



CUTR

CENTER for URBAN
TRANSPORTATION
RESEARCH

Technical Assistance for OneBusAway – Phase 1

March 2017

Prepared For

**Tampa Bay Area
Regional Transportation Authority**



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Technical Assistance for OneBusAway – Phase 1

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GLOSSARY

Automatic Vehicle Location (AVL) system: Technology that tracks where transit vehicles are located in real-time (e.g., using Global Positioning System (GPS) devices on the vehicles). An AVL system may produce predictions for when the vehicle is expected to arrive at upcoming stops based on the real-time location data.

General Transit Feed Specification (GTFS): A de facto data format for static transit data such as stops, routes, and schedules that typically changes three to four times a year. For more information see <https://developers.google.com/transit/gtfs/>.

GTFS-realtime (GTFS-rt): A de facto data format for real-time transit data (arrival predictions, vehicle positions, and service alerts) that typically changes several times a minute. For more information see <https://developers.google.com/transit/gtfs-realtime/>.

OneBusAway (OBA): An open-source software system, including native apps for smart phones, that provides real-time transit information. For more information see <http://onebusaway.org/>.

Real-time transit information (RTI): Data that describes the current state of the transit system, as opposed to the transit schedule. RTI is usually divided into three categories – arrival predictions, vehicle positions (usually shown on a map), and service alerts (e.g., detour announcements).

Service Interface for Real Time Information (SIRI): A European standard format for real-time transit information. For more information see http://en.wikipedia.org/wiki/Service_Interface_for_Real_Time_Information.

TransiTime: An open-source software system that transforms raw vehicle position information into arrival predictions. For more information see <https://github.com/Transitime/core>.

ABSTRACT

In 2013, Hillsborough Area Regional Transit and the University of South Florida's Center for Urban Transportation Research (CUTR) deployed OneBusAway, a mobile app that provides real-time transit information, in Tampa, Florida. OneBusAway is open-source software, which means that other regional transit agencies can be added to the same system to provide travelers with a single app for all multimodal travel information in the greater Tampa Bay area. This regional collaboration also reduces maintenance costs by allowing regional transit agencies to invest in a shared platform. In this project, the research team contacted the regional transit agencies in the greater Tampa Bay area to determine the current state of each agency's scheduling and automatic vehicle location technology. Based on this assessment, this report outlines an action plan with the next steps required to add other regional transit agencies to OneBusAway, including Hernando County (The Bus), Manatee County Area Transit, Pasco County Public Transportation, Polk County (Citrus Connection), Sarasota County Area Transit, and Citrus County Transit.

INTRODUCTION

Real-time Transit Information

The uncertainty associated with waiting times at transit stops/stations has long been a challenge for riders. The dissemination of real-time arrival times reduces this uncertainty and enabling riders to adapt their travel accordingly. Research has shown a number of benefits to riders and agencies when providing real-time transit information, including:

- shorter perceived wait time [1]
- shorter actual wait time [1]
- lowers learning curve for new riders [2]
- increased ridership [3][4]
- increased feeling of safety (e.g., at night) [5][6]

OneBusAway

OneBusAway (OBA) is a suite of software tools that provides many benefits to transit agencies interested in offering real-time bus/train tracking information to the public. In each OneBusAway city, riders can download OBA apps for a wide range of operating systems including iPhone, Android, Windows Phone, Amazon Fire Phone, Amazon Alexa, and Windows. However, unlike other apps, OneBusAway is open-source, which means that anyone can set up OneBusAway in their city – the source code is freely available to download, and, unlike most vendor-driven products, there are no ongoing licensing fees. A community of transit agencies, universities, vendors, and third-party developers has quickly grown around the OneBusAway open-source project, and each of these contributors continues to enhance the product. Maintenance costs are also reduced by allowing regional transit agencies to invest in a shared platform.

The OneBusAway community is governed by a Board of Directors, which is a consortium of transit agencies, universities, vendors, and third-party app developers. This Board of Directors helps to guide the roadmap for the project, including assisting in the coordination of investments for features that benefit multiple regions.

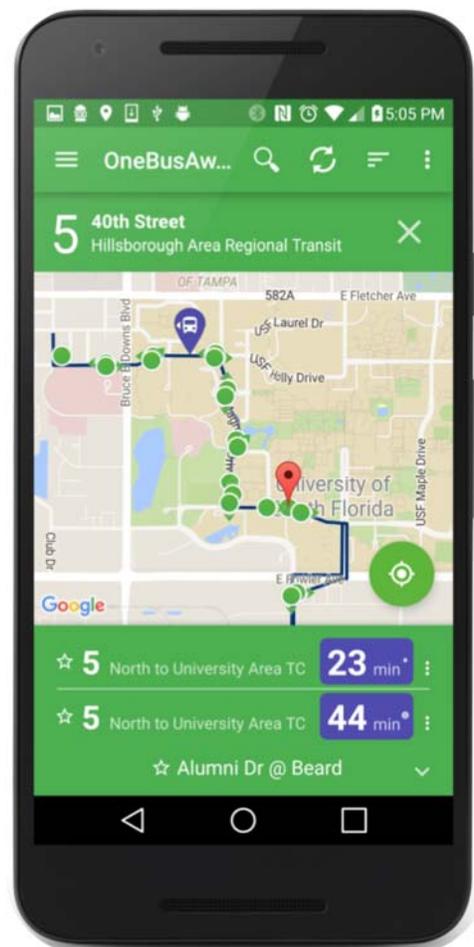


Figure 1 - The OneBusAway mobile transit app

In the research project, *Moving America on Transit – Innovation in Real-time Transit Information*, CUTR worked with Hillsborough Area Regional Transit Authority (HART) as a partner for a pilot deployment of a real-time transit information system using OneBusAway. The pilot deployment of OneBusAway in Tampa was successfully concluded on June 1, 2013. CUTR subsequently worked with HART to launch OneBusAway in Tampa to the public in August 2013, and assisted HART with preparing a Request for Proposal (RFP) for long-term support of the application. HART brought Cambridge Systematics on board for an initial support contract starting in late 2013. As part of another National Center for Transit Research (NCTR) project *Improving Access to Transit through Crowd-sourced Information*, CUTR is in the process of adding Pinellas Suncoast Transit Authority (PSTA) to OneBusAway Tampa Bay.

For a new agency’s real-time information to be added to OneBusAway Tampa Bay, there are four general preparation steps that must be completed by the agency:

1. Put route, stop, and schedule data in the General Transit Feed Specification (GTFS) format (<https://developers.google.com/transit/gtfs/>)
2. Operate an automated vehicle locator (AVL) system that provides arrival estimates
3. Provide real-time data in either the GTFS-realtime or Service Interface for Real Time Information (SIRI) format (<https://developers.google.com/transit/gtfs-realtime/>, http://en.wikipedia.org/wiki/Service_Interface_for_Real_Time_Information). For GTFS-realtime, information about predictions (TripUpdates) and vehicle locations (VehiclePositions) must be provided.
4. Perform quality-control testing of data in OneBusAway prior to sharing with the public.

These steps are shown below in Figure 2.



Figure 2 - The four requirements for launching new agencies in OneBusAway Tampa Bay

Current Efforts in the Tampa Bay Area

TBARTA is taking an initiative to assist additional regional transit agencies in adding their real-time arrival information to OneBusAway Tampa Bay. The desired result would be a single mobile app where transit riders could obtain real-time arrival information for any regional transit agency.

In this phase of the project, CUTR reached out to the following agencies to identify the current state of technology and determine efforts needed for each agency to be added to OneBusAway:

- Hernando County - The Bus
- Manatee County Area Transit - MCAT
- Pasco County Public Transportation – PCPT
- Polk County - Citrus Connection
- Sarasota County Area Transit – SCAT
- Citrus County Transit

An action plan that details the next steps towards supplying real-time information to OneBusAway for each of the transit agencies is included in this report. Future phases of this project would include completing the steps necessary for each agency to launch in OneBusAway Tampa Bay.

DATA COLLECTION FROM TRANSIT AGENCIES

All agencies listed in the previous section were contacted. A follow up phone call was conducted as well as in-person meetings. **Error! Not a valid bookmark self-reference.** summarizes the information collected from the transit agencies. Information for HART and PSTA is also included for reference purposes, so the other agencies can see how HART and PSTA have met the requirements for sharing information via OneBusAway Tampa Bay.

Table 1 – Status of Preparedness for OneBusAway

| Transit system | Does your agency have its transit system data in GTFS format? | Does your agency's AVL system provide arrival estimates? | Has your agency implemented a GTFS real-time (or SIRI) feed? | Would you like technical assistance? | Contact info |
|---|---|--|--|--------------------------------------|---|
| Hillsborough Area Regional Transit (HART) | Yes. Exports data from Trapeze. | Yes. OrbCAD AVL system produces arrival estimates. | Yes. An open-source OrbCAD->GTFS-realtime convertor was developed by CUTR at USF as part of the initial OneBusAway Tampa deployment. More details at https://github.com/CUTR-at-USF/HART-GTFS-realtimeGenerator . | N/A | Shannon Haney ITS Coordinator haneys@gohart.org (813) 384-6602 |
| Pinellas Suncoast Transit Authority (PSTA) | Yes. Exports data from CleverWorks software. | Yes. Clever Devices AVL system produces arrival estimates. | Yes. Clever Devices is providing a GTFS-realtime feed. | N/A | Walt Lenz Senior Project Director - Technology wlenz@psta.net (727) 540-1878 |
| Hernando County Transit – The Bus | Yes | No. Hernando put out ITS/AVL RFP on Feb 24th, proposals from vendors were due April 14th. As of late September 2016, RouteMatch is the selected vendor, with contract negotiations planned to begin shortly. | No. RFP included request for standardized real-time feed (GTFS real-time or SIRI). | Yes | Jannina Stampfli JStampfli@co.hernando.fl.us (352) 754-4057 ext. 28031 |

| | | | | | |
|--|---|---|---|-----|--|
| Manatee County Area Transit (MCAT) | Yes. GTFS data is maintained by Trillium Solutions, Inc. | No. MCAT tested a pilot program via TSO Mobile that attempted to make use of GPS currently tracked through the APC system installed on the fleet. MCAT decided not to pursue this AVL implementation, and will pursue an RFP for a full CAD/AVL system. | No. GTFS-realtime feed will be part of the MCAT CAD/AVL RFP and implementation, expected implementation in 2017. | Yes | Ryan Suarez Planning Manager, MCAT ryan.suarez@mymanatee.org (941) 747-8621 ext. 7622 |
| Pasco County Public Transportation (PCPT) | No. PCPT will be able to export schedule data in GTFS static format as part of RouteShout Phase 2 deployment, timeline for deployment to be determined. | Yes. PCPT has a RouteMatch real time AVL system that is currently installed but only used internally (not visible to public). | No. Per further discussion with RouteMatch a GTFS-realtime feed will not be installed as part of Phase 2 RouteShout (note that the following link says different, but is apparently wrong - http://routematch.com/solutions/public-transit-fixed-route/traveler-information-systems/) | Yes | Matt Clearly Business System Analyst mcleary@pascocountyfl.net (727) 847-2411 ext. 2704 |
| Polk County – Citrus Connection | Yes | Yes, an Avail AVL system. | No. However, Avail does offer GTFS and GTFS-realtime feeds as products. Switching to GTFS via Avail and deploying GTFS-realtime is likely covered by Citrus support and warranty agreement. Deployment of GTFS could happen by end of 2016, but GTFS-realtime would likely be first half of 2017. | Yes | Kelly Graham Transit Quality Assurance Analyst kgraham@ridecitrus.com (863) 327-1321 |
| Sarasota County Area Transit (SCAT) | Yes. GTFS comes from Trapeze. | Yes, Clever Devices AVL. | No. Current plans are to implement an in-house GTFS-realtime feed based on Clever Devices APIs in Q4 2016. Long-term plan may be to change from Clever Devices to Trapeze. | Yes | Barbara Garrett bgarrett@scgov.net (941) 404-8325 |

| | | | | | |
|------------------------------|---|---|---|-----|--|
| Citrus County Transit | Not currently. All service is deviated fixed route, and current GTFS format does not support this (although emerging GTFS-flex format does). RouteMatch has stated that they will be providing GTFS data of some kind as part of AVL implementation, expected 2 nd quarter 2017. | AVL is currently being implemented on deviated fixed routes by RouteMatch, expected 2 nd quarter 2017. | No. RouteMatch will provide real-time data of some type, expected 2 nd quarter 2017. | Yes | Lon Frye lon.frye@citrusbocc.com (352) 527-7634 |
|------------------------------|---|---|---|-----|--|

Agency Roadmaps for Joining OneBusAway Tampa Bay

As indicated in the above table, HART and PSTA are already sharing their real-time arrival information via OneBusAway Tampa Bay. The next steps for the remaining agencies to share their data in OneBusAway are discussed in the following subsections. The status of each agency is reflected in the arrow images. The arrow is green if the component exists, or there are immediate plans to deploy the component. If the arrow is gray if there are no immediate plans to deploy that component.

Hernando County Transit

The first three steps of the process (shown in green in Figure 3) are expected to be completed by RouteMatch as part of the new AVL implementation that Hernando is the process of procuring (estimated deployment in 2017).



Figure 3 - RouteMatch will implement GTFS and GTFS-realtime data feeds for Hernando County Transit

Action items for next steps:

1. **Work with Hernando County and RouteMatch to test the GTFS, AVL system, and GTFS-realtime data** – The new RouteMatch AVL system is estimated to be deployed in 2017.
2. **Configure OneBusAway to include Hernando County Transit data and perform quality control testing** - The final step of doing quality control testing of the data with OneBusAway prior to a public release (shown in gray in Figure 3) is the only step remaining after the AVL system with GTFS/GTFS-realtime feeds is deployed.

Pasco County Public Transportation

PCPT (Figure 4) has an older RouteMatch AVL system, which does not currently provide GTFS or GTFS-realtime data.



Figure 4 – GTFS and GTFS-realtime feeds will need to be developed for PCPT

Action items for next steps:

1. Develop GTFS and GTFS-realtime data

- a. **Option A – Purchase GTFS and GTFS-realtime data from RouteMatch** – Based on Hernando County’s experience, RouteMatch now offers GTFS and GTFS-realtime feeds as part of new procurements. An estimate should be requested to determine if RouteMatch can upgrade PCPT’s existing RouteMatch product to include these features, and what those costs would be.
- b. **Option B – Develop a RouteMatch->GTFS-realtime convertor** – An alternate approach to buying the GTFS and GTFS-realtime feeds from RouteMatch is to develop a software converter tool to transform RouteMatch data into GTFS-realtime¹. A similar approach was used to create a GTFS-realtime feed for HART that is currently used in OneBusAway. GTFS data would also need to be created and maintained. After examining the RouteMatch database, an estimate for the development of the GTFS and GTFS-realtime feeds should be produced. If this estimate is more cost-effective than Option A above, then this convertor should be developed.

2. Configure OneBusAway to include PCPT data and perform quality control testing –

After GTFS and GTFS real-time feeds are created using either Option A or B above, add this data to OneBusAway and test before launching to the public.

Polk County – Citrus Connection

Citrus Connection does have GTFS data and an Avail AVL system, but does not currently have a GTFS-realtime feed (Figure 5).



Figure 5 – Avail will implement a GTFS-realtime feed for Polk County’s Citrus Connection

However, Avail does offer both GTFS and GTFS-realtime feeds as products, and according to Avail the deployment of these feeds at Citrus Connection will be covered by Citrus’ support and warranty agreement.

¹ <https://groups.google.com/forum/#!topic/transit-developers/mtMte-4ThUI>

Action items for next steps:

1. **Work with Avail and Citrus Connection to test Avail GTFS and GTFS-realtime feeds** – According to Avail, they could likely deploy GTFS data at Citrus by the end of 2016, and the deployment of the GTFS-realtime could be completed in the first half of 2017.
2. **Configure OneBusAway to include Citrus Connection’s data and perform quality control testing** – After the Avail GTFS and GTFS real-time feeds are deployed at Citrus Connection, add this data to OneBusAway and test before launching to the public.

Manatee County Area Transit

MCAT has GTFS data maintained by Trillium Solutions, Inc. MCAT tried a pilot program via a vendor TSO Mobile that used GPS location information from the APC system installed on the fleet, but ultimately decided not to pursue that technology and therefore does not have an AVL system or arrival estimates (Figure 6).



Figure 6 – Arrival predictions and a GTFS-realtime feed will need to be implemented for MCAT

MCAT is in the process of writing a Request For Proposals (RFP) for a Computer Aided Dispatch / AVL system, with the goal of implementing a system by the end of 2017.

Action items for next steps:

1. **Work with MCAT to provide RFP language** – Help MCAT include language in their RFP so that the responding vendors understand what needs to be provided in the GTFS and GTFS-realtime feeds for applications like OneBusAway to successfully consume this data.
2. **Work with MCAT, Trillium, and their AVL vendor to test GTFS and GTFS-realtime feeds** – As data becomes available, evaluate the data and provide feedback to Trillium and/or their AVL vendor.
3. **Configure OneBusAway to include MCAT’s data and perform quality control testing** – After the GTFS real-time feed is created, add this data to OneBusAway and test before launching to the public.

Sarasota County Area Transit

SCAT currently exports GTFS data from Trapeze, and has an AVL system that produces arrival predictions from Clever Devices (Figure 7).



Figure 7 – GTFS-realtime feed will need to be implemented for SCAT

Action items for next steps:

1. Implement a GTFS-realtime feed

- a. **Option A - Purchase GTFS and GTFS-realtime feeds from Clever Devices** – From the research team’s experience with PSTA, Clever Devices has been working on a GTFS-realtime feed. However, it is currently unknown whether this feed is currently offered as a product to other agencies – Clever Devices has not yet responded to requests for more information about the GTFS-realtime feed as a product. If Clever Devices does offer a GTFS-realtime feed, a cost estimate should be requested.
- b. **Option B – Develop a Clever Devices->GTFS-realtime convertor** – An alternate approach to buying the GTFS-realtime feed from Clever Devices is to develop a software converter tool to transform Clever Devices data into GTFS-realtime². SCAT staff expressed interest in developing this converter in-house. After examining the Clever Devices API, the research team should work with SCAT staff to determine if SCAT can develop a converter. If not, an estimate for the development of the GTFS-realtime feed convertor should be produced. If this estimate is more cost-effective than Option A above, then this convertor should be developed.

2. **Configure OneBusAway to include SCAT’s data and perform quality control testing** – After the GTFS real-time feed is created, add this data to OneBusAway and test before launching to the public.

² <https://groups.google.com/forum/#!topic/transit-developers/mtMte-4ThUI>

Citrus County Transit

Citrus County Transit currently operates all deviated fixed route service, meaning that a portion of the bus stops will always be visited by a route, but the remaining stops will only be served if a rider calls in and requests a trip. Citrus County Transit is in the process of installing a RouteMatch AVL system on their deviated route vehicles that is expected to be operational in the second quarter of 2017. Steps 1 and 2 should be completed as part of this AVL deployment (Figure 8).



Figure 8 – Citrus County Transit operates deviated fixed route transit with a RouteMatch system

Action items for next steps:

1. **Assess options for deviated fixed routes** – The GTFS-flex format³ is an emerging standard for representing deviated fixed route information. This format will be reviewed, along with Citrus County Transit’s operations, to determine how GTFS-flex could be leveraged for their system. Options for real-time data will also be examined.
2. **Implement deviated fixed route data**
 - a. **Option A – Acquire data from RouteMatch** – RouteMatch has committed to providing open data, but it is currently unclear if this is GTFS, GTFS-flex, or something different. If the data is in the GTFS-flex format along with compatible real-time information, the research team can use the RouteMatch data source.
 - b. **Option B – Develop data** – If RouteMatch does not provide GTFS-flex data and compatible real-time information, the data can be created by the research team.
3. **Implement deviated fixed route support in OneBusAway** – Currently, OneBusAway does not support deviated fixed route service. This task will examine and if possible add support for the GTFS-flex format in OneBusAway.
4. **Configure OneBusAway to include Citrus County Transit’s data and perform quality control testing** – After the GTFS-flex and GTFS real-time feed is created, add this data to OneBusAway and test before launching to the public.

³ <http://gtfs.flex.com>

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