RPCGB's Strengthening Mobility and Revolutionizing Transportation (SMART) Project with UA (Paid Partnership with CLASTRAN and BJCTA)

UA Faculty PI: Xinwu Qian, Steven Jones, Alex Hainen, Jun Liu and Jeremy Pate

Department of Civil, Construction and Environmental Engineering, The University of Alabama

THE UNIVERSITY OF ALABAMA ENGINEERING

THE UNIVERSITY OF ALABAMA
Alabama Transportation Institute

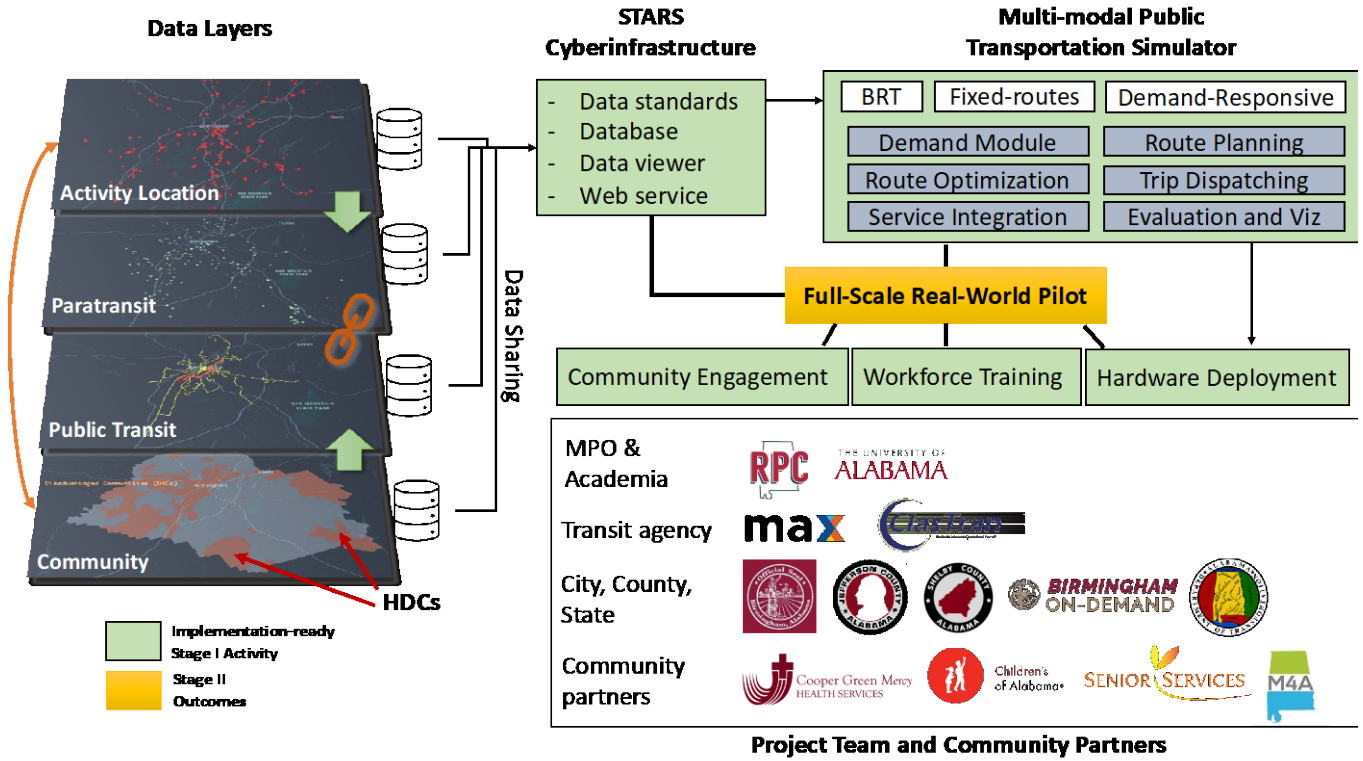
Project Scope

Jefferson & Shelby Counties, AL

- >41.6% of the total population and >39.7% of senior citizens live in Historically Disadvantaged Communities.
- >119K people in poverty and >20K households without a private vehicle.

Our Goal

- Revitalize regional public transportation services in **central Alabama** via a **community-** and **data-driven** platform.

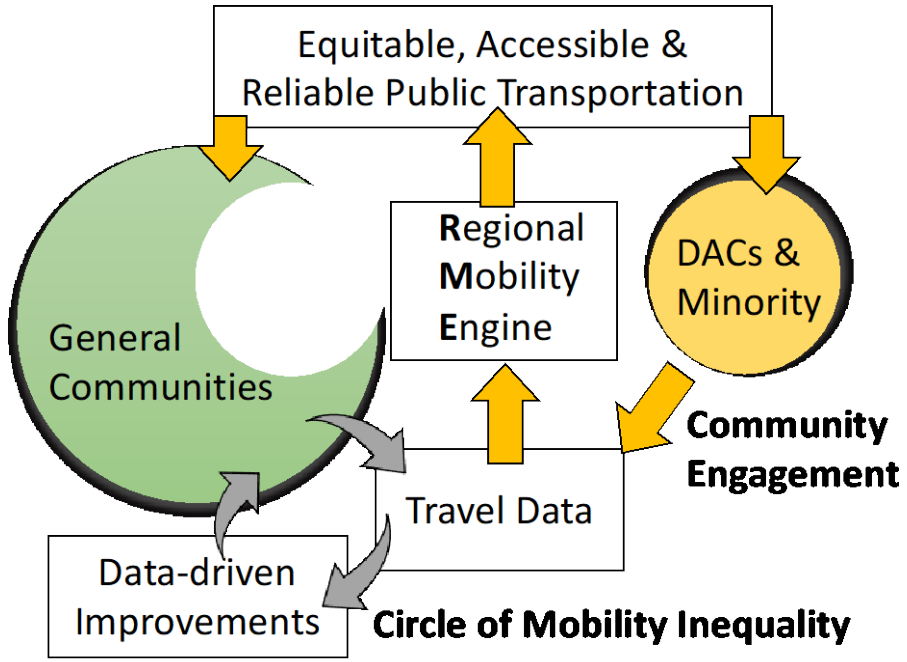


Framework of Regional Mobility Engine for Central Alabama

Project Tasks

Main tasks in our project (phase I):

- **Uncovering Communities' Travel Needs**
  - By using transit data, communities' sociodemographic, neighborhood movements and visits to places of interest
- **Agent-based Simulator for Multi-modal Public Transportation**
  - One-stop solution to test and evaluate plans for high-complexity transit optimization tasks
- **Deploying Cyberinfrastructure for Transit Service Integration**
  - By equipping the transit service providers and major activity locations with a practice-ready platform to share and consolidate their data
- **Hardware Deployment for Transit Communication and Signal Priority**
  - To improve the attractiveness of public transportation service and reliability

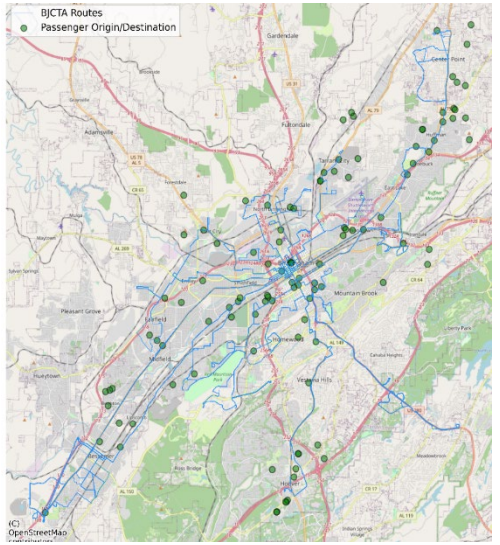


Vision of Regional Mobility Engine

Uncovering Communities' Travel Needs

Recovering the hidden demand for public transportation services

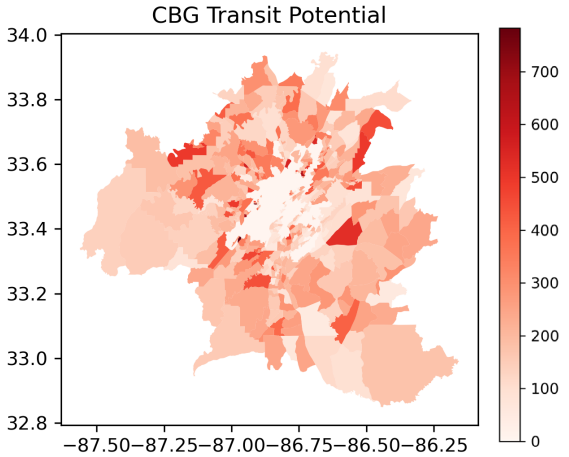
- Latent Transit Demand: Use a machine learning model for estimating the potential demand score of communities not covered by transit (387 out of 669 census-block groups)
- Hidden demand maybe 100% of currently served trips.
- Nearly 50% of the hidden demand can likely be captured with minor service modifications + combination of transit and micro-transit



Paratransit trips with a nearby transit stop at the origin/destination within the requested window

Public transportation survey

- Collecting information on transit use experiences and expectations
  - A. Local survey at major activity locations (e.g., malls)
  - B. Local survey at residential locations (homes)
  - C. Local survey in buses
- Identifying the top 20 locations not served by the transit system. E.g., Woodland Park (429 Woodland Dr) and Tannehill Promenade (4965 Promenade Pkwy)



Potential demand in CBGs without transit

Agent-based Simulator

Motivation

- The complexity of integrating systems at regional level cannot be handled by existing transportation planning tools

Input and Process

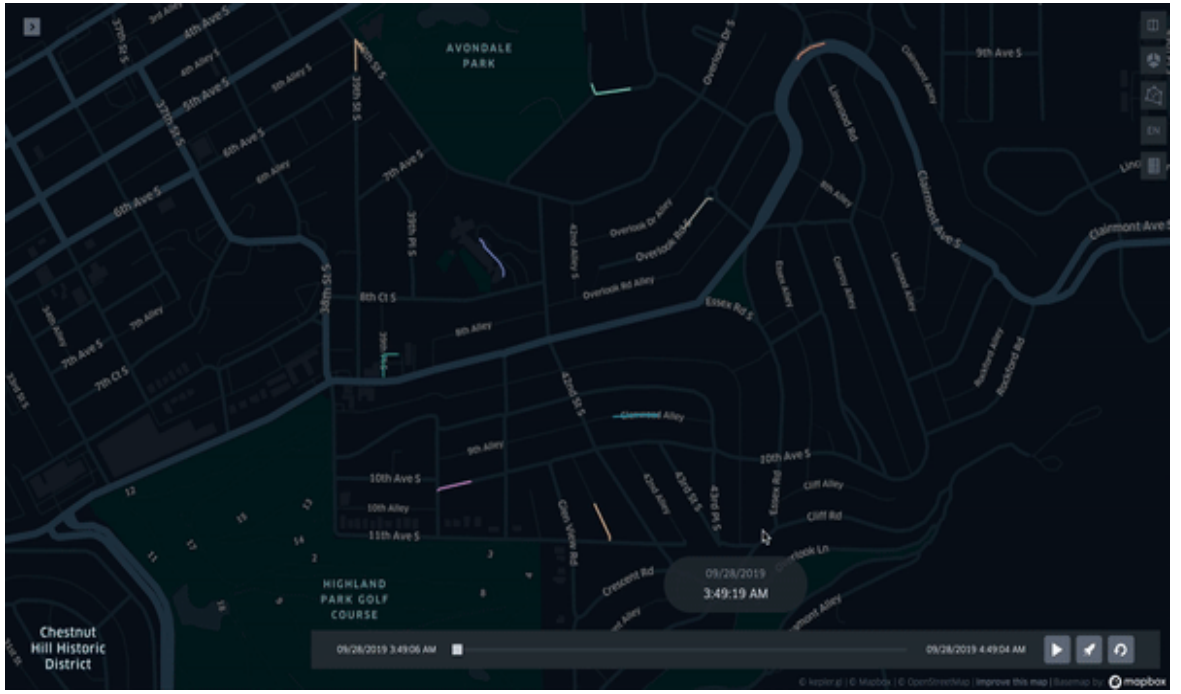
- Major public transportation modes (BRT, fixed-route, on-demand/paratransit shuttles) as well as demand analyses results
- Establishing fixed-route and flexible-route transit functionalities, incorporating time-scheduled and neighborhood-specific operations

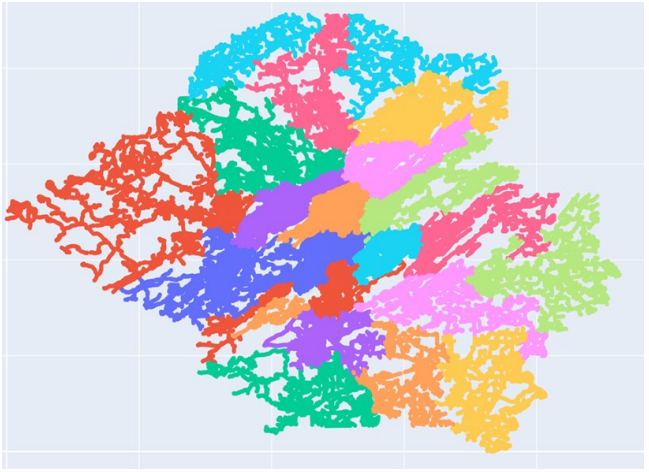
Optimizing the performance with parallel computing

- Dynamic vehicle distribution across zones/sub-networks, facilitating vehicle movement and zone transitions
- Load-balancing workflow by network repartitioning

Output

- Scenario testing and evaluation performance metrics covering efficiency, accessibility, and equity





Network partitioning for parallel computing

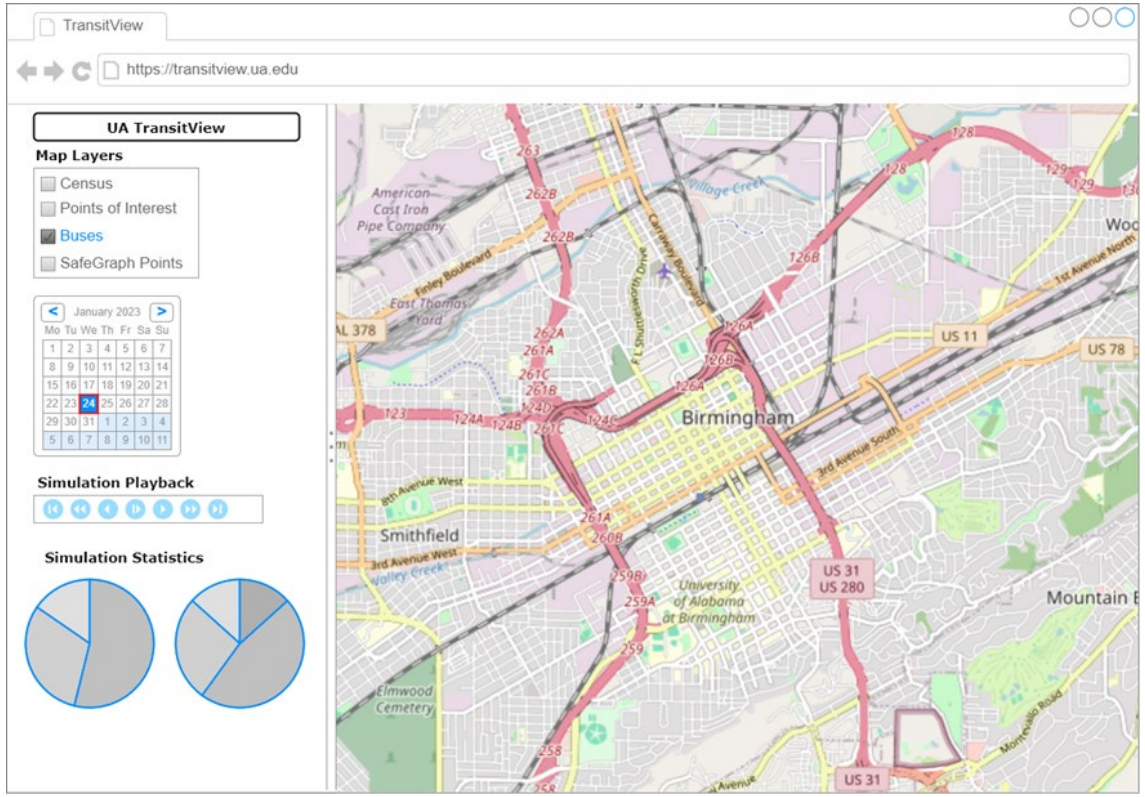
Cyberinfrastructure & Intersections Priority

Cyberinfrastructure

- Developing a high-level architecture plan for the TransitView system
- Five primary static map layers
  - Survey results for transit potential
  - SafeGraph point-of-interest of business locations
  - Census data (Socio-economic and demographic)
  - Jobs/employment opportunities
  - Underlying road network

Signal priority

- Based on ridership at BRT stops and their nearby stops (< 500m)
- Priority simulation of 11 intersections on 20th Street in downtown Birmingham, AL, using CALTRANS 170 controller platforms



Mockup version of the TransitView

Next Steps

Communities' Travel Demands

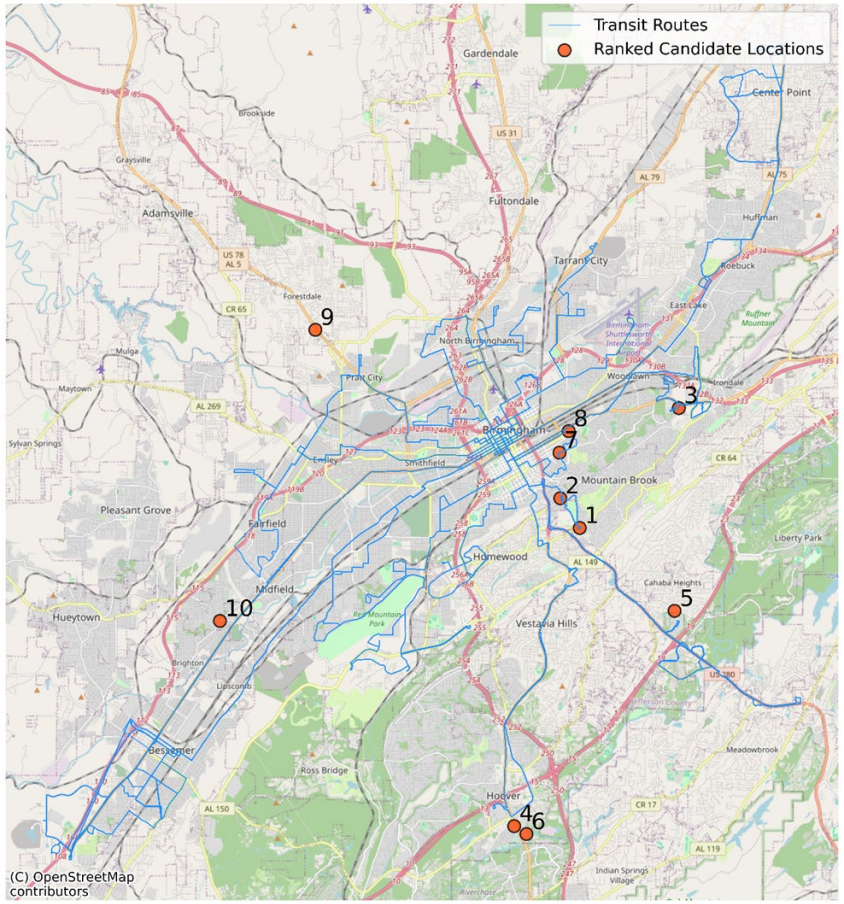
- Analyzing the expansion of the current transit routes
- Survey design and rollout

Agent-based Simulator

- Including real-world bus routing, taxi demand, passenger pick-up and drop-off

Cyberinfrastructure and priority

- Finalizing a feedback system to provide parameterized input to the simulation and modeling system.
- Implementing the system in cooperation with the connected vehicle vendor and the Birmingham traffic team



Candidate activity locations of extending transit routes