

# Campus Hiring Evaluation - Full Stack

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## Submission Guidelines

Time Allotted: 3 Hours (No additional time for pushing code to GitHub)

- Create a **Public** Repository on your Github Account with your **Roll Number** as the **Repository Name**
- Inside the repository, create 2 distinct folders, each designated for the submission of respective questions.
- Ensure that your name, or any mention of Affordmed, is entirely absent from the repository name, the README file, and all commit messages.
- For each question, submit comprehensive solutions. This includes your complete code and clear output screenshots. Incomplete submissions will not be considered for evaluation.
- We strongly encourage you to commit and push your code to GitHub regularly, at logical milestones in your development process. If you are using JavaScript or TypeScript, don't forget to add node modules to your .gitignore file.
- Please adhere to production-grade coding standards. This includes employing proper naming conventions, maintaining a well-organised folder structure, and providing

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appropriate comments within your code to enhance readability. This is only an indicative list and you are encouraged to demonstrate other best practices that you are aware of.

- For question 1, select any backend framework without utilising external libraries for algorithms. Capture output screenshots from API clients like Insomnia or Postman, **displaying request body, response and response time** for the average calculator problem. The output screenshots have to be taken of API calls to your app and not the test server
- For question 2, For the Stock Price Aggregation Problem, it is mandatory to use **React** or **Next**. While **JavaScript** is permitted, the use of **TypeScript** is preferred. Capture output screenshots of both mobile and desktop view of your web application for the Stock Price Aggregation Problem
- For Question 2, refrain from making API calls to the Test server; exclusively utilise your APIs from Question 1.
- Any instance of plagiarism, including using another applicant's API credentials, will lead to immediate rejection.

## Registration

- Before you start the test, you need to register with our Test Server.
- Your registration details, including Roll Number and Email, must align with your university/college email and roll number. (Email must support Google Form verified submission)
- Similarly, the GitHub Repository link that you shall submit in the Google Form will be matched against the github username that you submit during registration. Any mismatch will result in your submission being ignored.
- The Access Code that you need to use to authenticate yourself before accessing the test server APIs has been shared on the email that you would have received. (Don't use the Access Code present in the example below. As the name suggests, it's only an example and won't work)

## Registration API

This is an API to register your company with the test server

### Request (POST)

<http://20.244.56.144/evaluation-service/register>

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```
{  
  "email": "ramkrishna@abc.edu",  
  "name": "Ram Krishna",  
  "mobileNo": "9999999999",  
  "githubUsername": "github",  
  "rollNo": "aa1bb",  
  "collegeName": "ABC University",  
  "accessCode": "xgAsNC"  
}
```

## Response

You can register only once and cannot get the credentials again. **DON'T FORGET TO SAVE THIS!**

```
{  
  "email": "ramkrishna@abc.edu",  
  "name": "ram krishna",  
  "rollNo": "aa1bb",  
  "accessCode": "xgAsNC",  
  "clientID": "d9cbb699-6a27-44a5-8d59-8b1befa816da",  
  "clientSecret": "tVJaaaRBSeXcRXeM"  
}
```

## Authorisation Token API

This is an API to obtain the Authorisation Token for your company

### Request (POST)

<http://20.244.56.144/evaluation-service/auth>

```
{  
  "email": "ramkrishna@abc.edu",  
  "name": "ram krishna",  
  "rollNo": "aa1bb",  
  "accessCode": "xgAsNC",  
  "clientID": "d9cbb699-6a27-44a5-8d59-8b1befa816da",  
  "clientSecret": "tVJaaaRBSeXcRXeM"  
}
```

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## Response: (Status Code: 200)

```
{
  "token_type": "Bearer",
  "access_token":
    "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJYXBDdGFpbXMiOnsiZXhwIjoxNzQzNTc0MzQ0L",
    "expires_in": 1743574344
}
```

# Develop a Stock Price Aggregation HTTP Microservice

As a developer, you have been provided with access to the APIs of a stock exchange. Your task is to build the APIs detailed below that deliver real-time insights to various market participants

- Your users are assumed to be pre-authorized. Therefore, your application must not require user registration or login for accessing your APIs.
- The server's API provides data on stocks, and their respective price history.
- Your microservice should consist of these APIs
  - **Average Stock Price in the last “m” minutes:**
    - **Method:** GET
    - **Route:** `http://hostname/stocks/:ticker?minutes=m&aggregation=average`
    - **Response:**

```
{
  "averageStockPrice": 453.569744,
  "priceHistory": [
    {
      "price": 231.95296,
      "lastUpdatedAt": "2025-05-08T04:26:27.4658491Z"
    },
    {
      "price": 124.95156,
      "lastUpdatedAt": "2025-05-08T04:30:23.465940341Z"
    }
  ]
}
```

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```
{
  },
  {
    "price": 459.09558,
    "lastUpdatedAt": "2025-05-08T04:39:14.464887447Z"
  },
  {
    "price": 998.27924,
    "lastUpdatedAt": "2025-05-08T04:50:03.464903606Z"
  }
]
```

- Consider the efficient storage and retrieval of stock prices.
- **Correlation of Price Movement between 2 stocks in the last “m” minutes:**
  - **Method:** GET
  - **Route:** <http://hostname/stockcorrelation?minutes=m&ticker={NVDA}&ticker={PYPL}>
  - **Response:**

```
{
  "correlation": -0.9367,
  "stocks": {
    "NVDA": {
      "averagePrice": 204.000025,
      "priceHistory": [
        {
          "price": 231.95296,
          "lastUpdatedAt": "2025-05-08T04:26:27.4658491Z"
        },
        {
          "price": 124.95156,
          "lastUpdatedAt": "2025-05-08T04:30:23.465940341Z"
        },
        {
          "price": 459.09558,
          "lastUpdatedAt": "2025-05-08T04:39:14.464887447Z"
        },
        {
          "price": 998.27924,
          "lastUpdatedAt": "2025-05-08T04:50:03.464903606Z"
        }
      ]
    },
    "PYPL": {
      "averagePrice": 458.606756,
```

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```

    "priceHistory": [
      {
        "price": 680.59766,
        "lastUpdatedAt": "2025-05-09T02:04:27.464908465Z"
      },
      {
        "price": 652.6387,
        "lastUpdatedAt": "2025-05-09T02:16:15.466525768Z"
      },
      {
        "price": 42.583908,
        "lastUpdatedAt": "2025-05-09T02:23:08.465127888Z"
      }
    ]
  }
}

```

## ■ Formula for Correlation:

- Covariance:

$$\text{cov}(X, Y) = \frac{\sum_{i=1}^n (X_i - \bar{X})(Y_i - \bar{Y})}{n-1}$$

- Standard Deviation

$$\sigma_X = \sqrt{\frac{\sum_{i=1}^n (X_i - \bar{X})^2}{n-1}}$$

- Pearson's Correlation Coefficient:

$$\rho = \frac{\text{cov}(X, Y)}{\sigma_X \sigma_Y}$$

- Consider the disparity in available data for different stocks in the same time interval and time alignment of chosen tickers.
- More than 2 tickers shouldn't be supported for correlation simultaneously
- Each API call made by your application to the test server incurs a cost, which will negatively affect your test score.
- Your users require a responsive, performant, and accurate experience. Therefore, any attempts to minimise costs must not compromise user experience or display outdated data.

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- Your microservice must exclusively consume the test server API for data retrieval and must not utilise any third-party APIs. Nor should you create your own APIs for Users or Posts or Comments that have already been provided in the test server.
- The stock exchange reserves the right to modify the sorting order or data at any time, without prior notice, and at any frequency. Your application must be capable of adapting to these changes. Your choice of data structures and algorithms will be critical in ensuring your application remains performant and adaptable to these potential changes.

## Test Stock Exchange APIs

These sample API requests and responses are intended only as an example. Using the exact same request may not result in a matching response

### Get Stocks API

This is an API to obtain the stocks listed on the stock exchange

#### Request (GET)

Route with no pre-filled values

```
http://20.244.56.144/evaluation-service/stocks
```

#### Response

```
{
  "stocks": {
    "Advanced Micro Devices, Inc.": "AMD",
    "Alphabet Inc. Class A": "GOOGL",
    "Alphabet Inc. Class C": "GOOG",
    "Amazon.com, Inc.": "AMZN",
    "Amgen Inc.": "AMGN",
    "Apple Inc.": "AAPL",
    "Berkshire Hathaway Inc.": "BRKB",
    "Booking Holdings Inc.": "BKNG",
    "Broadcom Inc.": "AVGO",
    "CSX Corporation": "CSX",
    "Eli Lilly and Company": "LLY",
    "Marriott International, Inc.": "MAR",
    "Marvell Technology, Inc.": "MRVL",
    "Meta Platforms, Inc.": "META",
    "Microsoft Corporation": "MSFT",
    "Nvidia Corporation": "NVDA",
    "PayPal Holdings, Inc.": "PYPL",
    "TSMC": "2330TW",
    "Tesla, Inc.": "TSLA",
    "Visa Inc.": "V"
  }
}
```

## Get Specific Stock API

This is an API to obtain the price history of a particular stock during the recently elapsed time (in minutes).

### Request (GET)

Route with no pre-filled values

```
http://20.244.56.144/evaluation-service/stocks/:ticker?minutes=m
```

Route for Nvidia Corporation's Price

```
http://20.244.56.144/evaluation-service/stocks/NVDA
```

### Response:

```
{
```

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```
"stock": {  
  "price": 521.69464,  
  "lastUpdatedAt": "2025-05-03T06:25:49.559294489Z"  
}
```

Route for Nvidia Corporation's Price in the last 50 minutes

<http://20.244.56.144/evaluation-service/stocks/NVDA?minutes=50>

## Response:

```
[  
  {  
    "price": 666.66595,  
    "lastUpdatedAt": "2025-05-08T04:11:42.465706306Z"  
  },  
  {  
    "price": 212.9439,  
    "lastUpdatedAt": "2025-05-08T04:14:39.465201105Z"  
  },  
  {  
    "price": 163.42203,  
    "lastUpdatedAt": "2025-05-08T04:23:30.465542126Z"  
  },  
  {  
    "price": 231.95296,  
    "lastUpdatedAt": "2025-05-08T04:26:27.4658491Z"  
  },  
  {  
    "price": 124.95156,  
    "lastUpdatedAt": "2025-05-08T04:30:23.465940341Z"  
  },  
  {  
    "price": 459.09558,  
    "lastUpdatedAt": "2025-05-08T04:39:14.464887447Z"  
  },  
  {  
    "price": 998.27924,  
    "lastUpdatedAt": "2025-05-08T04:50:03.464903606Z"  
  }  
]
```

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# Develop a React based Stock Price Aggregation Frontend Web Application

Develop a responsive React frontend web application that delivers real-time analytical insights.

- Your React application must run exclusively on <http://localhost:3000>.
- Your application should consist of the following pages
  - **Stock Page:** Chart the prices of the stock over the specified time frame along with the average being distinctly highlighted. The user should be able to select different time intervals to alter the last m minutes for which the stock prices have to be displayed. Suitable UI features and concepts should be leveraged to display key stock details on hover or selection of data points on the chart.
  - **Correlation Heatmap:** Display a heatmap showing the variations in correlation between all the stocks over the last “m” minutes. Suitable UI features and concepts should be leveraged to display the average and standard deviation of a stock's price within the last 'm' minutes upon selecting or hovering over its label on either axis of the heatmap. The heatmap should also provide a suitable color legend indicating the correlation strength (e.g., from strong positive to strong negative).
- Your React application should be integrated with the backend APIs that you have developed, leveraging it for data retrieval as well as calculations and no calls must be made by your React Application to the test server APIs.
- Use Material UI only. If you aren't familiar with Material UI, employ native CSS. Use of ShadCN or other CSS Libraries is prohibited. Solely relying on native CSS or not using Material UI will result in lower scores. The UI must prioritise user experience, with a focus on highlighting key elements of each page.