TechTrek 2023

Challenge Statement

25th February 2023

Introduction

Insurance is an economic tool used to hedge against the risk of financial losses that may result from damage to the insured or their property. To benefit their staff, many companies provide a company insurance for their staff. Such insurance claim requires proper security and clarity, to ensure the claim process is smooth.

Challenge Statement

You are a group of developers in DBS, tasked to create a Proof-of-Concept insurance claim web application that allows employees to create a new insurance claim, edit or cancel an existing claim. The application should allow the employees to file their insurance claims in a clear and secure manner. This must be a web application.

All requirements included below is meant to be a guideline to guide your team on how to tackle this challenge statement. You should treat this challenge like an actual work project, and not as a test. Do communicate actively with your assessors for any other additional areas to consider.

*For each module, there will be a Frontend task and an accompanying Backend task as illustrated by the table below.

Module		Basic Requirements (Frontend)	Basic Requirements (Backend)
Login	**[1]**	Employees must be able to login	Server must be able to authenticate a Employee's identity
Dashboard	**[2]**	Display Employee's claim records: Pending/ Approved/ Rejected	Return a list of claim records of an Employee from the ***Insurance Claims*** table
Transactions	**[3]**	Create new claim	Insert claim record created from frontend into ***Insurance Claims*** table
	[4]	Edit pending/ rejected claims	Edit claim record from the ***Insurance Claims*** table
	[5]	Remove pending/ rejected claims	Delete claim record from the ***Insurance Claims*** table
	[6]	-	Ensure the **LastEditedClaimDate** is updated for each change

Basic Application Requirements (Frontend):

- You must render a login page
  - Employee must be able to login **[1]**.
- You must render a dashboard
  - Display Employee's claiming records, including Pending, Approved and Rejected Claims **[2]**.
- Customers must be able to:
  - Create new claim record **[3]**
    - Enter Employee's First Name and Last Name.
    - Enter receipt number.
    - Enter or select a date value.
    - Enter a claim amount.
    - Enter a purpose for expenditure.
    - Indicate whether this claim is a follow up claim. If it is a follow up claim, the previous claim ID field should show up.[1]
  - Edit a Pending or Rejected claim record **[4]**.
    - Edit one or more of the records shown above.
  - Delete a Pending claim record **[5]**.

Basic Application Requirements (Backend):

- You must set up a valid authentication API
  - Server must be able to authenticate an Employee's identity **[1]**.
- You must set up the respective API with the following functionalities:
  - Return a list of claim records of a Employee from the ***InsuranceClaims*** table **[2]**.
  - Insert claims created from frontend into ***InsuranceClaims*** table **[3]**.
  - Edit a claim record from the ***InsuranceClaims*** table **[4]**.
  - Delete a claim record from the ***InsuranceClaims*** table **[5]**.
  - The **"LastEditedClaimDate"** in the ***InsuranceClaims*** table should be auto populated by the system **[6].**

Basic Application Requirements (Integrate):

- Integration is a crucial requirement for this hackathon. The front end and back end should be ***integrated*** seamlessly.

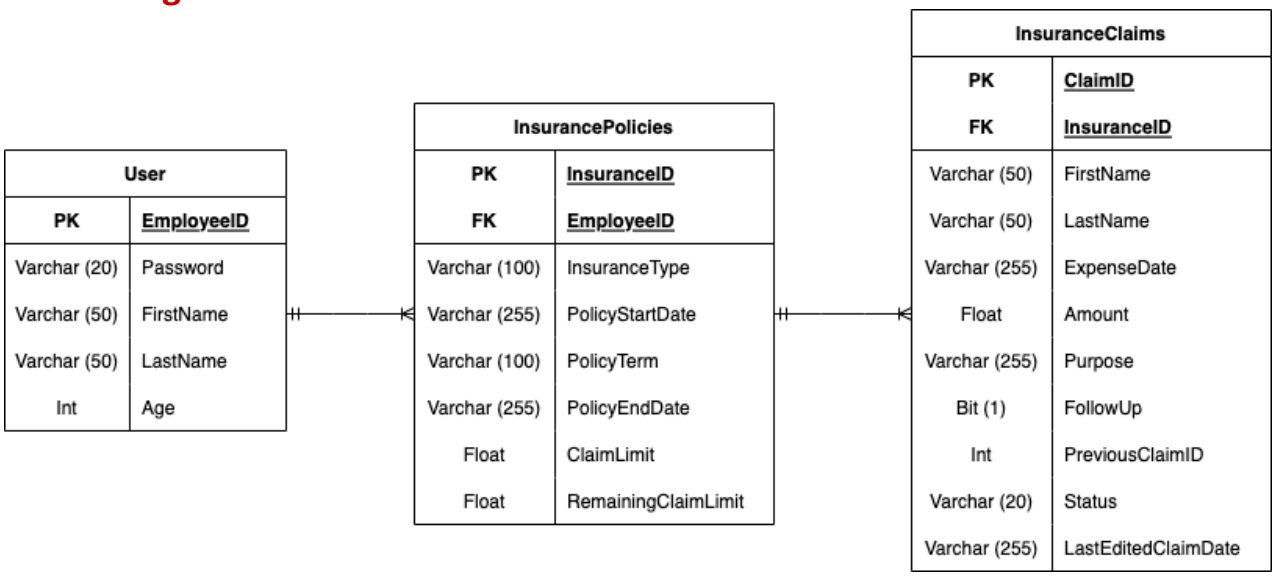
[1] For cases where the employee goes for multiple sessions/medical checkups, they will need to file their claim as a follow up.

Data provided

You will be given:

- Data in *JSON* and *SQL* format
  - The entries provided are not exhaustive and you can add more to suit the needs of your application
  - Entity Relationship Diagram (ERD). The following ER diagram is provided as a reference. We have provided datasets for ***User***, ***InsurancePolicies*** and ***InsuranceClaims*** entities.
  - The ***InsuranceClaims*** tables provided can be used to show how the CRUD is being implemented. These tables are part of the requirements **[2-5]**. You are free to add new attributes to match any new features you wish to introduce; teams **MAY** make changes so long as tasks requirements are met.

ERD Diagram[2]



[2] PolicyTerm refers to the duration that the policy will be valid for. LastEditedClaimDate refers to the date when the claim is last updated by the user.

Database Example

User Table

EmployeeID	58001001
Password	iLoveTT!23
FirstName	Irene
LastName	Lim
Age	27

Insurance Policies Table

InsuranceID	1016
EmployeeID	58001001
InsuranceType	Travel
PolicyStartDate	2023-02-28T00:00:00+08:00
PolicyTerm	1 month
PolicyEndDate	2023-03-31T00:00:00+08:00
ClaimLimit	1000.00
RemainingClaim	900.00

Insurance Claims Table

ClaimID	2023
InsuranceID	1016
FirstName	Irene
LastName	Lim
Date	2023-02-11T08:00:00+08:00
Amount	100.00
Purpose	Overseas Injury
FollowUp	0
PreviousClaimId	
Status	Approved
LastEditClaimDate	2023-02-16T15:32:24+08:00

Extension Modules

The following modules are extensions and are fully optional. You should tackle these extensions individually and showcase your knowledge in the relevant pillars. To recap, the pillars are:

1) Application Development and Support
2) DevOps and Site-Reliability Engineering
3) Data Engineering & Artificial Intelligence/Machine Learning
4) ICT Infrastructure

You will showcase your work in these modules together with the main challenge during the presentation segment of TechTrek. Each of the extension modules are separate from the Main Challenge. Do remember to highlight the pillar you are showcasing your skills in.

Do remember that these Extension Modules are meant for you to showcase your domain knowledge. You will be presenting your thoughts and decisions to the assessors, so remember to take into account their suggestions/clarifications.

Pillars	Modules	Requirements
Application Development and Support	**DEV 1**	Project Planning
	DEV 2	Application Support
DevOps and Site-Reliability Engineering	**SRE 1**	Availability and Mean Downtime
	SRE 2	SRE Principles
Data Engineering & Artificial Intelligence/Machine Learning	**AI 1**	Data treatment and cleaning
	AI 2	Develop a Random Forest Model
ICT Infrastructure	**ICT 1**	Dockerization
	ICT 2	Cloud Technology

Application Development and Support Modules

[DEV 1]

As an Application Developer, there is a need for proper planning of how the project should progress. For this challenge, you are an Application Lead in charge of this project. You are required to come up with a timeline required to develop the Main Challenge Statement into a working product for DBS.

Things to Consider:
Some things to consider includes (and are not limited to):

1. Security concerns
2. Manpower requirements
3. Cost of production
4. Timeline

Remember to justify your thought processes clearly and to the best of your ability.

[DEV 2]
As an Application Developer, there is a need to consider how best to support an application post production. For this challenge, you are an Application Support Lead, and highlight methods for the support and improvement of the application described by the Main Challenge Statement.

Things to Consider:
Some things to consider includes (and are not limited to):

1. How to push out improvements
2. Managing Downtime
3. Managing Manpower requirements
4. How to handle fallbacks

Remember to justify your thought processes clearly and to the best of your ability.

DevOps and Site-Reliability Engineering Modules

[SRE 1]

Downtime is a common challenge for development of any software. For this challenge, you are a Senior Site-Reliability Engineer. You are tasked to consider the issues of Accessibility and Mean Downtime for the application described in the Main Challenge.

Things to Consider:
Some things to consider includes (and are not limited to):

1. How to measure Accessibility
2. How to measure Mean Downtime
3. Factors to decrease Mean Downtime

Remember to justify your thought processes clearly and to the best of your ability.

[SRE 2]

To build a functional application, it is important to design and promote a service management strategy that works for your developed product. For this challenge, you are a Senior Site-Reliability Engineer. You are tasked to apply Site-Reliability Engineering (SRE) principles for an application described in the Main Challenge.

Things to Consider:
Some things to consider includes (and are not limited to):

1. Identify Service Level Objectives and Indicators
2. Develop risk acceptance and mitigation plan

Remember to justify your thought processes clearly and to the best of your ability.

Data Engineering & Artificial Intelligence/Machine Learning Modules

[AI 1]

As the world becomes more digitalized, data is generated rapidly across multiple platforms. In order to make use of these data productively, data treatment is necessary before they can be fed into models to create artificial intelligence. In this module, you will be tasked to perform data treatment on a dataset. The dataset will be given to you in csv format. It is recommended that you perform this task in Python or Excel.

ClientParticulars Dataset:

The dataset provided to you will have the following format:

- **FirstName** (String)
- **LastName** (String)
- **Gender** (String)
    - This field will take on either a "Male" or "Female" value.
- **Age** (float)
- **MarriageStatus** (String)
    - This field will take on either a "Single" or "Married" value.
- **PhoneNumber** (String)
    - This field is a combination of phone number and email address.
- **NetYearlyIncome** (float)
- **HighValueIndividual** (String)
    - This field will take on either a "Yes" or "No" value.

Note: The value of ***"NetYearlyIncome"*** will affect the value of ***"HighValueIndividual."***

Requirements:

- Remove the duplicated and unusable data. Explain how you determine that the data is unusable.
- Fill in the missing data in **"Age"**, **"MarriageStatus"**, **"HighValueIndividual"** and explain your method for doing so. Explain your considerations if any.
- Separate the phone number and email address into 2 separate columns **"PhoneNumber"** and **"EmailAddress."** The phone number should be in the format (xxx) xxx-xxxx.
- In addition to data treatment to maintain databases, data engineers are sometimes tasked to do database migration. Explain why database migration is necessary, and also outline your approach to migrate a database to another. Support your explanations with examples if necessary.

[AI 2]

With the huge amount of data available, DBS has been utilizing artificial intelligence/machine learning to solve problems. However, there have been many problems in creating a good model and evaluating its effectiveness. In this module, you are tasked to create a random forest model to predict the creditworthiness of future clients. The dataset will be given to you in csv format. It is recommended that you perform this machine learning task in Python.

ClientCreditRating Dataset:

The dataset provided to you will have the following format:

- **CreditWorthy** (String)
  - This field will take on either a "Yes" or "No" value.
- **Age** (int)
- **Education** (String)
  - This field will take on the value of "Diploma", "Bachelor", "Master" or "PhD."
- **MonthlyIncome** (int)
- **MarriageStatus** (String)
  - This field will take on either a "Single" or "Married" value.
- **HasChildren** (String)
  - This field will take on either a "Yes" or "No" value.
- **ExistingLoan** (String)
  - This field will take on either a "Yes" or "No" value.
- **PurposeOfLoan** (String)
  - This field will take on the value of "Holiday", "Investment", "Business Loan" or "Housing."

Requirements:

- Create a random forest model, rank the features in order of importance and evaluate its performance. Include **ONE** visualized tree from the training data in your solution. Explain your process in creating the random forest model, including what was done to improve its performance and ensure that the model is accurate.
- Explain your approach in determining the evaluation matrix to be used to evaluate the random forest model.
- Suppose there is insufficient training data. Explain the possible solutions for this and implement one of them in your model.
- Suggest an alternative machine learning model to be used for this dataset and explain your rationale for choosing it.

ICT Infrastructure Modules

[ICT 1]

With increased interest in cloud technology, Dockerization has developed to ease the burden between application development and cloud deployment. For this challenge, you are a Cloud Engineer Specialist. You are tasked to look into the application of Docker technology for an application described by the Main Challenge Statement.

Things to Consider:
Some things to consider includes (and are not limited to):

1. Requirements for the application to be Dockered
2. Pros and Cons of Dockerization of an application
3. Steps should an update of the application be required

Remember to justify your thought processes clearly and to the best of your ability.

[ICT 2]

Cloud services have seen an increased interest over the past few years, with more and more developers using cloud technology to deploy their applications. For this challenge, you are a Cloud Engineer Specialist. You are tasked to consider different cloud technologies available for the deployment of an application described by the Main Challenge Statement.

Things to Consider:
Some things to consider includes (and are not limited to):

1. Requirements for the application to be Cloud ready
2. Pros and Cons of the different Cloud Technologies
    a. Which option is the most cost effective
    b. Which option is the best fit for the application

Remember to justify your thought processes clearly and to the best of your ability.