Specification Document

Rural Grocery Network

Trevor Holthaus, Caroline Snell, Matt Llewelyn

Introduction

Many rural town grocery store owners in Kansas are unable to buy the quantity of product they need in order to purchase their stock straight from distributers. This forces them to go to others stores to buy their products to stock their own stores, which costs significantly more, making it difficult to turn a profit. This website is intended to help these grocery stores by making it easier for them to partner up with others stores to purchase straight from a distributer as a collective. Grocery store owners would be able to input what type and how much (or how many pallets) product they want at their location. The website would then be able to look at this info and find scenarios on what stores to partner up based off the product type and how many pallets would fit in a truck and then find the shortest path for trucks to take to deliver to those stores.

Project Overview

The Clients are the people over at the Rural Grocery Extension at K-State University who work with grocery store owners in rural areas of Kansas. The website is intended to be used both by them and the owners of the stores they work with. It will be hosted by K-State University.

The website will allow rural grocery store owners to partner up with other owners to buy product from distributers as a collective. This will help them save money because they are unable to purchase the amount needed to buy from the distributers on their own, forcing them to go to other stores to buy their product. Stores sell their product at a higher price then they bought it in order to make a profit. Since rural grocery store owners must buy from other stores, they're already buying their product at higher price and are unable to raise it much higher without their customers refusing to buy from them. This makes it more difficult for them to make money from their business.

The website will allow store and distributer locations to be imported from a .csv file or manually. The amount and type of products that the stores want to purchase will also be allowed to be inputted, along with other store information. The amount refers to pallet size, while the type will refer to how it has to be transported (does it need to be in a refrigerated truck). All the stores and distributers will appear on a map and a radius can be formed at any size, in miles, at any point clicked on the map. A path of the shortest length can then be generated between the stores within this radius. Scenarios will also be able to be found to find what stores to pair up based off different constraints, like truck size, product type, and product amount.

Since the website is open to the public some constraints will be in place to hide sensitive information from view of non-Admins. There will also be other constraints in place to only allow those with Admin permission to change information.

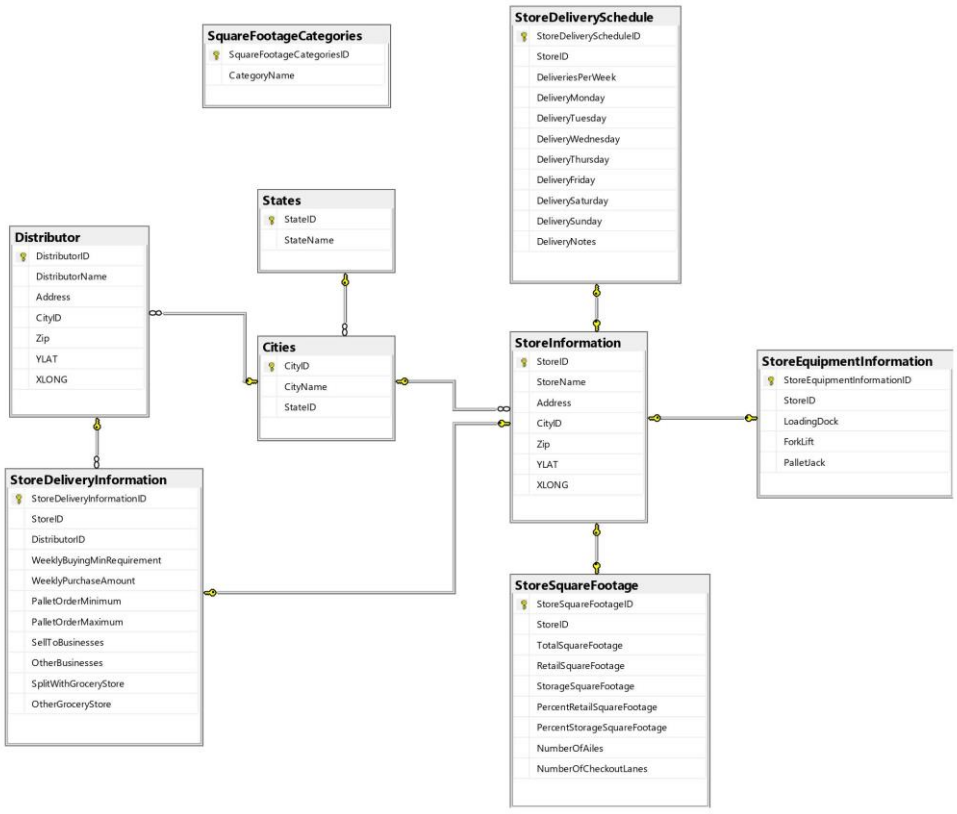
Development and Target Environments

The physical environment that the website will be used is on store owners' computers either at their homes or stores. The website will also be able to be used by Rural Grocery Extension on their computers as well.

No special hardware is necessary besides a computer with internet connection.

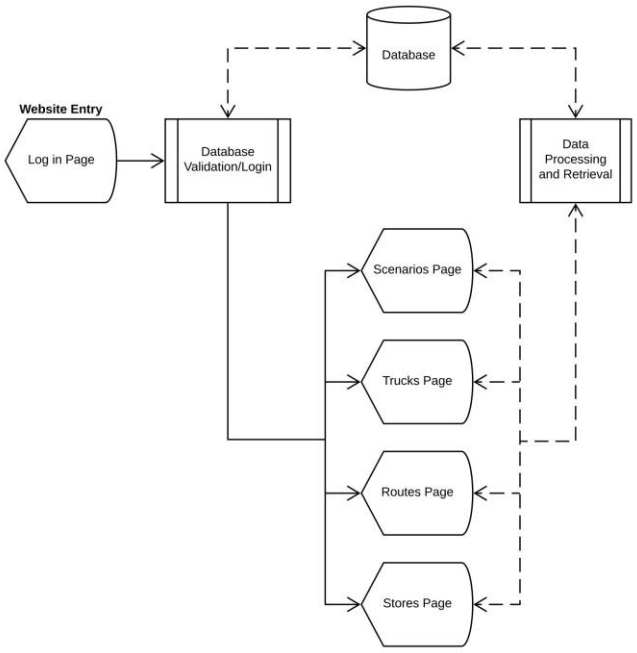
ArcGIS, SQL Server, .NET, and a Virtual Machine (through K-State) are all required to host the website and run it.

System Model



This database diagram shown above does a good job displaying that most of our tables are used to support the initial Store Information table in the center of the diagram. We have tables to

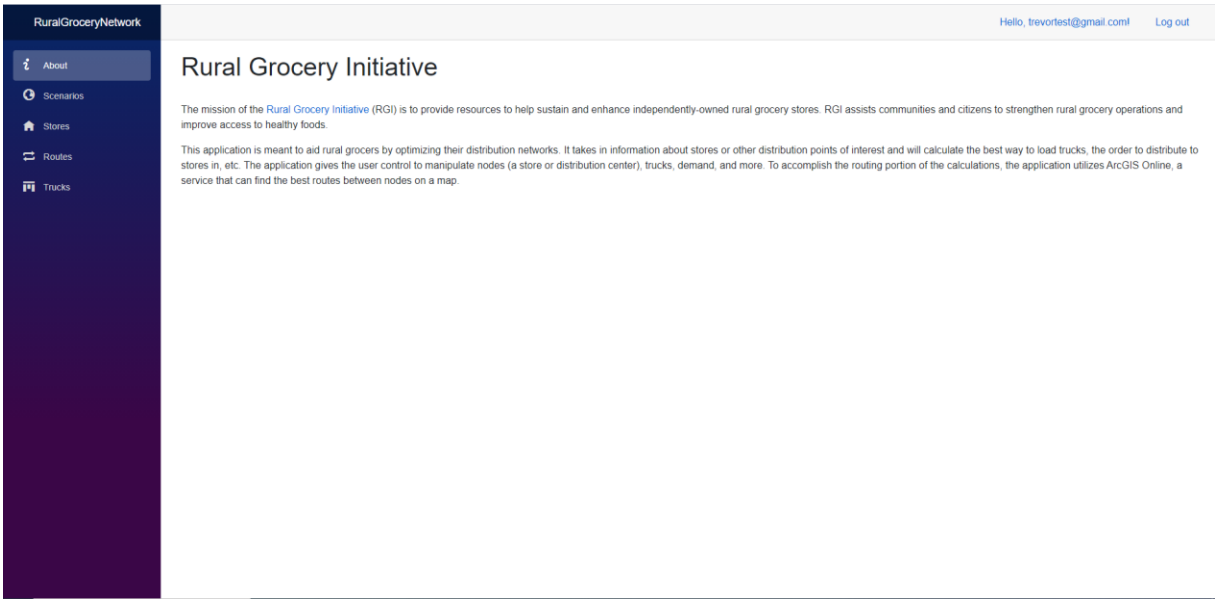
hold information regarding store equipment, square footage, delivery schedules, and delivery information. We also have separate tables to list all of the states, along with all of the cities in Kansas (could include all cities across US, but there is no need for that right now). Finally, we have a table for the distributors that are shipping product to our local stores.



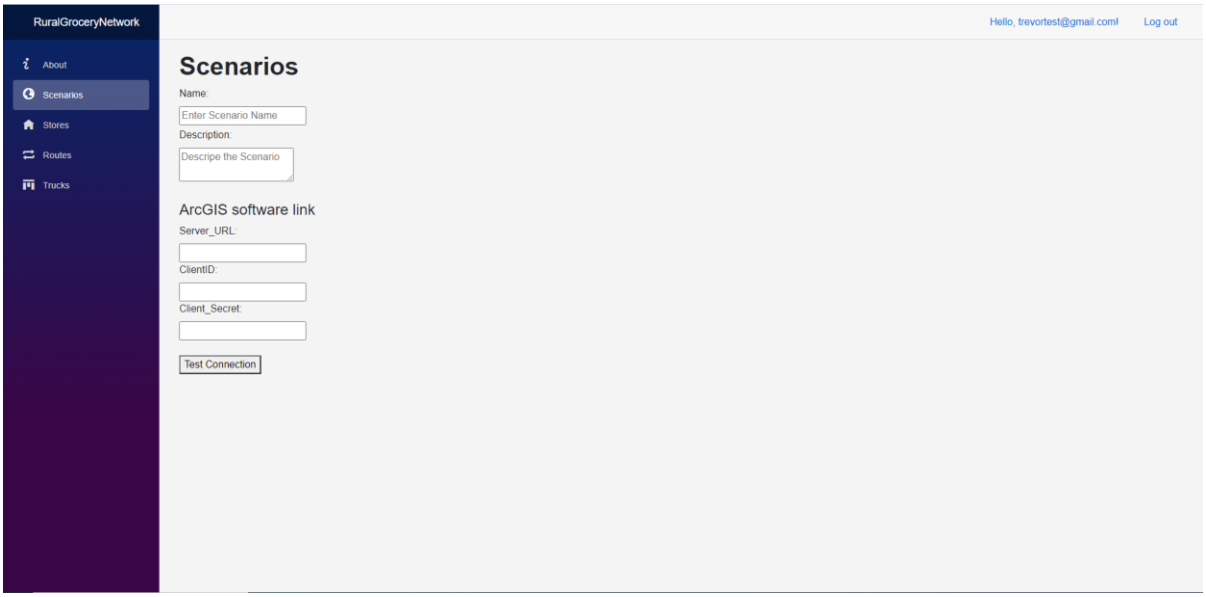
This image shows a general overview of how the website is laid out. We have our initial user log in page that has to communicate with the database to validate any and all credentials. Once a user signs in, they have access to each of the four pages shown at the bottom. There is the scenarios, trucks, routes, and stores page, and each communicates (or will communicate) with the database in some capacity to provide valuable information with the user.

User Interaction

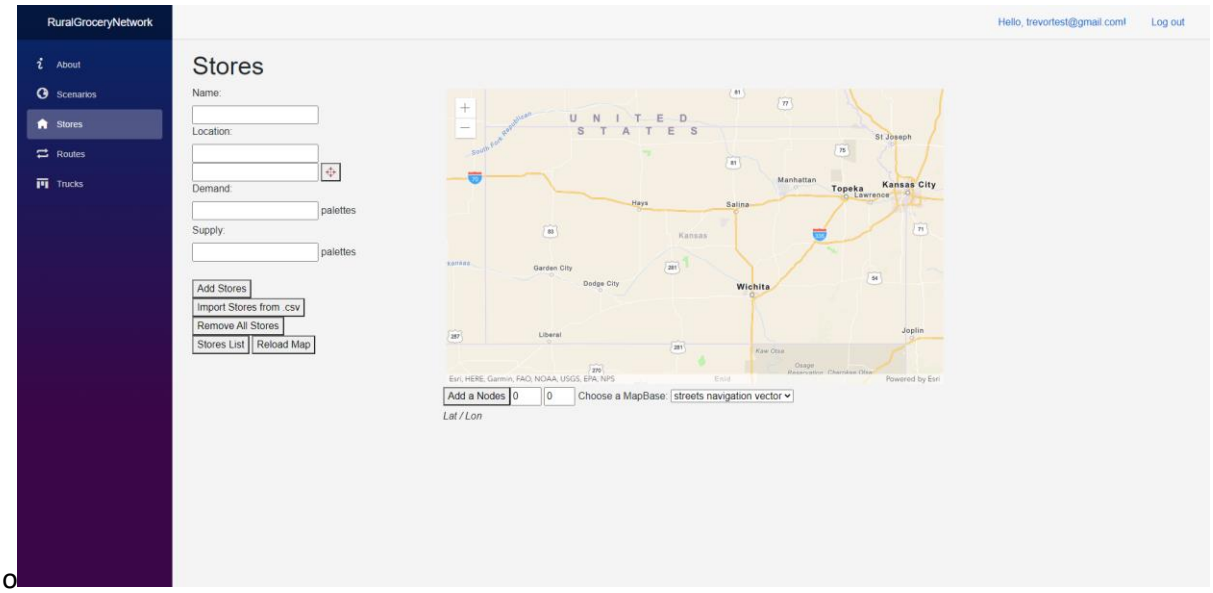
This section will walk through each of the main pages on the website and how the user should interact with each.



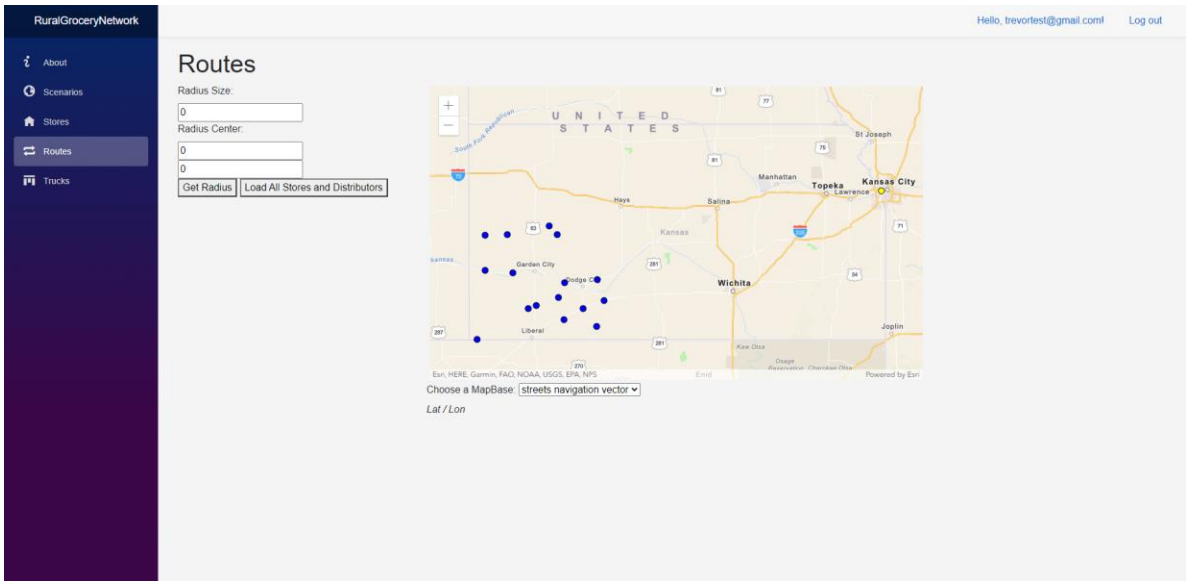
This is the landing page of the website that the user will first see upon completing a standard sign in or account creation procedure. There is some general information about the Rural Grocery Initiative, but other than that there is no functionality for the user on this page.



Next, we have the scenarios page. At this stage in development, we have not established any functionality on this page. This will be a focus for us this semester to create a more in-depth way for users to create scenarios outside of what is seen here.

o 

This stores page was left behind from the previous group. It appears that the goal was to add new stores by clicking a point on the map, but that functionality was not implemented whenever we received the project. There is some small functionality built into the map that allows you to find a route between two points that are clicked on the map. We are looking to add functionality to the “Import from .csv” button as well to allow an admin user to edit the database through a .csv they maintain.



The routes page is where we focused our work last semester. There is a button that must be clicked initially to load all of the stores and distributor locations found in the database. From there, a user can type a radius size into the top text box and then click any point on the map. This will populate the lower two text boxes with an X and Y coordinate of the clicked location, and then if the user clicks the “Get Radius” button a circle will be drawn around the selected location with a radius that the user provided. This functionality allows a user to see how close some of the nearby stores are so they know what stores

they could potentially partner with. They would then take this information to the scenarios page, which is still a work-in-progress.

Finally, we have the Trucks page that was left to us by the previous group. We think the intention was to create different sized trucks with different delivery dates to be used within scenarios that the user can create. We are still working with our clients to determine if we want to move forward using this page in this way, or if we will rework its intent.

Functional Requirements

The functional requirements include:

- There is a database that holds all 50 states, all Kansas towns (including some out of state for distributors), distributor information, and store information
    - Right now there is a database holding this data from a survey conducted by our customers
- There is a log-in system to protect the information, which is implemented
- There are 6 pages: About, Scenarios, Stores, Routes, Trucks, and Store Information
    - About – tells what the website is about – complete
    - Scenarios – Allows users to create scenarios (definition pending) - not complete
    - Stores – Allows admins to manage the stores in the database - not complete
    - Routes – Allows anyone to see the stores and create a route within a radius – started but not the most efficient route
    - Trucks – Allows admins to manage the trucks in the database – not complete
    - Store Information – Shows more specific information about the stores – not complete, couldn't get this page to work
- Admins have to keep the information up to date – started with Store page, not complete
- Without logging in the only page seen is the About page - complete
- Once logged in, a user can see all pages - complete

- Pending permissions to keep the data secure

Nonfunctional Requirements

- Mobile Friendly – complete
- 2 Factor Authentication – complete
- Going to be hosted by K-State – currently on an Azure VM to get everything figured out
- Don't allow duplicate emails for users - complete
- Probably won't be more than 100 users at one time
- The color scheme will be K-State colors - complete

Semester Goals

For the fall semester, our main goal was to be able to calculate routes between multiple stores based on location, which was achieved. This meant being able to update the database to hold locations for each store and populate the database with the stores from a survey. We created a connection to the ArcGIS Server in order to complete the route calculations. Once we had the route calculations, we were able to display the routes on a website using a map. We also got a website up and running using an Azure Virtual Machine and got feedback from our clients.

For the end of the year, we hope to build on our progress from the fall semester to at least get something that our customers will be able to start using. This means we would like to be able to calculate routes based on more than just location, including number pallets, weekly order price, days they receive deliveries, vendors they are supplied by, etc. Once we have those features added, we can setup a solid base for users to create their own scenarios. They will be able to choose certain stores, define the information for those stores (# of pallets, delivery days, etc.), and then create the best route or grocery store grouping from that data. We will also be figuring out the best way to calculate and store route combinations. Right now, it will calculate routes, but it isn't the most efficient way. We also discussed storing the most efficient routes once we have them so that it will save on computation time in the future.

If we could spend a lot more time on this project, we would want to be able to include some machine learning and AI to be able to suggest stores that could work together based on certain criteria. Also, it could learn and then be able to find patterns that people might not think about and be able to suggest new partnerships. Then when new stores are added it can immediately suggest what stores to partner with based on what other stores have done in the past. We also think it would be helpful if there were a way to have store owners be able to place orders together through the website; possibly using a connection to the distributor's website.