CS- 524 Introduction to Cloud Computing

Assignment-1

Answer 1

np(1+mc)= np
Where p = one time per user license fee
p=$12,000
c=0.4
n = no. of employees
m = no. of years

(i) Cumulative support expense = m*c*p
m*c*p = 12000
m*0.4*12000=12000
m=2.5 years

(ii) if np = 0.05*np(1+mc)
1+0.4m= 1/0.05
m=47.5 years

Answer 2

Three examples of IaaS, PaaS and SaaS are as follows
IaaS- Amazon Web Services, Microsoft Azure, Google Computer Engine
PaaS - AWS Elastic Beanstalk, Windows Azure, Google App Engine
SaaS - Salesforce, Dropbox, Google suite of apps

Answer 3

Consider a situation where an organization uses about 75% of the private cloud but there occurs an occasion on which they use the entire capacity of the cloud, i.e. 100% and still need more capacity. In such a case a configuration called Cloud bursting is used. This configuration enables the private cloud to automatically direct demand to a public cloud when the capacity of the former cloud reaches 100%.

This setup is extremely beneficial to a company since it allows for flexibility and cost savings.

The company does not need to forecast peak use times or keep resources available for such an event; instead, they may utilize this configuration whenever there is a demand, use additional resources, and only pay for the time they actually used those resources.

Therefore Cloud Bursting can be defined as a configuration that enables an organization to migrate from private to public cloud in order to avoid service outages when demand spikes and the need is satisfied by utilizing the public cloud's additional capacity.

Answer 4

In order to get into the depths of the legal consequences of Shadow IT, one must first address certain differences between the two kinds of clouds; public and private. The public cloud is more of a common-to-all-users service which lets individual users, companies or institutions share common resources. These resources can be infrastructure, software, runtime, middleware etc. Users often pay as per usage of resources and thus they can create applications at nominal prices. This has helped users in creating businesses more conveniently by letting them be less concerned about infrastructure, personnel, maintenance, scalability and costs; and more about their client-interactions and growth of business.

The private cloud on the other hand, has its boundaries closed to a single institution. While the services of the cloud remain almost entirely the same, the resources are not shared among all users but limited to users of that one institution.

Now that we have an overview of what the differences are, it is important to note that clouds are provided by third parties and can also be in-house.
A third party service replicates the users data and can cause a security risk. Other risks include data infringement, cybersecurity threats, intellectual property rights, hacking, HIPAA and SOX violations. Whereas moving to an in-house cloud or a privately owned cloud has its own perks for the company, such as

- Cost saving because the companies no longer have to pay a third party for their services.
- They can optimize the cloud as per their needs or the services they provide.
- Ofcourse, chances of security breach would be significantly reduced if access to data was limited to single-tenant and the data was better encrypted.

HIPAA - HIPAA is a federal statute enacted by the United States Department of Health and Human Services to protect the privacy of a patient's personal information. HIPAA stands for the Health Insurance Portability and Accountability Act, which safeguards information such as medical records, insurance policies, health insurance providers, treatment plans, payments, and medical histories, among other things. HIPAA breaches include, among other things, releasing PHI (Protected Health Information) data to other parties, limiting or delaying patients' access to

their PHI, and inappropriate disposal of PHI. Companies conducting business in the medical area must maintain the security of PHI and take any and all precautions necessary to avoid data breaches. In-house private clouds that are well-encrypted can be used for this.

SOX- The Sarbanes-Oxley Act or SOC was established in 2002 to enable full disclosure of any Publicly-traded company's finances by mandating annual reports of internal control of financing and an auditor's attestation. Unlike for large scale businesses that require to submit audited reports quarterly as well as annually using 10-Q and 10-K forms respectively, small scale businesses can submit it annually. This act not only focuses on the financial side of the company but also takes into account the IT department's role to play in financial reporting. Information security plays a crucial role as an insecure system can mean unreliable or tainted data including fraudulent transactions and records.

Answer 5

Instagram was founded by Kevin Systrom in 2010 and obtained a $7 million Series A investment round in February of 2011. It was valued at $25 million by one of its backers. Instagram was valued at $500 million by Twitter in 2012, and the company made an offer, but Systrom turned it down. That same year, Facebook paid $1 billion in cash and shares to purchase Instagram. There were 11 employees and 30 million users on Instagram at the time.

Because the owners didn't put much effort into creating the infrastructure, Instagram's worth soared in such a short period of time. They built their firm using cloud services and concentrated on providing consumers with an engaging photo-video sharing platform. They were even able to keep the number of staff to just a dozen because much of the infrastructure was cloud-based. They were able to save money on the application's development and upkeep as a result of this.
They utilized the money to augment the program by adding features like private and public accounts, interactive filters for photographs, messaging, commenting, sharing and liking media, and changing aspect ratios. As the software became more engaging, all of these enhancements helped them obtain a significant number of users.
Instagram, which began as a mobile app, quickly grew in popularity, outnumbering Facebook, which was mostly used by individuals on computers. Instagram had gained a larger share of the market when consumers started moving to handier devices.
Facebook had started earning a significant amount of money through advertisements since 2007. Since Instagram had a huge number of users, it had the potential to provide businesses a large platform to advertise their products which would generate huge revenue to the company and this was one of the significant reasons for the buy; a large number of users. Advertising is not only ongoing today, it has escalated to a larger scale. All of these factors helped instagram generate the value of $1 billion in just two years.

Answer 6

Amazon Elastic Cloud Computing provides an enormous list of infrastructural resources like CPU, storage, servers, networking etc that are a part of the Infrastructure-as-a-service service model and also provides operating systems including but not limited to Windows, Linux, Ubuntu, Fedora etc. which are part of the Platform-as-a-service service model. However it does not provide other features of PaaS such as middleware and runtime therefore we can categorize Amazon Elastic Cloud Computing as IaaS.

Answer 7

- I would start by selecting the appropriate cloud model for my business which in this case would be Private because as an individual company I will have confidential data of users that can be breached. I would be saving the rent on a "cage".

- I would select the Infrastructural requirements such as CPUs, Amazon EBS and EFS for storage, SR-IOV for networking which will provide higher bandwidth and lower CPU usage. I would not keep extra servers as cloud provides on time scalability options as per usage. Hence I would save money, time and employees by not having to anticipate peak times or maximum usage and paying only for what I use.

- I would save on licensing fees of operating systems by using AMIs that are supported by EC2
  .
- I would save money on leasing T14 lines for connectivity as I would be using EC2's enhanced networking and pay only for the actual use instead of paying for full capacity.

- I would save on salaries as I would have to hire a smaller number of people for development and maintenance.

- I would finally deploy my application Zing Interactive Media's Service and pay as per my usage to Amazon thus not having to pay any overhead costs.

Answer 8

To understand CPU pinning we must first understand the term CPU Affinity, which means designating processes to a certain CPU. Without process affinity, the scheduler can assign processes to any CPU available which makes it hard to predict the amount of CPU power that will be allocated to current and subsequent processes.
If similar processes are assigned to different CPUs then Cache miss will increase, this is because each CPU will have to fetch data required for the process however if similar processes were

assigned to a single CPU cache miss would decrease and thus the performance would increase.
To avoid the above situation of high cache miss and predict accurate CPU usage, availability and memory Intel introduced CPU pinning which makes use of process affinity. In CPU pinning similar types of processes are pinned to a single CPU in order to decrease cache miss. This means a certain percentage of the CPU is designated for a set of processes. Therefore we get accurate predictions of CPU usage.

Answer 9

The Amazon EC2 SLA guarantees 99.99 percent service availability, which translates to 52 minutes and 36 seconds of downtime a year.

Answer 10

The telecommunication infrastructure relies on networking appliances and high-performance computers. These gadgets have changed throughout time, but they have not been able to keep up with the market's rapid evolution. This is due to the fact that these are "Telecom-grade" equipment. A device that is particularly engineered to run in telecommunication infrastructure or networks for up to 15 years is referred to as telecom-grade hardware. These devices have a 99.999 percent uptime, or 5 minutes of downtime per year. The 15-year commitment stymies telecom infrastructure's rapid growth.

Virtualization of networking was essential to stay competitive and unveil new services into the business, for which seven of the world's largest telecom network operators developed a set of guidelines. In 2012, 13 network operators issued a White Paper on it, and soon after, the ETSI NFV Sector Specifications Group was formed, which comprised 52 more network operators, as well as suppliers and consultants from the telecom industry.

- The NFV is expected to act in the following areas :-
  Operational improvements- This is a concern since running a network utilizing equipment from many manufacturers would take a long time and cost a lot of money. If the same equipment is given by a cloud, it is delivered faster and without the need for the same vast number of pieces.

- Cost reductions- Normally a large workforce is required for maintenance of the infrastructure, however with automation about a tenth of the workforce will be needed which is a significant cost reduction.

- Scalability -Manual scalability takes a long time, approximately a year, and is expensive owing to the large labor required. The cloud provides quick scalability to the industry.

- Reduction of development time- Because no human hardware setup is necessary, and no shipping time is required, the development time is considerably shortened when using the cloud. All that is necessary is the selection of required characteristics. As a result, time and money are saved.

Resources:-

https://www.bmc.com/blogs/SaaS-vs-PaaS-vs-IaaS-whats-the-difference-and-how-to-choose/
Azure.microsoft.com
Cdc.gov
Hipaajournal.com
Sec.gov
https://www.mcafee.com/enterprise/en-us/about/cloud-compliance/sarbanes-oxley-encryption-compliance-requirements.html
http://aws.amazon.com/ec2/
https://www.etsi.org/technologies/nfv