

CHICAGO TRANSIT AUTHORITY

STATEMENT OF WORK (SOW)

FOR

SOFTWARE AND HARDWARE MAINTENANCE AND SUPPORT OF CLEVER DEVICES

SYSTEMS ON UP TO 1,900 BUSES LOCATED AT SEVEN GARAGES

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1 OVERVIEW

As part of the Chicago Transit Authority's mission to provide a world-class transit system, several core on-board and back-office systems provided by Clever Devices (Consultant), are required to support our fleet of 1,870 buses, including the enhancement of currently deployed systems that will improve the bus-transit experience for our customers.

These systems are also integrated with our mission-critical operations, and the data these systems produce is used by many different internal departments, including route planning and performance management analysis, maintenance analysis, claims, litigation and safety, and for providing accurate bus-location information to our customers.

1.1 TERMS USED IN THIS DOCUMENT

Throughout the document, the following terms are used to refer to the parties involved:

Consultant: The entity providing services and support for Clever Devices software license, maintenance, and hosting Services (Category A). Currently Clever Devices.

CTA: The Chicago Transit Authority.

1.2 OVERVIEW OF SCOPE

The scope of work with the Consultant breaks down into three categories:

- A. Annual software license, maintenance and hosting services
- B. Field support and repair of installed equipment including parts
- C. Application extensions, training and development of upgraded features

The designations of A, B and C will refer throughout the document to these categories.

All three parts of this scope are only able to be performed by the consultant Clever Devices. A certified trained Disadvantageous Business Enterprise (DBE) sub-contractor may perform parts of the field support (Category B) component. Sub-contractor support is also possible for the hosting services (Category A), but overall management and support is necessary from the consultant Clever Devices.

1.2.1 ANNUAL SOFTWARE LICENSE (CATEGORY A)

The annual software license allows the Consultant to continue to provide the support for the following critical applications:

Automated Voice Announcements (AVAS)	BusTracker, Bustime API
CleverCAD & Radio integration	GTFS feed to Google Transit and other third-party trip planners
Bus stop and schedule data	Automatic Passenger Counting (Planning Department)
Performance Metrics data (AVAS/RTBM)	Automatic Vehicle Monitoring
Secure Bus Access	Hard Brake
On-board destination sign integration	On-board Ventra integration
Transit Signal Priority (TSP)	Ridecheck Plus (APC Reporting data processing)
Disruption Management	CleverCAD Mobile
DCC High Availability	

1.2.2 FIELD SUPPORT AND REPAIR OF INSTALLED EQUIPMENT AND PARTS MANAGEMENT (CATEGORY B)

Field repair is critical to keep the physical equipment installed on buses operational and ensure buses make daily pull out run smoothly.

- On-board Intelligent Vehicle Network (IVN)
- Communications infrastructure (Rocket /Modems)
- Integration with on-board systems (J1939, J1708, Ethernet)
- Speakers
- LED Sign
- APC Sensors and equipment
- Secure Bus Access integration

1.2.3 APPLICATION EXTENSION, TRAINING, AND ENHANCEMENTS (CATEGORY C)

The CTA is constantly coming up with ideas to improve the technology integration of our on-board systems. Ideas to cut costs and improve customer safety or experience are expected to evolve over time. Examples of these include:

- Transit Signal Priority modifications
- Voice talent recording (or use of an automated voice)
- Professional Services for technology enhancements
- Training Services for our staff on expanded features

1.3 TABLE OF SYSTEMS

The following table summarizes the systems covered or impacted by this SOW. The Consultant will provide software maintenance and support for all onboard and back-office systems listed in the tables below. Consultant will provide admin guides, release notes, and user guides for each system in a shared location. Release notes will be provided for each new version release. Updates and upgrades to each of the licensed systems is part of this scope of services. When an update or upgrade warrants the need for updates or upgrades to the hosting infrastructure, the Consultant will coordinate with the CTA project manager to secure the infrastructure environment before proceeding with the application update or upgrade. Any update or upgrade to a software version will be accompanied by Consultant's factory testing scripts and results, CTA business user acceptance testing, and case by case stress / load testing and user training performed in a CTA DEV/TEST environment. Informal training is sufficient for major upgrades; training is not needed for minor upgrades. Any training days will come out of the training bucket. On acceptance of CTA testing and approvals from change committee a software update or upgrade will be deployed by the Consultant to the CTA's production environment.

Consultant will provide application system administration for all systems noted in the table below. CTA will provide a full-time system administrator and work in coordination with the Consultant system administrator. On request and by completion of required CTA forms, Consultant will be provided access to the CTA network over VPN. The system admin(s) will assist the CTA on maintaining existing interfaces or existing data extracts and loads between Clever Devices products and maintain Clever Devices product integrations with other enterprise applications.

Consultant acknowledges that all components of previously approved Task Orders or Change Orders will continue to be supported, maintained, enhanced and all incomplete tasks including and not limited to - open issue logs, incomplete project works, hardware installations, and system deployments will continue to be serviced as part of this scope of services.

On-Board Bus Systems		
System	Description	Document Reference
Intelligent Vehicle Network (IVN), BusWare	Core computing system that controls and supports all Clever Devices sub-systems, with associated hardware and software.	4 Software Maintenance (Category A)
Secure Bus Access (SBA)	PIN based logon and integration with vehicle multiplexer to prevent unauthorized bus movement.	2 BUS SERVICE (Category B)
Transit Signal Priority (TSP)	CTA is working on a centralized TSP program that will require much higher frequency of cellular communication to a central server. This will require testing support on a smaller pilot test which will lead to a larger scale implementation.	2 Bus Service (Category A) 6.5 Capitalized Task Order(Category C)
Automatic Passenger Counter (APC) SLA improvements	Use of APC data for NTD reporting Required by the FTA in 2018. We must have improved documented service.	Required 2.5 Non-Critical AVAS Defects (Category B)
IVN and ITS technology upgrades	Software upgrades to onboard ITS technology. Procure, install, deploy, and verify IVN5 and required controller kits, peripherals, and connectors with intent to replace all IVN3, IVN4, BIB (bus in box) from CTA's existing bus fleet.	6.5.2 Anticipated Deliverables
Fleetwide router, modem or Cell Card Replacement Option	Fleetwide Cellular replacement, modem replacement, router replacement or any communication component replacement in the Bus vehicle.	6.5.2 Anticipated Deliverables
Back-Office Systems		
System	Description	Document Reference
Real-Time Data & BusTime & BusTracker	BusTracker System including Data Communication Server (DCC), prediction server (APP), public externally hosted website, and developer API. Real-Time Data Provider for pushing data to the CTA RTBM System.	3.2 Current CTA Inventory & Parts Harvesting, 3.3 Materials Management Plan, 3.4 Monthly FSR Summary, 3.5 On-Board Communications Systems, 3.6 Service Level Agreement – Hardware Systems and Integration (SLA-HW), 4, Software Maintenance (Category A)

System	Description	Document Reference
CleverWorks	Back-end software to manage voice announcements, schedules, routes and BusTracker data. Bus-in-a-Box test units. The current HASTUS to Clever Works Integration will continue to be supported.	4.7 CleverWorks
Buslink Server Support	Back-end software for managing distribution of data to the fleet, including software support for seven garage servers. Supporting tools include Fleet Manager, Buslink Authentication, and File Manager.	4.3 BusTracker Hosting & Support
AVAS Data Ingester	Database connector to push Busstate (AVAS) data to CTA Oracle server for analysis.	4.9 AVAS Data Ingester
AVM3	Server and data flow for Automatic Vehicle Monitoring, including a web-based reporting solution.	4.10 Buslink Servers
CleverCAD	Back-end system to manage operations and real-time communications with vehicles, includes controller console application.	3.11 Software Maintenance (Category A)
RideCheck+	Back-end system to utilize data from Automatic Passenger Counters (APC) to inform the service planning process, improve system efficiency and integrate manual data collection	4.13 Ridecheck Plus
Hard Brake	Back-end server, to manage Hard Brake events and all reports generated from the system	4.12 Hard Brake
Disruption Management	Update, support, and maintain deployed Disruption Management services and its integration between Clever Works, Clever CAD, IVN's, BusTime, BusTracker, BusWares, GTFS, GTFS-RT, Turn by Turn operator maps, text to speech, operation notifications on TCH and other dependent CTA transit systems.	4.16 Disruption Management
CleverCAD Mobile	Support the Clever Mobile implementation at the CTA on service decisions such as Short Turn adjustments, hold runs, turnback, reliefs etc. Support, update, maintain the deployed Clever Mobile services to enter Disruption Management dynamic adjustments proactively into the application and allow updates to both the driver in real time as well as the BusTime prediction engine, GTFS, GTFS-RT, Real time API immediately. Supervisor Tablets will be provided and managed by CTA and the device configurations will be recommended by the consultant.	4.17 Clever Mobile for Street Supervisors

System	Description	Document Reference
Professional services as modification day usage	Consultant will provide the CTA with an annual bank of 60 person-days of Consultant staff time. Unused time will be rolled into subsequent contract year.	5 PROFESSIONAL SERVICES (C)
Voice Talent and Recording		5.1 VOICE TALENT & RECORDING SERVICES
SSL Certificates		5.2 SSL Certificates and website Hosting
Support Portal, weekly & monthly status reports	Online support portal to authorized CTA personnel – updated content.	6.1 Support Portal 6.2 Weekly Call and Monthly Meeting
Data ownership and maintenance of interfaces	Updated content.	6.3 Data Ownership
Integration with 3rd party High availability (HA)	In the event of a failure of a protected service the business continuity system should be configured to recover the protected service.	6.5.2 Anticipated Deliverables
Open Architecture & Open API integrations	One way or two-way Interaction / Integration between Clever Devices systems and CTA's enterprise systems, based on open Architecture and/or use of open APIs. To be defined on a case by case basis. See section 6.5.2 for specific anticipated examples.	6.5.2 Anticipated Deliverables

1.4 BUS COUNT PROJECTIONS

The CTA bus Fleet is expected to stay consistent with current levels per the rough estimate in the table below:

Series	Mfg	Size	2023	2024	2025	2026	2027	2028	2029	2030
1000	New Flyer	40	825	600	500	500	350	200		
4000	New Flyer	60	206	206	102					
4300	New Flyer	60	93	93	93	93	93	93	93	
600	Proterra	40-Elec	23	45	45	45	45	45	45	45
700	New Flyer	40-Elec	2	2	2	2	2			
7900	Nova	40	744	944	1044	1044	1044	1044	1044	1044
TBD-1	TBD	60-TBD			105	210	210	210	210	210
TBD-2	TBD	40-TBD					150	300	500	500
TBD-3	TBD	60-TBD								100
		Total:	1893	1890	1891	1894	1894	1892	1892	1899

2 SOFTWARE MAINTENANCE (CATEGORY A)

The back-end software that powers the Clever Devices Systems is an extensive and integrated system of programs on several servers spanning the CTA network. Software maintenance and periodic upgrades will be provided for licensed Clever Devices Software possessed by the CTA in accordance with the Software Maintenance Guidelines already established.

Upgrades to hardware, if required by Clever Devices software upgrades or CTA hardware needs will be a collaborative process and are included in the scope of the work outlined here.

2.1 RELEASE NOTES

All software updates require submission of appropriate release notes prior to acceptance and deployment of software. The relevant CTA staff will review and approve the release in a limited test phase and proceed to deployment per the test process.

2.2 TEST SERVERS

Consultant will support the following test servers:

- CleverCAD Test
- BusTime Test
- CleverWorks Test
- DCC Test
- AVM3 Test (Planned)

The virtual servers and hardware will be supported by the CTA, and the Consultant will utilize these servers for testing of software and will not charge additional license fees for a test instance.

2.3 BUSTRACKER HOSTING & SUPPORT

Consultant will continue to host and support the BusTracker external public facing application. While Consultant will make every effort to monitor the complex Bus Tracker system and will set up alerts to proactively determine service up / down status, CTA should report outages to Clever Devices support via the Clever Devices Technical Support Contact Mechanisms:

During regular business hours, Monday through Friday, 8:30am to 5:00pm Eastern Time, contact Clever Devices' service and support as follows:

Technical Support number 1-888-478-3359

Email address TechnicalSupport@CleverDevices.com

All after hour calls should be made solely to the Tech Support phone 1-888-478-3359. Direct outreach to designated Systems Engineers is also permissible.

2.3.1 BUSTRACKER HOSTING

Consultant will continue to lease four Windows-based web servers and network bandwidth (4 TB per month) for the CTA BusTracker system from American Eagle.com Inc. under a separate contract from the CTA's contract for transitchicago.com.

OPTION: Consultant should plan to optionally host a fifth server for test purposes for deployment of BusTime upgrades.

Two of the servers from American Eagle are used to support the BusTime Web servers on a configured load balancer to balance the performance or user load. These two servers are monitored via third party software which can determine if the website is up or down. Email alerts will be sent to Consultant and to a named resource or email distribution list from CTA. Consultant will respond on a best effort basis to these alerts.

Consultant shall hold American Eagle, or other web host provider, to a standard Service Level Agreement. The CTA in agreement with Consultant can open discussions about moving to an alternative web hosting provider if the current provider is not reliably meeting the established SLA.

2.3.2 BUSTRACKER CONNECTIVITY SUPPORT

Consultant will assist with network changes at either American Eagle, cellular provider or the CTA to ensure we incur minimal to no downtime. Consultant will receive data delay messages from the RTBM database server within 60s of a delay of data with updates on the quarter hour as well as an all-clear message. These messages will serve as a front-line early warning detection system of a possible data outage.

2.3.3 BUSTRACKER SUPPORT

The BusTracker system is a complex system with many sub-components that also require on-going support. Consultant is to provide end-to-end support of the BusTracker system working in partnership with CTA staff.

2.3.3.1 BusTracker Prediction Support

Consultant will continue to support the CTA on prediction accuracy issues as they arise by helping CTA to modify a combination of operational changes, data collection, or system parameters. The support is ad hoc, and any issues found outside of expected support will incur PROFESSIONAL SERVICES (C) Section 5 to implement a upgraded features or enhancements. Consultant will reinstate the ability to monitor BusTracker Prediction accuracy, when available.

2.3.3.2 API

Consultant will continue to maintain the BusTracker Application Programming Interface (API) and integration guides which support the development of third-party applications. The API should allow CTA third party systems or vendors to utilize Clever Devices data in real time. Examples of information needed via API includes and is not limited to:

- Real time bus location
- Bus number
- Route / block
- Stop level information
- Vehicle information
- Hard braking and other diagnostic data (Flagged as "Restricted" to prevent public access)
- Crowding information
- Arrival predictions
- Operator logon information

<http://www.transitchicago.com/developers/bustracker.aspx>

The CTA will maintain the content of the user community and will grant and revoke API keys. Modifications to this, such as automatic granting of an API key and reporting on API use, will be issued

through a Professional Services Task Order as outlined in section 5.0, PROFESSIONAL SERVICES (C). The basic support of the API functionality is the responsibility of Consultant.

2.3.3.3 Text Messaging

Text messaging is supported by the Consultant Web servers using an API. CTA has currently contracted separately with the SMS vendor, TextMarks. Consultant will help troubleshooting issues with TextMarks and the texting API.

Consultant will also assist with changing to another new potential SMS text provider if required and for a nominal cost as issued through a Professional Services Task Order as outlined in section 5.0

2.4 DATA COMMUNICATIONS CONTROLLER (DCC)

Consultant will completely maintain and support the applications on the back-end Data Communications Controller and will support any required upgrades to support the Clever Devices software.

Windows upgrades or hardware moves that are performed by CTA will be supported collaboratively to incur as little downtime as possible during planned maintenance.

2.5 BUSTIME PREDICTION SERVER

Consultant will completely maintain and support the applications on the back-end BusTime Prediction server and will support any required upgrades to support the Clever Devices software. Windows upgrades or hardware moves that are performed by CTA will be supported collaboratively in an effort to incur as little downtime as possible during planned maintenance.

2.6 BUSWARE ON-BUS SOFTWARE

At least once every year the CTA must receive a fleet-wide update to the on-bus IVN BusWare software. Every effort will be made to maintain a common fleet-wide BusWare version. Consultant will completely maintain the BusWare software on the buses and will support all required upgrades and will perform required software system and integration testing with each upgrade.

2.7 CLEVERWORKS

Consultant will completely maintain the applications on the CleverWorks server and will support any required upgrades to support the Clever Devices software. Upgrades to CleverWorks will come in a timely manner and will be fully tested in accordance with the established Consultant quality assurance protocols, provided with the proposal. All software on the CleverWorks server required for BusWare, fleet distribution, and management are the responsibility of Consultant. CTA staff may notify Consultant directly of any issues, especially during critical distribution times.

2.7.1 BUS-IN-A-BOX TEST UNITS

Bus-in-a-Box test fixtures require very infrequent maintenance and support. These will be upgraded with the latest BusWare upon request. Any upgraded IVN version (e.g., IVN5) will be included in future bus procurement proposals. Repair requests for support on the Bus-in-a-Box Test Units will come through the CTA Project Manager via the standard weekly meeting or e-mail.

2.8 RTD PROVIDER SERVICE

Consultant will maintain the RTDB Provider service to run on any mutually agreeable CTA server to pump real-time data from the DCC server to a database (Oracle or SQL Server) of the CTA's choosing. The CTA can operate a second RTDB Provider service for developmental and migration purposes. Only the RTDB Provider service running on the official Data Communications Controller (DCC) server is fully supported.

2.9 AVAS DATA INGESTER

Consultant will maintain the AVAS Data Ingestor service to run on any mutually agreeable CTA server to pump BusState data to a database (Oracle or SQL Server) of the CTA's choosing. The CTA can operate a second AVASDATA Ingestor service for developmental and migration purposes. Only the AVASDATA Ingestor service running on the official AVASINGST server is fully supported. No other software on the AVASINGST server is supported by Consultant; however, the CTA must keep the system in good working operation and will confer with Consultant upon any major operating system upgrades.

2.10 BUSLINK SERVERS

Consultant will fully support and maintain the following software on the CTA Buslink servers:

- BusLink Authentication Manager
- Fleet Manager Client (Log File Retention)
- BusLink Distribution Client
- File Manager

Consultant will actively participate in any upgrades to hardware, software, fault tolerance, business continuity or disaster recovery planning for the application and infrastructure for the Buslink servers and will work to maintain documentation and install software. Any migration to upgraded Buslink server hardware will be supported by the Consultant deployment team, with CTA staff performing the rollout, under the direction of Consultant staff.

2.10.1 AVM3

Consultant will fully support and maintain the AVM3 back-end SQL Server and application. CTA will provide the SQL Server license, while Consultant is fully responsible for the health and maintenance of the server. CTA staff, or its subcontractor, will allow for VPN access to the server and access for any hardware repair to the 567 W. Lake Street data center. Consultant will work with CTA to ensure that the AVM3 application is maintained with current patching and feature functionality. Consultant will actively participate in any upgrades to hardware, software, fault tolerance, business continuity or disaster recovery planning for the application and infrastructure.

2.10.2 AVM3 DATA DICTIONARY DISTRIBUTION

Consultant will maintain a current and as common as possible fleet wide AVM3 data dictionary and support the application, testing and distribution of data dictionary changes. Provisions for at least four updates per year to the AVM data dictionary including what is monitored, what is sent in real-time to CAD, and other bus specific modifications are required.

2.11 CLEVERCAD

Consultant will fully support and maintain the CleverCAD solution from end-to-end and all back-end infrastructure. Consultant will work with CTA Information Technology staff for backups and disaster recovery planning. Consultant will monitor the server and report on any health issues. Consultant will support and assist in any upgrades to hardware, software, fault tolerance, business continuity, or disaster recovery planning for the CleverCAD application and infrastructure.

2.11.1 CLEVERCAD APPLICATION AND SQL SERVER

Consultant will fully support the CleverCAD Application and Microsoft SQL Server back-end servers. CTA will continue to maintain the redundant virtual server architecture and necessary licenses. CTA Server staff are responsible for backups and fault tolerance while working with Consultant system engineers on timing and best practices.

2.11.2 CLEVERCAD WORKSTATION APPLICATION SUPPORT

Consultant will fully support the CleverCAD Workstation application. The CTA, or the established desktop support provider, will maintain the physical hardware post warranty, but Consultant will assist in maintaining the image of the workstation to keep their software up to date. CTA will continue to maintain the desktops while working with the Consultant for best practices for keeping the systems optimally tuned

2.11.3 CLEVERCAD REPORTING

Consultant will support a Clever CAD reporting interface and supporting canned reports in the CleverCAD system. Optional report creation and integration will be negotiated through the Professional Services portion of the contract. Currently the CleverCAD reporting server is not being used and services can dial down to ad hoc support until such time as reporting is developed from within the Clever Reports server.

2.11.4 CLEVERCAD ACTION TRACKER & UPGRADES

Consultant will continue to maintain the CleverCAD Action Tracker which identifies issues and system improvements. If a suggested improvement is proven to not enhance the product and will incur non-reoccurring engineering (NRE) costs from Consultant a professional services scope shall be outlined.

2.12 HARD BRAKE

Consultant will support and maintain the Hard Brake application, back-end server, data flow, and all reports generated from the system. Consultant will debug and fix any hard break issue as necessary to fix bus(es) that is not responding to hard brakes. The Hard Brake application is a replacement of the Tacholink/Circuit Link "Black Box" data recorder and provides secure files.

Consultant separated out the Hard Brake event from the AVM data and created the Hard Brake reporting utility. It allows users to create, save and print any of the four report types listed below. The reports are created and displayed in Adobe Acrobat (PDF) format.

There are four (4) types of reports that may be created and viewed using Hard Brake:

- **Hard Brake** - This event is recorded on a vehicle when its deceleration exceeds a set limit. The deceleration value is arrived at by measuring the changes in the vehicle's speed, regardless of whether the operator has engaged the vehicle's brakes. There is a default threshold deceleration (15 ft/sec²), a default event duration (300 ms), and a minimum speed (10 mph) that must be met to trigger a hard brake event.
- **Last Stop** - This is any occasion when the vehicle's speed falls to 0 mph. When a full stop takes place, an event is created and its data stored in a file that can be viewed using this application.
- **EDR (Event Data Recorder) Last Stop** - This combines the vehicle's reaching 0 mph with the simultaneous detection of an event by the vehicle's event data.
- **Incident** - This indicates unusual movement of the vehicle in any direction (backwards- forwards, right-left, up-down).

Reports show a vehicle's acceleration, speed, and distance on combined and separate graphs. They also include tables that list nine (9) key measurements that coordinate with the graphical data. The reports allow users to construct a clear picture of all hard brake events.

2.13 RIDECHECK PLUS

The Ridecheck Plus software is used by the Ridership Analysis & Reporting Department to utilize data from Automatic Passenger Counters (APC) to inform the service planning process, improve system efficiency and integrate manual data collection with CTA databases in support of annual statutory National Transit Database reporting requirements.

2.14 DESTINATION SIGN DISTRIBUTIONS

Consultant will assist with sending MTU file via Buslink and the BusWares software on the IVN for application of message sets to the destination sign, on busses capable of handling OTA sign updates.

2.15 ENHANCED SOFTWARE AND REPORTING TOOLS

As enhanced back-end technologies are developed and deployed to support the 1,900 buses subject to this SOW, CTA may ask Consultant to add maintenance for the enhanced system(s) at a negotiated rate.

2.16 DISRUPTION MANAGEMENT

Continue to provide Disruption Management services onto the 1900 buses subject to this SOW. Services include Update, support, maintain, and deploy disruption management and its integration between Clever Works, Clever CAD, IVN's, BusTime, BusTracker, BusWares, GTFS, GTFS-RT, Turn by Turn operator maps, text to speech, announce ad-hoc stops for Bus Bridges or Detours, and operation notifications on TCH and other dependent CTA transit systems.

Includes the support and enhancement of updated specifications of all Interface Control Document (ICD) to integrate into the other CTA enterprise systems (Example – Hastus, TOPS etc.). Services to include training and operational procedures; job aids for Controllers, Street Supervisors, Operators, and Managers on the Disruption Management Solution.

Support for the end-to-end solution includes and is not limited to the upgrades of other Clever Devices products as part of continuous support, maintenance, and upgrades of CleverCAD, DCC, BusTime Prediction servers, BusTime Web servers, BusWares onboard ITS hardware, software, CleverWorks BusTime API. Maintain the GTFS & GTFS-RT real time integrations to include schedule adjustments and prediction updates through the BusTime API and the existing BusTime Website. Integrations with 3rd party wayside signs (for example, Luminator) will be included. The scope of services to include CTA specific training materials and end-to-end testing: integration testing, stress testing, user / unit testing and acceptance testing as part of any potential future upgrade to disruption management or its dependent systems. In the event disruption management services are not deployed onto all 1900 buses subject to this SOW, the clever monthly invoice will be limited to only include the amount of buses onto which disruption management licenses are deployed for use at CTA.

2.17 CLEVER MOBILE FOR STREET SUPERVISORS

Supervisors make service decisions, such as Short Turn adjustments, hold runs, turnback, reliefs, etc. Consultant to provide licensing, support, maintenance, and upgrades to Clever Mobile software services through a CTA chosen tablet device. Software allows the Street Supervisors to enter Disruption Management adjustments proactively into the application and allows updates to both the driver in real time as well as the updates to turn by turn direction, text to speech, voice annunciations, BusTime prediction engine, GTFS, GTFS-RT, and Real time API immediately. Supervisor Tablets are provided and managed by CTA and the device configurations are recommended by the consultant. In the event Clever Mobile is not deployed onto all supervisor tablets subject to this SOW, the Consultant monthly invoice will be limited to only include a partial number of licenses.

2.18 SERVICE LEVEL AGREEMENT – SOFTWARE (SLA-SW)

The following table outlines the Service Level Agreements (SLA) for the software components of the Clever Devices systems and integration.

	Support	Response Time
BusWare	Complete on-bus software support.	16 hours if a fleet- wide implication affecting critical AVAS/BusTracker
Clever Works	Applications on servers CTA - Virtual Server	16 hours 4 hours if issue impacts a critical distribution
DCC	Applications on Servers CTA - Virtual Server	45 minutes for daytime issues. 2 hours for overnight issues.
BusTime Prediction	Applications on Servers CTA - Virtual Servers	45 minutes for daytime issues. 2 hours for overnight issues.
BusTime Web server	Complete server and application	45 minutes for daytime issues. 2 hours for overnight issues.
RTDB Provider Service	Windows Service	2 hours of notification if issue is truly with the service itself 1 hour if notified in peak time
Busstate Data Ingestor	Windows Service	16 hours
Ridecheck Plus	Applications on servers CTA - Virtual Servers	96 hours
AVM3	Complete servers and applications	16 hours
Clever-CAD inclusive of Disruption management and Clever Mobile	Complete servers and applications on the servers CTA – Virtual servers	1 hour of notification
Buslink Server Applications	Applications on servers CTA - physical servers	As needed assistance for reconfiguration, as requested with 16 hours of notification

The Consultant is required to report monthly on the adherence to the prescribed SLA. Any material failure to meet SLA conditions shall result in a credit to CTA of training hours (or future Task Orders) to be used during the duration of the contract.

Service Level – The minimum level of performance the Consultant agrees to adhere to for each Performance Metric. Requirements which do not follow the standard process, as agreed to by the Parties, are exempt from SLAs. Consultant should offer credits (as defined in the paragraph below) to CTA that will be available when it fails to meet the required Service Levels.

Training/Professional Services Credit in the amount of 1% of the fee invoiced to CTA for the month the performance credit was incurred (excluding pass-through expenses, such as taxes and reimbursed out-of-pocket expenses) will be credited into an “At-Risk Account” each month the Consultant meets the required Service Levels across all performance metrics. For the months that the Consultant does not meet the required Service Levels across all performance metrics the Consultant will “deposit” credit equal to 2% to the At-Risk Account. The credit amount will begin at 2% for the first occurrence of the Service Level not being met and increase by additional 1/2% for the second and third consecutive months of missed service level. In the event the At-Risk Account balance does not meet the At-Risk Amount for the month, Consultant will apply a negative credit to the At-Risk Account. At the annual anniversary of Contract renewal, the At-Risk Account will be transferred as credit to CTA for training or professional service hours.

3 BUS SERVICE (CATEGORY B)

The CTA bus network depends on a functioning Intelligent Vehicle Network (IVN) and sub systems

on board the bus. Consultant shall provide a field service technician on site at each CTA facility for at least a portion of each standard night work shift. Consultant will provide service from the Sunday night shift to the Thursday night shift. Work shifts are subject to demand and should address the most critical issues first.

Troubleshooting and Maintenance Services to be provided by the Consultant on the identified CTA fleet will be limited to the following CTA garages:

- **103rd Street:** 1702 E. 103rd St, Chicago 60617
- **77th Street:** 210 W. 79th St, Chicago 60620
- **74th Street:** 1815 W. 74th St, Chicago 60620
- **Kedzie:** 358 S. Kedzie Ave, Chicago 60612
- **Chicago:** 642 N. Pulaski Rd, Chicago 60624
- **North Park:** 3112 N. Foster Ave, Chicago 60625
- **Forest Glen:** 5419 W. Armstrong Ave, Chicago 60646

The following outlines the key terms relevant to field bus service.

- **AVA** - Automatic Vehicle Announcements
- **AVAS** - Automatic Voice Announcement System; encompasses all back-end and is essentially the CTA's AVL system.
- **AVC** – Automatic Volume Control
- **FSR** - Field Service Report
- **GPS** - Global Positioning System; includes gyroscope and odometer readings
- **IVN** - Intelligent Vehicle Network
- **LED** - Light Emitting Diode Sign
- **MMIS** - Maintenance Management Information System
- **NTF** - No Trouble Found
- **SBA** – Secure Bus Access
- **TCH** – Transit Control Head
- **TSP** – Transit Signal Priority
- **VPN** – Virtual Private Network

3.1 SECURE BUS ACCESS (SBA) SUPPORT

Consultant will maintain the Secure Bus Access (SBA) system and all associated integrations with the on-board multiplexer and ladder logic-based systems. Consultant will support testing new multiplexer ladder logic as professional services Task Orders. The day-to-day operation and support of SBA including logon logic resides within this scope of work. CTA will be responsible for installing new version of ladder logic and managing the ladder logic when repairing or replacing a bus multiplexer. The day-to-day distribution of PIN IDs remains within the scope of the CTA as developed and distributed through the TOPS system currently, and through the BUSPIN database. Consultant will support a change in the secret hash key (CleverWorks parameter) or ladder logic should any compromise in security occur or to improve the security posture of CTA.

3.2 TRANSIT SIGNAL PRIORITY (TSP)

Consultant will maintain the TSP functionality within the bus devices and applications. Consultant will provide support and maintenance, configuration, and maintain communications between onboard equipment and the external intersections. As additional buses and routes are added to the existing fleet, Consultant will ensure that all TSP communication will work on the existing supported communications systems.

As CTA considers enhanced TSP solutions such as TSP Centralization, then this will be supported through new Task Orders. This solution may require higher tracking and polling rate which would also be covered through the Task Order.

Buses' TSP message log files are saved on a server and this process needs to be maintained; any troubles with log files being uploaded to the server will require Clever Device's support.

The CTA may elect to change the conditions that trigger the TSP activation. One such condition is the passenger count criteria based on the APC. CTA is also considering changing any other conditions to test the various states of the bus to activate TSP. If there is a demand requiring Clever Device support, this should be included under maintenance work.

3.3 MOBILE/PORTABLE BUS-IN-BOX IN VEHICLE

Bus-in-a-Box with IVN5 test fixtures require very infrequent maintenance and support.

BIB will be upgraded with the latest BusWare upon request. Repair requests for support on the Bus-in-a-Box Test Units will come through the CTA Project Manager via the standard weekly meeting or e-mail.

3.4 CRITICAL AVAS DEFECTS

Critical AVAS defects are defined as those having a primary impact on the operation of automatic voice announcements and performance monitoring data. Such defects will be entered into MMIS for notification and required action by Consultant, either manually or automatically. Critical AVAS defects take priority over other issues and include:

- **Buslink No Data** - possible Wi-Fi or IVN outage
- **Navigation** - possible GPS malfunction
- **Odometer** - possible disconnect to bus odometer (shared CTA | Consultant) NOT included in the Consultant Defects unless deemed NOT a CTA issue.
- **TCH** - Identification of a possible Transit Control Head defect

The CTA will maintain a weekly accounting of the average critical buses by garage for reporting on a web page, updated monthly. The Critical AVAS Defects are computed as follows (these can be updated based on periodic review):

- **ODM** - Odometer Defect - at least TWO days out of the last TEN have more than 10% of at least 150 records with a zero-odometer reading.
- **NAV** - Navigation Defect - at least TWO days out of the last EIGHT have more than 30% of the records indicated as off route.
- **BL** - No Busstate File (Buslink) - no Busstate records from a fueled bus during the last SEVEN days.
- **BL** - Bus has BT Version, at least TWO days past the effective date of the distribution.
- **TCH** - Transit Control Head Defect - at least THREE days out of the last EIGHT having no stop event records for days with at least 250 events.

3.5 NON-CRITICAL AVAS DEFECTS

Non-Critical AVAS defects include Light-emitting Diode Signs (LED), bus internal and external speakers, Automatic Volume Control (AVD) microphones and destination sign integration. While each of these is important, they are not considered critical. While the CTA can report on APC defects via web pages, the other non-critical components are not identifiable by data alone. Such defects will be entered into MMIS and will require Clever Devices field support troubleshooting.

3.6 AUTOMATED DAILY E-MAIL & WEB-BASED INFORMATIONAL REPORTING

The CTA will send out a daily informational e-mail listing the critical AVAS and real-time observed defects in the 1700 hour (5PM) each weekday.

Clever Devices field staff will also have access to MMIS workstations and to the CTA intranet for accessing web-based reporting tools on AVAS defects.

It is expected that while the MMIS Clever Devices Tripper list is the priority for reporting defects, the field service technicians will also seek out the buses listed on the Automated Daily E-mail for proactive service. Clever Devices can request to modify the group distribution for the Automated Daily E-mail at any time or can create a group distribution list managed by the Clever Devices E-mail server. The CTA Information Technology staff will also create Virtual Private Network (VPN) accounts for any Clever Devices Field Service Technician who requires remote access to the CTA MMIS or web-based reporting tools. Clever device to ensure all consultants and subcontractors have completed a cyber security awareness training in order to be granted a CTA network access.

3.7 MMIS USAGE

CTA shall enter any and all requests for service into the MMIS system. CTA can automatically create Service Requests, and managers will then assign Work Orders in the TFV category to Clever Devices accounts. Clever Devices personnel will work from the MMIS in order to track and record all troubleshooting or repair work done on CTA vehicles that are in or out of warranty. All Clever Devices issues reported by CTA need to be logged into this system before any work will commence. The work order needs to include comments that the bus has been tripped. CTA is responsible for tripping the buses to an area designated for Clever Devices at each garage. Clever Devices shall not be responsible, but is not prevented from, for providing maintenance support for issues that are not in the MMIS system.

3.8 SERVICE RESPONSIBILITY FLOW

3.8.1 CTA'S RESPONSIBILITIES

- Utilize MMIS to enter work orders. The work order requires comments that the bus has been tripped and specific defect codes identifying issue.
- Identify the date and nature of the defect on the work order.
- Trip and hold all buses entered into the system in an agreed upon and specific location.
- Park all buses that have been entered into the system in a location that is easily accessible to Consultant's technicians and has proper lighting and electricity.
- Maintain the 802.11 network, components and ensure proper infrastructure to support coverage throughout each garage.
- All Clever Works database creation and distributions. (Distributions will be handled by Consultant's deployment team at any time of a BusWare upgrade, Clever Works database, sign database, AVM data dictionary or at any time when modifications to the distribution are required; pursuant to section 2.9: CleverWorks Schedule Updates)
- Supply all components and parts required for repair and replacement.
- System level maintenance and operation.

3.8.2 CONSULTANT'S RESPONSIBILITIES

- Inform the garage of the coverage schedule so that CTA can hold appropriate buses. Sign-in daily, when applicable, in compliance with CTA safety regulations, when reporting to the CTA garage.

- Log into MMIS to retrieve Clever Devices On-Board System Issues.
- Perform work on buses, at night or during the midday.
- Provide a hard copy, or electronic PDF, Field Service Report for all out of warranty support.
- Sign out of the garage before leaving.
- Report any CTA equipment defects that impact the system to appropriate CTA staff.

3.9 CLEVERWORKS SCHEDULE UPDATES

Consultant will manage the sending and distributing of all CleverWorks updates when there is a difference of BusWare versions, that necessitates modification of the standard export files to work across the fleet. Once we mutually agree that the system is standard and upgraded across the fleet, the CTA will support the sending of distributions. When an automated ability to update the BusTime (known as BusTracker) system is available Clever Devices staff will instruct CTA staff on monitoring the application of schedule changes to the BusTime system.

3.9.1 DESTINATION SIGN UPDATES

For all buses, Consultant shall support updating the destination sign message set via a distribution sent through the Buslink architecture. The CTA is responsible for creating the "MTU" file, managing destination sign codes and testing the file at the South Shops facility. Clever Devices will send the MTU file to the IVN for application on the ODK4 and will provide a report three days after an activation of the buses that must be manually updated. Clever Devices technicians will troubleshoot basic connectivity between the IVN and the ODK4 on the local bus Ethernet network.

3.10 BUSWARE UPDATES

Consultant will provide the CTA with release notes for all BusWare updates one week prior to testing a new BusWare release. BusWare updates will follow the established Consultant quality assurance protocols and CTA testing and quality assurance procedures, which are required in the work proposal.

3.10.1 ITEMS OUT OF CONTROL OF CONSULTANT'S TECHNICIANS

The following items are considered out of control of Consultant's field technicians:

- Wi-Fi coverage or issues at garages
- Odometer issues (once determined operational at the IVN)
- Power issues (fuses) to the IVN and other equipment
- Network configurations (both Cellular and WLAN)
- Buses not made available for repair

Buses identified as having Clever Devices systems defects that are determined to be due to items out of the control of Consultant Technicians, will not be considered in the calculation for purposes of determining the Service Level as defined in section 2.15: Service Level Agreement – AVAS (SLA-AVAS).

Consultant technicians will notate findings, close Work Orders in MMIS, and work with the appropriate CTA representatives to have buses posted for proper repair, or work with IT staff to resolve other issues.

3.11 MONTHLY FIELD SERVICE REPORTS

The field service manager, or designee, is required to produce a monthly report of vehicles repaired by garage. A spreadsheet summarizing Field Service Reports per visit will be provided. Information will include all troubleshooting and maintenance activity, date of service, bus number, garage, technical name, issue reported, diagnostic findings, and repair resolution. The CTA project management staff will work with the Consultant project management staff for a mutually agreeable report template.

Copies of these reports will be made available to the CTA, no more than one time per month. CTA is responsible for making warranty claims for buses under an OEM warranty.

3.12 AUTOMATIC VOLUME CONTROL

Pursuant to this contract, Consultant will check and correct, if necessary, the AVC (Automatic Volume Control) tuning to the CTA approved settings. CTA will designate a single point of contact responsible for approving the AVC settings. This service will be performed once per Bus Type per contract.

Current AVC settings will continue to be documented in a mutually agreeable format and any change, updates, and approvals will be documented in the same manner.

3.13 MAINTENANCE OF ON-BOARD COMMUNICATIONS SYSTEMS

Consultant is responsible for troubleshooting the on-bus data communication systems.

The network settings of each modem are identical and remotely managed. Each IVN is also set to an identical network setting of a common 192.168.2.20 IP with a network gateway of 192.168.2.1.

On buses equipped with a combinations of communication devices (Example - Rocket Mobile, cellular air card, Sierra Communication Device, modems, routers etc.), IVNs and any communication device on the bus can be replaced independent of each other without any need to configure based on the equipment change.

3.13.1 CONSULTANT'S RESPONSIBILITIES

- Troubleshoot physical and connectivity issues with modem or cellular device installed on the bus.
- Replace, break fix, or reseal cables and swap out parts as needed.
- Verify complete on-board Bus RTWN system operation after a replacement
- Notify CTA upon swap of cellular cards (in ESN and out ESN) via monthly FSR report or other mutually agreed upon method of communication.
- Return ALL defective equipment to CTA.
- Advise 2 weeks in advance on low stock of replacement parts in the inventory.
- Support and troubleshoot connectivity issues with CTA routers

3.13.2 CTA'S RESPONSIBILITIES

- Provide replacement modem or cellular parts
- Assist with back-end configuration, troubleshooting, and activation.
- Physical replacement of all antennas on the top of the bus, after testing and validation of the issue from Consultant technicians (South Shops).
- Provide support for pairing of cellular air cards and modems to vehicles.

3.14 REPEATER BUSES WITH NTF (NO TROUBLE FOUND)

Buses identified as No Trouble Found by Consultant technical personal after inspection and diagnosis will be reported to local CTA maintenance management. If requested, Consultant will validate the NTF for maintenance management on that work shift.

Buses that have been reported as NTFs and then reported again for the same or similar defects will require validation and a detailed description of the perceived defect to identify transient or intermittent problems. This process should be completed by qualified CTA employees only. If the defect is validated and confirmed it will be added to the MMIS system. If Consultant agrees with the diagnosis and must perform repairs within the scope of this document, the bus shall be included in the percentage of defects from the date of the original report. A bus shall be considered a repeat defect if the same or similar defect is reported and validated within five days of the original report. Buses reported and identified as NTFs three or more times will require specific diagnostics that are validated by qualified CTA supervisory or technical staff prior to Consultant responding. The CTA shall provide a method such that CTA approved out-of-scope materials and labor can be invoiced.

3.15 SERVICE LEVEL AGREEMENT – AVAS (SLA-AVAS)

The AVAS performance level for this maintenance agreement will be measured and reported for the seven CTA Garages identified utilizing the current CTA AVAS Maintenance Site http://transitweb/bus/avasmaint/maint_index2.asp. hereafter referred to as the AVAS Web Site.

The current AVAS Web Site presents those buses with possible critical AVAS defects based on CTA analysis of AVAS data provided by the Clever Devices AVAS system.

The collective monthly average number of "Possible critical AVAS defects" identified on and reported by the AVAS Web site for the seven CTA Garages identified in Section 3 (BUS SERVICE (Category B)) above, shall not exceed 3%. (that is 97% of the available buses do NOT have possible critical AVAS defects). This is computed on a monthly basis as a daily weekday average.

For the purposes of determining the AVAS performance level for this maintenance agreement, only those possible critical AVAS defects that fall within the maintenance responsibility of Consultant shall be measured and are defined as those currently listed on the AVAS Web site as "Navigation", "Not Reporting", "BTDatabase" (if Wi-Fi is properly functioning) and "TCH".

The underlying algorithm/query for determining possible critical AVAS defects shall not be altered unless agreed upon by both the CTA and Consultant.

CTA shall provide authorized Consultant personnel with access to the AVAS Web site and reports available that refer to the AVAS performance level.

If at any time a given garage goes above 2% "Critical AVAS Defects" for a week and does not improve the following week an automatic e-mail to the project manager of both Consultant and CTA will be

generated. (The CTA will create the automatic notification.) The automatic notification will only serve as a discussion point and an early warning system for both sides.

The Service Level Agreement for non-critical defects and anything else entered into the MMIS is subject to a standard response time of 96 hours within receipt of MMIS notification. If necessary, the CTA will generate reports from the MMIS reporting interface to access the quality of response time for all MMIS requests for Clever Devices systems repair.

The Consultant is required to report monthly on the adherence to the prescribed SLA.

3.16 CTA – CONSULTANT RESPONSIBILITY MATRIX

System	Primary Responsibility	Notes
IVN Intelligent Vehicle Network	Consultant	CTA to repair power if identified as no power by Consultant
APC / LED / TCH Automatic Passenger Counter Light Emitting Diode (Red Sign) Transit Control Head	Consultant	
Destination Sign	Luminator	Consultant for confirmation of communication to ODK
Rocket	Consultant	CTA to repair power if identified no power by Consultant; Modems and back- end Rocket support from TSS
Speakers	Consultant	CTA to support major harness repair.
Boom Mic	CTA	
Odometer	Consultant to troubleshoot	CTA to repair
Test Route	CTA to perform test route	
Radio/ BECS Interface Box Old Bus Emergency Communications System	Consultant for radio power relay check.	CTA for BECS Interface box
Silent Alarm	Consultant	CONSULTANT to troubleshoot. Depending on BusType may go back to CTA for replacement/wiring.
Handset	Consultant	All buses EXCEPT new Novas.
J1939 CAN Line RCTO Roll-call timeout	Responsible Vendor (Luminator, TK, Vansceo, Cummins)	Consultant can assist with confirming connectivity
Secure Bus Access	Consultant	CTA to know about the 8-minute timeout to move a bus for a Road Call

4 PARTS (CATEGORY B)

All warranty and non-warranty parts required to support the Clever Devices on-board systems shall be provided by and maintained by Consultant's field technicians. The technicians will utilize CTA capital spares and parts obtained from buses slated for retirement.

Consultant will monitor availability and procure parts via CTA stock room or prices quoted in price proposal. The following table summarizes the Parts issues across the bus types:

System	Parts Availability	Parts and Spares Acquisition
IVN4	Estimated available: 172	Can harvest off old Novas when they retire.
IVN5		If supply is depleted CTA will order from Consultant through-NAPA.
TCH-DVI	Estimated available: 153	Will obtain more through bus procurement process
TCH-VGA	Estimated available: 22	Can convert DVI to VGA as a swap one for one
LED Sign	Estimated available: 70	We can get some off buses when we retire them.
QuadBand Antennas	Spares obtained from Utility via CTA	If supply is depleted CTA will order from Utility/Mobile Mark through NAPA
Wi-Fi, GPS and Cellular Antennas	Only needed for buses without Rockets (old Nova, old New Flyer arctics)	We can get some off buses when we retire them.
Nova Bus InfoDev Sensors & Controller	Estimated available: 11	If supply is depleted CTA will order from Consultant through NAPA
Clever Devices APC Receivers/ Transmitters / Controllers	Spares obtained from Consultant via CTA stockroom	If supply is depleted CTA will order from Consultant through NAPA
EA Switches	Estimated available: 117 (old Nova style only)	All EA switches are the responsibility of CTA via the NAPA contract.
Handsets	Estimated available: 96	All handsets are the responsibility of CTA via the NAPA contract. (New Novas are a different part, NAPA can source the other handsets from CleverDevices.)
Radio Relays	Consultant has spares	If supply is depleted CTA will order from Consultant through NAPA.
AVC Sensor	Spares obtained from Consultant supply	If supply is depleted CTA will order from Consultant through NAPA.
Speakers	Spares obtained via CTA stockroom or new Nova warranty	If supply is depleted CTA will order from Bus OEM through NAPA.

4.1 ANNUAL PARTS COST

Consultant will provide Extended Hardware Warranty on all Clever Devices parts and subcomponents for each vehicle after the hardware warranty from the original equipment manufacturer of the bus expires.

Hardware warranty includes the repair or replacement of Clever Devices parts and subcomponents that fail during the term of the contract period. The CTA spare parts pool will be used to make immediate repairs to buses with Consultant replenishing that pool when utilized. Consultant will provide an itemized costing of parts which are not identified as proprietary to Clever Devices.

The Extended Hardware Warranty as defined by this Statement of Work will not cover the following "Non-Warranty" causes:

- Component circuitry damage caused by a failure to disconnect any of the ITS Hardware Sub-systems prior to performing welding on the vehicle.
- Damage caused by bus systems or other on-board systems to which the ITS Hardware is connected will not be covered under this warranty.
- Any non-warranty failure or a failure of the Clever Devices' hardware caused by misuse, accident, fire, water damage, or vandalism, or a failure of components due to fault of the vehicle manufacturer to follow Clever Devices installation practices, or generally accepted manufacturing practices in the installation of this equipment.
- Parts or subcomponents stolen from the bus.

Parts replacement from "Non-Warranty" causes may require that additional spares be purchased by CTA, upon recommendation and documentation from Consultant, via Task Order to replenish the spare inventory.

4.2 CURRENT CTA INVENTORY & PARTS HARVESTING

Any parts that the CTA owns will remain the property of the CTA but will be managed and installed by Consultant field technicians.

CTA will harvest parts from old and retired buses upon the removal of a bus from revenue service. We may require some assistance from Consultant to properly remove old equipment and prep for reuse. Consultant will quote any effort at removal and reuse of equipment that exceeds a demand of 50 buses in a calendar year.

4.3 MATERIALS MANAGEMENT PLAN

Consultant will provide a quantity estimate and a quote to have the necessary spares on hand. Consultant to quote this as a separate capital line item, and not part of the annual parts cost.

4.4 MONTHLY FSR SUMMARY

The monthly Field Service Report (FSR) summary will identify parts use by garage and bus so that adequate planning is determined. The Monthly FSR summary will indicate if parts are covered or not covered under the extended parts warranty. Advance notification of depleting spare availability due to non-warranty repair will come with the monthly FSA summary.

4.5 ON-BOARD COMMUNICATIONS SYSTEMS

Consultant is responsible for the physical on-bus data communication systems. Modems will be furnished by CTA staff to Consultant field service technicians configuring the modems and replacing devices. The Utility Rocket devices are also provided and managed by CTA. The cellular air cards for the Utility Rocket are also provided and managed by the CTA.

4.5.1 ROCKET MOBILE COMMUNICATIONS DEVICES

Currently some buses have the Rocket Mobile Communications Device provided by Utility. There are four serviceable parts to a Rocket Mobile Communication Devices: Antenna (two identical Mobile Mark Quad Band antennas}, Timing Device (similar to a Charge Guard), Four Port Ethernet Switch and the Rocket itself. The CTA will provide Consultant with sufficient spares of these items at the execution of the contract.

The overall service and replacement responsibilities are outlined in section 2.13.2, CTA’s Responsibilities.

4.6 SERVICE LEVEL AGREEMENT – HARDWARE SYSTEMS AND INTEGRATION (SLA-HW)

The following table outlines the Service Level Agreements (SLA) for the parts components of the Clever Devices systems and integration.

	Support	Critical / Non-Critical	Response Time
IVN	Repair and replacement	Critical	72 hours from MMIS assignment to Consultant
LED / Speakers	Repair and replacement	Non-Critical	96 hours from MMIS assignment to Consultant
TCH	Repair and replacement	Critical	72 hours from MMIS assignment to Consultant
APC	Repair and replacement	Non-Critical	96 hours from MMIS assignment to Consultant
Cellular	Replacement	Critical	72 hours from MMIS assignment to Consultant
Mobile Card	Replacement	Critical	72 hours from MMIS assignment to Consultant

Service Level Agreement (SLA) refers to the minimum level of performance the Consultant agrees to adhere to for each Performance Metric. Requirements which do not follow the standard process, as agreed to by the Parties, are exempt from SLAs. Consultant should offer credits to CTA that will be available when it fails to meet the required Service Levels.

The Consultant is required to report monthly on the adherence to the prescribed SLA. Any material failure to meet SLA conditions shall result in a credit to CTA of training hours (or related professional hours) to be used during the duration of the contract.

Credit is applied to the “At-Risk Amount,” defined as 1% of the fee invoiced to CTA for the month the performance credit was incurred (excluding pass-through expenses, such as taxes and reimbursed out-of-pocket expenses). The At-Risk Amount will be credited into a “At-Risk Bank Account” each month the Consultant meets the required Service Levels across all performance metrics. For the months that Consultant does not meet the required Service Levels across all performance metrics the At-Risk Amount will be debited at 3% from the At-Risk Bank Account. The At-Risk Amount will begin at 2% for the first occurrence of the service level not being met and increase by additional 1/2% for the second and third consecutive months of missed service level. At Risk In the event the At-Risk Account balance does not meet the At-Risk Amount for the month, Consultant will apply a negative credit to the At-Risk Bank Account. At annual renewal of Contract the At-Risk Bank Account will be transferred as credit to CTA for training hours or for use as credit to a professional service.

5 PROFESSIONAL SERVICES (C)

The dynamic nature of complex Intelligent Transit Systems (ITS) requires a nimble mechanism for emergency enhancements or modifications often outside the scope of a static statement of work (SOW). A bank of funding for short single deliverable activities to be quoted and executed in a timely manner shall be established.

5.1 VOICE TALENT & RECORDING SERVICES

Currently the CTA utilizes a third-party professional voice talent for all stop announcements and public service messages. A mutually agreeable studio, local to Chicago, will be selected for annual recording needs. The current demand is three to four studio sessions per year, lasting between two and six hours; these hours include post recording editing time.

The following is understood:

- Minimum session needs to be one hour.
- If the session goes over the booked time, it may have to end early (i.e., if there is another appointment booked). If there is not another appointment, CTA can continue with recording. It is also possible to move the other studio if available.
- Recommendation is to book a three-hour session two weeks in advance
- The studio needs the copy at least one hour in advance of the session, but prefers earlier
- The recording and editing time are built into the hourly rate. The producer normally edits after the voice talent is finished recording the audio phrases. CTA can wait for the files if there is ample time in the session or allow the studio to finish in off hours and pick up the files later.
- The audio files will be recorded in .wav format at 44 16-bit mono.
- The audio files can be given to CTA via FTP or on an 8-GB thumb drive (provided by CTA)
- The studio will provide two slates of each phrase to Consultant.
- CTA shall reserve the right to unlimited use of the recorded voice of the actor for CTA purposes.

Process for Consultant to pay studio:

- 1) Consultant to setup Studio PO and make sure terms are Net-15 days; Studio will receive a Consultant PO number to invoice against when services are provided.
- 2) When studio services occur:
 - a) CTA to open request with Consultant.
 - b) Studio session occurs
 - c) Studio emails invoice to Consultant Accounts Payable: AccountsPayable@Clever Devices.com
3. Once invoice received, Consultant will obtain Project Manager approval and process the invoice in the Consultant system
4. That will trigger a Consultant check to be issued to studio based on net 15-terms
5. Check will be mailed to Studio, which should receive it within the 30 days or less.
6. Consultant will invoice CTA for the Studio Services based on the agreed upon rate.
 - After the recording studio session, files are sent to Consultant for final mastering and preparation for import into CleverWorks.

5.2 SSL CERTIFICATES AND WEBSITE HOSTING

The CTA requires SSL certificates to support several internal applications related to the BusTime, CTA bus tracker public facing portal etc. To consolidate all aspects of the SSL certificates and certificate management necessary for each of the Consultant installed or Consultant hosted systems into a single contract, Consultant will maintain annual relationship with certificate provider in consultation with CTA-IT Senior Manager. Consultant will pay for the annual certificate renewal and coordinate with CTA-IT or 3rd party hosted vendors (ex. American Eagle, CTA BusTracker) to install and manage the certificate annual renewals. All certificate renewals should occur before its scheduled termination period.

5.3 TRAINING

Recognizing the need for quality staff to maintain the complex systems that support the Clever Devices system a training program is requested. A bank of funding for travel for Consultant staff and CTA staff CTA staff to attend workshop and user group meetings will be established. Training is critical to the overall successful operation of all systems covered in this agreement.

Training shall be provided for each of the identified applications as annual refresher and introduction to upgraded feature functionality. This training shall include the overview of system applications for end users, managers, and system administrators. This training shall occur on a case-by-case basis with every upgrade which is implemented a CTA. Training services shall include an annual exercise to review all the installed product features that are not used in the CTA's business process and suggest feature wise adaptation values. Consultant will provide updated user guides and admin guides for every system and release newer guides with every upgrade on an existing system. Training includes developing job aids for specific features when requested by the CTA-IT.

- Real-Time Data & integrations with other CTA enterprise systems
- BusTime (BusTracker) & API
- CleverWorks
- Buslink Server Support
- BusWare
- Fleet Manager
- AVAS Data Ingester
- AVM3
- CleverCAD Servers
- Including updated/enhanced applications as implemented and licensed to CTA

5.4 MODIFICATION DAYS BUCKET

Consultant will provide the CTA with an annual bank of 60 person-days of Consultant staff time. The 60 days are to be banked annually at the time of payment. This time can be used for example and not limited to:

- Update a system operation to meet the unique customization of the software
- Make modifications to the Software
- Enhance interfaces with other enterprise applications
- Develop job specific training materials for the CTA,
- Train personnel on CTA's premises,
- Develop new reports
- Make additions and/or modifications requests made by the CTA assigned project manager.

The CTA determines the use of these 60 staff days. Non-used days will be accumulated during the term of this SOW and all accumulated days not used during the term of this contract will be rolled into subsequent contracts if the CTA renews this Agreement without interruption.

The usage of modification days should be documented in a tracker by the consultant, and each use must be pre-approved by the CTA Project manager. The time needed by Consultant personnel to perform modifications requested by the CTA under this Agreement and that are not defects as defined in the present Agreement will be deducted from this bank, on approval from the CTA project manager. If the 60 days allotted have been completely used and there is no accumulated balance from the preceding years then, the time necessary to perform any work requested by the CTA under this Agreement except for work required for defects as defined in this Agreement, will be charged to the CTA by Consultant according to current rates for Consultant personnel.

6 MISCELLANEOUS ITEMS (CATEGORY C)

The final section outlines miscellaneous project management actions related to the contract.

6.1 SUPPORT PORTAL

The Consultant will provide an online support portal to authorized CTA personnel. Portal will include product guides, admin guides, release version history, training content, training videos and related product information that are licensed to the CTA. The same (or another) Consultant managed portal should provide an online ticketing system to enter / review / update incidents related to a software / system / hardware defect and request for changes to system / configuration.

Upon identification of a possible fault or difficulty in using any of the software or expected hardware features, CTA will promptly issue a sufficiently detailed trouble ticket to Consultant via Consultant 's Customer Portal, phone or other medium agreed by both parties. The trouble ticket issued by CTA will identify required information such as: Date of performance anomaly, the symptom of performance issue, software modules in question, hardware component in question, description of the issue, user's contact information, and the priority of the issue. Consultant will acknowledge all trouble tickets in accordance with the SLA goals and acknowledge the issue via a ticket number. Consultant will assign the ticket to a care representative whose product expertise and technical skills matches the issue reported. Portal will allow authorized CTA staff to review all status updates, review issue progression history, and provide additional information to existing open incidents. The portal will serve as a knowledge base for all CTA-reported incidents and will be used by both the CTA and Clever. The portal will include ability to report on a software or hardware issue maintained and managed by the Consultant. Reports on # of tickets opened, closed, resolution taken, duration the ticket was open and other key information will be made available in a monthly report dashboard.

Project Manager — Consultant will assign a customer service Project Manager to the CTA. The dedicated manager will work with CTA on all support related follow-up requests and will work directly with CTA's key business leads. The assigned manager will:

- Act as a liaison between consultant and CTA for support issues and shall be available for regular meetings with CTA to review status of issues. The Account Manager will work on escalated issues with consultants' internal teams like product owners, developers, analysts, DBA's, SQL writers, and technical gurus to coordinate a timely response to the CTA.
- Facilitate understanding of CTA's business objectives and provide cross-functional and product enhancements to meet CTA's defined business outcomes
- Responsible for maximizing adoption and feature utilization of all products licensed to the CTA. Coach business users on features of the system that are not well or fully utilized by the CTA business or IT groups and coordinate for training or adaptation procedures.
- Review indicators of success designed to enhance CTA's experience and uncover opportunities for improved adoption, education, or engagement
- Report achievements, SLA adherence, value realization, and maintain a strategic alignment for the lifetime of the contract.

- Develop and maintain ongoing success plans, roadmaps, upgrade plans, feature adaptation plan in collaboration with Consultant's internal subject matter experts and leaders.
- Produce Executive Business Reviews to maintain strategic alignment at the leadership level, review achievements, highlight opportunities and collaborate on a mutual success plan to account for the future technology. Distribute and review the SLA for the month and discuss areas for improving the service quality.
- Assist CTA in establishing communication with other Transit industry clients that also make use of consultant's products with the intent to exchange product implementation ideas and experience.
- Meet with representatives of the Authority and other interested parties as may be required in connection with the provision of the Scope of Work.
- Maintain an Action Tracker that outlines all outstanding issues. Distribute reports on an as needed basis and at a minimum prior to the monthly meetings.
- Host a monthly onsite meeting between CTA and Consultant 's leadership to evaluate and provide direction on roadmap, concerns raised by CTA, and deep dive on technical issues and status. Both sides will mutually agree on the date so appropriate arrangements can be made. Plan the agenda, participants and distribute updated Action Tracker reports 16 business hours prior to the monthly meeting for review. The monthly meeting is expected to be a full working day so that issues are itemized and addressed as appropriate with relevant CTA and Consultant project and specialized product owners.
- Conduct monthly table topic exercises on how a system is utilized, implemented at CTA and what features are not utilized.
- Work with the CTA on developing a statement of work required for future Task Orders and provide quotes on the level of effort involved.
- Participate in Task Order requirements gathering sessions and in IT change control procedures.

6.2 WEEKLY CALL AND MONTHLY MEETING

The CTA and Consultant project management team will host two weekly calls to discuss open issues, critical issues, and the action tracker. Holidays and general exclusions will be mutually agreed upon the week prior. Both sides will mutually agree on the date so appropriate arrangements can be made.

In addition to the weekly call, the CTA will host a monthly Consultant status meeting. The meeting will be scheduled on-site (567 W. Lake St.) at least once every month and by conference call if weather precludes meeting on-site. Both sides will mutually agree on the date so appropriate arrangements can be made. Consultant will maintain the action tracker and distribute 16 business hours prior to the monthly meeting for review. The monthly meeting is expected to be a full working day so that issues are itemized and addressed as appropriate with relevant CTA and Consultant project staff.

Consultant will host a monthly virtual executive meeting with CTA and Consultant Governance committee. It will include a formal presentation to cover the topics such as:

- Technology operations status
- SLA for the month and quarter
- FSR monthly report
- Percentage of defective AVAS by garage and month
- Summary of project status
- Financial review
- Updated list of software versions installed at CTA
- Updated list of Consultant or Consultant's sub-contractor personnel on site at CTA facility
- Updated list of Consultant contractors or sub contractors with access to CTA VPN
- Updated listing of spare parts in inventory
- Concerns or escalations to CTA governance committee

- Provide updated or additional content that may be requested by CTA governance committee as needed.

6.3 DATA OWNERSHIP

The Clever Devices database and the data contained within are owned by the CTA. Excluding any out of the box documentation provided with Maintenance, documents developed and distributed to the CTA as part of executing any portion of this contract, including Professional Services and future Task Orders, are owned by the CTA but may not be published or distributed outside of CTA. The Consultant will not reveal any confidential or non-confidential information without prior authorization from CTA. All data produced by Clever Devices systems and hosted on a CTA server or an external hosted server as part of this contract remains the property of the CTA for extraction, consumption and integration with or by other enterprise systems or portals or other databases (for example and not limited to - AVASDATA, RTBM, RTBMHIST, AVM, MMIS etc.) to support CTA's offline, online, or near real time analysis or for collaborating with other 3rd party applications with intent of improving overall service and overall performance metrics.

Consultant agrees that the CTA has right to develop interfaces including data and web-services that can extract, transform, report, copy, and interface with Clever Devices database in a manner which does not alter the source code or write to database raw tables. CTA agrees that before implementing such an interface to operational use, CTA will work with Consultant to ensure the interface will not adversely affect the database performance or cause software application performance issues. Consultant agrees to provide support and maintenance to all standard interfaces developed and delivered by Clever. Consultant also agrees to provide support and maintenance for any interfaces created by CTA after Consultant has reviewed the CTA developed or modified interfaces and Consultant has approved its operational use. Where necessary, Consultant will provide a cost proposal via modification days use and/or additional price quote, to review and provide corrections to CTA's custom-built interfaces on a case-by-case basis.

6.4 REMOTE LOGIN TO ENVIRONMENT

Upon request from the Consultant and on CTA's approval, CTA will supply the named entities of the consultant with a method to access the installed software remotely for maintenance and support purposes. The consultant must comply with CTA security and remote access policies in order to gain access to the CTA's environment.

6.5 CAPITALIZED TASK ORDER

At times deemed necessary CTA may request a Task Order for work capitalized across the fleet. Such work may include system enhancement(s) and upgrade(s) that require professional service(s).

The Consultant will be expected to perform additional scope of services on a per Task Order basis. Maintenance and the procurement of additional licenses are considered optional, and the Consultant will only provide maintenance or procure additional licenses if directed to do so by the CTA in a Task Order.

The Consultant is to be the sole point of contact for all system enhancements, operation, testing, training, warranty, problem determination, and resolution of the Clever Devices system and integrations with Clever Devices system for matters related to Task Orders under this sub-section, unless otherwise agreed upon in the Task Order scope.

All projects and Task Orders that will be associated with this contract will have a Scope of Services and accompanying Level of Effort to be agreed to by the CTA Senior Manager – Transit Systems, General Manager Purchasing (or designee), CTA Budget Analyst, and the Consultant prior to the start of work. All labor costs will be based on fully loaded hourly rates. All tasks will be coordinated through CTA's Senior Manager – Transit Systems and appropriate department subject matter experts, as appropriate and agreed upon for specific Task Orders.

Throughout execution of each individual Task Order, the Consultant is expected to account for the following considerations:

- **Ease of use:** Maintain consistency with current configuration to ensure that the system remains intuitive to use, maintains a common vernacular (language in everyday use), and provides a consistent graphical user interface, retains system performance, maintain existing system integrations, and associated reference materials.
- **Configuration:** The system shall maintain the ability for the CTA to perform future configuration.

6.5.1 EXPECTED TASK ORDER REQUIREMENTS

The Consultant will assist the CTA with the enhancement to the Clever Devices product, so that the product is configured and integrated to reflect CTA's business processes and the emerging structure as well as retaining enterprise systems integrations and terminology. Specific requirements and tasks will be established within each Task Order. It is expected that each Task Order will contain and require one or more the following elements, as appropriate and will be detailed in the agreed upon scope of work for each Task Order. All scope of services that are implemented with a Task Order will include a narrative on services that will be provided against each of the below sections.

- **General Requirements**

The Consultant will assign a project manager for each Task Order originated with this contract. The Consultant shall be responsible for all planned project management processes including, but not limited to, project requirements, schedule, cost, risk management, communication management, quality management, contract management, steering committee engagement and contract Task Order administration.

- **Project Plan**

The Consultant shall be responsible for ensuring all project milestones and dates are met. The Consultant must develop a realistic schedule, a comprehensive work plan, and a thorough project management approach. The Consultant must provide the following:

- A project plan and schedule showing the timeline to accomplish the identified tasks.
- Summary of required time, input, and data from CTA staff members, based on the selected and/or desired enhancement.
- Identify milestones for major activities in each Task Order and obtain CTA's approval on a per milestone completion criteria. Each milestone should be signed off by both parties to ensure it meets the established milestone criteria defined during the project planning phase.
- **Communication**

The Consultant must develop a communications plan, stakeholder engagement plan, and approach. The Consultant must work with the CTA's project manager at regular project meetings and must document project status reports, risk mitigation plans, open and closed issues, accomplishments, milestones, quality control, and meeting notes. The Consultant shall also coordinate and work with a change management team for approvals in baseline changes of scope, cost, schedule, and quality.

- **Supplementary Project Management Tools**

The Consultant must use project management tools and technology aligned or compatible with those used by the CTA (Microsoft Office, Microsoft Project, Visio). The tools used must be licensed, compatible, and versioned like the ones used by the CTA. Post project enhancement, all related documentation and data will be owned by the CTA.

- **Functional Specifications**

The Consultant will work with the CTA to develop functional specifications and scope of work for desired Task Order. The collaborative functional specification must describe how a product, enhancement, or business process will work entirely from the CTA's perspective, along with associated service level expectations, as applicable. The documentation must focus on features required without defining how it is

to be implemented. A general concept for necessary screens, menus, processes, dialogs, flowcharts, and data flow diagrams should be inclusive in the functional specification document.

- **Technical Specifications**

On approval of the functional specification by CTA, the Consultant must develop necessary technical specification to describe the implementation of the program. This includes providing a technical overview and approach, an architecture diagram that includes required updates necessary to existing DEV/TEST/PROD server, references data structures and data flow, updates to training guides, administrative guides, relational models, choice of algorithms available, reports, choice of 3rd party licenses etc. within the technical design specification document.

- **Enhancement Playbook**

In advance of enhancement execution, the Consultant must develop enhancement playbooks that identify detailed tasks in sequence required to perform the enhancement. The playbook must identify tasks, staff assignments, delivery dates, and required information expected from the CTA in order to perform contracted enhancements.

Pending enhancement complexity, the Consultant may be required to perform a proof of concept at the beginning of enhancement execution for CTA review and approval prior to executing full implementation.

- **Enhancement Execution**

After approval of the enhancement playbook the Consultant must perform enhancements in accordance with specific Task Order requirements. This will require adherence to previously developed functional and technical specifications in accordance with the schedule established in the approved enhancement playbook.

- **Custom Reporting, KPI's, API's. Configuration Updates**

In accordance with specific Task Order requirements the Consultant must develop custom reports, KPI's, APIs, and documentation about upgraded configuration as needed to coincide with enhancements, increased system load, and added user groups. Specific requirements will be developed based on collaborative discussions with CTA stakeholders and are expected to support long term maintenance and capital planning.

- **Testing**

The Consultant will create and execute a test plan that verifies all the requirements of the system as set forth in the scope of services and in accordance with specific requirements listed within each individual Task Order. Success and failure criteria are to be established before the testing occurs. Both the test plan and the success criteria will be subject to CTA approval. Upon test completion, the Consultant shall provide the CTA with a report of all results. Final decision on test pass/fail rests with the CTA project manager.

Testing should cover:

- **System Testing:** The Consultant must ensure all the components of the Clever Devices system are working properly and meet business and technical requirements. System testing must also include all reports and imports/exports with other CTA enterprise systems. System testing should include integration testing to ensure the data flows through all system / sub- systems / connected systems. System testing shall be conducted in development instances, and in alignment with enhancement development stages.
- **User Acceptance Test (UAT):** CTA users test the usability of the application and its reports and integrations with other CTA enterprise systems in a test environment. User acceptance testing shall be conducted in testing/development instances.
- **Device and System Load and Stress Testing:** As enhancements are created and/or implemented, testing will be required to ensure that the core system and the mobile system, as well as

associated hardware, support increases in usage and can sustain desired performance levels. The consultant will install necessary stress testing tools that are licensed for use in the CTA Dev/Test environment and will provide reports on stress testing outcomes for approval by the CTA Project Manager.

- End User Training

If agreed by the Parties in the Task Order, the Consultant will provide a training plan executed at CTA's location or at a location approved by the CTA. The Consultant may train the CTA staff in groups, using the "Train the Trainer" format. The training shall be provided in phases to the project staff and testing staff at the start of user acceptance testing and provided again to the trainers identified by the CTA post system acceptance. The Consultant must develop all training materials and coordinate with the CTA (Learning and Support department) to finalize the training materials and training format.

- Deployment

The Consultant is responsible for the final execution of the enhancements to the system and must ensure that it contains all necessary data inputs, ancillary data, configuration settings, and required initial data transfers. The Consultant is responsible for support of deployment of the final application, following approval testing and acceptance by CTA. The Consultant should recommend a deployment schedule and is required to collaborate with CTA IT to ensure successful deployment execution. The Consultant should develop and release to CTA for approval a deployment checklist that at a minimum includes all activities to be completed for a successful deployment in a proper sequence and the person responsible for the execution of each task.

- Schedule

The Consultant must draft and maintain a detailed project schedule. Consultant should list specific risks (and mitigation tactics) that arise from the schedule constraints. Final approval of the project schedule will be at the sole discretion of the CTA. Consultants must provide a milestone deliverables schedule for the enhancement implementation, including proposed earned value of professional services at each milestone. The CTA will review and approve the requirements modifications and implementation plan. Upon acceptance of each milestone, the Consultant will be authorized to submit invoices for payment.

- Version Upgrade and roadmap

If agreed by the parties in the Task Order, the Consultant must support CTA IT and provide recommendations with determining the appropriate time to implement upgraded versions as well as identify the strategy for upgrade and necessary sequential steps to be conducted.

- Hardware Need Identification & Support

The Consultant must define any hardware required to properly run the Application to deliver the Task Order and to meet the CTA's performance criteria. The Consultant shall provide notification to the CTA of hardware and infrastructure requirements in advance of performing any enhancements that require current configuration changes. The Consultant, per Task Order specifications, will be required to work with designated CTA IT staff to ensure the hardware for each environment is set up and configured.

- License Procurement (as required)

There is the potential that the Consultant may be required to procure and/or provide additional licensing through this contract. In the event of this occurrence, such purchase shall be done under a new Task Order which shall cover any necessary licensing or legal terms.

- Licensing
- Licensing requirements for both mobile and the desktop application.
- Technical Support:
- Provide information on annual technical support programs, specifically outlining included and excluded services

6.5.2 ANTICIPATED DELIVERABLES

Consultant shall not perform any work or services until a Task Order has been issued.

In an effort to provide Consultants with an expectation of scopes of work and deliverables that may be performed under this contract, a sample of long-range enhancements from CTA's Transit Systems roadmap are provided below. Note that the proposal response does not require pricing for the following items; rather, pricing of these items will be negotiated on an as needed basis when Task Orders are requested. The scope of service for each Task Order should include a response to each section in 2A: Expected Task Order Requirements.

Examples of Potential Upgrades / Enhancements - including but not limited to:

- Integration with 3rd Party High Availability (HA)

Task Order to integrate DCC with 3rd party software (example – Neverfail) to include services critical to DCC operations - DCC Server and DCC Updates services. The HA Engine should be configured to start, stop, and monitor these services on the Clever Devices DCC Real-Time Communications servers. In the event of a failure of a protected service the business continuity system should be configured to recover the protected service on the first failure and failover to the backup server if before a third failure occurs.

- TSP (Transit Signal Priority)

CTA is in coordination with CDOT and will require enhancements to Consultant services to implement a centralized TSP architecture. This will include all tasks for leveraging the advanced traffic controllers and communication, such that TSP requests will be sent from the bus to the central system at CDOT to the controller in the field thereby eliminating the TSP field devices. This requires extending the TSP functionality and enhancing it to support all current and future corridors up to 1900 buses. Consultant expertise and support are necessary to implement the centralized TSP architecture. Essential services include the hardware & software on buses and at the intersections plus any related software and networking elements that are parts of this TSP system and require technology's and Consultant's input and direct assistance with identifying upgraded equipment, installation, troubleshooting, software updates, configuration updates and documentation, and maintenance. Services will include additional data collection points, faster messaging frequency, and reporting that is important for the analysis and functioning of TSP. Technical configurations and updates on data storage capacity and changes to ensure CTA's Buslink and CDOT's MIST server are properly linked to the Iteris or other reporting software. Licensing updates to have one shop licensing for all 1900 buses will be essential.

- ITS Technology Upgrades

Task Order to provide hardware and make software upgrades to onboard ITS technology to procure, install, deploy, and configure all Clever Devices provided and supported hardware including and not limited to IVN, controller kits, peripherals, connectors, APC, handset upgrades etc. The Task Order will include an Acceptance Test Procedure (ATP) completed to validate each bus installation and each upgrade done. Functional failures or quality of workmanship issues found either during the ATP or subsequent bus inspections must be corrected by Consultant and approval signed by the Installation Supervisor as well as CTA Inspector. The total number of IVN5 purchases should take into consideration CTA's current program to purchases of new buses over the next several years.

- Fleetwide Router, Modem or Cell Card Replacement Option

CTA may request via Task Order a scope of work to cover Consultant's services for Fleetwide Cellular replacement, modem replacement, router replacement or any communication component replacement in the Bus vehicle.

- CAD Mobile for Street Supervisors

Supervisors make service decisions, such as Short Turn adjustments, hold runs, turnback, reliefs etc. Task Order to deploy software services through a CTA chosen tablet device to Street Supervisors allowing supervisors to enter Disruption Management adjustments proactively into the application and

allowing updates to both the driver in real time as well as the BusTime prediction engine, GTFS, GTFS-RT, Real time API immediately. Supervisor Tablets or laptops will be provided and managed by CTA and the device configurations will be recommended by the consultant.

- AVM-On-Demand

Module for AVM provides the ability to view faults and performance monitors live on a bus in service. The ability to monitor engine performance and ambient air temperature along with a look at faults in real-time can improve the ability to respond to road calls (or keep the bus in service after determining remotely that it is safe). Will require a fleet-wide license to use on all capable buses.

- CleverCAD Quick Launch Tool

Task Order to integrate CleverCAD with third-party applications by right clicking on a bus/event/incident and launching a command line or URL string with parameters (example - bus number).

- CleverInsights Implementation (RideCheckPlus Replacement)

CTA may request via Task Order to implement CleverInsights ridership reporting application which provides all the tools to clean, validate, visualize, and report on ridership levels. CleverInsights allows agency checkers to enter data directly into the application, minimizing processing time and discrepancies when copied over. Additionally, after processing occurs, users can view APC survey results side-by-side with checker surveys, allowing administrators to calibrate and build confidence in the APC system.

- Manual PSA LED Sign Flash

When a Public Service Announcement (PSA) is played manually either by the operator of the bus or via CleverCAD, flash a pattern on the LED sign to attract the attention of the hard of hearing (ADA request).

Process improvements and its integrations with key CTA business processes. Example – automate rollout of Bus inspection and operator checklists as part of daily / monthly / quarterly checks.

- Open Architecture & Open API integrations

One way or two-way Interaction / Integration between Clever Devices systems and CTA's enterprise systems, based on open Architecture and/or use of open APIs. This update will be done as a Task Order. Detailed specifications will be created at that time. As an example, core business systems that should integrate with the Clever Devices system are outlined below:

- Geographic information system: GIS
- TOPS
- Hastus
- Farebox
- Ventra
- Automatic Passenger Counting
- Automated Voice Announcement
- Infotainment / on board video screens
- Swiftly or other third party for improvement of prediction data
- MobileEye / Active Detection Collision Avoidance
- TSP / CDOT
- Other connected vehicle technology

Type of information that would be required and not limited to -

- Real time bus location
- Bus number
- Route / block
- Stop level information
- Hard brake
- APC counts
- Others

As enhanced and upgraded on-board technologies are installed on up to 1,900 buses subject to this SOW, CTA may ask Consultant to add maintenance for the system(s) at a negotiated rate via a Task Order.