*ELECTRIC VEHICLE CHARGING NETWORK*

***Abstract***:

Electric charging vehicle network aims to establish a robust and user-friendly electric vehicle (EV) charging network to meet the growing demand for sustainable transportation solutions. Leveraging advanced technology and strategic infrastructure deployment, ElectraNet will provide seamless access to charging stations across urban and suburban areas. Our project focuses on optimizing charging efficiency, ensuring compatibility with diverse EV models, and implementing smart grid integration for enhanced reliability and scalability. By fostering collaboration between stakeholders and prioritizing user experience, ElectraNet seeks to accelerate the adoption of EVs and contribute to a greener, more sustainable future for all.

***Introduction to Electric Vehicle Charging Network :***

As the world increasingly shifts towards sustainable energy solutions, the adoption of electric vehicles (EVs) has seen exponential growth. Central to this transition is the development of robust and extensive electric vehicle charging networks. These networks form the backbone of the EV infrastructure, ensuring that EV owners have reliable and convenient access to charging facilities, thereby addressing one of the most significant barriers to widespread EV adoption—range anxiety.

Electric vehicle charging networks consist of strategically placed charging stations that can be found in a variety of locations such as residential areas, commercial establishments, public parking lots, highways, and workplaces. These networks encompass different types of chargers, ranging from slow (Level 1) and medium (Level 2) chargers suitable for home and office use to fast (DC Fast Charging) chargers designed for quick top-ups during long-distance travel.

***Functional Requirements:***

User :

Users should be able to register by providing an email, username, and password, address, phone number.

Changing station :

Charging stations will have location and it shows the available ports and user should know about the charger\_id and user should have an idea about the capacity of the vehicle battery.

Vehicle :

Vechicle have the name of the vehicle and capacity of the battery

And electric vehicles have separate id for each vehicle.

Payment :

Users should be able to make payments for charging the vehicle The system should record payment details including amount, date, and associated payment\_id.And it should know the type of payment. Users should be able to view their payment history.

***ER Diagram :***



***Queries to create the tables in the Database :***

create database electricvehiclechargingnetwork;

Use electricvehiclechargingnetwork;

CREATE TABLE ChargingStation(charger\_ID INT PRIMARY KEY ,Location VARCHAR(255) NOT NULL,Capacity INT NOT NULL , AvailablePorts INT NOT NULL );

CREATE TABLE User(UserID INT PRIMARY KEY ,FullName VARCHAR(50) NOT NULL,Email VARCHAR(100) NOT NULL UNIQUE,PhoneNumber VARCHAR(20));

CREATE TABLE Vehicles(VehicleID INT PRIMARY KEY,Name VARCHAR(50),battery\_capacity VARCHAR(50),currentcharge INT,Location VARCHAR(10),Owner\_id INT );

CREATE TABLE Customers(CustomerID INT PRIMARY KEY ,FullName VARCHAR(50), Phone VARCHAR(20));

CREATE TABLE ChargingPort(ChargingPortID INT PRIMARY KEY ,PortType VARCHAR(50),Status VARCHAR(50));

CREATE TABLE Payments (PaymentID INT PRIMARY KEY ,CustomerID INT, Amount INT(100),PaymentMethod VARCHAR(50),StatusVARCHAR(50), FOREIGN KEY (CustomerID) REFERENCES Customers(CustomerID));

***UML Diagram :***

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| --- |
| Name: Charging Station |
| Attribute:  - chager\_id: int  - location: string  - capacity: int  -availableports-int |
| Operations :  + getcharger\_id(): int  + getlocation(): string  + getcapacity(): int  +getavailableports-int  + setchargerId(id: int): void  + setlocation(name: string): void  + setcapacity(info: int): void  +setavailableports(info:int)-int  + toString(): string |
| User | |
| Attributes:  - user\_id: int  - name: string  - email: string  -phone:long | |
| Operations:  + getuserId(): int  + getName(): string  + getemail(): string  + getphone(): long  + setuserId(id: int): void  + setName(name: string): void  + setemail(desc: string): void  + setphone(phone: long): void  + toString(): string | |

|  |
| --- |
| Vehicle |
| Attributes:  - vehicle\_id: int  - name: string  - battery\_capacity: int  -currentcharge: int  - location: string |
| Operations:  + getvehicleId(): int  + getname(): string  + getbattery\_capacity(): int  + getcurrentcharge(): int  +location():string  + setvehicleId(id: int): void  + setname(name: int): void  + setbattery\_capacity(id: int): void  + setcurrentcharge(currentcharge: int): void  +setlocation(location:string):void  + toString(): string |

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| --- |
| Customer |
| Attributes:  - customer\_id: int  - name: string  - contact\_info: string |
| Operations:  + getCustomerId(): int  + getName(): string  + getContactInfo(): string  + setCustomerId(id: int): void  + setName(name: string): void  + setContactInfo(info: string): void  + toString(): string |

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| --- |
| chargingport |
| Attributes:  - port\_id: int  -chargingeed:int  - status: string |
| + getportId(): int  + getchargingeed(): int  + gestatus(): string  + setportId(id: int): void  + setchargingspeed(id: int): void  + setStatus(status: string): void  + toString(): string |

|  |
| --- |
| Payment |
| Attributes:  - payment\_id: int  - session\_id: int  - date: int  -amount : int  -paymentmethod : string  - reason: string |
| + getpayment\_Id(): int  + getsesionId(): int  + getDate(): int  + getamount(): int  +getpaymentmethod():string  + setpaymentId(id: int): void  + setsessionId(id: int): void  + setDate(date: int): void  + setpaymentmethod(paymentmethod: string): void|  +setamount(amount,int):void  + toString(): string |

***All Classes Java file codes :***

***-Electric.java***

package package1;

import java.util.Date;

import java.util.\*;

public class Electric {

private int transcation;

private String user;

private int payment ;

private int subscripion;

private int charging station;

private int vechile;

public Electric(int transcation, String user, int payment, int subscription, int chargingstation,int vechile) {

this.transcation = transcation;

this.user = user;

this.payment = payment;

this.subscription = subscription;

this.cargingstation = cargingstation;

this.vechile=vechile;

}

public int getTranscation() {

return transcation;

}

public void settranscation(int transcation) {

this.transcation = transcation;

}

public int getUser() {

return user ;

}

public void setUser(String user) {

this.user = user;

}

public String getPayment() {

return payment;

}

public void setPayment(int payment) {

this.payment = payment;

}

public int getSubscription() {

return subscription;

}

public void setSubscription(int subscription) {

this.subscription = subscription;

}

public Date getCharingstation() {

return Chargingstation;

}

public void setChargingstation(String chargingstation) {

this.charingstation = chargingstation;

}

public void getVechile(String vechile){

return vechile;

}

public void setVechile(String vechile) {

this.vechile = vechile;

}

}

***-Transcation.java***

package package1;

import java.util.List;

import java.util.ArrayList;

public class Transcation {

private int transcationid;

private String name;

private List<Integer> genreIds;

public Transcation (int transctionid, String name) {

this.transctionid = transctionId;

this.name = name;

this.genreIds = new ArrayList<>();

}

public int getTranscationId() {

return transcation ;

}

public void setTranscationId(int transcation ) {

this.transcationId = transcationId;

}

public String getName() {

return name;

}

public void setName(String name) {

this.name = name;

}

public List<Integer> getGenreIds() {

return genreIds;

}

public void addGenreId(int genreId) {

this.genreIds.add(genreId);

}

}

***-User.java***

package package1;

public class User {

private int userId;

private String name;

public User (int userId, String name) {

this.userId = userId;

this.name = name;

}

public int getUserId() {

return userId;

}

public void setUserId(int userId) {

this.userId = userId;

}

public String getName() {

return name;

}

public void setName(String name) {

this.name = name;

}

}

***-Payment.java***

package package1;

import java.util.Date;

public class Payment {

private int paymentId;

private double amount;

private Date date;

private int userId;

public Payment(int paymentId, double amount, Date date, int userId) {

this.paymentId = paymentId;

this.amount = amount;

this.date = date;

this.userId = userId;

}

public int getPaymentId() {

return paymentId;

}

public void setPaymentId(int paymentId) {

this.paymentId = paymentId;

}

public double getAmount() {

return amount;

}

public void setAmount(double amount) {

this.amount = amount;

}

public Date getDate() {

return date;

}

public void setDate(Date date) {

this.date = date;

}

public int getUserId() {

return userId;

}

public void setUserId(int userId) {

this.userId = userId;

}

}

***-Subscription.java***

package package1;

import java.util.List;

import java.util.ArrayList;

public class Subscription {

private int SubscriptionId;

private int userId;

private String name;

private List<Integer> paymentIds;

public Subscription(int subscriptionId, int userId, String name) {

this.SubscriptionId = SubscriptionId;

this.userId = userId;

this.name = name;

this.paymentIds = new ArrayList<>();

}

public int getSubscriptionId() {

return subscriptionId;

}

public void setSubscriptionId(int playlistId) {

this.subscriptionId = subscriptionId;

}

public int getUserId() {

return userId;

}

public void setUserId(int userId) {

this.userId = userId;

}

public String getName() {

return name;

}

public void setName(String name) {

this.name = name;

}

public List<Integer> getpaymentIds() {

return paymentIds;

}

public void addpaymentId(int paymentId) {

this.paymentId.add(paymentId);

}

}

***-Charging.java***

package package1;

public class Charging {

private int userId;

private Strin name;

public Charging(int userId, String name) {

this.userId = userId;

this.name = name;

}

public int getUserId() {

return userId;

}

public void setUserId(int userId) {

this.userId = userId;

}

public int getName() {

return name;

}

public void setName(int name) {

this.name = name;

}

}

***-Vechile.java***

package package1;

import java.util.Date;

import java.util.List;

import java.util.ArrayList;

public class Vechile {

private int vechileId;

private String name;

private int transctionId;

private int paymentId;

private List<Integer> paymentIds;

private int length; // Length in seconds

private Date releaseDate;

public Vechile(int vechileId, String name, int transctionId , int paymentId, int length, Date releaseDate) {

this.vechileId = vechileId;

this.name = name;

this.tarnsctionId = transctionId;

this.paymentId = paymentId;

this.genreIds = new ArrayList<>();

this.length = length;

this.releaseDate = releaseDate;

}

public int getVechileId() {

return VechileId;

}

public void setvechileId(int vechileId) {

this.vechileId = vechileId;

}

public String getUser() {

return user;

}

public void setUser(String User) {

this.user = user;

}

public int getPaymentId() {

return paymentId;

}

public void setPaymentId(int paymentId) {

this.paymentId = paymentId;

}

public String getName() {

return name;

}

public void setName(String name) {

this.name = name;

}

public List<Integer> getPAymentIds() {

return PaymentIds;

}

public void addPaymentId(int PaymentId) {

this.paymentIds.add(paymentId);

}

public int getLength() {

return length;

}

public void setLength(int length) {

this.length = length;

}

public Date getReleaseDate() {

return releaseDate;

}

public void setReleaseDate(Date releaseDate) {

this.releaseDate = releaseDate;

}

}

***-Subsciption.java***

package package1;

public class Subscription {

private int subscriptionId;

private String name;

private double price;

public Subscription(int subscriptionId, String name, double price) {

this.subscriptionId = subscriptionId;

this.name = name;

this.price = price;

}

public int getSubscriptionId() {

return subscriptionId;

}

public void setSubscriptionId(int subscriptionId) {

this.subscriptionId = subscriptionId;

}

public String getName() {

return name;

}

public void setName(String name) {

this.name = name;

}

public double getPrice() {

return price;

}

public void setPrice(double price) {

this.price = price;

}

}

***-Main.java***

package package1;

import java.util.Date;

public class Main {

public static void main(String[] args) {

Subscription basicSubscription = new Subscription(1, "Basic", 9.99);

Subscription premiumSubscription = new Subscription(2, "Premium", 19.99);

User user1 = new User(1, "user1@example.com", "user1", "password1", basicSubscription.getSubscriptionId());

User user2 = new User(2, "user2@example.com", "user2", "password2", premiumSubscription.getSubscriptionId());

Payment payment1 = new Payment(1, "Payment One");

Payment payment2 = new payment(2, "Payment Two");

payment1.addGenreId(1);

Payment2.addGenreId(2);

Genre genre1 = new Payment(1, "Rock");

Genre genre2 = new Payment(2, "Pop");

Vechile vechile1 = new Vechile(1, vechile1.getVechileId(), "Vechile One", payment1.getPaymentId(), new Date());

Vechile vechile2 = new Vechile(2, vechile2.getVechileId(), "Vechile Two", payment2.getPaymentId(), new Date());

Chargingstation chargingstation1 = new Chargingstation(1, "Chargingstation One", payment1.getPaymentId(), suscription1.getPaymentId(), 240, new Date());

Chargingstation chargingstation2 = new Chargingstation(2, "Chargingstation Two", payment2.getPaymentId(), subscription2.getPAymentId(), 180, new Date());

song2.addGenreId(genre2.getGenreId());

Transction transction1 = new Transction(1, user1.getUserId(), "Transction One");

transction1.addPaymentId(payment1.getPaymentId());

transction1.addPaymentId(payment2.getPaymentId());

Vechile vechile1 = new Vechile(1, user1.getUserId(), vechile1.getPaymentId(), new Date());

user1.addHistory(history1);

Vechile vechile = new Vechile(2, user2.getUserId(), vechile2.getPaymentId(), new Date());

user2.addVechile(vechile2);

Payment payment1 = new Payment(1, 9.99, new Date(), user1.getUserId());

user1.addPayment(payment1);

Payment payment2 = new Payment(2, 19.99, new Date(), user2.getUserId());

user2.addPayment(payment2);

System.out.println("User 1 Subscription: " + basicSubscription.getName());

System.out.println("User 1 transaction: " + user1.gettranscation().size());

System.out.println("User 1 User: " + user1.getUser().size());

System.out.println("User 1 Payments: " + user1.getPayments().size());

System.out.println("Artist 1 Name: " + artist1.getName());

System.out.println("Artist 1 Vechile: " + artist1.getVecile().size());

}

}