SLIIT

COMPUTING | BUSINESS | ENGINEERING

Programming Application and Frameworks (IT 3030)

3^{rd} Year, 1^{st} Semester

Assignment 1

ElectroGrid (EG)

Sri Lanka Institute of Information Technology

Group Number: 26

Batch: Y3.S1.WE.IT.02.02

Group Members:

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1. Introduction

ElectroGrid is an online system which allow customers to pay their power bills directly through an online platform. First, the customer should register to the system as a valid user and then they can pay power bills as they wish. Through this system generates the monthly bills and automatically send to the users. The customer was given the opportunity to select the payment method according to their preference.

2. Work Distribution

Member	Web Service	Function
IT20146238 Jayathunga T.M.	Bill Management	• Add Bill Details • View Bill Details • Update Bill Details • Delete Bill Details
IT20173104 Shavinda Y.A.D.P	Payment Manage	• Add new payment • View payment History • Update payment • Delete payment
IT20272654 Rajapaksha R.P.S.V	Customer Management	• Add Customer • View Customer • Update Customer • Delete Customer
IT20211950 Amarasekara M.G.V.C	Power Failure Management	• Add Power Failure • View Power Failure • Update Power Failure • Delete Power Failure

3. GitHub Repository Link

https://github.com/IT20146238/ElectroGridSystem

4. Time schedule (Gantt Chart)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
1)Gathering of information and requirements	🟩									
2)Installation of Software		🟩								
3)Designing the Database			🟩	🟩						
4)Implementation					🟩	🟩	🟩	🟩		
5)Feedback session								🟩		
6)Integration and Testing								🟩	🟩	
7)Finalizing system and documents										🟩

5. Requirements Analysis

Requirement analysis includes both user requirements and system requirements. Electro Grid (EG) system has four main stake holders. Bill Management, Payment Management, Customer Management and Power Failure management.

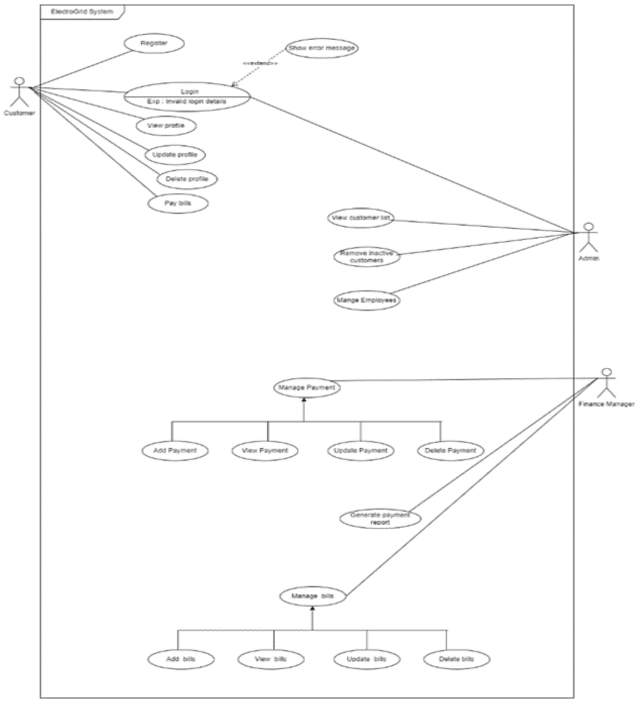
6. Technical Requirements

- Technical requirements are the technical issues that must be considered to make the system successful.
- Bills, Payment, Customer, and Power Failure detail can be updated, deleted, and view when needed, and sensitive details should be encrypted.

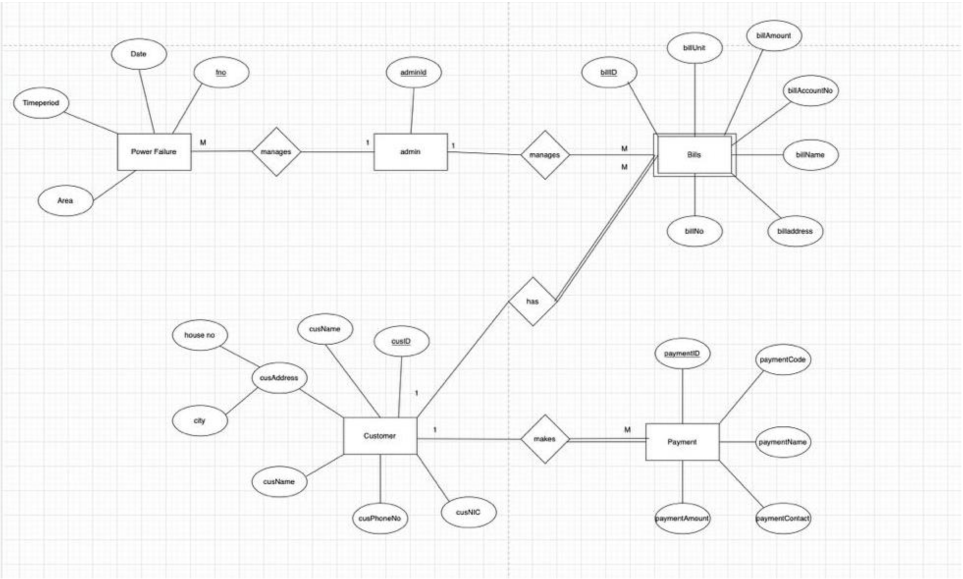
7. Functional Requirements

- **Bill Management**
  - **Add Bill to the system**
  - **View Bill**
  - **Update Bill Details**
  - **Delete Bill Details**
- **Payment Management**
  - **Add a new payment to the system**
  - **View payment history**
  - **Update payment**
  - **Delete payment**
- **Customer Management**
  - **Add a new customer to the system**
  - **View customer details**
  - **Update customer**
  - **Delete customer**
- **Power Failure Management**

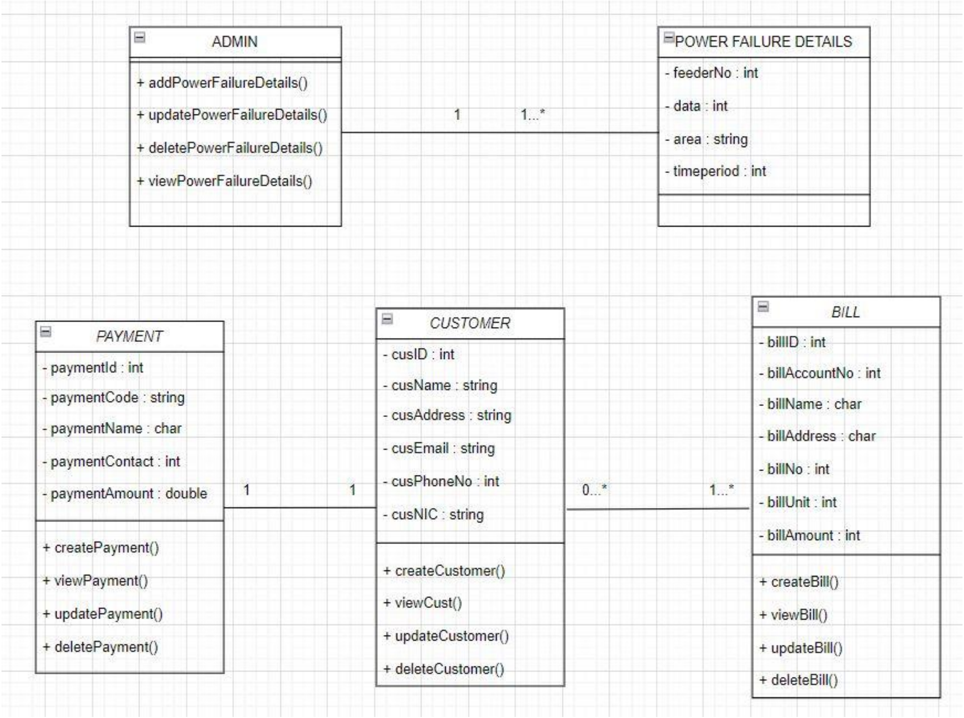
8. Requirements Modelling (Use Case Diagram)



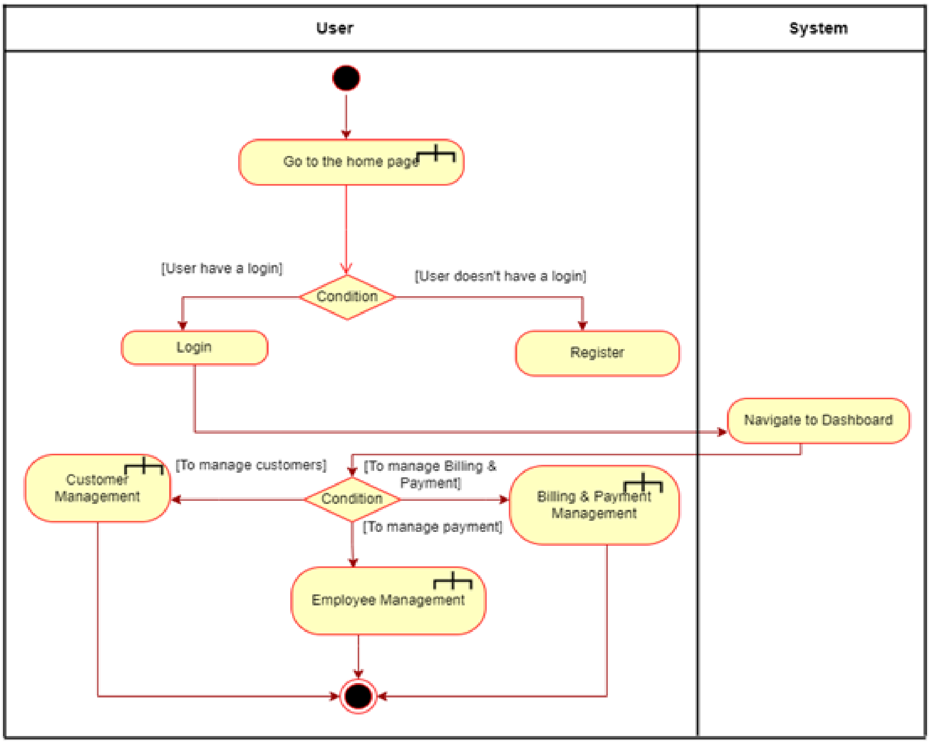
9. Overall DB Design (ER)



10. Overall, Class Diagram



11. Overall, Activity Diagram



12. Service Development and Testing

➢ Tools Used

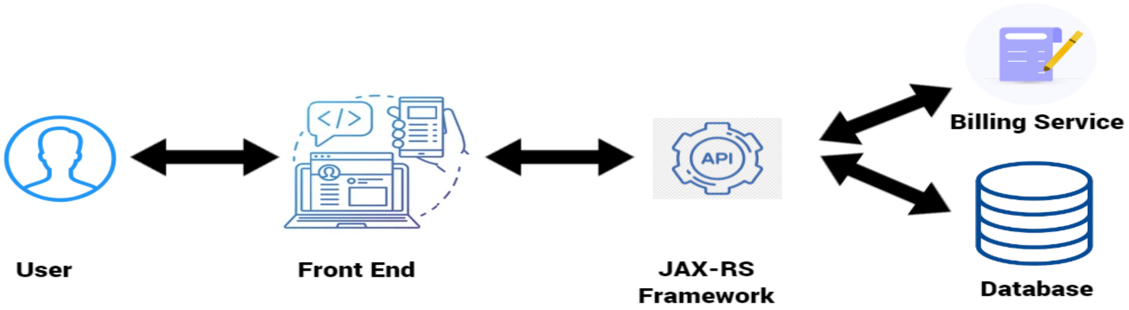
1. **Dependency Management Tool**: Maven – Provides a uniform build system and quality project information
2. **Testing Tool**: Postman – Easy to test server-side development projects without having proper frontend.
3. **Version Control System**: Git
4. **IDE**: Eclipse
5. **Programming Language**: Java with Jersey Framework (JAX-RS) – Good development framework for Restful web services.
6. **Database**: MySQL Work Bench
7. **Server**: Apache Tomcat Server

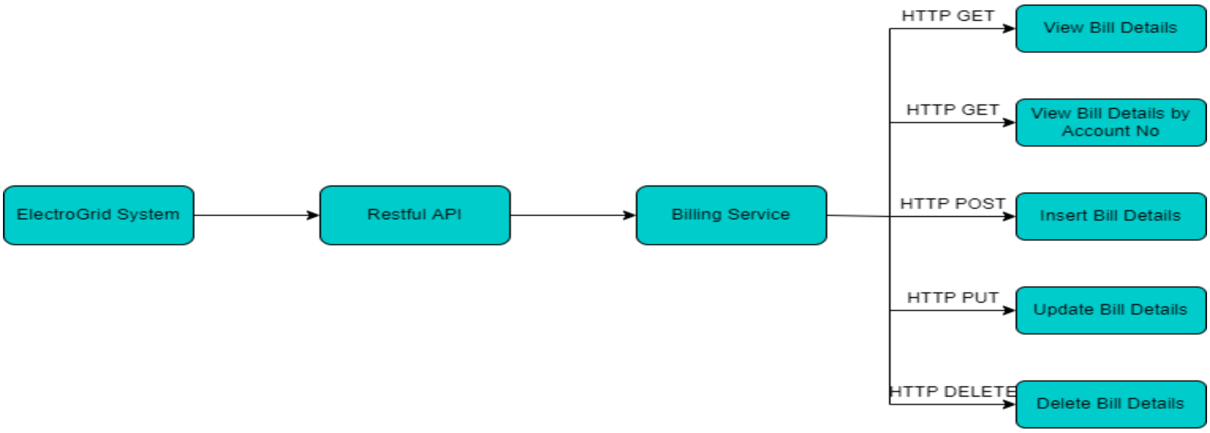
13. Individual Section

i) Bill Service

The billing service part is handled by the meter reader and bill manager. User can see their monthly bill details (no of units use, arrears, monthly bill amount, total bill amount) in this section.

- **API of the Server**





- **View Bill Details (GET)**

Resource – Bills

Request – GET OnlineElectricGrid/myService/Bills/

Media – Form Data

Response – HTML Table with All Bill Details in "billing service" Table of "`Error while connecting to the database for deleting."`

URL - http://localhost:8899/OnlineElectricGrid/myService/Bills/

- ### Insert Bill Details (POST)

Resource – Bills

Request – POST OnlineElectricGrid/myService/Bills/

Media – URL Encoded Form

Data -

KEY	VALUE
billAccountNo	30528630
billName	Nisal
billAddress	Matara
billNo	2541
billUnit	81
billtAmount	2456

Response – `"Bill Added successfully" or "Error occur during inserting"`

URL - http://localhost:8899/OnlineElectricGrid/myService/Bills/

- ### Update Bill Details (PUT)

Resource – Bills

Request – PUT OnlineElectricGrid/myService/Bills/

Media – Application JSON

Data -

```
{
      "billID":"1",
      "billAccountNo":"74589632",
      "billName":"Devidu",
      "billAddress":"Gampaha",
      "billNo":"8001",
      "billUnit":"202",
      "billtAmount":"4578"
}
```

Response – `"Updated Bill successfully "or "Error while updating the billing details."`

URL - http://localhost:8899/OnlineElectricGrid/myService/Bills/

- ### Delete Bill Details (DELETE)

Resource – Bills

Request – DELETE OnlineElectricGrid/myService/Bills/

Media – Application XML

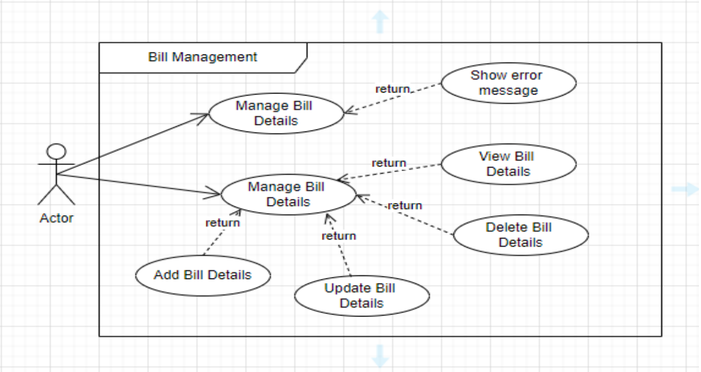
Data -

```
<billData>
       < billID >1</ billID >
</billData>
```

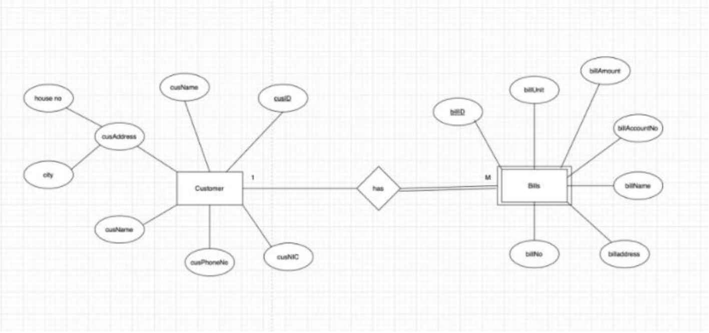
Response – "Deleted Bill successfully" or "Error while deleting the bill"

URL - http://localhost:8899/OnlineElectricGrid/myService/Bills/

➢ Use Case Diagram

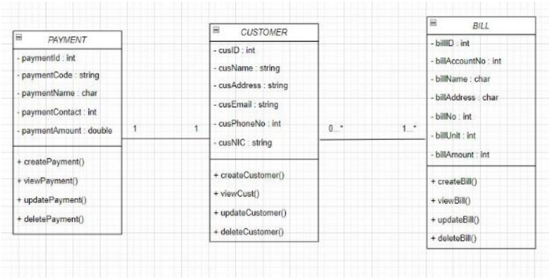


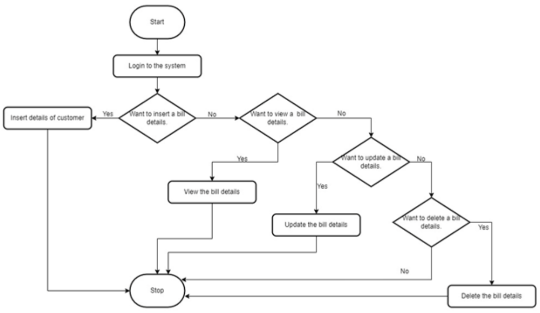
➢ ER Diagram



Class Diagram

Flow Chart




Start
Login to the system
Want to insert a bill details.
Yes
Insert details of customer
No
Want to view a bill details.
Yes
View the bill details
No
Want to update a bill details.
Yes
Update the bill details
No
Want to delete a bill details.
Yes
Delete the bill details
No
Stop

➢ Testing Methodology and Results

Test ID	Description	Input	Expected Output	Actual Output	Result
1	Add Bill	Bill Id: TNL2002 Account_no: 2592290912 Bill_no: 3003 Name: Rasika Address: Colombo Units: 180 T_Amount: 4000	Bill added successfully	Bill data added Successfully	Pass
2	View Bill		Display a HTML table with all the attributes in bill table	Displayed HTML Table with all the attributes in bill table	Pass
3	Update Bill	Bill Id: TNL2002 Account_no: 2592290912 Bill_no: 3003 Name: Dilshan Address: Galle Units: 150 T_Amount: 3500	Updated Successfully	Updated Successfully	**Pass**
4	Delete Bill	Bill id: “TNL2002”	Deleted Successfully	Deleted Successfully	**Pass**

ii) Customer Service

- **View Customer Details (GET)**

Resource – customer

Request – GET OnlineEG/myService/Customer/

Media – Form Data

Response – HTML Table with All Customer Details in “customer service” Table of "Error while connecting to the database for inserting."

URL - http://localhost:8088/OnlineEG/myService/Customer/

- **Insert Customer Details (POST)**

Resource – customer

Request – POST OnlineEG /myService/Customer/

Media – URL Encoded Form

Data -

KEY	VALUE
cusName	Pamal Weerasooriya
cusAddress	No 32, Jaffna
cusPhoneNo	0786543868
cusEmail	pamal@gmail.com
cusNIC	890354306V

Response – "Customer Added successfully" or " Error occur during inserting "

URL - http://localhost:8088/OnlineEG/myService/Customer/

- **Update Customer Details (PUT)**

Resource – customer

Request – PUT OnlineEG /myService/Customer/

Media – Application JSON

Data - {

```
"cusID":"4",
       "cusName":"Kamal Ranasingha",
"cusAddress":"No 45, Kandy",
"cusPhoneNo":"0723234998",
"cusEmail":"ranil@gmail.com",
       "cusNIC":"792132346V"
}
```

Response – "Error while updating the customer details." or "Updated successfully"

URL - http://localhost:8899/ OnlineEG /myService/Bills/

- **Delete Customer Details (DELETE)**

Resource – customer

Request – DELETE OnlineEG /myService/Customer/

Media – Application XML

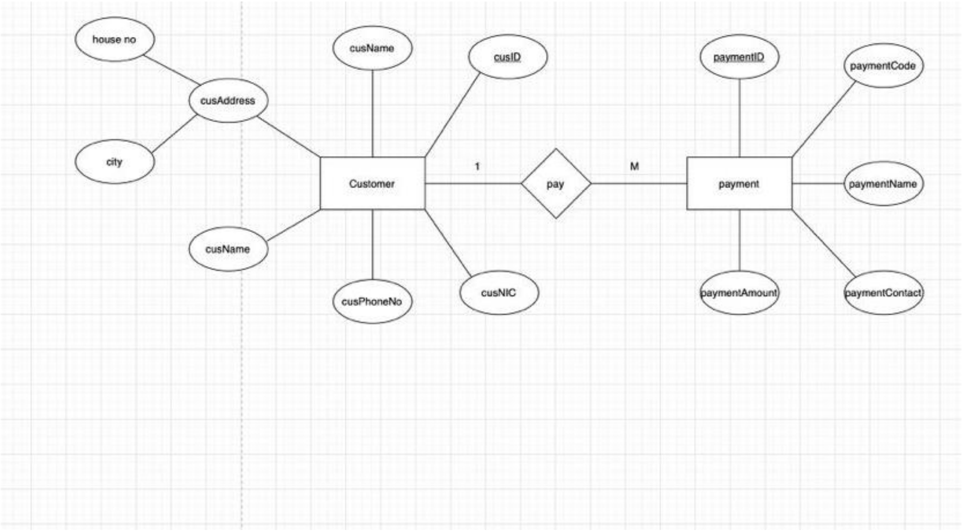
Data -

```
< customerData >
       <cusID>4</cusID>
 </ customerData >
```

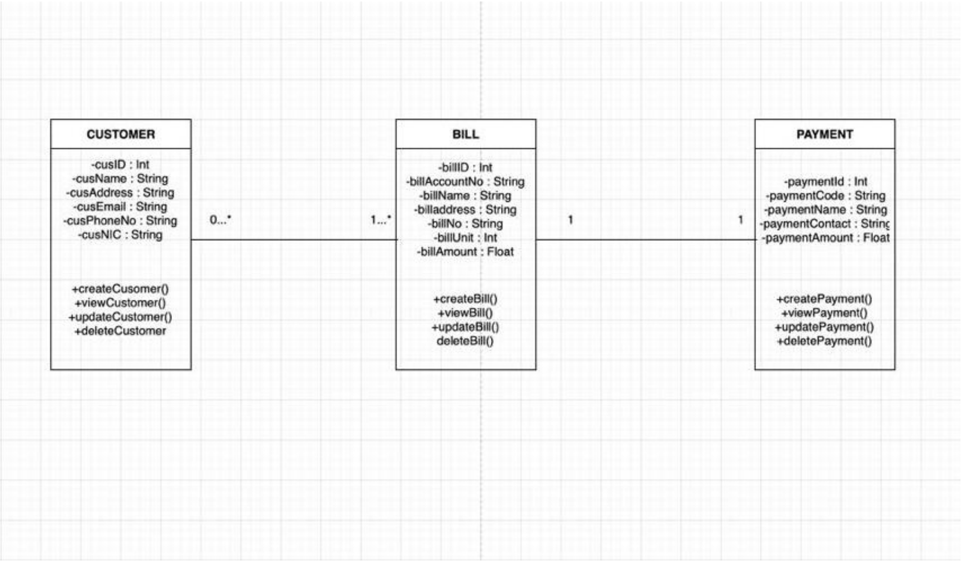
Response – "Deleted successfully" or "Error while deleting the customer"

URL - http://localhost:8088/OnlineEG/myService/Customer/

➢ Er Diagram



➢ Class Diagram



- **Testing Methodology and Results**

Test ID	Description	Input	Expected Output	Actual Output	Result
1	Add Customer	cusName : Pamal Weerasooriya cusAddress : No 32, Jaffna cusPhoneNo : cusEmail : pamal@gmail.com cusNiC : 890354306V	Customer added successfully	Customer data added Successfully	Pass
2	View Customer		Display a HTML table with all the attributes in customer table	Display a HTML table with all the attributes in customer table	Pass
3	Update Customer	cusName : Kamal Ranasingha cusAddress : No 45, Kandy cusPhoneNo : 0723234998 cusEmail : ranil@gmail.com cusNiC : 792132346V	Updated Successfully	Updated Successfully	Pass
4	Delete Customer	cusID: “4”	Deleted Successfully	Deleted Successfully	Pass

iii) Payment Service

This is an e-payment function that is a way of allowing customers to pay their electricity bills thru ElectricGrid system. Using this function customers can pay their bills and read payment history. Also, admins can read payment history, update admin remarks on the payment history and delete the payment history.

- **View Payment Details (GET)**

Resource - payments

Request – Get PaymentManagement/myService/payment/

Media – Form Data

Response – HTML Table with All payment Details in “payments” Table of "Error while connecting to the database for inserting."

URL:http://localhost:8080/PaymentManagement/myService/Payment

- **Insert Payment Details (POST)**

Resource – payments

Request – POST PaymentManagement/myService/payment/

Media – URL Encoded Form

Data -

KEY	VALUE
paymentCode	7635
paymentName	Y.A.D.P Shavinda
paymentAmount	1245
paymentContact	758652356

Response – "Payment done successfully" or " Error occur during inserting "

URL:http://localhost:8080/PaymentManagement/myService/Payment

- **Update Payment Details (PUT)**

Resource – payments

Request – PUT PaymentManagement/myService/payment/

Media – Application JSON

Data - {

```
"paymentID":"1",

"adminRemark":"no remark"

}
```

URL:http://localhost:8080/PaymentManagement/myService/Payment

- **Delete Payment Details (DELETE)**

Resource – payments

Request – DELETE PaymentManagement/myService/payment/

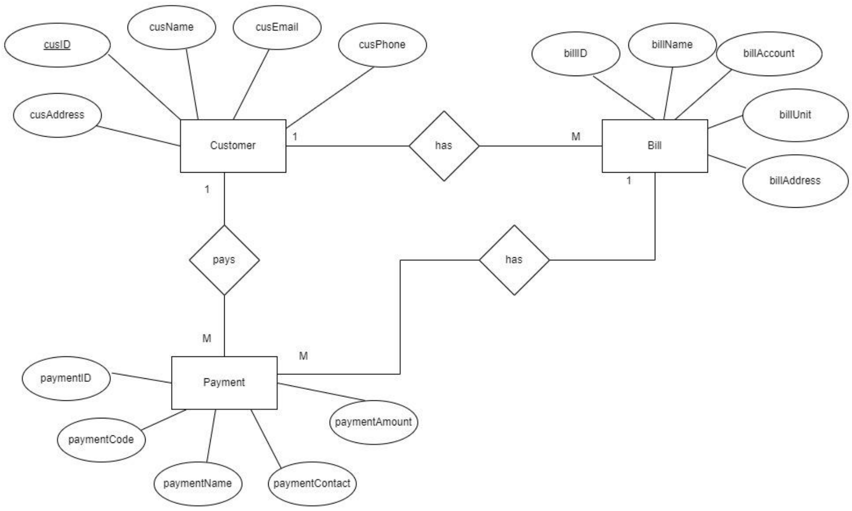
Media – Application XML

Data -
```
< paymentData>
        <paymentID>4</ paymentID >
  </ paymentData>
```

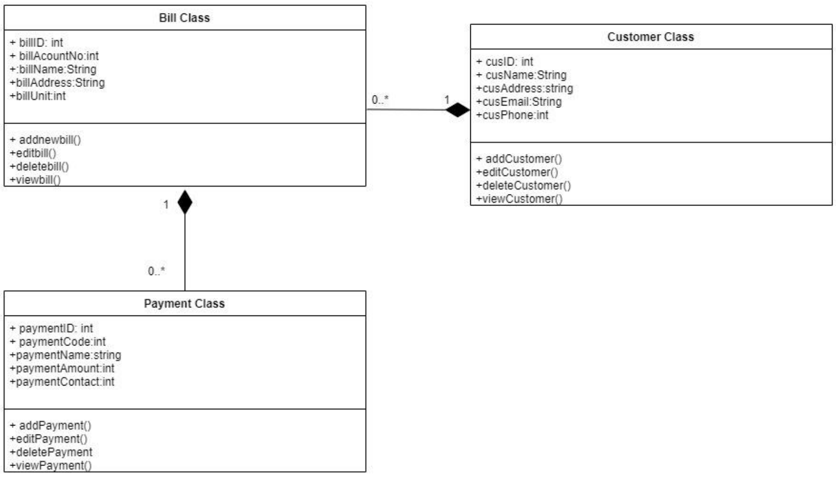
Response – "Deleted successfully" or "Error while deleting the payment

URL:http://localhost:8080/PaymentManagement/myService/Payment

➢ ER Diagram



➢ Class diagram



➢ Testing Methodology and Results

Test ID	Description	Input	Expected Output	Actual Output	Result
1	Add Payment	paymentCode:7635 PaymentName:Y.A.D.P Shavinda PaymentAmount: 1245 PaymentContact: 758652356	payment added successfully	payment added Successfully	Pass
2	View Payment		Display a HTML table with all the attributes in payment table	Displayed HTML Table with all the attributes in payment table	Pass
3	Update payment	PaymentID:2 AdminRemark:Invalide	Updated Successfully	Updated Successfully	pass
4	Delete payment	Payment ID:2	Deleted Successfully	Delete Unsuccessfully	fail

iv) Powe Failure Service

v) View Power Failure Details (GET)

Resource: - Power Failure

Request: - GET http://localhost:8180/ ElectricGrid /PowerFailure.

Media: - Form Data

Response: - HTML table with all attributes in funds table

URL: - http://localhost:8180/ ElectricGrid /PowerFailure

vi) Insert Power Failure Details (POST)

Resource: - Power Failure

Request: - POST http://localhost:8180/ ElectricGrid /PowerFailure.

Media: - URL Form

Response: - "Add Details successfully" or "Error while Insering"

URL: - http://localhost:8180/ ElectricGrid /PowerFailure.

vii) Update Power Failure Details (PUT)

Resource: - Power Failure

Request: - PUT http://localhost:8180/ ElectricGrid /PowerFailure.

Media: - Application JSON

Response: - "Update successfully" or "Error while updating"

URL: - http://localhost:8180/ ElectricGrid /PowerFailure.

viii) Delete Power Failure Details (DELETE)

Resource: - Power Failure

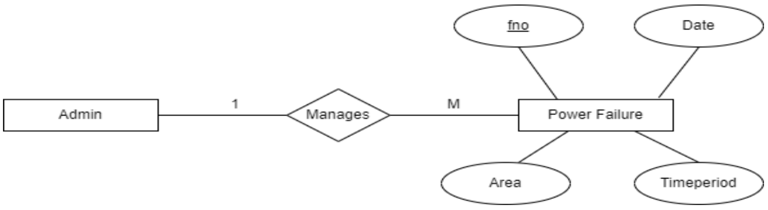
Request: - DELETE http://localhost:8180/ ElectricGrid /PowerFailure.

Media: - Application XML

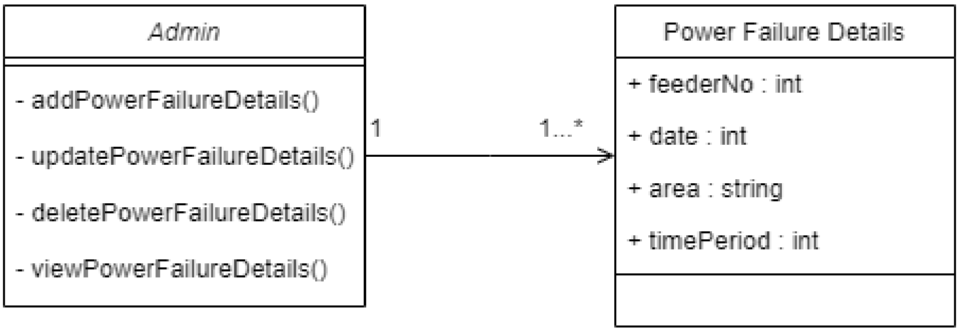
Response: - "Deleted successfully" or "Error while deleting"

URL: - http://localhost:8180/ ElectricGrid /PowerFailure.

b) ER Diagram

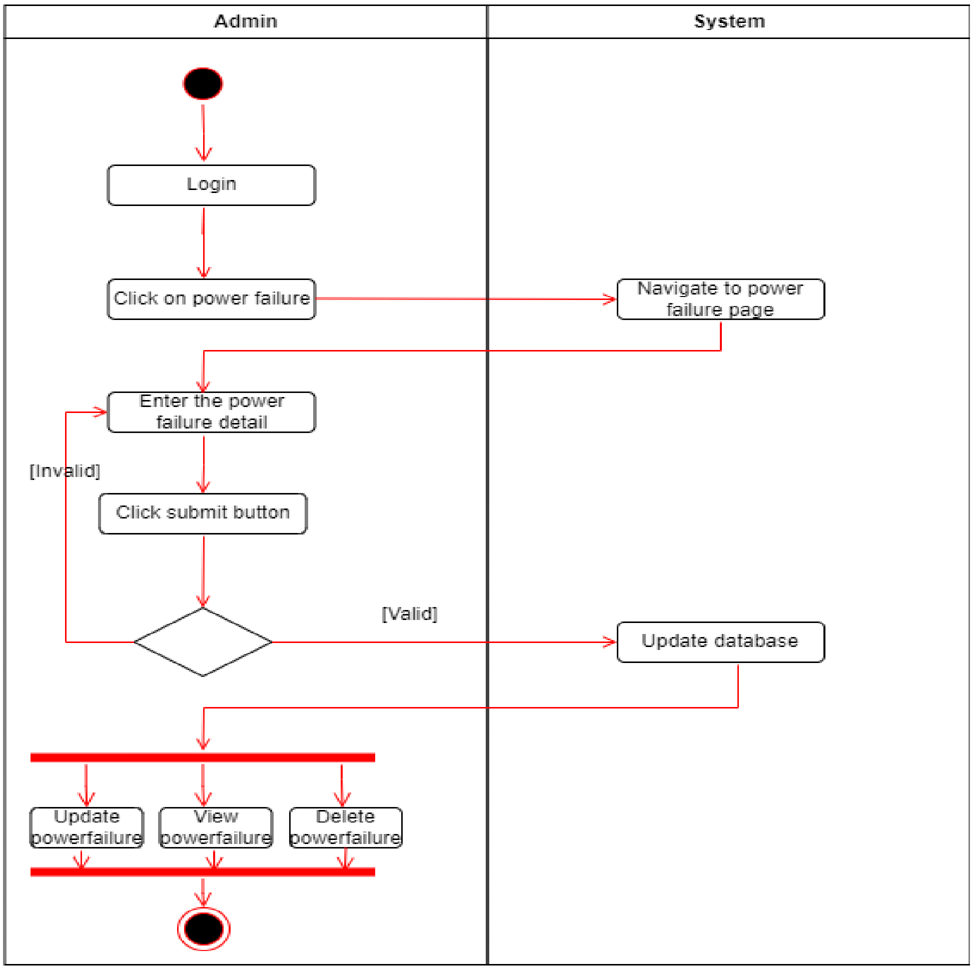


c) Class Diagram

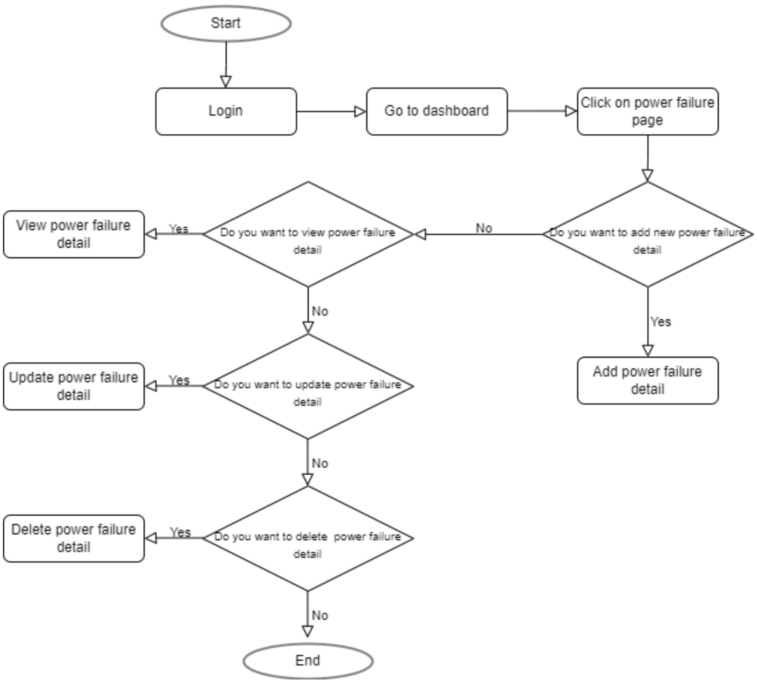


Admin
- addPowerFailureDetails()
- updatePowerFailureDetails()
- deletePowerFailureDetails()
- viewPowerFailureDetails()
1
1...*
Power Failure Details
+ feederNo : int
+ date : int
+ area : string
+ timePeriod : int

d) Activity Diagram



e) Flow Chart


Start
Login
Go to dashboard
Click on power failure page
Do you want to add new power failure detail
No
Yes
Add power failure detail
Do you want to view power failure detail
Yes
View power failure detail
No
Do you want to update power failure detail
Yes
Update power failure detail
No
Do you want to delete power failure detail
Yes
Delete power failure detail
No
End

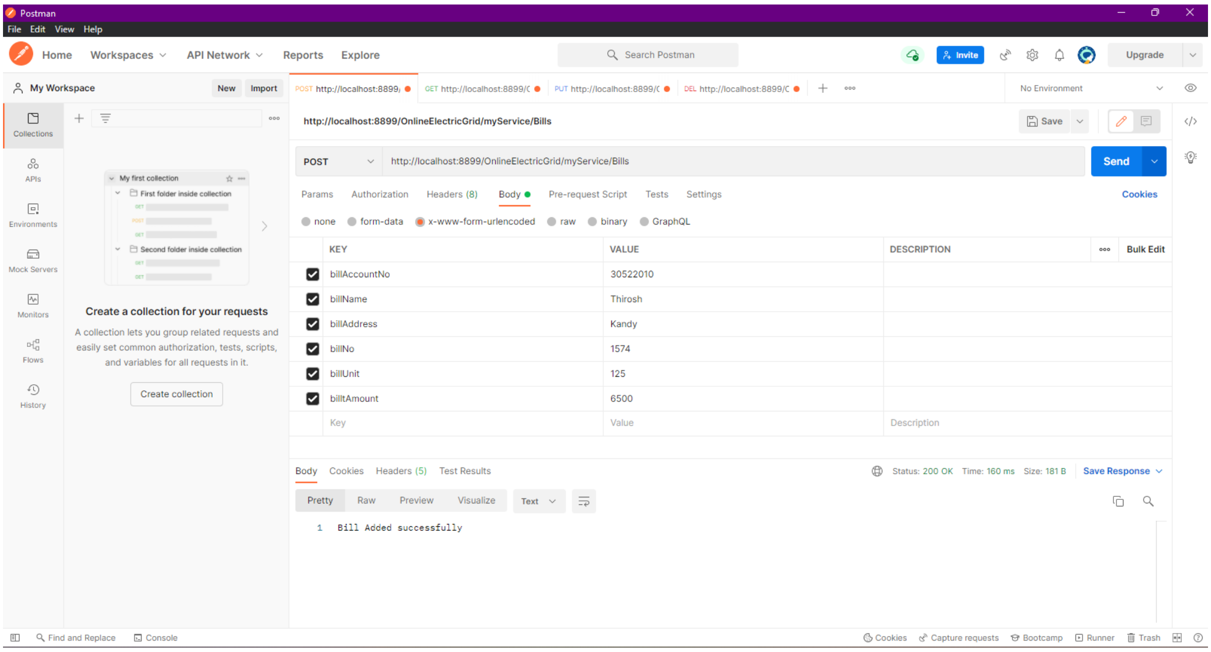
f) Testing Methodology and Results

Test ID	Description	Input	Expected Output	Actual Output	Result
1	Add Power Failure Detail	Feeder No: 008 Date: 2022.05.22 Area: Malabe Time Period: 8.00 - 10.00	Power Failure Detail added successfully	Power Failure Detail data added Successfully	Pass
2	View Power Failure Detail		Display a HTML table with all the attributes in Power Failure Detail table	Displayed HTML Table with all the attributes in Power Failure Detail table	Pass
3	Update Power Failure Detail	Feeder No: 005 Date: 2022.05.25 Area: Kaduwela Time Period:13.00-15.00	Updated Successfully	Updated Successfully	Pass
4	Delete Power Failure Detail	Feeder No : 006	Deleted Successfully	Deleted Successfully	Pass

2) Postman Services Screenshots

a) Bill Management

i) Insert Bill Screenshot



http://localhost:8899/OnlineElectricGrid/myService/Bills

POST http://localhost:8899/OnlineElectricGrid/myService/Bills

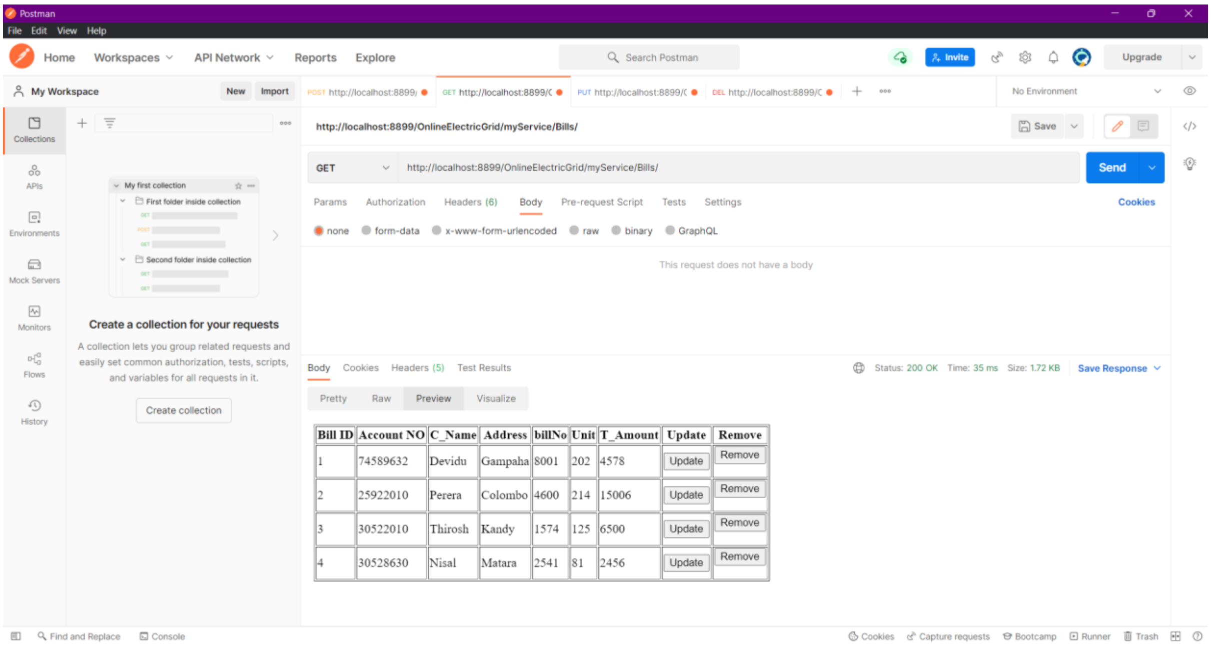
Body: ○ none ○ form-data ● x-www-form-urlencoded ○ raw ○ binary ○ GraphQL

	KEY	VALUE	DESCRIPTION
☑	billAccountNo	30522010	
☑	billName	Thirosh	
☑	billAddress	Kandy	
☑	billNo	1574	
☑	billUnit	125	
☑	billtAmount	6500	
	Key	Value	Description

Status: 200 OK Time: 160 ms Size: 181 B

```
1   Bill Added successfully
```

ii) View Bill Screenshot



http://localhost:8899/OnlineElectricGrid/myService/Bills/

GET http://localhost:8899/OnlineElectricGrid/myService/Bills/

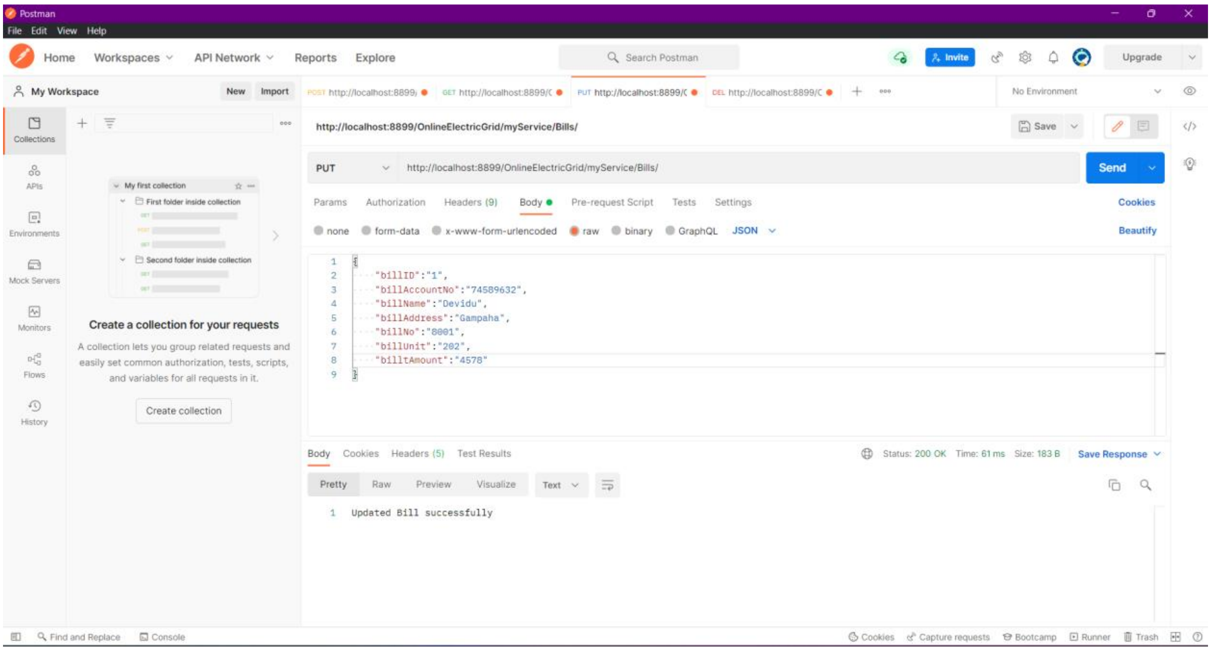
Body: ● none ○ form-data ○ x-www-form-urlencoded ○ raw ○ binary ○ GraphQL

This request does not have a body

Status: 200 OK Time: 35 ms Size: 1.72 KB

Bill ID	Account NO	C_Name	Address	billNo	Unit	T_Amount	Update	Remove
1	74589632	Devidu	Gampaha	8001	202	4578	Update	Remove
2	25922010	Perera	Colombo	4600	214	15006	Update	Remove
3	30522010	Thirosh	Kandy	1574	125	6500	Update	Remove
4	30528630	Nisal	Matara	2541	81	2456	Update	Remove

iii) Update Bill Screenshot



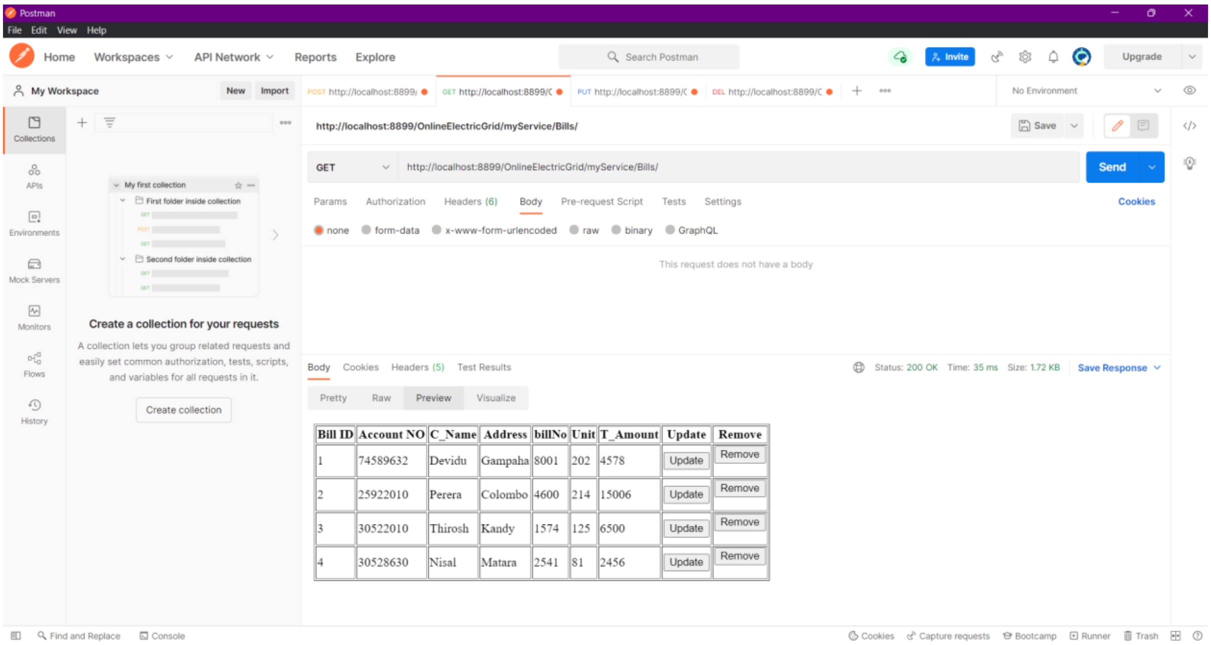
PUT http://localhost:8899/OnlineElectricGrid/myService/Bills/

```
{
    "billID":"1",
    "billAccountNo":"74589632",
    "billName":"Devidu",
    "billAddress":"Gampaha",
    "billNo":"8001",
    "billUnit":"202",
    "billtAmount":"4578"
}
```

Status: 200 OK Time: 61 ms Size: 183 B

```
Updated Bill successfully
```

After Update Check GET Method

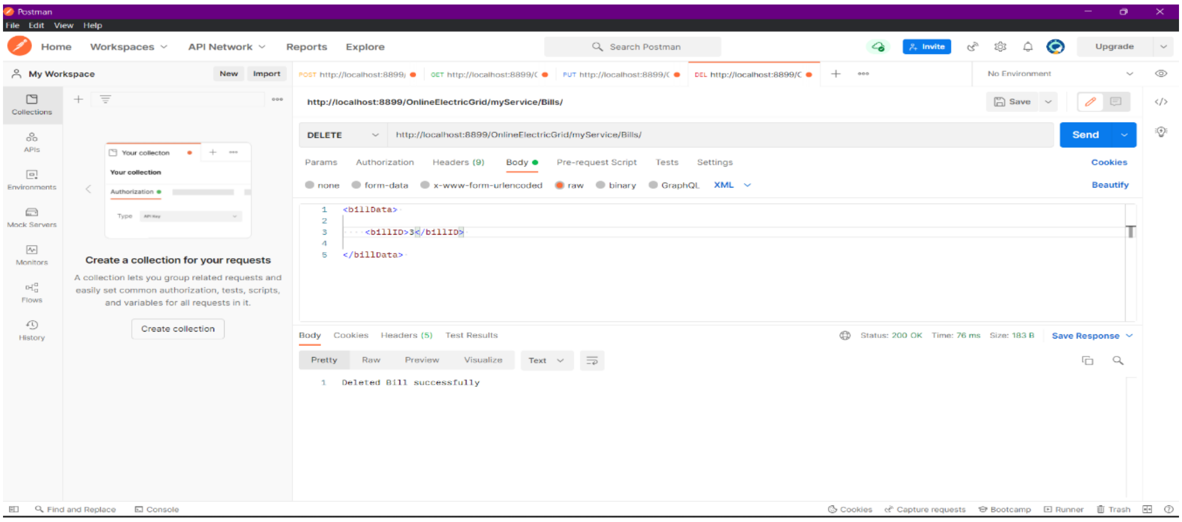


GET http://localhost:8899/OnlineElectricGrid/myService/Bills/

Status: 200 OK Time: 35 ms Size: 1.72 KB

Bill ID	Account NO	C_Name	Address	billNo	Unit	T_Amount	Update	Remove
1	74589632	Devidu	Gampaha	8001	202	4578	Update	Remove
2	25922010	Perera	Colombo	4600	214	15006	Update	Remove
3	30522010	Thirosh	Kandy	1574	125	6500	Update	Remove
4	30528630	Nisal	Matara	2541	81	2456	Update	Remove

iv) Delete Bill Screenshot



http://localhost:8899/OnlineElectricGrid/myService/Bills/

DELETE http://localhost:8899/OnlineElectricGrid/myService/Bills/

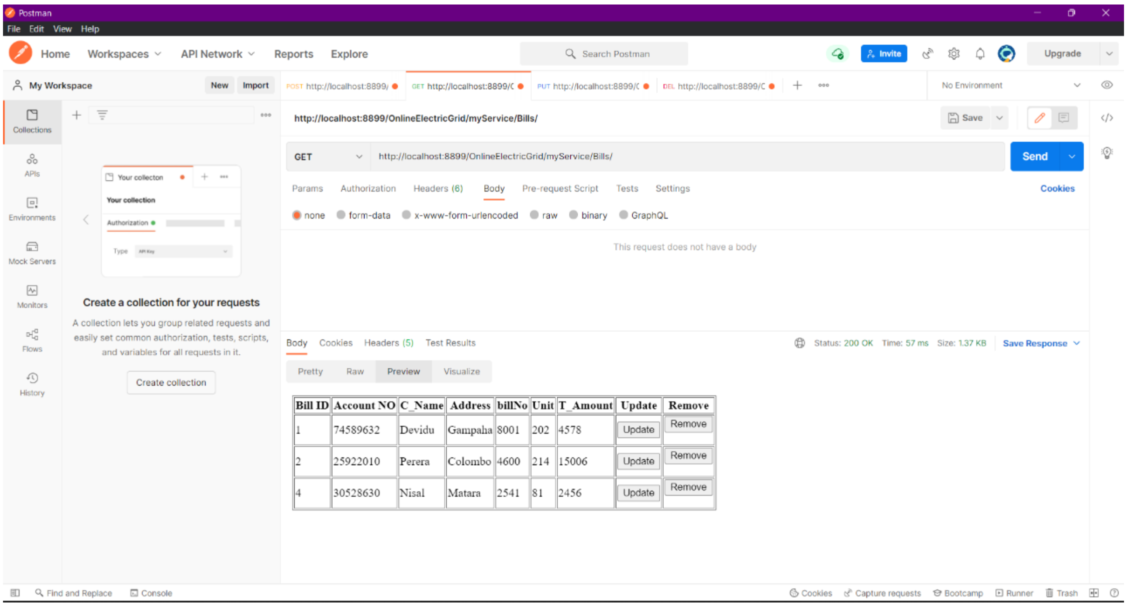
Body: raw XML

```
<billData>

    <billID>3</billID>

</billData>
```

Status: 200 OK Time: 76 ms Size: 183 B

```
Deleted Bill successfully
```

After Deleting Bill ID



http://localhost:8899/OnlineElectricGrid/myService/Bills/

GET http://localhost:8899/OnlineElectricGrid/myService/Bills/

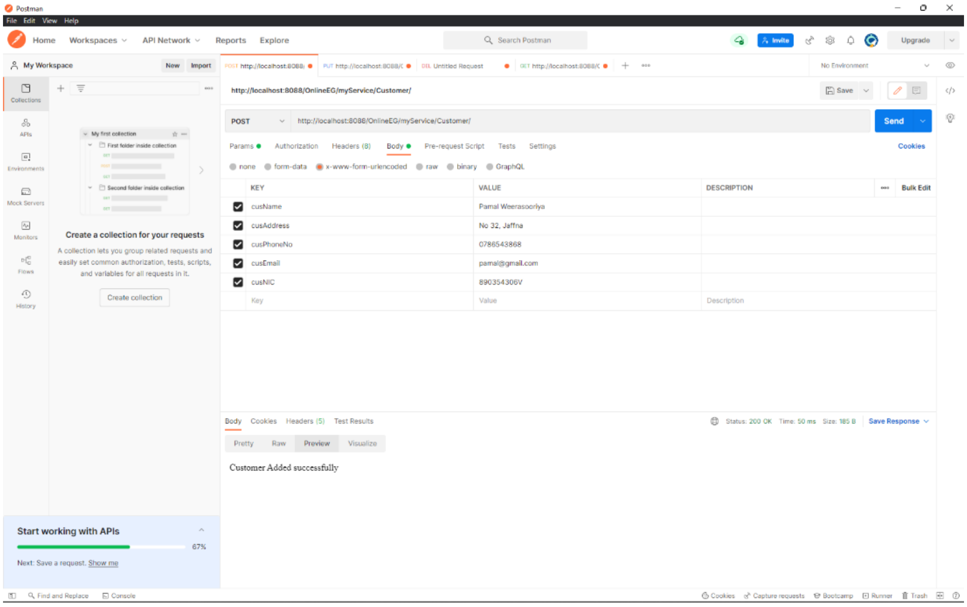
This request does not have a body

Status: 200 OK Time: 57 ms Size: 1.37 KB

Bill ID	Account NO	C_Name	Address	billNo	Unit	T_Amount	Update	Remove
1	74589632	Devidu	Gampaha	8001	202	4578	Update	Remove
2	25922010	Perera	Colombo	4600	214	15006	Update	Remove
4	30528630	Nisal	Matara	2541	81	2456	Update	Remove

b) Customer Management

i) Insert Customer Screenshot



http://localhost:8088/OnlineEG/myService/Customer/

POST http://localhost:8088/OnlineEG/myService/Customer/

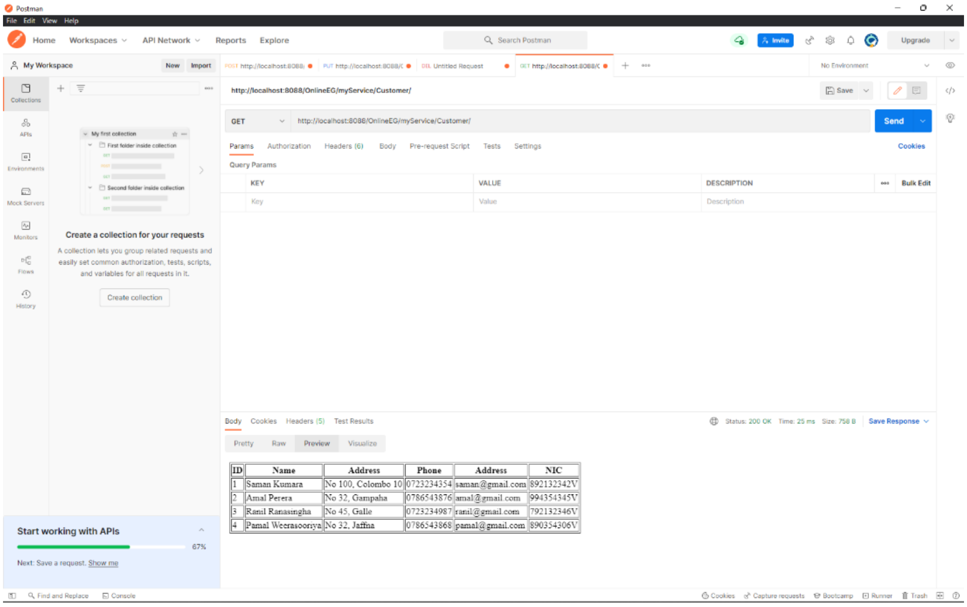
Body: x-www-form-urlencoded

	KEY	VALUE	DESCRIPTION
☑	cusName	Pamal Weerasooriya	
☑	cusAddress	No 32, Jaffna	
☑	cusPhoneNo	0786543868	
☑	cusEmail	pamal@gmail.com	
☑	cusNIC	890354306V	

Status: 200 OK Time: 50 ms Size: 185 B

Customer Added successfully

ii) View Customer Screenshot



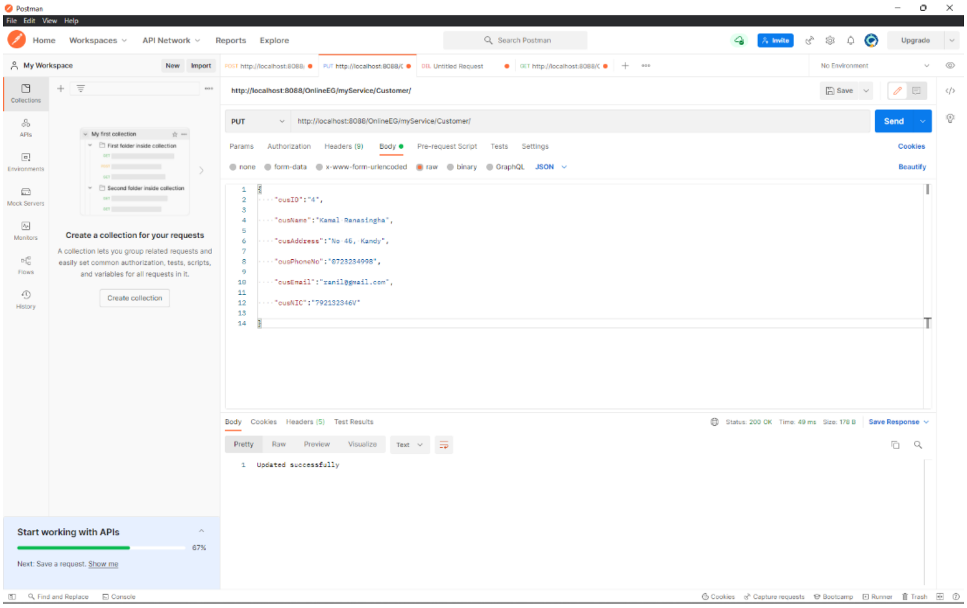
http://localhost:8088/OnlineEG/myService/Customer/

GET http://localhost:8088/OnlineEG/myService/Customer/

Status: 200 OK Time: 25 ms Size: 758 B

ID	Name	Address	Phone	Address	NIC
1	Saman Kumara	No 100, Colombo 10	0723234354	saman@gmail.com	892132342V
2	Amal Perera	No 32, Gampaha	0786543876	amal@gmail.com	994354345V
3	Ranil Ranasingha	No 45, Galle	0723234987	ranil@gmail.com	792132346V
4	Pamal Weerasooriya	No 32, Jaffna	0786543868	pamal@gmail.com	890354306V

iii) Update Customer Screenshot



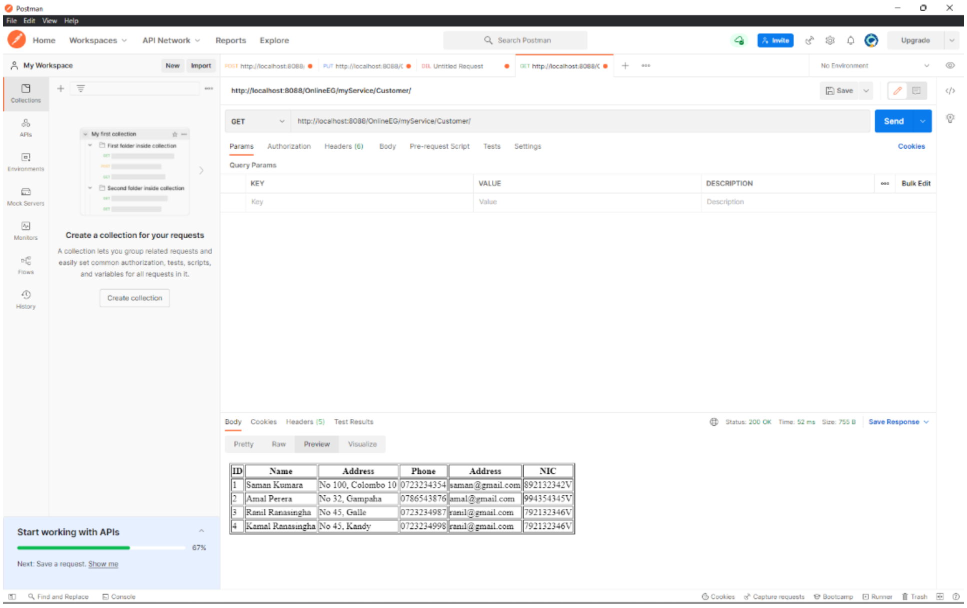
PUT http://localhost:8088/OnlineEG/myService/Customer/

```
{
    "cusID":"4",

    "cusName":"Kamal Ranasingha",

    "cusAddress":"No 45, Kandy",

    "cusPhoneNo":"0723234998",

    "cusEmail":"ranil@gmail.com",

    "cusNIC":"792132346V"

}
```

Status: 200 OK Time: 49 ms Size: 178 B

```
Updated successfully
```

Updated successfully

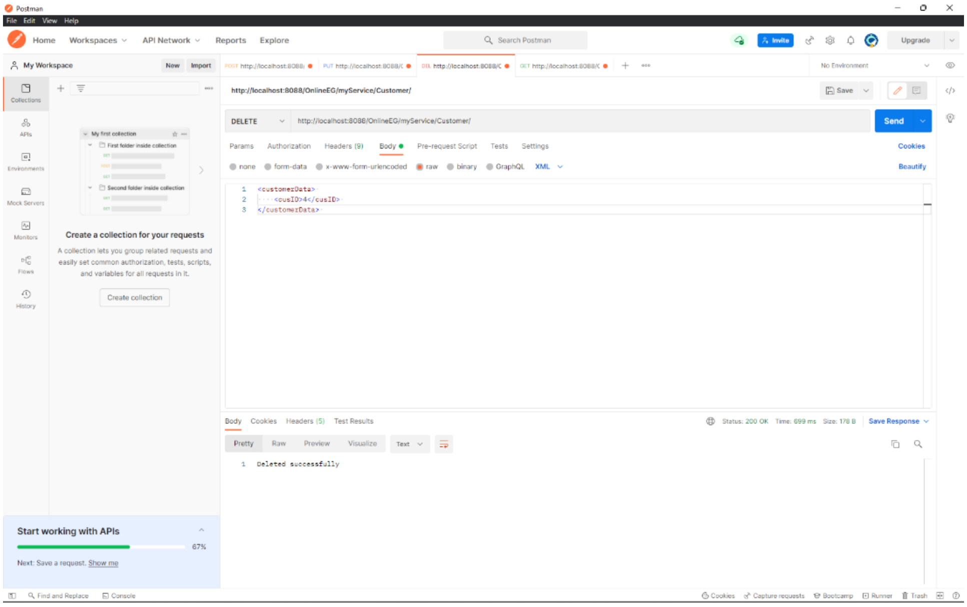


GET http://localhost:8088/OnlineEG/myService/Customer/

Status: 200 OK Time: 52 ms Size: 755 B

ID	Name	Address	Phone	Address	NIC
1	Saman Kumara	No 100, Colombo 10	0723234354	saman@gmail.com	892132342V
2	Amal Perera	No 32, Gampaha	0786543876	amal@gmail.com	994354345V
3	Ranil Ranasingha	No 45, Galle	0723234987	ranil@gmail.com	792132346V
4	Kamal Ranasingha	No 45, Kandy	0723234998	ranil@gmail.com	792132346V

iv) Delete Customer screenshot



DELETE http://localhost:8088/OnlineEG/myService/Customer/

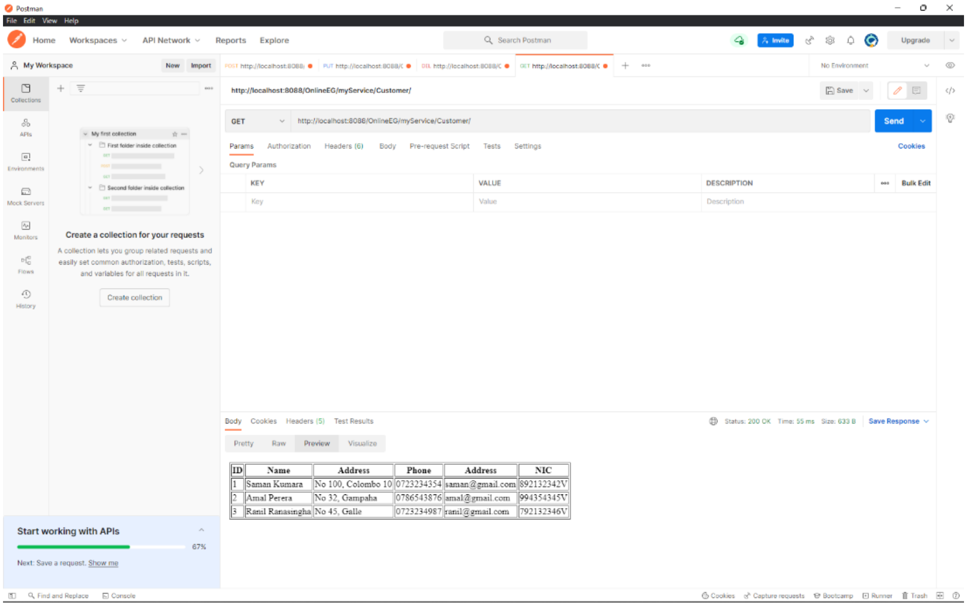
Body: raw XML

```
<customerData>
    <cusID>4</cusID>
</customerData>
```

Status: 200 OK Time: 699 ms Size: 178 B

```
Deleted successfully
```

Deleted successfully



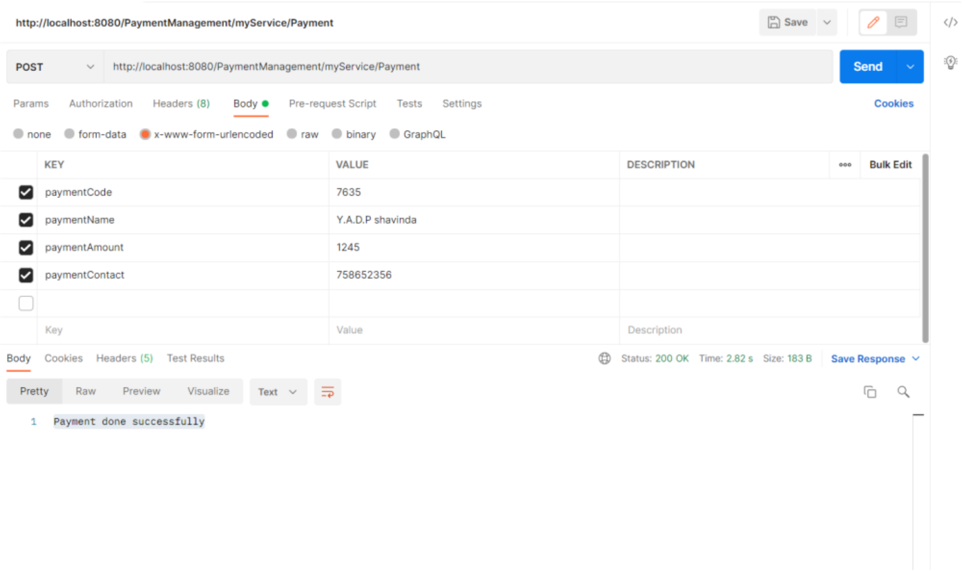
GET http://localhost:8088/OnlineEG/myService/Customer/

Status: 200 OK Time: 55 ms Size: 633 B

ID	Name	Address	Phone	Address	NIC
1	Saman Kumara	No 100, Colombo 10	0723234354	saman@gmail.com	892132342V
2	Amal Perera	No 32, Gampaha	0786543876	amal@gmail.com	994354345V
3	Ranil Ranasingha	No 45, Galle	0723234987	ranil@gmail.com	792132346V

c) Payment Management

i) Insert Payment Screenshot



http://localhost:8080/PaymentManagement/myService/Payment

POST http://localhost:8080/PaymentManagement/myService/Payment

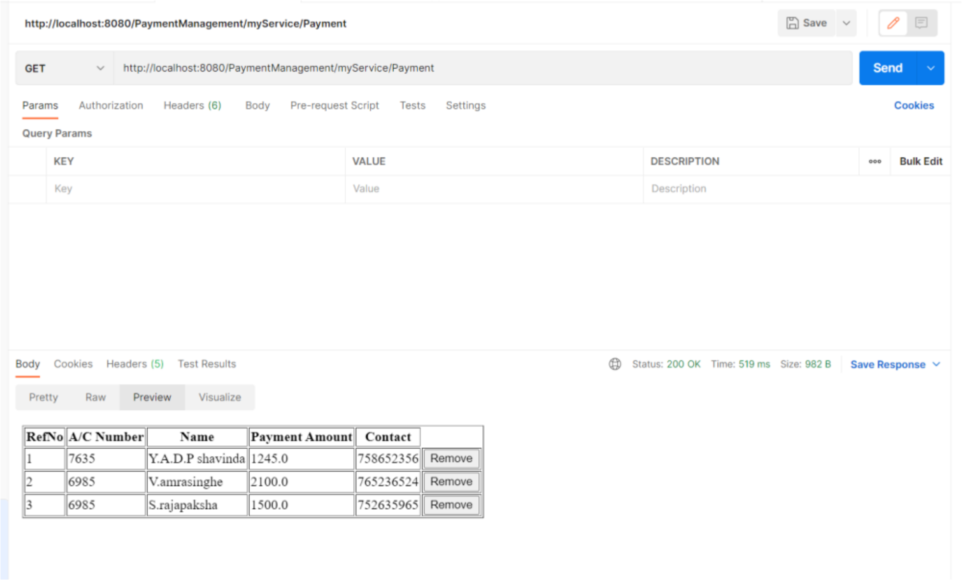
○ none ○ form-data ● x-www-form-urlencoded ○ raw ○ binary ○ GraphQL

	KEY	VALUE	DESCRIPTION
☑	paymentCode	7635	
☑	paymentName	Y.A.D.P shavinda	
☑	paymentAmount	1245	
☑	paymentContact	758652356	
□			
	Key	Value	Description

Status: 200 OK Time: 2.82 s Size: 183 B

```
1  Payment done successfully
```

ii) View Payment Screenshot



http://localhost:8080/PaymentManagement/myService/Payment

GET http://localhost:8080/PaymentManagement/myService/Payment

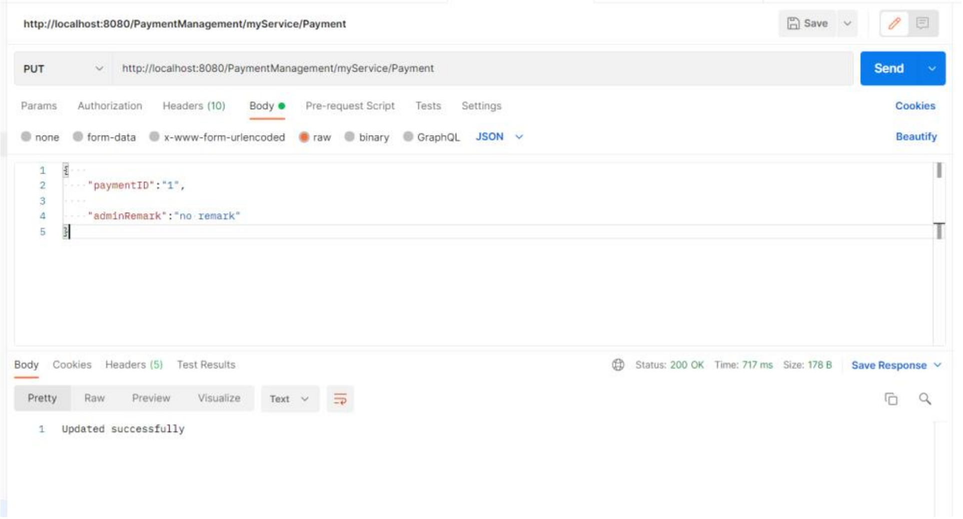
Query Params

KEY	VALUE	DESCRIPTION
Key	Value	Description

Status: 200 OK Time: 519 ms Size: 982 B

RefNo	A/C Number	Name	Payment Amount	Contact	
1	7635	Y.A.D.P shavinda	1245.0	758652356	Remove
2	6985	V.amrasinghe	2100.0	765236524	Remove
3	6985	S.rajapaksha	1500.0	752635965	Remove

iii) Update Payment Screenshot



PUT http://localhost:8080/PaymentManagement/myService/Payment

Body: ○ none ○ form-data ○ x-www-form-urlencoded ● raw ○ binary ○ GraphQL JSON

```
{
    "paymentID":"1",

    "adminRemark":"no remark"
}
```

Status: 200 OK Time: 717 ms Size: 178 B

Body — Text

```
Updated successfully
```

3) Reference

- a) Refer Lab sheet
- b) JAX-RS Documentation - https://docs.oracle.com/javaee/6/tutorial/doc/giepu.html
- c) SE Methodologies - https://acodez.in/12-best-software-development-methodologies-pros-cons/
- d) Maven Documentation - https://maven.apache.org/guides/

4) Appendices

- ➢ **Git Commit Log**