**Homework Assignment**

**Question 1. (Cloud Models)** Consider the three Cloud delivery models SaaS, PaaS and IaaS. For each of the scenarios below match the scenario to the best model of delivery for the scenario along with a brief explanation.

1. “An Electronic Health Record systems for clinics and doctors”

SaaS, the most basic form of cloud computing should be sufficient to allow doctors to run health care applications from a remote location. Since SaaS solutions are managed by the vendor and will not require the client to maintain storage of data and the network.

1. “A web hosting solution for PHP web applications”

PaaS. Consider a custom-written PHP shopping cart on your web site that allows people to log in using their Facebook logins. This would also be an example of a PaaS cloud application that would allow you to develop and modify source code for the web site and provide you exclusive control over all of the data in your database. It is not SaaS since you’re not actually using Facebook. You’re simply asking Facebook to provide a service or a piece of data for your application.

1. “A fast lighting storage solutions for gigantic amount of data”

IaaS. Custom storage solutions that provide control over how data is stored on physical hardware and communicated to customers over the network requires low level operating system and hardware configuration at a level that only IaaS can provide.

**Question 2: (Cloudonomics)** Which approach (private cloud, public cloud or hybrid cloud) is more economical for each of the following scenarios? Explain with the help of a brief description.

1. An organization that has been in business for a very long time serves about 15,000 users in the day and less than 50 users in the night.

Private Cloud or a inhouse server solution is probably best as 15,000 users will not require many servers. Since the demand is stable and it’s a long-running business a Cloud solution is not warrented in this case.

1. An organization that has been in business for a very long serves 2,000 users daily but 1,000,000 during the holiday session.”

Hybrid Cloud is the best solution for managing the small number of users on average and dealing with the large spike occasionally.

1. “A long-running business needs 20,000 computers for a one-time data processing.”

Public Cloud. It doesn’t make sense to buy 20,000 servers for a one-time use.

**Question 3:** **(Virtualization)** What type of virtualization (full hardware assisted, para-virtualization, containerization, no virtualization) is feasible for the following scenarios:-

1. A user wants to run a service that requires an unmodified Operating System on an advanced processor.

**Full.** A full virtualization technique will not require the guest operating system to be modified. An advanced processor will support virtualization in the hardware.

1. A user wants to run multiple independent applications sharing the same operating system kernel as well as some operating system libraries.

**Container.** Containers are a relatively new type of virtualization that splits the operating system (as apposed to the hardware) and its associated libraries among multiple isolated applications.

1. A user plans to run just a single application on a single physical server in a way that he gets maximum performance for that application.

**No virtualization.** Any kind of virtualization will have a performance hit due to sharing of resources. If a machine is going to run just one application then there is no reason to employ virtualization.

**Question 4.** **(Cloud Adoption and Cloud Security)** Research the Cloud Security Hype cycle and rank the following three Cloud Security technologies in the order of maturity. In addition, research the technologies mentioned and briefly discuss what they are.

* Disaster recovery as a service (DRaaS)
* Container Security
* Identity Proofing services

Gartner released a hype cycle for Cloud security just last year (2017). Based on the cycle the following is a list of Cloud technologies starting from the most mature to the least mature.

1. Identity Proofing services
2. Disaster recovery as a service (DRaaS)
3. Container Security

**Identity-proofing services** are currently the most mature Cloud security technology that allow Cloud-based verification of people’s identities before an enterprise issues them accounts and credentials. Such services are based on “life history” or transaction information aggregated from Cloud data sources. These services are also used as an additional interactive user authentication method, especially for risky transactions, such as accessing sensitive confidential information or transferring funds to external accounts. Identity-proofing services are typically used when accounts are provisioned over the Web and the user is not physically present. Examples of mature offerings today are Equifax and SureID.

**Disaster recovery as a service (DRaaS)** is in the early stages of maturity. Early adopters are small organizations that cannot readily afford a recovery data center, experienced IT staff and specialized skills needed to manage a Disaster Recovery program on their own. Examples of upcoming organizations providing DRaaS are IBM Cloud CVSR and Seagate Cloud Resiliency Services.

**Container Security.** The biggest issue with containers is that they do not have the same security boundaries virtual machines have. Theoretically, if a hacker can find an exploit in the underlying operating system, he can leverage that to gain access to the containers as well. The same is theoretically possible in reverse; a hacker could potentially exploit the container and gain access to the underlying server. Docker and other container technologies employ some functions that run as the "root" superuser which could have even larger implications in cloud provider environments: Imagine a situation where all cloud services were deployed via containers and a hacker was able to break out of one container and access other containers on the same hardware. This technology is still in the innovation trigger phase because containerization itself is a relatively new technology.