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Proposal and Project Outline

AwesomeCarDealer is a car sales company that sells cars in a small town of roughly 20000 people. AwesomeCarDealer expects annual car sales total to approximately 500 with roughly up to 1000 customers accessing their website annually. Recently, they decided to digitize their store and make it available online to reduce paperwork and reduce business overhead relating to paper pushing. To accompany this, they need a website where Customers can place Orders. The website will be programmed using the Node.js framework. The database will keep a ledger table, Transactions. Customers can place multiple orders. Each order can only be comprised of one vehicle. Since cars are being sold from one local dealer, there is no need to specify sellers.

EXECUTIVE SUMMARY

This project has undergone several significant revisions to address issues related to database schema design, ensure data integrity, and improve overall functionality. The changes reflect careful consideration of feedback and the practical needs of the system, particularly in managing relationships between entities and preventing data orphaning.

Initially, the design included a Warranties table with a composite primary key, but complications arose when attempting to manage composite keys effectively. To resolve this, the Warranties table was split into two tables: Warranties and WarrantyDetails. This separation allows Warranties to describe warranties linked to orders, while WarrantyDetails provides specific information about each warranty, including the covered item and the coverage end date. This change streamlines the database structure and improves the flexibility of handling warranties.

Additional changes were made to the attributes of various tables. The Customers table was enhanced by adding a name attribute and converting phoneNumber to a variable character format. These changes were made to better represent customer data and streamline the table's design. Similarly, the Vehicles table was updated to include a color attribute, adding more detail to the vehicle descriptions.

The Transactions table initially included an orderAge attribute intended to be auto-incremented. However, due to issues with having multiple auto-increment keys in one table without using a composite key, the auto-increment feature was postponed. It was determined that the transactionDate attribute might suffice, potentially rendering orderAge redundant.

Several updates were made to the Orders table based on feedback. The warranty attribute was changed from non-nullable with a default value of 0 to nullable, as not every order requires a warranty. This adjustment allows the system to check for NULL values instead of relying on a boolean flag.

To prevent the orphaning of entities and ensure referential integrity, several foreign key constraints were updated. The foreign key from Orders.orderID to Warranties was modified with ON DELETE SET NULL, ensuring that orders linked to warranties cannot be deleted without first addressing the warranty. Similarly, foreign key relationships were updated with ON DELETE CASCADE between Orders and Vehicles.VIN, as well as between Orders and Customers.customerID, to ensure that deleting a vehicle or customer does not leave orphaned orders. The WarrantyDetails table was intentionally left without an ON DELETE action, preserving the overarching warranty even if specific details are removed.

Finally, inspired by ongoing work, a section for CRUD operations was added to DLL.sql for future implementation, reflecting the project's commitment to continuous improvement. Overall, this project demonstrates a careful and iterative approach to database design, addressing both immediate issues and planning for future scalability and functionality.

Summary Reflection

Overall, we had a smooth planning process and early development process. SQL by and large was not an issue. Our biggest upset was in regards to the frontend application development. Difficulties arose when it came to using AJAX as both of us were unfamiliar with the stack. Moreover, the volume of code we had to push out was not well anticipated and in combination with unfortunate inclement circumstances, became our downfall. Group members had urgent responsibilities to attend to that postponed progress within the final four days. Large swaths of code were written but there was not time for bug fixes to roll out all features so we decided to only present on the website what is 100% functional. Our source code should reveal that most of the front end was complete to standards but not polished. We did not have time to get to implement the Patron attribute of Customers and add an added system for identifying returning customers for orders and making price adjustments. We encountered issues with regards to keeping track of variable names and many bugs were due to variables having the wrong types. One bug that stopped development for a significant period of time was when Customers.phoneNumber would not show up on the front end and constantly return undefined. We found this was due to an issue with how phoneNumber attributes were packed and loaded onto the database. Similar problems were encountered with respect to Vehicles and the Boolean values. This problem was the crux of the issue for why most of our code was unfinished. These were not herculean design problems but the time required to fix bugs was too great as it required significant and meticulous review of the codebase. The most drastic change in design was in regards to normalization of the database to ensure our entities were atomic and free of any partial or transitive dependencies. We are confident in our understanding of relational databases after this project.

DATABASE OUTLINE

Entity tables

Of note: Booleans may be represented as TINYINT within ERD

· **Customers:**

Master table with customer data that's kept by the dealership. Patron, is used by the dealership to identify recurring customers. To be a Patron the customer must have bought 2 items from the dealership.

Added ON DELETE SET CASCADE for Orders FK from Customers.customerID, if customer is deleted we want to make sure no orders are orphaned.

- customerID: int, auto_increment, unique, not NULL, PK
- name varchar NOT NULL
- email: varchar, not NULL
- phoneNumber: varchar, not NULL
- Patron: boolean or TINYINT in mysql

Relationship:

- 1:M Relationship between customers and orders implemented with customer id as a FK inside Orders.
- A customer can exist without being tied to an order.

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Orders:

The Orders table keeps track of data tied to the sale of an item, such as the customer, vehicle and price.

Added ON DELETE SET NULL to Warranties FK from Orders.orderID so we cannot delete an Order if it has a Warranty.

- orderID: int, auto increment, unique, not NULL, PK
- customerID: int, unique, not NULL, FK from customers

- shipped: bool, not NULL default false
- vehicles_VIN : int, unique, not NULL, FK from vehicles ● Price: float, not NULL
- Warranty bool, NOT NULL, default 0

Relationships:

- M:1 relationship between Orders and Customers,
- 1:1 relationship between Orders and Vehicle
- 1:M relationship between Orders and Transactions
- 1:1 relationship between Orders and Warranty

Warranties:

Containing a composite primary key of warrantyID and orderID, the table uses this composite primary key to find the details of the warranty which then has its own table.

- warrantyID int AUTO_INCREMENT NOT NULL
- orderID int NOT NULL FK from Orders
- detailsID int Unique NOT NULL

Relationships

- M:1 Relationship between WarrantyDetails and Warranties
- 1:M relationship between Warranties and Orders

WarrantyDetails:

The WarrantyDetails table keeps track of specific warranties

Did not add any ON DELETE action for WarrantyDetails as it is not needed, there may be a Warranty with multiple warranty details so we want to preserve the overarching Warranty relationship if we choose to stop service of one specific warranty we don't want to delete anything else.

- id: int NOT NULL PK, FK from Warranties
- itemToBeCovered varchar
- endCoverageDate datetime NOT NULL

Relationships:

- M:1 Relationship between WarrantyDetails and Warranties

Transactions:

Transactional table used to keep track of orders. Every time a sale occurs the Transactions table along with the Orders table is updated, but the Transactions table will have data relevant to the company to track items such as the status of the order. orderAge describes how old the order is and is used for sorting.

Added ON DELETE SET NULL for Transactions, this is the ultimate ledger that should not be modified unless we need to void an order, even when we need to void an order we should still maintain the transaction ledger.

- orderID: int, unique, not NULL, FK from Orders
- orderAge: int, not NULL
- transactionDate: datetime, not null
- total: float, not null
- Shipped: boolean, not null, default false

Relationships:

- 1:M Transactions to Orders

·**Vehicles:**

The Type of vehicle that is being sold in an order

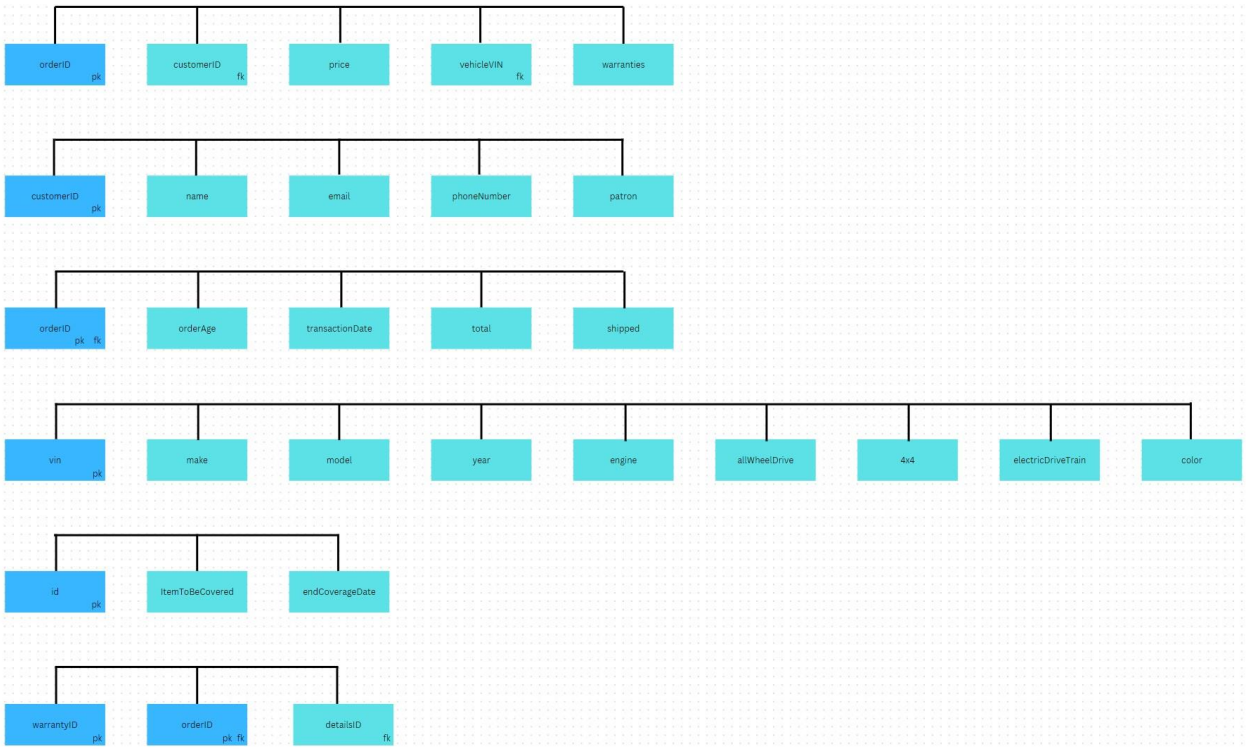
Added ON DELETE SET CASCADE for Orders FK from Vehicles.VIN so no orphans are created if a vehicle is deleted.

- VIN: int, unique, not NULL, PK, FK from Orders
- make: varchar, not NULL
- model: varchar, not NULL
- year: varchar, not NULL
- engine: varchar, not NULL
- allWheellDrive: boolean, not NULL
- 4x4: boolean, not NULL
- electricDriveTrain: varchar, not NULL
- color varchar NOT NULL

Relationships:

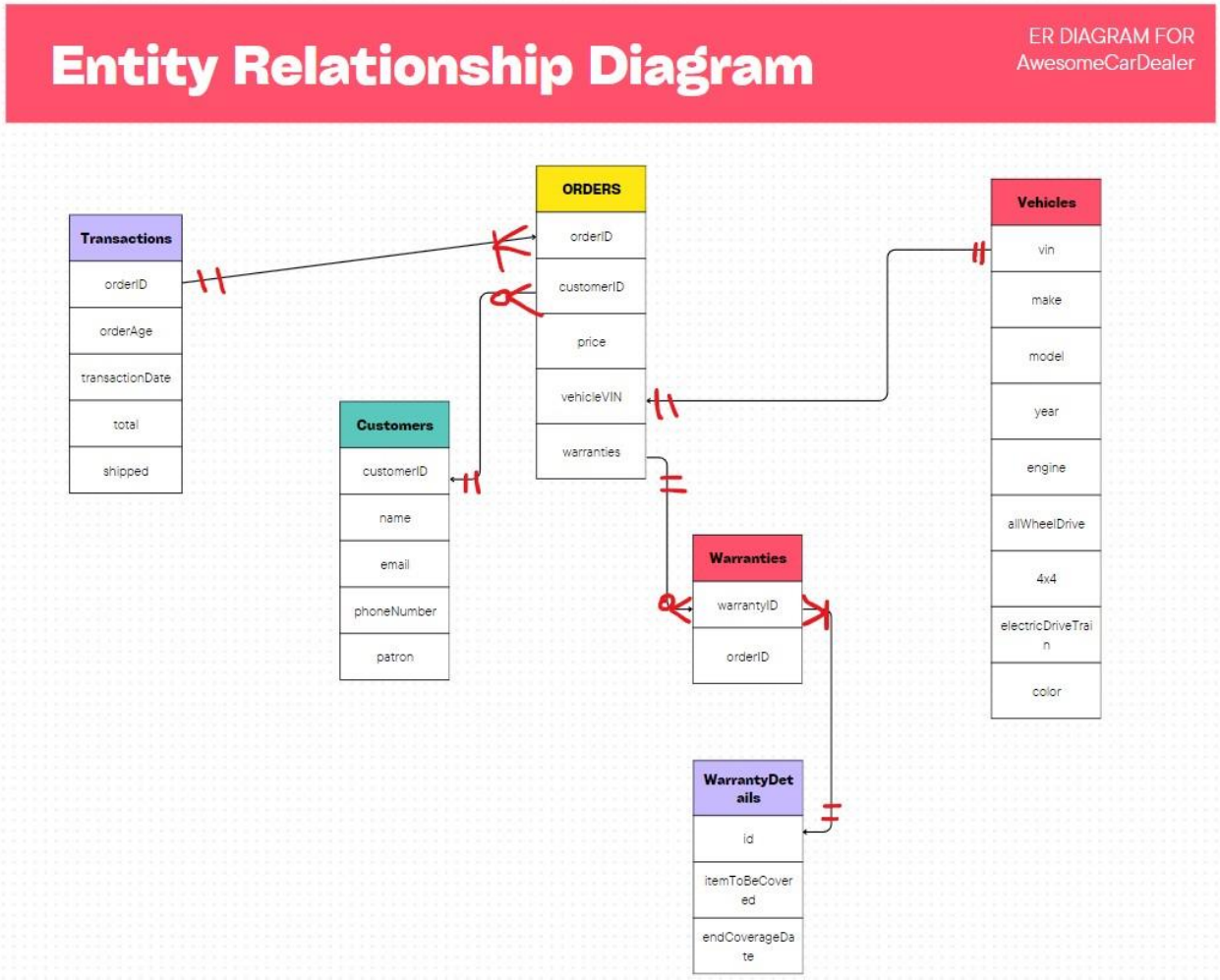
1:1 Vehicles to Orders

Dependency Diagram

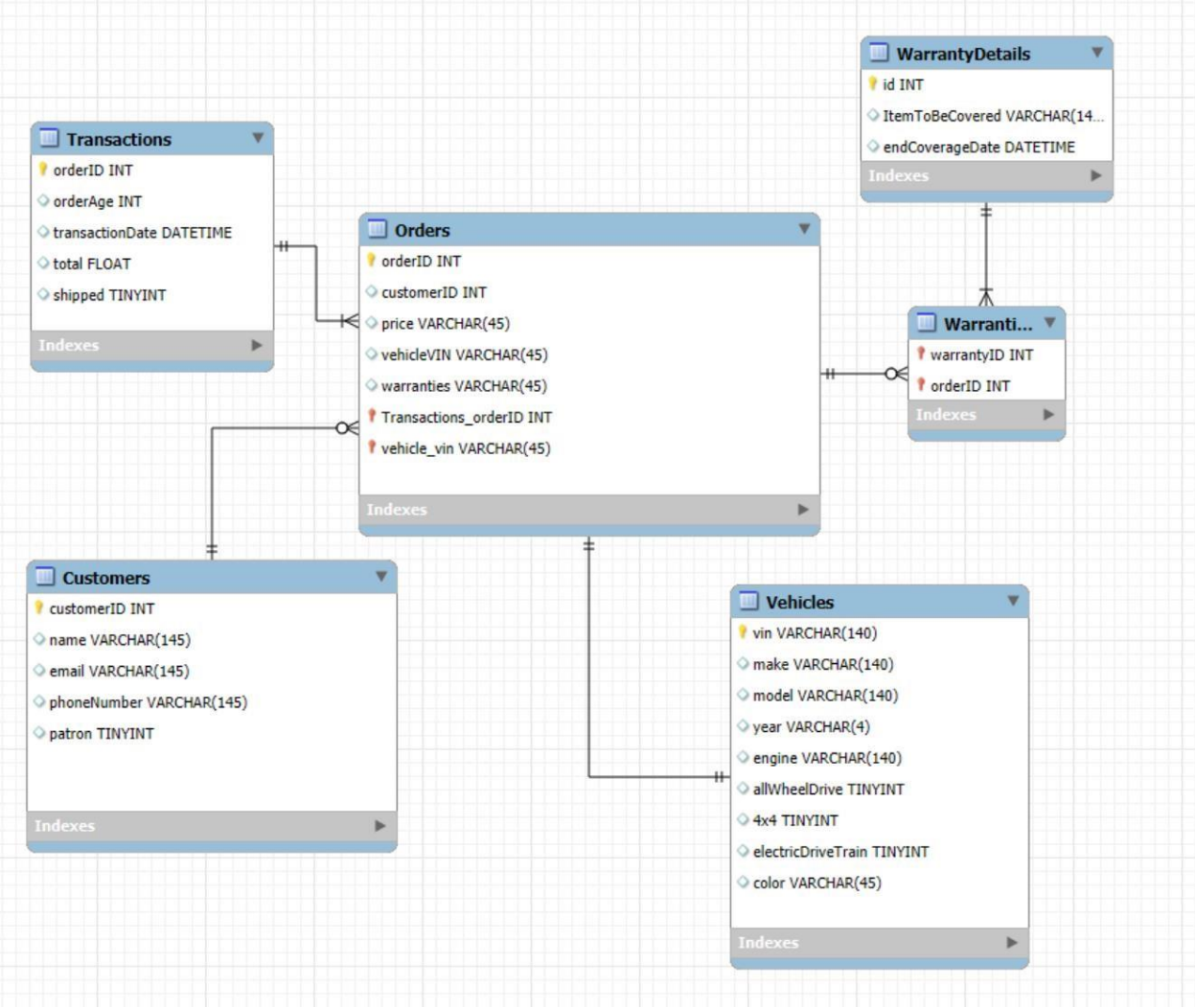


All tables feature proper functional dependencies

ER Diagram


Entity Relationship Diagram
ER DIAGRAM FOR
AwesomeCarDealer
Transactions
orderID
orderAge
transactionDate
total
shipped
ORDERS
orderID
customerID
price
vehicleVIN
warranties
Customers
customerID
name
email
phoneNumber
patron
Warranties
warrantyID
orderID
WarrantyDetails
id
itemToBeCovered
endCoverageDate
Vehicles
vin
make
model
year
engine
allWheelDrive
4x4
electricDriveTrain
color

Schema



DDL.sql Data

```
MariaDB [cs340_zhoup]> SELECT * FROM WarrantyDetails;
+-----+-----------------+---------------------+
| id  | ItemToBeCovered | endCoverageDate     |
+-----+-----------------+---------------------+
| 111 | Engine          | 2026-01-01 23:59:59 |
| 222 | Drive Train     | 2027-01-01 23:59:59 |
| 333 | Body            | 2025-01-01 23:59:59 |
+-----+-----------------+---------------------+
3 rows in set (0.001 sec)
```

```
MariaDB [cs340_zhoup]> COMMIT;SELECT * FROM Warranties;
Query OK, 0 rows affected (0.000 sec)

+------------+---------+-----------+
| warrantyID | orderID | detailsID |
+------------+---------+-----------+
|          1 |       1 |       111 |
|          2 |       2 |       222 |
|          3 |       3 |       333 |
+------------+---------+-----------+
3 rows in set (0.000 sec)
```

```
MariaDB [cs340_zhoup]> SELECT * FROM Transactions;
+---------+----------+---------------------+-------+---------+
| orderID | orderAge | transactionDate     | total | shipped |
+---------+----------+---------------------+-------+---------+
|       1 |        1 | 2026-01-01 23:59:59 |  2043 |       0 |
|       2 |        2 | 2026-02-01 23:59:59 |  1928 |       0 |
|       3 |        3 | 2026-03-01 23:59:59 |  1043 |       0 |
+---------+----------+---------------------+-------+---------+
3 rows in set (0.001 sec)
```

```
MariaDB [cs340_zhoup]> SELECT * FROM Orders;
+---------+------------+---------+-------------------+-------+----------+
| orderID | customerID | shipped | vehicle_VIN       | price | warranty |
+---------+------------+---------+-------------------+-------+----------+
|       1 |          2 |       0 | JN6MD06S2BW031939 | 30000 |        1 |
|       2 |          3 |       0 | JH4DB1550LS000111 | 40000 |        1 |
|       3 |          1 |       0 | 1JCCM85E5BT001312 | 50000 |        1 |
+---------+------------+---------+-------------------+-------+----------+
3 rows in set (0.001 sec)
```

```
MariaDB [cs340_zhoup]> Select * from Customers;
+------------+-------+--------------------------+-------------+--------+
| customerID | name  | email                    | phoneNumber | patron |
+------------+-------+--------------------------+-------------+--------+
|          1 | David | willnerd@oregonstate.edu | 7774442222  |      0 |
|          2 | Paris | zhoudp@oregonstate.edu   | 1112223333  |      0 |
|          3 | Greg  | atkinsg@oregonstate.edu  | 6667778888  |      1 |
+------------+-------+--------------------------+-------------+--------+
3 rows in set (0.001 sec)
```

```
MariaDB [cs340_zhoup]> Select * from Vehicles;
+-------------------+--------+----------+------+-----------------------+--------------+------+-----------
---------+-------+
| VIN               | make   | model    | year | engine                | allWheelDrive | 4x4  | electricDr
iveTrain | color |
+-------------------+--------+----------+------+-----------------------+--------------+------+-----------
---------+-------+
| 1JCCM85E5BT001312 | Jeep   | Wrangler | 2013 | 6-Cylinder, 3.6L      |             0 |    1 |
       0 | grey  |
| JH4DB1550LS000111 | Honda  | Civic    | 2019 | 4-cyl, Turbo Gas, 1.5L |             0 |    0 |
       0 | white |
| JH4KA4571LC033593 | Tesla  | Model 3  | 2018 | electric              |             0 |    0 |
       1 | blue  |
| JN6MD06S2BW031939 | Subaru | Impreza  | 2008 | 4-CYL, 2.0L           |             1 |    0 |
       0 | black |
+-------------------+--------+----------+------+-----------------------+--------------+------+-----------
---------+-------+
4 rows in set (0.001 sec)
```

Screen Captures READ VEHICLES

Vehicles Page

VIN	make	model	year	engine	allWheelDrive	4x4	electricDriveTrain	color	delete
1JCCM85E5BT001312	Jeep	Wrangler	2013	6-Cylinder, 3.6L	0	1	0	grey	Delete
JH4DB1550LS000111	Honda	Civic	2019	4-cyl, Turbo Gas, 1.5L	0	0	0	white	Delete
JH4KA4571LC033593	Tesla	Model 3	2018	electric	0	0	1	blue	Delete
JN6MD06S2BW031939	Subaru	Impreza	2008	4-CYL, 2.0L	1	0	0	black	Delete

READ CUSTOMERS

Customers Page

customerID	name	email	phoneNumber	patron	delete
2	Paris	zhoudp@oregonstate.edu	1112223333	0	Delete
3	Greg	atkinsg@oregonstate.edu	6667778888	1	Delete

READ ORDERS

Orders Page

orderID	customerID	shipped	vehicle_VIN	price	warranty
1	2	30000	0	1	
2	3	40000	0	1	

READ TRANSACTIONS

Transactions Page

orderID	orderAge	transactionDate	total	shipped
1	1	Thu Jan 01 2026 23:59:59 GMT-0800 (Pacific Standard Time)	2043	0
2	2	Sun Feb 01 2026 23:59:59 GMT-0800 (Pacific Standard Time)	1928	0

READ WARRANTY DETAILS

warrantyDetails Page

id	ItemToBeCovered	endCoverageDate
111	Engine	
222	Drive Train	

READ WARRANTIES

Warranties Page

warrantyID	orderID	detailsID
1	1	111
2	2	222

CREATE VEHICLES

- Home
- Vehicles
- Customers
- Orders
- Transactions
- Warranty Details
- Warranties

Vehicles Page

VIN	make	model	year	engine	allWheelDrive	4x4	electricDriveTrain	color	delete
1253123412	ewjaiof	wefawse	1242	Engine					Delete
1JCCM85E5BT001312	Jeep	Wrangler	2013	6-Cylinder, 3.6L	0	1	0	grey	Delete
JH4DB1550LS000111	Honda	Civic	2019	4-cyl, Turbo Gas, 1.5L	0	0	0	white	Delete
JH4KA4571LC033593	Tesla	Model 3	2018	electric	0	0	1	blue	Delete
JN6MD06S2BW031939	Subaru	Impreza	2008	4-CYL, 2.0L	1	0	0	black	Delete

Add A Vehicle

To add a new vehicle, please enter its information below and click 'Submit'!

Make: ewjaiof Model: wefawse Year: 1242 VIN: 1253123412 Engine: Engine All-Wheel Drive: False 4x4: False Electric Drive Train: False Color: red Submit

Update Vehicle

Select a VIN from the dropdown menu to update a vehicle's information:

VIN: Select a VIN Make: Model: Year: Engine: All-Wheel Drive: False 4x4: False Electric Drive Train: False Color: Submit

CREATE CUSTOMERS

Customers Page

customerID	name	email	phoneNumber	patron	delete
2	Paris	zhoudp@oregonstate.edu	1112223333	0	Delete
3	Greg	atkinsg@oregonstate.edu	6667778888	1	Delete

Add A Customer

To add a new person, please enter their information below and click 'Submit'!

Name: asdf Email: afwui@gmail.com Phone Number: 123412341 Submit

Customers Page

customerID	name	email	phoneNumber	patron	delete
2	Paris	zhoudp@oregonstate.edu	1112223333	0	Delete
3	Greg	atkinsg@oregonstate.edu	6667778888	1	Delete
4	asdf	afwui@gmail.com	123412341	0	Delete

Add A Customer

To add a new person, please enter their information below and click 'Submit'!

Name: Email: Phone Number: Submit

DELETE VEHICLES

- Home
- Vehicles
- Customers
- Orders
- Transactions
- Warranty Details
- Warranties

Vehicles Page

VIN	make	model	year	engine	allWheelDrive	4x4	electricDriveTrain	color	delete
1JCCM85E5BT001312	Jeep	Wrangler	2013	6-Cylinder, 3.6L	0	1	0	grey	Delete
JH4DB1550LS000111	Honda	Civic	2019	4-cyl, Turbo Gas, 1.5L	0	0	0	white	Delete
JH4KA4571LC033593	Tesla	Model 3	2018	electric	0	0	1	blue	Delete
JN6MD06S2BW031939	Subaru	Impreza	2008	4-CYL, 2.0L	1	0	0	black	Delete

Add A Vehicle

To add a new vehicle, please enter its information below and click 'Submit'!

Make: Model: Year: VIN: Engine: All-Wheel Drive: False 4x4: False Electric Drive Train: False Color: Submit

Update Vehicle

Select a VIN from the dropdown menu to update a vehicle's information:

VIN: Select a VIN Make: Model: Year: Engine: All-Wheel Drive: False 4x4: False Electric Drive Train: False Color: Submit

DELETE CUSTOMERS

Customers Page

customerID	name	email	phoneNumber	patron	delete
4	asdf	afwui@gmail.com	123412341	0	Delete

Add A Customer

To add a new person, please enter their information below and click 'Submit'!

Name: Email: Phone Number: Submit

Update Customer

Update a customer by using the dropdown menu to select a name

Name: Select a Customer Email: Phone Number: Submit

UPDATE VEHICLES

Vehicles Page

VIN	make	model	year	engine	allWheelDrive	4x4	electricDriveTrain	color	delete
1253123412	ewjaiof	wefawse	1234	Engine				red	Delete
1JCCM85E5BT001312	Jeep	Wrangler	2013	6-Cylinder, 3.6L	0	1	0	grey	Delete
JH4DB1550LS000111	Honda	Civic	2019	4-cyl, Turbo Gas, 1.5L	0	0	0	white	Delete
JH4KA4571LC033593	Tesla	Model 3	2018	electric	0	0	1	blue	Delete
JN6MD06S2BW031939	Subaru	Impreza	2008	4-CYL, 2.0L	1	0	0	black	Delete

Add A Vehicle

To add a new vehicle, please enter its information below and click 'Submit'!

Make: Model: Year: VIN: Engine: All-Wheel Drive: False 4x4: False Electric Drive Train: False Color: Submit

Update Vehicle

Select a VIN from the dropdown menu to update a vehicle's information:

VIN: 1253123412 Make: CHANGED Model: CHANGED Year: 1233 Engine: CHANGED All-Wheel Drive: False 4x4: False Electric Drive Train: False Color: CHANGED Submit

UPDATE CUSTOMERS

Customers Page

customerID	name	email	phoneNumber	patron	delete
4	asdf	2142134@QAWFE.WOW	1234126123	0	Delete

Add A Customer

To add a new person, please enter their information below and click 'Submit'!

Name: Email: Phone Number: Submit

Update Customer

Update a customer by using the dropdown menu to select a name

Name: Select a Customer Email: Phone Number: Submit