System Technology Analysis and Recommendations Technical Memorandum

UCAT Route Optimization Plan

This technical memorandum is a component of the **Ulster County Area Transit (UCAT) Route Optimization Study**. UCAT is partnering with the Ulster County Transportation Council (UCTC) on this project to study how the existing UCAT system — including its routes, schedules, and services — can be transformed to better serve the public.

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For more information, please contact:

Brian Slack

Principal Transportation Planner, UCTC

bsla@co.ulster.ny.us

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Task Overview

JF Public Transit Consultants LLC (JF Public) led the **Systems Technology Analysis and Recommendations** task as part of the **Ulster County Area Transit (UCAT) Route Optimization Plan**. The purpose of this task was to assess current needs and gaps in software technology to schedule and operate UCAT's fixed-routes, paratransit and flex services with the goal of identifying the parameters for software technology RFP. Our analysis included facilitated discussions on software needs and gaps with UCAT staff, software demonstrations from a variety of vendors, and a high-level cost analysis. This technical memorandum summarizes the findings from the current technology needs and gaps assessment and the recommendations for UCAT's technology solutions.

Needs and Gaps Assessment

Table 1 summarizes the software systems that UCAT currently uses to manage day-to-day operations and provide real-time information to riders through General Transit Feed Specification-Flex (GTFS-Flex) data.

Table 1: Existing software systems and their uses

Software System	UCAT Uses
Trapeze Novus DR	• Paratransit scheduling / booking for paratransit and flex. • Vehicle tracking of paratransit, flex and fixed route fleets. • Paratransit and fixed-route vehicle assignments. • Provides existing NTD and performance reporting.
Trapeze Drivermate	• Paratransit and flex route tablet-based solution for viewing a digital manifest and passenger tallies. • Utilized by all modes operated by UCAT.
Samsara	• Onboard safety artificial intelligence (AI) to coach unsafe driving behaviors. • Vehicle fleet tracking.
Seon	• Onboard surveillance cameras on all vehicles.
Asset Works	• Fleet repair tracking and parts inventory tracking.
Peak Transit (Formely Bishop Peak)	• Fixed route rider application/ real time GTFS

Trapeze Novus is primarily utilized by small to mid-size transit agencies across the US for scheduling and dispatching paratransit, non-emergency medical transport, and deviated fixed-route service. Trapeze Novus is not explicitly designed for fixed-route services. However, UCAT has utilized Trapeze Novus and **Trapeze Drivermate**, an electronic manifest software, as the main components for managing its day-to-day fixed-route scheduling and operations. While Trapeze Novus appears to be a suitable software solution for UCAT's paratransit and deviated fixed-route operations, staff noted several issues with it as a fixed-route operations solution.

Asset Works is primarily utilized for fleet asset management, tracking of parts, preventive maintenance work on vehicles, etc..

Samsara provides real time vehicle tracking on the entire UCAT fleet, Artificial Intelligence detecting unsafe driving behaviors to allow UCAT Admin Staff to coach Bus Operators and additional video surveillance onboard.

Peak Transit provides GTFS flex data through a external rider application for Fixed Route users. Currently there is not an existing integration between Peak Transit and Trapeze Novus.

Seon is the onboard video surveillance system which provides interior surveillance (video and audio) on the entirety of UCAT's fleet.

The following is a summary of the key gaps and opportunities for each service type and related software. These gaps were identified through several facilitated discussions with UCAT staff.

Key Gaps and Opportunities – Paratransit/Flex Software

- All trip routing is manually scheduled and is not automated through the Trapeze Novus software. While Trapeze Novus can automate the manifest process, staff does not utilize the feature as they do not trust the existing batch scheduling parameters/routing capabilities. The result is that the manual scheduling and driver assignment of trips is effectively the same as manually scheduling through a desktop spreadsheet software.
- The manual scheduling and assignment of trips also results in inefficient scheduling and less cost-effective use of available resources.
- All vehicles and operators must be manually assigned by a dispatcher.
- All dispatcher-operator communication is currently handled over two-way open radio. Staff are not leveraging the ability to use pre-scheduled or "canned" messaging through the Trapeze Drivermate system.

Key Gaps and Opportunities – Fixed-Route Software

- Trapeze Novus projected running times are not accurate and results in poor schedule optimization and on-time performance.
- Passenger counting is not automated on-board vehicles and requires manual entry via the Trapeze Drivermate tablet from the operators while loading/ unloading a passenger at each stop. Manual passenger tallies can be unreliable and susceptible to user error. Likewise, ridership counts entered through Trapeze Drivermate are not tied to a fixed-route bus stop location or ID.
- ADA stop announcements are not included in the Trapeze Drivermate package and requires operators to announce each timepoint.
- All vehicles and operators have to be manually assigned by a dispatcher via the Trapeze Novus software. This is both time consuming and can result in inefficient use of operator and vehicle resources.
- All dispatcher-operator communication is currently handled over two-way open radio. Staff are not leveraging the ability to use pre-scheduled or "canned" messaging through the Trapeze Drivermate system.
- Vehicle tracking is often not accurate within Trapeze Novus. Instead, dispatchers primarily rely Samsara, a separate vehicle tracking software, for locating vehicles because staff find it easier to use and more accurate than Trapeze Novus.
- Dispatchers do not have a way of tracking on-time performance or schedule adherence by vehicle.
- Staff is required to ride each route and manually time any schedule changes with existing setup.
- Dispatchers are responsible for answering all fixed-route rider calls. Dispatchers rely on paper schedules taped to the wall for providing riders with scheduled arrival times for the next bus rather than real-time arrival predictions.

Staff Comments on Existing Software

- "It is easier to use paper."
- "The scheduling parameters seem off in [Trapeze] Novus."
- "We would like to see auto updates to the schedules."
- "A system that provides turn by turn navigation."
- "It is challenging to understand all of the violation codes in [Trapeze] Novus."

Conclusion

Overall, the current fixed-route software, Trapeze Novus, has several inefficiencies including inaccurate schedule optimization, manual passenger counting, and limited communication and tracking features. Addressing these gaps with automation, improved software integration, and real-time tracking could improve operational efficiency, data accuracy, and overall performance.

Software Recommendation and Path Forward

Currently, software systems utilized by UCAT primarily operate independently; some systems provide application programming interfaces (APIs) that allow communication between different platforms while the systems still operate separately.

As UCAT is considered a mid-sized agency and given the structure of the existing service, as well as route changes stemming from the Route Optimization Study—including the possibility of adding on demand Microtransit—we recommend that UCAT issue a request for proposals (RFP) for a cloud-based solution to bundle the following modes:

- Cloud-based software as a service (SaaS) package for paratransit, and other on-demand transit services like a future microtransit service. The SaaS package should include:
    - A rider-facing application that includes features such as real-time arrivals, trip planning, and possibly fare payment.
    - Booking and scheduling features for paratransit and future on-demand (microtransit) services.
    - Computer-aided dispatch and automatic vehicle location (CAD/AVL) features for paratransit and future on-demand (microtransit) services.
- Cloud-based scheduling and CAD/AVL solution for fixed-route service including a with rider-facing application that includes features such as real-time arrivals, trip planning, and possibly fare payment.

Consultants researched various CAD/AVL fixed-route and on-demand software packages to compare functionality and price and determine the best option to meet UCAT's needs. UCTC and UCAT staff viewed demos of software systems via virtual recorded sessions during the month of November 2024. **Table 2** summarizes the software systems that were reviewed as part of this process.

Table 2: Software systems included in UCTC/UCAT Demo

Vendors	Software Components
Trip Spark Technologies	• Streets: a fixed-route CAD/AVL software. • Trapeze Novus: paratransit service booking and scheduling software. • Rides: on-demand booking and scheduling software for microtransit services.
Transit Technologies	• Trip Master by CTS: an on-demand (both microtransit and paratransit) booking and scheduling software. • Passio CAD/AVL: a fixed route CAD/AVL software. • Passio Go Rider Application: rider-facing application for real-time arrivals.
ETA Transit and RideCo	• RideCo: an on-demand (both microtransit and paratransit). booking and scheduling software. • ETA Transit: a fixed-route CAD/AVL software.
Swiftly and Spare	• Spare: an on-demand (both microtransit and paratransit). • Swiftly: a fixed-route CAD/AVL software.

A series of successful demonstrations have provided staff with a clearer sense of software packages that would meet the agency's needs and the average costs for those software systems. UCAT, UCTC, and the consultant team collectively determined that issuing a competitive bid to solicit a new software vendor would be the most effective approach to ensure that UCAT secures the best solution for their needs. Issuing a request for proposal (RFP) sooner rather than later will ensure that the agency has adequate time to prepare for software transition and implementation.

Software Systems Overview

The following outlines technical specifications/ requirements by service type for solutions to be procured by UCAT. These items can be placed into an RFP solicitation document under the Scope of Work/ Technical Requirements categories.

Cloud-Based Software as a Service (SaaS)

Cloud-based SaaS package for paratransit, and other on-demand transit services like a future microtransit service. The cloud-based SaaS package should also include a rider-facing customer service application that includes features such as real-time arrivals, trip planning, and possibly fare payment.

System Requirements

- A rider booking application available by web and rider app platform for paratransit, and microtransit services with the ability to leave real time rider feedback in the app.
- One-hundred percent automated scheduling solution which maximizes cost, coverage, convenience and efficiency of the service with the ability for dispatchers to manually move a trip if required.
- UCAT will have the ability to create service polygons (e.g., microtransit zones) and add virtual stop hubs as required.
- Receive automated daily, weekly, and monthly performance data reporting via email, tabular exports (e.g., CSV or Excel), and online dashboards.
- Customer service platform to respond to and track rider comments.
- Dispatch operations dashboard to track live vehicle statuses, service alerts (e.g.,. late bus), service performance, rider no-shows, and dispatch-to-vehicle messaging.
- Removable MDC (mobile data computer) for the vehicle, preferably through a ruggedized tablet device with minimal installation efforts.

Cloud-Based CAD/AVL Fixed Route Software Package

System Requirements

- Ability to seamlessly import fixed schedules to easily track statistical data related to ridership by route, by run, by stop, by hour, by day, by month, and vehicle running time data against the schedule.
- Ability to track all vehicles through multiple views systematically, by route and to the vehicle level.
- Ability to track real time service performance, garage pull-outs/ pull-ins.
- Remotely troubleshoot vehicles, sign-on, sign-off and mechanical defect codes.
- Dispatcher to vehicle communication through canned message and emergency alarm.
- Ability to create route detours in real time.
- Assign manpower and schedule rostering.
- Receive automated daily, weekly, and monthly performance data reporting via email and tabular dashboard access.
- Provides integration points for real time GTFS data by route, vehicle, stop with the ability to integrate to UCAT rider app, and on-demand app.
- Provides optional integration to onboard video surveillance systems and fleet tracking equipment

- Includes automatic passenger counters to be installed on bus entry and exit doors.
- Includes removable MDC computer for the vehicle, preferably through a ruggedized tablet device with minimal installation efforts.
- Includes Automatic Vehicle Announcements (AVA) system to mitigate UCAT Bus Operators from announcing timepoints.

Procurement Options

UCAT has two options for acquiring a new or updated system. **Sole source** procurement leverages UCAT's existing relationship with its current vendor to enhance and expand its existing system. Implementation of the solution could be quicker, but it lacks the opportunity for vendors to compete and for a custom team of solutions to respond with the best possible product. **Open procurement** would involve UCAT publishing a Request for Proposal (RFP) for any vendor to respond, giving UCAT more choices and facilitating the opportunity for unique team of vendors to come together with a solution. However, an open procurement would take more time than sole-source procurement and potentially involve a longer transition period as UCAT adapts to a new platform. For more specific information regarding procurement options in New York State, see the NYSDOT FTA Procurement Guidance.

Software Systems Comparison

Table 3 provides a summary of the modal capabilities of each vendor and solution that were demonstrated as part of this study, with an "X" indicating that the software solution provides direct support for that mode's operating needs. If UCAT were to pursue open procurement, certain vendors may bid as a team to combine their strengths on different modes.

Table 3: Software Capability Comparison Matrix

VENDOR	SOLUTION	FIXED-ROUTE SERVICE	PARATRANSIT SERVICE	MICROTRANSIT SERVICE	DEVIATED FIXED-ROUTE SERVICE
Trip Spark (Trapeze)	Novus		X		
	Rides On Demand			X	
	Streets	X			
Transit Technologies	Passio and Passio Go	X			
	CTS		X	X	X
Swiftly	Swiftly	X			
ETA Transit	CAD Solution	X			
RideCo	RideCo		X	X	X
Spare	Spare		X	X	

Document Appendix Package

This section provides an overview of the technical specifications that should be included for future software systems procurement.

Additionally, the link below will provide access to the materials provided for the various software demonstrations, as well as recordings of the sessions.

Software Demonstration Resources

Procurement Technical Specifications

Cloud Based SaaS (Software as a Service) Package For Rider App, On Demand, Microtransit and Paratransit Core Technical Functionality Specifications

- The system shall be web based and available to users or common operating systems, such as Microsoft Windows and Macintosh OS.
- The system shall include an online help feature. It must provide context-sensitive help information for each command, menu item, screen, and option.
- The system shall include a front end that is configurable or customizable.
- The system shall be capable of displaying time units in military (24-hour) time. Configuration of the proposed program via parameter files, option screen, or the like should be sufficient to tailor the proposed system to meet requirements.

Geographic Information Systems (GIS)

- The system shall provide a web based integrated GIS System.
- The GIS system shall not require periodic upgrades, and should remain up to date with street, address, and common locations.
- The GIS must allow the user to click on any spot on a map to display associated address data including street name and address number (or range), city and ZIP code.
- The GIS must be able to display ADA-compliant service corridors based on hours of service overlaid on the maps.
- The system shall display the approximate route of all paratransit or Microtransit vehicles in service based on their scheduled stops (either straight line or expected turn-by- turn route, with stops highlighted).
- The system shall allow for integrated editing of shapes such as polygons above the GIS.
- The GIS component shall be accessible from all other components: Registration, Reservations, Dispatching and Mobile Data Computers.
- The GIS system should utilize industry standard coordinate system(s) to be used to store coordinate locations of trip origins and destinations (e.g., latitude/longitude, state plane).
- The system shall allow uploading or creation of zones, polygons or stops for custom service areas, i.e. for Microtransit Service.

Real Time Scheduling and Administrative Features

The desired technology is software that includes shared ride batching or a scheduling algorithm that matches requesting passengers to available vehicles. While it is assumed that UCAT will not have direct access to the source

code, it is desired to be able to work with the selected vendor to adjust back-end parameters such as maximum estimated time of arrival (ETA), deviation thresholds for shared rides, on street and off-street travel speed settings, and walking thresholds for riders. Some other core features of the software shall include:

- A web based administrative console to manage trip reservations and access driver and rider data.
- A web and application-based interface to allow call-in reservations to be scheduled in real-time or in advance. Application must be accessible via Apple Store and Google Play.
- The ability to define a service area boundary that specifies the extent to where and when a rider can book a trip on district operated services. These boundary polygons or services areas should be easily drawn and defined by UCAT staff using the software solution provided.
- The platform shall offer scalability of service, with the ability to modify existing zones and create new zones. These functions must be available to the agency within the platform.
- The ability to automatically calculate and provide an ETA to rider once trip requests are submitted. After booking, the system should continue to calculate and provide updated ETA information to rider until time of pickup.
- A platform supporting the booking of both subscription-based and/or recurring trips.
- The ability to calculate the price of the trip to the rider upon trip request and/or before final trip confirmation is made.
- The system shall allow discounts to be applied to price based on factors such as rider type, trip start/end location, or time of day.
- The system shall be capable of continuous routing and itinerary optimization to improve efficiency.
- The system shall allow for dispatchers/administrative staff to have the ability to manually submit and modify future reservations as needed.
- The software shall provide replay controls to view the entire sequence of reported locations for a given time frame.
- The system shall allow UCAT the ability to customize branding elements of the customer mobile application.
- System must be able to differentiate between different types of services and trips for reporting purposes.
- The system shall record every trip with a calculated comparable fixed route for comparison purposes.

Customer Smartphone/ Web Based Application

The system must provide a smart phone rider app to allow passengers, at a minimum, to request trips (in real time) for origin-to-destination service operated by UCAT vehicles. The app shall be available for download from both Apple iTunes Store, Google Play Store, and UCAT website (if requested) and include the following features:

- Allow a rider profile to be created (for Microtransit) that identifies special needs of the rider in terms of fare payment, vehicle type, accessibility etc.
- Detect the customer's current location upon login.
- Fully integrate with the existing UCAT fare structure and fare payment options.
- Allow a rider to indicate a payment method, such as a credit card option, cash- payment on-board or other agency-sponsored fare payment options.
- Must allow for rider to pay for the trip by credit card using the application, or
- other fare collection as determined by UCAT.
- Provide the ability to track vehicle on a map within app and provide service availability forecasting.
- Provide the ability to select pickup and drop-off by either entering a street address into a search bar, searching for a Point of Interest, directly selecting locations displayed on a map, or based on the user's current location.
- Allow trips to be booked by desired arrival or departure times.
- Provide the ability to pre-set frequently used destinations for efficiency of trip bookings.
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- Prevent customers from booking trips that do not meet predetermined service criteria, including trips booked outside of the Paratransit service area or span of service.
- Provide the ability to give the user updates on their trip and allow other communication to occur, either directly through the app or via SMS messaging.
- Incorporate accessibility features to ensure that all can access the app, including those with visual impairments.
- The platform shall support booking trips.
- As an optional feature, provide the ability to show customer estimated time of arrival at destination instead of pickup origin. For example, if a rider wants to make a connecting bus, provide the ability to book a ride based on arriving at that station in advance of a specific time.
- Include Fixed Route information to allow trip planning for Microtransit and Fixed Route.

Data Integrity

The system shall be capable of maintaining data integrity while automatically recovering from failure situations. The vendor must provide descriptions and documentation of system recovery and restart processing for the following situations:

- System provides standardized, centralized error trapping and recovery.
- System maintains a detailed audit trail of all transactions --i.e., before and after images are captured --to maintain database integrity and as a potential source of information for other purposes.
- Recovery from data communications malfunction such as failure of the network or DBMS while a user is creating and/or updating data.
- Software malfunction resulting in the failure to create and/or update data while processing multiple files.
- Data center failure of operating system or CPU while the system is creating and/or updating files.
- Hardware, firmware, or software failure of storage devices.

System Performance

- The system shall be designed for and capable of 24 hours per day, 7 days per week operation.
- Using on-line scheduling, search, and confirmation of trip availability for any date shall be available with a maximum average response time of less than twenty (20) seconds for up to four (4) active workstations using the hardware and software in the Specification.
- The system shall offer a 'recovery' mode for operators to continue service if there is a network/data outage that puts the operator devices offline.

Data Security

- The system must provide the System Administrator with the following user-level security features:
- Control over an individual user's access to specific screens and fields within such screens.
- Control over an individual user's access to specific commands and functions.
- The system must be capable of restricting concurrent logons by an individual user.
- The system must log all log-in attempts (including the time, date, and ID of the PC from which the log-in was attempted).
- The system must permit the System Administrator to modify user account passwords.
- The system shall be up to date with modern technological security methods to protect passenger and agency data.

Rider Registration/Certification

The system shall support on-line comprehensive rider Registration for ADA, non-ADA riders, and Microtransit, and shall clearly delineate between them.

- The system shall provide for minimally the following data items in each rider record:
- First, middle, last
- Unique ID
- Email
- Photo
- Medicaid ID Number or SSN
- Home address: name of apartment building or complex, door or apartment number, floor number, street address, nearest cross street, city, zip code, home telephone number, mobile telephone number and latitude/longitude
- Mailing address: name of apartment building or complex, door or apartment number, street address, city, state, ZIP code
- Date of birth
- Sex
- Emergency contact information: contact name, relationship to rider, name of apartment building or complex, door or apartment number, floor number, street address, nearest cross street, city, zip code and telephone number
- Primary language spoken (default to English)
- ADA eligibility: Category 1, 2, and/or 3; status (e.g. temporary, permanent, visitor, conditional, trip by trip, or other, with a default of permanent); renewal date
- Transaction history of client's ADA certification
- Ability to upload and save client documentation, files, photos. Photo of client can be referenced on Operator's tablet
- Comment field such as driver's instruction that can be displayed on tablet when picking up or dropping off client.
- Specific trip eligibility or conditions
- Registration Eligibility Certification information: date application received, date doctor verification sent, date doctor verification received, registration date, phone verification, intake certifier
- Disability type (allow multiple selection of one or more): e.g., visual, hearing, speech, developmental, mental/cognitive, neurological, cardiovascular, musculoskeletal, respiratory, seizure disorder, other (fill in), comment field (at least 256 characters); the list must be customizable
- Suspension data: voluntary or involuntary; date from and to; date letter mailed; date letter received
- Mobility Aids (allow multiple selection of one or more): e.g., wheelchair oversized, manual, motorized; scooter; personal attendant; service animal; requires standing lift; walker; cane; brace; prosthesis; crutches; slowly; oxygen; other (fill in); the list must be customizable
- Service needs (allow multiple selection of one or more): e.g., curb to curb, request door to door, do not leave alone, visually assured entry, other; the list must be customizable
- Passenger-specific load time allowance, in minutes, in addition to the default or standard load time allowance
- Certification/Denials/Appeals history ADA Certified, Non-ADA and Senior Services riders
- Multiple funding sources, each with its own starting and ending dates, ride limits and percentage of payment, and a preferred sponsor, if any
- Comment field for miscellaneous notes
- The system shall allow for multiple funding sources per rider and at least one funding source per rider per trip. (Describe how funding data are stored and how funding sources are selected or automatically applied to trips.)
- The system shall allow authorized users to query tables of riders, reservations, and trips based on user-defined search parameters
- Selection criteria for displaying records must allow for the use of wildcards (*) in all criteria elements. Any and all of the fields in a record may be used in formulating a query. Queries must support at least Boolean and arithmetic (>, <, =) operators

- System must be able to generate a certification letter with ADA eligibility information for each customer
- System must be able to generate a rider profile that contains client information for ADA visitor requests to other agencies
- System must be able to generate a certification activity report that provides number of certifications conducted for any specific time frame by user
- System must be able to generate client information to be transferred to a physical ID card, 3.37" x 2.125" for identification purposes

System Parameter/System Setup Requirements

- The system shall support lists of vehicles, vehicle numbers, run times (shifts), and drivers that can be configured or edited by the user.
- The system shall allow Supervisors to set up and amend the daily set of available vehicles and drivers. This includes which drivers will be in which vehicles, what the corresponding run number will be, and what time period that run will operate including scheduled breaks.
- The Reservations function shall record at least the following items as part of the Trip Record. Describe the items the proposed system will record:

    - The system login ID of the person entering,
    - changing or deleting the reservation,
    - Trip ID,
    - The rider name,
    - The origin address, geo-code, & telephone number,
    - The destination address, geo-code, & telephone number,
    - Funding source (bill code)
    - The number of attendants,
    - The request time and type (pickup or appointment),
    - The promised pickup time window,
    - The scheduled pickup time as modified by continuous refinements to the daily schedule, either automatically by the system or manually be Schedulers.
    - The scheduled drop-off time as modified by continuous refinements to the daily schedule, either automatically by the system or manually by Schedulers.
    - A link via the rider ID key to the rider record should provide access to rider name, special needs flag, accessibility aids, notes, etc.

- The system shall provide multiple user-defined seating/wheelchair arrangements for each type of vehicle. This must include a minimum of five (5) different arrangements to incorporate 0-3 wheelchairs (or more as needed) with corresponding seats.
- The user shall be able to insert a break, meal, or out-of-service activity at any point in the sequence of events for a vehicle, and to schedule the break to a predefined location. The system shall allow for preset breaks at times assigned or automatically within a user-defined time period.
- The system shall support multiple service providers; parameters for each shall be configurable by the System Administrator such that their service allocation may be based on predetermined factors including but not limited to the following:

    - vehicle type,
    - geographic area,
    - day of the week,
    - time of day,

- origin and/or destination,
- nature of rider disabilities and/or physical aids

- The system must be able to automatically suspend or temporarily restrict the number of upcoming trip bookings for users that have an excessive level of cancelled or no-show rides. The threshold for limitations, and the limitations should be configurable based on agency requirements.

Reservations

- The system shall support multiple boundaries based on the days and hours of fixed-route service, as well as additional rules for Microtransit as requested by UCAT.
- The system shall alert the user when the source origin or destination of a trip is not within the ADA boundary (3/4 mile of a fixed bus route, and other boundaries as requested for Microtransit) during service hours and shall prevent the trip from being booked unless overridden by a supervisor.
- The user must be able to find the address of a trip origin or destination quickly using the maps of the integrated GIS.
- The system must have a method for selecting and using origin and destination locations without a street address, such as a street corner. (Describe the approach used.)
- If the rider's ADA eligibility is conditional, these conditions shall be prominently displayed (in a pop-up window or the like) when the rider record is selected during the process of booking a trip.
- If the rider's eligibility is suspended, the rider shall not be able to have a trip booked and previously booked subscription trips shall not be scheduled. Similarly, any subscription trips for ineligible riders shall not be generated.
- The system shall maintain a database of standing orders. When a subscription standing order trip is cancelled, the system must scan up to at least 7 days ahead and display other trips for this rider, and then must prompt the user to query the rider concerning cancellation of those trips.
- The system shall prompt the user when canceling the originating portion of a round-trip to determine if the return portion of the trip also needs to be cancelled.
- The system shall be able to schedule trips on-line in real-time and will provide continuous optimization of the existing schedules without manual intervention but with the ability for appropriate users to manually adjust a schedule as needed. The on-line scheduling capability must be integrated with dispatch, reservations, and cancellations. It will provide ride confirmation while the rider is on the telephone line.
- The system must be able to handle one-way, round-trip, and multi-leg trips without having to re-select the rider or re-enter data for subsequent legs. The system shall provide carry-over of origin and destination addresses for linked trips and provide the capability to flip the home origin and destination addresses when setting up the return leg of a round-trip.
- The system shall allow customizable settings for Trip Negotiation, such that if the agency uses a -15 and +15 minute window, or 0 and +30 minute window, the agent can negotiate with the caller to reserve a trip within the on-time window, as well as negotiate the trip in accordance with ADA regulation, i.e from 1 hour before to 1 hour after the requested time.
- The system shall be able to easily duplicate a travel request between the same origin and destination on different days (by specifying days from a pop-up calendar) or at different times.
- The system must provide simplified reservations duplication for groups traveling together who have an identical origin and destination. These group reservations shall be assigned to the same vehicle to the maximum extent possible.
- The system shall be able to display all reservations by a rider to facilitate individual and/or group cancellations.
- Entering a rider's name whose record contains a flag shall alert the user that the rider has special needs. The trip sheet/manifest shall be configurable to include optional notes associated with such riders.
- Users must be able to assign standing orders / subscription trips to a regular designated run if requested by UCAT.

Service Dispatching

- The system shall provide necessary dispatching tools for making day of service operational decisions, such as same day standby trips, canceled trips, no-shows, late riders, vehicle breakdowns, and open returns. The dispatcher must have the ability to easily change drivers & vehicles and adjust the schedules.
- The System must offer an incident management tool or dispatch log.
- The dispatch screen will be coded so that at least the following trip categories will be highlighted:
    - Cancellations occurring within the hour.
    - Runs in service that are not covered by a driver.
    - Unassigned trips
    - Live monitoring and alerts of any service delays
- For each pick-up and drop-off, the system shall display at least:
    - Vehicle number
    - Passenger name, last name first
    - Number of passengers, including attendants and companions.
    - Pickup and drop-off address
    - Promised arrival time window.
    - Estimated time of arrival.
    - Any special needs or problem address
    - Notes
- The system must be able to alert Dispatchers when a vehicle is running late (i.e., pick-up or drop-off more than X minutes beyond the promised time window, where X is defined by the System Administrator.)
- The system must also update the ETA for all upcoming stops for that vehicle and alert the Dispatcher(s) if any of the new ETAs are outside the promised time window.
- The system must display a slack screen showing any open times for vehicles in service. The System Administrator must be able to define slack time in terms of a minimum number of minutes (e.g., at least 10.).
- The system must automatically and continuously optimize vehicle manifests as new rides are booked, for rides pre-scheduled days in advance, same day bookings, and real-time bookings.
- The system must assign passenger bookings (including pre-scheduled rides) to a driver manifest immediately upon booking.
- The system shall maintain present and future vehicle manifests in an actionable state including for rides that are booked in advance. Dispatcher portal must show pre-scheduled rides assigned to specific vehicle manifests immediately upon ride booking follow the trip being assigned to a route.
- The system must automatically re-assign trips and optimize vehicle manifests when there are driver callouts (i.e. drivers cannot make their scheduled shift) or vehicle breakdowns. System must manage trip commitments and on-time performance proactively in response to driver callouts and breakdowns, automatically without dispatcher intervention.
- The system shall support manual trip override or re-assignment to a different.
- Ability to track by vehicle, playback by vehicle and track all vehicles at once.

Reporting

The reporting tool must allow any and all reports to be run and then displayed on screen or printed, at the user's option. Minimally required reports follow:

- **Trips and Miles** - A report is needed that will show, by agency, by bill code, by client individual trips, miles, and costs by carrier. The report summary must give totals for each agency by bill code and by carrier. The report summary must give totals by revenue, deadhead, zone and city. The report must print all agencies, agency specific, bill code specific or client specific. Trip costs are associated with the costing structure for each bill code / agency. The report must be able to be run for a specified date range.
- **Performance Reports** - Total trips requested, total actual trips taken, number of standing order trips, number of cancellations, number of no-shows, average ride time, number of miles, p/u +/- 15 minutes, p/u +/- 30 minutes, p/u +/- 45 minutes, d/o +/- 15 minutes, d/o +/- 30 minutes, d/o +/- 45 minutes, ride time +/- 60 minutes. Report must be able to be run for a specified date range.
- **New Clients Report** - This report will list all new clients set up. Report must be able to be run for a specified date range.
- **No Shows, Missed Trips, and Cancellations** – This report will list by agency total number of no-shows, missed trips, and cancellations. This will list no-shows, missed trips, and cancellations separately by agency with individual grand totals at end of report. The report must be able to be run for a specified date range.
- **Passengers per Hour Report** – This report will print out by route for specified carrier number of trips for each route and the number of passengers per hour. This should be listed individually by route with grand totals at end. This report must be able to be run for a specified date range.

Mobile Data Computers (MDC)/ Tablets

- The system shall provide a tested interface to Mobile Data Computer (MDC) equipment (Android or iOS tablet).
- The system shall require drivers to log in to their MDC before being able to accept trips for the day.
- The system shall allow a digital pre-trip inspection to be built in.
- The Mobile Data Computers must allow the driver of each vehicle to receive schedule changes, cancels, enter vehicle number and mileage, and choose best route to pick- up or drop-off location.
- Turn by turn instructions must be built in as an available feature. The map used shall be based on an up to date map that does not require an update. Further, real-time traffic must be available to assist drivers from getting from point A to B in the most efficient way possible.
- The Mobile Data Computer shall require input of mileage when the driver initially logs in, as well as when the driver completes his/her shift. The system must verify that the mileage entered is not less than the last time the odometer reading was entered.
- In the event an ineligible driver logs in, the system shall not allow the driver to proceed.
- Passenger trip notes shall be viewable to the driver.

Other Requirements

The vendor will be responsible for the transfer of all existing information to the new system, for UCAT's service area mapping and for the address matching verification. UCAT maintains a database containing customer information. The vendor shall use the existing database to the greatest extent practical to populate the current UCAT customer database on the software. If the vendor is unable to convert this database to the format required, the vendor shall be responsible for manually populating the new database with the customers selected by UCAT. The vendor must create a data conversion and validation plan at the beginning of the project that will detail how this process will occur. All data fields from the existing system must be transferred to the vendors' new system. For example, pick up and drop off locations must be able to be geo-located to a specific door or entry point, simply providing an address is not sufficient.

- The vendor will perform on-site testing during and after complete installation. The test reports shall contain the description of all tests performed, the results obtained, and any required modifications necessary as a result of testing and installation.
- The vendor will furnish UCAT with all system documentation needed to support the system.
- The vendor will provide contingency plans (Disaster/Recovery planning.) Document and Specification.
- The vendor will complete system implementation and sufficient staff training **within six months**, after notice to proceed.
- Vendor will provide a comprehensive system testing and validation plan as part of this installation. Vendor will produce the plan and execute this plan with UCAT personnel conducting the testing and validation of the system.
- Provide software warranty for five year starting at the acceptance of the installation at no additional cost.
- Provide software user manuals for each workstation.
- Provide 24-hour customer support for no less than one year from the date of accepted installation at no additional cost.
- Provide on-site maintenance for no less than one year from the date of accepted installation at no additional cost.

Fixed Route CAD AVL Software Package Core Functionality Specifications

UCAT will place CAD/AVL systems onboard active fixed route vehicles,. In addition, the CAD/AVL solution will be administered and monitored by staff at UCAT headquarters.

The CAD/AVL solution will satisfy the following requirements:

- CAD/AVL solution must be installed onboard UCAT's identified revenue vehicles and identified facilities with all hardware/equipment, software, components, and licenses necessary to maintain existing functionalities and all identified additional functionalities. Contractor will provide UCAT with licenses to any software necessary to operate the system.
- The AVL system must have the capability to capture and transmit vehicle location at a minimum of every twenty (20) seconds, 24 hours per day, and seven days per week.
- Onboard Mobile Data Computers (MDC's) are required and must be provided for revenue vehicles, if required for system access, such as ruggedized tablets, as approved by UCAT.
- Provide commercial-off-the-shelf and open architecture solutions, such as Application Programming Interfacing (API's), where applicable, to support a more modular system architecture.
- The CAD/AVL solution must operate on a standard MS Windows platform.
- The CAD/AVL solution must provide an integrated AVA system, using existing bus hardware (speakers, etc.).
- The CAD/AVL solution must provide an integrated APC system.
- The CAD/AVL solution must have the option to provide an Overt and Covert (silent) Emergency Alarm (EA).

Operations Requirements

For daily operations, the CAD/AVL solution must provide, at minimum, the following integrated functionality:

- Dispatch viewing at up to 10 UCAT dispatch work stations with configurable list windows (icons or text) to view the status of each vehicle in service. These windows must allow users to filter the views of vehicles based upon various criteria including the vehicle number, route, operator, schedule status, and be customizable to other CAD parameters determined by UCAT.
- Seamless integration, including relevant export and import capabilities between systems, support of XML, JSON, or similar formatting, into the CAD/AVL solution.
- Easy data transfer of individual operator and run assignments.
- Capturing of on-time performance in real-time, detour scheduling, onscreen turn-by-turn visual on vehicle MDCs.

- Ability to track vehicle and operator actions in real-time and retain data historically for a minimum of three months to include vehicle, block, run, route, and operator ID.
- The exporting of real time route, schedule, and stop data updates into Google Transit Feed Specifications (GTFS).
- The input of trip updates and service alerts to generate Google Transit Feed Specifications Real Time (GTFS-RT) files.
- Incident/accident reporting shall automatically populate bus and route information and notify appropriate UCAT Transit departments via email, text, or both.
- Ability for management to monitor on-time performance from CAD/AVL solution.
- Ability to assign operator workforce by run block.

Hardware Requirements

The CAD/AVL hardware requirements must support UCAT's operation and fleet, preferably without requiring the cabling and wiring of new onboard equipment and include all of the following:

- Capacity to interface with a wireless local area network (WLAN) at vehicle storage areas and supported facilities to automate bulk data transfer data (like route and map updates, for example) and reduce the cost of data transfer.
- GPS units with a minimum positional accuracy of 10 feet and time to first fix of 20 seconds or less.
- MDTs, including:
- Mounting hardware.
- A housing that provides appropriate protection for use on heavy-duty transit buses.
- A 10.1 color viewing display.
- For the tablet solution, it must include a hard-wired harness and/or connected to a power source for maintaining operability and battery life. The tablet must be removable.
- Required spare parts list, including identification of all proprietary items.
- Provide UCAT with an anticipated spare parts list for all hardware.
- Provide UCAT a list of required maintenance tools that UCAT is required to have to ensure functioning of CAD/AVL solution.
- Provide detail on the proposed APC, such as the type of sensors to be used, performance history, and the accuracy of passenger counts that UCAT can expect. For example, accurately accounting for heavy volumes of passenger boarding at bus stops and passengers boarding with mobility devices. Include hardware and software set up requirements, and present information on the integration and communication between the proposed CAD/AVL and APC component solutions.

Software Requirements

The CAD/AVL solution software must support UCAT's operations and include all of the following:

- An AVL component solution to allow for monitoring of on-time performance in real time (internally within UCAT and externally for customers) and route run time adherence.
- Security features to prevent unauthorized or accidental disclosure, alteration, or destruction of data.
- Designed to allow for mobile dispatching.
- Ability to capture and display real time traffic conditions on the provided maps for management and dispatch viewing.
- A Graphic Display that includes detailed maps of Ulster County, and the following mapping features:
    - Fixed route overlay, preferably using Google and/or KML formatting, showing all major streets and intersections.

  - Views of standard map display features such as zoom in or out.
  - Pan in any direction.
  - Point-and-click on features and vehicles to get information.

- An Automated Voice Annunciator system solution that meets all of the following requirements:

  - Internal capture of voice recording data and/or conversion of text-to-speech capability.
  - Capacity to push the voice data out externally to all appropriately identified service route vehicles immediately or at pre-determined times for specific time periods.
  - Provide capability for driver-initiated volume adjustment and safety announcements.
  - AVA files are saved within the AVL solution and can easily be updated and combined with pre-recorded voice files when necessary.
  - Capability to translate and broadcast in multiple languages.

- Capability to create geographic "boxes" or "fences" within the AVL software along UCAT routes with the functionality to trigger actions within a designated boxed or fenced area when a UCAT vehicle enters or exits that geographic area. For example, issue an onboard passenger announcement upon entry or exit.
- Software maintenance updates or upgrades to the CAD/AVL solution released to improve or maintain the stability of the CAD/AVL must be provided to UCAT at no charge for the first year of use from the date of UCAT's acceptance of the CAD/AVL solution. Required updates after this period must be included in the annual Maintenance and Support cost.
- Licenses for UCAT's use of any software must be provided.
- The CAD/AVL solution must provide a reporting tool that monitors CAD/AVL performance in a historical report and/or real-time, including down-time, data feed errors, prediction accuracy and other factors that reflect quality of service.

CAD/ AVL Public Internet Interface Requirements

UCAT currently manages and maintains its website. The new CAD/AVL solution must include a public interface that presents real-time vehicle location and stop arrival/departure information that links to UCAT's website via an API or a sub domain. The interface must include all of the following:

- A web display solution that is fully accessible and complies with American Rehabilitation Act Section 508, World Wide Web Consortium's (W3c) Accessibility Initiative (WAI) Guidelines, Web Content Accessibility Guidelines (WCAG) 2.1, and Americans with Disabilities Act (ADA) Guidelines and requirements at the time of implementation, specifically including, without limitation:

  - Content must support screen readers
  - Font size and color contrast must comply with above referenced guidelines

- Capacity to display route and stop-specific information, including route name, direction headed, and number. The display must meet or exceed all ADA requirements, including those found in 49 CFR §§ 37.167 and 38.35, as well as the requirements of the current version of the WCAG at the time of implementation.
- UCAT-supplied logos/graphics in its design and be viewable on all web-enabled mobile devices (i.e., smart phones, iPhone, iPad, and Android phones/tablets).
- Continuous updates to ensure all maps, routes, and stop information is current.
- The public users of the CAD/AVL interface must have the ability to view only those routes that are of interest to them.

Data Management Requirements

- UCAT will own all of the data generated, communicated, and stored using the CAD/AVL solution.
- The CAD/AVL solution must integrate with the new Automated Passenger Counter (APC) component solution to automatically compile data by combining the APC information with the AVL system in real time to allow for full data transfer functionality.
- The WLAN subsystem must have the capability to transfer securely, reliably, and automatically all collected but non-transmitted data from associated sub- components (e.g., APC, vehicle diagnostics, etc.) when individual vehicles are pulling into the maintenance facility.
- The CAD/AVL APC component solution must provide a backup method (for use when the WLAN subsystem is temporarily unavailable) for bi-directional data transfer.
- CAD/AVL data must be exported into a .csv format and/or into Microsoft Excel.
- UCAT must have direct read access to the database at no additional expense while the system is operational.
- All CAD/AVL solution generated data must be accessible by UCAT on demand and stored by the vendor for at least one year directly after system go-live.

Reporting Requirements

At a minimum, all the information listed below must be available on-demand, sent via email generated reporting and through a tabular system.

- Schedule Adherence
    - Arrivals and departure
    - Run times and variance
- APC ridership
- Service Route/Line Summary
- Service and Deadhead Hours and Miles
- Vehicle Headway reporting
- Average Travel Speed
- Incident Reporting
- On Time Performance by Stop, Vehicle, Route, Systematic and By Bus Operator
- Vehicle Pull-Out Report

Implementation

- The CAD/AVL solution must be installed and implemented in the in agreement with UCAT staff.
- The vendor must provide training to all dispatchers, supervisors, administrators, and maintenance technicians (discussed in greater detail in the following section) prior to deployment of the CAD/AVL solution.
- UCAT staff and the vendor will hold a kick-off meeting at UCAT's offices to introduce the project team, identify roles, establish lines of communication and responsibilities, planned technologies, and develop and collaboratively finalize the project implementation work plan and master schedule.

Staff Training

The vendor will provide the following training format at a minimum:

- Training philosophy (e.g., in-person, virtual, or hybrid)
- Training curriculum, including:
    - Training activities
    - Training materials

  - CAD/AVL documentation

- Delivery methods:

  - On-site and/or virtual classes.
  - Written tutorials.
  - Live webinar and/or prerecorded self-paced learning.
  - Train-the-trainer resources.

- Describe the resources provided and a preferred training path (e.g., curriculum specified) for operators, dispatchers, management, customer service, and maintenance staff.
- An estimated number of hours needed for UCAT staff to achieve a level of CAD/AVL understanding applicable to their user roles, including but not limited to operators, dispatchers, management, administrative, maintenance, operations, and system administrator(s).
- The vendor will be required to provide troubleshooting manuals to allow resolution of straight forward items as expeditiously as possible.