

# **Service Station Database**

Geog 463 Team Project Final Report  
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## **Executive Summary:**

The main goal our group's project is to provide a database that can be used to search for a best fit local service station depending on the user's needs. The main user of this database would be in the interest of the actual person who owns the vehicle, perhaps through a website or a mobile application. The user will be able to determine which service stations nearby have certain amenities that they need at the time of their search. This will help prevent the person from having to guess whether or not a place can provide what they need, saving time and money in the end by knowing where to go first. Additional data is available as well to further ease their selection such as weather, an address, a phone number, and even the price of certain products.

Originally our team was considering all Sheetz company based service stations in Pennsylvania but figured the area of interest was too large for how far the average person is willing to travel for vehicle related services. Reducing the search area to just places nearby State College limited our data significantly when only looking at Sheetz stations. Our team went ahead and broadened our data to contain other stations such as Shell, Sunoco and Exxon for example, all of which provide at least regular unleaded gas.

The database was constructed in Microsoft Access from information pulled from various online sources as well as some light research such as calling stations for current prices on products. The database was pieced together from various Excel spreadsheets containing all of our collected information. Other than some formatting corrections there were no issues with the import and relationship setup. Having the finished Access database allows for SQL queries to be performed to narrow down search results.

## **Introduction:**

In today's society, time is limited, valuable, and shouldn't be wasted on looking for

information that might not even be available. A large proportion of the surround area here at Penn State has access to the use of a vehicle at some point during their daily routines. With so many cars this has attracted a wide variety of service stations into the area, all with different amenities in order to compete against one another without spending all of their money on providing everything possible. The typical consumer looking for a service station may not know if the two or three service stations they know of can aid them adequately. Our group's database will help serve as a helpful resource that will help eliminate unfit or distant locations from the users area of interest.

The database will contain all of this information from the stores actual services, to prices, their nearby location, and contact information. Most of this information can be obtained by searching a specific company's website but that leaves out all of the other companies in that search, requiring multiple searches. In most cases the actual company is not a main interest of the consumer. The consumer is most interested in finding all the possible nearby stations that have what they need, at the price they can afford. Additional information is available in order to further specialize an ideal station such as weather at the station.

Having more information about more than just one company all in the same database provides the consumer a single source to help determine the shop best catered to their needs. Information in the database includes prices of gas and tobacco at each store as well as other service availability such as repairs, an air pump, to food and drinks. As with each location there will be information on the address, nearby hi-way, town and the weather in that area. Each store will also have details such as the name of the store and the owner, a phone number and the store type. A consumer may just be looking for the cheapest gas nearby no matter which company, or they may have to walk to get a car part and therefore just need the closest station to their location. The user will know which place to go based on our groups constructed

database of the local service stations near Penn State here in State College.

### **Procedures:**

With the creation of the Service Station Database, there were a number of steps that went into the final product. Work was divided into sections that would be completed within a specified time frame. These sections include the initial planning stage, a research and data gathering stage, and finally a database creation stage. Each phase of the database involved specific aspects and occasionally required going back over our initial ideas to revise and edit. The hope is that the creation of a service station database will help both city planners and the general public gain easier access to this information which could be helpful for a number of reasons.

The initial planning stage involved sitting down and finding out what the scope of the database would be. With such a large topic as service stations, there are a number of different ways we could have chosen to go. In the end it was decided that the database would encompass Centre County and include five separate service station providers (Sheetz, Shell, Sunoco, Valero, and Exxon/Mobile). The overall goal of the database was to allow a potential user to query various service stations to see what is provided at each. As the initial ideas came together a rough E-R Diagram was created to be revised as the project took shape.

Once the scope and goal of the database had been figured out, the research stage began. This stage encompasses all of the information gathering and formatting. Each team member was assigned a specific service station company to collect information from. Much of the information that was needed was provided online through various websites, but the remaining data was gathered by calling each service station and asking the employees for current prices on items and who the station owner is. As Laura, Aaron, and Sal collected their

respective station data into excel, it was compiled into a single spreadsheet by Kirsten. This spreadsheet was then processed into the necessary data layers and once finalized a revised E-R Diagram was created by Aaron.

After the final spreadsheet was created, the database creation began. Using Microsoft Access the necessary tables were created by using the excel file along with the CREATE TABLE and MODIFY TABLE SQL statements. Data was then imported by Kirsten, with the help from Laura and Aaron, from the compiled Excel spreadsheet to populate the tables. With the database populated, Kirsten organized and implemented the database and sample queries. The final paper was then created with Laura, Kirsten, Aaron, and Sal; each of whom was responsible for writing designated sections. Laura then formatted the final paper for submission and worked in conjunction with Kirsten to create the final presentation.

### **Description of the Data Model:**

Our data model is intended to serve both consumers and suppliers in the world of service stations. It would be useful if accessed from a mobile device by drivers who are looking for service stations in a particular area as well as in the comfort of their own homes. In some cases, it may even save drivers time and money by not having to physically search unknown areas for a service station that may meet their needs.

For example, imagine you are driving your car down US 322 near State College and notice that you are almost out of gas and are starting to feel hungry. You are anxious to reach your final destination and do not want to spend a lot of time off route. You are only interested in stopping at a place that has a cheap gas price and also offers food for you to eat on the go. Our database would make it easy for you to find out what service stations are located closest to US 322, what price they are offering for Unleaded gasoline, and if they sell food. The database

would sufficiently narrow down your options so that you can quickly access the station before you run out of gas.

Another example of a situation where this query may be useful is if you are trying to find the best place to fill your vehicle up with gas without having to drive by several stations and taking note of the individual prices. You can access the database from your personal mobile device and compare gas prices in a particular area of Centre county. By using the database to compare prices, you will save both time and money because your gas price questions are easily answered in a matter of minutes.

A third and final example of how this database can be utilized concerns those who distribute their products to gas stations. Our database can be used to help determine which drivers are responsible for delivering their goods to which service stations. For example, a driver for the Pepsi Corporation may be responsible for delivering to all stations along I-99. To determine what stations this entails, the Pepsi Corporation can run a query to determine how many stations and what particular stations are located in one particular area of Centre County.

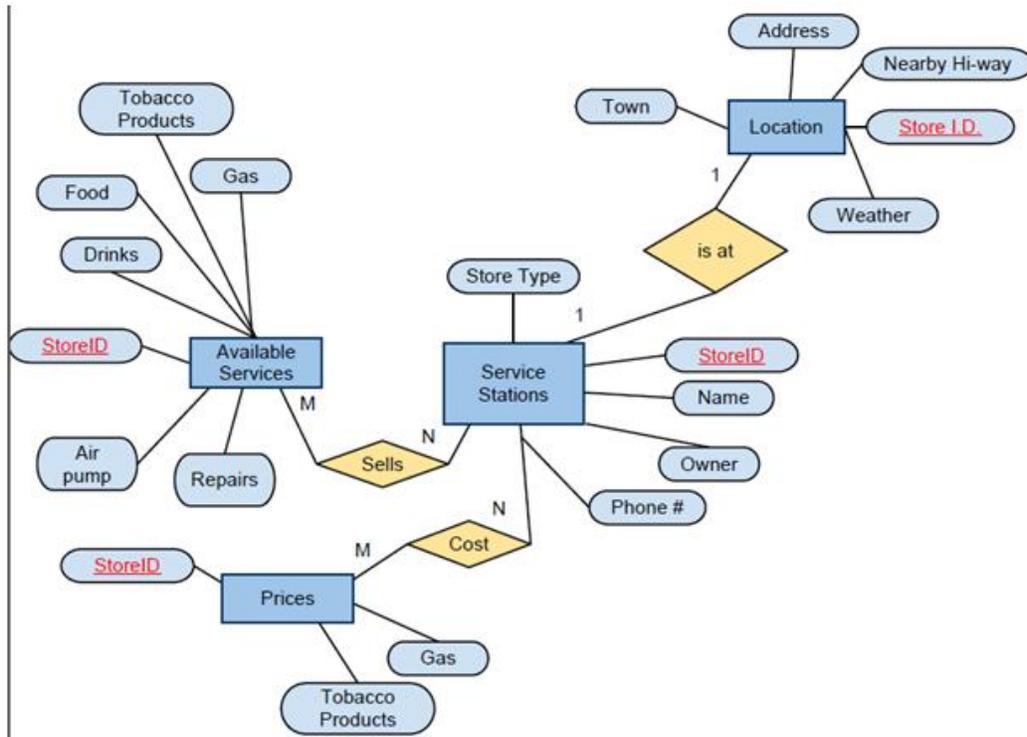
The conceptual elements listed in the design of our database include information that would be helpful to those accessing our database. First, we included a Store Id Number (noted as "StoredID") that we assigned to each service station which allows customers to differentiate between each station. Secondly, we included a field titled "Name" that tells users the name of each individual the service station. Then we included a field called "Store Type" which tell us which of the five companies the service station belongs to. These companies include Sheetz, Shell, Sunoco, Valero, and Exxon/Mobile. Fields such as Owner, to represent the store owner's name, and phone number, for those looking to contact the store, are the final two fields that we included in our Service Station table.

Although the Service Station table does include some good solid information about the

stations, we wanted to include information pertaining to the location of each station. For this, fields such as Address and Town were included to give the users a general address for each station. Information about the weather of that particular area was included in a field called "Weather" and information about access from highways to the station was gathered in a field called "Nearby Hi-way". This information, which also included the same Store ID number as the Service Station table, would be sufficient enough for drivers to be able to find the stations by plugging numbers into their GPS systems or locating stations with paper road maps.

Details about the retail of each service station are organized in a table called "Available Services" which includes "yes or no" answers for questions to if a station sells gas, food, drinks, tobacco products, has air-pumps available, or if it offers car repairs. This information is organized by entities titled "Gas", "Food", "Drink", "Tobacco Products", "Air pump" and "Repairs". Also, information about the prices of gasoline and tobacco products is recorded in an additional table labeled "Prices". These tables, like the rest of the tables in our query, are linked by the element StoreID.

Pictured below is the E-R Diagram that our database was modeled after. The diagram depicts the connections that were made between different elements of our database and visually shows how information was connected between one table and another. Our main table in the database is "ServiceStations". This table hold the information pertaining to the type of store each station is. This table lists the Store name, owner, phone number, and store type. The primary key of the "ServiceStations" table is "StoreID." For "StoreID", we assigned a



E-R Diagram

specific number to each individual store so that we would be able to differentiate between each one.

The “ServiceStations” table has a one-to-one relationship with the “Locations” table because located listed only houses one service station. The attributes that belong to the “Locations” table are those that are necessary for describing the location of each station. This table lists the address, town, nearby hi-way, and weather conditions at the station. The primary key for this table is “StoreID”.

“ServiceStations” is also connect to two other fields aside from “Location”. The “ServiceStation” table shares a many-to-many relationship with the “AvailableServices” table because many stations an have many available services. The table lists attributes sold at the

station, such as tobacco products, drinks, food, and gas. It also lists services available, such as air pumps and repairs. The primary key of this table is “StoreID”.

The final table in the E-R diagram is “Prices”, which has a many-to-many relationship with the “ServiceStations” table. This table represents the price of a pack of Marlboro cigarettes, labelled as “tobacco products”, and the price of unleaded gasoline, listed as “gasoline”. Like all of the other tables, the primary key for the “Prices” table is “StoreID”.

We chose to keep all four primary keys the same because it made the most sense to relate the tables all by the same entity. “StoreID” was a field that was going to be constant in every table to represent the service stations without any type of duplication.

The next step in the creation of our database was to take the E-R diagram and convert it into tables so that the proper information could be easily stored in our database. Pictured below is a detailed list of the tables that went into the design of our final database for service stations. The attributes that are italicized and in light blue are primary keys. The attributes in the upper half of the tables, which are shown with dark blue background, are the fields for the tables and the attributes listed below them, with the light blue background, describe what type of input is required for each field.

The top four tables, “ServiceStations”, “Location”, “Prices” and “AvailableServices” are the four tables of the database. For the “ServiceStations” and “Locations” tables that have one-to-one relationships, the primary key of the “Locations” table has to be an attribute in the “ServiceStations” table. “StoreID”, as you can see, is listed in both tables. For the other tables, since they share a many-to-many relationship with “ServiceStations”, the primary key of one table must appear in another, and vice versa. Because the primary key is the same for all tables, we did not have to add it to the table, again.

The bottom tables in the picture represent the type of relationships that link the tables in

the E-R diagram. The table includes the primary key of both tables and shows that they are linked. For example, “Cost” connects “ServiceStations” to “Prices”, “Sells” connects “ServiceStations” to “AvailableServices” and “Has” connects “ServiceStations” to “Location”.

Service Stations				
StoreID	Name	Store Type	Owner	Phone_Number
integer	varchar	varchar	varchar	varchar

Available Services						
StoreID	Gas	Air_Pump	Repairs	Food	Drinks	Tobacco
integer	varchar	varchar	varchar	varchar	varchar	Varchar

Prices		
StoreID	Gas	Tobacco Products
integer	integer	integer

Location				
StoreID	Weather	Town	Address	Nearby_HI-way
integer	varchar	varchar	Text	Text

Cost	
EntityID	StoreID
integer	integer

Has	
EntityID	StoreID
integer	integer

Sells	
EntityID	StoreID
integer	integer

The bottom tables in the picture represent the type of relationships that link the tables in the E-R diagram. The table includes the primary key of both tables and shows that they are linked. For example, “Cost” connects “ServiceStations” to “Prices”, “Sells” connects “ServiceStations” to “AvailableServices” and “Has” connects “ServiceStations” to “Location”.

After our tables were inserted into the database and our database was finished, we were able to go back and test the questions we wanted answered through our database by using SQL queries. For example, if you wanted to locate the stations that you could access from US322, you would type in the following:

```
SELECT *  
FROM Location  
WHERE Nearby_Hiway = 'US 322';
```

As a result, you would get a table that lists 11 stations as well as the information that describes the weather and location of the station.

If you are interested in finding the stations with gas selling for under \$3.50, you would type:

```
SELECT *  
FROM Prices  
WHERE (Gas_Price<='3.5');
```

As a result, you would get a table that lists 26 items because all of the service stations are selling gas for \$3.50 or less.

### **Description of Implementation:**

The data used for this database was comprised by contacting the various service stations and inquiring about their product prices, information, and availability. During construction of the database, besides a few formatting problems, there were not many issues with it. The bigger issue was the fact that we could not acquire every piece of information from these service stations that we would have liked to have, such as the store owner for many of them. Information like this was to be protected by these stations and not to be given over the phone. Our database has been tested and is working correctly.

### **Summary and Conclusions:**

Upon completion of our Service Station Database, we are hopeful that this tool will allow the general public and various agencies the ability to access station data quickly and easily. The

database is intended to be a means to find the closest service station which provides the necessary services for each user. Being able to search for a station along a certain highway or near a county can potentially save someone from running out of fuel or missing out on the cheapest fuel provider in the region.

If provided the time, there are some additions that could be made to this project. Our main priority would be to expand the database. The scope of the data would only be limited by the availability of the necessary data; potentially this database could be expanded to encompass the entire state or country. Another change we would like to make is the addition of more unique fields; these could include prices of different types of fuel, inclusion of unique food venues, and nearby recreation areas. Finally, we would also like to focus on making our database user-friendly. Creating an online or phone application would allow more people to utilize the database while they are on the road. It would also be good to access this project from GPS units so that drivers can see the closest station to their current location. If these additions could be completed, it would allow the database to continually grow as new stations are erected and areas change. If the database continues to grow, it would be necessary to ensure that dynamic data is correctly updated and efficiently managed. This could perhaps be achieved by connecting the database to an application which keeps tabs on current gas prices.

### **References:**

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## **Appendices:**

SQL instructions for Database Creation:

```
CREATE TABLE ServiceStations
    ([StoreID] integer,
     [Name] text,
     [Store Type] text,
     [Owner] text,
     [Phone_number] integer,
     PRIMARY KEY ([StoreID]));
```

```
CREATE TABLE AvailableServices
    ([StoreID] integer,
     [Gas] text,
     [Air_pump] text,
     [Repairs] text,
     [Food] text,
     [Drinks] text,
     [Tobacco] text,
     PRIMARY KEY ([StoreID]));
```

```
CREATE TABLE Prices
    ([StoreID] integer,
     [Gas] integer,
     [Tobacco] integer,
     PRIMARY KEY ([StoreID]));
```

```
CREATE TABLE Location
    ([StoreID] integer,
     [Weather] text,
     [Address] text,
     [Town] text,
```

[Nearby\_Hi-way] text,  
PRIMARY KEY ([StoreID]);