Jaunty Jalopies

Roland Around is the owner of an auto dealership, Jaunty Jalopies. While he'd like to eventually have a full website like most dealerships, he's decided for now that he'd just like a simple application so that he can update his inventory, track sales, maintain repair history, and let customers search inventory. Right now, he doesn't have enough staff to take pictures of vehicles, so only the details will be stored in the database. Along with the functions to support his operations, he also wants some reports so he can track how well his business is doing.

Roland 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, but the main database and application functionality must be present. You have latitude in how you implement the UI, as it could be a web application, a desktop application, text menus, or even a mobile app. Roland is a good friend of Leo Mark, who has convinced him that it's a good idea to store everything in a relational database, and that's why he's asked your team to build the initial system and then demonstrate it for him.

Functionality and Users

Jaunty Jalopies will have an anonymous 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 anonymous 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 add vehicles to inventory
- Salespeople, who will only have access to searching available inventory, and entering sales transactions
- Service writers, who enter repair details
- Managers, who can view inventory, sales transactions, repair history, and reports
- And the owner, Roland, who has access to everything and can perform any activity in the system (a combination of all permissions)

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 access 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 a password (which may not be unique) 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 Jaunty Jalopies. 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. Each vehicle type has attributes which are specific to that vehicle type. (The list of vehicle types and their attributes is in the appendix.) 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. (For example, a 2022 model year vehicle could be sold in 2021, but it's impossible to sell a 2023 model year vehicle since that year's models wouldn't exist yet.) The year entered must include century digits. (So "1999" is acceptable, but "15" is not.) The invoice price (the amount paid for the vehicle) is also stored and should include dollars and cents. Of course, the color of the vehicle 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 vehicle may have multiple colors, for example, silver and red. The list of colors is not expected to change. Finally, an optional description can be entered that contains additional information such as what accessories or equipment the vehicle has or any other information.

Customers

Customers can be either an individual person or a business. For all customers, their address (street address/city/state/postal code, it is not necessary to store individual elements of the street address, such as street number, name, direction, etc. separately, "123 Main Street Apt A" will be enough) and their phone number are collected. Customers also have the option of providing an email address so that Jaunty Jalopies 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 also assumed to be unique) and business name, along with the name of a primary contact and their title (such as owner, fleet manager, etc.), are recorded.

Sales

Vehicles are bought by customers via a salesperson. The list price is calculated as 125% of the invoice price, however, customers can negotiate and receive a lower price, which is recorded at the time of sale (the "sold price"). Market conditions may also enable a salesperson to sell a vehicle at a higher price. The system should store the details of customer who purchased the vehicle, 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 to determine when a vehicle leaves inventory.

Repairs

Jaunty Jalopies also provides repairs for the vehicles it has sold. Each repair must be associated with a vehicle. It cannot be assumed, however, that a repair for a vehicle is for the customer that originally bought it. Each repair will have a start date (therefore, the combination of vehicle, customer, and a start date should be unique for every repair), the date the repair was completed (which could be the same date as the start date, or later, but of course, not before), the odometer reading of the vehicle (in whole miles) any labor charges (in dollars and cents) for the repair, and a description of the repair. A vehicle will never have more than one repair starting on the same date, and a repair must be completed before a new one can be started. A repair may require parts, and for each part, the system will track the quantity of the part used for the repair, the vendor name, the part number (which may be alphanumeric), and the price of the part. Because part prices can change, you should not worry about maintaining a static list of vendor names, part numbers, or prices. By combining the labor charges with the cost of all parts used for the repair, the total repair cost can be determined.

Application Functionality

Anonymous Access

The only feature accessible without logging in is searching for vehicles. Because of this the initial state of the application should be to open the search page, with an option to login provided somewhere on that page.

The search page should initially display somewhere prominent, the total number of vehicles available for purchase in the system. Searching can be done on the following criteria:

- Vehicle type
- Manufacturer
- Model year
- Color
- List price (either greater than and/or less than an entered value)
- 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 or list price, it may be appropriate to use dropdowns to provide choices to the user. You do not need to allow making multiple selections for these fields, such as searching for multiple manufacturers, selecting a single value is acceptable. Results must match all search terms that are entered, and of course, should only return unsold vehicles.

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) –if a vehicle has multiple colors, return a single row with all colors listed
- If an entered keyword matched the description (you may indicate this with a checkbox, X mark, or other appropriate indicator)
- List Price

These results should be sorted by VIN in ascending order. Allowing the user to sort or filter results by other columns is optional and does not need to be implemented unless you desire to do so. Users can select an individual result, which will open a detail page that includes the VIN, vehicle type, attributes for that vehicle type, Model Year, Model Name, Manufacturer, color(s), list price (NOT invoice price), and the description for the selected result.

Privileged Access

As noted previously, users who are employees of Jaunty Jalopies will have access to additional features based on 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 various transactions 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. The new vehicle form will gather all the relevant details such as VIN, vehicle type, invoice price, etc., along with the date it was added to inventory. After submitting the data and successfully adding the vehicle to the database, the clerk will be taken to the detail page for the vehicle.

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 invoice price. After a vehicle is added to inventory, it is immediately available for sale and should be found when searching.

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. Upon loading the detail page for a vehicle, the salesperson will see the same detail page that customers do, with an added button or link to sell the vehicle. 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 sold price and sold date. However, if a sold price is less than or equal to 95% of the invoice price, the system will reject the sale. There is no restriction on sold prices that exceed the list price.

Service Writer

Service writers enter the details of repairs into the system. After they log in, they are provided a link or button to open the repair form. On it, they will enter a VIN. If the vehicle has not been sold, or the VIN does not match a vehicle in the database, an appropriate error message should be displayed. Otherwise, the rest of the repair form will be displayed.

The repair form should show the following details for a vehicle, like search result details: VIN, vehicle type, Model Year, Model Name, Manufacturer, and color(s), so that the service writer can be sure they are viewing the correct vehicle.

If no repairs are open for the vehicle, then the repair form will allow the user to start a new repair. The odometer reading should be entered, and the current date will be stored as the start date. The service writer will also be prompted to search for the customer associated with the repair. As this may not be the customer who originally purchased the vehicle, it may be necessary for the service writer to add a new customer to the system for the repair.

After creating the repair, the form should allow the service writer to enter labor charges and to add parts. When adding parts, all relevant details (quantity, vendor, part number, price) will be entered by the service writer. The service writers are well-trained and will enter details such as vendor names and part numbers consistently without typos, but you should still perform basic input validation (such as ensuring quantity is a number, etc.)

If the vehicle has an unfinished repair, then the repair form will only allow for updating labor charges, adding parts, or completing the repair. Any updates to labor charges cannot be less than their previous value. Upon choosing complete repair, the current date is stored on the repair as the completion date.

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 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 viewing a vehicle detail page, managers will see all information – the inventory clerk that added the vehicle, the invoice price, and the date it was added to inventory. In addition, if it has been sold, the buyer's contact information (everything except their driver's license or tax ID number), list price, sold price, sales date, and the salesperson's name (first and last) will be displayed. If any repairs have been made for the vehicle, they should be displayed under a "Repairs" section, and list the customer name (first and last name for individuals, or company name for companies), the service writer who entered the repair, and the repair's start date, end date, labor charges, parts cost, and total cost.

Roland Around

As stated previously, Roland 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, Roland's login will allow him to do anything a manager, inventory clerk, service writer, or salesperson can do, keeping in mind any context for business processes. In addition, the sales order form will allow Roland to enter sold prices that are less than or equal to 95% of the invoice price, and the repair form will allow him to update the labor charges on a repair to a value less than their previous value.

Reports

Roland 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.

Sales by Color

Roland wants to make sure he is stocking colors that will sell more often. This report will allow him to keep track of those trends, and he will probably review the data at least once a month. This report will list the number of vehicles for each color sold in the previous 30 days, the previous year, and over all time, starting from the last available sale date. As there are more colors than these three categories, it would be sensible for colors to be the rows for the table of the report. If a vehicle has multiple colors, it should be classified as "multiple" and not included in the count of vehicles that have only one color. If a color does not have any sales, it should be shown with a value of "0".

Sales by Type

Similarly, Roland would like to be able to review sales trends by each vehicle type. This report will list the number of vehicles sold by vehicle type in the previous 30 days, the previous year,

and over all time, starting from the last available sale date. If a vehicle type does not have any sales, it should be shown with a value of "0".

Sales by Manufacturer

Just like the previous reports, the last report of this kind will be by manufacturer name and will list the number of vehicles sold by manufacturer in the previous 30 days, the previous year, and over all time, starting from the last available sale date. Unlike the previous reports, however, due to the large number of manufacturers, if a manufacturer does not have any sales, it should be excluded from the report.

Gross Customer Income

This report will list, for the top 15 customers, the gross (not net) income received from them via vehicle sales and/or repairs (including any repairs in progress). This report will have two parts. The first part is a listing of the top 15 customers and should provide the customer's name (first/last for individuals or business name for business), the date of the first sale or repair start date, the date of their most recent sale or repair start date, their number of sales, their number of repairs, and the gross income (all sales and total repair costs combined). The list of customers will be by gross income descending and by last sale/repair start date descending.

The second part is a drill-down for the selected customer (which can be made accessible by clicking on an appropriate link, such as clicking on the customer's name, or a "more detail" button). The drill down will have a section for vehicle sales and a section for repairs. The vehicle sales section should list the following details from each sale: sale date, sold price, VIN, year, manufacturer, model, and salesperson name. The listing should be sorted by sale date descending and VIN ascending. The repairs section should list the following details for each repair: start date, end date (if the repair is not finished, this should not display any value), the VIN of the repaired vehicle, the odometer reading, parts cost, labor cost, total cost, and the service writer who opened the repair. This listing should be sorted by start date descending, end date descending, and VIN ascending; however, any incomplete repairs should be listed before completed ones with the same sorting criteria.

Repairs by Manufacturer/Type/Model

The purpose of this report is to identify repair trends by manufacturer, type, and model, and will have two parts. The first part will list for each manufacturer: the count of repairs, the sum of all parts costs, the sum of all labor costs, and the sum of total repair costs, including any repairs in progress. Manufacturers whose vehicles do not have any repairs should be listed on this report, and the report should be sorted by manufacturer name ascending.

From the first part, a drill-down for manufacturers that have repairs will be accessible (such as by clicking on an appropriate link, like the manufacturer's name, or a "more detail" button). The drill-down report will list a total for each vehicle type with repair count, parts costs, labor costs, and total costs. It will also list further details for that vehicle type, with each model's repair counts, parts costs, labor costs, and total costs. The totals by vehicle type should be

displayed before the details of its models. Models and/or vehicle types which do not have repairs should be excluded from this report. The drill-down should be sorted by repair count descending (by vehicle type sorted first, and then detail rows sorted).

Below Cost Sales

This report will be used to track all sales of vehicles that were below the invoice price of the vehicle. For each vehicle sale, it should list the date, the invoice price of the vehicle, the sold price, the sold price/invoice price ratio as a percentage (such as 96%), the customer's name (first/last for individuals or business name for businesses), and the name of the salesperson for the sale. For a sale whose ratio is less than or equal to 95%, the background of that row should be highlighted red. Sales should be listed by sales date descending and ratio descending.

Average Time in Inventory

This report, based on the difference between vehicle sales dates and when the vehicle was added to inventory, 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.

Parts Statistics

Roland thinks that he can negotiate better prices with parts vendors but wants to have good information to take to the bargaining table. In this report, you should list: the vendor's name, the number of parts supplied by that vendor, and the total dollar amount spent on parts.

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, the total net income (which is sold price less invoice price), and the sold price/invoice price ratio as a percentage (such as 125%). If a year or month does not have sales data, it can be excluded from this report. When the ratio for a month is greater than or equal to 125%, its row should be highlighted with a green background. If the ratio is less than or equal to 110%, it should be highlighted with a yellow background. 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 where two or more salespeople have sold the same number of vehicles, 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	SAAB	smart
Subaru	Tesla	Toyota	Vauxhall
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 and Attributes

- Car
  - Number of doors
- Convertible
  - Roof type
  - Back seat count
- Truck
  - Cargo capacity (in tons)
  - Cargo cover type (optional)
  - Number of rear axles
- Van/Minivan
  - Has Driver's Side Back Door
- SUV
  - Drivetrain type (FWD, 4WD, AWD, etc.)
  - Number of cupholders

Change History

Version	Date	Description
1.0	9/7/2021	Initial version of specification