Burdell's Ramblin' Wrecks

George P. Burdell, a famous Georgia Tech alumnus, has decided to go into the business of selling used cars. While he'd like to eventually have a full website like most car dealerships, he's decided for now that he'd just like a simple application so that he can update his inventory when buying and selling, keep track of financial information, and that customers can search his inventory. Right now, he doesn't have enough staff to take pictures of the cars, so only the details will be stored in the database. Along with the functions to support his operations, he wants a couple of reports so he can track how well his new business is doing.

Mr. Burdell is not so worried about the user interface, which is why there aren't any examples here of what forms or pages might look like, so you can make the UI as simple or as complicated as you'd like, as long as the main database and application functionality is present. You have latitude in how you implement the UI, as it could be a web application, a desktop application, or even a mobile app, as long as it has been built on a relational database system. Mr. Burdell took several of Leo Mark's courses and likes the idea of everything being in a relational database, and that's why he's asked your team to build the initial system for him. This could lead to a job working for the one and only George P. Burdell, so you should put your best effort into your design, implementation and your demonstration of what you've built!

Functionality and Users

Burdell's Ramblin' Wrecks will have a public-facing interface for searching vehicles, and additional features that can be accessed by logging in as a user. These features will be described in further detail later, but it is important to remember to distinguish between public users and logged-in users and what they may/may not access. Furthermore, there are distinct categories of users that will login, with various permissions:

- Inventory clerks, who buy vehicles and add them to inventory, along with information about the car's previous owner (also considered customer information), and enter repair information
- Salespeople, who will only have access to searching available inventory, entering customer information, and entering sales transactions
- Managers, who can view inventory, purchase history, sales transactions, repair history, and reports
- And the owner, Mr. Burdell, who has access to everything and can perform any activity in the system

A user can only have one of these permission sets. Since this is a prototype system, it will not be necessary to have an interface for adding/registering users and granting them appropriate permissions. The database administrator will manually add users and set permissions as needed. (Note that specific user permissions may be implemented how you see fit, on either the database level or enforced by the application.) All logged-in users will be identified using a unique username and password determined by the database administrator. (It is acceptable to store passwords in the database as plaintext in the initial version of this system.) You should

also store the first and last name of the user to further identify them in other areas of the system.

Operational Details

There are a variety of people and things involved in the day-to-day operations of Burdell's. Unless otherwise specified, any properties mentioned here are required. You should build a database schema that facilitates storing the information needed for these processes.

Vehicles

Vehicles are tracked on a variety of characteristics. First, each vehicle has a unique alphanumeric Vehicle Identification Number (VIN). Next, the type of vehicle is stored. The list of vehicle types is in the appendix and should be updatable in case new types of vehicles are manufacture1d. The manufacturer name is also stored, and a list of valid manufacturer names is provided in the appendix of this specification. This list of manufacturers is not static, so you should ensure the list can be updated within the database. The model name and model year must also be stored, and these will be free-form entered by the user, with the restriction that model years cannot exceed the current year plus one. (Someone might sell Burdell's a 2020 model year vehicle in 2019, but it's impossible to sell a 2021 model year car in 2019 since that year's models don't exist yet.) The year entered must include century digits. (So "1999" is acceptable, but "15" is not.). Of course, the color of the car is also an important detail, and a list of generic color names that can be chosen for a vehicle is also in the appendix. A car may have multiple colors, for example, silver and red. The list of colors is not expected to change. The mileage (odometer reading) is also stored for each vehicle. Finally, an optional description can be entered that contains additional information such as what accessories or equipment the car has or any other information.

Customers

Sellers and buyers (combined, referred to as "customers", because they are capable of buying and selling) can be either an individual person or a business. For all customers, their address (street/city/state/postal code) and their phone number are collected. Customers also have the option of providing an email address so that Burdell's can stay in touch with them electronically. If the customer is an individual, their first and last names, along with their driver's license number (which can be assumed to be unique), will be recorded. If the customer is a business, the business' tax identification number (similar to a Social Security number) and business name, along with the name of a primary contact and their title (such as owner, fleet manager, etc.), are recorded.

Sellers

Vehicles are sold to Burdell's by sellers, and the vehicle should link back to the seller that sold the vehicle. It is safe to assume that a car will only be sold to Burdell's once, but sellers may sell multiple vehicles. Purchase prices are determined using the Kelley Blue Book (kbb.com) and are entered for each sale manually by the inventory clerk handling the transaction, who will determine the condition of the vehicle (Excellent, Very Good, Good, Fair) which corresponds to

a certain Blue Book value. The purchase date should be tracked in order to determine how long the car is in inventory.

Repairs

Some cars are purchased and need repair work before they can be sold, or have manufacturer's recalls that require fixing, which are also treated as a repair. An inventory clerk will determine what repairs or recalls are necessary, get quotes for them, and input them into the system. For each repair, you will need to track its status (pending/in progress/complete), the name of the vendor performing the repair (you can assume that vendor names are unique), their address (street/city/state/postal code) and phone number, a description of the repair, the start date and end date of the repair, and the total cost. If the repair is associated with a recall, the NHTSA recall campaign number (which, despite being called a number, is alphanumeric), the recall description, and its associated manufacturer is also recorded. Note that a recall usually applies quite broadly to vehicles, so it is very unlikely that a recall will be associated with a single vehicle or single repair. Therefore, if the recall already exists in the database, the system should just link the repair to the existing recall. A vehicle cannot be returned for any public search results or be sold if it has any repairs pending or in progress (in other words, all repairs must be complete). Repair statuses will be manually updated by clerks as work is completed.

Buyers

Vehicles are bought by buyers in a sale transaction with a salesperson. The sales price is calculated as 125% of the original purchase price (the price Burdell's paid to buy the car) combined with 110% of any repair costs also associated with the vehicle. Just as with selling, the vehicle should have a link to the customer who purchased it, and it's possible (and good for business) that a buyer can purchase several vehicles. Should a buyer purchase several vehicles at the same time, they would still be handled as separate sales transactions. The purchase date should be tracked in order to determine when a car leaves inventory.

Application Functionality

Public Access

The only feature accessible to the public is searching for vehicles. Because of this the initial state of the application should be to open the "public" search page, with an option to login provided somewhere on that page.

The public search page should initially display somewhere prominent, the total number of cars available for purchase in the system, that is, cars without any pending or in progress repairs. Searching can be done on the following criteria:

- Vehicle type
- Manufacturer
- Model year
- Color

- Keyword, which searches the manufacturer, model year, model name and description fields. Anything that matches the entered keyword (either entirely or as a substring) for any of those fields should be returned.

For fields other than keyword, it may be appropriate to use drop-downs to provide choices to the user. You do not need to allow making multiple selections for these fields, selecting a single value is acceptable. Results must match all search options that are entered.

If no vehicles meet the search criteria, a message should be displayed: "Sorry, it looks like we don't have that in stock!"

If there are vehicles that match the search criteria, you should return the following attributes for each vehicle in the search results:

- VIN
- Vehicle type
- Model Year
- Manufacturer
- Model
- Color(s) – be sure if a car has multiple colors, that it only returns a single result row
- Mileage
- Sales Price

These results should be sorted by VIN in ascending order. Allowing the user to sort by other columns is optional. Users can select an individual result, which will open a detail page that includes the VIN, vehicle type, Model Year, Model Name, Manufacturer, color(s), mileage, sales price, and the description of the car.

Privileged Access

As noted previously, users who are employees of Burdell's will have access to additional features in order to perform their job duties. Remember that you do not need to provide any interface for creating or registering users and granting them privileges, as this will be done manually in the database for now. Privileged users will login using their username and password. Ideally, all users will start on the public-facing search screen, which provides a login option, and after logging in, will update to include access to the appropriate functionality.

One area of common functionality is the ability to look up and add customers to the system. However, this is only available when performing a purchase or sales transaction and is not something that needs to be independently accessible. Looking up a customer can be done using either the driver's license or tax ID. If no result is found, then the option to add a customer is provided, and based on the customer type, the appropriate fields (as described earlier in this specification) should be input into the system.

In addition, all privileged users will have an additional search option added to the search page which allows for searching by VIN.

Inventory Clerks

After an inventory clerk logs in, he/she will be given access to an "Add Vehicle" button or link, that will allow them to add new vehicles that have been purchased. On the add vehicle form, the clerk will need to search or add a customer in order to link the purchase to a seller. After selecting a seller for the car, the new vehicle form will gather all the relevant details such as VIN, vehicle type, condition, Blue Book value, etc., along with the date of purchase. After submitting the data and successfully adding the vehicle to the database, the clerk will be taken to the detail page for the vehicle. (What the detail page looks like for clerks will be described further on.)

Inventory clerks will need to also pull up previously purchased vehicles and will do that using the search screen, which should show them somewhere on the search screen the number of vehicles currently with repairs pending or in progress along with the number of vehicles available for purchase. Clerks can search on the same criteria as public users, along with the option to search by VIN. Unlike public search, however, the results for a clerk should include any vehicle that has not been sold even those with repairs pending or in progress. Selecting a result will load that vehicle's detail page.

The clerk's view of the detail page is similar to the detail page shown to public users and should show the same information but include fields for the original purchase price and the total of all repair costs. A newly-added car will show $0 total for repairs because it has no repairs yet. There should also be a section for repairs, which will list each repair associated with the car. This list should include all relevant details for each repair: vendor, start date, end date, status, cost, and the recall number, if applicable. There should also be a mechanism, using either a dialog box or popup, to display the repair description or the description of the manufacturer's recall, and also a way to update the status of a repair from pending, to in progress, to completed. Once a repair has been marked as completed, its status can no longer be updated. An "add repair" link or button should also be provided to access the add repair form.

If a repair needs to be entered, the clerk will access the add repair form and enter the information for that repair (these elements were described previously in the "Repairs" section). The manufacturer listing for the add repair form should use the same manufacturer listing that is provided in the appendix. Similar to how customers are handled, you should have a mechanism on the add repair form for searching and adding vendors to link them to a repair. Note that repair dates cannot overlap, so if a scheduled repair already exists for a vehicle, a new repair that overlaps with an existing repair cannot be added. A newly added repair should have the status of "pending" even if it starts on the day it is entered – the clerk will need to update the repair to "in progress" on the vehicle detail page.

Salespeople

Salespeople will start, after logging in, on the search page, with the same layout as a public search, with the added option to search by VIN, and like public users, with the results only including vehicles with no pending or in-progress repairs. Upon loading the detail page for a

vehicle, the sales person will see the same detail page that customers do, with an added button or link to sell the car. This will load the sales order form.

On the sales order form, salespeople can look up a customer (or add them if a customer is not found) and confirm the sale by entering the sales date. The sales price of the car cannot be changed – Mr. Burdell doesn't like the idea of bargaining over car prices and feels that customers will enjoy knowing that the price listed for a car is the price they will pay without any added hassle.

Managers

Managers have view-only access to all information along with reports (which will be described in their own section). Like inventory clerks and salespeople, after logging in, managers start on the search screen, which will display somewhere the number of vehicles currently with repairs pending or in progress, along with the number of vehicles available for purchase, with the same search options as a public search, and can also search by VIN. They additionally have the option to filter by sold vehicles, unsold vehicles, or all vehicles. When filtering by unsold or all vehicles, all unsold vehicles will be returned regardless of repair status.

When viewing a vehicle detail page, managers will see all information for the car – including all of the seller's contact information (everything except their driver's license or tax ID number), the name (first and last) of the inventory clerk that purchased the car, the original purchase price, the purchase date, the total cost of repairs, and a repairs section listing details for all repairs just like would be shown on an inventory clerk's view. In addition, if the car has been sold, the buyer's contact information (everything except their driver's license or tax ID number), sales date, and the salesperson's name (first and last) will be displayed.

Mr. Burdell

As stated previously, Mr. Burdell has access to the complete functionality of the system, must be able to view all information and reports, and should be able to do any activity described previously in this specification. Essentially, Mr. Burdell's login will allow him to do anything a manager, inventory clerk, or salesperson can do, keeping in mind any context for business processes. (For example, the vehicle detail page will show all information like it does for managers, and he will also be able to sell a car or add repairs to it, but the system should not allow him to add repairs to or sell a car that has been sold. This is just an example of one natural limitation – you may need to determine if there are others!)

Reports

Mr. Burdell has asked for a few reports that will be visible to him and to his managers. Access to these reports should be via a link, button, or dropdown menu that can be displayed on the initial search page for users that are allowed access to reports.

Seller History

This report will show detail about all vehicles purchased by Burdell's and their sellers. It will include the following elements: the name of the seller (either first name and last name or company name), the total number of vehicles they have sold to Burdell's, the average purchase price for the vehicles they have sold to Burdell's, and the average number of repairs per vehicle. The report should be sorted by total number of vehicles sold descending, followed by average purchase price ascending. In addition, any seller who has sold vehicles and shows an average of five or more repairs on this report should have their resulting row highlighted with a red background to indicate that they may be selling lower quality vehicles and that Burdell's may want to avoid buying from them in the future.

Inventory Age

This report, based on the vehicle purchase date, will display by vehicle type, the minimum, average, and maximum age of unsold vehicles in inventory, in days. If a vehicle type has no unsold units, the report should display "N/A" for that vehicle type.

Average Time In Inventory

This report, based on the difference between vehicle sales dates and the vehicle purchase dates, will display, by vehicle type, the average amount of time a vehicle remains in inventory, in days. If a vehicle type has no sales history, the report should display "N/A" for that vehicle type.

Price Per Condition

This report will display, by vehicle type, and for each condition (Excellent, Very Good, Good, Fair), the average price paid for cars that Burdell's has purchased. If a vehicle type or condition has never been purchased, the report should display "$0" for that result. Mr. Burdell would like to see this as a pivoted report, so vehicle type could be displayed as rows, with condition for the columns, or vice versa – your team can decide which form "looks" better.

Repair Statistics

Mr. Burdell thinks that he can negotiate better prices with repair vendors but wants to have good information to take to the bargaining table. In this report, you should list: the vendor name, the number of repairs completed by that vendor, the total dollar amount spent on completed repairs, the average number of repairs per vehicle completed by that vendor, and the average length of time (in days) to complete repairs by that vendor.

Monthly Sales

This report will be the most frequently used report and has two parts. First, a summary page, which lists for all sales transactions, by year and month, the total number of vehicles sold, the total sales income, and the total net income (which is sales price less purchase price and any repair costs). If a year or month does not have sales data, it can be excluded from this report. The results will be ordered by year and month descending, with the most recent year and month as the first result.

From each year/month result, a drilldown report for that year and month must be accessible. Based on the sales data for that year and month, the drilldown will display the top performing salespeople, by showing the salesperson's first and last name, the number of vehicles they sold in that year and month and their total sales for that year and month. To determine who is the top sales person for the month, the drilldown will be sorted by total vehicles descending followed by total sales descending. (In other words, in the event of a tie, the salesperson who has sold the highest dollar value will be considered the top salesperson.)

Appendix

Manufacturers

Acura	Alfa Romeo	Aston Martin	Audi
Bentley	BMW	Buick	Cadillac
Chevrolet	Chrysler	Dodge	Ferrari
FIAT	Ford	Freightliner	Genesis
GMC	Honda	Hyundai	INFINITI
Jaguar	Jeep	Kia	Lamborghini
Land Rover	Lexus	Lincoln	Lotus
Maserati	MAZDA	McLaren	Mercedes-Benz
MINI	Mitsubishi	Nissan	Porsche
Ram	Rolls-Royce	smart	Subaru
Tesla	Toyota	Volkswagen	Volvo

Colors

Aluminum	Beige	Black	Blue	Brown	Bronze	Claret
Copper	Cream	Gold	Gray	Green	Maroon	Metallic
Navy	Orange	Pink	Purple	Red	Rose	Rust
Silver	Tan	Turquoise	White	Yellow		

Vehicle Types

Sedan
Coupe
Convertible
Truck
Van
Minivan
SUV
Other

Change History

Version	Date	Description
1.0	5/28/2019	Initial version of specification
1.1	6/3/2019	Added “city” as an attribute needed for anywhere an address is collected. Clarified that all driver’s license numbers can be assumed to be unique. Added that only logged-in users are identified with a username and password. Adjusted wording for seller report to more clearly explain criteria for red highlighting.
1.2	7/1/2019	Added model name as another attribute to be displayed on the vehicle detail page. Added sort order to search results.