Zurich Technical Assignment

version 1.0.27

Run API Unit Test passing

Run UI Unit Test passing

TYPESCRIPT MONGODB REACT SWAGGER NESTJS AMAZON AWS

- Demo Website Link (AWS Cloudfront)

This project aims in creating a Web Application to meet the requirements of the UI technical assignment. **Built entirely with Typescript !!**

TLDR;

Technical Assignments (with description)

With this in mind, Zurich is concerned about:

- *React hosting solutions*
    - I decided to use AWS CDK (Cloudformation) to deploy React as a SPA
- *React security, how to secure home page from unauthorized access*
    - Using JWT Session Token (provided by Google OAuth 2.0 Redirect)
- *Proper used of React Redux reducer and actions*
    - Please find all redux store and reducers under `ui/src/commons/state` folder
- *Reusable react components*
    - All components are reusable and can be found in `ui/src/components` folder
- *How to make secure API call from react which require authentication*
    - I used `NestJS` + `Mongo DB` + `Google OAuth 2.0 URI Redirect`

Important Links

- Link to the Technical Assignment
- Links to API Swagger documentation
    - Users Module
    - Auth Module
    - Health Module
- Nest JS
- Create React App Template
- AWS CDK v2 Documentation
- Deployment Serverless API with NestJS and AWS CDK
- Mongo DB Atlas

Design and Architecture

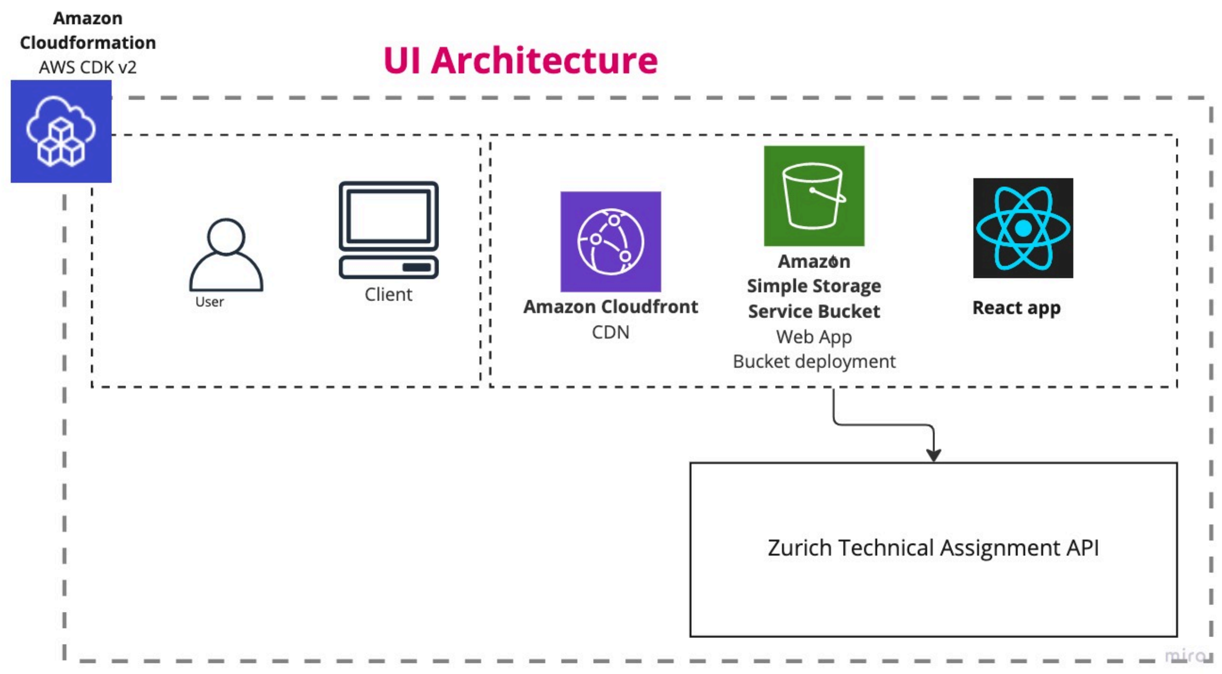
This Project (app) is built by leveraging IaaS (Infrastructure as a Service). The framework used is AWS CDK v2 (which is built on top of cloudformation and written in Typescript).

Infrastructure

- AWS CDK v2, makes it easy to scaffold on AWS cloud using Level 2 constructs.
- Using AWS CDK v2, you can easily maintain AWS Cloud resources under a single stack (Cloudformation stack)
- You can unit test your Tech stack, to make sure the right resources (and right count) are being deployed. which is a huge benefit
  - npm run test
- The CDK CLI offers easy to use build scripts to Create, Scale and Destroy all resources under a particular stack,
  - cdk bootstrap
  - cdk synth
  - cdk deploy
- If setup correctly, The stacks can be deployed individually or as a whole

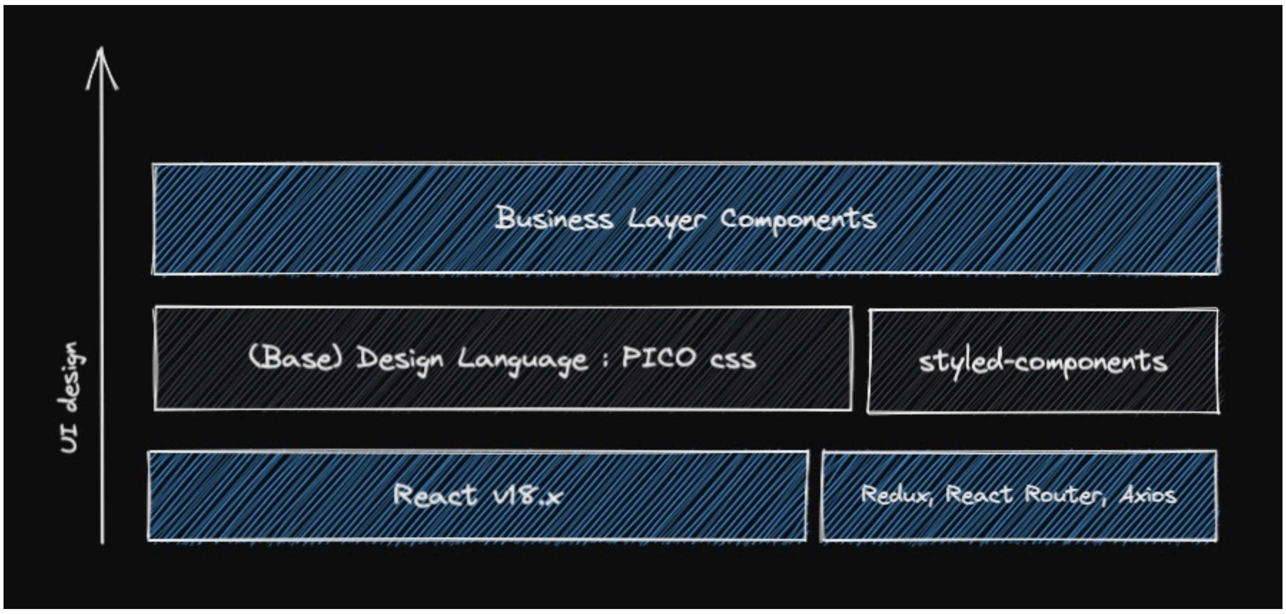
Frontend / UI Layer Architecture and Tech Stack

The Frontend is built using React v18.x and Redux (in Typescript). On the infrastructure, it consists of a S3 bucket hosting React App, connected to cloud front and served on HTTPS.



Technology Stack used

- React v18.x - scaffolding using `create-react-app`
- Typescript
- Redux - State management library
- React Router Dom - Client side routes
- Axios - Making Async calls to the Server
- PicoCSS - Lightweight UI design library, great for POCs
- Styled Components - Styling component library
- Toastify - Notification library
- Jest - All Unit testing is done using Jest
- Github Actions (UI_test.yml) - Created a Github workflow to show build is passing and show the coverage
- AWS CDK v2 - Hosting


UI design
Business Layer Components
(Base) Design Language : PICO css
styled-components
React v18.x
Redux, React Router, Axios

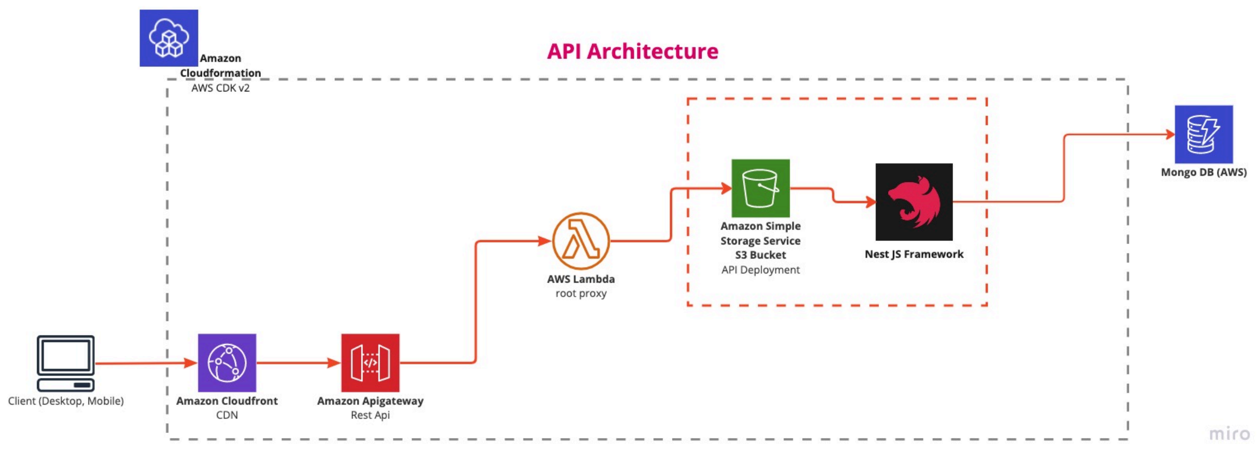
How to run it and deploy

- Navigate to the project root folder `<root-folder>/ui`
- Run `npm i`
- Run `npm start`
- In order to deploy, I have setup automation shell scripts under `<root-folder>/automation/scripts`
- Run `zsh ui-clean.sh` to clean src files
- Run `zsh ui-build.sh` to create a new build
- Run `zsh ui-deploy.sh` which copies it into aws -> `build` folder
- Then run `cdk deploy --ZurichTechSiteStack`

Backend / API Layer Architecture

The Backend API / Rest service is built using Nest JS. On the infrastructure, it consists of a S3 bucket for hosting and Lambda services and Apigateway which act as a proxy to the request response going in and out of Nest JS.

The API is located under the following path:
`./aws/lambda/api/`



Technology Stack Used

- NestJS v8.x - Restful API framework
- Typescript
- MongoDB Cloud - Database persistance layer
- OAuth2.0 Google strategy - OAuth2.0 sign on using Google
- cross fetch - Node JS client library for making Async calls to 3rd party API
- aws-lambda - AWS proxy server to the root API
- esbuild - Javascript deployment library to AWS cloud
- Jest - All Unit testing is done using Jest
- Github Actions (API_test.yml) - Created a Github workflow to show build is passing and show the coverage
- AWS CDK v2 - Hosting

> NOTE: for the sake of the demo, I had to deploy the API on `Heroku Cloud` since I had some last minute problems transitioning the API code from AWS CDK v1.168.0 to AWS CDK v2.0. But I've provided the API cloudformation template along with API code in `aws` folder

The RESTful API code is located at `/aws/lambda/api`

How to run it and deploy

- Navigate to the project root folder `<root-folder>/aws/lambda/api/`
- Run `npm i`
- Run `npm start:dev` to run it locally on port 3001
- In order to deploy, I have setup automation shell scripts under `<root-`

`folder>/automation/scripts`
- Run `zsh api-clean.sh` to clean src files
- Run `zsh api-build.sh` to create a new build
- Then run `cdk deploy --ZurichTechAPIStack` to deploy to AWS cloud

Testing and Automation

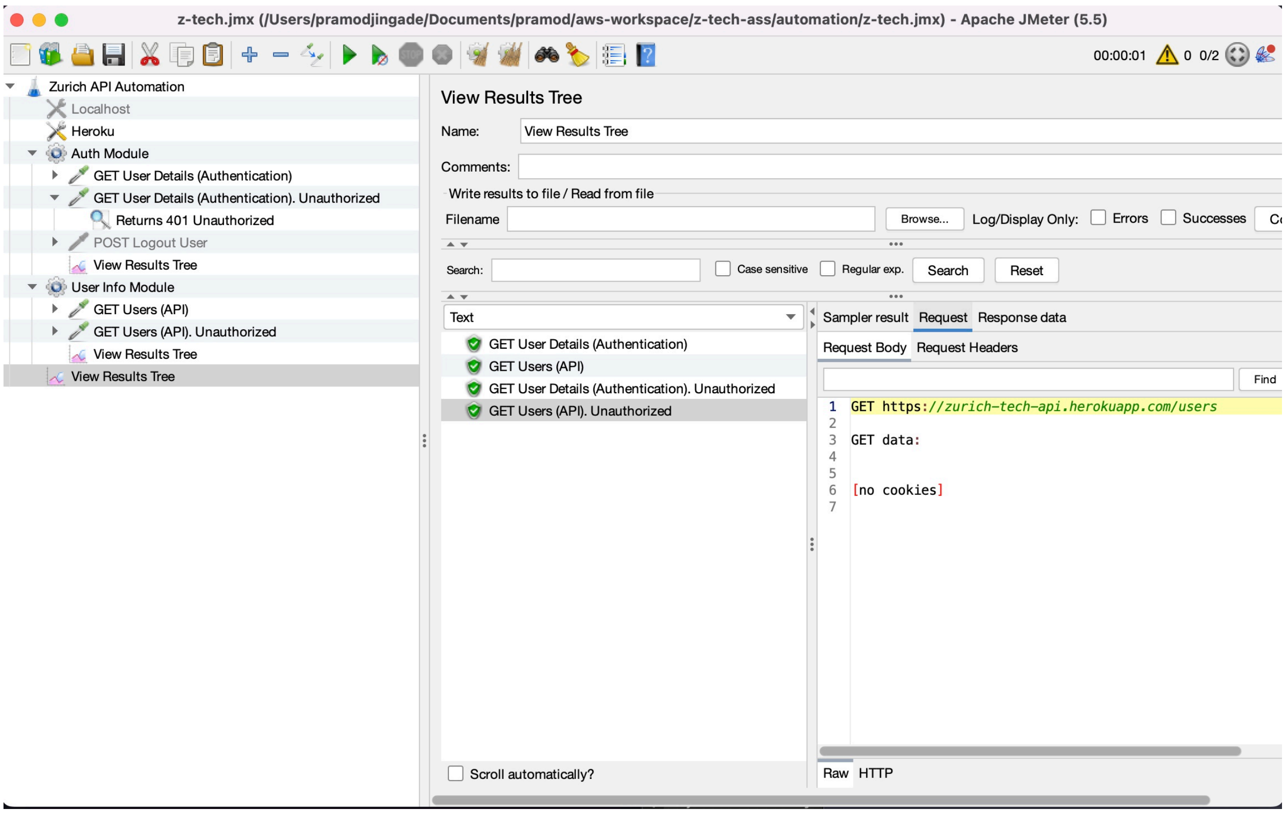
Unit Testing

Both the frontend and API were built using `Test driven development` approach. Given the timeframe, I have not been able to achieve >80% code coverage but written just enough to touch every aspect of code. 😅

- Unit Testing & Code coverage reports for UI can be found in the repository > actions > `Run UI Unit Test`
- Unit Testing & Code coverage reports for API can be found in the repository > actions > `Run API Unit Test`
- ❗ Unit Testing & Code coverage for AWS cloudformation has to be run locally, Github has problems setting up the AWS env on the cloud.
  - Navigate to `aws/`
  - run `npm i`
  - run `npm run test` to see the unit test result.

Automation

- I used `JMeter` to show the API Automation. The JMeter file can be found in - `automation/z-tech.jmx`



```
GET https://zurich-tech-api.herokuapp.com/users

GET data:


[no cookies]

```

Swagger Documentation

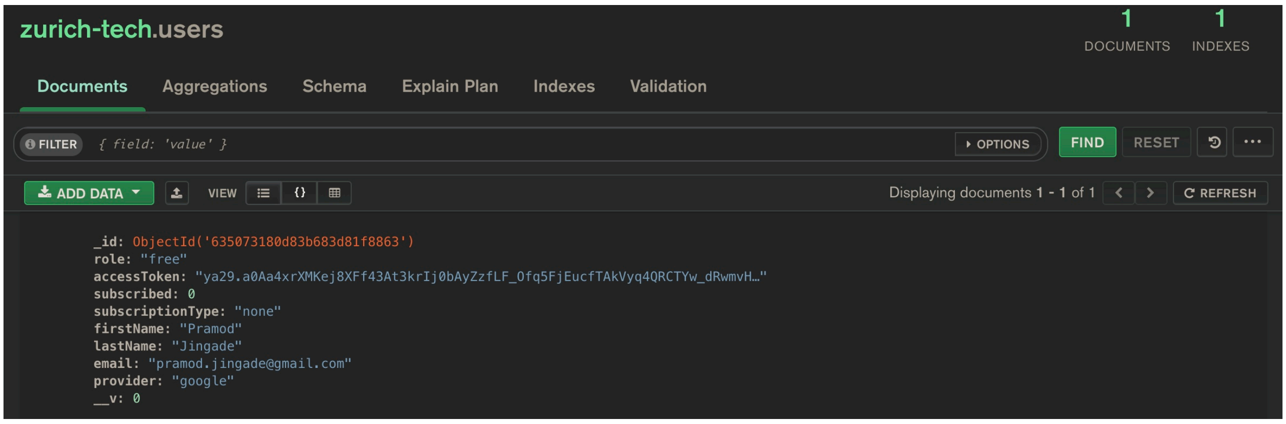
Nest JS framework provides good support for OpenAPI specification.

- Links to API Swagger documentation
    - Users Module
    - Auth Module
    - Health Module

Challenges Faced

- I had trouble deploying the API to AWS cloud in the given timeframe mainly due to -
    - the cloudformation template I was using earlier to deploy were all AWS CDK v1.168.x
    - I encountered deployment errors especially on the API side, so as last minute effort deploy the code to heroku to show it works
- Unnecessary use of a DB -
    - right now the Mongo DB is used purely to store the users who sign up for the first time, this is not required but for the sake of simplicity I added in

Mongo DB



```
_id: ObjectId('635073180d83b683d81f8863')
role: "free"
accessToken: "ya29.a0Aa4xrXMKej8XFf43At3krIj0bAyZzfLF_0fq5FjEucfTAkVyq4QRCTYw_dRwmvH…"
subscribed: 0
subscriptionType: "none"
firstName: "Pramod"
lastName: "Jingade"
email: "pramod.jingade@gmail.com"
provider: "google"
__v: 0
```

```
- The DB doesn't store `any sensitive` information apart from
Google email and first and last name and the jsonwebtoken that
Google provides
```

- Split architecture
  - I typically use the API to statically serve the UI in the same location as the API server. This is because I can make use of `cookies` for session storage
  - Due to the assignment requesting use of AWS, I had to split the frontend and API into 2 cloudformation templates
  - This would mean I cannot make use of Cookies to communicate session between the server and the client
  - I send the JSON token as part of the URL and the React application has a React hook to read it and store as part of the localStorage
  - JSON web tokens are `URL safe!!` plus they have expiry time of 24 hours `{exp: '24h'}`