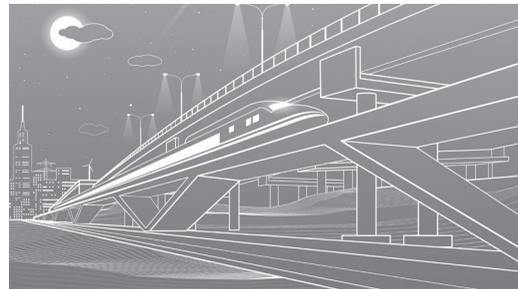


PARTNERSHIP PROFILES

JW Marriott Galleria | Houston, TX | October 15–17

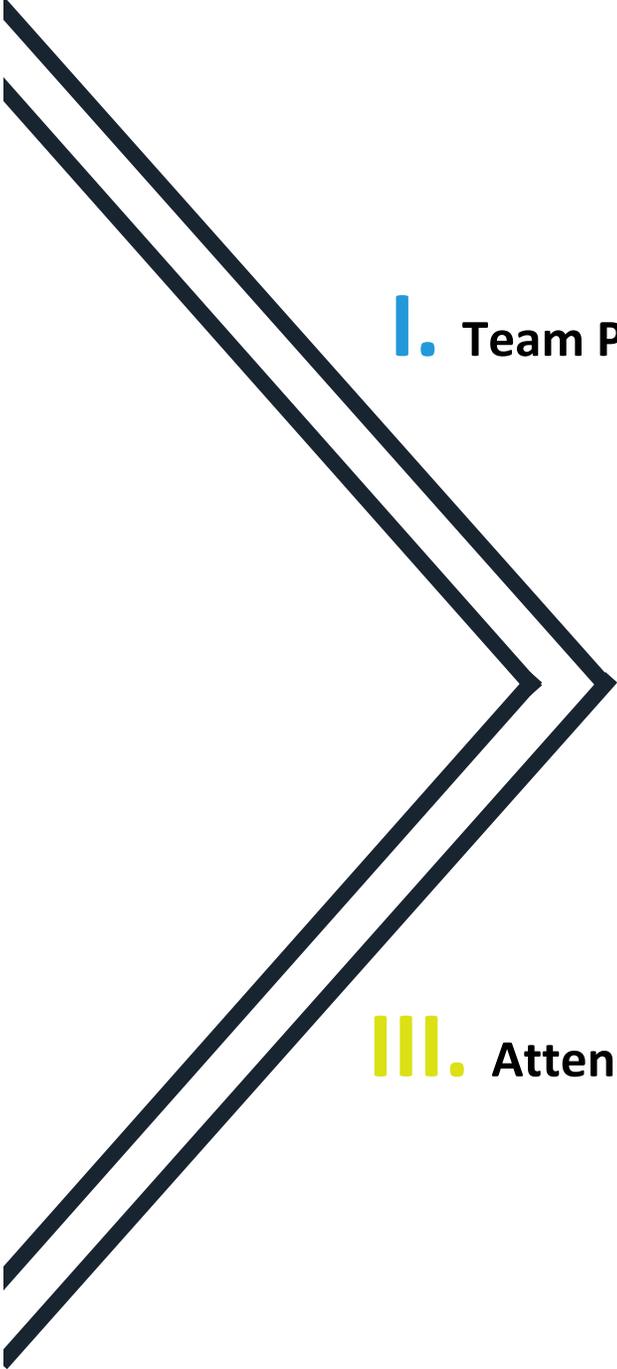


OPEN FOR INNOVATION | INNOVATE · DEVELOP · NETWORK



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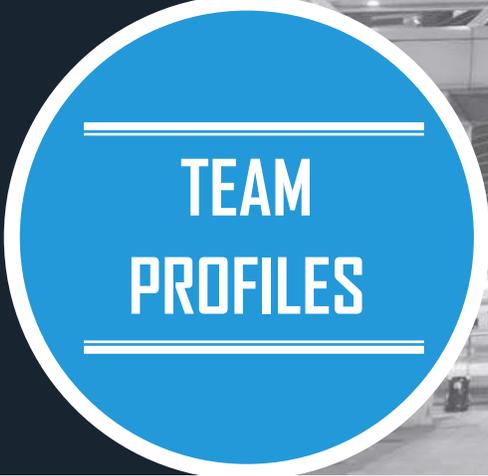
TEXAS MOBILITY SUMMIT



I. Team Profiles

II. Industry Profiles

III. Attendee List



**TEAM
PROFILES**

TEAM ARLINGTON | TEAM AUSTIN | TEAM BRYAN-COLLEGE STATION

TEAM COASTAL BEND | TEAM DALLAS-FORT WORTH | TEAM EL PASO

TEAM HOUSTON | TEAM SAN ANTONIO | TEAM TEXAS R&D | TEAM OPEN DATA



TEAM ARLINGTON (ARL-AV)



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AREAS OF INTEREST

- ☉ Connected & Automated Vehicles
- ☉ Electrification
- ☉ Shared Mobility

TOP CHALLENGES

Team ARL-AV envisions a place where innovative transportation technologies can be introduced, tested, and deployed in various conditions, including off-street, on-street, and on campus environments, and while interacting with pedestrians, bicyclists, and mixed traffic. To this end, we are developing creative solutions to address the following challenges:

- **Needs Assessment** – Identifying transportation needs and markets that low-speed automated shuttles are suited to address.
- **Deployment Barriers** – Technical, operational, regulatory and other challenges associated with rolling out low-speed AV service.
- **Scaling Opportunities** – Positioning Texas to be a leader in the successful development/deployment of low-speed AVs.

ONGOING INITIATIVES & PLANNED INVESTMENTS

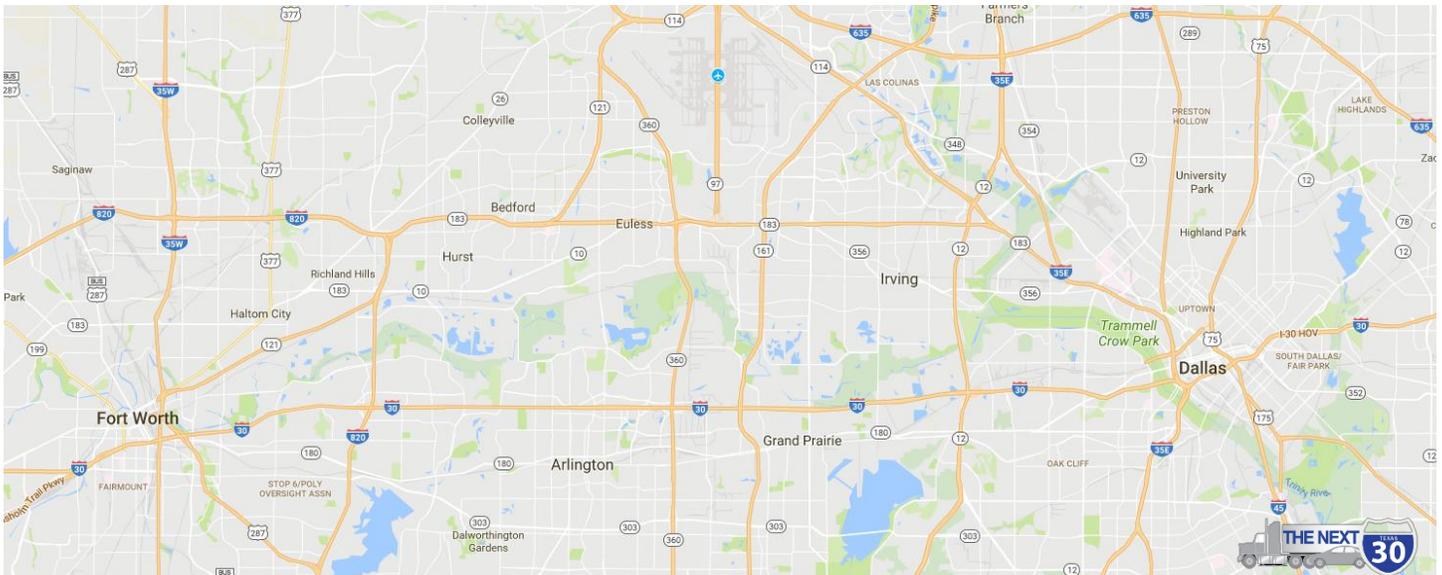
Team ARL-AV is a leader in mobility and innovation. The following highlights progress made on key projects in the past year:

- **Milo Rollout** – Two EasyMile EZ10 autonomous vehicles are currently being deployed in an off-street environment in Arlington's Entertainment District, connecting remote parking areas to AT&T Stadium and Globe Life Park during major events at the two venues. Tentative plans for a second low-speed AV demo in region in early 2018. Exploring options for future phases of deployment in campus and/or on-street environments.
- **Data Sharing Grant Programs** – \$250,000 in NCTCOG grants to help DFW cities make their traffic signal data accessible to developer community and each other. \$250,000 in NCTCOG grants to help DFW cities participate in Waze Connected Citizen's program. Both programs approved and grant awards made. In progress.
- **I-30 Test Bed** – \$1M NCTCOG commitment to fund testing of high-speed automated vehicles and associated technologies on the I-30 corridor between Dallas and Fort Worth, one of the test sites in the Texas network of automated vehicle proving grounds that received USDOT designation. Initial discussions with TxDOT Dallas District. RFP outline prepared.



TEXAS PROVING GROUNDS

I-30 Test Corridor: The I-30 Corridor between Dallas and Fort Worth serves two of the largest cities in Texas in a rapidly growing region of over 7 million people that is also a national freight hub. I-30 is a designated test facility for automated vehicle technology and value pricing initiatives. I-30 west of Dallas offers a varied test environment for high-speed automated vehicles: 1) closed managed lanes for initial testing; 2) open managed lanes for testing in a controlled environment; and 3) general purpose lanes for testing in complex expressway conditions.



USE CASES

The I-30 corridor connects the 3rd, 5th, 7th and 15th largest cities in Texas in the heart of the state's largest metropolitan region. It has been repeatedly designated as a test corridor by USDOT. This use case would contribute to regional connectivity throughout the DFW area. The transportation technology use cases that could be explored in the I-30 test corridor include:

- Truck platooning
- Cooperative adaptive cruise control
- Wireless communication technologies supporting transportation applications
- Improvements to operation of managed lanes, including accommodation of increasingly automated vehicles
- IoT sensors
- Transit vehicles
- Vehicle-mounted video capture and analytics

CORRIDOR CHARACTERISTICS

- Road is currently performing relatively well, with major safety and operational challenges.
- Reversible managed lanes that can be utilized off-peak for testing.
- Regional interest in diversifying modes in corridor.
- Corridor runs through two TxDOT districts with strong leadership and good cooperation with region's MPO (NCTCOG).
- Higher Education: UTA with robotics program and strong urban planning department in middle of corridor and major educational institutions in both Dallas and Fort Worth.
- Major GM plant is in the corridor; Toyota headquarters nearby.
- Significant disadvantaged populations with poor health, employment, and income outcomes.

Opportunities to Scale: While the I-30 test bed is unique with three distinct operating environments, the open managed lanes and general purpose lane test beds in the I-30 corridor are easily scalable to DFW's extensive network of managed lanes and expressways. Extension elsewhere in the state also feasible.



TEXAS PROVING GROUNDS

Arlington Rideshare Pilot Program: The City of Arlington is working to initiate a one-year demand-response rideshare pilot project to investigate the viability of the service.

USE CASES

The Arlington Rideshare pilot program will provide an on-demand, flexible service within and between key destinations in Arlington as well as surrounding commercial and residential areas. We anticipate that it will serve regional commuters, residents who lack access to private vehicles, students, and visitors. The key use cases addressed by this program are:

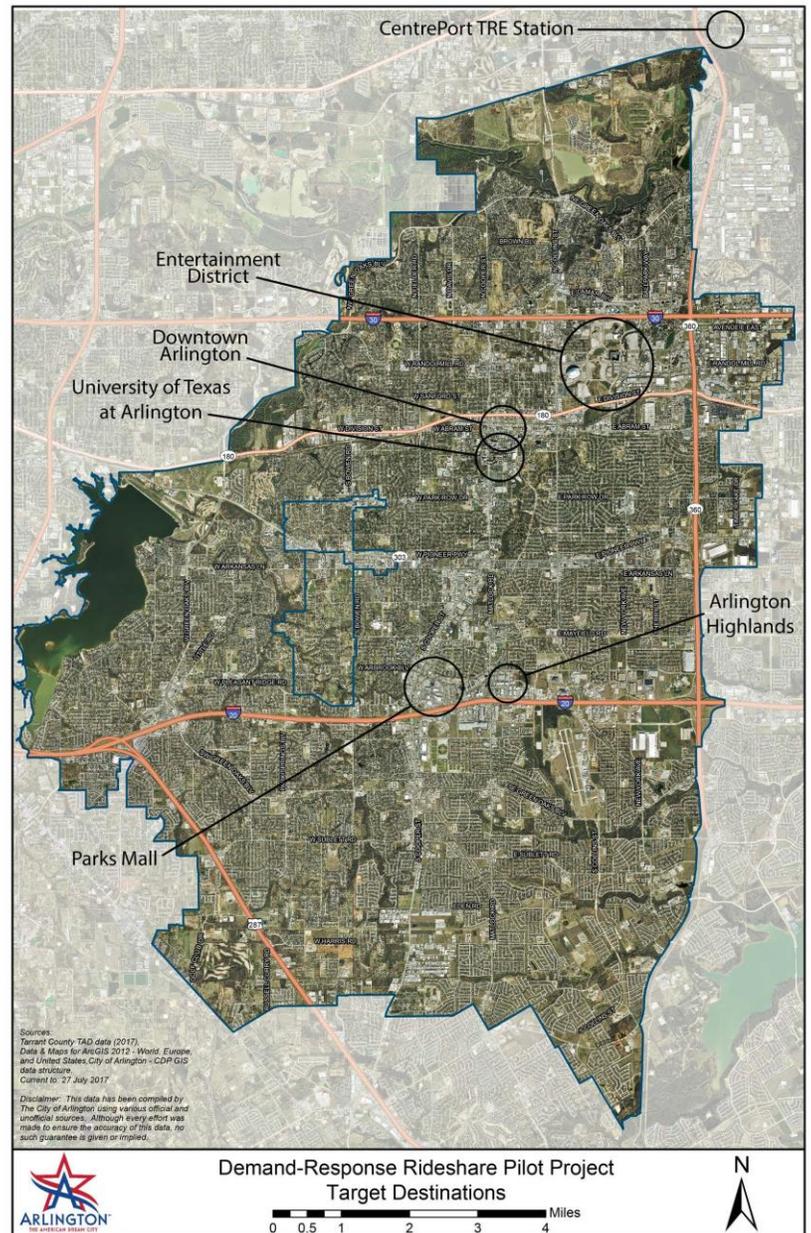
- First/Last Mile Service – On-demand service that connects people to nearest transit stop
- Center to Center Service – Connects commuters who are traveling between key activity nodes
- Community Connector Service – On-demand service anywhere within a zone

HUBS

- Centreport TRE Station
- Entertainment District
- Downtown Arlington
- University of Texas at Arlington
- Parks Mall
- Arlington Highlands

CORRIDORS

- 820
- I-20
- I-30
- 360
- Cooper Street
- Spur 303 (Pioneer Parkway)



Opportunities to Scale: Performance and ridership data from this pilot program will be used to inform future phases of rideshare, expanding service to additional areas of Arlington that are not currently served by public transportation.



BIG DATA. BIG QUESTIONS.

How can Arlington improve its free autonomous vehicle shuttle service by collecting community feedback?

End-User: Milo Riders

Use Case Problem Description

In order to expand mobility options and learn about innovative transportation technology, the City of Arlington has become the first municipal government in the United States to offer ongoing autonomous shuttle service to the general public. The Milo shuttles run along off-street trails in the Entertainment District, connecting remote parking lots to AT&T Stadium and Globe Life Park, during major events at the two venues. Passengers are picked up and dropped off at designated stops. A community engagement tool is needed to build awareness about Milo, better understand the public’s opinion of the service and of AV technology in general, measure how the technology performs, and collect data to inform future deployments of AV technology.

SOLUTION CAPABILITIES

Team ARL-AV would like to develop a digital community engagement tool with a survey that will collect community feedback to improve Milo and future AV service. Information that will be helpful includes public perception of before, during, and after the ride; general perception of AV technology; convenience of the service; reliability; wait times; and ways to improve the experience. Other capabilities include:

- Rate My Ride feature
- Estimated wait time for next shuttle
- Meet Milo: background information to build public awareness of the technology
- Forum for answering FAQs

OUTCOMES & KEY METRICS

- Customer satisfaction
- Public education
- Reliable performance

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

The digital community engagement tool will not only be useful for the initial AV pilot, but may also be used to conduct neighborhood outreach in areas of future expanded service. In addition, the tool may be used to gather feedback on other mobility needs and serve as an educational tool for other emerging technologies that Arlington is considering.

AT A GLANCE

Project Category:



Mobility-as-a-Service

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Area of Interest:

Entertainment District, Downtown,
University of Texas at Arlington campus

Timeframe of Interest:

1-2 years



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AREAS OF INTEREST

- ⊙ Connected, Automated, & Electric Vehicles
- ⊙ Big Data: Management, Open Platforms, Analytics, & Mobility Applications
- ⊙ Shared Mobility & Ladders of Opportunity

TOP CHALLENGES

Team Austin envisions a place of equity, economic opportunity, environmental stewardship enabled by a smart mobility transformation. Continuing its leadership in the USDOT Smart City Challenge, Team Austin is developing innovative solutions to address the following challenges:

- **Limited Mobility** – Traffic congestion with limited ability to expand right of way.
- **Affordability & Options** – Housing affordability issues combined with limited alternatives to driving.
- **Environmental** – Reducing our carbon footprint and air pollution and related health impacts.

ONGOING INITIATIVES & PLANNED INVESTMENTS

Team Austin is a leader in mobility and innovation. The following highlights progress made on key projects in the past year:

- **Connected and Autonomous Corridor** – Team Austin is deploying DSRC technology along Grove Blvd. and will test use cases associated with conveying pedestrian crossing information to bus drivers. The DSRC deployment will be conducted with private sector partners. Next phase, pending availability of resources, Team Austin plans to deploy an autonomous shuttle along Grove Blvd. to solve first/last mile problems.
- **EVs are for EVeryone** – “EVs are for EVeryone” is a new Austin Energy initiative to conduct electric vehicle outreach, program development, and deployment for all Austinites with a focus on low to moderate income communities. In addition to ongoing community engagement activities, several pilot programs are in the discovery phase. These include EV Multifamily Expansion, EV Car Share, E-Bike Share, and EVs for Teachers.
- **Opening Lane Closure Data – Beyond Waze** – Team Austin is working on consolidating its lane closure data into a system that can be easily shared internally, to improve operational efficiency, as well as externally, to improve mobility. This is a multi-agency effort with near-term benefits, as well as long-term benefits (e.g., supporting AV deployment).



TEXAS PROVING GROUNDS

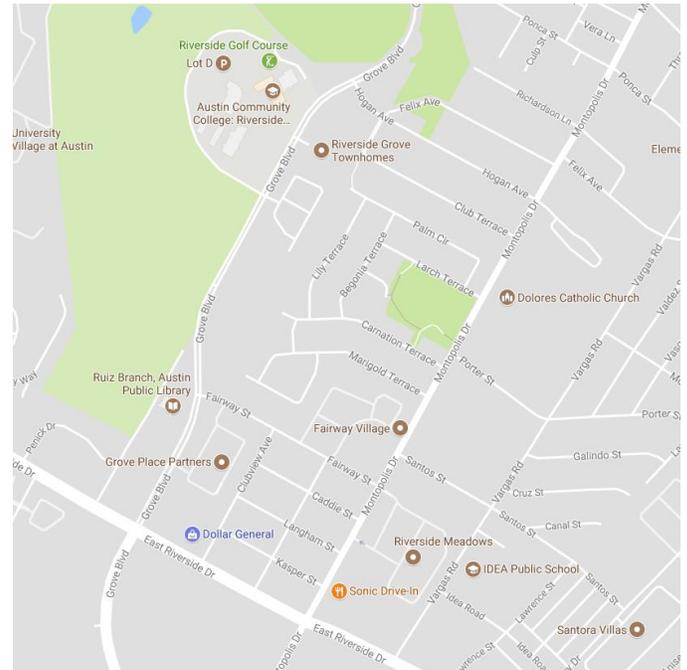
Grove Boulevard: Connects East Riverside Drive, a corridor slated for significant improvements in the near-term, with a library and community college.

USE CASES

1st/Last Mile Service – On-demand service that connects people to nearest transit stop. The primary objective of the Grove Boulevard autonomous vehicle pilot is to provide first/last mile service between bus routes that run along East Riverside Drive and destinations along Grove Boulevard. Currently the buses do run up Grove, but having a frequent shuttle connector will lead to efficiency in the bus service.

Urban Arterial – Service that connects people along a major corridor into downtown East Riverside Drive is a major corridor that connects communities to downtown.

Workforce Development – Team Austin is teaming with Austin Community College to create educational programs around autonomous vehicle maintenance at the community college facility on Grove Boulevard.



Opportunities to Scale: There are many opportunities to provide first/last mile service in Austin, and also to create workforce development opportunities. Other areas under consideration are the airport and the Domain.

CORRIDOR CHARACTERISTICS

Physical & Operational

Corridor Length (mi): 0.75
 Lanes: 2
 Intersections (Signalized/Total): 2
 Speed (mph): 35
 Peak Hour Volume: 400

Unique Characteristics:

- On-Street Parking
- Bike Lanes

Digital Infrastructure

Traffic Sensors:

- Video Detection
- Radar
- CCTV Cameras
- Bluetooth
- WiFi
- LIDAR

Communications:

- Fiber to Riverside & Grove
- Grove & Fairway is connected via a cellular modem
- DSRC Road-Side Units

Signal Capabilities:

- Adaptive
- Actuated
- Emergency Preemption
- ATSPM-Ready (HD data)

Community

Population: 10,290 people in census tract 23.18
 Density (people/sq mi): 16,300
 Median Household Income: \$27,275

Vehicle Ownership:

No-Vehicle: 15%
 1-Vehicle: 32%
 2+ Vehicles: 53%

Key Features: Community college, library



BIG DATA. BIG QUESTIONS.

Beyond Waze: Coordinated Lane Closures in the Austin Region

End-User: Transportation agency staff

Use Case Problem Description

There are many reasons why a roadway may be fully or partially closed, and many departments and agencies that manage this data. Creating a way to share information easily across departments and agencies will improve agency operations as well as regional mobility. The Austin region is entering a period of time when many road closures will be occurring, for Mobility 35, for the City's 2016 bond efforts, for MoPac, and more. Coordination will be critical to managing these closures in a way that limits the negative impact to the traveling public.

Currently, several internal meetings have been held within the City of Austin and with our partner agencies to define the problem and begin to develop solutions. The focus of this challenge is developing a method for agencies to collaborate on scheduling lane closures within the context of existing planned closures as well as near-real-time changes in conditions (e.g., a crash on one roadway may warrant a delay in beginning a closure of a parallel facility). (There is also an effort to improve how this data is disseminated to the public but that is not the focus of this challenge.)

SOLUTION CAPABILITIES

Team Austin is seeking a tool that provides an accurate and complete picture of the transportation system with respect to road and lane closures. Core capabilities include:

- Easy to view closure data
- Easy to enter closure data
- Ability to find conflicts (e.g., planned closure of a nearby road) and use this information to schedule lane closures

OUTCOMES & KEY METRICS

- Agency staff express willingness to use the tool
- Enhanced collaboration
- Satisfaction of general public

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

The ability to coordinate scheduling of lane closures is immediately useful for any region experiencing many road closures.

AT A GLANCE

Project Category:



Interagency Collaboration

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Area of Interest:

City of Austin

Timeframe of Interest:

FY2018

TEAM BRYAN/COLLEGE STATION



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AREAS OF INTEREST

- ⦿ Big Data: Analytics & Mobility Applications
- ⦿ Sensor-Based Infrastructure
- ⦿ Shared Mobility

TOP CHALLENGES

Team Bryan/College Station serves over 237,000 people, the state's fourth largest "downtown" (counting faculty, staff, and students at Texas A&M) and a substantial number of rural residents and oilfield activity. We envision a place where our transportation services enhance local quality of life. Continuing its leadership, Team BCS is developing innovative solutions to address the following challenges:

- **Fragmented System** – Providing seamless transportation services to citizens who need to travel to Bryan/College Station for work, medical, educational and recreational trips using a wide variety of modes.
- **Growing Downtown** – Using innovative solutions in Intelligent Transportation Systems and Transportation Demand Management, to move citizens and goods through, to, and around the state's fourth largest "downtown."
- **Expanding Multimodal Options** – Integrating inexpensive but effective transportation alternatives into a transportation network that is approaching a \$2,000,000,000 shortfall for multimodal infrastructure.

GOALS & OUTCOMES

Team BCS is dedicated to achieving measurable goals in collaboration with its partners to position Texas as a leader in mobility and innovation:

- **Community Engagement** – Use the discussion from the Regional Thoroughfare Concept public meetings as the basis for a community discussion about the balance between transportation investments; modal, work site and travel options; and the acceptable level of congestion.
- **Software Integration** – Fully implement the Section 5310 software trip sharing software.
- **Improved Service** – Work with local businesses, Texas A&M and others to deploy an effective trip delivery system that relies on transportation demand management and Intelligent Transportation systems to achieve a transportation network that does not exceed the determined acceptable level of congestion.



ONGOING INITIATIVES & PLANNED INVESTMENTS



Regional Mobility Symposium – We are working to bring our citizens, business community, and Texas A&M administrators together to determine the right balance between transportation investments; modal, work site and travel options; and an acceptable level of congestion. A regional thoroughfare concept map is being discussed at ten public meetings, as well as displayed on the MPO website. In addition, growth in student and general population has focused attention on transportation challenges. The lack of major transportation corridors afflicts the cities' systems as well as at the urban edges; existing problems and the expected growth will continue to cause deteriorating mobility for urban, suburban and rural residents. If some general agreement can be reached on what level of congestion is acceptable, then through our Texas Innovation Alliance partnership we can help determine what strategies we can employ to provide mobility options that meet local needs without trying to fund all of our \$2,000,000,000 transportation shortfall.



Make Every Day a Game Day – Texas A&M football game day transportation includes large components of signal operations, public works, parking and law enforcement staff and transit operations. These resources are managed in real-time to address transportation needs for a crowd of 110,000 to 130,000 fans (includes non-attendee tailgate crowd). The success of this inter-governmental, interdisciplinary, multimodal management effort is being transferred to regular day operations. There are a number of elements we might explore that would fit the Smart State initiatives - expanding trip making options, addressing oil activity and urbanization trends in the surrounding rural zones, improving bicycle/pedestrian safety, bus operations enhancements, increasing the amount and diversity of traveler information, and expanding the use of ITS. The Bryan-College Station area – with several large construction projects, regular daily congestion and game day event transportation challenges – has opportunities to showcase advanced technologies, operating environments and traveler information and communication.



Coordinated Human Service Agency Transportation – Team Bryan/College Station is working on implementing a coordinated Section 5310 software package whereby all agencies can see where other agencies are doing trip pick-ups and coordinate trips so that the entire fleet is more effective and efficient. The software is available but we need technical assistance in helping the providers install the software, teach them how to use it, and get them comfortable in utilizing the software so that trips can be shared across all 5310 agencies.

Texas Proving Grounds – Team BCS has no public comment on its automated vehicle test plans at this time. We are looking for guidance from our Texas Innovation Alliance partner cities regarding policy implications of automated vehicles.



BIG DATA. BIG QUESTIONS.

When every day is game day, how can BCS help people get to and from work on time?

End-User: Commuters who travel during peak hours

Use Case Problem Description

Bryan-College Station is the 15th fastest-growing metro area in the nation as of 2015. Increasing population means increased traffic as the two cities continue to grow and attract more people. How can Bryan-College Station use existing traffic management systems, originally designed for game-day events, to manage everyday traffic conditions? What if EVERY day was game day?

SOLUTION CAPABILITIES

Building upon the current traffic management capabilities, Team BCS would like to use the existing traffic management cameras to dynamically re-route traffic around incidents and obstructions every day. The system should be able to differentiate wrecks or other incidents from baseline congestion and communicate with the Destination Aggieland app to notify users directly of changes or hazards. Other capabilities include:

- Automatic detection of traffic incidents
- Automatic re-routing of traffic around incidents, via dynamic light timing and user notifications
- Communication with the Destination Aggieland app
- Incorporation of weather and flash flood information

OUTCOMES & KEY METRICS

- Reduced emergency response times to incidents, especially during rush hours
- Reduced impacts of increasing congestion
- Gap analysis of existing camera network: do loop detectors or other solutions need to be deployed?
- Easily utilized by traffic engineers and police directing traffic

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

The BCS traffic management system may be extended beyond football games and commuter hours to integrate with the regional transit system and notify travelers of approaching buses. Other regions across Texas would benefit from lessons learned related to special event management as well as everyday operations.

AT A GLANCE

Project Category:



Real-Time Traveler Information

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Area of Interest:

BCS Metro Area

Timeframe of Interest:

September - June of 2018-2019

TEAM COASTAL BEND



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AREAS OF INTEREST

⊙ Connected & Automated Vehicles ⊙ Shared Mobility ⊙ Freight & Logistics

TOP CHALLENGES

Team Coastal Bend envisions: 1) Mobility options for people of all ages and abilities by way of an integrated, multi-modal system; 2) Healthy, safe, connected, and diverse neighborhoods that are people-scaled, support a mix of land uses, and link key destinations by a variety of modes; and 3) Innovative freight management solutions to support continued growth of regional industry. Team Coastal Bend is developing innovative solutions to address the following challenges:

- **Deferred Maintenance** – Significant backlog of maintenance needs for surface transportation infrastructure has resulted in budget shortfalls and little freeboard to invest in innovative elements
- **Driving culture** – Strong sense of independence and driving culture limits openness to transit/non-vehicular modes and propagates the “just in case” mentality of private vehicle ownership
- **Increasing freight demand** – Relatively high volume of freight traffic creates complex safety and infrastructure challenges

ONGOING INITIATIVES & PLANNED INVESTMENTS

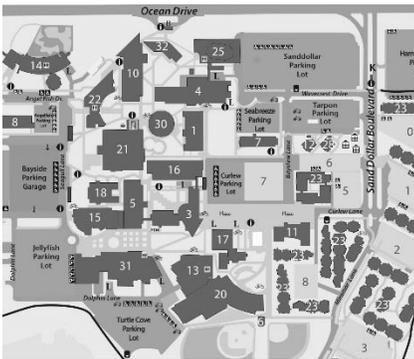
- **Harbor Bridge Replacement** – Construction began on new Harbor Bridge, which traverses the Ship Channel and includes portions of US 181 and I-37. The concrete structure will be the longest cable stay bridge in the US, with vertical clearance of 205 ft. Construction will be complete in 2020.
- **Regional Parkway Mobility Corridor Planning and Environmental Linkages (PEL) Study** – Concluded in spring of 2017, the PEL identified highest ranking alignment alternative alignments for two of seven segments. It built upon a feasibility study (2013) that determined that a multi-segment mobility corridor around the south side of Corpus Christi (from Park Road 22 on Padre Island to I-37) was merited and feasible if constructed in segments of independent utility.
- **Ongoing Implementation of Strategic Plan for Active Mobility** – The region’s Bicycle Mobility Plan defines a 290-mile network that will deliver riders within ¼ mile of over 80% of all daycare and academic institutions, groceries, low-income housing units, transit stops, and regional. Implementation is well underway, including: 7+ miles of roads under reconstruction with protected one-way cycle tracks on both sides; 30 miles of Bicycle Boulevards; construction of off-road multi-use trail; installation of 1,000+ bike racks and 150+ public pumps and FixIt stations at bus stops; and creation of a downtown bike share pilot program.



TEXAS PROVING GROUNDS

Test Environments: Team Coastal Bend has identified three potential test environments: 1) Texas A&M University Corpus Christi (TAMUCC) Campus, 2) Downtown Corpus Christi, and 3) Port of Corpus Christi.

TAMUCC Campus

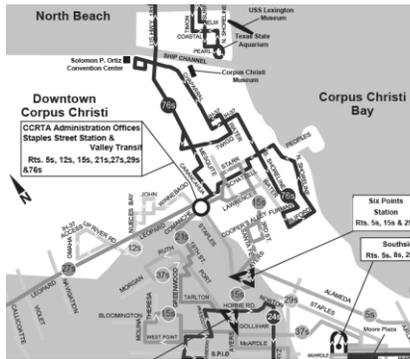


Closed Campus Shuttle

Circulates in a closed loop around a key district.

TAMUCC and the Corpus Christi Regional Transportation Authority are currently partnering to explore the feasibility of an autonomous circulator on the TAMUCC campus.

Downtown Corpus Christi

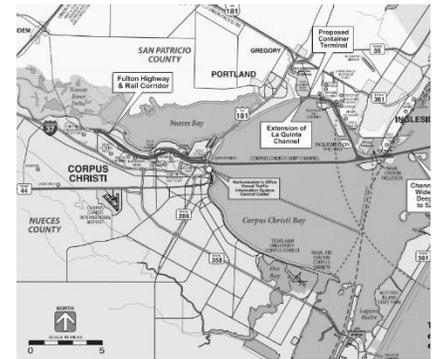


Community Connector

On-demand service anywhere within a zone

Corpus Christi's downtown is large, comprising three distinct districts. Investment in a critical mass of activity to create a true 18-hour urban experience would be greatly catalyzed by a dedicated circulator (people mover) to help mitigate the physical separation between downtown destinations.

Port of Corpus Christi



Freight & Logistics

Optimizes the movement of goods

Corpus Christi's industrial sector, centered around the Port of Corpus Christi (US 181 and Joe Fulton International Trade Corridor), is on the front end of a period of tremendous growth. This activity translates into new need and opportunity for enhance freight mobility innovations in order to preserve operational efficiency and avoid unintended impacts on community safety and quality of life.

Opportunities to Scale: Team Coastal Bend offers a diverse number of environments that enable a range of connected and automated applications to be tested. The lessons learned would enable expansion throughout the Coastal Bend Region as well as to other places in Texas.



TEAM COASTAL BEND

How can the Coastal Bend region improve the movement of goods?

End-User: Truck Drivers

Use Case Problem Description

During grain season, trucks stack on the Joe Fulton International Trade Corridor (JFITC) adjacent to the Corpus Christi Ship Channel, awaiting their turn at the elevator – sometimes as long as seven hours during peak harvest season. This impromptu queueing system is inefficient economically, unsafe for all involved, and is counter to our efforts to maintain our ozone attainment status. Given that manifestation of CV/AV technology in freight vehicles is leading the curve, the Port and partners are interested in expanding this project scope to include pilot applications of CV technology.

AT A GLANCE

Project Category:



Freight & Logistics

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Area of Interest:

Corpus Christi Metro Area

Timeframe of Interest:

TBD

SOLUTION CAPABILITIES

Team Coastal Bend is seeking a port community system solution that would enable the secure exchange of information among multiple public and private stakeholders. The system would better manage truck queuing and port operations to enable traffic to flow more efficiently for all users, including the traveling public and other Port tenants.

- Provide real-time information on queue times
- Enable truck drivers to check-in to the delivery location in advance
- Optimize cargo movement to reduce emissions
- Incorporate weather and flash flood information

OUTCOMES & KEY METRICS

- Enhance Safety: Improve visibility and maneuvering room, reduce vehicular accidents
- Address Congestion: Minimize queue length and wait times
- Maintain Economic Competitiveness: Reduce truck delay and provide fuel savings
- Improve Air Quality: Reduced idle time and GHG emissions

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

A state of the art port would enable the Coastal Bend region to remain economically competitive, supporting job growth and quality of life. Improved traffic operations could be extended beyond the port to other congested areas in the region. As a leading model, the port looks forward to collaborating with its other port partners in Texas and beyond.

TEAM DFW (TARRANT COUNTY)



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AREAS OF INTEREST

☉ Big Data ☉ Shared Mobility ☉ Public Private Partnerships

TOP CHALLENGES

Team Tarrant County envisions a place where all residents have ready, affordable, and safe access to life enriching and sustaining opportunities; where information, skills, and resources necessary to support the transportation of those without reliable access to a vehicle are easy to identify, access, and secure; and where community organization, governments, providers, and other work collaboratively to support mobility options for all; and is developing innovative solutions to address the following challenges:

- **Mobility Integration** – Development of platform for multiple transportation providers (public, non-profit, and private) that effectively provides wellness-related services (e.g. physical health, behavioral health, co-occurring disorders, chronic disease management, and life sustaining and enriching activities) in Tarrant County.
- **Affordability** – Lack of affordable, countywide transportation service options that can efficiently connect individuals with healthcare providers whether insured or not.
- **Ageing Population** – The “Gray Tsunami” and creation of sustainable transportation solutions.

ONGOING INITIATIVES & PLANNED INVESTMENTS

Team Tarrant County is a leader in mobility and innovation. The following highlights progress made on key projects in the past year:

- **Coordinated Plan** – Tarrant County, through the Tarrant Riders Network, developed countywide health and human services transportation plan, service outcomes, and potential implementation opportunities.
- **Strategic Partnerships** – Tarrant County and medical transportation providers in the county are partnering with public and private stakeholders to test TNC deployment, and the County has received a grant for an initial countywide transportation service option.
- **Engaged Community** – Tarrant County, JPS Health Network, MHMR Tarrant, MedStar, FWTA, HHSC, and other providers have invested incredible resources into the development of the next iteration of healthcare in Tarrant County. Healthcare services and delivery are already improving, and the challenge of the community having access to that care has come into sharp focus.



TEXAS PROVING GROUNDS

Test Environments: The City of Arlington and IH-30 proving grounds are in Tarrant County.

USE CASES



Healthy Link –Only about one in three residents in Tarrant County have viable access to general public transportation. Creating alternative, sustainable mobility options for wellness-related access is essential. Increasing options to more than medical appointments (i.e., grocery stores, for social visits, worship services, etc) is imperative to the County’s citizens.

1st/Last Mile Service – About one in three in Tarrant County that have viable access to bus service, community infrastructure is spotty (such as sidewalks, curb cuts, etc). Affordable, equitable first/last mile service is important to the health and wellbeing of our community.

Community Connector – Currently non-emergency medical transportation in Tarrant County has a minimum of 48 hour scheduling requirement. The lack of accessible, affordable, and on-demand transportation options for acute but not emergency visits, creates a barrier for overall community wellness.

Opportunities to Scale: Tarrant County is a large, diverse county with 41 different municipalities with multiple public, non-profit, and for profit service providers. Through a coordinated, collaborative effort, there are numerous possibilities if a universal, equitable booking and payment system were to be available to the County.



BIG DATA. BIG QUESTIONS.

How can Tarrant County provide a unified mobility wellness system?

End-User: Individuals needing access to wellness

Use Case Problem Description

Tarrant County is a large, diverse county without a unified transportation system. Numerous transportation providers, private, non-profit, and public, serve a portion of the citizens' needs.

With the fractured system comes multiple reservation and booking platforms, service management systems, and accessibility concerns. A unified system that links all providers and can allow for efficient subsidization is warranted.

Wellness-related transportation is an effective area for early demonstration because of existing resources, significant public-private costs, and community interest.

AT A GLANCE

Project Category:



Access to Healthcare

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Area of Interest:

Tarrant County

Timeframe of Interest:

18 to 24 month implementation

SOLUTION CAPABILITIES

Team Tarrant County is seeking a solution that enables persons to view, prioritize, and select mobility options to meet individual wellness needs.

- User reservation and payments across all service options in Tarrant County with accurate cost information and real-time service information.
- Accessible platform that is functional for all citizens
- Effective and innovative options for community subsidization from multiple sources based on set policies

OUTCOMES & KEY METRICS

- Reduction in non-essential use of emergency transportation and emergency room services related to mobility obstacles in Tarrant County
- Increased number of trips produced with existing financial resources
- Integration of transportation service options with healthcare providers and community stakeholders across the county

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

Reliable, affordable, and accessible mobility options are needed throughout Tarrant County, Texas, and nationally to help match individual medical needs with the appropriate transportation options.



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AREAS OF INTEREST

⊙ Connected & Automated Vehicles ⊙ Big Data ⊙ Freight & Logistics

TOP CHALLENGES

Team El Paso envisions a place of economic competitiveness and improved quality of life that is enhancing quality and effectiveness of capital investment in regional transportation. Team El Paso is innovatively addressing the following challenges:

- **Freight** – With increasing freight volumes, at the Port of Entries there are unpredictable wait times, limited ability to re-route around unexpected congestion, lack of data sharing/coordination within the freight logistics industry, and inability to enforce international participation.
- **Complexity** – There is unaccounted-for demand on our transportation infrastructure from neighboring states (NM and Chihuahua, MX, which accounts for \$95 Billion of cross-border trade annually) along with the nation's largest military base, that influences air quality, road wear, and congestion. Funding comes mainly from TxDOT and the FHWA.
- **Limited Information** – There is no single amalgamated source of historic information or data that allows for evidence-based decision-making that insures the highest rate of return on transportation investments as they relate to economic impact, competitiveness or quality of life in the region.

ONGOING INITIATIVES & PLANNED INVESTMENTS

- **Metropia/El Paso Region** – Team El Paso initiated the creation of a Data Hub and Platform to better manage congestion, increase efficiency of freight travel, and provide real-time traveler information. CRRMA, TxDOT El Paso and the City of El Paso have 3 distinct contracts with Metropia to pursue the shared database for data such as bridge wait times, incident management, congestion, and O/D data.
- **AV Proving Ground/Tornillo POE and Fabens Airport** – The El Paso Region with UTEP has formed a Capstone Class to research this AV Proving Ground Ports to Plane project further and will have data and several findings for the Fall 2017/Spring 2018 semesters.
- **Reimagine I-10/El Paso Region** – TxDOT is conducting an advanced planning study to analyze and evaluate the current and future transportation needs for the I-10 El Paso Corridor from the NM/TX state line to Tornillo. This study/project emphasizes the need to reimagine how I-10 operates today and develop unique solutions for the region. Goals include facilitating corridor movement, minimizing environmental impacts to human and natural environments, offering innovative transportation alternatives, and leveraging advanced technologies.



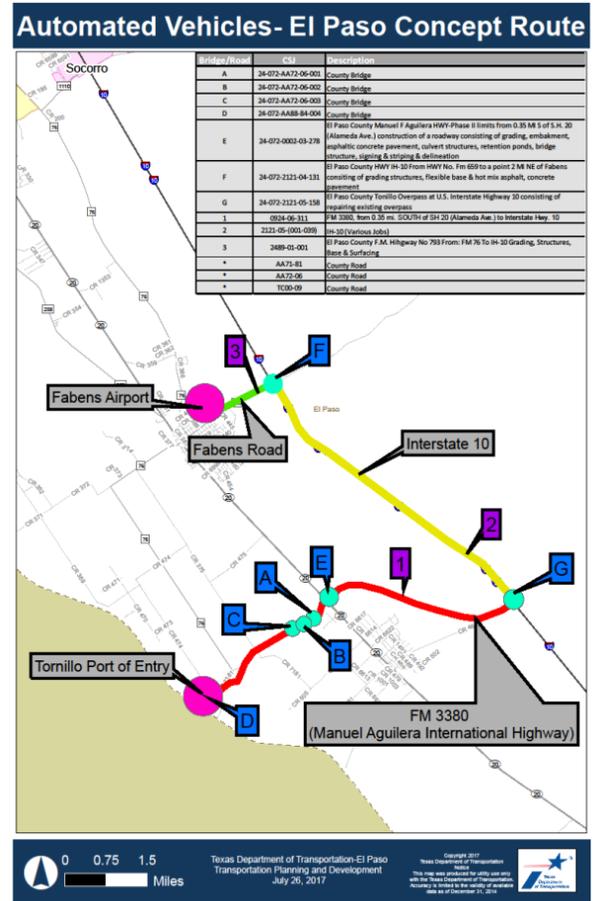
TEXAS PROVING GROUNDS

Ports to Planes: A 13.7 mile corridor connecting the Tornillo/Guadalupe Port of Entry to the Fabens Airport via FM3380 and I-10. The airport uses 270 acres of land and can be used for transportation services pertaining to this project. UTEP has already proposed to develop a technology research and acceleration park at the airport, which can support this project and what it encompasses. The El Paso Region with UTEP has formed a Capstone Class to research this AV Proving Ground Ports to Plane project further and will have data and several findings for the Fall 2017/Spring 2018 semesters.

USE CASES

- **Freight & Logistics** – Ports to Planes project that will optimize the movement of goods from the Tornillo/Guadalupe Port of Entry to the Fabens Airport using automatic vehicles.
- **Community Connector** – This project will connect the port of entry to rural transit and communities.
- **Rural Feeder Transit** – Service that connects people from rural areas to the port and the airport.

Opportunities to Scale: The pilot project from Tornillo/Guadalupe to Fabens is situated in a rural setting and could be replicated to the Zargoza POE to the EL Paso International Cargo Airport which is situated in an urban setting.



CORRIDOR CHARACTERISTICS

Physical & Operational

Corridor Length (mi): 13.7
 Functional Classification: 3
 Lanes:
 FM3380 – 2 lanes
 I10- 4 lanes
 Intersections (Signalized/Total): 2/3
 Speed (mph):
 FM 3380 – 50 Mph
 I10 – 70 Mph
 Peak Hour Volume: 3100 ADT

Digital Infrastructure

Traffic Sensors:
 ▪ Cameras
 ▪ Bluetooth
 Communications:
 ▪ Fiber only on I-10

Community

The 13.7 miles along this corridor is bounded by undeveloped land owned by the County of El Paso, University of Texas Lands and has an airport and a port of entry at each end.



BIG DATA. BIG QUESTIONS.

How can El Paso help navigate HEROs to the scene of an incident safely and efficiently?

End-User: HERO Employees, Emergency Services, Maintenance Crews

Use Case Problem Description

Safety, effective and efficient movement of people and goods on our transportation system is in jeopardy when there is a disabled motorists or even an attempt to make repairs on a vehicle along the side of the El Paso Highway System. Additionally, congestion on urban highway systems become greatly intensified due to incidents resulting from disabled vehicles and vehicular collisions. The Highway Emergency Response Operations (HERO) program will assist with our mission and remove disabled vehicles, improve the safety of our users and avoid vehicular collisions. But first we need to get the HEROs to the incidents or vehicles on the system. The El Paso Region would like to utilize the Metropia Application to assist with this goal.

AT A GLANCE

Project Category:



Real-Time Traveler Information

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Area of Interest:

El Paso Region

Timeframe of Interest:

TBD

SOLUTION CAPABILITIES

Team El Paso would like to integrate data sources to collect and display information that enables users to utilize the network safely and efficiently.

- Incidents occurring on-system
- Quickest route to incident
- Navigation of emergency services to incident

OUTCOMES & KEY METRICS

- Shortest Routes
- Time Saved
- Application Uses

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

El Paso’s Traffic Management Center, TransVista and Metropia’s application could provide real-time routing information to the HEROs by automating the incident notification on a hands free device. Thus directing HEROs to their destination faster to remove disabled vehicles and/or debris which reduces congestion, improve safety and improve our systems efficiency.

TEAM HOUSTON



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AREAS OF INTEREST

- ⊙ Connected & Automated Vehicles, Freight & Logistics
- ⊙ Big Data
- ⊙ Shared Mobility

TOP CHALLENGES

Team Houston envisions a place of sustainable, accessible and resilient transportation to “great places.” Team Houston is serving over 6 million people and developing innovative solutions to address the following challenges:

- **Fragmented Systems** – Data silos between and within entities leading to fragmented travel information systems.
- **Rapid Population & Freight Growth** – Rapid population and freight growth management leading to maximized system capacity/congestion.
- **Cultural barriers** – Difficulties associated with multi-modalism leading to a car-centric region.

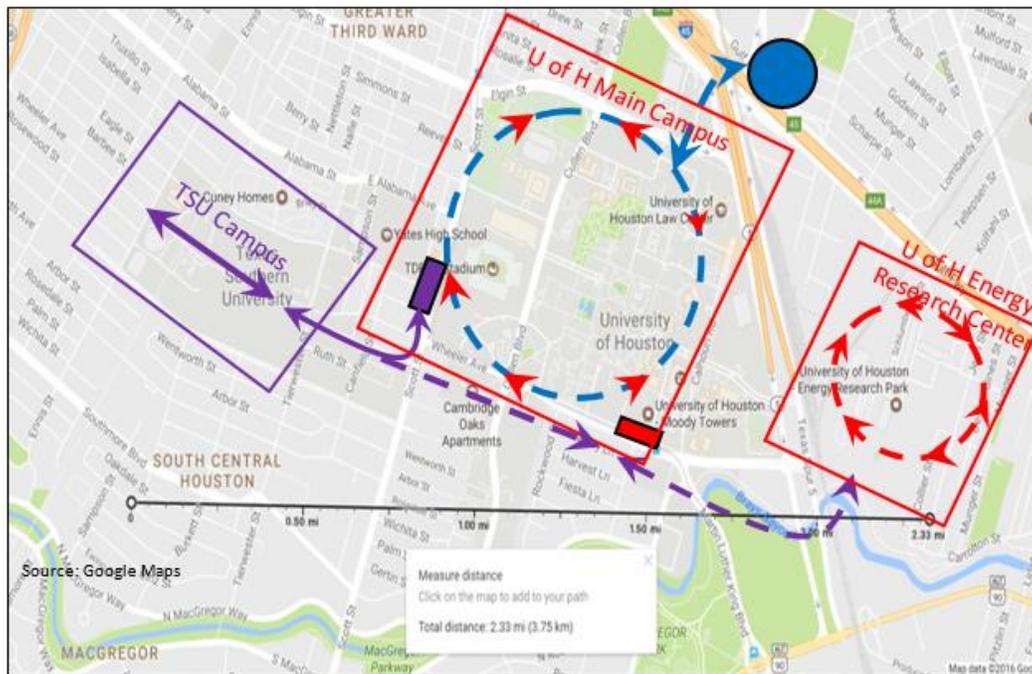
ONGOING INITIATIVES & PLANNED INVESTMENTS

Team Houston is a leader in mobility and innovation. The following highlights the progress made on key projects in the past year.

- **ConnectSMART** – Houston is deploying a one-stop digital platform for dispersing travel demand across time, route and mode. It will provide commuters with real-time travel information for best departure time, travel mode and alternate routes and it is the pilot project for the FHWA’s ATCMDT \$8.9 million grant. ConnectSMART will optimize Houston’s transportation system’s performance and management.
- **Intelligent Transportation System (ITS)** – As part of a TIGER grant project, the City of Houston is building an Intelligent Transportation System (ITS) that will be deployed across 400+ intersections. The new system will be fully integrated with Houston TranStar, and the City’s traffic management center, enabling traffic engineers and first responders to immediately detect, respond to, and share real-time information with the public.
- **University District Proving Grounds** – Houston is piloting a fully automated transit system connecting the campuses of Texas Southern University (TSU) and University of Houston (UH). The implementation is complemented by a multifaceted research and development program and will accomplish two functional use cases when fully deployed: 1) Fixed Route Shuttle and 2) Demand-Response AV Transport Services.

TEXAS PROVING GROUNDS

University District: Team Houston is seeking to connect the campuses of Texas Southern University and University of Houston with an automated transit system.



Multifaceted Research and Development Program will occur simultaneously with the following implementation phases

TSU Early Deployment Ph. A-D	↔	Early Depl. Ph. C LRT Station – Southeast LRT Connection
U of H ERC Connections Early Depl. Phase E	↔	Early Depl. Ph. E LRT Station – Southeast LRT Connection
U of H Main Campus Medium and Long Term	↔	Long Term METRO Eastwood Transit Center Connection

Figure A-2 University District Phased Transit Circulator System Implementation – Fixed Route Shuttle and Demand-Response AV Transport Services

USE CASES

The two primary use cases under consideration for piloting automated transit vehicles in the University District are:

- Phase I : Closed Campus Shuttle
Phase I within the University District will provide the region the benefit of a “living laboratory” and the testing and assessment of the electric vehicle power supply and infrastructure needs.
- Phase II: 1st/Last Mile Service
Both of these areas of benefit will accelerate the Houston Region’s ability to deploy this advanced technology in other major urban districts and activity centers with a much higher probability of successful deployments.

OPPORTUNITIES TO SCALE

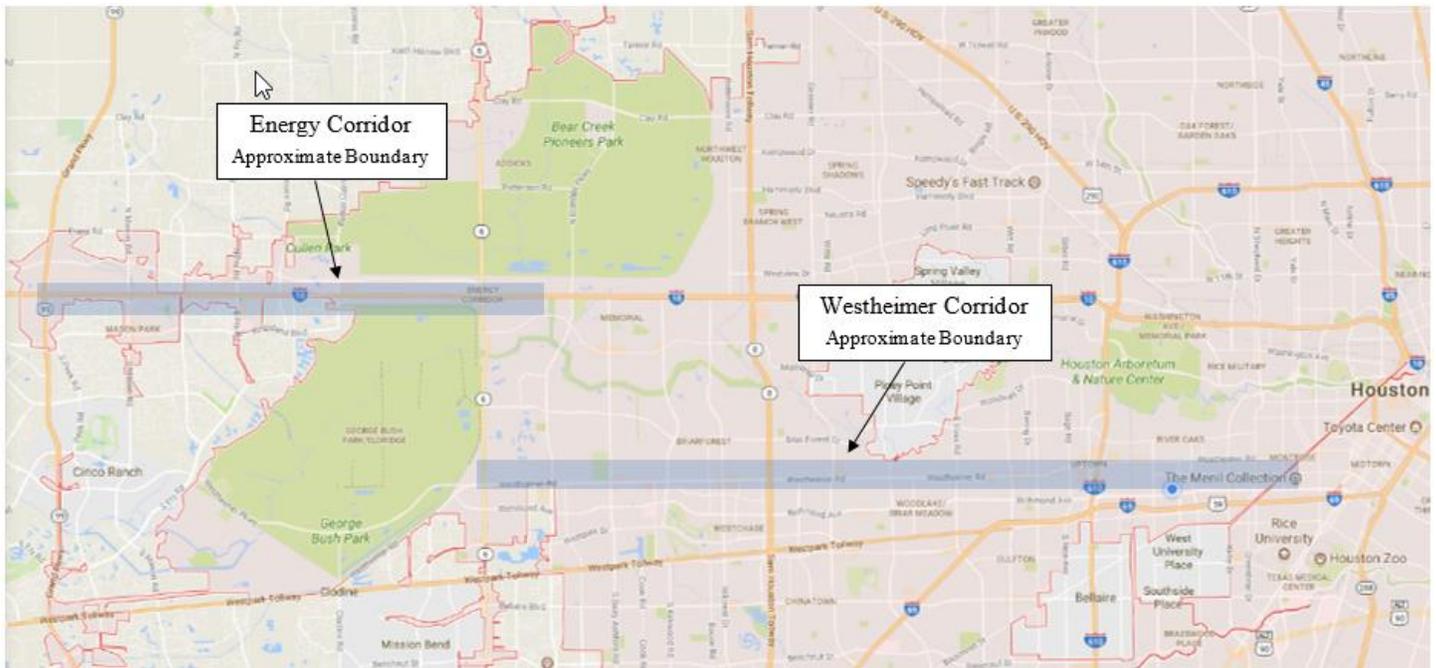
The University District Project will accelerate the Houston Region’s ability to accomplish early deployment of AV Transit technology in other major urban districts and activity centers with a much higher probability of successful deployment. These Urban Districts and Major Activity Centers include:

- Downtown District
- Uptown District
- Texas Medical District
- Energy Corridor District
- Greenway Plaza District
- Mid-Town District
- Woodlands Township District
- Sugar Land Town Center District
- Bush Intercontinental Airport District
- Hobby International Airport District



TEXAS PROVING GROUNDS

Westheimer & Energy Corridors: The Houston region has changed significantly in less than two decades to a far larger, more urban, and decentralized region due to rapid growth in population that is increasingly dispersed. The Westheimer and Energy Corridors are two of the most thriving and congested corridors in the region. New mobility options can provide essential transportation services in areas that are currently unserved or underserved. Team Houston is seeking to match customer needs for mobility service into the changing environment to identify concepts that work.



USE CASES

- **1st/Last Mile Service** – The shared mobility project for the Energy Corridor would provide service to commuter who live in master planned communities with a 3-5 mile radius to a transit hub (park and ride) and provide a circulator service to major employers in the energy corridor.
- **Urban Arterial** – The Westheimer ITS project provides updated technology throughout a major east-west arterial to enhance vehicle and transit movement. The corridor would be equipped to test AV/CV applications, initiate priority signals for buses and provide information to local agencies on route performance.
- **Freight & Logistics** – Optimizes the movement of goods

OPPORTUNITIES TO SCALE

Solutions piloted in the Westheimer and Energy Corridors may be extendable or transferable to address the following types of transit gaps:

1st/Last Mile Needs

- The Woodlands

Transit Deserts with Intercity Central Houston Needs

- Dayton/Liberty
- Hempstead/Prairie View
- Mont Belvieu

Significant Suburban Areas with Inter-Suburban Needs

- Woodlands-Cypress
- Woodlands-Tomball
- Sugar Land-Energy Corridor



BIG DATA. BIG QUESTIONS.

How can the greater Houston region improve first and last mile access for transit riders via a new or improved mobile application leveraging gamified rider-inputted amenity data?

End-User: Traveling public, especially persons with a disability

Use Case Problem Description

Thanks to apps like Google Transit and Apple Maps, transit agencies can put routes and schedules into the hands of smart phone users. While these apps enable riders to know where to get on and off the bus or train and generally what time they should depart and arrive, riders do not currently have information about the amenities at their origin or destination. Riders need this information to make first/last mile connections, safely plan transit trips, and to enhance their experience as a system consumer by having complete trip information. For riders with disabilities, having this information may be critical to independence. For each bus stop or rail platform, riders may want to know:

- It's a hot day – is there a shelter?
- I'm in a wheelchair – is there a bus landing pad?
- I'd like to leave my bike – is there a bike rack or locker?

SOLUTION CAPABILITIES

The ideal application would seamlessly incorporate five functions for riders using transit:

- 1) Viewing and reporting data for amenities (shelters, benches, sidewalks, bike racks, etc.)
- 2) Multimodal trip planning (origin to transit, on transit, from transit to destination)
- 3) En route trip information (status and location on current trip)
- 4) Gamification elements for data reporting (i.e., incentive/awards; may require user profile)
- 5) Ability to provide transit operators feedback (e.g., a link to METRO's public comment system)

OUTCOMES & KEY METRICS

- Application downloads
- Transit service ridership
- Customer satisfaction

Alternative measures may include the app's user rating and the amount of or reliability of user-inputted data.

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

The app will function on all major mobile device operating systems (Apple, Android, etc.). The app will be readily portable to other transit service areas, given the transit operator possesses the common fundamental data underlying the apps operation, such as GTFS. An existing inventory of first/last mile amenities will not be required as collecting such data is a primary aim of the application.

AT A GLANCE

Project Category:



Real-Time Traveler Information

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Area of Interest:

Houston METRO Service Area

Timeframe of Interest:

April 2018



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AREAS OF INTEREST

- ⊙ Connected & Automated Vehicles
- ⊙ Sensor-Based Infrastructure
- ⊙ Shared Mobility

TOP CHALLENGES

Team San Antonio envisions a connected, inclusive and resilient transportation system leading to a high quality of life and is addressing the following challenges:

- **Rapid Population Growth** – San Antonio is projected to grow by an additional 1 million people by 2040, almost doubling in population, adding over 170 vehicles daily to the region. San Antonio was ranked the 24th most congested city in 2015 and needs to continue to maximize the efficiency of vehicular travel within the existing roadway network.
- **Eliminate Pedestrian Fatalities & Serious Injuries** – San Antonio ranked 4th in the U.S. in 2014 for pedestrian fatality rates per 100,000 people for cities greater than 500,000 people. San Antonio is focusing on low cost systemic improvements to apply across the city to improve safety for all.
- **Barriers to Alternatives Transportation Choices** – Prevalence of highways and single-family neighborhoods create auto-centric city form and a discontinuous road network limiting multimodal access and isolating residents from alternative transportation choices.

ONGOING INITIATIVES & PLANNED INVESTMENTS

- **San Antonio Traveler Real-Time Information Portal (SATRIP)** – Includes installation of sensors to collect data and enhance information sharing with the public and transportation agencies to include real-time traffic data, integration of high water detection data, and pedestrian detection.
- **VIA Metropolitan Transit Mobile Ticketing (GoMobile)** – VIA's new mobile ticketing app allows bus and VIAtrans paratransit patrons to purchase fares using a smartphone. The digital ticketing process expedites boarding and reduces the need for cash and transfer cards. This key initiative helps VIA provide regional multimodal transportation options that connect our community to opportunity, support economic vitality, and enhance quality of life throughout our region.
- **Smart City Program, SmartSA** – In 2017, the Office of Innovation in partnership with other City Departments, was charged with launching a Smart City Program, SmartSA, which included nine projects in three SA Tomorrow Comprehensive Plan focus areas: transportation, sustainability and digital connected living. CoSA initiated and implemented numerous SmartSA projects including a 3-1-1 Mobile App, Wifi in the Parks, Digital Community Kiosks and a Parks Mobile App.



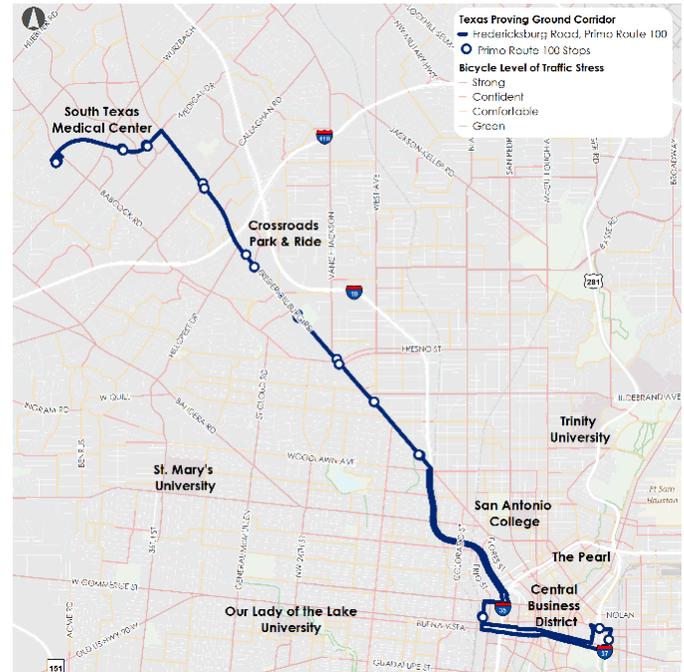
TEXAS PROVING GROUNDS

Fredericksburg Road – San Antonio’s economic backbone, frequent transit corridor, connecting South Texas Medical Center to Downtown.

USE CASES

- **1st/Last Mile Service** – On-demand service that connects people to nearest transit stop
- **Urban Arterial** – Service that connects people along a major corridor into downtown
- **Center to Center Service** – Connects commuters who are travelling between key activity nodes

Opportunities to Scale: Solutions developed along Fredericksburg Road may be applicable to other priority corridors, such as Military Drive and Blanco Road.



CORRIDOR CHARACTERISTICS

Physical & Operational

Corridor Length (mi): 11.3 miles
 Lanes: 4-6 lanes
 Intersections (Signalized/Total): 69/107
 Speed (mph): 30-45 mph
 Total Daily Volume: 53,000

Mode Share:

- Car: 88%
- Transit: 6.7%
- Pedestrian: 3.3%
- Other (Taxicab, Motorcycle, Bicycle or Other): 2.0%

Unique Characteristics:

- Dedicated Bus Lanes (Downtown Only)

Digital Infrastructure

Additional information may be obtained.

Community

Population within ¼ mile: 30,281
 Density (people/sq mi): 5,142
 Median Household Income: \$33,919

Vehicle Ownership:

- No-Vehicle: 17.9%
- 1-Vehicle: 48.2%
- 2+ Vehicles: 33.9%

Description of Land Uses:

Commercial and mixed use corridor including the South Texas Medical Center and the Central Business District, two key regional urban centers. Other key destinations include a HEB Grocery Store, Old Spanish Trail Park, Wonderland Mall, Crossroads Park & Ride, Centro Plaza, Henry B. Gonzalez Convention Center, the Alamo and the Riverwalk.



BIG DATA. BIG QUESTIONS.

How can San Antonio help travelers know when there is a faster route is available?

End-User: Commuting San Antonians, who may use Military Dr. and Blanco Rd. as potential alternates to freeways.

Use Case Problem Description

Freeway traffic can slow to a crawl at rush hour, and is only made worse by traffic incidents. Alternative routes offer a way to alleviate congestion, if travelers are aware of their availability. Team San Antonio would like to optimize its traffic management system across both freeways and arterials. If there is an incident on the freeway, can travelers be directed to a parallel route where the signals are retimed for improved traffic flow? If there is a lane closure on an arterial, can travelers be encouraged to take the freeway? Using connected corridor technology, San Antonio would like to optimize traffic flow on Military Dr., Blanco Rd., and surrounding freeways to improve slowdowns at rush hour, particularly in the event of an incident.

SOLUTION CAPABILITIES

Team San Antonio would like to use the sensors and cameras installed along Military Dr. and Blanco Rd. to improve commute times along those corridors. By measuring baseline traffic volumes and travel times in these areas, data may be published in real-time to encourage drivers to take the fastest route. Secondary outcomes include reduced crashes, lower pollution, and increased safety. Other capabilities include:

- Communicate arterial conditions to the public and the traffic management center
- Adapt arterial flows based on real-time information from freeways
- Identification of high -risk intersections along both corridors
- Actionable recommendations for improvements at high -risk intersections
- Ability to use this data for safety programs in the future

OUTCOMES & KEY METRICS

- Reduced travel times and increased volumes along both corridors
- Real -time data feed of traffic incidents on Blanco Rd. and Military Dr.
- Ability to correlate incidents on freeways with changes to flows on arterials

REGIONAL BENEFITS & CROSS-FUNCTIONAL APPLICATIONS

The integrated freeway -arterial traffic management system may be extended to other areas in the San Antonio region. Furthermore, other data, such as weather, may prove useful in predicting traffic patterns. As a whole, Texas would benefit from the ability to make adjustments to optimize freeway and arterial operations.

AT A GLANCE

Project Category:



Real-Time Traveler Information

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Area of Interest:

Military Drive & Blanco Road, San Antonio, Texas

Timeframe of Interest:

September 2017-October 2018

TEAM OPEN DATA



MEMBERS

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AREAS OF INTEREST

☉ Sensor-Based Infrastructure ☉ Big Data ☉ Shared Mobility

TOP CHALLENGES

Team Open Data is focused on developing innovative solutions to address the following challenges:

- **Data Silos** – Data on road closures and incidents is segmented between state and local governments.
- **Reliability & Accuracy** – There are multiple sources for congestion data on roads that sometime conflict.
- **Incomplete Information** – The public has a wide range of options for getting traveler information, both public and private, but often must go to multiple sources to get a complete picture.
- **Inconsistent Data Sharing** – Sharing of data between public agencies, with the public, and with the private sector is generally ad hoc, and limited by a wide variety of systems and standards.
- **Geospatial Complexity** – Geographic information often presents a particular challenge with multiple formats and mapping standards making information sharing more complex.
- **Privacy & Security** – More ongoing information sharing exposes information systems to additional security risks, requiring a thoughtful balance of openness and security.

VISION

Team Open data seeks to create a common-standards, shared-data capability “single source of truth” for condition, traffic and congestion data on all of the roads in the State of Texas. This source of truth would then be shared with the government agencies for traffic operations and planning. Most information should be shared with the public, while some data will need to be access controlled and only shared with trusted partners. The system will be flexible enough to evolve with changing needs and technology.

This data platform could function as a foundation for other application developers and vehicle manufacturers to utilize in building a transportation application. This data platform would not have a single point of failure as it would be in a decentralized data store and have security backing such as blockchain technology.



BIG DATA. BIG QUESTIONS.

To enable the meaningful exchange of information between TxDOT, local and regional transportation agencies, research institutions, the startup and entrepreneurial community, and industry, our team has identified the following priority use cases:



Response & Recovery – In a major emergency weather event, what information is needed by responders and the public to manage preparation, evacuation, response and recovery efforts? What should we be sharing now to enhance preparedness and planning? How do we coordinate this across multiple public and private partners?



Real-Time Traveler Information – What information does the average traveler need on a day to day basis to better plan routes (e.g. congestion, travel times, incident notification, road closures or specific lanes impacted, transit or other alternatives)? How do we consolidate these information sources across the multiple sources to provide a common picture? What are the most useful channels for conveying changing information in real time to the travelling public? What information should be access-controlled?



Traffic Tracker – What data does private industry, each agency, MPO, local transportation agency, toll operator, municipality, region, or other transportation partners have and how should it be modeled to deliver a single view of congestion for all transportation modes in the state? How should it be managed, maintained and accessed? With this detailed model, how can AI or machine learning predict and provide recommendations to state and local governments for decision making?



Digital Currency – Tax revenues for gasoline and diesel purchases, along with the tax revenue from vehicle purchases will decline dramatically with automated vehicles. Can a proof of concept be developed where taxation could be levied and collected on a road infrastructure per use basis?



MEMBERS

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VEHICLE CONNECTIVITY FOR SMART TRANSPORTATION¹

National Science Foundation Proposal for a 5G Wireless Research Testbed

A consortium led by Texas A&M University in partnership with the University of Texas at Austin, the City of Austin, and Southern Methodist University, has submitted a proposal for a National Science Foundation (NSF) grant offered under the Platforms for Advanced Wireless Research (PAWR) program. The grant would provide \$20 million in funding to establish a 5G wireless research network in Texas to test applications in the areas of transportation, energy, public safety, and health. The research would also help identify community best practices for supporting ultra-high density wireless networks. Four finalists for the \$20 million grants should be announced in October with testbed deployment beginning in January 2018. One-half of the grant funding is provided by private industry partners, including AT&T, Verizon, Intel, and Dell.

TEXAS TESTBED FOR 5G RESEARCH

A 5G research testbed in Texas would help accelerate research into these fundamental questions. The testbed would offer a scalable, accessible platform in College Station and Austin supported by Texas universities and cities and available to private sector innovators. It offers the opportunity to capture a significant new market sector in Texas and spur additional research grant opportunities. Further, the research conducted in the testbed is envisioned to provide guidance to public agencies on deployment of fiber and small cell installations within public rights of way, offer insight into private partnerships for deployment, and support the quantification of the benefits of vehicle connectivity in a range of applications.

BACKGROUND

The popular media and policy makers have focused on the opportunities presented by automated vehicles (AV) in addressing safety, congestion, emissions and mobility needs. Less attention has been given to connected vehicles (CV), such as vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) connectivity -- collectively referred to as V2X. It is generally acknowledged in the transportation community that vehicle connectivity offers additional benefits to automated driving systems by increasing the range of situational awareness for safety incidents and enabling harmonization of traffic flow to reduce congestion. Eventually automation and connectivity within vehicles will merge to form "connected automation" capabilities.

¹ By Ginger Goodin, P.E., Texas A&M Transportation Institute. The information is largely drawn from the forthcoming report *Connected Vehicle Infrastructure: Overview and Funding Implications* by Maxwell Steadman, Texas A&M Transportation Institute, Policy Research Center. <https://policy.tti.tamu.edu/finance/>. Content also provided by Tom Bamonte, NCTCOG, and Dave Sparks, Texas A&M Transportation Institute.



Until recently, the primary mode for connected vehicle communication has been 5.9GHz Dedicated Short Range Communication (DSRC). DSRC is a short range, one or two-way radio communication medium that the FCC in 1999 allocated for transportation purposes.⁽ⁱ⁾ It is low latency (low time delay), high bandwidth (high throughput), and has a range of up to 300 meters.⁽ⁱⁱ⁾ This means that DSRC devices can quickly transmit essential data without interruption between in-vehicle units and roadside units. In a connected vehicle environment, a DSRC device in a vehicle would transmit data that includes the vehicle's speed, position, heading, acceleration, size, brake status, and other relevant information in what is typically referred to as the basic safety message.⁽ⁱⁱⁱ⁾ USDOT has developed a range of applications using standard messages, including applications to reduce crashes, mitigate congestion, and reduce emissions.

V2V and V2I applications involving DSRC require a significant number of vehicles be equipped with DSRC in-vehicle units to be effective. With sufficient market penetration, DSRC devices could then be integrated into transportation infrastructure to communicate with vehicles and support V2I or I2V applications. However, the federal government has yet to require installation of DSRC units on new vehicles despite investments in research and standardization activities devoted to the development of CV technology using DSRC. SAE and IEEE have been actively working on standards documents for DSRC and V2V performance.^(iv) There are a number of barriers to DSRC-based connected vehicle deployment, as identified by the U.S. GAO.^(v) These include a lack of state and local resources to develop and maintain V2I systems, uncertainty associated with data security, and concerns over sharing of the DSRC spectrum with commercial interests. DSRC devices are reliant on an allocated radio frequency spectrum. This allocation is essential for DSRC to function in safety applications, as it reserves this band specifically for transportation uses. Without this reserved allocation, DSRC devices would be subject to potential radio interference from other devices, which could negatively impact any safety-related uses.

EMERGENCE OF 5G NETWORKS

While DSRC is the primary communication technology used thus far for transportation applications, 5th Generation Mobile Networks (5G) provide a potential future method of V2X communication. 5G will be the successor to current 4G mobile networks. It, along with advanced 4G-LTE, will provide increased data throughput, lower latency, and increased reliability over existing 4G networks. 5G would work much the same way as 4G currently works on mobile devices, with the vehicle sending and receiving information from a cell tower, or nearby 5G units in other vehicles and the infrastructure. It would allow for uses that existing DSRC technology does not, as it would allow a vehicle to stay continuously connected to infrastructure networks.^(vi) 5G networks will be deployed by wireless carriers and supported through small cell installations and fiber networks. It is expected that 5G wireless technology will enhance vehicle infotainment and mobile commerce applications and will extend to all vehicles regardless of level of vehicle automation.

5G networks offer promising opportunities to address the aforementioned DSRC challenges, such as connected vehicle market penetration, public deployment funding, and security concerns. However, 5G standards are still under development and will not be finalized until late 2018, with the first deployments sometime following.^(vii) Even so, with the rapid increase in the number of vehicles with built-in cellular connections, plus cellular connections established via smartphone docking, the installed base of vehicles capable of handling 5G will be very large within the next 5-10 years. Some chipmakers, such as Qualcomm, are now supplying chips that support both DSRC and wireless V2X communication. While this technology could potentially supplant DSRC as the primary CV communication technology, more research and testing is necessary to (1) understand the applications of 5G in transportation systems; (2) assess network reliability, data safeguards and data ownership issues; (3) address potentially conflicting business models that can impact message priority and availability; and (4) support the coexistence of DSRC and/or the migration of DSRC standards for vehicle connectivity.

ⁱ FCC Allocates Spectrum in 5.9 GHz Range for Intelligent Transportation Uses. Federal Communications Commission, Washington, D.C., 1999. Available at https://transition.fcc.gov/Bureaus/Engineering_Technology/News_Releases/1999/nret9006.html

ⁱⁱ Miucic, Radovan. Why DSRC? [Powerpoint Slides]. Available at <http://www.ieeevtc.org/conf-admin/vtc2016fall/20.pdf>

ⁱⁱⁱ Intelligent Transportation Systems: Vehicle-to-Infrastructure Technologies Expected to Offer Benefits, but Deployment Challenges Exist. Publication GAO-15-775. United States Government Accountability Office, Washington, D.C., 2015. Available at <http://www.gao.gov/assets/680/672548.pdf>

^{iv} Zmud, J., G. Goodin, M. Moran, N. Kalra, E. Thorn. Advancing Automated and Connected Vehicles Policy and Planning Strategies for State and Local Transportation Agencies. NCHRP 845. Transportation Research Board. Washington D.C. August 2017. <http://www.trb.org/Main/Blurbs/176418.aspx>

^v Intelligent Transportation Systems: Vehicle-to-Infrastructure Technologies Expected to Offer Benefits, but Deployment Challenges Exist. Publication GAO-15-775. United States Government Accountability Office, Washington, D.C., 2015. Available at <http://www.gao.gov/assets/680/672548.pdf>

^{vi} 5G Automotive Vision. 5G-PPP, Heidelberg, Germany, 2015. Available at <https://5g-ppp.eu/wp-content/uploads/2014/02/5G-PPP-White-Paper-on-Automotive-Vertical-Sectors.pdf>

^{vii} 3GPP. Release 15. Available at <http://www.3gpp.org/release-15>. Accessed August 14, 2017.



INDEX OF SUBJECT MATTER EXPERTS

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- Chandra Bhat (bhat@mail.utexas.edu) | Director, Center for Transportation Research (CTR)
Expertise: Travel Demand Modeling, Travel Behavior Analysis
- Natalia Ruiz (nruizjuri@mail.utexas.edu) | Director, Network Modeling Center, CTR
Expertise: Network modeling and simulation, transportation data analysis and visualization.
- James Kuhr (jkuhr@utexas.edu) | Research Associate, Network Modeling Center, CTR
Expertise: Public-Private Partnership Financing and Contracting, Design-Build Construction Methods

Texas A&M University

- Chris Poe (c-poe@tti.tamu.edu) | Assistant Agency Director, Connected and Automated Vehicle Strategy, Texas A&M Transportation Institute | Expertise: Connected and Automated Vehicles, Transportation Operations
- Ginger Goodin (g-goodin@tti.tamu.edu) | Senior Research Engineer, Texas A&M Transportation Institute | Expertise: Policy, Congestion Pricing, Managed Lanes
- Katie Turnbull (k-turnbull@tti.tamu.edu) | Executive Associate Director, Texas A&M Transportation Institute | Expertise: Transit, Shared Mobility, Managed Lanes

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Expertise: Automated Vehicles, Connected Vehicles, Traffic Management Systems, Smart Cities
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Expertise: Mobility-as-a-service
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Expertise: Infrastructure

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Expertise: Water Resources Planning and Management, Data Analytics, Transportation Safety



University of Houston

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- Mina Dawood (mmdawood@uh.edu) | Associate Professor, Civil & Environmental Engineering
Expertise: Analysis, design, construction and performance of fiber reinforced polymer and steel structure and structural systems
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- Carol Lewis (Lewis_CA@tsu.edu) | Professor, Transportation Studies; Emeritus Director, CTTR; Executive Committee UTC: Center for Cooperative Mobility and Competitive Megaregions (CM2)
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Expertise: Vehicles and Infrastructure; Mobility as a Service
- Gwen Goodwin (goodwingc@tsu.edu) | Interim Director, Center for Transportation Training and Research; Research Assistant Professor
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- Kevin Pete (Kevin.Pete@txdot.gov) | Research Portfolio Manager, RTI, TxDOT



CATALOG OF RESEARCH

Vehicles & Infrastructure

- *University District AV Transit Circulator System Early Deployment Project* | Multiple Contributors | TSU & U of H, with 2GT Vehicle Supplier Team | On-going
- *Use of Geothermal Energy For De-Icing Approach Pavement Slabs and Bridge Decks* | UT Arlington, Texas Department of Transportation | 2015-2018 |*
- *A Hybrid Integrated Sensing and Energy Conversion (HISEC) System For Harvesting Mechanical and Thermal Energy from Roadways* | Samer Dessouky and Hatim Sharif | UT San Antonio
- *Promoting Sustainability and Safety for Texas Rural Roadways through Self-Power Sensing and Detection Systems* | University of Texas at San Antonio and Southwest Research Institute | 2017-2018
- *UAV-Based Thermal Infrared Remote Sensing for Enhancing UTSA Campus Sustainability* | Urban Planning and Students Learning UT San Antonio
- *Development of Highway Sensing and Energy Conversion Modules for Generating Power* | Texas Department of Transportation | UT San Antonio with Southwest Research Institute and Texas A&M Transportation Institute | 2015-2016
- *Analysis, design, construction and performance of fiber reinforced polymer and steel structure and structural systems* | University of Houston
- *Context Aware Multiband Vehicular Networks* | Toyota InfoTechnology Center, Dinesh Rajan and Joseph Camp | SMU | 2010-2013
- *NeTS: Small: Channel Recognition for Optimized Links And Networks (CROLA)* | National Science Foundation | SMU | 2015-2018 | *
- *Building a Campus Citizens Band Radio Testbed (3.5 GHz)* | NXGEN Partners | SMU | 2017 -2018
- *Bridge Prioritization and Preservation for Route 66* | National Park Service | UT El Paso | 2017 – 2018 | *
- *NeTS: Small: Collaborative Research: Theory, Algorithms, and Experiments for Frequency-Agile Beamforming Mesh (FabMesh)* | NSF, CNS, NeTS, Princeton University | SMU | 2013-2017
- *CAREER: Leveraging Simultaneous Access to Multiple Frequency Bands in Multihop Wireless Networks* | NSF | SMU | 2012 -2018
- *NEXTCAR - Model Predictive Control for Energy-efficient Maneuvering of Connected Autonomous Vehicles* | ARPA-E | SwRI, University of Michigan and Toyota Motor Engineering & Manufacturing North America | 2017-2020 | *
- *NCHRP 03-127 Cybersecurity of Transportation Management Systems* | Transportation Research Board (TRB), National Academy of Sciences (NAS) | SwRI and Praetorian | 2017-2019 | *
- *Development, Integration, Implementation, and Maintenance Services (DIIMS) for Intelligent Traffic Management Systems – Includes ATMS, cyber-security, AV, CV, wrong-way driver detection and other ITS research and deployments* | Texas Department of Transportation (TxDOT) | 1998- 2018 (3 separate contracts)
- *CAR-STOP: - Communications and Radar-Supported Transportation Operations and Planning* | Texas Department of Transportation | UT Austin Center for Transportation Research | 2016-2018
- *Vehicle to Infrastructure Managed Lanes Testing* | UT Austin Center for Transportation Research with multiple collaborators and supporters including CINTRA and NCTCOG | 2017 -2019

(* denotes that hyperlink to more information available in electronic version)



Freight & Logistics

- *Development of TxDOT UAS Flight Operations Manual, Policy Recommendations, and Initial Application Evaluations* | Texas Department of Transportation, UT Arlington – Lead; TAMU & TAMU-Corpus Christi – Co-Leads | 2016-2018 |*
- *Assessing the Safety Issues Associated with Isolated Rural Intersections* | Texas Department of Transportation, Hatim Sharif and Samer Dessouky | UT San Antonio | 2016-2018
- *Reducing Traffic Crashes at Road Construction Access Points* | Texas Department of Transportation | Hatim Sharif and Samer Dessouky | UT San Antonio | 2017- 2019
- *Transportation and Economic Impact of Texas Shortline Railroads; Synthesis of Service Life Prediction for Bridges in Texas* | Dr. Lu Gao | U of H

Mobility-as-a-Service

- *University District AV Transit Circulator System Long Range Implementation Plan* | TSU & UH, METRO, HGAC, City of Houston | Planning to begin January 2018
- *Impacts of Regulations and Policies on Automated Roadway Vehicle Transit Operations* | National Cooperative Highway Research Program | November 2015 to June 2017
- *Does location matter? Performance Analysis of the Affordable Housing Programs in Dallas Fort Worth Metropolis* | US Department of Transportation & Tarrant County | UT Arlington | 2016-2017 | *
- *Transportation Planning & Validation of Surface Transportation Models in Houston, Texas* | Dr. Liang-Chieh (Victor) Cheng | U of H
- *U.S.- Mexico Bidirectional Study Abroad Program on Smart Cities* | Universidad de Guadalajara, Mexico & UT El Paso | 2016-Present
- *Mexico Interdisciplinary Research Collaboration on Smart Cities* | National Science Foundation | UT El Paso | 2017- 2020 | *
- *The Data Rodeo* | UT Austin Center for Transportation Research with the support of City of Austin, TxDOT Austin District and other local partners | 2015 - Present | *

(* denotes that hyperlink to more information available in electronic version)



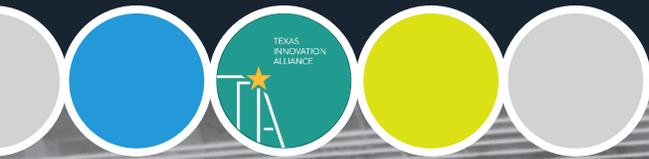
**INDUSTRY
PROFILES**

GUNDA CORPORATION | KAPSCH TRAFFICCOM

CISCO | EBERLE DESIGN INC. | NTT DATA

ARUP | CAMBRIDGE SYSTEMATICS | CDM SMITH

FREESE & NICHOLS | INRIX | PAPE-DAWSON ENGINEERS



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AREAS OF EXPERTISE

⊙ Connected Vehicles ⊙ Automated Vehicles ⊙ Shared Mobility

TOOLS & SERVICES

At Arup we are leading intelligent mobility thinking. We help our clients succeed in a rapidly changing, increasingly uncertain world by leveraging our global reach, multidisciplinary approach, research, thought leadership, and deep technical expertise in all aspects of the built environment. Arup fosters effective collaboration between the public sector, transportation operators, technology providers, designers, property owners, and academia. Our services include:

- Policy and strategy; planning, concept, and feasibility studies
- Project appraisal and scope definition
- Public consultation and stakeholder management
- Detailed design and specification development
- Procurement & construction management; operations & maintenance
- Project, risk, and value management; asset management

INDUSTRY PARTNER DESCRIPTION

Arup has significant urban mobility, infrastructure, and design experience at a variety of scales and complexities – further enhanced technical skills. Arup has demonstrated expertise and connections with transportation agencies in most major North American cities. Arup has advised several tech corporations in Silicon Valley on their transportation programs and adaptation strategies for future mobility. Recent work for the MTC in San Francisco has involved defining transportation forecasting scenarios with various levels of automated vehicle market penetration. In Victoria, Australia Arup undertook a similar long-term forecasting exercise for Transport Victoria. We use such insight to provide strategic planning, economic, commercial and policy advice in Texas.

PAST & ONGOING PARTNERSHIPS

Arup is empowering municipal decisions to achieve concrete community impact through a number of partnerships:

- **UK AutoDrive** – Arup is leading a three-year program to trial and demonstrate autonomous vehicles, showing how they might interact with the urban environment and the benefits they can bring.
- **Future Mobility Research, MTC San Francisco, CA** – The MTC commissioned Arup to conduct a future mobility research study for the region, helping the MTC to develop methods to evaluate how autonomous vehicles may impact travel forecasting and GHG emissions by interviewing experts from around the world to help develop a hierarchy of key variables impacting travel in 2020, 2030, and 2040.
- **Connect SF, San Francisco, CA** – Arup is leading a multi-agency effort for the City of San Francisco to envision the future of mobility in the city by bringing stakeholders and experts together to determine values and priorities in transportation for the coming decades for a prioritization framework to guide future transportation efforts.





AREAS OF EXPERTISE

© Big Data: Management & Platforms © Shared Mobility © Freight & Logistics

TOOLS & SERVICES

Cambridge Systematics, Inc. (CS) has 45 years of experience leveraging technology and ingenuity to advance the world of transportation.

- **Data Management and Open Platforms** – CS develops analytic tools and software solutions for mobility management, including real-time bus customer information systems. Our 1-Click platform is an open-source mobility management and cross-modal trip planning software product.
- **Shared mobility** – CS has been pioneering the application of shared mobility by integrating transportation network companies, bike-share, micro-transit and peer-to-peer carpool into transit planning.
- **Mobility Applications for Freight Operations** – CS freight and goods movement experience includes developing the Concept of Operations for the Freight Advanced Traveler Information System (FRATIS), overseeing prototype implementations in Los Angeles and South Florida, and evaluating the Texas I-35 corridor deployment.

INDUSTRY PARTNER DESCRIPTION

CS has planning applications and forecasting experience across all modes, including emerging travel options. We build open-source software to help local transportation, consumers and transit agencies coordinate mobility options. Our performance-based planning experience can readily be leveraged in analyzing the emerging smart city prototype. Based on long-standing partnerships in Texas, CS has knowledge of the planning context and State priorities. For TxDOT, we are updating the Texas Freight Mobility Plan, improving Project Tracker to help it become a more widely used resource and evaluating port connectivity in the State. We are updating regional travel demand models for San Antonio, El Paso and Houston-Galveston MPOs. We also are assisting Houston METRO, DART, CapMetro and VIA with a range of transit projects.

PAST & ONGOING PARTNERSHIPS

CS is empowering municipal decisions to achieve concrete community impact:

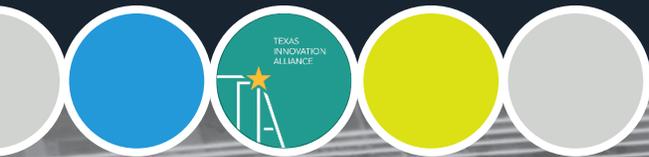
- **Texas** – CS analyzed a RideAustin public dataset to develop quantitative measures that document an entire ecosystem of challenges and solutions that ride-sharing brings to the urban mobility landscape.
- **Arizona** – CS developed a multimodal agent-based behavioral freight model that provides detailed outputs by different temporal resolutions, economic sectors, commodity types, industry class and truck types.
- **New York City** – CS is assisting in the development of the ConOps and Deployment Plan for a large-scale deployment of CV technologies.
- **Florida** – CS coordinated with 26 MPOs to assess data and performance for congestion reduction, system reliability and freight movement.
- **Los Angeles** – CS developed two web-based models for bicycle and pedestrian modes to better prioritize proposed investments and forecast potential changes in activity.

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AREAS OF EXPERTISE

- ⊙ Big Data: Management & Open Platforms
- ⊙ Communications & Telematics
- ⊙ Connected Vehicles

TOOLS & SERVICES

Cisco is a leader in networking infrastructure, open data platforms, and ecosystem development – offering an innovative solution set capable of contributing towards encouraging public-private data sharing:

- **Network Infrastructure** – Cisco has been a long time leader in providing reliable and powerful connectivity for a variety of needs.
- **Open Data Platforms** – Transportation, like many industries, has been riddled with proprietary technologies to solve individual problems that have not traditionally worked together. Cisco is bringing edge based real time aggregation, normalization, and utilization of data from proprietary and open systems to enable the solutions to transportation’s largest challenges.
- **Partnerships/Ecosystem** – Due to Cisco’s recognition as a leader in connectivity, we have been able to develop one of the largest and most productive ecosystems in the market. Cisco has a customer first mentality, which means partnering and integrating to all of the environments that our customers are required to manage.

INDUSTRY PARTNER DESCRIPTION

Cisco is the worldwide leader in IT that has proven amazing things can happen when you connect the previously unconnected. Cisco has been named multiple times as the leader in Smart Cities with more live deployments than any other company. We have shaped transportation corridors like in Kansas City, MO with the new street car and created platforms that enable the true real time collection, aggregation, normalization, and utilization of data required for the needs of connected and autonomous vehicles. Cisco is partnered with TTI, UT CTR, Austin CityUP, DIA, and several cities/municipalities in Texas to drive new and innovative solutions for transportation.

PAST & ONGOING PARTNERSHIPS

Cisco is empowering municipal decisions to achieve concrete community impact through a number of partnerships:

- **TTI** – In TTI, Cisco currently holds a seat on the Advisory council, as well as sponsorship in a number of current and future projects.
- **UT CTR** – UT has been a long time customer of Cisco and as such we are exploring multiple paths to aid in data sharing with the Center for Transportation Research in many of their endeavors.
- **Austin CityUP** – Cisco holds a board seat in Austin CityUP as well as helping to sponsor and drive several initiatives in the area.





AREAS OF EXPERTISE

- ⊙ Big Data: Management & Open Platforms
- ⊙ Big Data: Analytics & Mobility Applications
- ⊙ Sensor-Based Infrastructure

TOOLS & SERVICES

Eberle Design, Inc. is a leader in safety monitoring of signalized intersections, vehicle and railway detection, and in the collection and reporting of real-time traffic data that fulfills all Automated Traffic Signal Performance Measures (ATSPM) needs. EDI's iCITE® Data Aggregator DA-300® offers innovative remote intersection connectivity that provides real-time traffic data for the calculation of capacity, progression, multimodal and optimized maintenance operations. EDI's DA-300® can contribute real-time intersection and traffic cabinet health data for the Texas Proving Grounds that facilitates public/private data sharing.

- **iCITE® DA-300®** – Collects and reports a broad spectrum of traffic data for reliable interconnected or non-interconnected functional monitoring of any signalized intersection. The device aggregates a complete parsed dataset for any third-party data analytics or legacy ATMS solution provider. The DA-300 addresses all levels of ATSPM, and is a cost effective solution for arterials, highway ramps, and integrated corridor management data requirements. EDI DA-300 is *ATSPM Ready*®.

INDUSTRY PARTNER DESCRIPTION

Eberle Design, Inc. is a market-leading manufacturer of intersection safety monitoring, vehicle detection and real-time data collection/reporting solutions for the traffic control, parking/access and railway industries. The company's broad array of products include intersection conflict monitors, inductive loop detectors, flashers, load switches and other mission-critical devices that allow transportation and access control professionals to efficiently integrate, automate and manage signalized intersections, roads and access points. With more than five (5) million devices operational in traffic cabinets worldwide, more than two (2) billion error-free transactions are performed every 24-hours that are mission critical to ensure motorist, bicyclist and pedestrian safety. Eberle Design has been a trusted-partner of Texas traffic management agencies since 1980. For more information kindly visit the company's website at www.editraffic.com.

PAST & ONGOING PARTNERSHIPS

Eberle Design, Inc. is empowering municipal decisions to achieve concrete community impact through a number of partnerships:

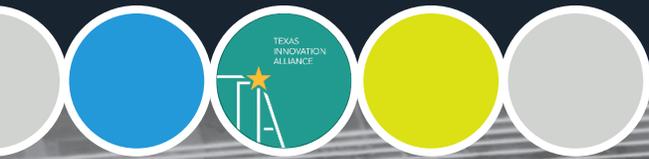
- Texas A&M TTI RELIS Smart Intersection Initiative partner
- NEMA 03TS Traffic Signal Industry Committee (Standards Development Initiatives)
- ITS America Advocacy Trust member

CONTACT INFO

Birgit Olson

Marketing Communications Specialist
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CONTACT INFO

John Dewar

Vice President & Principal
Freese and Nichols, Inc.
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AREAS OF EXPERTISE

- ⊙ Automated Vehicles
- ⊙ Shared Mobility
- ⊙ City Planning for Changing Mobility Trends

TOOLS & SERVICES

Freese and Nichols, Inc. is a leader in data analysis, community visioning, and land use planning/policy – offering an innovative solution set capable of contributing towards the Texas Proving Grounds and/or encouraging public-private data sharing:

- **Data Analysis** – Technical team of experts who can analyze new and unique data as well as understand its mobility implications.
- **Community Visioning** – Understanding of community values, character, and social cohesion that must be retained in evolution in new mobility technologies.
- **Land Use Planning/Policy** – Understanding of impacts of new mobility technologies on land use policy priorities, such as compact and sprawling growth, and larger city-wide concerns.

INDUSTRY PARTNER DESCRIPTION

Freese and Nichols (FNI) facilitates collaboration between government agencies and public interests to develop a common vision for the future and make that vision a reality through design and implementation. Working with numerous communities across Texas in planning studies such as comprehensive, small area, and transportation plans, FNI has helped cities lay a foundational vision to guide the incorporation of future technologies while maintaining the community character of today. FNI utilizes these planning studies to educate the public on future technologies and shape safety, health, and welfare priorities while looking toward partnering in future implementation strategies.

PAST & ONGOING PARTNERSHIPS

Freese and Nichols, Inc. is empowering municipal decisions to achieve concrete community impact through a number of partnerships:

- **FNI with City of Arlington and NCTCOG** – Partnership to educate attendees on the potential impacts of autonomous vehicles on cities at TxAPA Annual Conference in Frisco (November 2017).





AREAS OF EXPERTISE

- ⊙ Communications & Telematics
- ⊙ Connected Vehicles
- ⊙ Sensor-Based Infrastructure

TOOLS & SERVICES

Gunda Corporation (GUNDA) is passionate about transportation innovation and introducing emerging technologies to the communities we serve. Our experts take the time to consider how transportation projects should be designed in order to meet the needs of both today and tomorrow. General service line offerings include:

- **Ground Transportation** –planning, design, integration and testing of various modes of communications in transportation
- **Transit** – Planning, design and integration of sensor-based infrastructure for LRT and BRT projects
- **Technology Facilitation and Integration** – Participating with agencies, manufacturers and research organizations on possible deployment of AV/CV transit

INDUSTRY PARTNER DESCRIPTION

GUNDA applies emerging technologies to existing transportation facilities and infrastructure to improve current operations in preparation for future technologies. GUNDA's knowledge of existing transportation facilities and infrastructure, and understanding of emerging technologies is well placed in serving both public agencies and private firms that want to interface their products with infrastructure. GUNDA can assist clients with planning, data analytics, design, implementation and management of assets.

PAST & ONGOING PARTNERSHIPS

GUNDA is assisting our clients in the utilization of emerging technologies to solve transportation and municipal infrastructure challenges. Partnerships include:

- TXDOT Houston - Traffic Signals & ITS Asset Management
- NYSDOT - V2I, Data Analytics, Decision Support System for NYDOT Lower Hudson Transit Link Integrated Corridor Management
- City of Houston - City-wide V2I, Communications, Data Analytics for Houston ITS project

CONTACT INFO

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CONTACT INFO

Ahmad Sadegh

Smart Mobility/Smart City
Kapsch TrafficCom North America
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AREAS OF EXPERTISE

⊙ Connected Vehicles ⊙ Tolling Systems & Products ⊙ Traffic Management Sys.

TOOLS & SERVICES

Kapsch TrafficCom North America is a provider of ITS in the fields of tolling, traffic management, smart urban mobility, traffic safety and security, and connected vehicles. As a one-stop solutions provider, Kapsch offers end-to-end solutions, from components and design to the implementation and operation of systems – offering an innovative solution set capable of contributing towards the Texas Proving Grounds and/or encouraging public-private data sharing:

- **Urban Mobility** – Kapsch EcoTrafix modular application is a regional, multimodal and multiagency platform enabling agencies to deploy smart mobility solutions such as: ICM, Regional and Statewide Information Exchange Network, smart mobility deployment, and more.
- **Advanced Transportation Management Systems** – Kapsch’s DYNAC® Software is a high-performance, integrated and modular software suite used to monitor and control traffic, life safety, and management of facility assets and processes. The design allows for full integration of ATMS and SCADA, making it ideal for collecting traffic and facilities-related data from highways, managed lanes, and bridges and tunnels.
- **Electronic Toll Collection Systems** – Kapsch provides E2E tolling roadside systems and managed lanes – detection, single gantry, design, advanced host features (trip-building & dynamic pricing), and on-board units.

INDUSTRY PARTNER DESCRIPTION

With the focus of smart city and mobility, Kapsch has developed and acquired essential services and applications to partner with cities, communities and regions in this important mission. This includes transportation management, transit management, advanced signal systems, multi-agency and multimodal integrations, traveler information, electronic tolls system, mobility on demand, parking management, connected corridors, connected vehicles and more.

PAST & ONGOING PARTNERSHIPS

Kapsch TrafficCom North America is empowering municipal decision makers to achieve concrete community impact through a number of partnerships:

- **DFW ICM and 511 Partnership** – Kapsch as the overall system integrator partnered with DART, TxDOT, NCTCOG, NTTA, Cities of Dallas, Plano, and Richardson and Texas A&M, UT Arlington and SMU to deploy the US 75 ICM project and the first 511 traveler information system in Texas.
- **DFW Information Exchange Network and 511 System** – Kapsch is in partnership with NCTCOG to expand the regional information exchange network and 511 system to the entire DFW metroplex and 50 cities.
- **Niagara International Transportation Technology Coalition Information Exchange Network (NITTEC)** – Kapsch with NITTEC and its 14 member agencies in US/Canada has deployed their first bi-national Information Exchange Network. Kapsch is working with the coalition to expand and apply its EcoTrafix application to potential ICM systems.



AREAS OF EXPERTISE

- ⊙ Big Data: Management & Open Platforms
- ⊙ Big Data: Analytics & Mobility Applications
- ⊙ Sensor-Based Infrastructure

TOOLS & SERVICES

NTT DATA Services is a leader in Information Data Management, IT Security Services, and Application Services – offering an innovative solution set including the following:

- **Big Data Solutions & Analytics** – Multiple services, tools, methodologies, and reference architecture focusing on Information Management, Performance Management, Predictive Analytics, Data Mining, Machine Learning, and Governance.
- **Global Threat Intelligence Platform (GTIP)** – Delivers next-generation enterprise cybercrime toolkit of software and managed services to proactively identify and defend against IT Security threats.
- **AMO – Application Management Outsourcing** solution helps identify immediate and long-term optimization opportunities.

INDUSTRY PARTNER DESCRIPTION

NTT DATA Services is a top 10 global business and technology services provider with 100,000+ employees, across 50+ countries, with deep business and technology insight and industry expertise. Our Public Sector team focuses on applying technology in innovative ways to improve government operational efficiency and agility. Services include Digital and Application Services; Cloud; Infrastructure; Security; and BPO Services. NTT DATA has partnered with TxDOT to improve and modernize delivery of their IT services. TxDOT has reduced their annual IT operational spend by 28%, reinvested in platform and system modernization, and improved the quality of services to citizens and stakeholders.

PAST & ONGOING PARTNERSHIPS

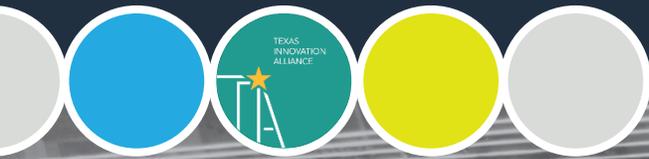
NTT DATA Services empowers its clients to achieve cost savings, service improvement, modernization and innovation through a number of partnerships:

- **Texas Department of Transportation** – TxDOT managed IT services agreement
- **Texas Department of Information Resources** – Various IT service projects
- **NTT Innovation Center** – NTT R&D program focused on enterprise IT services, security, cloud services, mobile solutions, social and data analytics.

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CONTACT INFO

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AREAS OF EXPERTISE

- ⊙ Big Data: Traffic Operations
- ⊙ Big Data: Transportation Planning & Performance Assessment
- ⊙ Roadway Analytics & Mobility Applications

TOOLS & SERVICES

INRIX is a leader in connecting cars to Smart Cities – offering an innovative solution set capable of contributing towards the Texas Proving Grounds and/or encouraging public-private data sharing:

- **Real-Time Traffic & Parking Data** – INRIX Monitoring Sites and APIs cover all use cases for traffic and parking operations.
- **Origin-Destination Data** – INRIX Trip Reports provide individual observations including O-D as well as discrete waypoints to identify specific routing of each trip.
- **Complete Analytic Suites** – Suite of tools to easily turn big data into valuable information.

INDUSTRY PARTNER DESCRIPTION

INRIX is the global leader in connected car services and transportation analytics, a new approach that leverages big data and the cloud to help manage urban mobility. By aggregating a variety of sources and applying intelligence, INRIX delivers comprehensive data and solutions to help move people, cities, and businesses forward. Our partners are automakers, governments, mobile operators, developers, advertisers, as well as enterprises large and small. INRIX collects anonymous, real-time GPS data from over 300 million connected vehicles and devices globally, providing real-time and historical information on all freeway, principal arterials, and most minor arterials across Texas.

PAST & ONGOING PARTNERSHIPS

INRIX is empowering municipal decisions to achieve concrete community impact through a number of partnerships:

- **CATT Lab at UMD** – The Center for Advanced Transportation Technology (CATT) Lab at UMD provides a powerful suite of roadway performance measures, both real-time and historical.
- **StreetLight Data** – StreetLight Insights is a comprehensive web based platform for location based (O-D) analysis.
- **Consultant Engineering & Planning Partners** – INRIX provides direct access to both data and analytics to industry leading consulting firms who specialize in servicing public sector clients.





AREAS OF EXPERTISE

⊙ Shared Mobility ⊙ Freight & Logistics ⊙ Communications & Telematics

TOOLS & SERVICES

Pape Dawson is a leader in shared mobility, freight and logistics, and communications and telematics – offering an innovative solution set capable of contributing towards the Texas Proving Grounds and/or encouraging public-private data sharing:

- **Shared Mobility** – Pape Dawson has completed and implemented a wide variety of projects that include the addition of hike and bike lanes and Complete Streets.
- **Freight & Logistics** – Not only is Pape Dawson a leader in traffic and mobility analytics, but also in the logistics of maintaining and increasing freight movement.
- **Communications & Telematics** – Pape Dawson leads innovative thinking in communications and telematics through our self-created data management platform that allows access for all involved in the project.

INDUSTRY PARTNER DESCRIPTION

Founded in 1965, Pape Dawson Engineers, Inc. has been on the forefront of innovative thinking and design throughout our history. Many of our projects include shared mobility and mobility applications, such as the South Texas Medical Center intersection improvements in which we created the final design for the addition of bike lanes and ADA compliant ramps. Using our self-created data management platform, we have streamlined the process for communication and telematics contributing to many successful projects with clients, including TxDOT, the City of San Antonio, Bexar County, and others.

PAST & ONGOING PARTNERSHIPS

Pape Dawson is empowering municipal decisions to achieve concrete community impact through a number of partnerships:

- **Texas Department of Transportation** – Pape Dawson has enjoyed a long history with TxDOT, resulting in a portfolio of varied, successful projects across the state.
- **City of San Antonio** – With our main office in San Antonio, Pape Dawson has developed a strong partnership with the City through projects and community involvement.
- **Bexar County** – Bexar County has long been a Pape-Dawson client, and many successful projects are the result of this collaboration.

CONTACT INFO

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**ATTENDEE
LIST**

TEXAS MOBILITY SUMMIT 2.0

First Name	Last Name	Organization
Ross	Alaspa	TxDOT
Sal	Alonzo	El Paso County
Linda	Alvarado-Vela	Alamo Area MPO
Melanie	Alvord	TxDOT
Darran	Anderson	TxDOT
Benjamin	Anyacho	TxDOT
Koushik	Arunachalam	Arcadis US Inc.
Kayleigh	Axtell	TxDOT
Sonya	Badgley	TxDOT
Tom	Bamonte	North Central Texas Council of Governments
Sharon	Barta	Retired Texas DOT
Bart	Benthul	Bryan-College Station MPO
Vernon	Beyer	Traffic Technology Services, Inc.
Oni	Blair	LINK Houston
Scott	Boone	Cambridge Systematics
Chris	Bosco	Freese and Nichols, Inc.
Martha	Boyd	TxDOT
David	Bridges	Texas A&M University -- Corpus Christi
Richard	Brooks	MedStar Mobile Healthcare
Sean	Cagan	Houston METRO
Joe	Camp	Southern Methodist University
Scott	Carlson	Iteris
Chris	Caron	TxDOT
Felipe	Castillo	HALL Group
Lea-Der	Chen	Texas A&M University - Corpus Christi
Kristie	Chin	University of Texas at Austin, CTR
Raymond	Chong	Corpus Christi
Eulois	Cleckley	HGAC
Hayley	Collins	Cambridge Systematics
Mark	Conway	Walter P Moore
David	Coronado	City of El Paso International Bridges Department
Kelley	Coyner	Center for Regional Analysis, George Mason University
Maureen	Crocker	Gulf Coast Rail District
Brian	Cronin	FHWA
Fabiola	Dagrin	Arup Texas, Inc
Jim	Dale	City of Austin, ATD
Jose	De La Cruz	City of San Antonio
Chris	Debaillon	Fort Bend County
Gail	Delaughter	Houston Public Media

TEXAS MOBILITY SUMMIT 2.0

First Name	Last Name	Organization
Samer	Dessouky	University of Texas at San Antonio
John	Dewar	Freese and Nichols, Inc.
Frank	DiGiammarino	Accelerated Digital Ventures
Robert	Dority	NTT DATA Services
Mark	Dowd	Smart Cities Lab
Robert	Doyal	VIA Metropolitan Transit
Terri	Duncan	TxDOT
Phil	Dupler	Fort Worth Transportation Authority
Jen	Duthie	City of Austin, ATD
Suzie	Edrington	VIA Metropolitan Transit
Amanda	Edwards	Council Member, City of Houston
Judge Ed	Emmett	Harris County
Robert	Evans	University of Texas at Austin, CTR
Brian	Fariello	TxDOT
Yvette	Flores	TxDOT
Amy	Fong	University of Texas at Austin, CTR
Les Sundra	Ford	First Transit
Ann	Foss	City of Arlington
Natasha	Fudge	Port of Corpus Christi
Travis	Fustes	Cintra
Glenn	Gadbois	Guest for Sunday Night
Mason	Gemar	General Motors
Nicole	Gilmore	TX Health & Human Services Commission, Medical Transportation Program
Dana	Glover	Texas Department of Insurance
Andrea	Gold	University of Texas at Austin, CTR
Ginger	Goodin	Texas A&M Transportation Institute
Gwen	Goodwin	Texas Southern University
Jerome	Gray	Houston METRO
Randy	Gregory	IBM
Ramesh	Gunda	Gunda Corporation
Ramesh	Gunda	Gunda Corporation, LLC
Hamid	Hajjafari	University of Texas at Arlington
Shima	Hamidi	University of Texas at Arlington
Clint	Harbert	Houston METRO
Robert	Heller	Southwest Research Institute
Kyle	Hirouji	CINTRA US SERVICES LLC
Sheila	Holbrook-White	MHMR Tarrant
Joseph	Holmes	First Transit
Jacque	Hrncir	City of Austin, ATD

TEXAS MOBILITY SUMMIT 2.0

First Name	Last Name	Organization
Courtney	Hunt	University of Houston
Maria	Irshad	ParkHouston
Lauren	Isaac	EasyMile
Marc	Jacobson	City of San Antonio
Christine	Jacoby	Freese and Nichols
Hudson	Jameson	Oaken Innovations
Tom	Jasien	Houston METRO
James	Johnson	Oaken Innovations
James	Johnson	Oaken Innovations, Inc.
Josh	Johnson	Southwest Research Institute
Cassandra	Jordan	TxDOT
Tim	Kelly	Houston METRO
Barbara	Koslov	Harris County Judge's Office
David	Krams	Port of Corpus Christi
James	Kuhr	University of Texas at Austin, CTR
Allison	Kurwitz	TxDOT, Bryan District
Tom	Lambert	Houston METRO
Jose	Landeros	County of El Paso
Ted	Lehr	City of Austin
Carol	Lewis	Texas Southern University
Bradie	Lockett	Houston METRO
Tim	Lomax	Texas A&M Transportation Institute
J. Sam	Lott	Texas Southern University
Kurt	Luhrsen	Houston METRO
Mike	Lukuc	Texas A&M Transportation Institute
Jianming	Ma	TxDOT
Danny	Magee	TxDOT
Bruce	Mann	Port Houston
Kent	Marquardt	TxDOT
Catherine	McCreight	TxDOT, Houston District
Daniel	McGinn	City of Corpus Christi
Robert	Miles	General Motors
Dave	Miller	Siemens
Lyndsay	Mitchell	City of Arlington
Julia	Monso	Cintra
Christopher	Mwalwanda	CDM Smith
Del	Nichols	Siemens
Robert	Nichols	Senator, Texas Legislature
Fawad	Noory	Domeo Technology
Birgit	Olson	Eberle Design, Inc.

TEXAS MOBILITY SUMMIT 2.0

First Name	Last Name	Organization
Mary Ann	Ottinger	University of Houston
Vassilis	Papayannoulis	Metropia, Inc
Michael	Parks	Brazos Valley Council of Governments
Chair Carrin	Patman	Houston METRO
Jordan	Payson	City of Austin, ATD
Kevin	Pete	TxDOT
Christopher	Poe	Texas A&M Transportation Institute
Jeffrey	Pollack	Corpus Christi MPO
Yi	Qi	Texas Southern University
Rebecca	Reyes	TxDOT
Abbey	Roberson	Texas Medical Center
Curtis	Rock	Corpus Christi Regional Transportation Authority
Troy	Rother	City of College Station
Shelley	Row	Shelley Row Associates
Daniel	Rudge	Bryan/College Station MPO
Natalia	Ruiz Juri	University of Texas at Austin, CTR
Scott	Rule	JPS
Leslie	Ruta	Port of Corpus Christi
Laura	Ryan	Commissioner, Texas Transportation Commission
Paula	Sales-Evans	TxDOT
Hannah	Santiago	City of San Antonio
Russell	Schaffner	Tarrant County
Gary	Schatz	City of Bryan
Darcie	Schipull	TxDOT, San Antonio District
Cynthia	Scott	Houston METRO
Judge Patrick	Sebesta	Brazoria County
Debbie	Sechler	Houston METRO
Matthew	Seubert	City of Houston Planning and Development Dept.
Mashhood	Shah	Pape-Dawson Engineers, Inc.
Jonathan	Sierra-Ortega	Senate Committee on Transportation
Andy	Skabowski	Houston METRO
Andrew	Slote	Tech Titans
Rob	Spillar	City of Austin, ATD
Christina	Stokes	El Paso Metropolitan Planning Organization
Sean	Strawbridge	Port of Corpus Christi
Stacey	Strittmatter	TxDOT
Nicole	Stuttz	Houston METRO
Karla	Taylor	City of Austin, ATD
Dan	Teczar	TxDOT

TEXAS MOBILITY SUMMIT 2.0

First Name	Last Name	Organization
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Trevor	Theunissen	Uber
Ted	Trepanier	INRIX
Roberto	Treviño	Houston METRO
Andy	Tryba	Ride Austin
Katie	Turnbull	Texas A&M Transportation Institute
Austin	Valentine	TxDOT
Jesus	Valtier	TxDOT
Linda	Vela	Alamo Area Metropolitan Planning Organization
Raghu	Veturi	Gunda Corporation
C. Michael	Walton	University of Texas at Austin
Jeffrey	Weatherford	City of Houston
Jeffrey	Weidner	University of Texas at El Paso
Joe	Willhite	WSP
Alicia	Winkelblech	City of Arlington
Steve	Young	VIA Metropolitan Transit
Mia	Zmud	Metropia, Inc



KEY PARTNERS

THANK YOU

Thank you to Team Houston for hosting the 2017 Texas Mobility Summit. A special thanks to Houston METRO and Houston-Galveston Area Council (HGAC) for your leadership and support as this year's Key Partners. We thank the Team Houston members for their commitment to advancing mobility and innovation in Texas. We recognize Commissioner Laura Ryan of TxDOT, Judge Ed Emmett of Harris County, Judge Patrick Sebesta of Brazoria County, Chair Carrin Patman of Houston METRO, Council Member Amanda Edwards of the City of Houston, and Senator Robert Nichols as Chairman of the Texas Senate Transportation Committee for their continued leadership and commitment to community.

The Texas Innovation Alliance recognizes that recent events call for the Summit to be a symbol where Texas stands united in the pursuit of innovation. It is an opportunity for us to apply our collective ingenuity to meet our challenges, whether they be historic flooding, reliable connections to medical services, or the everyday commute. From stories of local heroes to global support, there is the apparent realization that mobility is mission critical.



TEAM HOUSTON PARTNERS



SPONSORS

THANK YOU

Thank you to all of our sponsors for your commitment and leadership in the Texas Mobility Summit. We deeply appreciate your support and contributions to the success of the event. We look forward to continuing to foster public-private partnerships – improving the lives, safety, and economic prospects of all Texas communities through innovative mobility solutions.

--- PLATINUM ---



--- GOLD ---



--- SILVER ---





ACKNOWLEDGMENTS

THANK YOU

The Texas Innovation Alliance thanks all who have contributed to the success of the Texas Mobility Summit 2.0. The leadership and support from the Texas Department of Transportation (TxDOT) has been instrumental in developing the process, engaging stakeholders, and facilitating partnership opportunities. A sincere thanks to Darran Anderson, Director of Strategy & Innovation, for his direction and ethos of collaboration. We deeply appreciate the support of TxDOT's Division of Strategic Planning, who work diligently to enable the success of the Summit and Alliance activities.

We appreciate Dr. C. Michael Walton, Cockrell Centennial Chair in Engineering at the University of Texas at Austin and Chair of the Texas Technology Task Force (TTTF), and the TTTF members for contributing their expertise. We thank Tom Lambert, President & CEO of Houston METRO, and the Houston region public officials for their continued leadership and ability to bring people together with unity of purpose. A special recognition of the Texas Automated Vehicle Proving Grounds Partnership, particularly Texas A&M Transportation Institute and University of Texas at Austin's Center for Transportation Research, for demonstrating a future of connected and automated vehicle technologies. Thank you to the Organization Committee, including Cynthia Scott, Ramona Crayton, Tracy Jackson, and Eulois Cleckley of Team Houston; Houston TranStar; TxDOT; and Housman & Associates for your dedication and commitment.

To the Team Leads, we recognize your leadership, advancement of emerging technologies, and collaboration for the benefit of all Texas communities. Thank you to the team members, industry representatives, distinguished speakers, and many others for continuing Texas' leadership in mobility and innovation. Through our collective efforts, we are advancing the Texas Proving Grounds, expanding public-private data sharing, and effectively preparing our transportation systems to perform in moments of routine and resiliency.

2017 TEAMS

Team Arlington (ARL-AV)	Team Austin	Team Bryan-College Station	Team Coastal Bend
Team DFW (Tarrant County)	Team El Paso	Team Houston	Team San Antonio
	Team Texas R&D	Team Open Data	

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