services on Demand and these services are offered with low cost (pay as you go). It provides Scalable environment with high frequency of availability, reliability and the flexibility that enables the customer to develop and deploy a different type of applications.

Nowadays business organizations and its requirements are dramatically increases to earn more revenues, market shares and margins. In order to achieve this, business organizations can go for Cloud Computing because it provides the solution for all of these problems. There are many cloud service providers are available in the market but choosing the right service provider itself is an important task for the organization. So the main objective of this study is to help the business organizations to understand the strength and weakness of the three major service providers which we have taken into account.

The study is primarily based on the two important parameters; the first one is the number of Services offered and the second is the pricing schemes implemented by the Cloud service provider, especially for data storage. The study also focuses how to work with Google Cloud SQL.

Types of cloud: Cloud can be classified in to two broad categories (Steva, 2010).

- **Public cloud:** third party owns a public cloud, where resources such as software, Infrastructure and Platform are made available. The customer can access any or all of these resources over the web and they have to pay only for the amount of service obtained by them. The Leading vendors of Public Cloud are Amazon, IBM, Sun, Google and Microsoft.
- **Private cloud:** A Private Cloud is owned by a private organization for the use of their people. The access of resources by public is restricted.

Features of cloud computing: Cloud Computing offers several benefits to the customers to promote their business and cut the costs. IBM, 2011

- Rapid access to the resources
- Pay only for what you use
- Security enabled environment
- Location Independence
- Device Independence
- Reliability
- On Demand Services

Applications of cloud computing: Cloud Computing can be used almost all the areas wherever computer is used. Here some of the practical areas are (Michael, 2009):

- Backup and Recovery
- Health Care
- Bioinformatics Protein Structure prediction
- Agriculture

Amazon: Amazon is one of the leading IT Solution providers in the IT world. It offers all the three major services with low cost.

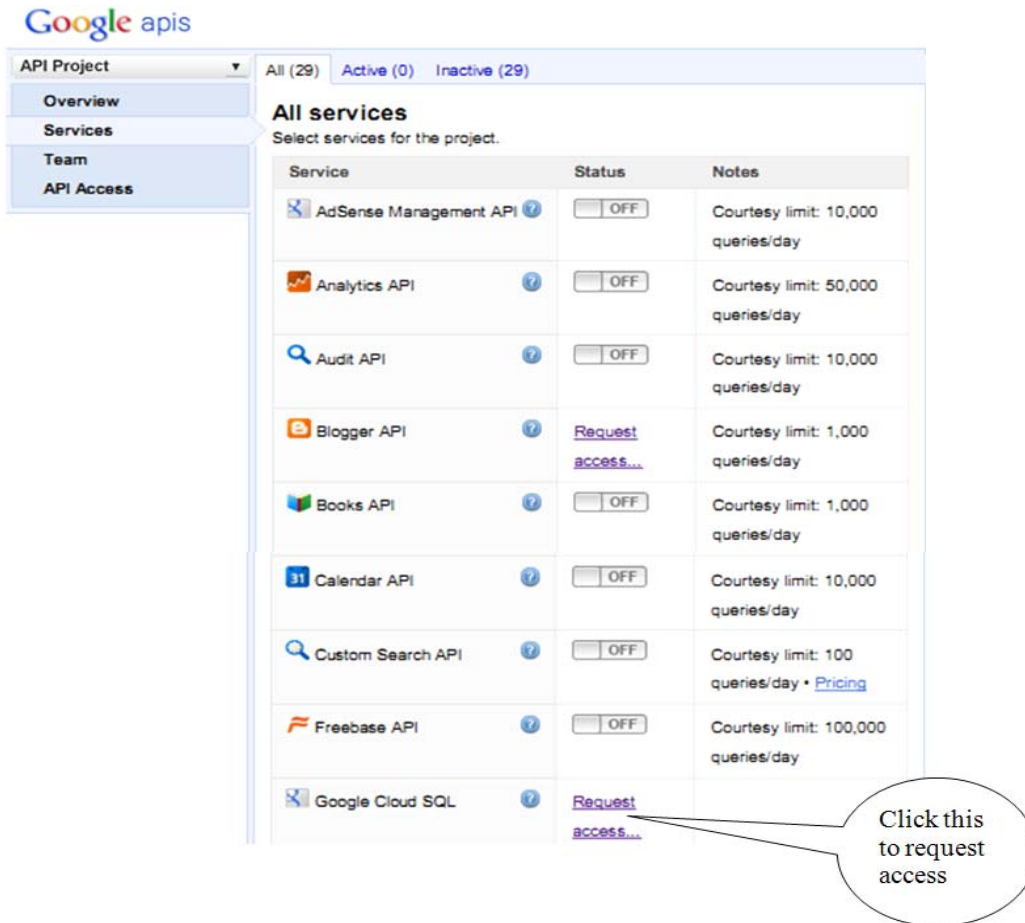


Fig. 1: Google APIs screen - snap shot

Amazon services: Amazon is continued to dominate the Cloud Computing field by introducing different products regularly to the market (Amazon web services, 2011). Some of the popular services are Amazon EC2, Amazon S3, Simple DB and Simple Queue Service (SQS) etc. Here we will see the two of them:

- **Amazon EC2:** is a flexible computing environment where the customer can dynamically increase or decrease the computing power on demand.
- **Amazon S3:** is a storage service, which is used by the customer to store their data. The data that are stored in Amazon are replicated and each copy is stored in different servers located in different places without additional cost. This has been done by Amazon to ensure the availability of the customer's data. Even if one of the servers fails and the other will do the job. The other major advantage of Amazon is it supports Database Management System and it implements various measures to ensure the confidentiality and the security of the customer's data.

Authorization and security:

Decommissioning process: Amazon uses a technique called Decommissioning process to ensure the authorized access to customer's data.

Customer account security: During account creation, it obtains all the important details of the customer and it is stored in the server. So these details are very useful in identifying the customer. It also includes the other security options: Identity and Access Management, Multifactor Authentication and Key rotation.

Google Apps: Google is one of the famous IT organizations, which offers cloud-computing services in the form of Google App Engine, Gmail, and Google Docs etc... Among these Google App engine is a technology framework for building, testing and deploying various applications.

Google Apps has three versions namely:

- Basic Google Apps

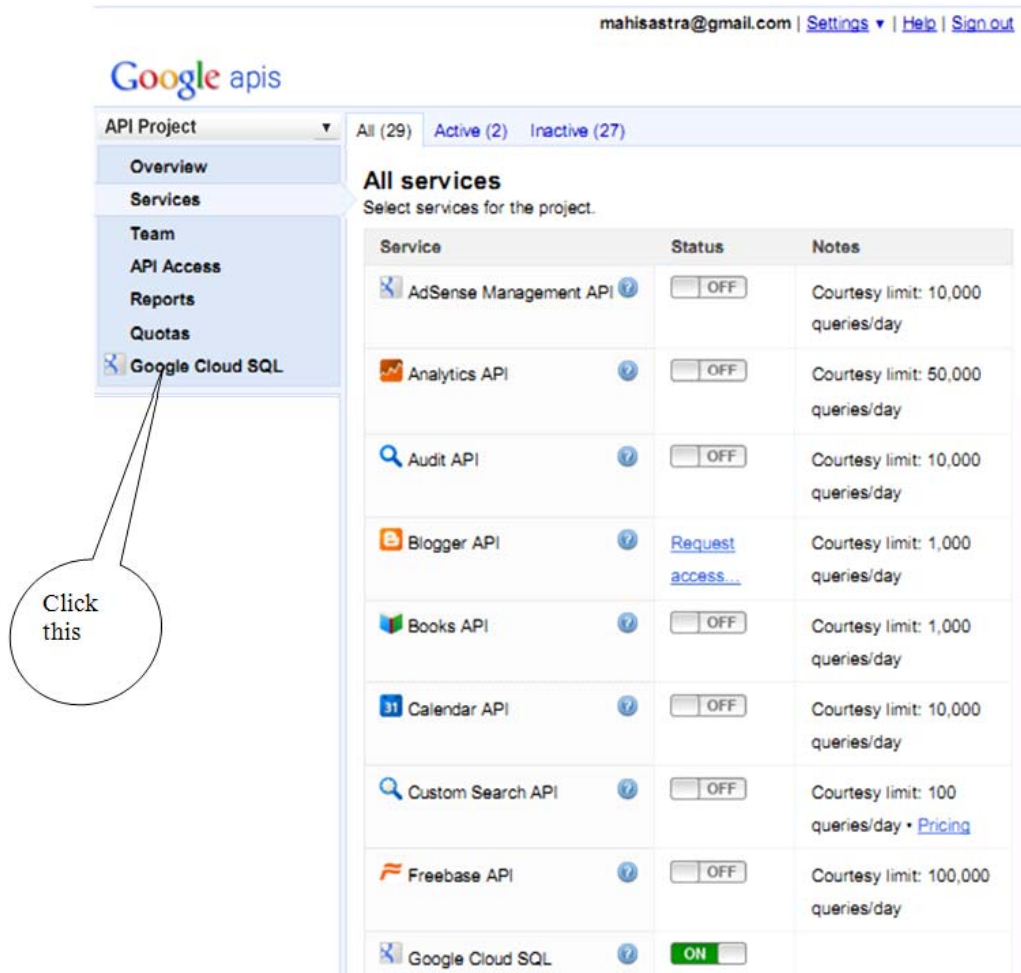


Fig. 2: Google APIs screen after the cloud SQL service is ON

- Google Apps for Business
- Google Apps for Education

Google App Engine is a highly scalable infrastructure to meet various requirements of individuals and business organizations. Also it has released API's like Google Maps and Google base API and it supports open source languages like python, java and frameworks like Slim3, Datanucleus and Django (Dion, 2008).

Google cloud SQL: Google is also providing support for relational database (MySQL, 2007). So we can deploy SQL applications in Cloud using Cloud SQL (Joe, 2011).

Working with cloud SQL: To work with Google Cloud SQL, you need a valid Google account. Once you create an account you can obtain Cloud SQL service. Go to Google APIs Console, it will list all the possible services; the Fig. 1 shows some of the services including Cloud SQL. Here all services by default in off mode and you can

turn it on by clicking the button but few services cannot be activated by clicking it, instead you can send request to access the specific service. Click the request access button against Google Cloud SQL and it will take you to the new window called Google Cloud SQL Limited Preview Signup, where you have to fill up your contact information and database usage details such as What is the size of your database, What is the maximum size of a single record, How many records are there in your database, Number of peak queries/transactions per second on the database, Number of average queries/transactions per day on the database, Do you plan to use SQL to replace or augment Datastore, What programming language do you use to build database applications, What are the problems you are trying to solve with Google Cloud SQL and What are some of the existing systems or database you are planning to replace or augment with Google Cloud SQL. Once you filled all these you press submit button and these details will be sent to Google service provider. After weeks of time you will be given permission to use the Cloud SQL service.

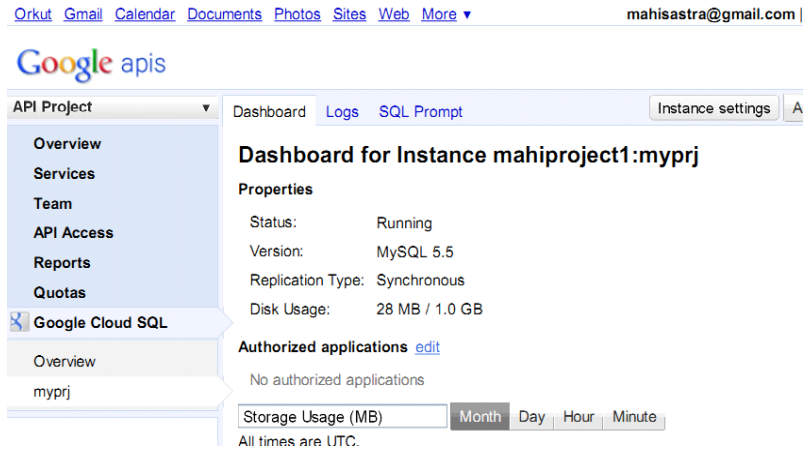


Fig. 3: Google APIs dashboard screen

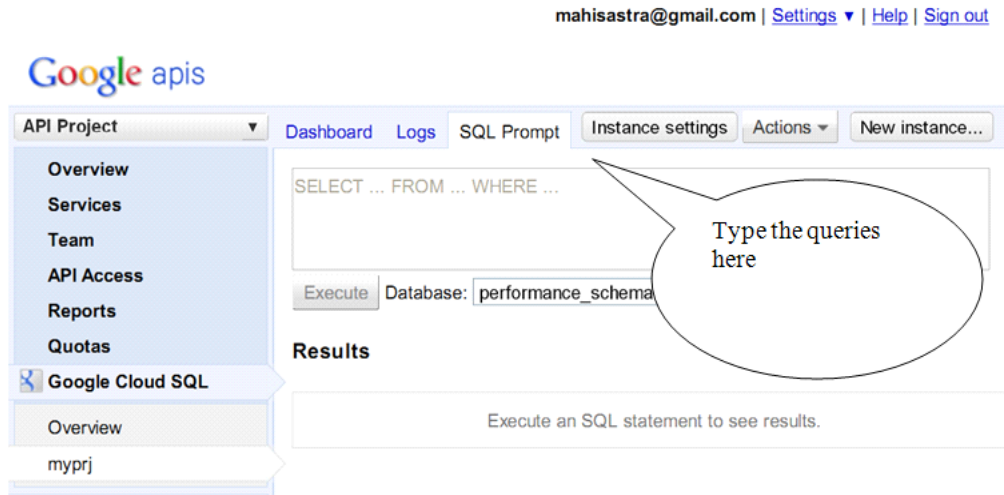


Fig. 4: Google APIs menu option

Figure 2 shows the Google API's Console after the activation of Cloud SQL Service

Now click Google Cloud SQL which is available under API Project, now you have to create a new instance (project) then click the instance, you will be in your Dashboard shown in Fig. 3

Figure 4 shows the Menu Options available in Google API's Console. Here you can find three menu options such as Dashboard, Logs and SQL Prompt. You just click SQL prompt, where you can type and execute SQL queries and verify the results.

Simple example: I wish to create a table called shop and the SQL query is (<http://dev.mysql.com/doc/refman/5.0/en/examples.html>)

```
CREATE TABLE shop (
  article INT(4) UNSIGNED ZEROFILL DEFAULT
```

```
'0000' NOT NULL, dealer CHAR(20) DEFAULT '' NOT NULL,
price DOUBLE(16, 2) DEFAULT '0.00' NOT NULL
PRIMARY KEY(article, dealer))
```

Google cloud SQL-snap shot: Figure 5 shows the SQL prompt where we can type and execute the SQL queries. Here a table called “Shop” has been created and stored in Cloud.

Figure 6 shows the SQL prompt, where insert query has been executed and 7 records were inserted in shop table.

Figure 7 shows the SQL prompt, where Select query has been executed and the records were retrieved from the shop table.

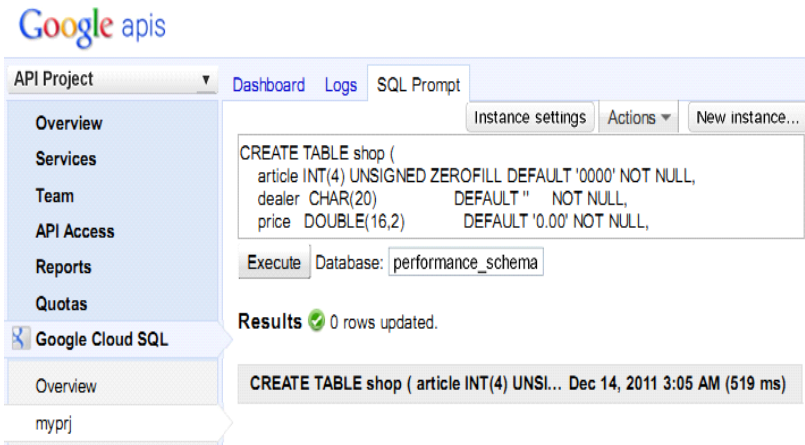


Fig. 5: Google APIs SQL prompt

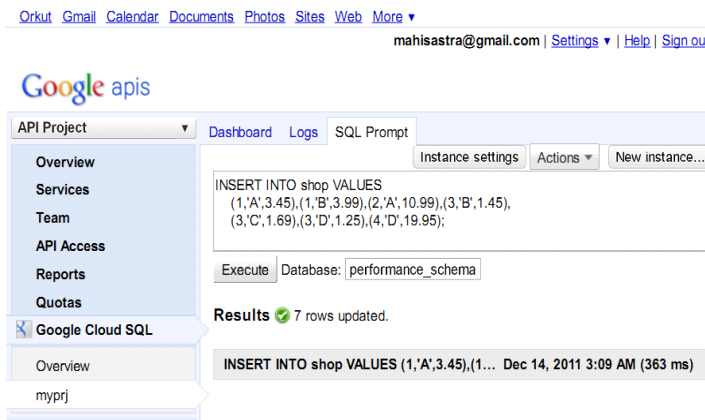


Fig. 6: Google APIs SQL prompt (insert query executed)

Microsoft azure: It is platform for building and deploying applications in the cloud. With Microsoft Azure we can run applications in the local machines and in the cloud (David, 2008).

The components of the azure:

- **Windows azure:** is an environment for running window-based applications and storing data in Data Centers
- **Net services:** are Distributed infrastructure services for cloud based applications and local applications
- **SQL services:** are the Cloud based data services on SQL Server.
- **Live services:** used to access data from Microsoft Live Applications

Storage services: Microsoft Azure offers three types of storage services (David, 2009):

- **Blobs:** to store large binary objects. Eg. Videos and images
- **Tables:** to store entity base data (Not Relational Table)
- **Queues:** to send and receive messages

Comparison of Amazon, Google and Microsoft Azure:

Amazon, Google and Azure are really offering the complete PaaS because they provide the real environment, which is normally required to build and deploy web-based applications. In the traditional software building process the initial investment will be very high to set up the infrastructure with the all required licensed software and hardware but in the cloud, they provide the licensed software, hardware and software maintenance everything. So it is very easy for customer to straight a way look in to their business.

Figure 8 shows the different services provided by each service providers. All of them are providing the

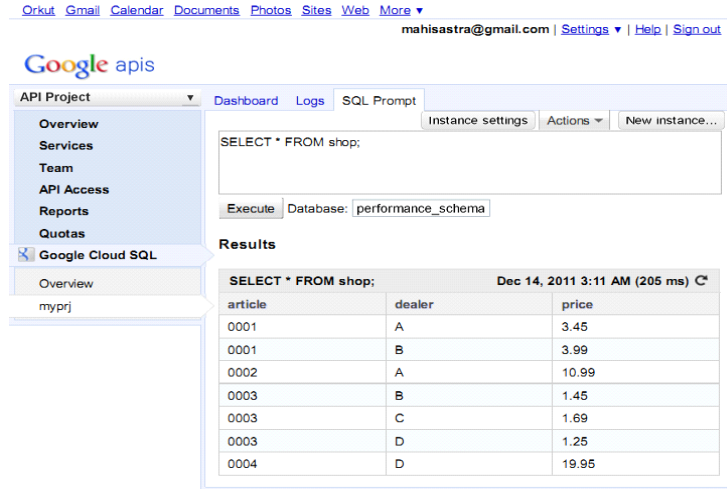


Fig. 7: Google APIs SQL prompt (select query executed)

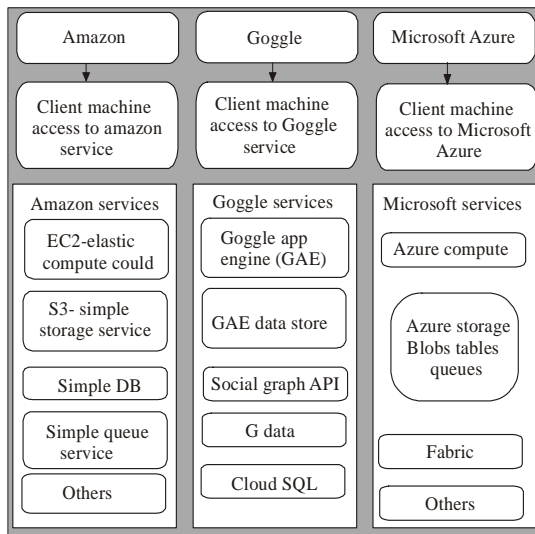


Fig. 8: Comparison of amazon, google and microsoft azure services

important service called storage service. But Amazon offers more number of services than the other two and it is suitable for both small and large organizations.

Pricing scheme for storage: Pricing is done based on three important attributes (Borko, 2010):

- Bandwidth
- Storage
- Compute

Many Cloud Service providers offer free quota up to certain amount of space for storing user data. The Table 1 shows the various pricing schemes of Amazon, Google and Microsoft Azure with respect to data storage.

Table 1: Pricing schemes of Amazon, Google and Microsoft azure

Resource	Unit	Amazon	Google	Microsoft
Stored data	GB / month	\$0.140	\$0.130	\$0.140
Request pricing	1000 requests (GET, PUT, GET)	\$0.010	\$0.010	\$0.010
	10,000 requests (GET, HEAD)	\$0.010	\$0.010	\$0.010
	Data transfer IN	GB / month	\$0.000	\$0.000
Data transfer OUT	GB/month	\$0.120	\$0.120	\$0.120
Compute	For 1 instance /1 h	\$0.030	\$0.080	\$0.040

It seems that the pricing scheme implemented by them is quite similar.

This pricing Scheme has been taken from their official website on 13th December 2011 and it is subject

to change (<http://aws.amazon.com/s3/pricing/>, <http://www.windowsazure.com/en-us/pricing/details/>, <http://code.google.com/apis/storage/docs/pricingandterms.html>).

Google App engine has grown to reach maturity level, Amazon has introduced many different instances and Microsoft has also done it (Danny, 2010).

There is a thought about Microsoft is targeting the big companies since its pricing scheme is high comparatively. So people will prefer either Google App engine or Amazon. The main problem with Google App Engine is once you started with Google App engine, it is something like locked in it. Amazon has introduced low power instance with Auto-Scaling service, which helps us to start or shutdown instances depends on the current requirement. This is free with CloudWatch. It is also possible to balance the load among the instances.

According to Jon Brodtkin, Microsoft Azure beats Amazon EC2 and Google App engine in speed test (Jon, 2012).

Pros and Cons: Though the motto of Cloud Service providers to offer better service, there might be some practical difficulties associated with each service providers. Here we discuss some of the pros and cons that are unique to each provider apart from the common things (Raghav, 2011)

Amazon:

Pros:

- Have got good experience in this field since 2002
- 1 year free tier period from the sign up date
- Support for RDBMS in the form of ORACLE and SQL Server
- Support for Linux Server Platforms.
- Easy to Migrate code to another
- Support for .NET and C#

Cons:

- Single point of failure with single micro instance
- Scaling is somewhat tough.

Google App engine:

Pros:

- Free tier Quota is offered
- Billed for actual CPU usage, not "Live" hours
- Scaling is easy
- Built-in authentication
- Support for relational database services as CLOUD SQL.

Cons:

- No Support for C#.NET
- Data Store errors
- Suffers availability problems

Microsoft Azure:

Pros:

- Azure provides 20 GB two way traffic for application
- It offers three types of storage : Blobs, Tables and Queues
- Support for RDBMS in the Cloud as SQL Azure

Cons:

- Price is high
- Very limited free tier period
- Only supports Microsoft family of products

Factors to be considered when choosing cloud service provider:

Cloud Computing provides several benefits for all companies ranging from small size to large size. However, there are many key factors should be considered before choosing the Cloud Service Provider (Fran, 2011):

- Viability of the Provider
- Security standards implemented by the Provider
- Transparency in Pricing and Billing
- Number of Integrated Services offered by the Provider

How we tested? We have created free user accounts in all the three cloud providers and did some sample applications. In Google App engine we have deployed some sample applications using Eclipse with Slim3 framework and also Eclipse with Data Nucleus framework.

CONCLUSION

We all should agree that the Cloud Computing plays a vital role in individual's and business organization's to help improve their business. This study reveals that all the three are the legends and the leaders in Cloud Computing market but Amazon is one step ahead of the other two in terms of the number of services offered to the customers and Microsoft Azure beats the other two in terms of speed. Before the introduction of Cloud SQL, Google App engine stores data in Data Store in the form of Entities (i.e.,) data are stored as Entities and attributes but now the new service Cloud SQL provides wonderful support for relational database MySQL (2007).

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