CSC 547 - HW 1

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Regular Problems

Problem 1

1. *The Amazon and Microsoft definitions mention the Internet as the delivery medium. Is this necessary?*

    - The internet as the delivery medium is not necessary. According to NIST, “Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) ….”. This suggests that cloud computing simply requires “on-demand network access”, and the cloud consumer can be connected to the cloud provider via multiple routes, not just the public internet.
    - Some common models include private, community and hybrid deployment which allow for them to exist on premise. Hence “network” may mean private networks and not necessarily the internet in such cases.
    - For example, NC State can create a facility that offers compute and storage for NC State students, accessible via unity ID. This solution would therefore be a “private cloud”.

2. *The NIST definition mentions a shared pool of resources. Provide examples of entities who can share. Do you see any tradeoffs in sharing?*

    - Clients of the cloud service provider are entities that “share” the common pool of resources. As an example, football[1] leagues from multiple countries (England - Premier League; Spain - La Liga; France - Ligue 1) might be using AWS/Google Cloud to host football highlights.
    - Tradeoffs in sharing:
        - Upholding quality standards: sharing resources would have implications on all the dependent clients sharing them. Taking the football example from above; since football (and most sports) matches occur mostly on the weekends, these clients may experience surges in demand at the same time. The cloud service provider may not be able to provide the desired performance if this occurs.

        - Security and privacy: sharing of resources on the cloud can potentially cause the risk of cloud security vulnerabilities like data theft, denial of service attacks which can be caused due to poorly configured security tools or using insecure third party applications.

3. *The NIST definition mentions minimal management effort. Which entity sees its effort reduced? Since "there is no free lunch in engineering", is there another entity whose management effort increases?*

    - The cloud service **clients** see their efforts reduced – they are the entities which experience "minimal management efforts".
    - However, this would lead to an increase in effort from the cloud service providers to set up the required infrastructure which would enable them to reduce "management efforts" of their clients, such as troubleshooting, software and hardware updates, land purchase, maintenance, etc.

Problem 2

1. Common characteristics:
    a. On-demand access
    b. Broad network access / device independence
    c. Resource pooling / multitenancy
    d. Resource elasticity: automatic, near-real-time resource provisioning
2. The characteristics defined in the lecture notes are better:
    a. The characteristics defined in the lecture notes are more concise, and some features like "security" mentioned in the reference, while extremely important, do not capture common characteristics of cloud computing and what it means. For example, cloud services from provider A could be more secure than that of provider B. There could also exist providers with no security or with major vulnerabilities in the security of their cloud infrastructure still offering cloud services.
    b. The reference mentions several "good" and "preferable" characteristics of cloud computing like performance which goes over and beyond what constitutes cloud computing. While the objective of cloud service providers is to offer good "performance", the characteristics mentioned in the lecturer notes are intended to enable this performance. Performance need not necessarily be an explicit characteristic in itself.
    c. The reference also additionally mentions productivity as a key characteristic of cloud computing. It claims that multiple users working on the same data simultaneously increases productivity. Practically, this could also hinder productivity and depends on the nature of the collaboration between the users. Hence "productivity", while desired, is not a key characteristic of cloud computing. It is rather a metric for the cloud consumer to quantify and track.

Problem 3

1. *Consider Example 1.2, page 4. Is this an example of cloud computing? If yes, according to which definition?*

    a. According to the NIST definition, this is not an example of cloud computing because:
        i. There are no exclusive “service providers” in this scenario as required in the NIST definition of cloud computing, since “personal” computers are being used for this computation. There is no second entity involved which deals with the management of resources.
        ii. There seems to be no “configurable computing resources” as required in the NIST definition of cloud computing. If they were calculating pi by brute force algorithms, it is safe to assume that the resource utilization was maximum at all times.

Problem 4

1. *Give an example (different from the one we presented in the notes or discussed in class) of:*
    a. *Cloud consumer*: Adobe - Creative Cloud (uses AWS)
    b. *Cloud provider:* **Tencent Cloud** is the second largest cloud service provider in China (behind Alibaba). Apart from its 21 regions, Tencent also has 5 more “partner regions” across the world. https://www.tencentcloud.com/
    c. *Cloud carrier:* TMobile Cloud Connect. https://www.t-mobile.com/business/solutions/networking/cloud-networking

Bonus problems

Problem 9

- *Cloud Computing Certifications, Admin role. Read reference [9]. It mentions several industry certifications that are available in the cloud computing space (the analogs of Cisco Certifications in the networking space). In this problem, we’ll narrow the list to the “big three” cloud providers. (More on these providers in Section 3.4.1, page 58.)*
  Consider the Cloud administrator role.
  1. Find information on the AWS certification exams. Supply a summary.
  2. Repeat for Google Cloud.
  3. Repeat for Microsoft Azure.

    - AWS Certified SysOps Administrator:
        - What you should know:
            - 1 yr hands on experience with AWS

                - Deploying, managing and operating AWS workloads
                - Implementing security controls and compliances on AWS
                - Operating the AWS CLI and management console
                - Using the security and networking solutions offered by AWS
            - After passing the exam I shall be certified to have:
                - The ability to implement requirements such as availability, performance, and scalability
                - The ability to troubleshoot cloud systems
                - The ability to deploy, manage and operate AWS workloads using the management console and the CLI
    - Professional Google Workspace Administrator:
        - What you should know:
            - Configuration, planning, operation and authorization of Google Workspace services
        - After passing the exam I shall be certified to have:
            - The ability to increase operational efficiency
            - Map business outcomes into policies and practices
    - Microsoft Azure Administrator:
        - What you should know:
            - Operating systems, networking, servers, and virtualization.
            - PowerShell, Azure CLI, the Azure portal, and Azure Resource Manager templates.
        - After passing the exam I shall be certified to have:
            - The necessary skillset to implement and manage a Microsoft Azure environment.
            - The ability to implement an organization's cloud infrastructure using Microsoft Azure
            - The skills to coordinate with other technical roles to deliver Azure solutions.

Problem 10

- *Cloud Computing Certifications, Architect role. Read reference [9]. It mentions several industry certifications that are available in the cloud computing space (the analogs of Cisco Certifications in the networking space). In this problem, we'll narrow the list to the "big three" cloud providers. (More on these providers in Section 3.4.1, page 58.)*
  Consider the Cloud architect role.
  1. Find information on the AWS certification exams. Supply a summary.
  2. Repeat for Google Cloud.
  3. Repeat for Microsoft Azure.

    - AWS Certified Solutions Architect:
        - What you should know:

            - 1 yr hands on experience with AWS technologies, such as networking, databases, compute, deployment and management
            - Deploying, managing and operating AWS workloads
            - Implementing security controls and compliances on AWS
            - Operating the AWS CLI and management console
            - AWS global infrastructure and services
            - Mapping AWS services to technical requirements
        - After passing the exam I shall be certified to have:
            - Deep knowledge of several AWS services and how they can be used to build complete solutions
            - The ability to design cost-effective, efficient, secure cloud solutions for a client, or to review their existing infrastructure and propose fixes
        - Exam details:
            - 130 minutes
            - $150
            - 65 questions
            - Multiple choice or multiple response type questions
            - Offered in multiple languages
            - Resting center or online proctored exam

    - Google Professional Cloud Architect:
        - What I should know:
            - 3+ years of industry experience, and 1+ years of GCP experience
        - After passing the exam I shall be certified to have:
            - The ability to let my employer leverage the full potential of Google Cloud Platform
            - Knowledge of effective cloud solution design, strategy, architectural best-practices
            - The ability to design long-term, secure, resilient, scalable, and highly available cloud systems
        - Other details:
            - 120 mins
            - Exam fee: $200
            - Must recertify
            - Offered in English, Japanese
            - Multiple choice and multiple select type questions
            - Taken remotely or in person at a test center
    - Microsoft Azure Solutions Architect Expert:
        - What I should know:
            - Designing cloud solutions on Microsoft Azure
            - IT operations such as virtualization, networking, security, identity and access management, data governance, business continuity etc.

- After passing the exam I shall be certified to have:
    - The ability to transform business requirements into technical designs for Microsoft Azure products
    - The ability to liaise with people from different technical backgrounds and create effective cloud solutions
- Exam details:
    - Exam fee: $165
    - Offered in multiple languages