

# **Beyond Traffic: The Smart City Challenge**

## *Connect to Jax – C2JAX: A smarter, better Jacksonville*

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As the largest geographic city in the United States, admittedly, there are a few places in the City of Jacksonville where parking is not a problem. Of course, those places are very often adjacent to pasture land for livestock rather than in downtown. Nonetheless, as the 12<sup>th</sup> largest city in United States by population, at over 820,000 people, we have plenty of parking issues, traffic issues, public transit issues, and general quality of life issues. While we have a growing and robust public transportation network with a steady increase in ridership, Jacksonville has historically been a very auto-centric city. As such, we have a high number of vehicles in our roads daily, hence a higher traffic volume.

The local electorate has time and again demanded the tax rate within the City remain among the lowest in the State of Florida. While this allows for a business-friendly climate, it makes providing essential services to nearly a million people more challenging, especially following the recent recession. Florida was one of the states hit hardest by foreclosures, a fact that had an even greater impact on local governments. The money necessary for capital improvements has shrunk. Maintaining the necessary cash flow to cover debt service remains a challenge.

Necessary repairs go undone. This past spring, during our Mayoral election, a section of roadway along the St. John's River in downtown fell in upon itself, leaving nearby residents without power for days.

Finally, two of our unfortunate claims to fame involve fatalities. Last year, Jacksonville had over 100 homicides for the second year in a row. Additionally, we were ranked the third highest Pedestrian Danger Index (PDI) of large metro areas in the country in 2014. PDI is the rate of pedestrian deaths relative to the number of people who walk to work in the region. It is simply not safe on our streets.

We are well capable of handing the current traffic load on our roads. However, we do have rush hour back-ups, slowdowns, and standstills due to the 100,000 people who come into the City each day from surrounding counties, and the nearly 60,000 people per day who commute into downtown. But for how long will we be able to effectively handle this ever increasing load? As is the case in most major cities, one stalled vehicle can substantially increase commute times. Pair this with expected population increases to cities, especially Southern cities, and the realities of the L.A. freeway seem ever looming.

The strengths of our City are like pencil lines on a blank canvas outlining the masterpiece that is prepared to unfold. Jacksonville sits at the intersection of the eastern and southern corridors of the federal interstate system with the crossing of Interstates 10 and 95, but does not have any other abutting metro areas. JAXPORT, our deep water port, handled 8.3 million pounds of cargo in 2014. Jacksonville International Airport has 90 non-stop daily flights with a 15 percent lower

ticket price than comparably sized airports, and Cecil Spaceport is an operational, registered spaceport. Additionally, Jacksonville has two Class 1 rail lines (CSX and Norfolk Southern) giving our port rail connectivity to the entire southern and eastern corridors.

The consolidation of our city and county governments means our Mayor and City Council govern 75 percent of the urban population, and we have established interlocal agreements with the transportation authority, electric and water utility, port authority, and airport authority. Our Mayor holds appointment power for a varying number of appointees of each authority. This consolidated form of government has made cooperation with entities such as our Metropolitan Planning Organization (MPO) much smoother. Our local MPO, the North Florida Transportation Planning Organization (TPO) represents four counties covering more than 3,000 square miles and 1.3 million citizens, as well as the United States Navy, which has two bases and nearly 25,000 enlisted personnel within the MPO.

The success of the collaboration between the TPO and local government is evidenced by the completion of a \$11 million, state-of-the-art Regional Transportation Management Center (RTMC). The RTMC has 6,500 square foot of traffic management space and 32 individual work stations, which can all view the 24' x 6'9" video wall. This facility is capable of withstanding a Category 3 hurricane, and is the first facility in Florida to be interconnected to the Florida Department of Law Enforcement to facilitate a combined response to Homeland Security threats.

The implementation plan for the Connect to Jax (C2JAX) project is simple and straight forward. First, we will complete our ITS foundation, including replacing dated fiber optic cable in our urban core, complete unconnected runs of fiber optic lines, install nearly 1,000 additional Bluetooth traffic sensors, complete installation of GPS trackers in all public vehicles including police, fire and emergency vehicles, as well as, all public works vehicles, and any unconnected public transit vehicles, and develop agreements with and promote the use of mobile apps, such as Waze, which will incorporate the data collected. Completion of these current assets will give us connected capability across our 840 square mile footprint that serves 75 percent of our urban population, with the ability to easily expand to cover the additional 25 percent in our region.

Next, we will focus on expanding our ITS foundation through the installation of wireless internet at each of our 1,000 intersections, expanding our preemptive signaling plan for emergency and public transit vehicles, expanding our network of 48 smart sensor enabled street lights to the entire urban core, and complete our current plan for our Bus Rapid Transit (BRT) system to appeal to more commuters and residents without vehicles. After the completion of the first two aspects of the C2JAX plan, Jacksonville will have an impressive ITS

foundation on which to build. For a cost of approximately \$10-12 million dollars, our infrastructure will have the capability to:

- Measure point of origin and destination information on 532 miles of freeways and arterial roadways through a system of over 700 miles of fiber optic cable and 1,000 Bluetooth traffic sensors combined with public vehicle GPS and mobile app integration;
- Connect first responders, public employees in the field, connected vehicles, and private citizens through a network of over 1,000 connected intersections, enabling our system to
  - increase the capabilities of first responders and public employees by providing continuous wireless connectivity to a high speed network,
  - provide the ability for preemptive signaling across the system for first responders and public transit,
  - allow for real-time route changes to adjust to variances in traffic volume and flow in the entire system, and
  - connect to coming future technologies such as connected and automated vehicles, public and private drones, and others;
- Manage traffic flow and implement cross agency, coordinated responses from a single location through our state-of-the-art Traffic Management Center;
- Provide valuable information to the public that is both useful to everyday citizens through mobile app integration, as well as to the private sector in machine readable formats, at a minimum.

Finally, with a solid ITS foundation, we will expand our capability for future technologies, such as automated vehicles, expand our data collection and use to increase efficiencies to improve environmental impacts and user-focused services, and develop long-range planning that anticipates the future demands of citizens while incorporating smart land use principles. We will implement these strategies in a wheel and hub approach consistent with the foundational infrastructure we have solidified.

While maintaining downtown as the hub for the entire City and enhancing its vibrancy, we can focus on specific neighborhoods to enhance their vitality through smart technology. For instance, installing smart light fixtures with mobile app connectivity that serve to increase public safety and increase parking turnover in key business districts can have a substantial impact on pedestrian safety and the economic vitality of the, mostly, small businesses in these areas. Additionally, we can reduce the necessity for cars in local neighborhoods and increase the availability of bike share and car share options to reduce the growing strain on parking.

Implementation of the C2JAX plan will continue to be a joint effort between the City of Jacksonville, Jacksonville Transportation Authority, North Florida Transportation Planning

Organization, and Florida Department of Transportation, District 2. Cooperation and collaboration is currently the business model between each of these partners and this will continue to be the case.

Due to the cooperation and collective foresight of all past partners, Jacksonville is poised to be a world leader in smart and connected technologies. We have made sound, common-sense decisions that have made our City a better place to live. Our project fits the timeline and scope of this challenge, and when complete, will create a complete ITS infrastructure that meets the needs of a million people, is ready to accept connected and automated vehicles, goes beyond traffic solutions to determine the utility of other technologies, provides open, machine-readable data, and fosters an innovative and entrepreneurial environment.

## **POPULATION CHARACTERISTICS**

Jacksonville is a rapidly growing metropolitan city in Northeast Florida and one of the state's major urban population centers. With 127.6 square miles of water, Jacksonville's ability to accommodate leisure activities, water transportation and military institutions was inevitable. In 1940, Naval Air Station Jacksonville was built as a major training station in World War II. In 1942, Naval Station Mayport was built and continues to operate today. These military installations, along with other nearby facilities, make Jacksonville the third largest military presence in the country behind Norfolk and San Diego. Jacksonville is a key location for national defense and international commerce.

Jacksonville is currently a major logistics distribution center and intermodal transportation hub on the eastern seaboard of the United States. The city has a transportation network embracing port and air cargo facilities, rail, and trucking routes that allows millions of tons of raw materials and manufactured goods to move through the City annually. The Jacksonville Port Authority reported over 2,000 vessels with 915,292 TEU's used the port in FY 2015. Over 180,000 passengers have embarked on cruises from JAXPORT in each of the last four years.

According to the 2010 Decennial Census, Jacksonville has a population of 821,784 people. The city has a land area of 747 square miles and a population density of 1,100.1 persons per square mile compared to the State of Florida's average population density of 350.6 persons per square mile. The City of Jacksonville represents a significant portion of the population of the 2010 Census Urbanized Area that it is located in. The city represents 77 percent of the urbanized area's population. The City of Jacksonville and Duval County are a consolidated form of government. The four other incorporated entities within Duval County (Jacksonville Beach, Atlantic Beach, Neptune Beach, and Baldwin) have not been included in the demographic and geographical characteristics for the City of Jacksonville.

Jacksonville is the largest city by area in the continental United States. The distance between its most extreme eastern point and its western edge is approximately 40 miles. Within the City of Jacksonville, there are nearly 500 distinct neighborhoods, ranging from rural to suburban to dense urban core areas. Fifty-nine percent of the City's population is Caucasian, while approximately 31 percent of the population African-American. Jacksonville also has a sizable Hispanic population, which constitutes 7.7 percent of the population.

The Census Urbanized Area has a population of 1,065,219. Many people who work within the City of Jacksonville often commute from the urbanized area's communities surrounding Jacksonville and Duval County. Growth presents the Census Urbanized Area with challenges and opportunities. Projections from the University of Florida show that developed areas will approximately double between the 2010 and 2060 Censuses, and a population increase will follow suit.

Nearly 75 percent of this area's population today is Caucasian. Approximately 22 percent of the population is African-American, and there is a rising Hispanic population at approximately 6 percent. Statewide, approximately 68 percent of the population is White, 15 percent Black and 17 percent Hispanic. Regionally, Hispanics and Latinos are projected to have the largest increase in numbers when compared to their current population. By 2030, the Hispanic and Latino populations are projected to increase by approximately 100,000 people. This represents 7 percent of the projected 2030 population for the area.

Finally, although Jacksonville is the largest geographic city in the United States, our urbanized area does not connect to any other. For purposes of testing system-wide technology, we are a stand-alone, self-supporting system, which will make data more reliable and increase our ability to determine the root causes of problems and the effectiveness of our solutions.

## **PUBLIC TRANSPORTATION SYSTEM**

The Jacksonville Transportation Authority (JTA) is an independent state agency governed by a seven-member Board of Directors. JTA operates Jacksonville's public bus service, downtown automated Skyway and paratransit service. The Authority also plans, designs and builds roads and bridges. JTA's mission is to improve Northeast Florida's economy, environment and quality of life by providing safe, reliable and efficient multimodal transportation services and facilities.

In 2015, JTA set out Blueprint 2020 outlining the highest priority projects to be implemented over the next five years. Key Blueprint 2020 Smart City Initiatives include:

### **Skyway System Plan and Technology Assessment**

Downtown Jacksonville's Automated Skyway Express, commonly known as the "Skyway," is a 2.5 mile bi-directional system with eight stations. Planning started in the 1970s, and the first

segment became operational in 1988. The total cost of the Skyway implementation was approximately \$186 million (including planning, design, construction, vehicles and equipment) using local, state, and federal funding. With strategically based stations, the Skyway could expand through the downtown core and serve both sides of the river. With infrastructure improvements, a fully built out automated system could operate both on an elevated system with at-grade extensions into nearby neighborhoods.

### **Bus Rapid Transit**

In addition to the Skyway, JTA has developed the \$123.3 million First Coast Flyer Bus Rapid Transit (BRT) system consisting of 84 stations and 57.7 route miles connecting to downtown along some of Jacksonville's busiest corridors. Two of the five corridors opened to commuters in December 2015. The remaining will roll out over the next three years. Over the course of the rollout, transit signal priority will be added to 96 intersections and two new Park and Ride lots will open.

### **Route Optimization Initiative**

With its Route Optimization Initiative, JTA recently focused on capturing the transit dependent population that was not taking advantage of the public system. JTA has shifted its focus to these communities that have a natural transit ridership by optimizing transit routes to make them frequent and more direct. Through technology directly aligned with GPS radio communications systems on board buses, customers can access real-time passenger information on their smart phones and computers. In its initial year, ROI has had a 6 percent in ridership growth, with 12 percent and 18 percent increase during Saturdays and Sundays, respectively. As a result of ROI and his work in upgrading Jacksonville mass transit, JTA CEO Nathaniel Ford was among 11 officials from across the country to receive the "White House Transportation Champion of Change" award in October 2015.

### **Jacksonville Regional Transportation Center**

JTA's vision of a regional multimodal hub is coming to a reality with the Jacksonville Regional Transportation Center (JRTC). The JRTC will be a multimodal hub, located in the heart of downtown that will integrate key local, regional and intercity service in one location. The key benefit of the JRTC will be improved connectivity between modes including local bus, BRT and Skyway; regional bus and future commuter rail service; and intercity bus and passenger rail service. Design on the JRTC began in December 2015. Construction of the intercity bus terminal will begin in 2016 with JRTC construction set to start in January 2017.

## **ENVIRONMENT AND CAPACITY**

A 12-year partnership among the North Florida Transportation Planning Organization (TPO), Florida Department of Transportation (FDOT) and Florida Highway Patrol (FHP) culminated in

November 2015 with the opening of the North Florida Regional Transportation Management Center (RTMC) in downtown Jacksonville. As the cornerstone of the North Florida Regional ITS Master Plan, the RTMC was funded by the TPO as part of their ongoing investment in Intelligent Transportation Systems, which totals over \$30 million since 2003.

In addition to the TPO, FDOT, and FHP, the RTMC also houses transportation pods for officials from the City of Jacksonville, the Jacksonville Fire and Rescue Department, the Jacksonville Sheriff's Office and the Florida Fish and Wildlife Conservation Commission. FHP provides dispatch for ten state law enforcement agencies from the Center, while FDOT District Two is connected to every other District RTMC in Florida. A future goal is to bring in operators and data analysts from additional agencies, such as JTA.

This state-of-the art center is the hub of the region's Intelligent Transportation Systems infrastructure encompassing traffic signal controllers, vehicle detection sensors, travel origin and destination sensors, wind sensors, cameras and message signs. As the first Transportation Management Center in Florida to co-locate staff across agencies, the RTMC is the ideal facility to support Smart City strategies.

The City of Jacksonville and its partners have demonstrated through past grant awards their ability to receive and administer large-scale awards. The City has sufficient staff to fully and expeditiously carry out the demonstration throughout the period of performance. City partners such as FDOT and JTA have a long history of completing large transportation projects on time and on schedule.

JTA manages up to \$40 million per year in grant funds, both in capital and operations. As a designated recipient of Federal Transit Administration funds, JTA is familiar with the process of applying for and securing grant funds, procuring goods within grant fund parameters, meeting federal DBE standards, and overall administration of federal grants.

The City of Jacksonville and its partners have participated in several demonstration and pilot projects focused around Smart City technologies. In 2010, JTA and the City were one of the early adopters in testing AVL devices programmed specifically for Transit Signal Priority along a highly travelled corridor connecting downtown Jacksonville to the City of Atlantic Beach.

Another partner, FDOT District Two, has installed a system to provide parking availability information to truckers as they approach a rest area just south of Jacksonville. This project installed two high definition microwave vehicle detectors (MVDs), a CCTV and a dynamic sign. The MVDs are used to count the number of vehicles entering and leaving the truck parking area and the CCTV is used by RTMC Operators to verify visually what the MVDs are telling them. Computer software was written that adds vehicles entering the truck parking area and then subtracts them when they leave the truck parking area, thus constantly updating the number of

available spaces. The number of spaces is then sent to the dynamic display sign so that truckers know the number of available spaces at the rest area. This project used existing ITS infrastructure (fiber optic cable and device cabinets), which was key in minimizing the cost of installation.

Most recently, the City partnered with General Electric and the JEA, Jacksonville's Electric Authority, to launch an Intelligent Lighting pilot program with 48 lights fixtures and sensors installed along two downtown streets. While the initial rollout is focused on lighting controls and parking enforcement, the system has the ability to detect gun shots, improve pedestrian safety, identify available parking, and monitor traffic flow, illegal activities, storm water, air quality, and garbage collection, as well as provide public Wi-Fi and electric car charging stations.

## **SHARING ECONOMY**

As part of Jacksonville's commitment to the sharing economy, plans for the Jacksonville Regional Transportation Center include both car share and bike share by 2019. A city-wide bike share system would also tie into the City of Jacksonville Bicycle Master Plan set to be complete by the end of 2016.

In another Blueprint 2020 initiative, JTA and 12 regional partners developed TransPortal, a Virtual Transportation Resource Center accessible online or by phone. It provides a single point of access to plan and book regional and local multimodal travel including:

- Traditional transit & paratransit
- Bicycling
- Walking
- Car and van pools
- Volunteer driver programs
- Social & not-for-profit agency services

This information includes cost, travel time and availability. The transportation resource center also provides customers with the ability to reserve, modify or cancel paratransit trips through the Internet.

TransPortal won the Innovator of the Year Award from the Florida Commission for the Transportation Disadvantaged in August 2013 and the Trapeze Group Innovate Award in 2014.

## **ACCESSIBLE DATA**

With the TransPortal program, JTA and its partners share data to help the citizens of Northeast Florida find the best transportation options for their unique trip. The development of this regional system has been the result of the coordinated and dedicated efforts of the regional partners who have the vision to look outside of their individual agencies and focus on the needs of customers.

Transportation partners in the region have long recognized the value in multi-loading passengers from different counties going to similar destinations. However, it was difficult to coordinate these trips manually. By sharing software and machine readable databases, the coordination of trips through TransPortal is automated. The software enables JTA and other agencies to optimize trips while maintaining the secure separation of client and trip information.

## TECHNOLOGY SOLUTIONS

The C2JAX demonstration deployment aims to use a synergistic array of technology applications. In combination these applications will test the technologies, identify traveler behaviors, measure performance and ultimately achieve the potential of connected vehicles (CV) and automated vehicles (AV) in a busy downtown.

Jacksonville's demonstration technology solutions will realize multiple synergistic effects. Each of the technology uses listed below aim to bring together complementary CV and AV applications. For example, intelligent traffic signals and pedestrian sensors on light fixtures conjoin for safety benefits. These synergies aim to capitalize on inherently complementary capabilities, and so reduce costs and increase benefits for drivers and businesses affected by delay and safety considerations.

As shown in the annotated map, the C2JAX demonstration will use the following technology solutions aligned with the twelve USDOT vision elements.

### Completing the Network

#### Additional fiber

Connecting intersections throughout Jacksonville to central signal management software at the RTMC is imperative for an effective traffic management system. The ability to make remote and/or real-time timing adjustments, monitor system health and quickly detect and track both critical and minor system malfunctions is critical to an efficient transportation system. Furthermore, properly creating network rings by installing redundant communication routes increases reliability.

For this reason, completing the City's fiber optic network is the first priority in order to implement C2JAX technology solutions. FDOT has installed 145 miles of fiber connecting ITS devices along the interstate system in North Florida. JEA, Jacksonville's Electric Authority, also has thousands of miles of fiber that could be used to connect Smart City sensors. However, on some arterial roads and in certain areas of downtown, Jacksonville still has gaps in the network. The missing pieces can be seen on the site map.

Google has begun working with city leaders to explore the possibility of bringing fiber to Jacksonville which would definitely be incorporated into the C2JAX demonstration. Full network connectivity will create over 1,000 communications hubs at each signalized intersection providing city residents and visitors with free public gigabit Wi-Fi, access to communications, information and municipal services across the city. To realize the potential of connected vehicles, Jacksonville's network must first connect to intelligent infrastructure.

#### *Intelligent Traffic Signal System*

Currently, 473 of Jacksonville's 1,040 intersections are connected to the City's network with advanced traffic controllers. As part of the C2JAX demonstration, the remaining 567 unconnected signals would be upgraded in tandem with the rollout of additional fiber. Once the network is complete, Jacksonville will have a technologically advanced signal system that is real time responsive across the entire City for easy integration with the other C2JAX solutions. In addition, Emergency Vehicle Preemption and Transit Signal Priority functionality will be added along heavily travelled corridors as controllers are connected and upgraded.

#### *BlueTOAD devices*

The Florida Department of Transportation (FDOT), in partnership with the North Florida TPO deployed BlueTOAD traffic monitoring devices along major roadways throughout North Florida in 2013. This technology allows transportation planners and incident management to monitor and provide archived data for performance monitoring and real-time data for operations.

Bluetooth Travel-time Origination and Destination (BlueTOAD) detects anonymous message authentication code (MAC) addresses, wireless identifications used to connect Bluetooth™ technologies on mobile devices in vehicles such as phones, headsets and music players. The system calculates travel time through analysis of subsequent detections.

Device installations are non-intrusive and are typically completed in under an hour. Travel times and road speeds are available in real time. Integration with existing traffic information systems, including overhead signs, web portals and traffic management centers, is straightforward. All data is archived for robust analysis of speed trends, origin-destination, route patterns, trip length analysis and signal timing studies.

The City of Jacksonville and FDOT currently maintain 160 BlueTOAD devices. An additional 918 devices would be needed to complete the system on all interstates and arterial roadways providing valuable data to the analysts at the RTMC.

#### *Other sensors*

Other ITS sensors that are currently used by the City and other agencies are 100 dynamic message signs, 30 road weather information systems and over 200 CCTV cameras. While these stand-alone sensors and communication devices will continue to be deployed on freeways and

arterials, the demonstration will add this smart infrastructure to light fixtures as part of an expansion of the smart lighting downtown pilot project. Video on Demand, air quality monitoring, storm water/street flooding monitoring and public Wi-Fi can also be added to these Intelligent light fixtures allowing for flexible upgrades based on future ITS needs.

Completing the gaps in Jacksonville's current infrastructure development will allow for interconnected communication between travelers and all the partner agencies based at the RTMC and satellite locations. These local agencies can then utilize all the data generated by these sensors to target areas of need due to demand and growth. Freight operations at JAXPORT can be enhanced to reduce delay, decrease environmental impacts, improve schedules and decrease bottleneck areas. Looking to the future, the region can easily implement the next steps needed to address connected and automated vehicle technology.

Applicable USDOT vision elements include:

- Vision Element #3: Intelligent, Sensor-Based Infrastructure
- Vision Element #6: Urban Delivery and Logistics
- Vision Element #7: Strategic Business Models and Partnering Opportunities
- Vision Element #10: Architecture and Standards
- Vision Element #11: Low-Cost, Efficient, Secure and Resilient ICT

### C2JAX App Development

Mobile computing, social media, GPS and data analytics offer new ways to more efficiently move people around Jacksonville. Information technology is being recognized as the key that allows people to use roads and transit services most effectively. Real-time information should clearly describe what routes are optimal based on a citizen's mode choice. The key to this transformative technology is the real-time link between transportation and transit partners and individual drivers and passengers conveniently utilizing these services.

Currently, there are multiple transportation apps focused on Jacksonville. Through the C2JAX demonstration, we will determine the best way to make the system's data readily available to users. Ideally, this will be accomplished by partnering with developers of a private app, such as Waze, discussed below. However, if that option proves to not be possible, the partners possess the capability of developing our own app so internal development is a possibility. This app will aggregate Jacksonville's transportation and transit information from multiple sources. With the additional fiber and sensors completing Jacksonville's ITS network, this app would expand FDOT's 511 information to include data from the arterial system as well. With sensors on intelligent light fixtures and in parking garages, the app will have the ability to send turn-by-turn directions to the nearest available parking space ultimately allowing reservation of parking and payment by smart phone.

With a robust, open-source app creating incentives to new and established transportation businesses, Jacksonville can leverage the data feeding C2JAX to place traffic information in the pocket of travelers while at the same time optimizing travel performance based on user feedback.

The following transportation apps focused on Jacksonville will be integrated into C2JAX:

#### FDOT's 511

The FDOT 511 Traveler Information System is a free phone and internet resource that provides real-time traffic information on Florida limited access facilities. The statewide system provides information on commuter travel times, construction, lane closures, crashes, congestion and severe weather affecting traffic. Callers can also access a limited amount of public transit, airport and seaport information. In the event of an emergency, 511 provides information on road closures and evacuation information. Selected area CCTV camera feeds are also available. Traditionally, this service has focused on the freeways, but is beginning to expand to the arterials.

#### Waze

Waze is a relatively new, free community-based traffic and navigation application recently purchased by Google. The application, while in its early developmental phases, is capable of providing travel time, speed and incident information for a user's potential route. The information is based on "Wazers" who actively feed the program data and confirm incident conditions, educating other users on traffic conditions in real time. FDOT has recently begun to partner with Waze to see how it can be used to provide this information for the state's arterial network.

#### Transit Apps

JTA's innovative TransPortal database has received multiple awards for helping citizens navigate the full spectrum of regional transportation options. JTA real-time transit information can found at NextBus, but in order to process payments for electronic tickets customers must navigate to a separate app such as My JTA or JTA's STAR Card website and app.

For travelers regularly crossing the St. Johns River east of downtown, the City of Jacksonville Information Technology Division developed an app with real-time ferry departure updates.

Applicable USDOT vision elements include:

- Vision Element #4: Urban Analytics
- Vision Element #5: User-Focused Mobility Services and Choices
- Vision Element #7: Strategic Business Models and Partnering Opportunities
- Vision Element #9: Connected, Involved Citizens

### **Automatic Vehicle Location Optimization**

Automatic Vehicle Location (AVL) is already being used to track over 400 vehicles in the FDOT fleet and on JTA BRT buses. Expanding Jacksonville's AVL capability will allow the City to track and manage its vehicles resulting in better performance and lower overall fleet costs. Adding AVL to the remainder of the JTA bus fleet and paratransit vehicles will assist in the Route Optimization Initiative and is a necessary component of Transit Signal Priority across all routes.

A live, interactive view allows fleet managers and traffic analysts at the RTMC to observe fleets of vehicles across agencies. Managers can monitor transit, public works, emergency response or utility vehicles in real time, noting vehicle status easily, seamlessly, and directly within the RTMC or satellite location. Using a combination of technology, hardware and software, AVL is a Smart City technology solution to control costs and manage resources through real-time, accurate monitoring of every vehicle in the City's fleet.

### *Emergency Vehicle Preemption*

Emergency Vehicle Preemption (EVP) for emergency first responder vehicles is a connected vehicle technology solution that would be leveraged with AVL installation on City police cars and fire trucks. The goal of EVP is to facilitate safe and efficient movement through intersections. EVP can improve response times, reduce intersection crash rates and prevent injuries and related costs.

### *Transit Signal Priority*

JTA's newly instituted First Coast Flyer BRT routes offer efficiency gains in moving more people in fewer vehicles along heavily travelled routes. Transit Signal Priority (TSP) reduces dwell time at traffic signals for BRT vehicles by holding green lights longer or shortening red lights. On other JTA bus routes, though, service suffers from poor signal progression due to heavy volumes and passenger vehicles blocking access to bus stops.

With AVL installed on the entire JTA fleet, TSP could be added to all connected signals reducing trip times and increasing reliability of all routes. The performance of this application would be measured by capturing real-time data to estimate bus travel time savings and person-hours saved.

Applicable USDOT vision elements include:

- Vision Element #2: Connected Vehicles
- Vision Element #3: Intelligent, Sensor-Based Infrastructure
- Vision Element #5: User-Focused Mobility Services and Choices

## **Intelligent Light Fixtures**

Intelligent lighting presents a unique platform for demonstration technologies. Lights are a ubiquitous presence and provide an optimal location for cameras and ITS sensors. Additionally, light fixtures already provide a source of power, secure mounting and a commanding viewpoint of surrounding areas. Light fixtures equipped with ITS sensors can serve as a foundation for a safer, more efficient and intelligent city. Leveraging the technologies currently being used in the GE intelligent lighting pilot program, the demonstration would add future Smart City capabilities outlined below.

### **Pedestrian Safety**

Pedestrian safety can be improved by generating early warning signals for drivers. These early warning signals will be sent from a fixture that has detected a pedestrian in the street to vehicles that will soon be crossing the area. With data on these pedestrian movements collected from the fixture sensors, the RTMC will optimize traffic signal times for road users.

Using advanced video analytics, the fixture sensors can monitor and detect pedestrians crossing the road and immediately send notifications to nearby vehicles (including early adopter transit and emergency vehicles), intelligent traffic signal infrastructure and personal mobile devices. In the case of an incident, relevant information can be recorded in the form of images, video streams and audio. This information can be made available to relevant authorities for further analysis, ultimately incorporating lessons learned into improved pedestrian safety.

Initial deployment of these sensors will be focused on accident data particularly focused on bus stops, senior citizen centers and school zones. Traffic safety enforcement will be targeted to these high-risk areas, further increasing pedestrian safety for vulnerable senior citizens and small children.

### **Intelligent Parking**

Light fixtures equipped with intelligent sensors can be used to reduce traffic and increase turnover in key business areas of the city of Jacksonville by using existing parking spots more efficiently. An estimated 30 percent of traffic in a city is caused by drivers searching for parking spots. Intelligent parking solutions will help the City of Jacksonville reduce congestion, improve air quality, and create more turnover during business hours, benefiting area business owners and retail establishments. Another benefit of this solution is the optimization of parking enforcement efforts. Using advanced video analytics, City staff can identify parking violations and available parking spaces.

Notification of potential violations detected by intelligent fixtures can be sent to the authorities for immediate action. GPS-time stamped photos of the vehicle in violation will aid them in

proving culpability. This solution can also help drivers to better understand their parking options, including on-street parking availability.

In anticipation of future electric vehicle deployment, the intelligent fixtures can also serve as energy storage and charging stations for parked EVs. JEA, a key partner in installing intelligent lighting, is exploring the use of smart-grid technology in the fixtures as part of the North Florida Clean Fuels Coalition's long-term strategy for promoting EVs.

#### *Dynamic Wayfinding*

Another use of intelligent lighting that will be incorporated into the project is the opportunity to add dynamic messaging signs to the fixtures and use the lights themselves as a way to direct drivers, cyclists, pedestrians and first responders to optimal routes.

For special events, lanes can be reversed to accommodate traffic flow by changing messages on digital signs attached to each fixture through a secure communication environment from the RTMC. During certain times of day or days of the week, streets open only to cyclists and pedestrians can be easily identified by these signs.

Additionally, popular bicycle/pedestrian routes that share lanes with cars can have higher light levels. In the event of a traffic accident, emergency personnel could bring a dimmed light up to full, just in the area of the accident. In other cases, police, fire rescue or medical personnel could reach their destination faster if the pole-mounted LED fixture in front of a home or business was flashing continuously as a beacon.

Applicable USDOT vision elements include:

- Vision Element #2: Connected Vehicles
- Vision Element #3: Intelligent, Sensor-Based Infrastructure
- Vision Element #5: User-Focused Mobility Services and Choices
- Vision Element #7: Strategic Business Models and Partnering Opportunities
- Vision Element #8: Smart Grid, Roadway Electrification and Electric Vehicles

#### **Open Data Portal**

With new ITS sensors implemented at connected intersections and installed as part of the rollout of Jacksonville's intelligent lighting pilot, the RTMC will amass volumes of data.

Additional data will stream in from citizens interacting with the C2JAX app. Sharing this data among the demonstration partners will help break down agency boundaries and organizational silos, allowing for more efficient service delivery. In addition to shared intra-agency information collection and dissemination, a fundamental goal of this project is to make this flood of data easily accessible to the public.

Open, machine-readable data will be made available to everyone allowing entrepreneurs to dig deeper with their own analytic tools that will support emerging transportation businesses. New value will be created when third parties develop innovative applications and services to address public and private needs. Open data will also empower citizens increasing engagement with transportation agencies and encouraging participation in policymaking and planning for the future.

This open data will be integrated and organized by the City's Information Technology Division and will be made available from the City of Jacksonville website. It will be rolled out at an early stage of the demonstration and scaled up as citizens increase their usage.

Applicable USDOT vision elements include:

- Vision Element #3: Intelligent, Sensor-Based Infrastructure
- Vision Element #4: Urban Analytics
- Vision Element #5: User-Focused Mobility Services and Choices
- Vision Element #7: Strategic Business Models and Partnering Opportunities

### **Skyway Extension and Automated Vehicles**

JTA's Automated Skyway Express (Skyway) is the driverless downtown people mover that currently travels a 2.5 mile bi-directional system with eight stations from 6am-9pm on weekdays. Ridership is relatively low, averaging 4,930 a day in 2015, but for special events like the 2005 Super Bowl and the annual One Spark festival ridership can climb to over 80,000.

Due to out-of-date technology (current Skyway vehicles are beyond mid-life and past due for overhaul), JTA has launched a Skyway Modernization Program including replacement of the existing vehicles and evaluation of future extensions. As JTA explores the proper vehicles, it could be the setting for the next generation of automated technology that could utilize the elevated structure and explore at-grade extensions as technology allows.

As the C2JAX downtown smart sensors are added to traffic signals and intelligent light fixtures, an automated vehicle picking up passengers from the current Skyway terminals can utilize the connected vehicle technology to move commuters into outlying neighborhoods without the high cost of fixed elevated rail and station constriction. Connecting these neighborhoods to the urban core would ultimately spur transit oriented development and smart land use.

As a pilot project, an electric assist bike share fleet would provide data on potential routes where automated personal transit vehicles would eventually be deployed. A system plan identifying the optimal downtown circulator system that connects with existing and emerging downtown developments and nearby neighborhoods is currently being developed by JTA.

Applicable USDOT vision elements include:

- Vision Element #1: Urban Automation
- Vision Element #2: Connected Vehicles
- Vision Element #3: Intelligent, Sensor-Based Infrastructure
- Vision Element #12: Smart Land Use

## RISKS

Every effort will be made to minimize technical, policy and institutional risks throughout the course of the C2JAX technology deployment.

The key technical risks are associated with hardware and software. While highly unlikely, bugs in the implementation of the sensors and operation of applications may result in vehicle crashes. Traffic flow may be impeded if the applications that enhance signal coordination and traffic progression fail. We will address these risks by designing the system to be as fail-safe and fault tolerant as possible. Software and devices will be beta tested downtown on weekends when traffic is lowest, next during off-peak periods and finally during peak period when results can be expected to be safe.

Political risks are likely to be minimal as the current mayoral administration strongly supports the project. The next election in 2019 is outside the timeframe of the grant. The Strong Mayor form of consolidated government allows for easier implementation of demonstration projects than other systems of local government.

Institutional risks among partner agencies will be mitigated with interlocal agreements outlining specific roles and responsibilities. Turnover of key agency personnel is mitigated by a redundancy of capable staff at the City and partners at the RTMC.

## PARTNERS

### **City of Jacksonville, Florida**

The applicant organization is the City of Jacksonville, Florida. The City of Jacksonville and Duval County's consolidation in 1968 eliminated any type of separate county executive or legislative bodies, and replaced these positions with the Mayor of Jacksonville and the City Council, respectively. Voters who live outside of the city limits proper of Jacksonville, but within one of the additional incorporated municipalities in Duval County, are allowed to vote in elections for these positions and to run for them.

Jacksonville's Mayor-Council form of city government is the Strong-Mayor form, in which the mayor serves as the city's Chief Elected Official. The City has a Chief Administrative Officer, the equivalent of a city manager, who administers the day-to-day operations of the City's departments. The Mayor holds veto power over all resolutions and ordinances made by the City Council and also has the power to hire and fire the head of various city departments. The current mayor is the Honorable Lenny Curry, who assumed office on July 1, 2015.

The City of Jacksonville's **Planning and Development Department** manages existing and future development and administers local, state and federal funds designated for housing and community development within the City of Jacksonville. Matters pertaining to zoning, the comprehensive plan, concurrency, land use, inspections, building codes, and the implementation of programs and activities such as home ownership, rental and owner-occupied housing rehabilitation, public facilities and improvements and assistance to the homeless and persons with HIV/AIDS all fall within the purview of this department.

The Planning Department's **Transportation Planning Division** is spearheading this application. The **Transportation Planning Division** focuses on transportation policy, planning and development activities, and is a key participant in coordinating land use and transportation issues related to land development in the City of Jacksonville through elements of the Comprehensive Plan, as well as the City's overall mobility needs. The Division provides inter-agency coordination with local and regional transportation partners, including the Jacksonville Transportation Authority, Jacksonville Airport Authority, Jacksonville Port Authority, North Florida Transportation Planning Organization, and Northeast Florida Regional Council.

The City's **Department of Public Works** is the primary caretaker of all city-owned properties and infrastructure. Public Works maintains roads that have been formally accepted for maintenance either under the old Duval County government or by the consolidated City of Jacksonville. There are many rights of way in the county that are open for vehicle access, but have not been accepted for maintenance. The Department's **Traffic Engineering Division** regulates, installs and maintains street markings, signs, signals and other vehicular and pedestrian traffic control devices on city-owned roadways. Through an agreement with the Florida Department of Transportation, the division also maintains 550 traffic signals on state-owned roadways. Traffic Engineering works very closely with the Jacksonville Sheriff's Office, which enforces the laws and regulations relating to traffic.

The Public Works Department's **Solid Waste Division** provides environmentally sound and cost effective solid waste and recycling services for the City of Jacksonville. The Division is responsible for disposal of trash; planning, building and operating sanitation and solid waste management facilities in Jacksonville; brownfields and ash site remediation and management of solid waste removal activities.

The City of Jacksonville's ***Information Technologies Division*** (ITD) supports technology needs for all City departments, agencies, constitutional offices and state-funded entities such as the Circuit Court and State Attorney's Office. ITD provides around-the-clock technology support for the Service Desk, Emergency Operations Center (911) telecom, plus website and intranet functionality. The division supports over 10,000 employees through the maintenance of 6,500 desktop devices, 10,500 radios, 6,000 telephones, 1,300 cell phones, and 1,100 network switches. It also supports multiple radio towers, fiber infrastructure, connectivity to all COJ buildings and 220 remote locations, two data centers, plus 300-plus applications and several mobile apps.

The Division has been awarded with the distinction of a top digital city for multiple years. The Center for Digital Government's Digital Cities Survey ranked Jacksonville as the third best city government for the second straight year. In 2012, COJ ranked tenth overall for cities with a population of 250,000 citizens or more.

### **Florida Department of Transportation**

The Florida Department of Transportation (FDOT) is a state executive agency, which reports directly to the Governor. FDOT's primary statutory responsibility is to coordinate the planning and development of a safe, viable, and balanced state transportation system serving all regions of the state, and to assure the compatibility of all components, including multimodal facilities. The Department's purview includes roadways, air, rail, sea, spaceports, bus transit, and bicycle and pedestrian facilities. The City of Jacksonville is located within FDOT District 2. FDOT District 2 is headquartered in Lake City, Florida and has an Urban Office in Jacksonville.

### **Jacksonville Transportation Authority**

The Jacksonville Transportation Authority, an independent state agency serving Jacksonville and Duval County, has multimodal responsibilities for the area. JTA designs and constructs bridges and highways and provides varied mass transit services. These include express and regular bus service, community shuttles for a neighborhood ride, a downtown Skyway monorail, the Trolley service, the Stadium Shuttle for various sporting events at Jacksonville Stadium, paratransit for the disabled and elderly, and Ride Request on demand services.

JTA's guiding document is the Blueprint for Transportation Excellence (BTE), its 20-year strategic plan to transform travel in Jacksonville. The goals are to modernize JTA technology; employ best-in class solutions to position the JTA as a regional leader in multimodal transportation; support the JTA's vision to improve the quality of life for Jacksonville citizens and optimize taxpayers' return on their investment; and drive economic vitality in greater Jacksonville and to position Northeast Florida for a robust future.

The Authority's governing body has seven members. Three members are appointed by the Governor and confirmed by the Senate; three members are appointed by Jacksonville's Mayor and confirmed by the City Council; and the seventh member is the District Two Secretary of the Florida Department of Transportation (FDOT). Members serve a four-year term with the exception of the FDOT Secretary who serves the length of his/her employment in that position, and can be re-appointed for an additional four years.

### **North Florida Transportation Planning Organization**

The North Florida TPO is the independent regional transportation planning agency for the counties in the Census Urbanized Area, including Duval, Clay, Nassau and St. Johns counties. Federal Statutes require urbanized areas with 50,000 or more people to have a Metropolitan Planning Organization. One of the TPO's key responsibilities includes developing a Unified Planning Work Program (UPWP) detailing the TPO's annual budget and planning activities. Another responsibility is a Transportation Improvement Program (TIP) listing the funding and staging of improvements for roadways, transit, air and seaports, bicyclists, pedestrians and the transportation disadvantaged over a five-year period. Its third major responsibility is to develop a Long Range Transportation Plan (LRTP) with a 20+ year time horizon based on current needs and forecasted future growth which lists the multimodal transportation projects that are needed and can be funded in that timeframe.

In addition to developing these plans and programs, the North Florida TPO identifies issues, convenes stakeholders, conducts studies and develops policies in light of local, national and global trends. The TPO also addresses current needs and challenges that impact our daily lives through programs for commuters, the transportation disadvantaged, bicyclists and pedestrians.

The North Florida TPO also hosts the North Florida Intelligent Transportation Systems (ITS) Coalition. The ITS Coalition has over 100 members, representing 60 agencies and organizations from throughout Northeast Florida that are stakeholders in the deployment of intelligent transportation assets. The coalition created an ITS Master Plan for the region in 2007 and an update to the Master Plan in 2010. The plan lays out a Regional Architecture for ITS deployment across multiple boundaries and jurisdictions. The Implementation Plan component describes the process for planning and implementing ITS projects throughout the area.

The TPO Board is comprised of elected officials and transportation agency representatives. Under board direction, the TPO is led by an Executive Director with professional staff in transportation planning, modeling, communications and finance. The Mayor of Jacksonville and three City Council members sit on the board. The Secretary of FDOT District 2 is a non-voting advisor to the board.

### **JEA, Jacksonville's Electric Authority**

JEA is the City of Jacksonville's public utility provider. JEA owns and operates an electric system with five generating plants, and all transmission and distribution facilities, including over 745 miles of transmission lines and more than 6,500 miles of distribution lines. JEA is also a joint owner with Florida Power & Light Company (FPL) of a sixth power plant, the St. Johns River Power Park (SJRPP), which is operated by JEA. The utility receives 9.6 megawatts of methane-generated power from Trail Ridge Landfill and 12.6-megawatts of energy from a 100-acre solar project on the Westside of Jacksonville that contains 200,000 solar panels. In 2013, JEA generated 12.5 million megawatt hours of energy.

A public-private partnership that JEA recently became a part of is GE's Intelligent Cities program. The program involves JEA trialing a new GE LED solution, which uses LED street lighting installations to connect, collect and analyze data being generated, harnessing the power of the "Internet of Everything" to assist their city and utility to run better while providing new services and conveniences for residents and visitors. Street lights will be repurposed with LEDs containing sensors, controls, wireless transmitters and microprocessors. This will allow JEA and the city to be able to create new opportunities for reducing cost, optimizing their operations and creating value-added services for its customers. In addition to piloting the intelligent-city enabling solution, JEA will also pilot LightGrid™, a wireless controls technology, which will provide significant energy savings to the city. LightGrid™ allows for more efficient management of streetlights. With remote monitoring and GPS mapping, municipalities are able to instantly identify usage and performance of street lights within specific locations.

JEA's governing body is made up of a Board of Directors appointed by the Mayor and confirmed by the City Council. The Board of Directors then appoints a CEO, who selects a top tier of management referred to as the Senior Leadership Team.

### **Jacksonville Chamber of Commerce**

The JAX Chamber is the chamber of commerce for Jacksonville and the surrounding area. It is a not-for-profit organization with more than 3,000 members serving Northeast Florida. The JAX Chamber promotes economic development by attracting and retaining companies, creating jobs and fostering a skilled workforce. Through advocacy programs, the Chamber works for business and represents business interests at the local, state and federal level. Another program, the Buy Chamber initiative promotes local member-to-member purchasing.

The JAX Chamber has a Transportation and Logistics Council that specifically serves the transportation and logistics industry. The committee works to foster an environment where transportation, logistics, supply chain professionals and policy makers, as well as those who serve those businesses, can meet, educate, debate and discuss cross-industry solutions.

### **Jacksonville Port Authority**

The Jacksonville Port Authority (JAXPORT) is an independent agency responsible for the development of public seaport facilities in Jacksonville. It owns three cargo facilities and a cruise terminal, and, according to a recent study, generates 132,000 jobs and more than \$27 billion in annual economic impact for the northeast Florida region.

JAXPORT is committed to the ongoing enhancement of port infrastructure and facilities. Construction was recently completed on a new intermodal container transfer facility at Dames Point, which facilitates the direct transfer of containers between vessels and trains. The new facility will allow for two unit trains each day (one inbound and one outbound) carrying up to 200 containers each. Other capital improvements are currently under construction – made possible with over \$100 million in federal and state funds. This project will enable future connections to sensors embedded in these infrastructure upgrades.

### **Downtown Investment Authority**

The Downtown Investment Authority was created to revitalize downtown Jacksonville by utilizing Community Redevelopment Area (CRA) resources and the Downtown Development Trust Fund to spur economic development. The Downtown Investment Authority (DIA) is a governing body for the Community Redevelopment Area (CRA) established by the City of Jacksonville. DIA and the City offer a variety of incentives for business to locate downtown, including expedited permitting and economic development incentives.

DIA's investments are steered by a six-member Board of Directors who conducts open-to-the-public business on an unpaid, volunteer basis. All six are confirmed by the Jacksonville City Council. It was formed to revitalize and preserve downtown property values and prevent deterioration in the downtown business district. The day-to-day operations of the DIA are administered by a Chief Executive Officer and four additional full-time staff.

## **EXISTING TRANSPORTATION INFRASTRUCTURE**

There are 387 arterial miles and 145 freeway miles within the City of Jacksonville.

### **Transit Services**

In 2013, users of all forms of public transit services logged 12,677,900 unlinked passenger trips in Jacksonville. Public transit customers travelled 79,384,700 passenger miles in the same year, ranking Jacksonville 44<sup>th</sup> in public transit mileage.

The Jacksonville Transportation Authority is the major public transit service provider for Jacksonville. JTA has a fleet of 220 transport vehicles and currently runs 44 scheduled bus routes, including two bus rapid transit (BRT) system lines and a road-based trolley line.

JTA recently began operating its bus rapid transit (BRT) system and branded it the First Coast Flyer. The BRT system is made up of five distinct projects: the Downtown project, which will connect the four corridors of the North, Southeast, East and Southwest. When completed, it will be the largest BRT system in the Southeast covering a distance of 57 miles. During FY2014, the Downtown and North corridors of First Coast Flyer entered the final design phase and plans were advanced to bring the Southeast, East and Southwest corridors to fruition. Service began on the Downtown and North corridors in December 2015, while the total \$134.1 million system is scheduled for completion by the end of 2016, pending funding.

The JTA Skyway continues to be an arm of the downtown transit network, with a 2.5 mile elevated monorail. Skyway users logged 1,079,200 unlinked trips in 2013 and 495,100 passenger miles. One of only five people movers in the United States, the Skyway celebrated its 25th anniversary on June 3, 2014. In December 2015, the JTA's Board of Directors approved Resolution No. 2015-30, related to the future of Skyway. The Resolution call for JTA to implement a Capital Plan to replace the vehicles, upgrade the operating system and infrastructure considering innovative technologies available. The Resolution also addresses for a Financial Plan that will identify the needs for modernization, and potential system expansion.

JTA also runs a Stadium Shuttle Service (SSS) that transports football fans from JTA lots located around Jacksonville to Jacksonville Jaguars NFL games. SSS operates three hours before kickoff and one hour after each game.

In furtherance of the Americans with Disabilities Act, JTA offers a Paratransit Service to provide destination to destination public transportation for people with disabilities who are unable to use fixed route services. Paratransit Service also offers travel training to ADA paratransit eligible individuals who have the ability to use fixed route.

### **Shared-use Mobility Services**

A variety of shared-use mobility services are offered in Jacksonville. These include a multitude of traditional vehicle-for-hire resources, including: taxi, limousine and airport shuttle services. Technology-enabled shared-use services are also available such as the ride-sourcing services Lyft and Uber; the round-trip carsharing service Zipcar; and the Peer-to-Peer carsharing service Relay Rides. The North Florida TPO also manages the "Cool to Pool" commuter matching and tracking carpool system.

### **Information and Communications Technology (ICT)**

FDOT has deployed over 145 miles of ITS fiber communication and ITS devices along the Interstate system in North Florida (approximately 68 miles on I-95, 15 miles on I-10 and 62 miles on I-295). It is currently or will be deploying another 260 miles of fiber along the I-75, I-10

and I-95 corridors thereby allowing this region able to tie into motorists over 100 miles away from the North Florida region.

Within the City of Jacksonville, there are nearly 200 miles of fiber communication and over 500 technologically advanced signal systems that are real time responsive. Combined, the abutting counties of Nassau, St. Johns and Clay County will be interconnected to provide another 100 miles of fiber communication and technologically advance signal systems. JEA has thousands of miles of dark fiber that could be leveraged to increase fiber connectivity and bandwidth.

### **Intelligent Transportation Systems (ITS)**

Several major arterial corridors are instrumented ITS assets, including upgraded traffic controllers, CCTV cameras, network hardware and software and advanced traffic management systems. The North Florida TPO has funded ITS deployments on over 100 miles of arterial roadway. ITS technology deployments include FDOT fiber optic backbone networks, nearly 150 CCTV cameras, 100 Dynamic Message signs, 160 Bluetooth sensors, hundreds of advanced traffic signal controllers, over 30 road weather information systems and nearly 400 vehicle detection systems.

The North Florida Regional Transportation Management Center (RTMC) recently opened in Jacksonville in November 2015. The RTMC houses multiple agencies, including Florida Department of Transportation Operations, Florida Highway Patrol Dispatch, Jacksonville Sheriff's Office Dispatch, Jacksonville Fire and Rescue Department, City of Jacksonville Traffic Engineering Division, North Florida TPO and other State and regional agencies. FDOT's District Two RTMC is connected to every other FDOT RTMC in Florida. In the operations center, RTMC staff employees can monitor feeds from the 600 cameras scattered throughout the city, many of them on interstates throughout the area. The cameras do not record any information, but can be used to provide multiple angles of an accident to help first responders on scene.

The RTMC is responsible for providing information on accidents and incidents to the traveling public, so that they can make informed decisions on their travel routes. Accidents and incidents occur on a daily basis, which close lanes or cause congestion along Interstates and arterial roadways. One way in which the RTMC can gather information is through a BlueTOAD system that uses the cell phone Bluetooth of travelers on ITS deployed roads to ping paired sensors, which record travel time between them. In areas where it is difficult or not cost effective to install other types of vehicle detection, Bluetooth devices are an easy, efficient means of generating travel times. That travel time is translated into a color-coded map. When vehicles travel between sensors at the speed they should be, the route is green. If a vehicle is traveling too slowly or is at a standstill, the yellow and red coloring shows the duty officers that there is a situation on that part of the road. In addition to travel times, the devices are able to provide Origin/Destination data for planners and result in greatly reduced costs for O&D Studies. To

date, the BlueTOAD devices have been found to be reliable and easy to maintain. By 2020, every interstate in Florida should have cameras, vehicle detection and a fiber optic backbone installed.

FDOT District 2 is working with the South West Research Institute (SWRI) and FDOT central office to create a new section of the statewide SunGuide software which would allow RTMC operators to dynamically change signal timing or divert traffic depending upon the type of incident. Once the SunGuide update is complete, traffic on I-95 can be diverted to US-1 and RTMC operators can monitor congestion, post detour messages and change signal timing to better control traffic flow on US-1. Similarly an incident on US-1 could result in detouring traffic to I-95 to avoid excess congestion on US-1.

### **Smart Grid Infrastructure**

The North Florida Clean Fuels Coalition (NFCFC) is currently funding a regional Electric Vehicle network. The North Florida TPO has budgeted \$300,000 to purchase and install approximately 25-30 electric vehicle charging stations. These stations will support the region's current 267 registered EVs and more rapid purchase of vehicles. Currently the growth rate of EV registrations in the region is over 50 percent a year.

The North Florida TPO, through the North Florida Clean Fuels Coalition, is developing a partnership with JEA to help design, build, operate and maintain the station network. Stations will be located based upon stakeholder input using a siting analysis. The NFCFC is also assisting JEA with its long-term strategy for promoting EVs, which involve incentives for purchase of EVs and, potentially, new rate structures. Together with other NFCFC stakeholders, the network will be branded and marketed throughout Northeast Florida, potentially complemented by roadway signage. As the project planning and implementation proceeds, the North Florida TPO will work closely with regulatory agencies.

## **DATA**

Most of the data collected by the City of Jacksonville and its partners is currently focused on the estimation of travel time reliability. With the BlueTOAD devices already in place, the RTMC can check travel time and speeds in comparison with predicted travel time reliability along freeways and a limited number of arterials. With the ultimate goal of reducing vehicle travel delay, this point-to-point travel time information allows the RTMC partner agencies to judge performance and provide triggers for implementing alternative timing and travel plans.

With the additional fiber and sensors needed to complete the network, the City's partners at the RTMC will be able to see a real-time picture of Jacksonville's entire transportation system with the ability to remotely adjust signal timing and change routes with dynamic messaging signs at every connected intersection. With the increase of connected vehicle data, delays can

be mitigated by using EVP and TSP to move emergency and transit vehicles more safely and efficiently. Until CV devices become commonplace in every vehicle, mobile apps or the C2JAX app will be able to provide a two-way exchange of information including user comments, instructions from RTMC staff, travel time data and information collected from intelligent lighting fixtures. With advanced recognition technology, these new sensors will also aid in route optimization for pedestrians, cyclists and eventually automated vehicles.

This new transportation data will be readily integrated into JTA's transit system resulting in more efficient trips, which in turn will attract users and revenue. Additionally the new sensors will allow for increased public safety surveillance combating both accidents and crime, as well as ensuring fair policing. Information from a smart parking management system will lead to optimized use of parking enforcement resources and sensors could eventually monitor debris on the road and trash bins triggering street sweepers and garbage trucks. Knowing the location of all city vehicles will allow agencies at the RTMC to more effectively control and route traffic.

JEA, Jacksonville's Electric Authority, has been at the forefront of the collection and dissemination of Smart City data with about 130,000 intelligent two-way electricity meters installed, which accounts for about a third of their system. JEA uses their advanced meters for billing, remote connect/disconnect, and register, interval and demand data capture. Currently, JEA deploys SCADA controlled protective devices such as Automatic Reclosers and Automatic Switches that allow their Operations team to keep customers in power and also restore power faster in various scenarios. JEA is also working on retrieving voltage data from their AMI system to better leverage potential distribution efficiency projects in the future, such as Conservation Voltage Reduction and Distributed Generation Support. Another possibility is having the meter data potentially detect voltage issues on the system before causing an outage or a customer complaint. Finally, with the improvements in EV technology, JEA is looking to gather data from this project to strategically place charging stations around its service territory.

## **ARCHITECTURE AND STANDARDS**

All partner agencies currently conform to the ITS standards published by the FDOT Central Office ITS Department. As detailed in the North Florida ITS Master Plan, all agencies using federal and state funds are required to conform to these standards.

To ensure conformity to the North Florida Regional ITS Architecture, all new partner projects are submitted to the North Florida ITS Steering Committee using a project update form eventually being incorporated into formal ITS Architecture updates. All C2JAX projects will be submitted for conformity review and lessons learned will be shared with the 100+ members of the North Florida ITS Coalition.

## **GOALS AND OBJECTIVES**

The primary goal of the demonstration is to improve mobility through management and operations of the Jacksonville transportation network. The objectives of this goal are:

- Increase roadway miles under surveillance by sensors
- Reduce system wide delay for cars, trucks, transit and emergency vehicles
- Reduce greenhouse gas emissions
- Increase connected intersections allowing for EVP and TSP
- Improve real-time transit management
- Improve reliability and predictability of travel
- Improve real-time traffic and transit information

The respective target measures would include:

- Number of miles under surveillance by sensors
- Average vehicle hours of delay per person per day
- Per capita greenhouse gas emissions from vehicle miles of travel per person
- Percent of transit routes with real time monitoring or management
- Percentage of intersections with EVP and TSP capability in the system
- Percent of transit routes with real time monitoring or management
- Variability of travel time on priority corridors
- Percent of travelers with access to real time traffic/transit information

## **CAPACITY**

The City of Jacksonville was ranked third nationwide by the Center for Digital Government and Digital Communities Program. In its 14th annual Digital Cities Survey in 2014, the organization recognized Jacksonville as third best overall among American cities with a population of 250,000 or more. The Center for Digital Government ranked Jacksonville third overall again in 2013 and tenth overall in 2012.

The Center for Digital Government's survey focused on how cities achieved their goals and objectives and increased efficiency despite tight fiscal constraints in the current economy. Top overall priorities include transparency, open data, mobile applications and competent IT personnel.

As mentioned earlier in the application, the partners have decades of collective experience managing large, federally funded projects. In 2011, the USDOT awarded JAXPORT a \$10 million

grant toward the development of an Intermodal Container Transfer Facility. This facility opened on schedule in late 2015 and is now facilitating the direct transfer of containers between vessels and trains, speeding up the shipment process and reducing the number of trucks on the road.

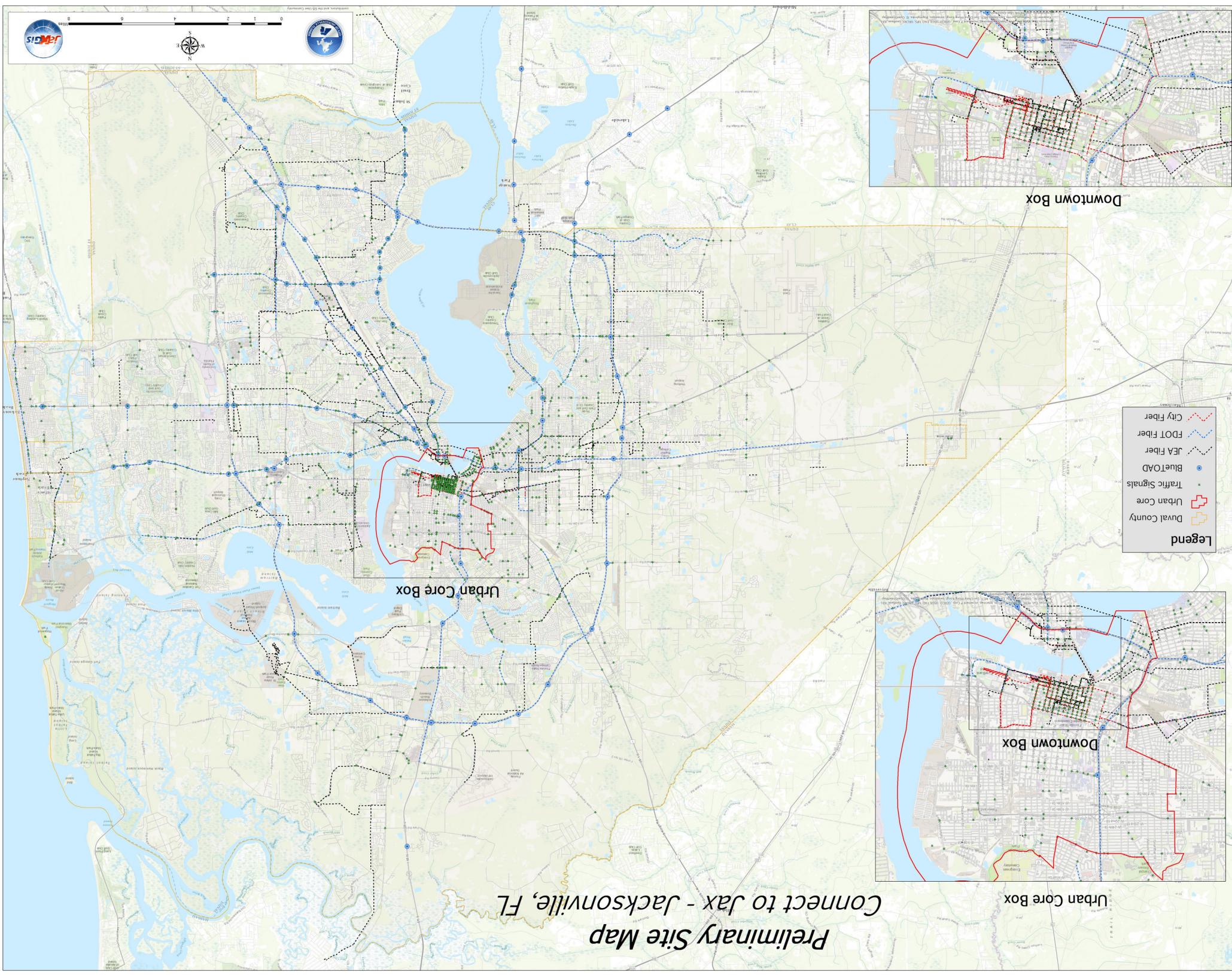
## COST LEVERAGING

In 2014, Jacksonville City Council extended the 6-cent Local Option Gas Tax (LOGT) to 2036. There is an interagency agreement between JTA and the City to share this tax, 5 cents to go to JTA and 1 cent to go to the City for road, pedestrian and bicycle projects. The City has discretion to implement ITS infrastructure with its share of the LOGT. Additionally, funds from Jacksonville's Storm Water Fee can be used for capital improvements.

JTA also has considerable discretion regarding \$15 million of its share of the LOGT, \$5 million of which has been allocated to mobility enhancements that could include adding intelligent lighting and sensors to Mobility Corridors. Mobility Corridor projects may include items such as sidewalks, bike paths, transit accessibility improvements, lighting and bus shelters

The North Florida TPO has provisional plans to deploy ITS of three of the major arterial streets needed to complete Jacksonville's network in the next two years. The TPO was the primary funder of the RTMC as part of their ongoing investment in Intelligent Transportation Systems, which totals over \$30 million since 2003.

FDOT has provided matching funds for several federally funded projects in the Jacksonville area, including \$20 million for the JAXPORT TIGER grant. FDOT will continue to support technology solutions with the rollout of its programmed District Two ITS projects through FY18.

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JTA  
Bus System Map

