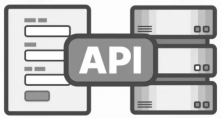

API Development (January 2025)

Mini Project

Project Overview

In this project, you will be working with other learners at your table to develop a complete web application featuring a backend consisting of API endpoints. The emphasis is on the design and implementation of the API endpoints. The web application can adopt a barebone interface. You are also allowed to use Postman to test the API endpoints.

Project Tasks

Study the business scenario carefully and perform the following tasks:

1. Conceptualise and list down a series of use cases for the web application. Use the following table format to list the use cases:

S/N	Use Case Name	Actor/User	Use Case Description

2. Design and implement a suitable relational database using SQLite to capture all the required data for supporting the use cases. The use of an object relational mapping framework is optional.

   Create the database and all the required tables. Populate the tables with some test data.

3. Design and implement all backend API endpoints for supporting the use cases. The API endpoints must be integrated with the database. You should also apply the best practices discussed in Module 2 as much as possible.

   Do also incorporate appropriate security functionalities such as cryptographic techniques, JSON web token and route protection whenever appropriate.

4. Test the API endpoints using Postman.

   You should incorporate unit testing whenever appropriate.

5. Design and implement one or more web pages using plain vanilla JavaScript and DOM to realise the use cases. Integrate the web pages with the API endpoints using the XMLHttpRequest object or fetch() API.

   Test the web pages in a browser by enabling CORS bypass.

Business Scenario

Figure 1 – Newly designed logo of CrazyBids.com

CrazyBids.com is a new Business-to-Consumer (B2C) e-commerce service to be launched by local start-up company Kent Ridge Technology ("KRT"). KRT had secured a Series A funding of S$1 million dollars from Merlion Investment Holding ("Merlion"), Singapore's largest sovereign wealth fund, in August 2022 to develop and bring-to-market CrazyBids.com. CrazyBids.com differs from conventional B2C shopping websites with its use of an innovative online auction bidding mechanism to sell its products instead of the usual fixed price mechanism.

The online auction process injects an element of fun, surprise and wholesome competition into the consumer purchase process. Consumers could potentially outbid others at the last minute to snap those elusive gadgets or jewelleries at bargain prices. Gone are the boring days of sitting in-front of a computer and just clicking the "checkout" button. CrazyBids.com promises to reinvent e-commerce!

You and your partner have recently been recruited by KRT to design and develop an enterprise-scale software system for implementing the business model of CrazyBids.com. You are all roaring to get started!

The **Online Auction System ("OAS")** allows CrazyBids.com to operate a first-party online auction service. Specifically, OAS is for selling product items based on English auction via a price ascending bid process, a form of dynamic pricing mechanism. All auctions have fixed ending times, i.e., a particular auction list will be closed when the predefined end date time is reached regardless of whether any new bid is received close to the end date time.

The auction process utilises a credit system. Customers must register for an account and purchase credit packages. The purchased credits are converted from real money on a 1:1 ratio, e.g., $100 is converted to 100 credits. Thereafter, customers can use the credits to place bids for product items.

By default, bids are placed manually by customers after they have login to the bidding system. The bid increments are determined based on the current price of an auction listing or product item. Table 1 lists the possible range of bid increments.

Current Price (Credit)	Bid Increment (Credit)
0.01 – 0.99	0.05
1.00 – 4.99	0.25
5.00 – 24.99	0.50
25.00 – 99.99	1.00
100.00 – 249.99	2.50
250.00 – 499.99	5.00
500.00 – 999.99	10.00
1,000 – 2,499.99	25.00
2,500 – 4,999.99	50.00
5,000 and above	100.00

Table 1 – Bid increments.

However, online auction is also known to cause fatigue among some customers who prefer to monitor their bids round-the-clock and constantly worry about being outbid, in particular at the last minute. To address this problem, CrazyBids.com has collaborated with **AI.SG**, another local technology start-up to develop an automated proxy bidding cum sniping agent for its premium customers. Customers whom use the software agent would need to pay an additional service fees equals to 5% of the winning bid price. This 5% revenue will be shared between AI.SG and CrazyBids.com.

CrazyBids.com's employees are responsible for placing product items for sales through the creation of auction listings. Each auction listing is for exactly one unit of a product item, and has a starting bid amount, a start date time and end date time. Customers can only view and place bids for auction listings that are currently active (defined as within the start date time and end date time). An expired auction listing is hidden and automatically closed after the end date time. Winner of a particular auction listing is determined automatically based on the following policy:

1. The auction listing has no bid and thus no winner.

2. The auction listing has no reserve price and has one or more bids – The highest bid is the winning bid.

3. The auction listing has a reserve price and has one or more bids:

    a. The highest bid is above the reserve price and thus is the winning bid.
    b. The highest bid is the same as or below the reserve price – An employee needs to manually intervene to decide whether or not to mark the highest bid as the winning bid.

Customers can view a list of won auction listings and can indicate the address for each won product item to be shipped to.