A Survey of Amazon Web Services for LAMP Stack

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Abstract

Amazon Web Services (AWS) is an industry forerunner and arguably the leader in cloud computing, but not without legitimate competition from other major cloud providers. This paper will survey the potential benefits of AWS cloud computing for a fictional case scenario of a local college seeking to provide online testing through the deployment of AWS LAMP stack. The findings of this paper will be abstracted and used in a team project that will compare the findings of another paper evaluating the potential benefits of AWS' competitor, Google Cloud Platform (GCP), on equivalent products.

Keywords: Amazon Web Services, AWS, LAMP stack, Elastic Beanstalk

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This paper is one part of a team project to compare AWS (Amazon Web Services) and GCP (Google Cloud Platform) in a case scenario for a fictional college to select the best cloud provider for online testing. The basic requirements are for a scalable and reliable web application to facilitate online testing and to store the test question banks and test results for future analysis.

Case Background

Thus far, Marietta Institute of Technology (MIT) has conducted exams offline to the student body of 5,000, but the school has decided to offer all exams online to improve overall efficiency. Requirements include web services, database and storage, networking, security, backup and recovery. Estimated number of simultaneous users range from a minimum of 10 students to a maximum of 5,000. For the purposes of this case survey of AWS, geographical location of MIT cloud servers will be the United States southeastern region.

Scope and Limitations

AWS offers one of the most, if not the most, extensive selection of cloud computing products and services. The scope of this paper will be limited to a LAMP (Linux, Apache, MySQL, PHP) stack as it pertains to the business needs of the case scenario, and will not be a comprehensive review of all AWS products and services. The LAMP stack in consideration will pertain to the numerical range of expected users, available locations, and expected level of reliability. AWS cloud computing pricing varies by usage, so pricing comparisons are based on best-guess estimates from the information posted on AWS website, starting from the 12-month free trial; actual prices will vary.

Method of Approach

The method employed for this research is a direct search from the AWS website, supplemented by online articles on comparisons for reference. An AWS account was created to initiate the 12-month free trial membership.

Findings

AWS

Cloud computing services can be broadly categorized into Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). AWS provides all three types of services. Of the numerous AWS offerings, the most commonly used AWS services are: Amazon EC2, Amazon Lightsail, Amazon S3, AWS Elastic Beanstalk, Amazon Route 53, Amazon RDS, Elastic Load Balancing and Auto Scaling. Table 1 lists these services with a brief description for each. For the MIT case, AWS Elastic Beanstalk is the most optimum way to configure and deploy a LAMP stack to host a web application for the online testing, along with Amazon RDS (Relational Database Service). LAMP stack refers to Linux, Apache, MySQL, and PHP, which is widely favored as the preferred combination for web server configuration.

AWS LAMP stack

The AWS LAMP stack can be easily configured, deployed and managed via the AWS Elastic Beanstalk (EB). Elastic Beanstalk is an "easy-to-use service for deploying and scaling web applications and services" that is provided to customers at no additional cost (AWS Elastic Beanstalk, n.d.). According to AWS user guide on EB, once an account has been created, a customer just uploads the code to EB and EB automatically manages details of deployment, capacity provisioning, load balancing, auto-scaling and even application health monitoring (AWS Elastic Beanstalk Deployment Task, n.d.). Through EB, customers can create one or

multiple instances (AWS defines instances as “virtual computing environments”), select the location of the server, and customize many features/functions.

Availability, Scalability

AWS offers data centers in multiple geographic regions and availability zones. At present, AWS has 16 geographic regions located over 11 countries around the globe and operates availability zones in over 42 countries. Table 2 lists regions and zones. Regions are completely isolated for maximum fault tolerance in case of natural disasters. Availability zones are set up with power grids and flood plains in mind, to avoid risk of service outages. Customers may select one or multiple regions to host their instances, depending on business needs.

A perk to having the option of multiple zones, AWS offers auto scaling and auto load balancing. If a business suddenly or temporarily exceeds expected range of use, AWS will automatically scale by creating more EC2 instances and/or balance the load across instances. Auto scaling can be achieved with AMI (Amazon Machine Image). AMI is a template that contains configurations of your software such as the operating system, the application server, and the applications (Instances and AMIs, n.d.). From an AMI, instances, which are copies of the AMI running as a virtual server in the cloud, can be launched (Instances and AMIs, n.d.).

If the work load is heavier on one of the instances, then AWS automatically distributes incoming app traffic to another instance with the AWS Elastic Load Balancing (ELB), which increases the fault tolerance and availability of applications (What Is Elastic Load Balancing, n.d.). AWS gives customers the option to choose Application Load Balancers, Network Load Balancers, and Classic Load Balancers. Table 3 lists details of the ELB products. Auto scaling and load balancing are quite arguably the most attractive features of cloud technology.

Basic networking is inclusive when a LAMP stack is created in AWS. For additional business needs like email or inter-office communications, AWS offers a variety of products and services.

Security

Security of the cloud (i.e. the compute, storage, database, networking infrastructure and physical data centers) is handled by AWS, and security of instances in the cloud (i.e. "software, data and access that sits on top of the infrastructure layer") are managed by the customer (Madhavan, 2017). To help customers manage the security of instances, AWS offers services like Multi-Factor Authentication (MFA), instance tag security group (control who controls your instance), and isolated regions with elastic IP address option to mask one region failure while rerouting. "AWS provides security-specific tools and features across network security, configuration management, access control, and data encryption" (Overview of Amazon Web Services, 2017), built in at no additional cost when a LAMP stack web app is launched. Of notable mention is the elastic IP address provision, which may decrease potential security risks of malicious IP address tracking to map and locate instances, by allowing customers to create their own IP address sets and/or by using different IP addresses in rerouting.

Pricing

AWS is pay per use and pricing can vary as much as the types of products and services offered. According to the monthly billing estimate on AWS, a basic LAMP stack recommended in the LAMP stack launch tutorials "will typically cost $40 per month or more if you are outside the AWS Free Tier limits" and a "LAMP stack that is not highly available would cost less than $1 per month if you qualify for the AWS Free Tier and are within its limit" (Launch a LAMP Stack Web App, n.d.). Instance pricing may be on-demand instances for unpredictable spikes in

workloads or Reserved Instances for more steady workloads, where AWS offers up to 75% discounts on Reserved Instances (Amazon EC2 Reserved Instances, n.d.).

Customer Support

All AWS customers receive the basic support, which gives 24/7 access to email a technical support request or to reference the AWS site tutorials, documents, white papers, forums, and FAQs. For customers with more technical assistance, AWS offers multiple levels of customer services. Table 4 lists the customer support plans and their respective pricing.

With the level of complexity in products and services available at AWS, significant amount of training is warranted for organizations that have extensive use of cloud computing. In addition to the free tutorials and documentations on the website, AWS offers training courses and even certification for professionals who need proficiency and need to demonstrate that proficiency in official capacity. The AWS certification can be used as a guide in the hiring process of organizations heavily invested in cloud computing. In that sense, the AWS certification can be viewed as an indirect extension of their effort to facilitate a level of customer support to their clients.

Value

To discuss the value of cloud computing over traditional solutions, it would be logical to consider price and utility. After all, the reason an organization would choose to utilize the cloud depends on how affordable the price is and how much more utility is offered. With multiple, respectable cloud computing providers available today, the discussion of the overall value of using AWS would need to involve not just price and utility, but the level of need for customization and preference with options like the AWS Marketplace, for global availability, and even the ease of use.

Customization

Due to the extensive offering of cloud computing products and services, AWS users can achieve a high level of customization to fit distinct individual cloud computing needs. With so many selections for customizations, though, the complexity of use increases, and some may argue that less is more with the majority of cloud computing users. So, AWS provides the Marketplace, where new customers can easily purchase a product that has been made by previous customers, just as a mobile app could be purchased from the app store. This option attempts to present a solution to the issue of complexity from too many selections. Whether or not an extensive level of customization is desirable would depend on the business requirements, and in the case for MIT, high level of customization is not necessary. For a case like MIT, the AWS LAMP stack via EB is a welcomed solution to the customization dilemma.

Global Availability

As with customization, the type of business and the cloud computing needs determine whether global availability is a necessity or an unnecessary luxury. AWS does offer services in 16 zones over 11 countries, but for the MIT case, the additional availability was not deemed a necessity. However, for e-commerce businesses based in multiple international regions, this would certainly be a value of AWS over competitors with fewer regions/zones of availability. The option of multiple availability zones is certainly a value for future growth and scalability.

Cost

While cloud computing providers generally offer value through the pay per use pricing strategy, with other providers like GCP also offering competitive pay per use pricing, pay per use pricing is not a value unique to AWS. The 12-month free trial is also not unique to AWS, as other providers like GCP also have comparable free trial and credits. The AWS simple monthly calculator is a handy cost estimator tool for customers who have predetermined usage details of

their service. The caveat is that usage details, such as the storage and compute capacity, must be known or predicted relatively accurately to arrive at a fair estimate of the cost, for comparison with another cloud provider.

Ease of Use

With so many competitors offering similarly attractive cloud computing options, finding value in AWS requires consideration of peripheral factors such as ease of use. Overall rating of experience and ease of use with AWS depends on the customer's prior knowledge and exposure to cloud computing and tech savvy levels. The sheer number of selections and options can be daunting to first time users, and AWS does provide a library of video tutorials to assist in overcoming the shellshock. AWS also adds convenience by providing a form of service like the Elastic Beanstalk, which allows a customer (i.e. a developer) to deploy and manage cloud applications without needing to expend resources for managing and configuring servers, databases, load balancers, firewalls, and networks. However, there is no direct voice contact with technical support. Instead, there is an entire section dedicated to FAQs and training, and if the answer cannot be located, the customer submits an email inquiry. For customers without substantial background in cloud computing and technology, the enormity of AWS, the complex website organization, along with lack of direct technical help hotline would not lend itself to be described as easy to use.

Recommendations

Based on the findings of this survey, AWS is recommended for purposes of availability and scalability on a global scale, when multiple customizations are required, and for intermediate tech-savvy user (developer) or an enterprise level business that can hire an AWS certified person to manage cloud computing.

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Tables

Table 1.

Commonly Used Services

AWS Service	What it does for your website
Amazon Lightsail	AWS' easiest way to launch and manage a virtual private server. It includes everything you need to jumpstart your project: a virtual machine, SSD-based storage, data transfer, DNS management, and a static IP.
Amazon EC2	Provides the virtual application servers, known as *instances*, to host website or web application.
Amazon S3	Provides secure, durable, and highly-scalable cloud storage for the *objects* that make up your website. Examples of objects you can store include HTML pages, CSS files, images, videos, and JavaScript.
AWS Elastic Beanstalk	Handles the details of your hosting environment, including provisioning AWS resources such as EC2 application servers, and configuring load balancing, scaling, and monitoring.
Amazon Route 53	A highly available and scalable cloud Domain Name System (DNS) web service.
Amazon RDS	Provides managed relational databases environments, known as *instances*, in the AWS cloud. Amazon RDS provides you six familiar database engines to choose from, including Amazon Aurora, Oracle, Microsoft SQL Server, PostgreSQL, MySQL and MariaDB
Elastic Load Balancing	Distributes requests to the EC2 instances running your application to achieve greater levels of fault tolerance.
Auto Scaling	Ensures that your application is optimized for availability. You can set a minimum number of available application servers and can add or remove application servers as demand on your website changes.

Note. Reprinted from Learn to Build on AWS - Websites. (n.d.). Retrieved April 4, 2018, from https://aws.amazon.com/getting-started/use-cases/websites/

Table 2.

AWS Available Regions

Code	Name
us-east-1	US East (N. Virginia)
us-east-2	US East (Ohio)
us-west-1	US West (N. California)
us-west-2	US West (Oregon)
ca-central-1	Canada (Central)
eu-central-1	EU (Frankfurt)
eu-west-1	EU (Ireland)
eu-west-2	EU (London)
eu-west-3	EU (Paris)
ap-northeast-1	Asia Pacific (Tokyo)
ap-northeast-2	Asia Pacific (Seoul)
ap-northeast-3	Asia Pacific (Osaka-Local)
ap-southeast-1	Asia Pacific (Singapore)
ap-southeast-2	Asia Pacific (Sydney)
ap-south-1	Asia Pacific (Mumbai)
sa-east-1	South America (São Paulo)

Note. Reprinted from Regions and Availability Zones. (n.d.). Retrieved April 18, 2018, from https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-regions-availability-zones.html

Table 3.

Comparison of Elastic Load Balancing Products

Feature	**Application Load Balancer**	**Network Load Balancer**	**Classic Load Balancer**
Protocols	HTTP, HTTPS	TCP	TCP, SSL, HTTP, HTTPS
Platforms	VPC	VPC	EC2-Classic, VPC
Health checks	✓	✓	✓
CloudWatch metrics	✓	✓	✓
Logging	✓	✓	✓
Zonal fail-over	✓	✓	✓
Connection draining (deregistration delay)	✓	✓	✓
Load Balancing to multiple ports on the same instance	✓	✓	
WebSockets	✓	✓	
IP addresses as targets	✓	✓	
Load balancer deletion protection	✓	✓	
Path-Based Routing	✓		
Host-Based Routing	✓		
Native HTTP/2	✓		
Configurable idle connection timeout	✓		✓

Cross-zone load balancing	✓	✓	✓
SSL offloading	✓		✓
Server Name Indication (SNI)	✓		
Sticky sessions	✓		✓
Back-end server encryption	✓		✓
Static IP		✓	
Elastic IP address		✓	
Preserve Source IP address		✓	

Note. Reprinted from Elastic Load Balancing Product Details. (n.d.). Retrieved April 18, 2018, from https://aws.amazon.com/elasticloadbalancing/details/#compare

Table 4.

Customer Service Plans

	Basic	**Developer**	**Business**	**Enterprise**
Customer Service and Communities	24x7 access to customer service, documentation, whitepapers, and support forums	24x7 access to customer service, documentation, whitepapers, and support forums	24x7 access to customer service, documentation, whitepapers, and support forums	24x7 access to customer service, documentation, whitepapers, and support forums
Best Practices	Access to 7 core Trusted Advisor checks	Access to 7 core Trusted Advisor checks	Access to full set of Trusted Advisor checks	Access to full set of Trusted Advisor checks
Health status and Notifications	Access to Personal Health Dashboard	Access to Personal Health Dashboard	Access to Personal Health Dashboard & Health API	Access to Personal Health Dashboard & Health API
Technical Support		Business hours** access to Cloud Support Associates via email	24x7 access to Cloud Support Engineers via email, chat & phone	24x7 access to Sr. Cloud Support Engineers via email, chat & phone
Who Can Open Cases		One primary contact/ Unlimited cases	Unlimited contacts/ Unlimited cases (IAM supported)	Unlimited contacts/ Unlimited cases (IAM supported)
Case Severity/ Response Times*		General guidance: < 24 business hours System impaired: < 12 business hours	General guidance: < 24 hours System impaired: < 12 hours Production system impaired: < 4 hours Production system down: < 1 hour	General guidance: < 24 hours System impaired: < 12 hours Production system impaired: < 4 hours Production system down: < 1 hour Business-critical system down: < 15 minutes
Architecture Support		General guidance	Contextual guidance based on your use-case	Consultative review and guidance based on your applications

Launch Support			Infrastructure Event Management (Available for additional fee)	Infrastructure Event Management (Included)
Programmatic Case Management			AWS Support API	AWS Support API
Third-Party Software Support			Interoperability & configuration guidance and troubleshooting	Interoperability & configuration guidance and troubleshooting
Architectural Review				Access to a Well-Architected Review delivered by AWS Solution Architects
Operations Support				Operational reviews, recommendations, and reporting
Training				Access to online self-paced labs
Account Assistance				Assigned Support Concierge
Proactive Guidance				Designated Technical Account Manager
Pricing	Included	Starts at $29 per month See pricing detail and sample	Starts at $100 per month See pricing detail and sample	Starts at $15k per month See pricing detail and sample

Note. Reprinted from AWS Support - Compare all support plans. (n.d.). Retrieved April 17, 2018, from https://aws.amazon.com/premiumsupport/compare-plans/