Bus Route Administrative Scheduling System

BRASS

Group Info

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Goals

- To provide a system that allows for faster and more efficient creation of bus routes for school districts
- To utilize the basic principles and methodologies we've learned in university to develop an application that meets the needs of a user group

Abstract

- Students come and go each school year
- Routes are affected with each new student
- Adding students requires updating old routes
- New routes should have minimal effect on older routes
- Drivers need to be informed of route changes
- The system will give a visual representation of all routes
- The system will have functionality to:
    - Build bus routes
    - Add and subtract students
    - Add and subtract busses

User Stories

- As a transportation supervisor, I want to input a number of student addresses so that I can build an optimal set of bus routes.
- As a transportation supervisor, I want to be able to add or remove a student from the program so that it alters only the bus route that carries that student.
- As a transportation supervisor, I want to be able to remove a bus from the system so that another bus can compensate for the loss of that bus.
- As a transportation supervisor, I want to be able to build out a network of bus routes to see the time it would take to pick up all students.
- As a transportation supervisor, I want to be able to add busses to a network of routes to see how additional busses will affect the time it takes to collect and distribute the students.

Division of Work

Front-End & Database: Timon Mannings

Clustering: Braden Lance

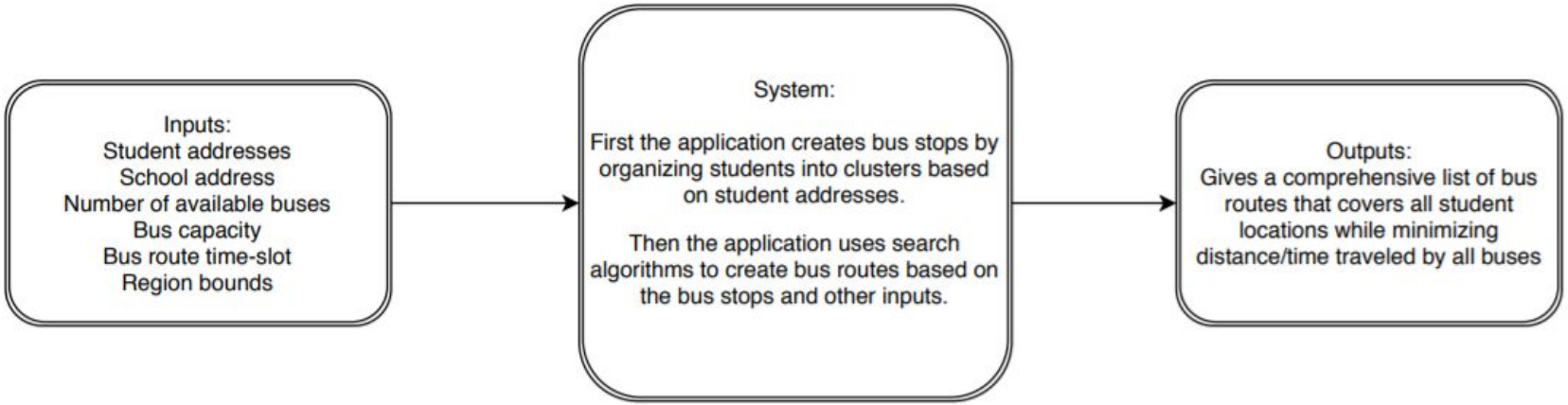
Map & Route Display: Bryan Huddleston

Route-Building: Nathan Boehringer

Constraints

- Software tools used for working on project shall be either free or eligible for department reimbursement
- Software development tools need to be supported in both Windows and OSX for all application features
- Access to school size data sets
- Access to school data formats
- Unable to meet in person for a large portion of the project due to Coronavirus

Design Diagrams



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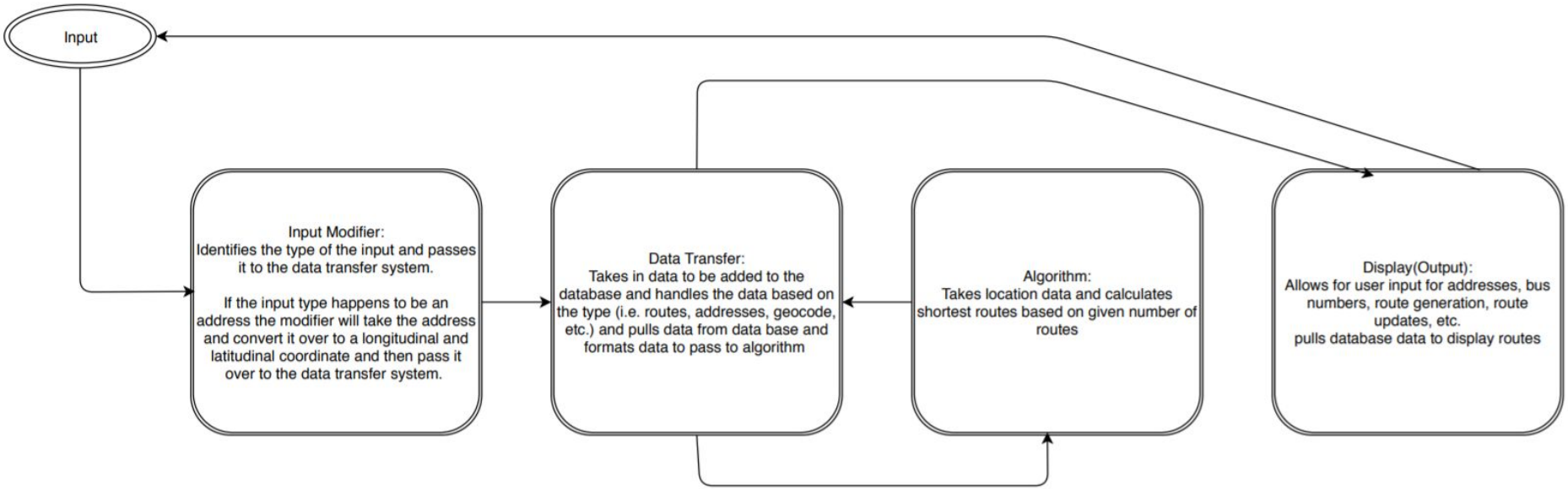
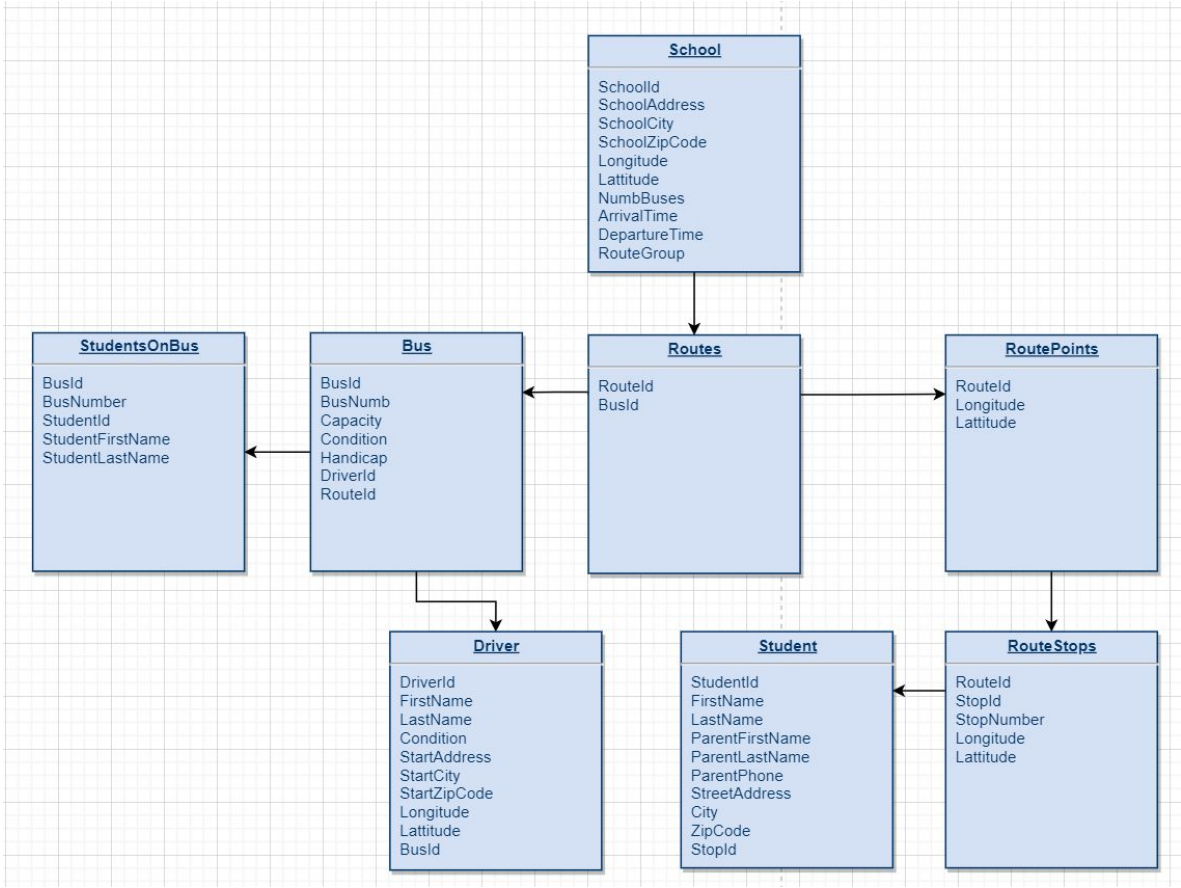


Design Diagrams



Technologies

- .NET Core
- Entity Framework
- SQL/SSMS
- ArcGIS

Timeline

Front-end designed	10/23/2019 - 12/9/2019
Front-end base created	12/9/2019 - 1/15/2020
Front-end completed	1/15/2020 - 2/29/2020
Decide Database Type	10/23/2019 - 11/4/2019
Design Data Types	10/23/2019 - 11/4/2019
Design Database Schema	11/11/2019 - 12/9/2019
Design Relational Model	11/11/2019 - 12/9/2019
Create Database	1/1/2020 - 2/19/2020
Output map routes based on input data	1/1/2020 - 2/29/2020
Seperate input data to useful clusters	2/10/2020 - 3/30/2020
Add location\student to route without changing more than one route	3/30/2020 - 4/20/2020
ArcGIS map created and integrated into the application	3/19/2020
Database integrated into application	3/19/2020 - 4/10/2020
Routes displayed on ArcGIS map	4/9/2020
Route building algorithms implemented into application	3/30/2020 - 4/20/2020
Implemented database calls from front-end application	4/15/2020 - 4/20/2020

Results

- Our database is complete.
- Our front-end is complete.
- We can cluster student addresses into stops based on proximity.
- We can create vehicle routes based on address geolocation.
- We are able to store these routes in the database based on user input and display them on the map.

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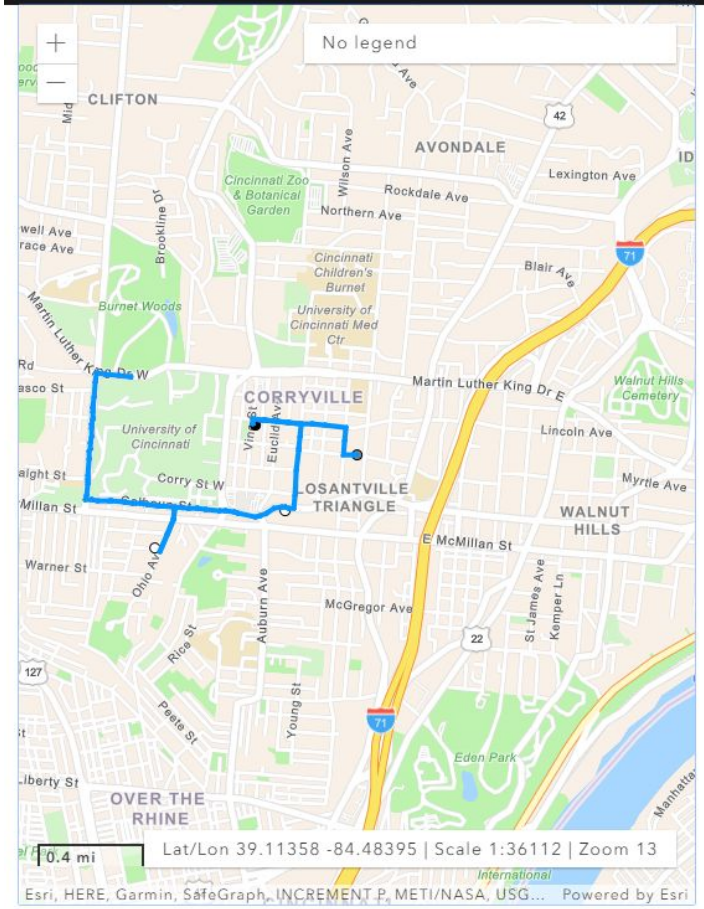
STUDENTS BUSES DRIVERS ROUTES SCHOOL LOGOUT



Select A Bus: Bus Number 1

BUS: 1

ASSIGNED ROUTE: 1

DRIVER NAME: BRYAN HUDDLESTON

NUMBER OF STUDENTS: 30

STATUS: FUNCTIONAL

HANDICAP ACCESSIBLE: YES

ROUTES

Select A Route All Routes

STUDENT NAME	STREET ADDRESS	STOP NUMBER	ASSIGNED BUS
Timon Mannings	9353 County Road 101	1	0
Bryan Huddleston	2307 Liberty Street	1	1
Braden Lance	2311 Forest Hill Drive	2	1
Nathan Boehringer	5834 Vine Street	4	1
Aaron Jenkins	2351 Liberty Dr.	Unassigned	Unassigned

UNASSIGNED STUDENTS:

0

UNASSIGNED DRIVERS:

0

CALCULATE ROUTE(S)

Challenges

- Time management on a short timeline while also dealing with other school requirements
  - Our group made sure to schedule time at least once a week to work on this project, and having a set plan on when to work helped to overcome the challenge.
- Learning how to use ArcGIS
  - Despite being something new for everyone involved, there is plenty of documentation on ArcGIS which helped the team to learn it relatively easier than expected.
- Meeting restrictions from Coronavirus quarantine
  - We were not able to meet in person towards the end of the project which made communication difficult

Demo

- https://youtu.be/ZLUJ18mJJ20