An Industrial Internship Report

Submitted in partial fulfillment for the award of the degree of

B. Tech

in

Information Technology

by

Priyal Bhardwaj 18BIT0272

December, 2021

DECLARATION BY THE CANDIDATE

I hereby declare that the project report entitled **"INDUSTRIAL INTERNSHIP REPORT"** submitted by me to School of Information Technology & Engineering, Vellore Institute of Technology University, Vellore in partial fulfillment of the requirement for the award of the degree of **B.Tech (Information Technology)** is a record of bonafide **Industrial Internship – (ITE3099)** work carried out by me. I further declare that the work reported in this **Industrial Internship report** has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in this institute or any other institute or university.

Place: Vellore

Date: 1st December, 2021 Priyal Bhardwaj

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

School of Information Technology & Engineering [SITE]

CERTIFICATE

This is to certify that the Industrial Internship report entitled **"INDUSTRIAL INTERNSHIP"** submitted by **Priyal Bhardwaj (18BIT0272)** to School of Information Technology & Engineering, Vellore Institute of Technology University, Vellore in partial fulfillment of the requirement for the award of the degree of **B.Tech (Information Technology)** is a record of bonafide **Industrial Internship – (ITE3099)** work carried out by her in **Optum – UnitedHealth Group**. The **Industrial Internship** project fulfills the requirements as per the regulations of this Institute.

Examiner – Panel In-Charge **Date** 01-12-2021

(Name and Signature)

Dr.V.Manjula

COMPANY CERTIFICATE XEROX TO BE ENCLOSED HERE

To Whom It May Concern

Date: 3-Sep-2021

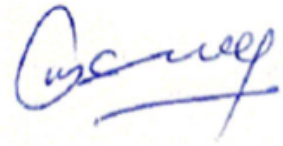
Name: Priyal Bhardwaj

Unique ID: 001688970

This is to certify that **Priyal Bhardwaj D/o UNMESH BHARDWAJ** has completed her internship with **Optum Global Solutions (India) Pvt. Ltd** as an Intern with Technology division from **16-Jun-2021** to **15-Aug-2021**. Her conduct during the aforesaid period was found to be satisfactory.

We wish her all the best in her future endeavor.

For Optum Global Solutions (India) Pvt. Ltd



Sumek Gopal

Vice President I Human Capital

ACKNOWLEDGEMENT

I would like to thank Mr. Andrew Witty, CEO of Optum - UnitedHealth Group, for giving me the opportunity to work there. I would also like to express my sincere gratitude towards Mr. Rajat Bansal (Sr. Manager), Mr. Venkat Reddy (Manager), Mr. Gaurav Nagpal (Mentor) and Mr. Sonu Mehta (Quality Consultant), at Optum - UnitedHealth Group, for their valuable and constructive suggestions during my time there. I would also like to thank my fellow teammates for working with me and helping me throughout the project.

Special thanks to the School of Information Technology, VIT, and its faculties for providing me with the knowledge required to work at Optum - UnitedHealth Group. I would also like to express my sincere gratitude towards my parents and friends for believing in me and supporting me throughout my journey.

TABLE OF CONTENTS

THE COMPANY: OPTUM – UNITEDHEALTH GROUP

ABOUT

1.11 Introduction

Optum - UnitedHealth Group, is an American pharmacy benefit manager and health care provider. It is a subsidiary of UnitedHealth Group since 2011. UHG formed Optum by merging its existing pharmacy and care delivery services into the single Optum brand, comprising three main businesses: OptumHealth, OptumInsight and OptumRx. In 2017, Optum accounted for 44 percent of UnitedHealth Group's profits and as of 2019, Optum's revenues have surpassed $100 billion. Optum has been operating in India since 2006 and has teams supporting health care operations, product development, automation, analytics and data solutions.

1.12 Work

Optum is a **health information technology and services firm** that is part of UnitedHealth Group. It provides technological, operational and consulting solutions and services to individuals, healthcare organizations, pharmaceutical companies as well as the federal and state governments.

1.13 Product

Earlier, a lot of companies followed Waterfall methodologies where releasing apps were scheduled once per year or even on longer intervals. But with the evolution of technologies, Agile development started to be adopted. The release cycles for most apps got shorter and shorter - from 1-2 weeks to a couple of

times per day. Earlier, following waterfall methodology the apps were manually tested. But with the shortening of the cycles over and over again, it became difficult to keep up. This is also so, because with time old applications got bigger and bigger. The companies needed more testers or had to release their apps with a higher risk of bugs which reduces reliability as already mentioned. For this primary problem, the test automation serves as a solution. ETAAS stands for enterprise test automation as a service. The aim of this project is to run tests automatically with little or no manual intervention in order to make the overall development and testing process easy and efficient. The key factor of ETAAS is automation. The basic expectation of ETAAS is to create common methods for all 4 types testing which can be used to test a wide range of projects and the tester could also perform complex testing scenarios like API validation, UI check and performance check in a single scenario. Finally, automation enables the tester/developer to focus on other issues such as customer needs, functionalities and improvements.

1.14 Benefit of the Product

The key factor of ETAAS is: automation. The testing process is automated as the user simply has to interact with the UI to create projects and testcases. All this can be done only after the user has successfully onboarded and details regarding his projects and testcases will be saved in one single space. Also, the tests can be recycled and reused for other projects so we do not have to go through the whole process again. The aim of ETAAS could be creating Generic methods required for testing UI using Selenium, API using RestAssured, Front-end performance using SauceLabs and Security using Zap alongside creating common methods for all 4 types testing which can be used to test a wide range

of projects and the tester could also perform complex testing scenarios like API validation, UI check and performance check in a single scenario.

DEVELOPMENT TEAM

1.21 Scrum Master

Mr. Lalit Gandhi

He was the Scrum Master for our team and conducted daily scrum meetings in which we had to update our tasks and discuss and technical issues we had faced.

1.22 Senior Manager

Mr. Rajat Bansal

He took care of any Virtual Desktop Infrastructure (VDI) issues and regularly gave insights on the project. He helped immensely while preparing for reviews with the Senior Directors.

1.23 Senior Software Developer

Mr. Gaurav Nagpal

All tasks were to be discussed with him. He was to be contacted in case of any doubts. He conducted daily progress meetings to check the functionality and progress and assign new tasks.

Mr. Venkat Reddy

In Gaurav Sir's absence he was to be approached for any issues.

1.24 Stakeholder

Mr. Sonu Mehta

He was the main stakeholder for the project and was to be approached for any doubts regarding the whole idea of the project.

1.25 Frontend Team

At the time of my joining, the Frontend Team had 2 members who were also fellow interns.

1.26 Backend Team

The Backend Team did not have anyone apart from myself though I was encouraged to include other interns as well if needed.

RESPONSIBILITIES

2.11 Post

I joined the team as a Software Development Intern.

2.12 Duration

My internship started on 16th June, 2021, for a period of 2 months. I officially completed my internship on 15th August, 2021

2.13 Working Hours

The working hours were flexible and the working days were from Monday to Friday. Sometimes due to a deadline, it got extended to Saturdays as well.

MEANS OF COMMUNICATION

2.21 Meetings

Regular meetings were conducted on Microsoft Teams, at least twice day.

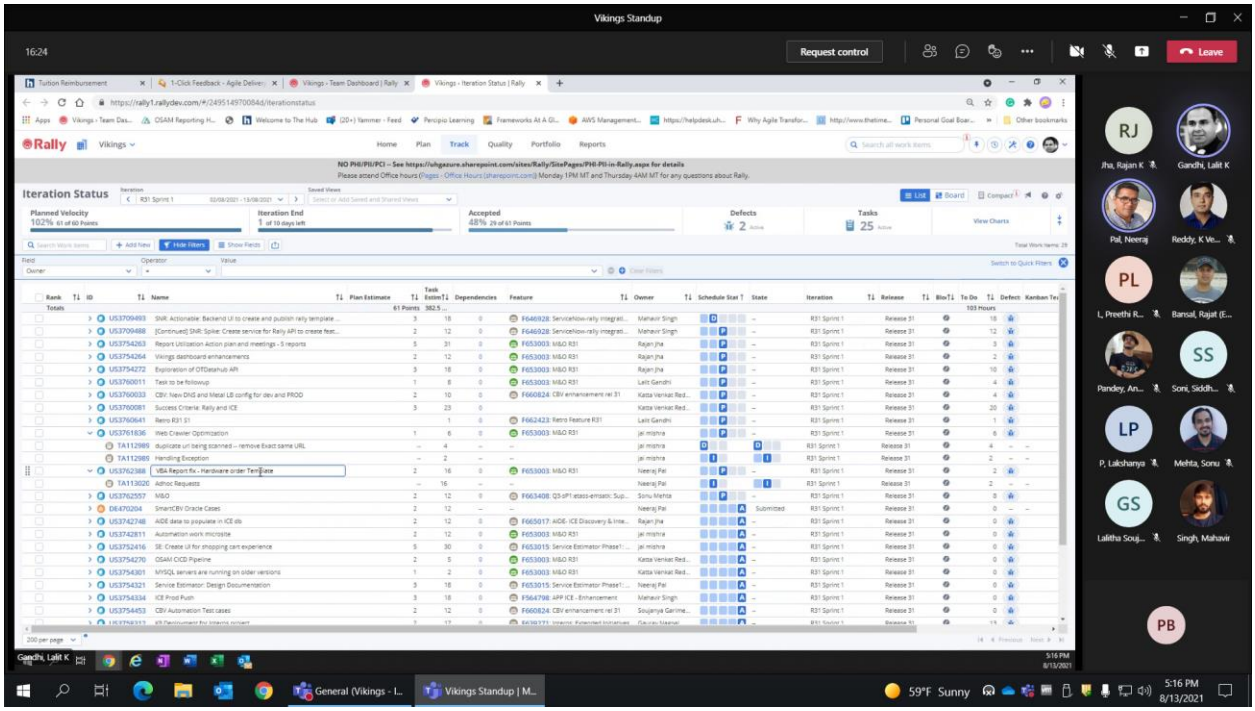
2.22 Agenda of the meetings

In the meetings, I had to give a detailed description of what I was working on, the extent of completion, by when will it be completed and what is the progress of the project. I was also told about the next functionality I have to develop after my current work has been completed. In the meeting, further functionalities tobe built were discussed.

2.23 Other communication

Apart from meetings, quick calls were also done at times to discuss any bugs of utmost importance.

After the deployment of the project, meetings were conducted to discuss bugs, additional features or to conduct a Usability Test.



DAY TO DAY ACTIVITIES

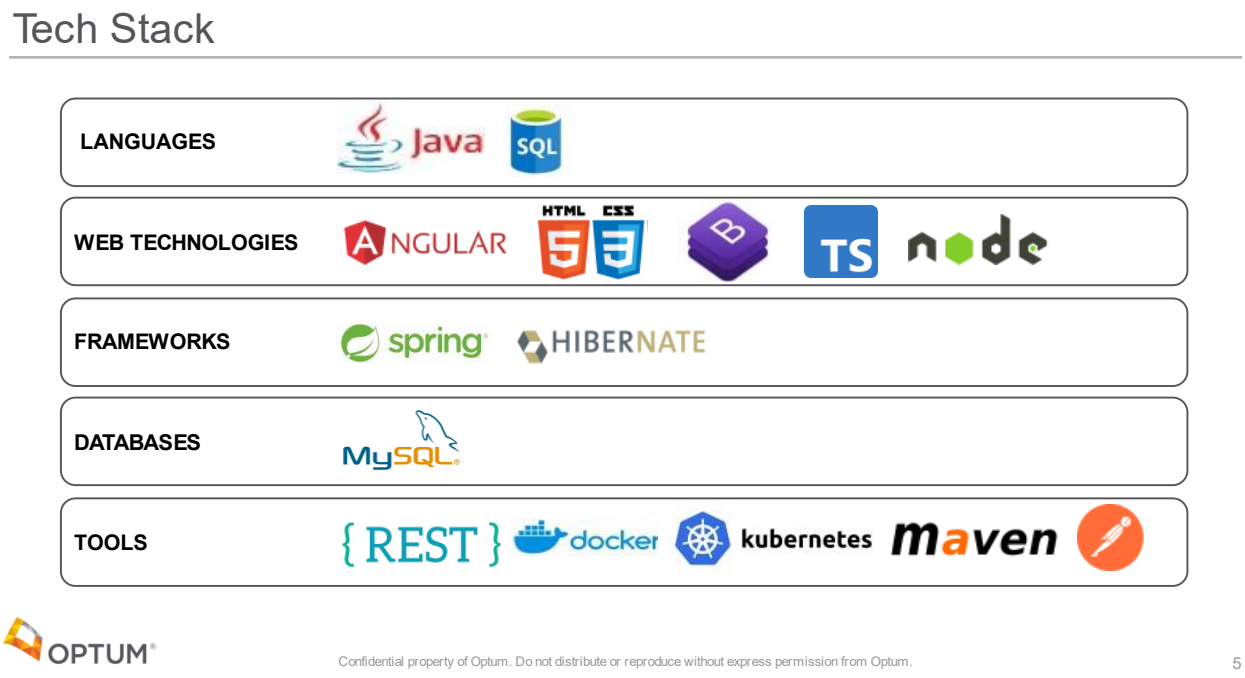
- Create ER Diagram for the modules as per the user requirement for the project.
- Develop the REST APIs using Spring Boot, a Java Framework, and any SQL Database (preferable MySQL).
- Test the modules, using any software testing tools, like Postman and send it to the supervisor.
- Create proper documentation of the REST APIs developed and deliver it to the Frontend Team.
- Assist in the integration of the REST APIs to Front-end, using AngularJS.
- Help in the deployment of the web-app using Docker and Kubernetes.
- Attend meetings regularly through Microsoft Teams.
- Meet deadlines and be available whenever required by the team.
- Ensure that the Backend Tasks are completed on time and ready for smooth integration with Front-end.

MODULES DEVELOPED

- Spring Rest API for LDAP Login
- Spring Rest API for JWT authorization
- ER Diagrams
- Implemented ER diagrams in MySQL
- Spring Rest API using Hibernate for Projects page and Testcases

- API testing using Postman
- Integration of APIs with Frontend
- Deployment of APIs on Docker and Kubernetes via GitHub

LANGUAGES, FRAMEWORKS, TOOLS AND SERVICES USED



DEVELOPMENT PHASE

3.11 Java

Java is a high-level, class-based, object-oriented programming language that is designed to have as few implementation dependencies as possible. It is used as the server-side language for most back-end development projects, including those involving big data and Android development. It's free and open source.

3.12 Spring Boot: Open-Source Java Framework

It is used to create a micro service. It provides infrastructure for developing Java applications.

3.13 MySQL: Database used locally.

MySQL is an open-source relational database management system.

3.14 Hibernate: Object Relational Mapping (ORM) Java Framework

It simplifies the development of Java application to interact with the database. It implements the specifications of Java Persistence API (JPA) for data persistence.

3.15 Rest API: Application Programming Interface

Representational state transfer is a software architectural style that was created to guide the design and development of the architecture for the World Wide Web. REST defines a set of constraints for how the architecture of an Internet-scale distributed hypermedia system, such as the Web, should behave

TESTING PHASE

3.21 Git and GitHub:

Git is a free and open-source distributed version control system designed to handle everything from small to very large projects with speed and efficiency. Git is easy to learn and has a tiny footprint with lightning-fast performance. It is used for tracking changes in source code during software

development. It is designed for coordinating work among programmers, but it can be used to track changes in any set of files. Its goals include speed, data integrity, and support for distributed, non-linear workflows.
GitHub provides hosting for software development and version control using Git. It offers the distributed version control and source code management (SCM) functionality of Git, plus its own features. It provides access control and several collaboration features such as bug tracking, feature requests, task management, continuous integration and wikis for every project.

Through this internship, I learnt the version control mechanisms very well. I learnt how to collaborate with the development team and work together on a project. I learnt the ins and outs of Git and the various command line arguments like, push, pull, rebase, merge and other commands used for collaboration and version control.

3.22 Postman

Postman is a great tool to test RESTful APIs I had made. It offers a sleek user interface with which to make HTML requests, without the hassle of writing a bunch of code just to test an API's functionality.

Postman is a collaboration platform for API development. Postman's features simplify each step of building an API and streamline collaboration so to help create better APIs—faster.

Postman has various features, but I learnt how to test the developed Software (Rest API) on it, using the API Client. It provides a very easy interface to test any HTTP Request—get, post, put, patch, delete or more. A number of custom features are available like setting different body types or

formatting the response.

Postman also helps in documenting the REST APIs for the easy integration in the Frontend. Postman's API documentation tool generates beautiful, machine-readable documentation for the API and automatically keeps it up to date. While testing itself, proper documentation takes place without extra efforts.

I learnt how to use Postman as an API Testing tool very well.

DEPLOYMENT PHASE

3.31 Docker

Container deployment is **a method for quickly building and releasing complex applications**. Docker container deployment is a popular technology that gives developers the ability to construct application environments with speed at scale.

3.32 Kubernetes

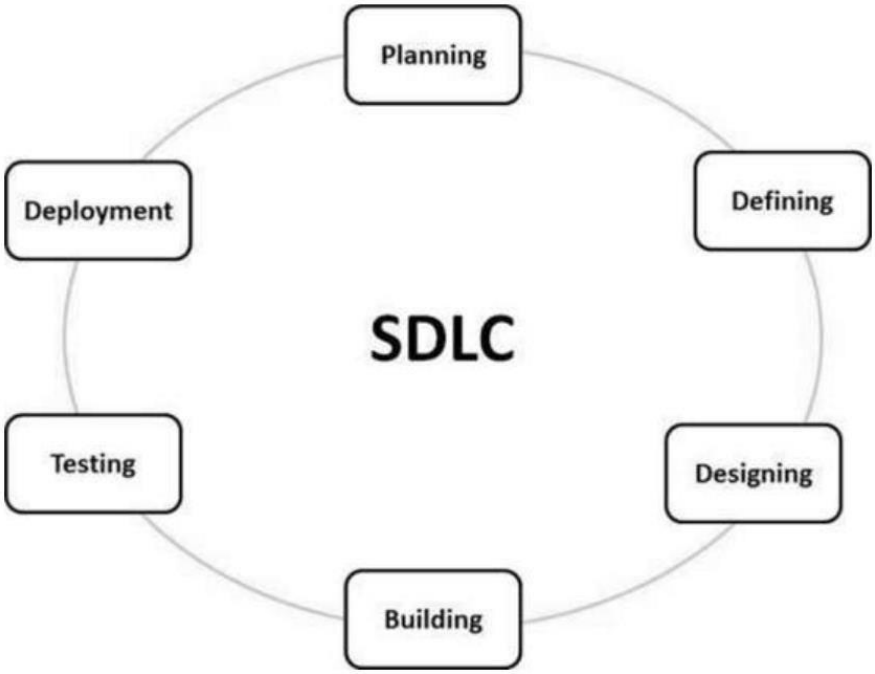
Kubernetes is an **open-source system** which allows you to run containers, manage them, automate deploys, scale deployments, create and configure ingresses, deploy stateless or stateful applications, and many other things.

I went through the basics of Docker and Kubernetes hosting to assist the team during deployment of the application. It was not a major part of my job.

PROCESS OF DEVELOPMENT

SOFTWARE DEVELOPMENT LIFE CYCLE

The complete development of the Software followed the Software Development Life Cycle strictly



4.11 Planning: My mentor planned on what had to be done.

4.12 Defining: On the basis of the plan required, I decided what tools are required

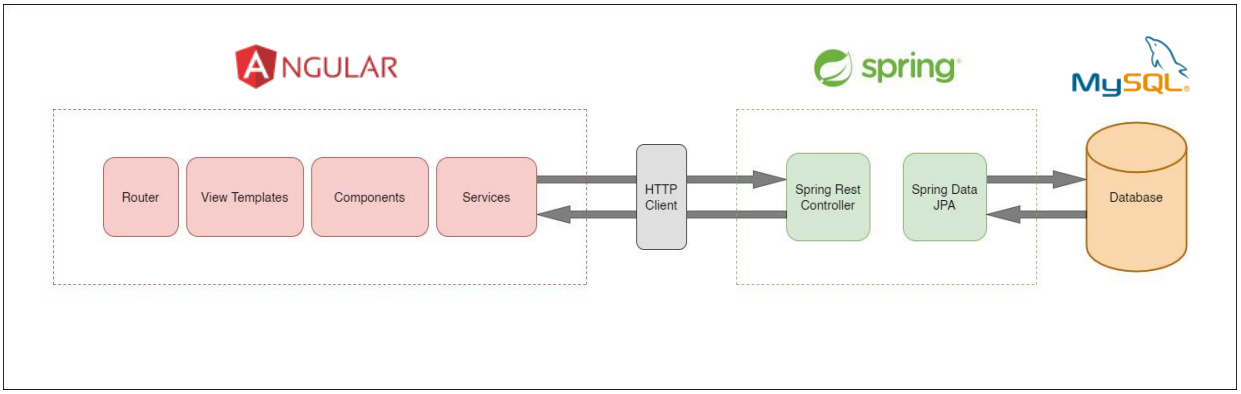
4.13 Designing: I developed the ER model.

4.14 Building: This was the coding phase

4.15 Testing: The APIs were tested using Postman.

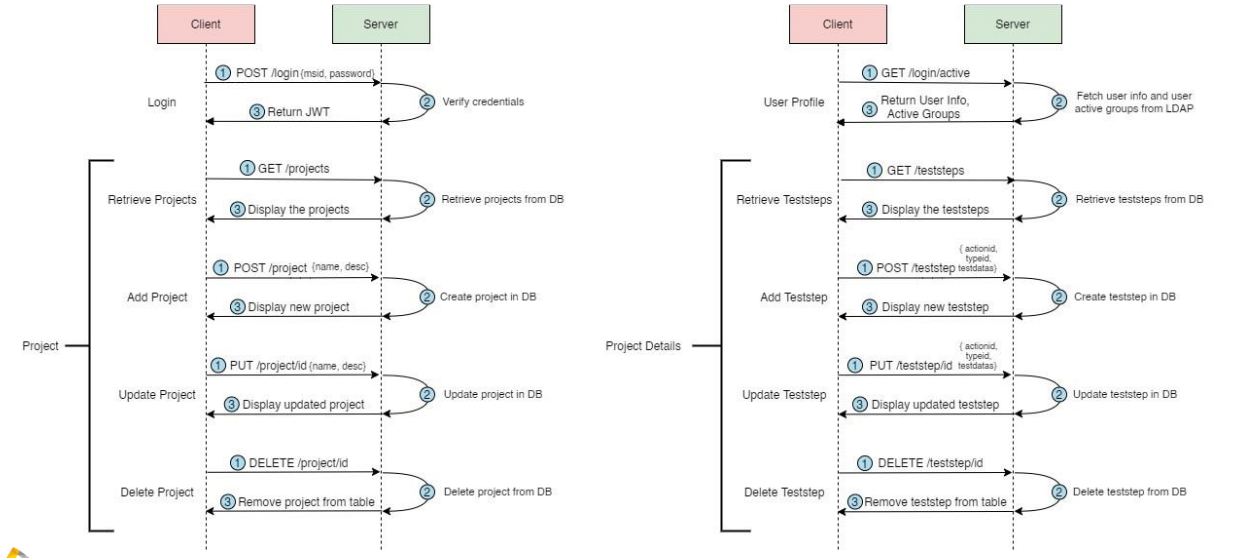
ARCHITECTURE

Architecture



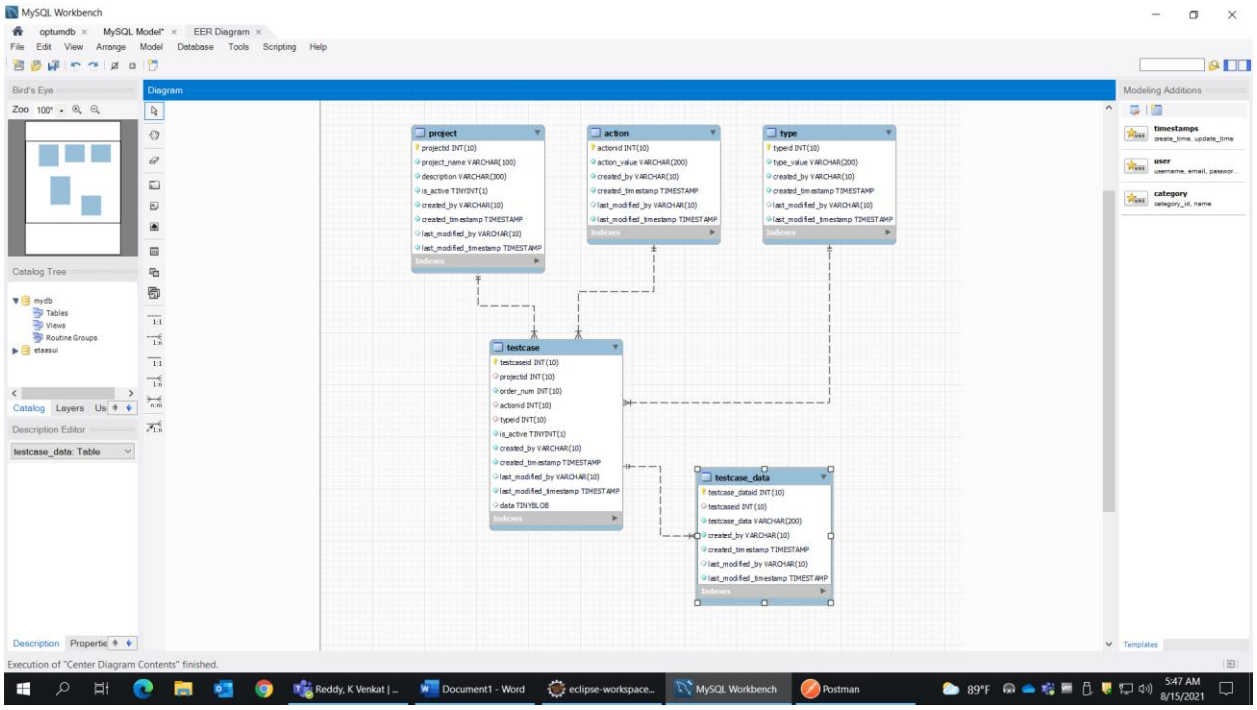
WORKFLOW OF PROJECT

Workflow of the Project

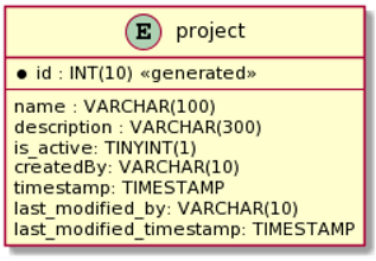


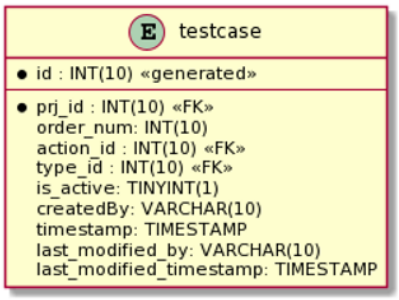
DATABASE MANAGEMENT

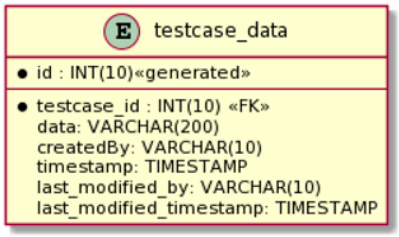
ER DIAGRAM

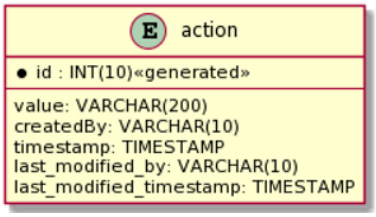


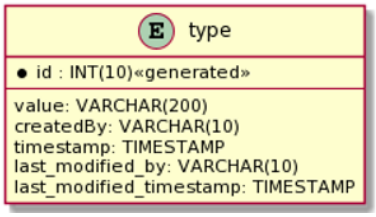
The complete ER model was not developed at once. The ER model was developed functionality wise. For example, the Projects model was developed, then the Testcase and Testcase_data models were developed.











Spring Rest API

MEASURES TAKEN

6.1.1 Json Web Tokens

I learnt about JSON WEB TOKENs (JWT) for Token Authentication. JWTs are used for securely transmitting information between parties as a JSON object.

JWTs can be signed using a secret (with the HMAC algorithm) or a public/private key pair using RSA or ECDSA. Signed tokens can verify the integrity of the claims contained within it, while encrypted tokens hide those claims from other parties. When tokens are signed using public/private key pairs, the signature also certifies that only the party holding the private key is the one that signed it.
JWTs contain 3 parts separated by a '.'

- Header – Containing basic
- Payload
- Signature

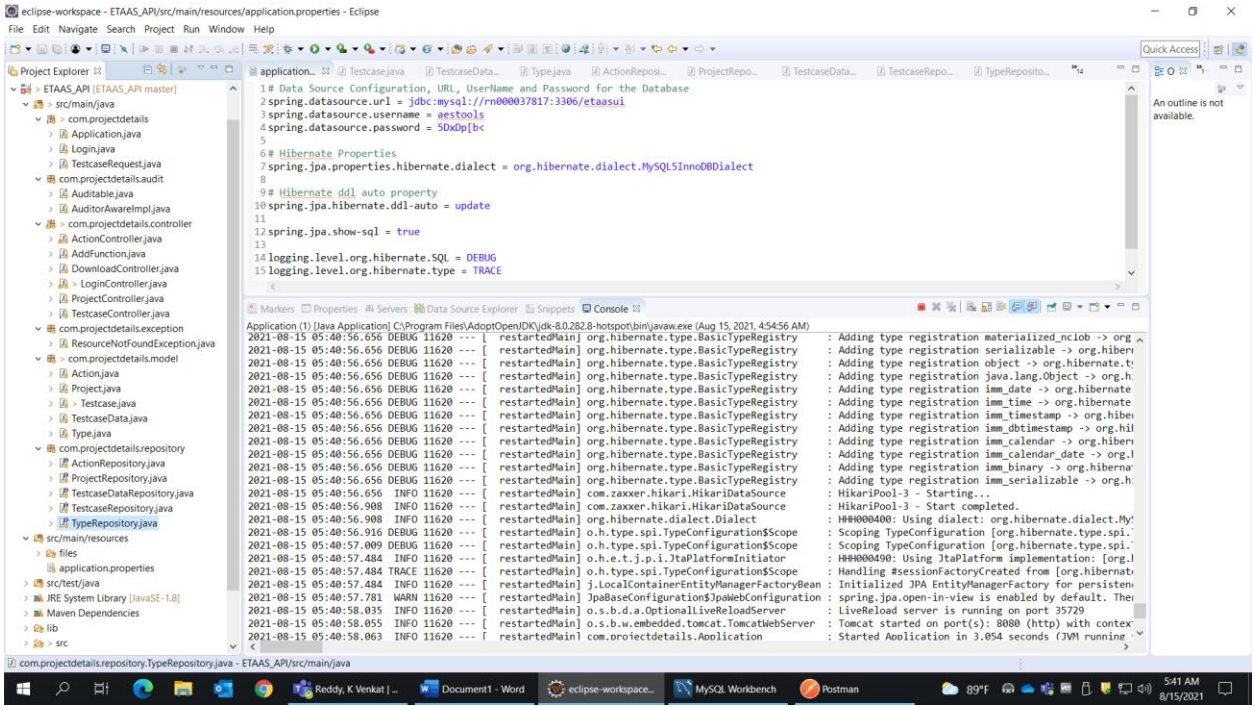
I used SHA256 to digitally sign this signature.

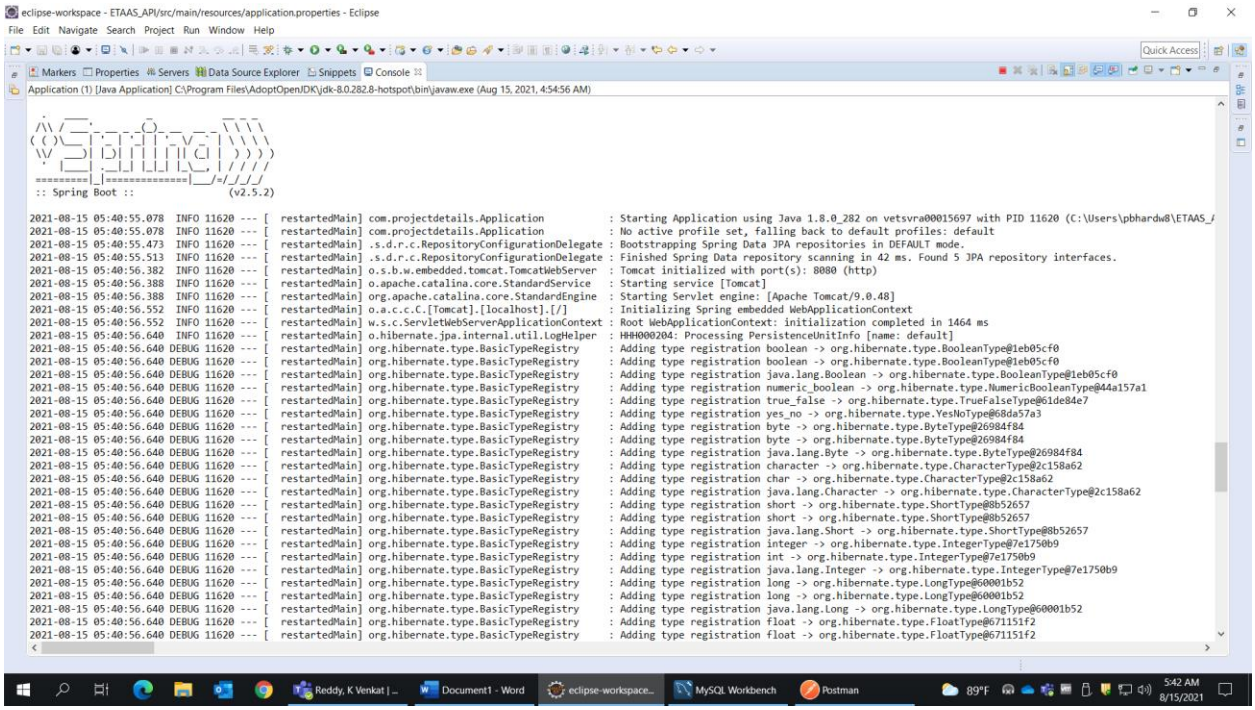
6.1.2 Programming Measures

- The code was developed using Object Oriented Programming Concepts like Classes, Objects and Inheritance.

- Proper Functions were used to handle the different http requests like GET, POST, etc.

- The code was developed in such a way that it does not throw any arbitrary error.
- Proper Error Handling was used.
- Try - Except blocks were used in almost the complete code to minimize chances of error.
- Proper Status Codes were sent as Response.





REST API DEVELOPMENT

As mentioned earlier, the APIs were tested on Postman. About 120+ APIs were developed by me. I mainly developed the APIs for the School Entity. While, the rest of the team developed it for Tutor and Institution.

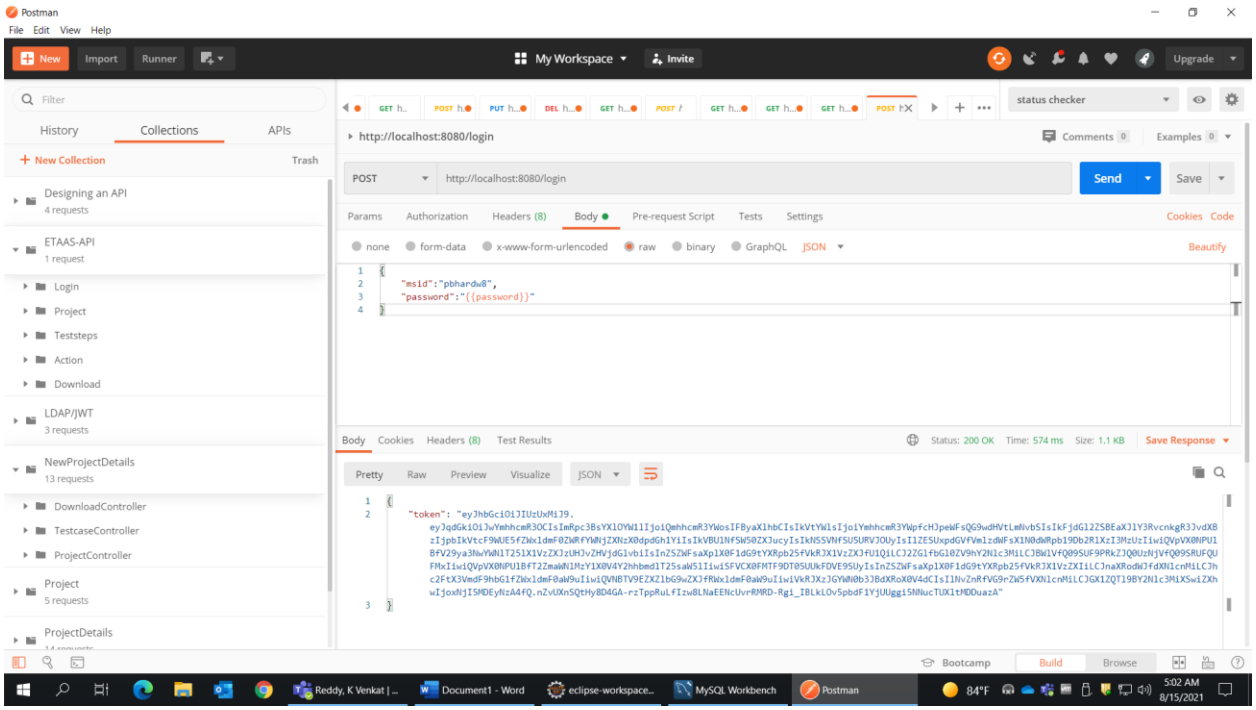
The HTTP methods used were post, get, delete, put and patch. The response of the APIs are in JSON format.

The main functionalities that I have developed have been mentioned above.

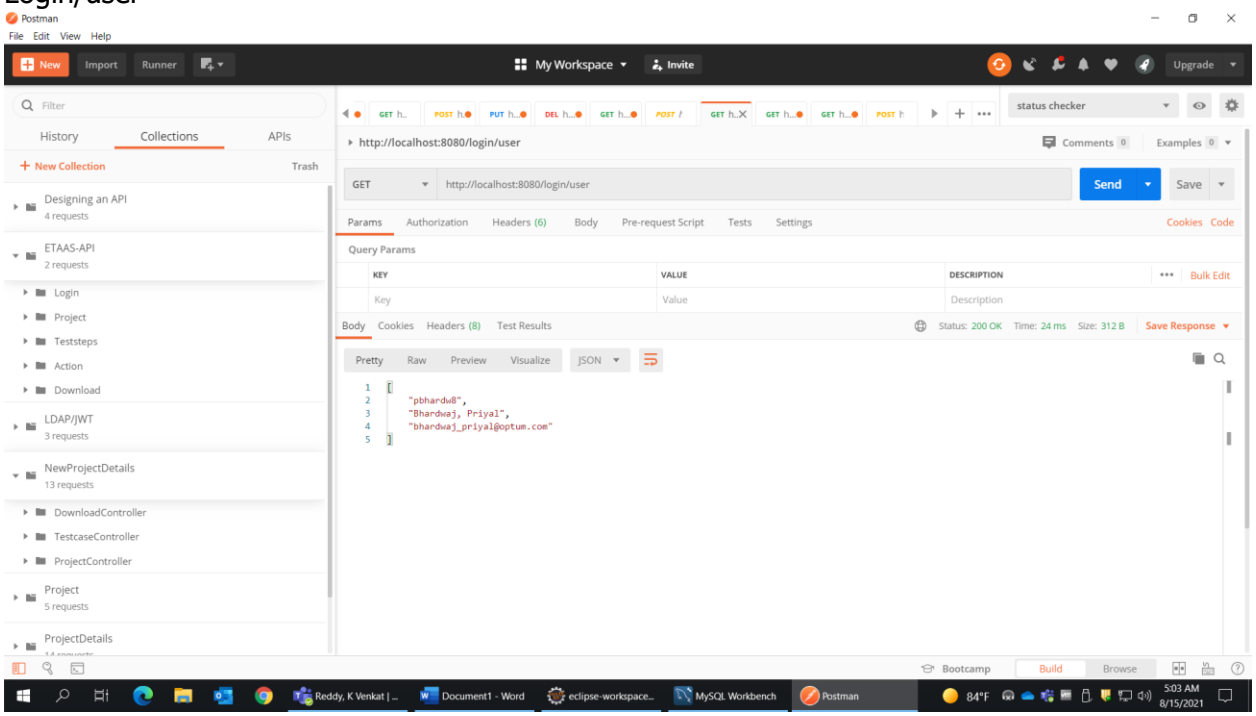
REST API TESTING

Some of the tests of the REST APIs are present below

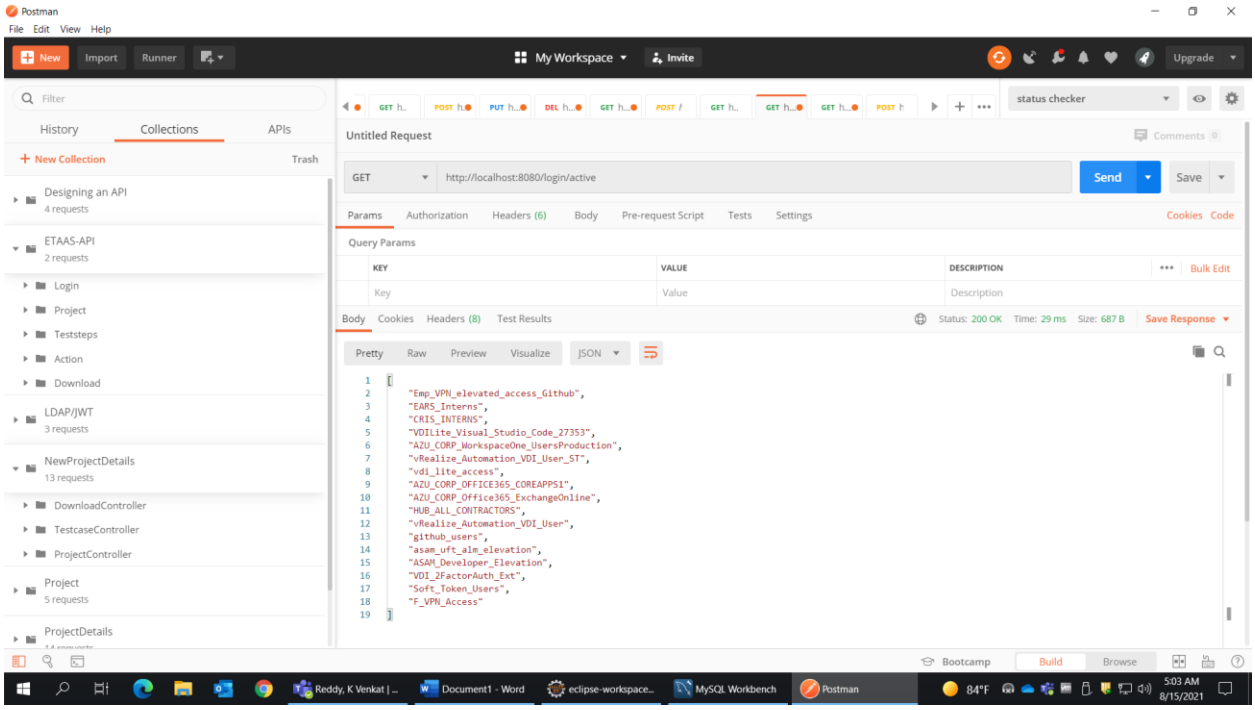
Login post



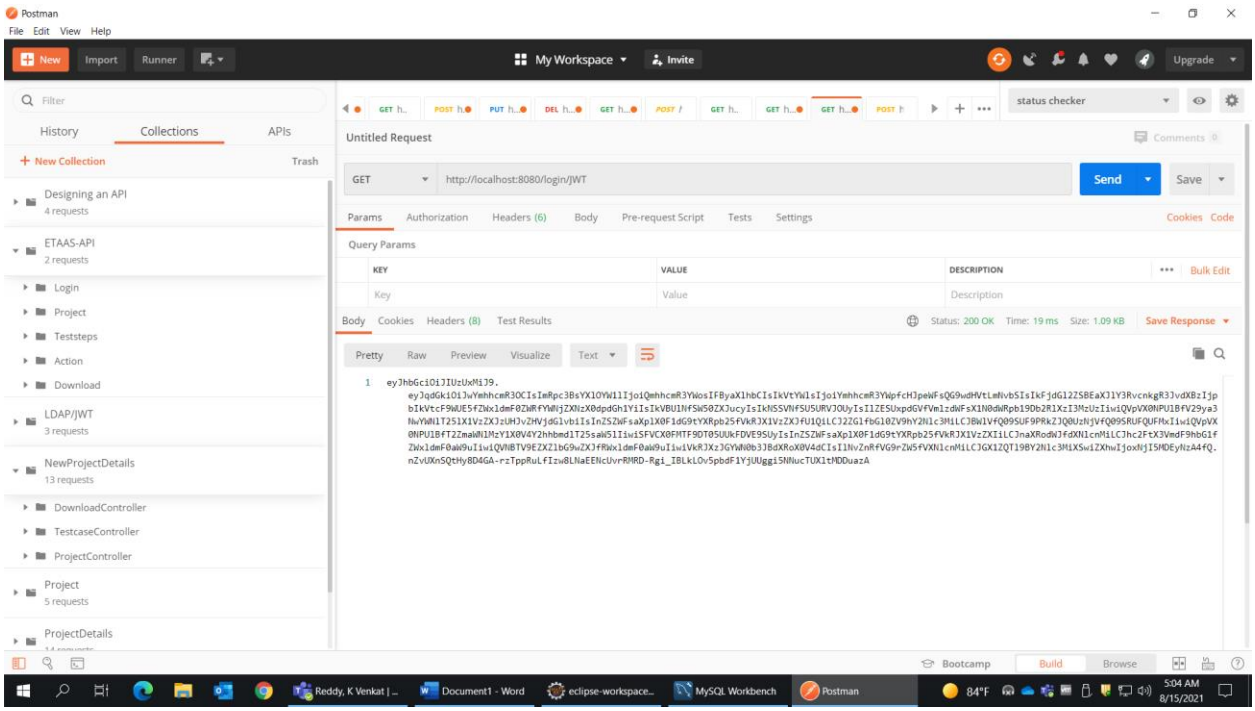
Login/user



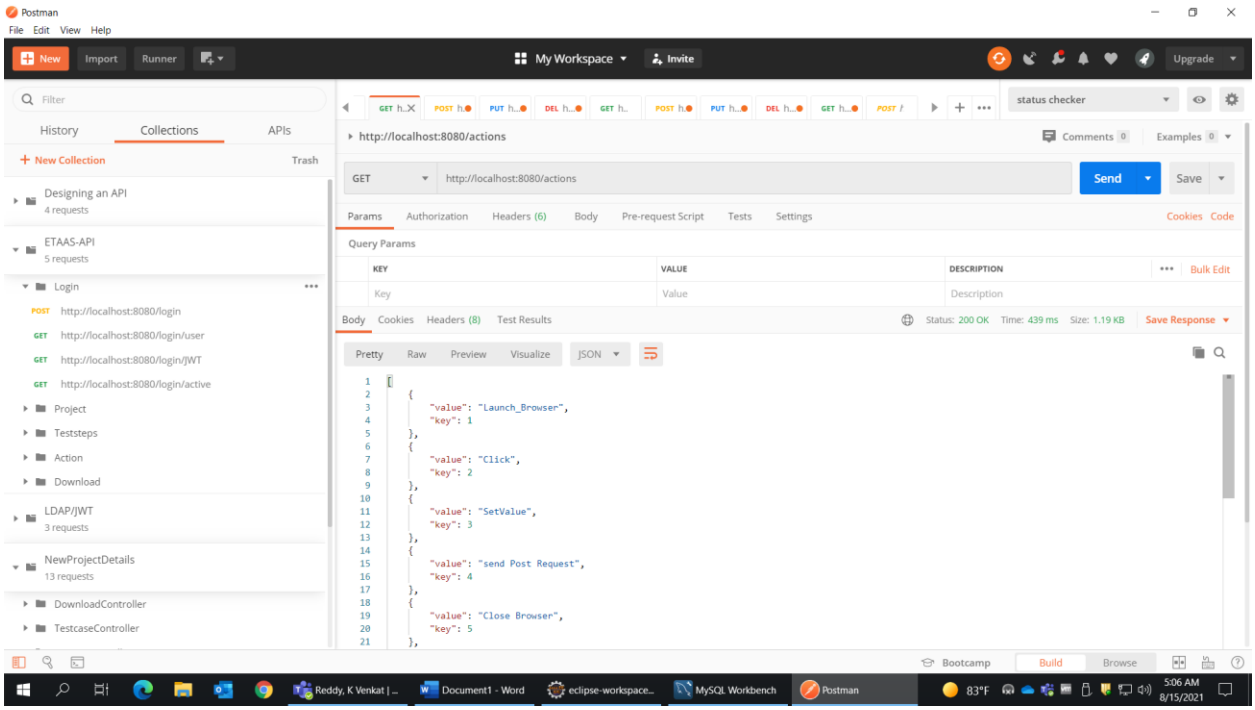
Login/active



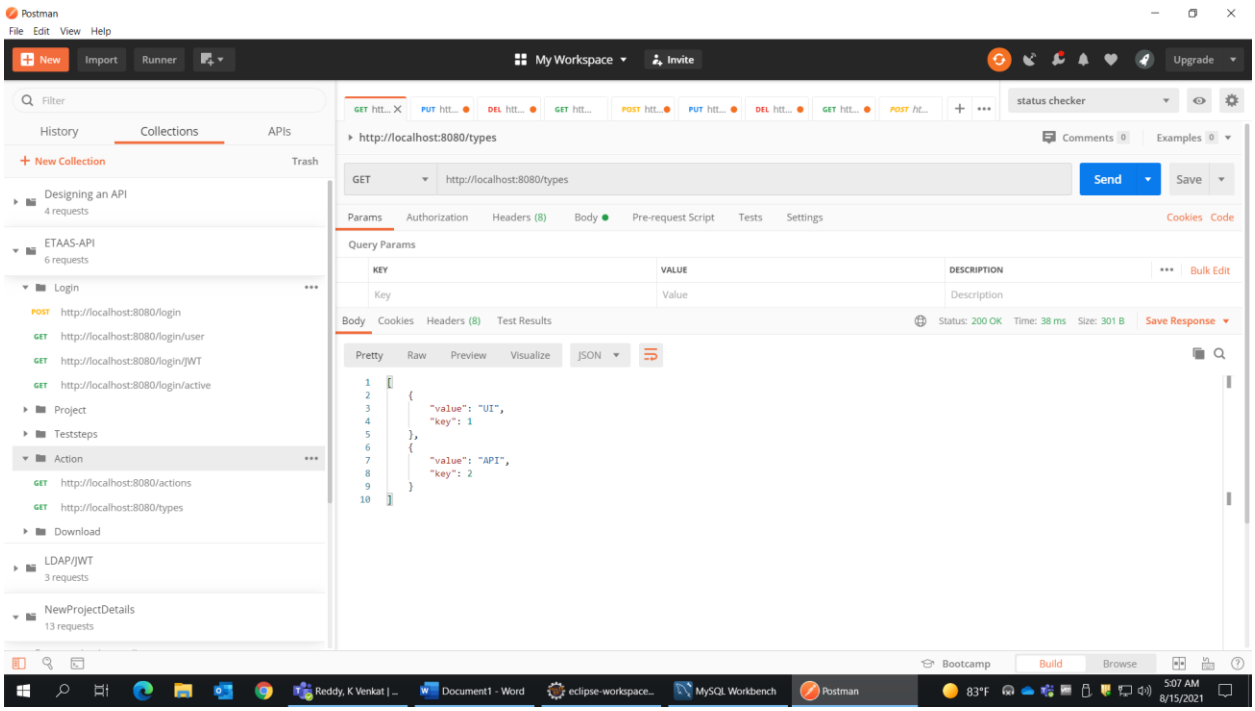
Login/JWT



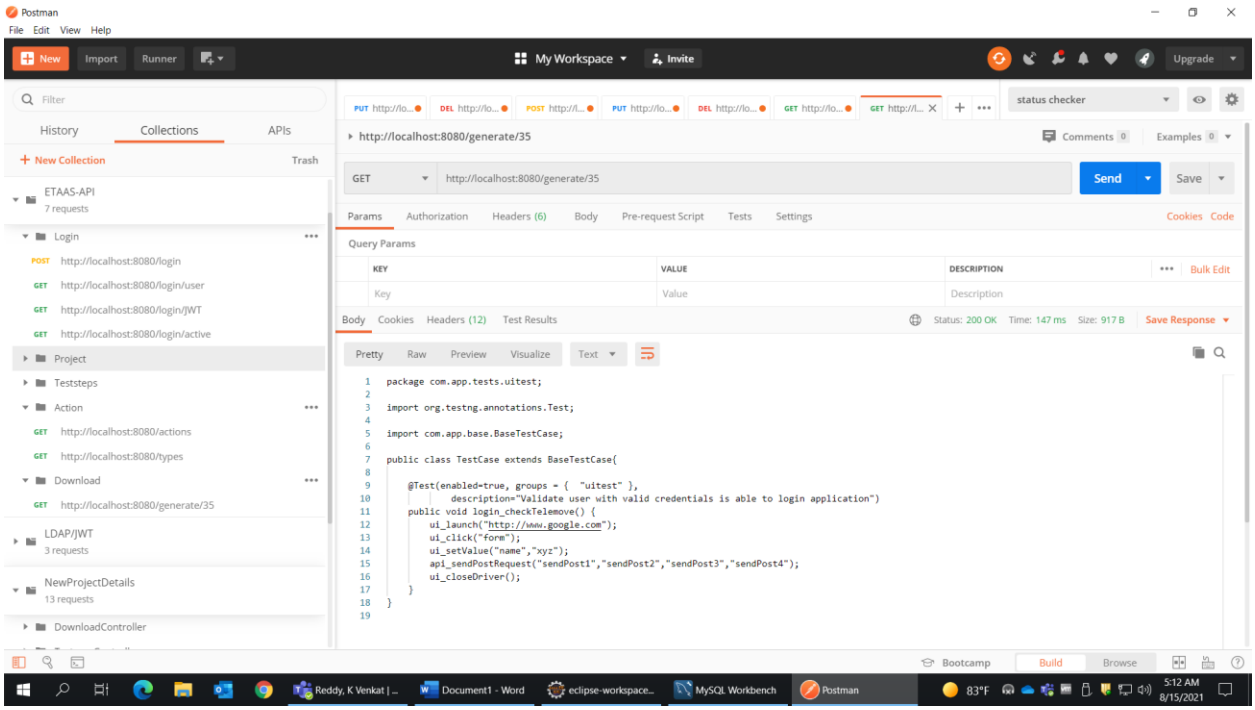
Actions



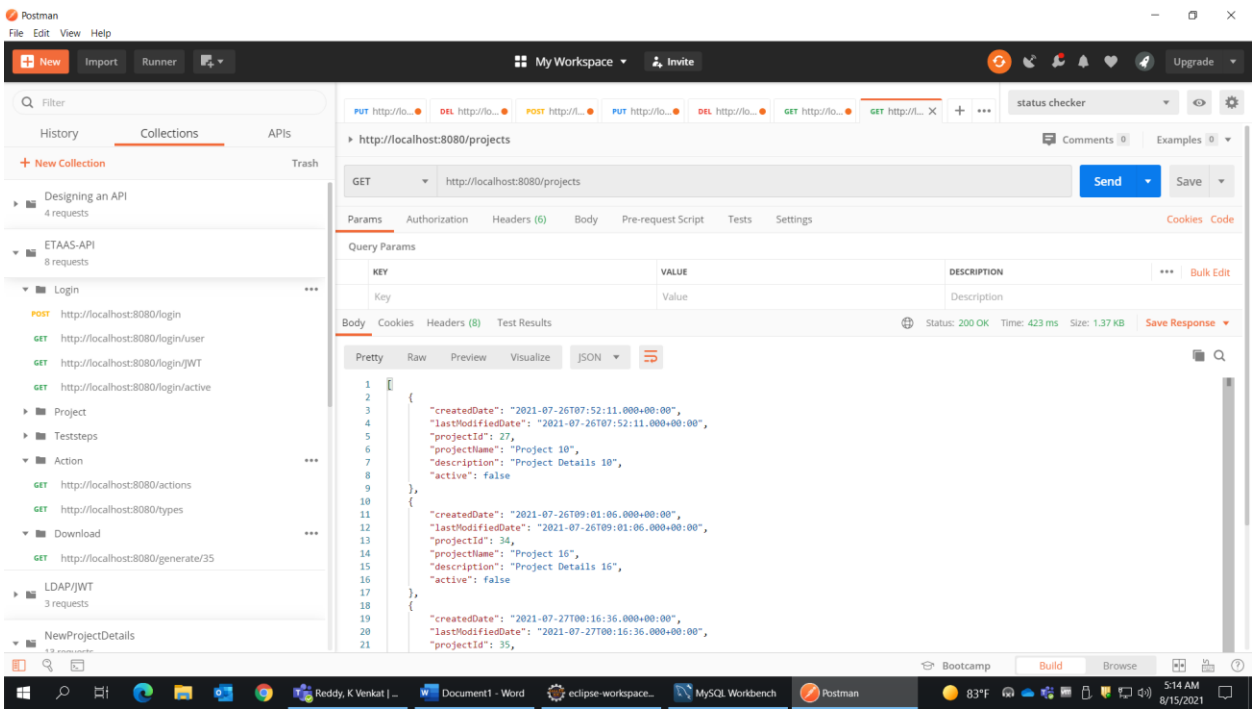
Types



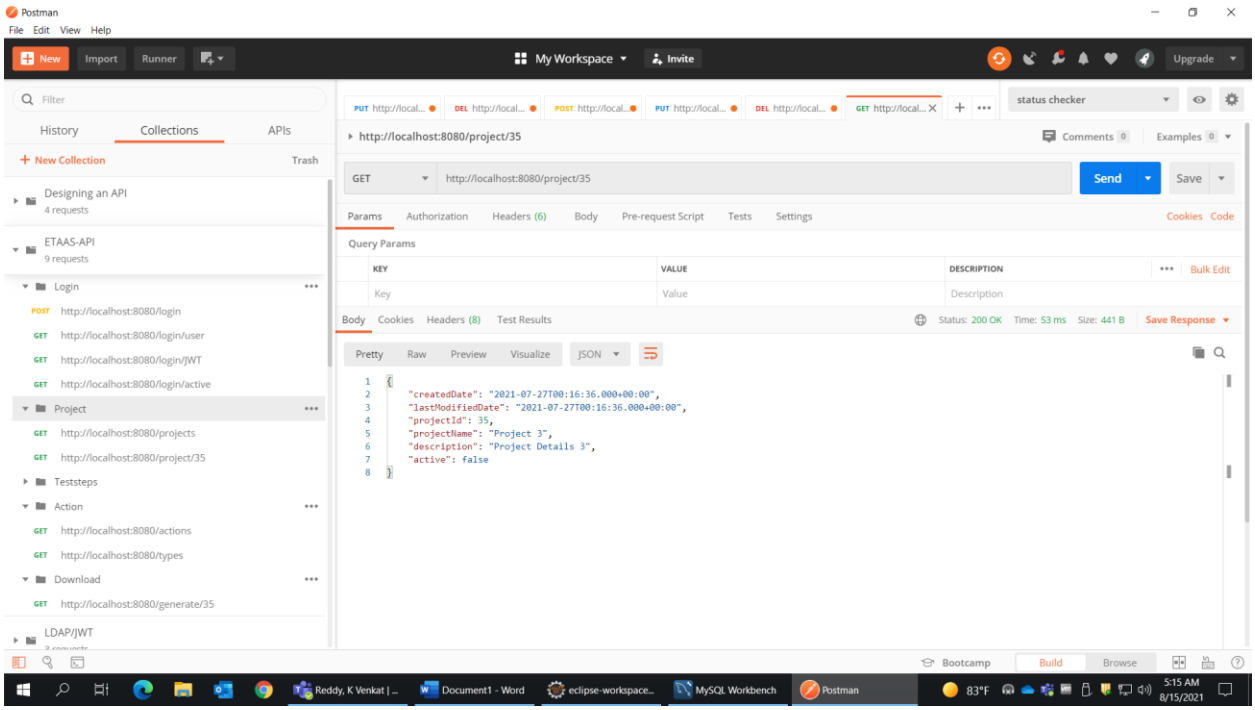
Generate/35



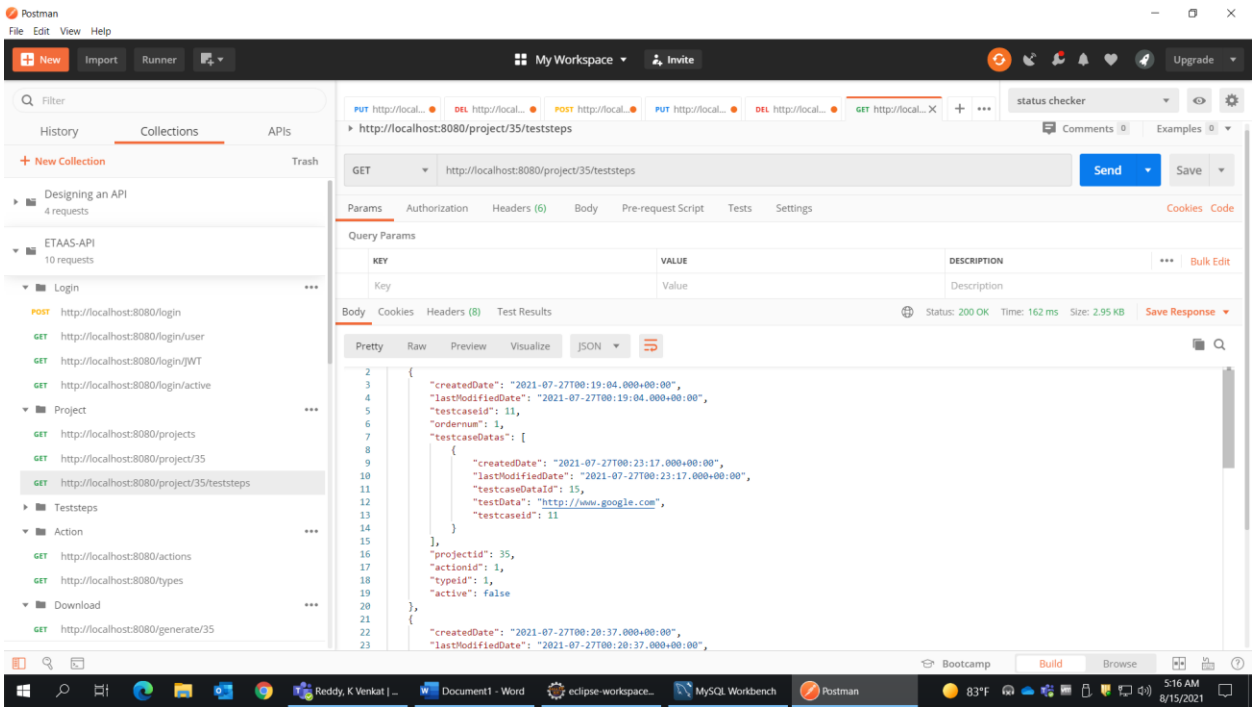
Projects



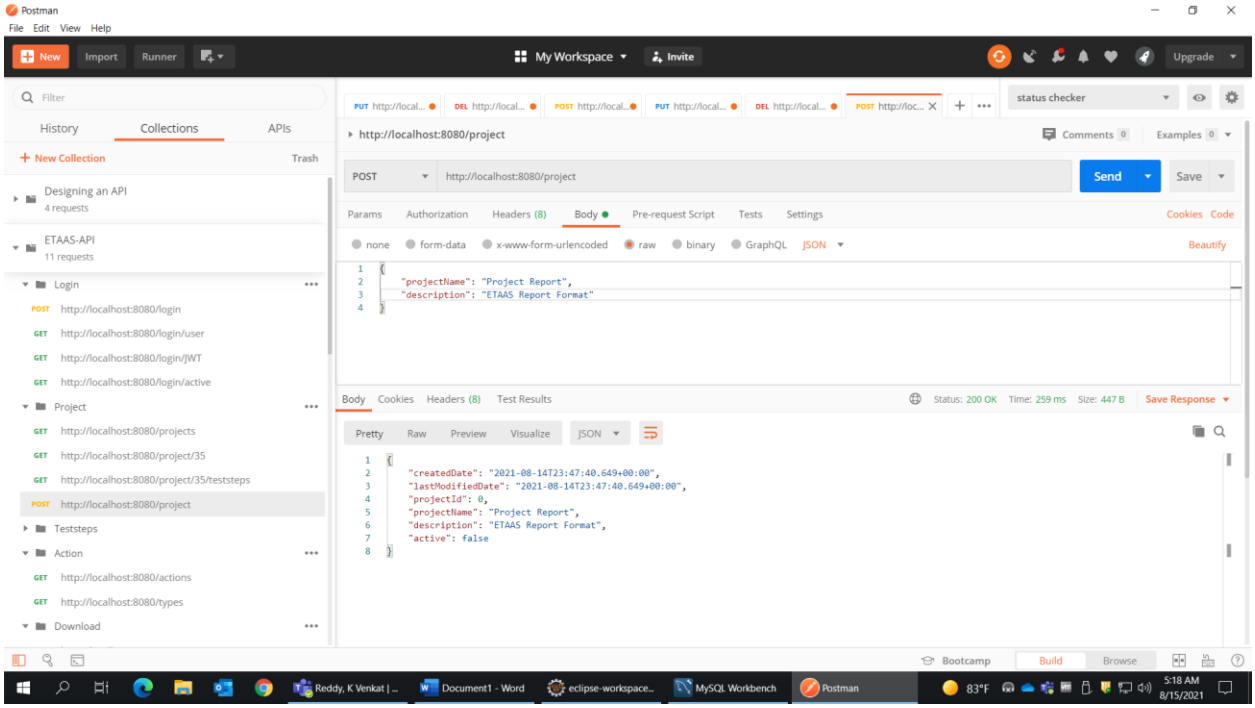
Project/id

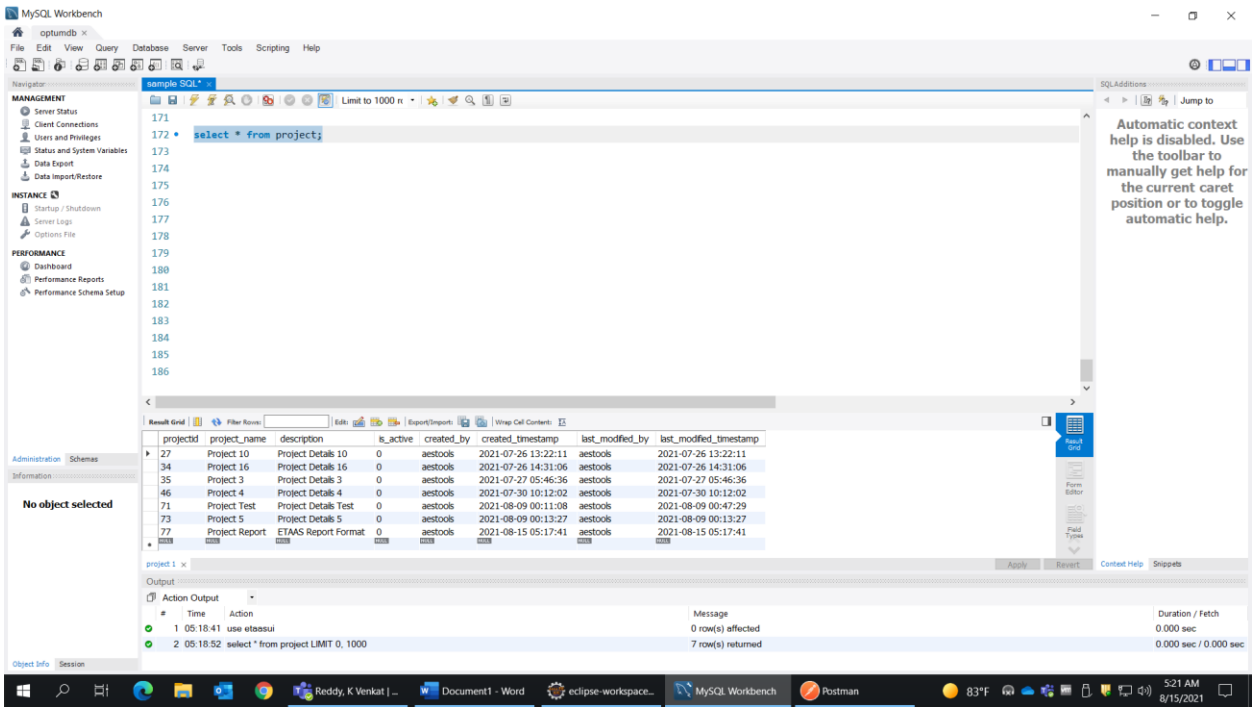


Project/id/teststeps

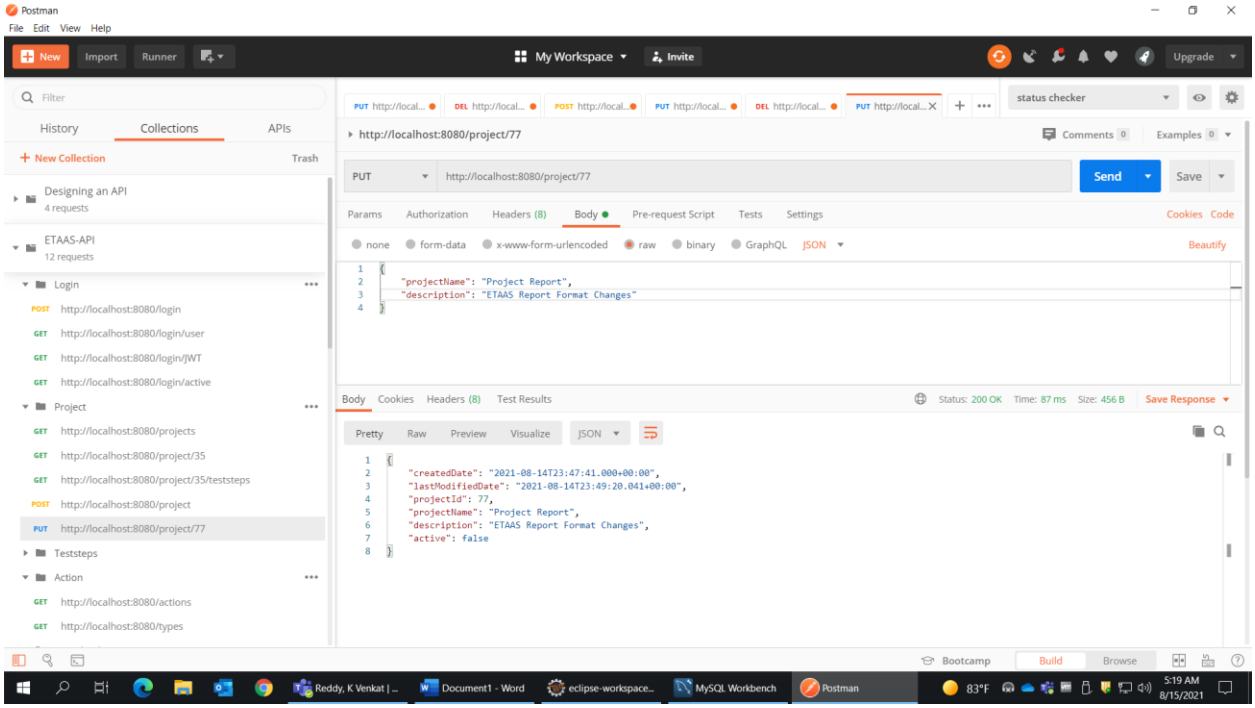


Project post

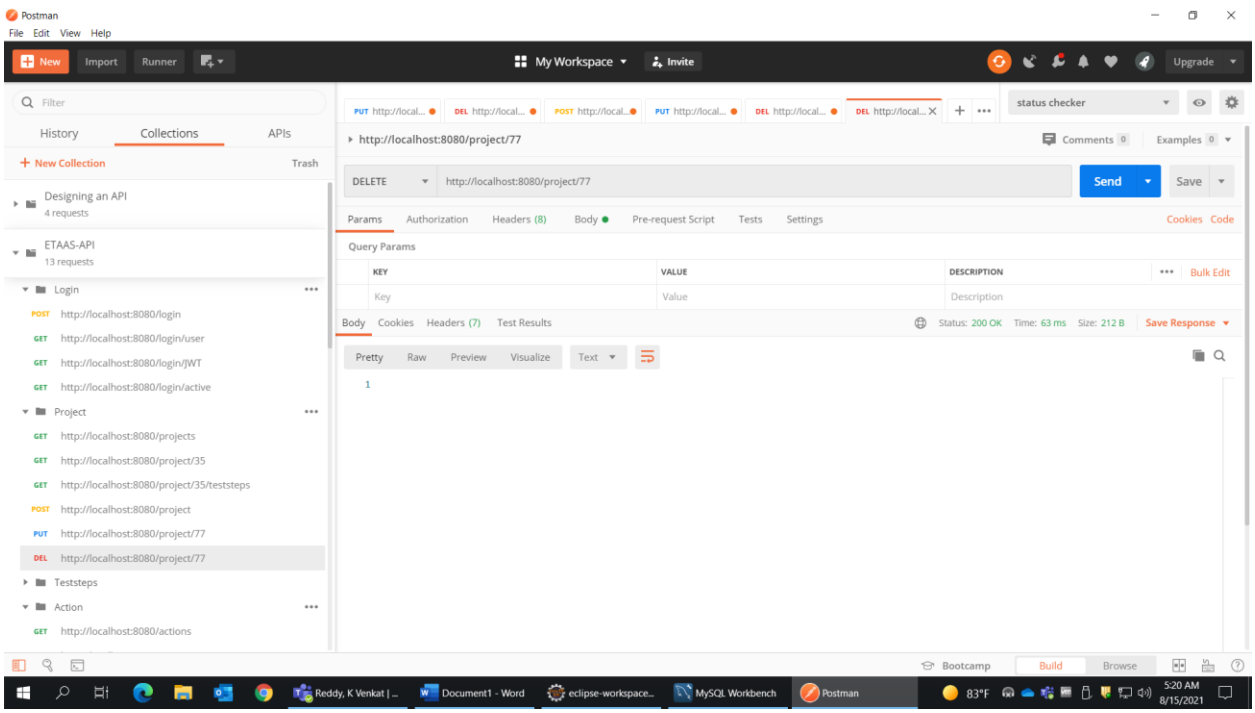


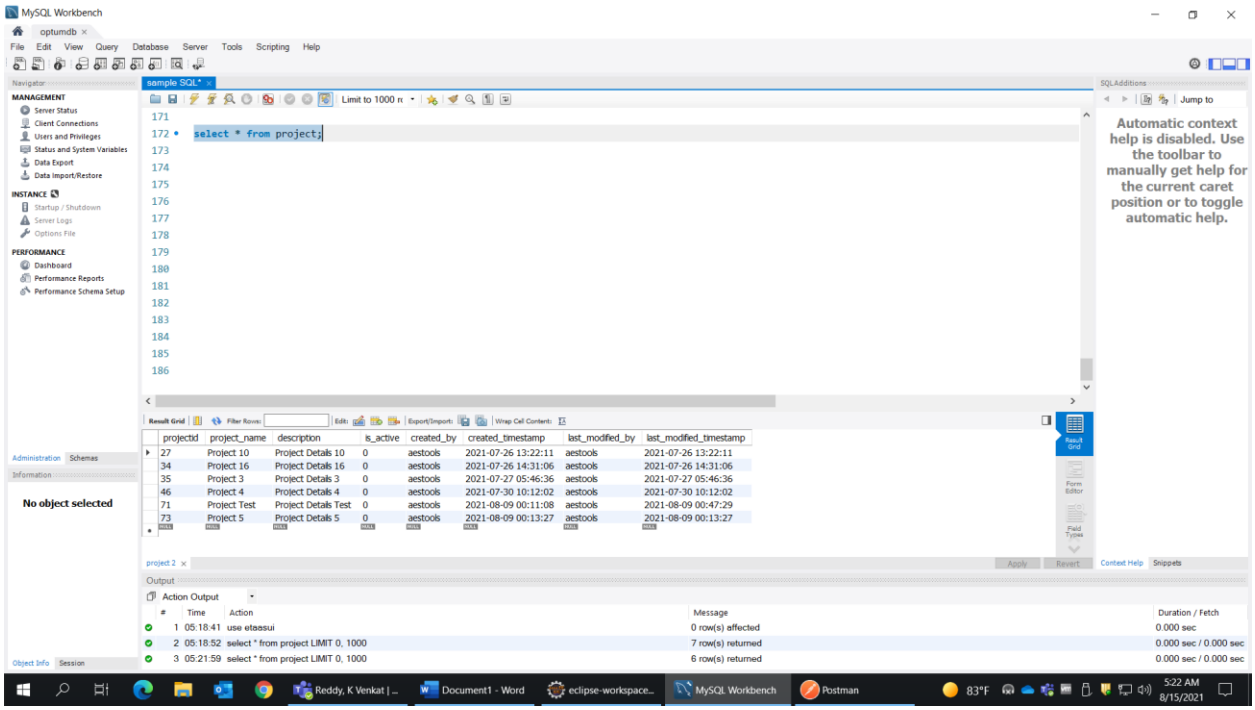


Project/id put

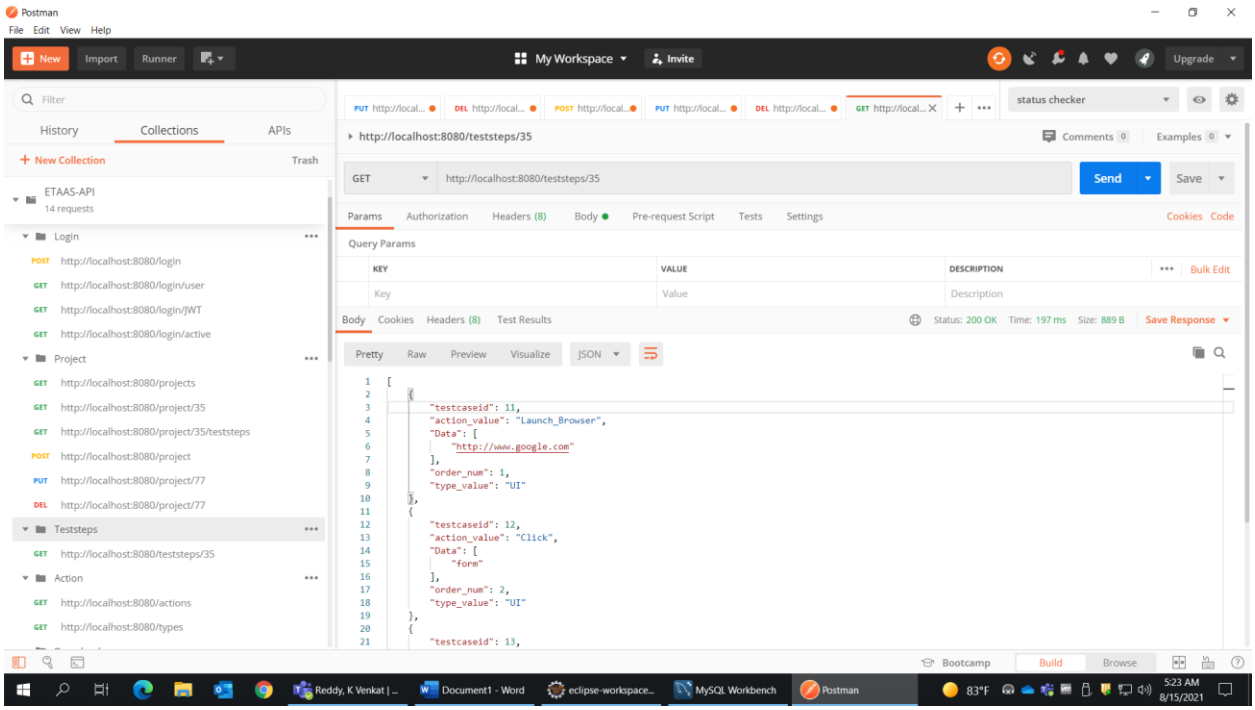


Project/id delete

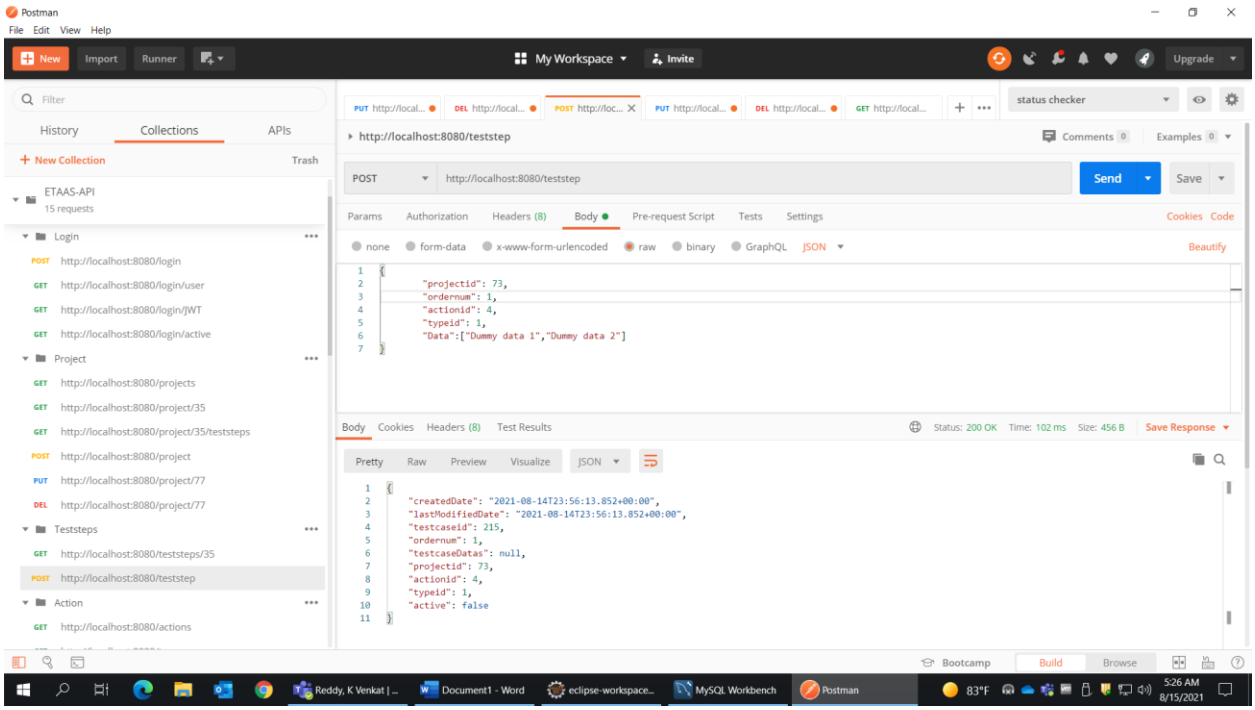




Teststeps/projectid



Teststep post


Postman
File Edit View Help
New Import Runner
My Workspace
Invite
Upgrade
History Collections APIs
New Collection Trash
ETAAS-API
15 requests
Login
POST http://localhost:8080/login
GET http://localhost:8080/login/user
GET http://localhost:8080/login/JWT
GET http://localhost:8080/login/active
Project
GET http://localhost:8080/projects
GET http://localhost:8080/project/35
GET http://localhost:8080/project/35/teststeps
POST http://localhost:8080/project
PUT http://localhost:8080/project/77
DEL http://localhost:8080/project/77
Teststeps
GET http://localhost:8080/teststeps/35
POST http://localhost:8080/teststep
Action
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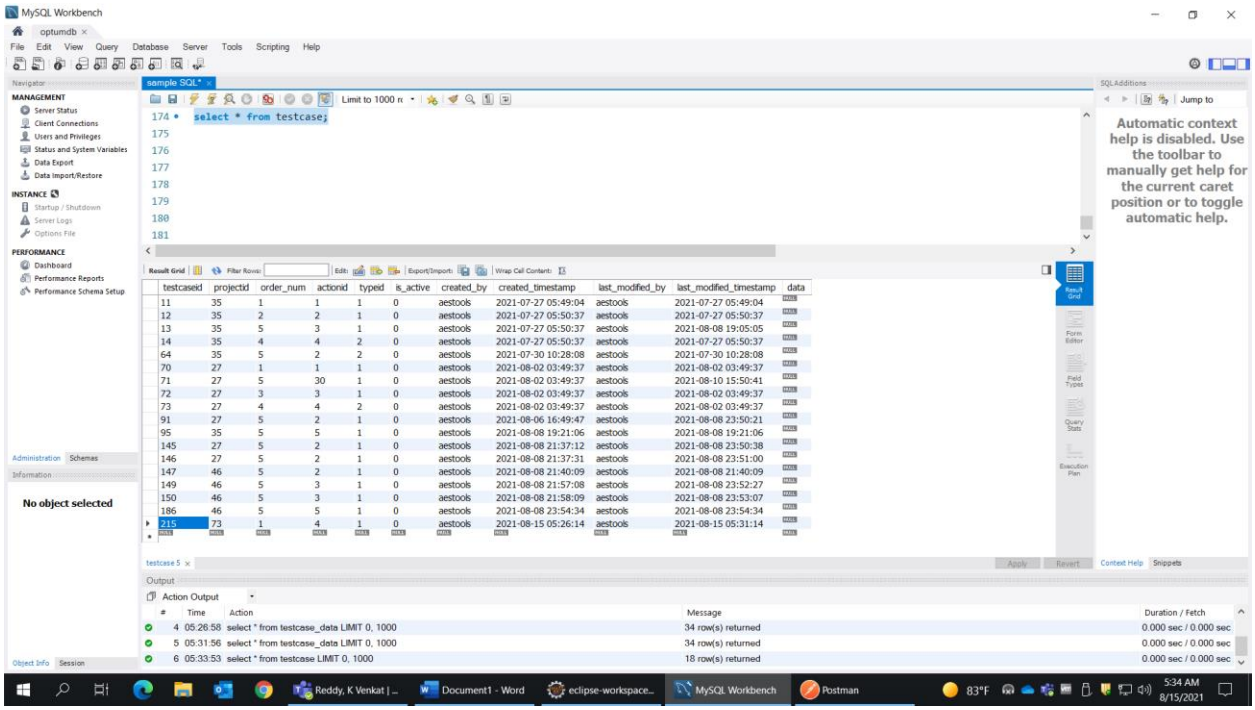
http://localhost:8080/teststep
POST http://localhost:8080/teststep
Send Save
Params Authorization Headers (8) Body Pre-request Script Tests Settings
none form-data x-www-form-urlencoded raw binary GraphQL JSON
{
"projectid": 73,
"ordernum": 1,
"actionid": 4,
"typeid": 1,
"Data":["Dummy data 1","Dummy data 2"]
}
Body Cookies Headers (8) Test Results
Status: 200 OK Time: 102 ms Size: 456 B Save Response
Pretty Raw Preview Visualize JSON
{
"createdDate": "2021-08-14T23:56:13.852+00:00",
"lastModifiedDate": "2021-08-14T23:56:13.852+00:00",
"testcaseid": 215,
"ordernum": 1,
"testcaseDatas": null,
"projectid": 73,
"actionid": 4,
"typeid": 1,
"active": false
}
Bootcamp Build Browse
Reddy, K Venkat | ... Document1 - Word eclipse-workspace... MySQL Workbench Postman
83°F 5:26 AM 8/15/2021


MySQL Workbench
optumdb
File Edit View Query Database Server Tools Scripting Help
sample SQL*
Limit to 1000 r
174 • select * from testcase;
175
176
177
178
179
180
181
MANAGEMENT
Server Status
Client Connections
Users and Privileges
Status and System Variables
Data Export
Data Import/Restore
INSTANCE
Startup / Shutdown
Server Logs
Options File
PERFORMANCE
Dashboard
Performance Reports
Performance Schema Setup
Administration Schemas
Information
No object selected
Object Info Session
Result Grid
testcaseid projectid order_num actionid typeid is_active created_by created_timestamp last_modified_by last_modified_timestamp data
11 35 1 1 1 0 aestools 2021-07-27 05:49:04 aestools 2021-07-27 05:49:04
12 35 2 1 1 0 aestools 2021-07-27 05:50:37 aestools 2021-07-27 05:50:37
13 35 5 3 1 0 aestools 2021-07-27 05:50:37 aestools 2021-08-08 19:05:05
14 35 4 4 2 0 aestools 2021-07-27 05:50:37 aestools 2021-07-27 05:50:37
64 35 5 2 2 0 aestools 2021-07-30 10:28:08 aestools 2021-07-30 10:28:08
70 27 1 1 1 0 aestools 2021-08-02 03:49:37 aestools 2021-08-02 03:49:37
71 27 5 30 1 0 aestools 2021-08-02 03:49:37 aestools 2021-08-10 15:50:41
72 27 3 3 1 0 aestools 2021-08-02 03:49:37 aestools 2021-08-02 03:49:37
73 27 4 4 2 0 aestools 2021-08-02 03:49:37 aestools 2021-08-02 03:49:37
91 27 5 2 1 0 aestools 2021-08-06 16:49:47 aestools 2021-08-08 23:50:21
95 35 5 5 1 0 aestools 2021-08-08 19:21:06 aestools 2021-08-08 19:21:06
145 27 5 2 1 0 aestools 2021-08-08 21:37:12 aestools 2021-08-08 23:50:38
146 27 5 2 1 0 aestools 2021-08-08 21:37:31 aestools 2021-08-08 23:51:00
147 46 5 2 1 0 aestools 2021-08-08 21:40:09 aestools 2021-08-08 21:40:09
149 46 5 3 1 0 aestools 2021-08-08 21:57:08 aestools 2021-08-08 23:52:27
150 46 5 3 1 0 aestools 2021-08-08 21:58:09 aestools 2021-08-08 23:53:07
186 46 5 5 1 0 aestools 2021-08-08 23:54:34 aestools 2021-08-08 23:54:34
215 73 1 4 1 0 aestools 2021-08-15 05:26:14 aestools 2021-08-15 05:31:14
Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.
Output
Action Output
Time Action Message Duration / Fetch
4 05:26:58 select * from testcase_data LIMIT 0, 1000 34 row(s) returned 0.000 sec / 0.000 sec
5 05:31:56 select * from testcase_data LIMIT 0, 1000 34 row(s) returned 0.000 sec / 0.000 sec
6 05:33:53 select * from testcase LIMIT 0, 1000 18 row(s) returned 0.000 sec / 0.000 sec
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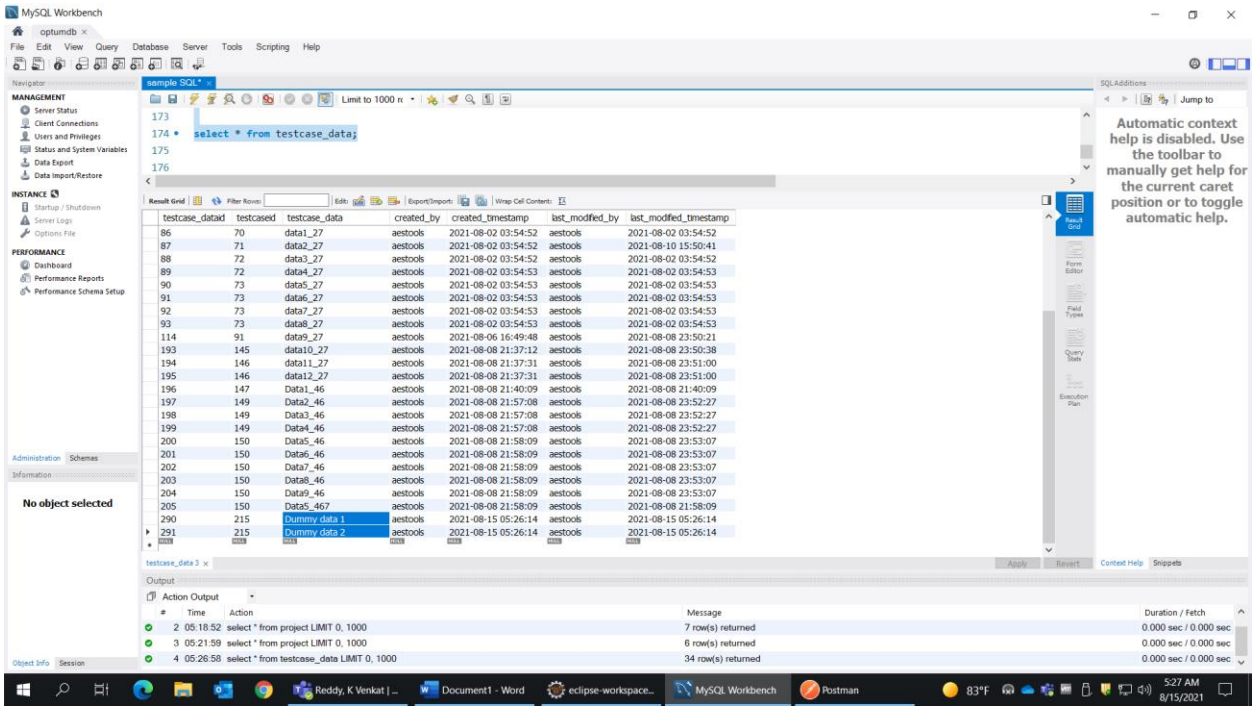
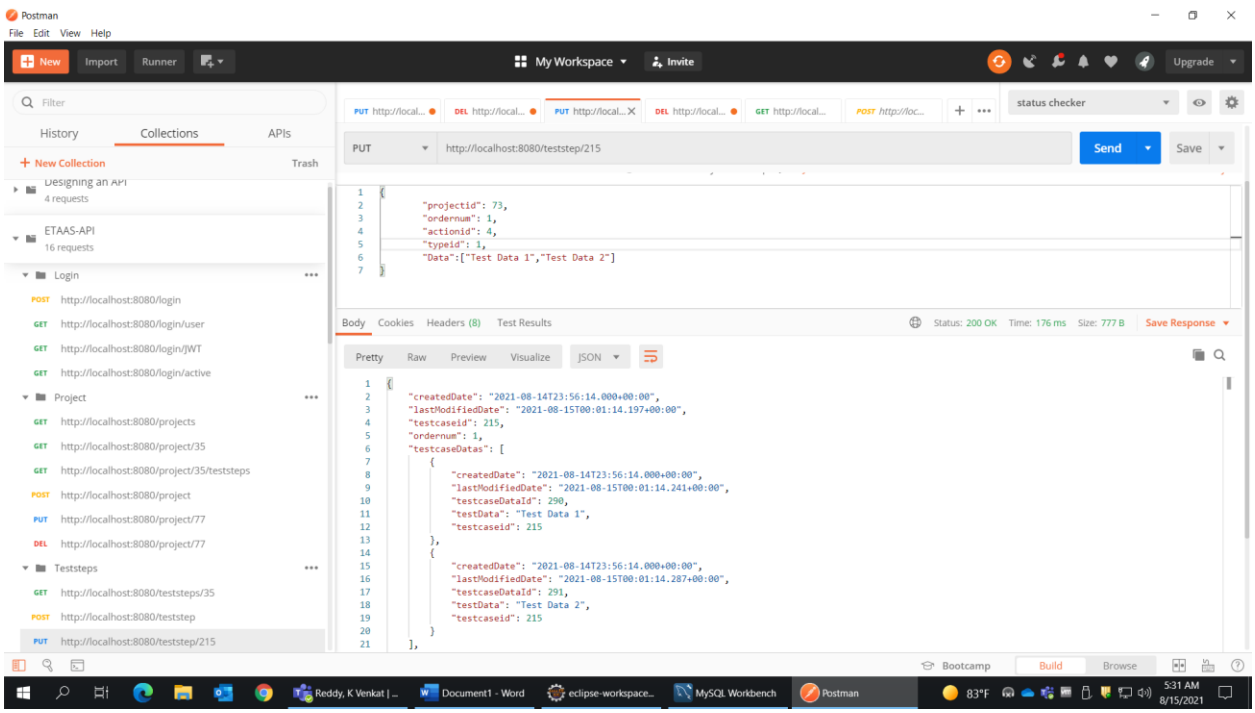
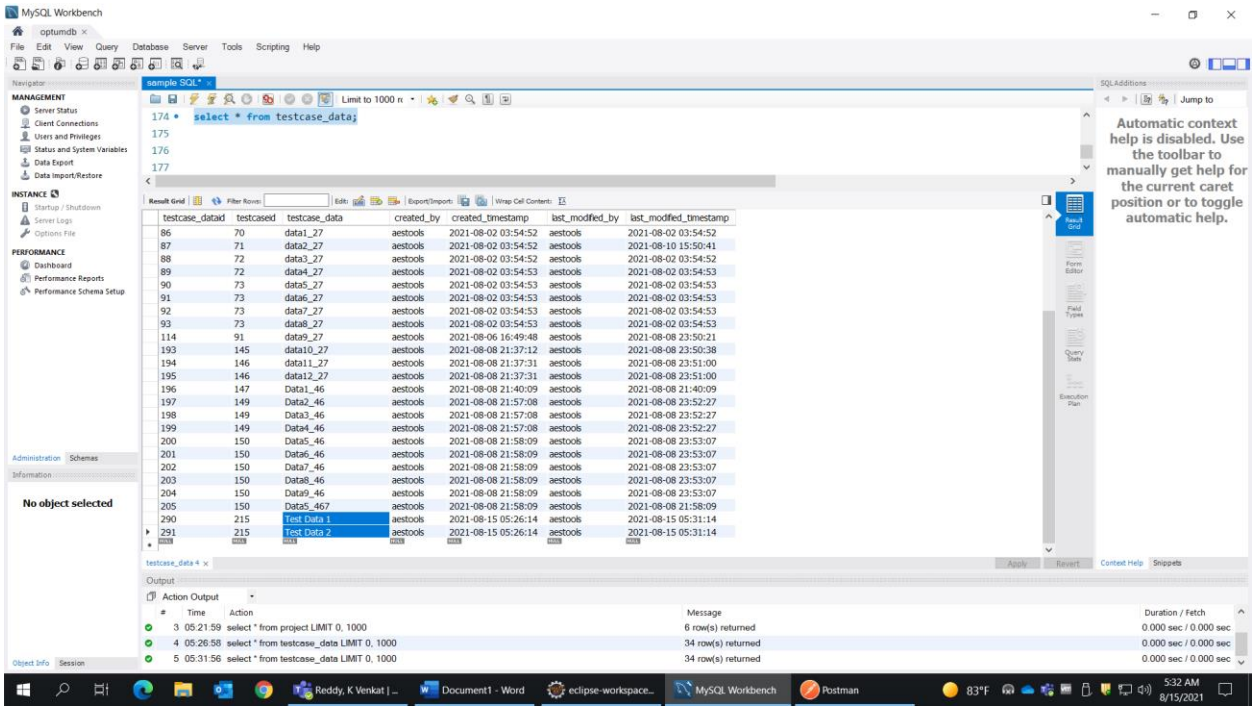
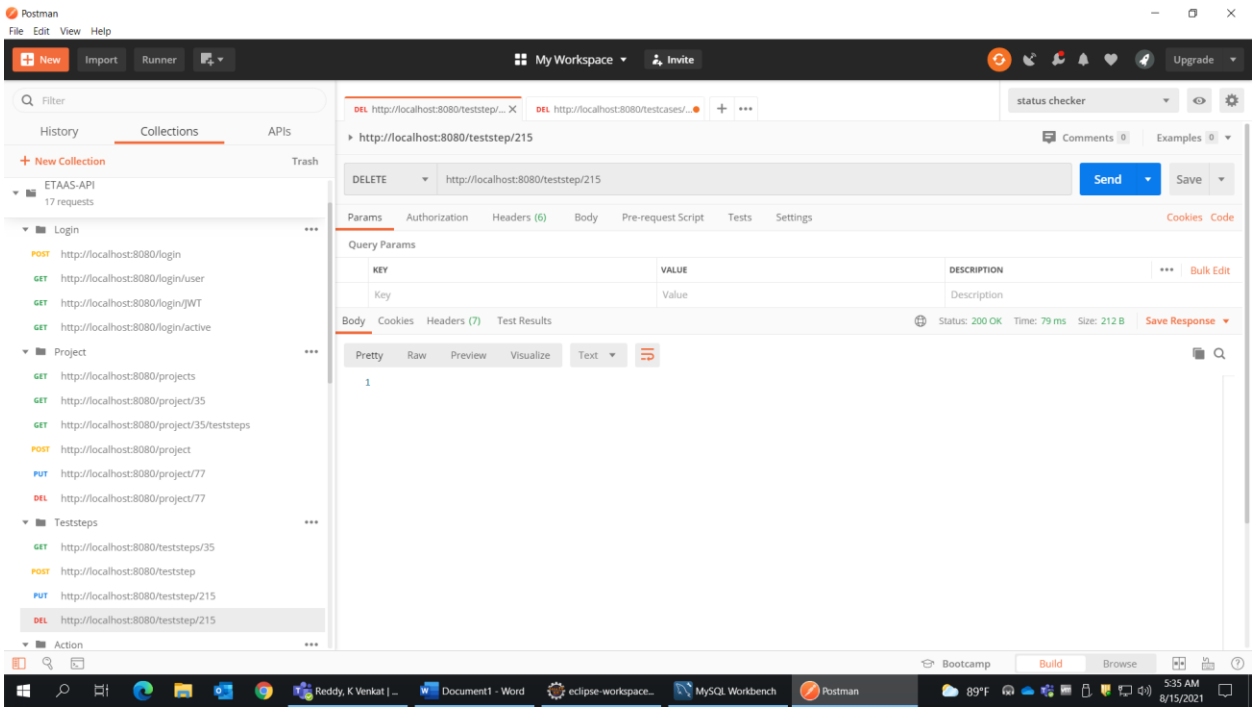


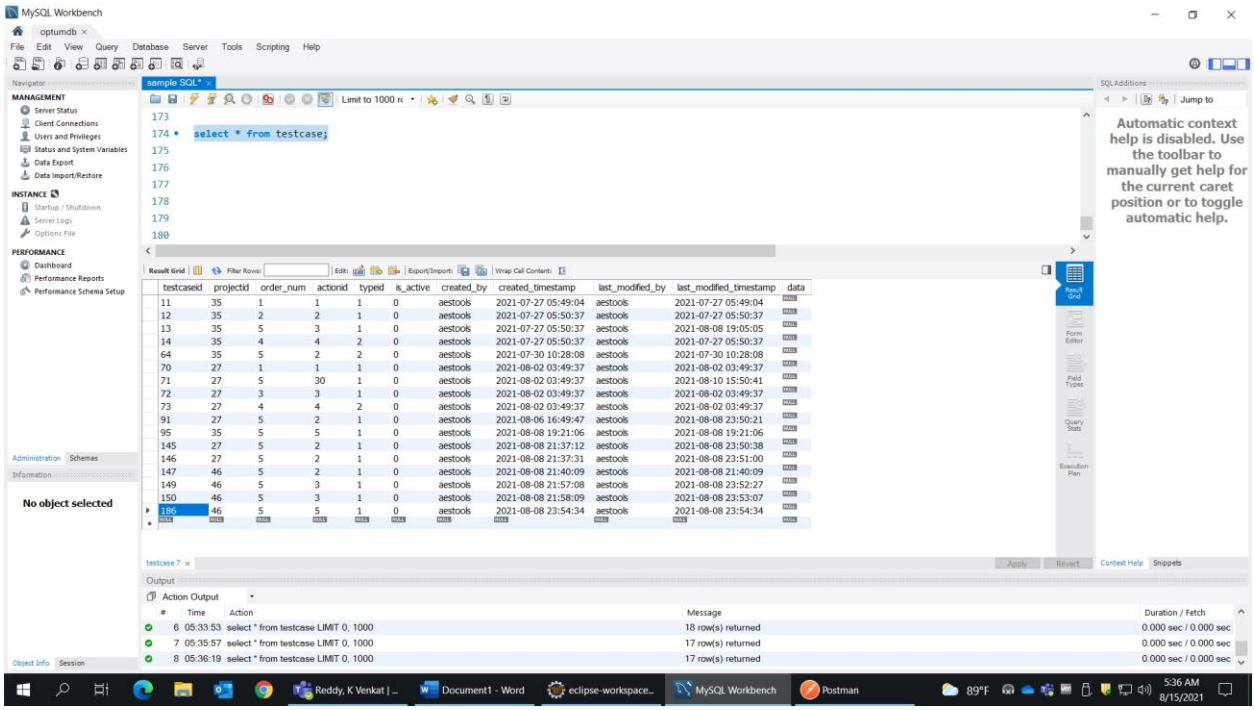
Teststep/id put



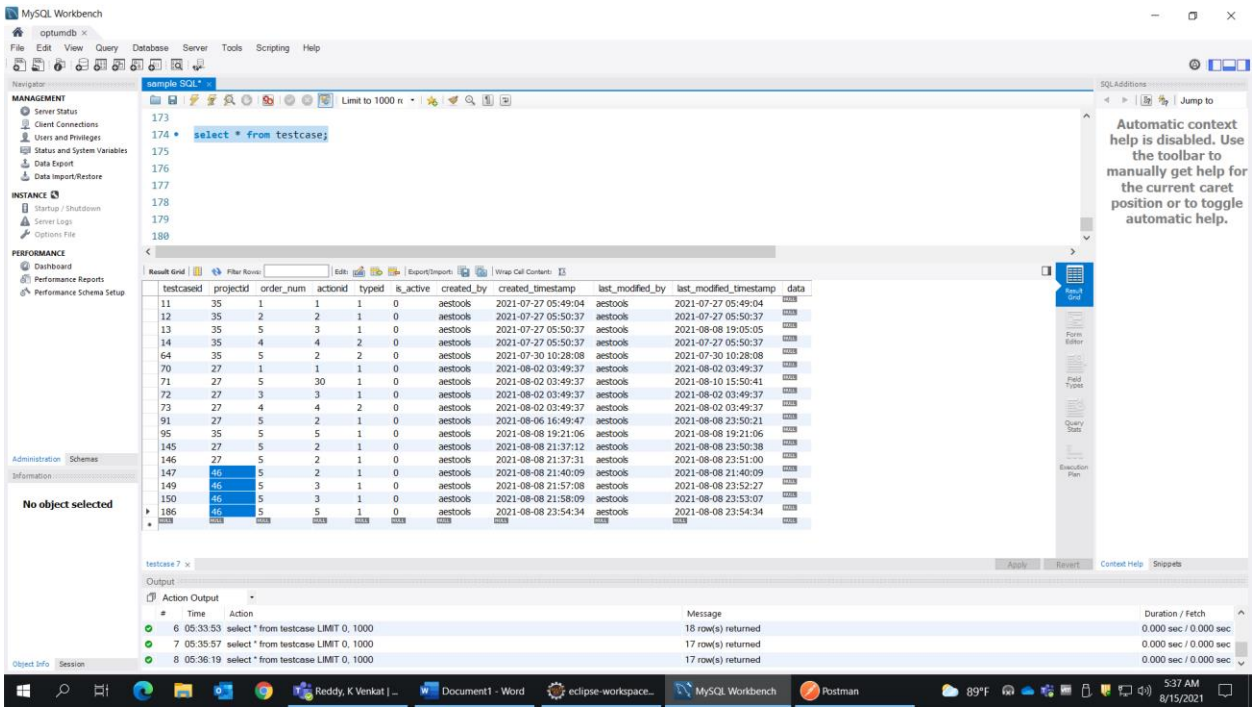


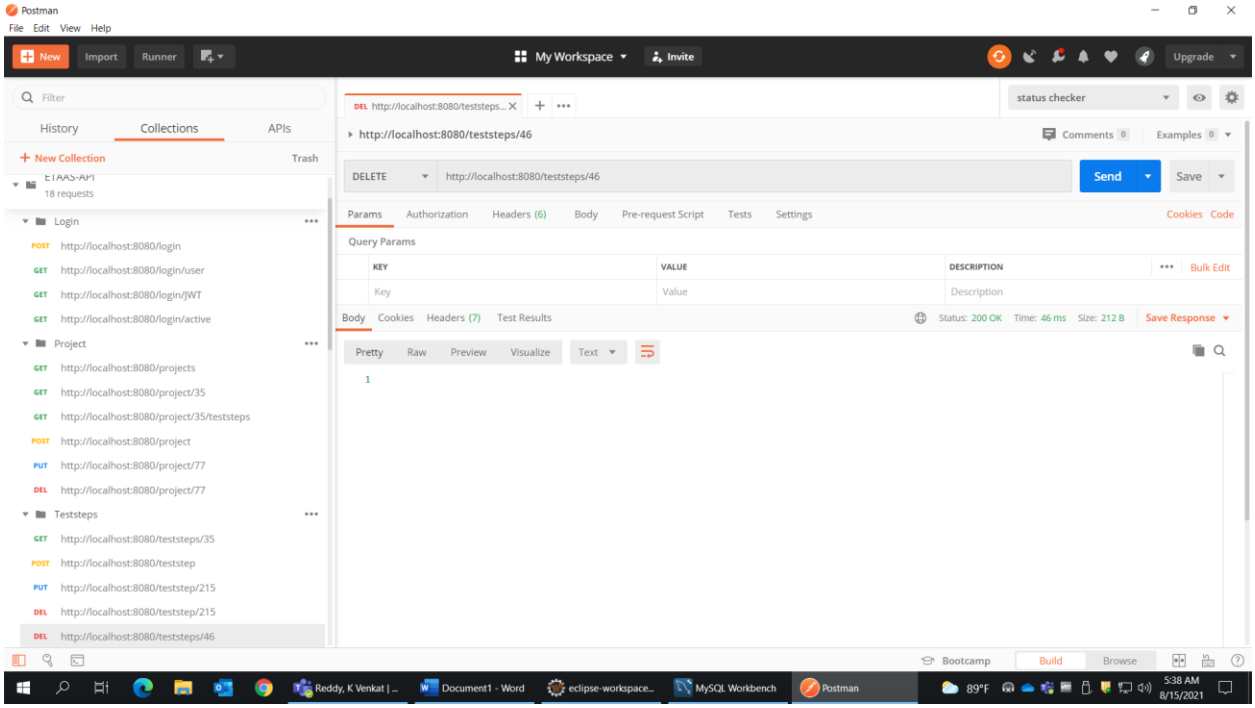
Teststep/id delete





Teststep/projectid delete




Postman
File Edit View Help
New Import Runner
My Workspace
Invite
Upgrade
History Collections APIs
New Collection Trash
ETAAS-API
18 requests
Login
POST http://localhost:8080/login
GET http://localhost:8080/login/user
GET http://localhost:8080/login/JWT
GET http://localhost:8080/login/active
Project
GET http://localhost:8080/projects
GET http://localhost:8080/project/35
GET http://localhost:8080/project/35/teststeps
POST http://localhost:8080/project
PUT http://localhost:8080/project/77
DEL http://localhost:8080/project/77
Teststeps
GET http://localhost:8080/teststeps/35
POST http://localhost:8080/teststep
PUT http://localhost:8080/teststep/215
DEL http://localhost:8080/teststep/215
DEL http://localhost:8080/teststeps/46
DEL http://localhost:8080/teststeps...
http://localhost:8080/teststeps/46
status checker
Comments 0
Examples 0
DELETE
http://localhost:8080/teststeps/46
Send
Save
Params Authorization Headers (6) Body Pre-request Script Tests Settings
Cookies Code
Query Params
KEY VALUE DESCRIPTION
Bulk Edit
Key Value Description
Body Cookies Headers (7) Test Results
Status: 200 OK Time: 46 ms Size: 212 B
Save Response
Pretty Raw Preview Visualize Text
1
Bootcamp Build Browse
Reddy, K Venkat | ...
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MySQL Workbench
Postman
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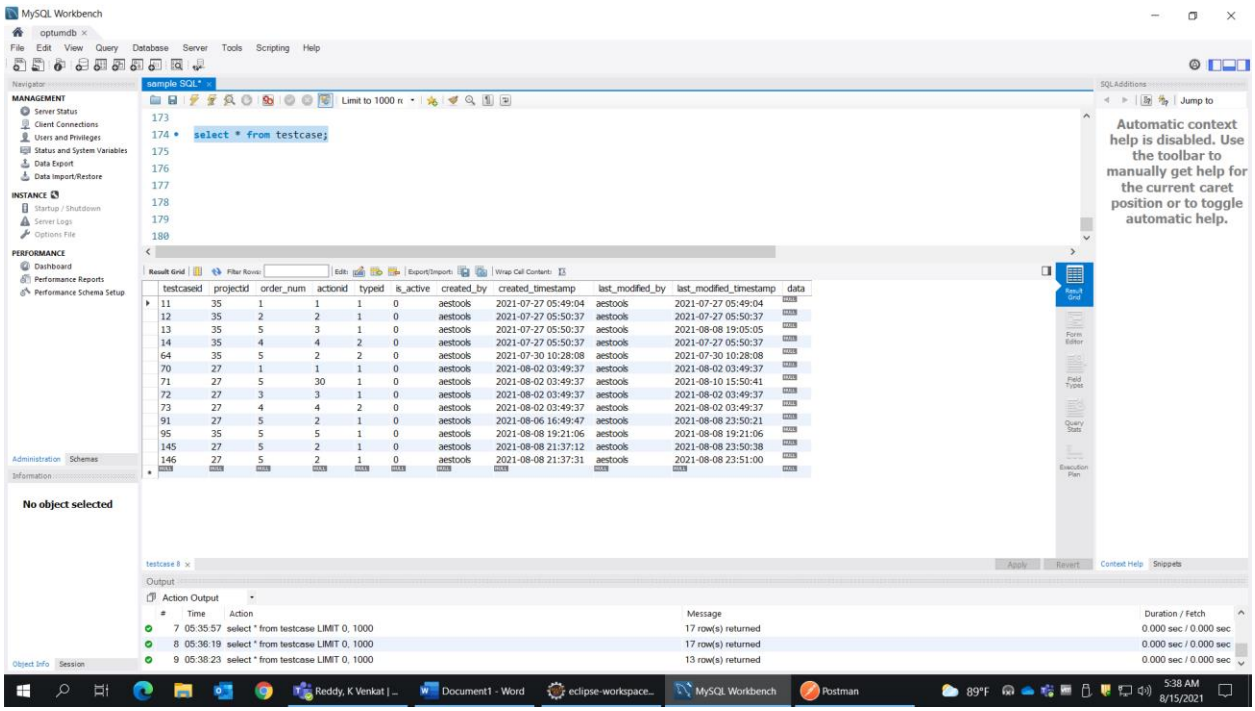
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14 35 4 4 2 0 aestools 2021-07-27 05:50:37 aestools 2021-07-27 05:50:37
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146 27 5 2 1 0 aestools 2021-08-08 21:37:31 aestools 2021-08-08 23:51:00
Automatic context help is disabled. Use the toolbar to manually get help for the current caret position or to toggle automatic help.
Output
Action Output
Time Action Message Duration / Fetch
7 05:35:57 select * from testcase LIMIT 0, 1000 17 row(s) returned 0.000 sec / 0.000 sec
8 05:36:19 select * from testcase LIMIT 0, 1000 17 row(s) returned 0.000 sec / 0.000 sec
9 05:38:23 select * from testcase LIMIT 0, 1000 13 row(s) returned 0.000 sec / 0.000 sec
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Document1 - Word
eclipse-workspace...
MySQL Workbench
Postman
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5:38 AM
8/15/2021

ADDITIONAL RESPONSIBILITIES

Front-End Developer

I was transferred to front-end team towards the end of the internship since the mentors wanted me to have experience working on that area as well before the internship ended. I was still answerable to the same people.

My additional tasks included:

- Fixing and design issues in the webpages
- All APIs are well integrated with the Frontend and the web page displays information as required
- The code developed is clean and will not create any bugs.

CONCLUSION

Through this internship for 61 days, I learnt how to develop the Server Side of any application. I applied the concepts that I learnt in my core subjects like DBMS, Web Technologies, Software Engineering, OOPs, to name a few. Software Testing tools and Docker/Kubernetes gave an insight to Deployment of applications as well. I also used Usability Testing of Human – Computer Interaction to judge the UX of the developed application. I learnt how to develop scalable applications to meet the industry requirements.

Apart from technical skills, I also learned how to work within a team. I developed leadership skills by leading the Backend team. Apart from that I portrayed excellent time management skills for which I was appreciated in the group.