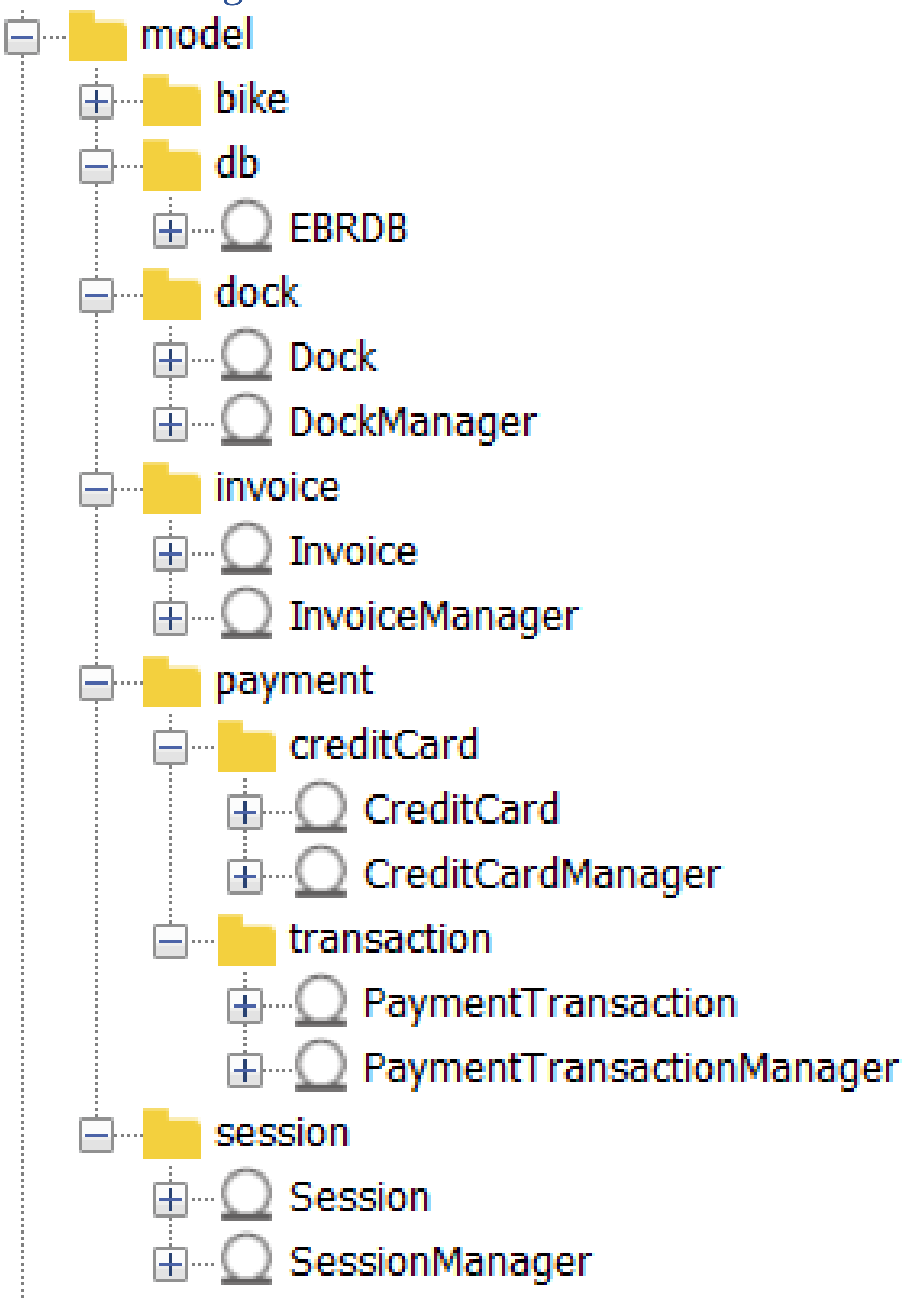
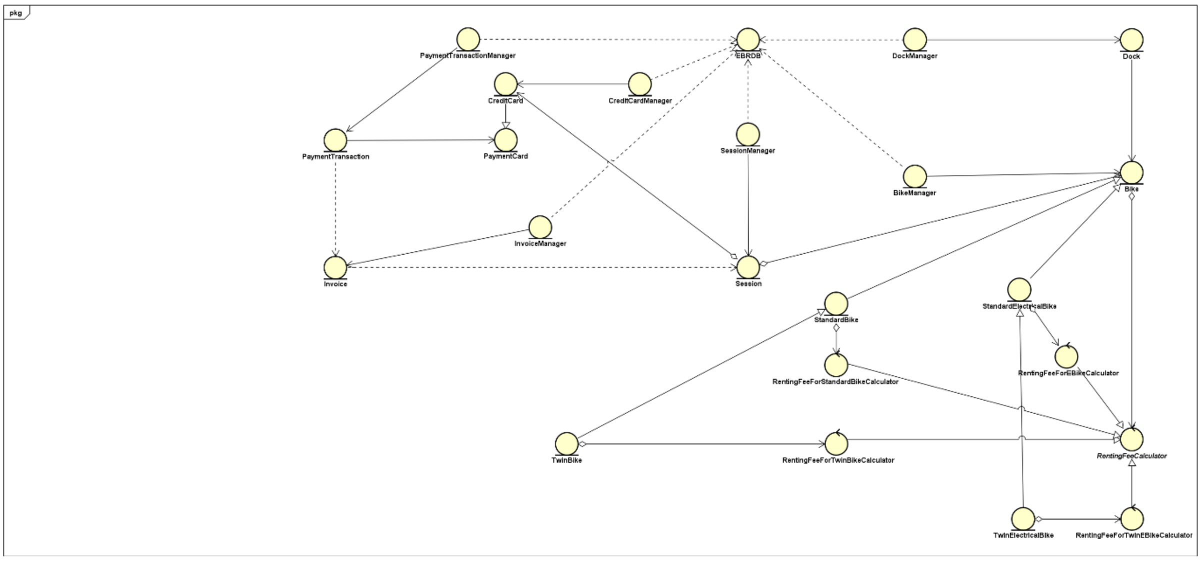
# Class Design - Model

## 1. Create Initial Design Classes



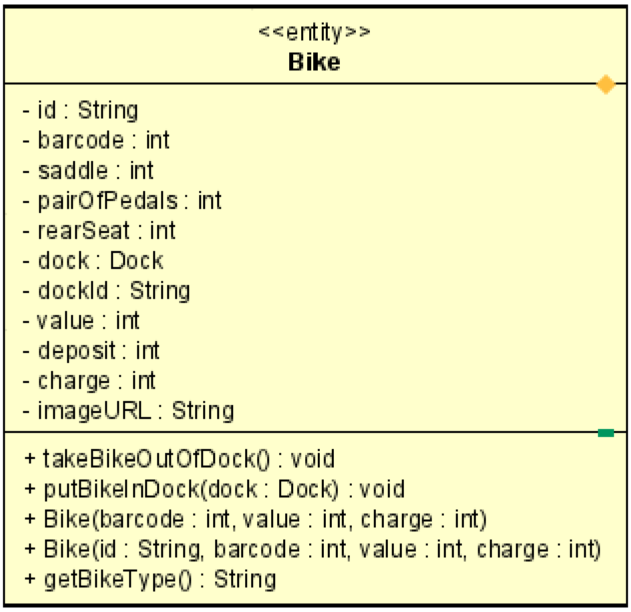
```
model
    bike
    db
        EBRDB
    dock
        Dock
        DockManager
    invoice
        Invoice
        InvoiceManager
    payment
        creditCard
            CreditCard
            CreditCardManager
        transaction
            PaymentTransaction
            PaymentTransactionManager
    session
        Session
        SessionManager
```

# 2. Define Relationships Between Classes



# 3. Class Design

## 3.1. Class “Bike”



```
<<entity>>
Bike

- id : String
- barcode : int
- saddle : int
- pairOfPedals : int
- rearSeat : int
- dock : Dock
- dockId : String
- value : int
- deposit : int
- charge : int
- imageURL : String

+ takeBikeOutOfDock() : void
+ putBikeInDock(dock : Dock) : void
+ Bike(barcode : int, value : int, charge : int)
+ Bike(id : String, barcode : int, value : int, charge : int)
+ getBikeType() : String
```

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | id | String | NULL | Bike id |
| **2** | barcode | int | NULL | barcode |
| **3** | saddle | int | NULL | saddle |
| **4** | pairOfPedals | int | NULL | Pair of pedals |
| **5** | rearSeat | int | NULL | Number of rear seats |
| **6** | dock | Dock | NULL | dock |
| **7** | dockId | String | NULL | Dock id |
| **8** | value | int | NULL | value |
| **9** | doposit | int | NULL | deposit |
| **10** | charge | int | NULL | charge |

| | | | | |
|---|---|---|---|---|
| **11** | imageURL | String | NULL | Image URL |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | takeBikeOutOfDock | void | Take bike out of dock |
| **2** | putBikeInDock | void | Put bike to a dock |
| **3** | getBikeType | String | Get bike type |

**Parameter:**

dock

Barcode

Value

Charge

id

**Exception:**

None

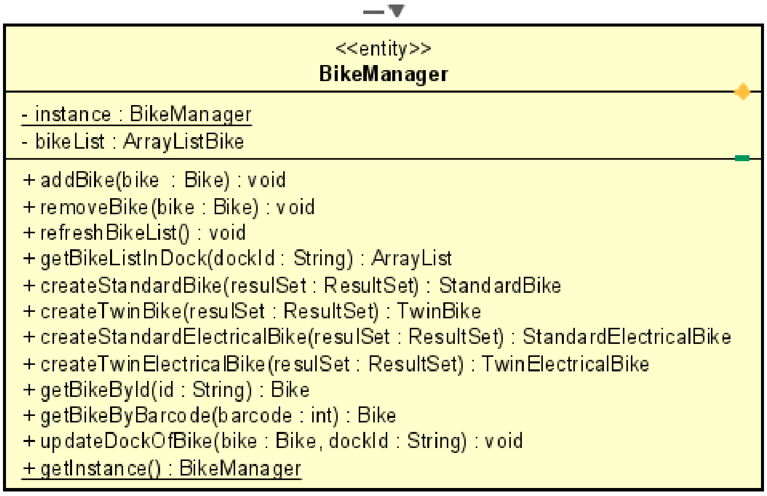
**Method**

None

**State**

None

## 3.2. Class “BikeManager”


<<entity>>
BikeManager
- instance : BikeManager
- bikeList : ArrayListBike
+ addBike(bike : Bike) : void
+ removeBike(bike : Bike) : void
+ refreshBikeList() : void
+ getBikeListInDock(dockId : String) : ArrayList
+ createStandardBike(resulSet : ResultSet) : StandardBike
+ createTwinBike(resulSet : ResultSet) : TwinBike
+ createStandardElectricalBike(resulSet : ResultSet) : StandardElectricalBike
+ createTwinElectricalBike(resulSet : ResultSet) : TwinElectricalBike
+ getBikeById(id : String) : Bike
+ getBikeByBarcode(barcode : int) : Bike
+ updateDockOfBike(bike : Bike, dockId : String) : void
+ getInstance() : BikeManager

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | instance | BikeManager | NULL | Bike instance |
| **2** | bikeList | ArrayList | NULL | Bike list |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | addBike | void | Add bike |
| **2** | removeBike | void | Remove bike |
| **3** | refreshBikeList | void | Refresh bike list |
| **4** | getBikeListInDock | ArrayList | Get bike list in dock |
| **5** | createStandardBike | StandardBike | Create standard bike |
| **6** | createTwinBike | TwinBike | Create twin bike |
| **7** | createStandardEBike | StandardEBike | Create standard e bike |
| **8** | createTwinEBike | TwinEBike | Create twin e bike |
| **9** | getBikeById | Bike | Get bike by id |
| **10** | getBikeByBarcode | Bike | Get bike by barcode |
| **11** | updateDockOfBike | void | Update dock |
| **12** | getInstance | BikeManager | Get bike instance |

**Parameter:**

bike

DockId

ResultSet

Id – bikeId

barcode

**Exception:**

None

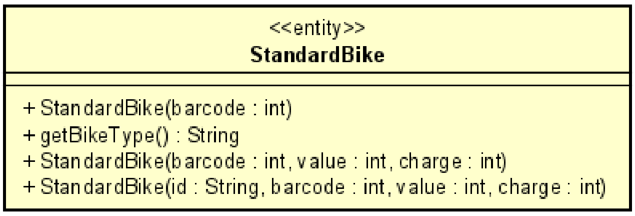
**Method**

None

**State**

None

### 3.3. Class “StandardBike”


<<entity>>
StandardBike
+ StandardBike(barcode : int)
+ getBikeType() : String
+ StandardBike(barcode : int, value : int, charge : int)
+ StandardBike(id : String, barcode : int, value : int, charge : int)

**Attribute**

None

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | getBikeType | String | Get bike type |

**Parameter:**

None

**Exception:**

None

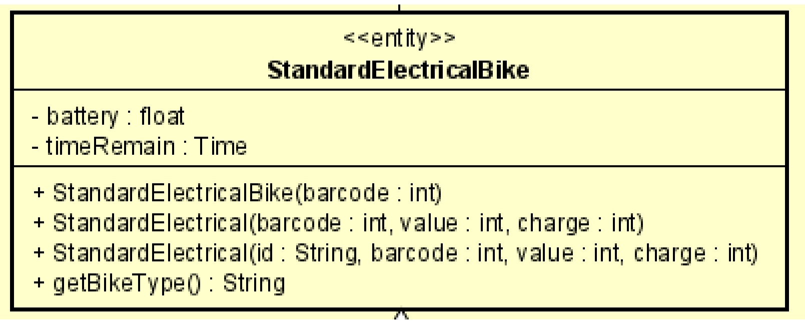
**Method**

None

**State**

None

### 3.4. Class “StandardElectricalBike”


<<entity>>
StandardElectricalBike
- battery : float
- timeRemain : Time
+ StandardElectricalBike(barcode : int)
+ StandardElectrical(barcode : int, value : int, charge : int)
+ StandardElectrical(id : String, barcode : int, value : int, charge : int)
+ getBikeType() : String

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| 1 | battery | float | 100.0 | battery remained |
| 2 | timeRemain | Time | NULL | usage time base on battery and bike |

**Operation**

None

**Parameter:**

None

**Exception:**

None

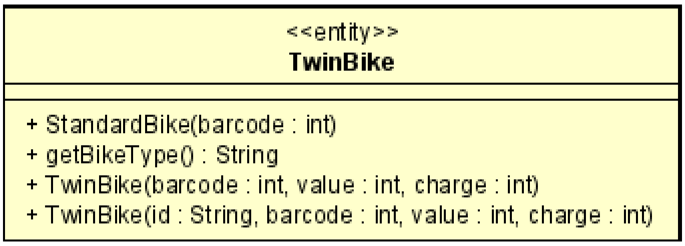
**Method**

None

**State**

None

### 3.5. Class “TwinBike”


<<entity>>
TwinBike
+ StandardBike(barcode : int)
+ getBikeType() : String
+ TwinBike(barcode : int, value : int, charge : int)
+ TwinBike(id : String, barcode : int, value : int, charge : int)

**Attribute**

None

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **1** | getBikeType | String | Get bike type |

**Parameter:**

None

**Exception:**

None

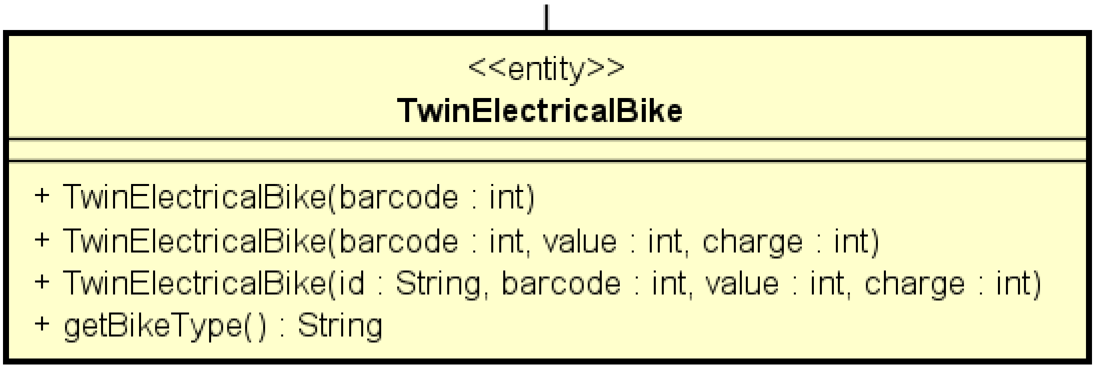
**Method**

None

**State**

None

### 3.6. Class “TwinElectricalBike”


<<entity>>
TwinElectricalBike
+ TwinElectricalBike(barcode : int)
+ TwinElectricalBike(barcode : int, value : int, charge : int)
+ TwinElectricalBike(id : String, barcode : int, value : int, charge : int)
+ getBikeType() : String

**Attribute**

None

**Operation**

| **#** | **Name** | **Return type** | **Desciption** |
|---|---|---|---|
| **1** | getBikeType | String | Get bike type |

**Parameter:**

None

**Exception:**

None

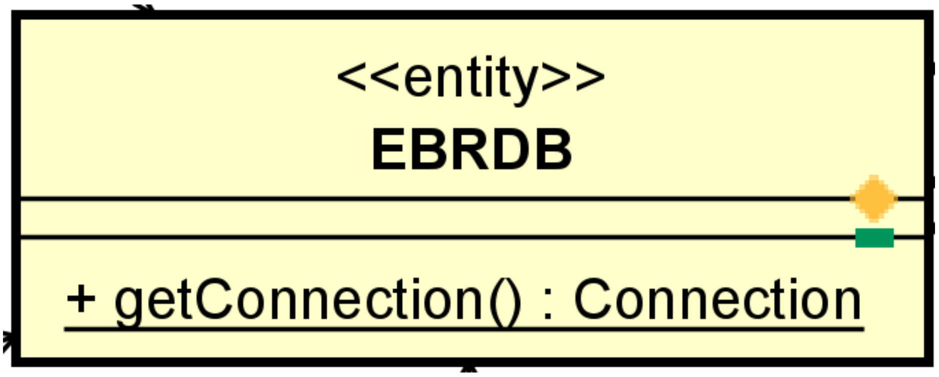
**Method**

None

**State**

None

## 3.7. Class “EBRDB”



**Attribute**

None

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | getConnection | Connect | get a connection to PostgreSQL database |

**Parameter:**

None

**Exception:**

None

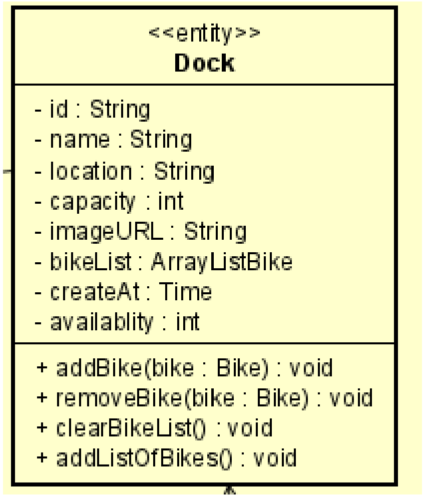
**Method**

None

**State**

None

## 3.8. Class “Dock”



**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | id | String | NULL | Dock id |
| **2** | name | String | NULL | Name of dock |
| **3** | location | String | NULL | Dock location |
| **4** | capacity | int | NULL | Dock size |
| **5** | imageURL | String | NULL | Dock image |
| **6** | bikeList | ArrayList<Bike> | NULL | Bike list in dock |
| **7** | createAt | Time | NULL | Time Create Dock |
| **8** | Availalbity | Int | NULL | Number of availability bike |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | addBike | void | Add bike to dock |
| **2** | removeBike | void | Remove bike out of dock |
| **3** | clearBikeList | void | Clear bike list in dock |
| **4** | addListOfBike | void | Add bike list to dock |

**Parameter:**

bike

**Exception:**

None

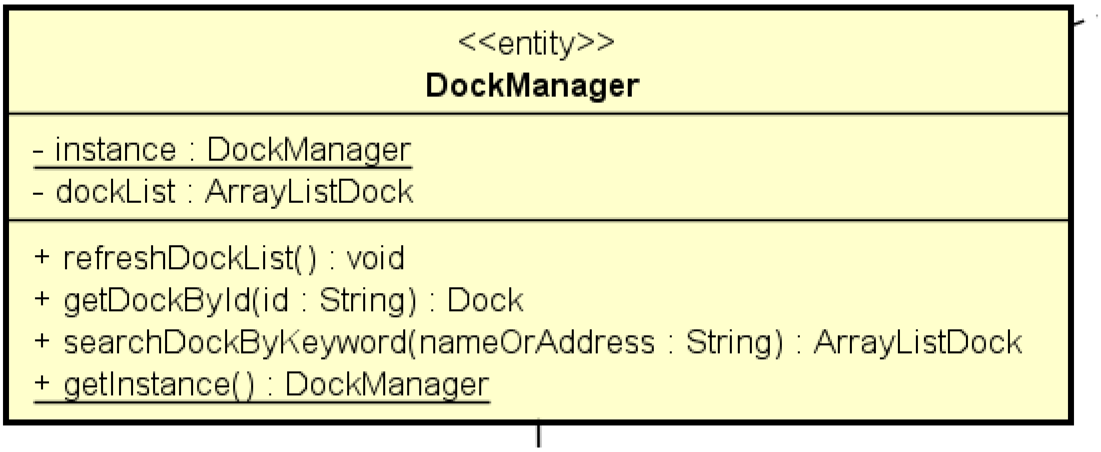
**Method**

None

**State**

None

### 3.9. Class “DockManager”


<<entity>>
DockManager
- instance : DockManager
- dockList : ArrayListDock
+ refreshDockList() : void
+ getDockById(id : String) : Dock
+ searchDockByKeyword(nameOrAddress : String) : ArrayListDock
+ getInstance() : DockManager

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | instance | DockManager | NULL | Instance of a dock |
| **2** | dockList | ArrayList<Dock> | NULL | Dock list |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | refreshDockList | void | Refresh dock list |
| **2** | getDockById | Dock | Get dock by id |
| **3** | searchDockByKeyword | ArrayList<Dock> | Get docks by keyword |
| **4** | getInstance | DockManager | Get dock instance |

**Parameter:**

Id - dock id

NameOfAddress – dock address

**Exception:**

None

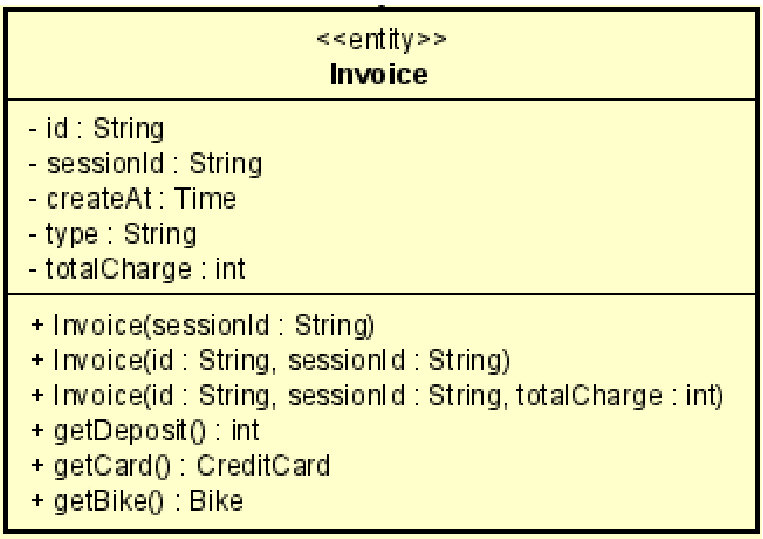
**Method**

None

**State**

None

### 3.10. Class “Invoice”



**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | id | String | NULL | Invoice id |
| **2** | sessionId | String | NULL | Session id |
| **3** | createAt | Time | NULL | Create time |
| **4** | type | String | NULL | Session correspond to invoice |
| **5** | totalCharge | int | NULL | Total Charge |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | getDeposit | int | Get deposit |
| **2** | getCard | CreditCard | Get credit card |
| **3** | getBike | Bike | Get bike |

**Parameter:**

None

**Exception:**

None

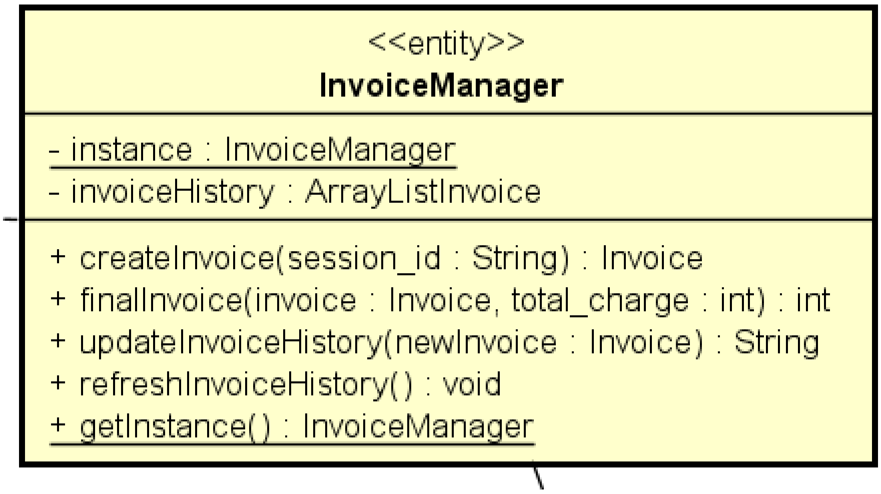
**Method**

None

**State**

None

### 3.11. Class “InvoiceManager”



<<entity>>
**InvoiceManager**

- instance : InvoiceManager
- invoiceHistory : ArrayListInvoice

+ createInvoice(session_id : String) : Invoice
+ finalInvoice(invoice : Invoice, total_charge : int) : int
+ updateInvoiceHistory(newInvoice : Invoice) : String
+ refreshInvoiceHistory() : void
+ getInstance() : InvoiceManager

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | instance | DockManager | NULL | Instance of a dock |
| **2** | invoiceHistory | ArrayList<Invoice> | NULL | Invoice History |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | createInvoice | Invoice | Create new invoice |
| **2** | finalInvoice | int | Complete invoice |
| **3** | updateInvoiceHistory | String | Update invoice history |
| **4** | refreshInvoiceHistory | void | Refresh invoice history |
| **5** | getInstance | InvoiceManager | Get invoice instance |

**Parameter:**

Session_id

Invoice

Total_charge

newInvoice

**Exception:**

None

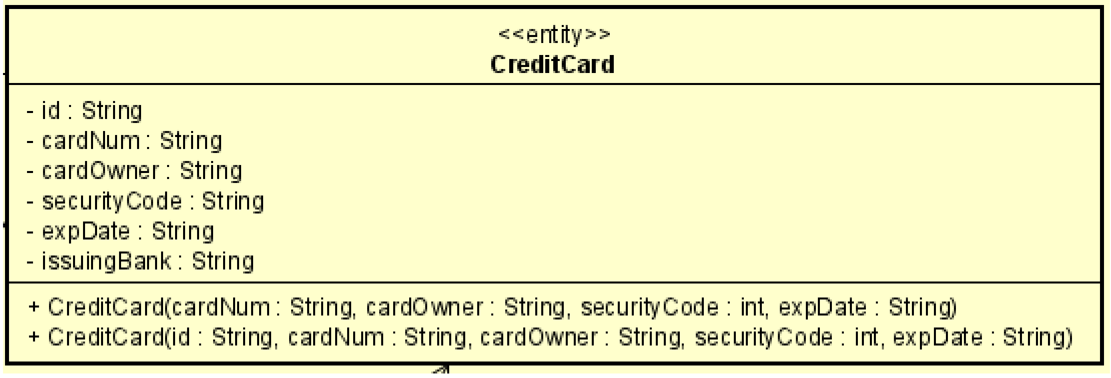
**Method**

None

**State**

None

## 3.12. Class “CreditCard”


<<entity>>
CreditCard
- id : String
- cardNum : String
- cardOwner : String
- securityCode : String
- expDate : String
- issuingBank : String
+ CreditCard(cardNum : String, cardOwner : String, securityCode : int, expDate : String)
+ CreditCard(id : String, cardNum : String, cardOwner : String, securityCode : int, expDate : String)

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | id | String | NULL | Card id |
| **2** | cardNum | String | NULL | Card number |
| **3** | cardOwner | String | NULL | Card owner’s name |
| **4** | securityCode | String | NULL | Card security code |
| **5** | expDate | String | NULL | Card exp date |
| **6** | issuingBank | String | NULL | IssuingBank |

**Operation**

None

**Parameter:**

None

**Exception:**

None

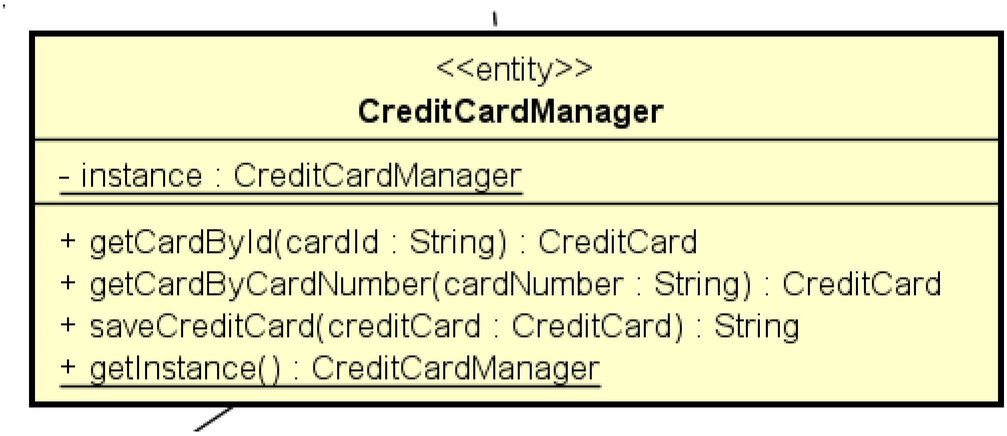
**Method**

None

**State**

None

## 3.13. Class “CreditCardManager”


<<entity>>
CreditCardManager
- instance : CreditCardManager
+ getCardById(cardId : String) : CreditCard
+ getCardByCardNumber(cardNumber : String) : CreditCard
+ saveCreditCard(creditCard : CreditCard) : String
+ getInstance() : CreditCardManager

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | instance | CreditCardManager | NULL | Instance of a card |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | getCardById | CreditCard | Get card by id |
| **2** | getCardByCardNumber | CreditCard | Get card by card number |
| **3** | saveCreditCard | String | Save credit card |
| **4** | getInstance | CreditCardManager | Get card instance |

**Parameter:**

CardId – card id

CardNumber – card number

creditCard

**Exception:**

None

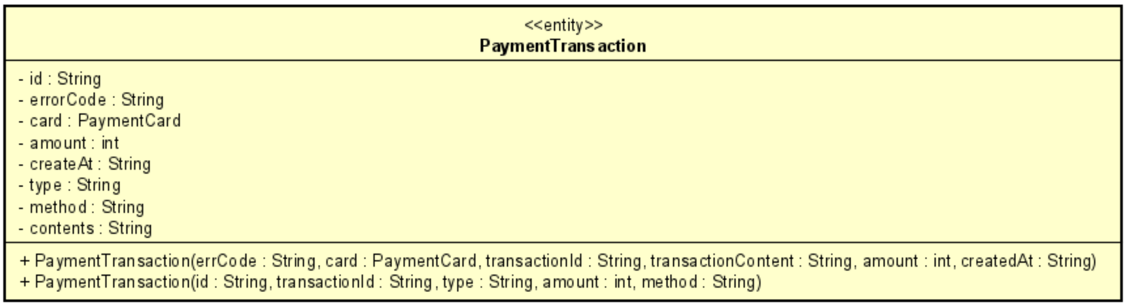
**Method**

None

**State**

None

## 3.14. Class “PaymentTransaction”



<<entity>>
PaymentTransaction
- id : String
- errorCode : String
- card : PaymentCard
- amount : int
- createAt : String
- type : String
- method : String
- contents : String
+ PaymentTransaction(errCode : String, card : PaymentCard, transactionId : String, transactionContent : String, amount : int, createdAt : String)
+ PaymentTransaction(id : String, transactionId : String, type : String, amount : int, method : String)

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | errorCode | String | NULL | Error code |
| **2** | card | PaymentCard | NULL | Credit card |
| **3** | transactionId | String | NULL | Transaction id |
| **4** | transactionContent | String | NULL | Contents of transaction |
| **5** | amount | int | NULL | Transaction amount |
| **6** | createAt | String | NULL | Transaction create time |
| **7** | id | String | NULL | PaymentTransaction id |
| **8** | type | String | NULL | Transaction type |
| **9** | method | String | NULL | Transaction method |

**Operation**

None

**Parameter:**

None

**Exception:**

None

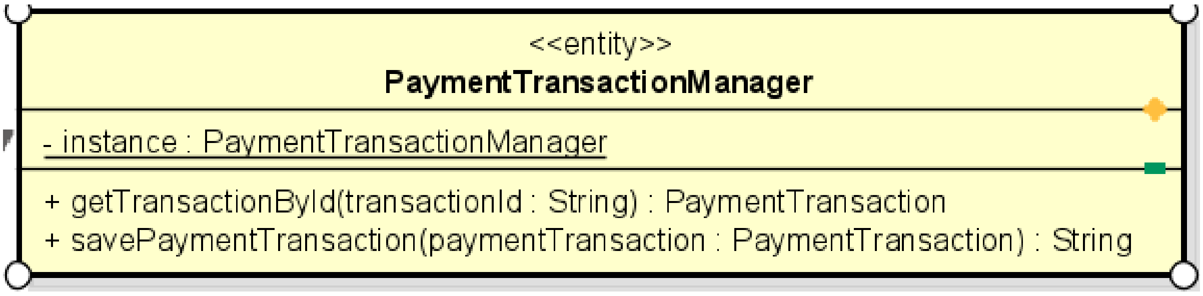
**Method**

None

**State**

None

## 3.15. Class “PaymentTransactionManager”


<<entity>>
PaymentTransactionManager
- instance : PaymentTransactionManager
+ getTransactionById(transactionId : String) : PaymentTransaction
+ savePaymentTransaction(paymentTransaction : PaymentTransaction) : String

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | instance | PaymentTransaction | NULL | Instance of transaction |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | getTransactionById | PaymentTransaction | Get transaction by Id |
| **2** | savePaymentTransaction | String | Save payment transaction |

**Parameter:**

TransactionId – transaction id

paymentTransaction

**Exception:**

None

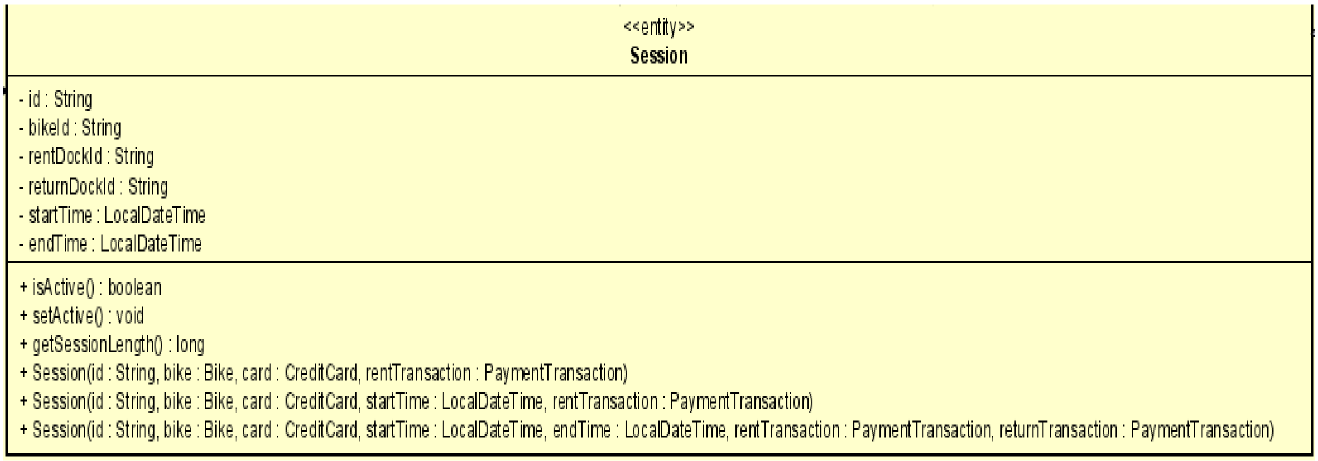
**Method**

None

**State**

None

### 3.16. Class “Session”



<<entity>>
Session
- id : String
- bikeId : String
- rentDockId : String
- returnDockId : String
- startTime : LocalDateTime
- endTime : LocalDateTime
+ isActive() : boolean
+ setActive() : void
+ getSessionLength() : long
+ Session(id : String, bike : Bike, card : CreditCard, rentTransaction : PaymentTransaction)
+ Session(id : String, bike : Bike, card : CreditCard, startTime : LocalDateTime, rentTransaction : PaymentTransaction)
+ Session(id : String, bike : Bike, card : CreditCard, startTime : LocalDateTime, endTime : LocalDateTime, rentTransaction : PaymentTransaction, returnTransaction : PaymentTransaction)

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| **1** | id | String | NULL | Session id |
| **2** | bikeId | String | NULL | Bike Id |
| **3** | rentDockId | String | NULL | Dock rented Id |
| **4** | returnDockId | String | NULL | Dock Return Id |
| **5** | endTime | LocalDateTime | NULL | End time |
| **6** | startTime | LocalDateTime | NULL | Start time |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| **1** | isActive | boolean | Session is active or not |
| **2** | setActive | void | Set session active |
| **3** | getSessionLength | long | Get session length |

**Parameter:**

None

**Exception:**

None

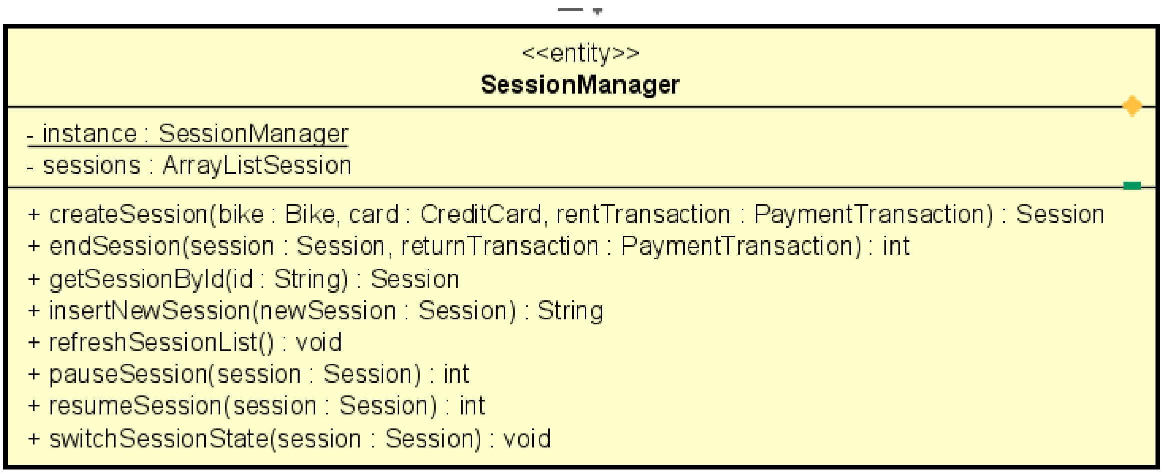
**Method**

None

**State**

None

## 3.17. Class “SessionManager”



```
<<entity>>
SessionManager
- instance : SessionManager
- sessions : ArrayListSession
+ createSession(bike : Bike, card : CreditCard, rentTransaction : PaymentTransaction) : Session
+ endSession(session : Session, returnTransaction : PaymentTransaction) : int
+ getSessionById(id : String) : Session
+ insertNewSession(newSession : Session) : String
+ refreshSessionList() : void
+ pauseSession(session : Session) : int
+ resumeSession(session : Session) : int
+ switchSessionState(session : Session) : void
```

**Attribute**

| # | Name | Data type | Default value | Description |
|---|---|---|---|---|
| 1 | instance | SessionManager | NULL | Session instance |
| 2 | sessions | ArrayList<Session> | NULL | Session list |

**Operation**

| # | Name | Return type | Desciption |
|---|---|---|---|
| 1 | createSession | Session | Create a session |
| 2 | endSession | int | Complete session |
| 3 | getSessionById | Session | Get session by id |
| 4 | insertNewSession | String | Insert new session to db |
| 5 | refreshSessionList | void | Refresh session list |
| 6 | pauseSession | int | Pause session |
| 7 | resumeSession | int | Resume session |

**Parameter:**

Bike

Card

PaymentTransaction

Session

newSession

**Exception:**

None

**Method**

None

**State**

None