CLOUD COMPUTING

Practical 1: Introduction to CC

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Part I: CASE STUDY I

Consider a telecommunication company C_A that provides network equipment to telecommunications industries across the globe. Over the years, C_A has grown considerably and their product portfolio has expanded to accommodate several acquisitions, including companies that specialise in infrastructure components for Internet, GSM, and cellular providers. C_A is a leading supplier of a diverse range of telecommunications infrastructure.

However, in recent years, market pressure has been increasing. C_A has begun looking for ways to increase its competitiveness and efficiency by taking advantage of new technologies, especially those that can assist in cost reduction. A detailed investigation on the company's assets, management structures, and its future plans has led to the following conclusions:

1. C_A various acquisitions have resulted in a highly complex and heterogeneous IT environment (IT resources). The IT complexity became a source of critical concern to company's board of directors.
2. C_A management decided to outsource applications maintenance and operations overseas. This lowered costs but unfortunately did not address their overall operational inefficiency.
3. C_A started considering cloud solutions. However, C_A is unsure of how to choose the right set of cloud computing technologies and providers. They became overwhelmed by the plenitude of cloud providers and cloud-based products.
   Points in favour of CA adopting cloud computing solutions:

Assume that you are hired as a cloud consultant to help C_A to adopt the cloud solutions.

1. Discuss within the context of cloud computing IT solutions the complexity of the C_A IT environment.
   CAs IT environment is a heterogenous one. It requires a cloud computing IT solution to be over the complexity due to:
   - ✓ CA's IT environment is inherently unscalable given its heterogenous nature, it would be very difficult, expensive (have to buy more physical infrastructure) and inefficient to try to expand the current IT environment. Whereas with cloud solutions, scalability is an inherent benefit.
   - ✓ It is also incredibly inefficient; having a diverse IT environment will lead to bottlenecks within different technologies which integrate and overlap within the environments. Having software provided as a service, would help reduce the inefficiencies in a cloud-based solution.
   - ✓ Moreover, the environment is not robust – if a critical issue arises that affects different components across regions, there aren't necessarily any dedicated teams on-site to help rectify the problem – whereas with cloud computing this can be provided as a service.
   - ✓ Moreover, CA could potentially run into other issues down the line when they try to connect to services across regions – they'd potentially have to build themselves robust services and applications to help integrate everything, while cloud computing approaches can be offered as part of PaaS, SaaS.

2. Why outsourcing is not a good solution for C_A, and why Cloud Computing is believed to be a much better solution? Justify your answer.
   Cloud computing has overtaken traditional outsourcing as the preferred operations solution. Cloud providers with "as a Service" (SaaS, IaaS, PaaS) models have paved the way better contracting options. Even though costs have reduced with CA outsourcing applications maintenance and operations overseas, cloud computing would offer much higher return on investment in the long run, with following advantages:
   - Reduced investments and costs
   - Increased availability and reliability
3. Suggest a logical process of actions to determine whether C_A should adopt the cloud computing solutions. (**Hint:** *consider some measures for complexity, heterogeneity, …, C_A application architecture, projected cost savings, pilot project, …*)
   A process of actions can be considered at C_A as following:
   - ✓ Following up proposals provided by a Cloud Solutions Providers and review based on current costs and demands.
   - ✓ Choosing which services they would like to migrate to the cloud – prima facie, a reasonable approach would be a combination of SaaS and IaaS.
   - ✓ Migrating experimentally and slowly; migrate some applications and see how they perform in the cloud – if the result is positive then CA know to migrate the rest.
   - ✓ Building and training IT team to handle the cloud architectures.

Part II: Basic concepts of Cloud Computing

1. **What are the cloud-delivery models and cloud-deployment models that characterise each of the following Cloud providers (Hint: *use online resources*)?**
   Cloud providers have many delivery models such as infrastructure as a Service (IaaS), Software as a Service (SaaS) and Platform as a Service (PaaS). They also have several cloud deployments models, including Public, Private and Hybrid.

	Cloud Delivery Model			Cloud Deployment Model		
	IaaS	**PaaS**	**SaaS**	**Public**	**Private**	**Hybrid**
a. Amazon Web Services	✓	✓	✓	✓	✓	✓
b. Microsoft Azure	✓	✓	✓	✓	✓	✓
c. Google Cloud Platform	✓	✓	✓	✓	✓	✓
d. IBM Cloud	✓	✓	✓	✓	✓	✓
e. VMware	✓	✓	✓	✓	✓	✓
f. Salesforce	✓	✓	✓	✓	✓	✓
g. Oracle Cloud	✓	✓	✓	✓	✓	✓
h. SAP	✓	✓		✓	✓	✓
i. Rackspace	✓	✓		✓	✓	✓
j. Eucalyptus	✓				✓	✓

2. **If you want to develop an application on the Cloud, which Cloud provider would you choose? Why?**

   For developing an application on the Cloud, AWS is a good candidate to choose because of the large number of online resources available (extensive documentation, AWS support team, YouTube tutorials, etc.). Moreover, AWS has a great reputation as a top cloud provider, and is trusted by developers and companies worldwide for cloud solutions.

3. **Explain the difference between cloud-based storage and traditional data centres.**

	Cloud-based storage	Traditional data centres
Capacity	Potentially unlimited capacity, and much easier to scale according to requirements.	Limited capacity, and individual responsibility to purchase and set up hardware.
Control	Less control over remotely located hardware.	Full control over data as well as hardware on premises.
Security	Increased security issues and vulnerabilities.	Physically connected to company's local network, security is a personal responsibility.
Cost	More cost effective by far, with on-demand Pay As You Go services.	Expensive in terms of time, cost, maintenance and system administration.

4. Explain the concept of scaling (horizontal vs vertical) in Cloud Data centres. (**Hint:** support your analysis by using some examples).

	Horizontal	Vertical
Definition	Horizontal scaling is provisioning extra servers to meet your requirements in cloud data centers, hence this refers to adding additional instances instead of completely moving to a bigger instance.	Vertically scaling is adding more power such as CPUs, RAM and memory to an already existing instance or completely replacing that instance with a more powerful instance.
For example	Using EC2 in AWS, you scale horizontally by adding more EC2 instances using an auto scaling group.	Using EC2 in AWS, you scale vertically by adding more power to an existing EC2 instance
Downtime	Much easier to accomplish without facing certain downtime.	Usually more expensive and faces downtime when services are temporarily unavailable.

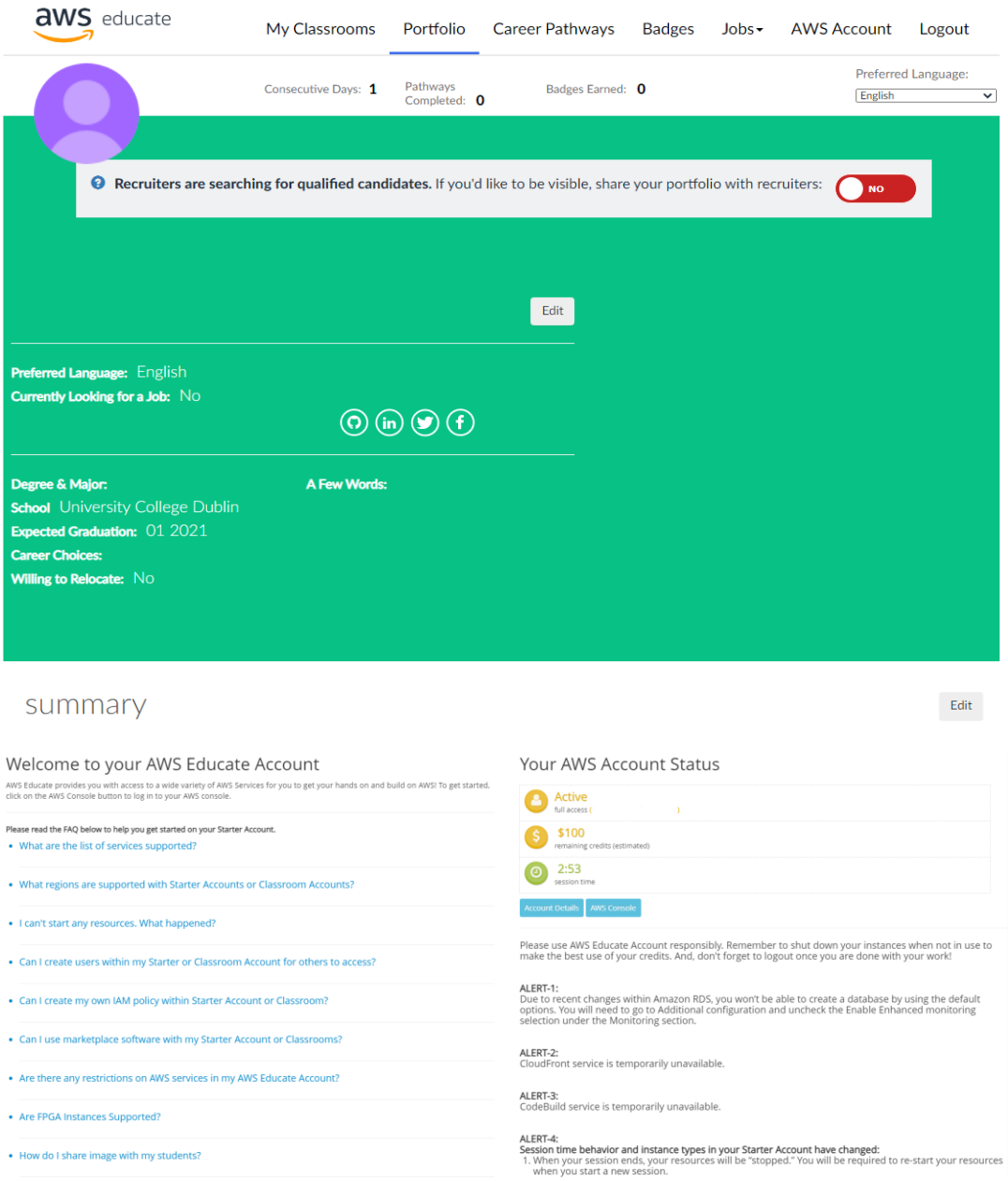
Part III: AWS Platform

Using online resources, explore the **AWS Cloud** (https://aws.amazon.com/) and **AWS Educate Cloud** (https://aws.amazon.com/education/awseducate/)

1. Register a regular **AWS account** or an **AWS Educate Starter Account** (free and does not request credit card but has some limitations compared to AWS account).

   Register an AWS Educate Starter Account with UCDconnect email.

2. Describe the provided GUI after you login.



Welcome to AWS Educate Account

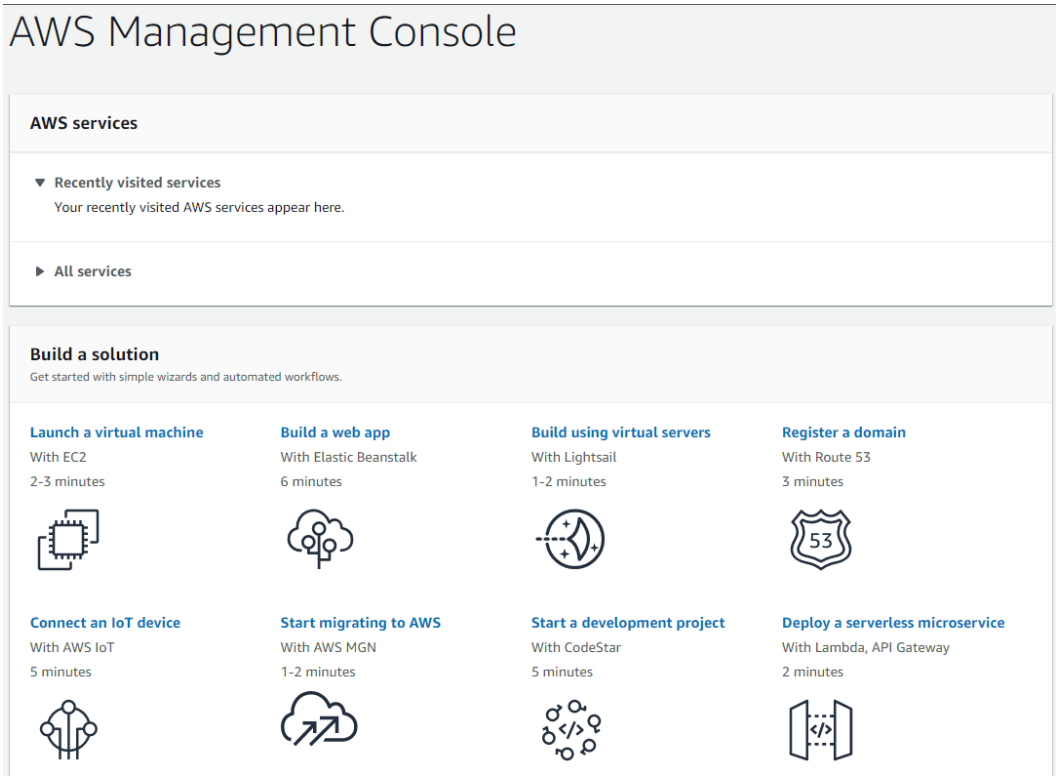
3. Describe the GUI of your profile.

"My Account" page shows a number of useful details about the user's AWS account. Some key points are:

- Account ID, name and seller information
- Personal contact details
- Currency settings
- Opt-in region settings (to enable AWS regions not set by default)
- Close account option

"My Billing Dashboard" is another crucial page which shows monthly spending for the account

Clicking on AWS Console to open the main screen for AWS Management Console, as below:



AWS Management Console

This screen includes AWS services:

- Lauch a virtual machine
- Build a web app
- Build virtual servers
- Register a domain
- Connect an IoT device
- Start migrating to AWS
- Start a development project
- Deploy a serverless microservice
- ...