Sri Lanka Institute of Information Technology

B.Sc. Honours Degree in Information Technology

Specialized in Software Engineering

Final Examination
Year 4, Semester 1 (2022)

SE4010– Current Trends in Software Engineering

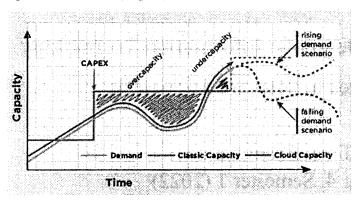| Duration: 2 Hours |
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June 2022

Instructions to Candidates:

- ♦ This paper has 4 questions.
- ♦ Answer all questions in the given booklet.
- ♦ The total marks for the paper is 100.
- ♦ This paper contains 8 pages, including the cover page.
- ♦ Electronic devices capable of storing and retrieving text, including calculators and mobile phones are not allowed.

Question 1   (35 marks)

a) Briefly explain the terms AWS Region and AWS Availability zone are? (You can use a diagram to explain the answer).

(02 Marks)

b) Analyze the diagram and briefly explain the operational expenditure (OpEx) vs Capital expenditure Model (CapEx) in terms of cloud computing.

(04 Marks)

c) Write the IAM JSON policy for the "productimages" s3 bucket.

```
{
   "Version": "2012-10-17",
   "Id": "S3PolicyId1",
   "Statement": [
      {
         "Sid": "IPAllow",
         "Effect": "Deny",
         "Principal": "*",
         "Action": "s3:*",
         "Resource": [
            "arn:aws:s3::: productimages",
            "arn:aws:s3::: productimages/*"
         ],
         "Condition": {
            "NotIpAddress": {
               "aws:SourceIp": "54.240.143.0/24"
            }
         }
      }
   ]
}
```

(04 Marks)

2

d) Your application on EC2 creates images thumbnails after profile photos are uploaded to Amazon S3. These thumbnails can be easily recreated, and only need to be kept for 45 days. The source images should be able to be immediately retrieved for these 45 days, and afterwards, the user can wait up to 6 hours.
Demonstrate the way you design this?

(05 Marks)

e) Draw Diagram of a custom VPC consisting public and private subnets. The diagram must consist of bellow entities.
     i.   Internet Gateway (IGW)
     ii. Router
     iii. Nat Gateway
     iv. Security Groups
     v. VPC

(20 Marks)

Question 2   (15 marks)

Nawaloka hospital needs a mobile app for their electronic channeling. Suppose you are a member in the app development team and you are engaging in doctor channeling section. Your development team has planned to use Flutter as app development kit and Firebase cloud as the database.

Figure 1 shows an image of doctor list screen. Consider the figure 1 and figure 2 to answer for a) \and b) parts.
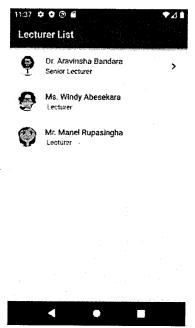

Figure 1: Lecturer List Screen   Figure 2: Alert Dialog Box

a) Construct all the steps to store and access images in local directory for lecturer list screen. (Write all the steps line by line. You need to specify folder names, locations, the content that should include inside pubspec.yaml etc.)

(Aravinda.png, Windy.png and Manel.png are the names of image files respectively)

(04 Marks)

b) Part of the code for above screen is given below. Write the missing part inside _myListView() and showAlertDialog() functions. You need to add the listview as shown in figure 1.

The first ListTile is supports for gesture recognition using onTap parameter. After tap on first ListTile, it should display an alert box as shown in figure 2. You can use a separate function showAlertDialog(BuildContext context) for the implementation of dialog box. (Please add your answer for respecting roman number (i to xx)

Ex: i).

    ii).

    iii).

(11 Marks)

4

```
import 'package:flutter/material.dart';

void main() => runApp(MyApp());

class MyApp extends StatelessWidget {
  // This widget is the root of your application.
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      debugShowCheckedModeBanner: false,
      title: 'ListViews',
      theme: ThemeData(
        primarySwatch: Colors.teal,
      ),
      home: Scaffold(
        appBar: AppBar(title: Text('Patient List')),
        body: BodyLayout(),
      ),
    );
  }
}
```
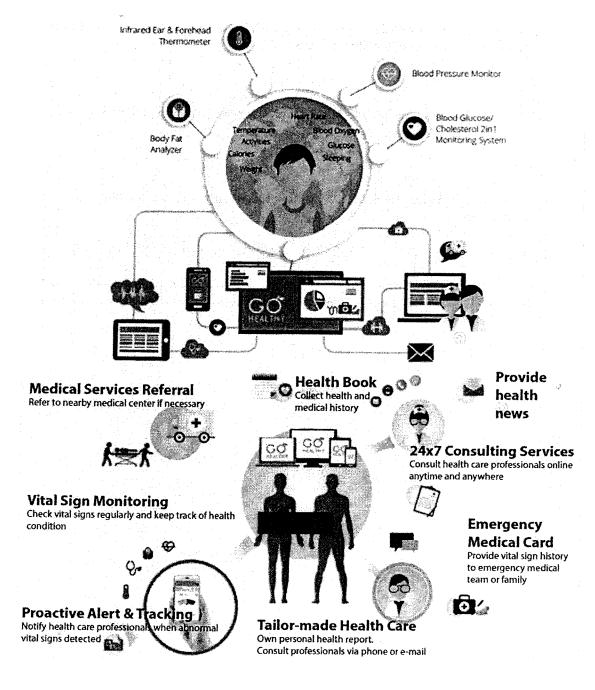
```
class BodyLayout extends StatelessWidget {
  @override
  Widget build(BuildContext context) {
    return _myListView(context);
  }
}

Widget _myListView(BuildContext context) {
i)_____
    children: <ii)_____ >[
    //list tile 1
      iii)_____
        leading: CircleAvatar(
          iv)_____: v)_____
        ),
        title: vi)_____('Dr. Aravinsha Bandara'),
        subtitle: vii)_____('Senior Lecturer'),
        trailing: viii)_____(Icons.keyboard_arrow_right),
        ix)_____{
          x)_____
        },
        selected: xi)_____,
      ),
      //list tile 2 (No need to implement this part)
      //list tile 3 (No need to implement this part)
    ],
  );
}
```

```
showAlertDialog(BuildContext context) {
// Create button
  Widget okButton = xii)_____
    xiii)_____: xiv)_____("OK"),
    xv)_____: () {
      Navigator.of(context).pop();
    },
  );

  // Create Alert Box
  AlertDialog alert = xvi)_____(
    title: xvii)_____("Hello !!"),
    content: xviii)_____("I'm attached to IT
department."),
    actions: [
      xix)_____,
    ],
  );

  // show the dialog
  showDialog(
    context: context,
    builder: (BuildContext context) {
      return xx)_____;
    },
  );

}
```

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Question 3 (25 marks)

A personal health tracking and recommendation service that tracks every move of a person, his/her eating habits, and then provides recommendations on daily routines, exercises, and meal options are to be developed. A person's activity and eating habits are to be tracked via smartwatches, smartphones, tablets, wireless weight scales, desktops, etc. This service is also to be coupled with a health care network of doctors, hospitals, and Ambulance services. Two high-level feature diagrams are illustrated below.

Infrared Ear & Forehead Thermometer

Blood Pressure Monitor

Body Fat Analyzer

Blood Glucose/ Cholesterol 2in1 Monitoring System

Temperature, Activities, Calories, Weight, Heart Rate, Blood Oxygen, Glucose, Sleeping

Medical Services Referral
Refer to nearby medical center if necessary

Health Book
Collect health and medical history

Provide health news

24x7 Consulting Services
Consult health care professionals online anytime and anywhere

Vital Sign Monitoring
Check vital signs regularly and keep track of health condition

Emergency Medical Card
Provide vital sign history to emergency medical team or family

Proactive Alert & Tracking
Notify health care professional when abnormal vital signs detected

Tailor-made Health Care
Own personal health report.
Consult professionals via phone or e-mail

Propose a cloud-based design for this application. Your answer should include the following:

a) A high-level architectural diagram illustrating all major modules and services as well as their interactions.
   Hint: *A diagram with the breakdown of microservices talking to each other and databases, tech stack used, and the justification for each microservice.*

(08 Marks)

b) Apply the 12 factors you have learned in classroom for this scenario while building the solution. (Explanation of 5 factors is enough)

(05 Marks)

c) If you apply a monolithic architecture for the above case study instead of microservices, explain what problems you may face.

(04 Marks)

d) Choose a deployment method for your proposed solution and write a proper justification for your selection.

(04 Marks)

e) An intern engineer says, "Kubernetes and Docker are the same when it comes to functionality" Do you agree with this statement? Please justify your answer.

(04 Marks)

Question 4 (25 marks)

a) "A blockchain based solution is not ideal for a military environment where the number of nodes in the network is small and all nodes are trustworthy." Do you agree with this statement? Justify your answer.

(08 Marks)

b) Briefly describe two characteristics of a 'Byzantine Fault' in a distributed system.

(04 Marks)

c) BigPharma Co Ltd. is a pharmaceutical corporation. They have decided to track the temperature of their latest drug and maintain them in a block chain through the entire journey of factory to consumer. Draw a sample block diagram (at least 3 blocks) with the minimum components needed for a blockchain.

(10 Marks)

d) Explain the problem used as the Proof of Work (PoW) problem in traditional Bitcoin mining process.

(03 Marks)

End of the paper