CLOUD COMPUTING AND SOFTWARE AS A SERVICE

42904

ASSIGNMENT 3

Structure of this assignment:
This assessment item focuses on Amazon Web Services (AWS) application development.

Weight of this assignment towards the overall subject grade:
35% of the overall subject grade.

Submission deadline and requirements:
Submission Deadline:
The deliverables of this assignment are two-fold as follows:

(a) Overview of the system architecture (Deliverable 1)
(b) The developed system in AWS (Deliverable 2)

Please note that you will be provided with a dedicated AWS account for this assignment. All development and deployment tasks must be carried out within this specific account. Both the above deliverables are due on 2 June 2025 by 6 PM.

Submission Requirements:
The submission requirements for the two deliverables are as below:

(a) Upload a soft copy of Deliverable 1 on Canvas by 2 June 2025 by 6 PM.
(b) Deliverable 2 must be completed in the AWS account provided to you by 2 June 2025 by 6 PM.

Objectives:
This assignment is linked to the following Subject Level Objectives: (1), (2), and (4).

Academic Standards:
Please refer to the statement on academic conduct and the use of plagiarism detection software in the subject outline.

Late Submission Policy:
You must hand in and email the assignment on time. An extension may be granted for illness, misadventure, or other extenuating circumstances beyond your control. The issue of an extension should be raised with the Subject Coordinator as soon as possible after the circumstances occur. Extension will generally not be granted on or after the assignment's due date.

Written consent in the form of an email should be obtained from the Subject Coordinator, allowing for late assignment submission. Please note that such permissions for late assignment submissions will only be considered due to prior unforeseen extraordinary

and genuine circumstances beyond your control. Late assignments submitted outside of these parameters will be deducted one mark per day, and more than seven days late assignments (without any special consideration) will receive zero marks.

Team/Group Registration:

This is an individual assessment item. You are required to complete this assignment on your own. This assignment also requires a bit of independent research to complete. You are required to complete and complete this on your own.

Assignment Description:

Consider a small startup currently in its early stages of operation. Their setup comprises a LAMP stack (MySQL, Apache, and PHP) running on a single desktop PC in a small office. Like many early-stage startups, it expects significant, rapid, and unpredictable growth in the coming months.

They want to move their offering to Amazon Web Services (AWS). As part of moving their current infrastructure to the cloud, they have requested a system architecture and implementation on AWS that addresses the following concerns:

1. Scalability: The application must be able to scale on demand. Given the uncertainty around the timing and extent of future growth, the startup wants to avoid both over-provisioning and under-provisioning.
2. Disaster Recovery: The system must incorporate disaster recovery measures to maintain high performance and throughput and ensure continuous availability even under adverse conditions.

Your task in this assignment:

Design and deploy a scalable, elastic, highly available, and fault-tolerant architecture that supports the startup's organic growth. This design should explicitly address the concerns outlined in the above project brief, ensuring it meets all specified requirements.

Assignment Deliverables:

The deliverables of Assignment 3 are two-fold as below:

(a) Deliverable 1 (AWS system architecture). Prepare a PDF document (limited to four or five pages) that clearly and concisely presents your proposed architecture diagram. Provide a justification for each Amazon Web Services (AWS) component you include, explaining how it supports the solution's requirements. Additionally, explicitly outline any assumptions made during the design process and list all AWS services used to implement the solution. You may use any diagramming tool of your choice to illustrate the system architecture.

(b) Deliverable 2 (Develop the Application in AWS). Use the AWS account that has been provided to you to build and deploy the application. You may either:

- (i) Leverage AWS Elastic Beanstalk to configure and deploy the application, (OR)
- (ii) Configure and deploy each component individually using AWS services.

In either case, you are required to utilize the following AWS services:

(a) AWS Beanstalk
(b) Amazon EC2
(c) Custom AMI (Amazon Machine Image). (Please note that you are required to create your own custom AMI)
(d) Custom Security groups allowing HTTP and SSH requests (All instances must use the same custom security group)
(e) Load Balancer
(f) Auto Scaling (with a minimum of two instances and a maximum of eight instances). Set scaling triggers on network output traffic with an upper threshold of 60% and a lower threshold of 30%.
(g) RDS (multi-availability zones deployed)
(h) Custom Virtual Private Cloud (VPC) (with at least two subnets in different Availability zones). All subnets must be public.
(i) All instances must use the same custom key pairs.
(j) Set email notifications for important events in your environment (if using Elastic Beanstalk)

Resources:

1. Lab and lecture contents regarding AWS
2. https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/GettingStarted.html
3. https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/CHAP_Tutorials.WebServerDB.CreateWebServer.html
4. https://docs.aws.amazon.com/autoscaling/ec2/userguide/as-register-lbs-with-asg.html#as-register-lbs-console
5. https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/install-LAMP.html

Assessment Process for Assignment 3:

The following assessment criteria will be used in grading process for this assignment.

Criteria	**Marks**	**Comments and Marks procured**
System Architecture • Does the developed system architecture meet the requirements outlined in the Assignment Description? • Have relevant AWS services been used for addressing the requirements?	10 marks	
AWS System Development • Does the developed AWS system address meet the requirements outlined in the Assignment Description?	25 marks	
Total	35 marks	<Total marks>