

# Cloud Computing with Amazon using Online Framework

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## Abstract

The purpose of this thesis was to show how to use Zend Framework to connect PHP applications to the cloud. To find out how easy it is for developers with basic knowledge of the Zend Framework, to incorporate cloud computing in their applications. In order to do this, a blog application was developed using the Zend Framework and the upload files functionality was connected to the cloud using the `Zend_Service_Amazon_S3` class. The development work was carried out on a personal computer. Notepad ++ was used as the editing software and Microsoft Word 2007 was used for documentation. Zend Framework 1.11.2 was the framework used for developing the blog application. Apache server was used for the web server. Amazon S3 web service was used to connect the application and for storage. The upload files functionality was not practically tested due to time constraints but an extensive guide on how to connect to the cloud, was put together in this thesis. Therefore any developer looking for instructions or reference on how to do this should be able to connect an application by following the steps described here.

**Keywords:** Cloud computing, Zend Framework, Amazon S3, XAMPP

## I. INTRODUCTION

Cloud computing is currently the topic of conversation for many people ranging from companies, developers and users with a little programming knowledge. Due to cloud computing, companies no longer have to spend a fortune in hardware and software. Developers can use development tools on the Internet without downloading and users can use applications on the Internet from anywhere in the world. This is a wave that has and will continue fascinating many. As cloud computing continues to evolve, new software is being developed that make it easier to connect to the cloud. The purpose of this purpose is to show how to connect an application to the cloud using the Amazon S3 service. This paper will mainly deal with developing a blog application using the Zend Framework. The functionality of upload files will then be connected to the cloud.

This paper is aimed at developers with a basic knowledge of PHP programming on the Zend Framework and will give an insight into the workings of a cloud computing enabled application. The reason I chose this topic was due to the fact that am relatively new to the Zend Framework, which I find quite interesting. When I heard about cloud computing using Zend Framework and I thought it would be a great paper that will help me gain a better understanding of the framework.

The scope of this paper is limited to a description of setting up the environment required to develop the application and the guide to the actual connection of the application to the cloud. However it does not include the complete code of the application, just the snippets of the upload files functionality.

## II. CLOUD COMPUTING

Cloud computing has had many definitions over the years but the most common understanding is that it is Internet computing whereby shared servers provide resources, software and data to computers and other devices on demand. The cloud itself is a set of hardware, networks, storage, services and interfaces that enable the delivery of computing as a service. Cloud services include the delivery of software, infrastructure and storage over the Internet based on user demand.

The underlying concept of cloud computing dates back to the 1960s where an idea of an ‘intergalactic computer network’ was introduced by J.C.R Licklider, who was responsible for enabling the development of ARPANET (Advanced Research Papers Agency Network) in 1969. Since then, cloud computing has developed along a number of lines.

Amazon played a key role in the development of cloud computing by initiating a new product development effort to provide cloud computing to external customers. They launched Amazon Web Services (AWS) on a utility computing basis in July 2002 which set the stage for the launch of Simple Storage Service (S3). In March 2006, Amazon launched the S3 which defined the model of ‘Pay-per-use’, which is now the standard for cloud pricing. Since then, other companies have joined in the provision of cloud services. The major ones include Amazon, Google, Microsoft, Salesforce, Skytap and Rackspace Cloud. The world of cloud computing has different parties involved:

- The end user who does not really have to know anything about the underlying technology.
- The business management who need to take responsibility for overall governance of data or services living in a cloud.
- The cloud service provider is responsible for IT assets and maintenance.

In mainframe computing, users shared powerful mainframes using dummy terminals. Stand-alone PCs became powerful enough to meet the needs of the users thus leading to PC computing. PCs, laptops and servers were connected through local networks to share resources and increase performance hereby creating network computing. Internet computing was achieved by the connection of local networks to other local networks forming a global network such as the Internet to utilize remote applications and resources. Grid computing provided shared computing power and storage through a distributed computing system. Cloud computing hence provides shared resources on the Internet in a simple and scalable way.

Mainframe computing and cloud computing might look similar but in reality have several differences. Mainframe computing offers finite computing power while cloud computing offers infinite power and capacity. In mainframe computing, dummy terminals acted as the user interface devices while in cloud computing, powerful PCs provide local computing power and support. There are basic features of the cloud:

- Elasticity and scalability means that the service needs to be available all the time and to be designed to scale upward for high periods of demand and downward for lighter ones. The application should be able to scale when additional users are added and when the application requirements change.
- Self-service provisioning should enable customers to easily get cloud services without going through a lengthy process.
- Application programming interfaces (APIs) need to be standardized for cloud services. These interfaces provide the instructions on how two applications or data sources can communicate with each other. A standardized interface lets the customer link a cloud service with ease instead of resorting to custom programming.
- Billing and metering of services should be a built-in service that bills customers.
- Performance monitoring and measuring is a feature with service management that monitors and optimizes the service thus maintaining the required service level for that organization.
- Security is a critical characteristic in a cloud. Turning over critical data or application infrastructure to a cloud service provider requires making sure that the information cannot be compromised.

Cloud application services, also known as ‘Software as a Service’ deliver services over the Internet, allowing users to remotely access applications from the cloud. They also eliminate the need to install and run the applications from the users’ own computers. A good example of application services is Yahoo mail or Gmail whereby all the users require is Internet to access their mail, regardless of the computer they are using.

Cloud platform services, also known as ‘Platform as a Service’ provide an integrated set of software that provides everything a developer needs to build an application for both software development and runtime. It facilitates the deployment of applications without the cost and hassle of buying and maintaining the hardware and software layers. Force.com and Google App Engine are good examples of platform services.

‘Infrastructure as a Service’, is the delivery of computing resources as a service. These resources include virtualized computers with guaranteed processing power and reserved bandwidth for storage and Internet access. Virtualization separates computing functions and technology implementations from the physical hardware. The ‘data Storage as a Service’ provides storage that the user requires including bandwidth requirements for the storage.

- Public cloud, whereby the computing resources are dynamically provisioned over the Internet via web applications or web services from an off-site third party provider. Here applications from different customers are likely to be mixed together in the cloud’s servers, storage system and networks.
- Private cloud, also known as internal cloud refers to cloud computing on private networks. These private clouds are built for a specific client thus providing full control over data, security and quality of service. A private cloud can be built and managed by a company’s own IT organization or by a cloud provider.
- Hybrid cloud, combines multiple public and private cloud models. They introduce the complexity of determining how to distribute applications across both public and private clouds.

#### **A. Processes Involved in Cloud Computing**

When a user accesses content in the cloud by making web service requests, the cloud goes through a couple of steps to service the request:

- Accepts the request
- Confirms that user has permission rights to make the request
- Validates the request against account limits
- Looks for suitable resources
- Attaches the resources to the user’s account
- Initializes the resources
- Returns identifiers for the resources to satisfy the request

Once these steps are completed, the user application then has exclusive access to the resources for as long as needed. After the user is done and the application does not need the resources, the application is responsible for returning them to the cloud. Here they are prepared for reuse by being reformatted, erased or rebooted and then marked as free.

### III. WEB SERVICES

Amazon web services (AWS) are a collection of web services that together form a cloud computing platform. Though these services are designed to work independently, they also work well together by sharing a common naming convention and authentication system. The web services are offered over the Internet by Amazon.com which was founded in 1994 and launched in 1995.

While trying to achieve the scale needed to create a profitable online business, the Amazon Company made investments in the world-scale Internet infrastructure that ensured reliability, efficiency, affordability and scalability. The company realized that developers everywhere could benefit from services that supported Amazon's web site. Thus in early 2006, Amazon launched the Simple Storage Service (S3). They continued on to provide a broad range of infrastructure, payment, workforce, merchant and web analysis services.

Every function in AWS can be accessed by making a web service call. Starting a server, creating a load balancer, allocating an IP address or attaching storage volume are all accomplished by making web service calls to AWS. These calls use either SOAP (Simple Object Access Protocol) or REST (Representational State Transfer) protocols. The command line tools and visual tools communicate with AWS using the open published APIs. This enables the user to duplicate any tools in their applications. The strict layering of AWS gives all developers an equal footing.

### IV. ZEND FRAMEWORK

A web framework is a software framework or foundation specifically designed to help developers build web applications. These frameworks usually provide core functionality common to most web applications, thus alleviating the overhead associated with the activities performed in web development. Most of these frameworks provide libraries for database access, templating frameworks, session management and code reuse. The Zend Framework (ZF) is a good example of a web framework that will be discussed here since it was used in this paper. Around fifteen years ago, PHP language was considered the most powerful and popular scripting language due to its ease of use. Another scripting language, Ruby, had been in existence for a while but not as many people were using it because it was not as fast, easy to learn or as convenient as PHP.

However the landscape changed when frameworks and toolkits specifically designed for easily building web-based applications were developed, led by the popular Ruby on Rails framework. These papers enabled users to create websites with virtually no effort. This inspired the development of the Zend Framework in 2005 by Zend Technologies.

The Model contains domain-specific instructions. It manages the behavior and data of the application domain, responds to a request about its state from the view and responds to instructions to change state from the controller. The View is the user interface of the controller. Multiple views can exist for a single model for different purposes. It would usually contain HTML, CSS, JavaScript and images. The Controller receives inputs from the user and instructs the model and viewport to perform actions based on that input. In ZF, each user event is represented by a request which is handed to an action that knows how to deal with it.

#### A. Developing the Blog Application

The blog application to be developed should enable the user to perform the basic functions of a blog, which are the following:

- Create a new blog
- Upload files (pictures, music, links and videos)
- Add a post to a blog
- Edit a post
- View a post
- Comment on a post
- Log in to account
- Log out of account

This blog application can take advantage of three AWS web services. The whole blog application can be uploaded to the Amazon EC2. The database can make use of the Amazon SimpleDB while the upload function will be used in Amazon S3. This paper therefore concentrated on storing the information uploaded by the users in the cloud.

The upload files feature will allow the user to include pictures, videos or links to go with the theme of the blog. This will not only make the blog interesting to read but also give the users a chance to personalize their blogs.

### V. DISCUSSION

Due to time limits, I was not able to complete the application to be a fully functional blog and test the functionality of the Zend Framework to connect to the cloud. However, with extensive research, I was able to compile a theoretical approach that should be able to work with a few errors.

The aim of this paper was to find out if a developer with a basic knowledge of the Zend Framework could easily connect an application to the cloud. This was partially achieved since a blog application was developed, though the upload functionality, which was to be connected to the cloud, was not practically implemented.

The purpose was to connect the upload function to Amazon S3 so that the end-user could be able to upload pictures or links relevant to the blog being posted. The connection to the cloud was made by the Zend\_Service\_Amazon\_S3 class, which made it possible to create buckets and put objects into the buckets. This paper required opening an Amazon S3 account, which was very easy and direct.

From the current blog application developed, an end-user will be able to create a new blog, login and logout, view and add posts. The comment and upload files functionalities are still in development. This can be attributed to local server problems and file configuration issues.

There is inexhaustible research material on this subject of connecting PHP applications to the cloud. Trying to practically implement it has led me to strongly conclude that it is possible for beginner developers to be able to connect their applications to the cloud. This provides endless possibilities for them in terms of hosting, speed and reliability in their web applications for reasonable prices.

## VI. CONCLUSION

This paper was aimed at finding out if a developer with a basic PHP knowledge could take advantage of the cloud services by connecting an application to the cloud using the Zend Framework and Amazon S3 services. The focus was on the upload files feature that was connected to a bucket in the Amazon S3 service. The paper showed that, while setting and opening an S3 account is fairly simple and direct, configuring the Zend Framework is quite brain-racking for a beginner. An installer package will be a good improvement, so the developer does not have to worry about file locations. The Zend Framework also lacks clear concise documentation and therefore it takes time to learn and understand it.

The result of the paper was a partially functional blog. The create a new blog, add post and view post functionalities were complete and in working order. Log in and log out functionalities were complete but had some errors. The upload files functionality, which was the main focus of this paper, was not complete due to time constraints. Though the paper did not complete a fully functional blog application, I was able to conclude that with a basic knowledge of PHP, a developer can take full advantage of the cloud services being offered. With limited resources, a developer can design and develop a web application that offers speed, scalability, security and is reliable.

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